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Standing Analysis for the FHWA Non-Programmatic Consultation for Transportation Projects in Missouri

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INTRODUCTION

1.1 PURPOSE OF STANDING ANALYSIS

This Standing Analysis provides an optional, streamlined alternative consultation process for the Federal Highway Administration (FHWA) and their designated non-federal representatives such as the Missouri Department of Transportation (MODOT) to address potential effects of future actions, pursuant to section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)(Act), to the following species and critical habitat(s):

Table 1. Species and critical habitat covered by this Dkey. The Federal status is represented as "E" for endangered species, and "T" for threatened species. Asterisks (*) Denotes species with designated critical habitat also covered by this Dkey.

Common Name	Scientific Name	Federal Status
Hellbenders		
Missouri Distinct Segment of the eastern hellbender	*Cryptobranchus alleganiensis alleganiensis*	E
Ozark hellbender	*Cryptobranchus alleganiensis bishopi*	E
Fishes		
Grotto sculpin	*Cottus specus*	E
Neosho madtom	*Noturus placidus*	T
Niangua darter	*Etheostoma nianguae*	T
Ozark cavefish	*Amblyopsis rosae*	T
Pallid sturgeon	*Scaphirhynchus albus*	E
Topeka shiner	*Notropis topeka (=tristis)*	E
Mussels		
Curtis pearlymussel	*Epioblasma florentina curtisii*	E
Fat pocketbook	*Potamilus capax*	E
Higgins eye (pearlymussel)	*Lampsilis higginsii*	E
Neosho mucket*	*Lampsilis rafinesqueana*	E
Pink mucket (pearlymussel)	*Lampsilis abrupta*	E
Rabbitsfoot*	*Quadrula cylindrica cylindrica*	T
Scaleshell mussel	*Leptodea leptodon*	E
Sheepnose mussel*	*Plethobasus cyphyus*	E
Snuffbox mussel*	*Epioblasma triquetra*	E
Spectaclecase (mussel)*	*Cumberlandia monodonta*	E
Western fanshell	*Cyprogenia aberti*	T
Winged mapleleaf	*Quadrula fragosa*	E
Snails		
Tumbling Creek cavesnail*	*Antrobia culveri*	E

Common Name	Scientific Name	Federal Status
Insects		
Hine’s emerald dragonfly*	*Somatochlora hineana*	E
Crustaceans		
Benton County cave crayfish	*Cambarus aculabrum*	E
Big Creek crayfish*	*Faxonius peruncus*	T
St. Francis River crayfish*	*Faxonius quadruncus*	T
Flowering Plants		
Decurrent false aster	*Boltonia decurrens*	T
Eastern prairie fringed orchid	*Platanthera leucophaea*	T
No common name	*Geocarpon minimum*	T
Mead’s milkweed	*Asclepias meadii*	T
Missouri bladderpod	*Physaria filiformis*	T
Pondberry	*Lindera melissifolia*	E
Virginia sneezeweed	*Helenium virginicum*	T
Western prairie fringed orchid	*Platanthera praeclara*	T
Bats		
Gray bat	*Myotis grisescens*	E
Ozark big-eared bat	*Corynorhinus townsendii ingens*	E
Indiana bat (Critical Habitat Only)	*Myotis sodalis*	E

The Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), and tricolored bat (*Perimyotis subflavus*) are comprehensively addressed under the FHWA, FRA, FTA Programmatic Consultation for Transportation Projects affecting IBAT, NLEB, or TCB, which provides ESA Section 7 coverage for transportation actions within the species’ ranges. Because these species are already evaluated through that national programmatic framework, they are not included within the scope of this Standing Analysis and associated DKey. However, the Indiana bat Critical Habitat in Missouri is covered under this key for completeness.

The U.S. Fish and Wildlife Service (Service) developed this standing analysis to streamline the process of reviewing actions that would result in a “may affect, not likely to adversely affect” (NLAA) determination for non-bat species and critical habitat(s) not covered under the national bat programmatic agreement. This standing analysis also provides proactive technical assistance to federal action agencies in making a “No Effect” determination.

This standing analysis provides an optional consultation process that is available to FHWA and its designated non-federal representatives (i.e., MODOT) for actions that meet the criteria described below as delivered through a Determination Key (DKey) in the Service’s Information for Planning and Consultation (IPaC) application. To obtain consultation documents, including technical assistance for NE and concurrence with NLAA determinations, FHWA and its designated non-federal representatives must use the associated DKey in IPaC to answer questions about the proposed action. By screening the project through the DKey, all or part of the standing analysis is adopted by FHWA and used to submit a concurrence request to support their NLAA determination. It also provides technical information to help agencies determine whether an action will have no effect on the species or critical habitat. Formal consultation under ESA Section 7(a)(2) is required for actions that "may affect" a listed species and critical habitat, unless the Service concurs in writing that actions are not likely to adversely affect listed species and critical habitat. Actions which an action agency determines will have no effect on species or critical habitat do not require submittal to the Service.

With the IPaC DKey established for this standing analysis, the FHWA and their designated non-federal representatives may receive a letter of concurrence for eligible projects by providing specific information requested by the DKey. Throughout the remainder of this document, statements regarding this standing analysis refer to both the standing analysis and the associated DKey.

1.2 BENEFITS OF THE STANDING ANALYSIS

For those federal actions that the Service has accumulated significant knowledge in analyzing previously, the Service is able to develop a standing analysis to streamline the consultation process for eligible federal actions. The streamlined process facilitated by this standing analysis will reduce the amount of Service staff time necessary to review actions requesting consultation and provide federal agencies, consultants, and other project proponents a predictable, consistent, and timely response for qualified actions. In addition, development of a standing analysis to assess the impacts of individual projects allows the Service to more efficiently track multiple independent actions on listed species and critical habitat.

1.3 ELIGIBILITY FOR USE OF THE STANDING ANALYSIS

This standing analysis supports FHWA and its designated non-federal representatives (i.e. MODOT) to use the associated Dkey to develop their request for concurrence from the Service and support their finding that the action is not likely to adversely affect species and critical habitat in Missouri. The standing analysis allows the Service to quickly evaluate the analysis of effects to listed species and critical habitat. If the proposed action is consistent with covered[1] area and covered activities, including any required conservation measures in the standing analysis, the Service will concur that the action will have insignificant, discountable, or completely beneficial effects on the relevant listed species and critical habitat (i.e., NLAA).

The standing analysis may also provide technical information to help FHWA and its designated non-federal representatives such as the Missouri Department of Transportation identify actions that will have no effects to the listed species and critical habitat. For projects that do not qualify to use the standing analysis, action agencies/project proponents should coordinate directly with the Missouri Ecological Services Field Office (ESFO) and address any consultation requirements, as appropriate.

[1] The term "covered" is used throughout this document to define the limits of use of a standing analysis. However, although the area, activities, and species are "covered" by the standing analysis, the future activities themselves are not "covered" by the standing analysis; there are additional steps (with or without a DKey) that take place for an action agency to utilize the information in the standing analysis and to request FWS concurrence that their proposed action is NLAA for listed species and critical habitat.

1.4 ENSURING ACCURATE DETERMINATIONS

As is true in all consultation procedures, the Service relies on complete and accurate information provided by federal action agencies during consultation. To apply this standing analysis to a project, it is the responsibility of the action agency/project proponent to provide information that is truthful and accurate and that fully represents the entire scope of the project in order to comply with the Act.

Where appropriate in our analysis, we make note of which activities are expected to have no effects[2] on a species or critical habitat. This information is provided as technical assistance to action agencies making no effect/may affect determinations.

1.5 UPDATES TO THE STANDING ANALYSIS

This standing analysis will be reviewed annually and updated as needed to ensure the analysis contains the best scientific and commercial data available. This update process will include regular reviews to ensure that the analysis is accurate and valid, and that the standing analysis still meets the Act's requirements. All updates will also ensure that the logic is sound and determinations are appropriate for covered activities. Updates will be signed under an updated cover.

Projects reviewed under this standing analysis must rely on the version that is current on the date consultation is completed. For reference, both current and previous versions of the standing analysis will be maintained by the lead field office. If we revise the standing analysis and determine reinitiation is required for any ongoing activities that used the previous standing analysis, the Services will contact the respective action agency and advise them of their need to reinitiate.

1.6 LIMITS/SIDEBOARDS

To assist action agencies/project proponents in determining whether their project meets the requirements of this standing analysis, the Service will provide a series of questions (Appendix A) to assess whether the action is not likely to adversely affect listed species or critical habitat because the impacts are either unable to be meaningfully measured, detected, or evaluated and, therefore, insignificant; or extremely unlikely to occur and, therefore, discountable. Any actions that are likely to adversely affect a listed species or critical habitat do not qualify under this standing analysis and require separate individual project review and consultation by the Missouri ESFO.

Actions that include certain activities will not be eligible to use the standing analysis. For projects requiring consultation (i.e., that "may affect" listed species or critical habitats) that do not qualify due to one or more of these exclusions, action agencies/project proponents must contact the Missouri ESFO directly to complete their consultation requirements.

[2] A "no effect" determination is appropriate when either the species is not present in the action area or is not exposed to any possible stressors or impacts from the proposed action, or the proposed action would not result in any physical, chemical, biotic changes to the environment that are reasonably certain to occur and would not occur but for the action (i.e., no action area can be defined).

To receive the Service's technical assistance acknowledgement of an action agency's NE determination or the Service's concurrence for a NLAA determination, based on this standing analysis, actions and activities may NOT include the following because the actions either are more likely to result in adverse effects or require a more in-depth evaluation of effects. Actions not eligible for using the key include:

1) Purposeful injury, mortality, or other forms of 'take' of a listed animal, as defined under the ESA (16 U.S.C. § 1532(19)) to include harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting, or attempting any such conduct. This includes but is not limited to, intentional removal or exclusion from occupied habitat (including manmade structures such as bridges, buildings, or culverts); destruction of active nests, dens, or roosts; handling or restraining animals without authorization; destruction of eggs or dependent young; and intentional flooding, draining, or sealing of occupied areas, and collection of a threatened or endangered plant species or its parts.
2) Actions that require a federal permit, license, right-of-way, or other authorization that must remain in effect to allow the ongoing operation, management, use, or occupancy of land or resources for more than 10 years after construction is complete.
    a. This includes only long-term operational authorizations that govern continued project operation or land use. This does not include permits that authorize only construction or installation of structures, even if the permitted activity or structure remains in place indefinitely or includes conditions allowing modification or removal.
    b. Examples include: Incidental take permits issued by the U.S. Fish and Wildlife Service under ESA section 10(a)(1)(B), Hydropower licenses issued by the Federal Energy Regulatory Commission, Long-term federal rights-of-way or land-use authorizations, Federally approved land or habitat management plans requiring continued federal authorization
3) Construction or operation of wind turbines;
4) Aerial or other broad application or storage of chemicals, including fertilizer, petroleum products, road chemical treatments (i.e., sodium chloride, magnesium chloride), herbicides and/or pesticides. This does not include projects using only targeted application methods such as hack-and-squirt, target backpack sprayers, basal bark, injections, cut-stump, or spot-spraying
5) Construction or modification of dams, permanent river diversions (e.g., channel realignment, channelization, levees, or new/modified dams), or other activities that would impact aquatic organism movement. "Diversion" means any activity that permanently removes stream length or streambed area. Coffer dams are excluded.
6) Surface or groundwater withdrawal or diversion
7) Dredging, gravel or sand mining, or snagging (removal of large woody debris; not including the removal of downed trees posing a safety risk) in rivers or streams.
8) Alteration of reservoir levels (increase or decrease), including planned or sustained changes in normal operating water levels or tailwater releases that exceed routine seasonal or previously established fluctuations (e.g., changes to flood pool levels, tailwater releases etc.) in Lake of the Ozarks, Clearwater, Bull Shoals, Norfork, Stockton, Lake Niangua, Pomme de Terre, or Wappapello.

9) Effects to a cave, mine, or their entrances or hydrology or karst features such as sinkholes or subsurface voids, including physical alterations from activities such as grading, excavation, dirt/scaping, boring, blasting, or drilling into karst fetaures
10) Military Training / Operations
11) Activities that involve changes to an outfall or effluent discharge, or construction / modification of a wastewater treatment facility where the proposed activity pertains specifically to the discharge, quality, or management of effluent conveyed through the pipe, thereby falling under the jurisdiction of the Missouri Department of Natural Resources (This is not intended to include the physical conveyance structure itself (including construction, repair, replacement, or removal of the pipe)

1.7 CONSERVATION MEASURES

This standing analysis applies conservation measures as design features to avoid adverse effects on an individual, population, or species. The Service has previously found that incorporation of certain conservation measures, while voluntarily adopted by action agencies, has reduced effects to the extent that the actions do not require formal consultation and the Service and the action agency have found that actions are not likely to adversely affect species and critical habitat. Projects using this standing analysis to support a determination of NE or NLAA must meet all the requirements of the standing analysis. The inability to voluntarily adopt certain conservation measures may result in a project not qualifying to use this standing analysis.

As part of the Programmatic Biological Opinion / Conference Opinion for Transportation projects in the Range of the Indiana bat, Northern long-eared bat, and tricolored bat, project sponsors implement standard measures as part of other environmental compliance processes (e.g., USACE wetland permitting), and many of these measures reduce potential effects on the covered species.

These include:

- Wetland avoidance/minimization and compensatory mitigation;
- Dust control;
- Clearly delineating vegetative clearing limits; and
- Compliance with State water quality standards through Storm Water Pollution Prevention Plans, which include erosion and sediment control, spill control, runoff detention, and treatment.
- Compliance with Federal Clean Water Act standards, such as 404 water quality certification and 404 removal/fill permit

In addition, AMMs related to specific activities and/or specific species or will be implemented where applicable and are described further in the covered activities descriptions (Section 3) or effects to the species (Section 5).

AMMs included in the analysis, when implemented, are expected to reduce potential impacts of the stressors. In some cases, impacts will be reduced to levels that are insignificant (i.e., unable to meaningfully measure, detect, or evaluate) or discountable (extremely unlikely to occur) and therefore, NLAA. In other cases, adverse effects will be unavoidable even with the application of AMMs, but impacts will be minimized.

2 Covered Area

This standing analysis applies throughout the state of Missouri. In delineating the geographic scope of this standing analysis (coverage area), we determined the appropriate extent based on the species and critical habitat(s) included and the activities covered herein. To qualify to use this standing analysis, a project's action area must fall completely within the covered area.

3 Covered Activities Descriptions

The activities described herein include all activities addressed in this standing analysis. The activity description, conservation measures, and covered area inform the standing analysis and describe which specific activities are appropriate for NE or NLAA outcomes under this analysis. The description of activities and their inclusion in the standing analysis should not be construed to indicate that these activities will always result in effects to the species or its critical habitat, nor is it meant to cover activities that fall outside of the analysis as described below. Action agencies are not required to use this standing analysis; they continue to have the option to request individual consultation on a project; however, in most cases, we anticipate use of the standing analysis will substantially decrease consultation timeframes.

FHWA provides stewardship over the construction, maintenance, and preservation of the Nation's highways, bridges, and tunnels. FHWA also conducts research and provides technical assistance to Federal, State, Territorial, Tribal, and local agencies to improve safety, mobility, and livability, and to encourage innovation. FHWA strives to advance environmental stewardship and streamlining for FHWA-funded projects through the application of the National Environmental Policy Act (NEPA) (P.L. 91-1970) and related environmental laws and regulations.

3.1 Road Construction

New construction activities can be associated with highway and transit projects that conform to the description of projects included in the proposed action. Primary project objectives may include mobility and/or safety improvements. Examples of roadway projects include new general-purpose lanes, realignments, bypass routes, interchanges, bicycle/pedestrian trails and facilities, and new sidewalks. Public transportation projects range from linear bus or rail alignments to fixed capital facilities such as parking lots, transit centers, parking garages, and vehicle maintenance and/or storage facilities. Widening or replacing aging bridges could occur for highway and transit projects.

Several activities and components of transportation are described within the roadway and transit construction category, such as staging area establishment, culvert extension and installation, and drainage system installation and enhancements.

Unique components of highway construction include stormwater treatment facility construction, paving, painting, illumination, and signing. Roadway construction that is designed to increase mobility often occurs in urban areas. In these cases, very little undeveloped or undisturbed property is affected and most of the impacts would occur in the existing rights of way. New highway interchange construction could occur in areas that are highly developed or within areas that are becoming increasingly developed, but do not typically occur in rural areas. Unique components of transit construction include construction of parking lots and garages; construction of bus stations/terminals; and operating and maintenance facilities.

Transit projects tend to be constructed in urban areas with some projects reaching to the suburban fringe. Some road construction is designed to improve the safety of the highway system. These projects include installation of sidewalks, slope flattening (which often require culvert extensions), and alignment modifications. Slope flattening and clear zone maintenance reduces hazards for automobiles that inadvertently leave the roadway. The clear zone is the total roadside border area that is available for safe, unobstructed use by errant vehicles. Slope flattening typically involves the placement and removal of fill material on existing cut slopes. Slopes are flattened to make them more traversable and improve site distance. Slope and ditch repair involves re-grading ditches and slopes to the current safety standards and design slopes. It may also include filling in or repairing sides of the ditches where necessary. Alignment modifications may include adding auxiliary lanes (e.g., truck climbing and acceleration lanes), channelization (new turn lanes), on-and off-ramp extensions, or realigning an intersection to improve the sight distance. If a new lane is added, an alignment modification of the adjacent road may be necessary to maintain continuity of the roadway.

Alignment modifications may also straighten curves or approaches to bridges. Alignment modifications could range in length from a few hundred feet to a couple thousand feet for curve realignments, or up to a few miles for realigning a major section of roadway. Truck lanes, turn lanes, and acceleration lanes typically average between 10 and 12 ft (3 and 3.7 m) wide. Sidewalk widths vary from 5 to 10 ft (1.5 to 3m) wide, depending on jurisdiction and intended use. Road realignments and widenings often range between 0.25 and 5.0 miles (0.4 and 8 km) in length. New interchanges and interchange improvements are also common safety projects.

