APPENDIX F

NON-HCP LISTED SPECIES INFORMATION

BIOLOGICAL ASSESSMENT

FOR THE

NiSOURCE MULTI-SPECIES, MULTI-STATE HABITAT CONSERVATION PLAN

NON-MSHCP SPECIES

MARCH 2011

NiSOURCE MULTI-SPECIES, MULTI-STATE HABITAT CONSERVATION PLAN

BIOLOGICAL ASSESSMENT

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1.0 INTRODUCTION

1.1 PURPOSE OF BIOLOGICAL ASSESSMENT

The U.S. Fish and Wildlife Service (USFWS, Service) is in receipt of an application from NiSource Gas Transmission and Storage (NiSource) for an Incidental Take Permit (ITP), pursuant to Section 10(a)(1)(B) of the Endangered Species Act of 1973 (ESA or Act), as amended. NiSource is requesting this ITP in association with the operation of their natural gas pipeline system (Proposed Action). As required to receive the ITP, NiSource has drafted a Habitat Conservation Plan (HCP; NiSource 2011) which identifies expected impacts to listed species and describes how the project will be designed to minimize or mitigate those impacts. Theoperation of this pipeline system requires the involvement of other federal agencies, including the Federal Energy Regulatory Commission (FERC), United States Forest Service (USFS), National Park Service (NPS), and United States Army Corps of Engineers (USACE, Corps). These agencies will be collectively referred to as "cooperating agencies" herein. Therefore, this is both a intra-service (within the USFWS) and inter-service (with other federal agencies) consultation.

It has been determined by the Service that the ITP would constitute a major federal action requiring review under the National Environmental Policy Act (NEPA) 42 U.S. Code (USC) § 4321 et. seq.), and as such, the USFWS is developing an Environmental Impact Statement (EIS; USFWS 2011) under NEPA to analyze its action on the ITP Application and connected action of approving NiSource's implementation of its HCP.

This Biological Assessment (BA) assists the USFWS and cooperating agencies in fulfilling their obligations under Sections 7(a)(2) and 7(c) of the ESA. Section 7 consultation is required when a federal action may affect listed species or designated critical habitat (50 CFR 402.14). Informal consultation is completed for those federal actions that may affect, but are not likely to adversely affect listed resources. Formal consultation is necessary for those federal actions that are likely to adversely affect listed resources. This BA will help address the federal agencies' requirements for both informal and formal consultation for the proposed action.

1.1.1 SPECIES EVALUATED

In addition to species that are covered by the HCP (HCP species), the consulation includes species that are not part of the HCP (non-HCP species). This BA evaluates effects on the non-HCP species, wheras the effects of the proposed action on the HCP species are documented in the HCP itself. Between these two documents, this BA and the HCP, consultation will be initiated for all species that may be affected by the proposed action.

The HCP evaluates the potential for the operation of NiSource's pipeline system to impact a total of 43 listed species (see Section 1.2.2 or more information). Of these, the HCP documents that 24 species will not be affected (no effect) by the proposed action. Of the remaining 19 species, NiSource has requested take coverage for ten, indicating that they are likely to be adversely affected by the proposed action. The remaining nine are not likely to be adversely affected because NiSource has agreed to implement avoidance and minimization measures (AMMs) or best management practices (BMPs) to avoid taking these species. The HCP provides the full analysis of effects on these 43 HCP species.

This BA addresses the potential for impacts on the additional 46 non-HCP species (Table 1). This list includes not only those species that are currently listed as threatened or endangered, but also species that are proposed for listing or are candidates for listing under the ESA. Section 7(a)(4) of the Act requires federal agencies to 'conference' with the Service for actions that are <u>likely to jeopardize</u> proposed species or <u>destroy or adversely modify</u> proposed critical habitat. A conference is a process similar to consultation, but the Incidental Take

Statement provided with a Conference Opinion does not take effect until the Service adopts it as its Biological Opinion, after species is listed. Although federal agencies have no requirements under the ESA to conserve candidate species, the Service encourages proactive measures that improve the status of candidiates and may avoid the need to list those species in the future.

As a matter of policy, the Service treats proposed species as if they were already listed as threatened or endangered, and thus, since this is also a intra-service consultation, the Service will be consulting on the proposed species identified in Table 1. Further, Service policy dictates that we treat candidate species as if they were already proposed for listing. The Service will be completing the necessary conference requirements for the candidate species identified in Table 1. Therefore, all of these species will be considered in this BA.

Table 1. Non-HCP species addressed by this BA.

Common Name	Status
Birds	
Piping plover & critical habitat *Charadrius melodus*	T (Louisiana) E (Ohio)
Red-cockaded woodpecker *Picoides borealis*	E
Fish	
Diamond Darter *Crystallaria cincotta*	C
Kentucky arrow darter *Etheostoma sagitta spilotum*	C
Pallid sturgeon *Scapnirhynchus albus*	E
Pygmy madtom *Noturus stanauli*	E
Roanoke logperch *Percina rex*	E
Spotfin chub *Erimonax monachus*	T
Mussels	
Dwarf wedgemussel *Alasmidonta heterodon*	E
Fat pocketbook *Potamilus capax*	E
Fluted Kidney shell pearlymussel *Ptychobranchus subtentum*	C
Orangefoot pimpleback pearlymussel *Plethobasus cooperianus*	E
Pink mucket pearlymussel *Lampsilis orbiculata*	E
Rabbitsfoot *Quadrula cylindrica*	C
Rayed bean *Villosa fabalis*	PE
Ring pink mussel *Obovaria retusa*	E

Common Name	Status
Rough pigtoe *Pleurobema plenum*	E
Slabside pearlymussel *Lexingtonia dolabelloides*	C
Snuffbox *Epioblasma triquetra*	PE
Spectaclecase *Cumberlandia monodonta*	PE
Plants	
American chaffseed *Schwalbea Americana L*	E
Eastern prairie fringed orchid *Platanthera leucophaea*	T
Globe (Short's) bladderpod *Lesquerella globosa*	C
Harperella *Ptilimnium nodosum*	E
Lakeside daisy *Tetraneuris herbacea*	T
Leafy-prairie clover *Dalea foliosa*	E
Leedy's roseroot *Rhodiola integrifolia Leedyi*	T
Michaux's sumac *Rhus michauxii*	E
Northeastern bulrush *Scirpus ancistrochaetus*	E
Northern monkshood *Aconitum noveboracense*	T
Peter's Mtn. mallow *Iliamna corei*	E
Pondberry *Lindera melissifolia*	E
Price's potato bean *Apios priceana*	E
Running buffalo clover *Trifolium stoloniferum*	E
Sensitive joint-vetch *Aeschynomene sensitive*	T
Shale barren rockcress *Arabis serotina*	E
Short's goldenrod *Solidago shortii*	E
Small-whorled pogonia *Isotria medeoloides*	T
Smooth coneflower *Echinacea laevigata*	E
Spring creek bladderpod *Lesquerella perforate*	E

Common Name	Status
Swamp pink *Helonias bullata L.*	T
Tennessee purple coneflower *Echinacea tennesseenis*	E
Virginia sneezeweed *Helenium virginicum*	T
Virginia spirea *Spiraea virginiana*	T
White-haired goldenrod *Solidago albopilosa*	T
Reptiles	
Eastern massasauga rattlesnake *Sistrurus catenatus catenatus*	C

E = Endangered; T = Threatened; C = Candidate; PE = Proposed Endangered

1.2 PROPOSED ACTION

The Proposed Action entails the operation of NiSource's pipeline system under issuance of the ITP for a 50-year term, including approval of the NiSource HCP, associated Implementing Agreement (IA). This section of the BA outlines those actions required to operate the pipeline system (Covered Actions) and the primary relevant sections of the HCP. This section of the BA provides only summaries and the reader is referred to the HCP, and associated draft EIS and IA, for additional information on the proposed action.

1.2.1 Covered Activities

The covered activities addressed are those activities necessary for safe and efficient operation of NiSource's pipeline system, many of which are performed pursuant to the regulations and guidance of the FERC, the USDOT, and other regulatory authorities. For this analysis, we have divided the covered activities into two main categories of subactivities related to NiSource's natural gas pipeline system:

(1) Operation and Maintenance Projects

The operation and maintenance (O&M) category constitutes the overwhelming majority of NiSource's field activities and is defined herein as those activities that do not require significant earth disturbance. Operation and maintenance includes activities conducted daily in order to keep the system operating efficiently and safely. This category of activities consists of the physical operation and the required maintenance, monitoring, and inspection of the facilities. These activities include vegetation maintenance, pipeline and appurtenant facility operation, maintenance, monitoring, and inspection, access road O&M, cathodic protection O&M, facility inspection activities, and facilities abandonment. These activities are limited to existing rights-of-way, appurtenant facilities, and access roads.

This BA further devides O&M activities into 20 subactivites:

- Facilities - vehicles, foot traffic, noise, communication facilities
- Vegetation Management - mowing
- Vegetation Management - chainsaw and tree clearing

- Vegetation Management - herbicides - hand, vehicle mounted, aerial applications
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Vegetation Disposal (upland) - brush pile burning
- Vegetation Management - tree side trimming by bucket truck or helicopter
- ROW repair, regrading, revegetation (upland) - hand, mechanical
- ROW repair, regrading, revegetation (wetland) - hand, mechanical
- ROW repair, regrading, revegetation - in stream stabilization and/or fill
- Access Road Maintenance - grading, graveling
- Access Road Maintenance - culvert replacement
- General Appurtenance and Cathodic Protection Construction - Off ROW Clearing
- General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole
- Pipeline Abandonment - in place
- Pipeline Abandonment - removal
- Well Abandonment - plugging, waste pits, site restoration
- Well Abandonment - facilities/building removal and site restoration
- Abandonment - Ownership transfer
- Inspection Activities - ground and aerial

(2) New Construction (Capital Projects)

NiSource's construction activities include those that require grading, excavation, or other significant form of earth disturbing activities in order to construct, replace, inspect, and maintain facilities. The disturbance may be as significant as constructing 100 miles of pipeline within a new ROW. These activities include construction related to pipelines, storage wells, general appurtenance and cathodic protection, compression-related facility, and communication facility, access roads.

This BA further devides New Construction activities into 31 subactivites:

- Vehicle Operation and Foot Traffic
- Clearing - herbaceous vegetation and ground cover
- Clearing - trees and shrubs
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Vegetation Disposal (upland) - brush pile burning
- Vegetation Clearing - tree side trimming by bucket truck or helicopter
- Grading, erosion control devices
- Trenching (digging, blasting, dewatering, open trench, sedimentation)
- Pipe Stringing - bending, welding, coating, padding and backfilling
- Hydrostatic Testing (water withdrawal and discharge), existing line
- Hydrostatic Testing (water withdrawal and discharge), new line
- Regrading and Stabilization - restoration of corridor
- Compression Facility, noise
- Communication Facility - guy lines, noise, lights
- Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling
- Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation

- Stream Crossings, wet ditch
- Stream Crossings, dry ditch
- Stream Crossings, steel dam & culvert
- Stream Crossings, dam & pump
- Stream Crossings, Horizontal Directional Drill (HDD)
- Stream Equipment Crossing Structures
- Crossings, wetlands and other water bodies (non-riparian) - clearing
- Crossings, wetlands and other water bodies (non-riparian) - tree side trimming
- Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading
- Crossings, wetlands and other water bodies (non-riparian) - pipe stringing
- Crossings, wetlands and other water bodies (non-riparian) - HDD
- Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore
- Storage wells - clearing and drilling
- Storage wells - reconditioning
- Storage wells - waste pits

Additional details on these covered activities can be found in chapter 2 of the HCP. Additionally, the Environmental Construction Standards (ECS; Appendix B of the HCP) provide greater detail and graphical representations of many of the construction and operation techniques. The ECS also describe the existing methodologies and BMPs NiSource uses to reduce and mitigate impacts to environmentally-sensitive areas during field activities[1]. Appendix C of the HCP contains photographs of a typical pipeline ROW and appurtenant facilities.

1.2.2 Habitat Conservation Plan

This HCP is a comprehensive planning document that provides for both enhanced conservation of listed species and regulatory compliance requirements for NiSource's pipeline activities. It provides a means to avoid, minimize, and mitigate for take of species caused by covered activities. It also documents the measures to be undertaken to avoid and minimize adverse effects to certain species for which take is therefore not anticipated. NiSource's intent for the HCP is to satisfy applicable provisions of the ESA pertaining to federally listed species protection and it concurrently improve the permitting efficiency for the construction, operation, and maintenance of NiSource's natural gas pipelines and ancillary facilities by providing a predictable and accepted structure under which pipeline activities can proceed.

In the HCP, NiSource evaluates the potential for the operation of their pipeline system to impact a total of 43 listed species (Table 2)[2]. Of these 43 species, NiSource is requesting an ITP for ten for NiSource's activities across their operating territory, referred to as the covered lands (See Section 1.3 Action Area for a description of

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[1] NiSource maintains three versions of the ECS, which contain minor differences specific to the particular subsidiary utilizing the document or location where the activity is being performed. While NiSource updates the ECS documents annually, any revisions made to the standards will be reviewed by the Service to ensure an equal or greater level of protection to natural resources as the ECS in effect at the time of issuance of an ITP. To accommodate any changes, the provisions of Chapter 9 will be used to amend the MSHCP or permit, as necessary. For convenience, the MSHCP will refer to the three ECS documents as a single set of standards, the ECS or the NiSource Gas Transmission & Storage Companies ECS, unless reference to one of the particular versions is appropriate.

[2] The effects of the action on these 43 species will not be evaluated in this BA, but are instead evaluated in the HCP. This table is provided here simply as part of the description of the HCP.

the covered lands). Of the 33 species remaining species, the HCP documents that 24 species would not be affected by covered activities, and nine species would not be adversely impacted by covered activities due to implementation of avoidance and minimization measures (AMMs) or best management practices (BMPs). Further, NiSource may, in coordination with the appropriate FWS Field Office, elect to do pre-project species surveys with the goal of establishing that the surveyed species will not be affected by the project. In these situations, the FWS may agree there would be no effect for those species.

Table 2. The 43 Species Evaluated in NiSource HCP

Species	Status	Take Anticipated
Mammals		
Gray bat *Myotis grisescens*	E	Avoid take through AMMs/BMPs
Indiana bat *Myotis sodalis*	E	Take Species
Louisiana black bear *Ursus americanus luteolus*	T	Avoid take through AMMs/BMPs
Virginia big-eared bat *Plecotus townsendii*	E	Avoid take through AMMs/BMPs
Delmarva fox squirrel *Sciurus niger cinereus*	E	No take anticipated
West Indian manatee *Trichechus manatus*	E	No take anticipated
Insects		
American burying beetle *Nicophorus americanus*	E	Take Species
Karner blue butterfly *Lycaeides melissa samuelis*	E	No take anticipated
Mitchell's satyr butterfly *Neonympha mitchellii mitchellii*	E	No take anticipated
Puritan tiger beetle *Cicindela puritana*	T	No take anticipated
Crustaceans		
Madison cave isopod *Antrolana lira*	T	Take Species
Nashville crayfish *Orconectes shoupi*	E	Take Species
Birds		
Interior least tern *Sterna antillarum*	E	Avoid take through AMMs/BMPs
Fish		
Maryland darter *Etheostoma sellare*	E	No take anticipated
Blackside dace *Phoxinus cumberlandensis*	T	No take anticipated
Cumberland darter *Etheostoma susanae*	C	No take anticipated
Gulf sturgeon *Acipenser oxyrinchus desotoi*	T	No take anticipated
Scioto madtom *Noturus trautmani*	E	No take anticipated

Species	Status	Take Anticipated
Slackwater darter *Etheostoma boschungi*	T	No take anticipated
Mollusks		
Birdwing pearlymussel *Lemiox rimosus*	E	Avoid take through AMMs/BMPs
Clubshell *Pleurobema clava*	E	Take Species
Cracking pearlymussel *Hemistena lata*	E	Avoid take through AMMs/BMPs
Cumberland bean pearlymussel *Villosa trabalis*	E	No take anticipated
Cumberland monkeyface pearlymussel *Quadrula rafinesque*	E	Avoid take through AMMs/BMPs
Dromedary pearlymussel *Dromus dromas*	E	No take anticipated
Fanshell *Cyprogenia stegaria*	E	Take Species
James spinymussel *Pleurobema collina*	E	Take Species
Louisiana pearlshell *Margaritifera hembeli*	E	No take anticipated
Northern riffleshell *Epioblasma torulosa rangiana*	E	Take Species
Oyster mussel *Epioblasma capsaeformis*	E	Avoid take through AMMs/BMPs
Pale liliput pearlymussel *Toxolasma cylindrellus*	E	No take anticipated
Purple cat's paw pearlymussel *Epioblasma obliquata*	E	No take anticipated
Sheepnose *Plethobasus cyphyus*	PE	Take Species**
Tan riffleshell *Epioblasma florentina walkeri*	E	No take anticipated
White cat's paw pearlymussel *Epioblasma obliquata perobliqua*	E	No take anticipated
White wartyback pearlymussel *Plethobasus cicatriocosus*	E	No take anticipated
Plants		
Braun’s rock cress *Arabis perstellata*	E	No take anticipated
Mead's milkweed *Asclepias meadii*	T	No take anticipated
Pitcher’s thistle *Cirsium pitcheri*	T	No take anticipated
Reptiles		
Bog turtle *Glyptemys muhlenbergii*	T	Take Species
Lake Erie water snake *Nerodia sipedon insularum*	T	No take anticipated
Amphibians		

Species	Status	Take Anticipated
Cheat mountain salamander *Plethodon nettingi*	T	Avoid take through AMMs/BMPs
Shenandoah salamander *Plethodon Shenandoah*	T	No take anticipated
EXN = Endangered, Experimental, nonessential PE = Proposed Endangered ** Sheepnose would be automatically added to the ITP should it become listed in the future. Source: NiSource 2010a; Chapter 4		

1.2.1.1 Avoidance and Minimization Measures

NiSource states in the HCP that it will avoid, minimize, and fully mitigate adverse effects of covered activities on HCP species. This is in addition to NiSource's existing ECS, its environmental compliance program, and existing pre-construction planning and project implementation specifications. NiSource will utilize the AMMs before employing mitigation measures.

Because NiSource's future activities are uncertain both in terms of where within the NCL they may occur and when, it is not feasible to predict exact impacts over the life of the requested permit. As such, the HCP analyzed species based on necessarily conservative assumptions.

Chapter 6 and Appendix F of the HCP provide a detailed discussion of proposed species-specific AMMs for HCP Species. Most of the AMMs are required to be implemented 100-percent of the time, though several are considered and labeled "non-mandatory" when NiSource determined it was impractical to implement in all cases. According to the HCP, NiSource's non-mandatory AMMs not associated with water body crossings will be applied on a case-by-case basis based on a review of location, feasibility, practicality, effectiveness, impacts to other resources, and impacts to timelines.

Beyond NiSource's existing "Natural Gas Pipeline & Storage Permitting Processes" outlined in Appendix K of the HCP, NiSource has established the following specifications for AMMs (other than waterbody crossings) when implementing its HCP (NiSource 2011; Section 5.2):

- In accordance with its current practice and corporate policy, NiSource will use a Project Environmental Information Form (PEIF) and Environmental Management & Construction Plan (EM&CP) – EZ form to gather data related to the potential project impacts.
- NiSource will consider, as a matter of first course, modifying the project activity and/or relocating facilities to avoid impacts on HCP Species. All relocations made to specifically avoid impacts on a HCP Species will be documented and reported.
- NiSource will evaluate each covered activity's potential to impact HCP Species and prepare a clearance package, through the development of an EM&CP with appropriate AMMs as identified in Chapter 6 and Appendix F of the HCP to minimize the impacts on these species. Mandatory AMMs will be identified and included in the EM&CP. Non-mandatory AMMs will be selected as appropriate on a project-by-project basis and utilized unless they cannot be feasibly implemented (see Chapter 5 of the HCP for more details). Consideration will also be given to customer and business needs and anticipated AMM effectiveness.

The clearance package will contain reply forms that will be used to evaluate and track the implementation of AMMs and actual impacts to HCP Species for a particular project. The information gathered during the pre-

construction planning and project implementation phases will be used to determine actual project impacts on HCP Species and help determine any required mitigation.

Given the potential impacts to a number of HCP Species due to crossing water bodies, Section 5.2.1.1 of the HCP provides specific details regarding the process to be utilized when determining appropriate water body crossing techniques. NiSource utilizes five basic methods for waterbody crossings including two open-cut methods (dry-ditch and wet ditch), horizontal bore, HDD, and spanning. Depending upon the species, a crossing method may be considered as a mandatory AMM or as a decision to be made on a site-specific basis. For those cases where it is situational-dependent, NiSource will complete a site-specific review of each individual crossing based on an engineering evaluation, an environmental assessment, an economic evaluation, and any regulatory drivers in place to determine which type of crossing will be selected.

1.2.1.2 Incidental Take Requested

In the HCP, NiSource requests incidental take for 10 species. Detailed take calculations for each of the take species is provided in Section 6.2 of the HCP under "Calculation of Incidental Take" for each species.

Due to the nature of NiSource's HCP, in terms of scope of covered lands and permit duration, NiSource has not been able to predict with any certainty where or when a given covered activity would occur. Thus, the species analyses include multiple conservative assumptions to ensure that the reasonable worst-case scenario for each species is considered. NiSource believes the analyses likely err on the side of overestimating impacts of the covered activities on the take species. In practice, as the HCP is implemented, NiSource anticipates that by utilizing the "avoidance and minimization measures" the actual take numbers will be much less than the amount estimated. However, obtaining the take authorization and having a process to avoid, minimize, and mitigate the impact of take that does occur will provide NiSource with the flexibility it needs to be efficient in its operations, while providing a benefit to the HCP Species through the HCP's landscape-level conservation approach.

The level and type of take requested (individuals or habitat) as part of the Proposed Action is summarized in Table 3.

Table 3. Summary of Incidental Take over the 50-Year Permit Duration

Species	Summary of Incidental Take
Indiana bat	Incidental take is requested for a low, but immeasurable percentage of the 2,637 total Indiana bat individuals estimated to be present within no more than 69,151 acres of summer and/or spring staging/fall swarming habitat loss
Bog turtle	Incidental take is requested for impacts to turtles and habitat at 25 sites
Madison Cave Isopod	Incidental take is requested for two populations within 2,764.5 surface acres and associated subsurface area of effect of Madison Cave Isopod habitat
Clubshell Mussel	Incidental take is requested for up to 166 acres of Clubshell habitat
Northern Riffleshell Mussel	Incidental take is requested for up to 165.3 acres of Northern Riffleshell habitat
Fanshell Mussel	Incidental take is requested for up to 283.2 acres of Fanshell habitat

Species	Summary of Incidental Take
James Spinymussel	Incidental take is requested for up to 12.8 acres of James Spinymussel habitat
Sheepnose Mussel	Incidental take is requested for up to 250.4 acres of Sheepnose habitat
Nashville crayfish	Incidental take is requested for up to 4.0 acres of Nashville crayfish habitat
American burying beetle	Incidental take is requested for 4 American burying beetle individuals

1.2.1.3 Compensatory Mitigation

Mitigation is required only when take is unavoidable, and would be conducted at a landscape scale using an ecoregional approach to identify and implement opportunities. As such, mitigation for impacts to a specific species could occur at a location far away from the exact area of impact. Table 4 summarizes NiSource's planned compensatory mitigation associated with the requested level of take for each of the 10 listed species.

Table 4. Summary of Mitigation Over the 50-Year Permit Duration

Species	Summary of Mitigation Proposed
Indiana bat	**Total Maximum Mitigation** Spring Staging/Fall Swarming = 2 hibernacula projects = **252 Acres** Gating estimate = $5,000 (estimated) Summer habitat (suitable) = **1,708 Acres** Storage Field Impacts = **9,000 Acres** **Sum = 10,960 Acres over 50 years = 219 acres/year**
Bog turtle	Construction (Ground-Disturbance) Activities and Non-ground-Disturbing O&M at **20 Sites** For each site impacted by looping (estimate of 10), new construction (estimate of five) and/or conventional replacement methods (open trench) (estimate of five) (and all non-ground-disturbing O&M impacts), NiSource can either **protect and restore a bog turtle site or protect an existing site with optimal bog turtle habitat**. Non-ground-Disturbing O&M Activities at **Five Additional Sites** The mitigation for take associated with O&M activities at sites that also involve ground-disturbing activities is addressed above. Mitigation for take associated with O&M activities at sites that do not involve ground-disturbing activities is either: **(1) habitat restoration/enhancement and long-term management agreement (life of the permit) within wetland that crosses ROW, or (2) off-site protection and restoration (same mitigation as described above).**
Madison Cave Isopod	NiSource is anticipating take of individuals of two populations (Lime Kiln Cave and one unknown population). As mitigation for this, NiSource shall protect two key parcels (containing surface karst features) and restore surface karst features (if needed). Key parcels are defined as a parcel of land with either an important natural feature (cave or spring) and its immediate recharge area, or an average of five surface karst features and a 300-foot buffer around each feature.
Clubshell Mussel	Riparian and/or streambed restoration, enhancement, and protection in occupied and unoccupied (for possible relocation) habitat (750 ac maximum).
Northern Riffleshell Mussel	Riparian and/or streambed restoration, enhancement, and protection in occupied and unoccupied (for possible relocation) habitat (884 ac maximum). Propagate, augment, expand, re-introduce into suitable habitat.
Fanshell Mussel	Riparian and/or streambed restoration, enhancement, and protection in occupied and unoccupied (for possible relocation) habitat (956 ac maximum).

James Spinymussel	Riparian and/or streambed restoration, enhancement, and protection in occupied and unoccupied (for possible relocation) habitat (77 ac maximum).
Sheepnose Mussel	Riparian and/or streambed restoration, enhancement, and protection in occupied and unoccupied (for possible relocation) habitat (973 ac maximum).
Nashville crayfish	Restore and/or protect riparian habitat (0.4 ac for aggregate take, 4 ac for new construction take)
American burying beetle	One-time payment $15,000 to fund propagation, monitoring, and survey programs.

NiSource has established two methods for implementing actual mitigation under these guidelines. The first would be NiSource-initiated mitigation efforts, and the second would be the funding of mitigation proposals through a mitigation fund and HCP-established Mitigation Panel.

NiSource has the option of initiating mitigation efforts before, during, or up to two years after undertaking Covered Activities for which there will be take; thus allowing for flexibility to pursue mitigation opportunities as they arise. For instance, if a parcel of land with significant habitat for a Take Species becomes available for purchase or for a conservation easement, NiSource may purchase or acquire a conservation easement on the property to compensate for past and/or future impacts to such species.

Before pursuing any specific mitigation efforts, NiSource would consult with the Service to determine how much compensation credit the particular mitigation project would provide. If the mitigation project would more than compensate for previous impacts to a given Take Species, NiSource would receive a mitigation "credit" toward future impacts to that species. If the mitigation effort does not fully compensate for previous impacts to a given Take Species, NiSource would either pursue additional mitigation efforts or would utilize the NiSource Mitigation Fund.

NiSource will also establish a Mitigation Fund to be administered by the National Fish and Wildlife Foundation (NFWF). This Mitigation Fund would be established before the ITP is granted and funds that are deposited at the outset would exceed the amount required to cover NiSource's mitigation obligations in year-one of the HCP, and would never fall below $100,000. This is meant to establish the fund, not pre-pay mitigation for the first year's take. In essence, NiSource's commitment to maintain the Mitigation Funds with at least $100,000 will guarantee that the company can meet its mitigation commitments even under the unlikely scenario that NiSource itself is not able to do so financially in the future.

At the end of the first year of HCP implementation, NiSource and the Service would jointly determine the actual level of take incurred in year-one. Based on this take calculation, NiSource would contribute additional money to the Mitigation Fund sufficient to mitigate for take in the first year, taking into account any efforts NiSource has already undertaken to mitigate for such impacts directly under the first implementation scenario. NiSource has committed to making the first annual contribution by March 31 of the second year, and all subsequent years throughout the life of the permit.

If NiSource is unable to identify mitigation to compensate for impacts directly as discussed above, then a "Mitigation Panel" established prior to HCP implementation, will assist in identifying specific mitigation proposals for recommendation to NiSource. The Mitigation Panel will be made up of a technical advisory member representative of the Service, a senior representative of NiSource, and two senior representatives of an NGO whose mission is conservation based. The Mitigation Panel will be responsible for making recommendations to NiSource, which in turn, will make recommendations to an external senior Service representative who will independently review and approve or disapprove the recommendations.

1.3 ACTION AREA

The proposed action area encompasses the covered lands to be covered by the ITP and associated HCP would include a one-mile wide corridor centered upon a majority of NiSource's existing system in 14 states (Louisiana, Mississippi, Tennessee, Kentucky, Virginia, West Virginia, North Carolina, Indiana, Ohio, Pennsylvania, New York, New Jersey, Delaware and Maryland) for approximately 15,650 miles (Figure 1). In addition to the designated one-mile corridor, the ITP and associated HCP would also entirely cover 12 counties in Ohio, Pennsylvania, Maryland, and West Virginia collectively, where NiSource operates some of its underground natural gas storage fields. Specifically this includes Hocking, Fairfield, Ashland, Knox, and Richland counties in Ohio; Bedford County, Pennsylvania; Allegany County, Maryland; and Kanawha, Jackson, Preston, Marshall, and Wetzel counties in West Virginia. In total, the ITP and HCP would cover an area of approximately 9.8 million acres.

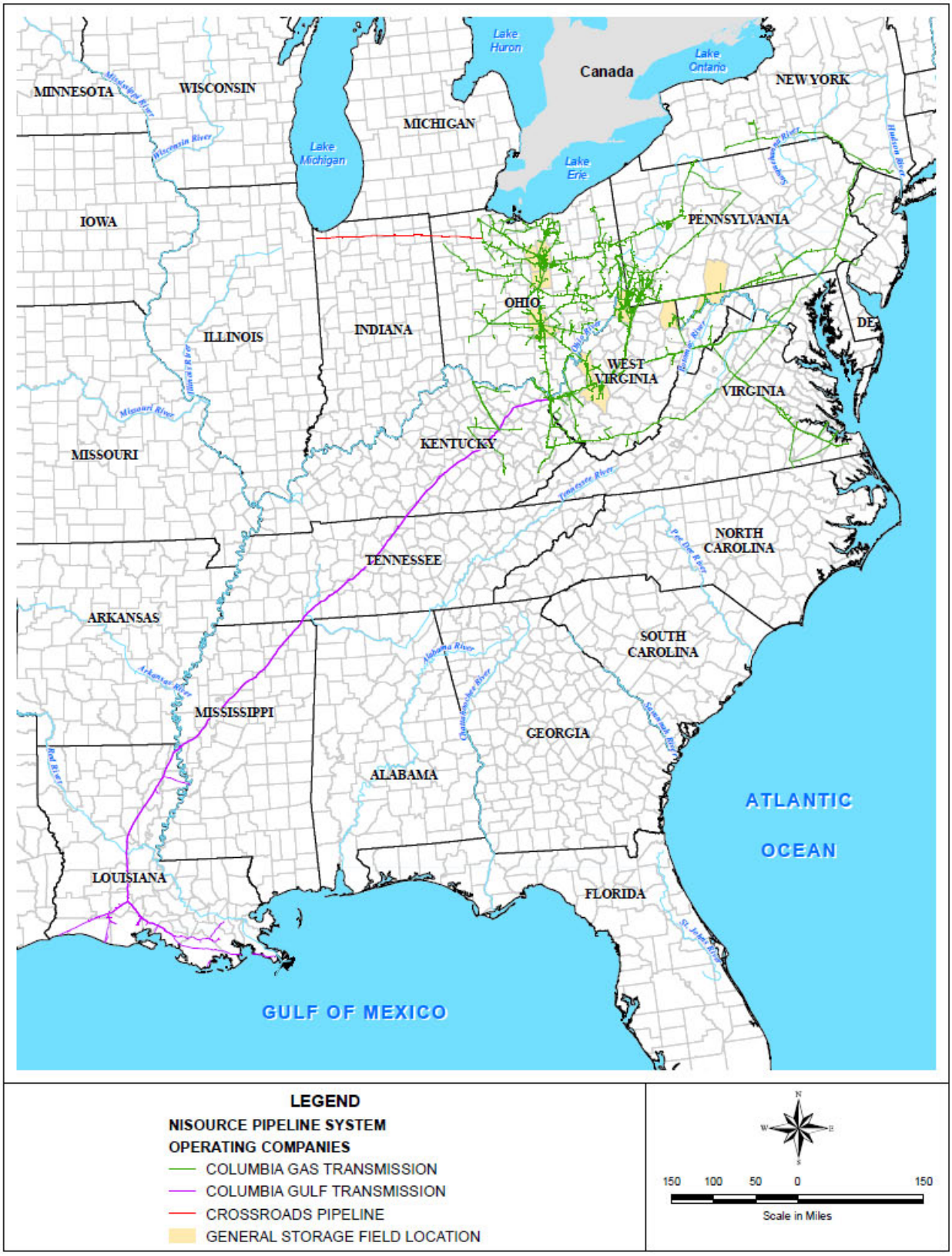

Figure 1. NiSource Covered Lands

1.3.1 Description

The NCL area acreage by state is summarized in Table 5.

Table 5. Covered Lands Acreage by State

State	Acres	State	Acres
Delaware	2,049	New York	185,422
Indiana	88,599	North Carolina	936
Kentucky	499,418	Ohio	3,219,472
Louisiana	485,622	Pennsylvania	1,694,423
Maryland	371,784	Tennessee	122,393
Mississippi	140,909	Virginia	446,248
New Jersey	43,335	West Virginia	2,475,988

The NCL includes almost every type of environment and land use found in the eastern United States. From the swamps of the Mississippi delta, to the fields of the central plains, to the parklands of the central Appalachians, and into the heavily urbanized northeastern states, an immense variety of land forms and processes comprise the NCL area. Additional description of the ecological setting of the covered lands can be found in Chapter 3 of the draft EIS.

2.0 STATUS OF LISTED SPECIES AND HABITAT IN THE ACTION AREA

2.1 MUSSEL SPECIES

2.1.1 DWARF WEDGEMUSSEL

Species Background & Habitat

The dwarf wedgemussel (*Alasmidonta heterodon*), a freshwater mussel found within the Atlantic drainages of the eastern seaboard, was listed as Endangered under the ESA in March of 1990, followed by the establishment of a Recovery Plan in 1993. Freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and similar microorganisms from the water. This species is considered a long-term brooder, having a mid-summer to fall fertilization period with glochidial release occurring the spring and summer of the following year (USFWS 1993a). Glochidia require a period of parasitizing host fish prior to maturation into adult mussels. While exact species have not been identified, experiments have identified tessellated darter (*Etheostoma olmstedi*), Johnny darter (*Etheostoma nigrum*), mottled sculpin (*Cottus bairdi*), slimy sculpin (*Cottus cognatus*), and Atlantic salmon (*Salmo salar*) as potential hosts, though the tessellated darter seems to be preferred (NatureServe 2010). After a few weeks of parasitizing the fish, juveniles detach from the host fish and must land in suitable habitat or they will perish. Adult mussels are largely sedentary, with little to no ability to move away from areas of disturbance (USFWS 1993a). The dwarf wedgemussel is most commonly found in shallow to deep water with a quick current and a stream bed of cobble, fine gravel, or firm silt/sand. Submerged aquatic vegetation and overhanging tree limbs near stream banks are also potential habitats (NatureServe 2010). Some studies have also identified muddy sand, sand, and gravel substrates in creeks and rivers of various sizes with areas of slow to moderate current, good water quality, and little silt deposits as ideal habitat (USFWS 1993a).

Status and Threats

The decline of the dwarf wedgemussel is primarily the result of habitat loss and degradation. Agricultural, domestic, and industrial pollution have been major contributors to this species' decline (NatureServe 2010). The majority of remaining populations of the species are mostly small and isolated geographically, leading to potential inbreeding depression, reduction of long-term colony viability, and a low likelihood of natural repopulation of extirpated areas (USFWS 1993a). Potential threats to dwarf wedgemussel populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off into the water body, exotic invasive species introduction, and further population fragmentation and genetic bottlenecking through take.

Distribution and Range

Although it was historically found along the eastern seaboard from Maine to North Carolina, inhabiting 15 major Atlantic drainages at approximately 70 locations, this species has been extirpated from numerous regional streams along the coast, with only 25-30 locations currently known to be inhabited by the species. Since the establishment of the Recovery Plan, new populations have been discovered and a number of known populations are possibly no longer extant. The species is thought to be extirpated in Canada, and is nearly extinct in Massachusetts and Connecticut. All remaining populations, exepting the Connecticut River population, of dwarf wedgemussel are considered relatively small and continuously declining (NatureServe 2010).

Presence in the Project Area

Based on initial project review (Armstrong et al. 2007), the NiSource project may affect this species in:

- Delaware River and tributaries – Delaware, Orange, and Sullivan Counties, NY; Pike County, PA
- Neversink River – Orange and Sullivan Counties, NY
- Basher Kill – Orange and Sullivan Counties, NYRappahannock River – Culpeper and Fauquier Counties, VA
- Mountain Run – Culpeper County, VA
- Nottoway River – Dinwiddie, Greensville, and Sussex Counties, VA
- South Anna River – Hanover and Louisa Counties, VA
- Blue Run – Orange County, VA
- Kettle Run – Prince William County, VA
- Other Locations – Morris County, NJ (historic) and Warren County, NJ; Chesterfield County, VA

2.1.2 FAT POCKETBOOK

Species Background & Habitat

The fat pocketbook (*Potamilus capax*), a freshwater mussel found within the Mississippi River drainage system, was listed as Endangered under the ESA in June of 1976, followed by the establishment of a Recovery Plan in 1989. Freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and similar microorganisms from the water. This species is considered a short-term brooder, having a spring to early summer fertilization period with glochidial release occurring during the summer (USFWS 1989a). Glochidia require a period of parasitizing host fish prior to maturation into adult mussels. While exact species have not been identified,

studies have shown the freshwater drum (*Aplodinotus grunniens*) as a likely host species (NatureServe 2010). After a few weeks of parasitizing the fish, juveniles detach from the host fish and must land in suitable habitat or they will perish. Adult mussels are largely sedentary, with little to no ability to move away from areas of disturbance. While reports are conflicting on the preferred habitat of the species, most accounts indicate a preference for a substrate with a stable mix of sand, mud and fine gravel, and that flowing water is required for the species to thrive (USFWS 1989a). Recent studies have also found the species inhabiting agricultural ditches, sloughs, bayous, and streams of the St. Francis watershed (NatureServe 2010).

Status and Threats

The decline of the fat pocketbook is primarily the result of habitat loss and degradation. Population losses, chiefly caused by impoundments, channelization, siltation, and pollution, have been well documented since the mid-19th century (USFWS 1989a). The majority of remaining populations of the species are mostly small and isolated geographically, increasing the susceptibility of individual populations to extirpation from catastrophic events such as toxic spills. The small size and isolation can also lead to potential inbreeding depression, reduction of long-term colony viability, and a low likelihood of natural repopulation of extirpated areas (USFWS 2007a). Threats to fat pocketbook populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off into the water body, exotic invasive species introduction, and further population fragmentation and genetic bottlenecking through take.

Distribution and Range

Although it was historically found throughout the Mississippi River drainage from the confluence of the Minnesota and St. Croix Rivers in Minnesota to the White River in Arkanasas, including the St. Francis, White and Wabash rivers, the species appears to have been extirpated over large portions of its original range. The species appears to be extinct in the upper Mississippi states of Minnesota, Wisconsin, Iowa, and parts of Ohio, with around 20 remaining populations in the Mississippi, White, Ohio, Wabash, and St. Francis River systems, with communities in Illinois, Indiana, Missouri, Arkansas, Mississippi and Louisiana. Historical information indicates that the species was once common throughout its range, though it is now considered rare in all parts of its range except for the St. Francis drainage, where the local population is still relatively healthy (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in association with the Mississippi River in East Carroll Parish, Louisiana, and Issaquena and Washington Counties, Mississippi, and in association with the Big Sunflower River in Sharkey and Washington Counties, Mississippi (Armstrong et al. 2007).

2.1.3 FLUTED KIDNEY SHELL PEARLYMUSSEL

Species Background & Habitat

The fluted kidneyshell (*Ptychobranchus subtentum*), a freshwater mussel found within the Cumberland and Tennessee River systems, became a Candidate species under the ESA in September 2006. Freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and similar microorganisms from the water. This species is considered a long-term brooder, having a late-summer to early-fall fertilization period with glochidial release occurring the spring and early-summer of the following year. Glochidia require a period of parasitizing host fish prior to maturation into adult mussels. Host fishes include the barcheek darter (*Etheostoma obeyense*), redline

darter (*Etheostoma rufilineatum*), fantail darter (*Etheostoma flabellare*), redline darter (*Etheostoma caeruleum*), and banded sculpin (*Cottus carolinae*). After a few weeks of parasitizing the fish, juveniles detach from the host fish and must land in suitable habitat or they will perish. Adult mussels are largely sedentary, with little to no ability to move away from areas of disturbance. The fluted kidneyshell generally inhabits small to medium rivers in swift current or riffle areas, with some populations recently documented in the shoal areas of larger rivers. Individuals are usually embedded in sand, gravel, or cobble substrates. Flowing, well-oxygenated waters are required for optimum population performance (NatureServe 2010).

Status and Threats

The decline of the fluted kidneyshell is primarily the result of habitat loss and degradation. Impoundments, stream channel alterations, water pollution, and sedimentation are thought to be major contributors to this species' recent declines, especially in the form of heavy-metal rich drainage and sedimentation from coal mining in the upper Cumberland River system. The majority of remaining populations of the species are mostly small and isolated geographically, leading to potential inbreeding depression, reduction of long-term colony viability, and a low likelihood of natural repopulation of extirpated areas (NatureServe 2010). Potential threats to fluted kidneyshell populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off into the water body, exotic invasive species introduction, and further population fragmentation and genetic bottlenecking through take.

Distribution and Range

Although it was historically common in many Cumberlandian Region streams, the species decline may predate European colonization, with evidence of species presence in parts of its assumed range only documented based upon historic Native American kitchen middens. The species, which once was found in large portions of the Cumberland and Tennessee River systems, appears to be extirpated in the state of Alabama, and is no longer found in the Cumberland or Tennessee River main stems, along with approximately three-fifths of the side streams that it is thought to have inhabited. While much of the species decline is historic, the fluted kidneyshell is also currently declining in range and population strength. Remaining populations are largely small and fragmented, with only one population, located in the upper Clinch River of the Tennessee River system, thought to be truly viable over the long-term (NatureServe 2010).

Presence in the Project Area

This species has only been reported in one county, Jackson County, Kentucky, within the NiSource project footprint, and has not been found in any watersheds that the project crosses (NatureServe 2010), so location of this species is considered unlikely.

2.1.4 ORANGE PIMPLEBACK PEARLYMUSSEL

Species Background & Habitat

The orangefoot pimpleback (*Plethobasus cooperianus*), a freshwater mussel found within the Ohio, Cumberland, and Tennessee River drainages, was listed as Endangered under the ESA in June of 1976, followed by the establishment of a Recovery Plan in 1984. Freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and similar microorganisms from the water. This species is considered a short-term brooder, having a spring or early-summer fertilization period with glochidial release occurring during the summer (USFWS 1984a).

Glochidia require a period of parasitizing host fish prior to maturation into adult mussels. The host species for orangefoot pimpleback glochidia is not currently known (NatureServe 2010). After a few weeks of parasitizing the fish, juveniles detach from the host fish and must land in suitable habitat or they will perish. Adult mussels are largely sedentary, with little to no ability to move away from areas of disturbance (USFWS 1984a). The orangefoot pimpleback is primarily found in medium to large rivers with sand, gravel and cobble substrates. Generally the species inhabits deep water riffles and shoals with steady currents, though it is also found in some shallower shoals and riffles (NatureServe 2010). It is commonly found at depths of 15 to 29 feet (USFWS 1984a).

Status and Threats

The decline of the orangefoot pimpleback is primarily the result of habitat loss and degradation. Chief causes of the species decline include impoundments, stream channelization, chemical contaminants, mining run-off pollution, and sedimentation (USFWS 1984a). The majority of remaining populations of the species are mostly small and isolated geographically, increasing the susceptibility of individual populations to extirpation from catastrophic events such as toxic spills. The small size and isolation can also lead to potential inbreeding depression, reduction of long-term colony viability, and a low likelihood of natural repopulation of extirpated areas (USFWS 2003a). Threats to orangefoot pimpelback populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off into the water body, exotic invasive species introduction, and further population fragmentation and genetic bottlenecking through take.

Distribution and Range

While the species was historically considered common and was even commercially harvested for a period, populations of orangefoot pimpleback are now considered rare and it is rapidly declining range-wide, with long-term viability prospects considered poor. (NatureServe 2010). Historically, the species was found in large portions of the Ohio, Wabash, Cumberland, Clinch, and Tennessee River systems, though it is now extirpated in Pennsylvania, and presumed extirpated in Ohio and West Virginia (NatureServe 2010). Extant populations are currently found in the lower Ohio River, middle reaches of the Cumberland River, and the lower Tennessee River (USFWS 1984a).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of the Tennessee River system in Hardin County, Tennessee, portions of the Duck River system in Maury County, Tennessee, and portions of the Ohio River system in Bracken, Lewis, and Pendleton Counties, Kentucky (Armstrong et al. 2007).

2.1.5 PINK MUCKET PEARLYMUSSEL

Species Background & Habitat

The pink mucket (*Lampsilis abrupta*), a freshwater mussel found in the Ohioan Interior Basin, primarily in the Tennessee, Cumberland, and Ohio River systems, was listed as Endangered under the ESA in June of 1976, followed by the establishment of a Recovery Plan in 1985. Freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and similar microorganisms from the water. This species is considered a long-term brooder, having a late-summer fertilization period with glochidial release occurring during the summer of the following year (USFWS 1985). Glochidia require a period of parasitizing host fish prior to maturation into adult mussels. The host species for pink mucket glochidia is not currently known, though recent tests have shown

that largemouth bass (*Micropterus salmoides*), spotted bass (*Micropterus punctulatus*), smallbouth bass (*Micropterus dolomieu*), walleye (*Sander vitreum*), sauger (*Sander canadensis*), and freshwater drum (*Aplodinotus grunniens*) were suitable (USFWS 2007d). After a few weeks of parasitizing the fish, juveniles detach from the host fish and must land in suitable habitat or they will perish. Adult mussels are largely sedentary, with little to no ability to move away from areas of disturbance (USFWS 1985). The pink mucket is found in medium to large rivers with substrates ranging from silt to boulders, rubble, gravel, and sand. The species is primarily found in large rivers with moderate to fast flowing water at depths from 1.5 to 26 feet (USFWS 1985).

Status and Threats

The decline of the pink mucket is primarily the result of habitat loss and degradation. Chief causes of the species decline include impoundments, dredging, degradation of water quality, over harvest by the commercial mussel industry, siltation, pollution, and channelization (NatureServe 2010). The small size and isolation of populations can lead to potential inbreeding depression, reduction of long-term colony viability, and a low likelihood of natural repopulation of extirpated areas (USFWS 1985). Potential threats to pink mucket populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off into the water body, exotic invasive species introduction, and further population fragmentation and genetic bottlenecking through take.

Distribution and Range

While the pink mucket was historically very widespread in distribution, with verified presence in 25 river systems, the species has never been documented in heavy densities in any location, thus the species has always been considered rare. Of the 25 river systems, spread throughout the Ohioan Interior Basin, that the species was historically documented in, only 16 are thought to still be inhabited, with the species considered extirpated in Ohio, Pennsylvania, and Illinois. The greatest current concentrations of the species are located in the Tennessee, Cumberland, Osage, Meramec, and Kanawha Rivers (USFWS 1985).

Presence in the Project Area

Based on initial project review (Armstrong et al. 2007), the NiSource project may affect this species in the following locations:

- Elk River – Kanawha and Clay Counties, WV
- Kanawha River – Kanawha County, WV
- Muskingum River – Washington and Morgan Counties, OH
- Ohio River – Pendleton County, KY; Lawrence, Gallia, and Meigs Counties, OH; Mason and Jackson Counties, WV
- Licking River – Bath and Rowan Counties, KY
- Tennessee River – Hardin County, TN
- Cumberland River – Trousdale County, TN

2.1.6 RABBITSFOOT

Habitat

The rabbitsfoot (*Quadrula cylindrica*), a freshwater mussel historically found widely spread through numerous river systems in the eastern United States, has been a candidate species under the ESA since November 2009. Freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and similar microorganisms from the water. This species is considered a short-term brooder, having a spring fertilization period with glochidial release occurring in the summer. Glochidia require a period of parasitizing host fish prior to maturation into adult mussels. Host fishes include the whitetail shiner (*Cyprinella galactura*), spotfin shiner (*Cyprinella spiloptera*), bigeye chub (*Hybopsis amblops*), blacktail shiner (*Cyprinella venusta*), and rosyface shiner (*Notropsis rubellus*). After a few weeks of parasitizing the fish, juveniles detach from the host fish and must land in suitable habitat or they will perish. Adult mussels are largely sedentary, with little to no ability to move away from areas of disturbance. The rabbitsfoot generally inhabits small to medium rivers with moderate to swift currents. In smaller streams in generally inhabits bars or gravel and cobble close to fast currents, while in medium to large rivers it usually resides in sand and gravel. The species has been documented at depths of up to 10 feet (NatureServe 2010).

Status and Threats

The decline of the rabbitsfoot is primarily the result of habitat loss and degradation. Impoundments, channelization, chemical contaminants, mining, and sedimentation have combined to significantly alter or eliminate viable habitat throughout much of its range. Many of the remaining populations of the species are small and isolated geographically, increasing the susceptibility of individual populations to extirpation from catastrophic events such as toxic spills. The small size and isolation can also lead to potential inbreeding depression and reduction of long-term colony viability (NatureServe 2010). Potential threats to rabbitsfoot populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off into the water body, exotic invasive species introduction, and further population fragmentation and genetic bottlenecking through take.

Distribution and Range

Historically, rabbitsfoot inhabited large portions of the lower Great Lakes sub-basin and Mississippi River Basin, with populations in 137 streams in 15 states, including the lower Great Lakes sub-basin, the Mississippi River sub-basin, and the Ohio, Cumberland, Tennessee, White, Arkansas, and Red River systems. This wide historical spread has experienced an over two thirds decline in both spread and density, with populations currently found in 46 streams in 13 states, with historic populations in Georgia and West Virginia considered extirpated, and populations in Alabama, Kansas, Louisiana, Mississippi, and Missouri considered in extreme peril (NatureServe 2010).

Presence in the Project Area

Based on a review of species presence records (NatureServe 2010), the NiSource project may affect this species in:

- DeKalb County, IN
- Adiar, Allen, Barren, Campbell, Floyd, Greenup, Jackson, Lewis, Monroe, Owsley, and Pendleton Counties, KY

- Sunflower County, MS
- Adams, Ashland, Coshocton, Defiance, Delaware, Fairfield, Franklin, Knox, Madison, Muskingum, Pickaway, Putnam, and Union Counties, OH
- Allegheny, Armstrong, Beaver, Fayette, Greene, Lawrence, Washington, and Westmoreland Counties, PA
- Hardin and Maury Counties, TN

2.1.7 RAYED BEAN

Species Background & Habitat

The rayed bean (*Villosa fabalis*), a freshwater mussel found in the upper and lower Great Lakes systems along with the Ohio and Tennessee River systems, has been a candidate species under the ESA since May 2004, and is currently proposed for listing as endangered (USFWS 2010d). Freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and similar microorganisms from the water (USFWS 2005d). This species is considered a long-term brooder, having a late-summer to fall fertilization period with glochidial release occurring during the spring of the following year. Glochidia require a period of parasitizing host fish prior to maturation into adult mussels. The host species for rayed bean glochidia is not currently known, though recent studies have shown that the Tippecanoe darter (*Etheostoma tippecanoe*) is a potential host species (NatureServe 2010). After a few weeks of parasitizing the fish, juveniles detach from the host fish and must land in suitable habitat or they will perish. Adult mussels are largely sedentary, with little to no ability to move away from areas of disturbance. The rayed bean is generally found in smaller, headwater creeks, though it has also been reported in larger rivers. Inhabited areas generally include shoal or riffle areas, and in shallow, wave-washed portions of glacial lakes, including extant populations in Lake Erie. It is usually found in substrates of gravel and sand, though it is also often found buried among the roots of vegetation such as water willow (*Justicia Americana*) and water milfoil (*Myriphyllum* sp.) (USFWS 2005d).

Status and Threats

The decline of the rayed bean is primarily the result of habitat loss and degradation. Chief causes of the species decline include impoundments, channelization, chemical contaminants, mining, and sedimentation. The heavy level of population concentration and development adjacent to much of its habitat invariably increases the likelihood that these impacts will continue into the future (USFWS 2005d). The small size and isolation of populations can lead to potential inbreeding depression, reduction of long-term colony viability, and a low likelihood of natural repopulation of extirpated areas (USFWS 2005d). Potential threats to rayed bean populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off into the water body, exotic invasive species introduction, and further population fragmentation and genetic bottlenecking through take.

Distribution and Range

Historically the rayed bean was located in 106 streams, lakes, and man-made canals in Illinois, Indiana, Kentucky, Michigan, New York, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and Ontario, though it appears to be extirpated form 78% of its historic range, no longer being found in 80 of its historical water bodies. Extant populations have been verified in 24 streams and one lake in Indiana, Michigan, Ohio, New York, Pennsylvania, and Ontario. Of the remaining populations, few are considered to be long-term viable with their reproductive success in question, though a number of viable population remain in the far northern portion of its range (USFWS 2005d).

Presence in the Project Area

Based on initial project review (Armstrong et al. 2007), the NiSource project may affect this species in the following locations:

- St. Joseph River – Defiance County, OH and Dekalb County, IN
- Fish Creek – Defiance County, OH and Dekalb County, IN
- Allegheny River – Armstrong and Clarian Counties, PA
- French Creek – Mercer County, PA
- Tippecanoe River – Marshall County, IN
- Olentangy River – Marion, Delaware, and Franklin Counties, OH
- Blanchard River – Hancock and Hardin Counties, OH
- Tymochtee Creek – Wyandot and Hardin Counties, OH
- Sandusky River – Wyandot County, OH
- Swan Creek – Lucas County, OH
- Deer Creek – Madison and Pickaway Counties, OH
- Whetstone Creek – Morrow County, OH
- Big Darby Creek – Pickaway, Madison, Franklin, Union, and Champaign Counties, OH
- Alum Creek – Franklin, Delaware, and Morrow Counties, OH
- Big Walnut Creek – Franklin, Delaware, and Morrow Counties, OH
- Scioto Brush Creek – Scioto County, OH
- Little Miami/East Fork Little Miami River – Warren, Clermont, and Brown Counties, OH
- Muskingum River – Coshocton County, OH
- Kokosing River – Coshocton County, OH
- Mohican River – Coshocton County, OH

2.1.8 RING PINK MUSSEL

Species Background & Habitat

The ring pink mussel (*Obovaria retusa*) was listed as endangered by the Service on September 29, 1989 and was extirpated from nearly all of its formerly documented wide range due to loss of habitat (USFWS 1991b). The population in the portions of the French Broad and Holston Rivers, Tennesse, was listed as an experimental nonessential population in 2007 (USFWS 2007b). Adult freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and other microorganisms from the water column. As a group, mussels can be extremely long-lived, living from a couple years to several decades, and possibly up to 100 to 200 years in extreme instances (USFWS 2003d). No specific quantitative longevity information for the ring pink is available. Most mussels, including the ring pink mussel, generally have separate sexes. Age at sexual maturity for the ring pink mussel is unknown, but is estimated in other mussel species to occur after a few years. Gravid females have been found with eggs in late August and with glochidia in September (NatureServe 2007). Glochidia are released in the form of conglutinates, which are analogous to cold-pill capsules (i.e., gelatinous containers with numerous glochidia within), and mimic fish prey. To ensure their survival, glochidia must come into contact with a specific host fish. Without the proper host fish, the glochidia will perish. Newly-metamorphosed juveniles then drop off to begin a free-living existence on the stream bottom. Unless dropped off in suitable habitat, they will perish. Thus, the complex life history of the ring pink and other mussels has many weak links that may prevent successful reproduction and/or recruitment of juveniles into existing populations (USFWS 2003d). The

host fish for the ring pink mussel is not known (USFWS 1991b). The ring pink mussel is a primarily a large river species that inhabits gravelly and sandy substrates in relatively shallow waters, up to two feet deep (USFWS 2003d). However, it has been reported in the Duck River, indicating it can survive in rivers of medium size (NatureServe 2007).

Status and Threats

Once found in the Ohio River and its large tributaries from West Virginia to Illinois and Kentucky, the ring pink is known today from only two stretches of the Tennessee River and one stretch each of the Cumberland and Green rivers. Loss of habitat due to impoundments is probably the primary cause for the decline of ring pink mussel populations (NatureServe 2007). Dams and reservoirs have flooded most of the mussel's habitat, reducing its gravel and sand habitat and probably affecting the distribution of its host fish. In addition, historically known ring pink mussel populations were also affected by commercial harvesting (USFWS 1991b, NatureServe 2007). Other threats include gravel dredging and channel maintenance (NatureServe 2007). A population in the Green River is threatened by water pollution from upstream oil and gas production (USFWS 1997). Only 5 populations of this mussel are known to exist, and their advanced age further reduces the chances of successful reproduction. These five populations are also geographically isolated from one another. Potential threats to ring pink populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off into the water body, exotic invasive species introduction, and further population fragmentation and genetic bottlenecking through take.

Distribution and Range

Historically, the ring pink mussel was widely distributed in the Ohio, Cumberland, and Tennessee River systems in Pennsylvania, West Virginia, Ohio, Illinois, Indiana, Kentucky, Tennessee, and Alabama (USFWS 1991b), but has since been extirpated throughout much of that range. Extant, but non-reproducing populations of the ring pink are primarily known from only five river reaches. In Kentucky waters, the ring pink mussel has been taken in recent years from the Tennessee River in McCracken, Livingston, and Marshall Counties, and from the Green River in Hart and Edmonson Counties. In Tennessee, the ring pink mussel is still believed to survive in the Cumberland River in Wilson, Trousdale, and Smith Counties, and in the Tennessee River in Hardin County. Also, one live specimen was taken in West Virginia's Kanawha River, Fayette County, in 1990. There is also a report of a recent occurrence in the Ohio River south of Gallipolis and the Muskingum River (NatureServe 2007). Overall, few individuals have been observed in recent years, and the existence of the five populations is questionable and all existing populations are considered to be non-reproducing (USFWS 2003d). Although historically widely distributed, little information exists regarding current densities, making a quantitative estimate difficult. Its current global abundance is estimated between 50 and 2,500 individuals with a global range estimated between 100 and 250 square km. The global short term trend for this species indicates the population is severely declining (greater than 70 percent) in its range, in condition/number of occurrences, and area occupied (NatureServe 2007).

Presence in the Project Area

Based on initial project review the NiSource project may affect this species in Bracken, Greenup, Lewis, and Pendleton counties, Kentucky; it also is assumed that the project will have no effect on this species in Monroe County, Kentucky and Hardin County, Tennessee.

2.1.9 ROUGH PIGTOE

Species Background & Habitat

The rough pigtoe, a freshwater mussel found in the Mississippi and Ohio River systems, was listed as Endangered under the ESA in June of 1976, followed by the establishment of a Recovery Plan in 1984. Freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and similar microorganisms from the water. This species is considered a short-term brooder, having a spring to early summer fertilization period with glochidial release occurring in the summer (USFWS 1984b). Glochidia require a period of parasitizing host fish prior to maturation into adult mussels. The host species for rough pigtoe glochidia is not currently known. After a few weeks of parasitizing the fish, juveniles detach from the host fish and must land in suitable habitat or they will perish. Adult mussels are largely sedentary, with little to no ability to move away from areas of disturbance (NatureServe 2010). The rough pigtoe is primarily found in medium to large rivers in shoals with moderate current. They inhabit sand, gravel, and cobble substrates and require flowing, well-oxygenated water to thrive (USFWS 1984b). The species is also occasionally found on flats and muddy sand (NatureServe 2010).

Status and Threats

The decline of the rough pigtoe (*Pleurobema plenum*) is primarily the result of habitat loss and degradation. Impoundments, channelization, chemical contaminants, mining, and sedimentation have combined to significantly alter or eliminate viable habitat throughout much of its range (USFWS 1984b). The majority of remaining populations of the species are mostly small and isolated geographically, increasing the susceptibility of individual populations to extirpation from catastrophic events such as toxic spills. The small size and isolation can also lead to potential inbreeding depression, reduction of long-term colony viability, and a low likelihood of natural repopulation of extirpated areas (USFWS 1984b). Potential threats to rough pigtoe populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off into the water body, exotic invasive species introduction, and further population fragmentation and genetic bottlenecking through take.

Distribution and Range

Unlike many mussel species in decline, the rough pigtoe remains relatively widespread, though general population decline and fragmentation is common, and the long term viability of most populations is questionable. Historically the species was found in 22 rivers in the Mississippi and Ohio River systems, though extant populations are now thought to only occur in the Green, Barren, Cumberland, Tennessee, and Clinch Rivers (USFWS 2006a). Viable populations that are thought to be reproducing are found below the Pickwick dam in the Tennessee River, along with portions of the Green River in Kentucky, and the Clinch River in Virginia, though the majority of the populations outside of these areas are generally small, geographically isolated, and are likely not viable over the long term (USFWS 2002a).

Presence in the Project Area

Based on initial project review (Armstrong et al. 2007), the NiSource project may affect this species in the following locations:

- Tennessee River – Hardin County, TN
- Cumberland River – Trousdale County, TN

- Ohio River – Pendleton, Bracken, and Lewis Counties, KY

2.1.10 SLABSIDE PEARLYMUSSEL

Species Background & Habitat

The slabside pearlymussel (*Lexingtonia dolabelloides*), a freshwater mussel found in the Cumberland and Tennessee River systems, became a Candidate species under the ESA in September 2006. Freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and similar microorganisms from the water. This species is considered a short-term brooder, having a spring to early summer fertilization period with glochidial release occurring during the summer. Glochidia require a period of parasitizing host fish prior to maturation into adult mussels (USFWS 2005c). Popeye shiner (*Notropsis ariommus*), Tennessee shiner (*Notropsis leuciodus*), silver shiner (*Notropsis photogenis*), rosyface shiner (*Notropsis rubellus*), saffron shiner (*Notropsis rubricroceus*), telescope shiner (*Notropsis telescopus*), and small mouth bass (*Micropterus dolomieu*) all appear to be host species for slabside pearlymussel glochidia (NatureServe 2010). After a few weeks of parasitizing the fish, juveniles detach from the host fish and must land in suitable habitat or they will perish. Adult mussels are largely sedentary, with little to no ability to move away from areas of disturbance. The slabside pearlymussel is largely found in large creeks to moderately sized rivers, inhabiting sand, fine gravel, and cobble substrates in relatively shallow riffles and shoals with moderate current. This species requires flowing, well-oxygenated water to thrive, and is usually found at depths of less than three feet (USFWS 2005c).

Status and Threats

The decline of the slabside pearlymussel is primarily the result of habitat loss and degradation. Chief causes of the species decline include impoundments, channelization, chemical contaminants, mining, and sedimentation. The majority of remaining populations of the species are mostly small and isolated geographically, increasing the susceptibility of individual populations to extirpation from catastrophic events such as toxic spills. The small size and isolation can also lead to potential inbreeding depression, reduction of long-term colony viability, and a low likelihood of natural repopulation of extirpated areas (USFWS 2005c). Potential threats to slabside pearlymussel populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off into the water body, exotic invasive species introduction, and further population fragmentation and genetic bottlenecking through take.

Distribution and Range

Historically the slabside pearlymussel was located in at least 32 streams in the Cumberland and Tennessee River systems, but is currently restricted to no more than 10 isolated stream segments (USFWS 2005c). Of the extant populations, only those in the Middle and North Forks Holston River, along with the Paint Rock and Duck Rivers are considered to be reproducing and at sufficient densities to be viable over the long term, with the viability of the remaining populations considered doubtful. In addition to reductions in range, the density of individuals in extant populations is considerably lower than in historical populations (NatureServe 2010).

Presence in the Project Area

Based on initial project review (Armstrong et al. 2007), the NiSource project may affect this species in the Duck River system in Maury County, Tennessee.

2.1.11 SNUFFBOX

Species Background & Habitat

In 2007, the U.S. Fish and Wildlife Service completed a status assessment for the snuffbox mussel (*Epioblasma triquetra*) and is proposing to list it as endangered (USFWS 2010d). Snuffbox are suspension-feeders, typically feeding on algae, bacteria, detritus, microscopic animals, and dissolved organic material. The life cycle of the snuffbox, like most freshwater mussels, is unusual and complex. Snuffbox is a dioecious species, it brooding habit is bradytictic: spawning occurs in the summer, and the larvae are released the following spring (Roe 2002). The male releases sperm in the water column that is then siphoned by the female to fertilize her eggs. Fertilized eggs develop into microscopic larvae, called glochidia, within special gill chambers. After brooding for up to seven months, the female expels mature glochidia, which then must attach to the gills or fins of a specific host fish species to complete development into juvenile mussels. If successfully attached to a host fish, glochidia mature within a few weeks. Juvenile mussels then drop off and continue to grow, if they fall onto appropriate substrate. Using fish as a host species allows the snuffbox to move upstream and populate habitats it could not reach otherwise. The snuffbox is usually found in small to medium-sized creeks in areas with a swift current, although it is also found in Lake Erie and some larger rivers. Adults often burrow deep in sand, gravel or cobble substrates, except when they are spawning or the females are attempting to attract host fish (USFWS 2010d).

Status and Threats

The snuffbox is declining throughout its widespread range and has become increasingly rare, although several dozen occurrences remain; many of them with good viability. Distribution is greatly fragmented but remains relatively wide. Long-term viability of most populations is questionable especially those in large rivers where zebra mussel populations are now established. The degree of decline has not been established (NatureServe 2010). Dams eliminate habitat and block fish passage leading to isolated, small, and unstable populations more likely to die out. Adult mussels are easily harmed by toxins and degraded water quality from pollution. Contaminants may directly harm mussels and affect the ability of surviving mussels to reproduce or disperse (affecting host fish). Excessive sedimentation suffocates freshwater mussels and reduces feeding and respiratory ability leading to decreased growth, reproduction, and survival. Nonnative zebra mussels pose a serious threat. Another invasive species, the round goby, is a nonnative fish that may displace native host fish species, thus reducing reproductive ability of the snuffbox reproduce. Destruction of habitat through stream channelization and maintenance and the construction of dams is still a threat in some areas. Dredging of streams has an immediate effect by physically removing and destroying individuals and also affects long-term re-colonization. Potential threats to snuffbox populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off into the water body, exotic invasive species introduction, and further population fragmentation and genetic bottlenecking through take.

