APPENDIX F

CONSERVATION FRAMEWORKS

NOT LIKELY TO ADVERSELY AFFECT SPECIES

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CONSERVATION FRAMEWORKS - NOT LIKELY TO ADVERSELY AFFECT SPECIES

To identify potential species to include as covered species in the MSHCP, NiSource obtained from the Service lists of federally threatened, endangered, proposed, and candidate (TEP&C) species in the counties crossed by the covered lands. In collaboration with the Service, NiSource then identified (1) TEP&C species for which the covered activities will have no potential to impact; (2) TEP&C species for which the covered activities have the potential to impact but adverse impacts are unlikely or can be avoided through avoidance and minimization measures; and (3) TEP&C species for which the covered lands have the potential to adversely impact. Where it is anticipated that covered activities will not impact or not adversely impact a species, NiSource is not requesting take coverage; these species are addressed below in Sections 1.0 and 2.0, respectively. Where it is anticipated that the covered activities will adversely impact a species, NiSource is requesting take coverage; these species are addressed in the MSHCP. Note that map references are not provided for these species as such locational information is sensitive and not for public disclosure.

1.0 Species that the covered activities will not affect

In early 2007, outreach with Service representatives was initiated to evaluate the county-wide list of TEP&C species (used as the initial species of concern list) to determine more accurately which species would be affected by the covered activities. From this outreach, NiSource determined that the covered activities would have no effect on a number of species, because the covered lands were outside the known or expected range, suitable habitat, and/or action area for that species (Armstrong et al. 2007).

These species are listed below in **Table F-1**. The intent of this documentation is to negate the need to further consult with the Service on these species for NiSource activities within the covered lands for the permit duration. If the Service concurs with this evaluation, NiSource is not requesting take coverage for the "no effect" species.

Table F-1. Species that the covered activities will not affect

Species Common Name	*Species Latin Name*	**Federal List Status**
Mammals		
Delmarva Peninsula fox squirrel	*Sciurus niger cinereus*	E
West Indian manatee	*Trichechus manatus*	E
Reptiles and Amphibians		
Shenandoah salamander[1]	*Plethodon Shenandoah*	E
Fish		
Blackside dace	*Phoxinus cumberlandensis*	T
Cumberland snubnose darter	*Etheostoma atripinne*	C

[1]Although initial consultation indicated that this species may be affected by covered activities in Madison and Page counties, Virginia (Armstrong et al. 2007), subsequent discussion with the Service (Niver 2008) and review of the closest known populations greater than 10 miles from the covered lands (VaDCR 2007, VaDGIF 2007) led to the determination that covered activities would have no effect on this species.

Species Common Name	*Species Latin Name*	**Federal List Status**
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T
Maryland darter	*Etheostoma sellare*	E
Scioto madtom	*Noturus trautmani*	E
Slackwater darter	*Etheostoma boschungi*	T
Aquatic Invertebrates		
Cumberland bean pearlymussel	*Villosa trabalis*	E
Dromedary pearlymussel	*Dromus dromas*	E
Louisiana pearlshell	*Margaritifera hembeli*	T
Pale lilliput pearlymussel	*Toxolasma cylindrellus*	E
Purple cat's paw pearlymussel	*Epioblasma obliquata obliquata*	E
Tan riffleshell	*Epioblasma florentina walkeri*	E
White cat's paw pearlymussel	*Epioblasma obliquata perobliqua*	E
White wartyback pearlymussel	*Plethobasus cicatricosus*	E
Terrestrial Invertebrates		
Karner blue butterfly	*Lycaeides melissa samuelis*	E
Mitchell's satyr butterfly[2]	*Neonympha mitchellii mitchellii*	E
Puritan tiger beetle	*Cicindela puritana*	T
Plants		
Braun's rock cress	*Arabis perstellata*	E
Pitcher's (sand dune) thistle	*Cirsium pitcheri*	T
Mead's milkweed	*Asclepias meadii*	T

2.0 Species that the covered activities may affect, but are not likely to adversely impact

For species in which the initial outreach indicated that the covered activities may affect the species, further review and analysis was completed. This review and analysis included, but was not limited to, review of recognized literature; life history; habitat requirements; planning units; populations distribution, status, and trend; project effects on critical habitat; and historic handling of the species on other NiSource projects. In some cases, it became apparent through the review process that although a particular species could be affected by the covered activities, it was not anticipated that the covered activities would adversely impact the species. If the Service concurs with this evaluation, NiSource is not requesting take coverage for these species.

[2] Initial project review (Armstrong et al. 2007) indicated that the covered activities may affect this species in Elkhart, Lake, LaPorte, Noble, and St. Joseph counties, Indiana, but would have no effect on this species in Morris and Warren counties, New Jersey. Subsequent map review was completed by Indiana Department of Natural Resources (Casabere 2008) of counties crossed by the covered lands in Indiana. It was determined that the Project would have no effect on the Mitchells' satyr butterfly because either the covered lands do not intersect species range or suitable habitats and/or the covered activities are not anticipated to otherwise affect the species.

These species are listed below in **Table F-2** and detailed in summary records titled Conservation Frameworks (**Attachments F1-F9**). If the Service concurs with this evaluation, NiSource is not requesting take coverage for these "not likely to adversely impact" species. The intent of this documentation is to negate the need to further consult with the Service on these species for NiSource activities within the covered lands for the permit duration.

Table F-2. Species that the covered activities may affect, but are not likely to adversely impact

Species Common Name	*Species Latin Name*	**Federal List Status**
Mammals		
Gray bat	*Myotis grisescens*	E
Virginia big-eared bat	*Corynorhinus townsendii virginianus*	E
Louisiana black bear	*Ursus americanus luteolus*	T
Bird		
Interior least tern	*Sterna antillarum*	E
Reptiles and Amphibians		
Cheat Mountain salamander	*Plethodon nettingi*	T
Aquatic Invertebrate		
Birdwing pearlymussel	*Lemiox rimosus*	E
Cracking pearlymussel	*Hemistena lata*	E
Cumberland monkeyface pearlymussel	*Quadrula intermedia*	E
Oyster mussel	*Epioblasma capsaeformis*	E

References

Armstrong, M., F. Clark, and R. Niver. 2007. U.S. Fish and Wildlife Service, Regional Leads for the NiSource MSHCP Project. Numerous electronic mail transmissions to ENSR forwarding information from various USFWS Field Offices in response to a request for initial project review and "may affect/no effect" call relative to covered species in the project area. Initial request for information sent by F. Clark on February 15, 2007. Responses received and forwarded to ENSR February – July 2007.

Casabere, L. 2008. Indiana Department of Natural Resources, Division of Nature Preserves. Electronic mail transmissions between March 3, 2007 and January 23, 2008.

Niver, R. 2008. U.S. Fish and Wildlife Service. Electronic mail transmission regarding no effect for Shenandoah Salamander. February 4, 2008.

Virginia Department of Conservation and Recreation Natural Heritage Program. 2007. Response to ENSR request for data dated received September 2007.

Virginia Department of Game and Inland Fisheries. 2007. WERMS database response to ENSR request for data dated received December 2007.

Attachment F-1
Conservation Framework for Gray Bat

BACKGROUND

The gray bat (*Myotis grisescens)* is the largest member of its genus in the eastern United States. Its forearm measures 40 to 46 mm, and weighs from 7 to 16 grams. It is easily distinguished from all other bats within its range by its unicolored dorsal fur. All other eastern bats have distinctly bi- or tri-colored fur on their backs. Following molt in July or August, gray bats are dark gray, but they often bleach to chestnut brown or russet between molts (especially apparent in reproductive females during May and June). The wing membrane connects to the foot at the ankle rather that at the base of the first toes, as in other species of *Myotis*.

Based on initial project review (Armstrong et al. 2007), this analysis concludes that the project **may affect** the gray bat in Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee.

Refer to the POPULATION DISTRIBUTION, STATUS, AND TREND section for analysis location details. Refer to SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES section for where AMMs would apply for this species.

LIFE HISTORY

The gray bat is restricted to regions in south central United States where large cave systems occur. Gray bats use caves throughout the year. Generally, gray bats hibernate in deep, cool caves with a vertical opening or shaft. Here, they form large clusters composed of both sexes of as many as thousands of individuals. Females usually enter hibernation by early October, while males and most juveniles remain active until they enter hibernation in early November (Service 1982). Gray bats emerge from hibernation in the spring and move to the summer range. In summer, females migrate to traditional caves that meet very narrow roost conditions where they form nursery colonies in small, dead end chambers or high domes. Adult males and yearlings form large bachelor colonies in caves near the nursery colonies. Both males and females select caves that are closely associated with or in close proximity to large bodies of water (rivers, lakes, or reservoirs) over which they forage almost exclusively.

HABITAT REQUIREMENTS

Roosting Habitat

The gray bat is restricted to roosting in cave habitats almost year-round with only rare exceptions. Because of highly specific roost and habitat requirements, fewer than 5 percent of available caves are suitable for occupation by gray bats (Service 1982). Males and females hibernate in the same caves. Suitable winter hibernacula are typically deep and vertical, with a large volume below the lowest entrance that acts as a cold air trap (Service 1982). Winter roosts typically range in temperature from 41°F to 52°F, have multiple entrances and good airflow (Martin 2007).

A much wider variety of cave types are used during spring and fall transient periods. In summer, maternity colonies prefer caves that act as warm air traps or that provides restricted rooms with dome ceilings that are capable of trapping the combined body heat of thousands of clustered individuals (Tuttle 1975; Tuttle and Stevenson 1978). Males and yearling females seem less restricted to specific cave and roost types (Tuttle 1976a). Cave temperatures for summer roosts range from 57°F to 77°F (Martin 2007). Typically, summer caves are within 0.6 miles of a river or lake. Most foraging occurs within seven miles of roosts (LaVal et al. 1977), but gray bats may range up to 12 miles nightly.

Foraging Habitat

Gray bats forage primarily over water along river and reservoir edges (Service 1982). Forestlands located around caves, between caves and foraging habitats are important for gray bats. Gray bats utilize surrounding forest outside of cave entrances for shelter for young that have just begun to fly and for bats of any age to fly from the cave to feeding areas in the protection of the forest canopy (Service 1982).

Gray bats forage on a variety of insects that comprise at least 55 families (Clawson 1984; Best et al. 1997). A studied conducted by Brack and Laval (2006) on the analysis of gray bat fecal pellets and comparison to insect availability light-trap samples in Missouri revealed that gray bat diets varied among locations, over time, between early evening and night, and among sample groups by sex, age, and reproductive condition. On a small scale the gray bat showed characteristics of an opportunistic forager; but on a larger scale they were selective, feeding within aquatic habitats where specific kinds of insect pray were abundant. The same study found that juveniles foraged more frequently in woodlands and ate more beetles than did adults (Brack and LaVal 2006).

PLANNING UNITS

The Planning Unit for this Conservation Framework includes the states within the NiSource MSHCP with extant or historical populations of the gray bat. The NiSource MSHCP states with historical populations found in the planning area are Kentucky (specifically in Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties) and Tennessee (specifically in Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties).

Based on existing information there is no reason to assume genetic differences exist among populations within the NiSource MSHCP covered lands. Accordingly, one planning unit will be utilized for gray bat for the purposes of the NiSource MSHCP.

POPULATION DISTRIBUTION, STATUS, AND TREND

Entire Range

Gray bats are a monotypic species that occupy a limited geographic range in limestone karst areas of the southeastern United States. Populations are found mainly in Alabama, northern Arkansas, Kentucky, Missouri, and Tennessee. Small populations inhabit northwestern Florida, western Georgia, and southeastern Kansas, southern Indiana, southern and southwestern Illinois, northeastern Oklahoma, northeastern Mississippi, western Virginia, and possibly western North Carolina.

Historically, individual hibernating populations of gray bats contained 100,000 to 1.5 million or more bats (Service 1982). About 95 percent of the bats hibernated in only nine caves with more than one-half in a single cave.

In 1970, the gray bat population was estimated to be 2.25 million. However, a survey in 1972 of key colonies in Alabama and Tennessee reported an average decline of more than 50 percent (Service 2007). Due to increases in protective measures in the late 1970's and throughout the 1980's at high priority colony sites, the declines have been halted at some major sites and those populations are now considered stable or in some cases are increasing (Service 2007).

Recent population status assessment work has shown that gray bat populations throughout their range are either stable or increasing. According to the recent U.S. Army Corps of Engineers publication, *Assessment of the Population Status of the Gray Bat (Myotis grisescens)* Arkansas, Alabama and Missouri have shown increasing population numbers at maternity sites. Missouri reported that 87% of maternity colonies in Central Missouri were stable or increasing. Alabama and Arkansas reported individual populations increasing by 28% to 34% at maternity colonies. Kentucky's summer counts indicate a stable to upward trend and winter hibernacula counts show a population increase of 27% since 1997. Both winter and summer counts in Tennessee indicate stable to increasing population numbers. Finally, 12 major hibernacula, covering five states show an overall population increase of 104%. In 1982, gray bat populations were estimated at 1,719,200 bats and in 2006; populations had increased to 3,377,100 bats (Martin 2007).

Populations Potentially Impacted

The distribution of gray bats is fragmented within one single range spanning several states. The planning area falls into habitat found only in counties within the states of Kentucky and Tennessee. Habitat is restricted to caves located in the karst topography of the southeastern United States. Potentially disturbed populations include summer roosting populations within the two states as well as known and potential hibernacula. Potentially impacted populations occur in the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee.

EFFECTS ON CRITICAL HABITAT

There are currently no critical habitat rules published for this species by the Service.

SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES

These species-specific AMMs apply to the covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee.

These species-specific measures supplement (and supersede where conflicting) the general BMPs specified in the NGTS ECS. Measures to avoid and minimize impacts to the

species in summer foraging habitat[3] (i.e., AMMs 11-18) have been identified to provide additional conservation benefits to the species within known and assumed occupied habitat. Measures in standard font text will be applied for all activities. Measures in *italic* font text will be applied on a case-by-case basis depending on the requirements of the activity. These requirements include consideration of customer and business needs, practicality, and effectiveness as more fully described in Chapter 5 of this MSHCP.

Surveys to Determine Presence of Potential Summer Roosts and/or Winter Hibernacula

1. NiSource will develop sufficient information as to whether potentially suitable summer and winter gray bat habitat exists within a proposed project area. This knowledge can be derived from several sources including, but not limited to, on-site visits, review of aerial photography and other maps, previous mining records (if applicable), forest inventories, previous species survey reports, and the work of NiSource's consultants or other designees. Gray bats have been documented using caves, quarries, bridges, and other man-made sites that act as summer and winter roosting and hibernation habitat. NiSource personnel or its consultants will determine whether potentially suitable summer and winter habitat exists within the project area by conducting "Summer/Winter Habitat Pre-Surveys" as described below. The results of such pre-surveys will be recorded and documented in NiSource's annual compliance report. Pre-survey results will be valid for at least 2 years. The Summer/Winter Habitat Pre-Survey Protocols are:

i. The openings should be at least one (1) foot in diameter or larger.

ii. The passage should continue beyond the dark zone and not have an obvious end within 40 feet of entrance (Note: This may not be verifiable by surveyor due to safety concerns.).

iii. Entrances that are collapsed or otherwise inaccessible to bats will be excluded.

iv. Abandoned mine (e.g., coal, limestone, etc...) openings that have occurred recently (i.e., within the past 12 months) due to creation or subsidence will be excluded however a written description and photographs of the opening must be included in the pre-survey report.

Surveys to Confirm Use of Summer Roosts and/or Winter Hibernacula

2. If potentially suitable summer and/or winter habitat is discovered as a result of the pre-survey above, do not alter, modify, or otherwise disturb entrances or internal passages of caves, mines, or other entrances to underground voids (potential summer roosts/hibernacula) within the covered lands of the MSHCP until further investigation is completed to determine if the potential habitat is in fact, occupied habitat. The winter survey protocols would follow those for "Determination of Potential Winter Habitat for Indiana Bat" due to the comprehensive overlap of range and habitat for these two species; however, a summer survey must also be completed for gray bats because this is a cave obligate species. The summer surveys must be completed between the dates of June 15th and August 15th. Summer survey protocols to determine whether potential summer roosting habitat for gray bats is occupied are provided in Attachment 1. *Otherwise, NiSource will assume presence of gray bats in this summer and/or winter habitat.* If surveys (conducted using approved methodology) fail to detect gray bats, AMMs in summer

[3] Summer foraging habitat is defined as all perennial streams, ponds, and lakes within the covered lands that are located within 12-miles of a known and/or assumed occupied summer roosting cave for gray bats.

and/or winter habitat are not mandatory. However, NiSource may employ some of the AMMs to maintain the viability of the potentially suitable habitat.

Measures to Avoid and Minimize Impacts to the Species in Known or Presumed Occupied Summer Roosts and/or Winter Hibernacula

3. When burning brush piles within 0.25 miles of occupied summer roost and/or winter hibernacula, the brush piles can be no more than 25' by 25' and must be spaced at least 100 feet apart.

4. No woody vegetation or spoil (e.g., soil, rock, etc…) disposal within 100-feet of known summer roost and/or winter hibernacula entrances and associated sinkholes.

5. Protect recharge areas of cave streams and other karst features that are hydrologically connected to known summer roost and/or winter hibernacula by following relevant ECS standards such as Section III, Stream and Wetland Crossings; and Section IV, Spill Prevention, Containment and Control.

6. Blasting within ½ mile of known or presumed occupied summer roost and/or winter hibernacula will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of known or presumed occupied site.

7. Drilling within ½ mile of known or presumed occupied summer roost and/or winter hibernacula will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of known or presumed occupied site.

8. If authorized by the landowner block (e.g., gate) access roads and ROW's leading to known summer roost and/or winter hibernacula from unauthorized access.

9. Equipment servicing and maintenance areas will be designated to areas away from streambeds, riparian zones, sinkholes, or areas draining into sinkholes.

10. Operators, employees, and contractors will be educated on the biology of the gray bat, identification of the bat, and its signs, activities that may affect bat behavior, and ways to avoid and minimize these effects.