3.1.1 Staging Areas

Staging areas are used for delivery and storage of construction materials and equipment, contractor office and storage trailers, and employee parking. These areas would be similar across road and transit projects and are typically contractor-selected and permitted. These areas are often fenced and located near project construction. Temporary fencing prevents machinery and equipment, materials storage, and construction activity from intruding into adjacent properties, wetland and stream buffers, and shoreline areas. Office trailers, placed on temporary foundations, are often connected to available utilities including power, telephone, water, and sewer as needed. Connecting to these utilities may include installing poles for power lines and excavating trenches to place water and sewer pipelines. After construction is complete, staging areas are restored, if appropriate, and disconnected from any utilities.

Depending on site conditions, construction staging areas vary in size and may require vegetation clearing, grubbing, grading or excavation to level the site, and installing drainage improvements. Extensive alterations to establish a staging area, such as blasting, are extremely unlikely. Cleared vegetation is often hauled offsite, mulched, and redistributed, or less commonly piled and burned onsite. Excess material (e.g., soil, rock, debris) is disposed of at offsite areas or reused as appropriate in construction. Conveyance systems for the movement of stormwater from a collection point to an outfall can consist of drainage pipes and stormwater facilities (e.g., ponds, vaults, and catch basins), using gravity or pumps to move the stormwater. Temporary driveways and access roads may be established from staging areas to the existing roadway network. Some staging areas may also be equipped with wheel washes that clean truck tires to reduce tracking dirt and dust offsite. Additional dust control is provided via water trucks and street sweepers. Staging, fueling, and storage areas are typically located in areas that minimize potential effects to sensitive areas.

<u>Additional Conservation Measures:</u> Specialized best management practices (BMPs) are employed around concrete-handling areas to prevent water contamination from uncured cement entering water bodies or stormwater facilities. Temporary erosion and sediment control measures are implemented prior to ground disturbance on these sites. Examples include marking clearing limits, establishing construction access, controlling runoff flow rates (e.g., sediment ponds, check dams), installing sediment controls and soil stabilization (silt fence, coir blankets, temporary seeding), protecting slopes, protecting drain inlets, and preventing/containing contaminant spills.

3.1.2 Offsite Use Areas

Offsite use areas are necessary for roadway projects and mainly consist of borrow material and waste disposal sites. Depending on the project, they can be owned by MODOT or another public or private entity. They are typically permitted separately from the project and are contractor selected. Common activities associated with material sites include vegetation removal, excavation, and rock crushing.

Project-specific locations include such areas as staging areas, access roads, borrow areas, and waste disposal areas for project-related activities. These types of project-related activities may or may not occur within the project limits of construction and are often carried out by MODOT contractors.

<u>Conservation Measures:</u>
For projects included in this standing analysis, MODOTs and their contractors:

1) shall adhere to all applicable Transportation Agency contract requirements;
2) comply with all State and Federal laws concerning activities in those offsite areas; and
3) implement the applicable AMMs listed in this document. Contractors must provide documentation to State DOTs and Transportation Agencies when requested to demonstrate compliance with Federal contracting requirements and all State and Federal laws.

If a new or existing staging or access area or a new or existing pit is used outside of a project's construction limit, such offsite areas must also meet the requirements for coverage. Projects that do not meet these criteria will not be covered under this standing analysis will require individual consultation with the Missouri Ecological Service Field Office.

3.1.3 Site Preparation

Site preparation applies to roadway projects and begins with vegetation removal, which may be permanent or temporary. Permanent conversion of a vegetated area into a developed area includes clearing vegetation then grubbing out the roots. Temporary vegetative clearing includes cutting vegetation but maintaining the root mass to allow for regrowth. Removed vegetation is disposed of similarly to staging area vegetation clearing. Preliminary earthwork consists of stripping topsoil from an area and either removing earth or placing and compacting earth for roadway prism construction or slope construction. The earth may be moved from or to another section on the same project, or it may come from or be disposed off-site. Completed cut or fill prisms may then be covered by any number of treatments, such as rock base and pavement, rock stabilization and riprap, or mulch and seeding. Drainage and utility work often accompany excavation and embankment. Impacts to wetlands and other sensitive areas are first avoided and minimized as much as possible, then mitigated when unavoidable. Utility work includes excavation to install new utility poles or trench excavation to install underground utilities. This work can be completed in forested areas.

Temporary road construction is often necessary for equipment access and involves similar site preparation activities as conducted for permanent roads. However, these roads are often unpaved, either constructed by grading, laying fabric and quarry spalls, or construction mats. Compaction is minimized so the materials can be removed, and the site restored and replanted following construction.

<u>Additional Conservation Measures:</u> A variety of temporary construction BMPs are used for site preparation, including silt fences, berms, fiber wattles, storm drain inlet protection, straw bale barriers, check dams, and detention or siltation ponds. Erosion control measures are installed and operational before commencement of ground-disturbing activities. Areas where vegetation should be preserved are clearly marked or fenced. If work is conducted at night, temporary lighting is utilized.

3.1.4 Culvert Installation

Culverts include small concrete and box girders that do not qualify as bridges due to their size. Typically bridges less than 20 ft (6.1 m) wide are referred to as either culverts or crossing structures. Conventional culverts include, but are not limited to, concrete, corrugated metal, timber, and polyvinyl chloride (PVC) piping. Culvert installation may occur independently or as part of a larger road improvement project. Proper culvert sizing is determined by consulting hydraulics manuals and fish passage guidance. Average culvert lengths range between 18 and 200 ft (5.5 and 61 m). Culvert replacements typically require less than one month to complete. Typical culvert replacements involve removing vegetation at the outlet and inlet area, removing existing pavement and roadbed to extract the existing culvert, placing the new culvert, backfilling, and replacing the pavement, installing armoring and headwalls, re-vegetating if necessary, and if flow is present, dewatering the work area and establishing a flow bypass prior to initiating work, then rewatering the work area once in-water work is complete. In-water construction typically occurs during low-flow months or during dry periods.

3.1.5 Bridge Construction

Bridge construction may be a component of a larger roadway project or a stand-alone project. There are multiple types of bridges, including but not limited to concrete slab, concrete arch, concrete box girder, concrete T beam, steel beam, pre-tensioned concrete beam, post-tensioned concrete beam, steel truss, and timber trestle. Bridges can span wetlands, streams, and other water bodies, as well as roadways and other transportation infrastructure. Some bridges span the stream systems they are crossing, while others have piers in the channel. The number of piers in the channel varies by bridge. Most new bridges are designed to span as much of the river as possible, and to provide the least amount of construction that is practicable on the system. Many bridge piers are now drilled shafts, eliminating shallow footings that are susceptible to scouring.

Bridge replacements tend to be long-term projects requiring one or more years to complete. Installation of new bridges may require construction of a detour bridge. Occasionally, half of the new bridge is constructed adjacent to the old bridge and acts as the detour bridge while the original is removed and replaced. Most bridge replacements use the same alignment or are constructed near the old alignment. Temporary bridges may be built as construction platforms. Often, in-water work is generally timed to minimize impacts to sensitive aquatic species. Some sedimentation of the waterway may occur during pile driving and removal. Bridge removal can also result in sediment and small concrete chunks entering the water.

Major bridge replacement construction activities often include:

- Clearing and grading for road widening;
- Clearing and grubbing of existing streamside vegetation;
- Construction of stormwater facilities;
- Excavation for new bridge abutments;
- Construction of bridge columns/piers/abutments;
- Concrete pouring;
- Pile installation and removal;
- Bridge demolition;
- Riprap placement; and/or
- Paving with asphalt or concrete.

Piles are installed using several different methods. Pile driving involves the use of an impact pile driving hammer, which is a large piston-like device that is usually attached to a crane. The power source for impact hammers may be mechanical, “air steam,” diesel, or hydraulic. In most impact drivers, a vertical support holds the pile in place while a heavy weight or ram moves up and down, striking an anvil which transmits the blow of the ram to the pile. In hydraulic hammers, the ram is lifted by fluid, and gravity alone acts on the down stroke. A diesel hammer, or internal combustion hammer, carries its own power source, and can be open-end or closed-end. An open-end diesel hammer falls just under the action of gravity. A closed-end diesel hammer (double acting) compresses air on its upward stroke and can therefore run faster than open-end hammers. Impact hammers can drive at a rate of approximately 40 strikes per minute.

Vibratory hammers can also be used to both install and remove piling. A vibratory hammer is a large, mechanical device, mostly constructed of steel (weighing 5 to 16 tons) that is suspended from a crane by a cable. A vibratory pile driving hammer has a set of jaws that clamp onto the top of the pile. The pile is held steady while the hammer vibrates the pile to the desired depth. Because vibratory hammers are not impact tools, noise levels are not as high as with impact pile drivers. However, piles that are installed with a vibratory hammer must often be “proofed.” Proofing involves striking the pile with an impact hammer to determine the load bearing capacity of the pile and may involve multiple impacts. If this is the case, noise will be elevated to that associated with impact pile driving. To remove piles, the hammer is engaged and slowly lifted with the aid of a crane, extracting the piling from the sediment.

Cofferdams are often installed to create an isolated work area, which can be dewatered for bridge and culvert installations or improvements. Cofferdams may consist of large casings (hollow cylinders) or created out of sheet piles. Cofferdams are generally installed with vibratory hammers. The exception to the use of vibratory hammers is when the substrate consists of very hard material, such as bedrock. In such cases, impact pile driving may be necessary. In other situations, other construction methods are used, such as stacked Jersey barriers with an impermeable liner, and sandbag/impermeable liner barriers, among others. These are accomplished typically by using a crane or excavator (Jersey barrier) or placed by hand (sandbags).

Bridges can be removed using several methods, including: (1) dismantled over water from adjacent bridge deck or approach; (2) dismantled over the water and lowered onto a barge and barged out to a dismantling site; (3) dismantled over water and sections removed by crane; and (4) falsework (temporary structures) can be built under and around the bridge, and the bridge dismantled by sections. Bridge removal methods are selected based on a number of factors, including bridge type, bridge size, size of the river, the location within the system, the topography, and the amount of access to the bridge and the banks (Table 2). Since many older bridges have bridge piers in the system, these also need to be removed. Concrete piers can be removed by demolition using a hoe ram (as long as pieces do not enter the water); removed by a vibratory hammer; they can be cut off two ft (0.6 m) below the ground level; or a temporary cofferdam can be constructed, and the material can be hydraulically removed. The bridge demolition method is determined by site and project-specific conditions.

Table 2. Bridge demolition and removal methods summarized by bridge type, including associated construction techniques and typical access methods used during in-water or over-water work.

Bridge Type	Construction Method	Access Method
Steel or Timber	Remove bridge in segments with or without dropping pieces into water.	• Work from shore via crane arm or other heavy equipment. • Work from adjacent bridge deck or bridge approach. • Work from temporary platform or false work erected within the water. • Lower bridge or segments onto barge. Barge material to shore.

Concrete	Remove bridge in segments without dropping pieces into the water. Frequently concrete slabs may be removed via saw cutting.	• Work from shore via crane arm or other heavy equipment. • Work from adjacent bridge deck or bridge approach. • Work from temporary platform or false work erected within the water. • Lower bridge or segments onto barge. Barge material to shore.
Piers	Leave the piers in place.	• N/A
	Piers located out of water – cut at ground level and remove.	• Work from shore via heavy equipment.
	Piers located out of water – removed with hoe ram.	• Work from shore via heavy equipment.
	Piers located in water – use vibratory hammer to lift and remove.	• Work from shore via crane arm or other heavy equipment. • Work from adjacent bridge deck or bridge approach. • Work from temporary platform or false work erected within the water • Lower piers or segments onto barge. Barge material to shore.
	Piers located in water – cut or break off at or below surface level (dependent upon substrate).	• Work from shore via crane arm or other heavy equipment. • Work from adjacent bridge deck or bridge approach. • Work from temporary platform or false work erected within the water • Lower piers or segments onto barge. Barge material to shore.

<u>Additional Conservation Measures:</u> Isolation of the work area and stream is often required on bridge replacement projects and may require the use of cofferdams, sandbag berms, temporary culverts, or flumes depending on site conditions. Bridge replacement projects often require column construction within stream channels which typically involves the isolation of the column location using a large diameter steel sleeve that is driven into the stream substrate. All work, including excavation for the footing, placement of forms, and pouring of the concrete, would then be completed within the sleeve at each column location. This technique helps minimize construction impacts by isolating the work from the stream.

Bridge replacements may require more than one construction season, due to multiple factors such as project complexity or if the in-water work may be limited to certain periods to minimize impacts to sensitive aquatic species. Often, work on the out-of-water portions or behind cofferdams will occur year-round.

3.1.6 Roadway Construction

Roadway construction activities generally include installation of the roadway itself, and associated structures such as retaining walls, noise walls, and stormwater treatment.

A roadway embankment is a raised area of fill often used in roadway approaches. The construction of roadway embankment consists of building up soil or rock to create a new ground surface at the elevation needed for the new roadway or associated structures. Roadway embankments slope outward; therefore, the higher the embankment, the wider the surface area needed at the base. To avoid future settlement, rollers and hauling equipment thoroughly compact each layer of soil or rock. Retaining walls are used to support the embankment fill area where other constraints may exist along the alignment. Once final grading is achieved, the roadway is paved, striped, and signed. More detail on paving is provided in the Maintenance, Preservation, and Facilities Improvements section.

Retaining walls are used to minimize the footprint width of the roadway cut or fill. Because retaining walls can be nearly vertical, they allow for a much smaller footprint than an earth slope. They can be used to support the roadway when the roadway is higher than the surrounding ground and can also be used in situations where the road is lower than the surrounding ground. In this case, the retaining wall supports the adjacent soil and prevents soil from slumping onto the roadway. Retaining walls are also used in areas where there is a high possibility of erosion, such as near a bridge abutment or water. The walls must have an area of free drainage between the retained soil and the back of the retaining wall to prevent water pressure from developing and adding to the soil loads. The drainage is usually provided by placing a layer of clean gravel and drainage pipes against the back of the retaining wall. There are a variety of wall types (soldier pile, mechanically stabilized earth [MSE], soil nail, among others). The type used depends on the structure it supports, the ground slope being retained, and available area.

Noise walls are mitigation measures designed to reduce noise impacts on sensitive receivers. They are typically precast panels or cast-in-place walls. They can be cast in a wide variety of patterns to improve their aesthetics. On bridges, noise walls may be cast into the traffic barrier. Noise walls are constructed to withstand the forces of wind and seismic loads.
Stormwater facilities are typically constructed to collect and treat stormwater runoff from impervious surfaces such as roads and bridges. The type of stormwater facility constructed will depend on the topography, profile of the road or bridge segment, availability of land, and availability and proximity of an outfall site for collected and treated water. A variety of approaches are utilized, such as bioswales, constructed stormwater wetlands and ponds, vaults, and where possible, infiltration and dispersion.

3.1.7 Equipment

General equipment associated with roadway or transit construction includes, but is not limited to dump trucks, front-end loaders, cranes, asphalt grinders, paving machines, compaction rollers, bulldozers, chainsaws, vibratory and impact pile drivers, barges, explosives, excavators, rock crusher track or pneumatic drill, graders, jack hammers, stingers, wire saws, air compressors, traffic control devices, generators, and other heavy equipment.

3.1.8 Post-Construction

Following road and transit construction, the site(s) are stabilized and restored using a variety of techniques. All exposed areas are typically mulched and seeded with an approved herbaceous seed mix and/or planted with woody shrub vegetation and trees (if appropriate) during the first available planting season. Temporary access road material is removed, and the area is restored to a more natural grade and stabilized through seeding and planting. Wetland and stream mitigation activities can occur at any point in the project, depending on site location. Common activities include wetland creation (excavation and fill removal), wetland restoration, enhancement (invasive plant removal and replanting with native species), stream channel reconstruction, and aquatic habitat enhancements (adding gravel and woody material).

3.2 Safety and Mobility

Safety and mobility projects may occur within both rural and urban environments. Projects in this category that conform to the description of projects included in the proposed action are designed to improve safety, traffic flow, and operations on existing road or transitway corridors. Work described in this section is intended to focus on those safety and mobility improvements that typically, by themselves, do not require new significant road construction.

Intelligent Transportation System highway projects typically include installing or repair/replacement of fiber-optic cables, traffic cameras, variable message signs, traffic information signs, weather stations, positive train control systems, and highway advisory radio systems. Highway safety projects may also include installation or repair of sidewalks, guardrail and curbing, concrete jersey barriers, and impact attenuators. Additional safety projects include signal and illumination improvements, raised (island) or painted channelization, tree removal/trimming from the clear zone, shrub cutting from the road prism when encroaching on sight distance, and rumble strip grinding. Channelization is the separation of conflicting traffic movements with the use of new turn lanes, traffic islands, or pavement markings.

Occasionally, dead or dying trees or trees susceptible to wind damage may create a hazard if they are in danger of falling into the ROW. Hazard tree removal/trimming occurs as highway maintenance but is often included within a larger safety improvement project. MODOT may combine safety projects with pavement preservation projects or complete them separately. These activities typically have limited or no vegetation impacts (e.g., installation of a Jersey barrier or raised channelization) and consist of activities described in other transportation project categories.

3.3 Maintenance, Preservation and Facilities Improvements

3.3.1 Bridge Repair, Retrofit, and Maintenance

Bridge repair, retrofit, and maintenance activities are implemented to prolong the use and function of bridges, ensure motorist safety, and protect the environment. Whether a bridge is repaired, rehabilitated, or replaced, depends on the age of the bridge and damage that may occur to a bridge (e.g., from a storm event, earthquake, or vehicle or boat collision). The length of stream and/or wetland potentially affected by bridge repair and maintenance depends upon the scale of the bridge project and the required actions. Culvert and bridge replacement activities are described in the roadway construction narrative.

Seismic retrofit activities are not temperature and/or time sensitive and may occur anytime throughout the year, while joint replacement and bridge deck replacement are temperature dependent activities, limited to the warmer months. Bridge scour repair work tends to occur during low-water times of year, and bridge painting may only occur late spring through fall when temperatures are high enough to allow the paint to dry properly. Bridge maintenance projects can be long-term, lasting more than one construction season.

Scour Repair Projects: Scour at bridge piers can become a major safety issue for some bridges. Repair of scoured bridge piers can include construction of temporary cofferdams around affected piers to isolate work areas; concrete or gabion repair to footing, columns or abutments; placement of riprap at scour locations; placement of concrete mattresses along bridge piers; or installation of concrete armor tetrapods (four-legged, interlocking concrete structures). A-JACKS are also used for direct bridge scour repair, especially where there is a low bridge with a limited hydraulic opening and when hauling rock is cost prohibitive.

