APPENDIX C: STATUS OF THE SPECIES AND CRITICAL HABITAT

Fish and Wildlife Guilds

The species in Table 1 of the Biological Opinion were assigned to functional guilds based on similarities in their life history traits. These guilds, and their representative species and critical habitats, are discussed in more detail below. Guild information was taken from OSMRE's Biological Assessment unless otherwise specified. Species status information was taken from OSMRE's Biological Assessment, verified and revised as needed. Additional information on status of the species and critical habitat can be found by species at

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1.1.1 Birds – Cuckoos

Cuckoos are members of the family Cuculidae, which also includes roadrunners and anis. They are slender, medium sized birds. Most are arboreal and a few are terrestrial. The ESA-listed yellow-billed cuckoo (*Coccyzus* americanus) represents this guild.

1.1.1.1 Status

The western distinct population segment (DPS) of the yellow-billed cuckoo was listed as threatened in 2014 (USFWS 2014p). Its population has been declining for the past 100 years, perhaps by several orders of magnitude, with a total number of breeding pairs between 680 and 1,025 (USFWS 2013m). Comparisons of historic and current information suggest that the western yellow-billed cuckoo's range and population numbers have declined substantially across much of the western U.S. over the past 50 years. Analysis of population trends is difficult because quantitative data, including historic population estimates, are generally lacking. However, rough extrapolations based on both observed densities of yellow-billed cuckoos and historic habitat distribution indicate that western populations were once substantial (Johnson et al. 2007).

1.1.1.2 Distribution

In the U.S., the western DPS of the yellow-billed cuckoo occurs in the following states: Washington, Oregon, California, Idaho, Nevada, Montana, Wyoming, Utah, Arizona, Colorado, New Mexico, and Texas (USFWS 2014p). The area for the western DPS of yellow-billed cuckoo is west of the crest of the Rocky Mountains. For the northern tier of Rocky Mountain states (Montana, Wyoming, northern and central Colorado), the crest coincides with the Continental Divide. In the southern tier of Colorado and New Mexico, the crest coincides with the eastern boundary of the upper Rio Grande drainage, including the Sangre de Cristo Mountains and excluding the drainage of the Pecos River. In west Texas, the DPS boundary is the line of mountain ranges that form a southeastern extension of the Rocky Mountains to the Big Bend area of west Texas, and that form the western boundary of the Pecos River drainage (USFWS 2014p). Approximately 3.5 percent of the yellow-billed cuckoo's range overlaps mineable coal.

1.1.1.3 Life History

Although the breeding season varies with food availability, breeding generally peaks in mid-June through August. Clutch size is usually two or three eggs, and development of the young is very rapid, with a breeding cycle of 17 days from egg-laying to fledging of young. Up to three broods may be raised in a season if sufficient prey is available (USFWS 2013m). Although yellow-billed cuckoos usually raise their own young, they are facultative brood parasites, occasionally laying eggs in the nests of other yellow-billed cuckoos or of other bird species (USFWS 2014p).

Diet of this species consists of caterpillars, and is often supplemented with beetles, ants, and spiders. They also take advantage of the annual outbreaks of cicadas, katydids, and crickets, and will forage for small frogs and lizards. In summer and fall, cuckoos forage on small wild fruits,

including elderberries, blackberries, and wild grapes. In winter, fruit and seeds become a larger part of the diet.

1.1.1.4 Habitat

Western yellow-billed cuckoos breed in large blocks of riparian habitats, particularly woodlands with cottonwoods (*Populus fremontii*) and willows (*Salix* spp.). Nesting sites are generally selected in locations near water. Dense understory foliage appears to be an important factor in nest site selection, while cottonwood trees are an important foraging habitat in areas where the species has been studied in California. In the Lower Colorado River area this species occupies riparian areas that have higher canopies, denser cover in the upper layers of the canopy, and sparser shrub layers when compared to unoccupied sites. Although this species is generally associated with breeding and nesting in large wooded riparian areas dominated by cottonwood trees, they have been documented nesting in salt cedar between Albuquerque and Elephant Butte Reservoir and along the Pecos River in southeastern New Mexico (USFWS 2011e). At the landscape level, the amount of cottonwood-willow-dominated vegetation cover in the landscape and the width of riparian habitat appeared to influence cuckoo distribution and abundance.

1.1.1.5 Threats

The primary cause of the decline of the western yellow-billed cuckoo is habitat loss and degradation. The main causes of habitat loss have been hydrologic alterations from dams, diversions, changes in flow patterns, channelization, levees, and encroachment into the flood plain from bank stabilization. Conversion of floodplains to agricultural use and establishment of non-native vegetation have also contributed to habitat loss and degradation.

1.1.1.6 Critical Habitat

Critical habitat for the yellow-billed cuckoo was proposed in 2014 (USFWS 2014q). Approximately 1.4 percent of the yellow-billed cuckoo's mapped designated critical habitat boundary overlaps mineable coal.

The PBFs for yellow-billed cuckoo critical habitat are:

(1) Riparian woodlands. Riparian woodlands with mixed willow-cottonwood vegetation, mesquite-thorn-forest vegetation, or a combination of these that contain habitat for nesting and foraging in contiguous or nearly contiguous patches that are greater than 325 ft (100 m) in width and 200 ac (81 ha) or more in extent. These habitat patches contain one or more nesting groves, which are generally willow-dominated, have above average canopy closure (greater than 70 percent), and have a cooler, more humid environment than the surrounding riparian and upland habitats. (2) Adequate prey base. Presence of a prey base consisting of large insect fauna (for example, cicadas, caterpillars, katydids, grasshoppers, large beetles, dragonflies) and tree frogs for adults and young in breeding areas during the nesting season and in post-breeding dispersal areas. (3) Dynamic riverine processes. River systems that are dynamic and provide hydrologic processes that encourage sediment movement and deposits that allow seedling germination and promote plant growth, maintenance, health, and vigor (e.g. lower gradient streams and broad floodplains, elevated subsurface groundwater table, and perennial rivers and streams).

1.1.2 Birds – Raptors

Raptors share the common characteristics of hunting, carnivory, powerful flight, and the physical characteristics of having strong talons and hooked bills. This guild is represented by the ESA-

listed California condor (*Gymnogyps californianus*) and the Mexican spotted owl (*Strix occidentalis lucida*). Similarities between these two species include their year-round residence and nesting behavior of using existing structures (cavities, potholes in cliffs) for nesting locations rather than nest building. Otherwise the biological requirements of these two species are not similar, as discussed more below.

The following is primarily taken from the recovery plans and most recent 5-year reviews for these species (USFWS 2013g, 2013h, 2012e). Other references used are cited in the text.

1.1.2.1 Status

The California condor was listed as endangered in 1967 under the Endangered Species Preservation Act of 1966 and in 1975 under the ESA. The population continued to decline and by 1987 the last remaining wild birds had been captured in order to start a captive breeding program. Eight captive-reared birds were released into the wild in southern California in 1992. Since then, condors have also been released in Arizona, Mexico, and other parts of California. The population has grown steadily in the last 20 years and the number of condors in the wild now exceeds the number in captivity. However, this increase is the result of captive breeding and intensive management rather than natural population growth and none of the reintroduced populations are regarded as having good viability (BirdLife International 2018).

The Mexican spotted owl was listed as threatened in 1993. There is little information on its population size or trends. Surveys have identified over 1,300 sites in the U.S. portion of its range as having a high probability of use by a single or a pair of owls. Estimates indicate the total population to be a few thousand individuals, assuming one or more individuals at each of these sites. These data do not indicate an increase in abundance, however.

1.1.2.2 Distribution

The California condor occurs today in central and southern California, northern Arizona, southern Utah, and northern Baja California, Mexico. As of 2014, there were 228 California condors living in the wild, with more than 120 in California, more than 70 in Arizona, and 30 in Baja, Mexico. They will also range into extreme southeastern Nevada. Approximately 2.2 percent of its range overlaps mineable coal.

The Mexican spotted owl occurs in forested mountains and rocky canyonlands in portions of Utah, Colorado, Arizona, New Mexico, and western Texas south into Mexico. Although it occurs over a broad geographic range it is not uniformly distributed over this area. It occurs primarily in disjunctive areas of isolated mountain ranges and canyons. Approximately 5.2 percent of its range overlaps mineable coal.

1.1.2.3 Life History

Courtship and nesting among California condors takes place in the winter (November through March). A single egg is produced between late January and early April. Chicks fledge by seven months of age but may require parental care until the following year. Condors may nest annually or every other year depending on when the chick fledges.

Condors are obligate scavengers that feed solely on carrion. They apparently locate prey by sight, either directly or by following other scavengers. They forage over a wide area, making

long-distance reconnaissance flights, circling over a carcass and perching for hours before feeding. Interior birds feed on deer, pronghorn, hogs, sheep, cows, and small mammals. Coastal birds also feed on whales, sea lions, and other marine species.

Today, condors forage predominately in open terrain of oak savannas and grasslands as well as coastal sites in central California. Less commonly, they may also forage in wooded areas.

Mexican spotted owls primarily prey on a variety of small mammals but will also take bats, birds, reptiles and arthropods. Canyon dwelling birds may take more woodrats and fewer birds than forest dwelling birds, which consume more voles. These regional dietary differences are likely the result of variation in occurrence and density of prey across the owl's range.

Courtship among Mexican spotted owls generally begins in March, with eggs laid in late March or early April. Mexican spotted owls can lay one to four eggs per clutch, with two being the most common. This is one of the lowest clutch sizes of North American owls. Chicks are usually born in early May and fledge within four to five weeks after hatching. Fledglings usually leave the nest before they can fly. They are dependent on their parents for food early in the fledging period. They may beg food from the parents until they disperse, usually in mid-September to early October.

1.1.2.4 Habitat

The California condor is a habitat generalist. It occurs in low to moderate elevations with cliffs available for nest sites and grasslands, oak savannas, mountain plateaus and canyons for foraging habitat. The species typically places nests in cliff cavities or caves or crevices among boulders. They may also place nests in burned hollows of old growth conifers, cliff ledges, broken tree tops, or nests of other species.

Condors will roost on ridges, rock outcrops, canyons, and tall trees or snags near foraging grounds. They will use these areas for preening and sunning as well as for social interaction and group activities.

The Mexican spotted owl relies on old-growth or mature forests with several key structural components: uneven aged stands, high tree density, high canopy closure, and multiple stories in the vertical structure of the vegetation. Throughout its range, the Mexican spotted owl does not build its own nests. Individuals use cavities, abandoned platform nests of raptors, and mistletoe-induced witches' brooms in coniferous trees that are about 80 feet (24 m) above ground. The Mexican spotted owl also will nest on ledges and potholes on cliffs where these features are present. Mexican spotted owls are typically year-round residents. Some individuals may travel to lower elevations during the non-breeding season.

1.1.2.5 Threats

Both raptors in this guild are threatened by habitat loss and degradation. The California condor is threatened by several other anthropogenic factors. Lead poisoning from eating prey killed with lead shot as well as ingestion of microtrash are the leading causes of death. Collisions with powerlines are another source of mortality (BirdLife International 2018).

1.1.2.6 Critical Habitat

The California condor had final critical habitat designated in 1977. The description does not describe PBFs. It merely identifies geographic boundaries of the critical habitat and includes the "area of land, water, and airspace to an elevation of 3,000 feet above the terrain" (USFWS 1977a).

The Mexican spotted owl had critical habitat designated in 2004 (USFWS 2004d). The PBFs for the Mexican spotted owl pertain to forest structure and the maintenance of adequate prey species.The PBFs related to forest structure include the following: (1) A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 percent to 45 percent of which are large trees with a trunk diameter of 12 inches (0.3 meters) or more when measured at 4.5 feet (1.4 meters) from the ground; (2) A shade canopy created by the tree branches covering 40 percent or more of the ground; and 3) Large dead trees (snags) with a trunk diameter of at least 12 inches (0.3 meters) when measured at 4.5 feet (1.4 meters) from the ground. The PBFs related to maintenance of adequate prey species include the following: (1) High volumes of fallen trees and other woody debris; (2) A wide range of tree and plant species, including hardwoods; and (3) Adequate levels of residual plant cover to maintain fruits, seeds, and allow plant regeneration. (C) Primary constituent elements related to canyon habitat include one or more of the following: (1) Presence of water (often providing cooler and often higher humidity than the surrounding areas); (2) Clumps or stringers of mixed conifer, pine-oak, pinyon-juniper, and/or riparian vegetation; (3) Canyon wall containing crevices, ledges, or caves; and (4) High percent of ground litter and woody debris.

1.1.3 Birds – Wading Birds

This group includes cranes, herons, egrets, storks, spoonbills, and ibises.

Wading birds have physical and behavioral adaptations for living in aquatic or semi-aquatic habitats. Their legs, neck, toes, and bills all may be specialized for living around water and finding food. Most wading birds are colonial nesters, however the one wading bird which may be affected by this action, the whooping crane, is not.

1.1.3.1 Status and Distribution

In the United States, whooping cranes (*Grus americana*) currently exist in the wild at three locations and in captivity at 12 sites. The total population as of February 2020 was 826 birds. The main flock of around 500 birds spends summers in the Wood Buffalo National Park in Canada and winters at Aransas National Wildlife Refuge on the coast of Texas. Two other flocks exist in Florida and Wisconsin. Whooping cranes migrating between Wood Buffalo National Park and Aransas National Wildlife Refuge could potentially use mine sites as stopover habitat.

1.1.3.2 Life history

Whooping cranes begin to look for mates and form pair bonds while they are still at their winter feeding grounds. When choosing a mate, the cranes perform elaborate displays. They will dance around, flap their wings, and call to a potential mate. The pair bonding continues as they fly to the breeding habitat in the north (the non-migratory populations find a mate and breed in the same general location).

At the breeding location, the pair mates and together they build a nest. They lay one to three eggs (usually two), but normally only one baby crane survives. Both parents take care of the egg and the young crane as it develops. The juvenile crane becomes independent early on, but still receives food from its parents. The juvenile stays with its parents throughout the first year, including the flight back to the wintering grounds. They can live above 20 to 25 years in the wild.

Whooping cranes are omnivores. They primarily eat crustaceans, small fish, insects, amphibians, and reptiles. They'll also eat grains, marsh plants, and acorns.

1.1.3.3 Habitat

Whooping cranes use wetlands, marshes, mudflats, wet prairies, estuarine marshes, bays and tidal flats, and fields. Whooping cranes once bred throughout the upper Midwest and northwestern Canada and wintered along the Gulf Coast near Texas. Today there are two migratory populations and one non-migratory population of whooping cranes. The largest flock is also the only natural migratory flock. It spends winters in Aransas National Wildlife Refuge in Texas and breeds in Wood Buffalo National Park in Canada. The non-natural migratory flock winters at the Chassahowitzka National Wildlife Refuge in Florida and breeds in the Necedah National Wildlife Refuge in Wisconsin. The non-migratory flock was formed in Florida as a reintroduction program. They live near Kissimmee in Florida year-round.

1.1.3.4 Threats

The main threat to whooping cranes is habitat loss. Coastal and wetland development projects have destroyed much of their habitat. Another problem affecting whooping cranes is their low reproductive rate and juvenile recruitment. They don't become reproductive in the wild until about five years of age and much later in captivity. Usually only one chick survives from a clutch and juvenile mortality is high.

1.1.3.5 Critical habitat

Critical habitat has been designated for whooping crane on the Monte Vista National Wildlife Refuge, Colorado; Alamosa National Wildlife Refuge, Colorado; Grays Lake National Wildlife Refuge and vicinity, Idaho; Cheyenne Bottoms State Waterfowl Management Area, Kansas; Quivira National Wildlife Refuge, Kansas; Platte River Bottoms between Lexington and Dehman, Nebraska; Bosque del Apache National Wildlife Refuge, New Mexico; Salt Plains National Wildlife Refuge, Oklahoma; and Aransas National Wildlife Refuge and vicinity, Texas.

None of the critical habitat designated for the whooping crane overlaps minable coal.

1.1.4 Birds – Woodpeckers

Woodpeckers make a distinct guild based on their strong bills for drilling and drumming on trees and long sticky tongues for extracting insects. They are also physically specialized with two toes forward and two toes back (zygodactyl feet) versus the three forward and one back of perching birds. One ESA-listed species represents this guild, the red cockaded woodpecker (*Picoides borealis*).

The following is taken from the most recent 5-year review and the recovery plan for the red cockaded woodpecker (USFWS 2006b, 2003a). Other references are cited in the text.

1.1.4.1 Status
The red cockaded woodpecker was listed as endangered in 1970. Its status has been improving since the mid-1990s. Although it remains at risk, no populations have been extirpated since 2003. In 2003 there were an estimated 14,068 red cockaded woodpeckers in 5,627 active clusters across 11 states. There were a range-wide total of 6,105 active clusters in 2006.

1.1.4.2 Distribution
The red cockaded woodpecker occurs in scattered populations throughout the southeastern U.S. States where it is known or believed to occur are Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Texas, and Virginia. The six largest populations are in the Apalachicola National Forest (Florida), North Carolina Sandhills, Francis Marion National Forest (South Carolina), Kisatchie National Forest (Louisiana), Eglin Air Force Base and Blackwater State Forest (Florida), and Red Hills hunting plantations in southern Georgia (NatureServe 2017). Approximately 12 percent of its range overlaps mineable coal.

1.1.4.3 Life History
Red-cockaded woodpeckers lay eggs in April to early-May. They usually produce a single brood. Incubation takes about 10 to 12 days and nestlings fledge at around 26 to 29 days. Nesting activity is finished by early July. Previous year's hatchlings may remain in the natal area and help raise subsequent broods.

Insects are the primary food of red cockaded woodpeckers, along with berries. Ants, spiders, cockroaches, centipedes, and termites are the primary species taken, along with larvae and eggs of various other insects.

1.1.4.4 Habitat
Red-cockaded woodpeckers require open pine woodlands and savannahs with large old pines, primarily longleaf pines, for nesting and roosting. Nesting cavities are excavated in old pines, a process that can take several years. Stands must be open with little or no hardwood midstory or overstory. Foraging habitat consists of mature pines with open canopy, low densities of small pines, little or no hardwood or pine midstory, few or no overstory hardwoods, and abundant native bunchgrass and forb groundcover. A regular fire regime is required to maintain this type of habitat.

1.1.4.5 Threats
Habitat loss and degradation are the primary threats to this guild. Habitat loss may occur through logging of mature pine stands. Fire suppression may allow hardwood species to invade pine stands, rendering the habitat unsuitable.

1.1.5 Birds – Passerines
Perching birds form a distinct guild based on their physical and behavioral characteristics. Physically they make a group based on their foot structure (three toes forward and one back for perching). Behaviorally they are distinct in nest building, predominantly in woody vegetation off the ground. Species in this guild are often migratory over long distances (e.g. wintering in Central and South America and breeding in the US in the summer).

This guild is represented by the ESA-listed southwestern willow flycatcher.

The following is taken from the most recent 5-year review and the recovery plan for the southwestern willow flycatcher (USFWS 2014g, 2002a). Other references are cited in the text.

1.1.5.1 Status

The southwestern willow flycatcher (*Empidonax traillii extimus*) was listed as endangered in 1995. Throughout its range the overall abundance of flycatcher territories has increased, although not in every part of the range. Populations along the Rio Grande River in New Mexico and the San Pedro/Gila River confluence in Arizona have seen large increases while those in coastal California, the Mohave and along the lower Colorado River have declined. The number of estimated territories rangewide increased from 986 in 2002 to 1,299 in 2008. The number of known breeding sites has increased from less than 50 to 288.

1.1.5.2 Distribution

The southwestern willow flycatcher occurs across southern California, extreme southern Nevada, southern Utah, New Mexico, southwestern Colorado, and western Texas in the United States. It also occurs in northernmost Sonora and Baja California, Mexico. Historically it was widespread across its range but the amount of suitable habitat within its range has been significantly reduced. It occurs in relatively small, isolated, widely dispersed locations. Approximately 4.1 percent of its range overlaps mineable coal.

1.1.5.3 Life History

Southwestern willow flycatchers typically begin nesting in early May, although they may start as soon as early April. They establish one or more territories within their home range during the breeding season. Their territories vary in size but generally range from 0.48 to 0.69 hectares (ha) (1.2 to 1.7 acres (ac)). Nests are constructed of grass and bark in medium sized bushes or small trees. Clutch size is three to four and young fledge 13 to 14 days after hatching. In the event of nest failure, southwestern willow flycatchers will attempt to renest and occasionally will raise a second brood. They depart the breeding grounds from mid-August to late September to migrate to their wintering grounds in Mexico and Central and South America.

The southwestern willow flycatcher is an insectivore that forages within and above the tree canopy, along edges, in openings, and above surface water. Insects are generally taken on the wing or gleaned from leaves or other vegetation. The most common prey items are wasps, bees, beetles, flies, butterflies, and moths.

1.1.5.4 Habitat

The southwestern willow flycatcher breeds in riparian areas with relatively dense vegetation. Nest sites can be located from sea level to over 2,000 m (6,100 ft) but mostly occur in lower elevation riparian habitats. The structure and species makeup, hydrologic characteristics, and elevation vary across its range but suitable breeding sites share some similarities. Nests are typically located where trees and shrubs have vegetation near the ground level and where there is a low-density canopy. Occupied sites are usually located in dense vegetation in the interior of a patch or aggregate of patches separated by openings. Nests are located near surface water or saturated soil. Vegetation at the nest site may be even- or uneven-aged, but is usually dense.

