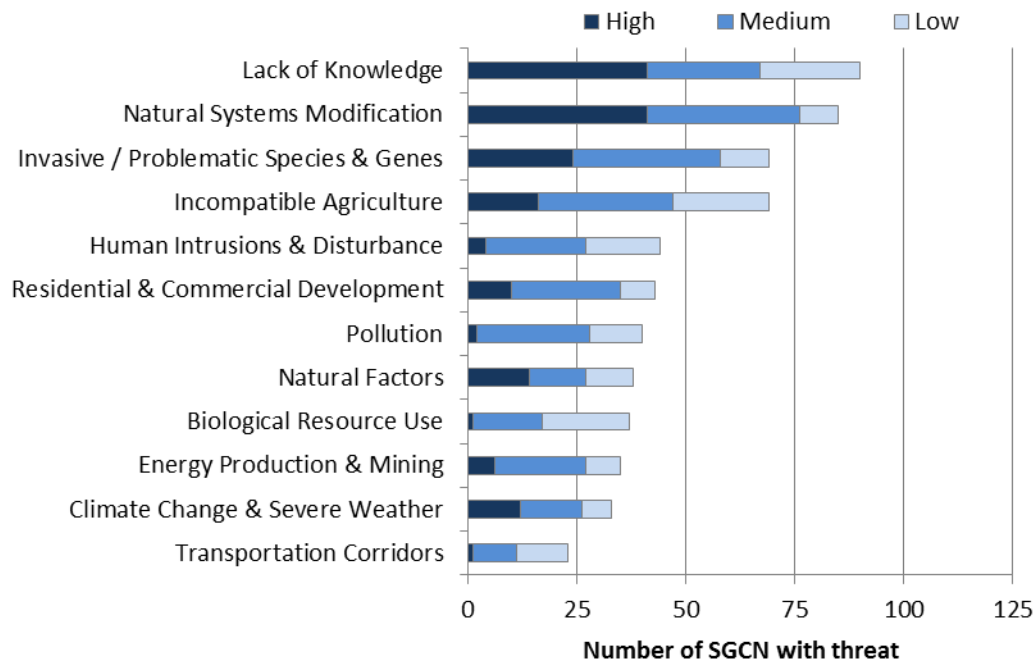


# Chapter 5: Threats and Actions for SGCN

## Summary of Threats

Overall, lack of knowledge and natural systems modifications (including alteration of natural hydrological and fire regimes) are issues for the greatest number of Colorado's 159 vertebrate animal and mollusk SGCN (Figures 3–5). Lack of knowledge is a factor for over half of these SGCN – this is especially true for Tier 2 species. Impacts from non-native or problematic native species (including pathogens), habitat conversion (cropland, urban development), and incompatible agricultural practices are also significant for many SGCN. Of the 55 Tier 1 SGCN, more than half are affected by these threats. For descriptions of the threats represented in the figures below, refer to Chapter 4 and Table 5.



**Figure 3. Threats to vertebrate and mollusk SGCN by priority.**

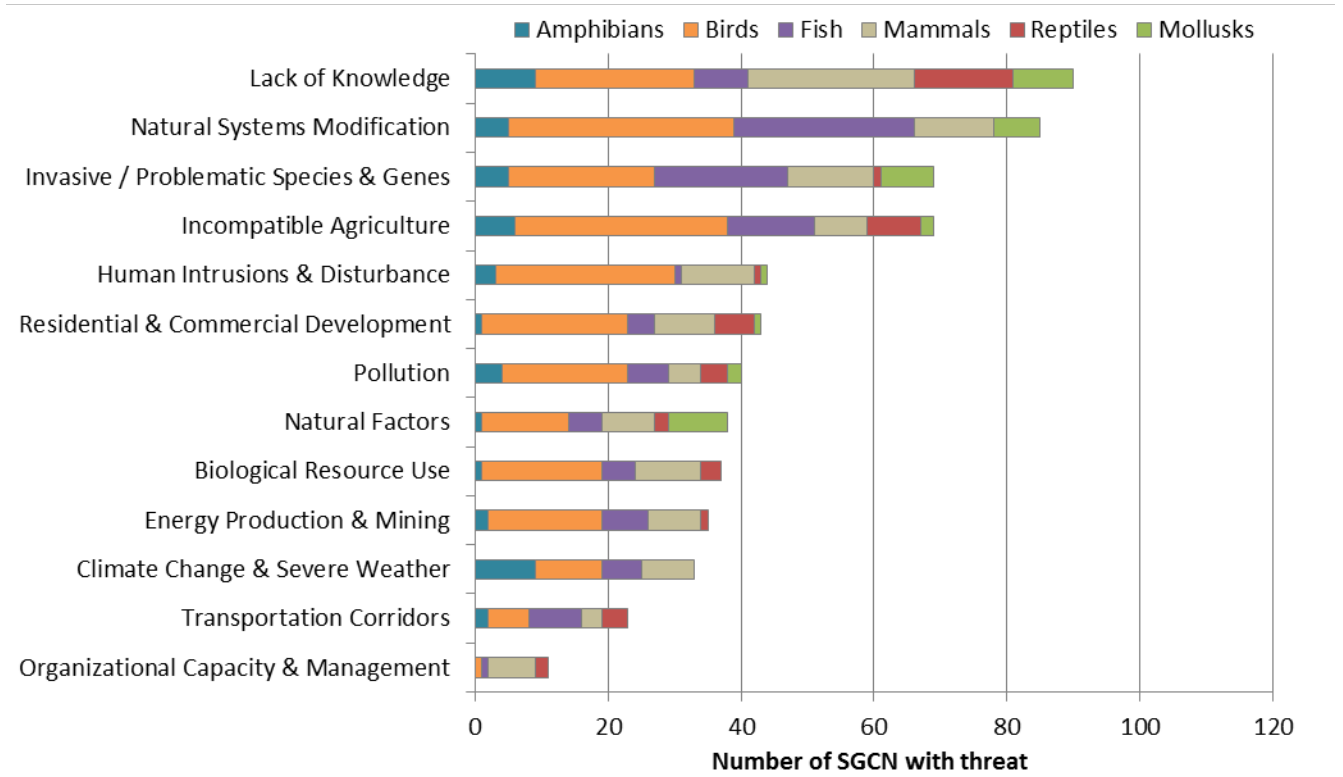


Figure 4. Threats to vertebrate and mollusk SGCN by taxonomic group.

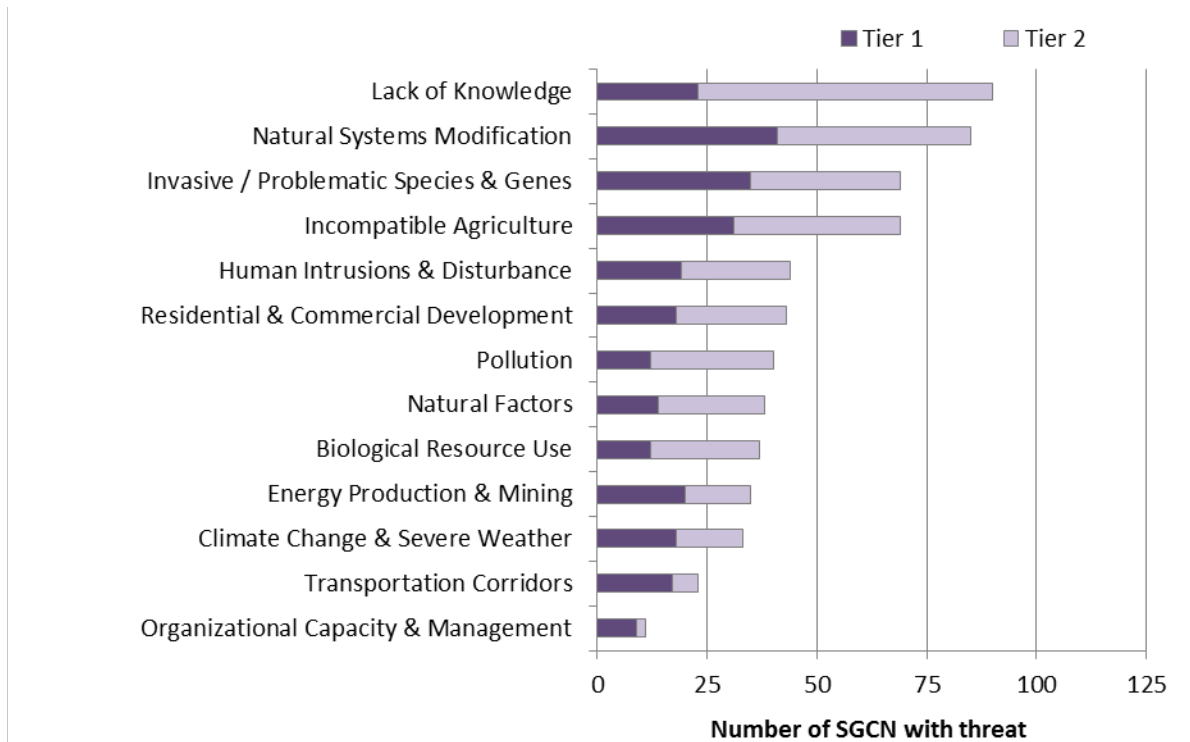
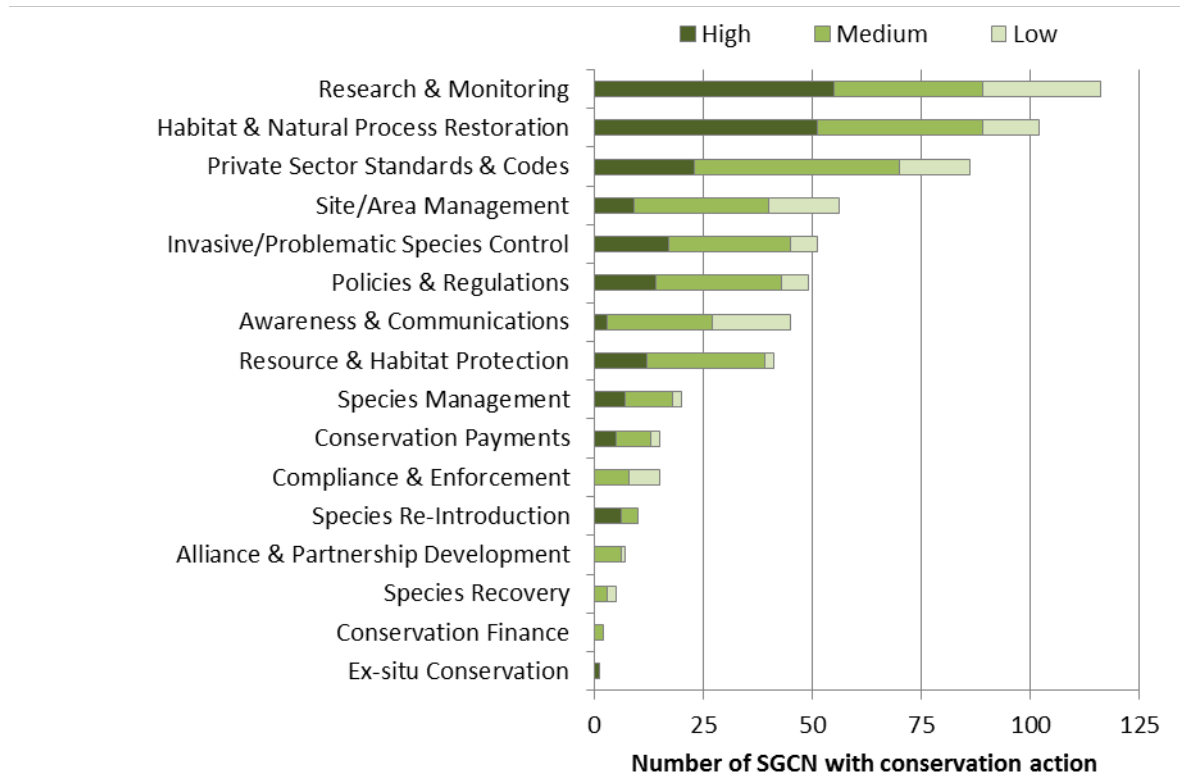


Figure 5. Threats to vertebrate and mollusk SGCN by Tier.

## Summary of Conservation Actions Needed

The highest priority conservation actions for SGCN include research/monitoring and management or restoration of habitats and ecological processes (Figure 6). For Tier 1 SGCN, restoration is the most needed conservation action, especially for aquatic species (Figures 7 and 8). Private enterprise also has a crucial role to play through application of standards such as Best Management Practices. Land and resource protection (conservation easements, water rights), control of invasive species, and application of policy and regulation are all important as well. Given the complexity of land use and ownership patterns in the state, conservation success for SGCN will require increasing the breadth and effectiveness of partnerships. Conservation of Colorado's wildlife is too big a task for one agency. Accomplishing the actions identified in this plan will require developing many new partnerships, as well as continuing to capitalize on existing partnerships. Creation, testing, and implementation of market-based conservation tools are ongoing – greater emphasis on these approaches is also needed. While research and monitoring won't achieve conservation in and of itself, conducting research to understand the limiting factors SGCN face is necessary to accurately identify and prioritize specific management/conservation actions needed. For descriptions of the conservation actions referenced in the figures below, refer to Chapter 4 and Table 6.



**Figure 6. Conservation actions needed for vertebrate and mollusk SGCN by priority.**

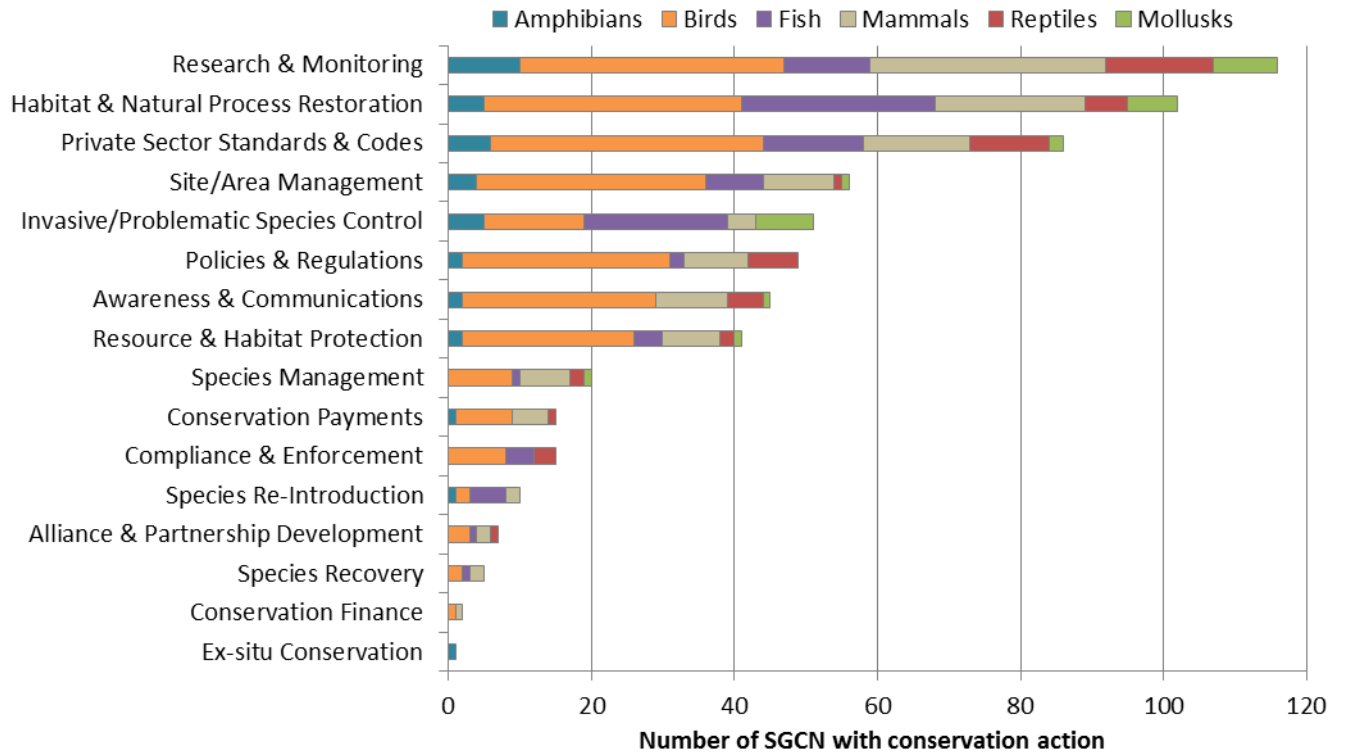


Figure 7. Conservation actions needed for vertebrate and mollusk SGCN by taxonomic group.

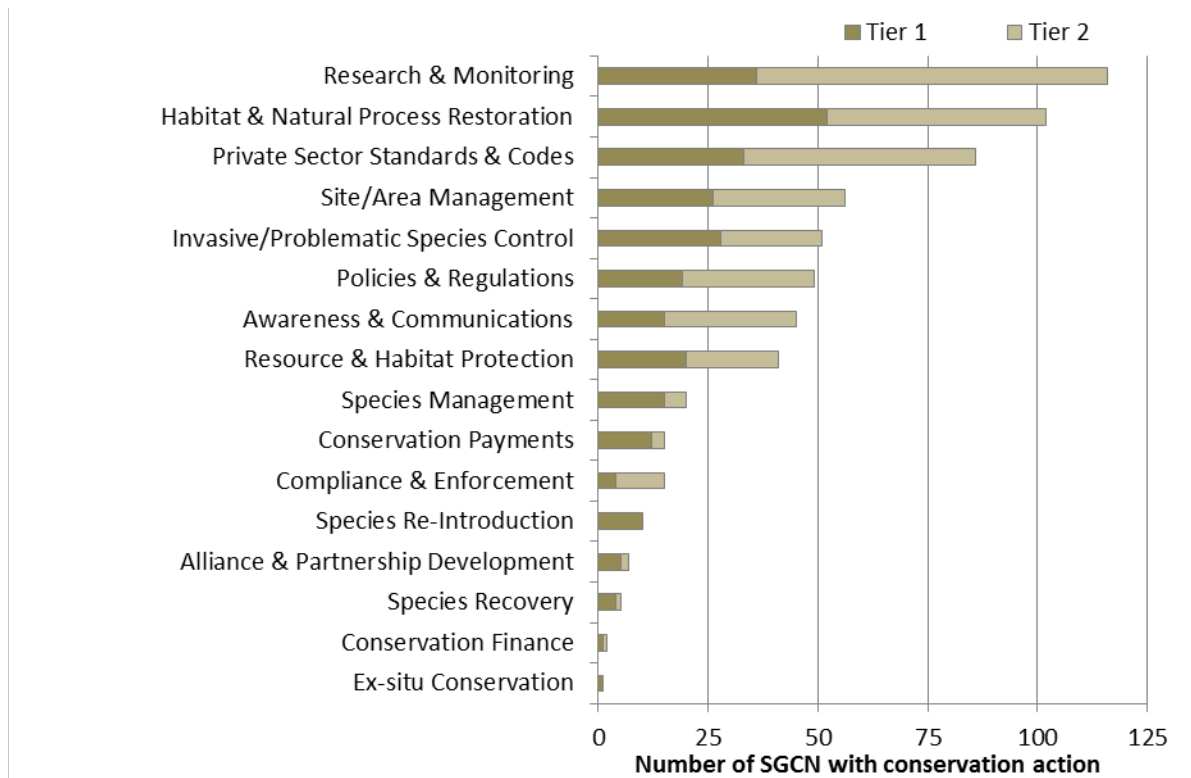


Figure 8. Conservation actions needed for vertebrate and mollusk SGCN by Tier.

## Threats & Actions Narratives for Tier 1 SGCN

As previously noted, there are a number of resources that explore threats to SGCN and conservation actions needed in considerable detail. These include existing conservation assessments, management or recovery plans, and published research results. For the purposes of the SWAP, the highest priority threats and conservation actions for Tier 1 SGCN are briefly summarized in the following narratives. Table 7 presents status and trend, habitats and distribution, threats, and prioritized conservation actions for all vertebrate and mollusk Tier 1 and Tier 2 SGCN. Refer to Appendix D for a list of management and recovery plans that provide additional information on threats, recommended or proposed conservation/management actions, and research needs for specific species. See Appendix E for a key to the distribution field.

In the following species summaries, threats are addressed in the order in which they appear in the Salafsky lexicon (described in Chapter 4).

### TIER 1 AMPHIBIANS

#### **Boreal Toad** (*Anaxyrus boreas boreas*)

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For detailed information on threats and conservation actions needed for this species, refer to the 2001 Conservation Plan and Agreement for the management and recovery of the Southern Rocky Mountain population of the Boreal Toad (*Bufo boreas boreas*) and the 2005 technical conservation assessment (links in Appendix D).

#### **Threats**

##### **7 Natural Systems Modification**

The loss of riparian zone cottonwood and aspen due to the encroachment of coniferous forest from natural forest succession has been identified as a threat to some boreal toad breeding habitat. The loss of cottonwoods and aspen causes beavers to shift to willow/shrub vegetation for dam construction, leaving dams more likely to blow out during flooding or runoff, increasing the risk of drying for associated wetlands. Boreal toad breeding ponds are commonly found in beaver pond complexes (Holland 2002).

##### **8 Invasives, Problematic Native Species, & Pathogens**

The primary threat to boreal toad populations is from a pathogenic chytrid fungus (*Batrachochytrium dendrobatidis*; Bd). Many amphibian declines and extinctions have been associated worldwide with amphibian chytridiomycosis caused by Bd infections (Berger et al.

1998; Green and Kagarise-Sherman 2001; Daszak et al. 2003). Bd is evidently native in many parts of the world, but genetic evidence indicates that one or more hypervirulent strains emerged recently from recombination of formerly geographically isolated lineages, likely the result of an increased worldwide trade in amphibians (Farrer et al. 2011). In Colorado, Bd has been implicated in dramatic declines in several populations of boreal toads since its discovery in the state in 1999 (Loeffler 2001). Bd infection is lethal to boreal toads (Carey et al. 2006) and directly impacts survival (Muths et al. 2003; Scherer et al. 2005; Pilliod et al. 2010). Carey (1993) developed a hypothesis that potential environmental stressors were leading to immunosuppression in boreal toads, causing them to be more susceptible to disease.