Measures to Avoid and Minimize Impacts to the Species in Known or Presumed Occupied Summer Foraging Habitat

11. *When performing vegetation management, tree clearing in known or presumed occupied summer habitat where gray bats forage (i.e., riparian corridors of perennial streams) should be kept to a minimum in order to preserve as much foraging area and tree cover as possible.*

12. Restrict use of herbicides for vegetation management near known or presumed occupied gray bat foraging habitat to those specifically approved for use in karst (e.g., sinkholes) and water (e.g., streams, ponds, lakes, wetlands) in order to not endanger their food source.

13. *Abandon pipelines in place to avoid disturbance to perennial streams that would result from pipeline removal and thus affect potential gray bat prey.*

14. *For repairs on perennial streams, replace damaged pipeline using HDD - do not install in-channel repairs (bendway weirs, hardpoints, concrete mats, fill for channel relocation, etc.).*

15. *Conduct repairs from a lay barge or temporary work bridges of the minimum length necessary to conduct the repairs rather than operating heavy equipment (e.g., backhoes,*

bulldozers) in perennial streams. Temporary construction and equipment bridges are not to be confused with stone or fill causeways with pipe structures, which should not be employed in occupied habitat.

16. *Remove equipment bridges as soon as possible after repair work and any site reseeding is completed on perennial streams.*

17. *Site staging areas for equipment, fuel, materials, and personnel at least 300 feet from the waterway to reduce the potential for sediment and hazardous spills entering the waterway.*

18. *Perennial stream crossings should be conducted during low flow conditions between the months of June 1 and November 30.*

19. *Avoid conducting perennial stream crossing construction activities after sunset in known or presumed occupied summer habitat to avoid harassment of foraging gray bats.*

20. Contaminants, including but not limited to oils, solvents, smoke from brush piles, and others should be strictly controlled as provided for in the EMCS and ECS, Section II, C, 2; and Section IV so the quality, quantity, and timing of prey resources are not affected.

21. Implement erosion control measures, ensure restoration of pre-existing topographic contours after any ground disturbance, and restore native vegetation (where possible) as specified in the ECS upon completion of work within 12-miles of known or presumed occupied summer roosts.

A detailed Environmental Management and Construction Plan (EM&CP) will be prepared for any project within gray bat habitat. The plan will incorporate the relevant requirements of NiSource's current ECS and include site-specific details particular to the project area and potential impact. The plan will be strongly oriented towards minimizing disturbance of hibernation and roosting caves and minimization of stream and riparian zone impacts within known foraging areas. 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 hi-light the environmental sensitivity of the habitat and any gray bat BMPs which must be implemented.

LEVELS OF TAKE

Through the application of the NGTS ECS and the species-specific AMMs, it is anticipated that the covered activities as described in the NiSource MSHCP **may affect, but are not likely to adversely affect** the gray bat. If the Service concurs with this determination, NiSource does not request take coverage for this species.

REFERENCES

Armstrong, M., F. Clark, and R. Niver. 2007. U.S. Fish and Wildlife Service, Regional Leads for the NiSource MSHCP Project. Numerous electronic mail transmissions to ENSR forwarding information from various Service Field Offices in response to a request for initial project review and "**may affect**/**no effect**" call relative to covered species in the project area. Initial request for information sent by F. Clark on February 15, 2007. Responses received and forwarded to ENSR February – July 2007.

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ATTACHMENT 1: Determination of Potential Summer Roost Habitat for Gray Bat

Due to the recent spread of White-nose Syndrome (WNS), the Service's March 29, 2009 Cave Advisory recommending the suspension of cave activities to protect bats, and the potential concerns regarding the transmission of WNS from use of survey gear in and immediately adjacent to a potential summer roost, the Service is currently in the process of considering revisions to this guidance. NiSource will ultimately be responsible to follow Service approved guidance to determine if summer roosting habitat for the Gray bat is present within the covered lands of the MSHCP.

Attachment F -2
Conservation Framework for Virginia Big-eared Bat

BACKGROUND

In 1979, the Virginia big-eared bat (*Corynorhinus townsendii virginianus)* was listed as endangered. Five caves in West Virginia were also designated as critical habitat (Service 1979). In 1984, a recovery plan for the Ozark and Virginia big-eared bat was established to set forth actions to prevent the extinction of both species.

Efforts have been made to protect summer and winter roost sites by gating or fencing caves in Kentucky, North Carolina, Virginia, and West Virginia. These efforts have stabilized or reversed population declines at these sites. Research efforts to determine foraging and summer habitat requirements have also been initiated in Kentucky, Virginia, and West Virginia (Service 2007).

Based on initial project review (Armstrong et al. 2007), this analysis concludes that the project **may affect** this species in Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.

Refer to the POPULATION DISTRIBUTION, STATUS, AND TREND section for analysis location details. Refer to the SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES (AMMs) section for where AMMs would apply for this species.

LIFE HISTORY

Much of the data is based on studies of non-endangered subspecies of Townsend's big-eared bat due to the lack of information available on the endangered Virginia big-eared bat.

The Virginia big-eared bat appears to be a relatively sedentary species. No long distance migrations have been reported. This species exhibits a high degree of site attachment, returning year after year to the same maternity roosts. Winter activity may include short movement among nearby hibernacula.

Big-eared bats feed principally on small moths (*Micro-lepidoptera*), averaging 0.24 inches in length, and also may take other insects, including representatives of Neuroptera, Coleoptera, Diptera, and Hymenoptera. Forest insects comprise a substantial portion of the diet of the Virginia big-eared bat (Service 2008). Howell noted that Townsend's big-eared bat captured insects from leaves and other places (Service 1984). However, Bell noted that big-eared bats feed mostly in the air along forested edges and should not be regarded as foliage gleaners (Service 1984).

Estrus and subsequent copulation begin in autumn and the peak of copulations occurs from November through February, although some females apparently mate before arriving at hibernacula. Young females are reproductively active and mate in their first autumn. Spermatozoa are stored in the reproductive tracts of females until spring when ovulation, fertilization, and gestation occur. Ovulation may occur either before or after a female leaves hibernation. Only a single embryo is developed, and length of gestation varies from 56 to 100

days, depending upon spring temperatures and the varying amounts of torpor experienced by the individual (Service 1984) .

In adult males, spermatogenesis occurs during the summer, reaching maximum activity in September. By late September and early October, the testes of adults begin to atrophy, coinciding with the appearance of sperm in the enlargening eipididymides. The accessory glands reach full size in late October. Copulation is preceded by a ritualized precopulatory behavior of audible vocalizations, followed by head nuzzling. Young males fail to reach sexual maturity in their first autumn (Service 1984).

Newborn bats are naked, and their large ears cover their unopened eyes for the first few days. At the age of one week, young bats are capable of producing adult-like audible "squawks". Young bats grow rapidly, nearly reaching adult forearm size in one month. They are capable of flight at two and a half to three weeks and are fully weaned by six weeks.

Big-eared bats prefer relatively cold places for hibernation, often near entrances of well ventilated parts of caves. During hibernation, they assume body temperatures that are highly correlated with ambient air temperatures and the temperature of the substrate on which they roost. In winter, they often move deeper into the more thermally stable parts of the same cave or move to other nearby caves if temperatures near entrances become too extreme. Over half of the autumn body mass in big-eared bats may be lost during hibernation with the greatest loss occurring in the first months of winter. The periodic arousal and movement of the bats contributes to loss of fat reserves (Service 1984).

During late March or early April, female big-eared bats congregate and form maternity colonies in the warm parts of certain caves. Although there may be occasional periods of torpor, the females usually remain alert and active in the maternity roost. The nocturnal activity pattern of bats in the maternity colonies varies as the maternity season progresses. During May and most of June, the colony remains outside the cave most of the night and often re-emerges in a pattern that probably is related to ensuring development of the young (Service 1984).

HABITAT REQUIREMENTS

The species typically requires caves or cliffs in limestone karst areas within mature hardwood forests dominated by oak, hickory, beech, maple, or hemlock trees (NatureServe 2007). Hibernation caves are cool 36.5^{o}F to 49.1^{o}F and well ventilated (Service 2007). They typically roost near cave entrances or in areas of significant air movement. During the winter both sexes hibernate together, while in the summer males either occur alone or in groups within caves (NatureServe 2007). Maternity colonies tend to be found deep within caves that are warmer than those used for hibernation 59^{o}F to 64.4^{o}F (Service 2007). The species may move from one roost site to another during both hibernation and summering (NatureServe 2007).

Foraging studies conducted in West Virginia using light tagging and radio telemetry techniques, have revealed that female Virginia big-eared bat often travel up to 4.35 miles from the maternity cave to forage each night. In other radio telemetry studies, females were tracked up to 6.21 miles from their maternity caves to forage and movements of 19.88 miles were noted between summer roosts and hibernacula. Foraging habitats include woodlands, old fields, and hay fields. The bats were also observed foraging in corn, hay, and alfalfa fields, although grazed pastureland and recent clear-cuts were not used by the bats studied. Each bat appeared to forage in the same general area on successive nights, but some bats used more than one foraging area.

The bats occupied night roosts (often man-made structures such as abandoned houses, barns, out buildings, and a state highway bridge) near the foraging areas. Forest insects comprise a substantial portion of the diet of the Virginia big-eared bat. They feed mostly in the air along forested edges and should not be regarded as foliage gleaners (Bell in Kunz and Martin 1982). Significant strides have been made in better understanding the species' ecology, however further research is needed on foraging habitat and seasonal movements, particularly to maternity sites. In addition, no coordinated efforts have been made to delineate the availability and quantity of the foraging habitats that are available in the vicinity of most major Virginia big-eared bat maternity caves.

PLANNING UNITS

The Planning Units for this Conservation Framework includes the states within the NiSource MSHCP with extant or historical populations of the Virginia big-eared bat. Historical populations occurred in the following NiSource MSHCP states: Virginia, West Virginia, Kentucky, and North Carolina. At this time, no extant populations of the Virginia big-eared bat are known to exist outside of the NiSource MSHCP area. A recent study evaluated population structure, genetic diversity, and dispersal in three subspecies of Townsend's big-eared bats (Piaggio et al., in review), and included samples of Virginia big-eared bat from four geographic regions:

- Pendleton and Grant Counties in West Virginia (i.e., Northern West Virginia);
- Fayette County, West Virginia (i.e., Southern West Virginia);
- Tazewell County, Virginia (i.e., Virginia); and
- Lee, Estill, and Jackson Counties in Kentucky (i.e., Kentucky).

The study found that the Tazewell County population had the lowest overall diversity, with haplotypes approaching fixation. Additionally, there was evidence of a population bottleneck in all regions except Kentucky. This reduced genetic diversity means that genetic drift may be driving diversity within these populations, thus diminishing biodiversity and evolutionary potential. These results further suggest complete loss of connectivity among regional populations. It is possible - because known colonies of Virginia big-eared bat are located in disjunct regions, which are beyond the known dispersal distances of these bats (Humphrey and Kunz 1976) – that the regional populations no longer maintain genetic connectivity. Therefore each regional population is likely an isolated entity subject to genetic drift and inbreeding. Piaggio et al. (in review) conclude that the geographic regions represent significantly differentiated and genetically unique populations of Virginia big-eared bats, which should be recognized as distinct evolutionary units and managed as such. Thus, four planning units have been identified for the NiSource MSHCP. The planning units include: (1) the northern West Virginia sub-population; (2) the southern West Virginia sub-population; (3) the Kentucky sub-population; and (4) the Virginia sub-population.

POPULATION DISTRIBUTION, STATUS, AND TREND

Entire Range

When the recovery plan was drafted the known population within maternity colonies was approximately 3,600 bats, and the known population of hibernating bats was approximately 2,585. It was assumed that there were additional sites that had not yet been identified. The most recent monitoring data show a significant overall population increase since the time of listing.

Survey data from 2006/2007 indicate a population of approximately 10,900 hibernating bats and 7,169 bats within known maternity colonies (Note: This figure does not include counts from bachelor colonies). Also, as described above, monitoring of the Higgenbotham site in Virginia has not been conducted due to safety concerns. The most recent counts for this cave indicate 1,160 bats during the winter (1999) and 350 bats during the summer (2002).

Within these overall population increases there is some variation between regions and within specific caves. The population in West Virginia seems to be increasing slowly at this time. In June 2006, the number of bats in the 10 summer colonies currently monitored by the West Virginia Department of Natural Resources was the highest observed since annual monitoring began. The 2006 level was 5.4% higher than the number tallied in 2005, but only 1.2% above the number observed in 2004. The number of Virginia big-eared bats in the Cave Hollow/Arbogast cave system dropped from over 1,100 bats to under 300 following vandalism in 1988/89. The number of bats in this cave is currently up to nearly 700, but still short of the 1988 population. The number of Virginia big-eared bats in Cave Mountain has declined since 1989, but the number observed in 2006 was the highest since 2002. It is possible that some of the Virginia big-eared bat in Mill Run Cave came from Cave Mountain Cave because that colony was not known to be in Mill Run Cave in the 1980s. The number of Virginia big-eared bat in Cliff Cave has been declining, but this population is heavily infested with strebilid flies and the summer 2007 maternity count documented predation by a house cat. The number of Virginia big-eared bats declined in Stinnett Cave probably due to vandalism in 1992/93. The number has increased following construction of angle iron gates, but is still about 200 Virginia big-eared bats less than in 1989. Some of the Virginia big-eared bats in this cave may have moved to Arbogast Cave in Virginia where a maternity colony has been found recently.

A few years ago, it appeared clear that populations in Kentucky were steadily increasing. However, Virginia big-eared bat numbers in Stillhouse, the main hibernaculum, have declined the last several surveys. It is very likely there is another currently unknown hibernaculum in the area. There are only five substantial summer sites known in Kentucky and these Virginia big-eared bat populations seem relatively stable. These populations only represent about a third or a quarter of the winter population so there are likely other as-yet-unidentified maternity sites in the area.

With the exception of the unknown status of the Higgenbotham site, Virginia big-eared bat numbers in Virginia are stable. In North Carolina, it appears as though the known population is gradually increasing. However, there are only three known hibernacula sites in the state which contain approximately 400 individuals.

In sum, overall population numbers appear to be slowly increasing, although there have been recent declines at a number of major Virginia big-eared bat caves. The Service (2008) categorized the recovery potential to be relatively high, based on the known ability to prevent disturbance in caves and address other threats to the subspecies.

Populations Potentially Impacted

The distribution of Virginia big-eared bats is fragmented within one single range spanning several states. The planning areas fall into habitat found in counties within the states of Kentucky, Virginia, and West Virginia. Habitat is restricted to caves located in the karst regions dominated by beech-maple-hemlock vegetation associations. Potentially disturbed populations

include summer roosting populations within the three states as well as known and potential hibernacula.

EFFECTS ON CRITICAL HABITAT

Five colony sites have been designated as Critical Habitat (Service 1979) for the Virginia big-eared bat. These are Cave Mountain Cave, Hellhole Cave, Hoffman School Cave, and Sinnit Cave, each in Pendleton County, West Virginia, and Cave Hollow Cave in Tucker County, West Virginia. The present Critical Habitat designation, however, is incomplete.

The nearest hibernacula designated as Critical Habitat to the NiSource Covered Lands is Cave Mountain Cave, which is located approximately 1.2 miles from the Covered Lands footprint. In the Federal Register notice designating this cave as Critical Habitat, a description of foraging habitat is not included; likewise, no primary constituent elements are described. The description solely entails the confines of the Cave Mountain Cave hibernacula.

Based on the Cave Mountain Cave description and the location of the cave outside of the Covered Lands footprint as described in the NiSource MSHCP, it is anticipated that the Project would not modify, and furthermore would have no impact on, Virginia big-eared bat Critical Habitat.

SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES

These species-specific AMMs apply to the covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia. These species-specific measures supplement (and supersede where conflicting) the general BMPs specified in the NGTS ECS. Measures to Avoid and Minimize Impacts to the Species in Summer Foraging and/or Fall Swarming Habitat[4] (i.e., AMMs 11-18) have been identified to provide additional conservation benefits to the species within known or presumed occupied habitat. Measures in standard font text will be applied for all activities. Measures in *italic* font text will be applied on a case-by-case basis depending on the requirements of the activity. These requirements include consideration of customer and business needs, practicality, and effectiveness as more fully described in Chapter 5 of this MSHCP.

Surveys to Determine Presence of Potential Summer Roosts and/or Winter Hibernacula (i.e., caves, quarries, and abandoned mine portals)

1. NiSource will develop sufficient information as to whether potentially suitable summer and winter Virginia big-eared bat roosting habitat exists within a proposed project area. This knowledge can be derived from several sources including, but not limited to, on-site visits, review of aerial photography and other maps, previous mining records (if applicable), forest inventories, previous species survey reports, and the work of NiSource's consultants or other designees. Virginia big-eared bats have been documented using caves, quarries, and abandoned mine portals (and their associated underground workings) as summer and winter roosting and

[4] Known or presumed occupied summer foraging and/or fall swarming habitat is defined as those habitats located within the covered lands where the bats would forage (i.e., woodlands, old fields, hayfields, and agricultural fields and night roost (i.e., rockshelters, abandoned houses, barns, outbuildings, and bridges) within 6 miles of known or presumed occupied summer and/or winter roosting caves.

hibernation habitat. NiSource personnel or its consultants will determine whether potentially suitable summer and winter roosting habitat exists within the project area by conducting "Summer/Winter Habitat Pre-Surveys" as described below. The results of such pre-surveys will be recorded and documented in NiSource's annual compliance report. Pre-survey results will be valid for at least 2 years. The Winter Habitat Pre-Survey Protocols are:

i. The openings should be at least one (1) foot in diameter or larger.

ii. The passage should continue beyond the dark zone and not have an obvious end within 40 feet of entrance (Note: This may not be verifiable by surveyor due to safety concerns.).

iii. Entrances that are flooded or prone to flooding (i.e., debris on ceiling), collapsed, or otherwise inaccessible to bats will be excluded.

iv. Abandoned mine (e.g., coal, limestone, etc...) openings that have occurred recently (i.e., within the past 12 months) due to creation or subsidence will be excluded however a written description and photographs of the opening must be included in the pre-survey report.