Common tree and shrub species found in southwestern willow flycatcher habitat include willows (*Salix* spp.), seepwillow (aka mulefat; *Baccharis* spp.), boxelder (*Acer negundo*), stinging nettle (*Urtica* spp.), blackberry (*Rubus* spp.), cottonwood (*Populus* spp.), arrowweed (*Tessaria sericea*), tamarisk (aka saltcedar; *Tamarix ramosissima*), and Russian olive (*Eleagnus angustifolia*). Vegetative species diversity may be low (e.g. monocultures of willow or tamarisk) or relatively high. Tree and shrub heights range from 2 to 30m (6 to 98 ft). Habitat used during migration, termed stopover habitat, may be along riparian corridors but in unsuitable nesting habitat.

The southwestern willow flycatcher has historically nested in native vegetation. Modern riparian communities frequently consist of non-native tamarisk and Russian olive. While the southwestern willow flycatcher still nests in native vegetation, it will also use these non-native stands as well as stands where native and non-native species are present in essentially even mixtures. Habitat may become unsuitable for breeding through maturation or disturbance but may remain suitable as stopover or foraging habitat. Habitat may therefore not remain suitable over the long term or in the same location. Over a five year period, under optimum conditions, habitat can germinate, be used for foraging or stopovers, and mature into suitable nesting habitat. Habitat not currently suitable for nesting may eventually become suitable, while being used as stopover or foraging habitat in the interim (USFWS 2013d).

1.1.5.5 Threats

The primary threats to the southwestern willow flycatcher are habitat loss and degradation due to dams, diversions and groundwater pumping, channelization and bank stabilization, removal of riparian vegetation, livestock grazing, recreation, fire, agricultural development, and urbanization. Successional changes may also result in habitat becoming unsuitable. Other threats include exotic species, brood parasitism, and small population size.

Destruction of invasive tamarisk by the non-native tamarisk leaf beetle may also result in loss of suitable nesting habitat. Beetle defoliation of tamarisk during the nesting season may result in nest failure. Replacement of tamarisk with native vegetation may also not result in suitable breeding habitat.

1.1.5.6 Critical Habitat

Final critical habitat for the southwestern willow flycatcher was designated in 2013 (USFWS 2013d). The PBFs are as follows: (1) Riparian vegetation. Riparian habitat along a dynamic river or lakeside, in a natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is comprised of trees and shrubs (that can include Goodding's willow, coyote willow, Geyer's willow, arroyo willow, red willow, yewleaf willow, pacific willow, boxelder, tamarisk, Russian olive, buttonbush, cottonwood, stinging nettle, alder, velvet ash, poison hemlock, blackberry, seep willow, oak, rose, sycamore, false indigo, Pacific poison ivy, grape, Virginia creeper, Siberian elm, and walnut) and some combination of: (a) Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 2 to 30 m (about 6 to 98 ft). Lower-stature thickets (2 to 4 m or 6 to 13 ft tall) are found at higher elevation riparian forests and tall-stature thickets are found at middle- and lower-elevation riparian forests; (b) Areas of dense riparian foliage at least from the ground level up to approximately 4 m (13 ft) above ground or dense foliage only at the shrub or tree level as a low, dense canopy; (c) Sites for

nesting that contain a dense (about 50 percent to 100 percent) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground); (d) Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.1 ha (0.25 ac) or as large as 70 ha (175 ac). (2) Insect prey populations. A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, which can include: flying ants, wasps, and bees (Hymenoptera); dragonflies (Odonata); flies (Diptera); true bugs (Hemiptera); beetles (Coleoptera); butterflies, moths, and caterpillars (Lepidoptera); and spittlebugs (Homoptera).

1.1.6 Birds – Shorebirds

The shorebird guild includes small wading birds associated with water, and which need exposed sand, gravel areas, or mud flats, for breeding and wintering habitat. They eat fish as well as small invertebrates picked out of mud or exposed soil. This guild is represented by the ESA-listed piping plover (*Charadrius melodus*), interior least tern (*Sternula antillarum*), and rufa red knot (*Calidris canutus rufa*).

1.1.6.1 Status

Piping plover populations in the Great Lakes watershed are listed as endangered; populations in the rest of its range are listed as threatened. The interior least tern is listed as endangered. The most recent 5 year review for the interior least tern concluded that it was biologically recovered and recommended that it be delisted. However, the review recommended that a delisting proposal not be initiated until three actions had occurred. These were: 1) completion and review of a rangewide population model for confirmation of population status and trends, 2) obtain commitments to management through conservation agreements, and 3) preparation of a range-wide monitoring strategy and plan. All of these actions are in progress (USFWS 2013l). The rufa red knot (*Calidris canutus rufa*) is listed as threatened and is a medium-sized shorebird about nine to 11 inches (in) (23 to 28 centimeters (cm)) in length. These birds are using the Central Flyway and it is possible they may stop on surface mines along this flyway during their migration.

1.1.6.2 Distribution

There are three breeding populations of piping plovers: along the Atlantic Coast from Newfoundland to South Carolina, beaches throughout the Great Lakes, and lakes of the northern Great Plains (USFWS 1988, 2009h, 2016b). Although their complete winter distribution is unknown, piping plovers are known to winter from North Carolina south to Florida, the Gulf coast, Mexico, and the Caribbean (NatureServe 2017). Approximately 12 percent of their range overlaps mineable coal. Interior least terns breed in isolated areas along the Mississippi River and its tributaries north of Baton Rouge, Louisiana and all drainages in Texas more than 50 miles inland from the coast. They winter in coastal areas of Central and South America and the islands of the Caribbean, although the extent of their winter distribution is not well known (USFWS 2013l). Approximately 16.2 percent of their range overlaps mineable coal. The rufa red knot migrates annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the Southeast United States, the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America. Rufa red knots are generally restricted

to ocean coasts during winter and occur primarily along the coasts during migration. However, small numbers of rufa red knots are reported annually across the interior United States during spring and fall migrations.

1.1.6.3 Life History

Piping plover and interior least tern breed and raise young in the spring and summer. They begin arriving on breeding grounds in mid-April and are usually gone by September (USFWS 1988, 1990c). Clutch size is usually 2 to 4. Chicks fledge in about three weeks (USFWS 1988, 2013l).

Piping plovers feed on terrestrial and aquatic invertebrates although the specific content of their diet is not well known (USFWS 1988, 2009h). Interior least terns are piscivores whose diet consists of a variety of small fish species or fingerlings of larger species (USFWS 2013l).

After the eggs hatch, rufa red knot chicks and adults quickly move away from high nesting terrain to lower, wetland habitats and moss. During their migrations, rufa red knots generally feed in coastal marine and estuarine habitat along the sand and muddy shorelines where intertidal invertebrates may easily be found and consumed. The primary food items for the rufa red knot include blue mussel, juvenile mussels, clams, snails, polychaete worms, insect larvae, and crustaceans. During the spring breeding season, the eastern population of rufa red knot consumes horseshoe crab eggs, and juvenile and adult mussels.

1.1.6.4 Habitat

Species in this guild usually nest in colonies on open, unvegetated or sparsely vegetated sandbars, shorelines, and islands of lakes, wetlands, reservoirs, and large rivers, although least terns will nest on sites created by human activity, including mine sites. Nests are made by scraping a depression in the sand or rocky substrate, which is sometimes lined with shells or pebbles. They forage in rivers or along open, wet, sandy areas and wetted shorelines (USFWS 1988, 2009h, 2013l).

Red knots generally nest in dry, slightly elevated tundra locations, often on windswept slopes with little vegetation Breeding areas are located inland, but near arctic coasts. Nests may be scraped into patches of mountain avens (*Dryas octopetala*) plants, or in low spreading vegetation on hummocky (characterized by knolls or mounds) ground containing lichens, leaves, and moss.

1.1.6.5 Threats

The primary threats to the species in this guild in the areas where their ranges overlap mineable coal are habitat loss and degradation due to construction of reservoirs, channelization of rivers, and modification of river flows. These activities may reduce sandbar habitat, flood nests during breeding season, and allow vegetation growth that discourages nesting (USFWS 2009h, 2013l). Other threats include sand and gravel mining, oil and gas development, and invasive species (USFWS 2009h). As stated above, interior least tern populations have recovered to the point they have been recommended for delisting. Therefore curtailment of interior least tern range through habitat loss is not considered a threat (USFWS 2013l).

1.1.6.6 Critical Habitat

Critical habitat has been designated for the Great Lakes breeding population, the northern Great Plains breeding population, and wintering populations of the piping plover. Only the northern

Great Plains breeding population critical habitat overlaps mineable coal, by approximately 32 percent.

The one overriding biological PBF for the Great Lakes breeding population of the piping plover that must be present at all sites is the dynamic ecological processes that create and maintain piping plover habitat. This biological process allows the physical processes to develop (USFWS 2002c). These processes occur on different habitat types in the northern Great Plains.

On prairie alkali lakes and wetlands, the physical PBFs include (1) Shallow, seasonally to permanently flooded, mixosaline to hypersaline wetlands with sandy to gravelly, sparsely vegetated beaches, salt-encrusted mud flats, and/or gravelly salt flats; (2) springs and fens along edges of alkali lakes and wetlands; and (3) adjacent uplands 200 ft (61 m) above the high water mark of the alkali lake or wetland. On rivers the PBFs include sparsely vegetated channel sandbars, sand and gravel beaches on islands, temporary pools on sandbars and islands, and the interface with the river. On reservoirs the PBFs include sparsely vegetated shoreline beaches, peninsulas, islands composed of sand, gravel, or shale, and their interface with the water bodies. On inland lakes (Lake of the Woods) the PBFs include sparsely vegetated and windswept sandy to gravelly islands, beaches, and peninsulas, and their interface with the water body.

No critical habitat has been designated for the rufa red knot or the interior least tern.

1.1.7 Birds – Grouse

Species in the grouse guild have feathered feet, a stout build, a ground dwelling habit, and lek mating behavior. This guild is represented by the ESA-listed Gunnison sage grouse (*Centrocercus minimus*).

1.1.7.1 Status

The rangewide population of Gunnison sage grouse was estimated at 4,705 in 2014. The majority of these birds are in the Gunnison Basin population, which is relatively stable. Other populations are much smaller and were in decline until 2010. Increases in several populations have been observed since then.

1.1.7.2 Distribution

Gunnison sage-grouse currently occur in seven populations in Colorado and Utah, occupying 3,795 square kilometers (1,511 square miles) (Gunnison Sage-grouse Rangewide Steering Committee [GSRSC] 2005; CDOW 2009).

The seven populations are Gunnison Basin, San Miguel Basin, Monticello-Dove Creek, Piñon Mesa, Crawford, Cerro Summit-Cimarron-Sims Mesa, and Poncha Pass. The vast majority of the population, an estimated 3,978 birds, is in the Gunnison Basin (USFWS 2014i). Approximately 6.6 percent of its range overlaps mineable coal.

1.1.7.3 Life History

Mating in this guild takes place at a lek, which is a place where multiple males gather to engage in courtship displays and compete for females. Males begin displaying at leks as early as January and continue into late May (Young et al 2000). Displays occur around dawn and dusk. Females arrive at the lek in early spring. They depart the lek after successful mating.

Males exhibit a high degree of site fidelity, returning to the same lek year after year (Patterson 1952). They will often continue to use them even if the habitat has declined in value. Because of this, they may not immediately show a response to degraded habitat conditions (USFWS 2014i).

Nesting occurs from mid-April to June. Hatching peaks in late May through late June (Childers 2009). Chicks may remain with females for up to 18 weeks but broods generally break up by September when chicks are approximately 70 days old (GSRSC 2005).

The diet of species in this guild consists of a variety of items, including insects, sagebrush, forbs, seeds, leaves, and buds. They forage on the ground and within the vegetation layer (USFWS 2014i).

1.1.7.4 Habitat

Species in this guild utilize a variety of habitats but the primary component is sagebrush (*Artemisia* spp.). Other vegetation may consist of a variety of native grasses, shrubs, and forbs. They will also utilize non-native vegetation. Large interconnected expanses of sagebrush with healthy, native understories are required (USFWS 2014i).

Leks are sparsely vegetated and usually located on elevated features such as ridges or grassy knolls or in low sagebrush, meadows, or other sites with good visibility and low vegetation (Connelly et al 2004). Nests are located in sagebrush although height and density of forbs and grasses may be greater than on adjacent rangeland. Nest sites are usually located in areas with a mix of sagebrush and grasses and forbs (Young 1994). Wet meadows may also be used as hiding and foraging areas.

1.1.7.5 Threats

The main threat to species in this guild is habitat loss and degradation. Native sagebrush habitat across the range of this guild has been greatly reduced. Conversion of native rangelands to forage and cropland has resulted in the loss of suitable habitat (USFWS 2014i). Other threats include livestock grazing, oil and gas development, habitat changes due to fire suppression, inappropriate herbicide application, and habitat fragmentation caused by structural and transportation developments.

1.1.7.6 Critical Habitat

The Gunnison sage grouse had critical habitat designated in 2014 (USFWS 2014i). The PBFs are as follows:

(1) Extensive sagebrush landscapes capable of supporting a population of Gunnison sage-grouse. (2) Breeding habitat composed of sagebrush plant communities that, in general, have the structural characteristics within the ranges described in the Federal Register notice designating critical habitat (USFWS 2014i). (3) Summer-late fall habitat composed of sagebrush plant communities that, in general, have the structural characteristics within the ranges described in the Federal Register notice designating critical habitat (USFWS 2014i). (4) Winter habitat composed of sagebrush plant communities that, in general, have sagebrush canopy cover between 30 to 40 percent and sagebrush height of 40 to 55 cm (15.8 to 21.7 in). (5) Alternative, mesic habitats used primarily in the summer-late fall season, such as riparian communities, springs, seeps, and mesic meadows.

1.1.8 Reptiles – Snakes

Snakes are limbless reptiles with elongated bodies. They are ectothermic carnivores that lack eyelids and external ears.

There are five snakes on the list of species that may be affected by the action: the northern Mexican gartersnake (*Thamnophis eques megalops*), the narrow-headed gartersnake

(*Thamnophis rufipunctatus*), the black pinesnake (*Pituophis melanoleucus lodingi*), the Louisiana pinesnake (*Pituophis ruthveni*), and the eastern massasauga rattlesnake (*Sistrurus catenatus*). All are listed as threatened. The black pinesnake and the Louisiana pinesnake have a section 4(d) rule exempting certain activities from the incidental take prohibitions of the ESA (USFWS 2015g, 2020). The following is taken from the *Federal Register* listings for these species and the species status assessment for the eastern massasauga rattlesnake (EMR) (USFWS 2014n, 2014o, 2015c, 2016c, 2016f; Szymanski et al. 2015).

1.1.8.1 Status

The snakes in this guild have all experienced significant declines in their distribution and abundance. The northern Mexican gartersnake's range and population density have been significantly reduced in the last 30 years. It occurs at low to very low population densities or may even be extirpated over as much as 90 percent of its historical distribution. The narrow-headed gartersnake is currently considered viable in 12 percent of its known localities. The remaining 88 percent of its known localities are considered either likely to have been extirpated or not likely to be viable (USFWS 2014n). The black pine snake has an estimated 11 populations, eight of which are considered likely to persist in the long term (USFWS 2014o). The Louisiana pinesnake (LPS) is considered one of the rarest snakes in North America (USFWS 2016f). It has been extirpated from much of its historical range. The number of presumed extant populations of the eastern massasauga rattlesnake has declined range wide by 38 percent with 24 percent of those having unknown status (USFWS 2016c). Of the presumed extant EMR populations, 40 percent are thought to be quasi-extirpated and 30 percent are presumed to be robust (USFWS 2016c).

1.1.8.2 Distribution

There are currently five localities in the United States where the northern Mexican gartersnake is considered viable. All are in Arizona. The northern Mexican gartersnake occurs in New Mexico in extremely low densities along the Gila River and Mule Creek. It also occurs in Mexico, although there is limited information about its distribution there. Approximately 0.6 percent of its range overlaps mineable coal. As of 2011 the narrow-headed gartersnake could reliably be found at only five locations in Arizona and New Mexico. Two of these locations were affected by a large wildfire and have likely experienced population declines as a result. Approximately 0.8 percent of its range overlaps mineable coal. The distribution of both species on Tribal lands is poorly known due to limited surveys (USFWS 2014n). The black pine snake is extant in three counties in Alabama and 11 of 14 counties in which it historically occurred in Mississippi. Much of its range in Mississippi is on the De Soto National Forest (USFWS 2014o). Approximately 9 percent of its range overlaps mineable coal. The Louisiana pine snake occurs in portions of northwest and west-central Louisiana and extreme east-central Texas. The eastern massasauga rattlesnake historically occurred in Illinois, Indiana, Iowa, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin, and Ontario. Its current range resembles its historic range. However the loss of populations from much of its historic range has resulted in a more restricted current range (Szymanski et al. 2015). Approximately 24 percent of its current range overlaps mineable coal.

1.1.8.3 Life History

The gartersnakes in this guild feed on a variety of prey, including fish, amphibians, reptiles, earthworms, deer mice, and leeches. The narrow-headed gartersnake specializes on fish as its primary prey (Rosen and Schwalbe 1988). The black pine snake feeds on rodents and other small

mammals as well as rabbits and quail (USFWS 2014o). The Louisiana pine snake feeds primarily on Baird's pocket gophers (USFWS 2016f). The eastern massasauga rattlesnake feeds on small mammals and occasionally other snakes (Szymanski et al. 2015).

Members of this guild reach sexual maturity between two and three years of age. Mating occurs in the spring and summer, and young are born in the summer. The narrow-headed gartersnake and northern Mexican gartersnake are viviparous (giving birth to live young), the Louisiana pine snake and black pine snake are oviparous (egg-laying), and the eastern massasauga rattlesnake is ovoviviparous (live young delivered from internal eggs). Number of young may range from four to 38 (USFWS 2014n, 2014o, Szymanksi et al. 2015).

1.1.8.4 Habitat

The narrow-headed gartersnake often occurs along well-lit sections of rocky streams with abundant riparian vegetation, in areas of pinyon-juniper, oak-pine, or ponderosa pine; it basks on rocks, shrubs, or snags, and it often seeks cover under rocks in or adjacent to water. It may be numerous among rocks in areas with riffles, deep pools, and abundant large boulders, whereas areas with broad expanses of small rock and sand, and streams that traverse meadows do not appear to be suitable habitat. The northern Mexican gartersnake is a riparian obligate that occurs mainly in wetlands, riparian woodlands and forests, and streamside gallery forests (USFWS 2014n). The black pine snake and Louisiana pine snake occur in upland longleaf pine dominated forests of the southeastern United States. They are rarely found in riparian areas, hardwood forests, or forested areas with closed canopies. Suitable habitat also has the following characteristics: sandy, well drained soils, a fire suppressed mid-story and dense herbaceous ground cover under an overstory of longleaf pines (USFWS 2015, 2016f). The eastern massasauga rattlesnake uses both wetland and upland habitat (Szymanski et al. 2015). All species hibernate/aestivate below ground in upland or wetland areas.

1.1.8.5 Threats

The primary threats to the gartersnakes in this guild are predation and competition from nonnative fish, frog and crayfish species (USFWS 2014n). The primary threat to the black pine snake and Louisiana pine snake is habitat loss, due to the loss of longleaf pine stands from conversion to other land uses as well as from fire suppression (USFWS 2104o). Habitat loss is also the primary threat to the eastern massasauga rattlesnake. Habitat for the eastern massasauga rattlesnake may be lost due to destruction of native habitat, conversion to agriculture, development and infrastructure conversion (Szymanski et al. 2015). Mining is not specifically identified as a threat, however any land use that would divert, dry up, or significantly pollute aquatic habitat would threaten the species in this guild that utilize it.

1.1.8.6 Critical Habitat

Critical habitat for the black pine snake was designated in 2020, and approximately 10.4 percent of the critical habitat for the species overlaps mineable coal. The physical and biological features for the conservation of the black pinesnake are: 1) a pine forest, historically dominated by longleaf pine and maintained by frequent fire, primarily having the following characteristics: (a) an open canopy that sustains a reduced woody mid-story (<10 percent cover) and abundant, diverse, native herbaceous groundcover (at least 40 percent cover); and (b) minimum of 5,000 acres (2,023 hectares) of mostly unfragmented habitat; 2)refugia sites – naturally burned-out rotted-out pine stumps and their associated root systems tunnels, in pine forest historically dominated by longleaf pine; 3) soils – deep, sandy, well-drained soils characteristic of longleaf pine forests: (a) no flooding or ponding; (b) <15 percent medium and coarse gravel fragments;

(c) >60 in (152 cm) depth to seasonal high water table; (d) >60 in (152 cm) depth to the hardpan; (e) textural components equaling >30 percent sand and <35 percent clay; and (f) a slope <15 percent.

Critical habitat for the narrow-headed garter snake was proposed April 28, 2020.

1.1.9 Reptiles – Turtles

Turtles are grouped together as a guild based on metabolic similarity (they are ectothermic), structural similarities including their bony or cartilaginous shell, and their characteristic low mobility relative to other aquatic and terrestrial species. This guild is represented by the following ESA-listed species: the yellow-blotched map turtle (*Graptemys flavimaculata*), the ringed map turtle (*Graptemys oculifera*), the flattened musk turtle (*Sternotherus depressus*) and the bog turtle (*Clemmys muhlenbergii*).

1.1.9.1 Status

All four turtle species representing this guild are listed as threatened. Recent data on population trends of the species in this guild are lacking. All populations in this guild seem to be declining and all species in this guild have experienced large reductions in their distribution compared to their historic range (NatureServe 2017).

1.1.9.2 Distribution

Members of this guild occur in the Appalachian and Gulf Coast coal basins. The amount of range overlap with mineable coal ranges from 0.7 percent for the bog turtle to 43 percent for the flattened musk turtle (Table 1).