Concrete mattresses consist of flat, continuous blocks of cured concrete (closed cell) or contain voids in which stream gravel can be placed (open cell). The concrete blocks are linked together with steel or synthetic cable. To install a concrete mattress, the streambed must be excavated at the leading and trailing edges to avoid undermining the device. The mattress is placed on geotextile or filter fabric with an excavator, and earth anchors are often used to secure it. The A-JACKS system is composed of cured concrete pieces resembling “jacks” that are assembled into a continuous, interlocking, yet flexible matrix. This matrix provides protection against high-velocity flow. The use of A-JACKS is an alternative to riprap placement and may avoid the need for streambed excavation. A-JACKS are typically secured together with steel cable. Placement typically requires an excavator which is operated from the stream bank whenever possible. Concrete armor tetrapods are similar in function but differ in shape.

Construction of temporary access fills may be required to provide a working platform for machinery. Working platforms are usually constructed of light, loose riprap matched to the material necessary for the repair. The platform material is then repositioned as the machinery backs away from the work site. Installation methods vary on a site-specific basis. In navigable waters, access from a barge may be required. Whenever possible, equipment, such as excavators, will operate from stream banks, bridges, or temporary work platforms to avoid in-channel operation. If in-channel equipment operation is necessary, aquatic spider excavators are often used, especially if access to the site is difficult, as they are small, relatively light, and have rubber tires to minimize substrate disturbance. Aquatic spiders are typically used in small streams, because the size of rock they can pick up is limited. Sometimes materials can be placed directly on the streambed with little to no excavation; in other instances, excavation is necessary to key in materials. Often, stream flow and anticipated erosion will determine specific aspects of design such as anchoring.

Seismic Retrofit Projects: Many bridges are undergoing or have undergone seismic retrofits. Retrofits can involve any of the following depending on the bridge type:

(1) removing and replacing bolts and or rivets with high-strength connections;
(2) installation of concrete catcher blocks at piers (not typically pre-cast, but constructed using steel-reinforced forms filled with concrete poured on site);
(3) installation of pier sleeves (collars) to the depth of the spread footing; and
(4) installation of longitudinal restrainers, transverse girder restrainers, and/or transverse deck restrainers which are typically installed under the bridge as looped steel cables or bolts. No fill or pile driving is required for their installation. Longitudinal restrainers prevent abutting spans from being pulled apart during an earthquake. Transverse restrainers pin abutting spans together, preventing them from being sheared apart vertically or laterally during an earthquake.

Deck Repair and Replacement Projects: Bridge deck repair and replacement is another activity that occurs regularly. Removal may involve traditional mechanical methods such as jackhammers, concrete saws, and cold-milling (grinding), or hydro-demolition (hydro-milling). Hydro-demolition uses a high-pressure water jet stream (up to 20,000 pounds per square inch) to remove unsound concrete. Concrete debris is contained and then removed with vacuum equipment. Deck repair can involve either partial-depth or full-depth patching. Partial-depth replacement repairs surficial damage to the travel surface by cleaning and filling voids with a suitable material (e.g., concrete, asphalt). In general, when full-depth patching occurs, a temporary form is held against the underside of the deck and material fills the void from above. Longer bridges have finger joints that must be repaired and replaced as needed.

Maintenance Projects: Bridge maintenance activities may include washing, painting, debris removal from bridge piers, guardrail repairs, lighting and signage repairs, and structural rehabilitation. Such activities generally include work such as repairing damage or deterioration in various bridge components; cleaning out drains; repairing expansion joints; cleaning and repairing structural steel; sealing concrete surfaces; concrete patching; and sanding and painting. Bridge painting involves washing the bridge with highly pressurized water or abrasive sand blasting to remove all corrosion, and then applying a minimum number of coats of paint. Paint must be applied when temperatures are above 40°F and it is not raining. Steel bridges also require rivet replacement and crack stabilization. These activities are often added to a bridge painting contract. Debris removal can be accomplished in a variety of ways depending on the type and quantity of debris, and the size and configuration of the bridge. Hand removal is possible in some instances, although the use of mechanical aids, such as chainsaws, winches, and heavy equipment, are often necessary. Structural rehabilitation may include replacement or repair of degraded steel superstructure, repair to bridge approaches, or repair or replacement of bridge rail. Work is typically conducted in a stepwise fashion, moving from one section of the bridge to the next, rather than on the entire bridge at once.

Equipment: Commonly used equipment for bridge repair and maintenance includes backhoes, bulldozers, excavators, barges, dump trucks, front-end loaders, scaffolding, drapes, generators, cranes, impact and vibratory pile drivers, drilling rigs, concrete saws, traffic control devices, compressors, and other heavy equipment. The equipment operates most frequently from the bridge deck, a work barge in navigable waters, or temporary false work hung beneath the bridge deck, although in rare instances equipment may be required to operate from the bank to remove debris or repair bridge abutments and supports.

3.3.2 Drainage System Repair and Maintenance

Drainage System Repair and Maintenance activities include all work necessary to maintain roadside ditches and channels, cross culverts and pipes, catch basins and inlets, and detention/retention basins. Drainage features function to keep the highway free from excess water that could create an unsafe condition. Thus, drainage facilities are cleaned periodically to permit free flow and to avoid erosion and damage to roads and other infrastructure. The extent of the area to be affected by drainage system repair and maintenance activities depends upon the size of the drainage channel or ditch and the specific actions required.

Drainage system repair and maintenance work may occur throughout the year depending on the weather and the specific project; however, most work is scheduled to occur during the summer, during low-water flow or dry conditions. Work may occur at any time of day or night, seven days a week. Most activities are completed within a few hours in any given location. However, some projects may take from one to five working days to complete. Roadside ditches are impacted by the accumulation of sediments, debris, vehicles that leave the roadway, and slides. Regular maintenance is required to remove built up sediments, debris or blockages, re-slope the sides, and maintain capacity. Material that is removed is recycled when possible or placed at suitable disposal sites.

Cross culverts convey water from one side of the highway to the other. These can become blocked by debris, sediment, vegetation, beaver-deposited materials, or slide materials. Occasionally, scouring within the system can result in blocking the culvert with rock or gravel. Blocked culverts can result in flooding over the roadway, or in severe cases, the culvert and the roadway can blow out. Regular removal of debris, sediment, and vegetation can help eliminate the problem. All of these obstructions must be removed regularly. Sometimes temporary diversions, such as sandbag berms, are installed to allow for culvert cleaning in a dewatered environment.

Catch basins and inlets are part of the highway storm drain system. Sediment accumulates within these structures, necessitating regular cleaning. Material is removed by manual clearing methods or by using a vacuum truck. Solids are tested and disposed of at an approved disposal facility. Solids may be recycled as fill material when suitable. Otherwise, they will be disposed of at an approved disposal facility. Liquids may be decanted at an approved decant facility. Regular cleaning improves water quality and minimizes sediments that enter the natural stream systems. Retention/detention facilities are used to contain runoff and remove sediments. Over time, sediments build up and must be removed to maintain capacity and filtration. Backhoes or other equipment remove the sediment build up, normally during dry conditions.
Other typical activities include excavation of debris and sediment from ditches and detention/retention basins, minor grading and reshaping along ditches and at storm drain outfalls and inlets, and repair of damaged culverts. Removal of newly constructed beaver dams is often necessary when the dams impact the effectiveness of storm drainage facilities.

Equipment: Commonly used equipment includes dump trucks, front-end loaders, backhoes, bulldozers, double drum dragline, vacuum truck, culvert rodder (trailer-mounted water jet system), water tank truck, truck-mounted attenuator, other heavy equipment, and hand tools, such as shovels and rakes. The equipment generally operates from the road prism, although in rare instances equipment may be required to operate outside of the developed road prism.

3.3.3 Pavement Preservation

Pavement preservation consists of patching, repairing, and replacing roadway surfaces and pavement. These include three types of pavements: (1) asphalt, (2) chip seal, and (3) concrete. If the existing pavement is in good condition, it may be covered with a new layer of asphalt. Repair of badly deteriorated pavement could require grinding of existing pavement or replacement of the road foundation material prior to repaving. This typically involves grinding off and replacing the existing asphalt pavement.

Most paving occurs during May through September. Activities may occur seven days a week, taking place either during daylight hours, night hours, or both, depending on traffic volumes. Project duration depends on the size of the area being paved and could take from 1 to 120 working days to complete. Pavement preservation through chip sealing (alternately termed bituminous surface treatment) involves the application of hot liquid asphalt and a layer of crushed rock on an existing asphalt surface. The application of bituminous surface treatment is a temperature-and weather-sensitive activity. These projects may include a rock crushing operation to produce the necessary aggregate.

Hot-mix asphalt paving is also a temperature-and weather-sensitive activity. Typically, the existing pavement is ground down (cold milling) and replaced, or simply overlaid with new asphalt. Cold milling creates dry pavement grounds that are hauled to a dumpsite, spread along the road shoulders, or recycled into new pavement. Profile grinding is another optional method of removing the pavement surface. All asphalt paving projects involve the use of an asphalt plant area where asphalt is mixed with crushed rock to produce the new hot-mix asphalt, as well as occasionally crushing of rock for the pavement materials.

Preservation of existing Portland Cement Concrete Pavement is typically accomplished by removal and replacement of the existing Portland Cement Concrete Pavement, the placement of additional dowel bars into the existing pavement or grinding of the existing surface. The removal results in concrete rubble that is typically hauled to a dumpsite. This is often accompanied by profile grinding as is the placement of additional dowel bars. Profile-grinding employs a series of diamond saws cooled by water that cut away the pavement. This creates pavement slurry that requires disposal at a dumpsite. Since paving may result in a slightly higher road surface, manholes, inlets, and guardrails may need to be raised or replaced. Guardrail raising involves the removal of existing guardrail, installation of taller posts, and reinstallation or replacement (depending on condition) of the rail.

Culverts may also require extension, repair, or installation as part of pavement preservation projects. Repair or replacement of worn or damaged culverts prevents damage to the roadbed from water saturating the roadbed fill material. Culverts require maintenance when at least 25% of their capacity is restricted by debris, sediment, or vegetation.

A paving project may also include installation of roadside signs, guideposts, and raised pavement markers; guardrail improvements, fence installation and repair; and paint striping. For most projects, installation of road signs, guideposts, and fencing involves minor amounts of excavation and vegetation removal. However, installation of very large signs, including concrete footings and steel supports, can potentially disturb substantial areas. Trenching may also be required to run utilities from existing sources to lighted signs. Paint striping may be completed with oil-based or latex-based paints, self-adhesive strips, or inset durable lane strips. Painting must be conducted in dry weather.

Equipment: Commonly used equipment for pavement preservation includes heavy trucks, asphalt grinders, pavers, chip spreaders, rock crushing operations, asphalt plants, front end loaders, compaction rollers or tampers (both vibrating and static), guardrail post drivers, small trucks and backhoes, and traffic control devices.

3.3.4 Facilities Preservation

Facilities preservation is the preservation, maintenance, and expansion of weigh stations, rest areas, and road maintenance facilities. Activities at these facilities may include expansion of buildings and parking areas; septic system expansion or alteration; paving, painting, striping, and signage; vegetation alteration and removal (including trees); and erosion and sediment control practices. Improvements to existing roadway facilities occur year-round depending on the weather and rarely involve expanding the building footprint.

Equipment: Commonly used equipment for facilities preservation includes dump trucks, front-end loaders, asphalt grinders, paving machines, generators, traffic control devices, and other heavy equipment.

3.4 Slide Abatement

Slide abatement typically involves removing slide debris from the roadway, stabilizing the slide areas, and repairing roads damaged by slides. The natural occurrence of landslides and other erosive slope processes is generally dependent on the geologic conditions, vegetation growth, antecedent groundwater conditions, and significant climatic or geologic events in a specific area. Original construction methods or other human factors may also influence landslide occurrence. Most landslides occur during the winter or during periods of heavy rainfall. The area affected by activities under slide abatement varies depending upon the scale of the material that is present on the roadway and that must be removed. The area affected will generally include the managed road prism/ROW but could include surface waters or wetlands in some instances.

The underlying cause of a slide is determined before permanent stabilization occurs. Permanent slide stabilization is often sought immediately following an event. For existing unstable slope problems, particularly those involving wet ground conditions, repairs are normally programmed for summer months when conditions are dryer. Stabilization methods that provide support include buttresses/berms/shear keys, retaining walls, and ground improvement. Buttresses are large, shaped piles, commonly constructed with coarse, angular, strong rock. Often buttresses must be keyed into stable material beneath the failure zone requiring significant excavations that sometimes result in tree removal/trimming. Berms are constructed of earthen materials near the toe of the landslide to provide a counterweight to the forces driving failure.

Immediate clean-up of slides that directly impact highways is imperative, and may occur at any time of year, any time of day or night. Work may take from a few days to more than 120 working days, depending on the magnitude of the slide. Construction of temporary access fills and roads may be required to provide a working platform or access for machinery. Working platforms are usually constructed of light, loose riprap matched to the material necessary for the repair. The platform material is then repositioned as the machinery backs from the work site.

Landslides, rockfall, debris flow, slope erosion, and settlement are different unstable slope categories described below.

3.4.1 Landslide

Landslide is defined as the vertical and horizontal displacement of a soil or rock mass, under the influence of gravity, within a slope or embankment. Generally, landslides can be divided into two categories based on failure geometry:

(1) circular (or rotational) which refers to all landslides having a concave upward, curved failure surface and involving a backward rotation of the original slide mass; and
(2) translational slides in which the surface of rupture along which displacement occurs is essentially planar. The rate of movement of landslides can vary from very slow moving to very rapid.

A variety of retaining wall types are used to provide landslide support. These walls may consist of large, reinforced masses, referred to as gravity walls, or they may consist of reinforcing anchors secured to a rigid wall face (e.g., soil nail wall, solider pile, tie-back wall). Ground improvement seeks to improve the shear resistance of the failing material by replacing or injecting high-strength materials into the ground (e.g., stone columns, pressure grouting).

Landslides involving near-surface failure zones may also effectively incorporate vegetation to improve shallow stability and reduce surface erosion. Subsurface drilling, sampling, and testing of the earthen materials are usually necessary to develop these designs.

3.4.2 Rockfall

Rockfall is the fall of newly detached segments of bedrock of any size from a cliff or steep slope. Movements are very rapid to extremely rapid and may not be preceded by minor movements. Rockfall and rockfall hazard mitigation involves stabilization, containment, avoidance, or some combination of these approaches. Stabilization measures include removing unstable material, reinforcing it with rock anchors and possibly shotcrete, and/or improving subsurface drainage by installing drains. Shotcrete is wet or dry mix concrete applied through a pneumatic hose. Wet mix concrete is pre-mixed with water, and dry mix incorporates water with the concrete at the point of discharge.

3.4.3 Debris Flow

Debris flow is a rapidly moving fluid mass of rock fragments, soil, water, and organic debris with more than half of the particles being larger than sand size. Generally, debris flows occur on steep slopes or in gullies, entrain debris and grow in volume as they move, and can travel long distances. Debris flows typically result from unusually high rainfall or rain-on-snow events.

3.4.4 Slope Erosion and/or Failure

Slope erosion and/or failure is the wearing-away of a soil mass by water, wind, or weathering. On slopes, this process can result in the overland flow of water in a dilute sheetwash, or the development of rills. Along streams or rivers, the process can entail the undercutting of adjacent stream/riverbanks.

3.4.5 Settlement

Settlement is the vertical displacement of a soil mass not associated with a horizontal movement within a slope or embankment. Generally, the movement is slow. Settlement usually results from poor foundation conditions, or loss of support from internal erosion (i.e., piping [culvert] failures).

Many of the treatments used for landslides are also applied to settlement if the settlement results in horizontal movement. If there is no horizontal movement associated with settlement, the response is typically limited to pavement patching and repairs.

3.4.6 Blasting

Blasting may be required when expanding the transportation footprint or as part of the stabilization efforts to remove unstable material. The scale of blasting operations can vary from breaking up a boulder or trimming an unstable overhang, to large-scale removal operations that involve thousands of cubic yards of material. The size and spacing of charges are largely dependent on the work objectives and the geologic structure of the rock. There are two general types of blasting: production and controlled. Production blasting uses widely spaced, large explosive charges that are designed to fragment a large amount of burden (the rock that lies between the existing slope face and blasthole). Controlled blasting uses more tightly spaced and smaller explosive charges to remove smaller amounts of burden. This technique can remove material along the final slope face, or it can be used prior to production blasting to create an artificial fracture along the final cut slope.

Holes are drilled into the rock to set explosives. Drilling may be done with hand equipment by workers suspended on ropes to crane-supported drill platforms. In some cases, drill access may require establishing small access roads to position a track-mounted drill rig. Soil and unconsolidated rock on top of the blasting surface is removed prior to blasting. Blasting mats may be required to contain flying rock, especially when blasting occurs adjacent to sensitive areas such as aquatic systems. Containment can also include installing anchored wire mesh. Temporary earthen or rock berms that function as heightened ditches or proprietary rockfall protection fences located close to the blasting area are also commonly used to contain rolling debris or minimize movement of blasted material. These structures are typically placed at the toe of landslides and are located to avoid impacts to stream or wetlands and designed to keep debris out of sensitive areas. Rock berms can also be permanent structures. Berms or fences are typically within the road prism; therefore, impacts to vegetation are minimal.

Debris flows are typically removed from the roadway through methods including ditch cleaning, catchment enlarging, and placement of concrete barriers. If debris flows occur consistently at a specific location, rockfall barriers such as anchored wire mesh may be used. Slope erosion will at times create overhanging rock and undercut "danger" trees. This material may be removed with a long-boom excavator. Typically, slide clean-up involves removing the debris from the roadway and patching the pavement if damage has occurred. In some cases, the road foundation or guardrail may be partially damaged and require replacement. Slide debris is often stockpiled or disposed of at existing gravel pits, quarry sites or waste areas. In some cases, existing privately owned sites are available and interested in receiving the debris. Suitable slide material may be used as fill for other maintenance or construction activities.

If slope failures enter creeks, the material is left in the creek if removing it would create greater harm. Permanent repairs to unstable slopes are mostly conducted outside (above) water bodies. However, sometimes the slope must be rebuilt and retaining walls or riprap may be used within the Ordinary High-Water Mark, and woody material may be incorporated, if appropriate. Culvert repair or cleaning may also be necessary for slide abatement.