Surveys to Confirm Use of Summer Roosts and/or Winter Hibernacula (i.e., caves, quarries, and abandoned mine portals)

2. If potentially suitable summer and/or winter roosting habitat is discovered as a result of the pre-survey above, do not alter, modify, or otherwise disturb entrances or internal passages of caves, mines, or other entrances to underground voids (potential summer roosts/hibernacula) within the Covered Lands of the MSHCP until further investigation is completed to determine if the potential habitat is in fact, occupied habitat. The winter survey protocols would follow those for "Determination of Potential Winter Habitat for Indiana Bat" due to the comprehensive overlap of range and habitat for these two species; however, a summer survey must also be completed for Virginia big-eared bats because this is a cave obligate species. The summer surveys must be completed between the dates of June 15 and August 15 to document presence of or use by (i.e., guano) Virginia big-eared bats. Summer survey protocols to determine whether potential summer habitat for Virginia big-eared bat is occupied are attached. *Otherwise, NiSource may assume presence of Virginia big-eared bats in this summer and/or winter habitat.* If surveys (conducted using approved methodology) fail to detect Virginia big-eared bats, AMMs in summer and/or winter habitat are not mandatory. However, NiSource may employ some of the AMMs to maintain the viability of the potentially suitable habitat.

Measures to Avoid and Minimize Impacts to the Species in Known or Presumed Occupied Summer Roosts and/or Winter Hibernacula (i.e., caves, quarries, and abandoned mine portals)

3. When burning brush piles within 0.25 miles of known or presumed occupied summer roosts and/or winter hibernacula, the brush piles can be no more than 25' by 25' and must be spaced at least 100 feet apart.

4. No woody vegetation or spoil (e.g., soil, rock, etc…) disposal within 100-feet of known or presumed occupied summers roost and/or winter hibernacula entrances and associated sinkholes.

5. Protect recharge areas of cave streams and other karst features that are hydrologically connected to known or presumed occupied summer roosts and/or winter hibernacula by

following relevant ECS standards such as Section III, Stream and Wetland Crossings; and Section IV, Spill Prevention, Containment and Control.

6. Blasting within ½ mile of known or presumed occupied summer roosts and/or winter hibernacula will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of these habitats.

7. Drilling within ½ mile of known or presumed occupied summer roosts and/or winter hibernacula will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of these habitats.

8. If authorized by the landowner, block (e.g., gate) access roads and ROW's leading to known or presumed occupied summer roosts and/or winter hibernacula from unauthorized access.

9. Equipment servicing and maintenance areas will be designated to areas away from streambeds, sinkholes, or areas draining into sinkholes.

10. Operators, employees, and contractors will be educated on the biology of the Virginia big-eared bat, identification of the bat, and its signs, activities that may affect bat behavior, and ways to avoid and minimize these effects.

Measures to Avoid and Minimize Impacts to the Species in Known or Presumed Occupied Summer Foraging and/or Fall Swarming Habitat

11. Within six miles of known or presumed occupied summer roosts and/or winter hibernacula, create or maintain a diversity of open, herbaceous habitats within the pipeline ROW.

12. *Avoid new ROW and appurtenant facility construction is prohibited within 200 feet of known or presumed occupied summer roosts and/or winter hibernacula.*

13. Contaminants, including but not limited to oils, solvents, smoke from brush piles, and others should be strictly controlled as provided for in the EMCS and ECS, Section II, C, 2; and Section IV so the quality, quantity, and timing of prey resources are not affected.

14. Implement erosion control measures, ensure restoration of pre-existing topographic contours after any ground disturbance, and restore native vegetation (where possible) as specified in the ECS upon completion of work within six miles of known or presumed occupied summer roosts and/or winter hibernacula.

15. *Avoid conducting construction activities after sunset in known or presumed occupied summer habitat to avoid harassment of foraging Virginia big-eared bats.*

16. Remove buildings within six miles of known or presumed occupied summer roosts and/or hibernacula between November 16th and March 31st. Buildings may be removed other times of the year once a Service approved bat biologist evaluates the buildings' potential to serve as night roosting habitat and determines Virginia big-eared bats are not present and/or using the structure.

17. *Site staging areas for equipment, fuel, materials, and personnel at least 300 feet from the waterway to reduce the potential for sediment and hazardous spills entering the waterway.*

18. Restrict use of herbicides for vegetation management within six miles of known or presumed occupied summer roosts and/or winter hibernacula to those specifically approved for use in karst (e.g., sinkholes) and water (e.g., streams, ponds, lakes, wetlands).

19. Between April 1st and November 16th and within six miles of known or presumed occupied summer roosts and/or winter hibernacula, use tanks to store waste fluids to ensure no loss of bats by entrapment in waste pits.

20. *Within six miles of known or presumed occupied summer roosts and/or winter hibernacula, avoid new construction through cliffline*[5] *habitat to protect night roosts.*

A detailed Environmental Management and Construction Plan (EM&CP) will be prepared for any project within Virginia big-eared bat habitat. The plan will incorporate the relevant requirements of NiSource's current ECS and include site-specific details particular to the project area and potential impact. The plan will be strongly oriented towards minimizing disturbance of hibernation and roosting caves and impacts within known foraging and night roosting habitats. 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 hi-light the environmental sensitivity of the habitat and any Virginia big-eared bat AMMs which must be implemented.

LEVELS OF TAKE

Through the application of the NGTS ECS and the species-specific AMMs, it is anticipated that the covered activities as described in the NiSource MSHCP **may affect, but are not likely to adversely affect** the Virginia big-eared bat. If the Service concurs with this determination, NiSource does not request take coverage for this species.

[5] A cliffline is defined as a naturally occurring, exposed vertical rock structure that is 10 feet or more in height and a minimum of 100 feet in length, of sandstone or limestone parent material. A cliffline may have boulders accumulated at its base. The cliffline usually contains fissures and openings of various sizes that have been created from rock sloughing, erosion, or geological forces. The cliffline is considered to be continuous if segments are separated by no more that 300 feet.

REFERENCES

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ATTACHMENT 1: Determination of Potential Summer Roost Habitat for Virginia Big-eared Bat

Due to the recent spread of White-nose Syndrome (WNS), the Service's March 29, 2009 Cave Advisory recommending the suspension of cave activities to protect bats, and the potential concerns regarding the transmission of WNS from use of survey gear in and immediately adjacent to a potential summer roost, the Service is currently in the process of considering revisions to this guidance. NiSource will ultimately be responsible to follow Service approved guidance to determine if summer roosting habitat for the Virginia big-eared bat is present within the covered lands of the MSHCP.

Attachment F-3
Conservation Framework for Louisiana Black Bear
(Ursa americanus luteolus)

BACKGROUND

The Louisiana black bear, one of 16 recognized subspecies of the American black bear, was listed as a threatened species within its historic range under the ESA by the Service on January 7, 1992. This designation has been extended to all species of American black bear within the range of the Louisiana black bear due to similarity of appearance (Service 1992). The historic range of the Louisiana black bear included all of Louisiana, eastern Texas, southern Mississippi, and southern Arkansas (Black Bear Conservation Committee [BBCC] 1995). However, Arkansas is not considered as historical range by the Service in the 1992 listing.

Other free-living bears of the species *U. americanus* within the same range specified in that rule were designated as threatened by similarity of appearance. The Louisiana black bear was once a common inhabitant of forested areas in east Texas, Louisiana, and southern Mississippi (BBCC 1997). Bear densities were likely highest within BLH and oak-hickory forest communities where hard mast production was greater than in other habitats (BBCC 1997). While Hall included the southernmost counties in Arkansas as part of the historical range (1981), there were no data to support doing so at the time of listing; accordingly, Arkansas is not considered part of the listed range (Service 1992).

Originally described as the "yellow bear" and given full species rank (*U. luteolus*) by Edward Griffith in 1821 (Griffith 1821), the Louisiana black bear was later identified as a subspecies (*U. a. luteolus*) in 1955 based on morphological differences in the skull and having proportionately large molars (Service1995b). Recent multivariate studies of skull morphology have lead researchers to determine that the Louisiana black bear can be considered a legitimate subspecies (Service 1995b).

In 1900, the estimate of total population size was 1,600 bears (Nature Serve 2007). In 1959, the Louisiana Wildlife Inventory estimated the population to be 80 to 120 bears within the Tensas and Atchafalaya River Basins in Louisiana (BBCC 1995). By the 1990s, population estimates in Louisiana ranged from 60 to 300 bears (BBCC 1995).

More than 80 percent of suitable Louisiana black bear habitat had been lost by the time of listing (1992) primarily due to clearing land for agriculture (Weaver 1990); the remaining habitat quality had been reduced by fragmentation and human activities. At that time, Louisiana black bears were generally known to occur in the Lower Mississippi River Alluvial Valley BLH forest communities of the Tensas River Basin of northeastern Louisiana and the Atchafalaya River Basin in central and southern Louisiana (Weaver 1990; BBCC, 1997); however, occupied habitat had not been definitively delineated. Those forest communities were likely sites for population persistence due to their remoteness and habitat productivity (BBCC 1997). All known breeding populations were believed to be demographically isolated at the time of listing (BBCC 1997). Bears had been occasionally reported in Louisiana outside of these areas, but it was unknown if those bears were reproducing females or only wandering sub-adults and adult males. Black bears were also known to exist in Mississippi along the Mississippi River (Weaver 1990) and smaller areas in the lower East Pearl River and lower Pascagoula River basins of southern

Mississippi (Weaver 1990). The last native breeding group in Mississippi was last documented about 1980 (Nowak 1986, p. 7). Except for wanderers, the bear has not appeared in eastern Texas for many years (Nowak 1986).

This analysis concludes that the project **may affect** this species in the following counties: East Carroll, Franklin, Iberia, Madison, Richland, and St. Mary parishes, Louisiana; and Humphreys, Issaquena, Sharkey, Warren, and Washington counties, Mississippi. NiSource anticipates that the covered activities will have **no effect** on this species in Avoyelles and St. Landry Parish, Louisiana. Within the covered lands, breeding and designated critical habitat occurs on Federal, State, and privately owned lands. The covered lands cross breeding and designated critical habitat within East Carroll, Franklin, Madison, Richland (the Tensas breeding population), Iberia and St. Mary (the Lower Atchafalaya breeding population) Parishes.

Refer to the POPULATION DISTRIBUTION, STATUS, AND TREND section for analysis location details. Refer to the SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES section for measures that would apply for this species and refer to the LEVELS OF TAKE section for where take and mitigation would apply.

LIFE HISTORY

Physical Description

The black bear is normally black with long hair and a short, well-haired tail. The facial profile consists of small eyes set above a broad nose pad with large nostrils. The muzzle can range in color from brown to yellowish-brown and a white patch on the chest and lower throat is occasionally present (BBCC 1995). Although weight varies considerably throughout their range, adult male black bears can weigh more than 600 pounds (lbs); adult females generally weigh less than 300 lbs (Pelton 1982). The median estimated weights for male and female Louisiana black bears in north Louisiana were 292 lbs and 147 lb respectively (Weaver 1999). Body lengths range from 3 to 6 feet nose to tail (BBCC 1995).

Reproduction and Dispersal

Because little is known of Louisiana black bear reproductive biology, assumptions are made based on studies of other black bear species. Female black bears reach sexual maturity at three to five years and have average litter sizes of one to three cubs, with two cubs being most common. Male to female sex ratios at birth usually average 1:1 (BBCC 1995). Years with poor hard and soft mast production can lead to decreases in litter size and cub survival, delayed first estrus, and low female fertility (Service 1995). Black bear cubs will stay with their mother throughout the first year, den with her the following winter, and finally disperse during the next summer.

Limited information suggests that sub-adult males may disperse up to 124 miles (BBCC 1997). Males will move off to establish their own home range while females tend to establish home ranges near their mother's home range (BBCC 1995). This alternate year breeding cycle will remain consistent unless there is a litter loss or if poor female health or nutritional status reduces estrous viability (Service 1995).

Denning and Hibernation

Black bears do not truly hibernate, but go through a dormancy period termed "carnivoran lethargy," which is a period of torpor which helps them survive food shortages and severe

weather during the winter. In warmer climates, such as in Louisiana, bears can remain active all winter (Wagner 1995) and can be easily aroused if disturbed. Previous Louisiana black bear research has shown that some females with cubs will leave their cubs for short periods to forage and that this behavior is especially prevalent among coastal Louisiana populations (BBCC 1995).

Bears den in heavy cover on the ground or in tree cavities during the winter months (Weaver 1999) and den type may vary depending on the habitat. Cubs are born in winter dens at the end of January or the beginning of February (Weaver 1990). Bears may enter dens between November and early January depending on latitude, available food, sex, age, and local weather conditions (Weaver 1990). Studies in the Tensas River Basin have found that pregnant females will enter dens as early as November 26 and emerge as late as May 30 (Service 1995). Adult females generally enter the den first, followed by sub-adults and adult males. At the end of the dormancy period, females with cubs are usually the last to leave the den.

In the Tensas River Basin, Weaver and Pelton (1994) found that den entrance dates for pregnant female bears ranged from November 26 to December 12 and emergence dates ranged from April 6 to May 30. They determined the average entrance and emergence dates to be December 4 and April 24, respectively. In a discussion with Bob Wagner and Dwayne Hightower (experienced bear biologists and researchers), they stated that "there was no existing peer-reviewed published data on coastal Louisiana bear denning dates." They also stated that most female bears in the Lower Atchafalaya River Basin (LARB) subpopulation had very localized movements until late April. Richard Pace and Bob Wagner (1994) documented, in an unpublished report, that 4 of 6 LARB pregnant female bears had denned by the last week of November (2 denned earlier), and 5 of those 6 bears had emerged by the first week of May (1 denned longer). They found average den entrance dates for pregnant female bears in the LARB and coastal subpopulations to be November 14 and December 7, respectively. The average den emergence date for pregnant female bears in both of those subpopulations was April 25. Based on these studies, it was determined that the average statewide denning season for Louisiana black bears is approximately December 1 through April 30.

Within the Tensas Basin, tree cavities are predominately used compared to ground dens (BBCC 1995, Crook 2008). Adult females used tree dens at a greater frequency (80 percent) than did adult males (68 percent) or sub-adults (43 percent) (Service 1995) and females selected tree dens more frequently (65 percent) than ground dens (Crook 2008). Crook (2008) did note, however, that females were able to successfully reproduce while using ground dens. As stated previously, the Service (through the final listing rule) extended legal protection to candidate and actual den trees. As the terms imply, "actual den tree" refers to any tree used by a denning bear during the winter and early spring seasons. Candidate den trees are defined in the final rule as bald cypress (*Taxodium distichum*) and tupelo gum (*Nyssa sp*.) having a diameter at breast height of 36 inches or greater, with visible cavities, and occurring in or along rivers, lakes, streams, bayous, sloughs, or other water bodies. Results of recent research involving Louisiana black bears indicate that they will use virtually any species of tree for a den site (including overcup oak, American elm, sweetgum, water hickory, and sycamore), regardless of its proximity to water, provided that it meets the minimum diameter and cavity presence criteria described above (Hightower et. al. 2002, Oli et. al. 1997, Weaver and Pelton 1994). Ground nests and brush dens require thick ground cover and bears will use the remains of tree tops either naturally felled or those that are left over from logging operations as daybed sites. Palmetto, switchcane, brush

piles and briar thickets are also important habitat characteristics used by black bears for ground dens.

Denning activity is influenced by food availability, age, gender, reproductive condition, photoperiod, and weather (BBCC 1995). Pregnant females will usually choose sites that are more secure and inaccessible than those selected by males (BBCC 1995). Males may select and move between bedding sites in multiple areas throughout the winter.

HABITAT REQUIREMENTS

Like other black bears, the Louisiana black bear is a habitat generalist. Large tracts of bottomland hardwood (BLH) forest communities having high species and age class diversity can provide for the black bear's life requisites (e.g., escape cover, denning sites, and hard and soft mast supplies) without intensive management (BBCC 2005). The term BLH forest community is used with no particular inference to hydrologic influence; this term means forests within southeastern United States floodplains which can consist of a number of woody species occupying positions of dominance and co-dominance (BBCC 1997). Other habitat types may be utilized, including marsh; upland forested areas; forested spoil areas along bayous, brackish marsh, and freshwater marsh; salt domes; and agricultural fields (Nyland 1995; Weaver 1999).

Remoteness is very important as most of the remaining bottomland forests, especially those in the Tensas River Basin and the Lower Atchafalaya River Basin, are heavily fragmented by agriculture and roads. Past research has indicated that good examples of remoteness include: timberland tracts located 0.5 miles from well-maintained roads and development (Rudis 1986); a forested tract of more than 2,500 acres (Rudis 1988); or a tract with 0.3 miles or less of road per 0.3861 square miles (mi^2) of forest (Pelton 1986). Forest tract size and the number of roads reflect the likelihood of human disturbances which can limit habitat suitability and use (Hellgren and Vaughan 1989, Brody and Pelton 1989).

Habitat loss, besides reducing the overall area, can result in fragmentation or isolation of habitat, as is evident for the Louisiana black bear (Clark 1999). Habitat fragmentation can restrict bear movements both within and between populations (BBCC 1997) which can affect population demographics and genetic integrity (Clark et al. 2006). Open areas, roads, large waterways, development, and large expanses of agricultural land may affect habitat contiguity. Such features tend to impede the movement of bears (Clark 1999). The long term protection of habitat and interconnecting corridors or habitat linkages between viable breeding populations is one of the recovery criteria for the Louisiana black bear (Service 1995).

Habitat linkages or corridors providing vegetative cover can facilitate the movement of bears through agricultural (or other open) lands, particularly when bears reside in fragmented tracts of forest, as is the case for the Louisiana black bear (Weaver et al. 1990). Habitat linkages, as described in Louisiana black bear population studies, are generally described as narrow and linear in shape, most likely resulting from the fact that ditches and bayous are the only remaining features connecting habitat fragments within a population. Non-linear habitat patches located between existing populations may also provide areas for bear movement. Such linkages increase the amount of forested habitat (Beausoleil et al. 2005) and may serve not only as pathways for concealed travel, but may also provide other functions such as escape cover, bedding and denning sites, routes for juvenile dispersal, and avenues for genetic exchange (Weaver 1999).