There are two separate bog turtle populations, a southern and a northern population separated by approximately 250 miles. In the north, Maryland has the largest number of occurrences and turtles; only about 20 populations thought to be viable exist outside Maryland and New Jersey. In the south, most occurrences and turtles are in North Carolina and Virginia (there are only a few viable populations elsewhere). Other populations occur in Pennsylvania (although they are known to be extirpated from western Pennsylvania), Maryland, southeastern Virginia and extreme northeastern Tennessee. The species is observed from sea level to 1280 m in the Appalachians; northern populations usually occur below 245 m. Most known populations occur on private property.

The yellow blotched map turtle is now limited to several counties in Mississippi. Known occurrences of the ringed map turtle are restricted to the Pearl River system within Mississippi and Louisiana. The flattened musk turtle is limited to a small portion of its historic range in the upper Black Warrior River system in Alabama (NatureServe 2017).

1.1.9.3 Life History

This guild is characterized by low fecundity, with sexual maturity occurring later in life. Male ringed map turtles, for example, are sexually mature at around three to five years of age, females at 10 to 16 years (NatureServe 2017). Other species mature somewhat earlier. Eggs are laid in clutches of three to four eggs in early summer, and a second nesting attempt may occur. Nests are constructed on elevated surfaces and in sands of riparian areas. Adults and juveniles in this guild typically overwinter by burrowing in soft mud. Adults are sedentary and spend substantial portions of time basking in the sun. Seasonal movements are made to accomplish breeding. Home ranges are small and overland movement distances are short due to the limited mobility of

these animals. Primary food sources are invertebrates, including insects, crustaceans and mollusks.

1.1.9.4 Habitat Requirements

Species in this guild occupy a variety of habitats during their life cycle. All rely on riparian areas and waters with connectivity between habitat types, and suitable nesting habitat in close proximity to the water.

Habitats used by this guild include spring seeps and open marshy wetlands, large creeks, and small and medium sized rivers with moderate gradient and moderate to fast current with shallow pools. Riparian habitat is also needed along with sand/dune or gravel areas for nesting. They require logs and roots or other structures for basking. Members of this guild may also use semi-permanent ponds or flooded pools. Streams or wetlands must be wide enough to allow enough sunlight for several hours of basking a day. They also require deep soft mud for thermoregulation and hibernation. Submerged rocks, overlapping flat rocks, or accumulations of boulders are also an important habitat component (NatureServe 2017, USFWS 2015b).

1.1.9.5 Threats

Threats to this guild include habitat loss or degradation from removal of riparian vegetation and changes in water flow, volume and quality. Habitat fragmentation from impoundments is also a threat as it may lead to genetic isolation. Changes in flow regimes may render habitat unsuitable. Other changes to the hydrologic balance may lead to changes in the sediment deposition regime rendering habitat unsuitable for some species or their prey. Other threats include collection for the pet trade and nest predation (Shiels 2015).

Legacy effects from inadequately reclaimed surface coal mines and present day coal mining is a threat to flattened musk turtle (USFWS 2014t). Currently, only four of the 12 reaches (Sipsey Fork, Brushy Creek, Blackwater Creek, and Blackburn Fork) may have basic characteristics of viability but there has been no long-term monitoring to document viability over the 10-year period. Even though four of the twelve stream occupied reaches are afforded protection by their location on U.S. Forest Service lands, these sites, and all remaining sites, continue to be threatened by non-point pollution from outside U.S. Forest lands, in association with non-sustainable land management practices and increased coal mining. Due to present threats from declining water quality related to urbanization, urban sprawl, reopened old coal mines in addition to new coal mining sites, loss of population connectivity caused by impoundments, and small populations of flattened musk turtle, individual numbers within populations appear to be declining and all populations remain vulnerable to stochastic and anthropomorphic events. Overall, the species appears to be declining (USFWS 2014t).

1.1.9.6 Critical Habitat

There is no critical habitat designated for the representative species in this guild; however, designated critical habitat for Black Warrior waterdog has a high degree of overlap with flattened musk turtle's range.

1.1.10 Amphibians – Salamanders

Salamanders are tailed amphibians that typically have slender bodies, blunt snouts, and short limbs. Their skin is moist and scaleless. Salamanders are important ecological components of many forest ecosystems in North America. In fact, the southern Appalachians have an extraordinarily rich and abundant salamander fauna. In mesic forests in the eastern U.S.,

salamanders are often the most abundant groups of vertebrates in both numbers and biomass. (Petranka et al. 1993).

Three species of salamanders may be affected by this action. Two are in the family Plethodontidae and one is in the family Proteidae. Members of the Plethodontidae lack lungs, respire through their skin, and have a nasolabial groove lined with glands that function in chemoreception. Plethodontids that may be affected by the action include the Cheat Mountain salamander (*Plethodon nettingi*) and the Jemez Mountains salamander (*P. neomexicanus*). The Black Warrior waterdog (*Necturus alabamensis*) is in the family Proteidae, whose members are larviform as adults, have three pairs of conspicuously bushy gills, and possess lungs.

1.1.10.1 Status

The Cheat Mountain salamander was listed as threated in 1989 (USFWS 1989a). Of an estimated 80 distinct populations, 60 (75 percent) exist on state- or federally-owned lands. Confirmed long-term presence (> 10 years) of the Cheat Mountain salamander has been established at seven distinct sites, however insufficient data are available to determine if these populations are stable, expanding, or declining (USFWS 2009b). The Jemez Mountain salamander was listed as endangered and had critical habitat designated in 2013 (USFWS 2013i, 2013j). There is insufficient data on the Jemez Mountain salamander to estimate population sizes and trends. However, available data and qualitative observations of the Jemez Mountain salamander indicate that they are found less often during most surveys than compared to 20 or more years ago and the number of sites with surveys resulting in zero Jemez Mountain salamander detections is increasing (USFWS 2013i).

The Black Warrior waterdog was listed as endangered in 2018 with critical habitat designated. The Black Warrior waterdog was determined to be endangered by habitat loss and water quality degradation resulting from point and non-point source pollution, in part related to legacy effects from surface coal mining, past forestry practices, sedimentation and impoundments. Information is limited concerning its status; however, fourteen populations with varying levels of disconnectivity have been identified. The species is highly susceptible to water quality threats due to highly permeable skin and gills and persistent exposure to water and stream bottom. Wide-spread impacts to water quality are present throughout the species range and is attributed to legacy effects from pre-SMCRA era coal mining and inadequately reclaimed mines, past forestry practices, and impoundments. Populations in the Bankhead National Forest contain numbers sufficient to allow regular captures. Other sites have had only one or two captures since 1990 (USFWS 2018a).

1.1.10.2 Distribution

The Cheat Mountain salamander's range is limited to a small segment of the Allegheny Mountains in eastern West Virginia. Currently, the majority of known populations of the Cheat Mountain salamander are found within the Monongahela National Forest (USFWS 2009b). Approximately 20.8 percent of the Cheat Mountain salamander's range overlaps mineable coal reserves. The Jemez Mountain salamander's range is restricted to the Jemez Mountains in north central New Mexico. The majority of Jemez Mountain salamander habitat is located on federally managed lands, including the U.S. Forest Service, the National Park Service (Bandelier National Monument), Valles Caldera National Preserve, and Los Alamos National Laboratory, with some

habitat located on Tribal land and private lands (USFWS 2013i). Approximately 11.1 percent of the Jemez Mountain salamander's range overlaps mineable coal reserves.

The Black Warrior waterdog is currently known from 13 sites in 5 counties in the Black Warrior River basin in northern Alabama above the Fall Line. Approximately 55% of its range and 39% of its designated critical habitat overlap mineable coal.

1.1.10.3 Life History

The Cheat Mountain salamander and Jemez Mountain salamander are both members of the genus *Plethodon,* also known as woodland salamanders. These salamanders do not possess lungs, do not utilize standing water for any life stage, and over-winter underground. These salamanders shelter under decaying logs and boulders during the day and prey from above ground at night, foraging on small insects including mites, springtails, ants, small beetles, and flies. Their home range is small; daily movements are typically less than three feet (1 m).

Female Jemez Mountain salamanders reach sexual maturity in three to four years and lay eggs every other year. Less is known about the reproductive biology of the Cheat Mountain salamander. However, both female Cheat Mountain salamander and Jemez Mountain salamander deposit small egg masses under fallen logs or debris in the late spring. Females attend the eggs until they hatch fully formed juvenile salamanders in the early fall. The lifespan of these salamanders in the wild is unknown; however the maximum lifespan of the Jemez Mountain salamander is greater than 15 years based on mark-recapture studies (USFWS 2009b, 2013i).

Little is known about the life history of the Black Warrior waterdog. Reproduction is aquatic with nesting probably occurring in late spring or summer with individuals probably reaching sexual maturity in their third winter. They are assumed to be opportunistic carnivores.

1.1.10.4 Habitat

Both Plethodontid salamanders prefer undisturbed high elevation forests and require cool moist habitats. Typical Cheat Mountain salamander habitat consists of stands of conifers such as red spruce (*Picea rubens*) and eastern hemlock (*Tsuga canadensis*) or stands of mixed deciduous forests at elevations above 2,000 ft (610 m) in the northern part of the known range to 3,500 ft (1,067 m) in the southern part of the range. The forest floor is usually covered with liverwort (*Bazzania trilobata*) and the habitat typically contains rock outcrops, emergent rocks, boulder fields, or narrow ravines lined with great rhododendron (*Rhododendron maximum*) (Pauley 2008). The Jemez Mountain salamander has been observed in forested areas along two sides of the rim of a volcanic crater which makes up the Jemez Mountains. At elevations between 7,000 and 11,000 feet (2,134 to 3,353 m) the Jemez Mountain salamander occurs primarily in areas which contain Douglas fir (*Pseudotsuga menziesii*), blue spruce (*P. pungens*), Engelman spruce (*P. engelmannii*), white fir (*Abies concolor*), limber pine (*Pinus flexilis*), Ponderosa pine (*P. ponderosa*), Rocky Mountain maple (*Acer glabrum*), and aspen (*Populus tremuloides*) (USFWS 2013j).

Black Warrior waterdogs are associated with stream depths of 1-4m, reduced sedimentation, and large leaf packs which support mayfly (Ephemeroptera) and caddisfly (Trichoptera) larvae. Habitat characteristics include rocks, submerged ledges, and other cover (USFWS 2018a).

1.1.10.5 Threats

Current threats to the Cheat Mountain salamander and Jemez Mountain salamander include habitat loss, fragmentation and modification due to timbering (private lands), as well as road and recreational development. The primary threats to the Cheat Mountain salamander and Jemez Mountain salamander posed by logging have been reduced in the recent years as a result of improved management on Federal and state owned lands resulting in a reduction of timber harvest in the salamanders' habitats. The Jemez Mountain salamander is particularly threatened by the effects of wildfires and post fire management (seeding, mulching). These species' populations are stable where their habitat is left undisturbed (USFWS 2009b, 2013i).

Degradation of water quality is considered the primary threat to the Black Warrior waterdog. Sources of water quality degradation in its range include run off from abandoned mines, impoundments, construction, silviculture, faulty septic tanks, and urban runoff. Surface mining is specifically mentioned as a threat primarily related to inadequate reclamation of abandoned mines pre-SMCRA, but also present day coal mining and reactivation of mining on former mined lands and predicted future coal mining activity (USFWS 2018a).

1.1.10.6 Critical Habitat

Critical habitat is not designated for the Cheat Mountain salamander, and designated critical habitat for the Jemez Mountain salamander does not overlap mineable coal reserves.

Approximately 39% of designated critical habitat for the Black Warrior waterdog overlaps mineable coal reserves in the Black Warrior River basin (Table 1). The following physical or biological features (PBFs) are essential to the conservation of the Black Warrior waterdog; (1) geomorphically stable, medium to large streams (typically 4 m (13 ft) wide or greater) with: (a) substrate consisting of clay or bedrock with little sand, and containing abundant rock crevices, rock slabs, and leaf packs; (b) moderate water velocity; and (c) prey base of aquatic macroinvertebrates; (2) water that lacks harmful levels of pollutants, including inorganic contaminants such as copper, arsenic, mercury, and cadmium; organic contaminants such as human and animal waste products; endocrine-disrupting chemicals; pesticides; nitrogen, potassium, and phosphorus fertilizers; and petroleum distillates; and (3) appropriate water quality parameters to support Black Warrior waterdog and primary prey base, including: (a) water temperature not exceeding 85 °F; (b) dissolved oxygen 5.5 mg/L or greater; (c) turbidity of an average monthly reading of 15 NTUs above background readings; (d) 115 mg/L of total suspended solids or less; and (e) a specific conductance of no greater than 225 µS per centimeter at 80 °F (USFWS 2018a).

1.1.11 Amphibians – Frogs and Toads

Frogs are amphibians with short, stout bodies that lack tails. They have smooth, moist skin and long hind legs that aid in leaping. Toads have smooth or warty, thick skin and short hind legs. The list of species that may be affected by the action includes the Chiricahua leopard frog (*Lithobates chiricahuensis*) and the Houston toad (*Bufo houstonensis*).

1.1.11.1 Status

The Chiricahua leopard frog was listed as threatened in 2002. Critical habitat was designated for the species in 2012. Data suggest the status of the Chiricahua leopard frog is at least stable and

probably improving in Arizona, declining in New Mexico, and unknown in Mexico (USFWS 2011b). The Houston toad (*Bufo houstonensis*) was listed as endangered in 1970. Critical habitat was designated for the species in 1978. Data suggests the status of the Houston toad is declining across its range. (USFWS 2011i).

1.1.11.2 Distribution

The Chiricahua leopard frog species occurs at elevations of 3,281 to 8,890 ft (1,000 to 2,710 m) in central and southeastern Arizona, west-central and southwestern New Mexico, and the sky islands and Sierra Madre Occidental of northeastern Sonora and western Chihuahua, Mexico. The distribution of the Chiricahua leopard frog in Mexico is unclear, as systematic or intensive surveys for it have not been conducted (USFWS 2007b). Approximately 1 percent of the Chiricahua leopard frog's range overlaps mineable coal reserves. The Houston toad is an endemic species that is restricted to a 12-county range in the central coastal region in Texas. It occurs in both inland and coastal prairie and sandy woodlands. (USFWS 2011i). Approximately 52 percent of its range occurs within mineable coal reserves.

1.1.11.3 Life History

The Chiricahua leopard frog has a complex life cycle, consisting of eggs and larvae that are entirely aquatic and adults that are primarily aquatic. Eggs are laid mainly from February into October, with most masses found in the warmer months. Upon hatching, tadpoles are mainly herbivorous and remain in the water, where they feed and grow, with growth rates faster in warmer conditions. Tadpoles have a long larval period, from three to nine months, and may overwinter. After metamorphosis, Chiricahua leopard frogs eat an array of invertebrates and small vertebrates and are generally inactive between November and February (USFWS 2007b).

The Houston toad also has a complex life cycle, consisting of eggs and tadpoles that are entirely aquatic and adults that are terrestrial, except for the breeding events. Mating occurs most frequently following weather patterns dominated by warm Pacific fronts. Eggs are laid in temporary ponds mainly from February through April to June. Upon hatching, tadpoles are herbivorous and remain in the water through metamorphosis (three to nine weeks depending on water temperature). After metamorphosis, juvenile toads disperse into upland habitats and eat an array of small arthropods. Adult toads migrate between breeding and nonbreeding habitats and aestivate under rocks, leaves, and in soil burrows during hot, dry periods and the coldest winter months. (USFWS 2011i).

Although amphibians are known to have limited dispersal and colonization abilities due to physiological constraints, limited movements, and high site fidelity, the Chiricahua leopard frog can disperse to avoid competition, predation, or unfavorable conditions. Dispersal most likely occurs within favorable habitat, making the maintenance of corridors that connect populations possibly critical to preserving populations of frogs (USFWS 2011b).

1.1.11.4 Habitat

The Chiricahua leopard frog is an inhabitant of montane and river valley cienegas, springs, pools, stock ponds, lakes, reservoirs, streams, and rivers. The species requires permanent or semi-permanent pools for breeding and water characterized by low levels of contaminants and

moderate pH. Some of the most robust extant breeding populations are in dirt livestock tanks (USFWS 2011b).

Houston toad habitat requirements vary based on different life stages. Deep sandy soils and overstory vegetation (pine forests) are important habitat components (Forstner and Dixon 2011); including those extending into the Gulf Coast prairie ecosystem. Breeding habitat consists of bodies of water supporting the reproductive and larval Houston toad life stages. Eggs and larvae develop in shallow water that persists for at least 60 days. The adjacent uplands support adults year-round and provide patch connectivity outward from the ponds for juvenile dispersal (USFWS 2011b).

1.1.11.5 Threats

Disease, particularly chytridiomycosis, a skin disease caused by the fungal pathogen *Batrachochytrium dendrobatidis*, has accounted for the majority of Chiricahua leopard frog declines. This disease seems to present more of a threat to the frog in New Mexico than it does in Arizona, perhaps due to the higher elevations and cooler conditions found at sites in New Mexico. The fungus can be spread by animals moving between waters or by vehicles and equipment that can transport infected water, mud, or plant material from infected sites. Chiricahua leopard frogs are fairly tolerant of variations in water quality; however, changes to water chemistry may serve as a stressor that makes frogs more susceptible to disease (USFWS 2011b).

Chiricahua leopard frog habitats are at risk from watershed erosion causing sedimentation that reduces forage opportunities, smothers egg masses, or fills in the ponds where most frog populations remain. Nonnative species (bullfrogs, crayfish, and non-native fish) also continue to significantly impact extant populations and threaten the frog (USFWS 2011b). As recent coal mining has not occurred within the range of the species, there is limited data to evaluate whether the Chiricahua leopard frog has been affected by coal mining operations.

Habitat destruction, fragmentation, and drought combined have resulted in increasingly isolated Houston toad populations, which compound into additional reductions in population from reduced recruitment, lesser ability of the species to compete for breeding habitat (chorusing magnitude) and collapse of subpopulations (USFWS 2011i).

Additionally, habitat degradation in the form of overgrowth of understory reducing invertebrate prey diversity, followed by wildlfires causing immediate loss of vegetation within core occupied habitat, place Houston toads at greater risk (USFWS 2011i). Coal mining occurs along the northwestern range for this species; however, only recently has the species been detected within juvenile dispersal distance. In this single instance, the permit is in reclamation status. The effects of mining on this species are unknown.

1.1.11.6 Critical Habitat

Critical habitat for the Chiricahua leopard frog does not overlap mineable coal reserves. Approximately 86 percent of critical habitat designated for the Houston toad overlaps mineable reserves. However, the nearest mines to known populations in Bastrop and Lee counties are in reclamation only and no additional mining is expected in the area.

1.1.12 Insects

Insects are a large group of invertebrates in the phylum Arthropoda. They have three-part bodies, three pairs of jointed legs, a chitinous exoskeleton, and typically one or two pairs of wings. The list of species that may be affected by the action includes one beetle, two butterfl**ies**, and one bumblebee. Many pollinator species are under threat worldwide for many reasons, including habitat loss. In the Appalachian and the Mid-western coal fields, native forests serve as pollinator habitat. Methods have been developed for re-establishing pollinator habitat on coal surface mines by reforesting mine sites using the Forestry Reclamation Approach (FRA) (Horn et al., 2017). The FRA can be applied in a manner that will produce soil conditions on mine sites similar to those of unmined forests. Mine operators are encouraged to establish diverse **c**ommunities of seeded and naturally invading native plants that will provide a continuous bloom cycle throughout the growing season.

1.1.13 Insects - Beetles

Beetles are a large group of insects in the order Coleoptera. They have forewings that are modified into hard cases called elytra. This guild is represented by the American burying beetle (*Nicrophorous americanus*).

1.1.13.1 Status

The American burying beetle was listed as endangered in 1989 (USFWS 1989b), and reclassified as threatened on October 15, 2020 (85 FR 65241). Critical habitat has not been designated. Though collection data varies, several populations are considered stable or increasing (USFWS 2008b).

1.1.13.2 Distribution

The range of the American burying beetle once extended across most of the eastern half of the United States. At the time of listing in 1989 only two American burying beetle populations were known, one on Block Island in Rhode Island and one in Latimer County in eastern Oklahoma. Since listing, the American burying beetle has been rediscovered in the majority of counties in eastern Oklahoma as well as additional populations in Nebraska, Arkansas, South Dakota, and Kansas. The species is now known to occur in six of the 16 ecoregions where it was once found (USFWS 2008b). Approximately 18.4 percent of the American burying beetle's range overlaps mineable coal reserves. This overlap occurs within the species' western range primarily in Oklahoma.

1.1.13.3 Life History

The American burying beetle exhibits parental care, a rare trait among beetles. To reproduce, a pair of American burying beetles selects, prepares, and buries a small vertebrate carcass weighing 50 to 200 grams. The female lays her eggs in a brood chamber containing the carcass. Once hatched the beetle pair feed the young by regurgitating the animal material until they're capable of feeding themselves. While individual American burying beetles are capable of breeding twice in a season most only breed once, with a lifespan of about 12 months (USFWS 2008b). Adult American burying beetles feed on carrion as well as capture and consume live insects (USWFS 1989b).

1.1.13.4 Habitat
The American burying beetle prefers moderate to well-developed forests with moderate to deep soils and understory with moderate cover of small shrubs. However, as the American burying beetle searches over a large home range to locate carrion of suitable size for reproduction, it is often found in a variety of habitats including grasslands and early successional forests. Soil moisture and consistency is very important for the American burying beetle. Extremely dry, saturated, or compacted soils are not conducive to the reproductive or overwintering needs of the beetle (USFWS 2008b).

1.1.13.5 Threats
It's suspected that a reduction in carrion availability due to land use changes and increased competition was the overriding cause of the species' decline. Habitat fragmentation, insecticide use, and soil disturbance activities are also considered possible contributing factors to the beetle's decline.