## **11 Climate Change & Severe Weather**

The predicted effects of climate change in the west include reduced snowpack and shorter periods of snow cover, snowmelt that occurs earlier in the season, a hydrologic cycle that is more dynamic as extreme rainfall events occur with greater frequency, and an overall warmer, drier, and more drought-like conditions (Melillo 2014). Climate change has the potential to alter the timing of pond breeding amphibians (Blaustein et al. 2001). Changes in snowpack could impact survival and breeding success of boreal toads (Corn 2003; Scherer et al. 2008).

### **Other Threats**

Degradation of breeding habitat from activities such as recreation (Campbell 1970), grazing (Bartelt 1998), and sedimentation due to road sanding runoff can contribute to direct mortality of adults and juveniles. Large scale wetland alterations such as reservoir construction can eliminate breeding habitat causing population declines (Hammerson 1999). Direct mortality from vehicle collisions on busy roads has been documented and can cause significant losses if near a breeding site where toads congregate in large numbers.

### **Information Needs**

Further research is required on the ecology of the chytrid fungus (*Batrachochytrium dendrobatidis*), including how it is spread, factors that make boreal toads susceptible to lethal infection, and environmental testing methods. Research is also needed on factors that potentially confer Bd resistance, including skin microbial community composition, particular habitat or behavioral characteristics, and possibly a genetic basis for a degree of Bd resistance.

### **Conservation Actions**

Accelerate the pace of re-introductions and translocations to establish additional populations within the species' native range. Rigorously assess factors affecting translocation success, to increase success of future efforts. Continue survey efforts to identify additional populations. Identify habitat protective actions effective at preventing Bd invasion, and implement such measures where feasible. Continue to support research on Bd resistance and Bd transmission.

## **Northern Leopard Frog (*Lithobates pipiens*)**

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For detailed information on threats and conservation actions needed for this species, refer to the 2007 technical conservation assessment (link in Appendix D).

### **Threats**

#### **1 Residential & Commercial Development**

The loss of wetland habitat is believed to be one of the causes of northern leopard frog declines in Washington, Oregon, Idaho and Montana (Koch et al. 1996). Urban development was consistent with observed regional declines in eastern Colorado (Johnson et al. 2011). Northern leopard frogs depend on a variety of habitat types: breeding ponds, midsummer foraging habitat, and suitable water bodies for overwintering (Merrell 1977), so are at risk of habitat fragmentation. Impairment of movement between these critical habitats could be a major threat to the persistence of local populations (Pope et al. 2000). Leopard frogs are also highly vulnerable to road mortality (Bouchard et al. 2009).

#### **8 Invasives, Problematic Native Species, & Pathogens**

The introduction of bullfrogs in western United States has been linked to northern leopard frog declines (Lannoo et al. 1994; Koch et al. 1996; Livo et al. 1998; Hammerson 1999; Johnson et al. 2011). Localized declines in Boulder County, Colorado, were attributed to a bullfrog introduction (Hammerson 1982). Typical northern leopard frog breeding habitat is devoid of predaceous fish (Merrell 1977), which makes them susceptible to introduced game fish.

The pathogenic chytrid fungus (*Batrachochytrium dendrobatidis*) has been implicated in amphibian declines around the world (Berger et al. 1998; Daszak et al. 2003). Chytrid fungus has been documented in Colorado populations of northern leopard frogs (Muths et al. 2003; Livo 2004; Johnson 2011).

#### **11 Climate Change & Severe Weather**

The predicted effects of climate change in the West include reduced snowpack and shorter periods of snow cover, snowmelt that occurs earlier in the season, a hydrologic cycle that is more dynamic as extreme rainfall events occur with greater frequency, and overall warmer, drier, and more drought-like conditions (Melillo 2014). Climate change has the potential to alter the timing of pond breeding amphibians (Blaustein et al. 2001) and changes in snowpack could also impact amphibians (Corn 2003). Drought was implicated in the extirpation of six populations in Larimer County, Colorado (Corn and Fogleman 1984).

### **Information Needs**

Further research is required on the ecology of the chytrid fungus (*Batrachochytrium dendrobatidis*) and the susceptibility of northern leopard frogs to this pathogen. Information is also needed on the chytrid fungus status of northern leopard frog populations in Colorado. Effective control methods for non-native bullfrogs are needed, as are inventory to identify occupied wetland habitats to guide protection of wetland habitats for this species.

### **Conservation Actions**

Protection of wetland habitat, e.g., through easements and other landowner agreements, is a key priority, particularly on the Front Range. Wetland areas that remain uninvaded by bullfrogs and other exotic amphibians are especially important. Identify opportunities to create or restore additional suitable habitat. Continue to support research on Bd resistance and Bd transmission. Carefully evaluate agency and private fish stocking locations to minimize impacts on northern leopard frog and other native amphibians.

## **TIER 1 BIRDS**

### **Brown-capped Rosy-Finch (*Leucosticte australis*)**

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#### **Threats**

##### **2 Incompatible Agriculture**

Grazing by sheep may have a negative effect on brown-capped rosy-finches at wintering sites if they trample vegetation and disturb seed availability in arid shrublands.

##### **6 Human Intrusions & Disturbance**

In Colorado, the brown-capped rosy-finch breeds in alpine environments that occur predominantly on U.S. Forest Service land, with many acres designated as wilderness and in national parks. The brown-capped rosy finch remains at high elevations throughout the year unless severe storm events push them down to lower elevations in the winter months (Johnson et al. 2000). During the breeding season, populations are distant from most human activities and are relatively isolated from threats, but in winter they may be impacted by human activities as they drop to lower elevations to forage and roost. As access and participation in recreational activities in the alpine environment increases, recreation may have an impact on this species. Disturbance to nest sites could occur from recreational activities such as hiking, spring skiing, or rock climbing (Johnson et al. 2000).

##### **11 Climate Change & Severe Weather**

The brown-capped rosy finch breeds above treeline in Colorado where it can find suitable nest sites in steep cliff faces overlooking the alpine tundra (Johnson et al. 2000). During the breeding



season, this species forages on and at the edges of snowfields and glaciers where insects and seeds are deposited and in fell fields, cliffs, and rock slides (Kingery 1998; Johnson et al. 2000). The brown-capped rosy finch is thought to be susceptible to climate change due to the potential depletion of late lying snowfields as temperatures increase and winter precipitation patterns change. Though it is unknown if brown-capped rosy finches are dependent on snowfields, they do provide access to an abundant food source as insects are trapped there when wind updrafts are cutoff and insects fall stunned to the snow surface (Kingery 1998). Breeding success could be impacted if summer monsoonal moisture patterns change, resulting in alterations in the alpine plant communities that affect insect abundance and seed availability. If severity of winter storms intensify and increase, causing birds to migrate more frequently, winter mortality could also be impacted by climate change.

### **Information Needs**

Information regarding population abundance and trends at both local and statewide levels is needed to better assess this species' status. Declining population trends have been shown for this species using Christmas Bird Count Data (Johnson et al. 2000), but these data may not provide an accurate assessment of the species since winter populations are eruptive and nomadic. The development of a statewide status assessment and monitoring program is therefore needed to determine if a downward trend is occurring, and what mechanism is driving this cycle. Potential threats at both summer breeding and wintering sites needs to be investigated to gain an understanding of potential impacts to populations.

### **Conservation Actions**

Develop techniques to assess the population status and develop a long-term monitoring program to evaluate changes in populations and distribution in the face of climate change are also needed. Secure habitats and protect them from potential detrimental anthropogenic effects to provide a buffer for any effects due to climate change.

## **Burrowing Owl (*Athene cunicularia*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Western Grasslands Initiative – a Plan for Conserving Grassland Habitat and Wildlife (2011); Burrowing Owl (*Athene cunicularia*): a technical conservation assessment (2004); Conservation Plan for Grassland Species in Colorado (2003); Status Assessment and Conservation Plan for Western Burrowing Owl in the United States (2003) (links in Appendix D).

## **Threats**

### **1 Residential & Commercial Development**

The burrowing owl is closely associated with prairie dog colonies, and therefore is affected, directly or indirectly, by issues that threaten prairie dogs. Burrowing owl habitat has decreased in area and become fragmented as prairie dog colonies have been eradicated or gone extinct (McDonald et al. 2004). Prairie dog colonies have been converted to residential and commercial development and cropland across much of their range.

### **2 Incompatible Agriculture**

In addition to habitat conversion, agricultural activities increase owl mortality and loss of prey through use of insecticides and pesticides, which jeopardize the health and stability of owl populations (Klute et al. 2003; Gervais et al. 2006). Intentional eradication of prairie dog colonies for agricultural purposes also directly affects burrowing owls.

### **5 Biological Resource Use**

Recreational shooting of prairie dogs can decrease owl fecundity (Woodward 2002) or cause direct mortality when owls are mistaken for prairie dogs (Butts 1973). Seasonal shooting closures have been implemented on public land to help conservation of prairie dog populations.

### **8 Invasives, Problematic Native Species, & Pathogens**

Prairie dog colonies have undergone dramatic collapses from sylvatic plague and eradication efforts, which has led to decreases in abundance of burrowing owls (Desmond et al. 2000).

## **Information Needs**

Some of the greatest influences on burrowing owl population demographics (adult and first-year survival) may be driven by conditions or impacts at wintering grounds in Mexico. Determining what factors are controlling population stability on wintering grounds may provide needed information for effective conservation.

## **Conservation Actions**

Conservation of burrowing owls hinges on the protection of healthy prairie dog colonies. Direct loss of prairie dog colonies through anthropogenic alternation (e.g., exurban development, energy development, poisoning) should be addressed through outreach to appropriate audiences, implementation of best management practices, securing of conservation easements and other habitat protections, and, when appropriate, use of zoning and other regulatory mechanisms to protect habitat. Indirect loss of prairie dog colonies due to sylvatic plague may be reduced through the development and use of vaccines to protect prairie dogs. The negative effects of sylvatic plague on burrowing owls may also be addressed by the conservation of large numbers or well-dispersed prairie dog colonies at landscape scales.

## **Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*): a technical conservation assessment (2007); Columbian Sharp-tailed Grouse Conservation Plan, Routt, Moffat, and Rio Blanco Counties, Northwest Colorado (2001) (links in Appendix D).

### **Threats**

#### **1 Residential & Commercial Development**

Urbanization leads to fragmentation and the loss of native cover at lek sites, nesting and brooding areas, and winter habitat, rendering urban landscapes unsuitable for Columbian sharp-tailed grouse (Hoffman 2001). Hoffman (2001) states that the greatest threat of urbanization in northwestern Colorado is in Routt County, within a 20 mile (32 kilometer) radius of Steamboat Springs. Continuously balancing future residential and commercial development with conservation of Columbian sharp-tailed grouse habitat is necessary to prevent the decline of this species in Colorado.

#### **2 Incompatible Agriculture**

##### ***Cropland***

Conversion of native cover to pasture and cropland in the past has resulted in dramatic decline of grouse populations. Healthy grouse populations require large, undisturbed, natural habitats with intact ecological functions, including natural disturbance regimes (Storch 2000). However, Columbian sharp-tailed grouse do use Conservation Reserve Program (CRP) fields, mine reclamation lands, and occasionally grain fields. Though sharp-tailed grouse are considered moderately tolerant of habitat change (Hoffman and Thomas 2007), they cannot persist on overly modified landscapes or in small, isolated native habitats. Within the current Colorado range of the Columbian sharp-tailed grouse, the conversion of native cover to cropland has run its course, with little conversion of native habitats currently taking place. In northwestern Colorado, where Columbian sharp-tailed grouse still persist, it is because these areas were unsuitable for crops and native cover suitable for grouse was left undisturbed (Hoffman 2001). Historically Columbian sharp-tailed grouse ranged across southwestern Colorado, but conversion of native cover to cropland extirpated grouse from this portion of their native range (Oyler-McCance et al. 2001). The loss of habitat to cropland has been reversed to some extent in Colorado by recovery of previously converted wheat acreage to CRP lands. In Colorado, preventing future loss of grouse habitat to agricultural uses and encouraging the placement of current croplands into the CRP will benefit Columbian sharp-tailed grouse.

### ***Grazing***

Private lands supply 71% of the Columbian sharp-tailed grouse habitat in northwestern Colorado (Hoffman 2001). Grazing in a manner that is incompatible with sharp-tailed grouse reduces or eliminates key food plants and the abundance of insects important to the growth and development of chicks, and increases predation rates by reducing cover needed for concealment from predators (Baines 1996; Hoffman and Thomas 2007). Use of herbicides to remove shrubs and create grassland for cattle is detrimental to sharp-tailed grouse, which require adequate shrub cover for nesting and overwintering. Consequently, incompatibly grazed habitat supports fewer leks, fewer males at leks, and smaller populations (Hoffman 2001; Flanders-Wanner et al. 2004). Alternately, compatible livestock grazing management can maintain and/or enhance habitat by promoting desirable plant communities, preventing weed encroachment, providing residual cover, and increasing plant diversity (Hoffman 2001). Compatible grazing on rangelands is based on controlling the intensity, timing, frequency, selectivity, and distribution of grazing animals (MWCC 1999). The use of sound grazing management practices within sharp-tailed grouse habitats will help prevent declines and could increase Columbian sharp-tailed grouse populations in Colorado.

### ***Herbicide Use***

In Colorado, herbicide use is more problematic to sharp-tailed grouse than the use of pesticides (Hoffman and Thomas 2007). The impacts of herbicide use include modification of habitat components required for both cover and food, which can cause increased levels of predation and starvation (Hoffman 2001). Consequently, managing herbicide use in grouse habitat will benefit Colorado sharp-tailed grouse.

### ***Loss of Conservation Reserve Program (CRP) Lands***

Within the Colorado range of the Columbian sharp-tailed grouse, there are 21,000 acres of CRP land. Approximately 21% of all known leks occur on these CRP lands, which also provide critical nesting and brood-rearing habitat. If these CRP lands are lost, sharp-tailed grouse populations will decline (Hoffman and Thomas 2007). Lands are enlisted in the CRP for 10 to 15 years. A concerted effort should be made to re-enlist lands whose contracts are expiring, and to enlist new lands into the program within the Colorado range of the Columbian sharp-tailed grouse. This is particularly true for CRP lands in the vicinity of Steamboat Springs, Colorado, where land values for urban development are high (Hoffman and Thomas 2007).

### ***Degradation of Wetlands***

Columbian sharp-tailed grouse are attracted to wetlands for the succulent vegetation as well as the abundance of invertebrates, which are an important nutritional resource for growing chicks (Hoffman 2001). In Colorado, wetlands within the range of sharp-tailed grouse have been converted to cropland and have suffered damage to wetland vegetation due to incompatible grazing by livestock (Hoffman 2001). Protecting the remaining wetland habitats within their current range will benefit Columbian sharp-tailed grouse.

### **3 Energy Production & Mining**

The Rocky Mountain west is an important oil and gas producing region in the United States. Since the early 2000s, oil and gas development within the area occupied by the Columbian sharp-tailed grouse in northwestern Colorado has increased dramatically. According to GIS data from the Colorado Oil and Gas Conservation Commission, as of October 2014 there are over 1,300 oil and gas wells currently permitted or drilled within habitat of the Columbian sharp-tailed grouse in Colorado (<http://cogcc.state.co.us/>). Traffic and infrastructure from energy development, including roads, pads, tanks, utility lines and buildings, stresses sharp-tailed grouse populations, and leads to fragmentation and loss of native cover. Ultimately, this negatively impacts lek sites, nesting and brooding areas, and winter habitat, rendering them marginal for the Columbian sharp-tailed grouse (Hoffman and Thomas. 2007).

### **7 Natural System Modifications**

Historically, fire was the major disturbance factor in sagebrush and mountain shrub biomes occupied by Columbian sharp-tailed grouse (Hoffman and Thomas 2007). A lack of fire in sharp-tailed grouse habitat is the most significant problem in Colorado (Hoffman and Thomas 2007). Within the range of sharp-tailed grouse, fire frequency has been altered over the past 150 years due to the introduction of both livestock and noxious weeds. Cattle remove vegetation, thereby reducing fuel loads. Reduction of fuel loads, combined with the fire suppression practiced in the west for the past century, has reduced the frequency of fires. In Colorado, lack of fire is the main problem for grouse, where large acreages of Gambel's oak, which sharp-tailed grouse don't use, have become decadent and overgrown, crowding out other more suitable xeric mountain shrubs (Connelly et al. 2004). Fire management that restored openings and species diversity in the shrub community would benefit sharp-tailed grouse in Colorado. Caution in use of fire as a management tool is recommended, however, because sagebrush does not recover quickly from fire, and can be eliminated by intense, frequent fires (Hoffman 2001).

### **8 Invasives, Problematic Native Species, & Pathogens**

Grazing by wild ungulates may also negatively impact sharp-tailed grouse populations. When significant amounts of privately-owned land are closed to hunting and native predators are controlled, populations of native grazers (particularly elk) increase due to lack of both hunter and predator take. The result is that the ground and shrub cover required by grouse are diminished by elk browsing. Grazing by elk has increased in sagebrush and on CRP lands for these reasons (Hoffman and Thomas 2007). Efforts to meet elk management goals through enhanced harvest by hunters would benefit sharp-tailed grouse populations.

### **11 Climate Change & Severe Weather**

Predicted changes in climate suggest that the West will experience an increase in temperature, a decrease in frosts, and increases in precipitation (Melillo et al. 2014). These changes are predicted to lead to an increase in conifers at the expense of shrublands, and an increase in fires

because of increasing fuel loads (Neilson et al. 2005). The effects of these changes, should they occur, is hard to predict, but incompatible management of sharp-tailed grouse habitat could intensify the adverse effects of climate change.

### ***Information Needs***

Research is currently underway on population demographics, chick and hen survival, and habitat use.

### ***Conservation Actions***

CPW recently embarked on a long term translocation program aimed at restoring Columbian sharp-tailed grouse to as much of their historic range as possible, according to the recently completed "Colorado Columbian Sharp-tailed Grouse Translocation Guidelines" (CPW 2014a).

Collaboration should be continued and expanded with Federal agency partners that manage lands occupied by Columbian sharp-tailed grouse, to ensure that grazing planning and practices acknowledge the importance of wildlife habitat and incorporate the needs of sharp-tailed grouse into grazing planning and prescriptions. Grazing should be prescribed to account for adequate nesting and brood rearing habitat for sharp-tailed grouse. Additionally, efforts should be undertaken to minimize the amount of undesirable woody encroachment into previously or currently occupied sharp-tailed grouse habitat. Suitable sharp-tailed grouse habitat needs are fairly well known, and can be generally characterized as diverse grassland/shrubland complexes with abundant forbs, adequate grass height, and limited or few trees. Rigorous assessments of habitat quality will dictate what management actions need to occur. Private lands provide a significant and important amount of habitat for Columbian sharp-tailed grouse, and interested partners, including CPW, need to be active in advocating for, and helping when necessary, in restoring disturbed private land habitat, including mine reclamation and CRP maintenance, establishment, and mid-contract management. CRP stands and seed mixes should include a diverse suite of beneficial forbs and legumes, including beneficial non-natives such as alfalfa where appropriate. Efforts to educate private landowners on the habitat needs of sharp-tailed grouse, and provide technical guidance and, if necessary, financial assistance to implement compatible grazing plans and/or to assist with the management of woody encroachment.

## **Golden Eagle (*Aquila chrysaetos*)**

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### **Threats**

#### **1 Residential & Commercial Development**

The expansion of urban and exurban development has resulted in the loss of breeding habitat along Colorado's Front Range (Boeker 1974; Scott 1985). Along with urbanization comes increased recreational activity that can cause disturbance to golden eagles.

#### **2 Incompatible Agriculture**

Agricultural development can render areas once used as wintering habitat unsuitable for golden eagles (Craig et al. 1986).

#### **3 Energy Production & Mining**

Golden eagles are at greater risk to mortality from wind turbines than other raptors (USFWS 2011a), and they are also susceptible to death from collisions with cars, fences, and wires (Kochert et al. 2002). Additionally, disturbance from pre-construction, construction, or operation and maintenance activities at wind developments may disturb eagles at concentration sites, or result in loss of productivity at nearby nests, leading to permanent loss of nesting territory (USFWS 2013a). The U.S. Fish and Wildlife Service lists the following three factors as reasons for the increased risk of collision by eagles with wind turbines (USFWS 2011a):

- (1) topographic features, season, and wind currents interact to create favorable conditions for slope soaring or kiting (stationary or near-stationary hovering) in the vicinity of turbines;
- (2) behavior that distracts eagles and presumably makes them less vigilant (e.g., active foraging or inter- and intra-specific interactions); and
- (3) resident status, with resident adults and young less vulnerable and dispersers and migrants (especially sub-adults and floating adults) more vulnerable. This latter point should not be taken to undercut the potential severity of the risk to breeding adult eagles and their young, as losses from these segments of the population, especially breeding adults, can have serious consequences to populations.

#### **5 Biological Resource Use**

Golden eagles appear to be less susceptible to chemical pollution than other raptors (Kochert et al. 2002). However, secondary poisoning can occur when eagles consume carrion killed by herbicides, pesticides, rodenticides, and lead shot. Rodent control may also impact eagles by reducing abundance of prey species.

#### **6 Human Intrusions & Disturbance**

Human activity near nests can cause breeding failures, but most evidence is anecdotal or correlative (Kochert et al. 2002). Colorado Parks and Wildlife recommends no surface

occupancy within ¼ mile of active golden eagle nests beyond that which already occurs, as well as restriction of human activity to within ½ mile of active nests from December 15 through July 15 (CPW 2008). Additionally, researchers can cause disturbance at nests, resulting in nest abandonment, nest mortality due to excessive egg cooling or heating during periods when the researcher is at the nest and brooding adults are away, or cause young to fledge prematurely (Kochert et al. 2002). Such disturbance can be avoided if proper protocols and precautions are developed and followed by researchers.

## **7 Natural System Modifications**

The recent increase in the incidence of catastrophic wildfire in the intermountain West, including Colorado, has the potential to disrupt the breeding biology of golden eagles. Nesting success at burned territories in Snake River Canyon, Idaho, declined after major fires, with abandoned territories being subsumed by neighboring pairs, resulting in a decreased number of nesting pairs (Kochert et al. 1999). Changes in precipitation and temperature predicted for the Rocky Mountain region over the next 50 years suggest the observed increase in wildfires recently witnessed in Colorado may persist (Westerling et al. 2006).