Distribution and Range

Historically the snuffbox was widespread, occurring in 208 streams and lakes in 18 States and Ontario, Canada. The population has been reduced to 74 streams and lakes in 14 States and Ontario, which is a 65 percent rangewide decline. Today it is rare and considered endangered in Illinois, Indiana, Michigan, and Wisconsin, threatened in Ohio, and rare in Missouri. In Minnesota, this species has been extirpated from the Mississippi River below St. Anthony Falls. It was recently documented in the Fox River basin in Illinois by a single weathered valve in Nippersink Creek with no specimens on the Wisconsin side of the basin. The species has not been collected alive in New York (historically known from Niagara River, Lake Erie, Buffalo River) since 1950 (Strayer

and Jirka, 1997) but spent shells have been found recently. Historically in Canada it occurred in Ontario in Lake St. Clair, Lake Erie, the Thames, Grand, Niagara, Ausable, and Saudenham Rivers but has been extirpated from all but the latter two. It is likely extirpated from Swan Creek (Lower Maumee drainage) in Ohio as only weathered shells were found there recently (NatureServe 2010). Most remaining populations are small and geographically isolated from one another, further increasing their risk of extinction.

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in Tennessee, Kentucky, Ohio, New York, and Pennsylvania. In Tennesse, it is known from select areas throughout the Clinch, Powell, North and South Fork Holston, and lower Nolichucky Rivers; Little River and the Tennessee River downstream from Knoxville; the Elk and Duck Rivers; the Cumberland and Obey Rivers. Dead shells (some recent) have been found in the Elk River and Richland Creek, Tennessee. In Kentucky, it is sporadic in the upper Green River and eastward. In Mississippi, it is found only in Tennessee River drainage. In Ohio, it is largely associated with the Great and Little Miami Rivers, Scioto and Muskingum tributaries in unglaciated Ohio including Big Darby Creek and Grad, Maumee, and Sandusky Rivers andSwan Creek in Lake Erie drainage. Two spent shells were recently collected in the mainstem of the Tonawanda Creek basin (Niagara River drainage) in western New York. This species occurs in Muddy Creek (French Creek drainage) in the Erie NWR in Crawford Co. (NatureServe 2010).

2.1.12 SPECTACLECASE

Species Background & Habitat

The spectaclecase (*Cumberlandia monodonta*), a freshwater mussel found throughout much of the Mississippi River system, has been a candidate species under the ESA since September 2006, and is currently proposed for listing as endangered (USFWS 2011). Freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and similar microorganisms from the water (NatureServe 2010). This species is considered a short-term brooder, having a spring to early summer fertilization period with glochidial release occurring during the summer. The spectaclecase may exhibit hermaphrodism, allowing smaller populations to persist. Glochidia require a period of parasitizing host fish prior to maturation into adult mussels. While numerous species of potential host species have been tested in laboratory experiments with negative results, wild-collected bigeye chub (*Hybopsis amblops*) and pealip redhorse (*Moxostoma macrolepidotum pisolabrum*) have been noted to carry spectaclecase glochidia. After a few weeks of parasitizing the fish, juveniles detach from the host fish and must land in suitable habitat or they will perish. Adult mussels are largely sedentary, with little to no ability to move away from areas of disturbance (USFWS 2005a). The spectaclecase is primarily found in larger streams and appears to be more of a habitat specialist than most mussel species. The species inhabits substrates from mud and sand to gravel, cobble, and boulders, generally in shallow riffles and shoals with variable current. Most commonly, spectaclecase is found in firm mud between large rocks in quiet water directly adjacent to swifter currents (NatureServe 2010).

Status and Threats

The decline of the spectaclecase is primarily the result of habitat loss and degradation. Chief causes of the species decline include impoundments, channelization, chemical contaminants, mining, and sedimentation. Exotic invasive species such as the zebra mussel (*Dreissena polymorpha*) are also considered a growing threat for many of the populations. The majority of remaining populations of the species are mostly small and isolated geographically, increasing the susceptibility of individual populations to extirpation from catastrophic events

such as toxic spills. The small size and isolation can also lead to potential inbreeding depression, reduction of long-term colony viability, and a low likelihood of natural repopulation of extirpated areas (USFWS 2005a). Potential threats to spectaclecase populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off into the water body, exotic invasive species introduction, and further population fragmentation and genetic bottlenecking through take.

Distribution and Range

Historically the spectaclecase was located throughout much of the upper two-thirds of the Mississippi River system and its tributaries, with populations in 45 streams across 15 states. The species appears to be extirpated from more than half of the streams that it was historically found in, and is no longer found in long reaches of the Illinois, Cumberland, Mississippi, and Tennessee Rivers that it once inhabited, though remnant populations do exist in pockets of those rivers (NatureServe 2010). Extant populations of the species are currently thought to occur in 20 streams in 10 states, though many of those populations are represented by a single specimen, and are thus considered non-viable (USFWS 2005a).

Presence in the Project Area

Based on initial project review (Armstrong et al. 2007), the NiSource project may affect this species in the Tennessee River in Hardin County, Tennessee.

2.2 PLANT SPECIES

2.2.1 RIPARIAN PLANTS

2.2.1.1 HARPERELLA

Species Background & Habitat

The harperella (*Ptilimnium nodosum*), an annual herb in the Carrot family found in portions of the southeast and mid-Atlantic United States, along with portions of the Ouachita Mountains in Arkansas, was listed as Endangered under the ESA in September of 1988, followed by the establishment of a Recovery Plan in 1991. A 5-Year Review was initiated in 2008 (USFWS 2008d). The species has two forms: P. nodosum and P. fluviatile, previously considered separate species, though they are now combined under the nodosum species and handled inclusively under the ESA. Two primary forms of the species, which previously divided it, are based largely on habitat and habitat derived characteristics, with one form found in seasonally flooded rocky streams, and the second found in coastal plain ponds. In both its habitats, the species occurs only within a narrow band of water depths, with the plant intolerant to dry conditions, yet unable to complete its life cycle if completely inundated, though it is tolerant of periodic, moderate flooding. The stream form grows on rocky and sandy shoals, or occasionally muddy banks, of seasonally flooded and quickly moving streams; generally in microsites that are sheltered from rapidly moving water. Stream populations flower in July and August, with seed germination in September. The harperella may spread vegetatively as well, and can be considered a facultative perennial, with submerged vegetation being able to survive the winter. Less is known about the pond form due to its rarity and a subsequent lower quantity of research. It is found on the edges of shallow pineland ponds, low savanna meadows, and along a granite outcrop in one site. It is a true annual, completing its reproductive cycle by late summer or fall, when the ponds are devoid of standing water and competing species have moved in. (USFWS 1991a and NatureServe 2010).

Status and Threats

The decline of harperella is primarily the result of habitat destruction or degradation. Due to the narrow range of water depths that the species can survive in, modifications in flow such as impoundments and diversions significantly threaten the species in riverine habitats through dying out or drowning. Similarly, dredging or filling of pond habitats threatens pond populations. Lowered water tables in areas adjacent to the species through ditching and other manipulations may lead to similar effects over the long term. Direct mortality has also been observed due to excessive silt levels or pH changes within stream habitats. Due to the spatial discreteness of inhabited microsites, yet the regular shifting of the location of these sites form year to year dependent on water fluctuations, potential habitat needs to be considered at a larger spatial scale than at the microsite level for long term species protection. Additionally, the species is thought to be a poor competitor, indicating a potential threat from invasive non-native species (USFWS 1991a). Potential threats to harperella populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

Similar to life history, historic and current population distribution is dependent on habitat form. Stream populations are found in portions of Maryland, Virginia, West Virginia, North Carolina, Alabama, and Arkansas. Pond populations are found in South Carolina and southern Georgia. Thirteen populations were known to be extant at the time of the Recovery Plan, nine in the riverine form, and four in the pond form (USFWS 1991a). Approximately 50% of the species historic range has been destroyed. Current estimates place the number of populations between 15 and 20. A number of these populations are in previously undocumented locations, indicating the potential for more populations in previously unknown areas. Population sizes range from 50 to 1,000,000 individuals, with the larger populations found in the riverine areas (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Allegany and Washington Counties, Maryland. Populations in these areas are of the riverine form and would be found in the shoals of seasonally flooded rocky streams (NatureServe 2010).

2.2.1.2 SPRING CREEK BLADDERPOD

Species Background & Habitat

The Spring Creek bladderpod (*Lesquerella perforata*), an annual herb in the Mustard family found in Wilson County, Tennessee, was listed as Endangered under the ESA in December of 1996, followed by the establishment of a Recovery Plan in 2006. The species generally has multiple coarsely haired stems, auriculate leaves, white cross-shaped flowers, and inflated round fruits. The species germinates between September and early October, overwinters as a small rosette of leaves, and continues development and flowering the following spring. Flowering occurs in March and April, and seed maturation occurs in late April into early May. Plants die back soon after fruit maturation and seeds lie dormant until autumn. Full sun is required for optimum growth and germination can only occur when correct temperatures and moisture contents coincide. Seeds may be capable of remaining dormant within the soil upwards of 6 years, awaiting adequate conditions to germinate. Spring Creek bladderpod is found within the floodplain fields of three streams. It is primarily located on newly disturbed sites and appears to require some degree of annual disturbance to complete its life cycle. Historically

this disturbance came from periodic flooding and its associated scouring, though cultivation appears capable of approximating this disturbance currently. Till cultivation that avoids fall plowing and delays spring plowing until May, when the species fruit have set, appears common in remnant population areas (USFWS 2006b and NatureServe 2010).

Status and Threats

The decline of Spring Creek bladderpod is primarily due to habitat destruction, combined with its extremely limited range. The species has shown strong resiliency during the conversion of much of the floodplain valley it inhabits to agriculture historically, with cultivation now providing one of the primary means of disturbance that the species requires, though fall or early spring plowing would prove detrimental to the species. Agricultural land in Wilson County is increasingly being converted to residential developments and their associated roads and utility lines, removing areas of the species range from vegetative cover. The conversion of cropland to pastures also poses a threat to the species from a lack of annual disturbance and the vegetative conversion to grasses, such as fescue, that would out-compete the bladderpod. Additionally, any further impoundments in the area, or other water projects that would change the water levels, flooding, or hydrology of the three Creeks, or of the downstream Lake would also be considered a threat to the species through modification or loss of the flood disturbances, or floodplain habitat on which it depends (USFWS 2006b). Potential threats to Spring Creek bladderpod populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

Spring Creek bladderpod has only ever been known from the Spring Creek, Bartons Creek, and Cedar Creek watersheds, near the City of Lebanon, in Wilson County, Tennessee. Prior to the impoundments of the Cumberland River, which formed Old Hickory Lake, into which all three watersheds flow, the species may have occurred downstream of known occurrences, but it has never been documented outside of these three watersheds. 21 extant occurrences are known, six along Spring Creek, 11 along Bartons Creek and its tributaries, and four along Cedar Creek (USFWS 2006b).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species within floodplain habitats in Wilson County, Tennessee (NatureServe 2010).

2.2.1.3 VIRGINIA SPIREA

Species Background & Habitat

The Virginia spiraea (*Spiraea virginiana*), a perennial shrub in the Rose family found in the southern Appalachians, was listed as Threatened under the ESA in June of 1990, followed by the establishment of a Recovery Plan in 1992. A 5-Year Review was initiated in 2009 (USFWS 2009b). The species is a clonal shrub often found in dense clumps with a sparsely branched upright to arching stems, a thick horizontal rhizome, variable leaves, and showy clusters of small white flowers (NatureServe 2010). The species exhibits a modular growth pattern, with several genetically identical forms that are determined by age and environmental conditions, showing an environmental tenacity that allows adaptive responses to an unpredictable habitat and a

range of disturbances. The species primarily reproduces vegetatively, with rhizome cloning expanding the size of an individual to the extent of available resources. When the limit is reached, sexual reproduction occurs, but based on the often-disturbed habitat that the species is found it, this growth limit is rarely reached. The species flowers profusely in June and July, though fruit and seed is rarely produced unless two different genets are placed in close proximity to each other, which rarely happens in current populations without direct management to that effect. Virginia spiraea inhabits the banks of high gradient sections of second and third order streams, along with meander scrolls and point bars, natural levees, and other braided features of lower stream reaches, often near the mouth of the stream. The species is found in early successional areas with a regime of frequent disturbance. A lack of competition appears to be key to the species, which shows a limited tolerance for short periods of overtopping arboreal species or fast-growing herbaceous competitors, but requires scouring flood events sufficient to topple the overstory and wash out many of the herbs and vines. The species is adapted to these scouring events through the ability to generate from the rootstock even if the above-ground vegetation is removed. While a level of scour is required by the species, it is rarely found on sites of maximum erosion, but more commonly in areas where depositions occur after high water flows, such as floodplains and overwash islands (USFWS 1992c).

Status and Threats

The decline of Virginia spiraea is primarily due to habitat loss and degradation. Multiple impoundments have been constructed within the watersheds of the species, posing a threat to populations both through direct mortality and habitat destruction from rising waters drowning previously suitable habitat, and from blocking root segments that wash down stream in flood events, which previously could have rooted in suitable habitat and re-colonized or newly colonized down stream portions of the range. Development of rivers and water control projects have also threatened the species through regulation of the disturbance events that it relies on to halt plant succession and reduce competition, and alternately through a limited number of high impact disturbances, which would wash away root stocks. The low level of sexual reproduction intrinsic in the species is also a threat to long term longevity, limiting its ability to recolonize areas lost to stochastic events, or to inhabit newly created disturbed habitats. Non-native exotic species introduced inadvertently into the area are also a concern in regards to out-competing the species for habitat and resources (USFWS 1992c). Potential threats to Virginia spiraea populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, the use of herbicides/pesticides, and further fragmentation and genetic bottlenecking through take.

Distribution and Range

Historically, Virginia spiraea was endemic to much of the Southern Appalachians, stretching from Georgia and Ohio south to Georgia and Tennessee. The species is considered extirpated from Pennsylvania, but there are an estimated 61 extant occurrences in 31 populations, found in Georgia, Kentucky, North Carolina, Ohio, Tennessee, Virginia, and West Virginia. Extant populations are found on streams that drain into the Ohio River, primarily within the Appalachian Plateau and Blue Ridge regions, though there is an outlier in the Bluegrass Region of Kentucky. Although the species covers a wide range, the majority of occurrences are small and considered poor in both quality and viability. Range-wide, there may be fewer than 30 distinct genotypes remaining among the various populations (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions Mercer, Raleigh, Summers, and Upshur Counties, West Virginia. Populations in these areas would be found in association with periodically flood-scoured banks of high gradient mountain streams, meander scrolls, point bars, natural levees, and braided features of lower stream reaches, along with occasional location near disturbed right-of-ways (NatureServe 2010).

2.2.2 TRANSITIONAL SUCCESSIVE PLANT SPECIES

2.2.2.1 AMERICAN CHAFFSEED

Species Background & Habitat

The American chaffseed (*Schwalbea americana*), a perennial herb in the Figwort family historically found throughout much of the eastern coast with extensions into Kentucky and Tennessee, was listed as Endangered under the ESA in September of 1992, followed by the establishment of a Recovery Plan in 1995. The species is a monotypic perennial found in pine flatwoods, fire-maintained savannas, ecotonal areas between peaty wetlands and xeric sandy soils, and other open grass-sedge systems. It generally occurs in sandy (sandy peat, sandy loam), acidic, seasonally moist to dry soils. American chaffseed is considered shade intolerant, primarily occurring in areas maintained in an open to partially open condition, often due to frequent, naturally-occuring fires. Many of the most vigorous remnant populations are found in areas that are still subject to frequent fires. The species is a hemiparasite, receiving nutrients both from chlorophyll and from parasitizing the roots of a variety of woody and herbaceous species. They produce showy, insect-pollinated flowers with a high level of zygomorphy elaborated for pollination by bees, with worker bumblebees (*Bombus impatiens* and *pennsylvanicus*) appearing to be the primary pollinator. Flowering occurs between April and June in southern populations, and June to mid-July in northern populations, with fruit maturation between early summer and October. The method of seed dispersal is thought to be wind driven but is not currently known (USFWS 1995a).

Status and Threats

The decline of American chaffseed is primarily the result of habitat destruction and the suppression of natural fires (USFWS 2010a). Much of the chaffseed's historical habitat has long since been converted to agriculture, housing and development, transportation corridors, and succession to woody vegetation, largely due to fire suppression (NatureServe 2010). Sandy pinelands, where the species is primarily found, is especially vulnerable to development due to their soils generally being level, deep, and suitable for building. In addition to direct habitat loss, development also indirectly threatens the species as urbanization generally results in total fire suppression, generally allowing un-developed portions to be encroached on by woody vegetation, choking out the chaffseed (USFWS 1995a). Potential threats to American chaffseed populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

American chaffseed was historically found from Massachusetts and New York south through the East Coast states to Florida and west through the Gulf Coast states into Texas, along with the inland states of Kentucky and Tennessee. The species is now considered extirpated north of the Carolinas, except for portions of New Jersey, along with several of the southern states in which it was currently found. Extant populations often have low

numbers of individuals, and the density of individuals in most populations appears to be declining (NatureServe 2009), though historical records indicate that the species may have always been relatively rare and local in distribution. Extant populations are located in New Jersey, North Carolina, South Carolina, Georgia, Alabama, Louisiana, and Florida, with the largest populations found in the Carolinas (USFWS 1995a).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of its historic range in Greensville and Sussex Counties, Virginia. Habitat types that the species might be found in include pine flatwoods, pitch pine lowland forests, seepage bogs, palustrine pine savannahs, and other grass and sedge dominated communities. No known extant populations of American chaffseed are located within Virginia, though patches of suitable habitat may occur, and due to its historic presence, the possibility of the existence of undocumented populations within the project area may exist (NatureServe 2010).

In addition, the NiSource project may affect this species in portions of its current range in Bourbon, Fayette, and Madison Counties, Kentucky, and Davidson and Trousdale Counties, Tennessee. Additionally, the project my intersect portions of the species historic range in Clark, Garrard, and Powell Counties, Kentucky, and in Maury County, Tennessee. The species is generally found on dry limestone rocks or open rock ledges (NatureServe 2010).

2.2.2.2 EASTERN PRAIRIE FRINGED ORCHID

Species Background & Habitat

The eastern prairie fringed orchid (*Platanthera leucophaea*), a perennial herb in the orchid family, was listed as Threatened under the ESA in October of 1989, followed by the establishment of a Recovery Plan in 1999. The species requires full sun for optimum growth, and are primarily found in tall grass calcareous silt loams or sub-irrigated sand prairies, though it can also be found in open portions of fens, sedge meadows, marshes, and bogs. The orchid grows from underground, annually regenerating tubers which remain dormant during the winter. Leaves and inflorescence generally emerge in May, with flowering in late June to early July and the seed dispersal period is generally completed in August-September. The species has large, showy white flowers which are fragrant at night, adapting the species for nocturnal pollination, generally by hawkmoths. Pollination is required for seed production, and seedling development is dependant on mycorrhizal association with fungus in the soil, which provides nutrients required for development. Disturbance also plays a key role in seedling development, with early successional vegetation stages required for seedling establishment. The orchid is adapted for periods of dormancy, for example during a fire, but is susceptible to disturbance throughout the growing season (USFWS 1989b and 1999).

Status and Threats

Historic declines of the eastern prairie fringed orchid are largely due to habitat conversion, with ongoing threats from habitat succession to woody vegetation, competition from non-native species, over collecting, and wetland drainage and development. Because the species can not survive in shaded areas, some variety of disturbance is required to halt the succession of habitats into woody or brushy stages. Historically prairie fires served this purpose, though with modern day fire control, and the majority of eastern land being either unmanaged, or heavily managed for some variety of economic purpose, areas that meet this requirement will generally be small in size and short in relative duration; thus, this species will likely only be found in small pockets of open native

vegetation, if at all (USFWS 1999). Potential threats to eastern prairie fringed orchid populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

The eastern prairie fringed orchid historically ranged from Iowa to Oklahoma in the west, with the majority of the species located to the west of the Mississippi River, spreading from Wisconsin and Illinois to western New York, Virginia, Maine and Ontario. The species range has declined more than 70 percent within the United States, with only 59 documented populations found within six states at the time of the Recovery Plan (USWFS 1999). In addition to being extirpated through much of its previous range, the species is considered very rare throughout its current range. Large populations no longer occur within the United States, with remaining populations being largely small and isolated (NatureServe 2010).

Presence in the Project Area

The NiSource project footprint crosses counties with known pocket populations of eastern prairie fringed orchid within the states of Indiana, Ohio and Virginia. Counties crossed include Clark, Holmes, Lucas, Ottawa, Sandusky and Wayne Counties in Ohio; and Augusta County in Virginia (NatureServe 2010). The species will primarily be found in areas of grass or sedge communities dominated by native species. Orchids will not be found in areas with a build up of woody vegetation, in areas that are otherwise predominantly shaded, or in areas that are heavily cultivated or are predominated by invasive species.

2.2.2.3 LEAFY-PRAIRIE CLOVER

Status and Threats

The decline of leafy prairie-clover is primarily the result of habitat destruction. The principal threat to the species comes from widespread fire suppression, leading to the succession of suitable habitat to woody vegetation. Due to the species' apparent lack of shade tolerance, woody invasives choke out populations unless they are controlled by burning or other means. Without ongoing land management, the majority of remaining populations will likely be extirpated over the long-term from this threat (NatureServe 2010). Other threats include inappropriate or illegal collection of individuals, development of suitable habitat, grazing and natural herbivory, and invasive non-native species in regards to competition (USFWS 1996). Potential threats to leafy prairie-clover populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

Historic population number and range of leafy prairie-clover is largely unknown due to the species disjunct populations, with populations only known in Tennessee, Alabama, and Illinois. 51 extant populations exist, the majority of which (44) are found in the Central Basin of Tennessee, along with four populations in Alabama and three in Illinois. Of the 44 populations found in Tennessee, only 17 are considered marginal or better (NatureServe 2010). Of the extant population, many are small, containing less than 25 individuals, many of which are immature and non-flowering. While additional populations may be found in the future, due to

intense searches for the species in the past, any newly discovered populations are likely to be small and marginal (USFWS 1996).

Species Background & Habitat

The leafy prairie-clover (*Dalea foliosa*), a perennial herb in the Pea family found in Tennessee, Alabama, and Illinois, was listed as Endangered under the ESA in May of 1991, followed by the establishment of a Recovery Plan in 1996. The species is a stout, but short-lived, perennial with several stems arising from a root crown. It has no capacity for vegetative spread, and thus is completely reliant on seed production and stock for ongoing population survival. Flowering begins in July, peaks in August and can continue into September in some locations, with first-year plants able to flower, but most individuals taking up to three years to do so. The inflorescence is composed of dense spikes of small purple flowers, and while the exact breeding mechanism is not known, it is thought that pollination occurs via insect vectors; specifically bumblebees, small bees, and syrphid flies. Seeds ripen by early October, disperse from late fall into early spring, and are capable of remaining dormant in the soil for many years, forming a seed bank. Adequate soil moisture is critical for seedling establishment. The species requires full sun and low competition for optimum growth, and thus appears to be disturbance dependent, with periodic burning or other means needed to minimize woody succession into suitable habitats. Leafy prairie-clover is found in thin-soiled mesic and wet-mesic dolomite prairies, limestone cedar glades, and limestone barrens. Soils are generally less than 18 inches deep and are formed of silt to silty clam loams over flat and fractured, horizontally bedded limestone or dolomite, often with areas of exposed bedrock at the surface (USFWS 1996).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Davidson, Maury, Williamson, and Wilson Counties, Tennessee, along with the potential discovery of undocumented extant pockets of the species within its historic range in Sumner County, Tennessee. Populations in these areas would be found in association with limestone glades and barrens (NatureServe 2010).

2.2.2.4 PRICE'S POTATO BEAN

Species Background & Habitat

The Price's potato bean (*Apios priceana*), a perennial herb in the Pea family found in Alabama, Mississippi, Kentucky, Tennessee, and Illinois, was listed as Endangered under the ESA in January of 1990, followed by the establishment of a Recovery Plan in 1993. The species is an herbaceous, twining vine that grows from a stout, thick, roundish tuber. It flowers from late-mid-July through mid-August, producing fleshy, greenish-pink flowers with maroon tints. Flowers are pollinated primarily by the long tailed skipper (*Urbanus proteus Linnaeus*), and also by honey bees (*Apis mellifera Linn*.) and bumble bees (*Bombus* spp.). Fruit mature in August and September, but seed set for the species is observed to be low. Vegetative reproduction and dispersal appears to be limited, possibly due to the single large tuber, rather than multiple small tubers found in related species. Price's potato bean thrives in open, wooded areas, and is usually found in forest gaps or along forest edges. The species shows a preference for mesic areas, often being located in open, low areas near streams, or along stream and river banks. It is also sometimes found at the base of small limestone bluffs. Most extant populations are found in cleared areas, such as powerline or road right-of-ways. The species is found on a substrate of well drained loams or old alluvium over limestone, and can survive on a broad range of soil pHs (USFWS 1993f).

Status and Threats

The decline of Price's potato bean is primarily due to its low reproductive success combined with human disturbances. Low levels of sexual reproduction, seen in low seed sets, and a limited ability to spread vegetatively, combined with the species only being found in small, widely disjunct populations leads to threats to its long-term viability. Threats from these population dynamics come from a lack of ability to repopulate extirpated areas, combined with an increased threat of population extirpation from stochastic events, and the potential for inbreeding depression. While selective logging may prove beneficial to the species through increasing light levels, clear cutting or heavy logging destroys, or heavily degrades habitat through heavy equipment use and skidding; however, the species has shown the ability to remain dormant until conditions improve, or to recolonize secondary-growth forests. The location of multiple remnant populations within right-of-ways is also a concern, with potential threats from maintenance activities, such as herbicide use, mowing, and brush clearing, along with the potential for population extirpations from activities such as road widening or line upgrades. Other threats include trampling and grazing by livestock, uncontrolled erosion, insect related depradation, and competition with exotics (USFWS 1993f). Potential threats to Price's potato bean populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, the use of herbicides/pesticides, and further fragmentation and genetic bottlenecking through take.

Distribution and Range

Price's potato bean populations have historically been found in 36 locations, in 22 Counties of five States, including Alabama, Illinois, Kentucky, Mississippi, and Tennessee (USFWS 1993f). Currently, there are 25 widely scattered populations that are thought to be extant, most of which have less than 50 individuals. The greatest remaining concentration of the species is found in western Kentucky and Tennessee. The one population discovered in Illinois historically was destroyed and the species is now considered extirpated in the state (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Maury, Wayne, and Williamson Counties, Tennessee, along with the potential for rediscovery of the species within portions of its historic range in Davidson County, Tennessee. Populations in these areas would be found in association with open, rocky, wooded slopes and floodplain edges under mixed hardwoods, or within forest clearings (NatureServe 2010).

2.2.2.5 RUNNING BUFFALO CLOVER

Species Background & Habitat

The running buffalo clover (*Trifolium stoloniferum*), a perennial herb in the Pea family historically found from West Virginia to Kansas, was listed as Endangered under the ESA in June of 1987, followed by the establishment of a Recovery Plan in 1989. The original Recovery Plan served to increase the knowledge base of biological information and current range and population of the species, and was subsequently revised in 2007 with updates to status, biology, and recommendations for species recovery. The species forms long ground-running stolons from a central root crown, with erect stems with trifoliate leaves arising from the stolon nodes, and flowering stocks crowned by a purple-tinged white flower head. Flowering occurs from mid-April to June, with

fruit production occurring from May to July. Bees (Apis spp. and Bombus spp.) are the primary pollination vectors, and while the species is self-compatible, there is no mechanism for self-pollination. Spring temperature fluctuations appear to be a major contributor to a break in seed dormancy and germination. Seed scarification also appears to play a large roll in germination in the species, accelerating the process. Historically, the scarification was provided by the digestive system of herbivores, especially bison (*Bos bison*), whose migratory patterns would serve to disperse the species. Cattle, while similar, are generally penned and do not serve as an ecological equivalent to the regionally extirpated bison, and both natural and managed mechanical scarification have shown poor results. The species is also capable of vegetative reproduction, with rooted stolons breaking off to form daughter plants. Running buffalo clover is found on mesic habitats with partial to filtered sunlight, in areas where this is a long-term pattern of moderate, periodic disturbance such as mowing, trampling, or grazing. It is primarily, though not exclusively, found in areas underlain by limestone or other calcareous bedrocks. Habitat associations include mesic woodlands, savannahs, floodplains, stream banks, sandbars (especially in areas where old trails cross or parallel the intermittent stream), grazed woodlots, mowed paths (cemeteries, parks, lawns, etc), old logging roads, jeep trails, ATV trails, skid trails, mowed wildlife openings within mature forest, and steep ravines (USFWS 2007f).

Status and Threats

The decline of running buffalo clover is primarily due to habitat destruction, habitat succession, and invasive plant competition. The major species decline evident after initial settlement of the region is largely considered to caused by the extirpation of buffalo from the region as buffalo are thought to have provided the right balance of periodic disturbance, soil enrichment, seed dispersal, and seed scarification. Cattle, while similar to bison morphologically, are neither migratorial nor free roaming, generally providing a long-term grazing pressure to the habitat rather than the short-term impacts found with moving herds. Unless carefully managed in the interest of the clover, cattle generally overgraze, which can destroy or heavily degrade populations, or undergraze, which can result in overshading and/or competition from other vegetation. Land development is also both a historic and current threat, as urban sprawl is common within previously occupied areas. Additionally, non-native clovers and other herbaceous species have bee introduced into the region and have contributed to the decline of the species through competition. Another threat to the species comes from an effective lack of long-range seed dispersal methods due to the penning of cattle, the eradication of bison, and an observed low seed vitality when ingested by white-tailed deer (*Odocoileus virginianus*); while human related regional impacts would appear to have created many new areas of suitable habitat for the species, no vectors are available to the species for inhabiting these new areas without direct management intervention. Finally, due to the small and spatially disjunct nature of most remaining populations, many populations face threats of complete extirpation without possible repopulation from stochastic events (USFWS 2007f). Potential threats to running buffalo clover populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

Historically, running buffalo clover was found in a strip from West Virginia to Kansas, including populations in Ohio, Kentucky, Indiana, Missouri, and Arkansas. Most of the historically known populations are extirpated, reducing the species current range to small portions of West Virginia, Ohio, Kentucky, and Indiana, along with one poor quality population in Missouri. Multiple new sites that were previously unknown were discovered during the research efforts following the publishing of the original Recovery Plan. One-hundred and four extant populations are currently recorded, though most are small and of poor quality (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Bourbon, Campbell, Clark, Fayette, Madison, and Montgomery Counties, Kentucky; Brown, Clermont, and Lawrence Counties, Ohio; and Pendleton, Pocahontas, Preston, Randolph, Tucker, and Webster Counties; West Virginia. Additionally, the potential for rediscovery of the species within portions of its historic range exists in Jackson County, Kentucky and Monongalia County, West Virginia. Populations in these areas would be found in association with moderately disturbed areas such as old roads, old home sites, cemeteries, and trails that pass through mesic woodlands (NatureServe 2010).

2.2.3 UPLAND/UPLAND SUCCESSIONAL PLANT SPECIES

2.2.3.1 GLOBE (SHORTT'S) BLADDERPOD

Species Background & Habitat

The globe, or Short's bladderpod (*Lesquerella globosa*), a perennial herb in the Mustard family historically found in parts of Indiana, Kentucky, and Tennessee, became a Candidate species under the ESA in December 2008. The species is a short-lived perennial with hairy gray-green foliage that generally grows one to one and a half feet tall. It has yellow flowers, with flowering occurring March through May, and produces small round fruit. The bladderpod is primarily found on steep, rocky wooded slopes and talus areas, along with cliff tops, bases, and ledges. It is often found in close proximity to rivers or streams, and generally on south to west facing slopes, often in association with outcrops of calcareous rock. Population size can vary from two to 1,500 individuals, with an average population size in the 50s (USFWS 2005b). Population fluctuations from year to year dependent on successful germination and seedling survival in its arid microhabitat (NatureServe 2010).

Status and Threats

The decline of globe bladderpod is primarily the result of habitat destruction, modification, or curtailment. While their cliff and slope side habitat is generally unsuitable for many uses, road construction appears to be common in these areas, thus road construction and maintenance have posed the most significant past and current threat to the species, fragmenting populations and destroying key habitat. Specific road related activities that pose a threat to the species include bank stabilization, herbicide use, mowing during the growing season, grading of road shoulders, and road widening or repaving, along with sediment deposition on adjacent populations. Artificial water level manipulation and impoundments have also threatened or destroyed some populations of the species, as many are found adjacent to waterways. Additionally, nonnative invasive species have posed and continue to pose a threat to the species through aggressive competition, including Japanese honeysuckle (*Lonicera japonica*), garlic mustard (*Alliaria petiolata*), alsike clover (*Trifolium hybridum*), sweet clover (*Melilotis alba*), fescue (*Festuca pratensis*), multiflora rose (*Rosa multiflora*), and wild hyacinth (*Camassis scilloides*). Other lesser threats include commercial and residential construction, trash dumping, cattle and goat grazing, shading from overstory trees, and competition and shading from herbaceous perennials (USFWS 2005b). Potential threats to Globe bladderpod populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

Endemic to the Interior Low Plateaus province, the globe bladderpod was historically found in 57 locations, stretching from middle Tennessee through northcentral Kentucky, and into southern Indiana (NatureServe 2010). Of the 57 historic populations, 33 are still extant, with 18 populations in Tennessee, 14 in Kentucky, and one in Indiana. Of the populations, the two largest with an average of up to 1,500 individuals are found in Cheatham County, Tennessee, with all other known extant sites average a handful of individuals to 50 plants, with no other sites having populations larger than 250 individuals (USFWS 2010e).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of its current range in Bourbon, Fayette, and Madison Counties, Kentucky, and Davidson and Trousdale Counties, Tennessee. Additionally, the project my intersect portions of the species historic range in Clark, Garrard, and Powell Counties, Kentucky, and in Maury County, Tennessee. The species is generally found on dry limestone rocks or open rock ledges (NatureServe 2010).

2.2.3.2 LAKESIDE DAISY

Species Background & Habitat

The lakeside daisy (*Hymenoxys herbacea*), a perennial herb in the Sunflower family found in Ontario, Illinois, and Ohio, was listed as Threatened under the ESA in June of 1988, followed by the establishment of a Recovery Plan in 1990. The species is an herbaceous, spring-blooming perennial with a short, tick taproot, a stout, branching stalk, and showy, bright yellow flowers. Flowering occurs from late April into early June. Pollination occurs primarily through insect vectors; generally bumble bees (*Bombus* spp.), carpenter bees (*Ceratina* spp.), and halictid bees (*Halictidae* spp.), though wind pollination may also occur. Outcrossing is required for seed production in the species, preventing self-fertilization or cross-fertilization between plants carrying the same incompatibility alleles. Seed dispersal is primarily wind born. Primary habitat for the species includes outcrops of dolomite or limestone bedrock, dry gravelly prairies on terraces or hills associated with major river systems, rocky shores, sand fields, and alvars. U.S. populations persist on dry, thin-soiled, degraded prairies with limestone or dolomite bedrock at or near the surface. The habitat is generally alkaline, seasonally wet in spring and fall, moderately to extremely droughty in summer, with little topographic relief, open and unshaded in nature, and have a low density and diversity of other vegetation (USFWS 1990b). Existing populations exist almost exclusively on alvars or bare rock in forest openings (NatureServe 2010).

Status and Threats

The decline of lakeside daisy is primarily the result of habitat destruction. Due to its dolomite and limestone habitats, inhabited areas are often subject to commercial quarrying, which directly destroys habitat, along with additional secondary impacts from fill activities and runoff from gravel washing. The habitat is also often used as a disposal site of fill from dredging and excavation activities in other areas, burying individuals and potential habitat. Additional threats include successional encroachment of woody species into suitable habitat areas due to fire suppression associated with development, competition with invasive non-native species, and localized herbivory. Extant populations, due to their small size and isolated nature, face a growing threat from localized extinction-causing events, such as stochastic environmental or demographic processes, or man-caused catastrophic events such as further habitat destruction destroying entire small pocket populations. Finally, due

to the species dependence on genetic outcrossing, these small disjunct populations face threats from reproductive failure from low population genetic variation, reduction of long-term colony viability, and a low likelihood of natural repopulation of extirpated areas (USFWS 1990b). Potential threats to lakeside daisy populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

Lakeside Daisy was historically found in restricted areas of limestone and dolomite outcrops in Ontario, Illinois, Ohio, and one population discovered in Michigan after the time of the Recovery Plan. At least 24 populations remain in Ontario on Mantioulin Island and Bruce Peninsula and are considered relatively stable, but the species is in danger of becoming extirpated within the U.S. Illinois natural populations are extirpated, though reintroduction efforts into portions of its previous range appear to be re-establishing. One natural Ohio population remains extant, though it is located within an active quarry and is considered critically imperiled. Another re-introduced population into previous range in Ohio, and a newly discovered population in Michigan form the remainder of known occurrences within the U.S. (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Erie and Ottawa Counties, Ohio. Populations in these areas would be found in association with dolomite and limestone outcrops (NatureServe 2010).

2.2.3.3 LEEDY'S ROSEROOT

Species Background & Habitat

The Leedy's roseroot (*Sedum integrifolium spp. leedyi* or *Rhodiola integrifolia ssp. leedyi*), a perennial herb in the Stonecrop family found in restricted portions of Minnesota and New York, was listed as Threatened under the ESA in April of 1992, followed by the establishment of a Recovery Plan in 1998. The species has thick, succulent, glaucous leaves, a scaly root crown, and dark red and yellow flowers. Flowers are generally functionally female or male, and generally appear in early June. Bees and syrphus flies are thought to be the primary pollination vectors. Seeds are winged and adapted for wind dispersal. Although root cloning is possible in the species, it is thought to be rare. Leedy's roseroot is only found in specialized Cliffside habitats (USFWS 1998c). The species is found on north or east-facing talus slopes or cliff ledges. It is always found associated with areas where ground water or cool air constantly seep through the strata or between rocks, which effectively maintains a cool, wet microclimate throughout the summer (NatureServe 2010). New York populations occur along a lake shore with ground water seeps while Minnesota populations are found on maderate cliffs, cooled by air exiting a cave network (USFWS 1998c).

Status and Threats

The decline of Leedy's roseroot is primarily the result of its disjunct populations and low numbers, along with degradation threats to its specialized environment. Due to small population sizes, combined with a wide spread between populations preventing natural repopulation of extirpated areas, the species faces an increased threat of extirpation from local stochastic events, along with potential inbreeding depression. Direct impacts to habitat come from development and construction in the form of erosion, rock slides, and cliffside construction such as

stairs. Upslope activities can also negatively affect the species through groundwater contamination in the form of fertilizer and pesticide runoff (USFWS 1998c). The species may also be threatened by hydrologic alterations in proximity to its habitat (NatureServe 2010). Potential threats to Leedy's roseroot populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, and the use of herbicides/pesticides.

Distribution and Range

Due to the species having only two dramatically disjunct populations on record, Leedy's roseroot is thought to be a relict of a Pleistocene flora that may have had a wider range prior to the last glaciation. Seven populations from four counties in two states, New York and Minnesota, have been recorded (USFWS 1998c). Five confirmed populations remain, three in the limestone cliffs of the Root and Whitewater River drainages in Fillmore and Olmstead Counties in southeastern Minnesota, and two over 800 miles away to the east on the cliff shores of Seneca Lake in Schuyler and Yates Counties of western New York (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in Schuyler County, New York.

2.2.3.4 MICHAUX'S SUMAC

Species Background & Habitat

The Michaux's sumac (*Rhus michauxii*), a perennial herb in the Sumac family found in Virginia, Georgia, and the Carolinas, was listed as Endangered under the ESA in September of 1989, followed by the establishment of a Recovery Plan in 1993. The species is a rhizomatous shrub that is densely pubescent and primarily dioecious. Flowering occurs in June, with small greenish-yellow to white flowers in dense clusters. The species is capable of rhizomatous cloning. Little specific information is known on the life history or reproductive mechanics of the species as most extant populations are unisexual, reproducing only vegetatively. Many current populations are thought to be comprised solely of clones of only one or two individuals. Additionally, the species appears to be shade intolerant, requiring some form of disturbance, such as periodic fires historically, to prevent the succession of occupied habitats into brush dominated forms. Michaux's sumac is found primarily in sandy or rocky open woods, underlain by sand or sandy loam acidic soils with low cation exchange capacities (USFWS 1993b). The species is often found in slightly loamy yet well drained depressions or swales scattered through longleaf pine (*Pinus palustris*) / scrub oak (*Quercus ilicifolia*) / wiregrass (*Aristida spp*.) woodlands (NatureServe 2010).

Status and Threats

The decline of Michaux's sumac is primarily the result of habitat degradation and destruction, combined with a low reproductive capacity resulting from the geographic isolation of discrete, unisexual populations. Much of the land that made up the species historic range has since been converted to agricultural, industrial, and residential purposes. In addition, development of large portions of its former range has resulted in wide-spread fire suppression, allowing the woody succession of many areas that were previously suitable habitat. The lack of genetic variation in many populations threatens the long term viability of the species, both from stochastic loss, and from potential hybridization with similar species. Additionally, many populations are found in proximity to right-of-ways, likely from disturbance acting as a substitute for historic fires, resulting in threats from off-target

herbicide drift and potential habitat destruction from corridor expansion, maintenance, or improvement. Finally, many of the populations are found on military lands, leading to potential habitat and/or individual loss from military training activities (USFWS 1993b). Potential threats to Michaux's sumac populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, the use of herbicides/pesticides, and further genetic bottlenecking through take.

Distribution and Range

Michaux's sumac was historically endemic to much of the inner Coastal Plain and lower Piedmont, with recorded occurrences from 23 counties in Virginia, Georgia, and the Carolinas. Since its discovery in 1895, half of the historic occurrences of the species have been extirpated, with the species largely disappearing from the southern half of its range. Approximately 50 extant populations of the species are known in North Carolina, Virginia, and Georgia, with the majority of the populations found in North Carolina. Most of the extant populations are now found on protected lands where they are managed for. While the number of stems within these populations is relatively large rangewide, it is estimated that most populations are made up of the clones of only one or two genetically distinct individuals, leading to concerns of the long term viability of the species (NatureServe 2010). At the time of the Recovery Plan, only four populations were known to contain both male and female plants (USFWS 1993b).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Dinwiddie County, Virginia. Populations would be found in association with sandy or rocky open areas of woodland (NatureServe 2010).

2.2.3.5 NORTHERN MONKSHOOD

Species Background & Habitat

The northern monkshood (*Aconitum noveboracense*), a perennial herb in the Buttercup family found in Iowa, Wisconsin, Ohio, and New York, was listed as Threatened under the ESA in April of 1978, followed by the establishment of a Recovery Plan in 1983. The species is an erect to reclining or climbing herb with stems up to eight feet in length, and small clusters of hooded pale to dark blue or white flowers. The species is poisonous, with strong alkaloids in the roots and leaves that are paralytic to the nervous and circulatory system (USFWS 1983a). The showy, zygomorphic flowers of the species bloom in July and August and are adapted for pollination by bumblebee. Seed dispersal is likely water borne, and while the species produces a copious quantity of seeds, the germination rate is generally low for unknown reasons. Midwestern populations are found on shaded or partially shaded cliffs and talus slopes. New York populations are found at high-elevation headwaters and in crevices along streams. While no rock substrate appears to be favored by the species, all inhabited areas have a generally cold soil environment, with either active and continuous cold air drainage, or cold ground water flow seeping out of nearby bedrock, creating a cool, damp microclimate (NatureServe 2010).

Status and Threats

The decline of northern monkshood is primarily the result of its disjunct populations and low numbers in most populations, along with degradation threats to its specialized environment. Due to small population sizes, combined with a wide spread between populations preventing natural repopulation of extirpated areas, the

species faces an increased threat of extirpation from local stochastic events, along with potential inbreeding depression. Impoundments and their resulting reservoirs threaten the species with potential inundation, along with potential blocking of seed dispersal to suitable habitat downstream. Logging operations pose a threat to the species, both through direct habitat destruction by machinery and skidding, but also through removal of shade trees opening up the overstory. Due to its association with cliff habitats, the species is also threatened by quarrying, resulting in direct habitat destruction and potential modification of the hydrologic conditions of the area. Other threats to the species include development, herbicide or pollutant run-off, grazing and trampling, and potential over collection of small populations (USFWS 1983a). Threats to northern monkshood populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, and the use of herbicides/pesticides.

Distribution and Range

Northern Monkshood has only ever been found, even historically, in three general locations: the Catskill Mountains of New York, in portions of northeastern Ohio, and unglaciated portions of northeast Iowa and southwest Wisconsin. There are approximately 70 extant populations, with the majority of remaining occurrences found in the Iowa and Wisconsin ranges. While a number of the Iowa/Wisconsin populations are large, with one population in Iowa having an estimated 10,000 individuals, most other populations are small, ranging in population size from less than 10 to 1,000 individuals. The species is likely limited in its distribution due to its highly specialized habitat requirements, its low rate of germination, its generally slow growth rate, and its general intolerance of disturbance (NatureServe 2010).

Presence in the Project Area

Based on initial project review, this species may intersect the covered lands in portions of Delaware and Sullivan Counties, New York, and Hocking County, Ohio. Populations in these areas would be found in association with high-elevation headwaters and stream crevices in New York, and in association with shaded or partially shaded cliffs and talus slopes in Ohio (NatureServe 2010).

2.2.3.6 PETER'S MOUNTAIN MALLOW

Species Background & Habitat

The Peters Mountain mallow (*Iliamna corei*), a perennial herb in the Mallow family found in the Appalachian Mountains of Virigina, was listed as Endangered under the ESA in May of 1986, followed by the establishment of a Recovery Plan in 1990 (USFWS 1990a). No change in status was recommended by the 5-Year Review of the listing in 2008 (USFWS 2008e). The species is rhizomatous, growing in clumps of densely pubescent branches, simple maple-like leaves, and clusters of solitary large pink flowers. The species flowers from late June to early August and are thought to be pollinated primarily by sweat bees, with fruits appearing from July to September. Seeds appear to require scarification for germination. The species is also capable of vegetative reproduction within individual clumps. Peters Mountain mallow, only found in one location, is found in shallow soil-filled pockets and crevices of the Clinch sandstone outcrops on the northwest-facing slope of Peters Mountain. They are found in proximity to the ridge line of a mixed deciduous-evergreen forest. Mature plants appear to prefer open sites with low quantities of competing vegetation; while they have a limited shade tolerance, the largest individuals are found in exposed areas. Natural fires likely played a key role in the species life cycle historically, both clearing competitive and dead vegetation for new regrowth, and in scarfication of seeds. Fires appeared to

be common in the area historically, but have been largely suppressed since regional settlement (USFWS 1990a and NatureServe 2010).

Status and Threats

The decline of Peters Mountain mallow is primarily due to regional fire suppression, which inhibits germination in the species and enhances the potential for the invasion of weedy competitors. Fire suppression also may have promoted the expansion of woodlands on the mountain, resulting in a reduction of direct sunlight on individuals of the species, which is thought to contribute to a decline in size and reproductive vigor of mature plants. With a fire management program being implemented, primary remaining threats concern individual mortality, and the effects of the small and spatially limited size of the population on long-term viability. Threats to individual survival include browsing herbivores and over-collection for scientific and management purposes. Due to the small size of the remnant occurrence of the species, it also faces threats from an increased threat of population extirpation from stochastic events, and the potential for inbreeding depression (USFWS 1990a and 2008e). Potential threats to the Peters Mountain mallow populations from NiSource projects include introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

Peters Mountain mallow has only ever been known from a single population on Peters Mountain in Giles County, Virginia. Prior to the widespread fire suppression associated with settlement, the species may have ranged over a wider cross section of the mountain, but no historical evidence exists to indicate the species presence in other locations. Between the species discovery in 1927 and the establishment of the Recovery Plan in 1990, the species declined from 50 plants to a wild populations of three individuals. Since the protection of the habitat area through the creation of a reserve by The Nature Conservancy, combined with ongoing monitoring and management efforts, and the expansion of the species range through a natural fire in June of 2004 leading to the growth and subsequent discovery of 60 seedlings, the species appears to be on the rebound, yet is still considered in imminent danger of extinction due to its limited range and ongoing need for active management (USFWS 2008e).

Presence in the Project Area

Based on initial project review, the NiSource project has only a limited potential for impacts on the species within Giles County, Virginia due to the species specificity on habitat requirements and the extremely discrete size of the population. The NiSource project footprint comes within approximately a mile of potential habitat, but does not actually cross it. Impacts, if any, will not be at a regional scale but very localized.

2.2.3.7 SHALE BARREN ROCKCRESS

Species Background & Habitat

The shale barren rock-cress (*Arabis serotina*), a biennial herb in the Mustard family found in Virginia and West Virginia, was listed as Endangered under the ESA in August of 1989, followed by the establishment of a Recovery Plan in 1991. The species has an inconspicuous basal rosette of leaves during its non-reproductive stage, and a slender stem with a wide, highly branched inflorescence and tiny white flowers. Flowering occurs from July until the first killing frost. The species is a falcultative biennial in that the basal rosette stage can persist for one to multiple years before the flowering stage occurs. The species is potentially rhizomatous, though the level of

vegetative reproduction is unknown. Little else about the species life history is known, requiring further study in the future. Shale barren rock-cress is endemic to the mid-Appalchian shale barrens, an area typified by xeric shale slopes with a scrubby growth of a variety of woody species and an open herbaceous cover (USFWS 1991c). The species is found on sparsely-vegetated xeric shale deposits on south or west facing slopes. Populations are found on both shale openings and shale woodlands adjacent to the openings. Slopes range from 20-70 degrees, a lithologically hard top layer, and surface soil temperatures ranging up to 145°F, a temperature high enough to cause direct damage to seedlings of most species (NatureServe 2010).

Status and Threats

The decline of shale barren rock-cress is primarily due to habitat degradation and effects of the species small range and harsh habitat. Due to the small size of most remnant populations, they face an increased threat of local extirpation, both due to the general harsh conditions, and through catastrophic loss from stochastic events. Herbivory, while historically considered contributory to the species decline, has since been deemed likely insignificant in regards to threat at a population level, though it may contribute to individual mortality or lower reproductive success in individuals. Drought may also be a significant natural threat to the species, with observed lower reproductive success during dry years. Transportation construction and maintenance, in the form of habitat destruction and increased disturbance of remnant populations, and dam construction, in the form of population destruction and habitat submersion, are the primary anthropogenic threats to the species. Gypsy moth (*Lymantria dispar*) invasions may also pose a threat to the species, both due to non-target mortality of cress pollinator species caught in the general pesticide spraying for gypsy moths, and potentially through the impacts of long-term habitat alterations through partial removal of tree cover from the community. Over collection by botanists may also pose a threat to smaller populations (USFWS 1991c). Encroachment by exotics, such as spotted knapweed (*Centaurea biebersteinii*) and various grasses, into the xeric sites may also pose a threat to the species, which is not considered competition tolerant (NatureServe 2010). Potential threats to the shale barren rock-cress populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

Shale barren rock-cress has only ever been found within portions of the western Virginia and eastern West Virginia part of the shale barrens, being one of the most restricted endemics of the shale barren community. Under 60 occurrences are thought to be extant, most of which contain 50 or fewer individuals, with a range wide population potentially lower than 4,000 plants (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Alleghany, Augusta, Page, and Rockbridge Counties, Virginia, and Greenbrier, Hardy, and Pendleton Counties, West Virginia. Populations in these areas would be found in association with sparsely vegetated, south or west-facing xeric shale slopes and barrens (NatureServe 2010).

2.2.3.8 SHORT'S GOLDENROD

Species Background & Habitat

The Short's goldenrod (*Solidago shortii*), a perennial herb in the Aster family found in northern Kentucky and Indiana, was listed as Endangered under the ESA in September of 1985, followed by the establishment of a Recovery Plan in 1988. The species has one to several erect stems, arising from a creeping rhizome, crowded alternate lanceolate leaves, and a cluster of golden yellow flower heads. Very little is known about the life history and reproductive status of the species due to its extremely limited population. Flowering occurs from mid-August to early November. Specific pollinators are not known, though sweat bees (probably Halictidae) were observed visiting the flowers. Wind dispersal is common in goldenrods, though this method is not currently expanding the species range. American bison (*Bos bison*) may have provided a distribution vector historically. The species is also capable of reproducing vegetatively (USFWS 1988). Short's goldenrod is primarily found in cedar glades and glade-like habitats (e.g. right-of-ways, roadside ledges, meadows/pastures) where droughty soils prevent habitat succession to trees/shrubs. The species is also found on roadsides, and on dry, rocky, overgrazed pastures. The species thrives in full sun or partially shaded environments, though it can persist for extended periods as succession from pasture to woodland occurs once the population is established. Seedling establishment seems to be limited to relatively bare soils in glades, roadsides, and woodland edges (NatureServe 2010). Open habitats for the species were likely maintained historically through natural disturbances such as periodic fires and trampling and grazing by large herbivores (e.g. bison, elk, and deer) (USFWS 1988).

Status and Threats

The decline of Short's goldenrod is primarily due to habitat destruction and alteration. The extirpation of the Falls of the Ohio population is likely due to heavy regional development associated with the rapid growth of Louisville, with similar habitat destruction from land conversion to agricultural, residential, and industrial uses contributing to the decline of the species in the other two known populations. Development and road construction have both contributed to the fragmentation and partial destruction of species occurrences in the Blue Licks population. Heavy grazing in pastures, along with pasture maintenance activities such as grading, sowing of Kentucky fescue (*Lolium arundinaceum*), and herbicide use, along with the removal of forest edge habitat for pasture expansion, have all contributed to species declines. Additionally, with the settlement of Ohio, and the associated elimination of bison and suppression of fires, successional expansion of woody species continues to degrade and eliminate potentially suitable habitat for the species, along with the potential loss of a theorized dispersal pathway of the goldenrod with the loss of the bison population. Other threats include direct impacts to the species from recreational use of its habitat and increases in aggressive exotic invasive species within its range. Due to the small and widely disjunct nature of remnant occurrences of the species, it also faces threats from a lack of ability to repopulate extirpated areas, combined with an increased threat of population extirpation from stochastic events, and the potential for inbreeding depression (USFWS 1988). Potential threats to Short's goldenrod populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, the use of herbicides/pesticides, and further fragmentation and genetic bottlenecking through take.

Distribution and Range

Short's goldenrod historically was only recorded in two widely separated populations in Kentucky. The Falls of the Ohio in Jefferson County, Kentucky was the first location where the species was discovered, but this

population has been likely extirpated since the 1860s. At the time of the Recovery Plan, only a single population was thought to be extant, located at the convergence of Robertson, Nicholas, and Fleming Counties, Kentucky in association with Blue Licks Battlefield State Park, which is considered the center of its range (USFWS 1988). Over 73,000 stems have been noted among the clustered sub-populations at this location, though due to the species ability to reproduce vegetatively, this may represent a relatively small number of genetically distinct individuals. Another naturally occurring population of the goldenrod was discovered in Harrison County, Indiana in 2001, where the species was not previously recorded (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Nicholas and Robertson Counties, Kentucky. Populations in these areas would be found in association with cedar glades or other openings, on roadsides, and on dry, rocky, overgrazed pastures (NatureServe 2010).

2.2.3.9 SMALL-WHORLED POGONIA

Species Background & Habitat

The small whorled pogonia (*Isotria medeoloides*), a perennial herb in the Orchid family found in portions of the Atlantic seaboard states from Maine to Georgia with outlying occurrences in the Midwest U.S. and Canada, was listed as Endangered under the ESA in October of 1982, followed by the establishment of a Recovery Plan in 1985, with a revision in 1992. Small whorled pogonia is found primarily in mixed-deciduous or mixed-deciduous/coniferous forests, often in second- or third-growth stages, occurring in both fairly young woodlands and in maturing stands. Historical agricultural use of inhabited locations is not uncommon. Common characteristics for the majority of inhabited locations include sparse to moderate ground cover, a relatively open understory canopy, and proximity to logging roads, stream, or other long persisting breaks in the forest canopy. Decaying vegetation may be important to the species, with inhabited areas usually including fallen was determined that the species had fulfilled reclassification criteria within the Recover Plan due to protection of over 25% of the viable populations, and was subsequently re-listed as Threatened in October of 1994 (USFWS 1994a). The species generally has a single glaucous stem arising from a fibrous rootstock, and a false whorl of leaves surrounding a single yellowish-green flower with a greenish-white lip. Populations of the species are formed of a combination of vegetative, abortive flower bud, flowering, and dormant individuals. Flowering occurs from late April to June across the species range, but due to a lack of scent and apparent lack of nectar, the species is primarily self-pollinating, along with a limited ability to reproduce vegetatively, though that appears rare. The species is capable for long periods of dormancy, with documented cases of the re-emergence of the species after four years of dormancy, and speculation that dormancy periods could extend as long as 10 to 20 years. Seedling establishment and future development is dependent on falling on a substrate containing a suitable mycorrhizal fungus with which the seedling trunks and limbs, leaf and front litter, bark, stumps, and roots of dead trees. The species appears to be relatively shade intolerant for a forest species, generally found along permanent breaks and in more ephemeral breaks such as wind-throw areas and stands with gypsy moth outbreaks. The species is found on a variety of soils, though a high level of acidity and a nutrient poor quality to the substrate appears common (USFWS 1992a).

Status and Threats

The decline of small whorled pogonia is primarily due to habitat destruction. Residential and commercial development, along with the associated road and utility developments, have both historically destroyed habitat

and continue to threaten the species due to many populations being located on private lands, where few protective regulatory mechanisms exist. Further, development has served to further fragment populations, forming barriers to natural seed dispersal. Additionally, while selective logging may prove beneficial, or at least non-harmful to the species if measures are taken to avoid direct impacts on individuals, heavy timbering or clear-cutting pose a serious threat to the species, both through direct mortality from crushing individuals by heavy equipment and skidding, but also through habitat conversion to an open canopy, where the species may not be able to compete with other sun-requiring herbaceous species. Other potential threats include recreational use of habitats, herbivory, over-collection of small populations, and inadvertent damage from research activities (USFWS 1992a). Potential threats to small whorled pogonia populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, and the use of herbicides/pesticides.

Distribution and Range

Although the small whorled pogonia is widespread both historically and currently, populations were typically very small even historically. The historic range of the species included all of the Atlantic seaboard from Maine to Georgia along with the eastern Great Lakes states and outlying occurrences in the Midwest U.S. and Canada. The species is now considered extirpated in Vermont and the District of Columbia, and are potentially extirpated in New York, Maryland, and Missouri. Approximately 93 populations are believed to be extant with better than poor viability; these populations are found in New Hampshire, Georgia, Virginia, Maine, South Carolina, North Carolina, Massachusetts, New Jersey, and Ohio. The largest populations are found in New Hampshire, Virginia, Maine, and Georgia, with populations of more than 100 stems, though the majority of the populations range wide are very small, with less than 3000 individuals thought to exist throughout its range. Most viable populations are now protected (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of New Castle County, Delaware; Hocking and Scioto Counties, Ohio; Centre and Chester Counties, Pennsylvania; and Fairfax, James City, Madison, and Prince William Counties, Virginia. Additionally, the potential for rediscovery of the species within portions of its historic range exists in Montgomery County, Maryland; Hunterdon County, New Jersey; Rockland County, New York; Greene, Monroe, and Montgomery Counties, Pennsylvania; and Greenbrier County, West Virginia. Populations in these areas would be found in association with mixed deciduous or mixed deciduous/coniferous woodlands in areas of sparse cover or along natural or man-made breaks (NatureServe 2010).

2.2.3.10 SMOOTH CONEFLOWER

Species Background & Habitat

The smooth coneflower (*Echinacea laevigata*), a perennial herb in the Aster family found in portions of Georgia, the Carolinas, and Pennsylvania, was listed as Endangered under the ESA in September of 1992, followed by the establishment of a Recovery Plan in 1995. The species is rhizomatous, with a smooth stem of up to five feet growing from a vertical root stock, variable leaves along the stem, and a solitary flower head with light pink to purple flowers. Flowering occurs from May through July, with fruit development from late June to September. Specific pollinators are unknown. Seeds are likely dispersed by seed-eating birds or small mammals. The species is capable of vegetative reproduction off of lateral rhizomes. Bare soils appear to be required for

seedling germination. Smooth coneflower populations are found in open woods, cedar barrens, along roadsides, within clear cuts, along dry limestone bluffs, and within power line right-of-ways. Soils are generally rich in magnesium or calcium, usually associated with amphibolite, dolomite, or limestone, gabbro, diabase, or marble. Optimal habitat for the species is characterized by abundant sunlight and little competition with other species in the herbaceous layer. Natural fires and large herbivores combined historically to offset natural succession of potential habitats to woody plants, opening areas for colonization by the species; thus the coneflower is considered disturbance dependent (USFWS 1995b). With widespread development curtailing natural disturbance methods, the species is now primarily found in association with man-made disturbances within forest habitats, where full or partial sun is available (NatureServe 2010).

Status and Threats

The decline of smooth coneflower is primarily due to habitat destruction and degradation. Since the discovery of the species, 62% of known occurrences have been extirpated, with the majority of documented reasons for extirpation coming from habitat conversion to agricultural, silvicultural, residential, or industrial uses; habitat conversion is often also cited for ongoing declines of remnant populations. Due to the location of many remnant populations within right-of-ways, the species faces ongoing threats from maintenance activities (e.g. herbicide use, mowing), along with potential road widening or line work directly destroying habitat. Regional development also poses a threat to the species with the resultant suppression of wild fires, removing natural disturbance mechanisms that would prevent the succession of otherwise suitable habitats to woody cover, which chokes out the species. The species also faces a threat from inadvertent or illegal harvest for horticultural and medicinal purposes, often due to confusion with other, more common coneflower species. Due to the small and widely disjunct nature of remnant occurrences of the species, it also faces threats from a lack of ability to repopulate extirpated areas, combined with an increased threat of population extirpation from stochastic events, and the potential for inbreeding depression (USFWS 1995b). Potential threats to smooth coneflower populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, the use of herbicides/pesticides, and further fragmentation and genetic bottlenecking through take.

Distribution and Range

The smooth coneflower is found from Georgia, through the Carolinas, and into Virginia, with a potential additional historic population within Pennsylvania, though it is now considered extirpated within the state. Of the approximately 61 historically documented populations, 2/3rds have been lost. Currently, the species is found within the four states in 10 counties, with about 100 occurences spread among about 20 populations. The majority of remnant populations are considered fair to poor in viability, though many extant populations occur on National Forest land, where they are actively monitored and managed for (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Allegheny and Botetourt Counties, Virginia. Populations in these areas would be found in association with woodlands in areas of sparse cover or along natural or man-made breaks (NatureServe 2010).

2.2.3.11 TENNESSEE PURPLE CONEFLOWER

Species Background & Habitat

The Tennessee purple coneflower (*Echinacea tennesseensis*), a perennial herb in the Aster family found in the Central Basin of Tennessee, was listed as Endangered under the ESA in June of 1979, followed by the establishment of a Recovery Plan in 1989. The species has a thick, branched rhizome topped by a basal rosette of leaves, and a short woody stalk topped by a head of showy purple flowers. Flowering occurs from mid-June to September during years of adequate growing season rainfall (NatureServe 2009). Pollination vectors are unknown but are assumed to be insect based. Seeds are generally too heavy for standard wind or water dispersal vectors, and are not barbed for adherence to animal fur, thus dispersal vectors are unknown, though a number of species are known to browse on seeds and seed heads. Additionally, the species is largely incapable of vegetative reproduction. Tennessee purple coneflower is primarily found in open limestone cedar glades, a habit type found in barren, open areas in forests that contain insufficient soil and resources to support woody vegetation. Glades generally have exposed or thinly soil-covered limestone bedrock and harsh environments, with dry, hot conditions and full sun exposure typical. It is uncommon to find the species in areas of 50% or more shade (USFWS 1989c). It is also sometimes found on calcareous barrens, with deeper soils than the glades, though it is often out-competed or shaded out in these areas (NatureServe 2010). The Tennessee purple coneflower has been proposed for delisting (USFWS 2010b).

Status and Threats

The decline of Tennessee purple coneflower is primarily due to habitat loss and degradation. The primary threat the species, both historically and currently, is habitat loss through development, as inhabited sites are often considered ideal for residential, industrial, and transportation route construction. Agricultural practices, such as grazing and bush-hogging, can also pose a threat to the species through defoliation, though if these practices are conducted at low intensities, the species appears to be resilient to them and may be benefited through an arrest in habitat succession. The species is also threatened through incidental or illegal take, as it is showy and may have horticultural value; this is increased due to the encroachment of development and the resulting increase in potential site visitation. Additionally, the species is considered a poor competitor, indicating a potential threat from non-native exotic introduction. Also, due to the large seed size and lack of known dispersal pathways, the species ability to recolonize previous portions of its range without direct management intervention is limited (USFWS 1989c). Potential threats to Tennessee purple coneflower populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

Tennessee purple coneflower has only ever been found in confirmed populations in the Central Basin of Tennessee, within a 14-mile circle where Davidson, Rutherford, and Wilson Counties come together. Multiple historically known occurrences are now considered extirpated, with 5 extant populations currently known, with population sizes ranging from 3,700 to 89,000 individuals (USFWS 1989c). While much of the species range has been lost, reintroduction efforts have been largely successful, and the species is currently considered relatively stable based upon this reintroduction success (NatureServe 2009).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Davidson and Wilson Counties, Tennessee. Populations in these areas would be found in association with open limestone cedar glades (NatureServe 2010).

2.2.3.12 WHITE-HAIRED GOLDENROD

Species Background & Habitat

The white-haired goldenrod (*Solidago albopilosa*), a perennial herb in the Aster family found in the Red River Gorge area of Kentucky, was listed as Threatened under the ESA in April of 1988, followed by the establishment of a Recovery Plan in 1993. The species is rhizomatous, largely decumbent, with long, soft hairs on its leaves and stems, and heads of bright yellow fragrant flowers. Flowering occurs from September through November, with fruit set in mid-October through December. Flowers are generally pollinated by bees and syrphid flies. Seeds disperse primarily via wind. While the species is rhizomatous, the extent of vegetative reproduction is not known. White-haired coneflower is found in rock-shelters on the upper slopes of the Red River Gorge. It is usually found in partial shade behind the drip line of rock-shelters, but is not found in the furthest depths of the larger rock shelters, nor in full sun, showing an apparent preference for partial shade. It is also occasionally found on rock ledges or in the sand soil along trails. The rock-shelters that the species is primarily found under largely protect the plants from direct rain, thus the species appears to prefer dry, sandy soils (USFWS 1993g).

Status and Threats

The decline of white-haired goldenrod is primarily due to habitat degradation and direct mortality, primarily due to heavy recreational use of its habitat. The Red River Gorge area has an extensive trail system, and many of the trails pass through or very near to rock-shelters. Rock-shelters are heavily used by hikers, campers, and rock climbers for shelter during inclement weather and for camping or day-use spots. Threats from this recreational use include trampling of individuals, compaction and damage to the shallow seeds and root systems, general habitat degradation from soil compaction, and fire building and garbage dumping degrading habitats. Additionally, the species is threatened by archaeological looters, who disturb habitat and dig up seeds and roots in the search for Native American artifacts. Logging adjacent to rock shelters also poses a threat through increased light intensity, decreased water availability, and the opening of habitat to invasive species. Additionally, the Red River Gorge has historically been proposed as an impoundment site, and while the plans were never carried out, if they were pursued in the future, the species would potentially be threatened by microclimate changes and the associated impacts of increased visitation to the area (USFWS 1993g). Potential threats to white-haired goldenrod populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

The white-haired goldenrod has only ever been found within the Red River Gorge area of Menifee, Powell, and Wolfe Counties of east central Kentucky. Roughly half of the known occurrences were reported as extirpated, with the majority of the remaining occurrences considered severely damaged in the 1970s. Currently, there are approximately 30 extant occurrences, and due to their proximity and known cross pollination between

occurrences, the whole range of occurrences may be considered one large, dispersed population (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Menifee and Powell Counties, Kentucky. Populations in these areas would be found in association with sandstone rockhouses or overhanging sandstone ledges, or rarely on rock ledges or along trails (NatureServe 2010).