3.5 Bank Stabilization, Flood Damage, and Sinkhole Repair

3.5.1 Bank Stabilization and Flood Damage Repair

Bank stabilization and flood damage repair involves the direct protection of embankments at bridges, culverts, and roadway sections from erosive forces of flowing water. High-water flows during floods, spring runoffs, or high tides can cause erosion of the bank to the point that the adjoining highway road prism is undermined. Other flood or high tide damage can include clogged culverts and deposition of debris along transportation corridors. Weather, flooding, or changes in the river or stream morphology often precipitate these activities. The erosion repair area will vary depending upon the size of the stream and the extent of the streambank or channel that is located adjacent to a road, bridge, or culvert.

Emergency work can occur throughout the year as soon as possible after or during the storm event. Work may last from 1 to 120 working days depending on the size of the repair and amount of work that is required. Construction of temporary access fills and roads may be required to provide a working platform or access for machinery. Working platforms are usually constructed of light, loose riprap matched to the material necessary for the repair. The platform material is then repositioned as the machinery backs from the work site.

Immediate repairs normally involve protection or reconstruction of the highway road prism including repaving, and associated infrastructure such as culverts and utilities. Flood debris removed from roads requires disposal at designated disposal sites. Clogged culverts often require cleaning or may need to be upgraded to a larger size to prevent further flow restrictions. Emergency repairs typically involve the placement of riprap by an excavator, or end-dumping of riprap when conditions are unsafe for an excavator. In cases where the emergency is not immediate, but imminent, and some planning time is available, natural channel design methods may be used to protect stream banks.

Bank stabilization techniques include placing riprap, gabion baskets, or natural channel design features to protect and restore eroded banks. Riprap armoring is constructed of angular rock placed on the stream bank. Riprap placement varies and may extend to the top of the bank or extend up the mean annual peak flow line but can be placed up to one foot above the 100-year flood level. Woody and herbaceous plantings are used above this level. For banks with grades steeper than 2:1, riprap is not suitable. Bank grading may be required prior to stabilizing the bank. If necessary, a rock or earthen berm may be constructed to catch rocks dumped (end-dumped) from trucks before they enter the stream. A riprap bedding layer (gravel filter blanket or geotextile) is installed to prevent underlying soils from washing through the riprap during high water.

Installation methods vary on a site-specific basis. In navigable waters, access from shore or a nearby structure is common; however, barges may be utilized. Whenever possible, equipment, such as excavators, will operate from stream banks, bridges, or temporary work platforms to avoid in-channel operation. Sometimes, materials can be placed directly on the streambed with little to no excavation. In other instances, excavation is necessary to key in materials. Often stream flow and anticipated erosion will determine specific aspects of design such as anchoring. Anchoring may be required for structures that include large woody debris. Several techniques exist including wood or steel piling, earth anchors, or rock overburden.

3.5.2 Sinkhole Repair

Sinkholes are depressions or holes in the ground or road surface caused by surface layer collapse. They can be formed gradually or suddenly by either natural erosive processes or human-related causes such as abandoned mine collapse or water withdrawals. Sinkholes are frequently associated with karst landscapes and could result in damage to transportation infrastructure. Sinkhole repair involves stabilizing the area through excavating or flushing (with water) loose material and creating either a permeable or impermeable plug with fill placement, then restoring the roadway embankment and pavement surface.

Sinkhole repair methods within a natural infiltration zone focus on allowing infiltration to continue. This consists of using clean, graded native limestone as fill material in layers of decreasing size, separated by Class-4 geotextile to prevent the migration of layers and more evenly distribute water flow. Within the road ROW, these layers would be carefully compacted prior to road reconstruction. Concrete can be selectively applied, more commonly in non-infiltration areas. Larger rock is placed first and then coarse aggregate is applied to fill the voids between the rocks. Concrete is then layered on top to form an impermeable plug. If present, native clay material is placed on top of the concrete or geotextile. Native soil materials are then placed on top of the plug and the roadway is restored.

Equipment: Commonly used equipment includes backhoes, barges, bulldozers, excavators, dewatering equipment, pile drivers, dump trucks, front-end loaders, cranes, chainsaws, generators, traffic control devices, and other heavy equipment.

3.6 Transportation Enhancements

Transportation enhancements may include projects such as bicycle/pedestrian paths, bus shelter installation, historic bridge or railroad depot rehabilitation, construction of overlooks, viewpoints, historical markers, and wildlife passage facilities. Construction activities associated with projects like these were previously described in the bridge maintenance and new highway construction sections.

Although overlooks, viewpoints, and historical marker pullouts may include the expansion of roadway surfaces, such expansion is typically small in scope compared to major road improvements (new travel lanes, passing lanes, among others).

3.7 OTHER COMMON ACTIVITIES

3.7.1 Geotechnical Drilling and Hazardous Waste Sampling

Subsurface sampling and testing to determine soil characteristics are often important steps in the engineering design process. Such sampling and testing may be associated with all programs/categories described. Subsurface sampling is accomplished by drilling test holes up to 300 ft (91.4 m) deep or digging soil pits up to 8 ft (2.4 m) deep. A slide repair project, for instance, may require two to three test holes to check for stability. A drill rig can be mounted on a variety of transportation vehicles including trucks, tractors, skids, and barges. The drill is typically 5 to 10 in (25.4 cm) in diameter. The drill shaft is lubricated using a mixture of bentonite (a natural, inert clay material) and water. The fluid is filtered and recycled back through the drilling operation.

When drilling is done off the roadway, impacts are minimized as much as possible through the selection of an appropriate sized and mounted drill rig, and limited vegetation removal. Normally, herbaceous, and woody vegetation is cut back as necessary for drill access and not grubbed, and trees are rarely removed. Subsurface sampling for hazardous materials may also be necessary for each program/category. It is very similar to subsurface sampling for geotechnical purposes. Durations will vary for these activities depending on the number of bore holes and substrate composition. Typically, one to several bore holes can be drilled in a day and most sampling is accomplished within a week.

3.7.2 Herbicide Application

Herbicide application to control invasive plant species is sometimes used in, but not limited to, areas within the project limits designated by the State DOT and Transportation Agency such as planting areas, erosion control seeding areas, bark mulch areas, roadside bark mulch rings, preservation areas, mitigation areas, and along established roadside. Herbicides are generally applied to green or growing tissue and prior to seed production but may be applied during fall regrowth periods. Herbicides used for invasive plant species control at environmental mitigation sites are often used in conjunction with mechanical and biological control. These control methods are also used near plantings to reduce competition from surrounding vegetation. The herbicide is typically applied directly to plant roots and foliage by targeted non-aerial means such as wicking, spraying from a backpack sprayer, injecting, or by applying to cut stumps. Aerial (aircraft) application is not included in the proposed action. While herbicide is not applied directly to soil or water, it can be applied to plants in wetland mitigation sites or riparian areas. Application of herbicides is in accordance with the National Pollution Discharge Elimination System aquatic noxious and nuisance weed permits and all applications are in accordance with the U.S. Environmental Protection Agency product label requirements. Appropriate buffers are applied between application sites and surface waters to avoid drift or overspray. Aquatic applications may be used in wetland mitigation sites. Herbicide application timing depends on the species being targeted, with most treatment occurring in the spring, early summer, and fall.

4 COVERED SPECIES AND CRITICAL HABITAT

The following section includes a summary of relevant background information on the species and critical habitat(s) used to develop this standing analysis. A complete description of the species can be found on ECOS (https://ecos.fws.gov). This overview is included to inform the reader of the species prior to the analysis of the effects of the action presented below. Species and critical habitats within a project's action area that may be affected by the proposed action, but are not covered by this standing analysis, will require individual consultation with the local ESFO.

4.1 Bats

4.1.1 Gray Bat (*Myotis grisescens*)

The gray bat was listed as endangered on April 28, 1976 (41 FR 17736). At the time of listing, the main historical threats to the gray bat were human disturbance to roosting bats, environmental contamination, impoundment of waterways and roost modification or destruction. Such roost modifications include cave entrance or mine sealing and other modifications of the internal environment and entrances. The species is also negatively impacted by cave commercialization, improper gating and natural calamities, like cave-ins and flood events. Emerging threats, like interactions with wind turbines and climate change have been added as potential threats, since gray bats were first federally listed.

The gray bat occurs in limestone karst areas, meaning a landscape marked by caves, sinkholes, springs, and other features, of the southeastern and Midwestern United States. It is estimated that more than 95% of the species range-wide population hibernate in only 15 caves. Based on known roost locations, mist net captures, results of acoustic surveys, and assumed flight pathways between roosts, the gray bat is assumed to occur within 102 of the 114 counties in Missouri.

Additional information on the gray bat can be found at https://www.fws.gov/species/gray-bat-myotis-grisescens.

4.1.2 Ozark Big-eared Bat (*Corynorhinus townsendii ingens)*

The Ozark big-eared bat was originally listed as an endangered subspecies on November 30, 1979, under the scientific name *Plecotus townsendii ingens* (44 FR 69206). However, a subsequent genetic analysis determined a taxonomic restructuring of the genus into Corynorhinus. The primary threat to the species is disturbance to maternity caves and hibernacula, as the species is highly sensitive to human entry and are well known to abandon sites after such. Recovery practices have largely centered around cave gating and limiting human disturbance.

The distribution of the Ozark big-eared bat historically was limited to northwestern Arkansas and neighboring Oklahoma and Missouri. However, there have been no confirmed observations of the species in Missouri since 1971, and the Service considers them extirpated from the state.

Additional information on the Ozark big-eared bat can be found at https://www.fws.gov/species/ozark-big-eared-bat-corynorhinus-townsendii-ingens.

4.1.3 Indiana Bat (*Myotis sodalis*) – Critical Habitat Only

Critical habitat for the Indiana bat was designated on September 24, 1976 (41 FR 41914). The critical habitat designated in Missouri represented the major hibernacula known at the time, with an estimated 75% of the known population hibernated at the sites designated as critical habitat. The bats are entirely dependent on the shelter provided by the caves and mines during the winter and their loss of subjection to excessive disturbance or modification would lead to the near or total extinction of the species. Due to the sensitive nature of these systems to disturbance, trespassing, and vandalism, the precise localities of these caves and mines were not released and instead critical habitat was designated at a county level. The caves in Missouri designated as critical habitat include 6 caves within Crawford, Franklin, Iron, Shannon, and Washington counties.

Additional information on the Indiana bat can be found at https://www.fws.gov/species/indiana-bat-myotis-sodalis.

4.2 Fishes

4.2.1 Grotto Sculpin (*Cottus specus*)

The Grotto Sculpin was listed as endangered on October 25, 2013 (78 FR 58938). The species' primary threats are water quality degradation and siltation. Because of the Grotto Sculpin's small range, population-scale fish kills are of particular concern. Fish kills can occur when contaminants from the surface wash into cave streams occupied by the species.

The Grotto Sculpin is found in just five cave systems and their resurgence streams within the Bois Brule drainage in Perry County, Missouri. The cave systems include those of Crevice Cave, Tom Moore Cave (Moore Cave), Mystery Cave, Rimstone River Cave, and Running Bull Cave. The areas are characterized by thousands of sinkholes where consistent water flow, organic input, and connection to surface streams are sufficient for Grotto Sculpin to migrate seasonally from underground streams to surface streams to complete their life cycle.

Critical habitat was also designated for the Grotto Sculpin at the time of listing on October 25, 2013 (78 FR 58923).

The Service determined the following physical or biological features are essential to the conservation of the species:

- Geomorphically stable stream bottoms and banks (stable horizontal dimension and vertical profile) with riffles, runs, pools, and transition zones between these stream features.
- Instream flow regime with an average daily discharge between 0.07 and 150 cubic feet per second (cfs), inclusive of surface runoff, cave streams, resurgences, springs, and occupied surface streams and all interconnected karst areas with flowing water.
- Water temperature between 12.8 and 16.7 °C (55 and 62 °F), dissolved oxygen 4.5 milligrams or greater per liter, and turbidity of an average monthly reading of no more than 200 Nephelometric Turbidity Units for a duration not to exceed 4 hours.
- Adequate water quality characterized by low levels of contaminants. Adequate water quality is defined as the quality necessary for normal behavior, growth, and viability of all life stages of the grotto sculpin.
- Bottom substrates consisting of a mixture of sand, gravel, pebble, cobble, solid bedrock, larger cobble and rocks for cover, with low amounts of sediments.
- Abundance of aquatic invertebrate prey base to support the different life stages of the grotto sculpin.
- Connected underground and surface aquatic habitats that provide for all life stages of the grotto sculpin, with sufficient water levels to facilitate movement of individuals among

habitats.

Additional information on the Grotto sculpin can be found at https://www.fws.gov/species/grotto-sculpin-cottus-specus.

4.2.2 Neosho Madtom (*Noturus placidus*)

The Neosho Madtom was listed as threatened on May 22, 1990 (55 FR 21148). Primary threats to the species include deteriorating water quality and heightened sedimentation resulting from lead-zinc mining, agricultural runoff, and urban development. Additionally, threats include the construction of impoundments, improper gravel extraction, and dewatering for municipal and agricultural.

Historically, the Neosho Madtom's range included the mainstem rivers of the Neosho River and Spring River drainage system south to the Neosho's confluence with the Arkansas River in Oklahoma (the Neosho River is now referred to as the Grand River in Oklahoma). The species was also known from the Illinois River in Oklahoma. The Neosho Madtom is now limited to approximately two-thirds of its original range, with the loss due to habitat alteration and/or fragmentation by 7 large mainstem dams (4 in Oklahoma and 3 in Kansas), and approximately 16 low-head dams in the remainder of its range. Within Missouri, the Neosho is known to occur only in the Spring River in Barton and Jasper counties in the southwestern portion of the state. Additional information on the species can be found at https://www.fws.gov/species/neosho-madtom-noturus-placidus.

4.2.3 Niangua Darter (*Etheostoma nianguae*)

The Niangua Darter was listed as threatened on June 12, 1985 (50 FR 24649). Threats to the species include the destruction of habitat caused by the removal of sand and gravel from the stream channel, degradation of stream quality caused by livestock grazing along stream banks and use of streams for livestock water sources, barriers to the movement, including other aquatic life, created by poorly designed low-water crossings, accumulating silt and gravel on the upstream side of low-water crossings and formation of plunge pools on the downstream side of bridges which changes the physical characteristics of streams, fertilizer and pesticide run-off into streams from adjacent farm fields, and degraded water quality caused by waste from humans and livestock.

The species inhabits clear, medium-sized streams in the Osage River watershed in west central Missouri. The Niangua darter is known to currently occur in the Maries River, Big Tavern Creek, Niangua River, Little Niangua River, Pomme de Terre River, Brush Creek, North Dry Sac River, and Bear Creek.

Critical habitat was designated for the Niangua Darter at the time of listing (50 FR 24649) and includes 90 of the 128 miles of streams inhabited by the species, plus a 50-foot riparian zone along each side of the 90 miles of stream. The critical habitat is in Camden, Cedar, Dallas, Greene, Hickory, Miller, and St. Clair Counties, Missouri.

The Service determined the following physical or biological features are essential to the conservation of the Niangua darter:

- Medium-sized creeks with silt-free pools and riffles
- Moderately clear water draining hilly areas underlain by chert and dolomite.
- Water ranging from 8 to 46 inches in depth over gravel with scattered rubble.

Additional information on the species can be found at https://www.fws.gov/species/niangua-darter-etheostoma-nianguae.

4.2.4 Ozark Cavefish (*Amblyopsis rosae*)

The Ozark Cavefish was listed as threatened on November 1, 1984 (49 FR 43965). Threats to the Ozark Cavefish include water pollution and declining bat populations. Contaminants can flow into the groundwater and travel for miles before finally reaching waters where the cavefish live. They also are at risk of specimen collection, cave disturbance and destruction, as well as changing water tables.

The Ozark Cavefish distribution is restricted to the Springfield plateau geologic province of Arkansas, Missouri, and Oklahoma. The Springfield plateau encompasses approximately 21,000 km^2 and drains the White, Neosho, and Osage rivers. In Missouri, active sites are distributed throughout 10 counties including Greene, Jasper, Lawrence, Newton, Christian, Barry, and Stone Counties.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/ozark-cavefish-amblyopsis-rosae.

4.2.5 Pallid Sturgeon (*Scaphirhynchus albus*)

The Pallid Sturgeon was listed as endangered on September 6, 1990 (55 FR 36641). Threats to the species primarily stem from habitat alterations resulting from dam construction, river channelization, and navigation maintenance along major waterways. These modifications detrimentally impact spawning grounds, diminish food availability or accessibility, and impede the sturgeon's movement within river systems. Water pollution stemming from rural and urban development along riverbanks further compounds threats to pallid sturgeon populations. A more recent concern with potential implications for the species' future is the phenomenon of hybridization with shovelnose sturgeon.

In Missouri, the Pallid Sturgeon inhabits the Mississippi River below lock and dam 25 near Winfield, Missouri and the entirety of the Missouri river. Pallid Sturgeon primarily utilize main channel, secondary channel, and channel border habitats throughout their range. Juvenile and adult Pallid Sturgeon are rarely observed in habitats lacking flowing water which are removed from the main channel (i.e., backwaters and sloughs).

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/pallid-sturgeon-scaphirhynchus-albus.

4.2.6 Topeka Shiner (*Notropis topeka*)

The Topeka Shiner was listed as endangered on December 15, 1998 (63 FR 69008). The primary threats to the species include habitat loss and degradation, diminished water quality, altered stream hydrology, barriers impeding fish movement, and heightened extreme weather events linked to climate change. Habitat loss and degradation, compounded by poor water quality, stem from various sources such as sediment-laden runoff, streamside vegetation removal, poorly engineered stream crossings, improper gravel extraction, inappropriate culvert placements, insufficient erosion controls, and timber clearance operations. Other contributors to hydrological changes include drain tile installation, wetland loss, groundwater depletion, channel straightening, and the construction of impoundments. Barriers to fish movement, such as dams, perched culverts, and high-velocity culverts, pose a significant threat to species like the Topeka Shiner, particularly in headwater reaches of streams where seasonal water fluctuations dictate habitat suitability and survival.

Missouri's Topeka Shiner extant streams identified by the Missouri Department of Conservation include: 2 streams within the Thompson River watershed (not including the Thompson River main stem), and 9 streams within the Moniteau Creek watershed (including the Moniteau Creek main stem). These occupied streams represent two population complexes: a remnant of the Thompson River population complex and the Moniteau Creek population complex, both of which are part of the larger Missouri River watershed. Sugar Creek in the Thompson River watershed is considered by the Missouri Department of Conservation to be susceptible to extirpation due to the relatively low numbers of individuals typically captured during sampling efforts and few sites with collection records.