### ***Information Needs***

Monitoring is required to determine the population status in the western U.S., where declines in golden eagles is suspected (Kochert et al. 2002, but see Nielson et al. 2014). The factors that may be involved in these declines and factors responsible for population trends in general, including fire, are poorly understood and require further elucidation. Further information on how environmental pollutants and habitat alterations at both breeding and winter grounds affect populations is needed. Estimates of current population size and trends would be useful in assessing proposals to harvest eagles for use by Native American's in religious ceremonies.

### ***Conservation Actions***

Conduct research to better understand how golden eagles use space and interact with topography surrounding wind farms. Appropriate siting, micro-siting, and implementation of best management practices to mitigate effects of wind power development are also needed. Securing protection of large, unfragmented landscapes to alleviate habitat loss and degradation from oil and gas development, conversion to cropland, and other anthropogenic alterations is important for the conservation of stable golden eagle populations.

## **Greater Sage-grouse (*Centrocercus urophasianus*)**

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The information presented here is a very limited summary of the detailed threats and conservation actions described in the 2008 Colorado Greater Sage-grouse Conservation Plan, and should not be construed as a comprehensive or prioritized list of the threats. The Colorado



Conservation Plan (link in Appendix D) should be referenced in developing threat assessments and conservation interventions for the species. Note that the impacts of the threats described below are variable across the distribution of greater sage-grouse; some threats are less significant or non-existent in some populations.

## **Threats**

### **1 Residential & Commercial Development**

The primary cause of sage-grouse decline is the loss and fragmentation of sagebrush habitats (USFWS 2013e). Habitat has been lost and fragmented by suburban and rural development, agricultural conversion to cropland, intensive grazing pressure, alterations to fire regimes, and invasion of non-native annual grasses (Schroeder et al. 1999; Walker et al. 2007). Housing development and the associated infrastructure (e.g., roads, fencing, powerlines, increased human activity) results in permanent habitat loss, degradation, and fragmentation. Colorado's human population growth has resulted in conversion of agricultural lands to residential land uses, and impacts of development have spread onto nearby public lands.

### **2 Incompatible Agriculture**

Grazing is one of the major land uses in sagebrush habitats, and has influenced sage-grouse habitat in a variety of ways, including removal of sagebrush from some areas, as well as alterations to understory plants needed for nesting, brood rearing, and other life history requirements. Direct and indirect impacts from improper grazing (grazing incompatible with local ecological conditions) on Greater Sage-grouse are uncertain and complex. However, grazing can also be used as a management tool to achieve desirable habitat conditions for the sage-grouse.

### **3 Energy Production & Mining**

Habitat has been lost and fragmented by energy development and the associated infrastructure (e.g., powerlines, pipelines, and roads). In Colorado, there is considerable overlap in the potential for oil and gas drilling and oil shale extraction (CGSSC 2008). Also, the largest coal reserves in the state significantly overlap with Greater sage-grouse habitat. Demand for both oil and gas and coal is expected to remain high. Potential threats related to energy production and mining activities and infrastructure include reduction in amount of available habitat, fragmentation and degradation of remaining habitat, direct disturbance and/or mortality of individual birds, and increased predation. Increased human disturbance related to oil and gas development can also reduce viability of sage-grouse populations (Walker et al. 2007).

### **8 Invasives, Problematic Native Species, & Pathogens**

Noxious and invasive weeds are considered a threat to rangeland health in much of greater sage-grouse habitat. Noxious weeds have the potential to degrade greater sage-grouse habitat,

primarily by increasing the fire regime frequency, decreasing plant diversity, and changing structure of plant and insect communities. A potentially significant issue for greater sage-grouse is the invasion of cheatgrass in the understory of sagebrush habitats. If cheatgrass out-competes native perennial plant species (which sage-grouse eat) to the point that the understory is comprised exclusively of annual grasses (which sage-grouse do not eat), value of the habitat could be significantly reduced. Juniper and pinion pine encroachment into sagebrush communities is occurring in some greater sage-grouse populations. Fire is important for suppressing expansion of pinion-juniper into shrub-steppe communities.

### ***Information Needs***

The Colorado Greater Sage-grouse Conservation Plan (CGSSC 2008) provides a detailed section on research needs related to greater sage-grouse. The section identifies detailed research topics that 1) are important to understanding greater sage-grouse populations and habitat; and 2) lead to more effective greater sage-grouse management. Some of the issues identified in the plan are listed below; see the plan for detailed, specific objectives and conservation strategies relates to each issue.

How greater sage-grouse population dynamics and sustainability are impacted by the quality and quantity of habitat and human-controlled activities in greater sage-grouse habitat is not well understood. The effectiveness of current measures designed to protect greater sage-grouse from impacts, specifically impacts of energy and mineral development, is unknown. The population-level impacts of predation, West Nile virus, and harvest are not well understood. There is also lack of information on invasive weed distribution in and the potential impact on greater sage-grouse habitat in Colorado.

Also, current methods for monitoring trends in greater sage-grouse populations and for estimating greater sage-grouse population size from lek counts make many unsupported assumptions. Research is needed to establish reliable and effective methods for monitoring greater sage-grouse population trends and estimating population size. CPW is currently undertaking this research.

### ***Conservation Actions***

The 2008 Colorado Greater Sage-grouse Conservation Plan provides comprehensive, detailed information and should be referenced in developing conservation actions for the species (link in Appendix D).

In this plan, each potential issue/threat has various objectives with corresponding conservation strategies. Each strategy has accompanying information regarding Responsible Parties, Timeline, and Cost. Because greater sage-grouse in Colorado are found in six separate populations, the potential threats and conservation strategies are diverse and complex. Existing local working

groups have developed local conservation plans. The statewide plan provides strategies for the cumulative, landscape-wide impacts to greater sage-grouse. Readers should consult and implement appropriate strategies within the statewide plan, and should also read and apply strategies with the applicable local plans. In some cases, more detail will be found in the local plans and in other cases, the statewide plan will be more specific.

## **Greater Sandhill Crane (*Grus canadensis tabida*)**

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### ***Threats***

#### **2 Incompatible Agriculture**

##### ***Staging areas***

During migration, greater sandhill cranes feed primarily in agricultural fields. Changes in agricultural practices and the loss of farmland to the effects of climate change and urbanization all have the potential to impact populations of greater sandhill cranes in Colorado. Farming practices after harvest frequently determine the amount of waste seed available for sandhill cranes (Littlefield and Ivey 2002). In the San Luis Valley, spring food for cranes is becoming a critical issue as waste grain is being reduced by fall tilling and irrigation of fields after harvest (SRMGSC 2007). This process is used to stimulate sprouting and then freezing of waste seed after harvest, which leaves a clean field for spring planting.

##### ***Breeding Areas***

Breeding sandhill cranes are dependent upon wet hay meadow and grain fields along the Yampa and Elk rivers in Routt County for foraging habitats (SRMGSC 2007). Cranes with broods prefer to forage in open, flooded meadows (Gerber et al. 2014). Frequently these sites are subject to agricultural practices that can be detrimental to nesting and fledging. Though meadows are generally good foraging sites for cranes, late June and July meadow mowing can kill crane chicks as they hide in dense vegetation and remain motionless, waiting for the threat to pass (Littlefield and Ivey 1994). In addition, meadows are often dried in June for hay harvest, and early drying can result in the unavailability of invertebrate foods, sometimes contributing to chick starvation (Littlefield and Ivey 2002).

#### **7 Natural System Modifications**

##### ***Staging Areas***

The single greatest threat to sandhill cranes appears to be loss of non-breeding habitat; particularly fall and spring staging areas in Colorado (Gerber et al. 2014). The major fall and spring migration stop for the Rocky Mountain population of the greater sandhill crane is in the San Luis Valley, Colorado. Most roosting areas are on the Monte Vista National Wildlife Refuge (NWR), Baca National Wildlife Area, Higel State Wildlife Area, Rio Grande State Wildlife Area,

the channel of the Rio Grande River, and private marshes and wet meadows along the river from the town of Monte Vista to the Alamosa NWR. Water withdrawal for urban and agricultural use, combined with climate change and drought, has lowered the water table in the San Luis Valley resulting in shrinking habitat for sandhill cranes (SRMGSC 2007). This loss of habitat has caused crowding leading to disease outbreaks. Consequently, avian tuberculosis, cholera, and botulism have caused crane mortality in staging areas in the San Luis Valley (Drewien et al. 2001).

### ***Breeding Areas***

Habitat loss within breeding areas is a serious threat to greater sandhill cranes in Colorado. Breeding cranes utilize the river valleys, marshes, and wet meadows of northern Colorado, where human populations are low but increasing. In Colorado, breeding sites are located on private lands that are desirable for exurban development (SRMGSC 2007).

### ***Information Needs***

Habitat inventories are needed to identify, classify, rank, and catalog habitats used by greater sandhill cranes in Colorado. This information will help facilitate the protection of important habitat through acquisition, easement, cooperative agreements, special-use permits, and mitigation exchanges and developments (SRMGSC 2007). Understanding how changing human impacts (including changes in agricultural practices induced by climate change) affect both breeding and non-breeding staging sites will be important for creating long-term conservation strategies (Gerber et al. 2014). Investigation of how changing agricultural practices are diminishing food availability in the San Luis Valley and the feasibility of augmenting food supplies by developing natural forage sites through wetland creation and enhancement is needed (SRMGSC 2007).

### ***Conservation Actions***

Conservation and appropriate management of important habitats is needed. In particular, maintaining or improving the health of riparian and wetland habitats, and ensuring adequate availability of food resources, is needed.

## **Gunnison Sage-grouse (*Centrocercus minimus*)**

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The information presented here is a very limited summary of the detailed threats and conservation actions described in the 2005 Gunnison Sage-grouse Rangewide Conservation Plan, and should not be construed as a comprehensive or prioritized list of the threats. The Rangewide Conservation Plan should be referenced in developing threat assessments and conservation interventions for the species (link in Appendix D). For additional information, refer also to the U.S. Fish and Wildlife Service's final listing decision (USFWS 2014a).

Note that the impacts of the threats described below are variable across the distribution of Gunnison sage-grouse; some threats are less significant for the Gunnison population compared with some satellite populations.

## **Threats**

### **1 Residential & Commercial Development**

As noted in the Rangewide Conservation Plan, if not managed properly, residential and commercial development and associated infrastructure (e.g., roads, power lines, reservoirs) have the potential to impact Gunnison sage-grouse habitat and populations. Current and future human population growth rates and patterns vary widely across the species' range, but are generally higher in low-elevation meadows, grasslands, and sagebrush. The impacts of residential and commercial development can be minimized by concentrating new growth in or near areas outside of occupied or suitable habitat. Gunnison County, where the majority of Gunnison sage-grouse are found, has successfully implemented land use regulations and voluntary conservation measures (including significant conservation easements) to avoid, minimize and/or mitigate potential adverse impacts of new construction in the county on the species. Development in the Gunnison Basin is currently considered by the United States Fish & Wildlife Service to be a threat of low magnitude to the persistence of the species. In the smaller satellite population areas, similar measures can aid in avoiding or minimizing the impacts of population growth on Gunnison sage-grouse habitat.

### **2 Incompatible Agriculture**

In addition to habitat conversion to cropland, grazing (one of the major land uses in sagebrush habitats) has influenced sage-grouse habitat in a variety of ways. Direct and indirect impacts from improper grazing (grazing that is incompatible with local ecological conditions) on Gunnison sage-grouse are uncertain and complex. Potential impacts include removal of sagebrush from some areas, as well as alterations to understory plants needed for nesting, brood rearing, and other life history requirements. However, grazing can also be used as a management tool to achieve desirable habitat conditions for the grouse. Conservation measures from the Gunnison Basin Candidate Conservation Agreement (CCA) should continue to address potential impacts from livestock grazing and operations on Federal lands in the Gunnison Basin. Also, conservation measures within the Candidate Conservation Agreement with Assurances (CCAA) Program have minimized impacts from livestock grazing and operations on private lands across the range of Gunnison sage-grouse.

### **3 Energy Production & Mining**

Current and potential leasable energy development is limited to a small portion of the species' overall range and to date, the majority of oil and gas development has occurred outside of occupied habitat for Gunnison sage-grouse. The San Miguel Basin and Dove Creek populations

are the only areas within Gunnison sage-grouse range that currently have a moderate amount of oil and gas production. There are no active coal operations in Gunnison sage-grouse habitat, and recoverable coal resources are limited in Gunnison sage-grouse range. Localized threats related to energy production and mining activities and infrastructure may include reduction in amount of available habitat, fragmentation and degradation of remaining habitat, direct disturbance and/or mortality of individual birds, and increased predation. These localized impacts, however, are not projected to pose a significant threat to the species.

### **Information Needs**

The Gunnison Sage-grouse Rangewide Conservation Plan (2005) provides a detailed section on research needs related to Gunnison Sage-grouse. The section identifies broad research topics that 1) are important to understanding populations and habitat; and 2) lead to more effective management. The highest priority research need is to evaluate the effect of habitat quality and quantity on the behavior and population dynamics.

### **Conservation Actions**

Again, the reader is referred to the Rangewide Conservation Plan in developing threat assessments and conservation interventions for the species (available online: <http://cpw.state.co.us/learn/Pages/GunnisonSagegrouseConservationPlan.aspx>).

## **Lesser Prairie-chicken (*Tympanuchus pallidicinctus*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: The Lesser Prairie-chicken Range-wide Conservation Plan (2013); Lesser Prairie-chicken Conservation Initiative (2008); Lesser Prairie-chicken (*Tympanuchus pallidicinctus*): a technical conservation assessment (2005); Federal listing documents; Lesser Prairie-chicken Recovery Plan (1992) (links in Appendix D).

### **Threats**

#### **2 Incompatible Agriculture**

Fragmentation, degradation, and conversion of grasslands has led to isolation and reduced viability of lesser prairie-chicken populations (Johnson et al. 2003; Silvy and Hagen 2004). In Colorado, a majority of the historically suitable habitat has been converted to croplands. The remaining landscape is sandy rangeland sites characterized by choppy or deep sands and sandsage. The primary limiting factor for lesser prairie-chicken populations in Colorado is the current lack of large continuous blocks of diverse grassland, approximately mid-calf to knee high, that contains abundant forbs, legumes and/or sandsage. This diverse grassland/forb/shrub community must provide the height and density that will provide adequate cover for nesting, brood-rearing, and year-round survival. This habitat has been dramatically altered by grazing

systems and management that have resulted in nearly complete loss of native mid-grass species which are critical for nesting. The majority of sandsage in Colorado is now dominated by shortgrass species, and/or has a dramatically reduced or eliminated grass component. Many of these habitats are lacking necessary components (e.g., adequate concealing cover for nesting, escape cover). Conservation Reserve Program fields contribute important habitat for lesser prairie-chickens. Loss of CRP fields and CRP fields planted with incompatible seed mixes exacerbate the degraded condition of available habitat.

### **3 Energy Production & Mining**

Oil and gas development fragments habitat and leads to behavioral avoidance, including lek abandonment, in areas where production and related infrastructure occur (Van Pelt et al. 2013). Hunt (2004) found well densities higher near abandoned leks than near active leks. Increasing densities of oil and gas wells may result in reduced lesser prairie-chicken populations.

### **14 Natural Factors**

Because lesser prairie-chickens have small home ranges and habitats are becoming more isolated and disjunct (Robb and Schroeder 2005), there is evidence of diminishing genetic diversity (Johnson et al. 2003, 2004). This can lead to appearance of deleterious recessive alleles, reduced reproductive output, and susceptibility to stochastic events.

### ***Information Needs***

Some basic rangewide natural history information is still lacking for the lesser prairie-chicken, including information on dispersal, recruitment, and the importance of parasites and infectious diseases. Also, information on local population size and the capacity for connectivity, as well as how habitat quality and patch size can mitigate mortality factors, is needed (Robb and Schroeder 2005). Research to better determine the direct and indirect effects of anthropogenic structures (e.g., oil and gas wells, wind turbines) is needed to implement the most effective mitigation programs. For restored grasslands, research to determine most effective seed mixes and planting techniques is needed, including how habitat responds to intentional occasional disturbance such as mid-contract management for CRP parcels.

### ***Conservation Actions***

Conservation of lesser prairie-chickens is dependent on the protection of large, unfragmented landscapes with suitable habitat. When possible, permanent conservation easements should be used to secure habitat in perpetuity. While permanent easements are preferable, term easements may have utility in some situations. Term length should be a minimum of 5-10 years, although longer is highly desirable. Programs that dis-incentivize the conversion of native habitats or planted grass cover to rowcrop production should be implemented. Negative effects from anthropogenic activities which cause habitat loss and fragmentation (oil and gas, wind power, electrical transmission) must be ameliorated through appropriate avoidance and minimization

and, when necessary, offsetting mitigation. Because of very low populations in Colorado, habitat protection and improvement around remaining leks is imperative and the possibility of population enhancement through translocations should be explored. Severe and long-term droughts have significant impacts on lesser prairie-chicken populations. While droughts themselves can not be prevented, providing sufficient high-quality habitat will allow the species to persist during such stressful periods.

In Colorado, sandsage rangelands and planted grass habitats (e.g., CRP) must be managed to provide habitat for lekking, nesting, and brood rearing. Landowner outreach, the Farm Bill, and other incentive programs (e.g., Lesser Prairie-chicken Rangewide Conservation Plan) should be used to encourage landowners to implement agricultural practices that are compatible with lesser prairie-chicken conservation. Cropland can be converted to suitable lesser prairie-chicken habitat using a diverse mix of plant species. The largest and most familiar program to do this is the Conservation Reserve Program.

The most limiting factor in the degree of suitability of currently enrolled CRP fields for lesser prairie-chicken in Colorado is the widespread use of an aggressive native grass, sideoats grama, which largely does not provide suitable lesser prairie-chicken habitat under current management regimes. This native species tends to out-compete other native grasses and necessary forbs and legumes in the highly disturbed system. Current CPW habitat use research using GPS radio telemetry is corroborating previous work from Kansas and abundant anecdotal evidence that the use of non-native but highly beneficial dryland adapted alfalfa in CRP plantings is providing habitat to lesser prairie-chickens in CRP dominated landscapes. CRP seed mixes must be designed so that the resulting habitat will address the structural and composition needs of lesser prairie-chickens.

Another factor limiting the potential for CRP to provide habitat is the declining national acreage cap, and the counties in southeastern Colorado often reach their allowable enrollment cap. However, establishing suitable habitat for lesser prairie-chickens through CRP or similar programs remains one of the quickest and most effective management actions to improve conditions for lesser prairie-chicken populations in Colorado.

Grazing management to ensure an adequate interspersed of habitat types and the mid-height warm season grasses and abundant forbs that are critical components of suitable lesser prairie-chicken habitat is needed. To be successful, this will require sound technical assistance, financial incentives, and landowner buy-in. Use of grazing management to improve habitat is on a much longer time frame than establishing adequate and suitable habitat on previously cropped acres through the CRP or similar programs. It is unknown how many years it will take to (or if it is even possible) to restore the most highly degraded sandsage areas to suitable habitat for lesser prairie-chickens.



Improving habitat conditions for lesser prairie-chickens in Colorado will require continued and improved commitment from a variety of government agencies and partners. Effective outreach will be necessary to engage private landowners in lesser prairie-chicken habitat efforts as the vast majority of potential habitat is on privately owned lands. Lastly, management actions must effectively incorporate scientific data and use sound techniques and methodology to recover or establish habitat that will directly address population limiting factors for lesser prairie-chickens.

## **Mountain Plover (*Charadrius montanus*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Western Grasslands Initiative – a Plan for Conserving Grassland Habitat and Wildlife (2011); Conservation Plan for Grassland Species in Colorado (2003); Mountain Plover (*Charadrius montanus*): a technical conservation assessment (2003); Proposed federal listing documents (links in Appendix D).

### **Threats**

#### **1 Residential & Commercial Development**

The major threat to the mountain plover is the loss of native habitats and the loss of those species that can create suitable habitat (especially prairie dogs) (Dinsmore 2003). In Colorado, residential and commercial development has replaced mountain plover habitat along the Front Range, in scattered locations throughout the eastern plains, and in South Park.

#### **2 Incompatible Agriculture**

Much mountain plover habitat in Colorado has been converted to cropland. Mountain plovers can adapt to changing landscapes by utilizing surrounding cropland for nesting. Though mountain plovers do use cropland, it may be less suitable in some areas (i.e., low chick survival rates) than shortgrass prairie or prairie dog towns (Dreitz 2008). As prairie dogs have undergone precipitous declines (Dreitz 2009), so have the bare-ground/shortgrass habitats that are ideal for mountain plover. Domestic livestock grazing has replaced the historic grazing regimes once found on the Great Plains, but livestock do not necessarily replicate grazed conditions necessary for plover nesting success. Instead, livestock often convert the mosaic of bare ground and vegetation structure favored by mountain plovers to more homogenous structure lacking the crucial bare ground component (Dinsmore 2003). Augustine and Derner (2012) suggest that prescribed burn and prairie dog grazing provide more suitable habitat on shortgrass prairie than intense livestock grazing alone.

### **3 Energy Production & Mining**

Oil and gas development near suitable habitat may limit plover use of areas and may fragment contiguous patches of suitable habitat. This, in combination with the above threats, contribute to a landscape that has become more fragmented for plover habitat, reducing the size of viable patches, and possibly isolating some breeding or wintering populations. In addition, associated disturbances such as noise, presence of humans, and vehicle traffic may result in behavioral avoidance. However, because plovers are attracted to disturbed ground for nesting, oil and gas development activities may hinder some nesting, but they could also attract plovers. If nests are known to be in the area, efforts to avoid destruction should be made.

### **8 Invasives, Problematic Native Species, & Pathogens**

Sylvatic plague is a significant threat to remaining prairie dog colonies, and mountain plovers are positively associated with prairie dog colonies. Addressing plague management would be a positive benefit to mountain plover conservation.

### ***Information Needs***

Precise rangewide and local population demographics information, including population size, is lacking for mountain plovers. There is a lack of understanding of how landscape management activities impact plover populations. Also, the movement patterns among and within regional populations is poorly understood. Lastly, knowledge of predator and prey communities and their dynamics at breeding and wintering grounds needs further study. It is possible the greatest threats to mountain plovers are not in Colorado on their breeding grounds, but rather on their wintering grounds, since research in Colorado shows significant use of fallow agricultural lands, which are abundant, for nesting habitat. Additional research is needed to determine what factors are limiting the population so that effective management can be implemented.