1.1.13.6 Critical Habitat
Critical habitat is not designated for the American burying beetle.

1.1.14 Insects – Bumble Bees
Bumble bees are a small group of insects in the family Apidae. They are large, furry corbiculate bees (smooth area on the hind legs surrounded by stiff bristles). This assists in transporting pollen. The list of species that may be affected by the action include the rusty patched bumble bee (*Bombus affinis*).

1.1.14.1 Status
The rusty patched bumble bee was listed as endangered in 2017 (USFWS 2017a). USFWS has determined that critical habitat is not determinable at this time for the RPBB. The RPBB currently exists in 13 states and has declined by 68% from 2000 to 2015 (USFWS 2016a).

1.1.14.2 Distribution
Historically, the rusty patched bumble bee was broadly distributed across much of the eastern United States and Upper Midwest. Its range comprised 15 ecoregions and 28 states. Since 2000, the species distribution has declined across its range with current records from six ecoregions and 13 states reporting presence of the rusty patched bumble bee (USFWS 2017a). Approximately 11 percent of the RPBB's range overlaps mineable coal reserves. This overlap occurs within the species' eastern range in Ohio, Illinois, and Indiana.

1.1.14.3 Life History
Rusty patched bumble bee colonies have an annual cycle. In spring, solitary queens emerge and find nest sites, collect nectar and pollen from flowers and begin laying eggs, which are fertilized by sperm stored since mating the previous fall. Workers hatch from these first eggs and colonies grow as workers collect food, defend the colony, and care for young. Queens remain within the nests and continue laying eggs. In late summer, new queens and males also hatch from eggs. Males disperse to mate with new queens from other colonies. In fall, founding queens, workers and males die. Only new queens go into diapause (a form of hibernation) over winter, and the cycle begins again in spring (USFWS 2017b).

1.1.14.4 Habitat

Rusty patched bumble bees once occupied grasslands and tallgrass prairies of the Upper Midwest and Northeast, but most grasslands and prairies have been lost, degraded, or fragmented by conversion to other uses. Bumble bees need areas that provide nectar and pollen from flowers, nesting sites (underground and abandoned rodent cavities or clumps of grasses), and overwintering sites for hibernating queens (undisturbed soil) (USFWS 2016a).

1.1.14.5 Threats

Pathogens, pesticides, habitat loss and degradation, and impacts from climate change are may be considered contributing factors to the rusty patched bumble bee's decline. OSMRE could not find any specific references to evaluate whether the rusty patched bumble bee has been directly affected by coal mining operations.

1.1.14.6 Critical Habitat

The Service concluded that critical habitat is not determinable at this time for the rusty patched bumble bee.

1.1.15 Insects – Butterflies

Butterflies are insects with 2 pairs of scaly, often conspicuously marked, wings, clubbed antennae, and slender bodies. They are active during the day and usually feed on nectar. The list of species that may be affected by these actions includes the Mitchell's satyr butterfly (*Neonympha mitchelli mitchelli*) and the Dakota skipper (*Hesperia dacotae*).

1.1.15.1 Status

The Mitchell's satyr butterfly was listed as endangered in 1991 under an emergency rule (USFWS 1991a). The final rule was published in 1992 (USFWS 1992). Critical habitat has not been designated. Mitchell's satyr butterfly populations in the northern part of the range have decreased drastically; however, multiple new populations of what appears to be Mitchell's satyr butterfly continue to be discovered in the southeastern U.S. Ongoing genetics research will confirm and compare the taxonomy of the southern butterflies (USFWS 2014l).

The Dakota skipper was listed as threatened in 2014. Critical habitat was designated in 2015. Approximately 26% percent of its total range overlaps mineable coal. The most recent five-year review listed 76 metapopulations consisting of 150 distinct subpopulations across three states and two Canadian provinces (USFWS 2019).

1.1.15.2 Distribution

When listed in 1992, the Mitchell's satyr butterfly was known to inhabit 30 locations in four states (Michigan, Indiana, Ohio, and New Jersey). Today, 16 populations exist in Michigan and one in Indiana. However, new populations were discovered in Virginia, Alabama, and Mississippi. These populations conform morphologically to Mitchell's satyr butterfly and will be treated as such by the Service unless more conclusive evidence indicates otherwise (USFWS 2014l). Approximately 9.6 percent of the Mitchell's satyr butterfly's range overlaps mineable coal reserves. This overlap occurs within the species' southern range in Alabama.

The Dakota skipper inhabits remnants of tallgrass and prairie and mixed-grass prairie in the northcentral United States. and into southern Saskatchewan and Manitoba Provinces of Canada.

In the United States, remaining populations occur in Minnesota, North Dakota, and South Dakota (USFWS 2018b).

1.1.15.3 Life History

Mitchell's satyr butterfly eggs hatch within seven to11 days, larvae feed throughout the summer, then diapause to resume feeding the following spring. Larvae feed on a variety of plants, predominately sedges and grasses found in fens, sedge meadows, and other wetlands. In the late spring or early summer larvae form a chrysalis. Adults emerge in mid-summer, and can be observed flying for two to three weeks. The number of broods a pair of beetles produce is determined by the length of the summer season. While northern populations produce one brood, southern populations produce two, exhibiting dual mating flight periods during the summer months. The host plants for oviposition are sedges (*Carex* sp.). Adult Mitchell's satyr butterflies are short lived; individuals live two to five days and are rarely observed feeding (USFWS 2014l).

Dakota skippers lay eggs on broadleaf plants although larvae feed only on grasses. They overwinter as larvae and complete one generation per year. Dakota skipper eggs hatch after incubating for seven to 20 days; therefore, hatching is likely completed before the end of July. Nectar and water sources for adult Dakota skippers vary regionally and include purple coneflower (*Echinacea angustifolia*), blanketflower (*Gaillardia aristata*), black-eyed Susan (*Rudbeckia hirta*), purple locoweed (*Oxtryopis lambertii*), bluebell bellflower (*Campanula rotundifolia*), prairie milkvetch (*Astragalus adsurgens*), and yellow sundrops (*Calylophus serrulatus*). Dakota skipper larvae feed on several native grass species. Little bluestem (*Schizachyrium scoparium*) is a frequent food source of the larvae, although they have been found on rosette grass (*Dichanthelium*) other native grasses. When presented with no other choice, the Dakota skipper larvae may feed on a variety of native and nonnative grasses (e.g., Kentucky bluegrass (*Poa pratensis*) through diapause (USFWS 2018).

1.1.15.4 Habitat

Only the habitat characteristics of the southern Mitchell's satyr butterfly populations follow as the northern populations do not overlap mineable coal. Most of the southern sites supporting the MSB in Alabama are small, localized herbaceous-shrub patches, dominated by a diverse assortment of sedges and other wetland graminoids. Additionally, the majority of these sites are located in wetlands that are associated with or influenced or created by beaver activity (Hart, 2004; USFWS, 2014l).

Dakota skippers are obligate residents of undistributed (remnant, untilled) high quality prairie, ranging from wet-mesic tallgrass prairie to dry-mesic mixedgrass prairie. High-quality prairie contains a high diversity of native plant species, including flowering herbaceous plants (forbs) (U.S. FWS 2014y).

1.1.15.5 Threats

The most significant threats to the Mitchell's satyr butterfly species are habitat loss, degradation, and destruction, primarily from natural succession and conversion from fen to agriculture, grazing, and the creation and filling of ponds. These threats have led to a reduction in populations at several sites, fragmentation, smaller-sized occupied sites, lack of connectivity between occupied sites, encroachment of exotic/invasive species, and hydrologic impacts

(USFWS 2014l). Most of the destructive activities are linked in some way to the hydrology that controls groundwater flow and water quality within a Mitchell's satyr butterfly occupied wetland.

Habitat loss, primarily through conversion of native prairie to non-native or woody species, is also the main threat facing the Dakota skipper. Habitat for this species may also be lost or degraded through haying, grazing, pesticide use, and flooding. Any of these practices may fragment habitat and isolate populations, leading to extirpation of small, local populations.

1.1.15.6 Critical Habitat

Critical habitat is not designated for the Mitchell's satyr butterfly. Critical habitat is designated for the Dakota skipper and 4% of the species total critical habitat range overlaps with Action Area in North Dakota.

1.1.16 Fishes

1.1.17 Fishes - Sturgeon

Sturgeons are long-lived, late-maturing fish. They are bottom feeders whose bodies are covered in bony plates called scutes rather than scales. This guild is represented by the ESA-listed Alabama sturgeon (*Scaphirhynchus sutkussi*), Gulf sturgeon (*Acipenser oxyrhynchus desotoi*), and pallid sturgeon (*Scaphirhynchus albus*).

1.1.17.1 Status

The Alabama sturgeon and pallid sturgeon are listed as endangered. Both sturgeon species have experienced drastic reductions in their range, primarily due to dams, changes in habitat quality, and overfishing. The Alabama sturgeon is particularly rare; there were only three documented occurrences from 2001-2010 (USFWS 2010b). The Gulf sturgeon is listed as threatened. The Suwannee and Choctawhatchee populatoins number in the thousands but other populations number in the hundreds (USFWS 2009c).

The following is taken from the recovery plans and five-year reviews of the three listed sturgeon species affected by the action (USFWS 2009c, 2010b, 2014m). Other references are cited in the text

1.1.17.2 Distribution

The sturgeon species potentially affected by these actions occur in the Gulf Coast, Illinois, Northern Rocky Mountain, Appalachian, Gulf and Western Interior coal basins. The amount of their range that overlaps mineable coal ranges from approximately 4 percent for the Gulf sturgeon to approximately 27 percent for the pallid sturgeon.

The Alabama sturgeon is restricted to the Mobile River Basin in Alabama and Mississippi. Its critical habitat overlaps mineable coal by ~14.4%. The pallid sturgeon occupies larger tributaries of the Mississippi River and Missouri River systems. Critical habitat has not been designated for it. The Gulf sturgeon is known from 5 river systems in Florida and 2 in Mississippi. Its critical habitat does not overlap mineable coal.

1.1.17.3 Life History

The Alabama and pallid sturgeons are both obligate freshwater species. The Gulf sturgeon is anadromous. It spends the winter feeding in the Gulf of Mexico, then returns in the spring to freshwater rivers to spawn and spend the summer. Relatively long lived, these sturgeons take several years to reach sexual maturity, females generally taking longer to mature than males.

Spawning occurs in the spring and summer, but females may not spawn every year. Larvae are predominantly pelagic and may drift long distances downstream from spawning sites. Adults can migrate long distances.

All sturgeon are benthic feeders lacking teeth. They rely on a combination of olfactory and tactile senses as well as electroreceptors to locate food. Sturgeon feed on aquatic insects, mollusks, crustaceans, other invertebrates, small fish, and fish eggs.

1.1.17.4 Habitat

In the action area, the sturgeons may be affected by this action all inhabit moderate to large size rivers. The Gulf Sturgeon also inhabits near shore marine and estuarine habitats. Adult Alabama and pallid sturgeon prefer strong currents over stable sand or gravel substrates.

1.1.17.5 Threats

These species are threatened by large river habitat alterations, including dams, channelization, impoundments, dredging, and altered flow regimes. These activities degrade habitat and/or impede migration and recruitment. Additional threats include: point and non-point discharges, incidental take in fisheries and climate change.

1.1.17.6 Critical Habitat

Critical habitat was designated for the Alabama sturgeon in 2009 (USFWS 2009d) and for the Gulf sturgeon in 2003 (USFWS and NOAA 2003). Roughly 14 percent of the Alabama sturgeon's designated critical habitat and roughly 9 percent of the Gulf sturgeon's designated critical habitat overlap mineable coal reserves.

The PBFs for Alabama sturgeon critical habitat are as follows:

(1) A flow regime (i.e., the magnitude, frequency, duration, seasonality of discharge over time) necessary to maintain all life stages of the species in the riverine environment, including migration, breeding site selection, resting, larval development, and protection of cool water refuges (i.e., tributaries). (2) River channel with stable sand and gravel river bottoms, and bedrock walls, including associated mussel beds. (3) Limestone outcrops and cut limestone banks, large gravel or cobble such as that found around channel training devices, and bedrock channel walls that provide riverine spawning sites with substrates suitable for egg deposition and development. (4) Long sections of free-flowing water to allow spawning migrations and development of embryos and larvae. (5) Water temperature not exceeding 32 °C (90 °F); dissolved oxygen levels not less than 5 mg/L (5 ppm), except under extreme conditions due to natural causes or downstream of existing hydroelectric impoundments, where it can range from 5 mg/L to 4 mg/L (5 ppm to 4 ppm); and pH (a measure of acidity) within the range of 6.0 to 8.5.

The PBFs for Gulf sturgeon critical habitat are as follows:

(1) Abundant food items, such as detritus, aquatic insects, worms, and/or mollusks, within riverine habitats for larval and juvenile life stages; and abundant prey items, such as amphipods,

lancelets, polychaetes, gastropods, ghost shrimp, isopods, mollusks and/or crustaceans, within estuarine and marine habitats and substrates for subadult and adult life stages.(2) Riverine spawning sites with substrates suitable for egg deposition and development, such as limestone outcrops and cut limestone banks, bedrock, large gravel or cobble beds, marl, soapstone, or hard clay;(3) Riverine aggregation areas, also referred to as resting, holding, and staging areas, used by adult, subadult, and/or juveniles, generally, but not always, located in holes below normal riverbed depths, believed necessary for minimizing energy expenditures during fresh water residency and possibly for osmoregulatory functions;(4) A flow regime (*i.e.*, the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time) necessary for normal behavior, growth, and survival of all life stages in the riverine environment, including migration, breeding site selection, courtship, egg fertilization, resting, and staging, and for maintaining spawning sites in suitable condition for egg attachment, egg sheltering, resting, and larval staging; (5) Water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages;(6) Sediment quality, including texture and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages; and (7) Safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats (*e.g.*, an unobstructed river or a dammed river that still allows for passage).

1.1.18 Fish – Madtoms

Madtoms are a group of small freshwater catfishes. This guild is represented by the ESA-listed Neosho madtom (*Noturus placidus*) and the yellowfin madtom (*Noturus flavipinnis*).

1.1.18.1 Status

There are approximately 29 madtom species within North America of which seven are federally listed. The representative species are listed as threatened. Populations of both representative species are considered stable (USFWS 2010c, 2013k).

1.1.18.2 Distribution

The madtoms are native to eastern and central North America. Many madtom species, particularly the listed species, have small or highly fragmented ranges. The Neosho madtom is found primarily in the Neosho and Cottonwood rivers in eastern Kansas and northeastern Oklahoma (USFWS 2013k). The yellowfin madtom is found in several tributaries of the upper Tennessee River drainage in Tennessee and Virginia (USFWS 2010c). Approximately 8.1 percent of the yellowfin madtom's range overlaps mineable coal while approximately 21.9 percent of the Neosho madtom's range overlaps mineable coal.

1.1.18.3 Life History

Madtoms are generally nocturnal, hiding under rocks or debris during the day and feeding on aquatic insects and their larva, worms, and small crustaceans at night. The Neosho madtom reaches sexual maturity in approximately one year and rarely lives longer than three years in the wild, though it is known to live up to eight years in a laboratory environment (USFWS 2013k). The yellowfin madtom reaches sexual maturity in approximately two years with a maximum lifespan of five years (USFWS 2010c). These species are believed to spawn between May and July, with eggs laid underneath stable stones and guarded by a parent.

1.1.18.4 Habitat

The Neosho and yellowfin madtoms inhabit medium streams to small rivers of moderate gradient with well-defined riffle-pool complexes. These fish generally shelter within pools under rocks or other debris during the day and forage pebble-gravel or rubble areas during the night. Gravel riffle habitat is of particular importance to the Neosho madtom for its foraging needs (USFWS 2010c, 2013k).

1.1.18.5 Threats

Threats to this guild include impoundments and siltation producing activities such as urban development, mining, logging, and agriculture. Urban development, mining, logging, and agriculture may result in bank failures, excessive sediment deposition, and increased turbidity and water temperature (Wood and Armitage 1997).

The decline of the Neosho madtom has been directly attributed to the construction of several impoundments. Significant stretches of Neosho madtom occupied streams have been impounded, resulting in short isolated reaches of suitable habitat and drastically fragmenting the surviving populations. Though there is very little recent coal mining activity within the current range of the Neosho madtom, a large portion of the species' range within the Spring River still suffers from elevated concentrations of metals resulting from the mining of lead, zinc, and coal (USFWS 2013k). In 1996, a coal slurry impoundment breach dumped an estimated six million gallons of coal slurry into the Powell River watershed. The coal fines were measurable more than 20 miles downstream into yellowfin madtom habitat (USFWS 2010d). Though populations of the yellowfin madtom within the Powell River are notably increasing today, coal mining and processing activities continue to impair both the Clinch and Powell rivers, particularly in Virginia (USFWS 2010c).

1.1.18.6 Critical Habitat

Critical habitat for the Neosho and yellowfin madtoms does not overlap mineable coal basins.

1.1.19 Fish – Darters

Darters are a group of small benthic fishes that have an absent or reduced swim bladder. They dart quickly from place to place when feeding or disturbed.

1.1.19.1 Status

There are about 220 species of darters in the eastern U.S. (Boschung and Mayden 2004). About one-third of these appear to have declining populations or are in danger of surviving. Factors contributing to their imperilment include specialized reproductive behaviors and a high degree of endemism. This guild is represented by 15 ESA-listed darters (Table 1). The six darters listed as threatened include: bayou darter, Kentucky arrow darter, goldline darter, snail darter, trispot darter, pearl darter. The nine darters listed as endangered includes: diamond darter, bluemask darter, vermilion darter, relict darter, watercress darter, duskytail darter, candy darter, rush darter, and Cumberland darter.

1.1.19.2 Distribution

The distribution of darters in North America is restricted to the area east of the Rocky Mountains. Darters potentially affected by these actions occur in the Appalachian, Illinois, Western Interior, and Gulf Coast coal basins. Their degree of range overlap with mineable coal ranges from approximately 7.1 percent to approximately 92.6 percent (Table 1).

1.1.19.3 Life History

The species in this guild all spawn in the spring or early summer. Darters have developed specialized reproductive behaviors, including egg burying, egg attaching, and egg clustering. Many species exhibit parental care of eggs and young. Those species that bury their eggs do so in sand or loose gravel or a mixture of the two. Species that bury their eggs do not exhibit parental care. Species that attach their eggs use objects such as plant stems and roots, leaves, logs, or rocks. Species that employ an egg clustering strategy deposit eggs in clumps or clusters in a structure prepared by the male. In all strategies males fertilize the eggs as they are laid by the female (Boschung and Mayden 2004).

Their diet consists primarily of benthic arthropods, especially immature aquatic insects. A few also consume snails and small crustaceans.

1.1.19.4 Habitat

Members of this guild occupy a variety of benthic habitats including springs and spring brooks, pools, small creeks, and small to medium sized rivers. They occur in stream gradients ranging from low to high with substrates that include sand, gravel, and cobble. They may occur in pools, riffles, or runs.

1.1.19.5 Threats

Threats to this guild include habitat loss and degradation resulting from sedimentation, water quality degradation, water withdrawals, impoundments, modification of riparian zones, industrial effluents and sewage. Sources of these threats include agricultural, urban, and residential development, deforestation, channel modification, coal and non-coal mining, oil and gas development, improper road construction, improper pesticide use, toxic chemical spills, and inadequate wastewater treatment. Habitats have been fragmented by dams, which may lead to genetic isolation and increased vulnerability to local extirpation. Coal mining is specifically considered as a threat for many darter species, including the Bluemask Darter (*Etheostoma akatulo*), Kentucky Arrow Darter (*E. spilotum*), Cumberland Darter (*E, susanae*), duskytail darter (*E. percnurum*) and diamond darter (*Crystallaria cincotta*). Coal mining may affect darters primarily through increased siltation and changes in water quality, including increased conductivity caused by increased levels of metals and other dissolved solids.

1.1.19.6 Critical Habitat

Critical habitat has been designated for the Cumberland darter (*Etheostoma susanae*), the diamond darter (*Crystallaria cincotta*), the rush darter (*E. phytophilum*), the Kentucky arrow darter (*E. spilotum)*, and the candy darter (*E. osburni*). Critical habitat has been proposed for the goldline darter (*Percina aurolineata*) and trispot darter (*Etheostoma trisella*) (USFWS 1977b, USFWS 2012f, 2013p, -2016d, 2018c). Approximately 22.9% of diamond darter critical habitat, 10.4% of Kentucky arrow darter critical habitat, 9.5% of rush darter critical habitat, and 37% of candy darter critical habitat overlaps mineable coal. Data were not available to calculate the overlap of Cumberland darter designated critical habitat. However, since the Cumberland darter's range overlaps mineable coal by 84.4%, its PBFs are listed here. No PBFs were listed for the goldline darter. Data were not available for the overlap of proposed critical habitats of trispot darter and goldline darter with mineable coal.

The PBFs for the Cumberland darter are as follows:

(1) Shallow pools and gently flowing runs of geomorphically stable, second- to fourth-order streams with connectivity between spawning, foraging, and resting sites to promote gene flow throughout the species' range. (2) Stable bottom substrates composed of relatively silt-free sand and sand covered bedrock, boulders, large cobble, woody debris, or other cover. (3) An instream flow regime (magnitude, frequency, duration, and seasonality of discharge over time) sufficient to provide permanent surface flows, as measured during years with average rainfall, and to maintain benthic habitats used by the species. (4) Adequate water quality characterized by moderate stream temperatures, acceptable dissolved oxygen concentrations, moderate pH, and low levels of pollutants. Adequate water quality is defined as the quality necessary for normal behavior, growth, and viability of all life stages of the Cumberland darter. (5) Prey base of aquatic macroinvertebrates, including midge larvae, mayfly nymphs, caddisfly larvae, and microcrustaceans.