Habitat linkages ranging from 2.5 acres to 12 acres can provide cover for black bears (Pelton and Van Manen 1997). Smaller areas (i.e., 2.5 acres) may provide suitable movement paths for shorter, within-population movements but may not be sufficient for establishing larger movement paths between populations. Beausoleil et al. (2005) recommended the establishment of habitat corridors to reduce the isolation of forested habitats for black bears and suggested that corridor width should vary with length and increase with distance.

While there is scientific discussion regarding the relative importance of wildlife corridors in general, they have been shown to be important for black bears (Cox et al. 1994). Telemetry data on Louisiana black bear movements in the Tensas River Basin demonstrate that habitat linkages should be considered in management plans intended to ensure Louisiana black bear population viability in fragmented habitats and to provide for the large home ranges (particularly of males) needed for unimpeded breeding and dispersal (Weaver 1999).

PLANNING UNITS

The planning unit for this Conservation Framework includes all the counties and parishes crossed by the MSHCP covered lands with extant populations of the Louisiana black bear. The project areas that include portions of the current range of the Louisiana black bear are located in Avoyelles, East Carroll, Franklin, Iberia, Madison, Richland, St. Landry and St. Mary parishes in Louisiana; and Humphreys, Issaquena, Sharkey, Warren, and Washington counties in Mississippi. The project area overlaps two of the four known breeding subpopulations (Tensas and Lower Atchafalaya River Basin). It is anticipated that management practices would be substantially similar whether or not there are genetic, landscape or behavioral distinctions between subpopulations.

POPULATION DISTRIBUTION, STATUS, AND TREND

Currently, Louisiana black bear breeding populations are predominantly restricted to three disjunct core (concentrated) populations: the Tensas River Basin, the Upper Atchafalaya River Basin, and the Lower Atchafalaya River Basins, Louisiana. A fourth additional, newly forming, repatriation core population occurs in east-central Louisiana. The Tensas River Basin (Tensas) breeding population occurs on a complex of BLH forests comprised of Tensas River NWR, adjacent Big Lake WMA, and four nearby small, relatively isolated, forested tracts formerly owned by Deltic Timber Corporation (now owned by Epps Plantation) in Tensas, Madison, Franklin, East Carroll, and Richland Parishes in Louisiana. The Deltic tracts support one of the highest densities of black bears reported for the southeastern coastal plain (Beausoleil 1999, p. 80). Historically, Louisiana black bears inhabiting the Tensas River NWR group have generally been considered a separate group of bears from those inhabiting the Deltic tracts. However, recent data indicate that bears are moving between these previously isolated populations (Louisiana Department of Wildlife and Fisheries [LDWF] 2007) and that the two subgroups have likely begun to function as one population (Service 2008b).

Two Louisiana black bear populations are located in the Atchafalaya River Basin (BBCC 1997). The Upper Atchafalaya River Basin population (Upper Atchafalaya) is located primarily within the Morganza Floodway and the forested areas between that Floodway and False River in Pointe Coupee Parish, Louisiana, and is approximately 110 miles south of the Tensas population. Much of the land between these two populations has been cleared for agricultural use. The Lower Atchafalaya River Basin population (Lower Atchafalaya) is found primarily south of U.S. Highway 90 (Hwy. 90) and west of the lower Atchafalaya River and Delta, in the coastal area of

St. Mary and Iberia Parishes. It is located approximately 70 miles south of the Upper Atchafalaya population and is separated from that population by U.S. Interstate 10, Hwy. 90, the Atchafalaya River, Bayou Teche, agricultural lands, developed areas, and permanently and seasonally inundated portions of the Atchafalaya River Basin, which is not currently believed to contain breeding bears due to the flooding regime. Population expansion in the coastal area is limited by development along Hwy. 90 to the north, and by the surrounding coastal marsh, which is believed to be unsuitable for sustaining bear populations.

A fourth breeding population has been recently established in Avoyelles and Concordia Parishes, Louisiana, near the confluence of the Mississippi and Red Rivers, an area containing approximately 100,000 acres of publicly owned, forested land. This area is separated from the Tensas and the Upper Atchafalaya populations primarily by agricultural lands. As the result of a multi-agency repatriation project, 36 adult females and 82 cubs have been relocated to public lands in this area between 2001 and 2007, to reduce demographic isolation of existing populations (LDWF 2007). This project was developed on the assumption that relocated females would remain at the new location and would be discovered by males traveling through the area. Natural reproduction of those bears was first documented in 2005, and reproduction has since been documented in 5 litters (LDWF 2006), resulting in an additional breeding population in Louisiana.

Louisiana black bear reproduction was speculated to occur in Mississippi at the time of listing (1992) (Stinson 1996), but was not confirmed until 2005 when a radio-collared female, moved as part of a reintroduction project in Louisiana, crossed into Mississippi and had cubs (Telesco 2006). Breeding has been subsequently documented for several additional individuals, but to date no core breeding populations are known to exist, and it is generally believed that the majority of bears in Mississippi are males that have dispersed from populations in other states (Young 2006). The Texas Parks and Wildlife Department (TPWD) has also documented black bear sightings in eastern Texas in the last 7 years, though there are currently no known Louisiana black bear breeding populations in eastern Texas (TPWD 2005). Clark et al. (2005) indicated the presence of a small breeding population with a few individuals crossing between Louisiana and Arkansas.

In 1997, the Statewide Louisiana black bear population was estimated to range from 200 to 400 bears (Pelton and Van Manen 1997). No reliable overall Louisiana black bear population estimate currently exists; however, estimates have been developed for specific geographic areas. Estimates for the Tensas River NWR population range from 119 to 131 bears (Boerson et al. 2003) and, for the nearby Deltic tracts, from 34 to 47 bears (Beausoleil 1999). The Lower Atchafalaya population was estimated to range from 68 to 86 bears and, for the Upper Atchafalaya, from 28 to 47 bears (Triant et al. 2004), but these may be underestimates of the actual population numbers (Triant et al. 2004). There are no population estimates for the repatriation population; however, a total of 36 females and 82 cubs have been moved to this area. Most studies of the Louisiana black bear have been conducted in these core breeding habitat areas and therefore probably small, but unknown, numbers of bears occurring outside those areas are not included in population estimates. Population estimates for Louisiana black bears at the time of listing appear to be lower than what recent research would indicate, and there is circumstantial evidence that the population is growing (LDWF 2007).

Populations Potentially Impacted

Based on federal, state, and local agency coordination, known element occurrence data and other baseline information identifying Louisiana black bear individuals and/or populations within the NiSource MSHCP area was obtained from the Service (**Table 1**). The areas potentially impacted are as follows.

Table 1. NiSource MSHCP Specific Occurrences for the Louisiana Black Bear

Subpopulation	County/Parish, State	Date Observed	Population Characteristics
Tensas River Basin	East Carroll, Franklin, Madison and Richland Parishes, Louisiana	1999 and 1998	119 to 131 estimated bears in Tensas River NWR subgroup, 34 to 47 estimated bears in Deltic tracts subgroup
Lower Atchafalaya Basin	Iberia and St. Mary Parishes, Louisiana	1999	68 to 86 estimated bears for entire subpopulation (may be an underestimate)
Mississippi	Humphreys, Issaquena, Sharkey, Warren, Washington counties, Mississippi	Unknown	Unknown

Source: Boerson et al. 2003, Beausoleil 1999, and Triant et al. 2004

EFFECTS ON CRITICAL HABITAT

More than 80 percent of suitable Louisiana black bear habitat had been lost by the time of listing (1992) primarily due to clearing land for agriculture (Weaver 1990); the remaining habitat quality had been reduced by fragmentation and human activities. Human-related mortality continues to pose an additional threat to the Louisiana black bear. The key habitat requirements of the Louisiana black bear are food, water, cover, and sufficient amounts of denning habitat. Reduced quantity and quality of these habitat requirements are the primary factors limiting the recovery of the bear.

The Service officially designated critical habitat for the Louisiana black bear on April 9, 2009 (Service 2009e). In total, approximately 1,195,821 acres fall within the boundaries of this critical habitat designation.

Critical habitat identifies geographic areas containing features that are essential to the conservation of a threatened or endangered species, and which may require special management considerations or protection. Within the critical habitat boundary, only those areas that contain the physical and biological elements essential to support the life cycle needs of the Louisiana black bear are considered "critical habitat." The Service has determined that those elements be defined as breeding habitat and corridors within bottomland and upland hardwood forests and adjacent vegetated areas. Designation of critical habitat does not affect land ownership or establish a refuge or preserve, and only applies to situations where federal implementation, funding, or a federal permit is involved. Critical habitat is located in Avoyelles, East Carroll,

Catahoula, Concordia, Franklin, Iberia, Iberville, Madison, Pointe Coupee, Richland, St. Martin, St. Mary, Tensas, West Carroll, and West Feliciana Parishes, Louisiana.

Information provided by the Service (Soileau 2008) indicates the NiSource covered lands intersects breeding and/or critical habitat in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary. It is anticipated that breeding and critical habitat does not intersect covered lands in Avoyelles and St. Landry parishes, Louisiana; or Humphreys, Issaquena, Sharkey, Warren, and Washington counties, Mississippi.

Implementation of the avoidance and minimization measures below will avoid impacts to designated Louisiana black bear critical habitat.

SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES

These measures apply to all known breeding habitat (i.e., where females have been documented to occur) and critical habitat as identified by the Service (Soileau 2008). Currently, these measures apply in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary. These species-specific measures supplement (and supersede where conflicting) the general BMPs specified in the NGTS ECS. Measures in standard font text will be applied for all activities. Measures in *italic* font text will be applied on a case-by-case basis depending on the requirements of the activity. These requirements include consideration of customer and business needs, practicality, cost, and effectiveness as more fully described in Chapter 5 of this MSHCP.

Avoidance and Minimization of Impacts to Individuals, Breeding, and Critical Habitat[6]

1. Conduct all vegetative clearing activities in breeding habitat between May 1st and November 14th.

2. When conducting those activities identified as potentially causing take in breeding and critical habitat, NiSource shall ensure, through a program of continuing education and appropriate preventive actions, that all potential bear attractants (i.e., human garbage and food scraps) generated during both project construction, and subsequent operation and maintenance of the proposed facility, shall be strictly controlled by using "bear-proof" waste disposal containers specifically approved by the Louisiana Department for Wildlife and Fisheries, the installation of signs at work sites to remind workers they are in bear country, and providing brochures developed by the Service that discuss the need for attractant control to all workers on-site. Implementation of these measures preclude the potential habituation of bears to human-associated food sources.

3. In breeding habitat (Figure 1, attached), no actual den tree or candidate den tree (36 inches or more in dbh regardless of species with visible cavities[7]) shall be removed or damaged. "Tree

[6] Although the average statewide denning season for Louisiana black bears is approximately December 1 through April 30, the denning season for the purposes of implementation of the NiSource MSHCP will be November 15 through April 30. The departure from the statewide standard is primarily a result of research on southern breeding populations (*See* life history and other biological background, habitat use discussion above) that suggest pregnant female bears entered dens earlier than the statewide standard and the majority of NiSource covered lands through bear habitat occur in the southern breeding populations.

[7] An opening can be of any size as well as in any location (e,g,. near the base, at the top of the trunk, etc…) on the ≥ 36 inches dbh tree to meet the definition of a cavity.

damage" includes the trunk, limbs, and the entire root system, including soil compaction from heavy equipment.

4. Reserved.

5. All woody vegetation (including trees and shrubs) proposed for removal shall be cut near ground level to the maximum extent practicable, leaving stumps and root systems in place. Examples of scenarios where stumps and root systems would be removed include side slopes, wet soils, the trench area, etc...

6. Revegetation success shall be monitored annually for the first three years following new pipeline construction or until revegetation is successful as described in the ECS. NiSource will include a monitoring report in its annual compliance report filed with the Service. Revegetation shall be considered successful if the vegetative coverage is at least 80 percent of the type, density, and distribution of the vegetation in adjacent areas not disturbed by construction. If revegetation is not successful at the end of three years, NiSource shall develop (in consultation with the Service) and implement a remedial revegetation plan to actively revegetate the area, and continue to do so until revegetation is successful.

7. Any mowing or widespread clearing of breeding habitat within the existing ROW, beyond the 10-foot width centered over each pipeline, will occur between May 1 and November 14 unless the area has been mowed within the last two years to ensure that Louisiana black bears and cubs using ground dens are not impacted (i.e., the area as maintained is not suitable for denning).

8. Existing ROWs located within designated critical habitat will be maintained in accordance with the NGTS ECS standards for environmentally sensitive areas specified on page 28, Section V.C. "Waterbodies, Wetlands, and Environmentally Sensitive Areas" provided however that only the center 10 feet of the ROW centered on the pipeline will be kept in an herbaceous state. Any trees greater than 15 feet tall located in the remaining portion of the ROW will either be selectively cut or treated with herbicides per NiSource policies on herbicide use.

Establishing New Permanent Facilities, including ROWs in Breeding and Critical Habitat

In addition to AMMs 1-8, the following measures will be followed for new construction activities within breeding and /or critical habitat.

9. New pipeline ROW shall be replanted with an appropriate conservation seed mix. Species planted should be native to Louisiana, appropriate to the soils, and provide soft or hard mast for bears and useful to other wildlife species. Annual rye should be planted within the 10-foot wide grass strip centered over the pipeline for quick cover as natives will colonize the area as long as there is an adequate seed source present. Previously forested portions of the construction ROW that will not be part of the permanent ROW will be planted with woody species (i.e., any bare root or containerized plants that are native and provide soft or hard mast and cover [e.g., bottomland hardwood, upland hardwood, or cypress-gum swamp for bears] is adequate). Typical plant spacing for woody species is 10-12 feet.

10. New pipeline ROWs will be maintained in accordance with the NGTS ECS standards for environmentally sensitive areas specified on page 28, Section V.C. "Waterbodies, Wetlands, and Environmentally Sensitive Areas" provided however that only the center 10 feet of the ROW centered on the pipeline will be kept in an herbaceous state. Any trees greater than 15 feet tall located in the remaining portion of the ROW will either be selectively cut or treated with herbicides per NiSource policies on herbicide use.

11. Critical forested bear travel corridors (**Figure 2, attached**) intersected by new pipeline ROW will be crossed using trenchless construction techniques such as HDD or horizontal bore. Trees greater than 15 feet tall in these areas will not be removed.

a) Priority 1 Critical Louisiana Black Bear Travel Corridors (blue polygons)- Lands within Priority 1 areas are extremely important to the bears (usually due to their already fragmented nature, narrow width or high quality habitat).

   i. These areas must be completely crossed using trenchless construction techniques with all entrance and exit holes outside of Priority 1 boundaries (i.e., no vegetation clearing).

   ii. No widening of an existing ROW will occur within Priority 1 corridors.

   iii. All Priority 1 lands, including those identified as non-bear habitat (e.g., agricultural lands), also identified by the Service and NRCS as WRP Special Project Areas will be crossed using trenchless technology should the landowners enroll those tracts into WRP or otherwise allow the tracts to revert or be restored to bear habitat. If WRP enrollment occurs after NiSource installs a pipeline, they will allow these tracts to revert or be restored to bear habitat provided however that only the center 10 feet of the ROW centered on the pipeline will be kept in an herbaceous state.

b) Priority 2 Critical Louisiana Black Bear Travel Corridors (orange polygons)- Lands within Priority 2 areas are still very important to the bears, but tend to be more expansive and intact.

   i. Trenchless construction techniques are required through tracts whose cover is comprised of ≥ 50% woody vegetation.

   ii. Clearing vegetation for entrance and exit holes to accomplish the construction process is allowed within these areas as multiple bores may be required for expansive areas.

   iii. Existing ROW may be widened to allow additional pipeline(s), but only as close to existing pipelines as the safety codes/requirements allow and not to exceed a 75-feet wide maintained ROW combined.

12. Prior to any clearing of breeding habitat, conduct a habitat assessment to record the number of potential den trees and amount of ground denning habitat that would be affected.

Construction Activities During the Denning Season (November 15 through April 30)

Construction-related activities within breeding Louisiana black bear habitat are permissible provided that the following AMMs are implemented in addition to AMMs 1-12 during the denning season.

13. Previously identified potential den sites/habitat will be cleared of vegetation outside of the denning season (i.e., work window is May 1 through November 14) to ensure no direct take of bears and/or cubs.

14. A constant level of noise/disturbance (generally equivalent in type and volume to that created by the proposed covered activities) is maintained throughout the project area through the denning season (i.e., November 15 through April 30) until work has finished. The amount of

disturbance/noise shall be generated for at least 24 continuous hours every 14 days in all portions of the project area that are within 750 feet of the active construction site.

LEVELS OF TAKE

Through the application of the NGTS ECS and the species-specific AMMs, it is anticipated that the covered activities as described in the NiSource MSHCP **may affect, but are not likely to adversely affect** the Louisiana black bear or result in destruction or adverse modification of critical habitat. If the Service concurs with this determination, NiSource does not request take coverage for this species.

Figure 1 Habitat for Louisiana Black Bear

This map contains sensitive information and is not included in this document.

Figure 2 Critical Louisiana Black Bear Travel Corridors

These maps contain sensitive information and are not included in this document.

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Attachment F-4
Conservation Framework for Interior Least Tern

BACKGROUND

The interior least tern (*Sterna antillarum*) was listed as federally endangered in 1985 under the protection of the Endangered Species Act (Service 1985). Recent efforts to aid in its recovery have included increased surveying, research projects, and increased public education by public and private conservation organizations. Efforts have been made to protect interior least tern nesting habitat through agency reviews of proposed changes to in-stream flow and the potential effects that may result to nesting areas (Service 1990). In 1990, the Service issued a recovery plan for the interior least tern, which describes actions needed to help species survival and set forth a path towards delisting after reaching the goal of 7,000 individuals (Service 1990).