### ***Conservation Actions***

In Colorado, conservation and management of shortgrass prairie is necessary for maintenance of healthy mountain plover populations. Use of best management practices (for example, prescribed fire, promotion of prairie dog colonies) to limit impacts from energy development, cropland conversion, and exurban development should be encouraged. Landowner outreach and incentive programs through the Farm Bill or other programs can be used to encourage grazing practices that are compatible with mountain plovers. Because prairie dogs are important for creating short grassland habitats preferred by mountain plovers, conservation actions which benefit prairie dogs should be implemented. Direct loss of prairie dog colonies through anthropogenic alternation (e.g., exurban development, energy development, poisoning) should be addressed through outreach to appropriate audiences (including policy-makers and landowners), implementation of best management practices, securing of conservation easements and other habitat protections, and, when appropriate, use of zoning and other regulatory mechanisms to protect habitat. Indirect loss of prairie dog colonies due to sylvatic plague may be

reduced through the development and use of vaccines to protect prairie dogs. The negative effects of sylvatic plague on mountain plovers may also be addressed by the conservation of large numbers or well-dispersed prairie dog colonies at landscape scales.

## **Plains Sharp-tailed Grouse (*Tympanuchus phasianellus jamesi*)**

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### **Threats**

#### **1 Residential & Commercial Development**

Plains sharp-tailed grouse in Colorado have been negatively impacted by residential and commercial development. Douglas County, one of the perennially fastest growing counties in the United States for a number of years, historically provided some of the best plains sharp-tailed grouse habitat in the state. This former stronghold does not currently, and likely never will, provide sharptail habitat due to habitat loss to residential development.

#### **2 Incompatible Agriculture**

##### ***Cropland***

Conversion of native cover to pasture and cropland in the past has resulted in dramatic decline of grouse populations. Healthy grouse populations require large, undisturbed, natural habitats with intact ecological functions including natural disturbance regimes (Storch 2000). Historically, plains sharp-tailed grouse ranged across the northern two thirds of eastern Colorado, but conversion of native cover to cropland has extirpated plains sharp-tailed grouse from much of their native range. In Colorado, preventing future loss of habitat to agricultural uses and encouraging the enrollment of croplands into the CRP within the current range of plains sharp-tailed grouse will benefit this species.

##### ***Grazing***

Private lands supply approximately 50 percent of the plains sharp-tailed grouse habitat in northeastern Colorado. Grazing that is incompatible with sharp-tailed grouse results in reduction or elimination of key grouse food plants and the abundance of insects important to the growth and development of chicks, and increases predation rates of adult and young grouse by reducing cover needed for concealment from predators (Baines 1996; Hoffman and Thomas 2007). Consequently, incompatibly grazed habitat supports fewer leks, fewer males at leks, and smaller populations of sharp-tailed grouse (Flanders-Wanner et al. 2004). Alternately, proper grazing management can maintain and/or enhance sharp-tailed grouse habitat by promoting desirable plant communities, preventing weed encroachment, providing residual cover, and increasing plant diversity (Hoffman 2001). Proper grazing management on rangelands is based on controlling the intensity, timing, frequency, selectivity and distribution of grazing animals (MWCC 1999). The use of sound grazing management practices within sharp-tailed grouse

habitats will help prevent declines and could increase plains sharp-tailed grouse populations in Colorado.

### **3 Energy Production & Mining**

#### ***Oil and Gas***

The Rocky Mountain west is an important oil and gas producing region in the United States. Since the early 2000s, oil and gas development within the area occupied by the plains sharp-tailed grouse in northeastern Colorado has increased dramatically. According to GIS data from the Colorado Oil and Gas Conservation Commission, as of October 2014 there are over 1,500 oil and gas wells currently permitted or drilled within habitat of the plains sharp-tailed grouse in Colorado (COGCC 2014). Traffic and infrastructure from energy development, including roads, pads, tanks, utility lines and buildings, stress sharp-tailed grouse populations and lead to fragmentation and the loss of native cover. Ultimately, this negatively impacts lek sites, nesting and brooding areas, and winter habitat, rendering them marginal for sharp-tailed grouse (Hoffman and Thomas 2007).

#### ***Renewable Energy***

There are four large scale wind farms within the range of the plains sharp-tailed grouse in Colorado, with potential for more development in the future (NRDC 2014). No research has been conducted on the impacts that wind turbines and other infrastructure (e.g., transmission lines) have on plains sharp-tailed grouse, but concerns include noise, habitat disruption, disturbance, fragmentation, and increased predator access (USFWS 2004; UWIN 2010). Pruet et al. (2009) demonstrated that greater prairie-chicken (*Tympanuchus cupido*) movements are altered by wind energy development; they avoid crossing under transmission lines and avoid activity near the tall structures associated with wind energy. However, it is unknown whether or not plains sharp-tailed grouse respond in a similar way. Sharp-tailed grouse tend to be fairly tolerant of limited development and disturbance, often using disturbed habitat such as homesteads, tree rows, and agricultural fields at certain times of year. Given the uncertainties surrounding the impacts of wind energy development on prairie grouse, the USFWS (2004) recommends restricting installation of wind turbines or wind facilities within a 5-mile radius of active grouse leks.

#### ***Information Needs***

Knowledge of plains sharp-tailed grouse biology in Colorado is limited. Research is needed on the effects of grazing practices on sharp-tailed grouse habitat, and on the minimum habitat patch size needed to support stable populations of sharp-tailed grouse (Braun et al. 1992). The spatial configuration of habitat suitable for prairie grouse may become critical if the amount of available habitat drops below a threshold. Consequently, information on the spatial description of habitat requirements is needed, particularly in areas that may be fragmented by cropland and energy development (Niemuth 2011).

## **Conservation Actions**

Effective conservation of remaining plains sharp-tailed grouse populations in Colorado rest largely with maintaining suitable habitat on previously cropped lands enrolled into the Conservation Reserve Program. Suitable habitat complexes of CRP, limited amounts of dryland agriculture in cereal grains, and native range exhibiting and maintaining a mid-grass and/or native shrub component will be necessary to sustain plains sharp-tailed grouse. Grazing management can be improved adjacent to CRP, but the existing rangeland where sharp-tailed grouse still occur is marginal at best, and this species is now exceedingly reliant upon suitable CRP, as the best of their historic range in Colorado has been permanently lost.

## **Southern White-tailed Ptarmigan (*Lagopus leucura altipetens*)**

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For detailed information on threats and conservation actions needed for this subspecies, refer to the following resources: White-tailed Ptarmigan (*Lagopus leucura*): a technical conservation assessment (2006) (link in Appendix D).

### **Threats**

#### **2 Incompatible Agriculture**

Grazing in the alpine environment by livestock, mostly sheep, may have a negative effect on white-tailed ptarmigan populations due to alterations in the alpine plant community as well as disturbance to willow carrs. Studies have shown that sheep grazing in the alpine reduces cover of some important food sources for ptarmigan (Hoffman 2006 and references therein).

#### **6 Human Intrusions & Disturbance**

Recreation in alpine areas has increased over the past few decades and will likely continue to increase. Recreational activities include skiing, hiking with dogs, all-terrain vehicle use, and snowmobiling, all of which have the potential to disturb white-tailed ptarmigan populations and/or degrade habitat.

#### **8 Invasives, Problematic Native Species, & Pathogens**

Expansion of wild ungulates, primarily elk but also mountain goats and moose, into alpine habitat may negatively affect white-tailed ptarmigan populations (Hoffman 2006). Elk grazing and browsing in the alpine & subalpine willow habitat of some areas (e.g., Rocky Mountain National Park) may result in reduced suitability for ptarmigan. Degradation of willow in alpine and subalpine habitats by elk could impact ptarmigans on wintering areas by reducing survival and lowering body condition.

## **11 Climate Change & Severe Weather**

White-tailed ptarmigan are an alpine species that depend on willows in the winter months to survive and lush alpine vegetation in the summer to breed and fledge young. There is concern that the species will be negatively impacted by climate change. Changes that could impact the species in Colorado are loss of willow carrs due to drying and degradation, increases in thaw/melt cycles in winter that limit roosting sites, changes in summer monsoonal patterns that result in warmer summer temperatures and less precipitation to maintain productive vegetation in alpine systems, increases in and severity of spring storms when young chicks are vulnerable, increase in predators not normally occurring at higher elevations due to warming trends, and potentially increases in avian diseases.

Ptarmigan are not well-adapted physiologically for dealing with high temperatures (Johnson 1968). Wang et al. (2002), in their study of white-tailed ptarmigan in Rocky Mountain National Park, found that over 25 years the average median hatch date has advanced 15 days, and that winter temperatures may have contributed to this species' long-term decline.

### ***Information Needs***

Continued monitoring of the species is needed to evaluate how it may respond to changing environmental conditions brought about by climate change. Recent research has provided reliable estimates of statewide survival and abundance (Seglund 2011; Seglund and Street 2013). Continuing this work is needed to test trends in survival, reproductive success, and population size.

### ***Conservation Actions***

In 2010, the southern white-tailed ptarmigan was petitioned to be listed as threatened under the Endangered Species Act. Colorado supports the largest population of southern white-tailed ptarmigan in the lower 48 states. Thus, if the subspecies does become listed, CPW will be responsible for the bulk of the protection and management of the species. Therefore, continued long-term monitoring using enhanced models to monitor range-wide trends in distribution and evaluate population status is needed. Coordination among agencies would help in these efforts.

## ***Southwestern Willow Flycatcher (*Empidonax traillii extimus*)***

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Final Recovery Plan Southwestern Willow Flycatcher (*Empidonax traillii extimus*) (2002); Federal listing documents (links in Appendix D).

## **Threats**

### **2 Incompatible Agriculture**

Incompatible grazing by livestock in riparian habitat has resulted in the loss of riparian vegetation, particularly within the arid west (Belsky et al. 1999). Incompatible grazing in riparian areas can reduce the overall density of vegetation, which is a primary attribute of southwestern willow flycatcher breeding habitat (USFWS 2002a). Related impacts may include soil compaction, increased runoff leading to gulying, downcutting, and a lowered water table, subsequently furthering the loss of riparian vegetation. Livestock can also directly destroy willow flycatcher nests (Valentine et al. 1988). In the arid mountain regions of the west, water resources and fertile land suitable to support cropland exists mainly along streams where water for irrigation and rich soils deposited on stream floodplains is found. These areas that once contained extensive riparian habitat suitable for willow flycatchers have been converted to agriculture (USFWS 2002a). Farming operations can also create habitat for brown-headed cowbirds (*Molothrus ater*) by creating short-grass fields, grain storage and livestock concentrations in proximity to willow flycatcher nesting habitat (USFWS 2002a).

### **7 Natural System Modifications**

The riparian habitat the southwestern willow flycatcher depends on has been disturbed by multiple human-induced activities, including reductions in water flow, interruptions in natural hydrological events and cycles, physical modifications to streams, modification of native plant communities by invasion of exotic species, and direct removal of riparian vegetation (USFWS 2002a). Streams occupied by the flycatcher have been disturbed by impoundments, dams, and reservoirs that alter the timing, frequency and quantity of flows, which in turn adversely impact riparian vegetation, rendering it unsuitable for willow flycatchers. Water diversion and groundwater pumping have dried riparian zones, leading to the loss of riparian shrubs necessary for willow flycatchers. Channelization, bank stabilization, levees, and other forms of flow controls have separated streams from their floodplains, reducing the cover of wooded riparian habitats willow flycatchers are dependent upon.

Fire within riparian habitats can be particularly damaging to riparian plant communities because they are not adapted to fire, nor are they fire regenerated. There is evidence that fire has increased in western riparian habitats where streams have been regulated because the reduction of flooding has allowed fuels to buildup, and because of the expansion and dominance of the highly-flammable tamarisk (Busch 1995). The loss of riparian habitat due to increased frequency of fire causes the direct loss of willow flycatcher habitat.

### **8 Invasives, Problematic Native Species, & Pathogens**

Many waterways within the range of the southwestern willow flycatcher have been invaded by tamarisk (*Tamarix ramosissima*). Southwestern willow flycatchers will nest in some habitats that

have become invaded by, or have become dominated by, tamarisk (Paradzick et al. 2000). Consequently, the restoration of riparian habitat through the removal of tamarisk can pose a threat to southwestern willow flycatchers. When conducted in areas of suitable habitat (occupied or unoccupied), and when conducted in the absence of restoration plans to ensure replacement by vegetation of equal or higher functional value, the result can be a decline in willow flycatcher populations (USFWS 2002a).

#### **14 Natural Factors**

The southwestern willow flycatcher suffers brood parasitism from brown-headed cowbirds, which reduces reproductive performance (USFWS 2002a). Under normal conditions, brood parasitism would not affect willow flycatcher viability. However, the increase in cowbird populations induced by the farming practices, in conjunction with the decline in condition of western riparian habitats, could be contributing to the population decline of willow flycatchers (Rothstein 1994).

#### **Information Needs**

Many life history traits of southwestern willow flycatchers require further study, including spacing and site tenacity, fecundity and mortality, mating system, and population structure and regulation. The dispersal and migratory behavior of juveniles is poorly understood, and information is needed on the winter status and distribution for much of the flycatcher's winter range, especially in northern South America (Sedgwich 2000; USFWS 2002a).

#### **Conservation Actions**

Maintenance of healthy riparian forest habitats in the San Luis Valley and southwestern Colorado is imperative for the conservation of southwestern willow flycatcher. Implementation of water management policies that encourage sustainable flows and support healthy willow and mature cottonwood riparian forests are needed. Public lands (state wildlife areas, national wildlife refuges, BLM) should be managed to benefit the species. Outreach to landowners and the use of incentive programs to maintain riparian forest and prevent habitat alteration or degradation (e.g., due to overgrazing) are important tasks.

### **Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*)**

For detailed information on threats and conservation actions needed for this species, refer to the following resources: Yellow-billed Cuckoo (*Coccyzus americanus*): a technical conservation assessment (2005); Federal listing documents (links in Appendix D).



## **Threats**

### **2 Incompatible Agriculture**

Incompatible grazing by livestock in riparian habitat has resulted in the loss of riparian vegetation, particularly within the arid west (Bock et al. 1993). Grazing in riparian areas can cause changes in the structure and composition of riparian vegetation, which may affect suitability of habitat for western yellow-billed cuckoo breeding and prey population abundance (USFWS 2014b). In the arid mountain regions of the west, water resources and fertile land suitable to support cropland exists mainly along streams, where water for irrigation and rich soils deposited on stream floodplains is found. Large areas of cottonwood–willow floodplain vegetation have been converted to agricultural uses, reducing the extent of habitat available to cuckoos for breeding (USFWS 2002a).

### **4 Transportation & Service Corridors**

Roads and railroads often follow along rivers, causing the loss and degradation of riparian habitat (NAS 2002). Additionally, gravel mining for road construction generally occurs along rivers and in the floodplain, affecting groundwater levels and riparian vegetation (Kondolf 1995).

### **7 Natural System Modifications**

The riparian habitat the western yellow-billed cuckoo depends on has been disturbed by multiple human induced activities, including alteration of hydrology due to dams, water diversions, management of river flow that differs from natural hydrological patterns, channelization, and levees and other forms of bank stabilization that encroach into the floodplain (USFWS 2014b). Impoundments, dams and reservoirs alter the timing, frequency and quantity of flows, which adversely affects riparian vegetation, rendering it unsuitable for cuckoos (Greco 2012). Water diversion and groundwater pumping has resulted in water stress to riparian habitat, ultimately reducing and degrading foraging, nesting, and cover habitat for cuckoos (USFWS 2014b). Channelization, construction of levees, bank stabilization, and flood control structures that encroach into the river and its floodplain cause direct loss of cuckoo habitat and separate the channel from the floodplain. This, in turn, results in reduction of water available to support riparian vegetation in the floodplain, causing the further loss of cuckoo habitat (USFWS 2014b).

Fire within riparian habitats can be particularly damaging because riparian plant communities are not adapted to fire, nor are they fire regenerated. There is evidence that fire has increased in western riparian habitats where streams have been regulated, due in part to the reduction of natural flooding, which has allowed fuels to build up. This situation is further exacerbated by the expansion and dominance of the highly-flammable tamarisk (Busch 1995; Stromberg and Chew 2002). The loss of riparian cottonwood forests due to increased frequency of fire results in the direct loss of cuckoo habitat.

## **8 Invasives, Problematic Native Species, & Pathogens**

Many western waterways have been invaded by tamarisk (*Tamarix ramosissima*). Areas that are dominated by tamarisk are unsuitable for cuckoos (USFWS 2014b). Habitat restoration should employ techniques that are sensitive to temporary impacts to cuckoos inhabiting degraded woodlands.

## **11 Climate Change & Severe Weather**

The primary impacts of climate change on the western yellow-billed cuckoo are expected to be through changes in the availability and distribution of habitat. The predicted effects of climate change in the West include a reduced snowpack and shorter periods of snow cover, snowmelt that occurs earlier in the season, a hydrologic cycle that is more dynamic as extreme rainfall events occur with greater frequency and overall warmer, drier, and more drought-like conditions (USFWS 2014b). The effect of these alterations will be a change in the magnitude and frequency of floods and a greater likelihood of drought. These changes could be either beneficial or detrimental to cuckoos. Where flooding increases water available to riparian floodplains, it may have a regenerative effect on cuckoo habitat, but where channelization has occurred excessive scouring could cause the loss of any remaining habitat (USFWS 2014b). Long droughts could also cause the death of cottonwood riparian forests without subsequent regeneration.

### **Information Needs**

Detailed censuses of declining western populations must continue in order to determine effective population sizes necessary for future conservation programs (Hughes 1999). Various life history traits of the cuckoo require additional research, including spacing and site tenacity, fecundity and mortality, mating system, and population structure and regulation (Hughes 1999). Many characteristics of juvenile biology are unknown, including parental dependence, and dispersal and migratory behavior. Yellow-billed cuckoos are brood parasites that will occasionally lay eggs in other yellow-billed cuckoo nests. Information is needed on the physiological and behavioral controls associated with the production of extra eggs, the frequency of parasitism, and the overall success rates of parasitically laid eggs (Hughes 1999).

### **Conservation Actions**

Western yellow-billed cuckoos are dependent on the maintenance of healthy riparian forests throughout western Colorado and the San Luis Valley. Implementation of water management policies which encourage sustainable flows and support healthy willow and mature cottonwood riparian forests is needed. Public lands (state wildlife areas, national wildlife refuges, BLM) should be managed to benefit the species. Outreach to landowners and the use of incentive programs to maintain riparian forest and prevent habitat alteration or degradation (e.g., due to overgrazing) are important tasks.

## TIER 1 FISH

### **Arkansas Darter (*Etheostoma cragini*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Arkansas Darter (*Etheostoma cragini*) Recovery Plan (2001) (link in Appendix D).

#### **Threats**

##### **7 Natural System Modifications**

Arkansas darters prefer low-gradient, cool, clear, spring-fed streams with dense vegetation and silty, sandy or sandy gravel substrates (Labbe and Fausch 2000; CPW 2001). Such ideal habitat has been reduced in the lower Arkansas River and its tributaries by anthropogenic activities. Ongoing and extensive water diversions, groundwater mining and impoundments in the Great Plains beginning in the 19<sup>th</sup> century have altered the hydrologic regime of Arkansas darter habitat, leading to increased drying and habitat intermittency (Falke et al. 2011). Although the Arkansas darter is adapted to the harsh, flashy hydrology of true plains streams, the level of anthropogenic disturbance to this habitat is beyond the limit of what many local species can tolerate in some areas (Fausch and Bestgen 1997; Samson et al. 2004). The mining of groundwater may be particularly detrimental for the species, as a recent study showed that overwinter survival was high in spring-fed pools where groundwater moderated winter temperatures and created patches of cooler water in summer temperatures (Groce et al. 2012). A study of genetic and demographic patterns revealed small effective population sizes, low levels of genetic diversity within populations, and high levels of genetic structure across the 12 remaining populations of Arkansas darter in Colorado (Fitzpatrick et al. 2014). These results suggest that the species may be at risk of negative effects of inbreeding depression, although no such effects have been observed.

##### **8 Invasives, Problematic Native Species, & Pathogens**

The non-native northern pike (*Esox lucius*) are predators of Arkansas darter. Results from a study by Labbe and Fausch (2000) indicate that northern pike have greatly reduced the distribution and abundance of the Arkansas darter in a 13 km stretch of upper Big Sandy Creek near Ramah Reservoir. Additionally, non-native largemouth bass (*Micropterus salmoides*), a potential predator, occur in some streams within Arkansas darter range, as a result of stocking into small impoundments.

### **Other Threats**

The degradation of stream banks and shallow wetlands from livestock grazing, and construction activities and water pollution near urban areas, have contributed to the reduction of Arkansas darter habitat in the lower Arkansas River drainage (CPW 2001).

### **Information Needs**

Further elucidation regarding the effect of non-native species on the Arkansas darter is needed. More studies are necessary to understand genetic and adaptive variation across the entire range of the Arkansas darter in Arkansas, Colorado, Kansas, Missouri, and Oklahoma. Fitzpatrick et al. (2014) suggest measuring and comparing fitness-related traits, using genetic data for reconstructing wild pedigrees, and conducting reciprocal transplant experiments as important next steps for long-term management of Arkansas darter populations.

### **Conservation Actions**

Securing water availability and habitat quality for existing populations (e.g., through easements and other landowner agreements) is a key priority, particularly for streams on the plains and in headwater reaches. Efforts should continue to identify additional potential re-introduction sites within the species' native range. Where necessary, agreements should be reached to improve habitat, for example by providing alternative stock-water sources so that over-grazed riparian reaches can be fenced. Culture techniques should continue to be refined, and factors affecting stocking success more formally evaluated.

## **Bluehead Sucker (*Catostomus discobolus*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: State of Colorado conservation and management plan for the Roundtail Chub (*Gila robusta*), Bluehead Sucker (*Catostomus discobolus*), and Flannelmouth Sucker (*Catostomus latipinnis*) (in development); Range-wide conservation agreement and strategy for Roundtail Chub (*Gila robusta*), Bluehead Sucker (*Catostomus discobolus*), and Flannelmouth Sucker (*Catostomus latipinnis*) (2006); Bluehead Sucker (*Catostomus discobolus*): a technical conservation assessment (2005) (links in Appendix D).