The PBFs for the diamond darter are as follows:

(1) A series of connected riffle-pool complexes with moderate velocities in moderate- to large-sized (fourth- to eighth-order), geomorphically stable streams within the Ohio River watershed. (2) Stable, undisturbed sand and gravel stream substrates that are relatively free of and not embedded with silts and clays. (3) An instream flow regime (magnitude, frequency, duration, and seasonality of discharge over time) that is relatively unimpeded by impoundment or diversions such that there is minimal departure from a natural hydrograph. (4) Adequate water quality characterized by seasonally moderated temperatures, high dissolved oxygen levels, and moderate pH, and low levels of pollutants and siltation. Adequate water quality is defined as the quality necessary for normal behavior, growth, and viability of all life stages of the diamond darter. (5) A prey base of other fish larvae and benthic invertebrates including midge, caddisfly, and mayfly larvae.

The PBFs for the rush darter are as follows:

(1) Springs and spring-fed reaches of geomorphically stable, relatively low gradient, headwater streams with appropriate habitat (bottom substrates) to maintain essential riffles, runs, and pools; emergent vegetation in shallow water and on the margins of small streams and spring runs; cool, clean, flowing water; and connectivity between spawning, foraging, and resting sites to promote gene flow throughout the species' range. (2) Stable bottom substrates consisting of a combination of sand with silt, muck, gravel, or bedrock and adequate emergent vegetation in shallow water on the margins of small permanent and ephemeral streams and spring runs. (3) Instream flow with moderate velocity and a continuous daily discharge that allows for a longitudinal connectivity regime inclusive of both surface runoff and groundwater sources (springs and seepages) and exclusive of flushing flows caused by stormwater runoff. (4) Water quality with temperature not exceeding 26.7 ºC (80 ºF), dissolved oxygen 6.0 milligrams or greater per liter (mg/L), turbidity of an average monthly reading of 10 Nephelometric Turbidity Units (NTU; units used to measure sediment discharge) and 15mg/L TSS (measured as mg/L of sediment in

water) or less; and a specific conductance (ability of water to conduct an electric current, based on dissolved solids in the water) of no greater than 225 micro Siemens per centimeter at 26.7 ºC (80 ºF). (5) Prey base of aquatic macroinvertebrates, including midge larvae, mayfly nymphs, blackfly larvae, beetles, and microcrustaceans.

The PBFs for Kentucky arrow darter critical habitat are:

(1) Riffle-pool complexes and transitional areas (glides and runs) of geomorphically stable, first- to third- order streams with connectivity between spawning, foraging, and resting sites to promote gene flow throughout the species' range. (2) Stable bottom substrates composed of gravel, cobble, boulders, bedrock ledges, and woody debris piles with low levels of siltation. (3) An instream flow regime (magnitude, frequency, duration, and seasonality of discharge over time) sufficient to provide permanent surface flows, as measured during years with average rainfall, and to maintain benthic habitats utilized by the species. (4) Adequate water quality characterized by moderate stream temperatures, acceptable dissolved oxygen concentrations, moderate pH, and low levels of pollutants. Adequate water quality is defined as the quality necessary for normal behavior, growth, and viability of all life stages of the Kentucky arrow darter. (5) A prey base of aquatic macroinvertebrates, including mayfly nymphs, midge larvae, caddisfly larvae, stonefly nymphs, and small crayfish.

The PBFs for candy darter critical habitat are:

(1) Ratios or densities of nonnative species that allow for maintaining populations of candy darters. A blend of unembedded gravel and cobble that allows for normal breeding, feeding, and sheltering behavior. (2)Adequate water quality characterized by seasonally moderated temperatures and physical and chemical parameters (e.g., pH, dissolved oxygen levels, turbidity) that support normal behavior, growth, and viability of all life stages of the candy darter. (3) An abundant, diverse benthic macroinvertebrate community (e.g. mayfly nymphs, midge larvae, caddisfly larvae) that allows for normal feeding behavior. (4) Sufficient water quantity and velocities that support normal behavior, growth, and viability of all life stages of the candy darter.

1.1.20 Fish – Minnows

The term minnow is commonly used in reference to any small fresh or saltwater bait fish. However, for the purposes of this BiOp, the term minnow refers to species within the freshwater fish family Cyprinidae and the subfamily Leuciscinae. The Leuciscinae (true minnows) are a large and diverse subfamily of cyprinids which includes species that vary quite substantially in size. The largest minnow in North America is the Colorado pikeminnow (*Ptychocheilus lucius*), an endangered species which once reached lengths of up to 6 feet (1.8 m) and weighed over 100 pounds (45 kg). The largest family of fishes in the world, Cyprinidae encompasses roughly 370 genera and 3,000 species worldwide including the minnows, carps, and related species (Froese and Pauly 2015). The cyprinid family is so diverse that it has proven difficult to determine exact species assignments into subfamilies. In general, all cyprinids lack stomachs and have toothless jaws. Cyprinids rely on specialized pharyngeal teeth for chewing food which are unique to each

species and utilized by taxonomists for the purposes of classification. This guild is represented by 12 ESA-listed species of cyprinids, all of which are currently classified within the subfamily Leuciscinae comprising the true minnows.

1.1.20.1 Status

According to the American Fisheries Society's Endangered Species Committee, nearly half (46 percent) of the 304 North American cyprinid species are classified at some level as imperiled. This number reflects 20 threatened and 47 endangered species as well as 49 vulnerable species, 11 extinct species, and 14 imperiled populations (Jelks et al. 2008). Three of the minnows representing this guild that may be affected by these actions are federally listed as threatened and nine are listed as endangered (Table 1).

1.1.20.2 Distribution

Minnows are widely distributed across the whole of North America and the rest of the world. Listed minnow species potentially affected by these actions occur in the Appalachian, Western Interior, and Northern Rocky Mountains and Great Plains coal basins. Their degree of range overlap with mineable coal ranges from approximately 1.2 percent to approximately 60.6 percent.

1.1.20.3 Life History

Minnows utilize a variety of reproductive strategies which can be loosely divided into two main categories depending on whether or not they prepare spawning substrate. Most species do not prepare spawning substrate and simply broadcast spawn or spawn in crevices. These species do not provide parental care to eggs or larvae but may be territorial (particularly crevice spawners) towards their spawning site. Spawning usually occurs over coarse substrate such as rocks or plants where eggs can fall into crevices, be deposited beneath or between rocks, buried, or otherwise hidden. Several broadcast spawning species associate themselves with other minnow or non-minnow species which do construct nests. Preparation of substrate for the purposes of spawning may be considered a form of pre-fertilization parental care. In North America this task is only undertaken by males. Substrates are prepared in a variety of forms including saucer, pit, pit-ridge, and mounds and utilize techniques such as egg-clumping and egg clustering (Boschung and Mayden 2004). In all strategies, males fertilize the eggs externally as they are laid by the female. Many broadcast spawning fish species congregate in large groups which many contain several thousand individuals. The eggs and larvae of broadcasting spawning fish develop while suspended in the water column and may be carried considerable distances downstream. Other species form individual male-female pairs utilizing a breeding strategy known as clasping. A clasp occurs when a male places a pectoral fin under a female and curves his body close to hers. The clasp allows a male more exclusive access to a female and assures fertilization of most of her eggs (Johnston and Page 1992).

Due to a lack of stomach and teeth, most minnows feed primarily on small invertebrates and aquatic vegetation. However, some larger species are capable of capturing and eating fish and other small vertebrates such as tadpoles.

1.1.20.4 Habitat

Minnows inhabit a variety of habitats including springs and spring brooks, pools, small creeks, and small to large sized rivers as well as lentic habitats such as ponds and lakes. They occur in stream gradients ranging from low to high with substrates that include silt, sand, gravel, and cobble. They may occur in pools, riffles, runs, eddies or glides.

1.1.20.5 Threats

Threats to this guild include habitat loss and degradation resulting from sedimentation, water quality degradation, water withdrawals, impoundments, modification of riparian zones and stream channels, competition/predation by nonnatives, industrial effluents, and sewage. Sources of these threats include agricultural, urban, and residential development, deforestation, channel modification, coal and non-coal mining, oil and gas development, improper road construction, improper pesticide use, toxic chemical spills, and inadequate wastewater treatment. Many minnow habitats have been fragmented by dams, which may lead to genetic isolation, prevent migration, and increase vulnerability to local extirpation.

Coal mining is specifically considered as a threat for six listed species that may be affected by the action: blackside dace (*Chrosomus cumberlandensis*), laurel dace (*Chrosomus saylori*), spotfin chub (*Erimonax monachu*s), slender chub (*Erimystax cahni*), Cahaba shiner (*Notropis cahabae*) and the palezone shiner (*Notropis albizonatus*). All six species are native to creeks, streams, and smaller river tributaries within the Tennessee, Cumberland, and Mobile River drainages. Historic mining within the Appalachian coal basin has contributed to the fragmentation and decline of these species and their ranges. Current coal mining may or may not present an immediate risk to these species. However, legacy effects including contaminated mine drainage and sedimentation from abandoned coal mines may continue to pose a threat to these species and/or prevent the reestablishment of their historic ranges.

The blackside dace is a federally threatened minnow identified as a headwater fish species of particular concern due to its current range, habitat, and existing coal mining impacts on the species. The blackside dace inhabits small streams within the upper Cumberland River watershed in Kentucky and Tennessee and in a tributary of the North Fork Powell River in Virginia (the North Fork Powell population is believed to be the result of a “bait bucket” introduction). Of all the minnow species that may be affected by these actions, the blackside dace is the most commonly encountered species of concern for coal mining operations. Fragmented by surface coal mining and other anthropogenic causes, the species now exists as several dozen small isolated populations.

The blackside dace tends to be less abundant when conductivity is elevated and has declined in abundance in streams that experienced higher conductivity after mining (USFWS 2015f; Black et al. 2013; Hitt, et al. 2016). Competition by the southern redbelly dace (*Chrosomus erythrogaster*) is also a concern. The southern redbelly dace displaces the blackside dace in streams where water quality and habitat have been altered by human influences (including coal mining) to create warmer and more turbid conditions (Starnes and Starnes 1981).

The laurel dace persists in three creek systems on Walden Ridge of the Cumberland Plateau in Tennessee. One of the greatest threats to the laurel dace is excessive sedimentation from the surrounding watershed cause by agriculture and silviculture activities. Two coal mining permits have been issued in this drainage. As of June 2017, one was in phase one bond release and the other had not been activated (M. Moran, personal communication, June 27, 2017). Therefore, coal mining may be a threat to the laurel dace.

Extirpated from most of its native range, the spotfin chub currently persists in five isolated tributary systems within the Tennessee River drainage. Pollution and sedimentation from coal mining contributed to the species' decline, particularly in the Emory, Clinch, and Powell river systems (USFWS 1983). The slender chub is historically known from the Clinch and Powell rivers, as well as the lower Holston River. The Holston River population is assumed extirpated as result of inundation from the construction of the Cherokee Dam. Despite numerous extensive survey efforts the slender chub has not been collected from the Clinch or Powell rivers in nearly 20 years. However, it is possible that the slender chub still exists in very low numbers in one or both rivers (USFWS 2014j). Despite increased coal mining activity within the Clinch River watershed in recent years, a multi-agency coordination effort intended to improve water and habitat quality impacts from coal mining and other sources in the Clinch and Powell rivers has resulted in some noticeable improvements. These improvements are indicated by successful efforts to reintroduce captively propagated mussels into the watersheds (USFWS 2014j). Though noticeable improvements in coal-related problems have occurred in the Clinch and Powell Rivers, contaminated drainage and sources of sedimentation, including from abandoned (lands affected before the enactment of SMCRA) and active coal mines, remain an ongoing threat to remaining populations and future reintroduction efforts of the spotfin chub and slender chub.

The only two remaining populations of the palezone shiner occur in the Paint Rock River in Alabama and the Little South Fork of the Cumberland River, Kentucky. The primary threats listed in the palezone shiner recovery plan (USFWS 1997) were water pollution from coal mining activities, reservoir construction, and subsequent loss of free-flowing stream habitat, removal of riparian vegetation and concomitant increases in stream temperatures, stream channelization, increased siltation associated with poor agricultural and mining practices, and deforestation of watersheds. All of these threats remain, but resource extraction (primarily oil production and coal mining) has been raised most often by Kentucky investigators for the observed water quality and habitat degradation that has occurred over the past three decades in the Little South Fork of the Cumberland River (USFWS 2014h).

1.1.20.6 Critical Habitat

Critical habitat has been designated for eight of the minnow species that may be affected by the action (USFWS 1977a, USFWS 1994, USFWS 2012f). These species and the amount of critical habitat overlap with mineable coal are shown in Table 1. PBFs are undefined for the slender chub, spotfin chub, and the Little Colorado spinedace. Critical habitat for the Rio Grande silvery minnow and the Little Colorado spinedace does not overlap potentially mineable coal reserves.

The PBFs for the laurel dace are as follows: (1) Pool and run habitats of geomorphically stable, first- to second-order streams with riparian vegetation; cool, clean, flowing water; shallow depths; and connectivity between spawning, foraging, and resting sites to promote gene flow throughout the species' range. (2) Stable bottom substrates composed of relatively silt-free gravel, cobble, and slab-rock boulder substrates with undercut banks and canopy cover. (3) An instream flow regime (magnitude, frequency, duration, and seasonality of discharge over time) sufficient to provide permanent surface flows, as measured during years with average rainfall, and to maintain benthic habitats utilized by the species. (4) Adequate water quality characterized by moderate stream temperatures, acceptable dissolved oxygen concentrations, moderate pH, and low levels of pollutants. Adequate water quality is defined as the quality necessary for normal

behavior, growth, and viability of all life stages of the laurel dace. (5) Prey base of aquatic macroinvertebrates, including midge larvae, caddisfly larvae, and stonefly larvae.

The PBFs for the humpback chub, bonytail, and Colorado pikeminnow are as follows:

(1) Water: This includes a quantity of water of sufficient quality (i.e., temperature, dissolved oxygen, lack of contaminants, nutrients, turbidity, etc.) that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage for each species. (2) Physical Habitat: This includes areas of the Colorado River system that are inhabited or potentially habitable by fish for use in spawning, nursery, feeding, and rearing, or corridors between these areas. In addition to river channels, these areas also include bottom lands, side channels, secondary channels, oxbows, backwaters, and other areas in the 100-year flood plain, which when inundated provide spawning, nursery, feeding and rearing habitats, or access to these habitats. (3) Biological Environment: Food supply, predation, and competition are important elements of the biological environment and are considered components of this constituent element. Food supply is a function of nutrient supply, productivity, and availability to each life stage of the species. Predation and competition, although considered normal components of this environment, are out of balance due to introduced nonnative fish species in many areas.

Critical habitat for the humpback chub, bonytail, and Colorado pikeminnow is located in large rivers unlikely to be directly affected by coal mining; impacts such as alteration of water chemistry or sediment quality may occur.

1.1.21 Fish – Suckers

Suckers are a group of freshwater benthic fishes that can range in size from 16 to 100 cm. Members of this group have a subterminal mouth with fleshy, protuberant lips and a single row of usually at least 20 pharyngeal teeth. This guild is represented by the ESA-listed Zuni Bluehead Sucker (*Catostomus discobolus yarrow*) and the razorback sucker (*Xyrauchen texanus*).

1.1.21.1 Status

There are over 70 species of suckers native to North America (Jacquemin and Doll 2015), 9 of which are federally listed as threatened or endangered. The representative species are both endangered. Factors contributing to their imperilment include interaction with invasive species, loss of habitat, and lack of genetic diversity due to isolated populations. The Zuni bluehead sucker is limited to five fragmented populations containing as few as several hundred individuals with distribution reduced over 90 percent in the last 20 years (Carman 2004; USFWS 2013o). The total adult population of the razorback sucker is thought to be no more than a few thousand (NatureServe 2017). Though restocking has been occurring in the Green and Colorado Rivers, the razorback sucker is experiencing a steady decline in population, with the largest remaining subpopulation more than halving to fewer than 3,000 over the course of ten years (Marsh et al. 2003).

1.1.21.2 Distribution

In North America, suckers are widely distributed; they can be found in rivers and streams throughout the country. The two sucker species representing this guild have a drastically reduced range that is limited to the Colorado River system in the Colorado Plateau and Northern Rocky Mountain coal basins. The range of the Zuni bluehead Sucker overlaps mineable coal by

approximately 18.2 percent and the range of the razorback sucker overlaps mineable coal by approximately 0.6 percent.

1.1.21.3 Life History

Most suckers are bottom feeders. Their diet consists of algae, zooplankton, detritus, aquatic insect larvae, and mollusks (Boschung and Mayden 2004). Spawning takes place during the spring or early summer months over sand, gravel, or rock substrate (Warren and Burr 2014). The Zuni bluehead Sucker requires clean gravel substrate with minimal silt for spawning (USFWS 2014c). It matures around age 2 with an average life span of four years. The razorback spawns during spring runoff over substrates of cobble, sand, and gravel. They may also spawn over rocky shoals and shorelines of reservoirs (USFWS 2002b). It matures in 2 to 3 years with an average lifespan of 20 years.

1.1.21.4 Habitat

The species in this guild occupy a variety of benthic habitats. They range from habitats like pools, pool-runs, backwaters, and flooded channels to medium-large rivers and shallow lakes. They occur in stream gradients that range from low to high with substrates that include sand, gravel, and cobble. The Zuni bluehead sucker prefers shaded headwater streams containing low-velocity pools, pool-runs and cobble/boulder/bedrock substrates (Carmen 2004). The razorback sucker is a large river species. Adults inhabit a variety of habitats throughout the year including backwaters, flooded side channels, pools, eddies, deep runs, and sheltered shoreline habitats (USFWS 2002b). High spring flows are necessary in order to maintain channel and habitat diversity, flush sediments from spawning areas, rejuvenate food production, and maintain gravel and cobble deposits used for spawning. Young require low velocity waters such as shorelines, bottomlands, and backwaters for nursery habitat (USFWS 2002b).

1.1.21.5 Threats

Threats to this guild consist mainly of habitat loss and degradation due to urban, agricultural, and industrial development. Degradation is a result of such processes as water withdrawal, sedimentation, stream alteration, gullying, elevated siltation, overgrazing, logging, vegetation removal, road construction, and impoundment construction. Secondary effects of urban development include increased waste and interaction with domestic and invasive species.

1.1.21.6 Critical Habitat

Critical habitat has been designated for both the Zuni bluehead sucker and the razorback sucker. None of the Zuni bluehead sucker's critical habitat overlaps with mineable coal, but 24.3% of the species total range overlaps mineable coal. Less than 1 percent of the designated critical habitat for the razorback sucker overlaps mineable coal reserves.

The PBFs for the Zuni bluehead sucker critical habitat are as follows:

(1) A riverine system with habitat to support all life stages of Zuni bluehead sucker (egg, larval, juvenile, and adult), which includes: a) Dynamic flows that allow for periodic changes in channel morphology and adequate river functions, such as channel reshaping and delivery of coarse sediments. b) Stream courses with perennial flows, or areas that may be periodically dewatered but serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted; c) Stream microhabitat types including runs, riffles, and pools with substrate ranging from gravel, cobble, and bedrock substrates with low or moderate amounts of fine sediment and substrate embeddedness; and d) Streams with depths generally less than 2 m (3.3 ft), and with slow to swift flow velocities less than 35 cm/sec

(1.1 ft/sec); e) Clear, cool water with low turbidity and temperatures in the general range of 2.0 to 23.0 °C (35.6 to 73.4 °F). f) No harmful levels of pollutants; g) Adequate riparian shading to reduce water temperatures when ambient temperatures are high and provide protective cover from predators; and (2) An abundant aquatic insect food base consisting of fine particulate organic material, filamentous algae, midge larvae, caddisfly larvae, mayfly larvae, flatworms, and small terrestrial insects. (3) Areas devoid of nonnative aquatic species or areas that are maintained to keep nonnatives at a level that allows the Zuni bluehead Sucker to continue to survive and reproduce.

The PBFs for the razorback sucker mirror that of the other endangered Colorado River fishes discussed in the minnows section and are as follows:

(1) Water: This includes a quantity of water of sufficient quality (i.e., temperature, dissolved oxygen, lack of contaminants, nutrients, turbidity, etc.) that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage for each species. (2) Physical Habitat: This includes areas of the Colorado River system that are inhabited or potentially habitable by fish for use in spawning, nursery, feeding, and rearing, or corridors between these areas. In addition to river channels, these areas also include bottom lands, side channels, secondary channels, oxbows, backwaters, and other areas in the 100- year flood plain, which when inundated provide spawning, nursery, feeding and rearing habitats, or access to these habitats. (3) Biological Environment: Food supply, predation, and competition are important elements of the biological environment and are considered components of this constituent element. Food supply is a function of nutrient supply, productivity, and availability to each life stage of the species. Predation and competition, although considered normal components of this environment, are out of balance due to introduced nonnative fish species in many areas.

(2) Additional selection criteria were provided for the razorback sucker in the 1994 critical habitat determination: (1) Presence of known or suspected wild spawning populations, although recruitment may be limited or nonexistent. (2) Areas where juvenile razorback suckers have been collected or which could provide suitable nursery habitat (backwaters, flooded bottom lands, or coves). (3) Areas presently occupied or that were historically occupied that are considered necessary for recovery and that have the potential for reestablishment of Razorback Suckers. (4) Areas and water required to maintain range wide fish distribution and diversity under a variety of physical, chemical, and biological conditions. (5) Areas that need special management or protection to ensure razorback survival and recovery. These areas once met the habitat needs of the Razorback Sucker and may be recoverable with additional protection and management.

1.1.22 Fish – Trout

Trout are a group of ray-finned fishes with a small adipose (fatty) fin behind the dorsal fin. Though the word trout often is used in the common names of some non-salmonids including some perch species, all trout described in this guild are freshwater fishes of the family Salmonidae and subfamily Salmonininae. This guild is represented by the ESA-listed Apache trout (*Oncorhynchus apache)*, Greenback cutthroat trout *(Oncorhynchus clarkia stomias)*, and the Gila trout *(Oncorhynchus gilae)*.