Based on initial project review (Armstrong et al. 2007), this analysis concludes that the project **may affect** this species in East Carroll and Madison parishes, Louisiana; and Issaquena, Warren, and Washington counties, Mississippi. However, after subsequent review, it was determined that the covered lands overlap with the interior least tern habitat in East Carroll Parish, Louisiana; and Issaquena County, Mississippi. It also was concluded that the project will have **no effect** on this species in Grant Parish, Louisiana (Armstrong et al. 2007).

Refer to the POPULATION DISTRIBUTION, STATUS, AND TREND section for analysis location details. Refer to the SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES section for where AMMs would apply for this species.

LIFE HISTORY

Reproduction and Demography

Interior least terns spend four to five months at their breeding sites. They arrive and form colonies in late April to early June. Courtship begins shortly after. Least terns nest in colonies and nests can be as close as just a few yards apart or widely scattered up to hundreds of yards. A clutch of two to three eggs are laid beginning in late May and incubation can occur until early August. Nests are laid in open, sandy areas, gravel patches, or exposed flats often adjacent to small pieces of debris (wood, stones, etc.). Both males and females incubate the eggs for 20 to 25 days. Once hatched, adults feed and care for chicks. Fledging occurs at approximately three weeks, though parental care often lasts until migration in early September (Service 1990).

Movement

Interior least terns are migratory; however, the wintering range is unknown. It is assumed that they travel to coastal Central and South America. It is likely that they have strong site fidelity, returning to the same breeding location year after year (Service 1990).

Ecological Relationships

The interior least tern is a breeding associate of the piping plover (*Charadrius melodus*) in the Mississippi River, the snowy plover (*Charadrius alexandrius*), and the American avocet (*Recurvirostra americana*) in the Arkansas River (Service 1990). They are often found nesting within or adjacent to least tern colonies. Interior least terns will defend any nest in the colony (Service 1990).

HABITAT REQUIREMENTS

Interior least terns depend on sand or gravel bars containing sparse vegetation, within an unobstructed river channel, or salt flats along lake shores for nesting. They often also nest on artificial habitats such as sand or gravel pits and dredge islands. Least terns often choose nest locations at higher elevations to prevent flooding that can occur during high flows (Service 1990). The breeding biology generally centers around three ecological factors including (Service 1985):

1. The presence of bare or nearly bare alluvial islands or sandbars;
2. The existence of favorable water levels during the nesting seasons; and
3. The availability of food.

Interior least terns forage for fish, feeding in shallow waters of rivers, streams, and lakes. In riverine colonies, individuals forage in close proximity to the colony. However, when nesting in artificial habitats they may travel as far as 2.0 miles from the colony to fish (Service 1990).

Riverine

The riverine nesting areas of interior least terns are sparsely vegetated sand and gravel bars within a wide unobstructed river channel, or salt flats along lake shorelines. Nesting locations usually are at the higher elevations and away from the water's edge because nesting starts when the river flows are high and small amounts of sand are exposed. The size of nesting areas depends on water levels and the extent of associated sandbars (Service 1990).

The Lower Mississippi River is very wide and carries a tremendous volume of water and sand. Sandbars form annually, are washed away, and shift position. Many sandbars are over 2.0 miles long and 0.75 mile wide. Nesting areas usually are several hundred acres in size. Mississippi River levels at the onset of nesting also influence the number of nests at a colony (Service 1990).

Artificial Nesting Habitat

The interior least tern has been observed nesting on dike fields along the Mississippi River. Other artificial nesting sites include sand and gravel pits, ash disposal areas of power plants, along the shores of reservoirs, and at other manmade sites (Service 1990).

Essential Breeding Habitat

Riverine sandbars, river channel environment including open channel area, channel width, and appropriate instream flows, and lake shorelines and other habitats provide essential habitat for the interior least tern. The interior least tern is completely dependent on these habitats for food and nesting sites. Therefore, destruction or adverse modification of remaining habitats will cause continued reduction of the species range and eventually a reduction in population numbers. Essential breeding habitat occurs along the entire length of the Mississippi River in all counties designated for the interior least tern in Mississippi and Louisiana.

PLANNING UNITS

There are no barriers preventing genetic interchange among interior least tern populations. Based on existing information regarding breeding populations, there is no reason to assume genetic differences exist among populations located within or near the MSHCP covered lands. This species will be assessed as a single planning unit (Service 1990).

POPULATION DISTRIBUTION, STATUS, AND TREND

Distribution

The interior least tern exhibits a localized pattern of distribution (Service 1985). The interior least tern is migratory and has historically bred along the rivers ranging from Texas to Montana and from eastern Colorado and New Mexico to southern Indiana. The river systems included the Red, Missouri, Arkansas, Mississippi, Ohio and Rio Grande. Some occasional occurrences have been documented in Michigan, Minnesota, Wisconsin, Ohio, and Arizona. Currently, the species continues to use most of the range described above, but within these river systems, it is restricted to unaltered portions of each river. Wintering location of the interior least tern is unknown. Least terns of unknown subspecies are documented along Central America and the northern coast of South America and are assumed to contain the interior subspecies (Service 1990).

Population Trend

Due to a lack of historic population estimates, there are no comprehensive numbers to compare with current estimates. The earliest studies of interior least terns indicate that the species was relatively common. In 1975, estimates documented 1,200 individuals, and in 1987 surveys documented 4,800. It is thought that increased survey efforts account for the difference between current and earlier estimations (Service 1990).

Census data on the interior least tern population looked at 684 miles of the Mississippi River from Cape Girardeau, Missouri to Vicksburg, Mississippi. The census occurred annually from 1985 to 1988. During that time, numbers of adult interior least terns increased from 1,264 in 1985 to 2,356 in 1988, with the highest numbers recorded in 1987 at 2,488 adults counted (Service 1990). These numbers indicate that, at the highest count in 1987, the density of interior least terns along the Mississippi River was approximately 2 adults per 0.62 miles of river stretch.

Regionally Significant Populations within the Planning Area

The planning unit for this species overlaps East Carroll parish in Louisiana and Issaquena County in Mississippi. These locations consist of breeding areas along the Mississippi River sandbars.

According to Natural Heritage data, one observation of an interior least tern was made within the NiSource MSHCP planning unit from 1990 to 1999 (Louisiana Natural Heritage Program [LNHP] 2007; Mississippi Natural Heritage Program [MNHP] 2007). The location of this observation occurs at the crossing of the Mississippi River on the border of East Carroll Parish, Louisiana, and Issaquena County, Mississippi. Multiple observations of interior least terns have occurred adjacent to the planning unit from 1990 to present.

EFFECTS ON CRITICAL HABITAT

No critical habitat has been designated for this species.

SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES

These measures apply to all known occupied locations (i.e., where individuals have been documented to occur) and/or suitable habitats where breeding occurrence may be presumed in East Carroll Parish, Louisiana; and Issaquena County, Mississippi, as indicated below. There are currently only four pipeline crossings of concern for this species near Pittman Island. Sandbars

may migrate around these four crossings and AMMs should be applied whenever sandbars/islands are within 650 feet of the crossings.

These species-specific measures supplement (and supersede where conflicting) the general BMPs specified in the NGTS ECS. Measures in standard font text will be applied for all activities. Measures in *italic* font text will be applied on a case-by-case basis depending on the requirements of the activity. These requirements include consideration of customer and business needs, practicality, and effectiveness as more fully described in Chapter 5 of this MSHCP.

The main conservation objective for ROW vegetation maintenance and all other O&M activities is to avoid or minimize impacts to breeding habitat for the interior least tern and avoid/minimize impacts to interior least tern. The main conservation objective for all construction projects (i.e., off existing ROW) is to avoid or minimize impacting breeding habitat (e.g., through project routing).

Surveys to Evaluate Presence of the Species within Suitable Breeding Habitat

1. Prior to initiation of activities, conduct least tern surveys within a 0.25-mile buffer of proposed activity within suitable habitat (i.e., sandbars, sandy shorelines, or islands) at 4 specified pipeline crossings of the Mississippi River. Surveys will be conducted by a biologist experienced in least tern surveys. If interior least terns are identified during surveys, implement AMMs #5-6. If no least terns are identified during surveys, proceed with proposed activities, implement AMM 3-4 and consider #7 regardless of any surveys.

OR

2. Assume presence of interior least terns within suitable habitat (i.e., sandbars, sandy shorelines, or island along and within the 4 specified pipeline crossings of the Mississippi River) and implement AMMs 3-7. (NiSource has the option of implementing either AMM#1 (surveys) or AMM#2 (assume presence), but one of these must be implemented).

Maintaining Suitable Nesting Habitat

3. Do not utilize occupied or suitable habitat for staging areas (i.e., sandbars, sandy shores, or islands). Use of staging area outside these areas will reduce direct impacts to potential nesting habitats.

4. Restore sandbar to previous contours and substrate after any operations and maintenance activities.

Avoiding Sandbars During Nesting Season

5. Avoid any activities within 650 feet of nesting colonies (sandbar/island) between May 15 and August 31.

6. Install new or replacement pipelines and utility lines under the river bottom using horizontal directional drilling (HDD) rather than open trenching. Drilling should be carefully undertaken and a plan should be in place to minimize and address the risk of habitat disturbance due to frac-outs and the appropriate distance of the staging area from interior least tern nesting habitat. If, after detailed engineering studies (e.g., geotechnical, physiological, topographical, and economic studies), it is determined (and agreed to by NiSource Natural Resources Permitting personnel) that HDD is not feasible, a report will be prepared and included in the annual compliance report submitted to the Service.

HDDs under the stream channel are permissible any time of the year. However, proximity of the HDD noise producing equipment should be placed at least 0.25 mile from the known or presumed occupied nest location (and preferably as far as possible from the nest as practical given the design of the drill).

Pipeline Abandonment

7. Abandon pipelines in place to avoid suitable habitat disturbance that would result from pipeline removal.

LEVELS OF TAKE

Through the application of the NGTS ECS and the species-specific AMMs, it is anticipated that the Project as described in the NiSource MSHCP may affect, but is not likely to adversely impact the interior least tern and NiSource does not request take coverage for this species.

REFERENCES

Armstrong, M., F. Clark, and R. Niver. 2007. U.S. Fish and Wildlife Service, Regional Leads for the NiSource MSHCP Project. Numerous electronic mail transmissions to ENSR forwarding information from various Service Field Offices in response to a request for initial project review and "may affect/no effect" call relative to covered species in the project area. Initial request for information sent by F. Clark on February 15, 2007. Responses received and forwarded to ENSR February – July 2007.

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Attachment F-5
Conservation Framework for Cheat Mountain Salamander

BACKGROUND

The Cheat Mountain salamander (*Plethodon nettingi)* is a member of the family Plethodontidae. The genus to which it belongs is referred to as the woodland salamanders. It is a small slender salamander reaching a maximum length of 4.5 inches. It has a dark dorsum with brassy flecks and a dark gray or black belly. It is found only in small distinct populations in high-elevation red spruce (*Picea rubens*) or mixed deciduous forests in the Allegheny Mountains of West Virginia. The Cheat Mountain salamander was listed as a Category 2 species by the Service in 1982. In 1988, the Service published a proposal to list the species as threatened. In 1989, the species was determined to be threatened (USFWS 1989).

Based on initial project review (Armstrong et al. 2007), this analysis concludes that the project **may affect** this species in Grant, Pocahontas, Pendleton, Randolph, and Tucker counties, West Virginia (Armstrong et al. 2007).

Refer to the POPULATION DISTRIBUTION, STATUS, AND TREND section for analysis location details. Refer to the SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES (AMMs) section for where AMMs would apply for this species.

LIFE HISTORY

Distribution

The Cheat Mountain salamander is found along the eastern edge of the Allegheny Mountains of West Virginia in Pendleton, Pocahontas, Randolph, and Tucker counties (USFWS 1989). The extent of the area is approximately 19.22 miles wide and 49.6 miles long almost entirely within the boundaries of the Monongahela National Forest (USFWS 1989). This species is found in forested areas above an altitude of 3,412 feet, where red spruce and yellow birch (*Betula alleghaniosis*) are or were the dominant tree species (USFWS 1989).

Reproduction and Demography

There are no observations of mating for the Cheat Mountain salamander. It is estimated that these salamanders will live up to about 20 years of age, during which the female can reproduce up to approximately eight broods in a lifetime (USFWS 1991). Mating usually occurs where populations' territories overlap. Fertilization is internal and complete development occurs within the egg, with no aquatic larval stage, unlike most other salamanders (USFWS 1989). Eggs are laid in damp moss, logs, and other moist environments to prevent desiccation. Cheat Mountain salamanders have egg masses containing 4 to 17 eggs, and have been found from May to August, with most observations in June (USFWS 1989).

Movement

It is estimated that the Cheat Mountain salamander is very limited in its movements. Pauly (2008a) found that the species likely did not move more than 3.28 feet. The home range of the closely related and better known redback salamander (*Plethodon cinereus*) is estimated to be only 15.5 to 29.1 square yards (USFWS 1991). In areas where habitat has been disturbed,

population expansion into new habitat and genetically mixing with other Cheat Mountain populations is minimized.

Ecological Relationships

The Cheat Mountain salamander eats invertebrates such as mites, springtails, beetles, flies, and ants. It is not known to be prey on any other species and has no known diseases (USFWS 1989). These salamanders are territorial and can be aggressive when it comes to defending their territory. It is believed that they are often out-competed by other salamanders for optimum habitat, especially by the redback salamander (USFWS 1991).

HABITAT REQUIREMENTS

Cheat Mountain salamanders are found above an altitude of 3,412 feet, preferably in red spruce or mixed-deciduous forests with moist soil and relatively cool temperatures. They are found under rocks and logs during the day, or in rock crevices below the ground (USFWS 1989). While the Cheat Mountain salamanders do not depend on red spruce forests to survive, they do provide ideal climate conditions much like other mature dense deciduous forests (USFWS 1991). At night, especially during rainy weather, the Cheat Mountain salamander forages on the forest floor in the damp cool climate (USFWS 1989).

Predictive modeling of Cheat Mountain salamander occurrences at the landscape level showed a positive correlation with higher elevations, sandstone geology, high rainfall levels, northeast aspect and distance from water (Dillard 2007). Predictive modeling of Cheat Mountain salamander occurrences at site level showed a negative correlation with depth to rock and a positive correlation with red spruce and eastern hemlock densities, percent canopy closure, and percent ground cover of bryophytes (Dillard 2007).

PLANNING UNITS

The planning unit for this Conservation Framework includes all counties within the NiSource MSHCP with current, extant, or historical populations of the Cheat Mountain salamander. All 70 known populations of the Cheat Mountain salamander occur in eastern West Virginia in Pendleton, Pocahontas, Randolph, and Tucker counties (**Table 1**). Populations in southeast Tucker and central Randolph counties could potentially be impacted by the project. Based on the available data, we assume for the NiSource MSHCP project that there is a single planning unit for the Cheat Mountain salamander. There is little information available to determine whether individual populations of Cheat Mountain salamander within the project area are genetically isolated and distinct (USFWS 1991).

POPULATION DISTRIBUTION, STATUS AND TREND

The Cheat Mountain salamander is found in a 19 by 50 mile area of Pendleton, Pocahontas, Randolph, and Tucker counties, West Virginia. The majority of the populations are found within the Monongahela National Forest (USFWS 1989). Refer to **Table 1** for a listing of known sites in the vicinity of the NiSource Covered Lands.

Table 1. Known Cheat Mountain Salamander Populations

Site Location (Quadrangle)	Site Location (County)	Number of Sites
Blackwater Falls	Tucker	2
Blackbird Knob	Tucker	1
Parsons	Tucker	1
Mozark Mountain	Tucker	4
Bowden	Randolph	12
Harman	Randolph	1
Laneville	Tucker/Randolph	1
Hopeville	Pendleton	6
Beverly East	Randolph	9
Whitmer	Randolph	1
Widell	Randolph/Pocahontas	14
Sinks of Gandy	Randolph	1
Spruce Knob	Pendleton	4
Snyder Knob	Randolph/Pocahontas	3
Durbin	Randolph	3
Cass	Pocahontas	5

Source: USFWS (1991).

There are approximately 70 known populations, all of which have been disturbed by human activities (USFWS 1991). The estimated total number of Cheat Mountain salamanders is several thousand individuals. Less than 10 individuals were found in 51 of the 68 populations in initial surveys (USFWS 1991), with some possibly containing over 1,000 individuals (NatureServe 2006). The population size for Cheat Mountain salamanders can be substantially influenced by activities causing habitat alterations, such as the construction of roads, logging, hiking paths, and mining (USFWS 1991). Also, interspecific competition and other environmental parameters may be to blame for their decline (USFWS 1991).

Dr. Thomas Pauley, a recognized species expert familiar with the existing NiSource pipeline ROW, delineated his determination of suitable and presumed occupied habitat for the salamander (Pauley 2008a).

EFFECTS ON CRITICAL HABITAT

No critical habitat has been designated for this species.

SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES

NiSource would apply the NGTS ECS document for all construction and O&M activities within the range of the species where it overlaps with the covered lands.

Measures within the NGTS ECS are designed to minimize impacts on the landscape and improve restoration success. More specifically, it appears that the Cheat Mountain salamander would benefit from maintaining existing upper soil profiles and allowing the return of native vegetation. Topsoil segregation, among other measures, as stated in the NGTS ECS will help to meet these objectives.

Cheat Mountain salamanders are unlikely to occupy existing maintained ROWs. Therefore, to avoid/minimize impacts to Cheat Mountain salamanders, NiSource reduced the covered lands to the existing ROW for approximately 103 miles of the species range.

In addition, the following AMMs were developed to further reduce potential impacts. These measures apply to all known occupied and potential habitat within the covered lands as shown on **Figure 1,** attached. Refer to POPULATION DISTRIBUTION, STATUS, AND TREND (populations potentially impacted) for applicable counties. These species-specific measures supplement (and supersede where conflicting) the general BMPs specified in the NGTS ECS. Measures in standard font text will be applied for all activities. Measures in *italic* font text will be applied on a case-by-case basis depending on the requirements of the activity. These requirements include consideration of customer and business needs, practicality, and effectiveness as more fully described in Chapter 5 of this MSHCP.