2.2.4 WETLAND PLANT SPECIES

2.2.4.1 PONDBERRY

Species Background & Habitat

The pondberry (*Lindera melissifolia*), a perennial herb in the Laurel family found in limited populations throughout the Southeastern U.S., was listed as Endangered under the ESA in July of 1986, followed by the establishment of a Recovery Plan in 1993. A 5-Year Review was initiated in 2008 (USFWS 2008e). The species is a deciduous, aromatic shrub, growing up to seven feet tall in large clumps of clonal stems. Flowering occurs in early spring, prior to leaf development, generally in February or March. Flowers are small, pale yellow, and dioecious. Stems flower in the second to fourth years of growth and continue to grow in subsequent years but generally die by the sixth to seventh year, creating a dense clump of combined live and dead stems. Clonal clumps expand primarily vegetatively. Because most populations are all-male or male-dominated, seed production in relation to the number of stems is low. Reproductive success may also be low due to the species early flowering, occurring during a period when late frosts often occur. Plants are often found in standing water in early spring, though the ponds are generally dry by April or May, when leaf expansion begins, breaking the stem dormancy (USFWS 1993e). Pondberry appears to be capable of occupying a variety of habitats as long as its hydrological requirements are met. Across its range, the species has been found on seasonally flooded wetlands (e.g. floodplain/ bottomland hardwood forests and forested swales), on the bottoms and edges of shallow seasonal ponds of old dune fields, along the edges of ponds and depressions in pine forests, around the edges of sinkholes in coastal areas with karst topography, and along the edges of sphagnum bogs. The species is commonly found in shaded areas, though it is sun tolerant (NatureServe 2010).

Status and Threats

The decline of pondberry is primarily due to alteration or destruction of its habitat, primarily through land-clearing, drainage modification, and timber harvesting. Land clearing for agricultural and residential development has been common throughout large portions of the species range, especially in the bottomland forests of Arkansas, Mississippi, and Missouri. Wetland drainage from ditch-building, field-leveling, and wetland conversion has also contributed to habitat destruction. Alternately, impoundments and reservoirs have contributed to flood portions of historic habitat. Additionally, timber harvesting threatens the species, both through direct crushing or destruction of habitat by heavy machinery, and through closed-canopy shade removal, opening up habitat to other species that may be more competitive in sunny areas than the pondberry. Due to small population sizes, a wide spread between populations, and many extant populations being made up solely of males, or from clones of a limited number of individuals, the species has little ability to naturally repopulate extirpated areas, along with facing an increased threat of extirpation from local stochastic events and potential inbreeding depression. Other threats include non-native exotic invasives, livestock grazing and trampling, and changing climactic conditions increasing the frequency of droughts in the southeast (USFWS

1993e). A new and spreading threat to the species also comes from Red Bay, or Laurel Wilt disease, a fungal infection spread by an invasive Asian beetle (NatureServe 2010). Potential threats to pondberry populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

Pondberry is chiefly a coastal plane species, historically ranging from North Carolina south to Florida and west to Louisiana, along with populations in portions of the Mississippi Embayment in southern Missouri and Arkansas. Species distribution appears to have always been very scattered, and the species has probably always been relatively rare. Approximately 99 populations are thought to be extant, though a number of these occurrences are spatially close enough that they should potentially be grouped, making the number of populations potentially lower. Extant populations are found in North Carolina, South Carolina, Georgia, Alabama, Mississippi, Arkansas, and Missouri. Rangewide, 17 populations are considered extirpated, and the species is considered extirpated in Louisiana and potentially Florida. Most populations are small and isolated, though a few populations are quite large by stem count; however, these larger populations appear to be dominated by clones with a small number of genetically distinct individuals (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Sharkey and Sunflower Counties, Mississippi. Populations in these areas would be found in association with floodplain forests, such as bottomland hardwood habitats (NatureServe 2010).

2.2.4.2 NORTHEASTERN BULRUSH

Species Background & Habitat

The northeastern bulrush (*Scirpus ancistrochaetus*), a perennial herb in the Sedge family found throughout the Appalachians, was listed as Endangered under the ESA in May of 1991, followed by the establishment of a Recovery Plan in 1993. The species is a leafy bulrush, with fibrous rhizomes, 3-angled culms with well developed leaves, and terminal branched inflorescences subtended by leaf-like bracts. The species is generally difficult to identify in the field due to the majority of individuals generally lacking flowers. Little is known about the life history and reproductive biology of the species due to this difficulty in identification, along with its naturally fluctuating population levels, and widely scattered distribution. The species reproduces both sexually and vegetatively, though vegetative reproduction appears more common in established populations, with sexually produced individuals appearing to have less vigor than vegetatively produced individuals. Sexual recruitment success is thought to be very low, limiting the species ability to spread into even directly adjacent habitat (USFWS 1993c). Flowering generally occurs in mid-June to mid-July, with fruit production from July to September, and germination as early as March. Northeastern bulrush is found in open, tall herb-dominated wetlands throughout its range. It is primarily found at the water's edge or within very shallow water, though it may also be located in areas with up to three feet of water, or in upland areas (NatureServe 2010). Habitats include natural ponds, shallow sinkholes, and wet depressions, though it has not been found in artificial habitats such as ditches, borrow pits, or dredged ponds. Habitat types seem to vary geographically, with the species primarily found associated with sinkholes in the southern part of its range, and a variety of wetland types in the northern part. Many apparently suitable wetland areas adjacent to populations do not host the species for

unknown reasons. The only common factor to all inhabited ponds is a seasonal and/or annual fluctuation in water levels from inundation to saturation (USFWS 1993c).

Status and Threats

The decline of northeastern bulrush is primarily the result of habitat destruction or modification. Development throughout much of the species range is common, resulting in direct habitat destruction through filling, draining, and dredging of wetland habitats for agricultural, residential, industrial, and recreational purposes. Pesticide and fertilizer laden run-off is also an indirect result of development, leading to a degradation of water quality in remaining wetland complexes. Any activity that has the potential to alter the natural hydrological regime of inhabited wetland complexes should be considered a threat to the species, including increased drawdown from developments, increased flow into seasonal ponds from vegetation removal or impervious surface increase. Other threats include erosion, sedimentation, and invasive exotics. Additionaly, due to small population sizes, the species is vulnerable to loss by stochastic events, inbreeding depression, and a loss of long-term population viability (USFWS 1993c). Potential threats to northeastern bulrush populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

Northeastern bulrush was historically found throughout much of the Appalachians and Northeastern U.S., from Virginia in the south, up to New York, New Hampshire, Vermont, and into Quebec. Historic population levels and range are unknown. Approximately 50-60 extant populations exist, with occurrences in Maryland, Massachusetts, New Hampshire, Vermont, Virginia, West Virginia, New York, Pennsylvania, and Virginia, with most of the occurrences located in Pennsylvania. Most populations are considered small, though population estimates are rough due to difficult identification (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Washington County, Maryland; Adams, Bedford, Cambria, Centre, Clinton, Cumberland, Franklin, Fulton, Lehigh, Monroe, and Northampton Counties, Pennsylvania; Alleghany, Augusta, and Rockingham Counties, Virginia; and Hardy County, West Virginia. Populations in these areas would be found in association with wetland complexes (NatureServe 2010).

2.2.4.3 SENSITIVE JOINT-VETCH

Species Background & Habitat

The sensitive joint-vetch (*Aeschynomene virginica*), an annual herb in the Pea family found in the lower coastal states of the Northeastern U.S., was listed as Threatened under the ESA in May of 1992, followed by the establishment of a Recovery Plan in 1995. A 5-Year Review was initiated in 2008 (USFWS 2008d). The species is a robust annual legume with bristly stems and pinnate leaves. Small yellow flowers streaked with orange-red appear between July and September, with some occurrences as late as October, and are pollinated by small bumblebees (*Bombus* spp.). Fruits are produced concurrent with flowering, with seed maturation throughout the flowering period, and generally larger quantities of seed production at upstream sites as compared to downstream sites, possibly due to longer periods of fresh water presence. Germination occurs from late May to

early June and seedlings grow quickly (USFWS 1995c). The species shows considerable natural annual fluctuations in population numbers, with studies showing yearly variation from 50 to 2,000 individuals on some sites. Sensitive joint-vetch is primarily found on the shores and estuarine-river marsh borders of fresh to slightly brackish tidal rivers. It is usually found within 6-7 feet of the low water mark on raised banks, generally on peaty, sandy, or gravelly substrates. The species has also been found in a few ditches and wet fields, but these populations are not considered stable (NatureServe 2010). It is generally found in sparsely vegetated areas due to natural factors such as storms, ice scour, accreting sediments, muskrat "eat outs", or deficiencies of nutrients limiting the growth of other species (USFWS 1995c).

Status and Threats

The decline of sensitive joint-vetch is primarily due to habitat alteration and destruction. Increased sedimentation of rivers and marshes from upland developments threatens the species, not only through habitat alteration, but also through changed conditions allowing invasive species to move into previously untenable habitats and out-compete the vetch. Damming of tidal rivers provides a threat through habitat alteration in the form of modifications to current, channel migration, sediment cycling, erosion, alteration of diurnal flood regimes, and changes in freshwater input and water temperature. Dredge and fill operations impact the species through direct habitat destruction, along with resuspension of sediments and contaminants, and increased access for motorboats. Regional development threatens the species both through habitat destruction, and through increased demand for fresh water, limiting fresh water inputs into the marsh habitats, both lowering regional water levels and allowing increased salinity from a lack of offset to salt water inputs. Other threats include water quality degradation, introduction of pest species, mining and timber harvest impacts to regional streams, and over-collection (USFWS 1995c). Due to the species being dependent on natural disturbance in the form of tidal action, any changes to water levels, tidal flow, or salinity levels should be considered a threat to the species (NatureServe 2010). Potential threats to sensitive joint-vetch populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

Sensitive joint-vetch was historically found throughout portions of the freshwater tidal marshes of Delaware, Maryland, New Jersey, North Carolina, Pennsylvania, and Virginia, though it has been considered extirpated in Delaware and Pennsylvania since the 1890s. 20 extant populations remain, with the largest number of remnant populations found in Virginia. The three extant populations within North Carolina are all found associated with ditches and are considered unstable (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Chesterfield, Henrico, and James City Counties, Virginia. Additionally, the potential for rediscovery of the species within portions of its historic range exists in Gloucester and Salem Counties, New Jersey, and Prince George and Surry Counties, Virginia. Populations in these areas would be found in association with freshwater tidal marshes (NatureServe 2010).

2.2.4.4 SWAMP PINK

Species Background & Habitat

The swamp pink (*Helonias bullata*), a perennial herb in the Lily family found from Staten Island, New York to the southern Appalachians, was listed as Threatened under the ESA in September of 1988, followed by the establishment of a Recovery Plan in 1991. A 5-Year Review was completed in 2008 (USFWS 2008b). The species has thick, stocky rhizomes, a stout hollow stem, a basal rosette of leaves, and a dense terminal cluster of fragrant pink flowers. The species primarily reproduces vegetatively through clonal rhizomal growth, with a limited quantity of sexual reproduction. Relatively few individuals in a population flower, with flowering occurring from March through May, followed by seed production in June. Pollinators likely include beetles, black flies, and other insects, along with the species being highly self-compatible and self pollinating. Due to the heavy weight of seeds, dispersal distances from wind, insects, and water tend to be low, leading to clumped populations when combined with clonal reproduction. Seedling recruitment and seed survival for the species both appear to be low (USFWS 1991d). Swamp pink is found in forested wetlands that are groundwater influenced and perennially water-saturated. These wetlands occur at sites where the water table is at or very near the surface and maintains a relatively stable height throughout the spring and summer. Some primary habitats include Atlantic white cedar (*Chamaecyparis thyoides*) swamps, headwater seepage wetlands, red maple (*Acer rubrum*) swamps, and occasionally black spruce-tamarach (*Picea mariana-Larix laricina*) bogs (NatureServe 2010). Soils are generally neutral to acidic with a thick layer of decomposed organic matter underlain by dark silt loams with a bottom layer of mixed sand, loam, and gravel, and are generally saturated but are rarely inundated. The species is often found adjacent to streams. The species also has a wide range of shade tolerance (USFWS 1991d).

Status and Threats

The decline of swamp pink is primarily due to habitat loss, fragmentation, and degradation. Habitat loss, in the form of development projects, along with draining and filling of wetlands, and timbering and clearing activities, have significantly reduced the quantity of available habitat for the species both historically, and as an ongoing threat. Regional development has also threatened the species through habitat fragmentation and water quality degradation from sedimentation and polluted run-off. Agriculture has been a key contributor to habitat degradation through off-site water withdrawal for irrigation, drainage of wetlands and conversion to agricultural purposes, and water quality degradation through an influx of nutrients, sediments, and chemicals into the wetlands, which contributes to increased succession rates and colonization by opportunistic weeds in previously suitable habitats. Also, modifications to the hydrologic character of the upstream watershed, such as stream improvement projects and stormwater control outflows, have contributed to direct mortality of some populations. Collection of the species, both inadvertently and illegally, is an ongoing problem as the species is conspicuous and showy, with potential markets in horticulture. Herbivory may also pose a natural threat to the species, as it is an early bloomer and would provide a food source when other browse is limited, though the threat is minor as the species primarily reproduces vegetatively (USFWS 1991d). Potential threats to swamp pink populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, the use of herbicides/pesticides, and further fragmentation and genetic bottlenecking through take.

Distribution and Range

Historically, swamp pink ranged from Staten Island, New York, and south along the Appalachian Mountains from New Jersey to Georgia. The species appears extirpated in New York, along with a significant decrease in number and vigor in New Jersey, though population losses in other areas have been offset by the discovery of new populations. Over 100 extant populations remain, with locations in New Jersey, Delaware, Maryland, Virginia, the Carolinas, and Georgia. The majority of known populations are found in New Jersey, and multiple populations in New Jersey, Delaware, Virginia, and North Carolina show a high level of local abundance; outside of those sites, the majority of the other extant populations are largely unprotected and have defined threats associated with them (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Gloucester, Morris, and Salem Counties, New Jersey; and Augusta and Henrico Counties, Virginia. Populations in these areas would be found in association with forested wetlands with a high water table (NatureServe 2010).

2.2.4.5 VIRGINIA SNEEZEWEED

Species Background & Habitat

The Virginia sneezeweed (*Helenium virginicum*), a small perennial forb in the Aster family found in parts of Virginia and Missouri , was listed as Threatened under the ESA in November of 1998, followed by the establishment of a Draft Recovery Plan in 2000 (USFWS 2000b), though a final plan has not been established. A 5-Year Review was initiated in 2008 (USFWS 2008c). The species is an herbaceous perennial wetland plant which occurs in semi-permanent, shallow, seasonally inundated wetlands or in proximity to sinkholes. The species flowers from early July into October, with timing reliant primarily on water availability during the late spring and early summer seasons. Pollination biology has not been studied in detail, but primary pollinators are thought to be bees, wasps, butterflies, and hoverflies (NatureServe 2010). Seeds disperse in the late fall and winter, with germination the following year in the late summer or early fall, dependent on the presence of suitable conditions. Seeds will not germinate in the dark or under standing water, though once established, growth appears to continue year-round, even while submerged. The species begins as a basal rosette with a diffuse root system in its first year and will not flower until at least the second year of growth. The species has a life span of up to five years, with flowering occurring on consecutive years (USFWS 1998a). Seasonal water fluctuations, especially inundations, appear to be key for species recruitment and maintenance. Populations are generally found in locations with a substrate consisting of poorly drained, acidic, silty soils underlain by gray clays and dolomitic bedrock. Basin habitat is generally flooded from January to July (NatureServe 2010). The species appears to be dependent on fluctuating water levels giving it a competitive advantage over other species such as shrubs and trees (USFWS 1998a).

Status and Threats

The decline of Virginia sneezeweed is primarily the result of habitat modification. Primary threats to the species include residential development, some agricultural practices, filling and ditching of wetland habitats, groundwater withdrawal, and other hydrological modifications. Partial defoliation, such as from cattle grazing or mowing, may be beneficial to the species, as it is bitter and unpalatable, leading to selective grazing of competitors; however, overgrazing or poorly timed mowing could adversely impact the species over the long

term. Exotic species invasion, especially from purple loosestrife (*Lythrum salicaria*), also poses a threat to the species due to habitat alteration and competition (USFWS 1998a). Potential threats to Virginia sneezeweed populations from NiSource projects include habitat loss or degradation, partial defoliation, local population or individual extirpation, introduction and/or spread of exotic species, and the use of herbicides/pesticides.

Distribution and Range

Due to the species being only described in 1936, with most populations only found between 2003-2005, the historical distribution of the species is not known. Extant populations have been located in limited habitats in Augusta and Rockingham Counties, Virginia, and in Boone, Cap Girardeau, Howell, Oregon, Shannon, Texas, Webster, and Wright Counties, Missouri. Up to 61 populations have been documented in recent years, though multiple occurrences may no longer be extant; determination of population size, location, and trend is complicated by widely annual fluctuations in population, combined with a lack of monitoring. Currently, the majority of the species is thought to occur in the Missouri populations, with Virginia occurrences largely restricted to small, discrete areas around sinkholes (NatureServe 2010).

Presence in the Project Area

Based on initial project review (Armstrong et al. 2007), the NiSource project may affect this species in portions of its range in Augusta and Rockingham Counties, Virginia. Habitat types that the species might be found in include wetlands, potholes, and low meadows. No known extant or historically present populations of Virginia sneezeweed are located within the NiSource footprint, though patches of suitable habitat may occur, and due to the proximity of known populations, the possibility of the existence of undocumented populations within the project area may exist.

2.3 BIRD SPECIES

2.3.1 PIPING PLOVER

Species Background & Habitat

The piping plover (*Charadrius melodus*), a migratory shorebird that cycles between southern to middle Canada and the Gulf Coast and Caribbean, including all regions between is divided into three distinct breeding populations in North America: the Great Lakes, the Northern Great Plains, and the Atlantic Coast. The Great Lakes breeding population (when on the breeding grounds), was listed as Endangered, and all other populations as Threatened, under the ESA in December of 1985. Two separate Recovery Plans were created for the Piping Plover shortly after listing, with a Plan for the Great lakes and Northern Great Plains finalized in 1988, and a revised Plan for the Atlantic Coast completed in 1996. A separate Plan covering only the Endangered Great Lakes populations was subsequently completed in 2003 (USFWS 2003b). Critical habitat was designated for the Great Lakes and wintering populations in 2001 (USFWS 2001a,b), and for the Northern Great Plains populations in 2002 (USFWS 2002b). A five (5)-Year Review was completed for the piping plover in 2009 (USFWS 2009a).

Piping plovers migrate over long distances between wintering and breeding grounds. Northern Great Plains and Great Lakes populations generally utilize the Gulf Coast while Atlantic populations generally utilize the southern Atlantic coast (NatureServe 2010). Males arrive on the breeding ground to establish a territory in April, with females arriving and breeding commencing in late April to May. The same territories are often used annually and adults are generally monogamous with a season but not between seasons. Nests are often within colonies of other beach-nesting birds, benefiting from protection in numbers. Eggs are incubated for about 27 days,

chicks once hatched are expected to forage immediately, and chicks are generally fledged within 25 days. The species generally disperses back to wintering ground in August. The species feeds primarily diurnally on exposed beach substrates, generally pecking shallowly for invertebrates (USFWS 2003b).

Piping plovers utilize sand upper beaches, especially in association with scattered grassy tufts, and sparsely vegetated shores and islands for breeding. Atlantic Coast populations generally breed on gently sloping foredunes and blow-out areas of sandy coastal beaches. Great Lakes populations primarily breed on sand and gravel shorelines, and behind foredunes among cobble and sparse vegetation on islands. Great Plains populations primarily utilized shorelines around small alkaline lakes, along with beaches of large reservoirs, river islands and adjacent sand pits, and other shorelines. Wintering populations are found most commonly on ocean beaches or on sand or algal flats in protected bays, with the highest abundance found on expansive sandflats, sandy mudflats, and sandy beaches, generally in habitats with high heterogeneity (NatureServe 2010).

Status and Threats

The decline of the piping plover is primarily the result of loss or degradation of habitat, human and pet disturbance, and predation. Shoreline development is common both in breeding and wintering grounds, which both removes areas of suitable habitat, and increases the potential for disturbance by humans and their pets. Inlet dredging, the construction of water control structure, and marina construction can also pose a threat through the disruption of natural dynamic processes which previously maintained the shoreline habitats. Motorized vehicle use of beach habitat, though illegal in many instances, also continues to pose a threat to the species through adult, chick, and egg direct mortality, and through compaction of, and subsequent degraded quality of, the substrate prior to breeding. A wide variety of human uses of beach habitats has long been considered a key threat to the species, with increased stress on adults and chicks leading to lower nesting success, a decrease in the amount of time spent foraging, and a higher susceptibility to the elements and predators. Predation is considered a common cause of adult and chick mortality, along with nest failure, which may be exacerbated by the common close proximity of human development, which often acts to draw greater concentrations of some predators such as pets, skunks (*Mephitis* spp.), and raccoons (*Procyon lotor*). Contaminants, both from oil spills, and from lethal and sub-lethal build up of other contaminants such as PCBs, leading to death, deformation, or reproductive impairment. Finally, due to the small size of many populations, they face an increased threat of extirpation from stochastic events, along with an increased chance of inbreeding depression and lack of breeding in otherwise able individuals due to a lack of mates (USFWS 2003b). Potential threats to piping plover populations from NiSource projects include temporary or permanent loss or degradation of habitat, potential attraction of predators, increased disturbance stress on individuals, and the potential for contaminant impacts from accidental spills or the use of herbicides for O&M activities.

Distribution and Range

Piping plovers were historically found throughout much of the shoreline habitat of eastern and central North America. The three major breeding populations were found on the beaches of the Atlantic Coast, the shorelines of the Great Lakes, and along the shores of alkali wetlands and major rivers in the Northern Great Plains. The species winters along the beaches of the Gulf of Mexico, along the Atlantic Coast from North Carolina to Florida, and in portions of eastern Mexico and the Caribbean. Historic population levels prior to listing are unknown, though the species is known to have seen significant declines due to hunting in the 1800s, followed by ongoing losses due to anthropogenic disturbance (USFWS 2003b). The 2001 International Piping Plover Census estimated 2,953 adults in the Northern Great Plains breeding population, 2,920 adults in the Atlantic Coast

breeding population, and only 72 adults in the Great Lakes population, though this represents more than a 50% increase from the 17 breeding pairs estimated in the area at the time of listing (Ferland and Haig 2002).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of its wintering habitat in Cameron, Lafourche, Plaquemines, St. Mary, Terrebonne, and Vermilion Parishes, Louisiana. Populations in these areas would be found in association with ocean beaches, sandflats, sandy mudflats, sandy beaches, and algal flats (NatureServe 2010). Additionally, the may cross approximately 116.7 acres of designated critical habitat in Cameron Parish.

2.3.2 RED-COCKADED WOODPECKER

Species Background & Habitat

The red-cockaded woodpecker (*Picoidees borealis*), a small, non-migratory woodpecker found in the Southern Coastal Plain region, was listed as Endangered in October of 1970, though it was not federally protected until the passage of the ESA in 1973. A Recovery Plan was established for the species in 1979, with subsequent revisions in 1985 and 2003 (USFWS 2003c). A 5-year review in 2006 found that recovery goals from the 2003 Recovery Plan had not yet been reached, and thus recommended no change in status (2006).

Red-cockaded woodpeckers are cooperative breeders, living in a family with a main breeding pair and zero to four helpers. The species is highly monogamous and pairs jointly defend all-purpose territories year-round. Breeding occurs from April to July, with egg laying from April to May, and chick fledging in 26 to 29 days, though they often remain dependent on parents for up to 5 months. They are non-migratory with only short distance dispersals in juveniles. Home range sizes for family groups range from 100-400 acres, dependent on forage quality, with only a portion of the range being visited each day. They create cavities in live pines, at least 60 years in age, often taking several years to complete them, in which they live and nest. The species is disturbance dependent, requiring periodic fires to control invasive hardwoods, without which it abandons clusters. The diet of the species primarily consists of adult, larvae, and eggs of tree surface and subsurface arthropods, along with minor contributions from fruits and seeds (USFWS 2003c). Red-cockaded woodpeckers are considered a keystone species due to their cavities, which influence the presence and abundance of at least 27 other cavity-dwelling vertebrate species (NatureServe 2010).

Red-cockaded woodpeckers are found in open pine woodlands and savannahs, with large old-growth pines which provide nesting and roosting habitat. Common cavity species include longleaf pine (*Pinus palustris*), loblolly pine (*Pinus taeda*), shorfleaf pine (Pinus echinata), slash pine (*Pinus elliotii*), pond pine (*Pinus serotina*), pitch pine (*Pinus rigida*), and Virginia pine (*Pinus virginiana*). Regular summer fires to inhibit hardwood succession are required. Large old pines are required so that the cavity can be excavated completely within the inactive heartwood, and due to the higher potential for heartwood decay, which facilitates excavation. Cavity trees must be in open stands with a limited quantity of hardwood mid- or over-story. Foraging habitats consist of mature pines with an open canopy, low densities of small pines and hardwoods, and abundant native bunchgrass and forbs as groundcover (USFWS 2003c).

Status and Threats

The decline of the red-cockaded woodpecker is primarily due to habitat loss, degradation, and fragmentation. Habitat loss poses an ongoing threat to the species, with direct conversion to developed uses, combined with intense logging of old growth stands, intensive short-rotation silvicultural practices, and clear-cutting for agricultural uses combining to highly fragment remaining habitats. In addition, with the development of much of the region, the associated suppression of naturally occurring wild fires has contributed to the loss of the fire maintenance regime that the species historically depended on, further reducing and/or fragmenting suitable habitats. The resulting fragmented populations face an increased threat of extirpation from stochastic events, along with the loss of genetic variability leading to the potential threat of inbreeding depression. Additionally, the species may face threats from disturbance during nesting and feeding activities, with disturbances in the form of recreationists and recreational vehicles, logging activities, and general vehicle use, leading to decreased feeding and brooding rates, and nest abandonment (USFWS 2006c). Potential threats to red-cockaded woodpecker populations from NiSource projects include temporary or permanent loss or degradation of habitat, and further species fragmentation and genetic bottlenecking.

Distribution and Range

Historically the red-cockaded woodpecker was found through much of the southeastern Piedmont and Coastal Plain, ranging from New Jersey to Texas, with inland populations in Kentucky, Tennessee, Missouri, Arkansas, and Oklahoma. While still widely ranged, the historic extent of suitable habitat and likely the associated population size have been reduced by about 97 percent, with the species now considered extirpated in all portions of its former range north of North Carolina, and from all interior states except for Arkansas. Remaining populations are fragmented, and the majority are quite small, with 50 percent of known individuals thought to occur in six populations, with the remaining individuals scattered over more than 130 sites (NatureServe 2010).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in portions of Calcasieu, Evangeline, Grant, La Salle, and Rapides Parishes, Louisiana. Additionally, the potential for rediscovery of the species within portions of its historic range exists in; Catahoula Parish, Louisiana; and Southampton and Sussex Counties, Virginia. Populations in these areas would be found in association with open, mature pine woodlands (NatureServe 2010).

2.4 FISH SPECIES

2.4.1 DIAMOND DARTER

Species Background & Habitat

The diamond darter (*Crystallaria cincotta*), a freshwater fish in the Perch family historically found throughout the Ohio River Basin, became a Candidate species under the ESA in July 2009 (USFWS 2009b). Little is known about the life history and reproductive habits of the species due to its limited population and recent discovery, only being described as a distinct species from the crystal darter (*Crystallaria asprella*) in 2008. The species is a benthic invertivore, and is usually found buried in the sand with only their eyes protruding, watching for food and predators (ODNR 2009). The diamond darter inhabits moderate to large warm-water streams with clean sand and gravel substrates and moderate current and spawning habitat is side channel riffles over sand and gravel substrates in moderate current (USFWS 2009b).

Status and Threats

The decline of the diamond darter is primarily the result of destruction, modification, or curtailment of its habitat. Impoundments of many rivers in the Ohio River Basin eliminated much of the species' historic habitat, and isolated the extant population from other historic portions of its range. The remaining population is faced with ongoing threats from water quality degradation and habitat loss from coal mining and oil and gas development, along with siltation from those activities, pollution from inadequate wastewater treatment, and invasive species. Additionally, due to the small remaining population size, the species faces an increased threat of extirpation from catastrophic events such as toxic spills, along with potential inbreeding depression, reduction of long-term colony viability, and a low likelihood of natural repopulation of extirpated areas (USFWS 2009b). This species is extremely rare and difficult to capture.

Potential threats to diamond darter populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off into the water body, and further population fragmentation and genetic bottlenecking through take.

Distribution and Range

Historically the diamond darter appears to have been found throughout the Ohio River Basin, including portions of the Muskingum and Ohio rivers in Ohio, the Green River in Kentucky, and the Cumberland River drainage in Kentucky and Tennessee. The only extant population of the species known to exist is located in a 22.4 mile section of the Elk River in Kanawha and Clay Counties, West Virginia (USFWS 2009a). It is considered extirpated throughout the remainder of its historic range, and is considered rare even within its remaining range, with only 18 individuals documented over the last 29 years (USFWS 2009b).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this species in a 22.4 mile section of the Elk River in Kanawha and Clay Counties, West Virginia, the only location where the species is known to still exist (USFWS 2009a).

2.4.2 PALLID STURGEON

Species Background & Habitat

The pallid sturgeon (*Scaphirhynchus albus*), a large freshwater fish in the Sturgeon family found in the Mississippi-Missouri River system, was listed as Endangered under the ESA in September of 1990, followed by the establishment of a Recovery Plan in 1993. The pallid sturgeon was differentiated from the shovelnose sturgeon (Scaphirhynchus platorynchus) in 1905, so little is known concerning its abundance or distribution prior to that date (USFWS 1993d). Little is known about the reproduction and spawning habits of pallid sturgeon (USFWS 1993d). The species is not migratory, though seasonal movement for spawning occurs. The species is considered an opportunistic suctorial feeder of benthic organisms with a diet that ranges from aquatic insects to fish depending on life stage (USFWS 2007c). Forage species include chubs, minnows, and suckers. Pallid sturgeon is a benthic-dwelling species, found in large, turbid, free-flowing rivers with swift currents. They are generally over sand or gravel substrate in water around 15 feet deep, usually in areas with an irregular bottom contour, which are common at the downstream end of sunken sand bars and in open channels with dunes (USFWS 1993d).

Status and Threats

The decline of the pallid sturgeon is primarily the result of destruction and modification of habitat, which has fragmented the species' range. Multiple impoundments across the species' range blocked spawning routes and inundated spawning and nursery areas, along with effectively fragmenting the species between Mississippi and Missouri River populations. Additionally, channelization in many areas modified water velocity, river width, and flow of water into backwater areas, destroying or heavily modifying key habitats for the species. Other threats to the species include incidental take during commercial and recreation harvest of shovelnose sturgeon, inadequacy of existing regulatory protection mechanisms, pollution, entrainment, and hybridization between the Endangered pallid and much more common shovelnose species of sturgeon (USFWS 1993d and 2007f). Potential threats to pallid sturgeon populations from NiSource projects include pollution run-off and small spills into the water body, and potential entrainment of juveniles or fry during hydrostatic testing.

Distribution and Range

Historically the pallid sturgeon was found in the middle and lower Mississippi River, throughout the Missouri River, and within the lower reaches of the Red, Platte, Kansas, and Yellowstone Rivers (USFWS 1993d). Approximately 40 percent of the suitable habitat across this range has been lost, largely due to impoundments and regulated flow, with extant populations found primarily in the Mississippi River, with smaller populations found in the upper and lower Missouri River, and within the Atchafalaya and Yellowstone Rivers. Natural reproduction is evident in some populations, but natural recruitment continues to be low throughout the range. The species range is highly fragmented and interaction between extant populations is no longer possible naturally in most cases. While the species range remains large, the density of unhybridized individuals is considered uncommon to rare throughout much of its range (NatureServe 2010).

Presence in the Project Area

Based on initial project review (Armstrong et al. 2007), the NiSource project may affect this species in portions of the lower Mississippi and Atchafalaya Rivers in East Carroll, Rapides, Madison, and St. Mary Parishes, Louisiana, and Issaquena, Sharkey, Warren, and Washington Counties, Mississippi. The covered lands may also affect populations in the lower Red River in Rapides Parish, and the lower Atchafalaya River in Terrebone Parish.

2.4.3 KENTUCKY ARROW DARTER

Species Background & Habitat

The Kentucky arrow darter's (*Etheostoma sagitta spilotum*) has been a candidate for listing under the ESA since 2010 (USFWS 2010b). Its preferred habitat consists of pools or transitional areas between riffles and pools (runs and glides) in moderate to high gradient streams with bedrock, boulder, and cobble substrates. In most recent surveys, the Kentucky arrow darter has been observed in streams ranging in size from first to third order, with most individuals occurring in second order streams in watersheds encompassing 20 square kilometers (7.7 square miles) or less (Thomas 2008). Kentucky arrow darters feed on a variety of aquatic invertebrates, but adults feed predominantly on larval mayflies (order Ephemeroptera), specifically the families Heptageniidae and Baetidae (Lotrich 1973; Lowe 1979). The peak spawning period for the subspecies is likely April (Bailey 1948, Lowe 1979), but male Kentucky arrow darters establish territories over riffles from March to May. Males fan out a depression in the substrate and defend these sites vigorously. Initial courtship behavior involves rapid dashes, fin-flaring, nudging, and quivering motions by the male followed by similar quivering responses of the female,

who then precedes the male to the nest. The female partially buries herself in the substrate, is mounted by the male, and spawning occurs (Etnier and Starnes 1993). It is assumed that the male continues to defend the nest until the eggs have hatched. Common associates of the Kentucky arrow darter include creek chub (*Semotilus atromaculatus*), central stoneroller (*Campostoma anomalum*), white sucker (*Catastomus commersonii*), rainbow darter (*E. caeruleum*), fantail darter (*E. flabellare*), and Johnny darter (*E. nigrum*) (Kuehne 1962, Lotrich 1973, Thomas 2008).

Status and Threats

The overall decline of the Kentucky arrow darter can be attributed to a variety of human-related activities that have degraded and/or limited its habitat and range. Activities such as coal mining, silviculture, agriculture, gas/oil well exploration, human development, and inadequate sewage treatment have all contributed to the degradation of streams within the range of the subspecies (Thomas 2008). Adverse impacts result primarily from inputs of dissolved solids and elevation of instream conductivity, sedimentation, removal of riparian vegetation, bank erosion and channel instability, inputs of untreated sewage, and agricultural runoff (USFWS 2010b).

Distribution and Range

The Kentucky arrow darter's historical distribution was limited to the upper Kentucky River system in eastern Kentucky and included portions of five subbasins: Red River (Rockbridge Fork of Swift Camp Creek), Sturgeon Creek, South Fork Kentucky River, Middle Fork Kentucky River, and North Fork Kentucky River (Thomas 2008). The subspecies continues to occupy these same subbasins, but recent range-wide surveys completed from 2007 to 2009 revealed that the subspecies has disappeared from over half of its historic range (Thomas 2008; USFWS 2010b).

Presence in the Project Area

Based on initial project review, the NiSource project may affect this subspecies in portions of the upper Kentucky River system in Clay, Lee, and Owsley counties, Kentucky.

2.4.4 ROANOKE LOGPERCH

Species Background & Habitat

The Roanoke logperch (*Percina rex*), a small freshwater fish in the Perch family found in the Roanoke and Nottoway River drainages, was listed as Endangered under the ESA in September of 1989, followed by the establishment of a Recovery Plan in 1992. The species is considered a diurnal, visual predator, generally flipping over stones in the river bed and consuming most food items encountered, with the primary prey consisting of chironomid and caddisfly larvae, and chironomids. The species is considered non-migratory. Spawning occurs in mid-April to early May, generally in areas of deep runs with gravel and small cobble bottoms. Eggs are buried and there is no subsequent parental care. The Roanoke logperch appears to utilize every major riverine habitat based upon life phase and season. Generally, the species occupies clean, clear, moderate to large sized warm-water streams and rivers with moderate gradients and relatively unsilted substrata. They most commonly inhabit riffle-run-pool areas and substratas made of mostly gravel and rubble. Males are generally found in shallow riffles, females in deep runs with gravel and small cobble bottoms, young in slow runs and pools with

clean sand bottoms, and all classes are assumed to winter under boulders in deep pools. Except during the winter, all age classes appear to be intolerant of moderate to heavy levels of silted substrata (USFWS 1992b).

Status and Threats

The decline of the Roanoke logperch is primarily the result of destruction and modification of habitat, along with fragmentation of the species. Primary causes of the species' habitat degradation include chemical spills, non-point runoff, channelization, impoundments, siltation, pollution, and cold-water release from dams. The primary factor leading to the species decline is thought to be siltation, due to reduction of habitat heterogeneity and productivity, increases in egg and larval mortality, and reduction in available food supplies (USFWS 1992b). Other threats include urbanization, industrial development, water supply and flood control projects, agricultural runoff, and industrial effluents (NatureServe 2010). Potential threats to Roanoke logperch populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off and small spills into the water body, potential entrainment of individuals during hydrostatic testing, and further population fragmentation and genetic bottlenecking through take.

Distribution and Range

Historically the Roanoke logperch was found in the Roanoke River drainage, including the Pigg and Smith rivers, along with the Nottoway River Drainage. Its range extended through portions of the Ridge and Wally, Blue Ridge, and lower Piedmont provinces (USFWS 1992b). The species is extant in eight descrete populations in five rivers/river reaches (USFWS 2007g). Currently, populations can be found in portions of the upper and middle Roanoke Rivers, upper and middle Pigg Rivers, the Nottoway River, and in three portions of the Smith River. The populations are separated by wide river gaps or large impoundments, comprising the remnants of a formerly widespread distribution, though the species may have never been found in large densities across its range (NatureServe 2010).

Presence in the Project Area

Based on initial project review (Armstrong et al. 2007), the NiSource project may affect this species in portions of the Nottaway River system, including portions of Stony and Sappony Creeks, along with other tributaries in Brunswick, Dinwiddie, Greensville, Mecklenburg, Southampton, and Sussex Counties, Virginia.

2.4.5 SPOTFIN CHUB

Species Background & Habitat

The spotfin chub (*Erimonax monachus*), a small freshwater fish in the Minnow family found in the upper and middle Tennessee River drainage, was listed as Threatened under the ESA in September of 1977, followed by the establishment of a Recovery Plan in 1983. Low population levels have limited the study of the species, limiting knowledge of its ecological interactions and reproductive behavior. The species is a diurnal insectivore which presumably feeds by sight and taste in benthic areas (USFWS 1983b). Typical prey includes larval invertebrates such as mayfly and caddisfly, along with small chironomids and simulids. The species is not migratory, and is generally highly localized, only moving within their immediate habitat under normal conditions. The species is thought to spawn in mid-April through late August, with eggs deposited in crevices, making them highly susceptible to siltation and other pollutants (NatureServe 2010). The spotfin chub is primarily found in moderate to large streams and rivers, generally of widths ranging from 55 to 230 feet with water depths from 1

to 3.2 feet (USFWS 1983b). They generally inhabit riffles and pools with moderate to swift current and clear water at cool to warm temperatures. Preferred substrates range from gravel to bedrock, though the species is rarely found in conjunction with sand and silt substrates (NatureServe 2010).

Status and Threats

The decline of the spotfin chub is primarily the result of destruction and modification of habitat, along with fragmentation of the species. Primary causes of the species' habitat degradation include siltation, coal sedimentation, pollution, inundation by reservoir development, release of cold water from reservoirs, stream channelization, and interspecific competition (USFWS 1983b). Potential threats to spotfin chub populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off and small spills into the water body, and potential entrainment of juveniles or fry during hydrostatic testing, and further population fragmentation through take.

Distribution and Range

Historically the spotfin chub was endemic to much of the Tennessee River drainage, found in 24 streams in the states of Alabama, Georgia, North Carolina, Tennessee, and Virginia, including upland-mountain habits in the Blue Ridge, Ridge and Valley, Cumberland Plateau, and Interior Low Plateau regions (USFWS 1983b). The species is extant in only five isolated tributary systems, with populations in portions of the Duck and Buffalo River, the Emory River system, the North Fork Holston River, the South Fork Holston River, and the Little Tennessee River. Additionally, nonessential experimental populations have been, or are in the process of being, introduced into portions of Abrams Creek, Shoal Creek, Tellico River, French Broad River, and Holston River. The species is considered uncommon to rare throughout most of its current range, though the Emory River population appears to be relatively strong (NatureServe 2010).

Presence in the Project Area

Based on initial project review (Armstrong et al. 2007), the NiSource project may affect this species in portions of the Buffalo River system in Lewis County, Tennessee.

2.4.6 PYGMY MADTOM

Species Background & Habitat

The pygmy madtom (*Noturus stanauli*), a small freshwater fish in the Catfish family endemic to the Tennessee River drainage, was listed as Endangered under the ESA in April of 1993, followed by the establishment of a Recovery Plan in 1994. Much of the species' life history is unknown due to low representation in studies. To date, only 50 individuals of the species have been collected, though these low numbers may be partially due to the species secretive habits. Reproductive habits are assumed to be similar to closely related madtoms, with nesting in cavities or under cover objects, reproduction occurring from spring to early summer, and young that are actively feeding within a few weeks of hatching. The pygmy madtom primarily preys on aquatic insect larvae, and is thought to be an opportunistic feeder, taking prey items in proportion to their abundance (USFWS 1994b). The species inhabits moderate to large rivers with clear water, and is generally located on shallow pea-size gravel or fine sand shoals, with a current ranging from moderate to strong. The species is also found in the flowing portions of pools during the reproductive season, and eggs are generally laid under slab rocks, in empty mussel shells, or in other similar situations (NatureServe 2009).

Status and Threats

The decline of the pygmy madtom is primarily the result of destruction and modification of habitat, along with fragmentation of the species. Multiple impoundments across the species' range effectively fragmented the species, along with heavily modifying and destroying their stream habitats. Additionally, the species is threatened by deteriorating water quality from siltation and other pollutants, primarily from run-off from adjacent lands, waste discharges, and stream bank erosion. Other threats to the species include increased regional urbanization, coal mining, and poorly managed agricultural practices. Due to the small and geographically isolated nature of remaining populations, the species faces an increased susceptibility of individual populations to extirpation from catastrophic events such as toxic spills. The small size and isolation can also lead to potential inbreeding depression, reduction of long-term colony viability, and a low likelihood of natural repopulation of extirpated areas (USFWS 1994b). Potential threats to pygmy madtom populations from NiSource projects include short-term impoundments, increased siltation, pollution run-off and small spills into the water body, potential entrainment of individuals during hydrostatic testing, and further population fragmentation and genetic bottlenecking through take.

Distribution and Range

The pygmy madtom is only known from two populations in the Tennessee River drainage and is generally not represented in historic records, though it is assumed that the species was once more widespread within the Tennessee River system and was possibly undetected in other locations. The two extant populations, located in the Duck River in Humphreys and Hickman Counties, Tenessee, and in the Clinch River in Hancock County, Tennessee, are sepearted by approximately 600 river miles, along with multiple impoundments (USFWS 1994b). Reintroduction efforts to return the species to its historic range began in 2006, with individuals introduced into portions of the French Broad River and the Holston River in Knox County, Tennessee. The success of these reintroductions is not currently known (NatureServe 2009).

Presence in the Project Area

Based on initial project review, the NiSource project may affect the Duck River population of the species. While no portion of the NiSource project footprint crosses inhabited portions of the river system, portions of the project footprint are found upstream from the extant species range in Maury County, Tennessee.

2.5 REPTILE SPECIES

2.5.1 EASTERN MASSASAUGA

Species Background & Habitat

The eastern massasauga (*Sistrurus catenatus catenatus*), a medium-sized rattlensake found in the southern Great Lakes region and Midwest, became a Candidate species under the ESA in October 1999. Similar to all rattlesnakes, the massasauga bears live young, with reproduction generally occurring biennially, though some annual reproduction has been reported. Annual reproducers mate in the spring and bear their young in the later summer to autumn, while biennial reproducers mate in the autumn, with young bearing in the following summer. Young are born from late July to early September, and disperse from the mother within a week of birth. Sexual maturity is generally reached between five and seven years of age, with a total life span of up to eight to ten years. Like all northern snakes, the species hibernates during the winter, going into the hibernacula in mid-September through late October, and emerging in late March to early April, though unlike other similar

species, they hibernate individually. Typical prey species include voles, deer mice, and shrews, though they will also consume frogs, birds, eggs, and other snakes. The species is preyed upon by carnivorous mammals, birds of prey, and other snakes (USFWS 1998b and 2000a).

Eastern massasaugas are found on both wetland and upland habitats, and typically shift between the two seasonally, with the shift varying across the species range, along with between sexes and life stages. Occupied sites are generally contain a mix of open sunlit areas and shaded areas for thermoregulation, have a water table near the surface for hibernation, and variable elevations between the adjoining wetland and upland areas. Hibernacula typically occur in wetlands, with crayfish burrows often utilized; though other structures such as sphagnum hummocks, small mammal burrows, and tree roots are also utilized, with the key factor being the presence of water that does not freeze. It is uncommon to find the species in open water areas (USFWS 1998b). Typical habitats include peatlands, marshes, bogs, sedge meadows, and swamp forest, with typical uplands including open savannas, prairies, and old fields (USFWS 2007e).

Status and Threats

The decline of the eastern massasauga is primarily due to habitat loss, and degradation. Wetland drainage for the conversion to farmland, along with the encroachment of urban development and the associated road and utility projects, have combined to eliminate much of the species' historic range, along with the fragmentation of the remaining areas of habitat and populations. The loss of suitable natural upland habitats has also led to the use of surrogate habitats, such as lawns, agricultural fields, roads, and open areas, which often leads to an increased vulnerability to indiscriminant killing and mortality. The increased fragmentation of habitat by roads has also lead to an increase in vehicle-caused mortality and injury. Additionally, the increase in development has also resulted in the suppression of natural fires, allowing woody succession to choke out the open upland habitats that the species requires. Other anthropogenic threats include illegal collection for the pet trade, and persecution and individual stress from human activity disturbance. Additionally, due to the small and disjunct nature of most remaining populations, they faced an increased threat of extirpation from stochastic events and reduced reproductive success (USFWS 1998b). Potential threats to eastern massasauga populations from NiSource projects include temporary or permanent loss or degradation of habitat, individual disturbance or mortality, chemical contaminants, facilitated predation and collection, water level manipulation and sedimentation, and further species fragmentation and genetic bottlenecking.

Distribution and Range

The historic range of eastern massasaugas stretched from western New York and southern Ontario to Iowa and Missouri, including portions of Pennsylvania, Ohio, Inidiana, Illinois, Michigan, Wisconsin, and Minnesota. While the current range resembles the historic range, the distribution within the range is considerably patchier, with approximately 40 percent of the counties that the species was historically supported in no longer containing known populations, along with the species being considered extirpated from Minnesota. Less than 35 percent of remaining occurrences of the species are considered secure (USFWS 2007e).

Presence in the Project Area

Based on initial project review (Armstrong et al. 2007), the NiSource project may affect this species in portions of Elkhart, LaPorte, Marshall, Noble, Porter, and St. Joseph counties, Indiana; Ashtabula, Champaign, Clark, Clinton, Columbiana, Crawford, Defiance, Erie, Fairfield, Fayette, Greene, Hardin, Huron, Licking, Logan, Lorain, Lucas, Marion, Medina, Montgomery, Ottawa, Paulding, Sandusky, Seneca, Stark, Trumbull, Warren, Wayne, and

Wyandot counties Ohio; and Butler and Mercer counties, Pennsylvania. Populations in these areas would be found in association with a mix of wetlands and associated uplands.

3.0 ANALYSIS OF EFFECTS ON LISTED SPECIES AND HABITATS

3.1 EFFECTS ON MUSSEL SPECIES

This section evaluates the effects of the proposed action on the dwarf wedgemussel, orange pimpleback, pink mucket, rabbitsfoot, rayed bean, ring pink, rough pigtoe, and spectaclecase mussels. Table A (Appendix A) identifies the pipeline activities and subactivities, as previously identified in the Description of the Proposed Action section ("Covered Actions"), and the environmental impacts resulting from each activity, and the anticipated responses of individuals and populations exposed to those impacts. Avoidance and minimization measures (AMMs), commonly referred to as Best Management Practices (BMPs) or conservation measures, were recommended to reduce potential impacts to these species. A list of the AMMs for mussels occurs at the end of this section. This table provides the complete record of the effects analysis for these species and was intended to be read in concert with and support this effects analysis section. None of these species has designated critical habitat within the covered lands, therefore none will be discussed here.

There are three species, the fat pocketbook, fluted kidneyshell, and slabside pearlymussel, for which we would expect no impacts if NiSource employs specific avoidance measures. The fat pocketbook pearlymussel occurs only in the Mississippi River in Mississippi within the covered lands. NiSource crosses the Mississippi River with a trunk line and has historically crossed the River using HDD. We believe that these actions would be <u>not likely to adversely affect</u> this species. The fluted kidneyshell, and slabside pearlymussel occur only in the Duck River within the covered lands. NiSource has agreed to apply all of the HCP mussel AMMs to this river and specifically to cross the Duck River using HDD. These measures work to either completely avoid or significantly reduce potential effects on the stream and riparian habitats and the mussel species. The AMMs will ensure that some activities do not occur in or near the habitat, making it unlikely that the mussels will be exposed to those activities. Where the mussels are exposed to pipeline activities, these AMMs will reduce the potential impacts so that these mussels only experience temporary disturbance and displacement for the duration of the activities. We believe that these actions would be <u>not likely to adversely</u> affect the kidneyshell and slabside pearlymussel.

The remainder of this section evaluates the effects of the proposed action on the remaining mussel species: dwarf wedgemussel, orange pimpleback, pink mucket, rabbitsfoot, rayed bean, ring pink, rough pigtoe, and spectaclecase mussels (hereafter mussels).

Activities that will have "no effect" or are "not likely to adversely affect" the species

Some of the covered activities will not have no effect or are not likely to adversely affect these species (Table A; NE/NLAA determinations). Activities involving non-earth disturbing vegetation management (e.g., mowing) and other limited earth disturbing activities as listed below are expected to have no effect on the species because individuals will not be exposed to them or their impacts are expected to be neutral on the species. Many activities involved in operating and maintaining the pipeline system are not likely to adversely affect the mussels because they will not occur in mussel. Mussels are unlikely to be exposed to the no effect activities or, if exposed, will only experience temporary disturbance and displacement for the duration of the activities. Some activities have been determined NLAA based on the implementation of specific agreed upon AMMs (Table A). These are activities that without those AMMs would have impacts on mussels. The prescribed AMMs must be effectively and uniformly implemented to achieve NLAA unless otherwise indicated by the Service. NiSource is

also expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). In short, we expect that these activities will only result in insignificant or discountable impacts to the species and its critical habitat. These activities include:

- Vegetation Management - mowing
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Vegetation Disposal (upland) - brush pile burning
- Vegetation Management - tree side trimming by bucket truck or helicopter
- General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole
- Pipeline Abandonment - in place
- Well Abandonment - plugging, waste pits, site restoration
- Abandonment - Ownership transfer
- Inspection Activities - ground and aerial
- Vehicle Operation and Foot Traffic
- Vegetation Disposal (upland) - brush pile burning
- Vegetation Clearing - tree side trimming by bucket truck or helicopter
- Trenching (upland) - digging, blasting, dewatering, open trench, sedimentation
- Pipe Stringing - bending, welding, coating, padding and backfilling
- Compression Facility - noise
- Communication Facility - guy lines, noise, lights
- Stream Equipment Crossing Structures
- Crossings, wetlands and other water bodies (non-riparian) - clearing
- Crossings, wetlands and other water bodies (non-riparian) - tree side trimming
- Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading, dewatering
- Crossings, wetlands and other water bodies (non-riparian) - pipe stringing
- Crossings, wetlands and other water bodies (non-riparian) - HDD
- Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore

Activities that are "likely to adversely affect" the species

Certain covered activities, including those activities that directly impact streams and theose that may result chronic sediment impacts, are expected to adversely affect mussels (Table A). To minimize potential for adverse effects, the agreed upon AMMs should be implemented for these activities when they occur in or near known or presumed occupied habitat. In addition, NiSource is expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). These activities include:

- Vegetation Management - chainsaw and tree clearing
- Vegetation Management - herbicides - hand, vehicle mounted, aerial applications
- ROW repair, regrading, revegetation (upland) - hand, mechanical
- ROW repair, regrading, revegetation (wetland) - hand, mechanical
- ROW repair, regrading, revegetation - in stream stabilization and/or fill

- Access Road Maintenance - grading, graveling
- Access Road Maintenance - culvert replacement
- General Appurtenance and Cathodic Protection Construction - off ROW clearing
- Pipeline Abandonment - removal
- Well Abandonment - facilities/building removal and site restoration
- Clearing - herbaceous vegetation and ground cover
- Clearing - trees and shrubs
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Grading, erosion control devices
- Hydrostatic Testing (water withdrawal)
- Hydrostatic Testing (water discharge), new or existing line
- Regrading and Stabilization - restoration of corridor
- Access Roads (not crossing streams) - upgrading, graveling, and culverts existing roads
- Access Roads (temporary or permanent can cross streams) - new road construction
- Stream Crossings, wet ditch
- Stream Crossings, dry ditch
- Stream Crossings, steel dam & culvert
- Stream Crossings, dam & pump
- Stream Crossings, Horizontal Directional Drill (HDD)
- Storage wells - clearing and drilling
- Storage wells - reconditioning
- Storage wells - waste pits

Potential environmental impacts or threats consist of direct physical impacts to individuals, habitat degradation or loss, and invasive species as described in Table A. These species are particularly susceptible to impacts from increased sedimentation and the presence of nuisance species in their habitat. Proposed activities that impact the breeding, feeding, and sheltering needs of these species may result in demographic consequences, including population numbers, and reproduction effects (e.g. reduced recruitment) of these species.

The operation and maintenance of existing NiSource facilities and the construction of new facilities in mussel habitat can be divided into two large categories of activities: a) those that directly impact mussels (e.g., vehicle crossings), or the streambed or stream banks (e.g., in-stream stabilization), or both (e.g., non-HDD laying of pipeline across a stream); and b) those that affect mussels indirectly often through the release of sediments into mussel habitat (e.g., grading of the ROW in the uplands).

As a general rule, the direct impacts are acute and often more harmful, while the indirect impacts could often be categorized as chronic impacting mussel habitat over years. Nevertheless, both could adversely affect individual mussels by affecting their ability to feed, shelter, and reproduce. Further, both types of activities have the potential to either temporarily or permanently alter or degrade mussel habitat. Although the impacts of some activities is likely to be temporary or the habitat restored, we expect that the effects would act long enough within the habitat to adversely affect mussels and their ability to feed, shelter, or reproduce.

The activities producing chronic sediment impacts that we term aggregate are likely to be widespread within the habitat for some species, but the effects are expected to be at a very low level. The activities producing acute

impacts (e.g., stream crossings, access roads, in-stream stabilization) would be limited geographically, but they would typically place severe stress on the individuals within the localized area of occurrence.

Determination

Based on this analysis, we conclude that the proposed action is likely to adversely affect mussels.

Mussel BMPs

1. A survey can be conducted to determine the presence of this mussel species. Mussel survey protocols designed to detect endangered mussels that often occur in low densities; protocols as of 2009 are provided in Appendix L of the HCP. Survey methodologies must be evaluated at minimum every five years and be updated to the most effective survey methods currently available. If the most current methodology implemented by a biologist, qualified to conduct the survey, does not indicate the presence of the species, it will be classified as unoccupied habitat and the AMMs will not be mandatory[3.]

If a survey is not completed, presence will be assumed. In that case, all suitable habitat would be treated as occupied, and all mandatory AMMs must be followed. NiSource or its contractors will follow the Service approved relocation plan as referenced below. Survey and relocation may be implemented in the same time period (as one action) as long as both survey and relocation protocols are followed (general relocation protocols are identified in Appendix L of the HCP, but may be modified in conjunction with Service Field Office based on conditions).

Relocation may be implemented only if: 1) all required permits are in place, 2) a Service approved relocation plan documenting all relevant protocols including how and where the mussels will be moved is in place, 3) a contingency plan is in place to conduct additional consultation with the Service should the actual field survey not reflect the conditions identified in the approved relocation plan, and 4) a monitoring program to evaluate the effects of the relocation is in place. Relocation will include at least all individuals of the federally endangered species identified in the impact area and may include other species based on the assessment of the Service Field Office and other regulatory agencies. A copy of the survey and any reports will also be included in the annual report submitted to the Service.

2. A detailed EM&CP will be prepared for any activity with potential effects (e.g., stream bed or stream bank disturbance, impacts to riparian habitat, activities causing sediment) within 100 feet of the ordinary high water mark of occupied mussel habitat. The plan will incorporate the relevant requirements of the NGTS ECS and include site-specific details particular to the project area and potential impact. The waterbody crossing will be considered as "high-quality" for the purpose of preparing this plan regardless of the actual classification. The plan will be strongly oriented towards minimizing stream bed and riparian disturbance (including minimization of tree clearing within 25 feet of the crossing [Figure 24, ECS]), preventing downstream sedimentation (including redundant erosion and sediment control devices which would be designed to protect mussel resources as appropriate), and weather monitoring by the Environmental Inspector to ensure work is not begun with significant precipitation in the forecast. The plan will comprehensively address all activities needed to complete the work and minimize take of mussels in occupied habitat including crossing the streams during dry periods when practical and using dry-ditch crossing techniques for intermittent streams leading to mussel habitat. The EM&CP will include the frac-out avoidance and contingency plans described in AMM #3 below. The EM&CP will

[3] However, NiSource may implement some of these measures if appropriate to protect potentially suitable habitat.

also include a sediment control component for uplands that drain to and impact occupied habitat. Detailed erosion control plans will be developed specific to slopes greater than or equal to 30 percent leading directly to occupied habitat. In areas with less than a 30 percent slope, ECS and AMM erosion control measures protective of mussels will be implemented. The plan will be approved in writing by NiSource NRP personnel prior to project implementation and will include a tailgate training session for all on-site project personnel to highlight the environmental sensitivity of the habitat and any

3. For activities in occupied habitat, install new or replacement pipelines and major repairs under the river bottom using HDD or other trenchless methods rather than open trenching unless the crossing evaluation report prepared in accordance with Section 5.2.1.1 and Appendix J of the HCP indicates otherwise. Drilling should be carefully undertaken and a plan should be in place to minimize and address the risk of in-stream disturbance due to frac-outs. The plan should also specifically reference mussel resources in the vicinity of the crossing as a key conservation concern and include specific measures identified in the NGTS ECS, from standard industry practices, or other mutually agreed-upon practices to protect this resource. The plan will also include a frac-out impact avoidance plan which will evaluate the site in terms not only of feasibility of conducting HDD, but the likelihood of large scale frac-out and its effects on mussels, and actions to address a large scale frac-out in occupied habitat. The plan should also consider the potential effects on mussels if drilling fluids are released into the environment. The plan must contain all information required for a FERC Section 7c filing at a minimum.

If, after detailed engineering studies (e.g., geotechnical, physiological, topographical, and economic), it is determined (and agreed to by NRP personnel) that an HDD is not feasible, a report will be prepared and included in the annual report submitted to the Service. However, due to the potentially significant amount of take that might occur for Ohio River crossings, open trenching in this river is not a “covered activity” as part of the NiSource MSHCP.

4. Install pipeline to the minimum depth described in the ECS and maintain that depth at least 10 feet past the high water line to avoid exposure of pipeline by anticipated levels of erosion based on geology and watershed character. Additional distance may be required should on-site conditions (i.e., outside bend in the waterbody, highly erosive stream channel, anticipated future upstream development activities in the vicinity, etc.) dictate a reasonable expectation that the stream banks could erode and expose the pipeline facilities. Less distance may be utilized if terrain or geological conditions (long, steep bank or solid rock) will not allow for a 10-foot setback. These conditions and the response thereto will be documented in the EM&CP and provided as part of the annual report to the Service.

5. For major repairs in occupied habitat, do not install in-channel repairs (bendway weirs, hardpoints, concrete mats, fill for channel relocation, or other channel disturbing measures) except when measures in AMM #3 above are not feasible from an engineering design perspective, and then, only in conjunction with a stream restoration plan based on Rosgen (*see* Wildland Hydrology 2009 http://www.wildlandhydrology.com/html/references_.html) or other techniques mutually agreed upon by NiSource and the Service that result in no take of listed mussels.

6. Conduct replacements/repairs from a lay barge or temporary work bridges of the minimum length necessary to conduct the replacements/repairs rather than operating heavy equipment (e.g., backhoes, bulldozers) in-stream. Temporary construction and equipment bridges are not to be confused with stone or fill causeways with pipe structures, which should not be employed in known or presumed occupied waterbodies.

7. Remove equipment bridges as soon as practicable (this is typically interpreted to be a few days to a few weeks unless there are extenuating circumstances) after repair work and any site restoration is completed

8. As part of the routine pipeline inspection patrols, visually inspect all stream crossings in occupied habitat at least yearly for early indications of erosion or bank destabilization associated with or affecting the pipeline crossing that is resulting, or would before the next inspection cycle, likely result in sediment impacts to mussel habitat beyond what would be expected from background stream processes. If such bank destabilization is observed, it will be corrected in accordance with the ECS. Follow-up inspections and restabilization will continue until the bank is stabilized (generally two growing seasons).

9. Do not construct culvert and stone access roads and appurtenances (including equipment crossing) across the waterbody or within the riparian zone. Temporary equipment crossings utilizing equipment pads or other methods that span the waterbody are acceptable provided that in-stream pipe supports are not needed.

10. For equipment crossings of small streams, use half pipes of sufficient number and size that both minimize impacts to stream bed and minimize flow disruption to both upstream and downstream habitat (ECS, Figure 22).

11. Reserved.

12. Abandon pipelines in place to avoid in-stream disturbance that would result from pipeline removal unless the abandonment would be detrimental to endangered mussels.

13. As described in the ECS section on "Spill Prevention, Containment and Control," site staging areas for equipment, fuel, materials, and personnel at least 300 feet from the waterway, if available, to reduce the potential for sediment and hazardous spills entering the waterway. If sufficient space is not available, a shorter distance can be used with additional control measures (e.g., redundant spill containment structures, on-site staging of spill containment/clean-up equipment and materials). If a reportable spill has impacted occupied habitat:

a. follow spill response plan; and
b. call the appropriate Service Field Office to report the release, in addition to the National Response Center (800-424-8802).

14. Ensure all imported fill material is free from contaminants (this would include washed rock or other materials that could significantly affect the pH of the stream) that could affect the species population or habitat through acquisition of materials at an appropriate quarry or other such measures.

15. For storage well activities, use enhanced and redundant measures to avoid and minimize the impact of spills from contaminant events in known or presumed occupied streams. These measures include, for example, waste pit protection, redundant spill containment structures, on-site staging of spill containment/clean-up equipment and materials, and a spill response plan provided to the Service as part of the annual report. These measures will be included in the EM&CP prepared for the activity.

16. Do not use fertilizers or herbicides within 100 feet of known or presumed occupied habitat. Fertilizer and herbicides will not be applied if weather (e.g., impending storm) or other conditions (e.g., faulty equipment) would compromise the ability of NiSource or its contractors to apply the fertilizer or herbicide without impacting presumed occupied mussel habitat. The EM&CP prepared for this activity (AMM# 2 above) will document relevant EPA guidelines for application.

17. Hydrostatic test water will not be obtained from known or presumed occupied habitat unless other water sources are not readily available. To prevent desiccation of mussels, water from known or presumed occupied habitat will be withdrawn in a manner that will not visibly reduce the wetted perimeter of the stream channel. Employ appropriately sized screens, implement withdrawal rates, and maintain withdrawal point sufficiently above the substrate to minimize impacts to mussels.

18. Do not discharge hydrostatic test water directly into known or presumed occupied habitat. Discharge water in the following manner (in order of priority and preference):

a. Discharge water down gradient of occupied habitat unless on-the-ground circumstances (e.g. man-made structures, terrain, other sensitive resources) prevent such discharge.
b. If those circumstances occur, discharge water into uplands >300 feet from occupied habitat unless on-the-ground circumstances (e.g. man-made structures, terrain, other sensitive resources) prevent such discharge.
c. If those circumstances occur, discharge water as far from occupied habitat as practical and utilize additional sediment and water flow control devices (Figures 6A&B, 7, 8, 14A&B; ECS) to minimize effects to the waterbody.

19. Do not drive across known or presumed occupied streams – walk these areas or visually inspect from bank and use closest available bridge to cross stream.

20. Clean all equipment (including pumps, hoses, etc.) that have been in a perennial waterbody for more than four hours within the previous seven days and will work in occupied or potential federally listed mussel habitat; following established guidelines to remove zebra mussels (and other potential exotic or invasive species) before entering a known or presumed occupied stream for a federally listed mussel, which is not known to be infested with zebra mussels. Do not discharge any water for other sources that might be contained in equipment (e.g. ballast water, hoses, sumps, or other containment). It is important to follow these guidelines even if work is not occurring in the immediate vicinity of these mussels since, once introduced into a watershed, invasive species could move and eventually affect the federally listed mussels.

3.2 EFFECTS ON PLANT SPECIES

3.2.1 RIPARIAN PLANTS

This section evaluates the effects of the proposed action on the plants in the Riparian Plant ecological group, which includes Virginia spiraea, harperella, and Spring Creek bladderpod. Table B (Appendix A) identifies the pipeline activities and subactivities, as previously identified in the Description of the Proposed Action section ("Covered Actions"), and the environmental impacts resulting from each activity, and the anticipated responses of individuals and populations exposed to those impacts. These tables provide the complete record of the effects analysis for these species and were intended to be read in concert with and support this effects analysis section. None of these species has designated critical habitat, therefore none will be discussed here.

Both Spring Creek bladderpod (Tennessee) and Harperella (Maryland and Virginia) occur in counties crossed by covered lands but are not anticipated to be impacted by NiSource activities. These species occurs in very localized areas in the states listed outside the covered lands or in very specific habitats in which NiSource does not work and will not be considered further in this analysis.

The remainder of this section evaluates the effects of the proposed action on the one remaining riparian plant species, Virginia spiraea.