The Service, jointly with the Missouri Department of Conservation and the Nature Conservancy, reestablished the Topeka Shiner under section 10(j) of the Act and classified the reestablished population as a NEP within portions of the species' historical range in Adair, Gentry, Harrison, Putnam, Sullivan, and Worth Counties, Missouri (78 FR 42702). Reintroduction sites included Little Creek headwaters in Harrison County; East Fork Big Muddy Creek in Gentry, Harrison, and Worth Counties; and tributaries of Spring Creek in Adair, Putnam, and Sullivan Counties. The special rule that accompanied the section 10(j) final rule was designed to broadly exempt, from the section 9 take prohibitions, any take of Topeka Shiners that is incidental to otherwise lawful activities.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/topeka-shiner-notropis-topeka.

4.3 HELLBENDERS

Eastern and Ozark Hellbenders represent two distinct subspecies of salamanders inhabiting Missouri. While Eastern hellbenders range from southern New York to northern Georgia and extend westward into Missouri, Ozark Hellbenders are exclusively found in southern Missouri and Arkansas. Both subspecies are permanently aquatic, favoring the cool, swift-flowing rivers characteristic of the Ozark Highland region. These nocturnal creatures typically seek refuge beneath flat rocks in sizable, perennial streams and rivers. They feature a distinctive appearance, characterized by a broad, flat head, diminutive lidless eyes, and variable coloration ranging from reddish-brown to greenish gray, sometimes with blotches. Their bodies and limbs are adorned with soft, prominent folds of skin, while their flattened, rudder-like tails aid in navigation through water currents.

Declining populations of hellbenders are primarily attributed to habitat degradation and alteration, including factors such as stream impoundments, ore and gravel mining, and sediment runoff. Water quality deterioration, stemming from sources like agricultural and livestock runoff, malfunctioning septic tanks, and chemical spills, also poses a significant threat. Illegal collection and human disturbance, predation, and diseases further exacerbate their plight. Additionally, a significant number of hellbenders fall victim to mistaken beliefs regarding their toxicity or perceived danger, resulting in unwarranted killings.

4.3.1 Eastern Hellbender (*Cryptobranchus alleganiensis alleganiensis*)

Populations of the Eastern Hellbender were listed as endangered as a Distinct Population Segment (DPS) on April 8, 2021 (86 FR 13465). The historical and current range of the Missouri DPS of the eastern hellbender are the same and include the: Niangua River, Gasconade River, Osage Fork of the Gasconade River, Big Piney River, Meramec River, Huzzah Creek, Courtois Creek, and Big River. We consider the DPS to consist of 3 populations, with each population defined as all the occupied rivers within a watershed flowing into the Missouri or Mississippi River. Thus, the Niangua River population consists of individuals in the Niangua River; the Gasconade River population consists of individuals from the Gasconade River, Osage fork of the Gasconade River, and Big Piney River; and the Meramec River population consists of individuals from the Meramec River, Huzzah Creek, Courtois Creek, and Big River.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/eastern-hellbender-cryptobranchus-alleganiensis-alleganiensis.

4.3.2 Ozark Hellbender (*Cryptobranchus alleganiensis bishopi*)

The Ozark Hellbender was listed as endangered on November 7, 2011 (76 FR 61956). The current range of the Ozark Hellbender is currently identified as Bryant Creek, the North Fork White River, the lower portion of the White River mainstem, the Spring River, the Eleven Point River, Jacks Fork River, and the Current River. Though the Black River is presumed to be part of the Ozark Hellbender's historical range, no additional hellbenders have been captured during surveys and habitat no longer appears suitable.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/ozark-hellbender-cryptobranchus-alleganiensis-bishopi.

4.4 MUSSELS

Mussels, being largely sedentary creatures, face considerable risks from pollutants, sediment, and alterations to their aquatic habitats. They are commonly found across various water bodies, with a preference for continuously flowing water atop stable substrates. Typically nestled in clean, silt-free beds of sand, gravel, and boulders, they thrive in streams and rivers. While some species inhabit oxbow lakes, backwaters, and muddy side-channels, others exhibit limited distribution, confined to specific rivers or locales. Remarkably, Missouri's waterways harbor significant populations of rare and endangered mussel species, underscoring their conservation importance. Mussels sustain themselves by siphoning and filtering nutrients from the water, a process through which they can filter several gallons daily. Their life cycle hinges on a symbiotic relationship with vertebrate hosts, predominantly fish. Despite their diminutive size and vulnerability in early life stages, mussels, under favorable conditions, can endure for remarkably extended periods, with some individuals surpassing 80 years of age.

The decline of numerous mussel species can be attributed to both direct and indirect alterations and degradation of stream habitats. Activities such as gravel mining, deforestation along stream banks, nonpoint source pollution from agricultural and urban areas, dredging, channelization, dam construction, and the creation of impoundments, work pads, and coffer dams have significantly impacted their habitats. These practices have led to habitat loss, increased stagnation, siltation, and potentially the elimination or reduction of essential host populations.

4.4.1 Curtis Pearlymussel (*Epioblasma curtisii*)

The Service listed the Curtis Pearlymussel as endangered on June 14, 1976 (41 FR 24062). The species has a small historical range within the Ozark Highlands, historically occurring in the Black, St. Francis, and White River drainages in Southeast Missouri and Northeast Arkansas. At the time of the last status review in 2010, a living population could not be located in Missouri. It had last been seen alive in 1993 when living specimens were observed from the Mudpuppy Conservation Area on the Little Black River in Missouri (USFWS 2010). The Little Black River remains the last place the Curtis Pearlymussel has been seen alive. No other information is available on the status of the species within its known range in Missouri and Arkansas. Therefore, it is still unknown whether an extant population exists.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/curtis-pearly-mussel-epioblasma-florentina-curtisii.

4.4.2 Fat Pocketbook (*Potamilus capax*)

The Service listed the Fat Pocketbook as endangered on June 14, 1976 (41 FR 24062). The species is found in Missouri within the St. Francis River drainage basin and upper Mississippi River in highly variable habitat ranging from relatively natural and stable conditions to impounded or channelized rivers.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/fat-pocketbook-potamilus-capax.

4.4.3 Higgins Eye Pearlymussel (*Lampsilis higginsii*)

The Service listed the Higgins Eye Pearlymussel as endangered on June 14, 1976 (41 FR 24062). The current range of the species within Missouri includes the Upper Mississippi River upstream of Lock and Dam 22 near Hannibal, Missouri.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/higgins-eye-lampsilis-higginsii.

4.4.4 Neosho Mucket (*Lampsilis rafinesqueana*)

The Service listed the Neosho Mucket as endangered on September 17, 2013 (78 FR 57076). In Missouri the Neosho Mucket is restricted to the Neosho River Basin; Center Creek upstream of Bens Branch, Spring River, North Fork Spring River downstream of the Dry Fork confluence, Cow Creek, a tributary to the Spring River, Shoal Creek, and Elk River.

The Service designated critical habitat for the Neosho mucket on June 1, 2015 (80 FR 24692). In total, approximately 777 river kilometers (483 river miles) in Arkansas, Kansas, Missouri, and Oklahoma fall with the boundaries of the critical habitat designation for the Neosho mucket.

The Service determined that the following physical or biological features are essential to the conservation of the Neosho Mucket:

- Geomorphically stable river channels and banks (channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) with habitats that support a diversity of freshwater mussel and native fish (such as stable riffles, sometimes with runs, and mid-channel island habitats that provide flow refuges consisting of gravel and sand substrates with low to moderate amounts of fine sediment and attached filamentous algae).
- A hydrologic flow regime (the severity, frequency, duration, and seasonality of discharge over time) necessary to maintain benthic habitats where the species are found and to maintain connectivity of rivers with the floodplain, allowing the exchange of nutrients and sediment for maintenance of the mussel's and fish host's habitat, food availability, spawning habitat for native fishes, and the ability for newly transformed juveniles to settle and become established in their habitats.
- Water and sediment quality (including, but not limited to, conductivity, hardness, turbidity, temperature, pH, ammonia, heavy metals, and chemical constituents) necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages.
- The occurrence of natural fish assemblages, reflected by fish species richness, relative abundance, and community composition, for each inhabited river or creek that will serve as an indication of appropriate presence and abundance of fish hosts necessary for recruitment of the Neosho Mucket and Rabbitsfoot. Suitable fish hosts for Neosho Mucket glochidia include Smallmouth Bass (*Micropterus dolomieu*), Largemouth Bass (*Micropterus salmoides*), and Spotted Bass (*Micropterus punctulatus*).
- Competitive or predaceous invasive (nonnative) species in quantities low enough to have minimal effect on survival of freshwater mussels.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/rabbitsfoot-quadrula-cylindrica-cylindrica

4.4.5 Pink Mucket (*Lampsilis abrupta*)

The Pink Mucket was listed as endangered on June 14, 1976 (41 FR 24062). The species occurs in Missouri in the Upper Mississippi River basin (Meramec, Bourbeuse, and Big rivers), the Lower Mississippi River basin (St. Francis River and Black and Spring rivers in the White River drainage), and the Missouri River drainage (Osage, Sac, and Gasconade rivers). The Pink Mucket is considered extirpated from the Little Black River in Missouri.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/pink-mucket-lampsilis-abrupta

4.4.6 Rabbitsfoot (*Quadrula cylindrica cylindrica*)

The Rabbitsfoot mussel was listed as threatened species on September 17, 2013 (78 FR 57076).

The species' current range in Missouri includes the St. Francis River, Big Creek, Black River, Spring River (in the southwest part of the state), North Fork Spring River, Center Creek, and Shoal Creek.

The Service designated critical habitat for the Rabbitsfoot (*Quadrula cylindrica cylindrica*), under the Endangered Species Act of 1973, as amended (Act). In total, approximately 2,312 river kilometers (1,437 river miles) in Alabama, Arkansas, Illinois, Indiana, Kansas, Kentucky, Mississippi, Missouri, Ohio, Oklahoma, Pennsylvania, and Tennessee, fall within the boundaries of the critical habitat designation for the Rabbitsfoot.

The Service determined that the following physical or biological features are essential to the conservation of the Rabbitsfoot mussel:

- Geomorphically stable river channels and banks (channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) with habitats that support a diversity of freshwater mussel and native fish (such as stable riffles, sometimes with runs, and mid-channel island habitats that provide flow refuges consisting of gravel and sand substrates with low to moderate amounts of fine sediment and attached filamentous algae).
- A hydrologic flow regime (the severity, frequency, duration, and seasonality of discharge over time) necessary to maintain benthic habitats where the species are found and to maintain connectivity of rivers with the floodplain, allowing the exchange of nutrients and sediment for maintenance of the mussel's and fish host's habitat, food availability, spawning habitat for native fishes, and the ability for newly transformed juveniles to settle and become established in their habitats.
- Water and sediment quality (including, but not limited to, conductivity, hardness, turbidity, temperature, pH, ammonia, heavy metals, and chemical constituents) necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages.
- The occurrence of natural fish assemblages, reflected by fish species richness, relative abundance, and community composition, for each inhabited river or creek that will serve as an indication of appropriate presence and abundance of fish hosts necessary for recruitment of the Neosho mucket and Rabbitsfoot. Suitable fish host for Rabbitsfoot may include, but are not limited to, Blacktail Shiner (*Cyprinella venusta*) from the Black and Little River and Cardinal Shiner (*Luxilus cardinalis*), Red Shiner (*C. lutrensis*), spotfin shiner (*C. spiloptera*), Bluntface Shiner (*C. camura*), Rainbow Darter (*Etheostoma caeruleum*), Rosyface Shiner (*Notropis rubellus*), Striped Shiner (*L. chrysocephalus*), and Emerald Shiner (*N. atherinoides*).
- Competitive or predaceous invasive (nonnative) species in quantities low enough to have minimal effect on survival of freshwater mussels.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/rabbitsfoot-quadrula-cylindrica-cylindrica

4.4.7 Scaleshell (*Leptodea leptodon*)

The Scaleshell mussel was listed as endangered on October 9, 2001 (66 FR 44171). The Scaleshell occurs in Missouri in the Meramec, Bourbeuse, and Gasconade rivers.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/scaleshell-leptodea-leptodon

4.4.8 Sheepnose (*Plethobasus cyphyus*)

The Sheepnose mussel was listed as endangered species on March 13, 2012 (77 FR 14914). In Missouri, the Sheepnose is restricted to the Meramec River, Bourbeuse River, and Osage Fork Gasconade River. The species also possibly occurs in the Mississippi River; however, the last known live record from the river is from 1988.

On April 24, 2026, the Service designated critical habitat for the Sheepnose mussel (*Plethobasus cyphyus*), under the Endangered Species Act of 1973, as amended (Act). In total, approximately 801 rmi (1,289 rkm) in 11 units were designated as critical habitat for sheepnose; (1) Lower Chippewa River, (2) Kankakee River, (3) Meramec and Bourbeuse Rivers, (4) Middle Allegheny-Tionesta, (5) Upper Green River, (6) Tippecanoe River, (7) Walhonding River, (8) Lower Tennessee River, (9) Upper Clinch River, (10) Powell River, and (11) Big Sunflower River.

The Service determined that the following physical or biological features are essential to the conservation of the Sheepnose mussel:

- Adequate flows, or a hydrological flow regime (magnitude, timing, frequency, duration, rate of change, and overall seasonality of discharge over time), necessary to maintain benthic habitats where the species are found and to maintain stream connectivity.
- Suitable substrates and connected instream habitats, characterized by geomorphologically stable stream channels and banks (*i.e.,* channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) that support the mussel species and their respective host fishes. For spectaclecase, these substrates are firm or stable substrates of coarse sand and gravel, are free from excessive silt, and typically include large rock, slabs, or boulders.
- Water and sediment quality necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages, including appropriate levels of dissolved oxygen (generally above 2 to 3 parts per million (ppm)), salinity (generally below 2 to 4 ppm), and temperature (generally below 86 degrees Fahrenheit (°F) (30 degrees Celsius (°C))). Additionally, concentrations of contaminants, including (but not limited to) ammonia, nitrate, copper, and chloride, are below acute toxicity levels for mussels.
- The presence and abundance of host fishes necessary for recruitment of the species; mooneye (*Hiodon tergisus*) and goldeye (*H. alosoides*).

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/sheepnose-plethobasus-cyphyus

4.4.9 Snuffbox (*Epioblasma triquetra*)

The Snuffbox mussel was listed as endangered species on February 14, 2012 (77 FR 8632). The species' current range in Missouri includes the Meramec River, Bourbeuse River, St. Francis River, and Black River.

On April 24, 2026, the Service designated critical habitat for the snuffbox mussel (*Epioblasma triquetra*), under the Endangered Species Act of 1973, as amended (Act). In total, approximately 2,425 rmi (3,902 rkm) in 38 units were designated as critical habitat for snuffbox; (1) Wolf River, (2) Embarrass River, (3) Little Wolf River, (4) Grand River (Michigan), (5) Clinton River, (6) Huron River, (7) Grand River (Ohio), (8) Allegheny River, (9) French Creek, (10) West Fork River, (11) Shenango River, (12) Middle Island Creek, (13) Little Kanawha River, (14) Kanawha River, (15) Olentangy River, (16) Little Darby Creek, (17) Big Darby Creek, (18) Stillwater River, (19) Tygarts Creek, (20) Kinniconick Creek, (21) Licking River, (22) Middle Fork Kentucky River, (23) Red Bird River, (24) Red River, (25) Green River, (26) Salamonie River, (27) Tippecanoe River, (28) Embarras River, (29) Rolling Fork Salt River, (30) Clinch River, (31) Powell River, (32) Paint Rock River, (33) Elk River, (34) Duck River, (35) St. Croix River, (36) Meramec River, (37) St. Francis River, and (38) Spring River.

The Service determined that the following physical or biological features are essential to the conservation of the Snuffbox mussel:

- Adequate flows, or a hydrological flow regime (magnitude, timing, frequency, duration, rate of change, and overall seasonality of discharge over time), necessary to maintain benthic habitats where the species are found and to maintain stream connectivity.
- Suitable substrates and connected instream habitats, characterized by geomorphologically stable stream channels and banks (*i.e.,* channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) that support the mussel species and their host fishes. For snuffbox, suitable substrates are stable gravel and sand with moderate flow and aquatic vegetation in and adjacent to riffles and shoals.
- Water and sediment quality necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages, including appropriate levels of dissolved oxygen (generally above 2 to 3 parts per million (ppm)), salinity (generally below 2 to 4 ppm), and temperature (generally below 86 degrees Fahrenheit (°F) (30 degrees Celsius (°C))). Additionally, concentrations of contaminants, including (but not limited to) ammonia, nitrate, copper, and chloride, are below acute toxicity levels for mussels.
- The presence and abundance of host fishes necessary for recruitment of the species; logperch (*Percina caprodes*) and darter and sculpin species.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/snuffbox-epioblasma-triquetra.

4.4.10 Spectaclecase (*Cumberlandia monodonta*)

The Service listed the Spectaclecase mussel as endangered under the Act on March 13, 2012 (77 FR 14914). The Spectaclecase mussel is currently found within Missouri in the Meramec River, Bourbeuse River, Big River, Osage River, Sac River, Gasconade River, Big Piney River, and Osage Fork of the Gasconade River.

On April 24, 2026, the Service designated critical habitat for the Spectaclecase mussel (*Cumberlandia monodonta*), under the Endangered Species Act of 1973, as amended (Act). In total approximately 1,140 rmi (1,835 rkm) in 12 units were designated as critical habitat for the spectaclecase mussel (1) St. Croix River, (2) Mississippi River, (3) Meramec River, (4) Big River, (5) Gasconade River, (6) Big Piney River, (7) Ouachita River, (8) Tennessee River, (9) Clinch River, (10) Nolichucky River, (11) Green River, and (12) Kanawha River.