### **Threats**

#### **7 Natural System Modifications**

The bluehead sucker (*Catostomus discobolus*) was historically common and abundant in the Upper Colorado River and its tributaries within the state of Colorado (Miller and Rees 2000, Ptacek et al. 2005). Presently, they are found in only 45% of this historic range in western Colorado (Bezzarides and Bestgen 2002). The major threats to this species are dams and reservoirs, diversion of water and associated changes in flow, stream channelization, and general

deterioration of riparian corridors (Weitzel 2002a; Ptacek et al. 2005). Dams along the Colorado River and its tributaries have complex direct and indirect effects on the species. Large dams such as Flaming Gorge, Navajo, and the Aspinnall Unit, and associated alterations have directly influenced thermal and hydrological regimes, reducing bluehead sucker populations in both the Lower and Upper Colorado River basins (e.g., Vanicek et al. 1970). Additionally, lowhead dams and constructed wetlands along Muddy Creek, a tributary of the Little Snake River in the Upper Colorado River basin, were shown to restrict downstream movement of bluehead sucker and create novel wetland habitat favoring non-native fish species (Beatty et al. 2009). These dams and constructed wetlands, however, may have positive indirect effects as they create a barrier to the upstream spawning of non-native fish species that prey on, hybridize, and compete with the bluehead sucker for resources. These findings highlight the complex impacts of dams on Colorado's native fish populations (Beatty et al. 2009). Fish passageways have been created for the bluehead sucker and other native fish at dam sites in the Colorado River near Palisade and on the Gunnison River (Landers 2012).

### **8 Invasives, Problematic Native Species, & Pathogens**

Hybridization between the non-native white sucker (*Catostomus commersoni*) and bluehead sucker has been documented, as well as individuals with genetic contributions from the white sucker, bluehead sucker, and native flannelmouth sucker (*Catostomus latipinnus*) (McDonald et al. 2008). The non-native white sucker has facilitated introgression between two native species, and therefore threatens the genetic integrity of the bluehead and flannelmouth suckers. A genetic study of the species revealed three distinct geographic areas that are evolutionarily significant for maintaining the genetic integrity of the bluehead sucker (referred to as evolutionarily significant units): the Bonneville Basin, the Upper Little Colorado River, and the Colorado River (Hopken et al. 2013). All bluehead sucker populations in the state of Colorado belong to the Colorado River unit (Hopken et al. 2013). The bluehead sucker is vulnerable to predation by several non-native fish species including northern pike and brown trout (Nesler 1995; Webber et al. 2012).

### **Other Threats**

The construction of roads through highly erodible soils, improper timber harvest practices, and overgrazing of riparian areas can alter stream channel flows, increase sediment loads, and degrade riparian habitat thereby affecting the quality of occupied bluehead sucker habitat (Ptacek et al. 2005).

### **Information Needs**

Further studies are needed to monitor and detect hybridization of the bluehead sucker with other species, especially non-natives (CPW 2014b). Furthermore, efforts should be made to determine the effectiveness of non-native species removal in bluehead sucker occupied habitat (CPW 2014b). Preliminary work has estimated that the species is fairly long-lived, with age estimates

ranging from 8-18 years at sites in Wyoming (Sweet et al. 2009) and in the White and Gunnison Rivers (CPW unpublished data). More information is needed on population demographics and habitat requirements for bluehead sucker within Colorado, noting any differences among streams (CPW 2014b). The role of tributaries in spawning and life history stages needs further investigation. Ideal habitat for the species should be identified to direct protection efforts throughout the Upper Colorado Basin. Lastly, more research is needed to determine if and where flow stages are too low to support bluehead sucker populations (CPW 2014b).

### **Conservation Actions**

Hybridization with non-native suckers is the most pressing conservation threat. Reaches that presently support bluehead and/or flannelmouth suckers and do not contain non-native suckers should be individually evaluated and all appropriate measures identified to ensure they remain uninvaded. Constructed barriers, in conjunction with mechanical or chemical removal, may be feasible in some streams, to open up additional habitat for re-introduction. Suppression of non-native predators, particularly northern pike and smallmouth bass, must continue throughout the basins where these species have invaded. Colorado's DRAFT Conservation and Management Plan for the 'three species,' which needs to be finalized, specifies additional conservation actions.

### **Bonytail Chub (*Gila elegans*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Bonytail (*Gila elegans*) Recovery Goals – Amendment and Supplement to the Bonytail Chub Recovery Plan (2002) (link in Appendix D).

### **Threats**

The bonytail chub (*Gila elegans*) is considered functionally extinct in Colorado (Carlson and Muth 1989). This species, endemic to the Colorado River Basin, was once widespread and abundant in the Yampa, Green, Colorado and Gunnison rivers (Jordan 1891). It is now the rarest native fish species in the basin. No verifiable occurrences of wild bonytail chub have been documented in Colorado since 1984, when one individual was caught in the Black Rocks area near Grand Junction, Colorado (Kaeding et al. 1986). A captive broodstock was established from some of the last wild bonytail collected, and stocking of captive-reared individuals is a primary recovery strategy (Nesler et al. 2003). Captive-bred bonytail are tagged with Passive Integrated Transponder (PIT) tags prior to stocking. Stocked fish have been detected in subsequent sampling, sometimes in large numbers, but there is little evidence of long-term survival, and no confirmed reproduction or recruitment. The primary threats to the species are streamflow regulation, habitat modification, predation by non-native fish, hybridization, and pesticides and pollutants (Vanicek and Kramer 1969; USFWS 2002b; Bestgen, Zelasko, and Compton 2006).

### **3 Energy Production & Mining**

A large uranium mill tailings pile from the Atlas Mine near Moab, Utah, poses two significant threats to endangered fish in the Colorado River: 1) toxic discharges of pollutants, particularly ammonia, enter the river through groundwater and could be directly toxic to bonytail chub (*Gilia elegans*); and 2) risk of catastrophic pile failure could bury nursery areas and destroy fish habitat (Fairchild et al. 2002; USFWS 2002b). If functional bonytail chub populations are established in Colorado, individuals may be capable of traveling downstream to areas affected by the mine. However, migration distances for bonytail chub are unknown.

### **4 Transportation & Service Corridors**

The Denver and Rio Grande railroad tracks parallel sections of the Colorado River near Grand Junction, Colorado and Cisco, Utah. No known derailments have occurred in these areas, but potential spills of hazardous materials threaten all endangered fish in this portion of the Colorado River (USFWS 2002b).

### **7 Natural System Modifications**

The construction of dams in the Colorado River Basin has fragmented and inundated riverine habitat; released cold, clear waters; altered ecological processes; affected seasonal availability of habitat; and blocked fish passage (USFWS 2002b). All of these factors have led to the decline of the bonytail chub (Carlson and Muth 1989; Minckley et al. 2003).

### **8 Invasives, Problematic Native Species, & Pathogens**

Non-native fish species now dominate many portions of the Upper Colorado River Basin, comprising 40 of the 54 total species in the basin as a whole (UCREFRP 2004). Many of these non-native species are thought to prey on bonytail chub, including smallmouth bass (*Micropterus dolomieu*), and have been implicated as one of the chief causes for lack of recruitment in native fishes (McAda and Wydoski 1980; Tyus et al. 1987; Minckley 1991; Bestgen, Zelasko, and Compton 2006; Marsh et al. 2013).

### **9 Pollution**

Pollutants and pesticides from agricultural runoff have been suggested as possible threats to the species, but no tissue analysis has been conducted on bonytail chub (Haynes and Muth 1981; Wick et al. 1981).

### **Information Needs**

Few studies on the bonytail chub were completed before populations experienced massive declines. Future studies should focus on understanding the life history and specific habitat requirements of bonytail chub using stocked populations (USFWS 2002b). This information is necessary for improving survival of stocked fish, and for identifying—and if necessary re-creating—the conditions needed for reproduction and recruitment; for example, off-channel

breeding habitat for bonytail chub (Minckley et al. 2003). More studies focusing on the effects of pesticides and pollutants on bonytail chub are also needed.

### **Conservation Actions**

Stocking success must be rigorously evaluated to identify factors contributing to survival. Stocked fish should be tracked as closely as possible to discover presumptive life-history traits. These traits should in turn direct and inform future recovery actions. Suppression of non-native predators, particularly northern pike and smallmouth bass, must continue throughout the basins where these species have invaded. Recovery efforts for this species are coordinated primarily by the Upper Colorado Endangered Fish Recovery Program, in which Colorado is a partner agency.

## **Brassy Minnow (*Hybognathus hankinsoni*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: South Platte Native Fish Conservation Plan & Arkansas Native Fish Conservation Plan (in development).

### **Threats**

The brassy minnow (*Hybognathus hankinsoni*) occurs in the Republican and South Platte river basins (Scheurer and Fausch 2002). The species has experienced a decline in abundance and distribution in Colorado, and was listed as state threatened in 1998 (Scheurer 2001; CPW 2014). Major threats to the species are habitat drying, habitat degradation, and non-native species.

### **2 Incompatible Agriculture**

Grazing by livestock has damaged 80% of the streams and riparian ecosystems in the western United States (USDOI 1994; Belsky et al. 1999). Erosion and siltation from cattle grazing can degrade habitat for native fishes like brassy minnow that prefer clear waters and densely vegetated streambanks with grasses, willows, and cottonwoods (Scheurer and Fausch 2002). Grazing has caused bank erosion in occupied brassy minnow habitat in the Arikaree River (Scheurer et al. 2003).

### **7 Natural System Modifications**

Although this species is adapted to withstand drought conditions that are common in the Great Plains, the additive effects of drought combined with streamflow reduction from diversions, reservoir storage, and irrigation pumping may cause further declines and even the extirpation of the species in Colorado. For example, irrigation pumping from sites in the Arikaree River coincided with the larval hatching season for brassy minnow, causing dewatering of occupied habitat, resulting in the death of most larvae during the dry summer of 2000 (Scheurer and Fausch 2002).



The species uses seasonally flooded habitats for spawning, recruitment and growth (Copes 1975; Goldowitz and Whiles 1999). In the Arikaree River, investigators found that brassy minnow survival and recruitment was strongly influenced by habitat drying as a result of the interactions of groundwater pumping, climate, and stream geomorphology (Falke et al. 2010). The use of temporary habitats makes the species extremely vulnerable to stochastic local extinction (Scheurer and Fausch 2002). Survival of brassy minnow is higher in spawning habitats that are large and dry slowly (Falke et al. 2010). Deep pools complexes, often created by beaver activity, serve as important refugia for the species during drought and winter freezing (Scheurer and Fausch 2002). Any water management activity that alters the processes that create these pools could have negative effects on the brassy minnow.

### **8 Invasives, Problematic Native Species, & Pathogens**

Non-native fish species such as largemouth bass are capable of decimating native fish populations, and may pose a threat to brassy minnow populations in off-channel ponds (Scheurer and Fausch 2002). Smallmouth bass have been shown to have a strong negative effect on brassy minnow (Schlosser 1988).

#### **Information Needs**

More surveys, as well as studies evaluating threats and investigating metapopulation dynamics are needed in the South Platte basin in Colorado, as most studies have focused on the Republican River basin.

#### **Conservation Actions**

Secure water availability and habitat quality for existing populations (e.g., through easements and other landowner agreements); this is particularly urgent in the Republican basin. Identify potential re-introduction sites within the species' native range, emphasizing opportunities to protect or re-create seasonally connected backwater and slough habitats. Study metapopulation dynamics, to understand importance of barriers and seasonal connectivity in life history, to direct future conservation activities.

## **Colorado Pikeminnow (*Ptychocheilus lucius*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Colorado Pikeminnow (*Ptychocheilus lucius*) Recovery Goals – Amendment and Supplement to the Colorado Squawfish Recovery Plan (2002); Colorado Squawfish Revised Recovery Plan (1991) (links in Appendix D).

#### **Threats**

The Colorado pikeminnow (*Ptychocheilus lucius*) is the largest native fish in the Colorado River basin (Tyus 1991). It was listed as federally Endangered in 1967. Formerly called the Colorado

squawfish, the Colorado pikeminnow is a member of a unique assemblage of fishes that evolved in warm, uninterrupted stretches of the Colorado River and its tributaries (Miller 1959; USFWS 2002c). The species now utilizes approximately 1,090 miles of river habitat in the upper Colorado River Basin above Lake Powell in the Green River, upper Colorado River, and San Juan River subbasins (USFWS 2011b). Wild populations in the lower part of the basin in Arizona, California, Nevada, and New Mexico are extirpated (USFWS 2011b). The wild population in the San Juan subbasin was also functionally extirpated and efforts to recover it are based upon stocking. Colorado pikeminnow are highly migratory, often traveling several hundred river kilometers to spawning sites, and subsequently making the journey in reverse back to a home range (Tyus and McAda 1984; Osmundson et al. 1998). The primary threats to the Colorado pikeminnow are streamflow regulation and associated habitat modification, and non-native fish (USFWS 2002c).

### **3 Energy Production & Mining**

A large uranium mill tailings pile from the Atlas Mine near Moab, Utah, on the north bank of the Colorado River poses two significant threats to Colorado pikeminnow: toxic discharges of pollutants and risk of catastrophic pile failure (USFWS 2011b).

### **7 Natural System Modifications**

Dam construction has resulted in the loss and degradation of habitat for the Colorado pikeminnow across its native range (Minckley and Deacon 1968; Clarkson and Childs 2000). Extensive dam building in the 1930s through the 1960s has been cited as the primary cause for the extirpation of Colorado pikeminnow in the lower Colorado River basin (Mueller and Marsh 2002; Osmundson 2011). Although the species still persists in the upper Colorado River basin, dams have blocked upstream passage, converted free-flowing riverine segments into lentic reservoir habitat, and cooled downstream reaches with hypolimnetic releases (Osmundson 2011). Altered flow regimes from dams and diversions can affect food web dynamics and interactions between Colorado pikeminnow and non-native fish species (Osmundson et al. 2002; Bestgen, Zelasko, and Compton 2006, Bestgen, Beyers, Rice, and Hains 2006). Flow recommendations that consider these dynamics have been developed for Colorado pikeminnow (Modde and Smith 1995; Osmundson et al. 1995; Holden 1999; McAda 2000; Muth et al. 2000). Other water management activities such as irrigation and groundwater pumping can result in high levels of selenium that may affect the survival and reproductive success of Colorado pikeminnow (Simpson and Lusk 1999; Osmundson et al. 2000; Osmundson et al. 2008). Entrainment of larval and/or adult pikeminnow into irrigation canals remains a significant cause of mortality (data in prep).

### **8 Invasives, Problematic Native Species, & Pathogens**

Colorado pikeminnow occur sympatrically with approximately 20 non-native fishes that are suspected to compete with and prey upon Colorado pikeminnow at various life stages, including

red shiners (*Cyprinella lutrensis*), fathead minnow (*Pimephales promelas*), channel catfish (*Ictalurus punctatus*), northern pike (*Esox lucius*), smallmouth bass (*Microperus dolomieu*), walleye (*Sander vitreus*), and green sunfish (*Lepomis cyanellus*) (USFWS 2002c, 2011b). Smallmouth bass, northern pike, walleye and channel catfish have been identified as the principal non-native threats to adult and sub-adult Colorado pikeminnow, with burbot (*Lota lota*) an emerging new predator (Johnson et al. 2008). These non-native fishes occupy the same habitat types as Colorado pikeminnow and likely compete for food resources (USFWS 2002c; Franssen and Durst 2014).

### **Information Needs**

Fish passageways have been created at several dams in the Upper Colorado River basin. Long-term monitoring should be in place to assess the effectiveness of the passageways for Colorado pikeminnow, as well as their use by non-native fish species. Also, more information is needed on the impacts of climate change to the Colorado River basin and its native fish species (USFWS 2011b). Lastly, more studies are needed to assess the impact of mercury on Colorado pikeminnow, as it may be causing reproductive impairment (USFWS 2011b).

### **Conservation Actions**

Continue non-native predator suppression throughout the basins where these species have invaded, and continue to improve its effectiveness. Continue to conduct habitat improvement in appropriate areas, to benefit native fish and disadvantage non-natives. In collaboration with the Upper Colorado Endangered Fish Recovery Program, assess entrainment at unscreened diversions and screens that do not operate continuously. Assess utilization of fish passage structures. Evaluate potential and pursue opportunities to develop experimental nonessential populations, disconnected from critical habitat, as fisheries. Recovery efforts for this species are coordinated primarily by the Upper Colorado Endangered Fish Recovery Program, in which Colorado is a partner agency.

## **Colorado River Cutthroat Trout (*Oncorhynchus clarkii pleuriticus*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Range-wide Status of Colorado River Cutthroat Trout (*Oncorhynchus clarkii pleuriticus*): 2010 (2013); Colorado River Cutthroat Trout (*Oncorhynchus clarkii pleuriticus*): a technical conservation assessment (2008); Conservation Agreement for Colorado River Cutthroat Trout (*Oncorhynchus clarkii pleuriticus*) in the States of Colorado, Utah, and Wyoming (2006) (links in Appendix D).

## **Threats**

The Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*) presently occurs in Colorado, Utah, and Wyoming (Hirsch et al. 2013). It formerly also inhabited portions of northern Arizona and New Mexico, but has been extirpated from those states (Hirsch et al. 2013). It is one of the three extant subspecies of trout native to Colorado (Behnke 1992; CPW 2014), and the only subspecies indigenous to Colorado's West Slope. Colorado River cutthroat trout (CRCT hereafter) are found in the following river basins of Colorado: Dolores, Gunnison, Upper Green, Upper Colorado, Yampa, White, and San Juan (Hirsch et al. 2013). Recent genetic and meristic studies have identified two extant cutthroat lineages within this range, provisionally designated the Blue Lineage, native to the Yampa, Green and White River Basins, and the Green Lineage, native to the Upper Colorado, Gunnison and Dolores basins (Metcalf et al. 2012; Bestgen, Rogers, and Granger 2013; USFWS 2014d). A third lineage native to the San Juan basin is evidently extinct, though blue and green lineage populations have been established in this basin by stocking. In keeping with currently-recognized inland cutthroat taxonomy, this account considers all cutthroats indigenous to the West Slope as CRCT (see the greenback cutthroat trout narrative for further detail). The subspecies occupies only 7% of its historic range in Colorado (Hirsch et al. 2013), and is considered a species of special concern (CPW 2014).

### **2 Incompatible Agriculture**

Intense concentrations of livestock can degrade habitat for CRCT by damaging stream banks, increasing sediment concentrations, and removing streambank and aquatic vegetation (Belsky et al. 1999; Agouridis et al. 2005).

### **3 Energy Production & Mining**

Mining in Colorado has altered stream channels and flushed heavy metals into water bodies. These impacts have resulted in the loss of native fish habitat and in some cases extensive fish kills (Alves 1997a). Although mining was present within the influence zone of only 12 CRCT sites rangewide (Hirsch et al. 2013), drainages in CRCT habitat could be affected by heavy metal pollution.

### **4 Transportation & Service Corridors**

The most common land uses occurring in the area of influence around CRCT conservation populations are recreation (non-angling and angling), livestock grazing, and timber harvest (Hirsch et al. 2013). A network of roads exists to support these land use activities, and these roads can create higher sediment loads in streams (Eaglin and Hubert 1993; Trombulak and Frissell 2000). Roads often require culverts that can create barriers to fish passage (Young 2008).

### **7 Natural System Modifications**

Habitat degradation from water development activities has contributed to the extirpation or reduction of CRCT populations across its native range (Young 2008). Interactions of stochastic

disturbances, such as channel drying and freezing, together with habitat fragmentation threaten CRCT populations, especially those that occupy stream reaches that are <7km long (Roberts et al. 2013). As of 2010, 27 out of 361 CRCT conservation populations have received in-stream flow enhancements (Hirsch et al. 2013).

## **8 Invasives, Problematic Native Species, & Pathogens**

Nonnative salmonids have affected populations of CRCT through hybridization, food and space competition, and predation. For example, nonnative rainbow trout (*Oncorhynchus mykiss*) have hybridized with CRCT, thus reducing the genetic integrity of the subspecies (Allendorf and Leary 1988; Forbes and Allendorf 1991; CRCT Conservation Team 2006; Hirsch et al. 2013). Managers recognize “conservation populations” as those that exist in a genetically unaltered condition (>99% purity) and/or have unique ecological, genetic, and behavioral attributes of significance that may be genetically introgressed (Utah Division of Wildlife Resources 2000; Hirsch et al. 2013). Brown trout (*Salmo trutta*) are predatory on CRCT (Hirsch et al. 2013). Rainbow, brown, and brook trout (*Salvelinus fontinalis*) all compete with CRCT for food and space (Hirsch et al. 2013). As of 2010, 54 conservation populations have experienced physical removal of competing/hybridizing species, and 51 have experienced chemical removal of competing/hybridizing species (Hirsch et al. 2013).

Natural or constructed barriers exist to limit genetic mixing of nonnative trout species and CRCT. However, these barriers also pose a threat to CRCT as they tend to restrict individuals to short, headwater stream segments (Young 2008). This restriction renders populations more vulnerable to extirpation from stochastic events, and could result in the long term loss of genetic variability (Young 2008; Roberts et al. 2013).

Whirling disease (*Myxobolus cerebralis*, WD) is a threat to CRCT. Habitat currently inhabited by CRCT is generally not optimal for tubifex worms (essential to the life history of the WD parasite), due to higher gradient, cold water and lack of organic matter. However, research has shown that high elevational habitats are still susceptible to infection. Regulatory mechanisms have been put in place to prevent stocking of WD-positive fish into any salmonid habitats.

### **Information Needs**

Restoration, conservation, and management activities have been implemented for CRCT conservation populations. More information is needed on the effectiveness of these actions (Hirsch et al. 2013).

### **Conservation Actions**

Provide additional security for existing populations where needed (e.g., through easements, setbacks, landowner agreements, barriers). Identify opportunities to extend length of available habitat for existing populations and, especially, to restore presumed metapopulations by

connecting populations that are currently isolated. Identify additional potential re-introduction sites within the species' historic range, and aggressively pursue re-introduction opportunities. Emphasis should especially be given to protecting and establishing additional GL populations, as well as those with potential unique life history adaptations (e.g., thermal tolerance).