Activities that will have "no effect" or are "not likely to adversely affect" the species

Some of the covered activities are expected to have no detectable effects on riparian plants (Table B). Activities involving non-earth disturbing vegetation management (e.g., chainsaw and tree clearing) and other limited earth disturbing activities as listed below are expected to have no effect on the species because individuals will not be exposed to them or their impacts are expected to be neutral on the species. Many activities involved in operating and maintaining the pipeline system are not likely to adversely affect the plants because they will not occur in the types of habitat this species occupies. Other activities will only result in insignificant or discountable impacts to the plants. NiSource is expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). These no effect or NLAA activities include:

- Vegetation Management – chainsaw and tree clearing
- Vegetation Management - tree side trimming by bucket truck or helicopter
- Existing ROW Repair – regrading (upland)
- ROW repair, regrading, revegetation in wetland (except in Raleigh, Co., WV)
- Access Road Maintenance – grading, graveling, culvert replacement (except in Raleigh Co., WV)
- General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole
- Pipeline Abandonment - in place
- Pipeline or Well Abandonment – ownership transfer
- Pipeline Inspection Activities – ground or aerial
- Vehicle operation and foot traffic
- Vegetation Clearing - tree side trimming by bucket truck or helicopter
- Trenching
- Pipe Stringing - bending, welding, coating, padding and backfilling
- New ROW - regrading and stabilization
- Compression Facility - noise
- Communication Facility - guy lines, noise, lights
- Access Road- culvert installation (except in Raleigh Co., WV)
- Stream Crossings
- Wetland and other water body crossings (except in Raleigh Co., WV)
- New Storage Well Activities
- Storage Well Maintenance Activities (e.g., hydraulic fracturing)

Activities that are "likely to adversely affect" the species

Certain covered activities are expected to adversely affect riparian plants (Table B). These activities are likely to impact individuals and destroy, alter, or otherwise disturb the habitats occupied by these species. NiSource is expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). To further minimize potential for adverse effects, additional BMPs may be developed in coordination with NiSource in the future. These activities include:

- Facilities – pipeline corridor presence (collection and human trampling) and vehicles being driven along the ROW as part of O&M

- Vegetation Management – mowing, earth disturbing activities, herbicide use, and vegetation disposal
- Existing ROW Repair – in-stream stabilization
- General Appurtenance and Cathodic Protection Construction - off ROW clearing
- Pipeline Abandonment – removal
- Well Abandonment – waste pits, facilities/building removal and site restoration
- Clearing- herbaceous, shrub, and tree
- Vegetation Disposal (upland)
- Grading
- Hydrostatic Testing – withdrawal and discharge
- Access Roads- upgrading existing roads and new road construction – grading and gravelling

Potential environmental impacts or threats consist of direct physical impacts to individuals, habitat degradation or loss, and invasive species as described in Table B. Proposed activities that impact the reproduction strategies (e.g., burying of seed beds, cutting plants before flowering), nutrition, and general sheltering needs of these species may result impact population numbers, and reproduction effects (e.g. reduced recruitment) of riparian plants.

The operation and maintenance of existing NiSource facilities and the construction of new facilities in riparian plant habitat can be divided into two large categories of activities: a) those that directly impact plants (e.g., mowing) and b) those that affect plants indirectly (e.g., introduction of invasive plants that may compete in the future).

As a general rule, the direct impacts are acute and often more harmful, while the indirect impacts could often be categorized as chronic, impacting riparian plants over time. Nevertheless, both could adversely affect individual or populations of plants. Further, both types of activities have the potential to either temporarily or permanently alter or degrade riparian plant habitat. Although the impacts of some activities is likely to be temporary or the habitat restored, we expect that the effects would act long enough within the habitat to adversely affect riparian plants and their ability to feed, shelter, or reproduce.

Determination

Based on this analysis, we conclude that the proposed action is <u>likely to adversely affect</u> Virginia spiraea.

3.2.2 TRANSITIONAL SUCCESSIVE PLANTS

This section evaluates the effects of the proposed action on the American chaffseed, Eastern prairie fringed orchid, Leafy prairie clover, Price's potato bean, and Running buffalo clover. Table C (Appendix A) identifies the pipeline activities and subactivities, as previously identified in the Description of the Proposed Action section ("Covered Actions"), and the environmental impacts resulting from each activity, and the anticipated responses of individuals and populations exposed to those impacts. This table provides the complete record of the effects analysis for this species and was intended to be read in concert with and support this effects analysis section.

There are three species that occur in counties crossed by covered lands but are not anticipated to be impacted by NiSource activities. These species either occur in very localized areas in the states listed outside the covered lands or in very specific habitats in which NiSource does not work. These species are American chaffseed, Leafy Prairie Clover, and Price's Potato Bean. Therefore, NiSource activities are not likely to adversely affect these species, as the likelihood of NiSource encountering populations of these species is extremely low.

The remainder of this section evaluates the effects of the proposed action on the remaining Transitional Successive Plant Species: eastern prairie fringed orchid, and running buffalo clover.

Activities that will have "no effect" or are "not likely to adversely affect" the species

Some of the covered activities are expected to have no detectable effects on the transitional successive plant species (Table C). Activities involving abandonment, ROW repair, road maintenance, noise, lights, and in-water work as listed below are expected to have no effect on these species because individuals will not be exposed to them or their impacts are expected to be neutral on the species. Several activities involved in operating and maintaining the pipeline system will likely have no effect on transitional successive plant species because they are in areas where these species do not occur. Additionally, two new disturbance (construction) activities will likely have no effect on these species due to activity location and the ability of plants to tolerate changes in noise and artificial light levels. In short, we expect that these activities will only result in insignificant or discountable impacts to the species and its critical habitat. NiSource is expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). These no effect activities include:

- ROW repair, regrading, revegetation - in stream stabilization and/or fill
- Access Road Maintenance - grading, graveling
- Access Road Maintenance - culvert replacement
- Pipeline Abandonment - in place
- Pipeline Abandonment – ownership transfer
- Compression Facility - noise
- Communication Facility - guy lines, noise, lights
- Stream Crossings, wet ditch
- Stream Crossings, dry ditch
- Stream Crossings, steel dam & culvert
- Stream Crossings, dam & pump
- Stream Crossings, Horizontal Directional Drill (HDD)
- Stream Equipment Crossing Structures

Many activities involved in operating and maintaining the pipeline system are not likely to adversely affect transitional successive plant species because they are discountable or may provide beneficial disturbances and create openings in the canopy. These activities include:

- Facilities - vehicles, foot traffic, noise, communication facilities
- Vegetation Management – mowing (if conducted prior to above ground vegetative growth)
- Vegetation Management - chainsaw and tree clearing
- General Appurtenance and Cathodic Protection Construction - Off ROW Clearing
- Inspection Activities - ground and aerial

Activities that are "likely to adversely affect" the species

Certain covered activities, including those activities that are likely to directly impact individual plants and appropriate habitat for transitional successive plant species, are expected to adversely affect these species (Table C). To further minimize potential for adverse effects, additional BMPs may be developed in coordination with NiSource in the future and implemented for these activities when they occur in or near known or presumed

occupied habitat. In addition, NiSource is expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). These activities include:

- Vegetation Management – mowing (if conducted after above ground vegetative growth)
- Vegetation Management - herbicides - hand, vehicle mounted, aerial applications
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Vegetation Disposal (upland) - brush pile burning
- ROW repair, regrading, revegetation (upland) - hand, mechanical
- ROW repair, regrading, revegetation (wetland) - hand, mechanical
- General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole
- Pipeline Abandonment – removal
- Well Abandonment - plugging, waste pits, site restoration
- Well Abandonment - facilities/building removal and site restoration
- Vehicle Operation and Foot Traffic [new construction]
- Clearing - herbaceous vegetation and ground cover
- Clearing - trees and shrubs
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Vegetation Disposal (upland) - brush pile burning
- Vegetation Clearing - tree side trimming by bucket truck or helicopter [new construction]
- Grading, erosion control devices
- Trenching (digging, blasting, dewatering, open trench, sedimentation)
- Pipe Stringing - bending, welding, coating, padding and backfilling
- Hydrostatic Testing (water withdrawal and discharge), existing line
- Hydrostatic Testing (water withdrawal and discharge), new line
- Regrading and Stabilization - restoration of corridor
- Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling
- Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation
- Crossings, wetlands and other water bodies (non-riparian) – clearing
- Crossings, wetlands and other water bodies (non-riparian) - tree side trimming
- Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading
- Crossings, wetlands and other water bodies (non-riparian) - pipe stringing
- Crossings, wetlands and other water bodies (non-riparian) – HDD
- Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore
- Storage wells - clearing and drilling
- Storage wells – reconditioning
- Storage wells - waste pits

Potential environmental impacts or threats consist of direct physical impacts to individuals, habitat degradation or loss, and introduction of invasive species, as described in Table C. These species are particularly susceptible to impacts from crushing, burying, chemical contaminants, and the introduction of invasive species.

The operation and maintenance of existing NiSource facilities and the construction of new facilities in transitional successive plant species habitat can be divided into two large categories of activities: a) those that directly impact transitional successive plants (e.g., vegetation clearing), or their habitat (e.g., access roads), or

both (e.g., grading); and b) those that affect transitional successive plant species indirectly often through the alteration of their habitat (e.g., introduction of invasive plants).

As a general rule, the direct impacts are acute and often more harmful, while the indirect impacts could often be categorized as chronic impacting transitional successive plant species habitat over years. Nevertheless, both could adversely affect individual transitional successive plant species by affecting their ability to collect sunlight, nutrients, and water, and to reproduce. Further, both types of activities have the potential to either temporarily or permanently alter or degrade transitional successive plant species habitat. Although the impacts of some activities are likely to be temporary or the habitat restored, we expect that the effects would act long enough within the habitat to adversely affect transitional successive plant species and their ability to grow and reproduce.

Determination

Based on this analysis, we conclude that the proposed action is likely to adversely affect transitional successive plant species.

3.2.3 UPLAND/UPLAND SUCCESSIVE SPECIES

This section evaluates the effects of the proposed action on the plants in the Upland and Upland Successive ecological groups. Table D (Appendix A) identify the pipeline activities and subactivities, as previously identified in the Description of the Proposed Action section ("Covered Actions"), and the environmental impacts resulting from each activity, and the anticipated responses of individuals and populations exposed to those impacts. These tables provide the complete record of the effects analysis for these species and were intended to be read in concert with and support this effects analysis section. None of these species has designated critical habitat, therefore none will be discussed here.

There are several species that occur in counties crossed by covered lands but are not anticipated to be impacted by NiSource activities. These species occur in very localized areas in the states listed outside the covered lands or in very specific habitats in which NiSource does not work. These species are lakeside daisy (OH), Michaux's sumac (VA), northern monkshood (NY), Peter's Mountain mallow (VA), small-whorled pogonia (in PA and NY only) and white-haired goldenrod (KY). These species will not be considered further in this analysis.

There are six species for which we would expect no adverse impacts if NiSource employs specific avoidance measures. These are Leedy's roseroot (NY), northern monkshood (OH), Short's bladderpod (TN), small-whorled pogonia (OH), and Tennessee purple coneflower (TN). NiSource has agreed to avoid the limited occurrences of these species within the covered lands. Therefore, NiSource activities are not likely to adversely affect these species, as the likelihood of NiSource encountering populations of these species in the states listed above is extremely low. The specific avoidance measures for each are listed at the end of the section.

The remainder of this section evaluates the effects of the proposed action on the remaining Upland and Upland Successive plant species: small-whorled pogonia (VA only), shale barren rockcress, Short's goldenrod, and smooth coneflower (hereafter upland plants).

Activities that will have "no effect" or are "not likely to adversely affect" the species

Some of the covered activities are expected to have no detectable effects on the upland plants (Table D). Activities involving non-earth disturbing vegetation management (e.g., chainsaw and tree clearing) and other

limited earth disturbing activities as listed below are expected to have no effect on the species because individuals will not be exposed to them or their impacts are expected to be neutral on the species. Many activities involved in operating and maintaining the pipeline system are not likely to adversely affect the upland plants because they will not occur in the types of habitat these species occupy. Other activities will only result in insignificant or discountable impacts to the upland plants. NiSource is expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). These no effect or NLTAA activities include:

- Vegetation Management – chainsaw and tree clearing
- Vegetation Management - tree side trimming by bucket truck or helicopter
- ROW repair, regrading, revegetation (wetland or in-stream)
- Access Road Maintenance - culvert replacement
- Pipeline Abandonment - in place
- Pipeline Abandonment – ownership transfer
- Vegetation Clearing - tree side trimming by bucket truck or helicopter
- Trenching
- Pipe Stringing - bending, welding, coating, padding and backfilling
- Regrading and stabilization
- Compression Facility - noise
- Communication Facility - guy lines, noise, lights
- Access Road- culvert installation
- Stream Crossings
- Wetland and other water body crossings
- New Storage Well Activities

Activities that are "likely to adversely affect" the species

Certain covered activities are expected to adversely affect upland plants (Table D). These activities are likely to impact individuals and destroy, alter, or otherwise disturb the upland habitats occupied by these species. NiSource is expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). To further minimize potential for adverse effects, additional BMPs may be developed in coordination with NiSource in the future. These activities include:

- Facilities – pipeline corridor presence (collection and human trampling) and vehicles being driven along the ROW as part of O&M
- Vegetation Management – mowing, earth disturbing activities, herbicide use, and vegetation disposal
- Existing ROW Repair – regrading (upland)
- Access Roads – maintenance (herbicide)
- General Appurtenance and Cathodic Protection Construction - off ROW clearing, trenching, anodes, bell hole
- Pipeline Abandonment – removal
- Well Abandonment – waste pits, facilities/building removal and site restoration
- ROW inspections
- Vehicle operation and foot traffic
- Clearing- herbaceous, shrub, and tree
- Vegetation Disposal (upland)
- Grading

- Hydrostatic Testing – withdrawal and discharge
- New ROW regrading and Stabilization
- Access Roads- upgrading existing roads and new road construction

Potential environmental impacts or threats consist of direct physical impacts to individuals, habitat degradation or loss, and invasive species as described in Table D. Proposed activities that impact the reproduction strategies (e.g., burying of seed beds, cutting plants before flowering), nutrition, and general sheltering needs of these species may result impact population numbers, and reproduction effects (e.g. reduced recruitment) of these species.

The operation and maintenance of existing NiSource facilities and the construction of new facilities in upland plant habitat can be divided into two large categories of activities: a) those that directly impact plants (e.g., mowing) and b) those that affect plants indirectly (e.g., introduction of invasive plants that may compete in the future).

As a general rule, the direct impacts are acute and often more harmful, while the indirect impacts could often be categorized as chronic, impacting upland plants over time. Nevertheless, both could adversely affect individual or populations of plants. Further, both types of activities have the potential to either temporarily or permanently alter or degrade upland plant habitat. Although the impacts of some activities is likely to be temporary or the habitat restored, we expect that the effects would act long enough within the habitat to adversely affect upland plants and their ability to feed, shelter, or reproduce.

Determination

Based on this analysis, we conclude that the proposed action is <u>likely to adversely affect</u> the small-whorled pogonia (Virginia only), shale barren rockcress, and smooth coneflower.

Upland /Upland Successive Plant BMPs

<u>Northern monkshood (Ohio)</u>

Avoid all activities in the area specified for this species. If the area cannot be avoided, consultation will need to be reinitiated for this species.

Avoidance Area: Crane Hollow State Nature Preserve, Laurel Township, Hocking County.

<u>Small-whorled pogonia (Ohio)</u>

Avoid all activities in the area specified for this species. If the area cannot be avoided, consultation will need to be reinitiated for this species.

Avoidance Area: Camp OtyOkwa, Benton Township, Hocking County.

<u>Globe (Short's) bladderpod (Kentucky)</u>

Avoid all activities in the area specified for this species. If the area cannot be avoided, consultation will need to be reinitiated for this species.

Avoidance Area: All areas designated by the Kentucky Natural Heritage Database. This species is not found in the covered lands in Tennessee.

Leedy's roseroot (New York)

Avoid all activities in the area specified for this species. If the area cannot be avoided, consultation will need to be reinitiated for this species.

Avoidance Area: Area designated by the NY Heritage Database, with a 50 meter buffer on all sides.

Tennessee purple coneflower (Tennessee)

Avoid all activities in the area specified for this species. If the area cannot be avoided, consultation will need to be reinitiated for this species.

Avoidance Area: All areas designated by the Tennessee Natural Heritage Database in southeastern Davison County. Further avoid impacting cedar glade habitat within the covered lands.

3.2.4 WETLAND PLANT SPECIES

This section evaluates the effects of the proposed action on the plants in the Wetland ecological group, which includes northeastern bulrush, pondberry, sensitive joint vetch, swamp pink, and Virginia sneezeweed. Table E (Appendix A) identifies the pipeline activities and subactivities, as previously identified in the Description of the Proposed Action section ("Covered Actions"), and the environmental impacts resulting from each activity, and the anticipated responses of individuals and populations exposed to those impacts. These tables provide the complete record of the effects analysis for these species and were intended to be read in concert with and support this effects analysis section. None of these species has designated critical habitat, therefore none will be discussed here.

The pondberry and the northeastern bulrush (in NY only) are known to occur in counties crossed by covered lands, but are not anticipated to be impacted by NiSource activities. Further, most of the current ROW is in agriculture and unsuitable for pondberry. In addition, For the sensitive joint vetch (in NJ only), NiSource has agreed to avoid the limited occurrences of these species within the covered lands in the states referenced in parentheses. Therefore, NiSource activities are not likely to adversely affect these species in those states, as the likelihood of NiSource encountering populations of these species in the states listed above is extremely low. The specific avoidance measure for sensitive joint vetch is listed at the end of the section.

The remainder of this section evaluates the effects of the proposed action on the remaining Wetland plant species: Swamp pink and Virginia sneezeweed, as well as northeastern bulrush (in PA and VA) and sensitive joint vetch (in VA only) (hereafter wetland plants).

Activities that will have "no effect" or are "not likely to adversely affect" the species

Some of the covered activities are expected to have no detectable effects on the wetland plants (Table E). Activities involving non-earth disturbing vegetation management (e.g., chainsaw and tree clearing) and other limited earth disturbing activities as listed below are expected to have no effect on the species because individuals will not be exposed to them or their impacts are expected to be neutral on the species. Many

activities involved in operating and maintaining the pipeline system are not likely to adversely affect the wetland plants because they will not occur in the types of habitat these species occupy. Other activities will only result in insignificant or discountable impacts to the wetland plants. NiSource is expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). These no effect or NLTAA activities include:

- Vegetation Management – chainsaw and tree clearing
- Vegetation Management - tree side trimming by bucket truck or helicopter
- Vegetation Disposal (upland)
- ROW repair, regrading, revegetation (in-stream)
- Pipeline Abandonment - in place
- Pipeline Abandonment – ownership transfer
- Vegetation Clearing - tree side trimming by bucket truck or helicopter
- Trenching
- Pipe Stringing - bending, welding, coating, padding and backfilling
- Regrading and stabilization
- Compression Facility - noise
- Communication Facility - guy lines, noise, lights
- Stream Crossings
- Wetland Crossings- horizontal bore
- New Storage Well Activities (except for Northeastern bulrush)

Activities that are "likely to adversely affect" the species

Certain covered activities are expected to adversely affect wetland plants (Table E). These activities are likely to impact individuals and destroy, alter, or otherwise disturb the wetland habitats occupied by these species. NiSource is expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). To further minimize potential for adverse effects, additional BMPs may be developed in coordination with NiSource in the future. These activities include:

- Facilities – pipeline corridor presence (collection and human trampling) and vehicles being driven along the ROW as part of O&M
- Vegetation Management – mowing, earth disturbing activities, herbicide use, and vegetation disposal
- Existing ROW Repair – regrading (upland and wetland)
- Access Roads - maintenance – (herbicide use and culvert replacement)
- General Appurtenance and Cathodic Protection Construction - off ROW clearing, trenching, anodes, bell hole
- Pipeline Abandonment – removal
- Well Abandonment – waste pits, facilities/building removal and site restoration
- ROW inspections
- Vehicle operation and foot traffic
- Clearing- herbaceous, shrub, and tree
- Grading

- Hydrostatic Testing – withdrawal and discharge
- New ROW regrading and stabilization
- Access Roads- culvert installation
- Access Roads- upgrading existing roads and new road construction
- New Storage Well Activities (Northeastern bulrush)

Potential environmental impacts or threats consist of direct physical impacts to individuals, habitat degradation or loss, and invasive species as described in Table E. Proposed activities that impact the reproduction strategies (e.g., burying of seed beds, cutting plants before flowering), nutrition, and general sheltering needs of these species may result impact population numbers, and reproduction effects (e.g. reduced recruitment) of these species.

The operation and maintenance of existing NiSource facilities and the construction of new facilities in wetland plant habitat can be divided into two large categories of activities: a) those that directly impact plants (e.g., mowing) and b) those that affect plants indirectly (e.g., introduction of invasive plants that may compete in the future).

As a general rule, the direct impacts are acute and often more harmful, while the indirect impacts could often be categorized as chronic, impacting wetland plants over time. Nevertheless, both could adversely affect individual or populations of plants. Further, both types of activities have the potential to either temporarily or permanently alter or degrade wetland plant habitat. Although the impacts of some activities is likely to be temporary or the habitat restored, we expect that the effects would act long enough within the habitat to adversely affect wetland plants and their ability to feed, shelter, or reproduce.

Determination

Based on this analysis, we conclude that the proposed action is <u>likely to adversely affect</u> Swamp pink, Virginia sneezeweed, Northeastern bulrush and sensitive joint vetch.

Wetland Plant BMPs

<u>sensitive joint vetch (in New Jersey only)</u>

Avoid all activities in the area specified for this species. If the area cannot be avoided, consultation will need to be reinitiated for this species.

Avoidance Area: Large tidal wetland extending southwest from Center Square Road in Logan Township, Gloucester County (beginning approx. 75°23'22.992"W, 39°46'51.094"N)

3.3 EFFECTS ON BIRD SPECIES

3.3.1 PIPING PLOVER & CRITICAL HABITAT

This section evaluates the effects of the proposed action on the piping plover. Table F (Appendix A) identifies the pipeline activities and subactivities, as previously identified in the Description of the Proposed Action section ("Covered Actions"), and the environmental impacts resulting from each subactivity, and the anticipated responses of individuals and populations exposed to those impacts. This table provides the complete record of

the effects analysis for this species and was intended to be read in concert with and support this effects analysis section.

Activities that will have "no effect" or are "not likely to adversely affect" the species

Ohio

There are two areas in Ohio along Lake Erie where critical habitat for piping plover has been designated, Headland Dunes State Nature Preserve and Sheldon Marsh State Nature Preserve. The covered lands for the NiSource HCP do not coincide with either of these areas of designated critical habitat. Additionally, although the range of the piping plover in Ohio falls within some areas of the covered lands, no suitable habitat exists within the covered lands. Therefore, we would not anticipate any impacts to piping plover or critical habitat from activities within the NiSource HCP covered lands in Ohio.

Louisiana

The majority of covered activities are expected to have no detectable effects on the piping plover or its critical habitat (Table F). Activities involving pipeline abandonment and storage wells are expected to have no effect on the species because individuals will not be exposed to them or their impacts are expected to be neutral on the species and its critical habitat. The remaining activities involved in the pipeline system are all not likely to adversely affect the piping plover or its critical habitat because they are extremely unlikely not occur in piping plover habitat. Piping plovers are unlikely to be exposed to these activities or, if exposed, will only experience temporary disturbance and displacement for the duration of the activities. There are several activities that will occur in critical habitat (e.g., pipeline operations in shoreline areas), but these area will be reclaimed and restored and should not cause any long-term impairment of function. In short, we expect that these activities will only result in insignificant or discountable impacts to the species and it's critical habitat.

Determination

Based on this analysis, we conclude that the proposed action <u>not likely to adversely affect</u> the piping plover and its critical habitat.

3.3.2 RED-COCKADED WOODPECKER

This section evaluates the effects of the proposed action on the red-cockaded woodpecker (hereafter RCW). Table G (Appendix A) identifies the pipeline activities and subactivities, as previously identified in the Description of the Proposed Action section ("Covered Actions"), and the environmental impacts resulting from each activity, and the anticipated responses of individuals and populations exposed to those impacts. Avoidance and minimization measures (AMMs) more commonly referred to as Best Management Practices (BMPs) were recommended to reduce potential impacts to this species. This table provides the complete record of the effects analysis for this species and was intended to be read in concert with and support this effects analysis section.

Activities that will have "no effect" or are "not likely to adversely affect" the species

Some of the covered activities are expected to have no detectable effects on the RCW (Table G). Activities involving minimal, non-earth disturbing vegetation management (e.g., mowing), passive facilities management,

and activities around stream crossings, as listed below are expected to have no effect on the species because individuals will not be exposed to them or their impacts are expected to be minimal on the species.

- Vegetation Management – mowing
- ROW repair, regrading, revegetation - in stream stabilization and/or fill
- Access Road Maintenance - grading, graveling
- Access Road Maintenance - culvert replacement
- General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole
- Pipeline Abandonment - in place
- Well Abandonment - plugging, waste pits, site restoration
- Well Abandonment - facilities/building removal and site restoration
- Abandonment - Ownership transfer
- Inspection Activities - ground and aerial
- Pipe Stringing - bending, welding, coating, padding and backfilling
- Hydrostatic Testing (water withdrawal and discharge), existing line
- Hydrostatic Testing (water withdrawal and discharge), new line
- Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation
- Stream Crossings, wet ditch
- Stream Crossings, dry ditch
- Stream Crossings, steel dam & culvert
- Stream Crossings, dam & pump
- Stream Crossings, Horizontal Directional Drill (HDD)
- Stream Equipment Crossing Structures
- Crossings, wetlands and other water bodies (non-riparian) - pipe stringing
- Storage wells - clearing and drilling
- Storage wells - reconditioning
- Storage wells - waste pits

Activities that are "likely to adversely affect" the species

Many covered activities are expected to adversely affect the RCW (Table G). NiSource is expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). These activities include:

- Facilities - vehicles, foot traffic, noise, communication facilities
- Vegetation Management - chainsaw and tree clearing
- Vegetation Management - herbicides - hand, vehicle mounted, aerial applications
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Vegetation Disposal (upland) - brush pile burning
- Vegetation Management - tree side trimming by bucket truck or helicopter
- ROW repair, regrading, revegetation (upland) - hand, mechanical
- ROW repair, regrading, revegetation (wetland) - hand, mechanical
- General Appurtenance and Cathodic Protection Construction - Off ROW Clearing
- Pipeline Abandonment – removal
- Vehicle Operation and Foot Traffic [new construction]
- Clearing - herbaceous vegetation and ground cover

- Clearing - trees and shrubs
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking [new construction]
- Vegetation Disposal (upland) - brush pile burning [new construction]
- Vegetation Clearing - tree side trimming by bucket truck or helicopter [new construction]
- Grading, erosion control devices
- Trenching (digging, blasting, dewatering, open trench, sedimentation)
- Regrading and Stabilization - restoration of corridor
- Compression Facility, noise
- Communication Facility - guy lines, noise, lights
- Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling
- Crossings, wetlands and other water bodies (non-riparian) - clearing
- Crossings, wetlands and other water bodies (non-riparian) - tree side trimming
- Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading
- Crossings, wetlands and other water bodies (non-riparian) - HDD
- Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore

Potential environmental impacts or threats consist of direct physical impacts to individuals and habitat degradation or loss, as described in Table G. The RCW is particularly susceptible to noise or other physical disturbance in their habitat. Proposed activities that impact the breeding, feeding, and sheltering needs of these species may result in demographic consequences, including population numbers, and reproduction effects (e.g. reduced recruitment) of these species.

Determination

Based on this analysis, we conclude that the proposed action is likely to adversely affect the RCW.

3.4 EFFECTS ON FISH SPECIES

3.4.1 DIAMOND DARTER

This section evaluates the effects of the proposed action on the diamond darter. Table H (Appendix A) identifies the pipeline activities and subactivities, as previously identified in the Description of the Proposed Action section ("Covered Actions"), and the environmental impacts resulting from each subactivity, and the anticipated responses of individuals and populations exposed to those impacts. This table provides the complete record of the effects analysis for this species and was intended to be read in concert with and support this effects analysis section.

Activities that will have "no effect" or are "not likely to adversely affect" the species

Some of the covered activities will not have no effect or are not likely to adversely affect the diamond darter (Table H; NE/NLAA determinations). Activities involving minor vegetation management (e.g., mowing) and other limited earth disturbing activities (e.g., are not expected to affect the species because individuals will not be directly exposed to them or their impacts on the habitat are expected to be minor. In short, we expect that these activities will only result in insignificant or discountable impacts to the species. In addition, NiSource has committed to applying several AMMs developed for mussels (listed in section 3.1) to areas of known presumed occupied the diamond darter habitat. These AMMs serve to reduce and avoid potential adverse impacts from several activities, as described in Table H. NiSource is also expected to conduct all activities in accordance with

their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). These activities include:

- Vegetation Management - mowing
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Vegetation Disposal (upland) - brush pile burning
- Vegetation Management - tree side trimming by bucket truck or helicopter
- General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole
- Pipeline Abandonment - in place
- Well Abandonment - plugging, waste pits, site restoration
- Abandonment - Ownership transfer
- Inspection Activities - ground and aerial
- Vehicle Operation and Foot Traffic
- Vegetation Disposal (upland) - brush pile burning
- Vegetation Clearing - tree side trimming by bucket truck or helicopter
- Trenching (upland) - digging, blasting, dewatering, open trench, sedimentation
- Pipe Stringing - bending, welding, coating, padding and backfilling
- Compression Facility - noise
- Communication Facility - guy lines, noise, lights
- Stream Equipment Crossing Structures
- Crossings, wetlands and other water bodies (non-riparian) - clearing
- Crossings, wetlands and other water bodies (non-riparian) - tree side trimming
- Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading, dewatering
- Crossings, wetlands and other water bodies (non-riparian) - pipe stringing
- Crossings, wetlands and other water bodies (non-riparian) - HDD
- Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore
- Storage wells - clearing and drilling
- Storage wells - reconditioning
- Storage wells - waste pits

Activities that are "likely to adversely affect" the species

Certain covered activities are expected to adversely affect the darter (Table H). Although the application of the mussel AMMs and adherence to the ECS will greatly minimize potential impacts, some adverse effects remain likely. These activities include:

- Vegetation Management - chainsaw and tree clearing
- Vegetation Management - herbicides - hand, vehicle mounted, aerial applications
- ROW repair, regrading, revegetation (upland) - hand, mechanical
- ROW repair, regrading, revegetation (wetland) - hand, mechanical
- ROW repair, regrading, revegetation - in stream stabilization and/or fill
- Access Road Maintenance - grading, graveling
- Access Road Maintenance - culvert replacement
- General Appurtenance and Cathodic Protection Construction - off ROW clearing
- Pipeline Abandonment - removal
- Well Abandonment - facilities/building removal and site restoration

- Clearing - herbaceous vegetation and ground cover
- Clearing - trees and shrubs
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Grading, erosion control devices
- Hydrostatic Testing (water withdrawal)
- Hydrostatic Testing (water discharge), new or existing line
- Regrading and Stabilization - restoration of corridor
- Access Roads (not crossing streams) - upgrading, graveling, and culverts existing roads
- Access Roads (temporary or permanent can cross streams) - new road construction
- Stream Crossings, wet ditch
- Stream Crossings, dry ditch
- Stream Crossings, steel dam & culvert
- Stream Crossings, dam & pump
- Stream Crossings, Horizontal Directional Drill (HDD)

Potential environmental impacts or threats consist of direct physical impacts to individuals, habitat degradation or loss, and invasive species as described in Table H. The darter is particularly susceptible to impacts from increased sedimentation and the presence of nuisance species in their habitat. Proposed activities that impact the breeding, feeding, and sheltering needs of these species may result in demographic consequences, including population numbers, and reproduction effects (e.g. reduced recruitment) of this species.

The operation and maintenance of existing NiSource facilities and the construction of new facilities in this habitat can be divided into two large categories of activities: a) those that directly impact the streambed or stream banks (e.g., vehicle crossings, in-stream stabilization), or both (e.g., non-HDD laying of pipeline across a stream); and b) those that affect darter indirectly often through the release of sediments into its habitat (e.g., grading of the ROW in the uplands).

As a general rule, the direct impacts are acute and often more harmful, while the indirect impacts could often be categorized as chronic impacting the stream habitat over years. Nevertheless, both could adversely affect individual fish by affecting their ability to feed, shelter, and reproduce. Further, both types of activities have the potential to either temporarily or permanently alter or degrade darter habitat. Although the impacts of some activities is likely to be temporary or the habitat restored, we expect that the effects would act long enough within the habitat to adversely affect the species and its ability to feed, shelter, or reproduce.

The activities producing chronic sediment impacts (Table H; aggregate impacts) are likely to occur within the habitat, but those effects are expected to be low-level. The activities producing acute impacts (e.g., stream crossings, access roads, in-stream stabilization) would be limited geographically, but they would typically place severe stress on the individuals within the localized area of occurrence. As the NiSource pipeline intersects part of the only known extant population of the diamond darter, it will be imperative to limit the potential for adverse impacts to the extent possible.

Determination

Based on this analysis, we conclude that the proposed action is <u>likely to adversely affect</u> the diamond darter.

3.4.2 PALLID STURGEON

This section evaluates the effects of the proposed action on the pallid sturgeon. Table I (Appendix A) identifies the pipeline activities and subactivities, as previously identified in the Description of the Proposed Action section ("Covered Actions"), and the environmental impacts resulting from each activity, and the anticipated responses of individuals and populations exposed to those impacts. These tables provide the complete record of the effects analysis for these species and were intended to be read in concert with and support this effects analysis section.

The covered lands crosses pallid sturgeon habitat at the Mississippi River. Both the size and setting of the Mississippi where the covered lands crosses significantly diminishes the potential for adverse impact to the pallid sturgeon (e.g., HDD required). Given the size of the river, NiSource can do very little activities within the channel itself. Further, if some sedimentation enter the system indirectly from one of these activities, the river at this point is a large, lowland system with a high volume flow and great capability to move sediments, greatly reducing the potential effects of sedimentation on this species.

Determination

Based on this analysis, we conclude that the proposed action is <u>not likely to adversely affect</u> the pallid sturgeon.

3.4.3 ROANOKE LOGPERCH

This section evaluates the effects of the proposed action on the Roanoke logperch. Table J (Appendix A) identifies the pipeline activities and subactivities, as previously identified in the Description of the Proposed Action section ("Covered Actions"), and the environmental impacts resulting from each activity, and the anticipated responses of individuals and populations exposed to those impacts. These tables provide the complete record of the effects analysis for these species and were intended to be read in concert with and support this effects analysis section.

Activities that will have "no effect" or are "not likely to adversely affect" the species

Some of the covered activities will not have no effect or are not likely to adversely affect these species (Table J; NE/NLAA determinations). Activities involving non-earth disturbing vegetation management (e.g., chainsaw and tree clearing) and other limited earth disturbing activities as listed below are expected to have no effect on the species because individuals will not be exposed to them or their impacts are expected to be neutral on the species. Many activities involved in operating and maintaining the pipeline system are not likely to adversely affect the Roanoke logperch because they will not occur in the types of habitat these species occupy. Other activities will only result in insignificant or discountable impacts to the Roanoke logperch. In addition, NiSource has committed to applying several AMMs developed for mussels (listed in section 3.1) to areas of known presumed occupied the diamond darter habitat. These AMMs serve to reduce and avoid potential adverse impacts from several activities, as described in Table J. NiSource is also expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). These activities include:

- Vegetation Management - mowing
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Vegetation Disposal (upland) - brush pile burning

- Vegetation Management - tree side trimming by bucket truck or helicopter
- General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole
- Pipeline Abandonment - in place
- Well Abandonment - plugging, waste pits, site restoration
- Abandonment - Ownership transfer
- Inspection Activities - ground and aerial
- Vehicle Operation and Foot Traffic
- Vegetation Disposal (upland) - brush pile burning
- Vegetation Clearing - tree side trimming by bucket truck or helicopter
- Trenching (upland) - digging, blasting, dewatering, open trench, sedimentation
- Pipe Stringing - bending, welding, coating, padding and backfilling
- Compression Facility - noise
- Communication Facility - guy lines, noise, lights
- Stream Equipment Crossing Structures
- Crossings, wetlands and other water bodies (non-riparian) - clearing
- Crossings, wetlands and other water bodies (non-riparian) - tree side trimming
- Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading, dewatering
- Crossings, wetlands and other water bodies (non-riparian) - pipe stringing
- Crossings, wetlands and other water bodies (non-riparian) - HDD
- Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore
- Storage wells - clearing and drilling
- Storage wells - reconditioning
- Storage wells - waste pits

Activities that are "likely to adversely affect" the species

Certain covered activities are expected to adversely affect the Roanoke logperch (TableJ). Although the application of the mussel AMMs and adherence to the ECS will greatly minimize potential impacts, some adverse effects remain likely. These activities include:

- Vegetation Management - chainsaw and tree clearing
- Vegetation Management - herbicides - hand, vehicle mounted, aerial applications
- ROW repair, regrading, revegetation (upland) - hand, mechanical
- ROW repair, regrading, revegetation (wetland) - hand, mechanical
- ROW repair, regrading, revegetation - in stream stabilization and/or fill
- Access Road Maintenance - grading, graveling
- Access Road Maintenance - culvert replacement
- General Appurtenance and Cathodic Protection Construction - off ROW clearing
- Pipeline Abandonment - removal
- Well Abandonment - facilities/building removal and site restoration
- Clearing - herbaceous vegetation and ground cover
- Clearing - trees and shrubs
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Grading, erosion control devices
- Hydrostatic Testing (water withdrawal)
- Hydrostatic Testing (water discharge), new or existing line

- Regrading and Stabilization - restoration of corridor
- Access Roads (not crossing streams) - upgrading, graveling, and culverts existing roads
- Access Roads (temporary or permanent can cross streams) - new road construction
- Stream Crossings, wet ditch
- Stream Crossings, dry ditch
- Stream Crossings, steel dam & culvert
- Stream Crossings, dam & pump
- Stream Crossings, Horizontal Directional Drill (HDD)

Potential environmental impacts or threats consist of direct physical impacts to individuals, habitat degradation or loss, and invasive species as described in Table J. Proposed activities that impact the breeding, feeding, and sheltering needs of these species may result in demographic consequences, including population numbers, and reproduction effects (e.g. reduced recruitment) of these species.

The operation and maintenance of existing NiSource facilities and the construction of new facilities in or near Roanoke logperch habitat can be divided into two large categories of activities: a) those that directly impact the Roanoke logperch (e.g., contaminant exposure) and b) those that affect Roanoke logperch indirectly (e.g., sedimentation, introduction of invasives that may compete in the future).

The activities producing chronic sediment impacts (Table J; aggregate impacts) are likely to occur within the habitat, but those effects are expected to be low-level. The activities producing acute impacts (e.g., stream crossings, access roads, in-stream stabilization) would be limited geographically, but they would typically place severe stress on the individuals within the localized area of occurrence.

Determination

Based on this analysis, we conclude that the proposed action is <u>likely to adversely</u> affect Roanoke logperch.

3.4.4 SPOTFIN CHUB

This section evaluates the effects of the proposed action on the spotfin chub. Table K (Appendix A) identifies the pipeline activities and subactivities, as previously identified in the Description of the Proposed Action section ("Covered Actions"), and the environmental impacts resulting from each activity, and the anticipated responses of individuals and populations exposed to those impacts. These tables provide the complete record of the effects analysis for these species and were intended to be read in concert with and support this effects analysis section.

The spotfin chub has designated critical habitat, but not within the covered lands. Therefore no critical habitat will be discussed here.

<u>Activities that will have "no effect" or are "not likely to adversely affect" the species</u>

Some of the covered activities will not have no effect or are not likely to adversely affect the spotfin chub (Table K; NE/NLAA determinations). Activities involving non-earth disturbing vegetation management (e.g., chainsaw and tree clearing) and passive facilities operation are expected to have little to no effect on the species. In addition, NiSource has committed to applying several AMMs developed for mussels (listed in section 3.1) to areas of known presumed occupied the spotfin chub habitat. These AMMs serve to reduce and avoid potential

adverse impacts from several activities, as described in Table K. NiSource is also expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). These activities include:

- Vegetation Management - mowing
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Vegetation Disposal (upland) - brush pile burning
- Vegetation Management - tree side trimming by bucket truck or helicopter
- General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole
- Pipeline Abandonment - in place
- Well Abandonment - plugging, waste pits, site restoration
- Abandonment - Ownership transfer
- Inspection Activities - ground and aerial
- Vehicle Operation and Foot Traffic
- Vegetation Disposal (upland) - brush pile burning
- Vegetation Clearing - tree side trimming by bucket truck or helicopter
- Trenching (upland) - digging, blasting, dewatering, open trench, sedimentation
- Pipe Stringing - bending, welding, coating, padding and backfilling
- Compression Facility - noise
- Communication Facility - guy lines, noise, lights
- Stream Equipment Crossing Structures
- Crossings, wetlands and other water bodies (non-riparian) - clearing
- Crossings, wetlands and other water bodies (non-riparian) - tree side trimming
- Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading, dewatering
- Crossings, wetlands and other water bodies (non-riparian) - pipe stringing
- Crossings, wetlands and other water bodies (non-riparian) - HDD
- Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore
- Storage wells - clearing and drilling
- Storage wells - reconditioning
- Storage wells - waste pits

Activities that are "likely to adversely affect" the species

Certain covered activities are expected to adversely affect the spotfin chub (Table K). Although the application of the mussel AMMs and adherence to the ECS will greatly minimize potential impacts, some adverse effects remain likely. These activities include:

- Vegetation Management - chainsaw and tree clearing
- Vegetation Management - herbicides - hand, vehicle mounted, aerial applications
- ROW repair, regrading, revegetation (upland) - hand, mechanical
- ROW repair, regrading, revegetation (wetland) - hand, mechanical
- ROW repair, regrading, revegetation - in stream stabilization and/or fill
- Access Road Maintenance - grading, graveling
- Access Road Maintenance - culvert replacement
- General Appurtenance and Cathodic Protection Construction - off ROW clearing
- Pipeline Abandonment - removal

- Well Abandonment - facilities/building removal and site restoration
- Clearing - herbaceous vegetation and ground cover
- Clearing - trees and shrubs
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Grading, erosion control devices
- Hydrostatic Testing (water withdrawal)
- Hydrostatic Testing (water discharge), new or existing line
- Regrading and Stabilization - restoration of corridor
- Access Roads (not crossing streams) - upgrading, graveling, and culverts existing roads
- Access Roads (temporary or permanent can cross streams) - new road construction
- Stream Crossings, wet ditch
- Stream Crossings, dry ditch
- Stream Crossings, steel dam & culvert
- Stream Crossings, dam & pump
- Stream Crossings, Horizontal Directional Drill (HDD)

Potential environmental impacts or threats consist of direct physical impacts to individuals, habitat degradation or loss, and invasive species as described in Table K. Proposed activities that impact the breeding, feeding, and sheltering needs of these species may result in demographic consequences, including population numbers, and reproduction effects (e.g. reduced recruitment) of these species.

The operation and maintenance of existing NiSource facilities and the construction of new facilities in or near habitat can be divided into two large categories of activities: (a) those that directly impact the fishes (e.g., contaminant exposure) and (b) those that affect the fishes indirectly (e.g., sedimentation, introduction of invasive species). As a general rule, the direct impacts are acute and often more harmful, while the indirect impacts could often be categorized as chronic, impacting these fish over time. Nevertheless, both could adversely affect individuals or a populations of these fish.

The activities producing chronic sediment impacts (Table K; aggregate impacts) are likely to occur within the habitat, but those effects are expected to be low-level. The activities producing acute impacts (e.g., stream crossings, access roads, in-stream stabilization) would be limited geographically, but they would typically place severe stress on the individuals within the localized area of occurrence.

Determination

Based on this analysis, we conclude that the proposed action is <u>likely to adversely affect</u> the spotfin chub.

3.4.5 KENTUCKY ARROW DARTER

This section evaluates the effects of the proposed action on the Kentucky arrow darter. Table L (Appendix A) identifies the pipeline activities and subactivities, as previously identified in the Description of the Proposed Action section ("Covered Actions"), and the environmental impacts resulting from each activity, and the anticipated responses of individuals and populations exposed to those impacts. These tables provide the complete record of the effects analysis for these species and were intended to be read in concert with and support this effects analysis section.

The spotfin chub has designated critical habitat, but not within the covered lands. Therefore no critical habitat will be discussed here.

Activities that will have "no effect" or are "not likely to adversely affect" the species

Some of the covered activities will not have no effect or are not likely to adversely affect the darter (Table L; NE/NLAA determinations). Activities involving non-earth disturbing vegetation management (e.g., chainsaw and tree clearing) and passive facilities operation are expected to have little to no effect on the species. In addition, NiSource has committed to applying several AMMs developed for mussels (listed in section 3.1) to areas of known presumed occupied darter habitat. These AMMs serve to reduce and avoid potential adverse impacts from several activities, as described in Table L. NiSource is also expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). These activities include:

- Vegetation Management - mowing
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Vegetation Disposal (upland) - brush pile burning
- Vegetation Management - tree side trimming by bucket truck or helicopter
- General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole
- Pipeline Abandonment - in place
- Well Abandonment - plugging, waste pits, site restoration
- Abandonment - Ownership transfer
- Inspection Activities - ground and aerial
- Vehicle Operation and Foot Traffic
- Vegetation Disposal (upland) - brush pile burning
- Vegetation Clearing - tree side trimming by bucket truck or helicopter
- Trenching (upland) - digging, blasting, dewatering, open trench, sedimentation
- Pipe Stringing - bending, welding, coating, padding and backfilling
- Compression Facility - noise
- Communication Facility - guy lines, noise, lights
- Stream Equipment Crossing Structures
- Crossings, wetlands and other water bodies (non-riparian) - clearing
- Crossings, wetlands and other water bodies (non-riparian) - tree side trimming
- Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading, dewatering
- Crossings, wetlands and other water bodies (non-riparian) - pipe stringing
- Crossings, wetlands and other water bodies (non-riparian) - HDD
- Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore
- Storage wells - clearing and drilling
- Storage wells - reconditioning
- Storage wells - waste pits

Activities that are "likely to adversely affect" the species

Certain covered activities are expected to adversely affect the Kentucky arrow darter (Table L). Although the application of the mussel AMMs and adherence to the ECS will greatly minimize potential impacts, some adverse effects remain likely. These activities include:

- Vegetation Management - chainsaw and tree clearing
- Vegetation Management - herbicides - hand, vehicle mounted, aerial applications
- ROW repair, regrading, revegetation (upland) - hand, mechanical
- ROW repair, regrading, revegetation (wetland) - hand, mechanical
- ROW repair, regrading, revegetation - in stream stabilization and/or fill
- Access Road Maintenance - grading, graveling
- Access Road Maintenance - culvert replacement
- General Appurtenance and Cathodic Protection Construction - off ROW clearing
- Pipeline Abandonment - removal
- Well Abandonment - facilities/building removal and site restoration
- Clearing - herbaceous vegetation and ground cover
- Clearing - trees and shrubs
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Grading, erosion control devices
- Hydrostatic Testing (water withdrawal)
- Hydrostatic Testing (water discharge), new or existing line
- Regrading and Stabilization - restoration of corridor
- Access Roads (not crossing streams) - upgrading, graveling, and culverts existing roads
- Access Roads (temporary or permanent can cross streams) - new road construction
- Stream Crossings, wet ditch
- Stream Crossings, dry ditch
- Stream Crossings, steel dam & culvert
- Stream Crossings, dam & pump
- Stream Crossings, Horizontal Directional Drill (HDD)

Potential environmental impacts or threats consist of direct physical impacts to individuals, habitat degradation or loss, and invasive species as described in Table L. Proposed activities that impact the breeding, feeding, and sheltering needs of these species may result in demographic consequences, including population numbers, and reproduction effects (e.g. reduced recruitment) of these species.

The operation and maintenance of existing NiSource facilities and the construction of new facilities in or near habitat can be divided into two large categories of activities: (a) those that directly impact the fishes (e.g., contaminant exposure) and (b) those that affect the fishes indirectly (e.g., sedimentation, introduction of invasive species). As a general rule, the direct impacts are acute and often more harmful, while the indirect impacts could often be categorized as chronic, impacting these fish over time. Nevertheless, both could adversely affect individuals or a populations of these fish.

The activities producing chronic sediment impacts (Table L; aggregate impacts) are likely to occur within the habitat, but those effects are expected to be low-level. The activities producing acute impacts (e.g., stream crossings, access roads, in-stream stabilization) would be limited geographically, but they would typically place severe stress on the individuals within the localized area of occurrence.

Determination

Based on this analysis, we conclude that the proposed action is <u>likely to adversely affect</u> the Kentucky arrow darter.

3.4.6 PYGMY MADTOM

This section evaluates the effects of the proposed action on the pygmy madtom. Table M (Appendix A) identifies the pipeline activities and subactivities, as previously identified in the Description of the Proposed Action section ("Covered Actions"), and the environmental impacts resulting from each activity, and the anticipated responses of individuals and populations exposed to those impacts. These tables provide the complete record of the effects analysis for these species and were intended to be read in concert with and support this effects analysis section. This species does not have designated critical habitat, therefore none will be discussed here.

The pygmy madtom occurs only in the Duck River within the covered lands. NiSource has agreed to apply all of the HCP mussel AMMs to this river (listed in section 3.1). These measures work to either completely avoid or significantly reduce potential effects on the stream and riparian habitats and the madtom. The AMMs will ensure that some activities do not occur in or near the habitat, making it unlikely that the madtom will be exposed to those activities. Where exposed to pipeline activities, these AMMs will reduce the potential impacts so that the madtom will only experience temporary disturbance and displacement for the duration of the activities.

Determination

Based on this analysis, we conclude that the proposed action is <u>not likely to adversely affect</u> the pygmy madtom.

3.5 EFFECTS ON REPTILE SPECIES

3.5.1 EASTERN MASSASAUGA RATTLESNAKE

This section evaluates the effects of the proposed action on the eastern massasauga rattlesnake. Table N (Appendix A) identifies the pipeline activities and subactivities, as previously identified in the Description of the Proposed Action section ("Covered Actions"), and the environmental impacts resulting from each subactivity, and the anticipated responses of individuals and populations exposed to those impacts. This table provides the complete record of the effects analysis for this species and was intended to be read in concert with and support this effects analysis section.

Activities that will have "no effect" or are "not likely to adversely affect" the species

Several of the covered activities are expected to have no detectable effects on the massasauga (Table N). Activities involving minor vegetation management (e.g., tree trimming and removal), passive facilities operation, and instream disturbance are not expected to affect the species because individuals will not be directly exposed to them or their impacts on massasauga habitat are expected to be minor. In short, we expect that these activities will only result in insignificant or discountable impacts to the species and its critical habitat. These activities are:

- Vegetation Management - chainsaw and tree clearing
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Vegetation Disposal (upland) - brush pile burning
- Vegetation Management - tree side trimming by bucket truck or helicopter
- ROW repair, regrading, revegetation - in stream stabilization and/or fill
- Pipeline Abandonment - in place

- Abandonment - Ownership transfer
- Inspection Activities - ground and aerial
- Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking
- Vegetation Disposal (upland) - brush pile burning
- Compression Facility, noise
- Communication Facility - guy lines, noise, lights
- Stream Crossings, wet ditch
- Stream Crossings, dry ditch
- Stream Crossings, steel dam & culvert
- Stream Crossings, dam & pump
- Stream Crossings, Horizontal Directional Drill (HDD)
- Stream Equipment Crossing Structures

Activities that are "likely to adversely affect" the species

Many of the covered activities are expected to adversely affect the massasauga (Table N). These impacts are expected despite any conservation measures that NiSource will take (i.e., NiSource is expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008)). These activities include:

- Facilities - vehicles, foot traffic, noise, communication facilities
- Vegetation Management – mowing
- Vegetation Management - herbicides - hand, vehicle mounted, aerial applications
- ROW repair, regrading, revegetation (upland) - hand, mechanical
- ROW repair, regrading, revegetation (wetland) - hand, mechanical
- Access Road Maintenance - grading, graveling
- Access Road Maintenance - culvert replacement
- General Appurtenance and Cathodic Protection Construction - Off ROW Clearing
- General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole
- Pipeline Abandonment - removal
- Well Abandonment - plugging, waste pits, site restoration
- Well Abandonment - facilities/building removal and site restoration
- Vehicle Operation and Foot Traffic [new construction]
- Clearing - herbaceous vegetation and ground cover
- Clearing - trees and shrubs
- Vegetation Clearing - tree side trimming by bucket truck or helicopter [new construction]
- Grading, erosion control devices
- Trenching (digging, blasting, dewatering, open trench, sedimentation)
- Pipe Stringing - bending, welding, coating, padding and backfilling
- Hydrostatic Testing (water withdrawal and discharge), existing line
- Hydrostatic Testing (water withdrawal and discharge), new line
- Regrading and Stabilization - restoration of corridor
- Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling
- Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation
- Crossings, wetlands and other water bodies (non-riparian) - clearing
- Crossings, wetlands and other water bodies (non-riparian) - tree side trimming

- Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading
- Crossings, wetlands and other water bodies (non-riparian) - pipe stringing
- Crossings, wetlands and other water bodies (non-riparian) - HDD
- Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore
- Storage wells - clearing and drilling
- Storage wells - reconditioning
- Storage wells - waste pits

Potential environmental impacts or threats to the massasauga consist both of direct physical impacts to individuals and habitat degradation or loss, as described in Table N. In particular, massasauga are susceptible to road kill and thus vehicle use at facilities and access roads will impact individuals. Mowing is also a concern as snakes may be killed or injured by equipment. In addition, activities that alter or degrade wetland habitats (e.g., vegetation clearing, filling, water alterations) would be expected to negatively impact or take massasaugas.

Determination

Based on this analysis, we conclude that the proposed action is likely to adversely affect the massasauga.

4.0 CONCLUSIONS & SUMMARY

Based upon the findings of this BA, we make the following conclusions regarding effects on listed species (Table 6). Note, however, that NiSource may, in coordination with the appropriate FWS Field Office, elect to do pre-project species surveys with the goal of establishing that the surveyed species will not be affected by the project. In these situations, the FWS may agree there would be no effect for those species.

Listed species

Listed species that are likely to be adversely affected (LAA) will require formal consultation (Table 6). Listed species that are not likely to be adversely affected (NLAA) will require informal consultation. Listed species that will not be affected (NE) will not require further analysis.

Proposed species

The three proposed species (Table 6) – spectaclecase, rayed bean, and snuffbox -- are likely to be adversely affected (LAA). These species will require formal intra-service consultation with the Service. They may require a formal conference with the other cooperating agencies if the Service determines in its biological opinion that they are likely to be jeopardized by the proposed action.

Candidate species

There are several candidate species listed in Table 6-- Diamond Darter, Kentucky arrow darter, Fluted Kidney shell pearlymussel, Rabbitsfoot, Slabside pearlymussel , Globe (Short's) bladderpod, and Eastern massasauga rattlesnake. Those candidates that are likely to be adversely affected (LAA) will require formal conference with the Service only. Proposed species that are not likely to be adversely affected (NLAA) will undergo an informal conference with the Service only. The other cooperating agencies, while encouraged to complete conservation actions for these species, will not be required to complete conference processes.

Table 6. Summary of determination of effects on all non-HCP species.

Species	Status	Determination NE	NLAA	LAA	Comments
Birds					
Piping plover & critical habitat	T/E		X		
Red-cockaded woodpecker	E			X	
Fish					
Diamond Darter	C			X	
Kentucky arrow darter	C			X	
Pallid sturgeon	E		X		
Pygmy madtom	E		X		
Roanoke logperch	E			X	
Spotfin chub	T			X	
Mollusks					
Dwarf wedgemussel	E			X	LAA in NY, VA, PA only (NLAA in NJ)
Fat pocketbook	E		X		
Fluted Kidney shell pearlymussel	C		X		
Orangefoot pimpleback pearlymussel	E			X	
Pink mucket pearlymussel	E			X	
Rabbitsfoot	C			X	
Rayed bean	PE			X	
Ring pink mussel	E			X	
Rough pigtoe	E			X	
Slabside pearlymussel	C		X		
Snuffbox	PE			X	
Spectaclecase	PE			X	
Plants					
American chaffseed	E		X		
Eastern prairie fringed orchid	T			X	
Globe (Short's) bladderpod	C		X		
Harperella	E		X		
Lakeside daisy	T	X			
Leafy-prairie clover	E			X	
Leedy’s roseroot	T		X		
Michaux’s sumac	E		X		
Northeastern bulrush	E			X	LAA in VA, PA only (NE in NY)
Northern monkshood	T		X		NLAA in OH only (NE in NY)
Peter’s Mtn. mallow	E	X			
Pondberry	E		X		
Price’s potato bean	E		X		
Running buffalo clover	E			X	
Sensitive joint-vetch	T			X	LAA in VA only (NLAA in NJ)
Shale barren rockcress	E			X	
Short’s goldenrod	E			X	
Small-whorled pogonia	T			X	LAA in VA only (NE in PA, NY, OH)
Smooth coneflower	E			X	
Spring creek bladderpod	E		X		
Swamp pink	T			X	
Tennessee purple coneflower	E		X		
Virginia sneezeweed	T			X	

Species	Status	Determination NE	NLAA	LAA	Comments
Virginia spirea	T			X	LAA in WV only (NE in OH)
White-haired goldenrod	T	X			
Reptiles					
Eastern massasauga rattlesnake	C			X	LAA in IN, OH only (NLAA in PA)

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6.0 APPENDIX A: SPECIES ANALYSIS TABLES

Table A. Analysis of effects on mussel species.

SPECIES:	Dwarf Wedgemussel, Fat Pocketbook, Fluted Kidneyshell, Orangefoot Pimpleback, Pink Mucket, Rabbitsfoot, Rayed Bean, Ring Pink Mussel, Rough Pigtoe, Slabside Pearlymussel, Spectaclecase, Snuffbox											
Pipeline Activity	**Subactivity**	**Environmental Impact or Threat**	**Stressor**	**Stressor Pathway (optional)**	**Exposure (Resource Affected)**	**Range of Response**	**Conservation Need Affected**	**Demographic Consequences**	**Management Options (BMP) Mandatory**	**Management Options (BMP) Optional**	**NE, NLAA or LAA**	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities, pipeline corridor presence	Physical impacts to individuals, Habitat loss and degradation, Loss and degradation of host fish habitat	Crushing, Sedimentation, Alteration of Flow, Scouring	Crushing by Vehicles, Stream Bed and Bank Erosion	All Mussell Life stages and habitat; Host Fish habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction (reduced feeding, breeding, recruitment)	2,4,8	19	LAA	AMMs 2, 4, and 8 reduce the probability and magnitude of impacts - aggregate take. AMM 19 precludes driving across occupied habitat and would eliminate crushing and habitat impacts from that activity when implemented. Recommend for dwarf wedge mussel or other small stream species that AMM # 19 (do not drive across stream) be mandatory.
Operation & Maintenance	Vegetation Management - mowing	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Habitat degradation, Degradation of host fish habitat	Sedimentation, Increase in Water Temperatures	denuding bank, grubbing with heavy equipment, disturbing soil	All Mussell Life stages and habitat; Host Fish habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	This is considered an aggregate sediment / temperature impact.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	Habitat degradation, Degradation of host fish habitat	Chemical Contaminants	algae blooms, impacts to individuals (surfactants and other constituents)	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2, 16		LAA	This is considered an aggregate sediment / contaminant impact with AMMs 2 and16 in place. Recommend developing a list of approved herbicides (note herbicides mixtures may contain surfactants and other potentially harmful constituents)
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	Sedimentation								NE	Recommend an AMM that would avoid these activities within a certain distance of stream. Note that impacts from hauling are covered under "Facilities" which covers all vehicle related impacts for O&M
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Neutral	Sedimentation								NE	Recommend an AMM that would avoid these activities within a certain distance of stream.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Neutral	None								NE	Anticipate no effect from this activity. This may require further discussion (possibly LAA if significant impacts to riparian corridor)
Operation & Maintenance	ROW repair, regrading, revegetation **(upland)** - hand, mechanical	Habitat degradation, loss of host fish, Loss and degradation of host fish habitat	Sedimentation	Vehicles causing earth disturbance in uplands and near stream	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2,16		LAA	This is considered an aggregate sediment impact.
Operation & Maintenance	ROW repair, regrading, revegetation **(wetland)** - hand, mechanical	Habitat degradation, loss of host fish, Loss and degradation of host fish habitat	Sedimentation	Vehicles causing earth disturbance in uplands and near stream	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	This is considered an aggregate sediment impact (note that wetland and uplands are not separated in the matrix for mussels and wetland impacts might actually be less - potentially NLAA with AMMs). Recommend using a severe weather avoidance AMM.
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	Physical impacts to individuals, Permanent or temporary loss of occupied habitat, Habitat degradation, Loss and degradation of host fish habitat	Crushing, Sedimentation, Altered Flow	Equipment crushes mussels crushed, riprap or structures cover suitable substrate, Altered flow result in sedimentation in water column and streambed, Stream channel width changes to increase velocity, changes in food availability, Change in host fish habitat, loss due to relocation of small segments of the channel	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction (reduced recruitment, feeding, breeding, displacement, sheltering)	2, 3, 5, 7, 8, 13, 14, 20.	6	LAA	AMMs 2, 3, 5, 7, 8, 13, 14, and 20 and non-mandatory AMM 6 reduce the impact of this activity. We should also consider adding AMM 1. Aggregate take from Instream stabilization and fill could involve rebuilding/relocating channel segments where erosion has caused damage indirectly affecting mussels (AMM # 5 specifically requires no take therefore no direct take).

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Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Management Options (BMP) Mandatory	Management Options (BMP) Optional	NE, NLAA or LAA	Comments
Operation & Maintenance	Access Road Maintenance - grading, graveling	Habitat degradation; Loss and degradation of Host fish Habitat	Sedimentation	tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed	Mussell habitat; Host Fish habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	This is considered an aggregate sediment impact.
Operation & Maintenance	Access Road Maintenance - culvert replacement	Habitat degradation, Loss and degradation of host fish habitat	Sedimentation	tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed	Mussell habitat; Host Fish habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	This is considered an aggregate sediment impact.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - off ROW clearing	Habitat degradation, Degradation of host fish habitat	Sedimentation	tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed	Mussell habitat; Host Fish habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	This is considered an aggregate sediment impact.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Neutral	None								NLAA	This is considered this insiginificant or discountable.
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None								NE	No impacts to stream habitats are anticipated from this action. Not always the best scenario - could produce significant impacts if pipeline is unstable (consider AMM addition to evaluate condition of pipeline before abandonment).
Operation & Maintenance	Pipeline Abandonment - removal	Physical Impacts to Individuals, Habitat degradation and loss, Loss and degradation of host fish habitat	Crushing, Sedimentation, Chemical Contaminants, Altered Flow	Equipment crushes imussels; Downstream degradation; Host fish leave so less chance of glochidia to attach to gills, Sedimentation downstream, Habitat impacts	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction (reduced recruitment, feeding, breeding, displacement, sheltering)	2,7,10,13, 20	6, 9, 12	LAA	This activity would cause direct impacts minimized by implementation of both mandatory and non-mandatory AMMs. Consider adding AMM # 1.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Habitat degradation, ,Degradation of host fish habitat	Sedimentation	Vegetation removal for site restoration. Host fish leave so less chance for glochidia to attach to gills	unlikely				2,15		NLAA	NLAA because of implementation of AMMs 2 and 15. Wells can be close to streams within floodplain, consider LAA.
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Habitat degradation, Degradation of host fish habitat	Sedimentation	Vegetation removal for site restoration. Host fish leave so less chance for glochidia to attach to gills	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	This is considered an aggregate sediment impact.
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Inspection Activities - ground and aerial	Neutral	None								NE	Driving across streams as part of inspection is figured into vehicle traffic above (line 3) .
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Neutral	None								NE	Impacts are included as part of other activities (e.g., stream crossing).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Management Options (BMP) Mandatory	Management Options (BMP) Optional	NE, NLAA or LAA	Comments
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Habitat degradation; Degradation of host fish habitat	Sedimentation	Near stream earth disturbance - minor sedimentation in water column and on stream bed; host fish leave so less chance for glochidia to attach to gills	All Mussell Life stages and habitat; Host Fish habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	This is considered an aggregate sediment impact.
New Disturbance - Construction	Clearing - trees and shrubs	Habitat degradation; Loss and degradation of host fish habitat	Sedimentation; Increase in Water Temperature	Near stream earth disturbance - sedimentation in water column and on stream bed; host fish leave so less chance for glochidia to attach to gills; low DO since vegetation no longer provides shade to stream	All Mussell Life stages and habitat; Host Fish habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	This is considered an aggregate sediment impact.
New Disturbance - Construction	Vegetation Disposal (upland) - hauling (**driving across stream**)	Physical Impacts to Individuals, Habitat degradation, Loss of host fish, Loss and degradation of host fish habitat	Crushing, Sedimentation, Chemical Contaminants,	Impacts from trucks driving across stream, crushing individuals, sediment in water column, potential comtaminants from vehicles	All Mussell Life stages and habitat; Host Fish habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction (reduced recruitment, feeding, breeding, displacement, sheltering)	2	19	LAA	Hauling could involve driving across streams and therefore impacts to mussels - if non-mandatory AMM 19 is implemented this goes to NE.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, piling, brush pile burning	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Grading, erosion control devices	Habitat degradation, Degradation of host fish habitat	Sedimentation	Near stream earth disturbance - sedimentation in water column and on stream bed;	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	This is considered an aggregate sediment impact.
New Disturbance - Construction	Trenching **(out of stream) -** digging, blasting, dewatering, open trench, sedimentation	Habitat degradation, Degradation of host fish habitat	Sedimentation	Near stream earth disturbance - sedimentation in water column and on stream bed;	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	This is considered an aggregate sediment impact.
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Neutral	None						2		NE	No impacts are anticipated from this activity.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal)	Habitat degradation, Degradation of host fish habitat, impacts to gametes	Sedimentation, impacts to sperm during reproduction	Gametes sucked into pipe during reproduction, minor sediment impacts	Habitat and gametes	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2,17,20		LAA	AMM 17 does not preclude taking water from an occupied stream, however, its provisions do move this ito minor / aggregate impacts.
New Disturbance - Construction	Hydrostatic Testing (water discharge), new or existing line	Habitat degradation, Degradation of host fish habitat,	Sedimentation, Chemical contaminants	Sediments introduced from discharge, chemical contaminants introduction from used pipeline	All Mussell Life stages; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, displacement, and recruitment)	2,18,20		LAA	Aggregate sediment and contaminant impacts. Work with applicant to revise AMM # 20 (see material from Bob Anderson 11/2010).