The Service determined that the following physical or biological features are essential to the conservation of the Spectaclecase mussel:

- Adequate flows, or a hydrological flow regime (magnitude, timing, frequency, duration, rate of change, and overall seasonality of discharge over time), necessary to maintain benthic habitats where the species are found and to maintain stream connectivity.
- Suitable substrates and connected instream habitats, characterized by geomorphologically stable stream channels and banks (*i.e.,* channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) that support the mussel species and their respective host fishes. For spectaclecase, these substrates are firm or stable substrates of coarse sand and gravel, are free from excessive silt, and typically include large rock, slabs, or boulders.
- Water and sediment quality necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages, including appropriate levels of dissolved oxygen (generally above 2 to 3 parts per million (ppm)), salinity (generally below 2 to 4 ppm), and temperature (generally below 86 degrees Fahrenheit (°F) (30 degrees Celsius (°C))). Additionally, concentrations of contaminants, including (but not limited to) ammonia, nitrate, copper, and chloride, are below acute toxicity levels for mussels.
- The presence and abundance of host fishes necessary for recruitment of the species; mooneye (*Hiodon tergisus*) and goldeye (*H. alosoides*).

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/spectaclecase-cumberlandia-monodonta.

4.4.11 Western Fanshell (*Cyprogenia aberti*)

The Western Fanshell mussel was listed as threatened on March 3, 2022 (87 FR 12338). In addition, the service finalized a rule under the authority of section 4(d) of the Act that provides measures that are necessary and advisable to provide for the conservation of these species. The 4(d) rule provides for the conservation of the species by allowing exceptions, including certain standard exceptions, to take prohibitions caused by actions and activities that, while they may have some minimal level of disturbance to the Western Fanshell, will not have a negative impact (i.e., will have only de minimis impacts) on the species' conservation. The exceptions to these prohibitions include incidental take associated with (1) Channel and bank restoration projects; (2) silviculture and forest management that implements best management practices; and (3) transportation projects that avoid instream disturbance in waters occupied by the species.

1. The first exception is for incidental take resulting from channel and bank restoration projects for creation of natural, physically stable, ecologically functioning streams, taking into consideration connectivity with floodplain and groundwater aquifers. This exception includes a requirement that bank restoration projects require planting appropriate native vegetation, including woody species appropriate for the region and habitat. This

exception also includes a requirement for surveys and relocation prior to commencement of restoration actions (and, if applicable, monitoring after relocation) for Western Fanshell that would otherwise be negatively affected by the actions. Actions related to restoration activities that would negatively affect Western Fanshell include individual mussels being removed, dislodged, crushed, and/or killed by heavy equipment operations and rip-rap placement; removal, destruction, and/or replacement of habitat; increased turbidity from streambed disturbance; and alterations to flow and turbidity from permanent (weirs) or temporary (causeways) structures needed for construction.

2. The second exception is for incidental take resulting from silviculture and forest management activities that use State-approved best management practices to protect water and sediment quality and stream and riparian habitat. Best management practices are designed to reduce sedimentation, erosion, and bank destruction, thereby protecting instream habitat for these species.
3. The third exception is for incidental take resulting from transportation projects that do not include activities that disturb instream habitat. Bridge designs that include spanning the stream and avoiding stream bank disturbance reduce sedimentation and erosion, thereby protecting instream habitat for these species.

The Western Fanshell exists within several basins in Missouri. The Spring River originates in the Ozark Highlands in Missouri, flows south to the South Fork Spring River confluence near Hardy, Arkansas, and then flows southwest to the Black River near Black Rock, Arkansas. Historically, the Western Fanshell occurred in the Spring River from the Sugar Creek confluence near Hardy, Arkansas to the Eleven Point River confluence north of Black Rock, Arkansas (approximately 48.3 rkm), and in the South Fork Spring River from near the Missouri/Arkansas state line to the confluence with Spring River (approximately 88.4 rkm). Within the Lower Mississippi–St. Francis River basin in Missouri, Western Fanshell currently has two populations, one in the Lower St. Francis River (below Lake Wappapello) and Upper St. Francis River (above Lake Wappapello). The Lower St. Francis River is approximately 456 rkm, but Western Fanshell only occurs at 1 site 0.8 rkm below Wappapello Dam. The Upper St. Francis River population occupies approximately 80 rkm and is one of the best remaining populations range wide. The Black River originates in the St. Francois Mountains in Missouri and flows southwesterly through Arkansas until its confluence with the White River near Newport, Arkansas. Historically, Western Fanshell occurred in the Black River from just below Clearwater Lake Dam to approximately 20.2 river kilometers (rkm) upstream of the Lawrence and Jackson County line (approximately 184.9 rkm).

Critical habitat was designated for the Western Fanshell on July 27, 2023 (88 FR 41724). In total, approximately 261.4 river miles (420.7 kilometers) in Arkansas and Missouri fall within the boundaries of the critical habitat designation for the Western Fanshell.

The Service determined that the following physical or biological features are essential to the conservation of the Western Fanshell:

- Adequate flows, or a hydrologic flow regime (magnitude, timing, frequency, duration, rate of change, and overall seasonality of discharge over time), necessary to maintain benthic habitats where the species are found and to maintain stream connectivity, specifically providing for the exchange of nutrients and sediment for maintenance of the mussels' and fish hosts' habitat and food availability, maintenance of spawning habitat for native host fishes, and the ability for newly transformed juveniles to settle and become established in their habitats. Adequate flows ensure delivery of oxygen, enable reproduction, deliver food to filter-feeding mussels, and reduce contaminants and fine sediments from interstitial spaces.

- Suitable substrates and connected instream habitats, characterized by geomorphically stable stream channels and banks (that is, channels that maintain lateral dimensions,
- longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) with habitats that support a diversity of freshwater mussel and native fish (such as stable riffle-run-pool habitats that provide flow refuges consisting of silt-free gravel and coarse sand substrates).
- Water and sediment quality necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages, including, but not limited to dissolved oxygen (generally above 3 parts per million (ppm)) and water temperature (generally below 80 degrees Fahrenheit (°F) (27 degrees Celsius (°C)). Additionally, water and sediment should be low in ammonia (generally below 1.0 ppm total ammonia-nitrogen) and heavy metals and lack excessive total suspended solids and other pollutants.
- The presence and abundance of fish hosts necessary for recruitment of the Western Fanshell; this includes Logperch (*Percina caprodes*), Rainbow Darter (*Etheostoma caeruleum*), Slenderhead Darter (*Percina phoxocephala*), Fantail Darter (*Etheostoma flabellare*), or Orangebelly Darter (*Etheostoma radiosum).*

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/western-fanshell-cyprogenia-aberti.

4.4.12 Winged Mapleleaf (*Quadrula fragosa*)

The winged Mapleleaf mussel was listed as endangered species on June 20, 1991 (56 FR 28345). Currently available data on winged Mapleleaf are restricted solely to the Bourbeuse River and are limited in scope to make any assessments of the species' viability in the river.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/winged-mapleleaf-quadrula-fragosa.

4.5 Crayfishes

4.5.1 Benton County Cave Crayfish (*Cambarus aculabrum*)

The Benton County Cave Crayfish was listed as endangered on April 27, 1993 (58 FR 25742). Threats to Bear Hollow Cave include contaminants from storm water runoff (incompatible chemical use/disposal, highways, and leaks and spills), excessive nutrient influx from residential septic systems and agriculture operations, physical alteration from mining operations (e.g., limestone quarries), vandalism, and hydrologic alteration from land clearing/conversion activities.

The Benton County Cave Crayfish is presently known from only four cave streams in Benton County Arkansas; Logan Cave, Old Pendergrass Cave, Elm Springs, and Bear Hollow Cave.

Bear Hollow Cave in particular has a total recharge of 4 km^2 that extends into southwest Missouri in McDonald and Barry counties.

The current condition and additional information about the species can be found at https://www.fws.gov/species/benton-county-cave-crayfish-cambarus-aculabrum

4.5.2 Big Creek Crayfish (*Faxonius peruncus*)

The Big Creek Crayfish was listed as threatened on May 30, 2023 (88 FR 25512). The primary threat to the Big Creek Crayfish is the Woodland Crayfish, a non-native crayfish that was discovered within a tributary to the St. Francis River in 1984. Since its introduction, the woodland crayfish has spread throughout a large portion of the upper St. Francis River drainage and has caused the range of the Big Creek Crayfish to contract. Water quality degradation is the other main threat, particularly from lead mining contamination.

The Big Creek Crayfish has localized distributions in the St. Francis River basin upstream of Wappapello dam in Iron, Madison, St. Francois, and Wayne counties in southeastern Missouri. The Big Creek Crayfish appears most abundant in Big Creek, other streams on the west side of the basin, and the Twelve-mile Creek sub watersheds on the east side of the basin. Because the species are habitat generalists and not all reaches of streams within the watershed have been sampled, it is likely that the species occur at more locations in the watershed. Therefore, we consider the species' ranges to include all streams within occupied 12-digit hydrologic units watersheds (referred to as sub watersheds).

At the time of listing, the Service designated critical habitat for the species; in total, approximately 1,069 river miles (1,720 river kilometers) in Iron, Madison, St. Francois, Washington, and Wayne Counties, Missouri.

The Service determined that the following physical or biological features are essential to the conservation of the Big Creek crayfish:

- Stream flow velocity generally between 0 and 1.1 feet per second (ft/s) (0 and 0.35 meters per second (m/s)).
- Stream depths generally between 0.2 and 1.6 ft (0.06 and 0.49 m) for the Big Creek Crayfish
- Water temperatures between 34- and 84-degrees Fahrenheit (°F) (1.1 and 28.9 degrees Celsius (°C)).
- Adequately low stream embeddedness so that spaces under rocks and cavities in gravel remain available to the Big Creek Crayfish.
- An available forage and prey base consisting of invertebrates, periphyton, and plant detritus.
- Connectivity among occupied stream reaches of the Big Creek Crayfish (both within and among occupied subwatersheds)
- Ratios or densities of nonnative species low enough to allow for maintaining the populations of the Big Creek Crayfish.

This critical habitat designation is designed for the conservation of those areas containing the physical and biological features necessary to support the species' life-history traits. Each of the areas designated in this rule contain sufficient PBFs to provide for one or more of the life history functions of the Big Creek Crayfish.

The Big Creek Crayfish also has a rule under 4(d) of the Act that provides regulatory measures considered necessary and advisable to provide for the conservation of the species. To discourage the spread of the Woodland Crayfish (and other invasive species) and discouraging other actions that could reduce the species' health, provisions of the rule prohibit all take except for:

1) Take from research or education when that person is conducting the research or education under a valid Missouri Department of Conservation Wildlife Collector's permit.
2) Take that is incidental to an otherwise lawful activity and occurs during restoration activities or other activities.

The current condition and additional information about the species can be found at https://www.fws.gov/species/big-creek-crayfish-faxonius-peruncus.

4.5.3 St. Francis River Crayfish (*Faxonius quadruncus*)

The St. Francis River Crayfish was listed as threatened on May 30, 2023 (88 FR 25512). The primary threat to the St. Francis River Crayfish is the Woodland Crayfish, a non-native invertebrate that was discovered within the St. Francis River tributary in 1984. Since its introduction, the woodland crayfish has spread throughout a large portion of the upper St. Francis River drainage and has caused the range of the St. Francis River Crayfish to contract. Water quality degradation is the other main threat, particularly from lead mining contamination.

The St. Francis River Crayfish has a localized distributions in the St. Francis River basin upstream of Wappapello dam in Iron, Madison, St. Francois, and Wayne counties in southeastern Missouri. The St. Francis River Crayfish mainly inhabits the upper St. Francis River tributaries on the upper end of the Upper St. Francis River watershed. Because the species is a habitat generalist and not all reaches of streams within the watershed have been sampled, it is likely that the species occur at more locations in the watershed. Therefore, we consider the species ranges to include all streams within occupied 12-digit hydrologic units watersheds (referred to as subwatersheds).

At the time of listing, the Service designated critical habitat for the species; in total, approximately 1,043 river miles (1,679 river kilometers) in Iron, Madison, St. Francois, Washington, and Wayne counties in Missouri.

The Service determined that the following physical or biological features are essential to the conservation of the St. Francis River Crayfish:

- Stream flow velocity generally between 0 and 1.1 feet per second (ft/s) (0 and 0.35 meters per second (m/s)).
- Stream depths generally between 0.2 and 1.7 ft (0.06 and 0.52 m)
- Water temperatures between 34- and 84-degrees Fahrenheit (°F) (1.1 and 28.9 degrees Celsius (°C)).
- Adequately low stream embeddedness so that spaces under rocks and cavities in gravel remain available to the St. Francis River Crayfish.

- An available forage and prey base consisting of invertebrates, periphyton, and plant detritus.
- Connectivity among occupied stream reaches and connectivity among occupied stream reaches of the St. Francis River Crayfish (both within and among occupied sub watersheds).
- Ratios or densities of nonnative species low enough to allow for maintaining the populations of St. Francis River Crayfish.

This critical habitat designation is designed for the conservation of those areas containing the physical and biological features necessary to support the species' life-history traits. Each of the areas designated in this rule contain sufficient PBFs to provide for one or more of the life history functions of the St. Francis River Crayfish.

The St. Francis River Crayfish also has a rule under 4(d) of the Act that provides regulatory measures considered necessary and advisable to provide for the conservation of the species. To discourage the spread of the woodland crayfish (and other invasive species) and discouraging other actions that could reduce the species' health, provisions of the rule prohibit all take except for:

1) Take from research or education when that person is conducting the research or education under a valid Missouri Department of Conservation Wildlife Collector's permit.
2) Take that is incidental to an otherwise lawful activity and occurs during restoration activities or other activities.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/st-francis-river-crayfish-faxonius-quadruncus

4.6 Snails

4.6.1 Tumbling Creek Cavesnail (*Antrobia culveri*)

The Tumbling Creek Cavesnail was listed as endangered via an emergency rule on December 27, 2001 (66 FR 66868) and formally listed as endangered on August 14, 2002 (67 FR 52879). The primary threats are related to the degradation of water quality in Tumbling Creek and include increased siltation from overgrazing, tree removal, and other activities. Nonpoint source pollution within the recharge area of Tumbling Creek cave is also a threat to the species. The deposition of silt into Tumbling Creek from aboveground activities within the recharge area of Tumbling Creek Cave has likely contributed to the decline of the species by eliminating the species' habitat, covering egg masses, or adversely impacting the snail in other ways.

The Tumbling Creek Cavesnail is restricted to a single cave stream in Tumbling Creek Cave in Taney County, southwestern Missouri. The cave occurs in the southeastern portion of the recharge area and north of the Bull Shoals reservoir. The recharge area encompasses the surface northwest of the cave system recently estimated at 7,055.38 acres (2,855.21 hectares). Suitable habitat includes the underside of rocks, small stones, and cobble, and occasionally the upper surface of solid rock bottom within sections of Tumbling Creek that have moderate current.

The Service designated critical habitat for the Tumbling Creek Cavesnail on Jul 28, 2011 (76 FR

37663). In total, approximately 25 acres (10.25 hectares) located in Taney County, Missouri, fall within the boundaries of the critical habitat designation.

The Service determined that the following physical or biological features are essential to the conservation of the Tumbling Creek cavesnail:

- Geomorphically stable stream bottoms and banks (stable horizontal dimension and vertical profile) in order to maintain bottom features (riffles, runs, and pools) and transition zones between bottom features; to continue appropriate habitat to maintain essential riffles, runs, and pools; and to promote connectivity between Tumbling Creek and its tributaries and associated springs to maintain gene flow throughout the population.
- Instream flow regime with an average daily discharge between 0.07 and 150 cubic feet per second (cfs), inclusive of both surface runoff and groundwater sources (springs and seepages).
- Water quality with temperature 55–62 °F (12.78–16.67 °C), dissolved oxygen 4.5 milligrams or greater per liter, and turbidity of an average monthly reading of no more than 200 Nephelometric Turbidity Units (NTU; units used to measure sediment discharge) for a duration not to exceed 4 hours.
- Bottom substrates consisting of fine gravel with coarse gravel or cobble, or bedrock with sand and gravel, with low amounts of fine sand and sediments within the interstitial spaces of the substrates.
- Energy input from guano that originates mainly from gray bats that roost in the cave; guano is essential in the development of biofilm (the organic coating and bacterial layer that covers rocks in the cave stream) that cavesnail's use for food.

he most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/tumbling-creek-cavesnail-antrobia-culveri

4.7 INSECTS

Insects are extremely sensitive to direct and indirect exposure to herbicide and pesticide application. Potential adverse effects of the action include crushing or harming eggs, larvae, or adults; toxic effects to insects due to direct or indirect exposure to the herbicides; physical habitat alteration; adverse effects to host plants or species, prey of insect larvae (e.g., aquatic macroinvertebrates including mayflies, isopods, caddisflies, midge larvae, and aquatic worms) and the prey of tenerals and adults (e.g., small flying insects, dipterans). To preclude directly taking (e.g., harming, killing) insect or adversely modifying critical habitat while conducting the management and restoration activities, the conservation measures identified above will be taken in the various project areas. Listed insects may occur near some project areas. Project design and implementation will require avoidance of preferred habitats; therefore, negative impacts are anticipated to be insignificant. Project activities may cause minor and temporary behavioral responses by some individuals while the activities are in progress. Such behavioral responses should be insignificant and will not rise to the level of take in a single event, nor cumulatively over the course of the project term.

4.7.1 Hine's Emerald Dragonfly (*Somatochlora hineana*)

The Hine's Emerald Dragonfly was listed as endangered on January 26, 1995 (60 FR 5267). Destruction or alteration of Hine's Emerald Dragonfly habitat is the primary threat to its survival as alteration of water regimes could potentially affect surface water flow patterns, cause seep heads, and reduce existing or potential larval habitat. Contamination from landfills, and past/present applications of chemicals such as insecticides, herbicides and fertilizers from agriculture and recreation remains a significant threat.

In Missouri the species is found in Crawford, Dent, Iron, Phelps, Reynolds, Ripley, Washington, and Wayne Counties in Missouri. The species occupies marshes and sedge meadows fed by calcareous groundwater seepage and underlain by dolomite bedrock. In general, these areas are characterized by the presence of slowly flowing water and nearby or adjacent forest edges.

The Service designated critical habitat for the species on September 5, 2007 (72 FR 51101), and revised this designation on April 23, 2010 (75 FR 21393). Currently, approximately 26,531.8 acres (ac) (10,737 hectares (ha)) in 37 units are designated in Cook, DuPage, and Will Counties in Illinois; Alpena, Mackinac, and Presque Isle Counties in Michigan; Crawford, Dent, Iron, Phelps, Reynolds, Ripley, Washington, and Wayne Counties in Missouri; and Door and Ozaukee Counties in Wisconsin.