1.1.22.1 Status
There are approximately 33 trout species within North America, of which 10 are federally listed. All three representatives of this guild were initially listed as endangered but were down-listed to threatened status.

1.1.22.2 Distribution
Trout are widely distributed across the whole of North America and the rest of the world. Listed trout species potentially affected by these actions occur in the Colorado Plateau and the Northern Rocky Mountains and Great Plains coal basins. Their degree of range overlap with mineable coal ranges from 0.3 to 6.2 percent.

1.1.22.3 Life History
The members of this guild spawn in the spring to early summer. All species in this guild require clean, coarse gravel substrates for spawning (USFWS 1998, 2003b, 2009g).

Female trout build nests of clean, silt-free gravel (redds), generally in the cooler months when water is cold and highly oxygenated. Eggs are fertilized by a male as they are laid and then buried within the redd. Newly hatched trout (alevins) continue to develop in the gravel beds for an additional 2 to 4 weeks while feeding off their remaining yolk sack. Once the yolk sack is consumed the alevins become fry and emerge from the gravel to feed. At this stage the fish become territorial and require large amounts of small prey items (generally tiny aquatic insects), protected areas with low velocity waters, and structure such as cobble or aquatic vegetation to conceal themselves from predators and other fry. Mortality rates are extremely high at this stage. The juvenile fish continue to grow and eventually gain enough strength to navigate stronger currents, allowing them to find and establish adult territories downstream of their spawning site.

Members of this guild prey primarily on aquatic invertebrates but greenback cutthroat have been reported to consume terrestrial vertebrates including salamanders (USFWS 1998, 2003b, 2009g).

1.1.22.4 Habitat
The species in this guild occur in moderate to high gradient high elevation mountain streams. Important habitat features include overhanging riparian vegetation, undercut banks, submerged large woody debris, deep pools, aquatic plant beds, and root masses (USFWS 1998, 2003b, 2009g).

1.1.22.5 Threats
Primary threats to this guild include modification of natural flow regimes through water withdrawal, water storage, dam construction, and diversion for agriculture, urban and agricultural development, logging, and mining (non-coal). These actions could result in habitat degradation, increased water temperatures, depleted flows necessary for migration, and reduced reproductive success. Whirling disease, a cartilaginous infection common in salmonids, is also a potential threat that causes involuntary circle swimming, rendering the fish unable to eat or evade predators (Faisal and Garling 2004).

1.1.22.6 Critical Habitat
Critical habitat is not designated for any of the trout species potentially affected by the proposed actions.

1.1.23 Crustaceans - Crayfishes
Crustaceans are a large group of arthropods in the class Crustacea. They have a hard exoskeleton, 2-parted limbs, and a pair of often highly modified appendages on each segment.

Their larvae begin as nauplii. The list of species that may be affected by this action includes three crustaceans: the Big Sandy crayfish (*Cambarus callainus*), and the Guyandotte River crayfish (*C. veteranus*) and the slenderclaw crayfish (*C. cracens*).

1.1.23.1 Status

The Big Sandy crayfish (*Cambarus callainus*) was listed as threatened and the Guyandotte River crayfish (*C. veteranus*) was listed as endangered in April 2016. The two species were formerly thought to be a single species, *C. veteranus*. However, Thoma et al. (2014) separated them based on genetic and morphological differences. The Guyandotte River crayfish has experienced a significant reduction in its historical range and is now restricted to two streams (Loughman et al. 2016). There has been a likely reduction in the Big Sandy crayfish's historical range as well. The populations of both species appear to be depressed, critically so for the Guyandotte River crayfish.

The slenderclaw crayfish was proposed for threatened status with a 4(d) rule in 2018. It currently is known from only 2 populations. There are no current population estimates for this species.

1.1.23.2 Distribution

The Big Sandy crayfish is endemic to the Big Sandy River basin in eastern Kentucky, southwestern Virginia, and southern West Virginia. Its range overlaps mineable coal by approximately 98 percent. The Guyandotte River crayfish is currently known only from Pinnacle Creek and Clear Fork in Wyoming County, West Virginia in the Guyandotte River basin. Its range overlaps mineable coal by approximately 100 percent.

The slenderclaw crayfish occurs in 2 populations in Shoal Creek (Marshall County), and Bengis Creek and Town Creek (DeKalb County) in the Tennessee River watershed in Alabama. These localities are on Sand Mountain at the southern end of the Cumberland Plateau. It range overlaps mineable coal by approximately 87 percent.

Unless noted, the following life history and habitat information is taken from the Federal Register notices of proposed and final listing of these species (USFWS 2015a, 2016e) and the Species Status Assessment for the slenderclaw crayfish (USFWS 2018d):

1.1.23.3 Life History

All three species are tertiary burrowers. They construct shallow excavations underneath loose cobbles and boulders in streams.

It is believed that the Big Sandy crayfish matures in its third year and mates in its third or fourth year. Egg laying occurs in late summer or fall, with release of young in the spring. Big Sandy crayfish are believed to live from five to seven years, with some possibly living as up to 10 years.

All sexes and age classes have been observed during March and May through October. Mating behavior has been observed in July. Ovigerous (egg carrying) females have been reported in July through October, with females carrying larvae in September, October, and March. Females that spawn late may overwinter with larvae attached.

There is less information available on the Guyandotte River crayfish, but it is believed to have a similar lifespan and age to maturity as the Big Sandy crayfish.

Males of the Guyandotte River crayfish have been observed in April and June through September. No ovigerous females are known to have been collected, but a laboratory-kept specimen collected in June extruded eggs in July. Females carrying larvae have been observed in March. Females with larvae have been observed under slab boulders in loose, depositional sands and silts in stream reaches with slower velocities.

A laboratory study showed the Big Sandy crayfish had a preferred animal matter but would also consume plant matter. Both the Big Sandy crayfish and the Guyandotte River crayfish may be opportunistic omnivores.

Little is known about the slenderclaw crayfish's life history. It is presumed to have a similar life history to other species in the family Cambaridae.

1.1.23.4 Habitat

Big Sandy and Guyandotte River crayfish appear to prefer higher elevation, clean, third or fourth order or larger fast flowing permanent streams and rivers. They are both associated with riffles and runs or pools with current. Large, unembedded slab boulders on sand, cobble, or bedrock stream are an important habitat component. They appear to be intolerant of excessive sedimentation. All known records of the Big Sandy crayfish are from about 180 to 500 m (600 to 1,640 ft) elevation and all known records of the Guyandotte River crayfish are from about 230 to 520 m (750 to 1,700 ft) elevation.

The slenderclaw crayfish is found in streams with large boulders and fractured bedrock about 5-6m wide, that are clear and up to 0.7m deep. It is also found in streams with sand, gravel, and cobble substrate that are ~3m wide and up to 0.15m deep.

1.1.23.5 Threats

The primary threat to Big Sandy and Guyandotte River crayfishes is habitat degradation due to erosion and sedimentation leading to stream substrate embeddedness (Loughman et al. 2016, 2017). The effects of small population size are also a threat. Other threats include degraded water quality and unpermitted stream dredging. It is also likely that competition from other crayfish, toxic spills, and climate change are additional contributing factors. Water quality is degraded in both the Big Sandy and Upper Guyandotte River basins with metals and pH impairment common (USFWS 2016e). The sources of these impairments include: coal mining; roads; logging; oil and gas development; on-road and off-road transportation; and residential/commercial development and associated stream modifications. Due to ongoing threats to Guyandotte River crayfish related to coal mining impacts to streams and water quality, the Service has developed species specific protective measures designed to avoid or minimize further impacts to the species (Appendix B).

Threats to the slenderclaw crayfish include hydrologic variation and alteration, poultry farming and agriculture, degraded water quality, low abundance, and non-native species. Coal mining is not mentioned as a threat.

1.1.23.6 Critical habitat

Critical habitat has been proposed for the Big Sandy River crayfish, Guyandotte River crayfish and slenderclaw crayfish. Proposed critical habitat for the Big Sandy crayfish overlaps mineable

coal by 90% and 100% of proposed critical habitat for the Guyandotte River crayfish overlaps mineable coal. Given the high degree of overlap of mineable coal with proposed designated critical habitat for both Big Sandy River crayfish and Guyandotte River crayfish the proposed PBFs are listed below. Data are not available to estimate overlap of proposed critical habitat with mineable coal for slenderclaw crayfish range.

Proposed PBFs essential for the conservation of the Big Sandy and Guyandotte River crayfishes include (85 FR 5072 5122):(1) Fast-flowing stream reaches with unembedded slab boulders, cobbles, or isolated boulder clusters within an unobstructed stream continuum (i.e., riffle, run, pool complexes) of permanent, moderate- to large-sized (generally third order and larger) streams and rivers (up to the ordinary high water mark as defined at 33 CFR 329.11). (2) Streams and rivers with natural variations in flow and seasonal flooding sufficient to effectively transport sediment and prevent substrate embeddedness. (3) Water quality characterized by seasonally moderated temperatures and physical and chemical parameters (e.g.,pH, conductivity, dissolved oxygen) sufficient for the normal behavior, growth, reproduction, and viability of all life stages of the species. (4) An adequate food base, indicated by a healthy aquatic community structure including native benthic macroinvertebrates, fishes, and plant matter (e.g., leaf litter, algae, detritus). (5) Aquatic habitats protected from riparian and instream activities that degrade the physical and biological features described in (1) through (4), above, or cause physical (e.g., crushing) injury or death to individual Big Sandy or Guyandotte River crayfish. (6) An interconnected network of streams and rivers that have the physical and biological features described in (1) through (4), above, that allow for the movement of individual crayfish in response to environmental, physiological, or behavioral drivers. The scale of the interconnected stream network should be sufficient to allow for gene flow within and among watersheds.

1.1.24 Mollusks – Freshwater Mussels

Mollusks are a large and highly diverse group of invertebrates in the phylum Mollusca. They exhibit a variety of characteristics such that it is difficult to describe a set of characteristics that applies to all members. Broadly however, they all possess a mantle with a cavity used for breathing and excretion. The mollusks analyzed here all possess a shell made from calcium and a foot of soft tissue. The list of mollusks that may be affected by these actions include 51 freshwater mussels and six snails.

Freshwater mussels are bivalve mollusks. Their shell consists of two valves connected by a hinge. They are filter feeders that occur in wide variety of aquatic habitats from small creeks to large rivers and lakes. This guild is represented by 51 species of freshwater mussels (Table 1).

1.1.24.1 Status

The list of freshwater mussels potentially affected by this action contains 51 species, 42 that are endangered, seven that are threatened, and two that were recently proposed (Table 1).

Freshwater mussels are one of the most imperiled faunal groups in North America. They have declined more than any other widely distributed group of organisms over the past 100 years (Strayer et al. 2004). Approximately 74 percent of all mussel species are in some form of imperilment, either as federally listed species or species of conservation concern.

North America contains the most mussel species anywhere in the world, with most of the diversity concentrated in the southeastern U.S. (Parmalee and Bogan 1998). The Tennessee-

Cumberland, Mobile, and Ohio River drainage basins are all centers of mussel diversity in the U.S. (USFWS 2014b; Williams et al. 2008a).

One of the most diverse mussel assemblages in the Southeast is located in the Clinch-Powell river system in Tennessee and Virginia. The Clinch River contains 24 federally endangered mussels. This is the highest concentration of extant federally listed species in the U.S. (Jones et al. 2014). Zipper et al. (2014) called the Clinch River "arguably the most important river for freshwater mussel conservation in the United States." The Powell River, a major tributary to the Clinch, contains at least 11 and possibly as many as 17 federally endangered mussels (Johnson et al. 2012).

Several surveys have documented a decline in the diversity and density of mussels in the Powell and Clinch rivers over the last 30 years (e.g. Wolcott and Neves 1994; Ahlstedt and Tuberville 1997; Diamond et al. 2002). More recently, Johnson et al. (2014) documented 29 species in the Powell River (down from a historical high of 46) as well as evidence of recruitment for four federally endangered species. Long-term monitoring in the Virginia reach of the Clinch River revealed a "dead zone" in a 68 km (42 mi) reach between St. Paul and Clinchport, while other sections exhibited low density but appeared to be recruiting. At one site in the "dead zone", mussel density declined by 96 percent over a 25 year period. The Tennessee portion of the Clinch population is "healthy and robust" (Jones et al. 2014).

Johnson et al. (2014) conducted intensive analyses of water and sediment quality at two sites in the Clinch River, with most data obtained over an approximately 2-year period, 2009 - 2011. These researchers found that turbidity, specific conductance (SC), and water-column concentrations of several constituents, including Cl, Ca, F, K, Fe, Na, Mg, Se, and sulfate, were significantly greater at the site in the impacted reach than at Horton Ford, in the Tennessee reference reach just south of the state line (RKM 320.4, RM 199.1). Additional water quality evaluation at 15 sites along the mainstem Clinch River showed that the spatial distributions of elevated dissolved ions (Ca, Na, Cl, and Fl) and metals (total Fe and Mn) concentrations correlated with spatial patterns of mussel decline. Johnson et al. (2014) found bed sediment contamination by metals at levels that appear capable of impairing mussel growth, but bed-sediment metal levels did not correspond with patterns of mussel decline. Caged hatchery-raised mussels exposed to ambient waters and native mussels harvested in impacted reaches accumulated higher tissue concentrations for a number of metals (e.g., Cd, Co, Cu, Fe, Pb, Ni, Th, V) than similarly treated mussels placed in reaches harboring high-quality assemblages, suggesting that water column exposure is more significant to metals uptake in mussels than are bed-sediment exposures.

The Johnson et al. (2014) findings indicate that dissolved major ion concentrations vary among river reaches but do not exceed water quality criteria. The researchers interpreted their findings to suggest that inflows to the mainstem from tributaries that drain mined areas increase dissolved constituent concentrations while water influxes from tributaries that drain land without mines cause dilution and lower concentrations. This interpretation is consistent with observations by numerous studies of elevated dissolved solids concentrations in waters draining lands with coal mining (e.g., Pond et al. 2008, and numerous other studies). In summary, Johnson et al. (2014) observed that concentrations of certain water-column metals (measured as total forms) and major

ions correlated with patterns of mussel decline, while organic compounds, water-column nutrients, bed sediment metals, and bed sediment organic compounds did not.

1.1.24.2 Distribution

Freshwater mussels potentially affected by this action are distributed across a large part of the action area, including the Appalachian, Gulf, Western Interior, and Illinois coal basins. They occur in streams and rivers ranging from headwaters to large rivers. The degree of range overlap with mineable coal ranges from approximately 4.0 percent to approximately 64.5 percent (Table 1).

1.1.24.3 Life History

The following is taken from the Service's recovery plan for five Cumberlandian mussels (USFWS 2004a).

Mussels are aquatic invertebrates that have a complex life history. They generally have separate sexes although hermaphroditism is known for some species. Age at sexual maturity is variable, ranging from three to 10 years. To reproduce, males expel sperm into the water column and females take the sperm in via a siphon during respiration and filter feeding. Fertilization takes place inside the female's gills and the resulting zygotes develop into specialized veliger larvae called glochidia.

Although some species do not fall clearly into either category, mussels are generally categorized as short-term or long-term brooders. Short-term brooders undergo fertilization in the spring and release glochidia in the summer or early fall. Long-term brooders undergo fertilization in late summer or early fall, incubate glochidia over the winter, and release them the following spring or summer.

Spawning in mussels appears to be dependent on water temperature. Winter releasers expel glochidia when water temperature is below a certain point and summer releasers expel glochidia when water temperature is above a certain point.

Released glochidia are expelled into the water column where they must come into contact with specific species of fish. They must attach to the gills or fins of these host fishes in order to transform into juvenile mussels. If they fail to come into contact with a host fish they die.

Glochidia are released as netlike mucoid strands, discreet packets termed "conglutinates", a mass of conglutinates termed a "superconglutinate", or as loose masses. Some conglutinates may resemble prey items of fish such as worms, insect larvae, or fish fry. Some mussels have modified their mantle tissue to exhibit bright colors, wave motions, or resemble fish prey items such as worms, insect larvae, or fish fry to attract a fish host so they may attach their glochidia to the fish.

Most mussel species require specific fish species as glochidial hosts, although host fishes are not known for all species. Mussels may use one primary host species or many, although most mussels use only a few fish species as larval hosts. Glochidia can remain attached to a host fish for long or short periods of time depending on the species. Newly transformed juveniles drop off the fish host and drift with the current until they settle onto and burrow into stream substrate. Survival of juvenile mussels is partly dependent on settling into suitable habitat although predation is also a factor.

Since mussels are relatively immobile as adults, parasitism of host fish by glochidia plays an important role in the distribution and dispersal of mussels both locally and between river drainages. A healthy fish community composed of species that mussels utilize as hosts is critical for a healthy mussel population.

Adult mussels feed by filtering detritus, plankton, and bacteria from the water. Juvenile mussels feed by using their foot to pick up organic and inorganic particles including bacteria, algae, diatoms, and detritus.

Mussels grow rapidly in their first years and then slow down when they reach sexual maturity. While smaller species may live 10 to 40 years, some larger species can live for 100 to 200 years.

1.1.24.4 Habitat

Mussels may occur in streams ranging in size from small headwaters to large rivers. They are usually found in patches (beds). Most species will bury themselves in the substrate, thus the physical qualities of the substrate (e.g. texture, particle size) may be important in determining suitable habitat, although no strong predictive relationships have been found between mussel distribution and numerous microhabitat variables.

In addition to suitable physical qualities, substrate must be stable to be good quality habitat for mussels. The stream channel itself must also be stable. Slab boulders are often the most stable area of a stream and make good mussel habitat. Areas that are stable enough to exhibit very little particle movement during floods (flow refuges) are also necessary for quality mussel habitat. Unstable substrates and stream channels are poor mussel habitat.

Water velocity may also predict where certain species are found. Heavier shelled species generally occur in areas with current while thin-shelled species tend to prefer edges and backwater areas.

1.1.24.5 Threats

Mussels and their habitats are impacted by excessive bed loads of smaller sediment particles, changes in turbidity, increased suspended solids (primarily resulting from nonpoint-source loading resulting from poor land-use practices and lack of, or maintenance of, best management practices), and pesticides. Other primarily localized impacts include coal mining, gravel mining, reduced water quality below dams, developmental activities, water withdrawal, impoundments, and non-native species. Mussels that have restricted ranges and low population levels also increase their vulnerability to toxic chemical spills and the deleterious effects of genetic isolation (USFWS 2004a). Threats to populations of host fishes can also be considered threats to mussels.

Water and sediment contaminants are generally acknowledged to be responsible for the declines in mussel populations that have been observed in the Clinch and Powell rivers (Price et al. 2014). There are multiple sources of pollution responsible for the decline in freshwater mussel diversity but several studies have identified coal mining as one of the sources in the Powell River (Kitchel et al. 1981; Wolcott and Neves 1990, 1994; McCann and Neves 1992; Ahlstedt and Tuberville 1997; Diamond et al. 2002). Long-term water monitoring shows that concentrations of coal mining related contaminants are declining in the Clinch and Powell rivers, although dissolved solids are increasing (Price et al. 2011). Although some authors feel that the specific sources of the decline in the Virginia reach of the Clinch River have not been identified (Jones et al. 2014; Price et al. 2014) the Service considers coal mining one of the major reasons listed species there remain imperiled (USFWS 2012c, 2013f).

Despite increased coal mining activity within the Clinch River watershed in recent years, a multi-agency coordination effort intended to improve water and habitat quality impacts from coal mining and other sources in the Clinch and Powell rivers has resulted in some noticeable improvements. These improvements are indicated by successful efforts to reintroduce captively propagated mussels into the watersheds (USFWS 2014j).

1.1.24.6 Critical habitat

Critical habitat has been designated for several mussel species being analyzed in this BiOp (Table 1). Some units partially or completely overlap critical habitat with glochidia host fish species, the slender chub, spotfin chub and yellowfin madtom.

While the PBFs described in the listings vary somewhat, they are similar (USFWS 2004b, 2004c, 2012b, 2013e). The description of critical habitat for the Neosho mucket and rabbitsfoot encompasses the PBFs for all mussel species with designated critical habitat so it will be used to assess the effects of this action on listed mussel species' critical habitat. The PBFs for the Neosho mucket and rabbitsfoot are as follows:

(1) 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). (2) 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. (3) 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. (4) The presence and abundance of suitable fish hosts necessary for recruitment. (5) Either no competitive or predaceous invasive (nonnative) species, or such species in quantities low enough to have minimal effect on survival of freshwater mussels.

1.1.25 Mollusks – Freshwater Snails

Mollusks are a large and highly diverse group of invertebrates in the phylum Mollusca. They exhibit a variety of characteristics such that it is difficult to describe a set of characteristics that applies to all members. Broadly however, they all possess a mantle with a cavity used for breathing and excretion. The mollusks analyzed here all possess a shell made from calcium and a foot of soft tissue.

Freshwater snails are univalve mollusks. This guild is represented by 5 ESA-listed species of freshwater snails (Table 1).

1.1.25.1 Status

Freshwater snails, along with freshwater mussels, are among the most imperiled fauna in North America. They share an imperilment rate of 74 percent with freshwater mussels (Johnson et al. 2013). This guild is represented by five freshwater snail species, four of which are listed as endangered and one which is listed as threatened (Table 1).

All of these species have experienced drastic reductions in their range and habitat, primarily due to impoundments and deterioration of water and habitat quality. They have all experienced declines of up to 90 percent of their historic ranges.

The following is taken from the recovery plan from the 5-year review and the recovery plan for six Mobile Basin aquatic snails (USFWS 2005, 2006a). Other references are cited in the text.