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Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Management Options (BMP) Mandatory	Management Options (BMP) Optional	NE, NLAA or LAA	Comments
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Habitat degradation, Loss and degradation of host fish habitat	Sedimentation	Near stream earth disturbance - minor sedimentation in water column and on stream bed; host fish leave so less chance for glochidia to attach to gills	Mussell habitat; Host Fish habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2,16		LAA	This is considered an aggregate sediment impact.
New Disturbance - Construction	Compression Facility - noise	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Access Roads (not crossing streams) - upgrading, graveling, and culverts existing roads	Habitat degradation, Degradation of host fish habitat	Sedimentation	Near stream earth disturbance - sedimentation in water column and on stream bed	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2, 7, 10, 20	9	LAA	This is considered an aggregate sediment impact.
New Disturbance - Construction	Access Roads (temporary or permanent can cross streams) - new road construction	Physical Impacts to Individuals, Permanent or temporary loss of occupied habitat, altered flow, Habitat degradation, Loss and degradation of host fish habitat	Crushing, Sedimentation, Chemical Contaminants, Altered Flow	Crushing of mussels by equipment, replacement of habitat by bridge, altered flow, sedimentation in water column and on stream bed; host fish leave so less chance for glochidia to attach to gills, changes in flow affect food availability	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers & reproduction (reduced recruitment)	2		LAA	This activity will cause direct and indirect impacts, Implementation of listed non-mandatory BMPs (in particular AMM 9) may reduce impacts to aggregate impacts.
New Disturbance - Construction	Stream Crossings, wet ditch (note that all stream crossings should be evaluated as wet-ditch crossings unless otherwise specified)	Physical Impacts to Individuals, Temporary loss of occupied habitat, Habitat degradation, riparina habitat loss, Loss and degradation of host fish habitat	Crushing, Sedimentation, Chemical Contaminants, Increase in Water Temperatures	Equipment crushes individuals; sedimentation in water column and streambed; downstream degradation; host fish and attached glochidia die; host fish leave so less chance of glochidia to attach to gills, changes in stream teperature	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers & reproduction (reduced recruitment)	2, 4, 5, 10, 20	9	LAA	This activity will have direct and indirect impacts. Implementation of listed non-mandatory BMPs (in particular AMM 9) will minimize those impacts.
New Disturbance - Construction	Stream Crossings, dry ditch	Physical Impacts to Individuals, Temporary loss of occupied habitat, Habitat degradation, Loss and degradation of host fish habitat	Crushing, Sedimentation, Chemical Contaminants, Increase in Water Temperatures, Altered Flow	Equipment crushes individuals; sedimentation in water column and streambed; downstream degradation; host fish leave so less chance of glochidia to attach to gills	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers & reproduction (reduced recruitment)	2, 4, 5, 10, 20	AMM 9	LAA	This activity will have direct and indirect impacts. Implementation of listed non-mandatory BMPs (in particular AMM 9) will minimize those impacts.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Management Options (BMP) Mandatory	Management Options (BMP) Optional	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Physical Impacts to Individuals, Temporary loss of occupied habitat, Habitat degradation, Loss and degradation of host fish habitat	Crushing, Sedimentation, Chemical Contaminants, Increase in Water Temperatures, Altered Flow	Equipment crushes individuals; sedimentation in water column and streambed; downstream degradation; host fish leave so less chance of glochidia to attach to gills	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers & reproduction (reduced recruitment)	2, 4, 5, 10, 20	9	LAA	This activity will have direct and indirect impacts. Implementation of listed non-mandatory BMPs (in particular AMM 9) will minimize those impacts.
New Disturbance - Construction	Stream Crossings, dam & pump	Physical Impacts to Individuals, Temporary loss of occupied habitat, Habitat degradation, Loss and degradation of host fish habitat	Crushing, Sedimentation, Chemical Contaminants, Increase in Water Temperatures, Altered Flow	Equipment crushes individuals; sedimentation in water column and streambed; downstream degradation; host fish leave so less chance of glochidia to attach to gills	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers & reproduction (reduced recruitment)	AMMs 2, 4, 5, 10, 20	9	LAA	This activity will have direct and indirect impacts. Implementation of listed non-mandatory BMPs (in particular AMM 9) will minimize those impacts.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Habitat degradation, Degradation of host fish habitat	Sedimentation	Sediment in water column and streambed	All Mussell Life stages; Host Fish and habitat; stream bed	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2,3,13		LAA	This is considered aggregate sediment impacts; Survey, relocate, and evaluate HDD for the Delaware River and avoid impacts to the Neversink River in New York to minimize impacts to Dwarf wedgemussel.
New Disturbance - Construction	Stream Equipment Crossing Structures	Neutral	None								NE	No effect is anticipated from this activity (note impacts are evaluated under and as part of construction activities, no individual impacts)
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Neutral	No Effect								NE	Action would not have significant impacts and would in most cases not be adjacent to occupied habitat.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Neutral	No Effect								NE	Action would not have significant impacts and would in most cases not be adjacent to occupied habitat.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading, dewatering	Habitat degradation, Degradation of host fish habitat	Sedimentation	Sedimentation in water column and streambed; downstream	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2,16		NLAA	Implementing AMM 2 moves this to NLAA.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Neutral	None								NE	No impacts are anticipate from this activity.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Neutral	None								NE	No impacts are anticipated from this activity.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Neutral	None								NE	No impacts are anticipate from this activity.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Management Options (BMP) Mandatory	Management Options (BMP) Optional	NE, NLAA or LAA	Comments
New Disturbance - Construction	Storage wells - clearing and drilling	Habitat degradation, Degradation of host fish habitat	Sedimentation	Sedimentation in water column and streambed; downstream	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2, 13, 15		LAA	Proposed well field locations do not overlap species habitat for the Dwarf Wedgemussel, Fat Pocketbook, Fluted Kidneyshell, Orangefoot Pimpleback, Rayed Bean, Ring Pink Mussel, Rough Pigtoe, Slabside Pearlymussel, or Spectaclecas; impact is NE for those species. This would be considered aggregate sediment impacts for species in or adjacent to storage well counties.
New Disturbance - Construction	Storage wells - reconditioning	Habitat degradation, Degradation of host fish habitat	Sedimentation, contaminants, invasive species, water level reduction	Sediments introduced from ground disturbance, chemical contaminants from flow back and well field work, invasive species from equipment, water level reduction from water withdrawal	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2, 13, 15, 17		LAA	This is considered to have aggregate impacts from sediment with AMM 2. AMMs 13, 15, and 17 reduce other impacts to insignificant or discountable. Note major contaminant event would be addressed outside the context of the HCP. (Note follow up with NiSource on on salinity of treated wastewater and radiation to surface waters).
New Disturbance - Construction	Storage wells - waste pits	Habitat degradation, Degradation of host fish habitat	Sedimentation, contaminants	Sediment in water column and streambed, contaminants;	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm,	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2, 15		NLAA	Proposed well field locations do not overlap species habitat for the Dwarf Wedgemussel, Fat Pocketbook, Fluted Kidneyshell, Orangefoot Pimpleback, Rayed Bean, Ring Pink Mussel, Rough Pigtoe, Slabside Pearlymussel, or Spectaclecas; impact is NE for those species. For other species implementing AMMs 2 and 15 moves this to NLAA.

Management Options (BMP)

Surveys to Evaluate Presence and Relocation of Species in NiSource Action Areas

1. Areas of suitable habitat within the streams listed above, along with other suitable crossed drainages in the counties listed above, should be avoided if possible or surveyed for species presence and a minimum impact footprint utilized when required. If a population of the mussel is identified within the project footprint, standard BMPs and environmental construction standards, as described in the Columbia Gulf Transmission (CGT) Environmental Construction Standards (ECS) manual (CGT 2008), should be utilized during work in and adjacent to the stream channel (see following management options for standard BMPs and ECSs). Finally, if species take is likely and can not otherwise be avoided, movement of individuals to an area of similar habitat directly upstream from the disturbance may be possible in consultation with the USFWS. Relocation may be implemented only if: 1) all required permits are in place, 2) a Service approved relocation plan documenting all relevant protocols including how and where the mussels will be moved is in place, 3) a contingency plan is in place to conduct additional consultation with the Service should the actual field survey not reflect the conditions identified in the approved relocation plan, and 4) a monitoring program to evaluate the effects of the relocation is in place. Relocation will include all mussels in an assemblage potentially impacted by the NiSource action. A copy of the survey and any reports will be included in the annual report submitted to the Service.

Pre-Construction Planning: Preparation of an Environmental Management & Construction Plan

2. A detailed Environmental Management & Construction Plan (EM&CP) will be prepared for any activity with potential effects within 100 feet of the ordinary high water mark of known or presumed habitat. The plan will incorporate the relevant requirements of the ECS and include site-specific details particular to the project area and potential impact. The plan will be strongly oriented towards minimizing stream bed and riparian disturbance (including minimization of tree clearing within 25 feet of the crossing [Figure 24, ECS]), preventing downstream sedimentation, and weather monitoring by the Environmental Inspector to ensure work is not begun with significant precipitation in the forecast. The plan will comprehensively address all activities needed to complete the work and strive to avoid the take of these mussels in occupied habitat. The EM&CP will include the frac-out avoidance and contingency plans described in #3 below. The EM&CP will also include a sediment control component for uplands reasonably likely to drain to and impact occupied habitat. Emphasis will be placed on developing detailed erosion control plans specific to slopes greater than 30% leading directly to occupied habitat. The plan will be approved in writing by NiSource personnel prior to project implementation and will include a tailgate training session for all on-site project personnel to highlight the environmental sensitivity of the habitat and any management options that must be implemented.

Stream Bed Construction

3. For activities in known or presumed occupied habitat, consider installing new or replacement pipelines and utility lines and performing major repairs under the river bottom using horizontal directional drilling (HDD) or other trenchless methods rather than open trenching. Drilling should be carefully undertaken and a plan should be in place to minimize and address the risk of in-stream disturbance due to frac-outs. The plan should also specifically reference mussel resources in the vicinity of the crossing as a key conservation concern and include specific measures identified in the ECS, from standard industry practices, or other mutually agreed upon practices to protect this resource. The plan will also include a frac-out impact avoidance plan which will evaluate the site in terms not only of feasibility of conducting HDD, but likelihood of large scale frac-out and its effects on mussels, and actions to address a large scale frac-out in occupied habitat. If, after detailed engineering studies (e.g. geotechnical, physiological, topographical, and economic studies), it is determined (and agreed to by NRP) that HDD is not feasible, a report will be prepared and included in the annual report submitted to the Service. However, due to the significant listed mussel assemblages known to occupy the Duck and Tennessee Rivers in the state of Tennessee, open trenching in these rivers is not a “covered activity” as part of the NiSource Habitat Conservation Plan (HCP).

4. Install pipeline to the minimum depth described in the ECS and maintain that depth at least 10 feet past the high water line to avoid exposure of pipeline by anticipated levels of erosion based on geology and watershed character. Additional distance may be required should on-site conditions (i.e., outside bend in the waterbody, highly erosive stream channel, anticipated future upstream development activities in the vicinity, etc.) dictate a reasonable expectation that the stream banks could erode and expose the pipeline facilities. Less distance may be utilized if terrain or geological conditions (long, steep bank or solid rock) will not allow for a 10-foot setback. These conditions and the response thereto will be documented in the EM&CP and provided as part of the annual report to the Service.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Management Options (BMP) Mandatory	Management Options (BMP) Optional	NE, NLAA or LAA	Comments

5. For major repairs in known or presumed occupied habitat, do not install in-channel repairs (bendway weirs, hardpoints, concrete mats, fill for channel relocation, or other channel disturbing measures).

6. Conduct replacements/repairs from a lay barge or temporary work bridges of the minimum length necessary to conduct the replacements/repairs rather than operating heavy equipment (e.g., backhoes, bulldozers) in-stream. Temporary construction and equipment bridges are not to be confused with stone or fill causeways with pipe structures, which should not be employed in known or presumed occupied waterbodies.

7. Remove equipment bridges as soon as practicable after repair work and any site restoration is completed.

8. As part of the routine pipeline inspection patrols, visually inspect all stream crossings in known or presumed occupied waterbodies for indications of significant erosion or bank destabilization associated with or affecting the pipeline crossing. If such bank destabilization is observed, it will be corrected in accordance with the ECS. Follow-up inspections and restabilization will continue until the bank is stabilized (generally two growing seasons).

Stream Bank Conservation

9. Do not construct culvert and stone access roads and appurtenances (including equipment crossing) across the waterbody or within the riparian zone. Temporary equipment crossings utilizing equipment pads or other methods that span the waterbody are acceptable provided that in-stream pipe supports are not needed.

10. Use half pipes of sufficient number and size that both minimize impacts to stream bed and minimize flow disruption to both upstream and downstream habitat.

Timing Restrictions to Minimize Impact to Reproducing Populations

11. Impacts to the mussel reproductive period will be avoided by working in the water or implementing an HDD from August 1 to March 31.

Pipeline Abandonment

12. Abandon pipelines in place to avoid in-stream disturbance that would result from pipeline removal.

Contaminants

13. As described in the ECS section on “Spill Prevention, Containment and Control,” site staging areas for equipment, fuel, materials, and personnel at least 300 feet from the waterway, if available, to reduce the potential for sediment and hazardous spills entering the waterway. If sufficient space is not available, a shorter distance can be used with additional control measures (e.g., redundant spill containment structures, on-site staging of spill containment/clean-up equipment and materials).

14. Ensure all imported fill material is free from contaminants that could affect the mussel population or known or presumed occupied waterbody habitat.

15. For storage well activities, use enhanced and redundant measures to avoid and minimize the impact of spills from contaminant events in known or presumed occupied streams. These measures include waste pit protection and a spill response plan. These measures will be included in the EM&CP prepared for the activity.

16. Avoid the use of fertilizers or herbicides within 100 feet of known or presumed occupied habitat. Fertilizer and herbicides will not be applied if weather (e.g., impending storm) or other conditions (e.g., faulty equipment) would compromise the ability of NiSource or its contractors to apply the fertilizer or herbicide without impacting presumed occupied mussel habitat. The EM&CP prepared for this activity (# 2 above) will document relevant guidelines for application.

Withdrawal and Discharge of Water

17. Do not draw hydrostatic test water from or discharge water directly into known or presumed occupied habitat.

18. Use best available water withdrawal/discharge impact avoidance techniques (low rate, screens, avoid known or presumed occupied areas to extent practical, do not vacuum up sediments, low rate of discharge to avoid scouring or erosion, discharge into upland area that does not allow water to flow overland into occupied streams or tributaries, avoid discharge of zebra mussels into sub-watersheds of known or presumed occupied streams). Confirm that the water source is not contaminated with zebra mussels.

Travel for O&M Activities

19. Do not drive across known or presumed occupied streams – walk these areas or visually inspect from bank and use closest available bridge to cross stream.

Exotic Species

20. Clean all equipment (including pumps, hoses, etc.) that have (1) been in a perennial waterbody for more than four hours within the previous seven days and (2) will work in occupied or potential federally listed mussel habitat for more than four hours; following established guidelines to remove zebra mussels (and other potential exotic or invasive species) before entering a known or presumed occupied stream for a federally listed mussel, which is not known to be infested with zebra mussels. It is important to follow these guidelines even if work is not occurring in the immediate vicinity of these mussels since, once introduced into a watershed, invasive species could move and eventually affect these mussels.

Table B. Analysis of effects on riparian plant species.

SPECIES:	Riparian Plants - Virginia Spiraea										
	NLAA species (not in covered lands): Harparella, Spring Creek Bladderpod										
Pipeline Activity	**Subactivity**	**Environmental Impact or Threat**	**Stressor**	**Stressor Pathway (optional)**	**Exposure (Resource Affected)**	**Range of Response**	**Conservation Need Affected**	**Demographic Consequences**	**Suggested Management Options (BMP)[1]**	**NE, NLAA or LAA**	**Comments**
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Neutral	None							NE	No impacts to riparian habitat are expected from this activity. ECS III states that at least a 15-foot undisturbed riparian buffer will generally separate facilities and streams.
Operation & Maintenance	Vegetation Management - mowing	Neutral	None							NE	No impacts to riparian habitat are expected from this activity. ECS III requires a 25-foot riparian buffer during maintenance operations.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Neutral	None							NE	No impacts to riparian habitat are expected from this activity. ECS III requires a 25-foot riparian buffer during maintenance operations.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	Take of individuals, Physical impacts to individuals, Habitat degradation	Crushing, Chemical contaminants, Alteration of sunlight regime	Vehicle operation, Direct application, Storm water runoff	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1,2, 9, 14	LAA	ECS V states that a 25-foot riparian buffer would be maintained and herbicides would not be used within 100 feet of a waterbody, unless specified by agencies. Herbicides should not be used near occupied habitat. With implementation of listed suggested BMPs, impacts may be reduced to NLAA by avoiding known or potential habitat.
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None							NE	No impacts to riparian habitat are anticipated from this action.
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Neutral	None							NE	No impacts to riparian habitat are anticipated from this action.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Neutral	None							NE	ECS III requires a 25-foot riparian buffer during maintenance operations.
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	Neutral	None							NE	ECS III requires a 25-foot riparian buffer during maintenance operations.
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	Take of individuals, Physical impacts to individuals, Habitat degradation	Crushing, Burial, Chemical contaminants, Soil compaction, Soil removal, Introduction of invasives in occupied habitat	Heavy equipment and machinery	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,9, 11, 12, 14, 18	LAA	Construction in wetlands in riparian areas or floodplains in areas of occupied habitat is LAA. Implementation of the listed suggested BMPs may reduce impact to NLAA or NE.
Operation & Maintenance	ROW repair, regrading, revegetation - instream stabilization and/or fill	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Crushing, Burial, Chemical contaminants, Soil compaction, Soil disturbance, Introduction of invasive species	Heavy equipment and machinery	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,9, 11, 12, 14, 17, 18	LAA	Construction in streambeds in areas of occupied habitat is LAA. Implementation of the listed suggested BMPs may reduce impact to NLAA.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)[1]	NE, NLAA or LAA	Comments
Operation & Maintenance	Access Road Maintenance - grading, graveling	Habitat degradation	Sedimentation	Wind erosion or storm water runoff	Unlikely	N/A	N/A	N/A	BMP 1,2	NLAA	ECS III requires a 25-foot riparian buffer during maintenance operations. Impacts are unlikely and the listed suggested BMP may be implemented to reduce impact to NE.
Operation & Maintenance	Access Road Maintenance - culvert replacement	Habitat degradation, Temporary loss of habitat	Sedimentation, Altered flow	Wind erosion or storm water runoff, Temporary impoundment	Unlikely	N/A	N/A	N/A	BMP 1,2	NLAA	ECS III requires a 25-foot riparian buffer during maintenance operations. Impacts are unlikely and the listed suggested BMP may be implemented to reduce impact to NE.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	Habitat degradation, Temporary to permanent loss of habitat	Sedimentation, Changes to sunlight regime	Wind erosion or storm water runoff, Removal of canopy vegetation	Unlikely	N/A	N/A	N/A	BMP 1,2	NLAA	ECS III requires a 25-foot riparian buffer during maintenance operations. Impacts are unlikely and the listed suggested BMP may be implemented to reduce impact to NE.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Habitat degradation	Sedimentation	Wind erosion or storm water runoff	Unlikely	N/A	N/A	N/A	BMP 1,2	NLAA	ECS III requires a 25-foot riparian buffer during maintenance operations. Impacts are unlikely and the listed suggested BMP may be implemented to reduce impact to NE.
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None							NE	No impacts to riparian habitat are expected from this activity.
Operation & Maintenance	Pipeline Abandonment - removal	Take of individuals, Physical impacts to individuals, Habitat degradation	Altered flow, Crushing, Burial, Soil compaction, Chemical contaminants, Introduction of invasive species	Temporary impoundment, Surface or storm water runoff, Heavy equipment and machinery	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,9, 10, 17, 18	LAA	BMP 12 would require the pipeline to be abandoned in place, thereby avoiding construction impacts. With implementation of BMP 10 in potentially occupied areas, impacts would likely be reduced to NE.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Crushing, Soil disturbance, Soil compaction, Chemical contaminants, Introduction of invasive species	Heavy equipment and machinery, Imported fill and materials, Storm water runoff	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,9, 12, 13, 18	LAA	Construction in occupied habitat is LAA. In addition to implementation of the listed suggested BMPS, avoiding areas of occupied habitat and establishing appropriate buffers may reduce effect to NLAA.
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Crushing, Soil disturbance, Soil compaction, Chemical contaminants, Introduction of invasive species	Heavy equipment and machinery, Imported fill and materials, Storm water runoff	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1,2, 9, 12, 14, 18	LAA	Construction in occupied habitat is LAA. In addition to implementation of the listed suggested BMPS, avoiding areas of occupied habitat and establishing appropriate buffers may reduce effect to NLAA.
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None							NE	No impacts to riparian habitat are expected from this activity.
Operation & Maintenance	Inspection Activities - ground and aerial	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Crushing, Soil compaction	Foot traffic, Vehicle operation	Discountable	N/A	N/A	N/A	BMP 1, 2,6, 17	NLAA	Minimal impacts to riparian habitat are expected from this activity. Implementation of suggested BMPs may reduce impact to NE.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Take of individuals, Physical impacts to individuals, Habitat degradation	Collection, Crushing, Soil compaction	Vehicle operation	Habitat, Population, Individuals	Stress, Kill	Reproduction, Habitat	Numbers, Reproduction, Range	BMP 1, 2,9	LAA	Vehicle operation should be avoided in areas of known habitat. Implementation suggested BMPs may reduce impact to NLAA.
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	Removal/cutting, Crushing, Soil compaction, Changes to sunlight regime	Vegetation removal, Vehicle operation	Habitat, Population, Individuals	Stress, Kill	Reproduction, Habitat	Numbers, Reproduction, Range	BMP 1, 2,9	LAA	Vegetation clearing in occupied habitat is LAA. In addition to implementation of the listed suggested BMPS, avoiding areas of occupied habitat and establishing appropriate buffers may reduce effect to NLAA.
New Disturbance - Construction	Clearing - trees and shrubs	Take of indivdiuals, Physical impacts to individuals, Habitat degradation, Temporary to permanent loss of habitat	Crushing, Changes to sunlight regime	Removal of overstory species, Vehicle operation	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1,2, 9	LAA	Increased potential from erosion due to vegetation clearing is considered LAA, because of risk of sedimentation. In addition to implementation of the listed suggested BMPS, avoiding areas of occupied habitat and establishing appropriate buffers may reduce effect to NLAA.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None							NE	No impacts to rparian habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Neutral	None							NE	No impacts to riparian habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	Crushing, Changes to sunlight regime	Removal of canopy coverage, Crushing or covering of individuals by falling tree limbs and leaves	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,9	LAA	Construction in occupied habitat is LAA. In addition to implementation of the listed suggested BMPS, avoiding areas of occupied habitat and establishing appropriate buffers may reduce effect to NLAA.
New Disturbance - Construction	Grading, erosion control devices	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary to permanent loss of habitat	Crushing, Burial, Soil disturbance, Soil compaction, Sedimentation, Chemical contaminants, Introduction of invasive species	Heavy equipment and vehicle operation, Topsoil removal, Storm water runoff of contaminants and sediment	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,9, 12, 18	LAA	Construction in occupied habitat is LAA. In addition to implementation of the listed suggested BMPS, avoiding areas of occupied habitat and establishing appropriate buffers may reduce effect to NLAA.
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Take of individuals, Physical impacts to individuals, Habitat degradataion, Temporary to permanent loss of habiat	Crushing, Burial, Soil disturbance, Soil compaction, Altered flow, Sedimentation, Chemical contaminants, Introduction of invasive species	Heavy equipment and vehicle operation, Topsoil removal, Wind erosion and surface or storm water runoff	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	For construction near riparian areas: BMP 1, 2,3, 4, 7, 9, 18	LAA	ECS VI states dewatering will not occur in occupied habitat; however, construction in or near occupied habitat is LAA. In addition to implementation of the listed suggested BMPS, avoiding areas of occupied habitat and establishing appropriate buffers may reduce effect to NLAA.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary to permanent loss of habitat	Crushing, Soil compaction, Sedimentation, Chemical contaminants, Introduction of invasive species	Heavy equipment and vehicle operation, Storm water runoff of contaminants and sediment	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1,2, 7, 9, 11, 18	LAA	Methods described in ECS II would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed suggested BMPs may result in lower impact (NLAA).
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Take of individuals, Habitat degradation, Temporary loss of habitat	Altered flow, Inundation	Withdrawal and discharge of water in or near occupied habitat	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1,2, 11, 17, 18	LAA	Impacts may be reduced to a NLAA with implementation of BMPs 17 and 18, which would avoid the withdrawal and discharge of water at presumed occupied habitat.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	Take of individuals, Habitat degradation, Temporary loss of habitat	Altered flow, Inundation	Withdrawal and discharge of water in or near occupied habitat	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,9, 15, 16	LAA	Impacts may be reduced to a NLAA with implementation of the listed suggested BMPs, which would avoid the withdrawal and discharge of water at presumed occupied habitat.
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary to permanent loss of habitat	Crushing, Burial, Soil disturbance, Soil compaction, Sedimentation, Chemical contaminants, Introduction of invasive species	Heavy equipment and vehicle operation, Topsoil removal, Storm water runoff of contaminants and sediment	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,9, 11, 12, 14, 18	LAA	Construction within occupied habitat is LAA. Implementation of the listed suggested BMPs may reduce impacts to NLAA.
New Disturbance - Construction	Compression Facility, noise	Neutral	None							NE	No impacts to this species are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None							NE	No impacts to this species are anticipated from this action.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary to permanent loss of habitat	Crushing, Burial, Soil disturbance, Soil compaction, Sedimentation, Chemical contaminants, Introduction of invasive species	Heavy equipment and vehicle operation, Topsoil removal, Storm water runoff of contaminants and sediment	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,11, 13, 16, 20	LAA	Construction within occupied habitat is LAA. Implementation of the listed suggested BMPs may reduce impacts to NLAA.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary to permanent loss of habitat	Altered flow, Crushing, Burial, Soil disturbance, Soil compaction, Sedimentation, Chemical contaminants, Introduction of invasive species	Altered streamflow through culvert, Heavy equipment and vehicle operation, Surface or storm water runoff of contaminants and sediment	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,7, 8, 9, 11, 12, 18	LAA	Construction within occupied habitat is LAA. Implementation of the listed suggested BMPs may reduce impacts to NLAA.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, wet ditch	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary to permanent loss of habitat	Altered flow, Crushing, Burial, Soil disturbance, Soil compaction, Sedimentation, Chemical contaminants, Introduction of invasive species	Temporary impoundment, Heavy equipment and vehicle operation, Surface or storm water runoff of contaminants and sediment	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 3, 4, 6, 7, 9, 11, 12, 18	LAA	Construction within occupied habitat is LAA. Implementation of the listed suggested BMPs may reduce impacts to NLAA.
New Disturbance - Construction	Stream Crossings, dry ditch	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary to permanent loss of habitat	Altered flow, Crushing, Burial, Soil disturbance, Soil compaction, Sedimentation, Chemical contaminants, Introduction of invasive species	Temporary impoundment, Heavy equipment and vehicle operation, Surface or storm water runoff of contaminants and sediment	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,3, 4, 6, 7, 9, 11, 12, 18	LAA	Implementation of the listed suggested BMPs may reduce impact to NLAA.
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary to permanent loss of habitat	Altered flow, Crushing, Burial, Soil disturbance, Soil compaction, Sedimentation, Chemical contaminants, Introduction of invasive species	Temporary impoundment, Heavy equipment and vehicle operation, Surface or storm water runoff of contaminants and sediment	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,3, 4, 6, 7, 9, 11, 12, 18	LAA	Implementation of the listed suggested BMPs may reduce impact to NLAA.
New Disturbance - Construction	Stream Crossings, dam & pump	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary to permanent loss of habitat	Altered flow, Crushing, Burial, Soil disturbance, Soil compaction, Sedimentation, Chemical contaminants, Introduction of invasive species	Temporary impoundment, Heavy equipment and vehicle operation, Surface or storm water runoff of contaminants and sediment	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,3, 4, 6, 7, 9, 11, 12, 18	LAA	Implementation of the listed suggested BMPs may reduce impact to NLAA.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	Crushing, Burial, Soil disturbance, Soil compaction, Sedimentation, Chemical contaminants	Frac-out, Staging and construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1,2, 3, 11, 12	LAA	Implementation of the listed suggested BMPs may reduce impact to NLAA.
New Disturbance - Construction	Stream Equipment Crossing Structures	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	Crushing, Burial, Soil disturbance, Soil compaction, Sedimentation, Chemical contaminants	Construction or staging in habitat, Surface or storm water runoff of contaminants used in construction	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1,2, 7, 9, 12	LAA	Implementation of the listed suggested BMPs may reduce impact to NLAA.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Neutral	None							NE	No impacts to riparian habitats are anticipated from this action.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Neutral	None							NE	No impacts to riparian habitats are anticipated from this action.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Neutral	None							NE	No impacts to riparian habitats are anticipated from this action.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Neutral	None							NE	No impacts to riparian habitats are anticipated from this action.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Neutral	None							NE	No impacts to riparian habitats are anticipated from this action.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Neutral	None							NE	No impacts to riparian habitats are anticipated from this action.
New Disturbance - Construction	Storage wells - clearing and drilling	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Cutting, Crushing, Soil disturbance, Soil compaction, Chemical contaminants, Introduction of invasive species	Heavy equipment and machinery, Storm water runoff of contaminants or sediment; Imported fill and materials	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,11, 14, 18	LAA	Construction in occupied habitat is LAA. In addition to implementation of the listed suggested BMPS, avoiding areas of occupied habitat and establishing appropriate buffers may reduce effect to NLAA. Proposed well field locations do not overlap riparian plant species habitat for Sensitive Joint Vetch (Aeschynomene virginica), Spring Creek Bladderpod (Lesquerella perforata), or Virginia Spiraea (Spiraea virginiana); impact is NE for thoses species.
New Disturbance - Construction	Storage wells - reconditioning	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Crushing, Soil disturbance, Soil compaction, Chemical contaminants	Vehicle operation	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,13	LAA	Construction in occupied habitat is LAA. In addition to implementation of the listed suggested BMPS, avoiding areas of occupied habitat and establishing appropriate buffers may reduce effect to NLAA. Proposed well field locations do not overlap riparian plant species habitat for Sensitive Joint Vetch (Aeschynomene virginica), Spring Creek Bladderpod (Lesquerella perforata), or Virginia Spiraea (Spiraea virginiana); impact is NE for thoses species.
New Disturbance - Construction	Storage wells - waste pits	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Crushing, Soil disturbance, Soil compaction, Chemical contaminants	Heavy equipment and machinery, Storm water runoff of contaminants or sediment; Groundwater transport of contaminants from waste pits	Habitat, Population, Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	BMP 1, 2,13	LAA	Construction in occupied habitat is LAA. In addition to implementation of the listed suggested BMPS, avoiding areas of occupied habitat and establishing appropriate buffers may reduce effect to NLAA. Proposed well field locations do not overlap riparian plant species habitat for Sensitive Joint Vetch (Aeschynomene virginica), Spring Creek Bladderpod (Lesquerella perforata), or Virginia Spiraea (Spiraea virginiana); impact is NE for thoses species.

Notes:
[1] An HCP has not been completed for this species. BMP 2 is considered mandatory for all species.

Suggested Best Management Practices (BMPs)
Listed BMPs are modified from HCPs for other species.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)[1]	NE, NLAA or LAA	Comments

Surveys to Evaluate Presence and Relocation of Species in NiSource Action Areas

1. Areas of suitable habitat within known occupied counties, along with other suitable crossed drainages in the counties listed above, should be avoided if possible or surveyed for species presence and a minimum impact footprint utilized when required. If a population of the mussel is identified within the project footprint, standard BMPs and environmental construction standards, as described in the Columbia Gulf Transmission (CGT) Environmental Construction Standards (ECS) manual (CGT 2008), should be utilized during work in and adjacent to the stream channel (see following management options for standard BMPs and ECSs).

Pre-Construction Planning: Preparation of an Environmental Management & Construction Plan

2. A detailed Environmental Management & Construction Plan (EM&CP) will be prepared for any activity with potential effects within 100 feet of the ordinary high water mark of known or presumed habitat. The plan will incorporate the relevant requirements of the ECS and include site-specific details particular to the project area and potential impact. The plan will be strongly oriented towards minimizing stream bed and riparian disturbance (including minimization of tree clearing within 25 feet of the crossing [Figure 24, ECS]), preventing downstream sedimentation, and weather monitoring by the Environmental Inspector to ensure work is not begun with significant precipitation in the forecast. The plan will comprehensively address all activities needed to complete the work and strive to avoid the take of these mussels in occupied habitat. The EM&CP will include the frac-out avoidance and contingency plans described in #3 below. The EM&CP will also include a sediment control component for uplands reasonably likely to drain to and impact occupied habitat. Emphasis will be placed on developing detailed erosion control plans specific to slopes greater than 30% leading directly to occupied habitat. The plan will be approved in writing by NiSource personnel prior to project implementation and will include a tailgate training session for all on-site project personnel to highlight the environmental sensitivity of the habitat and any management options that must be implemented.

Stream Bed Construction

3. For activities in known or presumed occupied habitat, consider installing new or replacement pipelines and utility lines and performing major repairs under the river bottom using horizontal directional drilling (HDD) or other trenchless methods rather than open trenching. Ground disturbance activities, such as grading, trenching, or bank alteration should not be completed in, or directly adjacent to occupied habitat. Sediment control methods should be employed if such activities cannot be avoided, along with the use of a minimum impact footprint to minimize rootstock destruction. Drilling should be carefully undertaken and a plan should be in place to minimize and address the risk of in-stream disturbance due to frac-outs. The plan should also specifically reference species resources in the vicinity of the crossing as a key conservation concern and include specific measures identified in the ECS, from standard industry practices, or other mutually agreed upon practices to protect this resource. The plan will also include a frac-out impact avoidance plan which will evaluate the site in terms not only of feasibility of conducting HDD, but likelihood of large scale frac-out and its effects on this species and actions to address a large scale frac-out in occupied habitat. If, after detailed engineering studies (e.g., geotechnical, physiological, topographical, and economic studies), it is determined (and agreed to by NRP) that HDD is not feasible, a report will be prepared and included in the annual report submitted to the Service.

4. Install pipeline to the minimum depth described in the ECS and maintain that depth at least 10 feet past the high water line to avoid exposure of pipeline by anticipated levels of erosion based on geology and watershed character. Additional distance may be required should on-site conditions (i.e., outside bend in the waterbody, highly erosive stream channel, anticipated future upstream development activities in the vicinity, etc.) dictate a reasonable expectation that the stream banks could erode and expose the pipeline facilities. Less distance may be utilized if terrain or geological conditions (long, steep bank or solid rock) will not allow for a 10-foot setback. These conditions and the response thereto will be documented in the EM&CP and provided as part of the annual report to the Service.

5. For major repairs in known or presumed occupied habitat, do not install in-channel repairs (bendway weirs, hardpoints, concrete mats, fill for channel relocation, or other channel disturbing measures).

6. As part of the routine pipeline inspection patrols, visually inspect all stream crossings in known or presumed occupied waterbodies for indications of significant erosion or bank destabilization associated with or affecting the pipeline crossing. If such bank destabilization is observed, it will be corrected in accordance with the ECS. Follow-up inspections and restabilization will continue until the bank is stabilized (generally two growing seasons).

Stream Bank Conservation

7. Do not construct culvert and stone access roads and appurtenances (including equipment crossing) across the waterbody or within the riparian zone. Temporary equipment crossings utilizing equipment pads or other methods that span the waterbody are acceptable provided that in-stream pipe supports are not needed. Streams and stream banks should be returned to a pre-disturbance condition when cross-stream activities are required, to avoid any changes to existing hydrologic conditions.

8. Use half pipes of sufficient number and size that both minimize impacts to stream bed and minimize flow disruption to both upstream and downstream habitat.

Timing Restrictions to Minimize Impact to Reproducing Populations

9. Impacts to these species' reproductive period will be minimized by implementing the following construction timing restrictions:
Harperella, sensitive joint vetch, and Virginia spiraea: Avoid construction between March and October or implement HDD
Spring creek bladderpod: ground disturbance should only be completed between June and August (between seed dispersal and germination); mowing should not occur between September and May, when seedlings or flowering adults could be defoliated

Pipeline Abandonment

10. Abandon pipelines in place to avoid in-stream disturbance that would result from pipeline removal.

Contaminants

11. As described in the ECS section on “Spill Prevention, Containment and Control,” site staging areas for equipment, fuel, materials, and personnel at least 300 feet from known or presumed occupied areas if available, to reduce the potential for sediment and hazardous spills entering the waterway. If sufficient space is not available, a shorter distance can be used with additional control measures.

12. Ensure all imported fill material is free from contaminants that could affect the species population or known or presumed occupied waterbody habitat.

Table C. Analysis of effects on transitional successive plant species.

SPECIES:	Transitional Successive Plant Species - Eastern Prairie Fringed Orchid, and Running Buffalo Clover										
	NE/NLAA, due to avoidance measures or not present in the covered lands: American chaffseed, Leafy Prairie Clover, Prices's Potato Bean										
Pipeline Activity	**Subactivity**	**Environmental Impact or Threat**	**Stressor**	**Stressor Pathway (optional)**	**Exposure (Resource Affected)**	**Range of Response**	**Conservation Need Affected**	**Demographic Consequences**	**Suggested Management Options (BMP)**	**NE, NLAA or LAA**	**Comments**
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Take of individuals, Physical impacts to individuals	Collection, Crushing	Foot traffic in occupied areas, Vehicle operation in occupied areas	Discountable	N/A	N/A	N/A	1,2,7,9,10	NLAA	Impacts are considered unlikely because ongoing disturbance may preclude species; however, BMPs should be implemented in areas where facilities are located near occupied habitat.
Operation & Maintenance	Vegetation Management - mowing	Take of individuals, Physical impacts to individuals, Potential habitat improvement	Crushing, Cutting, Introduction of invasive species	Vehicle and equipment operation	Discountable-Beneficial	N/A	N/A	N/A	1,2,4,7,8,9,10	NLAA	Mowing is potentially beneficial because it allows for the maintenance of open habitat areas. However, mowing performed during the flowering season could affect reproduction. With the implementation of listed suggested BMPs, impact is considered NLAA to beneficial.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Take of individuals, Physical impacts to individuals, Temporary habitat degradation, Potential habitat improvement	Crushing, Cutting, Sedimentation	Vehicle and equipment operation, Falling trees and debris, Ground disturbance, Wind erosion or storm water runoff	Discountable-Beneficial	N/A	N/A	N/A	1,2,4,6,7,8,9,10	NLAA	Long-term effects from canopy management may be beneficial; however, short-term impacts may occur in areas of occupied habitat. Brush and tree clearing or trimming, should be conducted selectively and full clear cutting of any areas wider than a right-of-way corridor should be avoided. With the implementation of listed suggested BMPs, impact is considered NLAA to beneficial.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	Take of individuals, Physical impacts to individuals, Potential habitat improvement	Crushing, Chemical Contaminants	Direct application, Storm water runoff, Vehicle operation	Habitat, Population, Few Individuals	Stress, Kill, Potentially Beneficial	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,3,4,6,7,8,9,10	LAA	Vegetation maintenance may be beneficial by providing open habitat; however, indiscriminate herbicde use will LAA. With the implementation of listed suggested BMPs, impact may be reduced to NLAA.
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Take of individuals, Physical impacts to individuals, Temporary loss of habitat	Crushing, Covering	Placement of piles, Vehicle operation	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Habitat	Numbers, Reproduction	1,2,4,7,9,10	LAA	Maintenance of ROW could impact successive species. In addition to implementation of the listed suggested BMPS, occupied habitat should be identified and avoided during maintenance activities to reduce impact to NLAA.
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Take of individuals, Physical impacts to individuals, Temporary loss of habitat	Crusing, Covering, Burning	Placement of piles, Vehicle operation	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Habitat	Numbers, Reproduction	1,2,4,7,9,10	LAA	Maintenance of ROW could impact successive species. In addition to implementation of the listed suggested BMPS, occupied habitat should be identified and avoided during maintenance activities to reduce impact to NLAA. Avoid brush pile burning in vicinity of populations.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Take of individuals, Physical impacts to individuals, Potential habitat improvement	Crushing	Falling debris, Vehicle operation	Discountable-Beneficial	N/A	N/A	N/A	1,2,4,7,9,10	NLAA	Long-term effects from canopy management may be beneficial; however, short-term impacts may occur in areas of occupied habitat. Brush and tree clearing or trimming, should be conducted selectively and full clear cutting of any areas wider than a right-of-way corridor should be avoided. With the implementation of listed suggested BMPs, impact is considered NLAA to beneficial.
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	Take of individual, Physical impacts to individuals, Temporary loss of habitat	Crushing, Burying, Chemical contaminants, Introduction of invasive species, Sedimentation	Heavy equipment and machinery, Ground disturbance, Topsoil removal, Staging areas, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,3,4,6,7,9,10,11	LAA	Maintenance of ROW could impact successive species. Occupied habitat should be identified and avoided during maintenance activities. Listed suggested BMPs should be implemented to reduce impact to NLAA.
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	Take of individual, Physical impacts to individuals, Temporary loss of habitat	Crushing, Burying, Chemical contaminants, Introduction of invasive species, Sedimentation	Heavy equipment and machinery, Ground disturbance, Topsoil removal, Staging areas, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,3,4,6,7,9,10,11	LAA	Maintenance of ROW could impact successive species. In addition to implementation of the listed suggested BMPS, occupied habitat should be identified and avoided during maintenance activities to reduce impact to NLAA.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE, NLAA or LAA	Comments
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	Neutral	None							NE	Impacts to transitional habitat are not expected from this activity.
Operation & Maintenance	Access Road Maintenance - grading, graveling	Neutral	None							NE	Impacts to transitional habitat are not expected from this activity.
Operation & Maintenance	Access Road Maintenance - culvert replacement	Neutral	None							NE	Impacts to transitional habitat are not expected from this activity.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	Take of individuals, Physical impacts to individuals, Temporary habitat degradation, Potential habitat improvement	Crushing, Cutting, Sedimentation	Vehicle and equipment operation, Falling trees and debris, Ground disturbance, Wind erosion or storm water runoff	Discountable-Beneficial	N/A	N/A	N/A	1,2,4,6,7,9,10	NLAA	Long-term effects from clearing may be beneficial; however, short-term impacts may occur in areas of occupied habitat. With the implementation of listed suggested BMPs, impact is considered NLAA to beneficial.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Take of individual, Physical impacts to individuals, Temporary loss of habitat	Crushing, Burying, Chemical contaminants, Introduction of invasive species, Sedimentation	Heavy equipment and machinery, Ground disturbance, Staging areas, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,,6,7,9,10	LAA	Maintenance of ROW could impact successive species. In addition to implementation of the listed suggested BMPS, occupied habitat should be identified and avoided during maintenance activities to reduce impact to NLAA.
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None							NE	No impacts transitional habitat is expected from this activity.
Operation & Maintenance	Pipeline Abandonment - removal	Take of individuals, Physical impacts to individuals, Habitat degradation	Crushing, Burying, Chemical contaminants, Introduction of invasive species, Sedimentation	Heavy equipment and machinery, Ground disturbance, Staging areas, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,5	LAA	Construction and ground disturbance may impact newly colonized areas. Implementation of BMP 12, which would require in-place abandonment, would reduce impact to NE.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Take of individuals, Physical impacts to individuals, Temporary loss of habitat	Crushing, Burying, Chemical contaminants, Introduction of invasive species, Sedimentation	Heavy equipment and machinery, Ground disturbance, Staging areas, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,3,4,6,7,9,10,11	LAA	Construction and ground disturbance may impact newly colonized areas. In addition to implementation of the listed suggested BMPs, occupied habitat should be identified and avoided to reduce impact to NLAA.
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Take of individuals, Physical impacts to individuals, Temporary loss of habitat	Crushing, Burying, Chemical contaminants, Introduction of invasive species, Sedimentation	Heavy equipment and machinery, Ground disturbance, Staging areas, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,3,4,6,7,9,10,11	LAA	Construction and ground disturbance may impact newly colonized areas. In addition to implementation of the listed suggested BMPs, occupied habitat should be identified and avoided to reduce impact to NLAA.
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None							NE	No impacts to individuals or habitat are expected from this activity.
Operation & Maintenance	Inspection Activities - ground and aerial	Take of individuals, Physical impacts to individuals	Crushing, Collection	Vehicle operation, Foot traffic	Discountable	N/A	N/A	N/A	1,2,4,9	NLAA	Impacts associated with this activity are expected to be minimal. Implementation of the listed suggested BMPs may reduce impact to NE.
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Take of individuals, Physical impacts to individuals	Crushing, Collection, Soil compaction	Vehicle operation in occupied habitat, Collection, Foot traffic in occupied habitat	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,9	LAA	In addition to implementation of the listed suggested BMPs, impacts from foot traffic may be minimized to NLAA by avoiding vehicle operation in known habitat areas and avoiding collection of individuals.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE, NLAA or LAA	Comments
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Take of individuals, Physical impacts to individuals, Temporary habitat degradation, Potential habitat improvement	Removal, Crushing, Burying, Soil Compaction, Sedimentation, Introduction of invasive species	Heavy equipment and machinery, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill, Potentially Beneficial	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,6,7,9,10	LAA	This activity may result in creation of suitable habitat. With implementation of suggested BMPs and avoidance of occupied habitat, impact may be reduced to NLAA to beneficial.
New Disturbance - Construction	Clearing - trees and shrubs	Take of individuals, Physical impacts to individuals, Temporary habitat degradation, Potential habitat improvement	Crushing, Burying, Soil Compaction, Sedimentation, Introduction of invasive species	Heavy equipment and machinery, Staging areas, Falling trees and debris, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill, Potentially Beneficial	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,6,7,9,10	LAA	This activity may result in creation of suitable habitat. Brush and tree clearing or trimming, if conducted selectively, in suitable or occupied habitat may provide a benefit to the species; however, full clear cutting of any areas wider than a right-of-way corridor should be avoided . With implementation of suggested BMPs and avoidance of occupied habitat, impact may be reduced to NLAA to beneficial.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Take of individuals, Physical impacts to individuals, Temporary loss of habitat	Crushing, Covering	Placement of piles, Vehicle operation	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Habitat	Numbers, Reproduction	1,2,4,7,9,10	LAA	In addition to implementation of the listed suggested BMPs, occupied habitat should be identified and avoided during maintenance activities to reduce impact to NLAA.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Take of individuals, Physical impacts to individuals, Temporary loss of habitat	Crusing, Covering, Burning	Placement of piles, Vehicle operation	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Habitat	Numbers, Reproduction	1,2,4,7,9,10	LAA	In addition to implementation of the listed suggested BMPs, occupied habitat should be identified and avoided during maintenance activities to reduce impact to NLAA.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Take of individuals, Physical impacts to individuals, Temporary habitat degradation, Potential habitat improvement	Crushing	Falling debris, Vehicle operation	Habitat, Population, Few Individuals	Stress, Kill, Potentially Beneficial	Reproduction, Habitat	Numbers, Reproduction	1,2,4,7,9,10	LAA	This activity may result in creation of suitable habitat. Brush and tree clearing or trimming, if conducted selectively, in suitable or occupied habitat may provide a benefit to the species; however, full clear cutting of any areas wider than a right-of-way corridor should be avoided . With implementation of suggested BMPs and avoidance of occupied habitat, impact may be reduced to NLAA to beneficial.
New Disturbance - Construction	Grading, erosion control devices	Take of individuals, Physical impacts to individuals, Temporary habitat degradation, Potential habitat improvement	Crushing, Burying, Chemical contaminants, Introduction of invasive species, Sedimentation	Heavy equipment and machinery, Ground disturbance, Staging areas, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,6,7,9,10	LAA	This activity may result in creation of suitable habitat. With implementation of suggested BMPs and avoidance of occupied habitat, impact may be reduced to NLAA to beneficial.
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Take of individuals, Physical impacts to individuals, Temporary habitat degradation	Crushing, Burying, Inundation, Chemical contaminants, Introduction of invasive species, Sedimentation	Heavy equipment and machinery, Ground disturbance, Staging areas, Wind erosion or storm water runoff, Dewatering	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,6,7,9,10	LAA	In addition to implementation of the listed suggested BMPs, occupied habitat should be identified and avoided during maintenance activities to reduce impact to NLAA.
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Take of individuals, Physical impacts to individuals, Temporary habitat degradation	Crushing, Soil compaction	Heavy equipment and machinery, Staging areas	Habitat, Population, Few Individuals	Stress, Kill	Repdroduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,6,7,9,10	LAA	In addition to implementation of the listed suggested BMPs, occupied habitat should be identified and avoided during maintenance activities to reduce impact to NLAA.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Take of individuals, Physical impacts to individuals, Temporary loss of habitat	Crushing, Water drawdown, Flooding	Heavy equipment and machinery, Staging Areas, Water use and discharge	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2	LAA	Impacts may be reduced to NLAA with implementation of listed suggested BMPs and ECSs, which would avoid water withdrawal and discharge into habitat.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE, NLAA or LAA	Comments
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	Take of individuals, Physical impacts to individuals, Temporary loss of habitat	Crushing, Water drawdown, Flooding	Heavy equipment and machinery, Staging Areas, Water use and discharge	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2	LAA	Impacts may be reduced to NLAA with implementation of listed suggested BMPs and ECSs which would avoid water withdrawal and discharge into habitat.
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Take of individuals, Physical impacts to individuals, Temporary habitat degradation, Potential habitat improvement	Crushing, Burying, Chemical contaminants, Introduction of invasive species, Sedimentation	Heavy equipment and machinery, Ground disturbance, Staging areas, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,3,4,6,7,9,10,11	LAA	In addition to implementation of the listed suggested BMPs, occupied habitat should be identified and avoided during maintenance activities to reduce impact to NLAA.
New Disturbance - Construction	Compression Facility, noise	Neutral	None							NE	No impacts to these species are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None							NE	No impacts to these species are anticipated from this action.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Take of individuals, Physical impacts to individuals, Temporary to permanent loss of habitat	Crushing Burying, Soil compaction, Sedimentation, Introduction of invasive species, Chemical contaminants	Heavy equipment and machinery, Ground disturbance, Staging areas, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,67,9,10,11	LAA	In addition to implementation of the listed suggested BMPs, occupied habitat should be identified and avoided during maintenance activities to reduce impact to NLAA.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Neutral	None							NE	No impacts to transitional habitat are expected from this activity.
New Disturbance - Construction	Stream Crossings, wet ditch	Neutral	None							NE	No impacts to transitional habitat are expected from this activity.
New Disturbance - Construction	Stream Crossings, dry ditch	Neutral	None							NE	No impacts to transitional habitat are expected from this activity.
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Neutral	None							NE	No impacts to transitional habitat are expected from this activity.
New Disturbance - Construction	Stream Crossings, dam & pump	Neutral	None							NE	No impacts to transitional habitat are expected from this activity.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Neutral	None							NE	No impacts to transitional habitat are expected from this activity.
New Disturbance - Construction	Stream Equipment Crossing Structures	Neutral	None							NE	No impacts to transitional habitat are expected from this activity.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Take of individuals, Physical impacts to individuals, Temporary habitat degradation, Potential habitat improvement	Removal, Crushing, Burying, Soil Compaction, Sedimentation, Introduction of invasive species	Heavy equipment and machinery, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill, Potentially Beneficial	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,6,7,9,10	LAA	This activity may result in creation of suitable habitat. With implementation of suggested BMPs and avoidance of occupied habitat, impact may be reduced to NLAA to beneficial.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Take of individuals, Physical impacts to individuals, Temporary habitat degradation, Potential habitat improvement	Crushiing, Burying, Soil Compaction, Sedimentation, Introduction of invasive species	Heavy equipment and machinery, Falling trees and debris, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill, Potentially Beneficial	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,6,7,9,10	LAA	This activity may result in creation of suitable habitat. With implementation of suggested BMPs and avoidance of occupied habitat, impact may be reduced to NLAA to beneficial.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE, NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Take of individuals, Physical impacts to individuals, Temporary habitat degradation, Potential habitat improvement	Removal, Crushing, Burying, Soil Compaction, Sedimentation, Introduction of invasive species	Heavy equipment and machinery, Staging areas, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill, Potentially Beneficial	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,6,7,9,10	LAA	In addition to implementation of the listed suggested BMPs, occupied habitat should be identified and avoided during maintenance activities to reduce impact to NLAA.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Take of individuals, Physical impacts to individuals, Temporary habitat degradation	Crusing, Burying, Soil compaction, Chemical contaminants	Heavy equipment and machinery, Staging areas, Storm water runoff	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,6,7,9,10	LAA	In addition to implementation of the listed suggested BMPs, occupied habitat should be identified and avoided during maintenance activities to reduce impact to NLAA.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Take of individuals, Physical impacts to individuals, Temporary habitat degradation	Crusing, Burying, Soil compaction, Chemical contaminants	Potential for frac-out, Heavy equipment and machinery, Staging areas, Storm water runoff	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,6,7,9,10	LAA	HDD is preferable to open trenching methods. With implementation of listed suggested BMPs, impact may be reduced to NLAA.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Take of individuals, Physical impacts to individuals, Temporary habitat degradation	Crusing, Burying, Soil compaction, Chemical contaminants	Potential for frac-out, Heavy equipment and machinery, Staging areas, Storm water runoff	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,6,7,9,10	LAA	Horizontal bore is preferable to other open trenching methods. With implementation of listed suggested BMPs, impact may be reduced to NLAA.
New Disturbance - Construction	Storage wells - clearing and drilling	Take of individuals, Physical impacts to individuals, Temporary habitat degradation, Potential habitat improvement	Removal, Crushing, Burying, Soil Compaction, Sedimentation, Introduction of invasive species	Heavy equipment and machinery, Staging areas, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill, Potentially Beneficial	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,6,7,9,10	LAA	Occupied habitat should be avoided. If occupied habitat is avoided and suggested BMPs are implemented, impact may be reduced to NLAA to beneficial. This activity may result in creation of suitable habitat. Proposed well field locations do not overlap habitat for the American chaffseed (Schwalbea americana), Eastern Prairie Fringed Orchid (Plateurothera leucophaea), Leafy Prairie Clover (Dalea foliosa), and the Prices's Potato Bean (Apios priceana); impact is NE for those species.
New Disturbance - Construction	Storage wells - reconditioning	Take of individuals, Physical impacts to individuals, Temporary habitat degradation	Crushing, Chemical contaminants	Heavy equipment and machinery, Staging areas, Wind erosion or storm water runoff	Habitat, Population, Few Individuals	Stress, Kill, Potentially Beneficial	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,6,7,9,10	LAA	Occupied habitat should be avoided. If occupied habitat is avoided and suggested BMPs are implemented, impact may be reduced to NLAA to beneficial. This activity may result in creation of suitable habitat. Proposed well field locations do not overlap habitat for the American chaffseed (Schwalbea americana), Eastern Prairie Fringed Orchid (Plateurothera leucophaea), Leafy Prairie Clover (Dalea foliosa), and the Prices's Potato Bean (Apios priceana); impact is NE for those species.
New Disturbance - Construction	Storage wells - waste pits	Take of individuals, Physical impacts to individuals, Habitat degradation, Temporary to permanent loss of habitat	Chemical contaminants	Groundwater transport of contaminants, Spills	Habitat, Population, Few Individuals	Stress, Kill	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	1,2,4,6,7,9,10	LAA	Occupied habitat should be avoided. If occupied habitat is avoided and suggested BMPs are implemented, impact may be reduced to NLAA to beneficial. This activity may result in creation of suitable habitat. Proposed well field locations do not overlap habitat for the American chaffseed (Schwalbea americana), Eastern Prairie Fringed Orchid (Plateurothera leucophaea), Leafy Prairie Clover (Dalea foliosa), and the Prices's Potato Bean (Apios priceana); impact is NE for those species.

Notes:
[1] An HCP has not been completed for this species. BMP 2 is considered mandatory for all species.

Best Management Practices (BMPs)

Surveys to Evaluate Presence and Relocation of Species in NiSource Action Areas

1. A survey can be conducted to determine the presence/absence of this species, but it must involve the most effective survey methods currently available since they occur in low numbers and may be missed even by surveys conducted using otherwise acceptable survey techniques. If an adequate survey effort does not indicate their presence, it will be classified as unoccupied habitat and the BMPs will not be mandatory. However, NiSource may implement some of these measures if appropriate to protect potentially suitable habitat. The definition of adequacy will be determined through consultation with the Service on a site-specific basis. If a survey is not completed, presence can be assum In that case, all suitable habitat would be treated as occupied, and approved BMPs followed. A copy of the survey and any reports will be included in the annual report submitted to the Service.

Pre-Construction Planning: Preparation of an Environmental Management & Construction Plan

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE, NLAA or LAA	Comments

2. A detailed Environmental Management & Construction Plan (EM&CP) will be prepared for any activity with potential effects within 100 feet of known or presumed habitat. The plan will incorporate the relevant requirements of the NGTS ECS and include site-specific details particular to the project area and potential impact. The plan will comprehensively address all activities needed to complete the work and strive to avoid the take of this species and impact to habitat. The EM&CP will include the frac-out avoidance and contingency plans described in the NiSource ECS. The EM&CP will also include a sediment control component for uplands reasonably likely to drain to and impact occupied habitat. Emphasis will be placed on developing detailed erosion control plans specific to slopes greater than 30 percent leading directly to occupied habitat. The plan will be approved in writing by NiSource NRP personnel prior to project implementation and will include a tailgate training session for all on-site project personnel to highlight the environmental sensitivity of the habitat and any BMPs that must be implemented.

Construction

3. Avoid use fertilizers or herbicides by hand and/or vehicle application within 100 feet of known or presumed occupied habitat, and avoid aerial applications within 300 feet of known or presumed occupied habitat. Fertilizer and herbicides will not be applied if weather (e.g., impending storm) or other conditions (e.g., faulty equipment) would compromise the ability of NiSource or its contractors to apply the fertilizer or herbicide without impacting presumed occupied habitat. The EM&CP prepared for this activity will document relevant guidelines for application.

4. Materials and equipment used near areas of occupied habitat should be certified weed-free and cleaned to avoid introduction of invasive pests. Noxious weeds in proximity to identified populations should be controlled via manually whenever possible or selective herbicide application on cut stems using standard BMPs for herbicide use and following guidelines in BMP #3 above.

5. Abandoned pipelines should be left in place, when possible, when located in or directly adjacent to occupied habitat.

6. Ground disturbance activities, such as trenching, grading, and excavations should be minimized within identified population areas, even if above-ground vegetation is not evident at the time of activities, to avoid potential destruction of dormant plant root systems. Heavy equipment and individuals should go around, rather than through, occupied habitat to avoid soil compaction on the sites.

Timing Restrictions to Minimize Impact to Reproducing Populations

7. Impacts to this species' reproductive period should be avoided by avoiding construction or implementing HDD.

8. If timed correctly to avoid direct impacts, such as defoliation of species individuals, mowing could prove beneficial to existing populations by providing the disturbance necessary to halt community succession, historically provided by fire. Mowing of inhabited areas during the growing season shoul minimized. Mowers should be set greater then 3-inches high.

Travel for O&M Activities

9. Do not drive across known or presumed occupied areas – walk these areas or visually inspect from adjacent upland

Contaminants

10. As described in the ECS section on “Spill Prevention, Containment, and Control,” site staging areas for equipment, fuel, materials, and personnel at least 300 feet from known or presumed occupied areas to reduce the potential for hazardous spills entering occupied habitat. If sufficient space is not available, a shorter distance can be used with additional control measures.

11. Ensure all imported fill material is free from contaminants that could affect the species population or known or presumed occupied habita

12. For storage well activities, use enhanced and redundant measures to avoid and minimize the impact of spills from contaminant events in known or presumed occupied habitat. These measures include waste pit protection and a spill response plan. These measures will be included in the EM&CP prepared for the activity (running buffalo clover only)

Table D. Analysis of effects on upland and upland successive plant species.

SPECIES:	Upland and Upland Successive Plants - small-whorled pogonia (VA only), shale barren rockcress, and smooth coneflower									
	No effect- not in covered lands or in areas NiSource would work:lakeside daisy (in OH, PA, and NY only), Michaux's sumac (VA), northern monkshood (NY), Peter's Mountain mallow (VA), Short's goldenrod (KY), small whorled pogonia (NY) and white-haired goldenrod (KY).									
	NLAA or No effect- AMM to avoid populations: Leedy's roseroot (NY), northern monkshood (OH), Short's bladderpod (TN), small whorled pogonia (OH), and Tennessee purple coneflower (TN)									
Pipeline Activity	**Subactivity**	**Environmental Impact or Threat**	**Stressor**	**Stressor Pathway (optional)**	**Exposure (Resource Affected)**	**Range of Response**	**Conservation Need Affected**	**Demographic Consequences**	**NE, NLAA or LAA**	**Comments**
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	physical impacts to individuals	Collection, Crushing, chemical contaminants	vehicles, people walking, people collecting	individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	AMM to avoid known populations needed
Operation & Maintenance	Vegetation Management - mowing	physical impacts to individuals	Crushing, Chopping		individuals- is mowing done on the shale barren areas?	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction,	LAA	AMM for mowing needed
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Habitat alteration	Altered sun/shade requirements, introduction of invasives, downslope erosion		Discountable				NLAA	SBRC are not particularly sensitive to specific shading requirements. Amount of tree removal on existing ROW is unlikely to result in erosion at the level where impacts to plants will occur.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	Physical impacts to individuals, Habitat alteration	Altered sun/shade requirements, Chemical Contaminants		Habitat, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction, Range	LAA	Develop AMMs for herbicide.
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	physical impacts to individuals	crushing		Habitat, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	Develop AMM to avoid placing materials on listed plants
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Physical impacts to individuals, Habitat alteration	crushing, burning		Habitat, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	Develop AMM to avoid burning near listed plants
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Habitat degradation	Altered sun/shade requirements, erosion		Discountable				NLAA	SBRC are not particularly sensitive to specific shading requirements. Amount of tree removal on existing ROW is unlikely to result in erosion at the level where impacts to plants will occur.
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	Physical impacts to individuals, Habitat degradation	Crushing, Burying, Soil compaction, Introduction of invasives	Heavy equipment and machinery destruction of individuals or habitat, equipment spills, spread of invasives by equipment	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	Develop AMM to avoid conducting activity in known or presumed habitat and establish an acceptable buffer
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	Neutral	None						NE	No impacts to individuals or habitat are expected from this activity. Species doesn't occur in wetlands.
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	Neutral	None						NE	No impacts to individuals or habitat are expected from this activity.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Access Road Maintenance - grading, graveling	physical impacts to individuals	chemical contaminants		habitat, population, individuals	injury, death	Reproduction, Nutrition, Habitat		LAA	Develop AMMs for herbicide use near listed plants
Operation & Maintenance	Access Road Maintenance - culvert replacement	Neutral	None						NE	No impacts to individuals or habitat are expected from this activity.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	Physical impacts to individuals, Habitat degradation	Crushing, Burying, Soil compaction, Introduction of invasives	Heavy equipment and machinery destruction of individuals or habitat, equipment spills, spread of invasives by equipment	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	AMM to avoid known populations needed
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Physical impacts to individuals, Habitat degradation	Digging up, Crushing, Burying, Soil compaction, , Chemical contaminants, Introduction of invasives	Heavy equipment and machinery destruction of individuals or habitat, equipment spills, spread of invasives by equipment	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	AMM to avoid known populations needed
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None						NE	No impacts to individuals or habitat are expected from this activity.
Operation & Maintenance	Pipeline Abandonment - removal	Physical impacts to individuals, Habitat degradation	Crushing, Burying, Soil compaction, Introduction of invasives	Heavy equipment and machinery destruction of individuals or habitat, equipment spills, spread of invasives by equipment	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	AMM to avoid known populations needed
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Physical impacts to individuals, Habitat degradation	Habitat Alteration, Chemical contaminants, Introduction of invasives in occupied habitat	Heavy equipment and machinery destruction of individuals or habitat, equipment spills, spread of invasives by equipment	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	AMM to avoid known populations needed
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Physical impacts to individuals, Habitat degradation	Crushing, Burying, Soil compaction, , Chemical contaminants, Introduction of invasives in occupied habitat	Heavy equipment and machinery destruction of individuals or habitat, equipment spills, spread of invasives by equipment	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	AMM to avoid known populations needed

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None						NE	No impacts to individuals or habitat are expected from this activity.
Operation & Maintenance	Inspection Activities - ground and aerial	Physical impacts to individuals	Crushing	Vehicles	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	AMM to avoid known populations needed
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Physical impacts to individuals,	Crushing, Soil compaction	Vehicles	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	Develop AMMs for new alignment and plants
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Physical impacts to individuals, habitat degradation	Burying, Soil compaction, introduction of invasive species, cutting and crushing,	Heavy equipment and machinery destruction of individuals or habitat, equipment spills, spread of invasives by equipment	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	Develop AMMs for new alignment and plants
New Disturbance - Construction	Clearing - trees and shrubs	Habitat degradation	burying	erosion	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	Develop AMMs for new alignment and plants
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	physical impacts to individuals	crushing		Habitat, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	Develop AMMs for new alignment and plants
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Physical impacts to individuals, Habitat alteration	crushing, burning		Habitat, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	Develop AMMs for new alignment and plants
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Habitat degradation	Altered sun/shade requirements		Discountable				NLAA	SBRC are not particularly sensitive to specific shading requirements. Amount of tree removal on existing ROW is unlikely to result in erosion at the level where impacts to plants will occur.
New Disturbance - Construction	Grading, erosion control devices	Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	Crushing, Burying, Soil compaction, introduction of invasive species	Heavy equipment and machinery destruction of individuals or habitat, equipment spills, spread of invasives by equipment	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	AMMs for new alignment needed
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Neutral	None						NE	no additional impacts after clearing and grading
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Neutral	None						NE	no additional impacts after clearing and grading

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Physical impacts to individuals, Habitat degradation	flooding, contaminants	From staging of equipment: destruction of individuals or habitat by heavy equipment operation, discharge into uplands will change water availability	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	Develop hydro testing AMMs
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	Physical impacts to individuals, Habitat degradation	flooding	From staging of equipment: destruction of individuals or habitat by heavy equipment operation, discharge into uplands will change water availability	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	Devlop hydro testing AMMs
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Neutral	None						NE	No impacts to this species are anticipated from this action.
New Disturbance - Construction	Compression Facility, noise	Neutral	None						NE	No impacts to this species are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None						NE	No impacts to this species are anticipated from this action.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Crushing, Burying, Soil compaction, contamination	Destruction of individuals or habitat by heavy equipment operation, spills from equipment	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	AMMs for new alignment needed
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Neutral	None						NE	Upland species.
New Disturbance - Construction	Stream Crossings, wet ditch	Neutral	None						NE	Upland species.
New Disturbance - Construction	Stream Crossings, dry ditch	Neutral	None						NE	Upland species.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Neutral	None						NE	Upland species.
New Disturbance - Construction	Stream Crossings, dam & pump	Neutral	None						NE	Upland species.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Neutral	None						NE	Clearing associated with staging areas addressed above
New Disturbance - Construction	Stream Equipment Crossing Structures	Neutral	None						NE	Upland species.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Neutral	None						NE	Upland species.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Neutral	None						NE	Upland species.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Neutral	None						NE	Upland species.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Neutral	None						NE	Upland species.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Neutral	None						NE	Upland species.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Neutral	None						NE	Upland species.
New Disturbance - Construction	Storage wells - clearing and drilling	Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	Crushing, Burying, Soil compaction, Top soil removal, introduction of invasive species by equipment, Chemical contaminants	Heavy equipment and machinery destruction of individuals or habitat, equipment spills, spread of invasives by equipment	NA				NE	No storage field counties in range of plant species
New Disturbance - Construction	Storage wells - reconditioning	Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	Crushing, Burying, Soil compaction, contamination	Destruction of individuals or habitat by heavy equipment operation, chemical use/direct contamination.	NA				NE	No storage field counties in range of plant species

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Storage wells - waste pits	Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	Crushing, Burying, Soil compaction, contamination	Destruction of individuals or habitat by heavy equipment operation, spills from equipment	NA				NE	No storage field counties in range of plant species

Upland /Upland Successive Plant BMPs

Northern monkshood (Ohio)

Avoid all activities in the area specified for this species. If the area cannot be avoided, consultation will need to be reinitiated for this species.

Avoidance Area: Crane Hollow State Nature Preserve, Laurel Township, Hocking County.