## **Common Shiner (*Luxilus cornutus*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: South Platte Native Fish Conservation Plan & Arkansas Native Fish Conservation Plan (in development).

### **Threats**

The common shiner (*Luxilus cornutus*) occurs in the South Platte River Basin (CPW 2014). It is rare in the mainstem South Platte River and has been documented in only four of its tributaries (Goettl 1981; Propst 1982; Nesler et al. 1997). It is one of several “glacial relict” fish species restricted to the transition zone along the Front Range, and subject to a number of threats associated with urban development (Fausch and Bestgen 1997, and see “transition zone” description in Habitat section of this Plan). The common shiner was listed as state threatened in 1998 (CPW 2014).

### **2 Incompatible Agriculture**

Excessive grazing in riparian zones can lead to erosion and siltation that compromises the cool, clear waters and clean gravels that are required for common shiner (Trial et al. 1983; Rahel and Hubert 1991; Belsky et al. 1999; CPW 2014). The species is not able to spawn in silt-bottomed streams (Miller 1964).

### **7 Natural System Modifications**

Although the streams historically and presently inhabited by common shiner continue to have perennial flows, most are moderately to heavily fragmented by diversion structures that are barriers to fish movement, and likely reduce connectivity to spawning and rearing habitat in at least some cases. Flow regime alteration may produce a mismatch between spawn timing and spawning habitat availability, compounded by channel alteration resulting in disconnected floodplain. Altered thermal regimes may also arise from hydrologic alteration and potentially impact life history processes.

Siltation has been identified as the primary factor in the extirpation of common shiner in several Front Range streams where they formerly occurred (Propst 1982; Nesler et al. 1997). As a result of vast urban development and the resulting loss of proper stream function, siltation is a widespread issue across nearly all common shiner habitats in Colorado. Studies of common

shiner in Vermont indicated that the species needs both riffle and pools, and in Wyoming it was associated with moderate currents (Rahel and Hubert 1991; Clark et al. 2008). Any water management activity that alters the processes that maintain these habitats could result in the further decline of common shiner in Colorado.

## **8 Invasives, Problematic Native Species, & Pathogens**

Non-native fishes including predatory species have become increasingly abundant in Front Range streams such as Boulder Creek, Saint Vrain Creek, and the Cache La Poudre River, where common shiners formerly or presently occur. Native fish (though not specifically common shiner) have been found to comprise a large proportion of the diet of non-native largemouth bass in the St. Vrain, where an imperiled population of common shiner occurs (CPW unpublished data). Brown trout also co-occur with common shiner in St. Vrain and other Front Range streams and have increased in numbers coincident with apparent declines in common shiner abundance (CPW unpublished data). Aspects of the common shiner's life history could make it particularly vulnerable to predation.

### **Information Needs**

More information is needed on the life history, habitat requirements, and ecology of common shiner. More surveys are needed to determine its abundance and current distribution in Colorado. Lastly, more studies are needed to identify primary threats to the species.

### **Conservation Actions**

Securing water availability and habitat quality for existing populations (e.g., through easements and other landowner agreements) is a key priority. Continue efforts to identify additional potential re-introduction sites within the species' presumptive native range. Identify opportunities for habitat improvement to create or restore suitable habitat. Evaluate feasibility of measures to suppress non-native predation on the St. Vrain population, and take any suitable actions. Re-establish a captive broodstock at the Mumma Native Aquatic Species Restoration Facility (NASRF) and/or in secure, isolated ponds. If appropriate, augment the St. Vrain population through stocking, and create additional populations through stocking when suitable habitat becomes available.

## **Flannelmouth Sucker (*Catostomus latipinnis*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: State of Colorado conservation and management plan for the Roundtail Chub (*Gila robusta*), Bluehead Sucker (*Catostomus discobolus*), and Flannelmouth Sucker (*Catostomus latipinnis*) (in development); Range-wide conservation agreement and strategy for Roundtail Chub (*Gila robusta*), Bluehead Sucker (*Catostomus discobolus*), and Flannelmouth

Sucker (*Catostomus latipinnis*) (2006); Flannelmouth Sucker (*Catostomus latipinnis*): a technical conservation assessment (2005) (links in Appendix D).

### **Threats**

The flannelmouth sucker (*Catostomus latipinnis*) occurs in large streams and rivers in the Western United States. In Colorado, it is found on the western slope in the Upper Colorado River Basin (Bezzarides and Bestgen 2002). The species has declined throughout the Basin, and now occupies half of its historic range (Bezzarides and Bestgen 2002). It has no listing status by the state of Colorado or the U.S. Fish and Wildlife Service. Habitat degradation and interactions with non-native species have been identified as the primary threats to flannelmouth sucker (Tyus and Saunders 2000; Rees, Ptacek, Carr, and Miller 2005; CPW 2014b).

### **2 Incompatible Agriculture**

Intense concentrations of livestock can degrade habitat for flannelmouth sucker by damaging stream banks, increasing sediment concentrations, and removing streambank and aquatic vegetation (Belsky et al. 1999; Agouridis et al. 2005). Increased sediment loads could have a negative impact on flannelmouth sucker populations (Rees, Ptacek, Carr, and Miller 2005), but the exact mechanisms and thresholds for the species are unknown.

### **4 Transportation & Service Corridors**

Road construction for timber harvesting, agriculture, recreation, and housing development can fragment native fish habitat and increase sediment loads in streams. Higher sediment loads can result in changes to stream channel geometry, thereby affecting the quality of habitat for flannelmouth sucker (Rees, Ptacek, Carr, and Miller 2005). The species has been shown to be highly associated with deep runs (Anderson and Stewart 2003, 2007), and changes in channel geometry could result in less availability of these runs.

### **7 Natural System Modifications**

Large dams such as Flaming Gorge, Navajo, and the Aspinall Unit, and the associated alterations have directly influenced thermal and hydrological regimes, reducing flannelmouth sucker populations in both the Lower and Upper Colorado River basins (e.g., Vanicek et al. 1970). Habitat loss has occurred through the de-watering of streams and the construction of dams that block the movement of flannelmouth sucker (Rees, Ptacek, Carr, and Miller 2005). Dams, impoundments and diversions can cause changes in channel geometry, water chemistry, water temperature and flow regimes. These changes can affect the quality of habitat occupied by flannelmouth suckers (Rees, Ptacek, Carr, and Miller 2005). For example, hypolimnetic dam releases have been shown to slow the growth of flannelmouth suckers, delay transition to the juvenile stage, and decrease swimming ability (Clarkson and Childs 2000; Ward et al. 2002). Changes in flow regimes and water temperature created by Flaming Gorge Dam displaced flannelmouth suckers to warmer locations during summer and reduced spawning success



(Vanicek et al. 1970). Impoundments can also have negative impacts on flannelmouth sucker populations (McAda 1977; Chart and Bergersen 1992; Bezzerides and Bestgen 2002). Although water development activities are generally viewed as detrimental to the native fish species that evolved in the lower Colorado River, there is evidence that the altered conditions can support natural flannelmouth sucker reproduction in areas downstream of the Grand Canyon (Mueller and Wydoski 2004).

Lowhead dams and constructed wetlands along Muddy Creek, a tributary of the Little Snake River in the Upper Colorado River basin, were shown to restrict downstream movement of flannelmouth sucker and create novel wetland habitat favoring non-native fish species (Beatty et al. 2009). These dams and constructed wetlands, however, may have positive indirect effects as they create a barrier to the upstream spawning of non-native fish species that prey on, hybridize, and compete with flannelmouth sucker for resources. These findings highlight the complex impacts of dams on Colorado's native fish populations (Beatty et al. 2009). Fish passageways have been created for the flannelmouth sucker and other native fish at dam sites in the Colorado River near Palisade and on the Gunnison River (Landers 2012).

## **8 Invasives, Problematic Native Species, & Pathogens**

Nonnative fish species hybridize with and prey upon flannelmouth sucker. The nonnative northern pike is a known predator of flannelmouth sucker (Nesler 1995). Other nonnative fish species that are common in the Colorado River and its tributaries, such as brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*), red shiner (*Notropis lutrensis*), and smallmouth bass (*Micropterus dolomieu*), likely also eat flannelmouth sucker, though direct evidence is lacking for some of these species (Rees, Ptacek, Carr, and Miller 2005). Hybrids between nonnative white sucker (*Catostomus commersoni*) and flannelmouth sucker have been documented in the Colorado, Gunnison, and Yampa rivers (Douglas and Douglas 2003; Shiozawa et al. 2003; Anderson and Stewart 2007). Hybridization between the non-native white sucker and the native bluehead sucker has also been documented, as well as individuals with genetic contributions from the white sucker, bluehead sucker, and native flannelmouth sucker (*Catostomus latipinnus*) (McDonald et al. 2008). The non-native white sucker has facilitated introgression between two native species, and therefore threatens the genetic integrity of the bluehead and flannelmouth suckers. White suckers have become pervasive throughout the Colorado River Basin, hybridizing readily with flannelmouth suckers, thus creating a serious extinction risk to flannelmouth suckers (McDonald et al. 2008).

### **Information Needs**

Information about flannelmouth sucker has been collected as a by-product of studies for other Colorado River fish that are federally listed (Rees, Ptacek, Carr, and Miller 2005), but more studies need to focus on obtaining information on the life history, ecology, movement patterns,

influence of non-native fish species, and the effects of anthropogenic habitat modification (Rees, Ptacek, Carr, and Miller 2005).

### **Conservation Actions**

Hybridization with non-native suckers is the most pressing conservation threat. Reaches that presently support flannelmouth and/or bluehead suckers and do not contain non-native suckers should be individually evaluated and all appropriate measures identified to ensure they remain uninvaded. Constructed barriers, in conjunction with mechanical or chemical removal, may be feasible in some streams, to open up additional habitat for re-introduction. Suppression of non-native predators, particularly northern pike and smallmouth bass, must continue throughout the basins where these species have invaded. Colorado's DRAFT Conservation and Management Plan for the 'three species,' which needs to be finalized, specifies additional conservation actions.

## **Flathead Chub (*Platygobio gracilis*)**

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### **Threats**

Flathead chub (*Platygobio gracilis*) occupy the mainstems of turbid rivers from the Northwest Territories of Canada south to Texas (Kucas 1980). In Colorado, the species is found in the Arkansas and Rio Grande river basins (Alves 1997b; Nesler et al. 1999). Its range within the state has been reduced (Woodling 1985; CPW unpublished data), and it is now listed as a species of special concern (CPW 2014).

### **2 Incompatible Agriculture**

Overgrazing by livestock can degrade flathead chub habitat by increasing stream width, decreasing channel depth, and increasing stream intermittency (Platts 1991; Rahel and Thel 2004a). Livestock waste in streams occupied by flathead chub can decrease water quality by lowering oxygen concentrations and increasing ammonia (Scarnecchia 2002).

### **3 Energy Production & Mining**

Heavy metal contamination from mining activities has been proposed as a contributing factor to the loss of flathead chub in the Arkansas River between the towns of Salida and Florence, Colorado (Woodling 1985; Rahel and Thel 2004a). Although water quality has improved in this stretch of the Arkansas River (Rahel and Thel 2004a), historic mines can still pose a threat to flathead chub. Stochastic events such as extreme rainstorms and mudslides can flush heavy metals from these mines into water bodies and cause extensive fish kills (Alves 1997a).

A significant amount of coalbed methane production occurs in the Raton Basin: an area that contains the Purgatorie River as well as smaller streams that are tributaries to the Arkansas River. Flathead chub have been documented as one of the most common fish species in the Purgatoire

River (Bramblett and Fausch 1991; Nesler et al. 1999; CPW unpublished data). Wastewater produced by coalbed methane production in the Purgatoire River drainage could alter streamflow conditions, making them more favorable for nonnative fish species. Discharged wastewater can convert intermittent streams on the plains into perennial flows (Freilich 2004), which in turn could allow the establishment of nonnative piscivorous fish (Rahel and Thel 2004a). This produced wastewater could also result in higher concentrations of saline and heavy metals, which could be toxic to flathead chub (Rahel and Thel 2004a).

## **7 Natural System Modifications**

Water development activities have led to the loss and degradation of habitat for flathead chub. Irrigation and groundwater pumping have caused channel dewatering in the Great Plains, resulting in loss of suitable habitat for the chub (Rahel and Thel 2004a). The species has been extirpated in the Arkansas River in western Kansas due to groundwater pumping from the Ogallala Aquifer (Cross and Moss 1987).

In Colorado, the apparent decline or disappearance of flathead chub from some stream reaches coincides strongly with fragmentation by diversion structures, dams and other barriers (CPW unpublished data). Impoundments and dams can negatively affect flathead chub populations by blocking fish movement, changing turbidity levels, creating reservoir habitat that can favor nonnative piscivores, and altering flow regimes (Bonner and Wilde 2002; Quist et al. 2004, Walters et al. 2014). Dams and impoundments also fragment habitat by dissecting long, continuous stretches of free-flowing streams that the species appears to require (Durham and Wilde 2008). Perkin and Gido (2011) estimated a minimum fragment length required for persistence as approximately 180 river kilometers, which is consistent with observed distribution patterns in Colorado. The abundance of flathead chub has been shown to be positively correlated with the percentage of fine substrate in the Missouri River drainage (Quist et al. 2004). Dams and impoundments typically lower the percentage of fine substrate downstream, creating less favorable habitat for flathead chub, a species associated with turbid plains river systems.

## **8 Invasives, Problematic Native Species, & Pathogens**

Non-native piscivores can negatively affect flathead chub through competition and predation. The influence of these piscivores likely interacts with the effects of impoundment such as stabilized flows and reduced turbidity (Quist et al. 2004). These changes can give sight-feeding non-native predators an advantage over species like flathead chub that evolved in turbid, dynamic river systems (Rahel and Thel 2004a). The combined effects of non-native piscivores and large impoundments and reservoirs are thought to have had a significant effect on flathead chub in portions of its range (Cross and Moss 1987; Pflieger and Grace 1987; Bonner and Wilde 2000).

### **Information Needs**

Research is needed to elucidate the mechanisms responsible for population trends in the Arkansas and Rio Grande river basins in Colorado (Rahel and Thel 2004). The life history of this species is poorly known, although research projects are underway within Colorado (Colorado State University and CPW) that will significantly increase our understanding, particularly of reproductive ecology and fish movement. Lastly, more research is necessary to understand the role of competitors and predators in limiting population size of flathead chub (Rahel and Thel 2004a).

### **Conservation Actions**

Continue ongoing studies of life history requirements and population dynamics in Fountain Creek. Evaluate restoration potential in reaches from which flathead chub have declined or disappeared, given results of these studies. Rigorously evaluate impacts of the newly-constructed fish passage structure at Owens-Hall diversion, and of Southern Delivery System infrastructure and operations, once in effect.

## **Greenback Cutthroat Trout (*Oncorhynchus clarkii stomias*)**

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For available information on threats and conservation actions needed for this species, refer to the following resources: Greenback Cutthroat Trout (*Oncorhynchus clarkii stomias*): a technical conservation assessment (2009); Greenback Cutthroat Trout Recovery Plan (1998) (links in Appendix D). Planning documents currently in preparation (multi-agency MOU; Recovery Outline) will provide the framework for future conservation actions once they are completed.

### **Introduction**

The greenback cutthroat trout (*Oncorhynchus clarkii stomias*) has been the subject of intense research and extensive conservation efforts in Colorado for over forty years. It was federally listed as endangered in 1973, then downlisted to threatened in 1978. Recently, genetic and meristic studies have supported major changes to traditionally held views on the taxonomy and distribution of cutthroat trout subspecies occurring within Colorado (USFWS 2014d). Until recently, the greenback cutthroat trout was considered to be the subspecies native to drainages east of the Continental Divide (Behnke 1992; USFWS 1998a; Young 2009), was thought to be represented on the landscape by a number of populations, and was being considered for delisting. Recent genetic and meristic studies revealed that Bear Creek, in the Arkansas River Basin west of Colorado Springs, contained the only known remaining population of greenback cutthroat trout in the world (Metcalf et al. 2012; Bestgen, Rogers, and Granger 2013; USFWS 2014d). The Bear Creek population likely represents the cutthroat trout lineage that was native to the South Platte River (Metcalf et al. 2012), ironically now occurring in Bear Creek as a result of stocking efforts from South Platte River sources (Kennedy 2010; Rogers 2012).

Other than the Bear Creek population, East Slope cutthroat populations that were formerly assumed to be greenback cutthroat trout now appear to represent one of two lineages, temporarily known as the Blue Lineage (hereafter BL) and the Green Lineage (hereafter GL) (Metcalf et al. 2007, 2012; Bestgen, Rogers, and Granger 2013; USFWS 2014d). BL populations almost certainly arise from early stocking efforts driven by wild spawn operations at Trappers Lake, in the headwaters of the White River Basin, from which at least 80 million eggs were taken in the first half of the 20<sup>th</sup> century. A full understanding of the GL populations' origins remains problematic; they may be native to the Western Slope and present on the East Slope due to stocking efforts (Metcalf et al. 2007, 2012); however the amount of genetic diversity among GL populations, as well as the distribution of unique genotypes, suggests that some GL populations may in fact be East Slope natives (USFWS 2014d). Ongoing research efforts are underway to help clarify the taxonomy of the GL.

At this writing inland cutthroat taxonomy has not been formally revised to reflect the recent findings. In terms of federal listing status, until FWS completes the ESA status review all populations that had previously been considered as "greenback cutthroat trout" continue to receive protection under the ESA. This includes populations of green lineage in Colorado on both sides of the Continental Divide.

Regardless of eventual taxonomic and regulatory status decisions, the lineage represented by Bear Creek will certainly remain a top conservation priority, as will the genetically unique GL populations. East Slope BL populations are probably a lower conservation priority because they are all replicates of the Trappers Lake source population, and the lineage is relatively well-represented on the West Slope. This summary will focus on the primary threats to the GL on the East Slope and the Bear CCreek GCT (threats to West Slope GL and BL are described in the Colorado River Cutthroat Trout narrative). Historically, the main threats to GL were mining, agriculture and water development activities (Young 2009). Non-native species introductions and invasions are likely the cause of more recent declines (Young 2009). Primary ongoing threats to the Bear Creek GCT are recreation activities. A short account of these threats is provided below.

## ***Threats to Bear Creek Greenback Cutthroat Trout***

### **6 Human Intrusions & Disturbance**

Bear Creek is located on the east side of Pike's Peak west of Colorado Springs. A network of Pike National Forest trails winds through occupied BCGCT habitat. Sections of the trail are highly eroded from heavy use, and are resulting in the loss of vegetation and increased sediment loading in Bear Creek (Reed and Billmeyer 2010). Efforts are underway to control sediment influx from trail erosion (Reed and Billmeyer 2010).

## **Threats to the Green Lineage**

### **2 Incompatible Agriculture**

Intense concentrations of livestock in riparian zones often lead to bank damage, higher sediment loading in streams, and the removal of streambank vegetation (Belsky et al. 1999; Agouridis et al. 2005). These changes can contribute to trout population reductions (Young 2009).

### **3 Energy Production & Mining**

Mining in GL habitat has caused alterations in stream channel geometry, contributed to higher sediment loads, and released toxic substances such as heavy metals (Young 2009). Regulations on new mines are much more stringent today, but massive rainstorms, mudslides, or other stochastic events could lead to the release of heavy metals from historic mines and result in catastrophic fish kills such as those documented in Kerber Creek (Alves 1997a).

### **7 Natural System Modifications**

Most current populations are established within headwater reaches on public lands and are not typically subject to water management issues.

### **8 Invasives, Problematic Native Species, & Pathogens**

Competition and predation by introduced non-native salmonids (brown trout *Salmo trutta*, brook trout *Salvelinus fontinalis* and rainbow trout *Oncorhynchus mykiss*) are serious threats. Additionally, cutthroats hybridize readily with rainbow trout creating an introgressed hybrid swarm. Most cutthroat populations that persist occur upstream of natural or artificial barriers that prevent invasion by non-native salmonids.

Whirling disease (WD) is a threat to greenback cutthroat trout. Habitat currently inhabited by greenbacks is not considered optimal habitat for tubifex worms (essential to the life history of the whirling disease parasite), due to higher gradient, cold water and lack of organic matter. However, research has shown that high elevational habitats are still susceptible to infection. Regulatory mechanisms have been put in place to prevent stocking of WD-positive fish into any salmonid habitats.

### **Information Needs**

More work is needed to resolve the taxonomy of the Bear Creek and Green lineages. East and West Slope Green Lineage fish have distinct morphological and genetic differences that warrant additional investigation (Bestgen, Rogers, and Granger 2013). Additional meristic studies of museum specimens, especially from the South Platte River basin, are also needed (Bestgen, Rogers, and Granger 2013).

## **Conservation Actions**

Aggressively pursue opportunities to establish additional BCGCT populations within the species' presumptive native range. Rigorously evaluate translocation success to determine extent of future stocking (e.g., are the effects of recent genetic bottlenecks pronounced?). Secure additional protection as needed for the extant population in Bear Creek, and for GL populations on the East Slope.

## **Humpback Chub (*Gila cypha*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Humpback Chub (*Gila cypha*) Recovery Goals – Amendment and Supplement to the Humpback Chub Recovery Plan (2002); Humpback Chub 2<sup>nd</sup> Revised Recovery Plan (1990) (links in Appendix D).

### **Threats**

The humpback chub is endemic to the Colorado River. It is a member of a suite of federally endangered “big river” fish species including bonytail chub (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*). Once common in the Colorado River, humpback chub are now restricted to approximately 7,300 to 13,800 individuals spread among six extant populations (USFWS 2002d). Only two of those populations exist in Colorado: the Yampa Canyon population on the Yampa River and the Black Rocks population on the Colorado River. The Yampa population has declined dramatically and is extremely imperiled. The primary threats to humpback chub identified in the Federal Recovery Plan are streamflow regulation, habitat modification, predation by non-native fish species, parasitism, hybridization with other native *Gila*, and pesticides and pollutants (USFWS 2002d).