1.1.25.2 Distribution

The freshwater snails representing this guild occur in the Mobile and Tennessee River drainages. The Mobile River basin species are restricted to rivers above the Fall Line. The Tennessee River species occurs in the Tennessee River in Jackson County, Alabama and Marion County, Tennessee as well as the lower Sequatchie River in Marion County, Tennessee and in Limestone Creek in Limestone County, Alabama. Their degree of range overlap with mineable coal ranges from approximately 3.4 percent to approximately 45.6 percent.

None of these species occurs in the small headwater streams usually directly affected by mining. However, since effects from mining may extend farther downstream (Daniel et al. 2015), we anticipate effects may still occur.

1.1.25.3 Life History

The ecological requirements of freshwater snails are similar to those of freshwater mussels, although they do not require a fish host for their larvae. Freshwater snails require good water quality, clean stable substrate, high dissolved oxygen, and sediment free water (Johnson 2009).

Little is known about the biology or life history of these snails. They are all gilled snails that require highly oxygenated water to survive. One species is believed to brood its young but the others lay eggs on rocks in swift current.

1.1.25.4 Habitat

The freshwater snails representing this guild all inhabit shoals, rapids, or riffles of larger streams and rivers. They require stable, hard substrates like boulders and cobbles as well as clean, highly oxygenated water.

1.1.25.5 Threats

Threats to freshwater snails include habitat loss and degradation from dams and impoundments, mining, toxic chemical spills, channelization and dredging, sedimentation and channel instability, and water quality degradation from point and non-point sources (Johnson 2009). Excessive nutrient input may also cause low dissolved oxygen levels and allow dense algae cover to develop. Dense algal mats may eliminate habitat for snails that live in shoals.

1.1.25.6 Critical Habitat

These representative species do not have designated critical habitat.

1.1.26 Mollusks – Terrestrial Snails

Mollusks are a large and highly diverse group of invertebrates in the phylum Mollusca. They exhibit a variety of characteristics such that it is difficult to describe a set of characteristics that applies to all members. Broadly however, they all possess a mantle with a cavity used for breathing and excretion. The mollusks analyzed here all possess a shell made from calcium and a foot of soft tissue.

Terrestrial snails are univalve mollusks. This guild is represented by the flat-spired three-toothed snail (*Triodopsis platysayoides*). The following is taken from the most recent 5-year review for the flat-spired three-toothed snail (USFWS 2007a):

1.1.26.1 Status

The flat-spired three-toothed snail was listed as threatened in 1978. At the time of its listing it was thought to be restricted to a few isolated populations. It is now known to be more widespread than previously thought, although the exact number of populations is not known. Approximately two-thirds of the known sites are on public lands and therefore are protected to some extent from foreseeable human impacts. The flat-spired three toothed snail is difficult to survey, therefore little is known about its population sizes or trends.

1.1.26.2 Distribution

The flat-spired three-toothed snail is endemic to the Cheat River gorge in West Virginia. It occurs on both sides of the gorge in an approximately 14 mile section in Monongalia and Preston Counties including portions of major tributary ravines. It is now known from 99 separate sites in this area. Its range overlaps mineable coal by approximately 70.3 percent.

1.1.26.3 Life History

Little is known about the life history of the flat-spired three-toothed snail. It feeds on a variety of plant and animal matter, including leaves, flowers, wood rat feces, lichens, catkins, mushrooms, and crickets, as well as the shells of other snails. The latter may provide a source of calcium in acidic environments.

The species is mostly nocturnal, with peak activity occurring in spring and early summer in cool, moist weather. It moves between rock features and nearby leaf litter. It may lay its eggs in soil or leaf litter in clusters of three to five eggs.

1.1.26.4 Habitat

The flat-spired three-toothed snail is usually found within 1 m (3 ft) of a rock feature. It occupies crevices in shale, sandstone, and limestone outcrops and talus slopes, although it seems to prefer stacked rock or boulder talus. It can be found in rock outcrops from the river to the ridge tops. It can be found in association with a variety of plant types but sweet birch, rhododendron, and red maple are commonly present at sites where it is found. It appears that rock structure is more important than tree age or vegetative composition. It prefers cool, moist sites. This requirement may be met by slope aspect or vegetative cover.

1.1.26.5 Threats

The primary threats to the flat-spired three-toothed snail are habitat loss from road building and logging and crushing by people engaged in recreational activities. Coal mining is not mentioned as a threat.

1.1.26.6 Critical Habitat

The representative species does not have designated critical habitat.

1.1.27 Mammals – Bats

Bats are flying mammals in the order Chiroptera. Their forelimbs are webbed, forming wings which make them the only mammal capable of true flight. They are the second largest order of mammals, with over 1,200 species worldwide. The four ESA-listed bats representing this guild are all in the family Vespertilionidae.

1.1.27.1 Status

The guild is represented by four ESA-listed species. The Indiana bat (*Myotis sodalis*) was first listed as endangered in 1967. In 2015, its population was estimated at 523,636, a decline of 9.8 percent from the 2013 estimate (USFWS 2013c, 2015d). The northern long-eared bat (*M. septentrionalis*) was listed as threatened in 2015 and a 4(d) rule was finalized in 2016. Population data and trends for the northern long-eared bat have not been rigorously collected; therefore it is difficult to estimate its rangewide population size. It is a widespread species that has been severely affected by White Nose Syndrome (WNS) in the northeastern part of its range. The gray bat (*M. grisescens*) was listed as endangered in 1976. The 5-year review completed in 2009 for the gray bat stated the population overall had increased and was recovering (USFWS 2009a). However, WNS has since been discovered in gray bats and it is uncertain what effect this will have on its population. The Virginia big-eared bat (*Corynorhinus townsendii virginianus*) was listed as endangered in 1979. Its population was estimated to be slowly increasing in the 5-year review conducted in 2008 (USFWS 2008a).

1.1.27.2 Distribution

The bats representing this guild occur across a large portion of the action area. They are found in the Appalachian, Illinois, Gulf Coast, and Northern Rocky Mountain and Great Plains coal basins. Their degree of range overlap with mineable coal ranges from approximately 18.8 percent to approximately 31.6 percent (Table 1). The two species with the highest overlap with mineable coal are Indiana bat and Virginia big-eared bat, with 31.6% and 27.6% range overlap with mineable coal, respectively.

1.1.27.3 Life History

The bats emerge from hibernacula in the spring and move to their summer territory. The Indiana bat and the northern long-eared bat typically use forested habitat for roosting and rearing of young but they may use a variety of other habitats as well. They have been observed using trees as small as 3” diameter at breast height. Roost trees are usually dead or dying with exfoliating bark. They may roost individually or in small groups. Reproductive females form larger groups, known as maternity colonies. Gray and Virginia big-eared bats move from caves used as winter hibernacula to caves used for summer roosts.

Young are born in early to mid-summer. Bats are unable to fly when born (non-volant) and are more susceptible to stressors during this flightless period. In late summer to early fall bats begin to move to their hibernation sites. An activity known as swarming takes place around the entrances to hibernacula prior to hibernation. During swarming, bats fly in and out of the hibernacula. They may roost in the hibernacula or in trees nearby during this time. Mating occurs during swarming. They are in the hibernacula by late fall.

Bats are insectivores that utilize a variety of insect species as food. Aquatic species (mayflies, stoneflies, and caddisflies) are an important part of some species diets.

1.1.27.4 Habitat

The Indiana bat and the northern long-eared bat use forested habitat for summer roosts. They use caves and mine portals for hibernation and the other two species, the gray bat and the Virginia big-eared bat, use caves and portals year round for roosting and hibernation. They may also use man-made structures like barns and sheds.

Bats forage at night in a variety of habitats including closed forest, open fields, riparian zones, and open water.

1.1.27.5 Threats

Threats to bats primarily include habitat loss and degradation, wind energy development, and WNS.

Habitat loss and degradation occur when forested summer habitat is destroyed through logging. Forested habitat may be removed during clearing and grubbing on mine sites. Winter habitat (hibernacula) can also be degraded or destroyed by development and other activities that cause caves and mines to become unsuitable as hibernacula. Wind energy (wind turbines) can cause significant mortality to bats when they fly into the rotating turbine blades.

White Nose Syndrome is a major threat to bats and has severely reduced populations of some bat species; its effect on other species remains to be seen. The WNS fungus has been found in caves occupied by as yet unaffected bats. The fungus has been found in 32 states and as many as 25 species of bats could be affected. So far it has killed millions of bats. All four species potentially affected by this action have either been confirmed to have WNS or the fungus that causes the disease. One species, the northern long-eared bat, has declined by 99 percent in the Northeast (USFWS 2014a).

1.1.27.6 Critical habitat

Both the Virginia big-eared bat and the Indiana bat have critical habitat designated (USFWS 1976, 1977a, 1979). Critical habitat for these bats consists of caves in several eastern states. None of the critical habitat overlaps mineable coal.

1.1.28 Mammals – Cats

Species in this taxonomic guild are members of the subfamily Felinae, family Felidae and are colloguially referred to as cats. They are carnivorous mammals with retractile claws, muscular bodies, and teeth and strong jaw muscles that allow for effectively capturing and killing prey. Their activity patterns often match their preferred prey and most are solitary predators.

This guild is represented by three listed species in three different genera: Canada lynx (*Lynx canadensis*); Gulf Coast ocelot (*Leopardus pardalis*); and jaguarundi (*Herpailurus yagouaroundi*), which is a monotypic genus.

1.1.29 Mammals - Canada lynx

1.1.29.1 Status

The U.S. Distinct Population Segment (DPS) of the Canada lynx was listed as threatened in 2000. There are six geographic units in the DPS but an overall estimate of the population size is lacking.

1.1.29.2 Distribution

The Canada lynx U.S. DPS occurs in the northern contiguous states from Maine to Washington and south along the Rocky Mountains to Colorado. Approximately 2% of its total range and 1% of its critical habitat overlap mineable coal.

1.1.29.3 Life History

Canada lynx breed in March and April, with kittens being born between May and July. Kittens stay with their mother for about 10 months. Females reach sexual maturity around ten months, although they may not breed their first season. Males reach sexual maturity at two to three years.

The Canada lynx's life history is closely intertwined with its primary prey, the snowshoe hare. Lynx populations generally increase and decrease with snowshoe hare population increases and decreases.

1.1.29.4 Habitat

The Canada lynx requires large areas of dense boreal forest (tens to hundreds of square kilometers) to meet its needs. Its habitat must contain enough snowshoe hares, allow for breeding opportunities, and provide dispersal options. There must also be denning habitat with enough snowshoe hares nearby to support kittens (USFWS 2017c). Lynx also require areas of deep, soft snow, as their large paws and low foot weighting give them an advantage over other predators in that type of snow.

1.1.29.5 Threats

Threats to the Canada lynx include habitat loss and fragmentation, wildfire suppression, harmful timber harvesting practices, and climate change (USFWS 2017c). Other human developments that may alter lynx habitat include oil and gas exploration and development, mines, reservoirs, and agriculture. These activities can destroy habitat through removal or modification of native plant communities, which can also decrease habitat connectivity and alter lynx corridors. Plowing of roads may also provide an advantage to other competing predators, such as coyotes (Ruediger et al. 2000). These activities also increase the potential for mortality associated with the activities or development.

1.1.29.6 Critical habitat

Approximately 1% of designated critical habitat for Canada lynx overlaps with mineable coal.

1.1.30 Mammals - Ocelot and jaguarundi

1.1.30.1 Status

Both the ocelot (*Leopardus pardalis*) and the Gulf Coast jaguarundi (*Herpailurus yagouaroundi*) are listed as endangered. There is no good estimate of jaguarundi populations in the U.S. There have been no verified sightings of jaguarundi in the U.S. since 1986 and the Texas Parks and Wildlife Department considers it to be extirpated in Texas. The ocelot population in Texas is estimated at 80 ocelots (USFWS 2018e).

1.1.30.2 Distribution

Ocelots occur in two separate populations, one in Willacy and Kennedy counties and the other in eastern Cameron County, primarily on Laguna Atascosa National Wildlife Refuge. The last confirmed sighting of a jaguarundi in Texas was in April 1986 near Brownsville. A total of at least 133,187 camera and live trap-nights have failed to document a single jaguarundi (USFWS 2013q).

1.1.30.3 Life history

There is little information on jaguarundi life history. They may have litter sizes of one to four and may have two litters per year. Their main prey are birds, small mammals, and reptiles. They are primarily active during the day, unlike the ocelot, which is primarily nocturnal (USFWS 2013q). Little data exist for ocelot reproductive rates, but year-round breeding is known and litter sizes in the wild may be two. Ocelots primarily prey on rodents, cottontails, and birds (USFWS 2016h).

1.1.30.4 Habitat
In the action area, ocelots, and possibly jaguarundis, are found in the Tamaulipan thornshrub communities in southern Texas. The ocelot's range overlaps mineable coal by approximately 21%; the range of the jaguarundi overlaps mineable coal by approximately 25%. No critical habitat is designated for either species.

1.1.30.5 Threats
The primary threat to both species is habitat loss and degradation.

1.1.31 Mammals – Other Mammals
The guild of other mammals is represented by the ESA-listed Utah prairie dog (*Cynomys parvidens*), and black-footed ferret (*Mustela nigripes*) (Table 1).

1.1.31.1 Status
The Utah prairie dog was listed as endangered in 1973. It was reclassified from endangered to threatened in 1984 with a 4(d) rule that allows regulated take. The special rule has been amended twice to increase the amount of regulated take allowed. Take is allowed on agricultural lands and where prairie dogs create serious human safety hazards or disturb the sanctity of significant human cultural or human burial sites. Take is allowed on lands within 0.5 miles of conservation lands and is limited to 10 percent of the annual range-wide population estimate (USFWS 2012d). The most recent survey in 2013 recorded 7,269 adults, down from a high of 7,979 in 2012. Counts from the last 30 years show significant fluctuation in annual numbers but population trends for the species appear to be stable to increasing (USFWS 2014d). The following Utah prairie dog discussion in this section is taken from the 2014 Service report on the status of the species (USFWS 2014d) and the Utah prairie dog recovery plan (USFWS 2012a).

The black-footed ferret (*Mustela nigripes*) was first listed as endangered in 1967, again in 1970, and grandfathered into the ESA in 1973. It has been extirpated from approximately 98 percent of its former range. The entire population currently in the wild is a result of reintroductions. It is unlikely that any undiscovered wild populations remain. It is difficult to get accurate data on trends in black-footed ferret populations although it is likely their numbers are declining. The current population size of breeding adult black-footed ferrets is estimated to be 418 (USFWS 2013a). The information in this section is from the recovery plan for the black-footed ferret (USFWS 2013a).

1.1.31.2 Distribution
The Utah prairie dog currently is found only in three areas in southwestern Utah: the Awapa plateau, the Paunsaugunt region, along the east fork and main stem of the Sevier River, and the West Desert region of Iron County, with a few isolated colonies existing in mountain and desert valleys in Iron and Beaver counties. They are found at elevations ranging from 1,646 m (5,400 ft.) up to 2,896 m (9,500 ft.). Approximately 13 percent of its range overlaps mineable coal.

Under subsection 10(j) of the ESA, the Service can designate reintroduced populations established outside the species' current range but within its historical range as "experimental." The Service can designate experimental populations as either "essential" or "nonessential." Nonessential populations are not essential to the continued existence of the species. Various nonessential experimental populations of black-footed ferrets have been established. There are reintroduction sites in Arizona, Colorado, Montana, South Dakota, Utah, Kansas, New Mexico

and Wyoming that have had varying degrees of success (USFWS 2013a). The degree of overlap of these sites with mineable coal is approximately 10.7 percent.

Federal agencies are not required to consult with the Service on NEPs. When NEPs are located outside a National Wildlife Refuge or National Park, they are treated as proposed for listing and only two provisions of § 7 of the ESA would apply:§§ 7(a)(1) and 7(a)(4). Section 7(a)(4) requires federal agencies to confer with the Service on actions that are likely to jeopardize the continued existence of a proposed species. The results of a conference are advisory in nature and do not restrict agencies from carrying out, funding, or authorizing activities. For purposes of § 9 of the Act, individual species within a NEP area are treated as threatened regardless of the species' designation elsewhere in its range. 16 U.S.C. § 1538.

1.1.31.3 Life History

Utah prairie dogs spend the winter underground, usually ceasing surface activity by August or September, although juveniles may be active until November. They emerge from hibernation in mid-March to mid-April. Mating takes place shortly thereafter. Pups are born in April, are full grown by October and sexually mature the following year. Utah prairie dogs are organized into clans consisting of an adult male, several females, and their offspring. Their home range is typically about 230 m (750 ft). They are affected by disturbance at a distance of about 107 m (350 ft). Utah prairie dogs are herbivores that prefer grasses and forbs as food. Alfalfa is a preferred food. They tend to select foods with higher moisture content and will often locate colonies in swales where vegetation remains moist even during droughts.

Black-footed ferrets are obligate associates of prairie dogs. They eat prairie dogs and use their burrows for shelter. Black-footed ferrets are nocturnal animals that spend the majority of their time underground in prairie dog burrows. They are less active in the winter, although they do not hibernate. Black-footed ferrets lead solitary lives except during the breeding season or when females are caring for young. Mating occurs during March and April. Litters of two to five kits are born after a 42 to 45 day gestational period. Kits leave their mothers at around four months of age and establish their own territories. They may disperse as far as 49 km (30 mi) from their natal area. Black-footed ferrets reach sexual maturity at 1 year of age and live three to four years in the wild. Prairie dogs are the main prey of black-footed ferrets. They will also prey on ground squirrels, deer mice, and cottontail rabbits.

1.1.31.4 Habitat

Utah prairie dogs occur in semi-arid areas of shrub-steppe and grassland. They require open habitats with short vegetation devoid of brushy areas and with deep well drained soils for burrowing. They prefer to live in swale type formations where moist herbaceous vegetation is available. Open areas are required for feeding, predator surveillance, and interactions with other prairie dogs. They will avoid areas dominated by brushy species and will not persist in these areas.

Since the black-footed ferret depends on prairie dogs for food and burrows, their habitat requirements are essentially the same as prairie dogs. Prairie dogs require areas of short vegetation in moist well drained soils and they will avoid heavily vegetated areas. Black-footed ferrets require a minimum prairie dog colony size of 200 acres for suitable habitat.

1.1.31.5 Threats

Threats to the Utah prairie dog include habitat loss and fragmentation from urban development, off-highway vehicle use, grazing, agriculture, and plague. Energy development from oil and gas operations is also a threat; however coal mining is not mentioned as threatening the species.

The main threats to the black-footed ferret are habitat loss, poisoning of prairie dogs, canine distemper, and sylvatic plague. Conversion of native prairie to farmland and widespread poisoning of prairie dogs has drastically reduced the available habitat. What habitat does remain is severely fragmented. Sylvatic plague has severely affected prairie dog populations, which has in turn been a factor in the decline of black-footed ferret populations. Poisoning of prairie dogs, conversion of prairie dog habitat, and disease led to a decline in available prey, which has drastically reduced black-footed ferret populations.

1.1.31.6 Critical Habitat

The Utah prairie dog and the black-footed ferret do not have Critical Habitat designated.

1.1.32 Mammals - Jumping Mice

Jumping mice are rodents in the family Zapodidae. They are characterized by hind legs that are much longer than the front legs. They are capable of jumping long distances relative to their body length.

Two subspecies of meadow jumping mice are on the list of species that may be affected by these actions: the Preble's meadow jumping mouse (*Zapus hudsonius preblei*) and the New Mexico meadow jumping mouse (*Zapus hudsonius luteus*).

The following is taken from the Species Status Assessment Report for the New Mexico meadow jumping mouse (USFWS 2014e) and the five-year review for the Preble's meadow jumping mouse (USFWS 2014f):

1.1.32.1 Status

The Preble's meadow jumping mouse was listed as threatened in 1998 and had critical habitat designated range-wide in 2003. It was proposed for delisting in 2008, but the Service decided in 2013 that delisting was not warranted. Little data exists on population sizes and trends for the Preble's meadow jumping mouse, although it appears it may be declining. The New Mexico meadow jumping mouse was listed as endangered in 2014 and had critical habitat designated in 2016. Estimating the population size of the New Mexico meadow jumping mouse is difficult, but it is also believed to be declining.

1.1.32.2 Distribution

The Preble's meadow jumping mouse's range extends from southeastern Wyoming to Colorado Springs, Colorado. Its range overlaps mineable coal by approximately 3.9%. The New Mexico meadow jumping mouse occurs in New Mexico, Arizona, and southern Colorado. Its range overlaps mineable coal by approximately 7.2%.

1.1.32.3 Life History

Jumping mice are true hibernators, active only during the summer months. They enter hibernation in the fall and emerge in late spring. Thus, in a few short months, they must breed, raise young, and accumulate enough fat reserves to last through their long hibernation period.

Jumping mice feed on a variety of items, including insects, fungi, and seeds. Their seed diet comes primarily from grasses and forbs.

Little is known about the reproductive patterns of jumping mice. It is believed they breed in July or August, producing one or two litters annually after a 17-21 day gestation. Nests may be located outside the riparian zone. Maternal care is provided until young are weaned.

Survival rates are likely low to moderate and highly variable. Lifespans are probably short, likely three years or less, with an average of less than one year. These factors, combined with the production of only one litter per year with seven or fewer young, result in naturally low population growth potential.

1.1.32.4 Habitat

Both species use well-developed riparian habitats with a nearby water source and nearby upland areas. Riparian areas are composed of dense associations of grasses, forbs, and shrubs. These areas include persistent emergent and scrub-shrub wetlands. Upland areas are usually minimally disturbed fields or pastures adjacent to the riparian zone.

1.1.32.5 Threats

Threats to jumping mice include habitat loss and modification through grazing, urbanization, wildfire, drought, and water management practices. Small population sizes are also a threat.