Small-whorled pogonia (Ohio)

Avoid all activities in the area specified for this species. If the area cannot be avoided, consultation will need to be reinitiated for this species.

Avoidance Area: Camp OtyOkwa, Benton Township, Hocking County.

Globe (Short's) bladderpod (Kentucky)

Avoid all activities in the area specified for this species. If the area cannot be avoided, consultation will need to be reinitiated for this species.

Avoidance Area: All areas designated by the Kentucky Natural Heritage Database.

This species is not found in the covered lands in Tennessee.

Leedy's roseroot (New York)

Avoid all activities in the area specified for this species. If the area cannot be avoided, consultation will need to be reinitiated for this species.

Avoidance Area: Area designated by the NY Heritage Database, with a 50 meter buffer on all sides.

Tennessee purple coneflower (Tennessee)

Avoid all activities in the area specified for this species. If the area cannot be avoided, consultation will need to be reinitiated for this species.

Avoidance Area: All areas designated by the Tennessee Natural Heritage Database in southeastern Davison County. Further avoid impacting cedar glade habitat within the covered lands.

Table E. Analysis of effects on wetland plant species.

SPECIES:	Wetland Plants - Northeastern bulrush (PA/VA), Virginia Sneezeweed (VA), Swamp Pink (NJ/VA), Sensitive Joint Vetch (VA)									
	NLTAA or No effect- AMM to avoid populations: Pondberry (MS), Northeastern bulrush (NY), Sensitive Joint Vetch (NJ)									
Pipeline Activity	**Subactivity**	**Environmental Impact or Threat**	**Stressor**	**Stressor Pathway (optional)**	**Exposure (Resource Affected)**	**Range of Response**	**Conservation Need Affected**	**Demographic Consequences**	**NE, NLAA or LAA**	**Comments**
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Physical impacts to individuals	Collection, Crushing	Foot traffic in occupied areas, Vehicles operated in occupied areas, spread of invasive plant species	individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	AMM to avoid known populations needed
Operation & Maintenance	Vegetation Management - mowing	Physical impacts to individuals	Cutting, Crushing	Mowing in occupied areas	individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction,	LAA	AMM for mowing needed
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Physical impacts to individuals, Habitat degradation	crushing, Changes to sunlight regime, downslope erosion	Removal of overstory vegetation, dropping of vegetation on plants	individuals, habitat	beneficial or neutral (northeastern bulrush may benefit from increased light exposure)			NLAA	Amount of tree removal on existing ROW is unlikely to result in erosion at the level where impacts to plants will occur. Trees cut in upland areas would not be felled into wetlands.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	Physical impacts to individuals, Habitat alteration	Altered sun/shade requirements, Chemical Contaminants		Habitat, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction,	LAA	Develop AMMs for herbicide.
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral							NE	Not in wetlands
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Neutral							NE	Not in wetlands
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Physical impacts to individuals, Habitat degradation	Crushing, Changes to sunlight regime	Removal of overstory vegetation, dropping of vegetation on plants	Habitat, Individuals	beneficial or neutral (northeastern bulrush may benefit from increased light exposure)	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	AMM to avoid known populations needed
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	habitat degradation	Sedimentation, Chemical contaminants	erosion, spraying of herbicide adjacent to weltands	Habitat, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	AMM to avoid buffer around known populations needed
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Crushing, Burying, Soil compaction, Introduction of invasives	Heavy equipment and machinery, Imported fill and materials, Storm water runoff	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	Develop AMM to avoid conducting activity in known or presumed habitat and establish an acceptable buffer.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	ROW repair, regrading, revegetation - instream stabilization and/or fill	Neutral	None						NE	No impacts to individuals or habitat are expected from this activity.
Operation & Maintenance	Access Road Maintenance - grading, graveling	physical impacts to individuals	chemical contaminants		habitat, population, individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	Develop AMMs for herbicide use near listed plants
Operation & Maintenance	Access Road Maintenance - culvert replacement	physical impacts to individuals	altered hydrology, digging up plants, crushing		habitat, population, individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	AMM to avoid known populations needed
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	Physical impacts to individuals, Habitat degradation	Crushing, Burying, Soil compaction, Introduction of invasives		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	AMM to avoid known populations needed
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Physical impacts to individuals, Habitat degradation	Digging up, Crushing, Burying, Soil compaction, , Chemical contaminants, Introduction of invasives		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	AMM to avoid known populations needed
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None						NE	No impacts to individuals or habitat are expected from this activity.
Operation & Maintenance	Pipeline Abandonment - removal	Physical impacts to individuals, Habitat degradation	Crushing, Burying, Soil compaction, Introduction of invasives	Heavy equipment and machinery destruction of individuals or habitat, equipment spills, spread of invasives by equipment	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	AMM to avoid known populations needed
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Physical impacts to individuals, Habitat degradation	Habitat Alteration, Chemical contaminants, Introduction of invasives in occupied habitat	Heavy equipment and machinery destruction of individuals or habitat, equipment spills, spread of invasives by equipment	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	AMM to avoid known populations needed
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Physical impacts to individuals, Habitat degradation	Crushing, Burying, Soil compaction, , Chemical contaminants, Introduction of invasives in occupied habitat	Heavy equipment and machinery destruction of individuals or habitat, equipment spills, spread of invasives by equipment	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	AMM to avoid known populations needed

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None						NE	No impacts to individuals or habitat are expected from this activity.
Operation & Maintenance	Inspection Activities - ground and aerial	Physical impacts to individuals	Crushing	Vehicles	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	AMM to avoid known populations needed
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Physical impacts to individuals,	Crushing, Soil compaction	Vehicles	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	Develop AMMs for new alignment and plants
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Physical impacts to individuals, habitat degradation	Burying, Soil compaction, introduction of invasive species, cutting and crushing,		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	Develop AMMs for new alignment and plants
New Disturbance - Construction	Clearing - trees and shrubs	Habitat degradation	burying	erosion	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	Develop AMMs for new alignment and plants
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None						NE	No impacts to rparian habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Neutral	None						NE	No impacts to riparian habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Habitat degradation	Altered sun/shade requirements		Discountable				NLAA	Amount of tree removal on existing ROW is unlikely to result in erosion at the level where impacts to plants will occur. Primary impacts from the original clearing of new ROW- not side trimming along ROW.
New Disturbance - Construction	Grading, erosion control devices	Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	crushing, burying, cutting roots		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	AMMs for new alignment needed
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Neutral	None						NE	no additional impacts after clearing and grading
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Neutral	None						NE	no additional impacts after clearing and grading
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Physical impacts to individuals, Habitat degradation	altered hydrology, contaminants		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	Develop hydro testing AMMs
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	Physical impacts to individuals, Habitat degradation	altered hydrology		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	Devlop hydro testing AMMs

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Neutral	None						NE	No impacts to this species are anticipated from this action.
New Disturbance - Construction	Compression Facility, noise	Neutral	None						NE	No impacts to this species are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None						NE	No impacts to this species are anticipated from this action.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Crushing, Burying, Soil compaction, contamination		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	AMMs for new alignment needed
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	crushing, burying, digging up, altered hydrology		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	AMMs for new alignment needed
New Disturbance - Construction	Stream Crossings, wet ditch	Neutral	None						NE	wetland species
New Disturbance - Construction	Stream Crossings, dry ditch	Neutral	None						NE	wetland species
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Neutral	None						NE	wetland species
New Disturbance - Construction	Stream Crossings, dam & pump	Neutral	None						NE	wetland species
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Neutral	None						NE	Clearing associated with staging areas addressed above
New Disturbance - Construction	Stream Equipment Crossing Structures	Neutral	None						NE	wetland species
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Physical impacts to individuals, habitat degradation	Burying, Soil compaction, introduction of invasive species, cutting and crushing,		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	Develop AMMs for new alignment and plants
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Habitat degradation	Altered sun/shade requirements		Discountable				NLAA	Amount of tree removal on existing ROW is unlikely to result in erosion at the level where impacts to plants will occur. Primary impacts from the original clearing of new ROW- not side trimming along ROW.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	cutting root systems, digging up plants, burying		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	AMMs for new alignment needed.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Neutral	None						NE	no additional impacts after clearing and grading
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	Sedimentation	Frac-out	Limited to Some Habitat, Population, Few to Some Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	Clearing for HDD addressed in upland/wetland clearing activities.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Neutral	None						NE	
New Disturbance - Construction	Storage wells - clearing and drilling	Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Cutting, Crushing, Soil disturbance, Soil compaction		Limited to Some Habitat, Population, Few to Some Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	NE Bulrush is only plant that overlaps with new storage field areas. AMMs for avoidance of plants is needed.
New Disturbance - Construction	Storage wells - reconditioning	Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	Crushing, Soil disturbance, Soil compaction, Chemical contaminants		Limited to Some Habitat, Population, Few to Some Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	NE Bulrush is only plant that overlaps with new storage field areas. AMMs for avoidance of plants is needed.
New Disturbance - Construction	Storage wells - waste pits	Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Crushing, Soil disturbance, Soil compaction, Chemical contaminants		Limited to Some Habitat, Population, Few to Some Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	NE Bulrush is only plant that overlaps with new storage field areas. AMMs for avoidance of plants is needed.

Wetland Plant BMPs

sensitive joint vetch (in New Jersey only)

Avoid all activities in the area specified for this species. If the area cannot be avoided, consultation will need to be reinitiated for this species.

Avoidance Area: Large tidal wetland extending southwest from Center Square Road in Logan Township, Gloucester County (beginning approx. 75°23'22.992"W, 39°46'51.094"N)

Table F. Analysis of effects on piping plover.

SPECIES:	Piping Plover (*Charadrius melodus*)										
Pipeline Activity	**Subactivity**	**Environmental Impact or Threat**	**Stressor**	**Stressor Pathway (optional)**	**Exposure (Resource Affected)**	**Range of Response**	**Conservation Need Affected**	**Demographic Consequences**	**NE, NLAA or LAA**	**Comments**	**Critical Habitat**
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Habitat degradation, potential attraction of predators, increased disturbance stress on individuals, potential for contaminant impacts	altering habitat, predation, nuisance noise disturbance, chemical contaminants	Changing surface can alter habitat, trash left behind can attract predators, disturbance to individuals from maintenance activities. Potential for spills wherever vehicles operate.	Unlikely to occur in suitable habitat				NLAA		NLAA- these facilities do not occur and are not expected in critical habitat.
Operation & Maintenance	Vegetation Management - mowing	Noise disturbance to individuals	nuisance noise, human disturbance	disturbance to individuals from maintenance activities.	Few individuals	none; temporary avoidance			NLAA	Suitable habitat has little to no vegetation. Disturbance of individuals is expected to be temporary and minor because the activity is short-term and will not occur in occupied habitat.	NLAA- mowing in CH is unlikely since suitable habitat has little or no vegetation.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Noise disturbance to individuals	nuisance noise, human disturbance	disturbance to individuals from maintenance activities.	Few individuals	none; temporary avoidance			NLAA	Suitable habitat has little to no vegetation. Disturbance of individuals is expected to be temporary and minor because the activity is short-term and will not occur in occupied habitat.	NLAA- these activities in CH is unlikely since suitable habitat has little or no vegetation.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	increased disturbance stress on individuals, potential for contaminant impacts	nuisance noise disturbance, chemical contaminants	ingestion of herbicides when foraging, alter surface from driving/rutting, disturbance to individuals from maintenance activities.	Few individuals	none; temporary avoidance			NLAA	Vehicle rutting should be minimal if vehicles use approved access roads. Spill impacts will be minimal if BMPs stated in the ECS are adhered to. Suitable habitat has little to no vegetation. Noise disturbance is expected to be minor because the activity will not occur in occupied habitat.	NLAA. There is no vegetation near pipl foraging habitat. Herbacides should not affect the prey base.
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	increased disturbance stress on individuals, potential for contaminant impacts	predation, nuisance noise disturbance, chemical contaminants	disturbance to individuals from maintenance activities.	Few individuals	none; temporary avoidance			NLAA	Suitable habitat has little to no vegetation. Noise disturbance is expected to be minor because the activity will not occur in occupied habitat.	NLAA. Per the ESC disturbed areas will be restored. Also, these activities in CH is unlikely since suitable habitat has little or no vegetation.
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	increased disturbance stress on individuals, potential for contaminant impacts	predation, nuisance noise disturbance, chemical contaminants	disturbance to individuals from maintenance activities.	Few individuals	none; temporary avoidance			NLAA	Per the ESC disturbed areas will be restored. Predation and contaminant spill impacts should be minimal if BMPs outlined in the ECS are followed. Activity in adjacent areas shoudl be of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. Also, these activities in CH is unlikely since suitable habitat has little or no vegetation.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Increased disturbance stress on individuals	nuisance noise disturbance	Potential for disturbance to individuals in adjacent habitat from maintenance activities.	Few individuals				NLAA	Activities are located outside of habitat. Disturbance of individuals is expected to be temporary and minor because the activity is short-term and will not occur in occupied habitat.	NLAA. Activities are located outside of habitat. No impacts to habitat is anticipated from this action.
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	increased disturbance stress on individuals,	nuisance noise disturbance,	disturbance to individuals from maintenance activities.	Few individuals	none; temporary avoidance			NLAA	Activities are located outside of habitat. Disturbance of individuals is expected to be temporary and minor because the activity is short-term and will not occur in occupied habitat.	NLAA. Per the ESC disturbed areas will be restored. Although noise could alter desirability for individuals to use habitat, noise is expected to be minimal and of short temporal duration. Also, these activities in CH is unlikely since suitable habitat has little or no vegetation.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments	Critical Habitat
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	habitat alteration, increased disturbance stress on individuals,	habitat alteration, nuisance noise disturbance,	disturbance to individuals from maintenance activities.	Few individuals, little habitat	none; temporary avoidance			NLAA	Per the ESC disturbed areas will be restored. These activities shoudl be of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. Although noise could alter desirability for individuals to use habitat, noise is expected to be minimal and of short temporal duration. Also, these activities in CH is unlikely since suitable habitat has little or no vegetation.
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	habitat alteration, increased disturbance stress on individuals,	habitat alteration, nuisance noise disturbance,	disturbance to individuals from maintenance activities.	Few individuals, little habitat	none; temporary avoidance			NLAA	Per the ESC disturbed areas will be restored. These activities shoudl be of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. Although noise could alter desirability for individuals to use habitat, noise is expected to be minimal and of short temporal duration. Also, these activities in CH is unlikely since suitable habitat has little or no vegetation.
Operation & Maintenance	Access Road Maintenance - grading, graveling	habitat alteration, increased disturbance stress on individuals,	habitat alteration, nuisance noise disturbance,	disturbance to individuals from maintenance activities.	Few individuals, little habitat	none; temporary avoidance			NLAA	Per the ESC disturbed areas will be restored. These activities shoudl be of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. Although noise could alter desirability for individuals to use habitat, noise is expected to be minimal and of short temporal duration. Also, these activities in CH is unlikely since suitable habitat has little or no vegetation.
Operation & Maintenance	Access Road Maintenance - culvert replacement	habitat alteration, increased disturbance stress on individuals,	habitat alteration, nuisance noise disturbance,	disturbance to individuals from maintenance activities.	Few individuals, little habitat	none; temporary avoidance			NLAA	Per the ESC disturbed areas will be restored. These activities shoudl be of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. Although noise could alter desirability for individuals to use habitat, noise is expected to be minimal and of short temporal duration. Also, these activities in CH is unlikely since suitable habitat has little or no vegetation.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	habitat alteration, increased disturbance stress on individuals,	habitat alteration, nuisance noise disturbance,	disturbance to individuals from maintenance activities.	Few individuals, little habitat	none; temporary avoidance			NLAA	Per the ESC disturbed areas will be restored. These activities shoudl be of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. Although noise could alter desirability for individuals to use habitat, noise is expected to be minimal and of short temporal duration. Also, these activities in CH is unlikely since suitable habitat has little or no vegetation.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	habitat alteration, increased disturbance stress on individuals,	habitat alteration, nuisance noise disturbance,	disturbance to individuals from maintenance activities.	Few individuals, little habitat	none; temporary avoidance			NLAA	Per the ESC disturbed areas will be restored. These activities shoudl be of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. Although noise could alter desirability for individuals to use habitat, noise is expected to be minimal and of short temporal duration. Also, these activities in CH is unlikely since suitable habitat has little or no vegetation.
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None						NE	No action/disturbance. No impacts to habitat or individuals are anticipated from this action.	No action/disturbance. No impacts to habitat is anticipated from this action.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments	Critical Habitat
Operation & Maintenance	Pipeline Abandonment - removal	habitat alteration, increased disturbance stress on individuals,	habitat alteration, nuisance noise disturbance,	disturbance to individuals from maintenance activities.	Few individuals, little habitat	none; temporary avoidance			NLAA	Per the ESC disturbed areas will be restored. These activities shoudl be of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. Although noise could alter desirability for individuals to use habitat, noise is expected to be minimal and of short temporal duration.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	habitat alteration, increased disturbance stress on individuals,	habitat alteration, nuisance noise disturbance,	disturbance to individuals from maintenance activities.	Few individuals, little habitat	none; temporary avoidance			NLAA	Per the ESC disturbed areas will be restored. These activities shoudl be of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. If facilities can be determined to be located outside of known habitat a no effect finding can be made.
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	habitat alteration, increased disturbance stress on individuals,	habitat alteration, nuisance noise disturbance,	disturbance to individuals from maintenance activities.	Few individuals, little habitat	none; temporary avoidance			NLAA	Per the ESC disturbed areas will be restored. These activities shoudl be of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. If facilities can be determined to be located outside of known habitat a no effect finding can be made.
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None						NE	No action/disturbance. No impacts to habitat or individuals are anticipated from this action.	No action/disturbance. No impacts to habitat is anticipated from this action.
Operation & Maintenance	Inspection Activities - ground and aerial	Habitat degradation, increased disturbance stress on individuals,	altering habitat, nuisance noise disturbance,	Driving could cause rutting in habitat, noise from low aerial	Few individuals, little habitat	none; temporary avoidance			NLAA	Noise is expected to be minimal from these activities. Chance of rutting from tires could alter habitat, however, areas of rutting would be limited to tire width. Activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Noise is expected to be minimal from these activities. Chance of rutting from tires could alter habitat, however, areas of rutting would be limited to tire width. In addition, if vehicles stay on approved access roads a NE can be reached. Contaminant spill impacts could affect foraging , however, impacts should be minimal if BMPs outlined in the ECS are followed.
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Habitat degradation, increased disturbance stress on individuals,	altering habitat, nuisance noise disturbance,	Driving could cause rutting in habitat, noise from low aerial	Unlikely to occur in suitable habitat	none; temporary avoidance			NLAA	Noise is expected to be minimal from these activities. Chance of rutting from tires could alter habitat, however, areas of rutting would be limited to tire width. Activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Noise is expected to be minimal from these activities. Chance of rutting from tires could alter habitat, however, areas of rutting would be limited to tire width. In addition, if vehicles stay on approved access roads a NE can be reached. Contaminant spill impacts could affect foraging , however, impacts should be minimal if BMPs outlined in the ECS are followed.
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Noise disturbance to individuals	nuisance noise, human disturbance	disturbance to individuals from maintenance activities.	Unlikely to occur in suitable habitat	none; temporary avoidance			NLAA	Suitable habitat has little to no vegetation. Disturbance of individuals is expected to be temporary and minor because the activity is short-term and will not occur in occupied habitat.	NLAA- these activities in CH is unlikely since suitable habitat has little or no vegetation.
New Disturbance - Construction	Clearing - trees and shrubs	Noise disturbance to individuals	nuisance noise, human disturbance	disturbance to individuals from maintenance activities.	Unlikely to occur in suitable habitat	none; temporary avoidance			NLAA	Suitable habitat has little to no vegetation. Disturbance of individuals is expected to be temporary and minor because the activity is short-term and will not occur in occupied habitat.	NLAA- these activities in CH is unlikely since suitable habitat has little or no vegetation.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Noise disturbance to individuals	nuisance noise, human disturbance	disturbance to individuals from maintenance activities.	Unlikely to occur in suitable habitat	none; temporary avoidance			NLAA	Suitable habitat has little to no vegetation. Disturbance of individuals is expected to be temporary and minor because the activity is short-term and will not occur in occupied habitat.	NLAA- these activities in CH is unlikely since suitable habitat has little or no vegetation.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Noise disturbance to individuals	nuisance noise, human disturbance	disturbance to individuals from maintenance activities.	Unlikely to occur in suitable habitat	none; temporary avoidance			NLAA	Suitable habitat has little to no vegetation. Disturbance of individuals is expected to be temporary and minor because the activity is short-term and will not occur in occupied habitat.	NLAA- these activities in CH is unlikely since suitable habitat has little or no vegetation.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Noise disturbance to individuals	nuisance noise, human disturbance	disturbance to individuals from maintenance activities.	Unlikely to occur in suitable habitat	none; temporary avoidance			NLAA	Suitable habitat has little to no vegetation. Disturbance of individuals is expected to be temporary and minor because the activity is short-term and will not occur in occupied habitat.	NLAA- these activities in CH is unlikely since suitable habitat has little or no vegetation.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments	Critical Habitat
New Disturbance - Construction	Grading, erosion control devices	habitat alteration, increased disturbance stress on individuals,	habitat alteration, nuisance noise disturbance,	disturbance to individuals from maintenance activities.	Few individuals, little habitat	none; temporary avoidance			NLAA	Per the ESC disturbed areas will be restored. These activities shoudl be of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. If facilities can be determined to be located outside of known habitat a no effect finding can be made.
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	habitat alteration, increased disturbance stress on individuals,	habitat alteration, nuisance noise disturbance,	disturbance to individuals from maintenance activities.	Few individuals, little habitat	none; temporary avoidance			NLAA	Per the ESC disturbed areas will be restored. These activities shoudl be of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. If facilities can be determined to be located outside of known habitat a no effect finding can be made.
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	habitat alteration, increased disturbance stress on individuals,	habitat alteration, nuisance noise disturbance,	disturbance to individuals from maintenance activities.	Few individuals, little habitat	none; temporary avoidance			NLAA	Per the ESC disturbed areas will be restored. These activities shoudl be of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. If facilities can be determined to be located outside of known habitat a no effect finding can be made.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	increased disturbance stress on individuals,	nuisance noise disturbance,	disturbance to individuals from construction activities.	Few individuals, little habitat	none; temporary avoidance			NLAA	Noise is expected to be minimal if noise mitigation outlined in the ECS is followed. In addition, activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Hydrostatic testing should not alter habitat.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	increased disturbance stress on individuals,	predation, nuisance noise disturbance, chemical contaminants	disturbance to individuals from construction activities.	Few individuals, little habitat	none; temporary avoidance			NLAA	Noise is expected to be minimal if noise mitigation outlined in the ECS is followed. In addition, activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Hydrostatic testing should not alter habitat.
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	habitat alteration, increased disturbance stress on individuals,	habitat alteration, nuisance noise disturbance,	disturbance to individuals from maintenance activities.	Few individuals, little habitat	none; temporary avoidance			NLAA	Per the ESC disturbed areas will be restored. These activities shoudl be of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. If facilities can be determined to be located outside of known habitat a no effect finding can be made.
New Disturbance - Construction	Compression Facility, noise	Disturbance stress on individuals	nuisance noise disturbance		Unlikely to occur in suitable habitat				NLAA	If facilities can be determined to be located outside of known habitat a NE finding can be made.	NLAA. Although noise could alter desirability to use habitat it is very unlikely that facilities will be built in habitat, making exposure unlikely to occur. In addition, if facilities can be determined to be located outside of known habitat a no effect finding can be made.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Disturbance stress on individuals	nuisance noise disturbance		Unlikely to occur in suitable habitat				NLAA		NLAA. Although noise and lighting could alter desirability to use habitat it is very unlikely that facilities will be built in habitat, making exposure unlikely to occur. In addition, if facilities can be determined to be located outside of known habitat a no effect finding can be made.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments	Critical Habitat
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Habitat degradation, potential attraction of predators, increased disturbance stress on individuals,	altering habitat, predation, nuisance noise disturbance,	Changing surface can alter habitat, trash left behind can attract predators, disturbance to individuals from maintenance activities. .	Unlikely to occur in suitable habitat				NLAA	New roads in occupied habitat are extremely unlikely and effects would be localized and limited. Access roads are typically narrow and localized. In addition, activity in building or constructing roads is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Habitat changes should be minimal in areas where new roads are built.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Habitat degradation, potential attraction of predators, increased disturbance stress on individuals,	altering habitat, predation, nuisance noise disturbance,	Changing surface can alter habitat, trash left behind can attract predators, disturbance to individuals from maintenance activities. .	Unlikely to occur in suitable habitat				NLAA	New roads in occupied habitat are extremely unlikely and effects would be localized and limited. Access roads are typically narrow and localized. In addition, activity in building or constructing roads is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Habitat changes should be minimal in areas where new roads are built.
New Disturbance - Construction	Stream Crossings, wet ditch	increased disturbance stress on individuals,	nuisance noise disturbance,	Potential for disturbance to individuals in and adjacent habitat from maintenance activities.	Unlikely to occur in suitable habitat				NLAA	Activities extremely unlikely to occur in occupied habitat, but may take place in locations adjacent to habitat. Noise is therefore expected to be minimal. Noise mitigation will be followed per the ECS. Activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Activities extremely unlikely to occur in CH.
New Disturbance - Construction	Stream Crossings, dry ditch	increased disturbance stress on individuals,	nuisance noise disturbance,	Potential for disturbance to individuals in and adjacent habitat from maintenance activities.	Unlikely to occur in suitable habitat				NLAA	Activities extremely unlikely to occur in occupied habitat, but may take place in locations adjacent to habitat. Noise is therefore expected to be minimal. Noise mitigation will be followed per the ECS. Activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Activities extremely unlikely to occur in CH.
New Disturbance - Construction	Stream Crossings, steel dam & culvert	increased disturbance stress on individuals,	nuisance noise disturbance,	Potential for disturbance to individuals in and adjacent habitat from maintenance activities.	Unlikely to occur in suitable habitat				NLAA	Activities extremely unlikely to occur in occupied habitat, but may take place in locations adjacent to habitat. Noise is therefore expected to be minimal. Noise mitigation will be followed per the ECS. Activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Activities extremely unlikely to occur in CH.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments	Critical Habitat
New Disturbance - Construction	Stream Crossings, dam & pump	increased disturbance stress on individuals,	nuisance noise disturbance,	Potential for disturbance to individuals in and adjacent habitat from maintenance activities.	Unlikely to occur in suitable habitat				NLAA	Activities extremely unlikely to occur in occupied habitat, but may take place in locations adjacent to habitat. Noise is therefore expected to be minimal. Noise mitigation will be followed per the ECS. Activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Activities extremely unlikely to occur in CH.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	increased disturbance stress on individuals,	nuisance noise disturbance,	Potential for disturbance to individuals in and adjacent habitat from maintenance activities.	Unlikely to occur in suitable habitat				NLAA	Activities extremely unlikely to occur in occupied habitat, but may take place in locations adjacent to habitat. Noise is therefore expected to be minimal. Noise mitigation will be followed per the ECS. Activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Activities extremely unlikely to occur in CH.
New Disturbance - Construction	Stream Equipment Crossing Structures	increased disturbance stress on individuals,	nuisance noise disturbance,	Potential for disturbance to individuals in and adjacent habitat from maintenance activities.	Unlikely to occur in suitable habitat				NLAA	Activities extremely unlikely to occur in occupied habitat, but may take place in locations adjacent to habitat. Noise is therefore expected to be minimal. Noise mitigation will be followed per the ECS. Activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Activities extremely unlikely to occur in CH.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Habitat degradation, potential attraction of predators, increased disturbance stress on individuals, potential for contaminant impacts	altering habitat, predation, nuisance noise disturbance, chemical contaminants	Changing surface can alter habitat, trash left behind can attract predators, disturbance to individuals from maintenance activities. Potential for spills wherever vehicles operate.	Unlikely to occur in suitable habitat				NLAA	These activities are extremely unlikley to occur in suitable habitat. Per the ESC disturbed areas will be restored. In addition, activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. Contaminant spill impacts could affect foraging , however, this and other impacts should be minimal if BMPs outlined in the ECS are followed.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Increased disturbance stress on individuals,	nuisance noise disturbance	Potential for disturbance to individuals in adjacent habitat from activities.	Unlikely to occur in suitable habitat				NLAA	Activities are located outside of habitat. Noise is expected to be minimal. Minimal impacts to habitat or individuals are anticipated from this action.	NLAA. Activities extremely unlikely to occur in CH.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Habitat degradation, potential attraction of predators, increased disturbance stress on individuals, potential for contaminant impacts	altering habitat, predation, nuisance noise disturbance, chemical contaminants	Changing surface can alter habitat, trash left behind can attract predators, disturbance to individuals from maintenance activities. Potential for spills wherever vehicles operate.	Unlikely to occur in suitable habitat				NLAA	These activities are extremely unlikley to occur in suitable habitat. Per the ESC disturbed areas will be restored. In addition, activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. Contaminant spill impacts could affect foraging , however, this and other impacts should be minimal if BMPs outlined in the ECS are followed.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Habitat degradation, potential attraction of predators, increased disturbance stress on individuals, potential for contaminant impacts	altering habitat, predation, nuisance noise disturbance, chemical contaminants	Changing surface can alter habitat, trash left behind can attract predators, disturbance to individuals from maintenance activities. Potential for spills wherever vehicles operate.	Unlikely to occur in suitable habitat				NLAA	These activities are extremely unlikley to occur in suitable habitat. Per the ESC disturbed areas will be restored. In addition, activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. Contaminant spill impacts could affect foraging , however, this and other impacts should be minimal if BMPs outlined in the ECS are followed.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments	Critical Habitat
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Habitat degradation, potential attraction of predators, increased disturbance stress on individuals, potential for contaminant impacts	altering habitat, predation, nuisance noise disturbance, chemical contaminants	Changing surface can alter habitat, trash left behind can attract predators, disturbance to individuals from maintenance activities. Potential for spills wherever vehicles operate.	Unlikely to occur in suitable habitat				NLAA	These activities are extremely unlikley to occur in suitable habitat. Per the ESC disturbed areas will be restored. In addition, activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. Contaminant spill impacts could affect foraging , however, this and other impacts should be minimal if BMPs outlined in the ECS are followed.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Habitat degradation, potential attraction of predators, increased disturbance stress on individuals, potential for contaminant impacts	altering habitat, predation, nuisance noise disturbance, chemical contaminants	Changing surface can alter habitat, trash left behind can attract predators, disturbance to individuals from maintenance activities. Potential for spills wherever vehicles operate.	Unlikely to occur in suitable habitat				NLAA	These activities are extremely unlikley to occur in suitable habitat. Per the ESC disturbed areas will be restored. In addition, activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity.	NLAA. Per the ESC disturbed areas will be restored. Contaminant spill impacts could affect foraging , however, this and other impacts should be minimal if BMPs outlined in the ECS are followed.
New Disturbance - Construction	Storage wells - clearing and drilling	Neutral	None						NE	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.
New Disturbance - Construction	Storage wells - reconditioning	Neutral	None						NE	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.
New Disturbance - Construction	Storage wells - waste pits	Neutral	None						NE	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.

Table G. Analysis of effects on red-cockaded woodpecker.

SPECIES:	**Red-Cockaded Woodpecker (*Picoides borealis*)**										
Pipeline Activity	**Subactivity**	**Environmental Impact or Threat**	**Stressor**	**Stressor Pathway (optional)**	**Exposure (Resource Affected)**	**Range of Response**	**Conservation Need Affected**	**Demographic Consequences**	**Suggested Management Options (BMP)**	**NE, NLAA or LAA**	**Comments**
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Habitat degradation, increased disturbance stress on individuals and nesting pairs, Reduction in prey abundance	altering habitat and prey habitat, nuisance noise disturbance	direct and indirect impacts from ground disturbance, noise from facility operations	Individuals, Habitat	Harm, Harass, Kill	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction	1, 2,3, 4,5	LAA	If facilities can be located outside of known or presumed nesting and foraging habitat and habitat buffer a NLAA or NE decision can be made. If Suggested BMPs are implemented a NLAA may be considered.
Operation & Maintenance	Vegetation Management - mowing	Reduction in prey abundance, noise disturbance on individuals	altering prey habitat and direct impacts to prey, nuisance noise disturbance	direct and indirect impacts from ground disturbance, noise from mowing	Discountable	N/A	N/A	N/A	1,2, 3, 4,5	NLAA	Mowing activities will be of short temporal duration and noise should be minimal.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Habitat degradation, increased disturbance stress on individuals and nesting pairs, Reduction in prey abundance	altering habitat, nuisance noise disturbance	Removing trees has potential to remove direct habitat as well as create noise disturbance which can decrease feeding and brooding rates.	Lifstages, many Individuals, Potential large areas of habitat	Harm, Harass, Kill	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction	1, 2,3, 4,5	LAA	If facilities can be located outside of known or presumed habitat and habitat buffer an NE decision can be made. If Suggested BMPs are implemented a NLAA may be considered.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	Reduction in prey abundance, noise disturbance on individuals, potential for chemical contaminants, damage to cavity trees, reduced foraging habitat suitability	altering prey habitat and direct impacts to prey, nuisance noise disturbance, chemical contaminants, nesting habitat degradation	Noise from vehicles, alter prey habitat from herbicides, degrade nesting habitat	Habitat, individuals	Harm, Harass,	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction	1, 2,3, 4,5	LAA	Noise disturbance should be minimal and of short-temporal duration. If implement noise impact mitigation measures in accordance with the ECS section II J. Herbicide application will be within ROW and therefore should not be directly on habitat, but applied to adjacent foraging habitat. Aerial application overspray may damage or kill nest trrees. With surveys and hand application in nesting areas and avoidance of nesting habitat, NLAA may be possible.
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Increased disturbance stress on individuals and nesting pairs, nesting/foraging habitat degradation	Noise disturbance, degrade nesting/ foraging habitat, alter fire regime	Noise from construction activities can cause decreased feeding and brooding rates and potentially cause nest abandonment. Piling, chipping, and debris may affect tree survival and growth, degrade foraging and nesting habitat and alter fire regime	Habitat	Harm, Harass	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction	1, 2,3, 4,5	LAA	Noise disturbance should be minimal and of short-temporal duration. If implement noise impact mitigation measures in accordance with the ECS section II J. Avoiding piling, chipping, and stacking within potential foraging and nesting habitat may allow a NLAA

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE, NLAA or LAA	Comments
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Reduction in prey abundance, noise disturbance on individuals, Habitat loss or degradation	Air/smoke disturbance, altering habitat	potential to damage/kill nest trees and nesting habitat or foraging habitat, smoke from fire	Habitat, individuals	Harm, Harass, Kill	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction	1, 2,3, 4,5	LAA	Per the ESC brush pile burning will be in a controlled environment so that fires will not spread off the construction work area. In addition, activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity. Smoke from pile burning could drive individuals and breeding pairs away. Pile burning may damage or kill adjacent trees, including nest trees and alter herbabceous ground cover. Avoiding pile burning within potential foraging or nestign habitat may lead to NLAA
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Habitat degradation, increased disturbance stress on individuals and nesting pairs, Reduction in prey abundance	altering habitat, nuisance noise disturbance	Removing or altering trees has potential to remove direct habitat as well as create noise disturbance which can decrease feeding and brooding rates.	Lifestages, Few Individuals, Potential large areas of habitat	Harm, Harass, Kill	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction	1, 2,3,4	LAA	Implementation of suggested BMPs 1, 3, & 5 can lead to a NLAA decision. Implementation of suggested BMPs 1 , 3 and 4 can lead to a NE finding.
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	Increased disturbance stress on individuals, decrease of prey abundance	Noise disturbance, alter foraging habitat	Noise from construction activities can cause decreased feeding and brooding rates and potentially cause nest abandonment.	Discountable	N/A	N/A	N/A	1,2,3, 4	LAA	Noise disturbance should be minimal and of short-temporal duration. If implement noise impact mitigation measures in accordance with the ECS section II J. Construction activity is maintenance on existing ROW and therefore not conducted in habitat, but could affect adjacent foraging habitat. Regrading can damage/kill trees adjacent to ROW. Avoiding potential nesting and foraging habitat may lead to NLAA
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	Neutral								LAA	Same as above - forested wetalnds may = RCW habitat
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	Neutral	None							NE	No impacts are anticipated from this action, activity does not overlap species habitat.
Operation & Maintenance	Access Road Maintenance - grading, graveling	Increased disturbance stress on individuals, decrease of prey abundance	Noise disturbance, alter foraging habitat	Noise from construction activities can cause decreased feeding and brooding rates and potentially cause nest abandonment.	Discountable	N/A	N/A	N/A	1, 2,3, 4,5	NLAA	Noise disturbance should be minimal and of short-temporal duration. If implement noise impact mitigation measures in accordance with the ECS section II J. Adjacent foraging habitat could be affected by grading and graveling .
Operation & Maintenance	Access Road Maintenance - culvert replacement	Neutral	None							NLAA	Same effects as line above, just localized

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE, NLAA or LAA	Comments
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	Habitat degradation, increased disturbance stress on individuals and nesting pairs, Reduction in prey abundance	altering habitat, nuisance noise disturbance	Removing trees has potential to remove direct habitat as well as create noise disturbance which can decrease feeding and brooding rates.	Lifestages, Few Individuals, Potential large areas of habitat	Harm, Harass, Kill	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction	1,2, 3, 4,5	LAA	If implement noise impact mitigation measures in accordance with the ECS section II J. If Suggested BMPs are implemented a NLAA may be considered.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Increased disturbance stress on individuals, decrease of prey abundance	Noise disturbance, alter foraging habitat	Noise from construction activities can cause decreased feeding and brooding rates and potentially cause nest abandonment.	Discountable	N/A	N/A	N/A	1, 2,3, 4,5	NLAA	Noise disturbance should be minimal and of short-temporal duration. If implement noise impact mitigation measures in accordance with the ECS section II J. Construction activity is maintenance on existing ROW and therefore not conducted in habitat, but could affect adjacent foraging habitat.
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None							NE	No action/disturbance. No impacts to habitat or individuals are anticipated from this action.
Operation & Maintenance	Pipeline Abandonment - removal	Increased disturbance stress on individuals, decrease of prey abundance	Noise disturbance, alter foraging habitat	Noise from construction activities can cause decreased feeding and brooding rates and potentially cause nest abandonment.	Discountable	N/A	N/A	N/A	1, 2,3, 4,5	LAA	Noise disturbance should be minimal and of short-temporal duration. If implement noise impact mitigation measures in accordance with the ECS section II J. Construction activity is maintenance on existing ROW and therefore not conducted in habitat, but could affect adjacent foraging habitat. Extensive work within nesting areas may significantly alter behavior and reduce nestling survival
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Increased disturbance stress on individuals, decrease of prey abundance	Noise disturbance, alter foraging habitat	Noise from construction activities can cause decreased feeding and brooding rates and potentially cause nest abandonment.	Discountable	N/A	N/A	N/A	1, 2,3, 4,5	NLAA	Noise disturbance should be minimal and of short-temporal duration. If implement noise impact mitigation measures in accordance with the ECS section II J. Construction activity is maintenance on existing ROW and therefore not conducted in habitat, but could affect adjacent foraging habitat. If Suggested BMPs are implemented a NE may be considered.
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Increased disturbance stress on individuals, decrease of prey abundance	Noise disturbance, alter foraging habitat	Noise from construction activities can cause decreased feeding and brooding rates and potentially cause nest abandonment.	Discountable	N/A	N/A	N/A	1, 2,3, 4,5	NLAA	Noise disturbance should be minimal and of short-temporal duration. If implement noise impact mitigation measures in accordance with the ECS section II J. Construction activity is maintenance on existing ROW and therefore not conducted in habitat, but could affect adjacent foraging habitat. If Suggested BMPs are implemented a NE may be considered.
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None							NE	No action/disturbance. No impacts to habitat or individuals are anticipated from this action.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE, NLAA or LAA	Comments
Operation & Maintenance	Inspection Activities - ground and aerial	Increased disturbance stress on individuals	Noise disturbance	Noise from vehicles can cause decreased feeding and brooding rates and potentially cause nest abandonment.	Discountable	N/A	N/A	N/A	1, 2,3, 4,5	NLAA	Noise disturbance should be minimal and of short-temporal duration. If implement noise impact mitigation measures in accordance with the ECS section II J.
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Increased disturbance stress on individuals	Noise disturbance	Noise from vehicles can cause decreased feeding and brooding rates and potentially cause nest abandonment.	Individuals, Habitat	N/A	N/A	N/A	1, 2,3, 4,5	LAA	Noise disturbance should be minimal and of short-temporal duration. If implement noise impact mitigation measures in accordance with the ECS section II J. Same as for O&M above
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Increased disturbance stress on individuals, decrease of prey abundance	Noise disturbance, alter foraging habitat, long-term habitat alteration	Noise from construction activities can cause decreased feeding and brooding rates and potentially cause nest abandonment.	-Lifestages, Few Individuals, Potential large areas of habitat	Harm, Harass, Kill	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction	1, 2,3, 4,5	LAA	Implement noise impact mitigation measures in accordance with the ECS section II J. If Suggested BMPs are implemented a NLAA may be considered.
New Disturbance - Construction	Clearing - trees and shrubs	Habitat degradation, increased disturbance stress on individuals and nesting pairs, Reduction in prey abundance	altering habitat, nuisance noise disturbance	Removing trees has potential to remove direct habitat as well as create noise disturbance which can decrease feeding and brooding rates.	Many individuals, Potential large areas of habitat	Harm, Harass, Kill	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction	1, 2,3, 4,5	LAA	Implement noise impact mitigation measures in accordance with the ECS section II J. Suggested BMPs are implemented a NLAA or NE may be considered.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Increased disturbance stress on individuals and nesting pairs	Noise disturbance, habitat degradation	Noise from construction activities can cause decreased feeding and brooding rates and potentially cause nest abandonment.	Individuals, Habitat	Harm	N/A	N/A	1, 2,3, 4,5	LAA	Noise disturbance should be minimal and of short-temporal duration. Implement noise impact mitigation measures in accordance with the ECS section II J. Piling and chipping may alter habitat If Suggested BMPs are implemented a NE may be considered.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE, NLAA or LAA	Comments
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Reduction in prey abundance, noise disturbance on individuals, Habitat degradation	Air/smoke disturbance, altering habitat	potential to burn habitat or foraging habitat, smoke from fire	Individuals, Habitat	N/A	N/A	N/A	1, 2,3, 4,5	LAA	Per the ESC brush pile burning will be in a controlled environment so that fires will not spread off the construction work area. Smoke from pile burning could drive individuals and breeding pairs away. In addition, activity is of short temporal duration and displaced individuals or groups are able to return after completion of activity. Same as for O&M. If activity can be conducted when outside of the nesting season, a NE finding can be considered.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Habitat degradation, increased disturbance stress on individuals and nesting pairs, Reduction in prey abundance	altering habitat, nuisance noise disturbance	Removing or altering trees has potential to remove direct habitat as well as create noise disturbance which can decrease feeding and brooding rates.	Few Individuals, Potential large areas of habitat	Harm, Harass, Kill	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction	1, 2,3, 4,5	LAA	If Suggested BMPs are implemented a NLAA or NE may be considered. Implement noise impact mitigation measures in accordance with the ECS section II J.
New Disturbance - Construction	Grading, erosion control devices	Increased disturbance stress on individuals, decrease of prey abundance	Noise disturbance, alter foraging habitat	Noise from construction activities can cause decreased feeding and brooding rates and potentially cause nest abandonment.	Individuals, Habitat	Harm, Harass	N/A	N/A	1, 2,3, 4,5	LAA	If Suggested BMPs are implemented a NE may be considered. Implement noise impact mitigation measures in accordance with the ECS section II J. May affect tree survival and growth, including nest trees and foraging habitat.
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Increased disturbance stress on individuals, decrease of prey abundance	Noise disturbance, alter foraging habitat	Noise from blasting and other construction activities can cause decreased feeding and brooding rates.	Individuals	Harass	N/A	N/A	1, 2,3, 4,5	LAA	If Suggested BMPs are implemented a NE may be considered. Implement noise impact mitigation measures in accordance with the ECS section II J. May affect tree survival and growth, including nest trees and foraging habitat.
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Increased disturbance stress on individuals, decrease of prey abundance	Noise disturbance, alter foraging habitat	Noise from construction activities can cause decreased feeding and brooding rates and potentially cause nest abandonment.	Discountable	N/A	N/A	N/A	1, 2,3, 4,5	NLAA	If Suggested BMPs are implemented a NE may be considered. Implement noise impact mitigation measures in accordance with the ECS section II J.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Neutral	None							NE	No impacts are anticipated from this action, activity does not overlap species habitat.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	Neutral	None							NE	No impacts are anticipated from this action, activity does not overlap species habitat.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE, NLAA or LAA	Comments
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Increased disturbance stress on individuals, decrease of prey abundance, habitat destruction/degradation	Noise disturbance, alter foraging habitat, alter nesting habitat	Noise from construction activities can cause decreased feeding and brooding rates and potentially cause nest abandonment. Regrading and earth moving ay damage nest trees and foraging habitat	Individuals, Habitat	N/A	N/A	N/A	1, 2,3, 4,5	LAA	If Surveys and avoidance of nesting and foraging habitat are implemented a NLAA or NE may be considered. Implement noise impact mitigation measures in accordance with the ECS section II J.
New Disturbance - Construction	Compression Facility, noise	Increased disturbance stress on individuals	Noise disturbance	Noise from compression facility can cause decreased feeding and brooding rates and potentially cause nest abandonment.	Few lifestage, Few Individuals	Harm, Harass	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction	1, 2,3, 4,5	LAA	If Suggested BMPs are implemented a NLAA or NE may be considered. Implement noise impact mitigation measures in accordance with the ECS section II J.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Increased disturbance stress on individuals	Noise disturbance	Noise from compression facility can cause decreased feeding and brooding rates and potentially cause nest abandonment.	Few lifestage, Few Individuals	Harm, Harass	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction	1, 2,3, 4,5	LAA	If Suggested BMPs are implemented a NLAA or NE may be considered. Implement noise impact mitigation measures in accordance with the ECS section II J.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Increased disturbance stress on individuals, decrease of prey abundance, habitat destruction/degradation	Noise disturbance, alter foraging habitat, disturb nest trees and nesting habitat	Noise from construction activities can cause decreased feeding and brooding rates and potentially cause nest abandonment, nesting and foraging habitat degradation	Individuals, Habitat	Harm, Harass , kill	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction	1, 2,3, 4,5	LAA	If Suggested BMPs for surveys and avoidance are implemented a NLAA may be considered.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE, NLAA or LAA	Comments
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Neutral	None							NE	No impacts are anticipated from this action, activity does not overlap species habitat.
New Disturbance - Construction	Stream Crossings, wet ditch	Neutral	None							NE	No impacts are anticipated from this action, activity does not overlap species habitat.
New Disturbance - Construction	Stream Crossings, dry ditch	Neutral	None							NE	No impacts are anticipated from this action, activity does not overlap species habitat.
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Neutral	None							NE	No impacts are anticipated from this action, activity does not overlap species habitat.
New Disturbance - Construction	Stream Crossings, dam & pump	Neutral	None							NE	No impacts are anticipated from this action, activity does not overlap species habitat.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Neutral	None							NE	No impacts are anticipated from this action, activity does not overlap species habitat.
New Disturbance - Construction	Stream Equipment Crossing Structures	Neutral	None							NE	No impacts are anticipated from this action, activity does not overlap species habitat.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Habitat degradation in forested wetlands that contain pond pine, loblolly	Noise disturbance, alter foraging habitat, disturb nest trees and nesting habitat		Individuals, Habitat	Harm, Harass , kill	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction		LAA	These activities, when conducted in forested wetlands thatcontain pines, may affect nesting and foraging habitat. Avoiding work within forested wetlands containing pine species may lead to a NE or NLAA
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Habitat degradation in forested wetlands that contain pond pine, loblolly	Noise disturbance, alter foraging habitat, disturb nest trees and nesting habitat		Individuals, Habitat	Harm, Harass , kill	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction		LAA	These activities, when conducted in forested wetlands thatcontain pines, may affect nesting and foraging habitat. Avoiding work within forested wetlands containing pine species may lead to a NE or NLAA
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Habitat degradation in forested wetlands that contain pond pine, loblolly	Noise disturbance, alter foraging habitat, disturb nest trees and nesting habitat		Individuals, Habitat	Harm, Harass , kill	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction		LAA	These activities, when conducted in forested wetlands thatcontain pines, may affect nesting and foraging habitat. Avoiding work within forested wetlands containing pine species may lead to a NE or NLAA
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Neutral	None							NE	No impacts are anticipated from this action, activity does not overlap species habitat.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Neutral	Noise disturbance, alter foraging habitat, disturb nest trees and nesting habitat		Individuals, Habitat	Harm, Harass , kill	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction		LAA	These activities, when conducted in forested wetlands thatcontain pines, may affect nesting and foraging habitat. Avoiding work within forested wetlands containing pine species may lead to a NE or NLAA
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Neutral	Noise disturbance, alter foraging habitat, disturb nest trees and nesting habitat		Individuals, Habitat	Harm, Harass , kill	Breeding, Feeding, Sheltering	Numbers, Range, Reproduction		LAA	These activities, when conducted in forested wetlands thatcontain pines, may affect nesting and foraging habitat. Avoiding work within forested wetlands containing pine species may lead to a NE or NLAA
New Disturbance - Construction	Storage wells - clearing and drilling	Neutral	None							NE	No impacts are anticipated from this action. Proposed well field locations do not overlap species habitat.
New Disturbance - Construction	Storage wells - reconditioning	Neutral	None							NE	No impacts are anticipated from this action. Proposed well field locations do not overlap species habitat.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE, NLAA or LAA	Comments
New Disturbance - Construction	Storage wells - waste pits	Neutral	None							NE	No impacts are anticipated from this action. Proposed well field locations do not overlap species habitat.

Notes:
1. Under the "comment" column: where appropriate, If Nisource can confirm by survey (field or desktop) that facilities, storage wells and other subactivities are located outside of known or presumed foraging or nesting habitat, the effect decision may be changed no NE or NLAA.

Management Options (BMP)

Surveys to Evaluate Presence ~~and Relocation~~ of Species in NiSource Action Areas

1. A survey should be conducted to determine the presence/absence of suitable potential foraging or nesting habitat for this species by correctly following the Survey Protocol descibed in Appendix 4 (pp. 288-290) of the Recovery Plan for the Red-cockaded Woodpecker - Second Revision (2003). If an adequate survey effort does not indicate the presence of suitable potential foraging or nesting habitat, that site will be classified as unoccupied habitat and the BMPs will not be mandatory. If no suitable nesting habitat is present within the project impact area, but suitable foraging habitat is present and will be impacted, an additional survey effort should be conducted to identify any suitable nesting habitat within 0.5 miles of the project area to determine if there could be potential use of that impacted foraging habitat by groups outside of the project area. If no suitable nesting habitat is present within 0.5 miles of the project area, that site will be classified as unoccupied and a "no effect" determination is appropriate. However, all potential nesting habitat identified by the above described surveys should be surveyed for cavity trees. If no active clusters are found, then that site will be classified as unoccupied and a "no effect" determination is appropriate. If one or more active clusters are found, a foraging analysis should be conducted to determine whether sufficient amounts of foraging habitat will remain for each group post-project. If the amount of foraging habitat remaining is determined to be adequate for all groups present, then a "NLAA" determination will be appropriate. If an inadequate amount of foraging habitat would remain post-project, an "LAA" condition would exist. Any modification, disturbance, or destruction to an active cavity tree would result in "take." NiSource may implement some of these measures if appropriate to protect potentially suitable habitat. The definition of adequacy will be determined through consultation with the Service on a site-specific basis. If a survey is not completed, presence can will be assumed. In that case, all suitable habitat would be treated as occupied, and all BMPs followed. A copy of the survey and any reports will be included in the annual report submitted to the Service.

Pre-Construction Planning: Preparation of an Environmental Management & Construction Plan

2. A detailed Environmental Management & Construction Plan (EM&CP) will be prepared for any activity with potential effects within known or presumed habitat. The plan will incorporate the relevant requirements of the NGTS ECS and include site-specific details particular to the project area and potential impact. The plan will be strongly oriented towards avoidance measure in areas of known occupied populations. The plan will comprehensively address all activities needed to complete the work and strive to avoid the take of individuals in occupied nesting or suitable potential foraging habitat. The plan will include establishment of a buffer zone and foraging habitat area from a cavity tree or group of cavity trees (cluster). The plan will be approved in writing by NiSource NRP personnel prior to project implementation and will include a tailgate training session for all on-site project personnel to highlight the environmental sensitivity of the habitat.

Construction

3. No removal or trimming of pine trees with a diameter at breast height of 10 inches or more that could be utilized as nest or foraging habitat should be completed in occupied or potential nesting or foraging habitat.

4. Staging areas should not be sited within suitable potential nesting or foraging habitat to avoid any potential individual stress from increased disturbance.

Timing Restrictions

5. O&M and new construction activities within occupied or potential nesting habitat should be avoided during the breeding season (April through July).

Columbia Culf Transmission Environmental Construction Standards

If a population or individuals of the species is identified within the project footprint, standard best management practices and environmental construction standards, as stated in the Columbia Gulf Transmission Environmental Construction Standards, should be utilized during work in and adjacent to the habitat. Environmental Construction Standards that NiSource has proposed include: (1) standard BMPs for spill prevention should be implemented within occupied or potential habitat for the species, (2) Herbicide use for O&M activities should be minimized in areas potentially used as foraging or nesting sites by the species, (3) disturbed areas should be restored immediately following construction using native plants, along with ongoing monitoring to ensure that the restoration efforts are effective, and (4) noise mitigation measures should be implemented in and adjacent to known or presumed occupied nesting or foraging habitat.

Table H. Analysis of effects on Diamond darter.

SPECIES: Diamond darter (*Crystallaria cincotta*)

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Permanent or temporary loss of habitat, degraded water quality, reduction of prey population diversity and abundance	Increased sedimentation and turbidity, flow alteration, physical disturbance	In-stream and riparian activity	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,4,8	19	LAA	AMMs 2, 4, and 8 reduce the probability and magnitude of impacts - aggregate take. AMM 19 precludes driving across occupied habitat and would eliminate crushing and habitat impacts from that activity when implemented.
Operation & Maintenance	Vegetation Management - mowing	Habitat degradation	Minor increased sedimentation and turbidity	Erosion from cleared areas outside of riparian buffer	discountable						NLAA	ECS erosion control measures (restoration in graded areas, and establishment of an undisturbed riparian buffer along streams during vegetation maintenance) redueces the potential impact of this activity.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Habitat degradation	Minor increased sedimentation and turbidity	Erosion from cleared areas outside of riparian buffer	Habitat, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	ECS erosion control measures (restoration in graded areas, and establishment of an undisturbed riparian buffer along streams during vegetation maintenance) reduces the potential impact of this activity; This is considered an aggregate sediment / temperature impact.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	decreased water quality for individuals and prey	Chemical Contaminants	algae blooms, impacts to individuals (surfactants and other constituents)	Habitat, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2, 16		LAA	This is considered an aggregate sediment / contaminant impact with AMMs 2 and16 in place. Recommend developing a list of approved herbicides (note herbicides mixtures may contain surfactants and other potentially harmful constituents)
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	degraded habitat and water quality, reduced prey	Minor incresaed sedimentation and turbidity, lowered DO, Nuisance species	erosion, Storm water runoff, Algae blooms	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,16		LAA	ECS erosion control measures reduces the potential impact of this activity; however this species habitat is highly susceptible to sedimentation effects; This is considered an aggregate sediment impact.; AMM 19 precludes driving across occupied habitat and would eliminate crushing and habitat impacts from that activity when implemented.
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	degraded habitat and water quality, reduced prey	Minor incresaed sedimentation and turbidity, lowered DO, Nuisance species	erosion, Storm water runoff, Algae blooms	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	ECS erosion control measures reduces the potential impact of this activity; however this species habitat is highly susceptible to sedimentation effects. This is considered an aggregate sediment impact; recommend using a severe weather avoidance AMM.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
Operation & Maintenance	ROW repair, regrading, revegetation - instream stabilization and/or fill	Permanent or temporary loss of habitat, degraded water quality, reduction of prey population diversity and abundance	Increased sedimentation and turbidity, flow alteration, physical disturbance	In-stream and riparian activity	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 3, 5, 7, 8, 13, 14, 20.	6	LAA	AMMs 2, 3, 5, 7, 8, 13, 14, and 20 and non-mandatory AMM 6 reduce the impact of this activity. Aggregate take from Instream stabilization and fill could involve rebuilding/relocating channel segments where erosion has caused damage indirectly affecting mussels (AMM # 5 specifically requires no take therefore no direct take).
Operation & Maintenance	Access Road Maintenance - grading, graveling	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity	Wind or storm water erosion	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II and V would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects; This is considered an aggregate sediment impact.
Operation & Maintenance	Access Road Maintenance - culvert replacement	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Disturbance, Altered flow, Noise	Wind or storm water erosion; Equipment placed in stream; In-stream construction	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2	9	LAA	Impact could be reduced to NE through implementation of BMP 9, which would avoid culvert placement in occupied habitat; This is considered an aggregate sediment impact.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	Habitat degradation	Sedimentation	tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	This is considered an aggregate sediment impact.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity	Wind or storm water erosion	habitat, individuals	none expected					NLAA	This specific activity should cause only very minimal impacts.
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Pipeline Abandonment - removal	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity and increased turbidity, Contaminants, Disturbance	Wind or storm water erosion; Equipment/materials in stream; In-stream construction	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,7,10,13, 20	6, 9, 12	LAA	With implementation of AMM 12 in potentially occupied areas, impacts would likely be reduced to NE. BMP 12 would require the pipeline to be abandoned in place, thereby avoiding construction, sedimentation, and restoration impacts.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Habitat degradation, Water quality impacts, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants (fertilizers and chemicals used in revegetation), Nuisance species (Didymo algae)	Wind or storm water erosion, algae blooms	Habitat, Population, Individuals	none expected			2,15		NLAA	NLAA because of implementation of AMMs 2 and 15. Wells can be close to streams within floodplain, consider LAA.
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Habitat degradation, Water quality impacts, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants (fertilizers and chemicals used in revegetation), Nuisance species (Didymo algae)	Wind or storm water erosion, algae blooms	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II and V would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects; This is considered an aggregate sediment impact.
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
Operation & Maintenance	Inspection Activities - ground and aerial	Habitat degradation, water quality impacts, physical impacts to individuals	minor sedimentation, contaminats (equipment leaking)	in-stream vehical operation	Unlikely						NLAA	Implementation of the listed suggested AMM 19 may result in lower impact (NLAA).
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Reduction of prey population, Physical impacts to individuals	Sedimentation and increased turbidity	Erosion from lack of vegetation	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Increased potential from erosion due to vegetation clearing is considered LAA, because of risk of sedimentation and species' high susceptibility to these effects.; This is considered an aggregate sediment impact; if a a 25' undisturbed riparian buffer in presumed habitat is maintianed, could lower impact to NLAA.
New Disturbance - Construction	Clearing - trees and shrubs	Habitat degradation, Water quality impacts, Reduction of prey population, Physical impacts to individuals	Sedimentation and increased turbidity, Raised water temperatures, Lowered dissolved oxygen	Erosion from lack of vegetation, removal of riparian vegetation that provides shade to stream	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Increased potential from erosion due to vegetation clearing is considered LAA, because of risk of sedimentation and species' high susceptibility to these effects.; This is considered an aggregate sediment impact; if a a 25' undisturbed riparian buffer in presumed habitat is maintianed, could lower impact to NLAA.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Physical Impacts to Individuals, Habitat degradation, Loss of host fish, Loss and degradation of host fish habitat	Crushing, Sedimentation, Chemical Contaminants,	Impacts from trucks driving across stream, crushing individuals, sediment in water column, potential comtaminants from vehicles	All Mussell Life stages and habitat; Host Fish habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction (reduced recruitment, feeding, breeding, displacement, sheltering)	2	19	LAA	Hauling could involve driving across streams and therefore impacts to mussels - if AMM 19 is implemented this goes to NE.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Habitat degradation and loss, Water quality impacts	Increased water temperatures, Lowered dissolved oxygen	Removal of riparian vegetation that provided shade to stream	Habitat,	none expected					NLAA	No impacts are anticipated from this activity.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Grading, erosion control devices	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation, Water Quality Impacts (increased turbidity)	Wind or storm water erosion	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of AMMs 12-14 move this subactivity to NLAA.
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Disturbance	Wind or storm water erosion, Equipment placed in stream, In-stream construction	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of AMMs 2,3,4,&11 move this subactivity to NLAA.
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity Contaminants, Disturbance	Altered flow results in sedimentation, Equipment placed in stream, In-stream construction	habitat	none expected					NLAA	Theses impacts are limited to laying the pipe only, impacts from new pipelines are covered in other subactivities.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Temporary loss of habitat, Habitat degradation	Altered flow, Increased turbidity	Withdrawal and discharge of water	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,17,20		LAA	AMM 17 does not preclude taking water from an occupied stream, however, its provisions do move this ito minor / aggregate impacts.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	Temporary loss of habitat, Habitat degradation	Altered flow, Increased turbidity	Withdrawal and discharge of water	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,18,20		LAA	Aggregate sediment and contaminant impacts. Work with applicant to revise AMM # 20 (see material from Bob Anderson 11/2010).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity Contaminants	Wind or storm water erosion; Equipment use in proximity to stream, Storm water runoff of contaminants used during construction (fuels) and restoration (fertilizers), Algae blooms	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2,16		LAA	AMMs reduce impacts, but any ground disturbance that may result in sedimentation in occupied habitat is considered LAA; This is considered an aggregate sediment impact.
New Disturbance - Construction	Compression Facility, noise	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants	Wind or storm water erosion; Equipment use in proximity to stream, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2, 7, 10, 20	9	LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the AMMs 2,13,16 result in lower impact; This is considered an aggregate sediment impact.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Altered flow, Contaminants	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of AMM 9 may result in lower impact (NLAA or NE).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, wet ditch	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Altered flow, Noise	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 4, 5, 10, 20	9	LAA	Implementation of AMM 9 may result in lower impact (NLAA or NE).
New Disturbance - Construction	Stream Crossings, dry ditch	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Altered flow, Noise	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 4, 5, 10, 20	AMM 9	LAA	Impacts may be reduced to NLAA through implementation of the listed suggested BMPs.
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Altered flow, Noise	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 4, 5, 10, 20	9	LAA	Implementation of AMM 9 may result in lower impact (NLAA or NE).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, dam & pump	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Altered flow, Noise	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	AMMs 2, 4, 5, 10, 20	9	LAA	Implementation of AMM 9 may result in lower impact (NLAA or NE).
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Altered flow, Noise	Frac-out, Wind or storm water erosion, Near stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2,3,13		LAA	Implementation of AMMs 2,3,13 result in lower impact.
New Disturbance - Construction	Stream Equipment Crossing Structures	none	neutral								NE	No effect is anticipated from this activity (note impacts are evaluated under and as part of construction activities, no individual impacts)
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Removal of vegetation that provided shade to non-riparian waterbodies connected to occupied habitat	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Habitat degradation and loss, Water quality impacts	Sedimentation and increased turbidity	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Habitat degradation and loss, Water quality impacts	Sedimentation and increased turbidity	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Habitat degradation and loss, Water quality impacts	Potential for frac-out, Contaminants, Sedimentation	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Habitat degradation and loss, Water quality impacts	Potential for frac-out, Contaminants, Sedimentation	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Storage wells - clearing and drilling	none	neutral								NE	There are no storage well counties in or near habitat.
New Disturbance - Construction	Storage wells - reconditioning	none	neutral								NE	There are no storage well counties in or near habitat.
New Disturbance - Construction	Storage wells - waste pits	none	neutral								NE	There are no storage well counties in or near habitat.

Notes:

[1] These Conservation Measures were developed as AMMs for HCP mussels. NiSource has comitted to apply these AMMs more broadly to the other aquatic species within the covered lands that may be affected by their activities

Conservation Measures for diamond darter (italics indicate non-mandatory measures).

Pre-Construction Planning: Preparation of an Environmental Management & Construction Plan

2. A detailed EM&CP will be prepared for any activity with potential effects (e.g., stream bed or stream bank disturbance, impacts to riparian habitat, activities causing sediment) within 100 feet of the ordinary high water mark of occupied mussel habitat. The plan will incorporate the relevant requirements of the NGTS ECS and include site-specific details particular to the project area and potential impact. The waterbody crossing will be considered as “high-quality” for the purpose of preparing this plan regardless of the actual classification. The plan will be strongly oriented towards minimizing stream bed and riparian disturbance (including minimization of tree clearing within 25 feet of the crossing [Figure 24, ECS]), preventing downstream sedimentation (including redundant erosion and sediment control devices which would be designed to protect mussel resources as appropriate), and weather monitoring by the Environmental Inspector to ensure work is not begun with significant precipitation in the forecast. The plan will comprehensively address all activities needed to complete the work and minimize take of mussels in occupied habitat including crossing the streams during dry periods when practical and using dry-ditch crossing techniques for intermittent streams leading to mussel habitat. The EM&CP will include the frac-out avoidance and contingency plans described in AMM #3 below. The EM&CP will also include a sediment control component for uplands that drain to and impact occupied habitat. Detailed erosion control plans will be developed specific to slopes greater than or equal to 30 percent leading directly to occupied habitat. In areas with less than a 30 percent slope, ECS and AMM erosion control measures protective of mussels will be implemented. The plan will be approved in writing by NiSource NRP personnel prior to project implementation and will include a tailgate training session for all on-site project personnel to highlight the environmental sensitivity of the habitat and any mussel AMMs which must be implemented.

Stream Bed Construction

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments

3. For activities in occupied habitat, install new or replacement pipelines and major repairs under the river bottom using HDD or other trenchless methods rather than open trenching unless the crossing evaluation report prepared in accordance with Section 5.2.1.1 and Appendix J indicates otherwise. Drilling should be carefully undertaken and a plan should be in place to minimize and address the risk of in-stream disturbance due to frac-outs. The plan should also specifically reference mussel resources in the vicinity of the crossing as a key conservation concern and include specific measures identified in the NGTS ECS, from standard industry practices, or other mutually agreed-upon practices to protect this resource. The plan will also include a frac-out impact avoidance plan which will evaluate the site in terms not only of feasibility of conducting HDD, but the likelihood of large scale frac-out and its effects on mussels, and actions to address a large scale frac-out in occupied habitat. The plan should also consider the potential effects on mussels if drilling fluids are released into the environment. The plan must contain all information required for a FERC Section 7c filing at a minimum.

4. Install pipeline to the minimum depth described in the ECS and maintain that depth at least 10 feet past the high water line to avoid exposure of pipeline by anticipated levels of erosion based on geology and watershed character. Additional distance may be required should on-site conditions (i.e., outside bend in the waterbody, highly erosive stream channel, anticipated future upstream development activities in the vicinity, etc.) dictate a reasonable expectation that the stream banks could erode and expose the pipeline facilities. Less distance may be utilized if terrain or geological conditions (long, steep bank or solid rock) will not allow for a 10-foot setback. These conditions and the response thereto will be documented in the EM&CP and provided as part of the annual report to the Service.

5. For major repairs in known or presumed occupied habitat, do not install in-channel repairs (bendway weirs, hardpoints, concrete mats, fill for channel relocation, or other channel disturbing measures).