The main Cheat Mountain salamander conservation objective for ROW vegetation maintenance and all other operation and maintenance activities is to avoid or minimize impacts to known or potential Cheat Mountain salamander habitat and avoid or minimize impact to Cheat Mountain salamanders (e.g., crushing/killing/chemical application).

The main Cheat Mountain salamander conservation objective for all construction projects is to avoid or minimize impacting known or potential Cheat Mountain salamander habitat (e.g., through project routing) and avoid or minimize impact to Cheat Mountain salamanders (crushing/killing).

Surveys to Evaluate Presence of the Species and/or Suitable Habitat

1. Consider conducting field surveys within the mapped potential range of the Cheat Mountain salamander (Figure 1) for all previously unsurveyed areas to determine whether potential habitat occurs in the project vicinity (the project footprint and a 300-foot buffer). These surveys can be conducted by surveyors deemed to be qualified by the Service and the West Virginia Department of Natural Resources (as demonstrated by obtaining a valid WV State Collecting Permit for Cheat Mountain salamander). A list of currently recognized surveyors can be obtained from the West Virginia Field Office or the WVDNR on an annual basis. These habitat surveys will be accepted for ten years. NiSource will ensure that surveyors have information regarding known locations, 300-foot buffers, and potential habitat of Cheat Mountain salamanders.

If a field survey is not conducted, assume the entire project area as potential habitat, go to step 1.

For any activity within the mapped potential range that involves disturbances within 300 feet of known or assumed habitat.

Step 1. Consider conducting habitat surveys of project area that has not previously been surveyed. Maintain positive and negative findings in a GIS database. The results will be submitted to the Service in the annual compliance report. If the project area has been previously surveyed and no potential habitat is present, no further surveys, or AMMs are needed. If the project area has previously been surveyed and potential habitat is present, go to step 2. If project area has previously been surveyed and Cheat Mountain salamanders are known to be present, go to step 3. If a habitat survey is not conducted, assume the entire project area as potential habitat, go to step 2.

Potential habitat present?

- If no, document for future NiSource activities and annual compliance report and no further Cheat Mountain salamander AMMs are needed.
- If yes, conduct Cheat Mountain salamander surveys or assume Cheat Mountain salamander presence.

Step 2a. If conducting Cheat Mountain salamander surveys:

Cheat Mountain salamander found?

- If no, document for future NiSource activities and annual compliance report and no further Cheat Mountain salamander AMMs are needed.
- If yes, conduct further Cheat Mountain salamander AMMs – go to step 3.
- Submit both positive and negative survey reports to the Service annually.

Step 2b. If assuming presence, employ further Cheat Mountain salamander AMMs – go to step 3.

Step 3. Employ further Cheat Mountain salamander AMMs.

Vegetation Management on the Existing ROW

2. Conduct covered activities within existing ROWs.

3. Minimize annual mowing of herbaceous layer to 10-foot width directly over pipeline(s).

4. Minimize permanent ROW width mowed an approximate 5 year cycle near known or potential Cheat Mountain salamander sites to 50 feet or less.

5. Leave small piles of woody debris on ground along edge of (but within) existing ROW after side-trimming of trees to provide shade/cover for Cheat Mountain salamander.

6. Herbicide application:
   a. Apply herbicides in accordance with NiSource policy and procedures, EPA guidelines and requirements, state requirements, and the manufacturer's label. Prior to herbicide use, consult with the timing requirements specified previously.
   b. Avoid aerial herbicide application over mapped potential range.
   c. For application of herbicides (vehicle or hand) within known or presumed Cheat Mountain salamander sites, follow the following herbicide guidelines.
      i. All herbicide will be sprayed within existing ROW. Ensure that no "overspray" or drift goes off the existing ROW.
      ii. Apply herbicides during fall (after August 30)
      iii. Inject pellets of glyphosate or imazapyr directly into trunks of woody vegetation (red maple, alder, poison sumac)
      iv. Hack and squirt (frill or drill and fill) – cut trunk of tree and apply glyphosate using backpack sprayer, squirt bottle, syringe, or tree injector
      v. Cut stump/stem – cut tree or shrub and apply glyphosate to cut surface using spray bottle or wick applicator

vi. Wick application – apply glyphosate directly to leaves and/or stem via "glove application" or paint stick with a contained reservoir to hold the herbicide

vii. Spot spray – spray glyphosate directly onto leaves or stem via backpack sprayer, squirt bottle, or modified low volume hydraulic applicator – no high pressure sprayers

viii. Herbicide will not be applied using an open container of herbicide for any application to reduce risk of spills

ix. When conducting foliar application of glyphosate, the surfactant LI-700 may be used in accordance with EPA-approved label instructions

x. Filling and emptying of herbicide containers will occur in upland areas

xi. All applicators will have a spill kit available

xii. All hoses, tanks, and clamps will be inspected in uplands prior to use each treatment day

xiii. Apply herbicide when wind speed at treatment height is ≤ 5 miles per hour.

7. Vegetation Disposal

   a. *If clearing trees or other native woody vegetation in areas close to known Cheat Mountain salamander populations, shred or cut these materials into large chucks to create cover boards or slabs and then place them along the edge of and up to 20 feet from the edge of the ROW.*

   b. Avoid dragging vegetation through known or assumed Cheat Mountain salamander habitat (carry pieces and if too large, cut into smaller pieces).

   c. Keep in any piles or stacks of vegetation in existing ROW.

   d. Avoid burning brush piles in the known or assumed Cheat Mountain salamander habitat.

8. *Reserved.*

<u>Other Operation & Maintenance Activities</u>

9. Right of Way Repair - Conduct covered activities within existing ROW

10. Existing Access Road Maintenance and Culvert Replacement

   a. Avoid staging equipment in known or assumed habitat

   b. Avoid additional clearing of trees

   c. Avoid channelizing streams

11. Avoid abandoning pipe (leaving on surface) adjacent to or within Cheat Mountain salamander habitat. Below-grade abandonment is acceptable.

12. *Avoid vehicle-use in ROWs with enhancements for Cheat Mountain salamander. Conduct patrols, vegetative maintenance, etc., by foot whenever practical.*

Construction Practices (Looping projects considered in new routing section below)(Existing or Future ROW).

13. Conduct covered activities within existing ROW.

14. Employ silt fences around construction/soil disturbance activities adjacent to known or assumed Cheat Mountain salamander sites. The silt fencing should completely isolate the work area from adjacent Cheat Mountain salamander habitat, and to ensure silt does not enter un-disturbed parts of the habitat.

15. *Avoid pulling woody vegetation out by the roots to avoid destruction of potential nests.*

16. Avoid withdrawing water from sources that may affect known or assumed Cheat Mountain salamander habitat for hydrostatic testing.

17. Avoid discharging hydrostatic testing water into known or assumed Cheat Mountain salamander habitat.

Discharge hydrostatic testing water down gradient of known or assumed Cheat Mountain salamander habitats.

OR

Discharge water >300 feet from known or assumed Cheat Mountain salamander habitat.

OR

Discharge water as far as practical from Cheat Mountain salamander habitats and utilize additional sediment and water flow control devices (Figures 6A&B, 7, 8,14A&B; ECS) to minimize effects to the Cheat Mountain salamander habitat.

18. Re-vegetate all disturbed areas in accordance with the ECS (e.g., use indigenous, non-invasive species).

19. Avoid use of fertilizers within 100 feet of known or assumed Cheat Mountain salamander habitat.

20. Refuel equipment and check for leaks each day as described in the ECS section on "Spill Prevention, Containment and Control".

New Construction Routing Criteria

21. Construct loops entirely within existing ROW.

OR

Route new pipelines to avoid being within 300 feet of known or assumed Cheat Mountain salamander sites.

OR

Conduct horizontal directional drilling (HDD) or horizontal bore to install pipe under Cheat Mountain salamander sites. Boring should occur at least 8 feet below the surface.

OR

Further consultation with the Service is necessary.

22. Route new access roads at least 300 feet away from known or assumed Cheat Mountain salamander sites. If not feasible, further consultation with the Service is necessary.

LEVELS OF TAKE

Through the application of the NGTS ECS and the species-specific AMMs, it is anticipated that the covered activities as described in the NiSource MSHCP **may affect, but are not likely to adversely affect** the Cheat Mountain salamander. If the Service concurs with this determination, NiSource does not request take coverage for this species.

REFERENCES

Armstrong, M., F. Clark, and R. Niver. 2007. U.S. Fish and Wildlife Service, Regional Leads for the NiSource MSHCP Project. Numerous electronic mail transmissions to ENSR forwarding information from various USFWS Field Offices in response to a request for initial project review and "**may affect**/**no effect**" call relative to covered species in the project area. Initial request for information sent by F. Clark on February 15, 2007. Responses received and forwarded to ENSR February – July 2007.

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Figure 1 Suitable Habitat for the Cheat Mountain Salamander

This map contains sensitive information and is not included in this document.

Attachment F-6
Conservation Framework for Birdwing Pearlymussel

BACKGROUND

The Service listed the birdwing pearlymussel (*Conradilla caelata = Lemiox rimosus)* as an endangered species in 1976 (Service 1983). Historically, this species was known to exist in 11 rivers in the Tennessee River system with one record in the Cumberland River, but is now believed to exist in only four rivers, with speculation that populations may no longer be viable in two of those rivers due to low numbers. Birdwing pearlymussel was once considered widely distributed within its range, but currently there are estimated to be between 50 and 1,000 individuals. Little information exists regarding current mussel densities. However, in 1979, the greatest density in the Clinch River was recorded as 0.12 mussels/square yard. Densities of 0.012 mussels/square yard are assumed representative of surviving populations potentially affected by the covered activities (Hubbs 2008). The global short-term trend for this species indicates the population is severely declining (greater than 70 percent) in its range, condition/number of occurrences, and area occupied. The global range is less than 38.61 square miles (NatureServe 2007). Research suggests that mussels avoid high flow areas of rivers that produce shearing forces making it difficult for juvenile mussels to settle and adult mussels to remain stable (Service 2002). In the absence of survey or other data, it is assumed that 25 percent of any stream reach is suitable mussel habitat (Morales et al. 2006). It is also assumed that accumulations of sediments greater than or equal to 0.24 inches would be lethal to the birdwing pearlymussel, and that dissolved concentrations greater than or equal to 600 milligrams per liter (mg/l) would harm and harass individuals (Ellis 1936; Aldridge et al. 1987; Watters 2000).

Based on initial project review (Armstrong et al. 2007), this analysis assumes that the project **may affect** this species in Maury County, Tennessee.

Refer to the POPULATION DISTRIBUTION, STATUS, AND TREND section for analysis location details. Refer to the SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES section for where AMMs would apply for this species.

LIFE HISTORY

Adult freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and other microorganisms from the water column. For their first several months, juvenile mussels employ foot (pedal) feeding, and are thus suspension feeders that feed on algae and detritus. Mussels tend to grow relatively rapidly for the first few years, and then slow appreciably at sexual maturity, when energy is being diverted from growth to reproductive activities (Service 2005).

As a group, mussels are extremely long-lived, living from a couple years to several decades, and possibly up to 100 to 200 years in extreme instances. The life span of the birdwing pearlymussel is believed to be greater than 50 years (Service 1983).

Most mussels, including the birdwing pearlymussel, generally have separate sexes. Age at sexual maturity for the birdwing pearlymussel is unknown, but in other species is estimated to occur after a few years. Males expel clouds of sperm into the water column, which are drawn in by females through their incurrent siphons. Birdwing pearlymussel breed from mid-summer

through fall or early winter. Fertilization takes place internally, and the resulting zygotes develop into specialized larvae termed glochidia within the gills. Birdwing pearlymussel is thought to be a long-term brooder, with glochidial development in the female taking place over winter and released the following spring (Service 1983). Hermaphroditism occurs in many mussel species, but is not known for the birdwing pearlymussel. This reproductive mechanism, which is thought to be rare in dense populations, may be implemented when populations exhibit low densities and high dispersion levels. Females changing to hermaphrodites may be an adaptive response assuring that a recruitment class may not be lost in small populations (Service 2005).

Glochidia are released in the form of conglutinates, which are analogous to cold capsules (i.e., gelatinous containers holding numerous glochidia), and mimic fish food organisms. The glochidia of the birdwing pearlymussel are subovate and hookless. Hookless glochidia tend to have a more delicate shell and most frequently parasitize the gill filaments of the host fish (Service 1983).

To ensure their survival, glochidia must come into contact with a specific host fish(es). Without the proper host fish, the glochidia will perish. The mussel host fish species for birdwing pearlymussel has been identified as the snubnose darter (*Etheostoma simoterum*) (Service 2007). Two potential host fish species have also been recognized, the banded darter (*E. zonale*) (NatureServe 2007) and the greenside darter (*E. blennioides*) (Service 2007). In many species of mussels, a few weeks are spent parasitizing the fishes' gill tissues. Newly-metamorphosed juveniles drop off to begin a free-living existence on the stream bottom. Unless dropped off in suitable habitat, they will die. Thus, the complex life history of the birdwing pearlymussel and other mussels has many weak links that may prevent successful reproduction and/or recruitment of juveniles into existing populations (Service 2005).

Adult birdwing pearlymussel are organisms that burrow into the upper substrate layer of the stream where they fall. Movement is very minimal, if not absent, during the adult life stage. Dispersal of juveniles occurs while the glochidia are encysted on the host fish (NatureServe 2007).

This species is in a monotypic genus and is easily separated from all other species. No subspecies or varieties of this species have been recognized.

HABITAT REQUIREMENTS

The birdwing pearlymussel is categorized as a riffle species, typically found in shallow, fast-flowing water with stable, clean substrate. However, it has been reported at water depths of up to seven feet. Its preferred habitat also includes small to medium free-flowing streams of moderate gradient over stable, relatively silt-free rubble, gravel, and sand substrates. Birdwing pearlymussels are apparently intolerant of lentic conditions and has been extirpated from many river sections that were impounded within its historic range (Service 1983). For the purposes of this project, it is assumed that the average river width this species occurs within is 200 feet.

PLANNING UNITS

The planning unit for this Conservation Framework includes the states cross by the MSHCP covered lands with extant or historical populations of the birdwing pearlymussel. Historical populations occurred in the following NiSource MSHCP states: Tennessee and Virginia. Extant populations, including Non-essential Experimental Populations (NEP), exist

outside of the MSHCP covered lands in the Tennessee River drainage within the states of Tennessee and Virginia. Extant populations within the covered lands boundary may occur in the Duck River in Maury County, Tennessee. Due to this, one planning unit will be utilized for the purposes of this MSHCP.

POPULATION DISTRIBUTION, STATUS, AND TREND

Entire Range

Extant populations of the birdwing pearlymussel are known from four rivers in two states and two Service regions. Region 4 has the most extant occurrences with some smaller populations occurring in Region 5. It currently is believed to survive in the Clinch and Powell Rivers in Tennessee and Virginia, and in the Duck and Elk Rivers in Tennessee (Service 1983).

During historical times, the birdwing pearlymussel had a wide distribution occurring in 11 rivers of the Tennessee River system, although they have never been found in large numbers and have therefore been considered a rare species (Service 1983).

The population is severely declining (greater than 70 percent) in its range, and has been eliminated from many streams of the upper Tennessee River from which it was historically known. In addition, the species is no longer known in the State of Alabama (Service 2007).

Populations Potentially Impacted

Duck River

It is believed that the Duck River supports one of the only known "good populations" of birdwing pearlymussel in existence. One of the last sizable populations was surveyed in August of 1997 near Lillard Mill Dam (River Mile 179). Survey results revealed 59 males, 23 females, and 11 juveniles (NatureServe 2007). Recent studies conducted by the Nature Conservancy suggest freshwater mussel populations, on a whole, in the Duck River are on the rise compared to past years. Relative to the MSHCP covered lands, suitable and possibly occupied habitat for the birdwing pearlymussel may exist in the vicinity of the project in Maury County, Tennessee.

EFFECTS ON CRITICAL HABITAT

No critical habitat has been designated for the birdwing pearlymussel.

SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES

These measures apply to all known occupied and presumed occupied areas in Maury County, Tennessee. Refer to POPULATION DISTRIBUTION, STATUS, AND TREND (populations potentially impacted) for a list of applicable waterbody crossings. These species-specific measures supplement (and supersede where conflicting) the general BMPs specified in the NGTS ECS. Measures in standard font text will be applied for all activities. Measures in *italic* font text will be applied on a case-by-case basis depending on the requirements of the activity. These requirements include consideration of customer and business needs, practicality, and effectiveness as more fully described in Chapter 5 of this MSHCP. Details on selecting the appropriate waterbody crossing method are provided in Section 5.2.1.1.

The main birdwing pearlymussel conservation objective for ROW maintenance and O&M activities is to avoid or minimize impacts to known or presumed occupied habitat (e.g., minimize impacts to stream banks and bed) and avoid/minimize impact to birdwing pearlymussel

(e.g., crushing, killing, sedimentation). The main birdwing pearlymussel conservation objective for all construction projects (i.e., off existing ROW) is to avoid or minimize impacting known or presumed occupied habitat (e.g., use of trenchless installation) and avoid/minimize impact to birdwing pearlymussel (e.g., crushing, killing, sedimentation). If, after detailed engineering and environmental studies, it is determined (and agreed to by NiSource Natural Resources Permitting [NRP] personnel) that avoidance is not feasible, a report will be prepared and NiSource will consult with the Service before proceeding with the project.

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

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**. 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.[8]

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**, 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.

Pre-Construction Planning: Preparation of an EM&CP

2. A detailed EM&CP will be prepared for any activity with potential effects (e.g., streambed 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 streambed 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 that 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

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

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% leading directly to occupied habitat. These plans will include techniques such as hard or soft trench plugs, temporary sediment barriers, a wider trench at the slope base, and/or temporary slope drains (plastic). In areas with less than a 30% 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.

Streambed Construction

3. For activities in occupied habitat, install new or replacement pipelines and major repairs under the river bottom using horizontal directional drilling (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 7(c) filing at a minimum.