### **4 Transportation & Service Corridors**

The Denver and Rio Grande Western railroad tracks parallel the Colorado River at Black Rocks and Westwater Canyon. Potential hazardous waste spills resulting from a train derailment threaten humpback chub populations in these areas. A network of pipelines containing petroleum products cross or closely follow the Yampa River upstream of Yampa Canyon, none of which contain emergency shut-off valves (USFWS 2002d). Leaking or bursting pipes could result in deleterious effects to the fish community in the Yampa River.

### **7 Natural System Modifications**

The construction of dams along the mainstem of the Colorado River and its tributaries has fragmented and inundated riverine habitat, released cold, clear waters; altered ecological processes; affected seasonal availability of habitat; decreased turbidity that serves as cover from predators and creates sandy backwater habitat for young humpback chub; and blocked fish

passage (Minckley and Deacon 1968; Marsh and Douglas 1997; Valdez and Ryel 1997; USFWS 2002d). Flow recommendations have been developed that specifically consider flow-habitat relationships in habitats occupied by humpback chub in Colorado including Black Rocks (McAda 2000) and Yampa Canyon (Modde and Smith 1995; USDOJ 1995; Modde et al. 1999; USFWS 2002d). The Green River Dam in Utah is slated for rehabilitation, and the final plans for renovation include a fish passageway to allow for the upstream and downstream movement of native fishes, including humpback chub (USDOA 2014).

## **8 Invasives, Problematic Native Species & Genes, & Pathogens**

Predation by non-native northern pike (*Esox lucius*) and smallmouth bass (*Micropterus dolomieu*) has likely impacted the Yampa Canyon population. These non-native species remain uncommon in the Black Rocks section of the Colorado, although they may have increased recently.

The non-native Asian tapeworm (*Bothriocephalus acheilognathi*) has been implicated in the decline in the condition of humpback chub below Glen Canyon Dam (Meretsky et al. 2000). In 2005, an Asian tapeworm was documented for the first time in a roundtail chub (*Gila robusta*) in the Yampa River (Ward 2005). The tapeworm could pose a serious threat to the humpback chub populations in Colorado as they are difficult to eradicate, have a rapid life cycle of only 15 days, and are non-host specific (Hoffman 1976; Granath and Esch 1983).

Several members of the genus *Gila* reside in the Colorado River including humpback chub (*G. cypha*), roundtail chub (*G. robusta*), and bonytail chub (*G. elegans*). While members of the group historically were likely allopatric, dams and diversions have eliminated or compromised the realized niches of these species, and they now occur sympatrically (Douglas et al. 1998). Morphological characters can be used to separate out each taxon, but hybrids often possess intermediate characters. Hybrid intermediacy has led to inaccurate field identification. In Black Rocks and Westwater Canyon, researchers have documented higher proportions of roundtail chub during low flow years (Kaeding et al. 1990; Chart and Lentsch 2000). These low flow years result in increased sympatry between both chub species, and potentially increase the chances for hybridization (USFWS 2002d). Thus, it is necessary to mimic natural hydrological flow regimes to maintain natural proportions of *Gila* species and intergrades (USFWS 2002d).

## **9 Pollution**

Pollutants and pesticides from agricultural runoff have been suggested as possible threats to the species, but no tissue analysis has been conducted on humpback chub (Haynes and Muth 1981; Wick et al. 1981).



### **Information Needs**

Because of the difficulty of sampling in canyon-bound, big river reaches preferred by this species, accurate population estimates are particularly difficult to obtain. Life history studies in Arizona at the confluence of the Little Colorado River and the Colorado River have revealed that larger adults spawn more frequently than smaller adults, that there are residents in spawning grounds, and that juveniles move out of the Little Colorado River in large numbers during monsoon season (July-September) (Yackulic et al. 2014). Comparably detailed studies that focus on movement, growth, and survival of humpback chub are needed in occupied habitat in the state of Colorado at Black Rocks near Grand Junction and Yampa Canyon. More information is needed to determine the extent, if any, of Asian tapeworm infestations and any associated declines in the condition of humpback chub in Yampa Canyon and Black Rocks. Tissue analysis of humpback chub is also needed to determine levels of bioaccumulation of pesticides and pollutants (USFWS 2002d).

### **Conservation Actions**

Continue to suppress non-native predators, particularly northern pike and smallmouth bass, throughout the basins where these species have invaded. Recovery efforts for this species are coordinated primarily by the Upper Colorado Endangered Fish Recovery Program, in which Colorado is a partner agency.

## **Mountain Sucker (*Catostomus platyrhynchus*)**

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### **Threats**

The mountain sucker (*Catostomus platyrhynchus*) is distributed throughout western North America. In Colorado, it occurs in the northwestern part of the state in the Green River drainage, as well as the headwaters of the Colorado, Yampa, and White rivers (Snyder 1981; Belica and Nibbelink 2006). Population trends are largely undocumented for Colorado, but declines have been documented in California (Erman 1986), Wyoming (Patton et al. 1998), and South Dakota (Schultz and Bertrand 2012). It is listed as a species of special concern in Colorado (CPW 2014).

### **3 Energy Production & Mining**

This species occurs in northwestern Colorado, an area that has undergone significant energy development in the last decade. More roads and culverts have been built in the area, and this could result in the fragmentation of mountain sucker habitat. Spills from oil and gas related activities could result in the contamination of occupied mountain sucker habitat.

## **7 Natural System Modifications**

Dams and impoundments can fragment habitat and create barriers to movement, eliminate habitat, and alter fish species assemblages (Decker and Erman 1992; Moyle 2002; Belica and Nibbelink 2006). All of these changes can threaten the long-term survival of mountain sucker. Populations that occur downstream from dams may experience changes in flow regimes and water temperatures. These could have deleterious effects on mountain sucker (Belica and Nibbelink 2006).

Backwater pools and off-channel habitats provide refugia for mountain suckers in the presence of non-native brown trout (Olsen and Belk 2005). Water management activities that degrade or eliminate off-channel habitats could exacerbate the negative effects of predatory, non-native fish species (Scott and Helfman 2001; Olsen and Belk 2005).

## **8 Invasives, Problematic Native Species, & Pathogens**

Predation from non-native salmonids is considered a potentially limiting factor for mountain sucker (Isaak et al. 2003). For example, mountain sucker has been found to be negatively associated with the predatory, non-native brown trout (*Salmo trutta*) (Decker and Erman 1992; Giddings et al. 2006; Dauwalter and Rahel 2008). Interactions with other non-native fish species are largely unknown.

### ***Information Needs***

In Colorado, more information is needed on population trends of mountain sucker (Belica and Nibbelink 2006). Movement patterns and habitat requirements are not well known for the species (Belica and Nibbelink 2006). Further, more studies are needed assessing the impacts of oil and gas development on mountain sucker. Lastly, future research should focus on understanding aspects of the community ecology of mountain sucker, such interaction and competition with non-native fish species.

### ***Conservation Actions***

Hybridization with non-native suckers is the most pressing conservation threat. Reaches that presently support mountain suckers and do not contain non-native suckers should be individually evaluated and all appropriate measures identified to ensure they remain uninvaded. Constructed barriers, in conjunction with mechanical or chemical removal, may be feasible in some streams, to open up additional habitat for re-introduction. Suppression of non-native predators, particularly northern pike and smallmouth bass, must continue throughout the basins where these species have invaded.

## **Northern Redbelly Dace (*Phoxinus eos*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: South Platte Native Fish Conservation Plan & Arkansas Native Fish Conservation Plan (in development); Northern Redbelly Dace (*Phoxinus eos*): a technical conservation assessment (2006) (link in Appendix D).

### **Threats**

The northern redbelly dace (*Phoxinus eos*) occurs in Canada, the northeastern United States, west to Montana. The southernmost populations occur in the South Platte River basin in Colorado, where it is listed as state endangered (CPW 2014). As a glacial relict species restricted to the transition zone along the Front Range, it is subject to a number of threats associated with urban development (Fausch and Bestgen 1997, and see “transition zone” description in Habitat section of this Plan). Since 1986, the species has only been documented in one area in Colorado: the West Plum Creek drainage south of Denver (Bestgen 1989; Nesler et al. 1997).

### **1 Residential & Commercial Development**

The West Plum Creek drainage is located south of Denver near Sedalia, Colorado in Douglas County. The population of Douglas County has grown 7.2% from 2010 to 2013 (U.S. Census Bureau 2014). The West Plum Creek area is relatively close to Denver, and housing developments have been built since Bestgen (1989) confirmed the presence of northern redbelly dace in the area. This increased development may result in loss, degradation or fragmentation of occupied dace habitat. Reaches of St. Vrain Creek and the Big Thompson River where northern redbelly dace were historically collected have been impacted by urban development to a much greater extent.

### **7 Natural System Modifications**

The northern redbelly dace is typically found in clear, spring-fed, low velocity streams and small ponds with cool water, high vegetation cover (Stasiak 1987; Wright 2011; Felts and Bertrand 2014). Impoundments, diversions groundwater pumping, and dams could degrade or fragment habitat by increasing turbidity, changing channel morphology, and dewatering and/or altering flows (Stasiak 2006). Stream channelization for flood control has greatly reduced the amount of permanent near-channel standing water or low-flow habitat for the species along the Front Range of Colorado (CPW 2014).

### **8 Invasives, Problematic Native Species, & Pathogens**

Introduced fish species are considered a major threat to northern redbelly dace (Stasiak 2006). In the headwaters of the Niobrara River in Nebraska, northern redbelly dace may be declining due to the presence of stocked brown trout (*Salmo trutta*), northern pike (*Esox lucius*), bass (*Micropterus salmoides*) and bluegill (*Lepomis macrochirus*) (Stasiak 1976; Stasiak 1989; Stasiak

2006). Western mosquito fish may negatively impact northern redbelly dace by displacement from its preferred thermal regime (Ciepiela et al. 2013).

### **Information Needs**

Increased frequency of sampling, as well as studies on the hydrology and flow dynamics are needed in the W. Plum Creek area (Wright 2011).

### **Conservation Actions**

Securing water availability and habitat quality for existing populations (e.g., through easements and other landowner agreements) is a key priority. Continue efforts to identify additional potential re-introduction sites within the species' native range. Identify opportunities for habitat improvement to create or restore suitable habitat. Maintain the broodstock at NASRF and create additional populations through stocking when suitable habitat becomes available.

## **Orangespotted Sunfish (*Lepomis humilus*)**

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### **Threats**

The orangespotted sunfish (*Lepomis humilus*) is widespread throughout the Central United States. In Colorado, it occurs in the Arkansas and South Platte River basins (Nesler et al. 1997; Nesler et al. 1999). Few studies have investigated the status and trends of orangespotted sunfish in Colorado.

### **7 Natural System Modifications**

The orangespotted sunfish occurs in both lakes and streams on Colorado's Eastern Plains, and is tolerant of low flow conditions and high water temperatures (Tomelleri and Eberle 1990). However, tolerance thresholds for these harsh conditions are unknown. The dewatering of streams caused by groundwater pumping may be a threat to this species. In stream habitats the orangespotted sunfish prefers clear streams with rocky substrate, but is tolerant of brief periods of siltation (Tomelleri and Eberle 1990). Dams and diversions that alter both the creation and maintenance of these rocky beds and sediment concentrations could create less favorable habitat for species. Anecdotal observation suggests that declines may be associated with increased siltation (CPW unpublished data). The species also inhabits standing water—historically mostly near-channel floodplain ponds, which have decreased in availability through channelization, and often declined in quality due to contaminants and nutrients (Nesler et al. 1997). Although abundant new lentic habitat has been created for water storage and gravel mining, most of these waters contain largemouth bass and other centrarchids; it has been speculated that these may outcompete orangespotted sunfish based on size, aggressiveness and physiochemical tolerance (Propst 1982).

### **Information Needs**

More information is needed on the habitat preferences, threats, and status of orangespotted sunfish in Colorado.

### **Conservation Actions**

Secure water availability and habitat quality for existing populations, e.g., through easements and other landowner agreements. Identify potential ponds for broodstock maintenance, should that become necessary. Identify opportunities for habitat improvement to create or restore suitable habitat. Maintain the broodstock at NASRF and create additional populations through stocking when suitable habitat becomes available.

## **Orangethroat Darter (*Etheostoma spectabile*)**

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### **Threats**

The orangethroat darter (*Etheostoma spectabile*) is widespread throughout the central United States. In Colorado, it is restricted to the far eastern side of the state in the Republican River Basin (Cancalosi 1980; Woodling 1985). The species is also found in Lodgepole Creek, in Wyoming, a tributary to the South Platte that joins the South Platte near Ovid, Colorado. One may surmise from this that the orangethroat darter historically also occurred in eastern portions of South Platte basin within Colorado, but it has never been collected there.

### **7 Natural System Modifications**

Dewatering, primarily due to groundwater depletion, is an immediate or prospective threat for much of the Republican Basin within Colorado (Falke et al. 2011; McGuire 2011). The species is tolerant of warm water and able to withstand short periods of intermittent stream flow, taking refuge in small pools (Cross and Collins 1975). However, tolerance thresholds for the darter are unknown; it is likely that direct habitat loss and fragmentation for extended periods of time due to dewatering could negatively affect the species. The orangethroat darter prefers fast moving water and silt-free habitats (Pfleiger 1997). Dams and diversions create lentic habitats, block fish passage, and alter sediment concentrations, creating less favorable habitat for orangethroat darter (Woodling 1985).

### **Information Needs**

Basic information is needed on life history and habitat preferences as they relate to potential impacts of fragmentation.

### **Conservation Actions**

Securing water availability and habitat quality for existing populations, e.g., through easements and other landowner agreements, is a key priority. Identify reaches most likely to retain unfragmented, perennially-flowing water 30-50 years from now, and concentrate efforts to protect surface and groundwater in those areas.

## **Plains Minnow (*Hybognathus placitus*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: South Platte Native Fish Conservation Plan & Arkansas Native Fish Conservation Plan (in development); Plains Minnow (*Hybognathus placitus*): a technical conservation assessment (2005) (link in Appendix D).

### **Threats**

The plains minnow (*Hybognathus placitus*) is a small, slender fish that occurs in the Great Plains region from Montana to Texas. In Colorado, it is found on the eastern plains, and is listed by the State of Colorado as endangered (CPW 2014). Specimens have been collected from the Republican River, South Platte River, and Arkansas River basins, but it is considered extremely rare in the state (Cancalosi 1980; Goettle 1981; Propst 1982; Woodling 1985; Scheurer 2002; CPW 2014). In the Arkansas River, CPW has recently (2013) initiated a stocking augmentation program. Little information is available on the distribution, life history, population trends, and community ecology of plains minnow (Rees, Carr, and Miller 2005a). This information is critical for the management and conservation of this species.

### **2 Incompatible Agriculture**

Grazing by livestock has damaged 80% of the streams and riparian ecosystems in the western United States (USDOI 1994; Belsky et al. 1999). Erosion and siltation from cattle grazing can degrade habitat for native fishes (Scheurer and Fausch 2002). Although water quality parameters are undefined for this species, it is likely that a reduction in water quality could lead to a reduction in overall fitness of plains minnow (Rees, Carr, and Miller 2005a).

### **7 Natural System Modifications**

Population declines in the Arkansas River (Kansas and Colorado) are associated with dewatering and changes in channel morphology (Cross and Moss 1987). These changes are caused by

groundwater pumping, diversions, impoundments, and land use practices that modify flow regimes (Rees, Carr, and Miller 2005a).

## **8 Invasives, Problematic Native Species, & Pathogens**

Non-native fish species are likely to threaten the health and population of plains minnow through competition and predation (Rees, Carr, and Miller 2005a). However, there is a lack of research on the interactions between plains minnow and non-native fish species.

### **Information Needs**

More sampling is needed in the Republican River, Arkansas River, and South Platte River basins to determine how much of this species' historic range is still occupied (Scheurer et al. 2003). More information is needed on the life history, ecology and habitat requirements of plains minnow (Rees, Carr, and Miller 2005a). Further studies are also needed examining the impacts of nonnative fish species on the plains minnow. Lastly, determining the response of the species to changes in stream flow is critical for informing management decisions on flow regimes (Rees, Carr, and Miller 2005a).

### **Conservation Actions**

Establish a South Platte basin broodstock and initiate an augmentation stocking program in the South Platte Basin. Continue stocking in the Arkansas basin. Rigorously evaluate factors affecting survival and persistence, to increase success of future efforts. Identify opportunities for habitat improvement to create or restore suitable habitat.

## **Plains Topminnow (*Fundulus sciadicus*)**

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### **Threats**

The plains topminnow (*Fundulus sciadicus*) is a Great Plains endemic. In Colorado, it occurs in the mainstem of the South Platte River and its tributaries (Woodling 1985). Population declines have been documented across its range (Weitzel 2002b). In 2013, the US Fish and Wildlife Service found the species not warranted for federal ESA listing or candidate status (USFWS 2013f). It has no special status in Colorado, although certain populations appear to have declined (CPW unpublished data), and it is vulnerable given its life history requirements. The primary threats to plains topminnow are competition with nonnative fish species, water management activities, urban and rural development, and intense livestock grazing (Rahel and Thel 2004b; Pasbrig et al. 2012; USFWS 2013f).

### **1 Residential & Commercial Development**

Plains topminnow habitat has likely been lost or degraded due to the rapid development of the Front Range of Colorado (Nesler et al. 1997). Urban and ex-urban development in the Front Range corridor has caused stream channelization and water quality degradation.

## **2 Incompatible Agriculture**

Across its range, the plains topminnow is most abundant in spring fed pools with clear water and high cover of macrophytes (Rahel and Thel 2004b). Intense cattle grazing can result in a loss of aquatic vegetation, as well as an increase in turbidity, therefore degrading plains topminnow habitat (Platts 1991; Rahel and Thel 2004b). Overgrazing can also lead to increased bank erosion and stream intermittency (Platts 1991).

## **7 Natural System Modifications**

The decline in plains topminnow populations has been linked to the de-watering of critical backwater habitats from irrigation drawdown and drought (Haas 2005; Koupal and Pasbrig 2010). Although drought conditions are a common occurrence across the Great Plains, the lowering of ground water levels from irrigation pumping has increased the magnitude of stream de-watering (Fausch and Bestgen 1997; Dodds et al. 2004; Rahel and Thel 2004b). Plains topminnow are usually located in headwater and naturally intermittent reaches of prairie streams, and are therefore highly vulnerable to habitat loss from irrigation and water diversions that lower the water tables and in-stream flows (Rahel and Thel 2004b). They tend to prefer standing water or slow-moving habitat such as backwater, sloughs, or seasonally-connected near-channel habitat. These habitat types are particularly likely to be impacted by channel modification associated with water management and/or urban development.

## **8 Invasives, Problematic Native Species, & Pathogens**

Several nonnative fish species have been suggested as potential predators and competitors of plains topminnow including largemouth bass (*Micropterus salmoides*) and, especially, Western mosquitofish (*Gambusia affinis*). In a laboratory experiment, western mosquitofish likely caused plains topminnow mortality by direct injury and competition for food resources (Haas 2005). Western mosquitofish could cause dramatic reductions in plains topminnow populations (Rahel and Thel 2004b; Haas 2005). Another study revealed that a shift in fish species assemblage over to generalist and nonnatives coincided with the loss of plains topminnow (Fischer and Paukert 2008). In Colorado, CPW researchers found a strong correlation between mosquitofish invasion and subsequent apparent disappearance of plains topminnow at invaded sites (CPW unpublished data).

## **Information Needs**

More information is needed on basic life history traits, the roles of predation and competition, and mechanisms used by plains topminnow to re-establish populations after local extirpations (Rahel and Thel 2004b).

## **Conservation Actions**

Secure water availability and habitat quality for existing populations (e.g., through easements and other landowner agreements). Continue efforts to identify additional potential re-introduction sites within the species' presumptive native range. Sites that remain uninvaded by



*Gambusia* are especially important. Rigorously evaluate factors affecting success of translocations, to increase success of future efforts. Continue survey efforts to identify additional populations. Identify opportunities for habitat improvement to create or restore suitable habitat.

## **Razorback Sucker (*Xyrauchen texanus*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Razorback Sucker (*Xyrauchen texanus*) Recovery Goals – Amendment and Supplement to the Razorback Sucker Recovery Plan (2002); Razorback Sucker (*Xyrauchen texanus*) Recovery Plan (1998) (links in Appendix D).

### **Threats**

The razorback sucker (*Xyrauchen texanus*) was once common to abundant throughout the Colorado River Basin and its tributaries (Minckley 1991). In 1991, the razorback sucker was listed as Endangered throughout its entire range (USFWS 2002e). In Colorado, all extant populations are supplemented with stocked fish. Stocked fish survive well, with individual fish known to have persisted for over a decade post-release. Reproductive behavior and larval production are observed regularly in the Colorado River and more recently in the White (as well as in reaches outside of Colorado); however, evidence that wild-spawned fish survive to be juveniles or recruit to adulthood remains elusive. Threats to the species include streamflow regulation, habitat modification, competition with and predation by nonnative fish species, and pesticides and pollutants (USFWS 2002e).

### **2 Incompatible Agriculture**

Irrigation has caused high selenium concentrations in upper Colorado River, the Gunnison River, and the San Juan River (Anderson et al. 1961). Selenium concentrations have been shown to be negatively correlated with egg diameter and percent hatch, and positively correlated with deformities in razorback suckers (Hamilton et al. 2005).

### **3 Energy Production & Mining**

A large uranium mill tailings pile from the Atlas Mine near Moab, Utah poses two significant threats to endangered fish in the Colorado River: 1) toxic discharges of pollutants, particularly ammonia, enter the river through groundwater and are directly toxic to razorback sucker, and 2) risk of catastrophic pile failure could bury nursery areas and destroy fish habitat (Fairchild et al. 2002; USFWS 2002e).

### **4 Transportation & Service Corridors**

The Denver and Rio Grande Western railroad tracks parallel the Colorado River at Black Rocks and Westwater Canyon. Potential hazardous waste spills resulting from a train derailment

threaten razorback sucker populations in these areas. A network of pipelines containing petroleum products cross or closely follow the Yampa River upstream of Yampa Canyon, none of which contain emergency shut-off valves (USFWS 2002e). Leaking or bursting pipes could result in deleterious effects to the fish community in the Yampa River.