6. Conduct replacements/repairs from a lay barge or temporary work bridges of the minimum length necessary to conduct the replacements/repairs rather than operating heavy equipment (e.g., backhoes, bulldozers) in-stream. Temporary construction and equipment bridges are not to be confused with stone or fill causeways with pipe structures, which should not be employed in known or presumed occupied waterbodies.

7. Remove equipment bridges as soon as practicable after repair work and any site restoration is completed.

8. As part of the routine pipeline inspection patrols, visually inspect all stream crossings in known or presumed occupied waterbodies for indications of significant erosion or bank destabilization associated with or affecting the pipeline crossing. If such bank destabilization is observed, it will be corrected in accordance with the ECS. Follow-up inspections and restabilization will continue until the bank is stabilized (generally two growing seasons).

Stream Bank Conservation

9. Do not construct culvert and stone access roads and appurtenances (including equipment crossing) across the waterbody or within the riparian zone. Temporary equipment crossings utilizing equipment pads or other methods that span the waterbody are acceptable provided that in-stream pipe supports are not needed.

10. Use half pipes of sufficient number and size that both minimize impacts to stream bed and minimize flow disruption to both upstream and downstream habitat.

Timing Restrictions to Minimize Impact to Reproducing Populations

11. Impacts to this species' reproductive period will be avoided by avoiding in-water construction or implementing an HDD from late January to August 31.

Pipeline Abandonment

12. Abandon pipelines in place to avoid in-stream disturbance that would result from pipeline removal.

Contaminants

13. As described in the ECS section on “Spill Prevention, Containment and Control,” site staging areas for equipment, fuel, materials, and personnel at least 300 feet from the waterway, if available, to reduce the potential for sediment and hazardous spills entering the waterway. If sufficient space is not available, a shorter distance can be used with additional control measures.

14. Ensure all imported fill material is free from contaminants that could affect the species population or known or presumed occupied waterbody habitat.

15. For storage well activities, use enhanced and redundant measures to avoid and minimize the impact of spills from contaminant events in known or presumed occupied streams. These measures include waste pit protection and a spill response plan. These measures will be included in the EM&CP prepared for the activity.

16. Avoid use fertilizers or herbicides within 100 feet of known or presumed occupied habitat. Fertilizer and herbicides will not be applied if weather (e.g., impending storm) or other conditions (e.g., faulty equipment) would compromise the ability of NiSource or its contractors to apply the fertilizer or herbicide without impacting presumed occupied habitat. The EM&CP prepared for this activity (AMM# 2 above) will document relevant guidelines for application.

Withdrawal and Discharge of Water

17. Do not draw hydrostatic test water from or discharge water directly into known or presumed occupied habitat.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments

18. Use best available water withdrawal/discharge impact avoidance techniques (low rate, screens, avoid known or presumed occupied areas to extent practical, do not vacuum up sediments, low rate of discharge to avoid scouring or erosion, discharge into upland area that does not allow water to flow overland into occupied streams or tributaries, avoid discharge of invasive aquatic species into sub-watersheds of known or presumed occupied streams). Confirm that the water source is not contaminated with invasive aquatic species.

Travel for O&M Activities

19. Do not drive across known or presumed occupied streams – walk these areas or visually inspect from bank and use closest available bridge to cross stream.

Exotic Species

20. Clean all equipment (including pumps, hoses, etc.) that have (1) been in a perennial waterbody for more than four hours within the previous seven days and (2) will work in occupied or potential federally listed habitat for more than four hours; following established guidelines to remove exotic or invasive species before entering a known or presumed occupied stream for a federally listed species which is not known to be infested with invasive species. It is important to follow these guidelines even if work is not occurring in the immediate vicinity of this species since, once introduced into a watershed, invasive species could move and eventually affect the federally listed species.

Table I. Analysis of effects on pallid sturgeon.

SPECIES:	Pallid Sturgeon (*Scaphirhynchus albus*)									
Pipeline Activity	**Subactivity**	**Environmental Impact or Threat**	**Stressor**	**Stressor Pathway (optional)**	**Exposure (Resource Affected)**	**Range of Response**	**Conservation Need Affected**	**Demographic Consequences**	**NE or NLAA or LAA**	**Comments**
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Water quality degradation, stress on individuals	Sedimentation, Stormwater runoff	Stormwater runoff from pollution generating pavement, erosion	Life stages and habitat; Population, individuals	none expected			NLAA	The amount of sediment within the river from this activity is expected to be very small.
Operation & Maintenance	Vegetation Management - mowing	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Sedimentation, Increase in Water Temperatures, Decrease of dissolved oxygen	denuding bank, grubbing with heavy equipment, disturbing soil, water quality degradation since vegetation no longer provides shade to stream	Unlikely				NLAA	Minor sedimentation may occur from this activity. Erosion control measures outlined in the ECS will further reduce the likelihood that sedimentation will occur. This species prefers turbid waters and minor sedimentation is not likely to affect the species. Also, the ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Chemical Contaminants	direct exposure to chemicals from spills and stormwater runoff	Life stages and habitat; Population, individuals	none expected			NLAA	Exposure to contaminants within the river from this activity is expected to be very small.
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Habitat degradation and water quality degradation, stress on eggs,	Increase in Water Temperatures, Decrease of dissolved oxygen	habitat and water quality degradation since vegetation no longer provides shade to stream	Unlikely				NLAA	The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance.
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	Water quality degradation, Reduction of prey population	Sedimentation	tributary and/or near stream earth disturbance can cause minor increase in sedimentation	Unlikely				NLAA	Minor sedimentation may occur from this activity. Erosion control measures outlined in the ECS will further reduce the likelihood that sedimentation will occur. This species prefers turbid waters and minor sedimentation is not likely to affect the species. The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	Water quality degradation, stress on individuals, Reduction of prey population	Sedimentation, contaminants	tributary and/or near stream earth disturbance can cause minor sedimentation ; contaminant spills from equipment located in connected wetland	Unlikely				NLAA	Although there is a chance for contaminant spills from equipment, this would not likely jeopardize this species as spills would take place outside of habitat. In addition, contaminant spill impacts should be minimal in any habitat if BMPs outlined in the ECS are followed. Sedimentation will also be minimal as the ECS states that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. In addition, sedimentation occurring in an adjacent wetland would likely dissipate before reaching occupied habitat.
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	Water quality degradation, Reduction of prey population, contaminant impacts, physical impacts	Sedimentation, Altered Flow, spill contaminants, noise	altered flow from tributary or occupied habitat could result in increased sedimentation, contaminant spills from equipment located in-stream and tributaries, noise from in water work	discountable				NLAA	These types of instream activities are extremely uncommon in this section of the river.
Operation & Maintenance	Access Road Maintenance - grading, graveling	Water quality degradation, reduction of prey population	Sedimentation	tributary and/or near stream earth disturbance, may result in minor increase of sedimentation	Unlikely				NLAA	Although there is a chance for contaminant spills from equipment, this would not likely jeopardize this species as spills would take place outside of habitat. Minor sedimentation may occur from this activity. Erosion control measures outlined in the ECS will further reduce the likelihood that sedimentation will occur. This species prefers turbid waters and minor sedimentation is not likely to affect the species.
Operation & Maintenance	Access Road Maintenance - culvert replacement	Water quality degradation, reduction of prey population, contamination	Sedimentation, contaminants	tributary and/or near stream earth disturbance, may result in minor increase of sedimentation, equipment located in tributary stream could have spill release.	Unlikely				NLAA	Although there is a chance for contaminant spills from equipment, this would not likely jeopardize this species as spills would take place outside of habitat. Minor sedimentation may occur from this activity. Erosion control measures outlined in the ECS will further reduce the likelihood that sedimentation will occur. This species prefers turbid waters and minor sedimentation is not likely to affect the species.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	Water quality degradation, reduction of prey population	Sedimentation	tributary and/or near stream earth disturbance, may result in minor increase of sedimentation	Unlikely				NLAA	Minor sedimentation may occur from this activity. Erosion control measures outlined in the ECS will further reduce the likelihood that sedimentation will occur. This species prefers turbid waters and minor sedimentation is not likely to affect the species.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population, contaminants	Sedimentation,, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation altered flow result in increased sedimentation, contaminant spills from equipment located in-stream and tributary, noise from in water work	Unlikely				NLAA	These types of instream activities are extremely uncommon in this section of the river.
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Pipeline Abandonment - removal	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population	Sedimentation,, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation altered flow result in increased sedimentation, contaminant spills from equipment located in-stream and tributary, noise from in water work	Unlikely				NLAA	NiSource is most likley to abandon pipelines in-place in this area.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Water quality degradation, reduction of prey population	Sedimentation	tributary and/or near stream earth disturbance, may result in minor increase of sedimentation	Unlikely				NLAA	Minor sedimentation may occur from this activity. Erosion control measures outlined in the ECS will further reduce the likelihood that sedimentation will occur. This species prefers turbid waters and minor sedimentation is not likely to affect the species. In addition, if wells can be located outside of habitat and riparian buffer zones the determination would likely be NE.
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Water quality degradation, reduction of prey population	Sedimentation	tributary and/or near stream earth disturbance, may result in minor increase of sedimentation	Unlikely				NLAA	Minor sedimentation may occur from this activity. Erosion control measures outlined in the ECS will further reduce the likelihood that sedimentation will occur. This species prefers turbid waters and minor sedimentation is not likely to affect the species. In addition, if wells can be located outside of habitat and riparian buffer zones the determination would likely be NE.
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Inspection Activities - ground and aerial	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Sedimentation, Increase in Water Temperatures, Decrease of dissolved oxygen	denuding bank, grubbing with heavy equipment, disturbing soil, water quality degradation since vegetation no longer provides stormwater filter or shade to stream	Discountable				NLAA	Temperature increases from herbaceous vegetation removal would be slight. Minor sedimentation may occur from this activity. The ECS establishes erosion control measures to minimize sedimentation. This species prefers turbid waters and minor sedimentation is not likely to affect the species.
New Disturbance - Construction	Clearing - trees and shrubs	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Sedimentation, Increase in Water Temperatures, Decrease of dissolved oxygen	denuding bank, grubbing with heavy equipment, disturbing soil, water quality degradation since vegetation no longer provides shade to stream	Unlikely				NLAA	Minor sedimentation may occur from this activity. This species prefers turbid waters and minor sedimentation is not likely to affect the species.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Increase in Water Temperatures, Decrease of dissolved oxygen	water quality degradation since vegetation no longer provides shade to stream	Unlikely				NLAA	The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance.
New Disturbance - Construction	Grading, erosion control devices	Water quality degradation, reduction of prey population	Sedimentation	tributary and/or near stream earth disturbance, may result in minor increase of sedimentation	Discountable				NLAA	Minor sedimentation may occur from this activity. This species prefers turbid waters and minor sedimentation is not likely to affect the species.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Permanent or temporary loss of habitat, Habitat degradation and water quality degradation, physical impacts, Reduction of prey population	Sedimentation, short-term altered flow, contaminants, noise	near and in-stream earth disturbance may result in increased sedimentation, blasting can cause physical stress on individuals, altered flow result in increased sedimentation, contaminant spills from equipment located in-stream, noise from in water work	Discountable				NLAA	This section of the river is only crossed via HDD
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Temporary loss of habitat, water quality degradation, stress on individuals, Reduction of prey population	Sedimentation, short-term altered flow, contaminants	near, in-stream, and tributary earth disturbance may result in increased sedimentation, altered flow result in increased sedimentation, contaminant spills from equipment located in-stream and tributary	Discountable				NLAA	This section of the river is only crossed via HDD
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Water quality degradation, reduction in prey population	Sedimentation, noise	near and in-stream earth disturbance may result in increased sedimentation altered flow may result in increased sedimentation, noise from in water work	Discountable				NLAA	Minor sedimentation may occur from this activity. This species prefers turbid waters and minor sedimentation is not likely to affect the species. If construction can be restricted to July 1-October 15 and/or Management Option 18 is implemented the determination of effect would likely be NE as no water is taken from or discharged into occupied streams.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	Water quality degradation, reduction in prey population	Sedimentation, noise	near and in-stream earth disturbance may result in increased sedimentation altered flow may result in increased sedimentation, noise from in water work	Discountable				NLAA	Minor sedimentation may occur from this activity. This species prefers turbid waters and minor sedimentation is not likely to affect the species. If construction can be restricted to July 1-October 15 and/or Management Option 18 is implemented the determination of effect would likely be NE as no water is taken from or discharged into occupied streams.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Water quality degradation, reduction of prey population	Sedimentation	tributary and/or near stream earth disturbance, may result in minor increase of sedimentation	Discountable				NLAA	Minor sedimentation may occur from this activity. This species prefers turbid waters and minor sedimentation is not likely to affect the species. In addition, if construction can be restricted to July 1-October 15 the determination of effect would likely be NE.
New Disturbance - Construction	Compression Facility, noise	Neutral	None						NE	No impacts to stream habitats are anticipated from this action, these facilities will not be located in a riparian area.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None						NE	No impacts to stream habitats are anticipated from this action, these facilities will not be located in a riparian area.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Water quality degradation, stress on individuals, Reduction of prey population	Sedimentation, contaminants	tributary and/or near stream earth disturbance can cause minor sedimentation, contaminant spills from equipment located in tributary or adjacent to stream	Unlikely				NLAA	Although there is a chance for contaminant spills from equipment, this would not likely jeopardize this species as spills would take place outside of habitat. In addition, contaminant spill impacts should be minimal in any habitat if BMPs outlined in the ECS are followed. Sedimentation will also be minimal as the ECS states that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. In addition, sedimentation occurring in an adjacent wetland would likely dissipate before reaching occupied habitat.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Water quality degradation, reduction of prey population, contamination	Sedimentation, contaminants	tributary and/or near stream earth disturbance, may result in minor increase of sedimentation, equipment located in tributary stream could have spill release.	Unlikely				NLAA	Activity would not be conducted in occupied habitat. Contaminant spill impacts should be minimal in any habitat if BMPs outlined in the ECS are followed. Minor sedimentation may occur from this activity, however would likely dissipate prior to reaching occupied habitat. In addition, this species prefers turbid waters and minor sedimentation is not likely to affect the species. If construction can be restricted to July 1-October 15 a NE finding can be made.
New Disturbance - Construction	Stream Crossings, wet ditch	Neutral	None						NE	This method of crossing would not be applicable to large rivers.
New Disturbance - Construction	Stream Crossings, dry ditch	Neutral	None						NE	This method of crossing would not be applicable to large rivers.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Temporary loss of occupied habitat, Physical impacts to individuals, Habitat degradation and water quality degradation, reduction of prey population	Sedimentation, altered flow, contaminants, impoundment, noise	tributary and near stream earth disturbance may result in increased sedimentation altered flow may result in increased sedimentation, contaminant spills from equipment located in tributary stream, dam could restrict up/down stream movement of species, noise from in water work	Discountable				NLAA	This section of the river is only crossed via HDD
New Disturbance - Construction	Stream Crossings, dam & pump	Temporary loss of occupied habitat, Physical impacts to individuals, Habitat degradation and water quality degradation, reduction of prey population	Sedimentation, altered flow, contaminants, impoundment, noise	tributary and near stream earth disturbance may result in increased sedimentation altered flow may result in increased sedimentation, contaminant spills from equipment located in tributary stream, dam could restrict up/down stream movement of species, noise from in water work	Discountable				NLAA	This section of the river is only crossed via HDD
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Water quality degradation, Physical Impacts to Individuals, reduction of prey population	Sedimentation, Frac-out, Noise	tributary, near and in stream earth disturbance may result in increased sedimentation, risk of frac-out during drilling operations, noise from drilling activities	Life stages and Habitat; Population, Individuals	none expected			NLAA	This activity may contribute minor sediments to the river; major disturbances are extremely unlilely to occur.
New Disturbance - Construction	Stream Equipment Crossing Structures	Neutral	None						NE	This method of crossing would not be applicable to large rivers.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Neutral	None						NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Neutral	None						NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Neutral	None						NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Neutral	None						NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Neutral	None						NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Neutral	None						NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.
New Disturbance - Construction	Storage wells - clearing and drilling	Neutral	None						NE	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.
New Disturbance - Construction	Storage wells - reconditioning	Neutral	None						NE	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.
New Disturbance - Construction	Storage wells - waste pits	Neutral	None						NE	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.

Table J. Analysis of effects on Roanoke logperch.

SPECIES:	**Roanoke Logperch (*Percina rex*)**											
Pipeline Activity	**Subactivity**	**Environmental Impact or Threat**	**Stressor**	**Stressor Pathway (optional)**	**Exposure (Resource Affected)**	**Range of Response**	**Conservation Need Affected**	**Demographic Consequences**	**Conservation Measures (Mandatory)[1]**	**Conservation Measures (Non-Mandatory)[1]**	**NE, NLAA or LAA**	**Comments**
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Habitat degradation, Water quality degradation	Sedimentation, Contaminants	Stormwater runoff from pollution generating pavement, Stormwater erosion	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,4,8	19	LAA	AMMs 2, 4, and 8 reduce the probability and magnitude of impacts - aggregate take. AMM 19 precludes driving across occupied habitat and would eliminate crushing and habitat impacts from that activity when implemented.
Operation & Maintenance	Vegetation Management - mowing	Neutral	None		discountable						NLAA	No impacts to stream habitats are anticipated from this action (ECS II).
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Sedimentation, Increase in Water Temperatures, Decrease of dissolved oxygen	denuding bank, grubbing with heavy equipment, disturbing soil, water quality degradation since vegetation no longer provides shade to stream	Habitat, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	ECS erosion control measures (restoration in graded areas, and establishment of an undisturbed riparian buffer along streams during vegetation maintenance) reduces the potential impact of this activity; This is considered an aggregate sediment / temperature impact.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Chemical Contaminants	direct exposure to chemicals from spills and stormwater runoff	Habitat, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2, 16		LAA	This is considered an aggregate sediment / contaminant impact with AMMs 2 and16 in place. Recommend developing a list of approved herbicides (note herbicides mixtures may contain surfactants and other potentially harmful constituents)
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	Habitat degradation, Water quality degradation	Minor sedimentation, Lowered dissolved oxygen, Contaminants	tributary and/or near stream earth disturbance can cause minor increase in sedimentation , Storm water runoff, fertilizers used in revegeation can cause algae blooms which will lower dissolved oxygen	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,16		LAA	ECS erosion control measures reduces the potential impact of this activity; however this species habitat is highly susceptible to sedimentation effects; This is considered an aggregate sediment impact.; AMM 19 precludes driving across occupied habitat and would eliminate crushing and habitat impacts from that activity when implemented.
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	Permanent or temporary loss of habitat, Habitat degradation, Water quality degradation, Physical impacts to individuals, Reduction of prey	Minor sedimentation, Lowered dissolved oxygen, Contaminants	tributary and/or near stream earth disturbance can cause minor increase in sedimentation , Storm water runoff, fertilizers used in revegeation can cause algae blooms which will lower dissolved oxygen, Equipment located in connected wetland can increase chance of spills	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	ECS erosion control measures reduces the potential impact of this activity; however this species habitat is highly susceptible to sedimentation effects. This is considered an aggregate sediment impact; recommend using a severe weather avoidance AMM.
Operation & Maintenance	ROW repair, regrading, revegetation - instream stabilization and/or fill	Permanent or temporary loss of habitat, Habitat degradation, Water quality degradation, Physical impacts to individuals, Reduction of prey	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 3, 5, 7, 8, 13, 14, 20.	6	LAA	AMMs 2, 3, 5, 7, 8, 13, 14, and 20 and non-mandatory AMM 6 reduce the impact of this activity. Aggregate take from Instream stabilization and fill could involve rebuilding/relocating channel segments where erosion has caused damage indirectly affecting mussels (AMM # 5 specifically requires no take therefore no direct take).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
Operation & Maintenance	Access Road Maintenance - grading, graveling	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants (fuels and chemicals)	Wind or storm water erosion	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II and V would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects; This is considered an aggregate sediment impact.
Operation & Maintenance	Access Road Maintenance - culvert replacement	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work, minor noise from construction activities in water.	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2	9	LAA	Impact could be reduced to NE through implementation of BMP 9, which would avoid culvert placement in occupied habitat; This is considered an aggregate sediment impact.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Sedimentation, Increase in Water Temperatures, Decrease of dissolved oxygen	denuding bank, grubbing with heavy equipment, disturbing soil, water quality degradation since vegetation no longer provides shade to stream	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. In addition the ECS outlines the use of erosion control measures and restoration of graded areas. A NLAA finding can be made with the Implementation of listed BMP.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population	Sedimentation, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation, altered flow result in increased sedimentation and short-term impoundment, contaminant spills from equipment located in-stream and tributary, noise from in water work	habitat, individuals	none expected					NLAA	This specific activity should cause only very minimal impacts.
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Pipeline Abandonment - removal	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population	Sedimentation, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation, altered flow result in increased sedimentation and short-term impoundment, contaminant spills from equipment located in-stream and tributary, noise from in water work	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,7,10,13, 20	6, 9, 12	LAA	With implementation of AMM 12 in potentially occupied areas, impacts would likely be reduced to NE. BMP 12 would require the pipeline to be abandoned in place, thereby avoiding construction, sedimentation, and restoration impacts.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Habitat degradation, Water quality degradation	Minor sedimentation, Lowered dissolved oxygen, Contaminants	tributary and/or near stream earth disturbance can cause minor increase in sedimentation , Storm water runoff, fertilizers used in revegeation can cause algae blooms which will lower dissolved oxygen	Habitat, Population, Individuals	none expected			2,15		LAA	ECS measures will minimize impacts through erosion control and restoration of graded areas; In addition, the ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. If implementation of the listed BMP's occur, a NLAA finding can be made.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Habitat degradation, Water quality degradation	Minor sedimentation, Lowered dissolved oxygen, Contaminants	tributary and/or near stream earth disturbance can cause minor increase in sedimentation , Storm water runoff, fertilizers used in revegeation can cause algae blooms which will lower dissolved oxygen	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II and V would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects; This is considered an aggregate sediment impact.
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Inspection Activities - ground and aerial	Neutral	None		Unlikely						NLAA	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Reduction of prey population, Physical impacts to individuals	Sedimentation and increased turbidity	Erosion from lack of vegetation	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Increased potential from erosion due to vegetation clearing is considered LAA, because of risk of sedimentation and species' high susceptibility to these effects.; This is considered an aggregate sediment impact; if a a 25' undisturbed riparian buffer in presumed habitat is maintianed, could lower impact to NLAA.
New Disturbance - Construction	Clearing - trees and shrubs	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Sedimentation, Increase in Water Temperatures, Decrease of dissolved oxygen	denuding bank, grubbing with heavy equipment, disturbing soil, water quality degradation since vegetation no longer provides shade to stream	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Increased potential from erosion due to vegetation clearing is considered LAA, because of risk of sedimentation and species' high susceptibility to these effects.; This is considered an aggregate sediment impact; if a a 25' undisturbed riparian buffer in presumed habitat is maintianed, could lower impact to NLAA.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Vegetation Disposal (upland) - hauling (**driving across stream**)	Physical Impacts to Individuals, Habitat degradation,	Crushing, Sedimentation, Chemical Contaminants,	Impacts from trucks driving across stream, crushing individuals, sediment in water column, potential comtaminants from vehicles	All Mussell Life stages and habitat; Host Fish habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction (reduced recruitment, feeding, breeding, displacement, sheltering)	2	19	LAA	Hauling could involve driving across streams and therefore impacts to mussels - if AMM 19 is implemented this goes to NE.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Habitat degradation and water quality degradation, stress on eggs,	Increase in Water Temperatures, Decrease of dissolved oxygen	habitat and water quality degradation since vegetation no longer provides shade to stream	Habitat,	none expected					NLAA	Establishment of a 25' undisturbed riparian buffer may lower impact to NE.
New Disturbance - Construction	Grading, erosion control devices	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation, Water Quality Impacts (increased turbidity)	Wind or storm water erosion	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of AMMs 12-14 move this subactivity to NLAA.
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population	Sedimentation,, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation, altered flow result in increased sedimentation and short-term impoundment, contaminant spills from equipment located in-stream and tributary, noise from in water work	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		NLAA	Contaminant spill impacts should be minimal if BMPs outlined in the ECS are followed.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population	Sedimentation,, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation, altered flow result in increased sedimentation and short-term impoundment, contaminant spills from equipment located in-stream and tributary, noise from in water work	habitat	none expected					NLAA	These impacts are limited to laying the pipe only, impacts from new pipelines are covered in other subactivities.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Temporary loss of habitat, Habitat degradation	Minor sedimentation, Altered flow	Withdrawal and discharge of water	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,17,20		LAA	AMM 17 does not preclude taking water from an occupied stream, however, its provisions do move this ito minor / aggregate impacts.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	Temporary loss of habitat, Habitat degradation	Minor sedimentation, Altered flow	Withdrawal and discharge of water	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,18,20		LAA	Aggregate sediment and contaminant impacts.
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Permanent or temporary loss of habitat, Habitat degradation, Water quality degradation, Physical impacts to individuals, Reduction of prey	Minor sedimentation, Lowered dissolved oxygen, Contaminants	tributary and/or near stream earth disturbance can cause minor increase in sedimentation , Storm water runoff, fertilizers used in revegeation can cause algae blooms which will lower dissolved oxygen,	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2,16		LAA	AMMs reduce impacts, but any ground disturbance that may result in sedimentation in occupied habitat is considered LAA; This is considered an aggregate sediment impact.
New Disturbance - Construction	Compression Facility, noise	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population	Sedimentation, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation, altered flow result in increased sedimentation and short-term impoundment, contaminant spills from equipment located in-stream and tributary, noise from in water work	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2, 7, 10, 20	9	LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the AMMs 2,13,16 result in lower impact; This is considered an aggregate sediment impact.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work, minor noise from construction activities in water.	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of AMM 9 may result in lower impact (NLAA or NE).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, wet ditch	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work, minor noise from construction activities in water.	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 4, 5, 10, 20	9	LAA	Implementation of AMM 9 may result in lower impact (NLAA or NE).
New Disturbance - Construction	Stream Crossings, dry ditch	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work, minor noise from construction activities in water.	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 4, 5, 10, 20	AMM 9	LAA	

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Temporary loss of occupied habitat, Physical impacts to individuals, Habitat degradation and water quality degradation, reduction of prey population	Sedimentation, altered flow, contaminants, impoundment, noise	tributary and near stream earth disturbance may result in increased sedimentation altered flow may result in increased sedimentation, contaminant spills from equipment located in tributary stream, dam could restrict up/down stream movement of species, noise from in water work	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 4, 5, 10, 20	9	LAA	Implementation of AMM 9 may result in lower impact (NLAA or NE).
New Disturbance - Construction	Stream Crossings, dam & pump	Temporary loss of occupied habitat, Physical impacts to individuals, Habitat degradation and water quality degradation, reduction of prey population	Sedimentation, altered flow, contaminants, impoundment, noise	tributary and near stream earth disturbance may result in increased sedimentation altered flow may result in increased sedimentation, contaminant spills from equipment located in tributary stream, dam could restrict up/down stream movement of species, noise from in water work	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	AMMs 2, 4, 5, 10, 20	9	LAA	Implementation of AMM 9 may result in lower impact (NLAA or NE).
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Water quality degradation, Physical Impacts to Individuals, reduction of prey population	Sedimentation, Frac-out, Noise	tributary, near and in stream earth disturbance may result in increased sedimentation, risk of frac-out during drilling operations, noise from drilling activities	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2,3,13		LAA	Implementation of AMMs 2,3,13 result in lower impact.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Equipment Crossing Structures	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work, minor noise from construction activities in water.	discountable						NLAA	No effect is anticipated from this activity (note impacts are evaluated under and as part of construction activities, no individual impacts)
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Activity is not located in streams or rivers. Non-riparian wetland activity should not affect occupied habitat.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Activity is not located in streams or rivers. Non-riparian wetland activity should not affect occupied habitat.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Activity is not located in streams or rivers. Non-riparian wetland activity should not affect occupied habitat.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Activity is not located in streams or rivers. Non-riparian wetland activity should not affect occupied habitat.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Activity is not located in streams or rivers. Non-riparian wetland activity should not affect occupied habitat.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Activity is not located in streams or rivers. Non-riparian wetland activity should not affect occupied habitat.
New Disturbance - Construction	Storage wells - clearing and drilling	Neutral	None								NE	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.
New Disturbance - Construction	Storage wells - reconditioning	Neutral	None								NE	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.
New Disturbance - Construction	Storage wells - waste pits	Neutral	None								NE	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments

Notes:

[1] These Conservation Measures were developed as AMMs for HCP mussels. NiSource has comitted to apply these AMMs more broadly to the other aquatic species within the covered lands that may be affected by their activities.

Conservation Measures for roanoke logperch (italics indicate non-mandatory measures).

Pre-Construction Planning: Preparation of an Environmental Management & Construction Plan

2. A detailed Environmental Management & Construction Plan (EM&CP) will be prepared for any activity with potential effects within 100 feet of the ordinary high water mark of known or presumed habitat. The plan will incorporate the relevant requirements of the NGTS ECS and include site-specific details particular to the project area and potential impact. The waterbody crossing will be considered as "high-quality" for the purpose of preparing this plan regardless of the actual classification. The plan will be strongly oriented towards minimizing stream bed and riparian disturbance (including minimization of tree clearing within 25 feet of the crossing [Figure 24, ECS]), preventing downstream sedimentation (including redundant erosion and sediment control devices which would be designed to protect resources as appropriate), and weather monitoring by the Environmental Inspector to ensure work is not begun with significant precipitation in the forecast. The plan will comprehensively address all activities needed to complete the work and strive to avoid the take of these species in occupied habitat. The EM&CP will include the frac-out avoidance and contingency plans described in AMM #3 below. The EM&CP will also include a sediment control component for uplands reasonably likely to drain to and impact occupied habitat. Emphasis will be placed on developing detailed erosion control plans specific to slopes greater than 30 percent leading directly to occupied habitat. The plan will be approved in writing by NiSource NRP personnel prior to project implementation and will include a tailgate training session for all on-site project personnel to highlight the environmental sensitivity of the habitat and any BMPs that must be implemented.

Stream Bed Construction

3. For activities in known or presumed occupied habitat, consider installing new or replacement pipelines and utility lines and performing major repairs under the river bottom using horizontal directional drilling (HDD) or other trenchless methods rather than open trenching. Drilling should be carefully undertaken and a plan should be in place to minimize and address the risk of in-stream disturbance due to frac-outs. The plan should also specifically reference roanoke logperch in the vicinity of the crossing as a key conservation concern and include specific measures identified in the ECS, from standard industry practices, or other mutually agreed upon practices to protect this resource. The plan will also include a frac-out impact avoidance plan which will evaluate the site in terms not only of feasibility of conducting HDD, but likelihood of large scale frac-out and its effects on the species, and actions to address a large scale frac-out in occupied habitat. If, after detailed engineering studies (e.g., geotechnical, physiological, topographical, and economic studies), it is determined (and agreed to by NRP) that HDD is not feasible, a report will be prepared and included in the annual report submitted to the Service.

4. Install pipeline to the minimum depth described in the ECS and maintain that depth at least 10 feet past the high water line to avoid exposure of pipeline by anticipated levels of erosion based on geology and watershed character. Additional distance may be required should on-site conditions (i.e., outside bend in the waterbody, highly erosive stream channel, anticipated future upstream development activities in the vicinity, etc.) dictate a reasonable expectation that the stream banks could erode and expose the pipeline facilities. Less distance may be utilized if terrain or geological conditions (long, steep bank or solid rock) will not allow for a 10-foot setback. These conditions and the response thereto will be documented in the EM&CP and provided as part of the annual report to the Service.

5. For major repairs in known or presumed occupied habitat, do not install in-channel repairs (bendway weirs, hardpoints, concrete mats, fill for channel relocation, or other channel disturbing measures).

6. Conduct replacements/repairs from a lay barge or temporary work bridges of the minimum length necessary to conduct the replacements/repairs rather than operating heavy equipment (e.g., backhoes, bulldozers) in-stream.

7. Remove equipment bridges as soon as practicable after repair work and any site restoration is completed.

8. As part of the routine pipeline inspection patrols, visually inspect all stream crossings in known or presumed occupied waterbodies for indications of significant erosion or bank destabilization associated with or affecting the pipeline crossing. If such bank destabilization is observed, it will be corrected in accordance with the ECS. Follow-up inspections and restabilization will continue until the bank is stabilized (generally two growing seasons)

Stream Bank Conservation

9. Do not construct culvert and stone access roads and appurtenances (including equipment crossing) across the waterbody or within the riparian zone. Temporary equipment crossings utilizing equipment pads or other methods that span the waterbody are acceptable provided that in-stream pipe supports are not needed.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments

10. For equipment crossings of small streams, use half pipes of sufficient number and size that both minimize impacts to stream bed and minimize flow disruption to both upstream and downstream habitat.

Travel for O&M Activities

11. Do not drive across known or presumed occupied streams – walk these areas or visually inspect from bank and use closest available bridge to cross stream.

Pipeline Abandonment

12. Abandon pipelines in place to avoid in-stream disturbance that would result from pipeline removal.

Contaminants

13. As described in the ECS section on "Spill Prevention, Containment and Control," site staging areas for equipment, fuel, materials, and personnel at least 300 feet from the waterway, if available, to reduce the potential for sediment and hazardous spills entering the waterway. If sufficient space is not available, a shorter distance can be used with additional control measures (e.g., redundant spill containment structures, on-site staging of spill containment/clean-up equipment and materials).

14. Ensure all imported fill material is free from contaminants that could affect the species population or known or presumed occupied waterbody habitat.

15. Reserved

13. As described in the ECS section on "Spill Prevention, Containment and Control," site staging areas for equipment, fuel, materials, and personnel at least 300 feet from the waterway, if available, to reduce the potential for sediment and hazardous spills entering the waterway. If sufficient space is not available, a shorter distance can be used with additional control measures (e.g., redundant spill containment structures, on-site staging of spill containment/clean-up equipment and materials).

17. Prepare a site specific stormwater management plan and spill pollution prevention plan to reduce the potential for non-point source pollution entering occupied streams.

Withdrawal and Discharge of Water

18. Do not draw hydrostatic test water from or discharge water directly into occupied habitat.

19. Use best available water withdrawal/discharge impact avoidance techniques (low rate, screens, avoid known or presumed occupied areas to extent practical, do not vacuum up sediments, low rate of discharge to avoid scouring or erosion, discharge into upland area that does not allow water to flow overland into occupied streams or tributaries).

Exotic Species

20. Clean all equipment (including pumps, hoses, etc.) that have (1) been in a perennial waterbody for more than four hours within the previous seven days and (2) will work in occupied or potential federally listed habitat for more than four hours; following established guidelines to remove exotic or invasive species before entering a known or presumed occupied stream for a federally listed species which is not known to be infested with invasive species. It is important to follow these guidelines even if work is not occurring in the immediate vicinity of this species since, once introduced into a watershed, invasive species could move and eventually affect the federally listed species.

Table K. Analysis of effects on spotfin chub.

SPECIES: spotfin chub (*Erimonax monachus*)

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Habitat degradation, Water quality impacts	Sedimentation and increased turbidity, Contaminants	Wind or storm water erosion, Storm water runoff from impermeable areas	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,4,8	19	LAA	AMMs 2, 4, and 8 reduce the probability and magnitude of impacts - aggregate take. AMM 19 precludes driving across occupied habitat and would eliminate crushing and habitat impacts from that activity when implemented.
Operation & Maintenance	Vegetation Management - mowing	Habitat degradation	Minor increased sedimentation and turbidity	Erosion from cleared areas outside of riparian buffer	discountable						NLAA	ECS erosion control measures (restoration in graded areas, and establishment of an undisturbed riparian buffer along streams during vegetation maintenance) redueces the potential impact of this activity.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Habitat degradation	Minor sedimentation and increased turbidity	Wind or storm water erosion from cleared areas outside of riparian buffer	Habitat, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	ECS erosion control measures (restoration in graded areas, and establishment of an undisturbed riparian buffer along streams during vegetation maintenance) reduces the potential impact of this activity; This is considered an aggregate sediment / temperature impact.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	Habitat degradation	Chemical Contaminants	Storm water runoff	Habitat, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2, 16		LAA	This is considered an aggregate sediment / contaminant impact with AMMs 2 and16 in place. Recommend developing a list of approved herbicides (note herbicides mixtures may contain surfactants and other potentially harmful constituents)
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	Habitat degradation, Water quality impacts	Minor sedimentation and increased turbidity, Lowered dissolved oxygen, Contaminants (fertilizers and chemicals used in revegetation)	Wind or storm water erosion, Storm water runoff, Algae blooms	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,16		LAA	ECS erosion control measures reduces the potential impact of this activity; however this species habitat is highly susceptible to sedimentation effects; This is considered an aggregate sediment impact.; AMM 19 precludes driving across occupied habitat and would eliminate crushing and habitat impacts from that activity when implemented.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	Permanent or temporary loss of habitat, Habitat degradation, Water quality impacts; Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants (fertilizers and chemicals used in revegetation)	Wind or storm water erosion, Storm water runoff, Algae blooms, Surface water connections between wetlands and occupied habitat	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	ECS erosion control measures reduces the potential impact of this activity; however this species habitat is highly susceptible to sedimentation effects. This is considered an aggregate sediment impact; recommend using a severe weather avoidance AMM.
Operation & Maintenance	ROW repair, regrading, revegetation - instream stabilization and/or fill	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants (fertilizers and chemicals used in revegetation, fuels), Fill in stream, Noise	Wind and/or storm water erosion; Algae blooms, Equipment in stream, Fill placed in stream	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 3, 5, 7, 8, 13, 14, 20.	6	LAA	AMMs 2, 3, 5, 7, 8, 13, 14, and 20 and non-mandatory AMM 6 reduce the impact of this activity. Aggregate take from Instream stabilization and fill could involve rebuilding/relocating channel segments where erosion has caused damage indirectly affecting mussels (AMM # 5 specifically requires no take therefore no direct take).
Operation & Maintenance	Access Road Maintenance - grading, graveling	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants (fuels and chemicals)	Wind or storm water erosion	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II and V would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects; This is considered an aggregate sediment impact.
Operation & Maintenance	Access Road Maintenance - culvert replacement	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Impoundment, Contaminants, Disturbance, Altered flow, Noise	Wind or storm water erosion; Equipment placed in stream; In-stream construction	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2	9	LAA	Impact could be reduced to NE through implementation of BMP 9, which would avoid culvert placement in occupied habitat; This is considered an aggregate sediment impact.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	Habitat degradation	Minor sedimentation and increased turbidity	Wind or storm water erosion from cleared areas outside of riparian buffer	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	This is considered an aggregate sediment impact.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation	Wind or storm water erosion	habitat, individuals	none expected					NLAA	This specific activity should cause only very minimal impacts.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Pipeline Abandonment - removal	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Disturbance	Wind or storm water erosion; Equipment/materials in stream; In-stream construction	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,7,10,13, 20	6, 9, 12	LAA	With implementation of AMM 12 in potentially occupied areas, impacts would likely be reduced to NE. BMP 12 would require the pipeline to be abandoned in place, thereby avoiding construction, sedimentation, and restoration impacts.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation, Contaminants (fertilizers and chemicals used in revegetation)	Wind or storm water erosion, algae blooms	Habitat, Population, Individuals	none expected			2,15		NLAA	NLAA because of implementation of AMMs 2 and 15. Wells can be close to streams within floodplain, consider LAA.
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Habitat degradation, Water quality impacts, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Lowered dissolved oxygen, Contaminants (fertilizers and chemicals used in revegetation)	Wind or storm water erosion, algae blooms	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II and V would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects; This is considered an aggregate sediment impact.
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Inspection Activities - ground and aerial	Neutral	None		Unlikely						NLAA	Implementation of the listed suggested AMM 19 may result in lower impact (NLAA).
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Reduction of prey population, Physical impacts to individuals	Sedimentation and increased turbidity	Erosion from lack of vegetation	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Increased potential from erosion due to vegetation clearing is considered LAA, because of risk of sedimentation and species' high susceptibility to these effects.; This is considered an aggregate sediment impact; if a a 25' undisturbed riparian buffer in presumed habitat is maintianed, could lower impact to NLAA.
New Disturbance - Construction	Clearing - trees and shrubs	Habitat degradation, Water quality impacts, Reduction of prey population, Physical impacts to individuals	Sedimentation and increased turbidity, Raised water temperatures, Lowered dissolved oxygen	Erosion from lack of vegetation, removal of riparian vegetation that provides shade to stream	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Increased potential from erosion due to vegetation clearing is considered LAA, because of risk of sedimentation and species' high susceptibility to these effects.; This is considered an aggregate sediment impact; if a a 25' undisturbed riparian buffer in presumed habitat is maintianed, could lower impact to NLAA.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Vegetation Disposal (upland) - hauling (**driving across stream**)	Physical Impacts to Individuals, Habitat degradation,	Crushing, Sedimentation, Chemical Contaminants,	Impacts from trucks driving across stream, crushing individuals, sediment in water column, potential comtaminants from vehicles	All Mussell Life stages and habitat; Host Fish habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction (reduced recruitment, feeding, breeding, displacement, sheltering)	2	19	LAA	Hauling could involve driving across streams and therefore impacts to mussels - if AMM 19 is implemented this goes to NE.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Habitat degradation and loss, Water quality impacts	Increased water temperatures, Lowered dissolved oxygen	Removal of riparian vegetation that provided shade to stream	Habitat,	none expected					NLAA	No impacts are anticipated from this activity.
New Disturbance - Construction	Grading, erosion control devices	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation, Water Quality Impacts (increased turbidity)	Wind or storm water erosion	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of AMMs 12-14 move this subactivity to NLAA.
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Disturbance	Wind or storm water erosion, Equipment placed in stream, In-stream construction	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of AMMs 2,3,4,&11 move this subactivity to NLAA.
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity Contaminants, Disturbance	Altered flow results in sedimentation, Equipment placed in stream, In-stream construction	habitat	none expected					NLAA	Theses impacts are limited to laying the pipe only, impacts from new pipelines are covered in other subactivities.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Temporary loss of habitat, Habitat degradation	Altered flow, Increased turbidity, Entrapment during withdrawal	Withdrawal and discharge of water	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,17,20		LAA	AMM 17 does not preclude taking water from an occupied stream, however, its provisions do move this ito minor / aggregate impacts.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	Temporary loss of habitat, Habitat degradation	Altered flow, Increased turbidity, Entrapment during withdrawal	Withdrawal and discharge of water	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,18,20		LAA	Aggregate sediment and contaminant impacts. Work with applicant to revise AMM # 20 (see material from Bob Anderson 11/2010).
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity Contaminants	Wind or storm water erosion; Equipment use in proximity to stream, Storm water runoff of contaminants used during construction (fuels) and restoration (fertilizers), Algae blooms	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2,16		LAA	AMMs reduce impacts, but any ground disturbance that may result in sedimentation in occupied habitat is considered LAA; This is considered an aggregate sediment impact.
New Disturbance - Construction	Compression Facility, noise	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants	Wind or storm water erosion; Equipment use in proximity to stream, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2, 7, 10, 20	9	LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the AMMs 2,13,16 result in lower impact; This is considered an aggregate sediment impact.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Altered flow, Contaminants, Impoundment	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of AMM 9 may result in lower impact (NLAA or NE).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, wet ditch	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Altered flow, Noise, Impoundment	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 4, 5, 10, 20	9	LAA	Implementation of AMM 9 may result in lower impact (NLAA or NE).
New Disturbance - Construction	Stream Crossings, dry ditch	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Altered flow, Noise, Impoundment	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 4, 5, 10, 20	AMM 9	LAA	Impacts may be reduced to NLAA through implementation of the listed suggested BMPs.
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Altered flow, Noise, Impoundment	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 4, 5, 10, 20	9	LAA	Implementation of AMM 9 may result in lower impact (NLAA or NE).
New Disturbance - Construction	Stream Crossings, dam & pump	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Altered flow, Noise, Impoundment	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	AMMs 2, 4, 5, 10, 20	9	LAA	Implementation of AMM 9 may result in lower impact (NLAA or NE).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Altered flow, Noise	Frac-out, Wind or storm water erosion, Near stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2,3,13		LAA	Implementation of AMMs 2,3,13 result in lower impact.
New Disturbance - Construction	Stream Equipment Crossing Structures	none	neutral								NE	No effect is anticipated from this activity (note impacts are evaluated under and as part of construction activities, no individual impacts)
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Storage wells - clearing and drilling	Neutral	None								NE	There are no storage well counties in or near habitat.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Storage wells - reconditioning	Neutral	None								NE	There are no storage well counties in or near habitat.
New Disturbance - Construction	Storage wells - waste pits	Neutral	None								NE	There are no storage well counties in or near habitat.

Notes:
[1] These Conservation Measures were developed as AMMs for HCP mussels. NiSource has comitted to apply these AMMs more broadly to the other aquatic species within the covered lands that may be affected by their activities.

Conservation Measures for spotfin chub (italics indicate non-mandatory measures).

Pre-Construction Planning: Preparation of an Environmental Management & Construction Plan

2. A detailed Environmental Management & Construction Plan (EM&CP) will be prepared for any activity with potential effects within 100 feet of the ordinary high water mark of known or presumed habitat. The plan will incorporate the relevant requirements of the NGTS ECS and include site-specific details particular to the project area and potential impact. The waterbody crossing will be considered as "high-quality" for the purpose of preparing this plan regardless of the actual classification. The plan will be strongly oriented towards minimizing stream bed and riparian disturbance (including minimization of tree clearing within 25 feet of the crossing [Figure 24, ECS]), preventing downstream sedimentation (including redundant erosion and sediment control devices which would be designed to protect resources as appropriate), and weather monitoring by the Environmental Inspector to ensure work is not begun with significant precipitation in the forecast. The plan will comprehensively address all activities needed to complete the work and strive to avoid the take of these species in occupied habitat. The EM&CP will include the frac-out avoidance and contingency plans described in AMM #3 below. The EM&CP will also include a sediment control component for uplands reasonably likely to drain to and impact occupied habitat. Emphasis will be placed on developing detailed erosion control plans specific to slopes greater than 30 percent leading directly to occupied habitat. The plan will be approved in writing by NiSource NRP personnel prior to project implementation and will include a tailgate training session for all on-site project personnel to highlight the environmental sensitivity of the habitat and any BMPs that must be implemented.

Stream Bed Construction

3. For activities in known or presumed occupied habitat, consider installing new or replacement pipelines and utility lines and performing major repairs under the river bottom using horizontal directional drilling (HDD) or other trenchless methods rather than open trenching. Drilling should be carefully undertaken and a plan should be in place to minimize and address the risk of in-stream disturbance due to frac-outs. The plan should also specifically reference roanoke logperch in the vicinity of the crossing as a key conservation concern and include specific measures identified in the ECS, from standard industry practices, or other mutually agreed upon practices to protect this resource. The plan will also include a frac-out impact avoidance plan which will evaluate the site in terms not only of feasibility of conducting HDD, but likelihood of large scale frac-out and its effects on the species, and actions to address a large scale frac-out in occupied habitat. If, after detailed engineering studies (e.g., geotechnical, physiological, topographical, and economic studies), it is determined (and agreed to by NRP) that HDD is not feasible, a report will be prepared and included in the annual report submitted to the Service.

4. Install pipeline to the minimum depth described in the ECS and maintain that depth at least 10 feet past the high water line to avoid exposure of pipeline by anticipated levels of erosion based on geology and watershed character. Additional distance may be required should on-site conditions (i.e., outside bend in the waterbody, highly erosive stream channel, anticipated future upstream development activities in the vicinity, etc.) dictate a reasonable expectation that the stream banks could erode and expose the pipeline facilities. Less distance may be utilized if terrain or geological conditions (long, steep bank or solid rock) will not allow for a 10-foot setback. These conditions and the response thereto will be documented in the EM&CP and provided as part of the annual report to the Service.

5. For major repairs in known or presumed occupied habitat, do not install in-channel repairs (bendway weirs, hardpoints, concrete mats, fill for channel relocation, or other channel disturbing measures).

6. Conduct replacements/repairs from a lay barge or temporary work bridges of the minimum length necessary to conduct the replacements/repairs rather than operating heavy equipment (e.g., backhoes, bulldozers) in-stream.

7. Remove equipment bridges as soon as practicable after repair work and any site restoration is completed.

8. As part of the routine pipeline inspection patrols, visually inspect all stream crossings in known or presumed occupied waterbodies for indications of significant erosion or bank destabilization associated with or affecting the pipeline crossing. If such bank destabilization is observed, it will be corrected in accordance with the ECS. Follow-up inspections and restabilization will continue until the bank is stabilized (generally two growing seasons)

Stream Bank Conservation

9. Do not construct culvert and stone access roads and appurtenances (including equipment crossing) across the waterbody or within the riparian zone. Temporary equipment crossings utilizing equipment pads or other methods that span the waterbody are acceptable provided that in-stream pipe supports are not needed.

10. Use half pipes of sufficient number and size that both minimize impacts to stream bed and minimize flow disruption to both upstream and downstream habitat.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments

Timing Restrictions to Minimize Impact to Reproducing Populations

11. Impacts to this species' reproductive period will be avoided by avoiding in-water construction or implementing an HDD from April 15 to August 31.

Pipeline Abandonment

12. Abandon pipelines in place to avoid in-stream disturbance that would result from pipeline removal.

Contaminants

13. As described in the ECS section on "Spill Prevention, Containment and Control," site staging areas for equipment, fuel, materials, and personnel at least 300 feet from the waterway, if available, to reduce the potential for sediment and hazardous spills entering the waterway. If sufficient space is not available, a shorter distance can be used with additional control measures (e.g., redundant spill containment structures, on-site staging of spill containment/clean-up equipment and materials).

14. Ensure all imported fill material is free from contaminants that could affect the species population or known or presumed occupied waterbody habitat.

15. *Reserved*

16. Avoid use fertilizers or herbicides within 100 feet of known or presumed occupied habitat. Fertilizer and herbicides will not be applied if weather (e.g., impending storm) or other conditions (e.g., faulty equipment) would compromise the ability of NiSource or its contractors to apply the fertilizer or herbicide without impacting presumed occupied habitat. The EM&CP prepared for this activity (AMM# 2 above) will document relevant guidelines for application.

Withdrawal and Discharge of Water

17. Do not draw hydrostatic test water from or discharge water directly into known or presumed occupied habitat.

18. Use best available water withdrawal/discharge impact avoidance techniques (low rate, screens, avoid known or presumed occupied areas to extent practical, do not vacuum up sediments, low rate of discharge to avoid scouring or erosion, discharge into upland area that does not allow water to flow overland into occupied streams or tributaries, avoid discharge of invasive aquatic species into sub-watersheds of known or presumed occupied streams). Confirm that the water source is not contaminated with invasive aquatic species.

Travel for O&M Activities

19. Do not drive across known or presumed occupied streams – walk these areas or visually inspect from bank and use closest available bridge to cross stream.

Exotic Species

20. Clean all equipment (including pumps, hoses, etc.) that have (1) been in a perennial waterbody for more than four hours within the previous seven days and (2) will work in occupied or potential federally listed habitat for more than four hours; following established guidelines to remove exotic or invasive species before entering a known or presumed occupied stream for a federally listed species which is not known to be infested with invasive species. It is important to follow these guidelines even if work is not occurring in the immediate vicinity of this species since, once introduced into a watershed, invasive species could move and eventually affect the federally listed species.

Table L. Analysis of effects on Kentucky arrow darter.

SPECIES: Kentucky arrow darter (*Etheostoma sagitta*)

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Habitat degradation, Water quality impacts	Sedimentation and increased turbidity, Contaminants	Wind or storm water erosion, Storm water runoff from impermeable areas	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,4,8	19	LAA	AMMs 2, 4, and 8 reduce the probability and magnitude of impacts - aggregate take. AMM 19 precludes driving across occupied habitat and would eliminate crushing and habitat impacts from that activity when implemented.
Operation & Maintenance	Vegetation Management - mowing	Habitat degradation	Minor increased sedimentation and turbidity	Erosion from cleared areas outside of riparian buffer	discountable						NLAA	ECS erosion control measures (restoration in graded areas, and establishment of an undisturbed riparian buffer along streams during vegetation maintenance) redueces the potential impact of this activity.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Habitat degradation	Minor sedimentation and increased turbidity	Wind or storm water erosion from cleared areas outside of riparian buffer	Habitat, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	ECS erosion control measures (restoration in graded areas, and establishment of an undisturbed riparian buffer along streams during vegetation maintenance) reduces the potential impact of this activity; This is considered an aggregate sediment / temperature impact.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	Habitat degradation	Chemical Contaminants	Storm water runoff	Habitat, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2, 16		LAA	This is considered an aggregate sediment / contaminant impact with AMMs 2 and16 in place. Recommend developing a list of approved herbicides (note herbicides mixtures may contain surfactants and other potentially harmful constituents)
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	Habitat degradation, Water quality impacts	Minor sedimentation and increased turbidity, Lowered dissolved oxygen, Contaminants (fertilizers and chemicals used in revegetation)	Wind or storm water erosion, Storm water runoff, Algae blooms	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,16		LAA	ECS erosion control measures reduces the potential impact of this activity; however this species habitat is highly susceptible to sedimentation effects; This is considered an aggregate sediment impact.; AMM 19 precludes driving across occupied habitat and would eliminate crushing and habitat impacts from that activity when implemented.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	Permanent or temporary loss of habitat, Habitat degradation, Water quality impacts; Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants (fertilizers and chemicals used in revegetation)	Wind or storm water erosion, Storm water runoff, Algae blooms, Surface water connections between wetlands and occupied habitat	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	ECS erosion control measures reduces the potential impact of this activity; however this species habitat is highly susceptible to sedimentation effects. This is considered an aggregate sediment impact; recommend using a severe weather avoidance AMM.
Operation & Maintenance	ROW repair, regrading, revegetation - instream stabilization and/or fill	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants (fertilizers and chemicals used in revegetation, fuels), Fill in stream, Noise	Wind and/or storm water erosion; Algae blooms, Equipment in stream, Fill placed in stream	Habitat, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 3, 5, 7, 8, 13, 14, 20.	6	LAA	AMMs 2, 3, 5, 7, 8, 13, 14, and 20 and non-mandatory AMM 6 reduce the impact of this activity. Aggregate take from Instream stabilization and fill could involve rebuilding/relocating channel segments where erosion has caused damage indirectly affecting mussels (AMM # 5 specifically requires no take therefore no direct take).
Operation & Maintenance	Access Road Maintenance - grading, graveling	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants (fuels and chemicals)	Wind or storm water erosion	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II and V would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects; This is considered an aggregate sediment impact.
Operation & Maintenance	Access Road Maintenance - culvert replacement	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Impoundment, Contaminants, Disturbance, Altered flow, Noise	Wind or storm water erosion; Equipment placed in stream; In-stream construction	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2	9	LAA	Impact could be reduced to NE through implementation of BMP 9, which would avoid culvert placement in occupied habitat; This is considered an aggregate sediment impact.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	Habitat degradation	Minor sedimentation and increased turbidity	Wind or storm water erosion from cleared areas outside of riparian buffer	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2		LAA	This is considered an aggregate sediment impact.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation	Wind or storm water erosion	habitat, individuals	none expected					NLAA	This specific activity should cause only very minimal impacts.
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Pipeline Abandonment - removal	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Disturbance	Wind or storm water erosion; Equipment/materials in stream; In-stream construction	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,7,10,13, 20	6, 9, 12	LAA	With implementation of AMM 12 in potentially occupied areas, impacts would likely be reduced to NE. BMP 12 would require the pipeline to be abandoned in place, thereby avoiding construction, sedimentation, and restoration impacts.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation, Contaminants (fertilizers and chemicals used in revegetation)	Wind or storm water erosion, algae blooms	Habitat, Population, Individuals	none expected			2,15		NLAA	NLAA because of implementation of AMMs 2 and 15. Wells can be close to streams within floodplain, consider LAA.
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Habitat degradation, Water quality impacts, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Lowered dissolved oxygen, Contaminants (fertilizers and chemicals used in revegetation)	Wind or storm water erosion, algae blooms	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II and V would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects; This is considered an aggregate sediment impact.
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Inspection Activities - ground and aerial	Neutral	None		Unlikely						NLAA	Implementation of the listed suggested AMM 19 may result in lower impact (NLAA).
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Reduction of prey population, Physical impacts to individuals	Sedimentation and increased turbidity	Erosion from lack of vegetation	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Increased potential from erosion due to vegetation clearing is considered LAA, because of risk of sedimentation and species' high susceptibility to these effects.; This is considered an aggregate sediment impact; if a a 25' undisturbed riparian buffer in presumed habitat is maintianed, could lower impact to NLAA.
New Disturbance - Construction	Clearing - trees and shrubs	Habitat degradation, Water quality impacts, Reduction of prey population, Physical impacts to individuals	Sedimentation and increased turbidity, Raised water temperatures, Lowered dissolved oxygen	Erosion from lack of vegetation, removal of riparian vegetation that provides shade to stream	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Increased potential from erosion due to vegetation clearing is considered LAA, because of risk of sedimentation and species' high susceptibility to these effects.; This is considered an aggregate sediment impact; if a a 25' undisturbed riparian buffer in presumed habitat is maintianed, could lower impact to NLAA.
New Disturbance - Construction	Vegetation Disposal (upland) - hauling (**driving across stream**)	Physical Impacts to Individuals, Habitat degradation,	Crushing, Sedimentation, Chemical Contaminants,	Impacts from trucks driving across stream, crushing individuals, sediment in water column, potential comtaminants from vehicles	All Mussell Life stages and habitat; Host Fish habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction (reduced recruitment, feeding, breeding, displacement, sheltering)	2	19	LAA	Hauling could involve driving across streams and therefore impacts to mussels - if AMM 19 is implemented this goes to NE.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Habitat degradation and loss, Water quality impacts	Increased water temperatures, Lowered dissolved oxygen	Removal of riparian vegetation that provided shade to stream	Habitat,	none expected					NLAA	No impacts are anticipated from this activity.
New Disturbance - Construction	Grading, erosion control devices	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation, Water Quality Impacts (increased turbidity)	Wind or storm water erosion	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of AMMs 12-14 move this subactivity to NLAA.
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Disturbance	Wind or storm water erosion, Equipment placed in stream, In-stream construction	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of AMMs 2,3,4,&11 move this subactivity to NLAA.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity Contaminants, Disturbance	Altered flow results in sedimentation, Equipment placed in stream, In-stream construction	habitat	none expected					NLAA	Theses impacts are limited to laying the pipe only, impacts from new pipelines are covered in other subactivities.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Temporary loss of habitat, Habitat degradation	Altered flow, Increased turbidity, Entrapment during withdrawal	Withdrawal and discharge of water	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,17,20		LAA	AMM 17 does not preclude taking water from an occupied stream, however, its provisions do move this ito minor / aggregate impacts.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	Temporary loss of habitat, Habitat degradation	Altered flow, Increased turbidity, Entrapment during withdrawal	Withdrawal and discharge of water	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2,18,20		LAA	Aggregate sediment and contaminant impacts. Work with applicant to revise AMM # 20 (see material from Bob Anderson 11/2010).
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity Contaminants	Wind or storm water erosion; Equipment use in proximity to stream, Storm water runoff of contaminants used during construction (fuels) and restoration (fertilizers), Algae blooms	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2,16		LAA	AMMs reduce impacts, but any ground disturbance that may result in sedimentation in occupied habitat is considered LAA; This is considered an aggregate sediment impact.
New Disturbance - Construction	Compression Facility, noise	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None								NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants	Wind or storm water erosion; Equipment use in proximity to stream, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2, 7, 10, 20	9	LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the AMMs 2,13,16 result in lower impact; This is considered an aggregate sediment impact.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Altered flow, Contaminants, Impoundment	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2		LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of AMM 9 may result in lower impact (NLAA or NE).
New Disturbance - Construction	Stream Crossings, wet ditch	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Altered flow, Noise, Impoundment	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 4, 5, 10, 20	9	LAA	Implementation of AMM 9 may result in lower impact (NLAA or NE).
New Disturbance - Construction	Stream Crossings, dry ditch	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Altered flow, Noise, Impoundment	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 4, 5, 10, 20	AMM 9	LAA	Impacts may be reduced to NLAA through implementation of the listed suggested BMPs.
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Altered flow, Noise, Impoundment	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	2, 4, 5, 10, 20	9	LAA	Implementation of AMM 9 may result in lower impact (NLAA or NE).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, dam & pump	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Altered flow, Noise, Impoundment	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction (population bottlenecking), Range	AMMs 2, 4, 5, 10, 20	9	LAA	Implementation of AMM 9 may result in lower impact (NLAA or NE).
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	Sedimentation and increased turbidity, Contaminants, Altered flow, Noise	Frac-out, Wind or storm water erosion, Near stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	2,3,13		LAA	Implementation of AMMs 2,3,13 result in lower impact.
New Disturbance - Construction	Stream Equipment Crossing Structures	none	neutral								NE	No effect is anticipated from this activity (note impacts are evaluated under and as part of construction activities, no individual impacts)
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Habitat degradation and loss, Water quality impacts	Slightly increased temperatures and decreased dissolved oxygen may result	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	discountable						NLAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas;
New Disturbance - Construction	Storage wells - clearing and drilling	Neutral	None								NE	There are no storage well counties in or near habitat.
New Disturbance - Construction	Storage wells - reconditioning	Neutral	None								NE	There are no storage well counties in or near habitat.
New Disturbance - Construction	Storage wells - waste pits	Neutral	None								NE	There are no storage well counties in or near habitat.

Notes:
[1] These Conservation Measures were developed as AMMs for HCP mussels. NiSource has comitted to apply these AMMs more broadly to the other aquatic species within the covered lands that may be affected by their activities.

Conservation Measures for Kentucky arrow darter (italics indicate non-mandatory measures).

Pre-Construction Planning: Preparation of an Environmental Management & Construction Plan

2. A detailed Environmental Management & Construction Plan (EM&CP) will be prepared for any activity with potential effects within 100 feet of the ordinary high water mark of known or presumed habitat. The plan will incorporate the relevant requirements of the NGTS ECS and include site-specific details particular to the project area and potential impact. The waterbody crossing will be considered as "high-quality" for the purpose of preparing this plan regardless of the actual classification. The plan will be strongly oriented towards minimizing stream bed and riparian disturbance (including minimization of tree clearing within 25 feet of the crossing [Figure 24, ECS]), preventing downstream sedimentation (including redundant erosion and sediment control devices which would be designed to protect resources as appropriate), and weather monitoring by the Environmental Inspector to ensure work is not begun with significant precipitation in the forecast. The plan will comprehensively address all activities needed to complete the work and strive to avoid the take of these species in occupied habitat. The EM&CP will include the frac-out avoidance and contingency plans described in AMM #3 below. The EM&CP will also include a sediment control component for uplands reasonably likely to drain to and impact occupied habitat. Emphasis will be placed on developing detailed erosion control plans specific to slopes greater than 30 percent leading directly to occupied habitat. The plan will be approved in writing by NiSource NRP personnel prior to project implementation and will include a tailgate training session for all on-site project personnel to highlight the environmental sensitivity of the habitat and any BMPs that must be implemented.

Stream Bed Construction

3. For activities in known or presumed occupied habitat, consider installing new or replacement pipelines and utility lines and performing major repairs under the river bottom using horizontal directional drilling (HDD) or other trenchless methods rather than open trenching. Drilling should be carefully undertaken and a plan should be in place to minimize and address the risk of in-stream disturbance due to frac-outs. The plan should also specifically reference roanoke logperch in the vicinity of the crossing as a key conservation concern and include specific measures identified in the ECS, from standard industry practices, or other mutually agreed upon practices to protect this resource. The plan will also include a frac-out impact avoidance plan which will evaluate the site in terms not only of feasibility of conducting HDD, but likelihood of large scale frac-out and its effects on the species, and actions to address a large scale frac-out in occupied habitat. If, after detailed engineering studies (e.g., geotechnical, physiological, topographical, and economic studies), it is determined (and agreed to by NRP) that HDD is not feasible, a report will be prepared and included in the annual report submitted to the Service.

4. Install pipeline to the minimum depth described in the ECS and maintain that depth at least 10 feet past the high water line to avoid exposure of pipeline by anticipated levels of erosion based on geology and watershed character. Additional distance may be required should on-site conditions (i.e., outside bend in the waterbody, highly erosive stream channel, anticipated future upstream development activities in the vicinity, etc.) dictate a reasonable expectation that the stream banks could erode and expose the pipeline facilities. Less distance may be utilized if terrain or geological conditions (long, steep bank or solid rock) will not allow for a 10-foot setback. These conditions and the response thereto will be documented in the EM&CP and provided as part of the annual report to the Service.

5. For major repairs in known or presumed occupied habitat, do not install in-channel repairs (bendway weirs, hardpoints, concrete mats, fill for channel relocation, or other channel disturbing measures).

6. Conduct replacements/repairs from a lay barge or temporary work bridges of the minimum length necessary to conduct the replacements/repairs rather than operating heavy equipment (e.g., backhoes, bulldozers) in-stream.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Conservation Measures (Mandatory)[1]	Conservation Measures (Non-Mandatory)[1]	NE, NLAA or LAA	Comments

7. Remove equipment bridges as soon as practicable after repair work and any site restoration is completed.

8. As part of the routine pipeline inspection patrols, visually inspect all stream crossings in known or presumed occupied waterbodies for indications of significant erosion or bank destabilization associated with or affecting the pipeline crossing. If such bank destabilization is observed, it will be corrected in accordance with the ECS. Follow-up inspections and restabilization will continue until the bank is stabilized (generally two growing seasons)

Stream Bank Conservation

9. Do not construct culvert and stone access roads and appurtenances (including equipment crossing) across the waterbody or within the riparian zone. Temporary equipment crossings utilizing equipment pads or other methods that span the waterbody are acceptable provided that in-stream pipe supports are not needed.

10. Use half pipes of sufficient number and size that both minimize impacts to stream bed and minimize flow disruption to both upstream and downstream habitat.

Timing Restrictions to Minimize Impact to Reproducing Populations

11. Impacts to this species' reproductive period will be avoided by avoiding in-water construction or implementing an HDD from April 15 to August 31.

Pipeline Abandonment

12. Abandon pipelines in place to avoid in-stream disturbance that would result from pipeline removal.

Contaminants

13. As described in the ECS section on "Spill Prevention, Containment and Control," site staging areas for equipment, fuel, materials, and personnel at least 300 feet from the waterway, if available, to reduce the potential for sediment and hazardous spills entering the waterway. If sufficient space is not available, a shorter distance can be used with additional control measures (e.g., redundant spill containment structures, on-site staging of spill containment/clean-up equipment and materials).

14. Ensure all imported fill material is free from contaminants that could affect the species population or known or presumed occupied waterbody habitat.

15. *Reserved*

16. Avoid use fertilizers or herbicides within 100 feet of known or presumed occupied habitat. Fertilizer and herbicides will not be applied if weather (e.g., impending storm) or other conditions (e.g., faulty equipment) would compromise the ability of NiSource or its contractors to apply the fertilizer or herbicide without impacting presumed occupied habitat. The EM&CP prepared for this activity (AMM# 2 above) will document relevant guidelines for application.