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 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) 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 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 direct or lethal 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).

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

11. *Reserved.*

Pipeline Abandonment

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.

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). 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 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.

Withdrawal and Discharge of Water

17. Hydrostatic test water and/or water for storage well O&M will not be obtained from known or presumed occupied habitat unless other water sources are not reasonably available. To prevent desiccation of mussels, water from known or presumed occupied habitat will be withdrawn in a manner that will not visibly lower the water level as indicated by water level height on the stream channel bank. Employ appropriately sized screens, implement withdrawal rates, and maintain withdrawal point sufficiently above the substrate to minimize impacts to the species.

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.

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.

Zebra Mussels and Other Invasives

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 (**Appendix L**). 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.

LEVELS OF TAKE

Through the application of the NGTS ECS and the species-specific AMMs, it is anticipated that the covered activities as described in the NiSource MSHCP **may affect, but are not likely to adversely affect** the Birdwing pearlymussel. If the Service concurs with this determination, NiSource does not request take coverage for this species.

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Attachment F-7
Conservation Framework for Cracking Pearlymussel

BACKGROUND

The Cracking pearlymussel (*Hemistena lata)* was listed as an endangered species by the Service in 1989. The Cracking pearlymussel has been extirpated throughout much of its former range or reduced to isolated populations. The majority of the remaining populations are small and geographically isolated. Its global abundance is unknown at this point; numbers as low as 50-1,000 individuals have been suggested (NatureServe 2007). Sharp declines in population densities have been noted and this species is a very rare component of the fauna when present. Very rarely are more than a few individuals found at a particular site. Increasing rarity has been noted by qualitative sampling and by absence from commercial shell harvests (NatureServe 2007). Densities of 0.012 mussels/square yard are assumed to be representative of surviving populations potentially affected by the covered activities (Hubbs 2008). Research suggests that mussels avoid high-flow areas of rivers that produce shearing forces making it difficult for juvenile mussels to settle and adult mussels to remain stable (Service 2002). In the absence of survey or other data, it is assumed that 25 percent of any stream reach is suitable mussel habitat (Morales et al. 2006). It is also assumed that accumulations of sediments greater than or equal to 0.24 inches would be lethal to the Cracking pearlymussel, and that dissolved concentrations greater than or equal to 600 milligrams per liter (mg/l) would harm and harass individuals (Ellis 1936; Aldridge et al. 1987; Watters 2000).

Based on initial project review (Armstrong et al. 2007), this analysis concludes that the project **may affect** this species in Hardin, Wayne, and Maury counties, Tennessee.

Refer to the POPULATION DISTRIBUTION, STATUS, AND TREND section for analysis location details. Refer to the SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES section for where AMMs would apply for this species.

LIFE HISTORY

Adult freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and other microorganisms from the water column. For their first several months, juvenile mussels employ foot (pedal) feeding, and are thus suspension feeders that feed on algae and detritus. Mussels tend to grow relatively rapidly for the first few years, and then slow appreciably at sexual maturity, when energy is being diverted from growth to reproductive activities (Service 2005).

As a group, mussels are extremely long-lived, living from a couple years to several decades, and possibly up to 100 to 200 years in extreme instances (Service 1991). No quantitative longevity information on the Cracking pearlymussel is available.

Most mussels, including the Cracking pearlymussel, generally have separate sexes. Age at sexual maturity for the Cracking pearlymussel is unknown, but in other species is estimated to occur after a few years. Males expel clouds of sperm into the water column, which are drawn in by females through their incurrent siphons. Gravid females of similar freshwater species have been found between May and July (Service 1991). Fertilization takes place internally, and the resulting zygotes develop into specialized larvae termed glochidia within the gills of a host fish.

Hermaphroditism occurs in many mussel species (Service 2002), but is not unknown for the Cracking pearlymussel. This reproductive mechanism, which is thought to be rare in dense populations, may be implemented when populations exhibit low densities and high dispersion levels. Females changing to hermaphrodites may be an adaptive response assuring that a recruitment class may not be lost in small populations. If hermaphroditism does occur in Cracking pearlymussel, it may explain the occurrence of small, but persistent populations over long periods of time common in many parts of its range.

Specific information regarding the glochidia of Cracking pearlymussel is unknown (NatureServe 2007). Fecundity is positively related to body size and inversely related to glochidia size (Bauer 1994). Total fecundity (including glochidia and ova) per female of the Cracking pearlymussel is probably in the tens of thousands. Glochidia must come into contact with a specific host fish(es) in order for their survival to be ensured. Without the proper host fish, the glochidia will perish. Little information is known regarding host fishes of the Cracking pearlymussel (NatureServe 2007). In many species of mussels, a few weeks are spent parasitizing the fishes' gill tissues. Newly metamorphosed juveniles drop off to begin a free-living existence on the stream bottom. Unless they drop off in suitable habitat, they will die. Thus, the complex life history of the Cracking pearlymussel and other mussels has many weak links that may prevent successful reproduction and/or recruitment of juveniles into existing populations (Service 2002).

Adult Cracking pearlymussel are organisms that burrow into the upper substrate layer of the stream where they fall. Movement is very minimal, if not absent, during the adult life stage. Dispersal of juveniles occurs while the glochidia are encysted on the host fish (NatureServe 2007).

HABITAT REQUIREMENTS

The Cracking pearlymussel is primarily a moderately sized stream species and occurs primarily in gravel-riffle areas where it is habitually buried deep within the substrate. Habitats with Cracking pearlymussel may also have sand, gravel, and cobble, with higher water velocities. If they are found in slower flows, a substrate of sand and mud is preferred (Service 2007).

PLANNING UNITS

The planning unit for this Conservation Framework includes the states crossed by the MSHCP covered lands with extant or historical populations of the Cracking pearlymussel. Historical populations occurred in the following NiSource MSHCP states: Indiana, Ohio, Pennsylvania, Kentucky, Tennessee, Alabama, and Virginia. There are no extant populations existing outside of the NiSource MSHCP area in the Ohio River drainage. Extant populations within the NiSource MSHCP boundary occur in Tennessee (Tennessee and Elk rivers); and Virginia (Clinch and Powell rivers). Populations may also exist in the Green River system in Kentucky (Service 1991). Non-Essential Populations (NEP's) have also been proposed for reintroduction of the species to the French Broad River continuing down to its confluence with the Holston River (Knox, Sevier, Grainger, and Jefferson counties, Tennessee) (NatureServe 2007). Another NEP for the Cracking pearlymussel was established in 2001 for a section of the Tennessee River below the Wilson Dam in Colbert and Lauderdale counties, Alabama.

Historically, there were presumably no absolute barriers preventing genetic interchange among its tributary sub-populations that occurred in various streams. With the completion of numerous dams on streams, such as the Tennessee River primarily during the first half of this century, some main stem Cracking pearlymussel populations were lost, and other populations became isolated (NatureServe 2007). Based on existing information, however, there is no reason to assume genetic differences exist among populations within the NiSource MSHCP project area. Further, the river systems within the NiSource MSHCP area do not have significantly different management strategies or threats associated with them. Due to this, one planning unit will be utilized for the purposes of this MSHCP.

POPULATION DISTRIBUTION, STATUS, AND TREND

Entire Range

During historical times, the Cracking pearlymussel was fairly widespread, occurring in many streams in the Ohio, Cumberland, and Tennessee river systems, although rarely very common. Archaeological evidence on relative abundance indicates that it has been an uncommon or even rare species in many streams for centuries (Service 1991).

The Cracking pearlymussel has been eliminated from 70 percent of the total number of streams from which it was historically known. This species has also been eliminated from long reaches of former habitat in miles of the Illinois, Cumberland, and other rivers, and from several reaches of the Ohio and Tennessee rivers. In addition, the species is no longer known in the States of Ohio, Indiana, Illinois, Pennsylvania, and Alabama (NatureServe 2007).

Museum collections of this species, with few exceptions, are almost always small (~6 cm to 90 mm) (NatureServe 2007). Fair numbers also were recorded historically from the Tennessee River system in the Tennessee and Clinch rivers in Virginia.

Populations Potentially Impacted

Tennessee River

Cracking pearlymussel collections previously inhabited larger portions of the Tennessee River. They were documented from below Knoxville downstream to Muscle Shoals, Alabama (Service 1991). Several smaller tributaries of the Tennessee River also have been historically documented to sustain small populations of Cracking pearlymussel. However, none have been observed since the 1970s in those locations. One of the more recent specimens of Cracking pearlymussel was found at Diamond Island (River Mile 196) below Pickwick Landing Dam, Harding County, in November 1980 (NatureServe 2007). Recruitment has not necessarily been documented in recent years in all of these locations.

Duck River

The Cracking pearlymussel has been reported from the Duck and Buffalo rivers in Central Tennessee historically and potentially may have pockets of existing small populations. None, however, have been documented in recent times (NatureServe 2007). Recent studies conducted by The Nature Conservancy suggest freshwater mussel populations, on a whole, in the Duck River are on the rise compared to past years.

EFFECTS ON CRITICAL HABITAT

No critical habitat has been designated for the Cracking pearlymussel.

SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES

These measures apply to all known occupied and presumed occupied areas in Maury and Hardin County, Tennessee. Refer to POPULATION DISTRIBUTION, STATUS, AND TREND (populations potentially impacted) for a list of applicable waterbody crossings. Based on a conversation with Don Hubbs (2008) it has been determined that this species no longer occurs in the Buffalo River in Wayne County, Tennessee. If the Service concurs with this determination, AMMs will not be applied in this county. These species-specific measures supplement (and supersede where conflicting) the general BMPs specified in the NGTS ECS. Measures in standard font text will be applied for all activities. Measures in italic font text will be applied on a case-by-case basis depending on the requirements of the activity. These requirements include consideration of customer and business needs, practicality, and effectiveness as more fully described in Chapter 5 of this MSHCP. Details on selecting the appropriate waterbody crossing method are provided in Section 5.2.1.1.

The main Cracking pearlymussel conservation objective for ROW maintenance and O&M activities is to avoid or minimize impacts to known or presumed occupied habitat (e.g., minimize impacts to stream banks and bed) and avoid or minimize impact to Cracking pearlymussel (e.g., crushing, killing, sedimentation). The main Cracking pearlymussel conservation objective for all construction projects (i.e., off existing ROW) is to avoid or minimize impacting known or presumed occupied habitat (e.g., through project planning, use of trenchless installation) and avoid or minimize impact to Cracking pearlymussel (e.g., crushing, killing, sedimentation). If, after detailed engineering and environmental studies, it is determined (and agreed to by NiSource Natural Resources Permitting [NRP] personnel) that avoidance is not feasible, a report will be prepared and NiSource will consult with the Service before proceeding with the project.

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

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**. 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.[9]

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**, 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

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

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.

Pre-Construction Planning: Preparation of an EM&CP

2. A detailed EM&CP will be prepared for any activity with potential effects (e.g., streambed 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 streambed 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 that 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% leading directly to occupied habitat. These plans will include techniques such as hard or soft trench plugs, temporary sediment barriers, a wider trench at the slope base, and/or temporary slope drains (plastic). In areas with less than a 30% 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.

Streambed Construction

3. For activities in occupied habitat, install new or replacement pipelines and major repairs under the river bottom using horizontal directional drilling (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 7(c) filing at a minimum.

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 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) 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 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 direct or lethal 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).

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

11. *Reserved.*

Pipeline Abandonment

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.

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). If a reportable spill has impacted occupied habitat:

c. follow spill response plan; and

d. 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 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.

Withdrawal and Discharge of Water

17. Hydrostatic test water and/or water for storage well O&M will not be obtained from known or presumed occupied habitat unless other water sources are not reasonably available. To prevent desiccation of mussels, water from known or presumed occupied habitat will be withdrawn in a manner that will not visibly lower the water level as indicated by water level height on the stream channel bank. Employ appropriately sized screens, implement withdrawal rates, and maintain withdrawal point sufficiently above the substrate to minimize impacts to the species.

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):

d. Discharge water down gradient of occupied habitat unless on-the-ground circumstances (e.g., man-made structures, terrain, other sensitive resources) prevent such discharge.

e. 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.

f. 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.

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.

Zebra Mussels and Other Invasives

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 (**Appendix L**). 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.

LEVELS OF TAKE

Through the application of the NGTS ECS and the species-specific AMMs, it is anticipated that the covered activities as described in the NiSource MSHCP **may affect, but are not likely to adversely affect** the Cracking pearlymussel. If the Service concurs with this determination, NiSource does not request take coverage for this species.

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Attachment F-8
Conservation Framework for
Cumberland Monkeyface Pearlymussel

BACKGROUND

The Cumberland monkeyface *(Quadrula intermedia)* was listed as an endangered species by the Service on June 14, 1976 (Service 2006a). The Cumberland monkeyface has been extirpated throughout much of its former range or reduced to isolated populations. This species has been eliminated from nearly two-thirds of its historical range and has been reduced to only a few extant populations (NatureServe 2007). The majority of the remaining populations are small and fragmented and its global abundance is estimated at 1 to 1,000 individuals (NatureServe 2007). Little information exists regarding current densities making a quantitative estimate difficult. Cumberland monkeyface have been experiencing declines in population densities for most areas and have never been abundant when present. However, recent studies of one river in particular, the Duck River of Tennessee, have shown increases in Cumberland monkeyface compared to past years (Ahlstedt et al. 2004). This population is believed to be the most viable, range-wide. Densities of 0.0036 mussels/square yard are assumed to be representative of surviving populations potentially affected by the covered activities in the Duck River (Hubbs 2008; Ahlstedt et al. 2004). This density is based in part on the proportional detection of this species in recent survey efforts in the Duck River (Ahlstedt et al. 2004). Research suggests that mussels avoid high-flow areas of rivers that produce shearing forces, making it difficult for juvenile mussels to settle and adult mussels to remain stable (Service 2002). In the absence of survey or other data, it is assumed that 25 percent of any stream reach is suitable mussel habitat (Morales et al. 2006). It is also assumed that accumulations of sediments greater than or equal to 0.24 inches would be lethal to the Cumberland monkeyface pearly mussel, and that dissolved concentrations greater than or equal to 600 milligrams per liter (mg/l) would harm and harass individuals (Ellis 1936; Aldridge et al. 1987; Watters 2000).

Based on initial project review (Armstrong et al. 2007), this analysis concludes that the project **may affect** this species in Maury County, Tennessee.

Refer to the POPULATION DISTRIBUTION, STATUS, AND TREND section for analysis location details. Refer to the SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES section for where AMMs would apply for this species.

LIFE HISTORY

Adult freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and other microorganisms from the water column. During the first several months, juvenile mussels employ foot (pedal) feeding, and are thus suspension feeders that feed on algae and detritus. Mussel growth is relatively rapid for the first few years, and slows appreciably at sexual maturity, when energy is diverted from growth to reproductive activities (Service 2005).

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 (Service 2005b). However, no quantitative longevity information regarding the Cumberland monkeyface is available.

Most mussels, including the Cumberland monkeyface, generally have separate sexes. Age at sexual maturity for the Cumberland monkeyface is unknown, but in other species it is estimated to occur after a few years. Males expel clouds of sperm into the water column, which are drawn in by females through their incurrent siphons. Fertilization takes place internally, and the resulting zygotes develop within the gills into specialized larvae termed glochidia. Cumberland monkeyface are thought to be a short-term breeder (tachytictic), with most spawning taking place in the spring and females becoming gravid in May or June (Service n.d.).

Glochidia are released in the form of conglutinates, which are analogous to cold-pill capsules (i.e., gelatinous containers holding numerous glochidia), and mimic fish food organisms. To ensure their survival, glochidia must come into contact with a specific host fish(es). Without the proper host fish, the glochidia will perish. Recent studies have identified two cyprinids, the streamline chub (*Erimystax dissimilis*) and blotched chub (*Erimystax insignis*) as glochidial host species for the Cumberland monkeyface. Both fish hosts are known to occupy similar riffle habitats as the mussel (Service 2006a). In many species of mussels, glochidia parasitize the fishes' gill tissues for a few weeks. Newly-metamorphosed juveniles then drop off to begin a free-living existence on the stream bottom. Unless dropped off in suitable habitat, they will die. Thus, the complex life history of the Cumberland monkeyface and other mussels has many weak links that may prevent successful reproduction and/or recruitment of juveniles into existing populations (Service 2005a).

Adult Cumberland monkeyface pearlymussels are organisms that burrow into the upper substrate layer of the stream where they fall. Movement is very minimal, if not absent, during the adult life stage. Dispersal of juveniles occurs while the glochidia are encysted on the host fish (NatureServe 2007).

HABITAT REQUIREMENTS

The habitat of the Cumberland monkeyface pearlymussel consists of shallow (i.e., generally two feet or less in depth) shoal and riffle areas in free-flowing streams of high to moderate gradient. Substrate preferences include firm rubble, gravel, and sand and the species most often remains buried with only siphons visible. The species has never been found in small streams (Service n.d.).

PLANNING UNITS

The planning unit for this Conservation Framework includes all the counties crossed by the covered lands with extant, or historical populations of the Cumberland monkeyface. Historical populations occur in the following NiSource MSHCP states: Tennessee and Virginia. Extant populations, including Non-essential Experimental Populations, exist outside of the MSHCP covered lands in the Tennessee River drainage in the states of Tennessee and Virginia. However, the covered lands area in Virginia does not overlap the range of the Cumberland monkeyface. The only project county that includes portions of the current or historic range of the Cumberland monkeyface is Maury County, Tennessee. Due to this, one planning unit will be utilized for the purposes of this MSHCP.

POPULATION DISTRIBUTION, STATUS, AND TREND

1. Entire Range

Extant populations of the Cumberland monkeyface are believed to exist in five rivers from two states. It currently is believed to survive in the Clinch and Powell rivers in Tennessee and Virginia and in the Duck, Elk, and Tellico rivers in Tennessee (NatureServe 2007).

During historical times, the Cumberland monkeyface had a distribution occurring from 11 rivers in the Tennessee River system, but still were never found in large numbers (NatureServe 2007).