The Service determined that the following physical or biological features are essential to the conservation of the Hine’s emerald dragonfly:

For egg deposition and larval growth and development:

- Organic soils (histosols, or with organic surface horizon) overlying calcareous substrate (predominantly dolomite and limestone bedrock);
- Calcareous water from intermittent seeps and springs and associated shallow, small, slow flowing streamlet channels, rivulets, and/or sheet flow within fens;
- Emergent herbaceous and woody vegetation for emergence facilitation and refugia;
- Occupied burrows maintained by crayfish for refugia; and
- Prey base of aquatic macroinvertebrates, including mayflies, aquatic isopods, caddisflies, midge larvae, and aquatic worms.

For adult foraging; reproduction; dispersal; and refugia necessary for roosting, resting, refuge for adult females to escape from male harassment, and predator avoidance (especially during the vulnerable teneral stage):

- Natural plant communities near the breeding/larval habitat which may include fen, marsh, sedge meadow, dolomite prairie, and the fringe (up to 328 ft (100m)) of bordering shrubby and forested areas with open corridors for movement and dispersal; and
- Prey base of small flying insect species (e.g., dipterans).

This critical habitat designation is designed for the conservation of those areas containing the physical and biological features necessary to support the species' life-history traits. Each of the areas designated in this rule contain sufficient PBFs to provide for one or more of the life history functions of the Hine's Emerald Dragonfly.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/hines-emerald-somatochlora-hineana.

4.8 Flowering Plants

4.8.1 Decurrent False Aster (*Boltonia decurrens*)

The decurrent false aster (also known as claspingleaf doll's daisy) was listed as threatened on November 14, 1988 (53 FR 45858). The primary threats to the species are the destruction or modification of wet prairies and natural marshes. Prolonged flooding during the growing season may also be a limited flooding, as large flooding events along the Mississippi River become more frequent. The species is also susceptible to discing and herbicide use in low-lying marginal lands for crop weed control.

The decurrent false aster is found in eastern half of St. Charles County in areas subject to Mississippi River flooding including wet prairies, in marshes, and along the shores of some rivers and lakes including riverbanks, old fields, roadsides, mudflats, and lake shores. There currently consists of 18 known populations in Illinois and 2 known populations in Missouri. Not all these populations are considered self-sustaining. These hardy perennials are commonly found in North American habitats, particularly in regions with a preference for damp or wet soils. The decurrent false aster is often spotted along the margins of freshwater bodies, such as riverbanks, pond edges, and the borders of marshes. It favors habitats with consistently moist conditions, demonstrating a strong affinity for areas where the water table is relatively high. The soil composition in decurrent false aster habitats varies but typically includes loamy or sandy soils. These well-draining soils are essential for the plant's growth, allowing it to receive adequate moisture without succumbing to waterlogged conditions. The adaptability to different soil types contributes to the widespread distribution of this species in suitable regions. In terms of sunlight, decurrent false asters are predominantly sun-loving plant; they flourish in areas with ample sunlight, showcasing their full potential when exposed to direct sunlight for a significant portion of the day. This preference for sunlight is reflected in their growth habit, with the plants often reaching heights that allow them to absorb sunlight efficiently.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/claspingleaf-dolls-daisy-boltonia-decurrens

4.8.2 Eastern Prairie-Fringed Orchid (*Platanthera leucophaea*)

The eastern prairie-fringed orchid was listed as threatened on September 28, 1989 (54 FR 39857). The main threats to the species are the lack of land management of high-quality wetland habitats on which this species depends, including increased development, spread of exotic species, and fire suppression.

The eastern prairie fringed orchid is a large and showy North American orchid species adapted to fire and drought. It occurs in Illinois, Indiana, Iowa, Maine, Michigan, Missouri, Ohio, Virginia, and Wisconsin. In Missouri, the eastern prairie-fringed orchid is found in Grundy County in mesic areas of upland prairies, in bottomland prairies, and in prairie fens. This orchid species prefers habitats characterized by tallgrass prairies and wet meadows, showcasing a particular affinity for regions with well-drained soils. It often thrives in areas with a history of natural disturbances, such as occasional fires or periodic flooding, which contribute to the maintenance of its preferred open, sunny conditions. The eastern prairie-fringed orchid is particularly associated with native grasses like big bluestem and Indian grass, as well as other prairie wildflowers. Its habitat is often marked by a diverse array of plant species. The eastern prairie-fringed orchid is well adapted to abundant sunlight and typically thrives in locations with open canopies, where sunlight can penetrate to the ground, supporting the orchid's photosynthetic needs. This sunlight requirement is crucial for its growth, development, and flowering. The soil composition in these habitats is typically well-drained and may consist of loamy or sandy soils. Adequate drainage is essential for the orchid's survival, preventing waterlogging that could be detrimental to its delicate roots.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/eastern-prairie-fringed-orchid-platanthera-leucophaea

4.8.3 Geocarpon (*Geocarpon minimum*)

Geocarpon was listed as threatened on July 16, 1987 (52 FR 22930). As an early successional species, competition from successional grasses and shrubs can invade, trap soil and moisture, and allow oak-juniper woodland invasion due to a lack of natural disturbance regime.

The species is found in scattered locations within Dade, Polk, Greene, Cedar, Lawrence, Henry, and St. Clair counties on channel sandstone exposure. Personnel from the Missouri Department of Conservation have reported 25 documented sites in Missouri. Geocarpon habitat is often characterized by its proximity to wetlands and damp, sandy soils. These plants prefer areas with a high-water table, ensuring a consistently moist environment that is essential for their growth and reproduction. Geocarpon are most commonly found along the edges of freshwater marshes, riverbanks, and other waterlogged landscapes. The soil composition in Geocarpon habitats is usually sandy or loamy, providing a well-draining substrate that prevents waterlogging while retaining enough moisture for the plants to flourish. This preference for specific soil types is a key factor in the distribution of geocarpon.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/geocarpon-geocarpon-minimum

4.8.4 Mead’s Milkweed (*Asclepias meadii*)

Mead’s milkweed was listed as threatened species on September 1, 1988 (53 FR 33982-33996). Habitat loss and modification represent the greatest threat. This species’ requirement of tallgrass prairie and glade/barren habitat makes it vulnerable to disturbances that alter habitat conditions or successional stages. This plant is essentially restricted to sites that have never been plowed and only lightly grazed, and hay meadows that are cropped annually for hay

Within Missouri, Mead’s milkweed is found in prairie remnants and railroad rights-of-way, primarily in the Osage Plains region, and on igneous glades in the St. Francois Mountains region of the Ozarks. Mead's milkweed is typically found in tallgrass prairies, open meadows, and savannas, particularly in regions with well-drained soils. It displays a preference for habitats that receive ample sunlight, showcasing its adaptability to open canopies and sunny landscapes. This plant is often associated with native grasses and wildflowers, creating a diverse and vibrant ecosystem. The soil composition in Mead's milkweed habitats typically consists of well-drained, sandy, or loamy soils. This characteristic allows the plant's roots to access moisture while avoiding waterlogged conditions, contributing to its resilience in various environmental conditions. One notable feature of Mead's milkweed habitats is their periodic exposure to natural disturbances such as fire. This plant has evolved to thrive in landscapes where occasional fires are a natural part of the ecosystem. The presence of fire helps control competing vegetation, promoting the growth and establishment of Mead's milkweed, which often emerges from underground rhizomes after a fire event.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/meads-milkweed-asclepias-meadii

4.8.5 Missouri Bladderpod (*Physaria filiformis)*

The Missouri bladderpod, also known as the limestone glade bladderpod, was listed as threatened on January 8, 1987 (52 FR 679). Threats to Missouri bladderpod include habitat loss to the natural glade habitat of the Missouri bladderpod is threatened with residential development, overgrazing and competition from encroaching woody and non-native grasses. The lack of fire on the landscape is also negatively impacting the species.

The Missouri bladderpod is found in Dade, Greene, Christian, and Lawrence counties and can be locally abundant in rocky grazed pastures and along roadsides in areas with limestone outcrops and glades. Missouri bladderpod is typically found in open, rocky glades, and prairies, where it thrives in well-drained, gravelly or rocky soils. These habitats often feature sparse vegetation, with the Missouri bladderpod adapted to the challenges of these environments, where competition for resources can be intense. One of the defining characteristics of the Missouri bladderpod's habitat is the prevalence of sunny conditions. The plant exhibits a preference for open canopies, basking in full sunlight, which is crucial for its growth and reproductive success. This sunlight requirement is reflected in the plant's stature, often growing low to the ground to maximize exposure to sunlight. Given the specific geological features of its habitat, the Missouri bladderpod has adapted to tolerate nutrient-poor soils.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/limestoneglade-bladderpod-physaria-filiformis

4.8.6 Pondberry (*Lindera melissifolia*)

The pondberry was listed as threatened on July 31, 1986 (51 FR 27495). The species primary threated include habitat modification through wetland drainage, timber-harvesting, road construction, and conversion of habitat to agricultural.

The pondberry is currently found in Ripley County in swampy, sandy depressions of lowland forests with poorly drained sandy soils in heavily shaded areas. Pondberry habitats in Missouri typically include lowland areas, swamps, and the edges of ponds or slow-moving streams. The plant thrives in soils that are consistently moist and occasionally experience seasonal flooding. The proximity to water sources ensures a suitable environment for pondberry, allowing it to flourish in areas with a high-water table. The soil composition in pondberry habitats is often characterized by loamy or sandy soils with good drainage. While pondberry can tolerate periodic inundation, well-drained soils prevent waterlogging, supporting the health and longevity of the shrub. These habitats often feature a mix of other wetland vegetation, including sedges, rushes, and various aquatic plants. Pondberry is well adapted to coexist with these species, creating a complex and interconnected ecosystem that benefits both the plant and the diverse array of organisms that inhabit wetland environments. The shrub's preference for partially shaded areas within its wetland habitat is reflected in its ability to thrive under the canopy of taller vegetation, where it can receive filtered sunlight.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/pondberry-lindera-melissifolia.

4.8.7 Virginia Sneezeweed (*Helenium virginicum)*

The Virginia sneezeweed was listed as threatened on November 3, 1998 (63 FR 59239). Primary threats to the species include changes to hydrology (e.g., drought or flooding as a result of changing climate, ditching or pond deepening on private lands, or groundwater withdrawal associated with development), ATV or other vehicle use, and competition and encroachment by other plant species including invasive species such as knapweed.

Virginia sneezeweed habitats in Missouri typically include open, sunny areas with a high-water table or that periodically flood, creating consistently moist to wet soils within the Ozark plateau. This plant is well adapted and resilient to seasonal changes in water levels. The soil composition in Virginia sneezeweed habitats is often loamy or sandy, allowing for good drainage to prevent waterlogging while retaining enough moisture to support the plant's needs. Virginia Sneezeweed contributes to overall biodiversity of these ecosystems and often coexists with a diverse array of moisture-loving wetland vegetation, including grasses, sedges, and other wildflowers. Preferred habitat includes stream edges and shoreline, plains around sinkholes and ponds, wet meadows, and other low-lying areas where water collects.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/virginia-sneezeweed-helenium-virginicum

4.8.8 Western Prairie-Fringed Orchid (*Platanthera praeclara*)

The western prairie-fringed orchid was listed as threatened on September 28, 1989 (54 FR 39857). Main threats to the species include the conversion of remnant prairie to cropland, incompatible use of herbicides and pesticides, siltation, changes in hydrology, fire suppression, encroaching woody vegetation, and the spread of non-native, invasive plant species. Heavy grazing and early haying may also have detrimental impacts on population.

In Missouri, the western prairie-fringed orchid is known only in Atchison, Holt and Harrison counties in mesic areas of upland prairies, and in bottomland prairies. Western prairie-fringed orchids are typically associated with tallgrass prairies and meadows, where they thrive in open, sunny environments. These habitats are characterized by a rich diversity of native grasses, wildflowers, and other herbaceous plants. The soil composition in western prairie-fringed orchid habitats is often well-drained and can include loamy or sandy soils. This characteristic allows the orchid's specialized root system to access moisture while preventing waterlogging, ensuring optimal conditions for its growth and development. One of the defining features of these habitats is the periodic occurrence of natural disturbances, such as fire. Western prairie-fringed orchids have evolved to thrive in landscapes where occasional fires play a role in shaping the ecosystem.

The presence of fire helps control competing vegetation, creating the open conditions that are conducive to the orchid's growth. Given its specific ecological niche, the western prairie-fringed orchid is highly dependent on openness to sunlight.

The most up to date information on the current condition and threats to the species can be found at https://www.fws.gov/species/western-prairie-fringed-orchid-platanthera-praeclara

5 EFFECTS OF COVERED ACTIVITIES

This section covers the effects of the anticipated activities covered in this standing analysis to the covered species and critical habitat (above). Where appropriate in our analysis, we make note of which activities are expected to have no effect on a species and critical habitat. This information is provided as helpful technical assistance to those agencies and project proponents who may be unfamiliar with the species and activities and can be incorporated by reference by action agencies when they make a NE determination.

The effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action but that are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02).

A project's action area must include all areas affected (i.e., modifications to land, air, or water) by the proposed action, and not merely the immediate area involved in the action. If the activities satisfy the two-part test for causation ("but for" and "reasonably certain to occur"), they should be considered as part of the action. To qualify for use of this standing analysis, a project's action area must be wholly encompassed by the coverage area for this standing analysis as described above and all activities within the proposed action must fit within the scope of the standing analysis.

5.1 EFFECTS TO BAT SPECIES

Bats covered by this Dkey include the gray bat and Ozark big-eared bat. All other listed bat species (Indiana bat, Northern long-eared bat, and Tricolored bat) in Missouri are covered under the FHWA, FRA, FTA Programmatic Consultation for Transportation Projects affecting IBAT, NLEB, or TCB. Furthermore, the Missouri ESFO considers the Ozark big-eared bat extirpated in Missouri; all proposed projects within the Species List Area[3] reach a NE outcome for the species.

The other bat species covered by the key can be adversely affected if physical characteristics of hibernacula are impacted, if hibernating individuals are disturbed, if individuals roosting under bridges or in culverts or tunnels are disturbed, or if the species' prey base is reduced. However, differences in the species' life history influence how individuals may be affected in other ways. Therefore, other impacts are evaluated separately for each species.

[3] The Service is actively updating the species' range and Species List Area, which informs the IPaC system.

Projects involving the installation or operation of one or more wind turbines are not eligible to use the key. Therefore, impacts from these activities are not discussed below.

5.1.1 Projects with No Effects

Projects occurring entirely within areas already developed are unlikely to affect the species. Therefore, the user is asked if the action will occur entirely within an already-developed area. If the user answers "Yes", the key bypasses additional questions informing outcomes for the species and provides a NE outcome for the gray bat, northern long-eared bat, tricolored bat, and Indiana bat.

A NE outcome is also provided for the gray bat when results of presence/absence surveys indicate probable absence of the species. To be eligible for the NE outcome, surveys must follow the Service's Range-wide Listed Bat Survey Guidelines, site study plans must be submitted to the Missouri ESFO and approved prior to conducting surveys, results must be verified by the Missouri ESFO, and all documentation must be uploaded to IPaC. In addition, the action cannot be located within an area in which the species' presence has been documented.

Extensive bat surveys have been conducted within portions of the Kansas City and St. Louis metropolitan areas, and the lack of gray bat detections within these areas indicate the likelihood of the species' presence is very low. Therefore, this Dkey uses embedded GIS data to determine if actions are located within these areas. Proposed actions located entirely within these areas bypass additional questions informing the species' outcomes and automatically reach NE outcomes for the gray bat.

5.1.2 Effects to Hibernacula and Hibernating Bats

The gray bat can be adversely affected if the integrity of their hibernacula is impacted or if hibernating individuals are disturbed. The integrity of a hibernaculum includes the structural characteristics of the hibernaculum, the microclimate, and the surrounding forested habitat used by tree-roosting bats for fall swarming and spring staging.

To ensure actions with potential to result in these impacts do not reach NLAA outcomes, this Dkey uses embedded GIS data to determine if projects are located within 0.5-mile of a hibernaculum considered a priority or biologically significant or within 3 miles of the Sodalis Nature Preserve hibernaculum (for the Indiana bat only) (referred to as "hibernacula buffers"). A 0.25-mile hibernacula buffer is delineated around all other hibernacula, including historical hibernacula not currently occupied but that are potentially important for species recovery. Projects located within a hibernacula buffer automatically reach a MA outcome for the bat species documented within the hibernaculum. Any activities outside of these hibernacula buffers and covered by the key will have no effect on hibernating individuals and the hibernaculum's integrity, including structural characteristics of the hibernaculum, the hibernaculum's microclimate, and the surrounding forested habitat used by tree-roosting bats for fall swarming and spring staging.

5.1.3 Effects to Individuals Roosting in Manmade Structures

Gray bats may roost during the active season (April 1 – October 15) under bridges or in culverts or tunnels, abandoned buildings, barns, houses, outbuildings, or other manmade structures.

Therefore, the Dkey also asks if the project will involve work on or impact any of the following structures:

Culverts or tunnels that are ≥ 4.0 feet (1.3 meters) in height and > 23 feet (7 meters) in length, provided they are not regularly flooded. For this context, "regularly flooded" refers to conditions where the structure is frequently overtopped, such that the culvert or tunnel ceiling is submerged during typical flow events (e.g., high-water periods during summer or after moderate rainfall), making potential roosting areas unavailable.

Bridges that contain structural features that could provide roosting habitat, such as expansion joints, cracks, hinges, or weep holes. This excludes bridges constructed of creosote-treated wood, slab-type bridges lacking crevices, and bridges subject to heavy traffic use (i.e., bridges with sustained high volumes of vehicle passage such as those over interstate highways, primary state routes, or other roadways where traffic is continuous and noise, vibration, and disturbance levels would preclude safe or suitable roosting).