Withdrawal and Discharge of Water

17. Do not draw hydrostatic test water from or discharge water directly into known or presumed occupied habitat.

18. Use best available water withdrawal/discharge impact avoidance techniques (low rate, screens, avoid known or presumed occupied areas to extent practical, do not vacuum up sediments, low rate of discharge to avoid scouring or erosion, discharge into upland area that does not allow water to flow overland into occupied streams or tributaries, avoid discharge of invasive aquatic species into sub-watersheds of known or presumed occupied streams). Confirm that the water source is not contaminated with invasive aquatic species.

Travel for O&M Activities

19. Do not drive across known or presumed occupied streams – walk these areas or visually inspect from bank and use closest available bridge to cross stream.

Exotic Species

20. Clean all equipment (including pumps, hoses, etc.) that have (1) been in a perennial waterbody for more than four hours within the previous seven days and (2) will work in occupied or potential federally listed habitat for more than four hours; following established guidelines to remove exotic or invasive species before entering a known or presumed occupied stream for a federally listed species which is not known to be infested with invasive species. It is important to follow these guidelines even if work is not occurring in the immediate vicinity of this species since, once introduced into a watershed, invasive species could move and eventually affect the federally listed species.

Table M. Analysis of effects on pygmy madtom.

SPECIES:	pygmy madtom (Noturus stanauli)										
Pipeline Activity	**Subactivity**	**Environmental Impact or Threat**	**Stressor**	**Stressor Pathway (optional)**	**Exposure (Resource Affected)**	**Range of Response**	**Conservation Need Affected**	**Demographic Consequences**	**Management Options (BMP)**	**NE, NLAA or LAA**	**Comments**
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Habitat degradation, Water quality degradation	Sedimentation, Contaminants	Stormwater runoff from pollution generating pavement, Stormwater erosion	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, reproduction, range	2,4,8	NLAA	AMMs 2, 4, and 8 reduce the probability and magnitude of impacts.
Operation & Maintenance	Vegetation Management - mowing	Neutral	None							NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Sedimentation, Increase in Water Temperatures, Decrease of dissolved oxygen	denuding bank, grubbing with heavy equipment, disturbing soil, water quality degradation since vegetation no longer provides shade to stream	Unlikely	N/A	N/A	N/A	2	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats. The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Chemical Contaminants	direct exposure to chemicals from spills and stormwater runoff	Unlikely	N/A	N/A	N/A	2, 16	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats. This species is highly sensitive to chemicals and a spill within occupied habitat has potential to eliminate the population.
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None							NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Neutral	None							NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Habitat degradation and water quality degradation, stress on eggs,	Increase in Water Temperatures, Decrease of dissolved oxygen	habitat and water quality degradation since vegetation no longer provides shade to stream	Unlikely	N/A	N/A	N/A	2	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats.The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. In addition, the project foot print is located upstream and outside of known habitat.
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	Habitat degradation, Water quality degradation	Minor sedimentation, Lowered dissolved oxygen, Contaminants	tributary and/or near stream earth disturbance can cause minor increase in sedimentation , Storm water runoff, fertilizers used in revegetation can cause algae blooms which will lower dissolved oxygen	Unlikely	N/A	N/A	N/A	2,13, 16	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats. ECS measures will minimize impacts through erosion control and restoration of graded areas; In addition, the ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Management Options (BMP)	NE, NLAA or LAA	Comments
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	Permanent or temporary loss of habitat, Habitat degradation, Water quality degradation, Physical impacts to individuals, Reduction of prey	Minor sedimentation, Lowered dissolved oxygen, Contaminants	tributary and/or near stream earth disturbance can cause minor increase in sedimentation , Storm water runoff, fertilizers used in revegetation can cause algae blooms which will lower dissolved oxygen, Equipment located in connected wetland can increase chance of spills	Unlikely	N/A	N/A	N/A	2,13, 16	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats. Although there is a chance for contaminant spills from equipment, this would not likely affect this species as spills would take place outside of habitat. In addition, contaminant spill impacts should be minimal in any habitat if BMPs outlined in the ECS are followed. Sedimentation will also be minimal as the ECS states that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. In addition, sedimentation occurring in an adjacent wetland would likely dissipate before reaching occupied habitat.
Operation & Maintenance	ROW repair, regrading, revegetation - instream stabilization and/or fill	Permanent or temporary loss of habitat, Habitat degradation, Water quality degradation, Physical impacts to individuals, Reduction of prey	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work	Unlikely	N/A	N/A	N/A	2, 3, 5, 7, 8, 13, 14	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats. Although there is a chance for contaminant spills from equipment, this would not likely affect this species as spills would take place outside of habitat. In addition, contaminant spill impacts should be minimal in any habitat if BMPs outlined in the ECS are followed. Sedimentation will also be minimal as the ECS states that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance.
Operation & Maintenance	Access Road Maintenance - grading, graveling	Temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation	tributary and in stream earth disturbance can cause increase in sedimentation	Unlikely	N/A	N/A	N/A	2	NLAA	The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. In addition the ECS outlines the use of erosion control measures and restoration of graded areas.
Operation & Maintenance	Access Road Maintenance - culvert replacement	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work, minor noise from construction activities in water.	Unlikely	N/A	N/A	N/A	2	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats. The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. In addition the ECS outlines the use of erosion control measures and restoration of graded areas.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Sedimentation, Increase in Water Temperatures, Decrease of dissolved oxygen	denuding bank, grubbing with heavy equipment, disturbing soil, water quality degradation since vegetation no longer provides shade to stream	Unlikely	N/A	N/A	N/A	2	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats. The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. In addition the ECS outlines the use of erosion control measures and restoration of graded areas.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Management Options (BMP)	NE, NLAA or LAA	Comments
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Neutral	None							NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None							NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Pipeline Abandonment - removal	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population	Sedimentation, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation, altered flow result in increased sedimentation and short-term impoundment, contaminant spills from equipment located in-stream and tributary, noise from in water work	Unlikely	N/A	N/A	N/A	2, 7, 10, 13	NLAA	Although this species is highly sensitive to siltation and the project footprint is located within this species range, it does not cross known occupied habitat and effects are expected to be minimal. Contaminant spill impacts should be minimal if BMPs outlined in the ECS are followed.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Habitat degradation, Water quality degradation	Minor sedimentation, Lowered dissolved oxygen, Contaminants	tributary and/or near stream earth disturbance can cause minor increase in sedimentation , Storm water runoff, fertilizers used in revegetation can cause algae blooms which will lower dissolved oxygen	Unlikely	N/A	N/A	N/A	2,13, 15, 16	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats. ECS measures will minimize impacts through erosion control and restoration of graded areas; In addition, the ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance.
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Habitat degradation, Water quality degradation	Minor sedimentation, Lowered dissolved oxygen, Contaminants	tributary and/or near stream earth disturbance can cause minor increase in sedimentation , Storm water runoff, fertilizers used in revegetation can cause algae blooms which will lower dissolved oxygen	Unlikely	N/A	N/A	N/A	2, 13, 15, 16	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats. ECS measures will minimize impacts through erosion control and restoration of graded areas; In addition, the ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance.
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None							NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Inspection Activities - ground and aerial	Neutral	None							NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Habitat degradation, Water quality degradation	Sedimentation, Contaminants	Stormwater runoff from pollution generating pavement, Stormwater erosion	Habitat, Population, Individuals	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, reproduction, range	2	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats. If Management Option 17 is implemented, a NLAA decision can be considered.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Management Options (BMP)	NE, NLAA or LAA	Comments
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Sedimentation, Increase in Water Temperatures, Decrease of dissolved oxygen	denuding bank, grubbing with heavy equipment, disturbing soil, water quality degradation since vegetation no longer provides stormwater filter or shade to stream	Unlikely	N/A	N/A	N/A	2	NLAA	Temperature increases from herbaceous vegetation removal would be minimal, given the size of the system. Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats.
New Disturbance - Construction	Clearing - trees and shrubs	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Sedimentation, Increase in Water Temperatures, Decrease of dissolved oxygen	denuding bank, grubbing with heavy equipment, disturbing soil, water quality degradation since vegetation no longer provides shade to stream	Unlikely	N/A	N/A	N/A	2,20	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None							NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Neutral	None							NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Habitat degradation and water quality degradation, stress on eggs,	Increase in Water Temperatures, Decrease of dissolved oxygen	habitat and water quality degradation since vegetation no longer provides shade to stream	Unlikely	N/A	N/A	N/A	2	NLAA	The project footprint is located upstream and not directly within known occupied habitat.
New Disturbance - Construction	Grading, erosion control devices	Temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation	Wind or storm water erosion	Unlikely	N/A	N/A	N/A	2	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats.
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population	Sedimentation,, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation, altered flow result in increased sedimentation and short-term impoundment, contaminant spills from equipment located in-stream and tributary, noise from in water work	Unlikely	N/A	N/A	N/A	2,5, 7, 13,14	NLAA	Although this species is highly sensitive to siltation and the project footprint is located within this species range, it does not cross known occupied habitat and effects are expected to be minimal. Contaminant spill impacts should be minimal if BMPs outlined in the ECS are followed.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Management Options (BMP)	NE, NLAA or LAA	Comments
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population	Sedimentation,, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation, altered flow result in increased sedimentation and short-term impoundment, contaminant spills from equipment located in-stream and tributary, noise from in water work	Unlikely	N/A	N/A	N/A	2,5, 7, 13,14	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats. Contaminant spill impacts should be minimal if BMPs outlined in the ECS are followed.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Temporary loss of habitat, Habitat degradation	Minor sedimentation, Altered flow	Withdrawal and discharge of water	Habitat	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction Range	2,17,18, 19	NLAA	Implementation of BMPs 18 and 19 avoid the withdrawal and discharge of water at presumed occupied habitat.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	Temporary loss of habitat, Habitat degradation	Minor sedimentation, Altered flow	Withdrawal and discharge of water	Habitat	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction Range	2,17,18, 19	NLAA	Implementation of BMPs 18 and 19 avoid the withdrawal and discharge of water at presumed occupied habitat.
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Permanent or temporary loss of habitat, Habitat degradation, Water quality degradation, Physical impacts to individuals, Reduction of prey	Minor sedimentation, Lowered dissolved oxygen, Contaminants	tributary and/or near stream earth disturbance can cause minor increase in sedimentation , Storm water runoff, fertilizers used in revegetation can cause algae blooms which will lower dissolved oxygen,	Unlikely	N/A	N/A	N/A	2,13, 16	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats. Impacts may be reduced with implementation of ECS III, which would minimize potential impacts from grading and BMPs 13 and 16, which would avoid the use of contaminants near waterbodies.
New Disturbance - Construction	Compression Facility, noise	Neutral	None							NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None							NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population	Sedimentation, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation, altered flow result in increased sedimentation and short-term impoundment, contaminant spills from equipment located in-stream and tributary, noise from in water work	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction	2,5, 7, 13,14	NLAA	The ECS outlines the use of erosion control measures and restoration of graded areas. Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Management Options (BMP)	NE, NLAA or LAA	Comments
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work, minor noise from construction activities in water.	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, range	2,6, 7, 8, 9, 11, 13,	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats. The ECS outlines the use of erosion control measures and restoration of graded areas. A NLAA finding can be made with the implementation of listed BMPs . In addition, if replace culverts with a fish friendly passage there will be a net benefit from this action.
New Disturbance - Construction	Stream Crossings, wet ditch	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work, minor noise from construction activities in water.	Unlikely	N/A	N/A	N/A	2,4, 6, 7, 8, 9, 11, 13	NLAA	The mainstem Duck will only be corssed via HDD. Any impacts from this activity on tributaries are not expected to measurabley affect the species in the Duck. Contaminant spill impacts should be minimal if BMPs outlined in the ECS are followed.
New Disturbance - Construction	Stream Crossings, dry ditch	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work, minor noise from construction activities in water.	Unlikely	N/A	N/A	N/A	4, 6, 7, 8, 9, 11, 13	NLAA	The mainstem Duck will only be corssed via HDD. Any impacts from this activity on tributaries are not expected to measurabley affect the species in the Duck. Contaminant spill impacts should be minimal if BMPs outlined in the ECS are followed.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Management Options (BMP)	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Temporary loss of occupied habitat, Physical impacts to individuals, Habitat degradation and water quality degradation, reduction of prey population	Sedimentation, altered flow, contaminants, impoundment, noise	tributary and near stream earth disturbance may result in increased sedimentation altered flow may result in increased sedimentation, contaminant spills from equipment located in tributary stream, dam could restrict up/down stream movement of species, noise from in water work	Unlikely	N/A	N/A	N/A	4, 5, 7, 13,14	NLAA	The mainstem Duck will only be corssed via HDD. Any impacts from this activity on tributaries are not expected to measurabley affect the species in the Duck. Contaminant spill impacts should be minimal if BMPs outlined in the ECS are followed.
New Disturbance - Construction	Stream Crossings, dam & pump	Temporary loss of occupied habitat, Physical impacts to individuals, Habitat degradation and water quality degradation, reduction of prey population	Sedimentation, altered flow, contaminants, impoundment, noise	tributary and near stream earth disturbance may result in increased sedimentation altered flow may result in increased sedimentation, contaminant spills from equipment located in tributary stream, dam could restrict up/down stream movement of species, noise from in water work	Unlikely	N/A	N/A	N/A	2,4, 5, 7, 13,14	NLAA	The mainstem Duck will only be corssed via HDD. Any impacts from this activity on tributaries are not expected to measurabley affect the species in the Duck. Contaminant spill impacts should be minimal if BMPs outlined in the ECS are followed.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Water quality degradation, Physical Impacts to Individuals, reduction of prey population	Sedimentation, Frac-out, Noise	tributary, near and in stream earth disturbance may result in increased sedimentation, risk of frac-out during drilling operations, noise from drilling activities	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, range	2,3, 4, 5, 7, 13,14	NLAA	Implementation of AMM 2 will reduce activity in and potential impacts to the stream and near-stream habitats.
New Disturbance - Construction	Stream Equipment Crossing Structures	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work, minor noise from construction activities in water.	Unlikely	N/A	N/A	N/A	2,6, 7, 9, 13, 14	NLAA	Although this species is highly sensitive to siltation and the project footprint is located within this species range, it does not cross known occupied habitat and effects are expected to be minimal. Contaminant spill impacts should be minimal if BMPs outlined in the ECS are followed.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Neutral	None							NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Neutral	None							NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Management Options (BMP)	NE, NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Neutral	None							NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Neutral	None							NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Neutral	None							NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Neutral	None							NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.
New Disturbance - Construction	Storage wells - clearing and drilling	Neutral	None							NE	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.
New Disturbance - Construction	Storage wells - reconditioning	Neutral	None							NE	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.
New Disturbance - Construction	Storage wells - waste pits	Neutral	None							NE	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.

Management Options (BMP)

Pre-Construction Planning: Preparation of an Environmental Management & Construction Plan

2. A detailed Environmental Management & Construction Plan (EM&CP) will be prepared for any activity with potential effects within 100 feet of the ordinary high water mark of known or presumed habitat. The plan will incorporate the relevant requirements of the ECS and include site-specific details particular to the project area and potential impact. The plan will be strongly oriented towards minimizing stream bed and riparian disturbance (including minimization of tree clearing within 25 feet of the crossing [Figure 24, ECS]), preventing downstream sedimentation, and weather monitoring by the Environmental Inspector to ensure work is not begun with significant precipitation in the forecast. The plan will comprehensively address all activities needed to complete the work and strive to avoid the take of these mussels in occupied habitat. The EM&CP will include the frac-out avoidance and contingency plans described in #3 below. The EM&CP will also include a sediment control component for uplands reasonably likely to drain to and impact occupied habitat. Emphasis will be placed on developing detailed erosion control plans specific to slopes greater than 30% leading directly to occupied habitat. The plan will be approved in writing by NiSource personnel prior to project implementation and will include a tailgate training session for all on-site project personnel to highlight the environmental sensitivity of the habitat and any management options that must be implemented.

Stream Bed Construction

3. For activities in known or presumed occupied habitat, consider installing new or replacement pipelines and utility lines and performing major repairs under the river bottom using horizontal directional drilling (HDD) or other trenchless methods rather than open trenching. Drilling should be carefully undertaken and a plan should be in place to minimize and address the risk of in-stream disturbance due to frac-outs. The plan should also specifically reference mussel resources in the vicinity of the crossing as a key conservation concern and include specific measures identified in the ECS, from standard industry practices, or other mutually agreed upon practices to protect this resource. The plan will also include a frac-out impact avoidance plan which will evaluate the site in terms not only of feasibility of conducting HDD, but likelihood of large scale frac-out and its effects on mussels, and actions to address a large scale frac-out in occupied habitat. If, after detailed engineering studies (e.g. geotechnical, physiological, topographical, and economic studies), it is determined (and agreed to by NRP) that HDD is not feasible, a report will be prepared and included in the annual report submitted to the Service. However, due to the significant listed mussel assemblages known to occupy the Duck and Tennessee Rivers in the state of Tennessee, open trenching in these rivers is not a “covered activity” as part of the NiSource Habitat Conservation Plan (HCP).

4. Install pipeline to the minimum depth described in the ECS and maintain that depth at least 10 feet past the high water line to avoid exposure of pipeline by anticipated levels of erosion based on geology and watershed character. Additional distance may be required should on-site conditions (i.e., outside bend in the waterbody, highly erosive stream channel, anticipated future upstream development activities in the vicinity, etc.) dictate a reasonable expectation that the stream banks could erode and expose the pipeline facilities. Less distance may be utilized if terrain or geological conditions (long, steep bank or solid rock) will not allow for a 10-foot setback. These conditions and the response thereto will be documented in the EM&CP and provided as part of the annual report to the Service.

5. For major repairs in known or presumed occupied habitat, do not install in-channel repairs (bendway weirs, hardpoints, concrete mats, fill for channel relocation, or other channel disturbing measures).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Management Options (BMP)	NE, NLAA or LAA	Comments

6. Conduct replacements/repairs from a lay barge or temporary work bridges of the minimum length necessary to conduct the replacements/repairs rather than operating heavy equipment (e.g., backhoes, bulldozers) in-stream. Temporary construction and equipment bridges are not to be confused with stone or fill causeways with pipe structures, which should not be employed in known or presumed occupied waterbodies.

7. Remove equipment bridges as soon as practicable after repair work and any site restoration is completed.

8. As part of the routine pipeline inspection patrols, visually inspect all stream crossings in known or presumed occupied waterbodies for indications of significant erosion or bank destabilization associated with or affecting the pipeline crossing. If such bank destabilization is observed, it will be corrected in accordance with the ECS. Follow-up inspections and restabilization will continue until the bank is stabilized (generally two growing seasons).

Stream Bank Conservation

9. Do not construct culvert and stone access roads and appurtenances (including equipment crossing) across the waterbody or within the riparian zone. Temporary equipment crossings utilizing equipment pads or other methods that span the waterbody are acceptable provided that in-stream pipe supports are not needed.

10. Use half pipes of sufficient number and size that both minimize impacts to stream bed and minimize flow disruption to both upstream and downstream habitat.

Timing Restrictions to Minimize Impact to Reproducing Populations

11. Impacts to the mussel reproductive period will be avoided by working in the water or implementing an HDD from August 1 to March 31.

Pipeline Abandonment

12. Abandon pipelines in place to avoid in-stream disturbance that would result from pipeline removal.

Contaminants

13. As described in the ECS section on "Spill Prevention, Containment and Control," site staging areas for equipment, fuel, materials, and personnel at least 300 feet from the waterway, if available, to reduce the potential for sediment and hazardous spills entering the waterway. If sufficient space is not available, a shorter distance can be used with

14. Ensure all imported fill material is free from contaminants that could affect the mussel population or known or presumed occupied waterbody habitat.

15. For storage well activities, use enhanced and redundant measures to avoid and minimize the impact of spills from contaminant events in known or presumed occupied streams. These measures include waste pit protection and a spill response plan. These measures will be included in the EM&CP prepared for the activity.

16. Avoid the use of fertilizers or herbicides within 100 feet of known or presumed occupied habitat. Fertilizer and herbicides will not be applied if weather (e.g., impending storm) or other conditions (e.g., faulty equipment) would compromise the ability of NiSource or its contractors to apply the fertilizer or herbicide without impacting presumed occupied mussel habitat. The EM&CP prepared for this activity (# 2 above) will document relevant guidelines for application.

Withdrawal and Discharge of Water

17. Do not draw hydrostatic test water from or discharge water directly into known or presumed occupied habitat.

18. Use best available water withdrawal/discharge impact avoidance techniques (low rate, screens, avoid known or presumed occupied areas to extent practical, do not vacuum up sediments, low rate of discharge to avoid scouring or erosion, discharge into upland area that does not allow water to flow overland into occupied streams or tributaries, avoid discharge of zebra mussels into sub-watersheds of known or presumed occupied streams). Confirm that the water source is not contaminated with zebra mussels.

Travel for O&M Activities

19. Do not drive across known or presumed occupied streams – walk these areas or visually inspect from bank and use closest available bridge to cross stream.

Exotic Species

20. Clean all equipment (including pumps, hoses, etc.) that have (1) been in a perennial waterbody for more than four hours within the previous seven days and (2) will work in occupied or potential federally listed mussel habitat for more than four hours; following established guidelines to remove zebra mussels (and other potential exotic or invasive species) before entering a known or presumed occupied stream for a federally listed mussel, which is not known to be infested with zebra mussels. It is important to follow these guidelines even if work is not occurring in the immediate vicinity of these mussels since, once introduced into a watershed, invasive species could move and eventually affect these mussels.

16. Avoid use fertilizers or herbicides within 100 feet of known or presumed occupied habitat. Fertilizer and herbicides will not be applied if weather (e.g., impending storm) or other conditions (e.g., faulty equipment) would compromise the ability of NiSource or its contractors to apply the fertilizer or herbicide without impacting presumed occupied habitat. The EM&CP prepared for this activity (AMM# 2 above) will document relevant guidelines for application.

17. Prepare a site specific stormwater management plan and/or spill pollution prevention plan to reduce the potential for non-point source pollution entering occupied streams.

Withdrawal and Discharge of Water

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Management Options (BMP)	NE, NLAA or LAA	Comments

18. Do not draw hydrostatic test water from or discharge water directly into occupied habitat.

19. Use best available water withdrawal/discharge impact avoidance techniques (low rate, screens, avoid known or presumed occupied areas to extent practical, do not vacuum up sediments, low rate of discharge to avoid scouring or erosion, discharge into upland area that does not allow water to flow overland into occupied streams or tributaries).

Travel for O&M Activities

20. Do not drive across known or presumed occupied streams – walk these areas or visually inspect from bank and use closest available bridge to cross stream.

Table N. Analysis of effects on eastern massasauga rattlesnake.

SPECIES:	**Eastern massasauga (*Sistrurus catenatus catenatus*)**										
Pipeline Activity	**Subactivity**	**Environmental Impact or Threat**	**Stressor**	**Stressor Pathway (optional)**	**Exposure (Resource Affected)**	**Range of Response**	**Conservation Need Affected**	**Demographic Consequences**	**Suggested Management Options (BMP)**	**NE or NLAA or LAA**	**Comments**
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Individual injury or mortality	Crushing	direct impact from vehicle	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction	1, 2,7,15 19	LAA	ECS requirement for spill prevention will significantly limit potential for contamination in wetland/stream habitats
Operation & Maintenance	Vegetation Management - mowing	Individual injury or mortality, temporary or permanent loss of habitat;	Crushing, other injury, Predation	direct impact from mower, loss of habitat connectivity and cover	adults, subadults	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction	1,2,7, 8,15,19	LAA	If mowing can be conducted in the snakes dormant period, a NLAA can be considered.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	removal of woody vegetation	none	none	few adults & subadults	none expected				NLAA	The extent of tree clearing around the pipeline & facilities would likely be too little to measurably impact EMR or its habitat; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	acute or chronic exposure to chemical contaminants	Chemical contaminants;	direct and indirect exposure to chemicals from application,	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction	1, 2,15,19	LAA	If BMPs can be followed a NLAA decision can be considered.
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Individual disturbance	Crushing; other injury	potential impact to individuals located in downed vegetation.	Unlikely				1, 2,15,19	NLAA	It is unlikely that species would remain in close proximity to the work area with active construction.
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Individual disturbance	Burning	Potential impact to individuals located in piled vegetation.	Unlikely				1,2, 15, 19	NLAA	It is unlikely this species would remain in the immediate work area when this activity is started.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	removal of woody vegetation	None	none	few adults & subadults	none expected				NLAA	The extent of tree clearing around the pipeline & facilities from this method would likely be too little to measurably impact EMR or its habitat; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	Temporary or permanent loss of habitat;	predation	loss of habitat connectivity and cover	adults, subadults	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	Temporary or permanent loss of habitat;	predation; flooding or dessication	loss of habitat connectivity and cover	all Life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19,20,21,22,23	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	none	none							NE	

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE or NLAA or LAA	Comments
Operation & Maintenance	Access Road Maintenance - grading, graveling	Temporary or permanent loss of habitat,	predation	loss of habitat connectivity and cover	all Life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	Access Road Maintenance - culvert replacement	Temporary or permanent loss of habitat,	predation	loss of habitat connectivity and cover	all Life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	Temporary or permanent loss of habitat;	Predation	loss of habitat connectivity and cover	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction, Range	1,2,15,19,21,22,23	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Temporary or permanent loss of habitat	predation; flooding or dessication	loss of habitat connectivity and cover	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction, Range	1,2,14,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None							NE	In-place abandonment is preferred, to avoid impacts from removal, as long as the pipeline is not adversely impacting the habitat
Operation & Maintenance	Pipeline Abandonment - removal	Temporary or permanent loss of habitat,	predation; flooding or dessication	water-level manipulation in wetter areas for construction; loss of habitat connectivity and cover	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Temporary or permanent loss of habitat	predation	loss of habitat connectivity and cover	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19,21,22,23	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Temporary or permanent loss of habitat	Crushing	Direct impact to individual from equipment/vehicle.	adults, subadults	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19,21,22,23	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None							NE	

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE or NLAA or LAA	Comments
Operation & Maintenance	Inspection Activities - ground and aerial	Neutral	None							NE	No impacts to individuals or habitats are anticipated from this action.; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Individual injury or mortality;	crushing	Direct impact from vehicle	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers	1,2,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	predation, temporary or permanent loss of habitat	Crushing; Predation	loss of habitat connectivity and cover; Direct impact from vehicle	adults, subadults	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19,21,22,23	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided
New Disturbance - Construction	Clearing - trees and shrubs	removal of woody vegetation	Crushing; Predation	loss of habitat connectivity and cover; Direct impact from vehicle	adults, subadults	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19,21,22,23	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Individual disturbance	Crushing; other injury	potential impact to individuals located in downed vegetation.	Unlikely				1, 2,15,19	NLAA	It is unlikely that species would remain in close proximity to the work area with active construction.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Individual disturbance	Burning	Potential impact to individuals located in piled vegetation.	Unlikely				1,2, 15, 19	NLAA	It is unlikely this species would remain in the immediate work area when this activity is started.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	removal of woody vegetation	crushing	direct impacts from vehicle	adults, subadults	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19	LAA	This activity should cause little take
New Disturbance - Construction	Grading, erosion control devices	temporary or permanent loss of habitat	crushing; predation	loss of habitat connectivity and cover; Direct impact from vehicle	adults, subadults	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Temporary or permanent loss of habitat, Individual injury or mortality	Crushing,flooding or dessication	Direct impact to individual and burrows from equipment/vehicle, water-level manipulation in wetter areas for construction	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Individual injury or mortality, temporary or permanent loss of habitat	Crushing	Direct impact to individual and burrows from equipment/vehicle.	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	water level alterations	flooding or dessication; freezing	water level manipulation	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	water level alterations	flooding or dessication; freezing	water level manipulation	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Individual injury or mortality, temporary or permanent loss of habitat	Crushing	Direct impact to individual and burrows from equipment/vehicle.	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19,21,22,23	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE or NLAA or LAA	Comments
New Disturbance - Construction	Compression Facility, noise	Neutral	None							NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None							NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Individual injury or mortality, temporary or permanent loss of habitat	Crushing, predation	Direct impact to individual and burrows from equipment/vehicle; loss of habitat connectivity and cover.	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,9,10,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Individual injury or mortality, temporary or permanent loss of habitat; water level alterations	Crushing, flooding or dessication; freezing; predation	Direct impact to individual and burrows from equipment/vehicle; water level manipulation; loss of habitat connectivity and cover	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,9,10,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided
New Disturbance - Construction	Stream Crossings, wet ditch	Neutral	None							NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Stream Crossings, dry ditch	Neutral	None							NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Neutral	None							NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Stream Crossings, dam & pump	Neutral	None							NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Neutral	None							NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Stream Equipment Crossing Structures	Neutral	None							NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Habitat degradation, exposure to predators	dessication or flooding; Predation; crushing	loss of habitat connectivity and cover; Water-level manipulation, Direct impact from vehicle	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	removal of woody vegetation; Individual injury or mortality	crushing	Direct impact from vehicle	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE or NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Temporary or permanent loss of habitat, Individual injury or mortality	Crushing, dessication or flooding;	Direct impact to individual and burrows from equipment/vehicle, water-level manipulation in wetter areas for construction, loss of habitat connectivity and cover	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Individual injury or mortality, temporary or permanent loss of habitat	Crushing, Chemical contaminants	Direct impact to individual and burrows from equipment/vehicle, contamination from equipment spills	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Temporary or permanent loss of habitat, Individual injury or mortality	crushing, predation	Direct impact to individuals and burrows from equipment/vehicle, loss of habitat connectivity	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,14,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Temporary or permanent loss of habitat, Individual injury or mortality	crushing, predation	Direct impact to individuals and burrows from equipment/vehicle, loss of habitat connectivity and cover	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,15,19	LAA	potential take of individuals would be GREATLY limited of known/potential burrow habitat is identified and avoided
New Disturbance - Construction	Storage wells - clearing and drilling	Individual injury or mortality, temporary or permanent loss of habitat, exposure to predators	Chemical contaminant, Crushing, Predation	Direct exposure to chemicals from spills, Direct impact to individual and burrows from equipment/vehicle, loss of habitat connectivity and cover	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction	1,2	LAA	If BMPs can be followed a NLAA decision can be considered. A NE determination can be made in select counties. Proposed well field locations do not overalp species habitat in Elkhart, LaPorte, Marshall, Noble, Porter, and St. Joseph counties, Indiana; Ashtabula, Champaign, Clark, Clinton, Columbiana, Crawford, Defiance, Erie, Fayette, Greene, Hardin, Huron, Licking, Logan, Lorain, Lucas, Marion, Medina, Montgomery, Ottawa, Paulding, Sandusky, Seneca, Stark, Trumbull, Warren, Wayne, and Wyandot counties Ohio; and Butler and Mercer counties, Pennsylvania.
New Disturbance - Construction	Storage wells - reconditioning	Individual injury or mortality, temporary or permanent loss of habitat	Chemical contaminant, Crushing	Direct exposure to chemicals from spills, Direct impact to individual and burrows from equipment/vehicle	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction	1,2	LAA	If BMPs can be followed a NLAA decision can be considered. A NE determination can be made in select counties. Proposed well field locations do not overalp species habitat in Elkhart, LaPorte, Marshall, Noble, Porter, and St. Joseph counties, Indiana; Ashtabula, Champaign, Clark, Clinton, Columbiana, Crawford, Defiance, Erie, Fayette, Greene, Hardin, Huron, Licking, Logan, Lorain, Lucas, Marion, Medina, Montgomery, Ottawa, Paulding, Sandusky, Seneca, Stark, Trumbull, Warren, Wayne, and Wyandot counties Ohio; and Butler and Mercer counties, Pennsylvania.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE or NLAA or LAA	Comments
New Disturbance - Construction	Storage wells - waste pits	Individual injury or mortality, temporary or permanent loss of habitat	Contaminant, Crushing	Direct exposure to chemicals from spills, Direct impact to individual and burrows from equipment/vehicle	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction	1,2	LAA	If BMPs can be followed a NLAA decision can be considered. A NE determination can be made in select counties. Proposed well field locations do not overalp species habitat in Elkhart, LaPorte, Marshall, Noble, Porter, and St. Joseph counties, Indiana; Ashtabula, Champaign, Clark, Clinton, Columbiana, Crawford, Defiance, Erie, Fayette, Greene, Hardin, Huron, Licking, Logan, Lorain, Lucas, Marion, Medina, Montgomery, Ottawa, Paulding, Sandusky, Seneca, Stark, Trumbull, Warren, Wayne, and Wyandot counties Ohio; and Butler and Mercer counties, Pennsylvania.

Management Options (BMP)

Surveys to Evaluate Presence and Relocation of Species in NiSource Action Areas

1. Areas of suitable habitat within the Counties listed above should be avoided if possible or surveyed for species presence and a minimum impact footprint utilized when required. If an adequate survey effort does not indicate their presence, it will be classified as unoccupied habitat and the BMPs will not be mandatory. However, NiSource may implement some of these measures if appropriate to protect potentially suitable habitat. The definition of adequacy will be determined through consultation with the Service on a site-specific basis. The survey should be conducted from May-early June. If a survey is not completed, presence can be assumed. In that case, all suitable habitat would be treated as occupied, and all BMPs followed. NiSource or its contractors may choose to collect and transplant species within an action area into suitable habitat outside of the disturbance area if O&M or new construction activities will likely result in a take. Survey and relocation may be implemented in the same time period (as one action) as long as both survey and relocation protocols are followed. A copy of the survey and any reports will be included in the annual report submitted to the Service. In re-location areas-establish a monitoring program to evaluate species survival, adequacy of handling techniques and recolonization of the action area. Implement corrective measures based on monitoring results.

Pre-Construction Planning: Preparation of an Environmental Management & Construction Plan

2. A detailed Environmental Management and Construction Plan (EM&CP) will be prepared for any project potentially impacting waterbodies or wetlands in proximity to eastern massasauga habitat. The plan will incorporate the relevant requirements of NGTS ECS and include site-specific details particular to the project area and potential impact. Waterbody crossings will be considered as "high-quality" for the purpose of preparing this plan regardless of the actual classification. The plan will be strongly oriented towards minimizing stream bed and riparian disturbance (including establishing a 300 foot buffer within species range), preventing downstream sedimentation (including redundant E&S devices as appropriate), and weather monitoring by the Environmental Inspector to ensure work is not begun with significant precipitation in the forecast. The plan will be approved in writing by NiSource Natural Resources Permitting (NRP) personnel prior to project implementation and will include a tailgate training session for all onsite project personnel to highlight the environmental sensitivity of the habitat and any BMPs which must be implemented.

Construction

3. For activities in known or presumed occupied habitat, consider installing new or replacement pipelines and utility lines and performing major repairs under the river bottom using horizontal directional drilling (HDD) or other trenchless methods rather than open trenching. Drilling should be carefully undertaken and a plan should be in place to minimize and address the risk of in-water disturbance due to frac-outs. The plan should also specifically reference species resources in the vicinity of the crossing as a key conservation concern and include specific measures identified in the ECS, from standard industry practices, or other mutually agreed upon practices to protect this resource. The plan will also include a frac-out impact avoidance plan which will evaluate the site in terms not only of feasibility of conducting HDD, but likelihood of large scale frac-out and its effects on this species and actions to address a large scale frac-out in occupied habitat. If, after detailed engineering studies (e.g., geotechnical, physiological, topographical, and economic studies), it is determined (and agreed to by NRP) that HDD is not feasible, a report will be prepared and included in the annual report submitted to the Service. If wetland or waterbody avoidance through rerouting or HDD is not feasible, all guidelines for open trench wetland crossings found in the NiSource ECS must be strictly adhered to.

4. Install pipeline to the minimum depth described in the ECS and maintain that depth at least 10 feet past the high water line to avoid exposure of pipeline by anticipated levels of erosion based on geology and watershed character. These conditions and the response thereto will be documented in the EM&CP and provided as part of the annual report to the Service.

5. Conduct replacements/repairs from a lay barge or temporary work bridges of the minimum length necessary to conduct the replacements/repairs rather than operating heavy equipment (e.g., backhoes, bulldozers) in-stream. Temporary construction and equipment bridges are not to be confused with stone or fill causeways with pipe structures, which should not be employed in known or presumed occupied waterbodies.

6. Remove equipment bridges as soon as practicable after repair work and any site restoration is completed.

7. Speed limits at facilities and on access roads, within or in close proximity to occupied habitat, should be posted and not be greater then 10 MPH.

8. The use of an open platform mower or flail mower are recommended because they create little if any suction that can increase the risk of mower-related snake mortality. Blade height must be set at a minimum of six inches.

Contaminants

9. As described in the ECS section on "Spill Prevention, Containment and Control," site staging areas for equipment, fuel, materials, and personnel at least 300 feet from the waterway or wetland, if available, to reduce the potential for sediment and hazardous spills entering the waterway or wetland. If sufficient space is not available, a shorter distance can be used with additional control measures. Develop a plan for avoiding impacts during spill response.

10. Ensure all imported fill material is free from contaminants that could affect individuals or known or presumed occupied wetland habitat.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE or NLAA or LAA	Comments

11. For storage well activities, use enhanced and redundant measures to avoid and minimize the impact of spills from contaminant events in known or presumed occupied streams. These measures include waste pit protection and a spill response plan. These measures will be included in the EM&CP prepared for the activity.

12. Avoid use fertilizers or herbicides within 300 feet of known or presumed occupied habitat. Fertilizer and herbicides will not be applied if weather (e.g., impending storm) or other conditions (e.g., faulty equipment) would compromise the ability of NiSource or its contractors to apply the fertilizer or herbicide without impacting presumed occupied habitat.

Aerial spraying should be avoided in occupied or presumed habitat. To the maximum extent possible, herbiciding should occur during the snake's dormant period.

13. Concrete coating activities will not take place within 300 feet of any wetland.

Stream Bank Conservation

14. Do not construct culvert and stone access roads and appurtenances (including equipment crossing) across the waterbody or within the riparian zone. Temporary equipment crossings utilizing equipment pads or other methods that span the waterbody are acceptable provided that in-stream pipe supports are not needed.

Timing Restrictions

15. Avoid operating vehicles/equipment, mowing, clearing trees, applying herbicide, etc., in eastern massasauga habitat during the periods of the year when the snakes are most active above-ground: March through October. If vehicle operation or mowing must occur during these months, it should take place during hot afternoons when snakes are least active.

Pipeline Abandonment

16. Abandon pipelines in place to avoid in-stream disturbance that would result from pipeline removal.

Withdrawal and Discharge of Water

17. Do not draw hydrostatic test water from or discharge water directly into known or presumed occupied habitat.

18. Use best available water withdrawal/discharge impact avoidance techniques (low rate, screens, avoid known or presumed occupied areas to extent practical, do not vacuum up sediments, low rate of discharge to avoid scouring or erosion, discharge into upland area that does not allow water to flow overland into occupied streams or tributaries, avoid discharge of invasive aquatic species into sub-watersheds of known or presumed occupied streams). Do not withdrawal/discharge between October and March when massasaugas are likely to be in hibernation. Confirm that the water source is not contaminated with invasive aquatic species.

Travel for O&M Activities

19. Do not drive across known or presumed occupied streams or wetlands – walk these areas or visually inspect from bank and use closest available bridge to cross stream. Minimize vehicle use within eastern massasauga habitat.

Exotic Species

20. Clean all equipment following established guidelines to remove exotic or invasive species before entering a watershed. It is important to follow these guidelines even if work is not occurring in the immediate vicinity of this species since, once introduced into a watershed, invasive species could move and eventually affect the federally listed species. During hydrostatic testing, do not draw water from another source (wetland or waterbody) and discharge it into wetlands or waterbodies in occupied or presumed habitat.

Restoration

21. Re-vegetate all disturbed eastern massasauga habitat with appropriate native species.

22. Monitor all restoration plantings for proper establishment and implement supplemental plantings as necessary.

23. In the case of wetlands, consult with the appropriate land management or state agency to develop a project-specific wetland restoration plan. The restoration plan should include measures for re-establishing herbaceous and/or woody species, controlling the invasion and spread of undesirable exotic species (e.g., purple loosestrife and phragmites), monitoring the success of the revegetation and weed control efforts and the reestablishment of hydrology, and corrective measures based on the results of monitoring.

Amendment to the
NiSource Multi-Species, Multi-State Habitat Conservation Plan
Biological Assessment

For the

West Virginia Northern Flying Squirrel
(*Glaucomys sabrinus fuscus*)

June 2011

PURPOSE OF THE AMENDMENT

The Virginia northern flying squirrel was originally listed as endangered under the Endangered Species Act (ESA) on July 1, 1985 (U.S. Fish and Wildlife Service [USFWS] 1985). On August 26, 2008, the USFWS published a final rule to remove ESA protections for the Virginia northern flying squirrel, more commonly known as the West Virginia northern flying squirrel (USFWS 2008). A lawsuit challenging the final rule was filed, and on March 25, 2011, the U.S. District Court for the District of Columbia vacated and set aside the 2008 delisting rule (Friends of Blackwater et. al. v. Salazar et al., 1:09–cv–02122-EGS). The decision, handed down on March 25, 2011, reinstated Federal protections that were in place prior to the 2008 delisting. On June 17, 2011, the Service published in the Federal Register a notice to reinstate listing protections for the WVNS in compliance with the court order (USFWS 2011). Therefore, WVNFS is currently listed as endangered throughout its range.

The WVNFS was removed from consideration in the NiSource HCP upon its delisting in 2008. Now, upon its relisting, we must consider potential impacts to this species. Therefore, we are amending the NiSource Biological Assessment to add WVNFS as a non-HCP species.

STATUS OF LISTED SPECIES AND HABITAT IN THE ACTION AREA

Species Background, Habitat, & Range

The northern flying squirrel, *Glaucomys sabrinus fuscus*, is comprised of 25 subspecies, including the Virginia northern flying squirrel, *G. s. fuscus*. The USFWS subsequently determined that a more suitable common name for *G. s. fuscus* is the West Virginia northern flying squirrel (WVNFS), because the majority of the range of the subspecies occurs in West Virginia. The subspecies will be referred to as such throughout the rest of this document.

The WVNFS is a small, nocturnal, gliding mammal endemic to the Alleghany Highlands of West Virginia and Virginia. The squirrel is relatively short-lived, with an average life span of about 4 years (USFWS 2006b). Adult WVNFS average 10 to 12 inches in total length and 3 to 5 ounces in weight (USFWS 2003).

Northern flying squirrels are gregarious and commonly share nests. Up to seven adult WVNFS have been observed in a single nest box (USFWS 1990). WVNFS apparently live in family groups of adults and juveniles; when the species has been located it has been possible to trap 2 to 8 individuals within a discrete area (USFWS 1990). Adult females have been found in nest boxes with juveniles that are clearly large enough to fend for themselves (USFWS 1990).

Only limited reproductive information is available for the WVNFS, but capture data suggests that breeding activity occurs in the late spring and early summer and only a single litter per year is reared (USFWS 1990). Investigators working with other subspecies of northern flying squirrel report a gestation period of 37 to 42 days (USFWS 1990). Young are born between March and May (NatureServe 2007). Fourteen WVNFS litters observed in nest boxes in Virginia and West

Virginia in the late 1980s contained from one to five young with an average of 2.9 young per litter (USFWS 1990). Although northern flying squirrels may use dens year-round, females commonly change den sites during the birthing season, perhaps to avoid parasites present in used dens (USFWS 2003). Weaning occurs at about two months of age (USFWS 1990) but young may stay with their mother for some time after weaning (USFWS 2003). WVNFS achieve sexually maturity within one year (NatureServe 2007).

Localized migration is common among the species. If travel corridors exist, individuals will migrate to other populations over time (USFWS 2006b). The species is nocturnal with most frequent activity occurring a few hours before sundown until sunrise (USFWS 1990). The majority of time is spent on the ground foraging for food items (USFWS 1990). Natural predators include hawks, bobcat, raccoon, opossum, skunks, owls, weasels, fox, mink, snakes, and fishers (USFWS 2006b).

The WVNFS is a genetically distinct subspecies confined to the montane boreal forests of the central Appalachians Mountains. The disjunct distribution of the subspecies and its great distance from the rest of the species' range in the northern United States and Canada suggests that the WVNFS is a relict form which has become isolated in small patches of suitable habitat by changing climatic and vegetational conditions since the last ice age (USFWS 1990).

The WVNFS is associated with high-elevation forest types, particularly those dominated by red spruce, in the Alleghany Mountains (USFWS 2006b). The WVNFS also has been captured in stands dominated by overstory northern hardwoods, though generally with a conifer understory and/or some overstory red spruce or eastern hemlock (USFWS 2006b). Though the WVNFS is tolerant of a variety of stand conditions, its optimal habitat is believed to be comprised of mesic, mature forest conditions in red spruce or in the red spruce-northern hardwood ecotone, on north facing slopes, with widely-spaced mature trees, abundant snags and downed woody debris, and abundant hypogeal fungi and lichens (USFWS 2006b). Radiotelemetry research indicates that the WVNFS preferentially selects stands with a spruce component over northern hardwood or mixed mesophytic stands (Menzel et al. 2006). Despite the preference for mature spruce forests, the WVNFS has shown the ability to persist in and around remnant patches of red spruce (USFWS 2006b).

Food habits of the WVNFS indicate reliance primarily on hypogeal fungi (truffles) and lichens (USFWS 2006b). Fecal samples of WVNFS captured in West Virginia indicate the most common foods eaten were lichen, fungi (mostly hypogeal), pollen (buds), and insects (USFWS 2003). Mitchell (2001) found that in the spring the WVNFS' diet consisted primarily of tree buds, lichens, and hypogeal fungi. In the fall, fungi (both hypogeal and epigeal) and beechnuts were the most commonly used food items. Investigators have observed a strong associative link between hypogeal fungi and the roots of red spruce trees. Therefore, the presence of red spruce is a deterministic factor for WVNFS foraging habitat (USFWS 2006b).

Availability of suitable nest sites may limit the number and distribution of the WVNFS (USFWS 2003). The species preferentially nests in natural tree cavities but also will nest in dreys and

man-made boxes (USFWS 2003). During the cooler months, the WVNFS commonly occupies tree cavities and woodpecker holes (USFWS 2003). In the summer, the WVNFS is known to construct and use dreys on conifer branches or in hardwood foliage (USFWS 1990). Five WVNFS tracked with radiotelemetry used cavity nests primarily in birch trees, and dreys in spruce trees (USFWS 2003). Nest sites are commonly located on north-facing slopes with dense tree canopy (USFWS 2003). Of trees occupied by nesting WVNFS, the minimum diameter at breast height was 4.3 inches for deciduous trees and 5.5 inches for spruce. While the WVNFS shows a high plasticity in nest tree selection, nest trees are typically larger and taller than the surrounding trees (USFWS 2003).

When gliding, the WVNFS preferentially uses coniferous trees as landing points, probably because flying squirrels have difficulty maintaining traction on the smooth, flaky bark of hardwoods such as yellow birch (USFWS 2003).

Telemetry data in West Virginia have shown that home ranges of the WVNFS are larger than originally thought. Home ranges are 24 to 49 acres for females and over 370 acres for males (USFWS 2003).

Current estimates of the amount of WVNFS habitat vary widely from 242,000 acres (U.S. Department of Agriculture (USDA), Northern Research Station 2006, unpublished map) to 600,000+ ac (Menzel et al. 2006b, p. 4), across which the WVNFS is widely dispersed (USFWS 2008). Of the 242,000 acres of habitat in the USDA model, roughly 20 percent is optimal habitat and 80 percent is likely habitat. Approximately 68 percent of the modeled habitat (164,560 acres) occurs on the Monongahela National Forest (MNF), West Virginia (USFWS 2003).

Status and Threats

At the time of listing, 10 WVNFS individuals were known from Randolph and Pocahontas counties, West Virginia, and Highland county, Virginia (USFWS 2006a). It was thought then that vast stretches of unsuitable habitat separated the four known population centers and that the WVNFS was very rare and perhaps no longer present in much of its former range. The final rule listing the subspecies qualitatively described historic habitat losses and suggested that, "[I]n these last occupied zones, the squirrels and their habitat may be coming under increasing pressure from human disturbances such as logging and development" (USFWS 1985).

Although the quantity and quality of WVNFS habitat may be reduced from historical levels, it is now known that the WVNFS is more widespread and more resilient in its habitat use than formerly thought (USFWS 2006a). In addition, habitat trends are moving in a positive direction in terms of forest regeneration and conservation (USFWS 2006a). WVNFS population numbers are currently stable and increasing in some locations (NatureServe 2007). On August 26, 2008,, the USFWS issued a final rule (USFWS 2008) to remove the WVNFS from the Federal List of Endangered and Threatened Wildlife, due to recovery. This rule was challenged and the USFWS issued a final rule on June 17, 2011, to comply with a court order that reinstated the regulatory protections under the ESA for the WVNFS.

Long-term nest box monitoring data from over 30 sites provides evidence of the continued presence of WVNFS over several years or decades (USFWS 2006b). Reproduction has been confirmed at 65 percent of these sites through the capture of nestlings, and the capture of juveniles at about the same percentage confirms recruitment (USFWS 2006b). Since WVNFS has a relatively short lifespan, averaging approximately 4 years, persistence at a single nest box site for any amount of time over 5 years indicates successful reproduction and the presence of multiple generations (USFWS 2006b).

At the time of listing, the WVNFS was thought to be an extremely rare and declining taxon that had disappeared from most of its historical range (USFWS 1985). It is now known that occupancy of available habitat has increased and is much more widespread than formerly thought (USFWS 2006a). The USFWS has determined that the WVNFS continues to occupy the areas identified in the 1985 final listing rule as well as numerous additional sites dispersed throughout its historical range (USFWS 2006a). Due to forest management practices and rangewide proactive conservation activities, a substantial amount of WVNFS habitat is now considered secure and improving in quality (USFWS 2006a). Relative to the information available at the time of listing, recovery actions have resulted in a reduction of threats that have led to a: 1) a significant increase in the number of known WVNFS sites, 2) an increase in the number of individual squirrels, 3) multiple generation reproduction, 4) the proven resiliency of the squirrels, and 5) the vast improvement and continued expansion of suitable habitat (USFWS 2006a).

The future trend for habitat quantity and quality is expected to be favorable because of the gradual recovery of the red spruce-northern hardwood ecosystem and the lack of rangewide habitat threats. As habitat availability increases into the foreseeable future, the carrying capacity of secured and protected habitat should allow for persistence of viable populations of the WVNFS (USFWS 2006a).

Distribution and Range

The current known range of WVNFS follows the spine of the high Allegheny Plateau in a northeast to southwest alignment. The current range includes portions of seven counties in West Virginia and Highland County in Virginia (USFWS 2006b). Helmick Run (Grant County, West Virginia) marks the northeast range periphery and Briery Knob (Greenbrier County, West Virginia) the southwest range periphery (USFWS 2006b). The current range of the WVNFS is thought to encompass most of its historic range (USFWS 2006b). The only portions of the historic range which are not currently occupied are the extreme northern portions of Grant County, West Virginia, and the area from Briery Knob south to Cold Knob in Greenbrier County, West Virginia. These unoccupied areas collectively make up less than 10 percent of the historic range (Menzel et al. 2006).

There have been 107 WVNFS capture sites, of which 105 are in West Virginia and 2 are in Highland County, Virginia (USFWS 2006b). These capture sites are dispersed across seven general areas of relict habitat in the Allegheny Highlands region:

- Cranberry Glades/Upper Williams (Pocahontas and Webster counties, West Virginia)
- Gauley Mountain (Pocahontas, Randolph, and Webster counties, West Virginia)
- Kumbrabow/Mead Westvaco Experimental Research Forest (Randolph County, West Virginia)
- Cheat Mountain (Pocahontas and Randolph counties, West Virginia)
- Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia; Highland county, Virginia)
- Stuart Knob (Randolph and Tucker counties, West Virginia)
- Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia)

At the end of the 2006 monitoring season, there had been 1,198 captures (including 85 recaptures) of WVNFS at the 107 capture sites (USFWS 2007). Approximately half of these captures were prior to 1997 and half were made between 1997 and 2006 (USFWS 2007).

Presence in the Project Area

The project may affect this species in Pendleton, Pocahontas, Randolph, and Tucker counties, West Virginia. We anticipate the project will have no effect on this species in the West Virginia Covered Lands counties of Grant, Greenbrier, and Webster as the Covered Lands do not intersect with suitable WVNFS habitat. No other counties in West Virginia or Virginia with suitable WVNFS habitat are crossed by NiSource Covered Lands.

Based on federal, state and local agency coordination, known element occurrence data and other baseline information identifying WVNFS population centers within the NiSource MSHCP project area was obtained from the West Virginia Natural Heritage Program. The known WVNFS population centers which overlap or are in close proximity to the NiSource MSHCP area are:

- Cheat Mountain (Pocahontas and Randolph counties, West Virginia)
- Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia)
- Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia)

The majority of the WVNFS population centers within the NiSource MSHCP area are found within the MNF.

EFFECTS ON THE WEST VIRGINIA NORTHERN FLYING SQUIRREL

This section evaluates the effects of the proposed action on the WVNFS. Table 1 identifies the pipeline activities and subactivities, as previously identified in the Description of the Proposed Action section ("Covered Actions"), and the environmental impacts resulting from each subactivity, and the anticipated responses of individuals and populations exposed to those

impacts. This table provides the complete record of the effects analysis for this species and was intended to be read in concert with and support this effects analysis section.

Activities that will have no effect or are not likely to adversely affect the species

Some of the covered activities are expected to have no detectable effects on WVNFS (Table 1). Activities involving presence of pipelines and appurtenant facilities, in-stream work, stream crossings, pipeline abandonment, hydrostatic testing, communication facilities and compression-related facilities are expected to have no effect on the species because individuals will not be exposed to their effects. Activities that do not involve tree removal or herbicides (including many vegetation management actions, and pipeline replacement actions), access road operation and maintenance are all not likely to adversely affect the WVNFS because work is not involving WVNFS habitat and noise is not anticipated to rise to the level where adverse effects would be discernable and because of several proposed AMMs that will minimize or avoid potential effects, making those effects either insignificant or discountable. Vehicle operations are not likely to adversely affect the WVNFS because the squirrels are nocturnal and primarily travel from tree to tree.

NiSource is expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). To further minimize potential for adverse effects, additional BMPs may be developed in coordination with NiSource in the future. In particular, proposed AMM 1 addresses the need to implement the Land and Resource Management Plan for work within the MNF (where the majority of overlap between NiSource and WVNFS habitat occurs). These no effect or NLAA activities include:

- Facilities
- Vegetation Management - mowing
- Vegetation Management - tree side trimming by bucket truck or helicopter
- Vegetation Disposal
- ROW repair, regarding, revegetation (upland, wetland or in-stream)
- Access Road Maintenance – grading, graveling, and culvert replacement
- General Appurtenance and Cathodic Protection Construction- trenching, anode, bell hole
- Pipeline Abandonment - in place
- Pipeline Abandonment – ownership transfer
- Inspection Activities
- Vehicle Operation and Foot Traffic
- Vegetation Clearing- herbaceous and ground cover
- Vegetation Clearing - tree side trimming by bucket truck or helicopter
- Vegetation Disposal
- Grading
- Trenching
- Pipe Stringing - bending, welding, coating, padding and backfilling

- Hydrostatic Testing
- Regrading and stabilization
- Compression Facility - noise
- Communication Facility - guy lines, noise, lights
- Access Road- culvert installation
- Stream Crossings
- Wetland and other water body crossings (everything except tree clearing)

Activities that are likely to adversely affect the species

A few of the covered activities, including components of pipeline replacement or new construction, access road construction, and storage well construction and abandonment, are expected to adversely the WVNFS (Table 1). Although we do not know the precise locations where these activities will occur within the covered lands, at least a portion of these projects will likely occur within WVNFS habitat. We estimate approximately 19,988 acres of WVNFS habitat intersect with NiSource Covered Lands. Of course, much less than this would be impacted over the course of the permit. Despite several AMMs that will limit the potential effects, we believe that adverse impacts to the species or its habitat are still likely to occur.

NiSource is expected to conduct all activities in accordance with their Environmental Construction Standards (ECSs) described for the project (Columbia Gulf Transmission, 2008). To further minimize potential for adverse effects, additional BMPs may be developed in coordination with NiSource in the future. These activities include:

- Vegetation Management – chainsaw and tree clearing
- General Appurtenance and Cathodic Protection Construction- Off ROW Clearing
- Well Abandonment- plugging, waste pits, site restoration
- Vegetation Clearing – trees and shrubs
- Access Road- new construction
- Wetland crossings- clearing
- New Storage Well Activities

Vegetation Management- Activities that may result in adverse effects to WVNFS include chainsaw and tree clearing and herbicide application. Tree removal can result in injuring or killing young squirrels and in the loss or alteration of habitat. Aerial application of herbicides may result in exposure of individual squirrels to chemicals that may cause sickness or death.

General Appurtenance and Cathodic Protection Construction- Off ROW Clearing- Activities that may result in adverse effects to WVNFS include tree clearing. Tree removal can result in injuring or killing young squirrels and in the loss or alteration of habitat.

Well abandonment- Presence of waste pits may result in adverse effects to WVNFS. Squirrels may drink contaminants from pits resulting in sickness or death.

Pipeline Replacement/ New Construction- Activities that may result in adverse effects to WVNFS include tree clearing. Tree removal can result in injuring or killing young squirrels and in the loss or alteration of habitat.

Access Road Construction- Activities that may result in adverse effects to WVNFS include tree clearing. Tree removal can result in injuring or killing young squirrels and in the loss or alteration of habitat.

Storage Wells- Activities that may result in adverse effects to WVNFS include tree clearing. Tree removal can result in injuring or killing young squirrels and in the loss or alteration of habitat. Presence of waste pits may result in adverse effects to WVNFS. Squirrels may drink contaminants from pits resulting in sickness or death.

Determination

Based on this analysis, we conclude that the proposed action is likely to adversely affect WVNFS.

CONCLUSIONS & SUMMARY

Based on the findings of this BA amendment, the WVNFS will be adversely affected by the proposed action and will require formal consultation.

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Table 1. Analysis of effects on West Virginia Northern Flying Squirrel.

SPECIES:	West Virginia Northern Flying Squirrel (*Glaucomys sabrinus fuscus*)										
Pipeline Activity	**Subactivity**	**Environmental Impact or Threat**	**Stressor**	**Stressor Pathway (optional)**	**Exposure (Resource Affected)**	**Range of Response**	**Conservation Need Affected**	**Demographic Consequences**	**Suggested Management Options (BMP)**	**NE or NLAA or LAA**	**Comments**
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	physical impacts to individuals, habitat alteration	direct physical impact, contaminants, compaction of habitat, noise	collision with squirrel, hydrocarbons from vehicles, compacting or tearing up soils, noise	not anticipated to rise to the level of adverse effect				1	NLAA	Nocturnal and primarily travel from tree to tree. Unlikely to stay in area with construction. See Service 2007 BO.
Operation & Maintenance	Vegetation Management - mowing (Aug 1-April 14)	disturbance to individuals	noise		not anticipated to rise to the level of adverse effect				1	NLAA	Periodic mowing of ROW is not anticipated to result in noise significant enough to cause alterations in behavioral patterns.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing (Aug 1-April 14)	physical impacts to individuals, habitat alteration	direct physical impact, loss or alteration of habitat, noise	loss of habitat connectivity and cover; crush young if within tree when tree falls	individuals (young), habitat	annoyed to mortality	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,2,6	LAA	Can avoid lethal impacts to young by conducting tree removal between September 15th and April 1.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications (Aug 1-April 14)	physical impacts to individuals, habitat alteration	Chemical contaminants, change in vegetation	direct and indirect exposure to chemicals from application, impacts to vegetation	individuals (all life stages), habitat	annoyed to mortality	Breeding, Feeding, Sheltering	Numbers, reproduction	1,2,3	LAA	Impacts to vegetation within ROW are not anticipated to result in adverse effects. Aerial application is the only potential for impacts. Avoid aerial application. Does USFS allow aerial application?
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	disturbance to individuals	noise		not anticipated to rise to the level of adverse effect				1,2	NLAA	Periodic vegetation management of ROW is not anticipated to result in noise significant enough to cause alterations in behavioral patterns.
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	physical impacts to individuals	direct physical impact	smoke from burn pile	not anticipated to rise to the level of adverse effect				1,2	NLAA	small brush piles with smoke levels similar to recreational campfires
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	physical impacts to individuals	direct physical impact	cut branch that has squirrel sitting on it	not anticipated to rise to the level of adverse effect				1,2	NLAA	
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	disturbance to individuals	noise		not anticipated to rise to the level of adverse effect				1,2,7,8	NLAA	
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	disturbance to individuals	noise		not anticipated to rise to the level of adverse effect				1,2	NLAA	
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	none	none						1,2	NE	
Operation & Maintenance	Access Road Maintenance - grading, graveling	disturbance to individuals	noise		not anticipated to rise to the level of adverse effect				1,2	NLAA	
Operation & Maintenance	Access Road Maintenance - culvert replacement	none	none						1,2	NE	

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE or NLAA or LAA	Comments
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	physical impacts to individuals, habitat alteration	direct physical impact, loss or alteration of habitat, noise	loss of habitat connectivity and cover; crush young if within tree when tree falls	individuals (young life stages), habitat	annoyed to mortality	Breeding, Feeding, Sheltering	Numbers, Reproduction, Range	1,2	LAA	Can avoid lethal impacts to young by conducting tree removal between September 15th and April 1.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	disturbance to individuals	noise		not anticipated to rise to the level of adverse effect				1,2	NLAA	
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None							NE	In-place abandonment is preferred, to avoid impacts from removal, as long as the pipeline is not adversely impacting the habitat
Operation & Maintenance	Pipeline Abandonment - removal (pipe left on surface)	none	none						1	NE	Pipe left on surface would not result in a barrier for WVNFS
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	physical impact to individuals	Contaminants	Drinking water in waste pits	all life stages		Breeding, Feeding, Sheltering	Numbers, reproduction	1	LAA	
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	disturbance to individuals	noise	noise from activities	not anticipated to rise to the level of adverse effect				1,2	NLAA	
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None							NE	
Operation & Maintenance	Inspection Activities - ground and aerial	Neutral	None							NE	No impacts to individuals or habitats are anticipated from this action.; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
New Disturbance - Construction	Vehicle Operation and Foot Traffic	physical impacts to individuals, habitat alteration	direct physical impact, contaminants, compaction of habitat, noise	collision with squirrel, hydrocarbons from vehicles, compacting or tearing up soils, noise	not anticipated to rise to the level of adverse effect				1	NLAA	
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	disturbance to individuals	noise		not anticipated to rise to the level of adverse effect				1,4,5	NLAA	
New Disturbance - Construction	Clearing - trees and shrubs	physical impacts to individuals, habitat alteration	direct physical impact, loss or alteration of habitat, noise	loss of habitat connectivity and cover; crush young if within tree when tree falls	individuals (young), habitat	annoyed to mortality	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,4,5,6	LAA	Can avoid lethal impacts to young by conducting tree removal between September 15th and April 1. WVNFS still anticipated to cross ROW (not significant barrier). Primary concern is loss of habitat.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	disturbance to individuals	noise		not anticipated to rise to the level of adverse effect				1,5	NLAA	It is unlikely that species would remain in close proximity to the work area with active construction.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	physical impacts to individuals	direct physical impact	smoke from burn pile	not anticipated to rise to the level of adverse effect				1,5	NLAA	It is unlikely this species would remain in the immediate work area when this activity is started.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	physical impacts to individuals	direct physical impact	cut branch that has squirrel sitting on it	not anticipated to rise to the level of adverse effect				1,5	NLAA	

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE or NLAA or LAA	Comments
New Disturbance - Construction	Grading, erosion control devices	disturbance to individuals	noise		not anticipated to rise to the level of adverse effect						
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	disturbance to individuals	noise		not anticipated to rise to the level of adverse effect						
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	disturbance to individuals	noise		not anticipated to rise to the level of adverse effect					NE	
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	none	None								
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	none	None								
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	disturbance to individuals	noise		not anticipated to rise to the level of adverse effect				7,8,9		
New Disturbance - Construction	Compression Facility, noise	Neutral	None							NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None							NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	disturbance to individuals, habitat alteration	noise, habitat loss (similar to ROW)		individuals (young), habitat				1,4,5,6	LAA	Similar impacts from clearing as new ROW. New access roads are not anticipated to be a barrier to WVNFS. Infrequent use by NiSource for O&M- not a new highway.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	none	None						1	NE	
New Disturbance - Construction	Stream Crossings, wet ditch	Neutral	None						1	NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Stream Crossings, dry ditch	Neutral	None						1	NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Neutral	None						1	NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Stream Crossings, dam & pump	Neutral	None						1	NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Neutral	None						1	NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Stream Equipment Crossing Structures	Neutral	None						1	NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	physical impacts to individuals, habitat alteration	direct physical impact, loss or alteration of habitat, noise	loss of habitat connectivity and cover; crush young if within tree when tree falls	individuals (young), habitat	annoyed to mortality	Breeding, Feeding, Sheltering	Numbers, Reproduction,	1,4,5,6	LAA	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	physical impacts to individuals	direct physical impact	cut branch that has squirrel sitting on it	not anticipated to rise to the level of adverse effect				1,5	NLAA	

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	Suggested Management Options (BMP)	NE or NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	disturbance to individuals	noise		not anticipated to rise to the level of adverse effect				1	NLAA	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	none	None						1	NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	none	None						1	NE	clearing associated with staging areas addressed in clearing sections above.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	none	none						1	NE	clearing associated with staging areas addressed in clearing sections above.
New Disturbance - Construction	Storage wells - clearing and drilling	Individual injury or mortality, temporary or permanent loss of habitat, exposure to predators	Chemical contaminant, loss/degradation of habitat	Direct exposure to chemicals from spills, loss of habitat connectivity and cover	all life stages		Breeding, Feeding, Sheltering	Numbers, reproduction	1,4,5,6	LAA	
New Disturbance - Construction	Storage wells - reconditioning	physical impact to individuals	Contaminants	Direct exposure to chemicals from spills	not anticipated to rise to the level of adverse effect				1	NLAA	WVNFS not anticipated to stay in work area. Exposure to any chemicals associated with drilling activities is not expected.
New Disturbance - Construction	Storage wells - waste pits	physical impact to individuals	Contaminants	Drinking water in waste pits	all life stages		Breeding, Feeding, Sheltering	Numbers, reproduction	1	LAA	

Management Options (BMP)

All Activities

1. When within WVNFS habitat within the Monongahela National Forest, implement the Land and Resource Management Plan Forest-Wide Management Direction for WVNFS (TE63 to TE66).

Operations and Maintenance (O&M)

2. Employ all practical measures to minimize the area of disturbance when conducting O&M activities in occupied or potential habitat.
3. Avoid aerial application of herbicides within mapped WVNFS habitat.

New Construction

4. When possible select routes that avoid tree clearing in suitable habitat.
5. Employ all practical measures to minimize the area of disturbance when conducting construction activities in occupied or potential habitat.

Timing Restrictions

6. Conduct tree removal between September 15 and April 1 to avoid felling of potential nest trees (i.e., trees greater than 5 inches diameter at breast height) in occupied or potential habitat when young WVNFS may be present in nests..

Restoration and Re-vegetation

7. Re-vegetate all disturbed WVNFS habitat with appropriate native species (red spruce).
8. Monitor all restoration plantings for proper establishment and implement supplemental plantings as necessary.
9. Establish an adequate number of nest boxes. Use 15 nest boxes per 50 acres and 1 box for each additional 5 acres.