The population is severely declining (greater than 70 percent) in its range, and has been eliminated from many streams of the upper Tennessee River from which it was historically known. In addition, the species is no longer known to exist in the State of Alabama. A decline of greater than 90 percent is estimated over the long term (NatureServe 2007).

2. Populations Potentially Impacted

Duck River

A survey of the Duck River population in Tennessee in August 1997 only found two very old individuals. Previously, one Cumberland Monkeyface was found in 1995, and none were located in 1993 and 1994 surveys (NatureServe 2007). It was thought that the Duck River had too few specimens to be viable (NatureServe 2007). However, a more recent study, conducted from 2001 to 2003, revealed 19 individuals. The total percent composition for the Cumberland monkeyface compared to all mussels collected was 0.22 percent (Ahlstedt et al. 2004). It was surmised that the Cumberland monkeyface is restricted to an approximately 22-mile reach of upper-river from Lillard Mill Dam (River Mile 179) to Jackson's Bend, where it is generally distributed but rare. This was found to be an increase of nine miles from previous surveys (1977), and numbers increased over seven fold (Ahlstedt et al. 2004). It is now believed that the Duck River contains the best remaining population range-wide of this species. Relative to the MSHCP covered lands, suitable and possibly occupied habitat for the Cumberland monkeyface may exist in the vicinity of the project in Maury County, Tennessee.

EFFECTS ON CRITICAL HABITAT

No critical habitat has been designated for the Cumberland monkeyface.

SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES

These measures apply to all known occupied and presumed occupied areas in Maury County, Tennessee. Refer to POPULATION DISTRIBUTION, STATUS, AND TREND (populations potentially impacted) for a list of applicable waterbody crossings. These species-specific measures supplement (and supersede where conflicting) the general BMPs specified in the NGTS ECS. Measures in standard font text will be applied for all activities. Measures in italic font text will be applied on a case-by-case basis depending on the requirements of the activity. These requirements include consideration of customer and business needs, practicality, and effectiveness as more fully described in Chapter 5 of this MSHCP. Details on selecting the appropriate waterbody crossing method are provided in Section 5.2.1.1.

The main Cumberland monkeyface pearlymussel conservation objective for ROW maintenance and O&M activities is to avoid or minimize impacts to known or presumed

occupied habitat (e.g., minimize impacts to stream banks and bed) and avoid/minimize impact to Cumberland monkeyface pearlymussel (e.g., crushing, killing, sedimentation). The main Cumberland monkeyface pearlymussel conservation objective for all construction projects (i.e., off existing ROW) is to avoid or minimize impacting known or presumed occupied habitat (e.g., use of trenchless installation) and avoid/minimize impact to Cumberland monkeyface pearlymussel (e.g., crushing, killing, sedimentation). If, after detailed engineering and environmental studies, it is determined (and agreed to by NiSource Natural Resources Permitting [NRP] personnel) that avoidance is not feasible, a report will be prepared and NiSource will consult with the Service before proceeding with the project.

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

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**. 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.[10]

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**, 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.

Pre-Construction Planning: Preparation of an EM&CP

2. A detailed EM&CP will be prepared for any activity with potential effects (e.g., streambed 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 streambed 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 that would be designed to protect

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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% leading directly to occupied habitat. These plans will include techniques such as hard or soft trench plugs, temporary sediment barriers, a wider trench at the slope base, and/or temporary slope drains (plastic). In areas with less than a 30% 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.

Streambed Construction

3. For activities in occupied habitat, install new or replacement pipelines and major repairs under the river bottom using horizontal directional drilling (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 7(c) filing at a minimum.

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 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) 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 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 direct or lethal 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).

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

11. *Reserved.*

Pipeline Abandonment

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.

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). If a reportable spill has impacted occupied habitat:

e. follow spill response plan; and

f. 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 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.

Withdrawal and Discharge of Water

17. Hydrostatic test water and/or water for storage well O&M will not be obtained from known or presumed occupied habitat unless other water sources are not reasonably available. To prevent desiccation of mussels, water from known or presumed occupied habitat will be withdrawn in a manner that will not visibly lower the water level as indicated by water level height on the stream channel bank. Employ appropriately sized screens, implement withdrawal rates, and maintain withdrawal point sufficiently above the substrate to minimize impacts to the species.

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):

g. Discharge water down gradient of occupied habitat unless on-the-ground circumstances (e.g., man-made structures, terrain, other sensitive resources) prevent such discharge.

h. 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.

i. 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.

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.

Zebra Mussels and Other Invasives

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 (**Appendix L**). 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.

LEVELS OF TAKE

Through the application of the NGTS ECS and the species-specific AMMs, it is anticipated that the covered activities as described in the NiSource MSHCP **may affect, but are not likely to adversely affect** the Cumberland monkeyface pearlymussel. If the Service concurs with this determination, NiSource does not request take coverage for this species.

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Appendix F–9
Conservation Framework for Oyster Mussel

BACKGROUND

On January 10, 1997, the oyster mussel (*Epioblasma capsaeformis*) was designated as endangered throughout its entire range, except where listed as experimental populations (Service 1997, 2001). The oyster mussel is endemic to the Cumberland and Tennessee River systems. This species has undergone significant reductions in range and numbers, and now exists as relatively small, isolated populations, most of which are of questionable long-term viability. Once present in thousands of river miles, the oyster mussel now persists only at extremely low numbers in three river systems in Kentucky, Tennessee, and Virginia. One extant population, within the Tennessee River drainage is thought to be relatively healthy with occurrences in the Clinch, Powell, and Duck Rivers. Specific to the Duck River in Maury County, Tennessee, oyster mussel populations are thought to be relatively healthy; occurring at 16 sites in a 28-mile reach of the middle portion of the river. A second extant population, located in the Cumberland River drainage is also thought to be relatively healthy, with occurrences in Buck Creek and the Big South Fork Cumberland River. The third remaining extant oyster mussel population, located in the Tennessee River drainage within the Nolichucky River, is thought to be of doubtful viability; only a single live specimen was found during the most recent sampling of this region, a sampling of 20 sites in 2000. Its global abundance is estimated at 1,000 - 2,500 individuals (NatureServe 2007). Sharp declines in population densities have been noted and it is a very rare component of the existing fauna when present (Service 2004a; NatureServe 2007). Densities of 0.012 mussels per square yard are assumed to be representative of surviving populations potentially affected by the covered activities (Hubbs 2008).

Based on initial project review (Armstrong et al. 2007), this analysis concludes that the project **may affect** this species in Maury County, Tennessee. The project will have **no effect** on this species in Monroe, Kentucky (Armstrong et al. 2007).

Refer to the POPULATION DISTRIBUTION, STATUS, AND TREND section for analysis location details. Refer to the SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES section for where AMMs would apply for this species.

LIFE HISTORY

Adult freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and other microorganisms from the water column. For their first several months juvenile mussels employ foot (pedal) feeding, and are thus suspension feeders that feed on algae and detritus. Mussels tend to grow relatively rapidly for the first few years, and then slow appreciably at sexual maturity, when energy is being diverted from growth to reproductive activities (Service 2005).

As a group, mussels are extremely long-lived, living from a couple years to several decades, and possibly up to 100 to 200 years in extreme instances. No quantitative longevity information on the oyster mussel is available. Qualitative estimates of oyster mussel longevity propose that individuals live no longer than three or four decades at most, while specific qualitative analysis of gravid female oyster mussels estimate a maximum life span of ten years (Service 2004a).

Most mussels, including the oyster mussels, generally have separate sexes. Age at sexual maturity for the oyster mussel is unknown, but in other species is estimated to occur after a few years. The reproductive cycle of the oyster mussel is similar to that of other native freshwater mussels. Males release sperm into the water column; the sperm are then taken in by the females through their siphons during feeding and respiration. The females retain the fertilized eggs in their gills until the larvae (glochidia) fully develop. The mussel glochidia are released into the water, and within a few days they must attach to the appropriate species of fish, which they parasitize for a short time while they develop into juvenile mussels. They then detach from their fish host and sink to the stream bottom or other substrate where they continue to develop, provided they land in a suitable substratum with the correct water conditions. The oyster mussel spawns in late summer and early fall, and glochidia overwinter in the female mussel for release in the following spring (Service 2004a).

Hermaphroditism occurs in many mussel species, but is not known for the oyster mussel. This reproductive mechanism, which is thought to be rare in dense populations, may be implemented when populations exhibit low densities and high dispersion levels. Females changing to hermaphrodites may be an adaptive response assuring that a recruitment class may not be lost in small populations. If hermaphroditism does occur in the oyster mussel, it may explain the occurrence of small, but persistent populations over long periods of time common in many parts of its range (Service 2004a).

In April and May, gravid females have been observed moving to the substrate surface upon which they open their valves, exposing a mantle pad that ranges from sky blue to bluish white in color (Service 2004a). Microlures, in the shape of insect larvae (e.g., mayfly/stonefly) tails are attached to the rear of the mantle pad. These tiny fingerlike projections rotate circularly to entice the host fish (Service 2004a). As the host fish inspects the microlure as a potential prey item, the female oyster mussel emits her glochidia into the throat cavity of the fish. Each female expels approximately 12,000 to 16,000 glochidia (Service 2004a).

Seven native fish have been identified as host fish for the oyster mussel. These host fish include the following species: redline darter (*Etheostoma rufilineatum*), which spawns late May to early August in eastern Tennessee; wounded darter (*E. vulneratum*), which spawns late May to late July; dusky darter (*Percina sciera*), which spawns late May to early July; bluebreast darter (*E. camurum*), whose spawning peaks mid-May to early June in Ohio (complete by the end of June) and late May to late July or early August in Tennessee; banded sculpin (*Cottus carolinae*), which spawns January-February and probably March-April in Illinois; mottled sculpin (*C. bairdi*), which spawns in spring, the date depending on the locality; and black sculpin (*C. baileyi*), which spawns from late winter to mid-spring (Service 2004b). Once metamorphosis of the oyster mussel is complete, the juvenile drops from the host fish onto the streambed (Service 2007). Metamorphosis into the juvenile form takes approximately 19 to 34 days of parasitism on the host fish (NatureServe 2007).

Adult oyster mussels are organisms that burrow into the upper substrate layer of the stream where they fall. Movement is very minimal, if not absent, during the adult life stage (NatureServe 2007).

HABITAT REQUIREMENTS

Typical habitat for this species consists of streams ranging from medium-sized creeks to large rivers. The oyster mussel prefers a gravel/boulder and coarse sand substrate (rarely found

in mud), and moderate to swift currents. The species appears to prefer shallow shoals and riffles in association with beds of water willow (*Justicia Americana*). The oyster mussel also has been observed in areas of swift currents in gravel pockets between bedrock ledges (Service 2004a).

PLANNING UNITS

The planning unit for this conservation framework includes the areas crossed by the MSHCP covered lands with extant or historical populations of the oyster mussel. Historical populations occurred in the following NiSource MSHCP states: Kentucky, Tennessee, and Virginia. Extant populations exist outside of the MSHCP covered lands in the Tennessee River system in the states of Tennessee and Virginia. Extant populations within the MSHCP covered lands boundary occur from the Duck River in Maury County, Tennessee (Service 2004a).

The Duck River oyster mussel population is presently proposed as a separate species from *Epioblasma capsaeformis* populations found elsewhere within the Cumberlandian Region based on distinctiveness of molecular genetic markers, differences in mantle pad coloration and texture, greater height of marsupial expansion of the female shell, smaller glochidial size, differing host fish specificity, and behavioral differences in movement of micro-lures. For the purposes of this analysis, this population is considered to be part of the *Epioblasma capsaeformis* species.

Furthermore, because the Duck River is the only section of oyster mussel habitat covered within the NiSource MSHCP, the oyster mussel populations within the Duck River represent one planning unit for the purposes of this analysis.

POPULATION DISTRIBUTION, STATUS, AND TREND

Entire Range

Extant populations of the oyster mussel are known from three streams in the Tennessee River system in Tennessee and Virginia (Service 2004a).

During historical times, the oyster mussel was fairly widespread throughout the Cumberland River and Tennessee River systems. Its range included four physiographic provinces (Interior Low Plateau, Cumberland Plateau, Ridge and Valley, Blue Ridge) and six states (Alabama, Georgia, Kentucky, North Carolina, Tennessee, and Virginia). Currently, this species is highly fragmented and most populations are of questionable long-term viability. The oyster mussel is considered extirpated from the entire Cumberland River system, having been eliminated from the Cumberland River mainstem and all of its tributaries. Populations also have been eliminated from the entire Tennessee River mainstem and a number of its tributaries, and from the entire Blue Ridge physiographic province. It appears to have been eliminated from the states of Alabama, Georgia, and North Carolina (Service 2004a).

Recent quantitative density studies of the oyster mussel provide insight into the distribution of the species. Studies of the Powell River between 1983 and 1999 could only produce the oyster mussel in the early years of the study regime, with a density of between 0.02 and 0.03 per square foot noted when found. No oyster mussels were revealed during this quantitative study after the year 1983, though a single live individual was found during qualitative sampling during the years 1988 and 1989. Though these numbers indicated that the oyster mussel has rebounded in the Tennessee portion of the Clinch River, it is close to extirpation on the Virginia side of the river (Service 2004a).

Current analysis indicates that oyster mussel populations at certain locations in the Clinch River in both Virginia and Tennessee are recruiting, and continue to be viable. The Duck River population also harbors a large and thriving population, occurring at 16 sites in a 28-mile reach of the middle portion of the stream. The extant population found in the Nolichucky River is very small and of doubtful viability, with only a single live specimen found during sampling in 2000 (Service 2004a).

Populations Potentially Impacted

Duck River

Extant oyster mussel populations were last observed in the Duck River in Marshall and Maury counties, Tennessee in 2000-2001. These populations are thought to be relatively healthy, occurring at 16 sites in a 28-mile reach of the middle portion of the stream (Service 2004a). The Duck River oyster mussel population is presently proposed as a separate species from *Epioblasma capsaeformis* populations found elsewhere within the Cumberlandian Region based of distinctiveness of molecular genetic markers, differences in mantle pad coloration and texture, greater height of marsupial expansion of the female shell, smaller glochidial size, differing host fish specificity, and behavioral differences in movement of micro-lures (NatureServe 2007). Relative to the MSHCP covered lands, suitable and possibly occupied habitat for the oyster mussel may exist in the vicinity of the project in Maury County, Tennessee.

EFFECTS ON CRITICAL HABITAT

Recently, critical habitat was designated for the Duck River in Tennessee, Bear Creek in Alabama and Mississippi, Powell River in Tennessee and Virginia, Clinch River in Tennessee and Virginia, Copper Creek in Virginia, Nolichucky River in Tennessee, Big South Fork in Tennessee and Kentucky, and Buck Creek in Kentucky (Service 2007).

The designated critical habitat is located approximately 20 miles from the MSHCP impact area for this species. Based on the location of the critical habitat relative to the covered lands footprint as described in the MSHCP, it is anticipated the project would not modify or have any impact on oyster mussel critical habitat.

SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES

These measures apply to all known occupied and presumed occupied areas in Maury County, Tennessee. Refer to POPULATION DISTRIBUTION, STATUS, AND TREND (populations potentially impacted) for a list of applicable waterbody crossings. These species-specific measures supplement (and supersede where conflicting) the general BMPs specified in the NGTS ECS. Measures in standard font text will be applied for all activities. Measures in *italic* font text will be applied on a case-by-case basis depending on the requirements of the activity. These requirements include consideration of customer and business needs, practicality, and effectiveness as more fully described in Chapter 5 of this MSHCP. Details on selecting the appropriate waterbody crossing method are provided in Section 5.2.1.1.

The main oyster mussel conservation objective for ROW maintenance and O&M activities is to avoid or minimize impacts to known or presumed occupied habitat (e.g., minimize impacts to stream banks and bed) and avoid/minimize impact to oyster mussel (e.g., crushing, killing, sedimentation). The main oyster mussel conservation objective for all construction projects (i.e., off existing ROW) is to avoid or minimize impacting known or presumed occupied

habitat (e.g., use of trenchless installation) and avoid/minimize impact to oyster mussel (e.g., crushing, killing, sedimentation). If, after detailed engineering and environmental studies it is determined (and agreed to by NiSource NRP personnel) that avoidance is not feasible, a report will be prepared and NiSource will consult with the Service before proceeding with the project.

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

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**. 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.[11]

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**, 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.

Pre-Construction Planning: Preparation of an EM&CP

2. A detailed EM&CP will be prepared for any activity with potential effects (e.g., streambed 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 streambed 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 that 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

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

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% leading directly to occupied habitat. These plans will include techniques such as hard or soft trench plugs, temporary sediment barriers, a wider trench at the slope base, and/or temporary slope drains (plastic). In areas with less than a 30% 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.

Streambed Construction

3. For activities in occupied habitat, install new or replacement pipelines and major repairs under the river bottom using horizontal directional drilling (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 7(c) filing at a minimum.

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 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) 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 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 direct or lethal 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).

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

11. *Reserved.*

Pipeline Abandonment

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.

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). If a reportable spill has impacted occupied habitat:

g. follow spill response plan; and

h. 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 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.

Withdrawal and Discharge of Water

17. Hydrostatic test water and/or water for storage well O&M will not be obtained from known or presumed occupied habitat unless other water sources are not reasonably available. To prevent desiccation of mussels, water from known or presumed occupied habitat will be withdrawn in a manner that will not visibly lower the water level as indicated by water level height on the stream channel bank. Employ appropriately sized screens, implement withdrawal rates, and maintain withdrawal point sufficiently above the substrate to minimize impacts to the species.

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):

j. Discharge water down gradient of occupied habitat unless on-the-ground circumstances (e.g., man-made structures, terrain, other sensitive resources) prevent such discharge.

k. 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.

l. 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.

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.

Zebra Mussels and Other Invasives

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 (**Appendix L**). 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.

LEVELS OF TAKE

Through the application of the NGTS ECS and the species-specific AMMs, it is anticipated that the covered activities as described in the NiSource MSHCP **may affect, but are not likely to adversely affect** the oyster mussel. If the Service concurs with this determination, NiSource does not request take coverage for this species.

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