5.1.4 Effects to any structures with previously established bat use

Users that answer "Yes" are asked if they have or plan to have a qualified surveyor inspect the bridge, culvert, or structure for signs of roosting bats (guano, urine staining, bat vocalizations, and/or bats) within two years of the project start date. Accompanying the question is a note stating that surveys should be completed during the same season in which impacts are expected to occur and that surveys must follow the Service's Range-wide Listed Bat Survey Guidelines Survey Guidelines. If the user answers "No", the user reaches a MA outcome for the gray bat unless a P/A survey is completed. Users that answer "Yes" are asked if there were signs of bats. If the user indicates there were no signs of bats, the user proceeds to the next question in the key. If the inspection has yet to be completed, the user is instructed to complete the inspection. If the user indicates there were signs of bats, the user is asked if the species was identified. The user automatically reaches a MA outcome for any species that were identified. Because visual surveys of roosting bats do not indicate presence or absence of other bat species within the action area, users proceed through additional questions regarding bat presence and potential impacts.

The intentional removal or exclusion of known or suspected listed bats from a building or structure is considered intentional take and thus, outside the scope of this Dkey (see General Exclusions).

5.1.5 Impacts to Aquatic Resources

Gray bats may be adversely affected if impacts to streams or other wetlands reduce the abundance of the species' prey base, which is primarily aquatic insects. However, most projects impacting waters of the United States require a permit by the U.S. Army Corps of Engineers under section 404 of the Clean Water Act. Because these authorizations typically require implementation of measures to minimize impacts to wetlands, we expect the effects on aquatic resources will be temporary and minimal (insignificant) due to the scale of qualifying projects, the temporary nature of the activity, and implementation of measures to minimize impacts. In addition, actions involving stream diversion or dam construction or that affect the water level of lakes or reservoirs downstream of listed species or critical habitat are not eligible to use the this

Dkey (see **GENERAL EXCLUSIONS**). Therefore, questions regarding impacts to aquatic resources are not included in the effects pathway for bats.

5.1.6 Impacts from Minor Noise, Vibration, and Night Lighting

Projects using this Dkey may produce minor noise and vibration either temporarily (such as from operation of construction equipment) or permanently (such as from vehicular traffic). However, projects only reach a NLAA outcome for each bat species if the action area is located outside the species' hibernaculum buffers and if the species' summer roosting habitat will not be affected during the active season (or for the tricolored bat, the pup season). Thus, we expect the gray bat, Indiana bat, northern long-eared bat, and tricolored bat will be minimally exposed to temporary noise and vibration from projects reaching NLAA outcomes for the species and will not respond by flushing from their roosts. For those actions that may expose the species to minor noise or vibration, we expect the effects to be insignificant given there are several examples of gray bats continuing to roost in areas where they are habitually exposed to noise and vibration. Therefore, minor noise or vibration is not addressed further in the species' effects pathway.

Projects using this Dkey may also result in night lighting that is either temporary during the construction phase and/or permanent during the operation phase (such as facility lighting). Gray bats, Indiana bats, northern long-eared bats, and tricolored bats could be exposed to this stressor at night while foraging and commuting. However, night lighting is localized and is typically most severe in areas where the species are absent because forested habitat is already absent or has been removed during site preparation. For these reasons, we expect the species will be minimally exposed to night lighting and will adjust their behavior to avoid these areas. Because we expect any effects from the stressor will be insignificant, night lighting is not addressed further in the effects pathway.

5.1.7 Impacts from Increased Road Traffic

Projects using this Dkey may result in continued or increased road traffic, either temporarily (e.g., related to construction or equipment mobilization) or permanently (e.g., due to new access roads or increased vehicular use associated with a project).

We also do not expect that the gray bat will be adversely affected by permanent increases in road traffic from actions covered by the Dkey. Gray bats typically roost in caves, bridges, or other sheltered structures less likely to be directly affected by road traffic. Therefore, we also do not expect the species will be adversely affected by long-term increases in road traffic caused by actions reaching NLAA outcomes through the Dkey. Because we expect the effects of road traffic on the gray bat will be insignificant, road traffic is not addressed further in the key.

5.1.8 Impacts to Summer Roosting Habitat and Individuals

To ensure actions that could affect the integrity of summer roosting habitat or disturb roosting individuals do not reach NLAA outcomes, the Dkey uses embedded GIS data to determine if projects are located near a known summer roost (referred to as "gray bat summer roost buffers"). Buffer sizes range from 0.25-miles to 0.5-miles and depend on the number of gray bats documented in each roost to account for the greater foraging area required to support larger summer colonies (*see Impacts to Prey Base or Movement Corridors*). Projects located within a gray bat summer roost buffer automatically reach a MA outcome for the species.

5.1.9 Impacts to Prey Base or Movement Corridors

To ensure projects with potential to adversely affect the gray bat's prey base or movement corridors do not reach NLAA outcomes, the following questions result in MA outcomes for the gray bat when the user answers "Yes" (unless results of presence/absence surveys indicate the species is absent; see *Projects with No Effects*):

- Will more than 100 acres of forested habitat be removed or impacted?
- Will the action result in greater than 0.5-mi (2,640 linear feet) of tree removal along the banks(s) of a perennial pond, lake, river, and/or stream (independent of the total area or acreage of the project)?

Because we assume gray bats occur in higher densities near their summer roosts, this Dkey also uses embedded GIS data to determine if projects are located within a gray bat summer roost buffer. As noted above, the size of each gray bat summer roost buffer depends on the number of gray bats documented in the roost to account for the greater foraging area required to support larger summer colonies. A 0.5-mile buffer is delineated around summer roosts containing more than 5,000 individuals, which represent roosts considered Biologically Significant and classified in the species' most recent 5-year review as Category 1 (5,000–25,000 individuals) or Category 2 (over 25,000 individuals) (USFWS 2025). A 0.25-mile is delineated around all other gray bat summer roosts. Projects located within a gray bat summer roost buffer automatically reach a MA outcome to ensure activities that could adversely affect the gray bat's prey base or movement corridors do not reach NLAA outcomes.

5.2 EFFECTS TO STREAM-DWELLING SPECIES

Stream-dwelling species covered by this Dkey represent the aquatic species occurring primarily in surface streams within the Missouri, which includes the Big Creek crayfish, Curtis Pearlymussel, Eastern Hellbender, Fat Pocketbook, Higgins Eye Pearlymussel, Neosho madtom, Neosho Mucket, Niangua darter, Ozark Hellbender, Pink Mucket, Rabbitsfoot, Scaleshell, Sheepnose, Snuffbox, Spectaclecase, St. Francis River Crayfish, Topeka Shiner, Western Fanshell, and Winged Mapleleaf.

The stream-dwelling species have SLAs encompassing watersheds occupied by the species because large projects in upland areas of the watersheds have potential to affect stream conditions in occupied stream reaches. However, most of the actions that could result in far-reaching downstream effects (such as aerial or other broad application of chemicals, stream diversion, and construction of dams) are not eligible to use this Dkey. Therefore, we created GIS layers for each stream-dwelling species that more specifically represent areas occupied by the species. We refer to the layers as “stream layers”, and the layers include the stream channel of occupied streams as well as 200 feet on each side of the channel.

The main ways that stream-dwelling species may be adversely affected is by disturbance in occupied areas, by changes to the physical structure of habitat, and by impacts to stream conditions, such as increases in turbidity or sedimentation, increased stream temperature due to loss of canopy cover, or other water quality degradation (such as increased levels of nitrogen and phosphorus, heavy metals, fecal coliform, or other pollutants). Disturbance of individuals can result in changes in foraging, sheltering, and breeding behavior and in some instances, injury or mortality. Changes to the physical structure of habitat may reduce the fitness of individuals and reproductive success due if the prey base is reduced, habitat for breeding is affected, or if predation risk is increased due to reduced availability of refugia. Impacts to stream conditions may also affect the fitness of individuals and reproductive success. For example, high levels of turbidity can foul fish and crayfish gills, sediment deposition can reduce the prey base and cover spaces under rocks and in the stream substrate used for refugia and foraging, increased temperature can reduce the ability of individuals to occupy the affected area, and degraded water quality can affect the health of individuals in a variety of ways.

To ensure actions with potential to adversely affect these species do not reach NE or NLAA outcomes, the user is asked if the project will occur within the stream channel and if the project will affect stream conditions (such as turbidity, sedimentation, flow regime, or other water chemistry or quality parameters). If the user answers “Yes” to either of the questions, they reach a MA outcome for species with stream layers intersected by the proposed project area.

Because the stream layers can extend at least 5 miles upstream of known locations, projects not overlapping with the stream layers are unlikely to result in adverse effects to the species. Projects occurring outside the stream channel and not affecting stream conditions are also not likely to adversely affect the species.

5.3 Effects to Cave Obligates

Cave obligate species covered by this Dkey represent the aquatic species occurring primarily within cave systems, which includes the Benton County cave crayfish, grotto sculpin, Ozark cavefish, and Tumbling Creek cavesnail.

The main ways that cave obligate species may be adversely affected are the same as those for stream-dwelling species: by disturbance in occupied areas, by changes to the physical structure of habitat, and by impacts to stream conditions, such as increases in turbidity or sedimentation, increased stream temperature due to loss of canopy cover, or other water quality degradation (such as increased levels of nitrogen and phosphorus, heavy metals, fecal coliform, or other pollutants). Because above-ground projects affect water conditions in occupied underground streams (and surface streams occupied by the grotto sculpin), cave obligate species covered by the key have SLAs encompassing the recharge areas[4] of occupied caves.

To avoid direct effects to individuals from disturbance, projects that may affect a cave or mine,

[4] The geographical area in which surface water can infiltrate the ground and replenish the underlying groundwater.

their entrances, other openings (e.g., sinkholes), hydrology, or environment (physical or other alteration) including activities that require boring, blasting, or drilling into karst geology are not eligible to use this Dkey.

To ensure other actions with potential to adversely affect cave obligate species do not reach NE or NLAA outcomes, the user is provided a list of conservation measures that ensures impacts to the species' habitat and stream conditions are avoided, and the user is also asked if the project will implement all relevant conservation measures. If the user answers "No", they reach a MA outcome for the species for which all relevant measures cannot be implemented.

For projects intersecting the grotto sculpin SLA, the user is also asked if the project will involve the installation of vertical drains. Vertical drains are wells, pipes, pits, or bores in the ground into which drainage water can be discharged. Because vertical drains with inadequate filter systems can input sediment and other contaminants into the groundwater, users that answer "Yes" to the question reach a MA outcome for the grotto sculpin so that the Missouri ESFO can provide a more in-depth review of the project.

Conservation Measures

- Minimize sedimentation and introduction of chemical or nutrient-laden runoff into streams, sinkholes, caves, and abandoned wells by implementing and monitoring erosion and sediment controls for the duration of the project.
- Take care to contain all construction debris to prevent its accidental introduction into caves, sinkholes, or springs as a result of clean-up activities, run-off, flooding, wind, or other natural forces.
- Dispose of chemicals, toxic waste, garbage, and wash water from trucks in areas designated for such wastes. These sites should be away from caves and sinkholes.
- If temporary roadways must be built, ensure that roadways are of low gradient with sufficient roadbed and storm water runoff drains and outlets.
- Revegetate disturbed areas as soon as possible to minimize erosion.
- Ensure that chemical spills are quickly reported; proper steps are taken to mitigate damages; and ensure proper cleanup occurs. Have a spill plan in place before a spill occurs. Make sure materials needed to contain a spill are readily and quickly accessible.
- During times of pesticide application, avoid spraying at least 50 feet from any groundwater input (i.e., sinkholes, vertical drainpipes, spring resurgences, and streams).
- Avoid pesticide and herbicide application prior to precipitation events to minimize direct runoff into nearby groundwater inputs.

Additional Conservation Measures for the Grotto Sculpin

- Establish and maintain forested buffers at least 100 feet wide along streams and at least 50 feet wide around cave and sinkhole entrances as well as vertical drainpipes.
- Do not seal or alter cave entrances or sinkholes as sculpin depend on the outside environment for food and nutrients.
- Avoid and minimize disturbances during nesting and spawning activities from November to March.

5.4 Effects to Pallid Sturgeon

The pallid sturgeon may be adversely affected in the same ways as stream-dwelling species: by disturbance in occupied areas, changes to the physical structure of habitat, and by impacts to stream conditions. However, we used additional pathway to evaluate effects to the pallid sturgeon because a step-by-step process for evaluating effects has already been developed for the species.

In coordination with the Service, the U.S. Army Corps of Engineers (Corps) developed Standard Local Operating Procedures for Endangered Species (SLOPES) that include criteria for reaching NE or NLAA determinations for the pallid sturgeon and other species. Although the procedures pertain to actions requiring a Nationwide Permit (NWP) under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act, any project eligible to use this Dkey and potentially adversely affecting the pallid sturgeon requires an NWP. Therefore, we incorporated the SLOPES procedures to cover more circumstances for which NE or NLAA outcomes are appropriate.

To ensure actions with potential to result in these impacts do not reach NE or NLAA outcomes, the following circumstances result in MA outcomes:

- Projects involving the addition or modification to water intake structures when the following water intake minimization measures cannot be implemented:
    - Water intakes will be screened with a ¼-inch (6.35 mm) or smaller mesh
    - Water intakes will have an intake velocity of less than ½ ft/sec (15.24 cm/sec), and
    - Water intakes will be placed at water depths greater than 15 feet (4.575 m).
- The project will involve activities that will disturb more than 100 feet of shoreline or increase sediment loads for more than 48 hours.
- The project will involve streambank stabilization or boat ramp activities (i.e., construction or maintenance) that cannot be completed outside the pallid sturgeon spawning season (March 1 – June 30) and conducted from the top of the bank.

5.5 Effects to Hine's Emerald Dragonfly

The Hine's emerald dragonfly occurs in marshes and sedge meadows fed by calcareous groundwater seepage and underlain by dolomite bedrock. Because no other species covered by this Dkey occupy similar habitat, we developed an effects pathway specific to the species.
The main way that Hine's emerald dragonfly may be adversely affected is by disturbance to its habitat. Because the species occurs in a specific habitat that is uncommon, we used an effects pathway primarily based on the proximity of projects to known occurrence sites and the presence of suitable habitat.

To ensure actions with potential to adversely affect the Hine's emerald dragonfly do not reach NE or NLAA outcomes, this Dkey first uses embedded GIS data to determine if projects overlap with known occurrence sites. Known occurrence sites were delineated using element of occurrence polygons in Missouri Department of Conservation natural heritage data.
Projects overlapping with known sites automatically reach a MA outcome for the species.

If a project does not overlap with any known occurrence sites, the user is asked if the project will occur within 500 meters of calcareous wetland, fen, sedge meadow, or marsh suitable for Hine's Emerald Dragonfly (a description of suitable habitat is provided).

If the user answers "Yes", they are asked if the following conservation measures can be implemented:

- Avoid changing the hydrology of the seep, fen, sedge meadow, slow moving stream, or intermittent stream pools by diverting, altering, or collecting the flow through ditching, underground tile or "spring developments.", impounding the habitat or inundating it with a dam or other structure, or dredging or deepening of the habitat to create a pool or pond.
- Minimize sedimentation and introduction of chemical or nutrient-laden runoff into streams, sinkholes, caves, and abandoned wells by implementing and monitoring erosion and sediment controls for the duration of the project.
- Do not apply pesticides and herbicides prior to precipitation events and at least 65-ft from suitable larval habitat to minimize direct runoff into nearby groundwater inputs.
- Pesticides should not be applied during the sensitive flight period Jun 1 – Aug 1
- Staging and filling of fuel, herbicides and other chemicals in upland areas should not be up gradient to HED larval habitat or within rapid recharge areas (e.g. Henry formation) or documented through groundwater modeling or analysis;
- Access by foot or operational vehicles should only use existing trails and access paths with no operational vehicles on matting in suitable wetland areas

If the measures cannot be implemented, the user reaches a MA outcome for the species. If the measures can all be implemented, the user reaches a NLAA outcome for the species.

5.6 Effects to Flowering Plants

Species of flowering plants covered by this Dkey include the decurrent false aster, eastern prairie-fringed orchid, Geocarpon, Mead's milkweed, Missouri bladderpod, pondberry, Virginia sneezeweed, and western prairie-fringed orchid.

The main ways plant species may be adversely affected is by disturbance to the species' habitat or to plants themselves. Although various conservation measures can be implemented to avoid adverse effects, most plant species covered by the key occur in specific habitats that are uncommon, such as remnant prairies. Therefore, we used an effects pathway primarily based on the proximity of projects to known occurrences and the presence of suitable habitat.

To ensure other actions with potential to adversely affect flowering plant species do not reach NE or NLAA outcomes, this Dkey first uses embedded GIS data to determine if projects overlap with known occurrence sites. Known occurrence sites were delineated using element of occurrence polygons in Missouri Department of Conservation natural heritage data. Projects overlapping with known sites automatically reach a MA outcome for the relevant species. If a project does not overlap with any known occurrence sites, the user is asked if the project will impact an area with suitable habitat for the species (a description of suitable habitat is provided for each species). If the user answers "Yes", they are asked if surveys were conducted during the blooming season (blooming season dates are provided for each species). If surveys were not conducted, the user reaches a MA outcome for the relevant species. If surveys were conducted, the user is asked if the species was observed. If the user answers "Yes", the user reaches a MA outcome for the relevant species.

5.7 Effects to Critical Habitat

Critical habitat covered by this Dkey includes that for the Indiana Bat, Big Creek Crayfish, Grotto Sculpin, Hine's Emerald Dragonfly, Neosho Mucket, Snuffbox, Sheepnose, Spectaclecase, Niangua Darter, Rabbitsfoot, St. Francis River Crayfish, Tumbling Creek Cavesnail, and Western Fanshell.

The pathway for evaluating effects to critical habitat depends on the physical or biological features (PBFs) considered essential to the species' conservation. Therefore, the user is asked a series of questions regarding potential impacts to critical habitat PBF, which are species-specific.

6 Summary and Conclusion

After considering the relevant information pertaining to the species and critical habitat, reviewing the covered activities and associated required conservation measures, and evaluating their anticipated effects), we conclude that the actions subject to this standing analysis will support a federal action agency determination of "No Effect" or support a section 7(a)(2) determination pursuant to the Act of "may affect, not likely to adversely affect," as appropriate, for the subject species and critical habitat as described above. This standing analysis is based on the consultation provisions of section 7(a)(2) of the Act and the information cited and will undergo review and revision, as needed, if any of the following conditions have been met: 1) If new information reveals the effects of the covered action(s) to the covered species or critical habitat are occurring in a manner or to an extent not considered in this standing analysis based on applied use; or 2) If the species or critical habitat covered by the standing analysis has a change in status.

This standing analysis will be provided online and through IPaC via a link within the DKey output letter.