1.1.32.6 Critical Habitat

Critical habitat for the Preble's meadow jumping mouse was designated in 2003. The PBFs for the Preble's meadow jumping mouse were revised in 2010 (USFWS 2010a). Approximately 4.4 percent of Preble's meadow jumping mouse critical habitat overlaps mineable coal. The PBFs that could be affected if coal mining were to occur in Preble's meadow jumping mouse critical habitat are as follows:

> (1) Riparian corridors: (a) Formed and maintained by normal, dynamic, geomorphological, and hydrological processes that create and maintain river and stream channels, floodplains, and floodplain benches and that promote patterns of vegetation favorable to the PMJM; (b) Containing dense, riparian vegetation consisting of grasses, forbs, or shrubs, or any combination thereof, in areas along rivers and streams that normally provide open water through the PMJM's active season; and (c) Including specific movement corridors that provide connectivity between and within populations. This may include river and stream reaches with minimal vegetative cover or that are armored for erosion control; travel ways beneath bridges, through culverts, along canals and ditches; and other areas that have experienced substantial human alteration or disturbance.
>
> (2) Additional adjacent floodplain and upland habitat with limited human disturbance (including hayed fields, grazed pasture, other agricultural lands that are not plowed or disked regularly, areas that have been restored after past aggregate extraction, areas supporting recreational trails, and urban–wildland interfaces).

Critical habitat for the New Mexico meadow jumping mouse was designated in 2016. Approximately 9.3 percent of this critical habitat overlaps mineable coal. The PBFs that could be

affected if coal mining were to occur in New Mexico meadow jumping mouse critical habitat are as follows:

(1) Riparian communities along rivers and streams, springs and wetlands, or canals and ditches that contain: (a) Persistent emergent herbaceous wetlands especially characterized by the presence of primarily forbs and sedges (*Carex* spp. or *Schoenoplectus pungens*); or (b) Scrub-shrub riparian areas that are dominated by willows (*Salix* spp.) or alders (*Alnus* spp.) with an understory of primarily forbs and sedges.

(2) Flowing water that provides saturated soils throughout the New Mexico meadow jumping mouse's active season that supports tall (average stubble height of herbaceous vegetation of at least 61 cm (24 inches) and dense herbaceous riparian vegetation composed primarily of sedges (*Carex* spp. or *Schoenoplectus pungens*)) and forbs, including, but not limited to one or more of the following associated species: spikerush (*Eleocharis macrostachya*), beaked sedge (*Carex rostrata*), rushes (*Juncus* spp. and *Scirpus* spp.), and numerous species of grasses such as bluegrass (*Poa* spp.), slender wheatgrass (*Elymus trachycaulus*), brome (*Bromus* spp.), foxtail barley (*Hordeum jubatum*), or Japanese brome (*Bromus japonicas*), and forbs such as water hemlock (*Circuta douglasii*), field mint (*Mentha arvense*), asters (*Aster* spp.), or cutleaf coneflower (*Rudbeckia laciniata*).

(3) Sufficient areas of 9 to 24 km (5.6 to 15 mi) along a stream, ditch, or canal that contain suitable or restorable habitat to support movements of individual New Mexico meadow jumping mice.

(4) Adjacent floodplain and upland areas extending approximately 100 m (330 ft) outward from the boundary between the active water channel and the floodplain (as defined by the bankfull stage of streams) or from the top edge of the ditch or canal.

If mining were to occur in jumping mouse critical habitat, effects to the PBFs would occur. Removal of riparian vegetation cover would eliminate the riparian vegetation PBF. Replacement of riparian vegetation could occur but would likely not develop into suitable habitat before bond release. Under SMCRA the regulatory authority would have no control over the site after bond release, and the landowner may choose to remove the vegetation.

1.1.33 Mammals - North American Wolverine

1.1.33.1 Status

The North American wolverine (Gulo gulo luscus) was proposed for threatened status in 2016. Its current population level and trends are uncertain, although it is estimated the population in the contiguous United States is around 250-300 (USFWS 2016g).

1.1.33.2 Distribution

There appear to be two separate wolverine populations in the contiguous United States: one in the North Cascades in Washington, and one in the northern Rocky Mountains in Idaho, Montana, and Wyoming, as well as the Wallowa Range in Oregon (USFWS 2016g). Approximately 2% of its range overlaps mineable coal.

1.1.33.3 Life History
Female wolverines may give birth as early as two years of age and produce an average of 1-2 kits per litter. Breeding occurs from late spring to early fall and kits are born from mid-February through March. Females excavate dens in deep snow. Dens are abandoned as the snow melts and offspring mature.

Wolverines are opportunistic omnivores. Their primary food source is carrion; they also eat small animals, birds, fruits, berries, and insects.

1.1.33.4 Habitat
In the contiguous U.S., North American wolverines occur in high-elevation alpine parts of Washington, Idaho, Montana, Wyoming, California, and Colorado.

1.1.33.5 Threats
The primary threat to wolverines is habitat loss and degradation from loss of deep snow due to climate change (USFWS 2016g).

1.1.34 Mammals - Grizzly Bear

1.1.34.1 Status
The grizzly bear is listed as threatened and has a variety of other statuses including experimental non-essential populations.

1.1.34.2 Distribution
In the contiguous U.S. the grizzly bear is found in parts of Washington, Idaho, Montana, and Wyoming. Its range overlaps mineable coal by approximately 1%.

1.1.34.3 Life history
Grizzly bears can have a maximum home range of over 1,400 square miles but females may have a home range of about 150 square miles annually. They have a promiscuous mating system with breeding occurring from May-July. Litter size varies from 1-4. Grizzly bears are omnivores that will eat almost anything, including animal matter, fish, insects, plants, fungi, and garbage (USFWS 2011j).

1.1.34.4 Habitat
Grizzly bears use a variety of habitats, including woodlands, forests, alpine meadows, and prairies. In many habitats they prefer riparian areas along rivers and streams. Large areas of space are necessary for grizzlies, due to their large home range sizes.

1.1.34.5 Threats
Habitat destruction, modification, and range curtailment were the major contributing factors leading to the listing of the grizzly bear. Today, human interactions and conflict are major threats.

1.1.35 Plants – Xeric Species
This guild is represented by 18 species; eight are listed as endangered and nine are listed as threatened (Table 1). Plants placed in the xeric guild almost universally survive with minimal, intermittent water inputs, do not encounter groundwater sources, and rely on precipitation for their moisture needs (e.g. deserts).

1.1.35.1 Status
Populations of 11 of these species are in decline, while two are considered stable. The final five species have an unknown population trend status (NatureServe 2017).

1.1.35.2 Distribution

This guild includes species that occur in two coal basins (the Colorado Plateau and the southern tip of the Northern Rocky Mountains and Great Plains) and four states (Colorado, Utah, New Mexico, and Arizona). Most of these species are rare endemics; eight occur in only one county, four occur in only two counties, and five occur in either four or five counties. The degree of range overlap with mineable coal ranges from approximately 1 percent to 38 percent (Table 1).

1.1.35.3 Life History

Fifteen of the species examined in this guild are perennial species, two have a biennial life form, and one is an annual. Nine of these species are herbs (seven perennial, two biennial, and one annual) and seven are cacti (all perennial).

Most of the species within this guild flower in the summer, use generalist ground dwelling insects as pollinators, set seed in late summer, and use abiotic factors (wind, rain, gravity) most often (but sometimes use insects, birds, and small mammals) to disperse their seeds. In addition to sexual reproduction, five of these species also vegetatively reproduce.

1.1.35.4 Habitat

All the species within this guild occur in dry habitats with coarse, well drained, and nutrient deficient soils. Often these species require very specific soil conditions which define their range. Others that occur in more common soil types may only tolerate minimal competition; these species are generally confined to steep slopes and other extreme and barren areas. Most cannot tolerate significant disturbance, competition (from both native and non-native species), and/or indirect sunlight.

All but one (Welsh's milkweed, which uses surface and groundwater) rely on surface water (rain and/or snow) for their moisture needs; this guild tends to occur in areas with very deep groundwater levels inaccessible to individual plants.

1.1.35.5 Threats

Threats to this guild include oil, gas, water, and mineral development; commercial and private off-road vehicle use; commercial and residential development; livestock grazing and trampling; railroad, highway, and gas and electrical transmission line construction and maintenance; agricultural activities; recreation; private collection (i.e. illegal harvest); competition from noxious and other invasive species (e.g. cheatgrass is commonly mentioned as a threat to this guild); drought; climate change; pesticides; and herbivores.

Although coal mining is not known to be a threat to the majority of the species analyzed, it is specifically mentioned as a threat for three species. The Wright fishhook cactus (*Sclerocactus wrightiae*) occurs within the San Rafael Swell in Emery County, Utah. In 2005, surface coal mining in known and potential habitat of Wright fishhook cactus was analyzed and, mostly due to known Wright fishhook cactus occurrences, roughly 20 percent (1,424 ac) was deemed unsuitable for mining (USFWS 2008c). In this case, the listed status of this species protected its habitat from potential development. The Mesa Verde cactus (*Sclerocactus mesae-verdae*) is not thought to currently be under threat by coal mining (USFWS 2011c), but in the past coal mining

has been mentioned as a threat to this species (USFWS 1984).The latest North Park phacelia (*Phacelia formosula*) 5-year review (USFWS 2011d) mentions coal mining as an ongoing threat.

1.1.35.6 Critical Habitat

Three species within this guild have designated critical habitat: DeBeque phacelia (*Phacelia submutica*), parachute beardtongue, (*Penstemon debilis*), and Welsh's milkweed (*Asclepias welshii*). Of this group only the critical habitat for DeBeque phacelia overlaps mineable coal; therefore, there should be no adverse effects from this action to the critical habitat of two other species. Approximately 1.1 percent of the critical habitat for Debeque phacelia overlaps mineable coal.

The PBFs for DeBeque phacelia are: (1) Suitable Soils and Geology: (a) Atwell Gulch and Shire members of the Wasatch formation. (b) Within these larger formations, small areas (from 10 to 1,000 ft^2 (1 to 100 m^2)) on colorful exposures of chocolate to purplish brown, light to dark charcoal gray, and tan clay soils. These small areas are slightly different in texture and color than the similar surrounding soils. Occupied sites are characterized by alkaline (pH range from 7 to 8.9) soils with higher clay content than similar nearby unoccupied soils. (c) Clay soils that shrink and swell dramatically upon drying and wetting and are likely important in the maintenance of the seed bank. (2) Topography: moderately steep slopes, benches, and ridge tops adjacent to valley floors. Occupied slopes range from 2 to 42 degrees with an average of 14 degrees. (3) Elevation and climate: (a) elevations from 4,600 to 7,450 ft (1,400 to 2,275 m) (b) climatic conditions similar to those around DeBeque, Colorado, including suitable precipitation and temperatures. Annual fluctuations in moisture (and probably temperature) greatly influences the number of DeBeque phacelia individuals that grow each year and are thus able to set seed and replenish the seed bank. (4) Plant Community: (a) small (from 10 to 1,000 ft^2 (1 to 100 m^2)) barren areas with less than 20 percent plant cover in the actual barren areas (b) presence of appropriate associated species that can include (but are not limited to) the natives *Grindelia fastigiata*, *Eriogonum gordonii*, *Monolepis nuttalliana*, and *Oenothera caespitosa*. Some presence of, or even domination by, invasive nonnative species, such as *Bromus tectorum*, may occur, as DeBeque phacelia may still be found there. (c) appropriate plant communities within the greater pinyon–juniper woodlands that include: (i) Clay badlands within the mixed salt desert scrub, or clay badlands within big sagebrush shrublands (5) Maintenance of the Seed Bank and Appropriate Disturbance Levels: (a) within suitable soil and geologies, undisturbed areas where seed banks are left undamaged (b) areas with light disturbance when dry and no disturbance when wet.

1.1.36 Plants – Mesic Species

This guild is represented by 18 species; nine are listed as endangered and nine are listed as threatened (Table 1).

1.1.36.1 Status

Populations of nine of these species are considered to be in decline, while five are considered stable. The final four species have an unknown population trend status. One species, running buffalo clover, was proposed for delisting in August 2019.

1.1.36.2 Distribution

This guild includes representative species that occur in six coal basins; Gulf Coast, Illinois, Appalachian, Western Interior, Northern Rocky Mountains and Great Plains, and the Colorado Plateau. The degree of range overlap with mineable coal ranges from approximately 3.7 to 85.1 percent (Table 1).

1.1.36.3 Life History

Fifteen of the species examined in this guild are perennial species, two have a biennial life form, and one is an annual. All 18 of these species are herbs. Most of the species within this guild flower in the summer, use generalist insects as pollinators, set seed in late summer and fall, and most often use abiotic factors (wind, rain, gravity) to disperse their seeds but sometimes use insects, birds, and small mammals. In addition to sexual reproduction, nine of these species asexually reproduce.

1.1.36.4 Habitat

The species within this guild typically occur in well to moderately drained soils with adequate moisture during the growing season. Twelve of these species prefer habitats that occasionally experience disturbance (e.g. fire, light grazing/trampling, mowing at the correct time of year, old roads, rights of way). The species that prefer occasional disturbance also prefer the partial and full sun environments of forest gaps, grasslands, and edge habitats. The species intolerant of disturbance occur in closed canopy forests under cool temperatures, high humidity, and partial to low light conditions.

Two species in this guild occur in glade habitats. Theses glades are openings in woodlands with shallow soils which lie directly over bedrock. This prevents deep rooted species like trees and shrubs from surviving to maturity. Depressions within these glades sometimes allow for temporary pools to form, providing moisture for significant times of the year, but the majority of the land is a very dry, prairie-like habitat. Gentian pinkroot (*Spigelia gentianoides*) within Bibb County, Alabama (for the purposes of this review), and earthfruit (*Geocarpon minimum*) both occur in these unique and sensitive habitats (USFWS 2009e, 2009f). Earthfruit also occurs along the edges of slick spots in saline barren complexes in Texas (Poole 2007).

1.1.36.5 Threats

Threats to this guild include: agricultural development (conversion to row crops, pastureland, constructing impoundments, etc.); clear cutting; vegetative succession (e.g., loss of a disturbance, such as fire); commercial and private OHV use; commercial and residential development; livestock overgrazing grazing and trampling; road construction and maintenance; gas and electrical transmission line construction and maintenance; recreation; private collection (i.e., illegal harvest); competition from noxious and other invasive species; drought; climate change; pesticides; herbivores; mowing during important lifecycle events (e.g., flowering); and quarrying. Lignite surface mining operations are specifically identified as one of the threats for the Navasota ladies' tresses, and the Service has formally consulted on at least two lignite mining related CWA 404 permits. Approximately 14 percent of its known population was lost at one point due to a habitat destruction related to lignitie mining, highway construction, landfill, and pipeline installation (USFWS 2009i). Except for this species, coal mining is not specifically mentioned as a threat to any of the other 17 mesic species.

1.1.36.6 Critical Habitat

Two species within this guild have designated critical habitat: Short's bladderpod (*Physaria globosa*) and Pagosa skyrocket (*Ipomopsis polyantha*) (USFWS 2012g, 2014r). Of this group only the critical habitat for Short's bladderpod overlaps mineable coal. Approximately 0.5 percent of the designated critical habitat for Short's bladderpod overlaps mineable coal.

The PBFs for Short's bladderpod are:(1) Bedrock formations and outcrops of calcareous limestone, sometimes with interbedded shale or siltstone, in close proximity to the mainstem or tributaries of the Kentucky and Cumberland rivers. These outcrop sites or areas of suitable bedrock geology should be located on steeply sloped hillsides or bluffs, typically on south- to west-facing aspects. (2) Shallow or rocky, well drained soils formed from the weathering of underlying calcareous bedrock formations, which are undisturbed or subjected to minimal disturbance, so as to retain habitat for ground-nesting pollinators and potential for maintenance of a soil seed bank. (3) Forest communities with low levels of canopy closure or openings in the canopy to provide adequate sunlight for individual and population growth. Invasive, nonnative plants must be absent or present in sufficiently low numbers not to inhibit growth or reproduction of Short's bladderpod.

If mining were to occur in the critical habitat of the Short's bladderpod, effects to the PBFs would occur. Removal of topsoil and the vegetative community, and the change in landscape characteristics would eliminate PBFs. Topsoil formation could occur but it would take many years to reform landscape characteristics, and they may never return. These PBFs would not be present on the site, if at all, until long after bond release had occurred. The regulatory authority would have no control over the site after bond release, and the landowner may choose a postmining land use not conducive to the regeneration of this critical habitat.

1.1.37 Plants – Hydric Species

This guild is represented by 20 species; seven are listed as endangered, 12 are listed as threatened, and 8 are listed as endangered (Table 1).

1.1.37.1 Status

Populations of 14 of these species are in decline, while three are considered stable. The final three species have an unknown population trend status.

1.1.37.2 Distribution

Most of the species in this guild occur in the Appalachian and Gulf Coast coal Basins, but it also includes species that occur in the Illinois, Western Interior, Northern Rocky Mountains and Great Plains, and Colorado Plateau Basins. The degree of range overlap with mineable coal ranges from 1.1 to 91.0 percent (Table 1).

1.1.37.3 Life History

Nineteen of the species examined in this guild are perennial species, and one is an annual. Seventeen of these species are herbs, and three are shrubs.

Most of the species within this guild flower and fertilize in the spring and summer. Twelve (including one that is also capable of self-pollination) use generalist insects as pollinators, four use abiotic pollination (water, wind), two have unknown pollinators, and two species use only a

few species of pollinators. The eastern prairie fringed orchid (*Platanthera leucophaea*) uses only hawkmoths for pollination (USFWS 2010e) and the white fringeless orchid (*Platanthera integrilabia*) has only three known pollinators (Zettler et al. 1996).

This guild sets seeds or sporulates from summer through fall. Fifteen species have been found to use abiotic factors (water, gravity, and wind) for seed dispersal, one has been found to use animals, and four have unknown seed dispersal agents. In addition to sexual reproduction, 11 of these species asexually reproduce.

1.1.37.4 Habitat

The species within this guild typically occur in soils that are sufficiently wet to develop anaerobic conditions during the growing season. Ten of these species prefer habitats that occasionally experience disturbance (e.g. fire, scouring of streambeds due to seasonal flooding); these 10 species also prefer near and/or full sun environments of forest gaps, streambeds, bogs, grasslands, and edge habitats. The species intolerant of disturbance occur in both closed canopy forests under partial to low light conditions and full sun environments of lakes, perennial streams rivers, and grasslands.

1.1.37.5 Threats

Threats to this guild include: agricultural development (e.g. filling wetlands, aquifer depletion, conversion to row crops, conversion of native forest to pine plantations); pollution resulting from upstream development; clear cutting (both within and upstream of their habitat, which results in increased turbidity and siltation); vegetative succession (e.g. loss of a disturbance, such as fire or seasonal flooding); commercial and private off-road vehicle use; commercial and residential development including upstream of their habitat (resulting in increased turbidity and sedimentation); livestock grazing and trampling; road, gas and electrical transmission line construction and maintenance; recreation, including camping, hiking, mountain biking, and horse riding through or near streams; private collection (i.e. illegal harvest); competition and physiologic stress from noxious weeds and other invasive species (e.g. disease, insects, feral hogs, aggressive native plants); drought; climate change; pesticides, including effects to the species and their pollinators; mowing during important lifecycle events (e.g. flowering); quarrying; impoundments which change the seasonal quantity of water flowing through habitat; and coal mining.

1.1.37.6 Critical Habitat

Four species within this guild, the Pecos sunflower (*Helianthus paradoxus*) and Navajo sedge (*Carex specuicola*), Neches river rose-mallow (*Hibiscus dasycalyx*), and Texas golden gladecress (*Leavenworthia texana*) have designated critical habitat (USFWS 2008d, 1985). Neither the Pecos Sunflower nor the Navajo sedge's critical habitat overlap mineable coal; therefore, there should be no adverse effects from this action to the critical habitat of these species.

Approximately one hundered percent of the critical habitat of both the Neches River rose-mallow and the Texas golden gladecress overlap mineable coal. Mining in an area of critical habitat of the Neches River rose-mallow occurred in the late 1980s or early 1990s, prior to the species being listed. The portion of the surface coal mining permit that was analyzed (a stock pond) was used for sediment control but was not mined. It was maintained and upgraded and approved as a

permanent pond. The stock pond and surrounding area have been in reclamation since before the species listing.

The primary constituent elements for Neches River rose-mallow are: (1) Intermittent or perennial wetlands within the Neches, Sabine, and Angelina River floodplains or Mud and Tantabogue Creek basins that contain hydric alluvial soils and the potential for flowing water when found in depressional sloughs, oxbows, terraces, side channels, or sand bars.(2) Native woody or associated herbaceous vegetation largely with an open canopy providing partial to full sun exposure without with low levels or no nonnative species.

The primary constituent elements for the Texas golden gladecress are: (1) Exposed outcrops of the Weches Formation. Within the outcrop sites, there must be bare, exposed bedrock on top-level surfaces or rocky ledges with small depressions where rainwater or seepage can collect. The openings should support Weches Glade native herbaceous plant communities. (2) Thin layers of rocky, alkaline soils, underlain by glauconite clay (greenstone, ironstone, bluestone), that are found only on the Weches Formation. Appropriate soils are in the series classifications Nacogdoches clay loam, Trawick gravelly clay loam, or Bub clay loam, ranging in slope 1–15 percent. (3) The outcrop ledges should occur within the glade such that Texas golden gladecress plants remain unshaded for a significant portion of the day and trees should be far enough away from the outcrop(s) that leaves do not accumulate within the Texas golden gladecress habitat. The habitat should be relatively clear of nonnative and native invasive plants, especially woody species, or with only a minimal level of invasion.