## **7 Natural System Modifications**

The construction of dams along the mainstem of the Colorado River and its tributaries has fragmented and inundated riverine habitat; released cold, clear waters; altered ecological processes and sediment regimes; affected seasonal availability of habitat; and blocked fish passage (Minckley and Deacon 1968; Marsh and Douglas 1997; Holden 1979; USFWS 2002e). Fish passageways have been created for the razorback sucker and other native fish at dam sites in the Colorado River near Palisade and on the Gunnison River (Landers 2012). The Green River Dam in Utah is slated for rehabilitation, and the final plans for renovation include a fish passageway to allow for the upstream and downstream movement of native fishes, including razorback sucker (USDOA 2014).

The razorback sucker evolved under the highly variable flows of the Colorado River before dams and impoundments were established. Adult razorback suckers spawn over clean cobble bars during spring runoff, and their larvae drift into floodplain habitats inundated during the spring floods (McAda and Wydoski 1980; Wick et al. 1982; USFWS 2002e). The dam-related changes in timing and flow levels on the Colorado River and its tributaries, along with channelization, have led to a loss of floodplain nurseries that are necessary for the survival and reproduction of the razorback sucker (McAda and Wydoski 1980). Re-creation of suitable nursery habitat (mostly in Utah) and timing of dam releases to coincide with razorback spawning appear to hold promise for meeting the razorback sucker's life history requirements despite the persistence of these threats (UCREFRP 2012).

## **8 Invasives, Problematic Native Species, & Pathogens**

Numerous non-native species are reported as predators on the razorback sucker, including striped bass (Karam et al. 2008), common carp, green sunfish, largemouth bass, and flathead catfish (20+ authors, see citation list on pg. 23 of the Recovery Plan, USFWS 1998b). Smallmouth bass (*Microperus dolomieu*) northern pike (*Esox lucius*), walleye (*Sander vitreus*) and channel catfish (*Ictalurus punctatus*) have been identified as the foremost threats, along with burbot (*Lota lota*), an emerging new predator (Johnson et al. 2008). These non-native species are cited as the primary biological threat to the survival and reproduction of razorback sucker (USFWS 1998b).

### **Information Needs**

More information is needed on suitable habitat for razorback sucker. Pesticides have been cited as a possible threat to the razorback sucker, but little to no research has been done investigating the effects of pesticides on the species. The severity of selenium impacts needs to be determined with much more certainty.

## **Conservation Actions**

Suppression of non-native predators, particularly northern pike and smallmouth bass, must continue throughout the basins where these species have invaded. Recovery efforts for this species are coordinated primarily by the Upper Colorado Endangered Fish Recovery Program, in which Colorado is a partner agency.

## **Rio Grande Chub (*Gila pandora*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Rio Grande Chub (*Gila pandora*): a technical conservation assessment (2005) (link in Appendix D).

### **Threats**

The Rio Grande chub (*Gila pandora*) was once widespread in New Mexico (Rio Grande and Pecos River basins), Colorado (upper Rio Grande and San Luis River basins), and Texas (Pecos River basin) (Zuckerman and Langlois 1990; Bestgen, Compton, Zelasko and Alves 2003; Rees, Carr, and Miller 2005b). In Colorado, overall numbers of individuals have been reduced by as much as 75% (Zuckerman and Langlois 1990; Bestgen, Compton, Zelasko and Alves 2003; Rees, Carr, and Miller 2005b). It is now considered a Species of Special Concern (CPW 2014). Major threats are degradation of habitat following dam and impoundment construction, predation by and competition with non-native fish species, heavy metals from natural sources and mining, and excessive grazing (Bestgen, Compton, Zelasko and Alves 2003; Rees, Carr, and Miller 2005b).

### **2 Incompatible Agriculture**

The Rio Grande chub is commonly associated with aquatic macrophytes such as *Potamogeton*, woody debris, and overhanging riparian vegetation. Overgrazing in occupied habitat can lead to the degradation or elimination of these microhabitat types, and is thus cited as a possible threat to the species although studies are lacking (Calamusso and Rinne 1999; Bestgen, Compton, Zelasko and Alves 2003).

### **3 Energy Production & Mining**

Heavy metals and cyanide from the Summitville Mine were released into the headwaters of the Alamosa River beginning in 1986 (Csiki and Martin 2008). These pollutants may be responsible for absence of fishes upstream and in Terrace Reservoir (Woodling 1995). In 1997, heavy metals from historic mines were flushed by a summer rainstorm into Kerber Creek. All fish in Kerber Creek died, along with 43% of the fish in a 4km stretch of San Luis Creek (Alves 1997a; Bestgen, Compton, Zelasko and Alves 2003). Rio Grande chub were known to occupy these two creeks, and continued monitoring of the site has shown a decline in numbers of individuals following the contamination event (Bestgen, Compton, Zelasko and Alves 2003).

## **7 Natural System Modifications**

The construction of at least 56 large-scale dams along the entire length of Rio Grande River began in the late 1800s, and accelerated through the 1960s (Cowley 2006). These structures have homogenized and depleted flows, altered natural seasonal flow regimes (Molles et al. 1998), fragmented habitat, and interrupted fundamental processes such as sediment and nutrient transport (Ellis et al. 2001), causing a decline in the Rio Grande chub and other native fish species.

## **8 Invasives, Problematic Native Species, & Pathogens**

Negative interactions with non-native species have been cited as one of the main contributing factors to the decline of the Rio Grande chub in the Carson and Santa Fe National Forests in northcentral New Mexico, close to the Colorado border (Calamusso and Rinne 1999). The species composition at occupied Rio Grande chub sites in Colorado was found to be dominated by non-native fish: the most common among these were fathead minnow (*Pimephales promelas*), white sucker (*Catostomus commersonii*), and red shiner (*Cyprinella lutrensis*), respectively (Bestgen, Compton, Zelasko and Alves 2003). All of these species are suspected to compete with or prey on the Rio Grande chub, although direct evidence is lacking.

### **Information Needs**

Seasonal patterns and basic life history information for the Rio Grande chub is sorely lacking. Furthermore, there is little information available on predation by non-native species, as well as the dietary habits of the species. More studies are also needed to better understand the impact of grazing on Rio Grande chub. Lastly, earlier studies on the impacts of non-native species on Rio Grande chub have been conducted in New Mexico (Calamusso and Rinne 1996), but more investigation is needed within Colorado.

### **Conservation Actions**

Provide additional security for existing populations where needed (e.g., through easements and other landowner agreements, barriers). Identify opportunities to extend length of available habitat for existing populations and, especially, to restore presumed metapopulations by connecting populations that are currently isolated. Identify additional potential re-introduction sites within the species' historic range, and aggressively pursue re-introduction opportunities.

## **Rio Grande Cutthroat Trout (*Oncorhynchus clarkii virginalis*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Conservation Agreement for Rio Grande Cutthroat Trout (*Oncorhynchus clarkii virginalis*) in the States of Colorado and New Mexico (2013); Rio Grande Cutthroat Trout (*Oncorhynchus clarkii virginalis*) Conservation Strategy (2013); Rio Grande Cutthroat Trout

(*Oncorhynchus clarkii virginalis*): a technical conservation assessment (2006); Conservation plan for Rio Grande Cutthroat Trout (*Oncorhynchus clarki virginalis*) in Colorado (2004) (links in Appendix D).

### **Threats**

The Rio Grande cutthroat trout (*Oncorhynchus clarkii virginalis*) occurs in the Canadian, Pecos and Rio Grande river basins in New Mexico and Colorado (Behnke 2002). It is the southernmost subspecies of *O. clarkii* (Pritchard et al. 2009). Rio Grande cutthroat trout populations have suffered serious declines in distribution, and the species presently occupies an estimated 11% of its historic range (USFWS 2014c), and remaining populations are restricted to high elevations and short stream segments (Alves et al. 2008). It was considered “warranted” for federal listing under the Endangered Species Act in 2008 (USFWS 2008), but was then removed from the candidate list in 2014 (USFWS 2014c). In Colorado, it is a species of special concern (CPW 2014).

Recent genetic studies have called into question traditional concepts regarding the taxonomy and distribution of cutthroat trout in Colorado (Metcalf et al. 2007; Metcalf et al. 2012; Bestgen, Rogers, and Granger 2013). Rio Grande cutthroat trout, however, remain a distinct subspecies limited to the Rio Grande basin of Colorado and New Mexico (Metcalf et al. 2012; Bestgen, Rogers, and Granger 2013). Microsatellite data has revealed “clear genetic differentiation between populations in the Rio Grande River and the Canadian and Pecos River drainages” and prompted the recommendation that these populations be conserved as evolutionary significant units (Pritchard et al. 2009).

### **7 Natural System Modifications**

Wildfires in the range of Rio Grande cutthroat trout have depressed or eliminated fish populations (Japhet et al. 2007; Patten and Sloane 2007). Ash flows and debris from wildfires can wash into streams and cause fish kills (Rinne 1996; Brown et al. 2001). The watersheds occupied by Rio Grande cutthroat trout have a high risk of burning and causing high amounts of debris flow (Miller and Bassett 2013). The Rio Grande headwaters, however, have only a moderate risk of fire and debris flow compared to the rest of the species’ range (Miller and Bassett 2013).

### **8 Invasives, Problematic Native Species, & Pathogens**

Non-native rainbow trout (*O. mykiss*) and other non-native cutthroat trout subspecies readily hybridize with Rio Grande cutthroat trout, resulting in introgression and loss of conservation populations (Pritchard and Cowley 2006; Alves et al. 2008). Other non-native fish species, including brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*) have displaced or eliminated native cutthroat trout through competition and predation (Harig et al. 2000; Dunham et al. 2002; Peterson et al. 2004; Shemai et al. 2007).

Whirling disease has contributed to the collapse of wild trout populations in the western United States (Ayre et al. 2014). This disease damages the cartilage of infected fish, causes them to swim in a whirling motion. This altered state renders them incapable of feeding or avoiding predation (USFWS 2014c). Rio Grande cutthroat trout are predicted to have relatively low likelihood of infection (Ayre et al. 2014) compared to Colorado River cutthroat trout, but the disease is still considered a threat to the species (USFWS 2014c).

## **11 Climate Change & Severe Weather**

Drought and increased stream temperatures have been identified as a major threat to Rio Grande cutthroat trout (Haak et al. 2010). Droughts in the southwestern United States are expected to increase in frequency and severity (Hoerling and Eischeid 2007). This could result in stream dewatering and a decrease in available habitat (Zeigler et al. 2012; USFWS 2014c). Average annual air temperature has increased across the range of Rio Grande cutthroat trout since the mid-20<sup>th</sup> century, and this trend could result in elevated stream temperatures that are unsuitable for Rio Grande cutthroat trout that rely on coldwater habitat to complete their life cycle (Williams et al. 2009; Ziegler et al. 2012; USFWS 2014c).

### ***Information Needs***

Unlike many of the rare fish species in Colorado, there is a relatively rich amount of information available on the Rio Grande cutthroat trout. The distribution of the species is fairly well understood (Alves et al. 2008). However, more surveys are needed to identify Rio Grande cutthroat trout conservation populations and characterize their habitat (RGCTCT 2013). More information is needed on the life history of the species, including spawning patterns and sex ratios. It is unknown if spawning occurs every year (RGCTCT 2013). Movement patterns of the species within small streams are largely unknown (Alves et al. 2008). Future research should also focus on assessing the effectiveness of restoration activities in occupied habitat.

### ***Conservation Actions***

Secure water availability and habitat quality for existing populations (e.g., through easements and other landowner agreements). Increase the number of populations through re-introduction into suitable habitat. Continue efforts to identify additional potential re-introduction sites within the species' presumptive native range, including larger drainages with tributary streams. Sites that remain relatively free of non-native predators are especially important. Rigorously evaluate factors affecting success of current stocking efforts, to inform future stocking. Continue survey efforts to identify additional populations. Identify opportunities for habitat improvement to create or restore suitable habitat.

## Rio Grande Sucker (*Catostomus plebeius*)

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Rio Grande Sucker (*Catostomus plebeius*): a technical conservation assessment (2005); State of Colorado Rio Grande Sucker Recovery Plan (1994) (links in Appendix D).

### Threats

The Rio Grande sucker (*Catostomus plebeius*) is endemic to the Rio Grande Basin. The largest part of its range is in New Mexico, with smaller portions extending into Colorado and Mexico. Populations in Colorado declined precipitously during the 20<sup>th</sup> century, until surveys in 1994 confirmed that only one population remained in Hot Creek in Conejos County (Rees and Miller 2005). It is now listed as a state endangered species in Colorado, and was petitioned for federal listing in 2014. The primary threats to the species are 1) habitat loss through the dewatering of streams, 2) habitat fragmentation and movement barriers caused by dams and diversions, 3) changes in stream temperatures, water chemistry, and channel geometry, and 4) competition and predation by non-native fish species.

### 7 Natural System Modifications

The construction of at least 56 large-scale dams along the entire length of Rio Grande River began in the late 1800s, and accelerated through the 1960s (Cowley 2006). These structures have homogenized and depleted flows, altered natural seasonal flow regimes (Molles et al. 1998), fragmented habitat, and interrupted fundamental processes such as sediment and nutrient transport (Ellis et al. 2001), causing a decline in the Rio Grande sucker and other native fish species.

### 8 Invasives, Problematic Native Species, & Pathogens

Non-native fish species compete with, prey on, and hybridize with Rio Grande sucker. In the last 40 years, the non-native white sucker (*Catostomus commersonii*) has largely replaced the Rio Grande sucker in Colorado (Langlois et al. 1994). It has been suggested that competition between these two species for food, spawning sites, and rearing areas has negatively impacted the Rio Grande sucker (Rees and Miller 2005). Hybrids between these two species have been documented at Hot Creek, but rates were low, and hybridization does not appear to be a major factor in the decline of Rio Grande sucker in Colorado (Zuckerman and Langlois 1990; Swift-Miller et al. 1999). Other non-native fish species such as the brown trout (*Salmo trutta*) and northern pike (*Esox lucius*) are predators of the Rio Grande sucker.

### Other Threats

The feeding habits of the Rio Grande sucker suggest a preference for streams with low turbidity and minimal sediment deposition (Swift-Miller et al. 1999a). However, land use changes such as

road construction, overgrazing, and timber harvest have led to increased sediment loads in Western streams (Judy et al. 1984; Rees and Miller 2005). There are no studies on the impact of these land use practices in occupied Rio Grande sucker habitat, but it is likely that high turbidity and sediment deposition from these activities has depleted and degraded the food supply for the species in Colorado (Swift-Miller et al. 1999b).

### **Information Needs**

Seasonal patterns and basic life history information for the Rio Grande sucker is sorely lacking. More studies are needed to understand the habitat use patterns, diel movements, and life history events of the species. Future studies should also focus on the impacts of grazing, road construction, and culverts on Rio Grande sucker habitat.

### **Conservation Actions**

Secure water availability and habitat quality for existing populations (e.g., through easements and other landowner agreements, barriers). Continue efforts to identify additional potential re-introduction sites within the species' native range. Rigorously evaluate factors affecting success of current stocking efforts, to increase future success. Continue survey efforts to identify additional populations. Identify opportunities for habitat improvement to create or restore suitable habitat.

## **Roundtail Chub (*Gila robusta*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: State of Colorado conservation and management plan for the Roundtail Chub (*Gila robusta*), Bluehead Sucker (*Catostomus discobolus*), and Flannelmouth Sucker (*Catostomus latipinnis*) (in development); Range-wide conservation agreement and strategy for Roundtail Chub (*Gila robusta*), Bluehead Sucker (*Catostomus discobolus*), and Flannelmouth Sucker (*Catostomus latipinnis*) (2006); Roundtail Chub (*Gila robusta robusta*): a technical conservation assessment (2005) (links in Appendix D).

### **Threats**

The roundtail chub (*Gila robusta*) was once common in the entire Colorado River Basin, but populations have declined in recent decades (Minckley and Deacon 1968; Carlson and Muth 1989; Osmundson 1999). In the portion of the upper Colorado River Basin located within Colorado, roundtail chub occupies approximately 55% of its historical range; it is declining or extirpated from sections of the Dolores, Gunnison, San Juan, and Green rivers (Bezzarides and Bestgen 2002; Bestgen et al. 2011). It is now considered a "species of special concern" in Colorado (CPW 2014). Population declines are more severe in the lower Colorado River Basin in Arizona and New Mexico, where the species is a Candidate for listing under the Endangered



Species Act (USFWS 2005). Budy et al. (2013) suggest that the roundtail chub is in grave decline in Utah. The primary threats to the species are flow alterations, physical habitat modifications, and the introduction of non-native fishes (USFWS 2002d; CPW 2014).

#### **4 Transportation & Service Corridors**

The Denver and Rio Grande Western railroad tracks parallel the Colorado River at Black Rocks and Westwater Canyon. Potential hazardous waste spills resulting from a train derailment threaten roundtail chub populations in these areas. A network of pipelines containing petroleum products cross or closely follow the Yampa River upstream of Yampa Canyon, none of which contain emergency shut-off valves (USFWS 2002d). Leaking or bursting pipes could result in deleterious effects to the fish community in the Yampa River.

#### **7 Natural System Modifications**

The construction of dams along the mainstem of the Colorado River and its tributaries has fragmented and inundated riverine habitat; released cold, clear waters; altered ecological processes and sediment regimes; affected seasonal availability of habitat; and blocked fish passage (Minckley and Deacon 1968; Valdez and Ryel 1995; Marsh and Douglas 1997; USFWS 2002d). Roundtail chub declines are common in impoundments after reservoir construction (Bezzarides and Bestgen 2002). Wolford Mountain Reservoir hosts the only reservoir-dwelling population of roundtail chub in Colorado (Ewert 2010). Fish passageways have been created for the roundtail chub and other native fish at dam sites in the Colorado River near Palisade and on the Gunnison River (Landers 2012). The Green River Dam in Utah is slated for rehabilitation, and the final plans for renovation include a fish passageway to allow for the upstream and downstream movement of native fishes, including roundtail chub (USDOA 2014).

Lowhead dams and constructed wetlands along Muddy Creek, a tributary of the Little Snake River in the Upper Colorado River basin, were shown to restrict downstream movement of roundtail chub and create novel wetland habitat favoring non-native fish species (Beatty et al. 2009). These dams and constructed wetlands, however, may have positive indirect effects as they create a barrier to the upstream spawning of non-native fish species that prey on, hybridize, and compete with the roundtail chub for resources. These findings highlight the complex impacts of dams on Colorado's native fish populations (Beatty et al. 2009).

The homogenization of flows in occupied roundtail chub habitat has led to an increase in continuous flatwater without the topographic and hydraulic heterogeneity required to create and support roundtail chub populations (Bestgen et al. 2011). Reductions in transport of fine sediment may also alter downstream geomorphic characteristics and availability of spawning sites and rearing habitat (Valdez and Ryel 1995; Van Steeter and Pitlick 1998; Douglas and Douglas 2000). Changes in discharge timing and magnitude may shift environmental cues

needed by fish for proper timing of migration and spawning, thereby preventing successful reproduction (Muth et al. 2000).

### **8 Invasives, Problematic Native Species, & Pathogens**

Several non-native fish species are predators of the roundtail chub. A clear example was documented in the Yampa River between Hayden and Lily Park during 2000-2003, where the combined effects of drought conditions and increasing smallmouth bass (*Micropterus dolomieu*) and northern pike (*Esox lucius*) populations reduced habitat and recruitment of juvenile fish and increased predation on all size classes (Anderson and Stewart 2007). Negative effects of smallmouth bass on roundtail chub have also been documented in the Dolores River (White 2008; CPW 2010a). Non-native channel catfish (*Ictalurus punctatus*) were also abundant in eddies with roundtail chub in the Yampa and Green Rivers, and are likely predators of the chub (Karp and Tyus 1990).

The non-native Asian tapeworm (*Bothriocephalus acheilognathi*) has been implicated in the decline in the condition of humpback chub (*Gila cypha*) below Glen Canyon Dam (Meretsky et al. 2000). In 2005, an Asian tapeworm was documented for the first time in a roundtail chub (*Gila robusta*) in the Yampa River (Ward 2005). Potential impacts on the roundtail chub are unknown, though none have been observed.

Several members of the genus *Gila* reside in the Colorado River including humpback chub (*G. cypha*), roundtail chub (*G. robusta*), and bonytail chub (*G. elegans*). Recent research suggests that extensive introgressive hybridization has occurred within this group prior to the creation of dams and diversions (Gerber et al. 2001). However, it is also suggested that these human constructions have eliminated or compromised the realized niches of these species, and they now occur sympatrically (Douglas et al. 1998). Morphological characters can be used to separate out each taxon, but hybrids often possess intermediate characters. Hybrid intermediacy has led to inaccurate field identification. In Black Rocks and Westwater Canyon, researchers have documented higher proportions of roundtail chub during low flow years (Kaeding et al. 1990; Chart and Lentsch 2000). These low flow years result in increased sympatry between both chub species, and potentially increase the chances for hybridization (USFWS 2002d). Thus, it is necessary to mimic natural hydrological flow regimes to maintain natural proportions of *Gila* species and intergrades (USFWS 2002d).

### **Information Needs**

More population surveys and life history studies on roundtail chub are needed in the upper Colorado River Basin, especially in smaller streams (Bezzarides and Bestgen 2002). Efforts should also focus on identifying and protecting important tributary streams from further flow alterations and habitat degradation (Bezzarides and Bestgen 2002).

## **Conservation Actions**

Suppression of non-native predators, particularly northern pike and smallmouth bass, must continue throughout the basins where these species have invaded. Colorado's DRAFT Conservation and Management Plan for the 'three species,' which needs to be finalized, specifies additional conservation actions.

## **Southern Redbelly Dace (*Phoxinus erythrogaster*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: South Platte Native Fish Conservation Plan & Arkansas Native Fish Conservation Plan (in development); Southern Redbelly Dace (*Phoxinus erythrogaster*): a Technical Conservation Assessment (2007) (link in Appendix D).

## **Threats**

The southern redbelly dace (*Phoxinus erythrogaster*) is a small fish species that occurs throughout the Missouri River basin (Stasiak 2007). In Colorado, only two known wild populations exist. These occur in small tributaries to the Arkansas River near Pueblo, Colorado (Bestgen, Crockett, and Foutz 2013). Major threats to the species in Colorado are loss of habitat due to dewatering; habitat degradation due to impoundments, nonpoint source pollution, channelization and siltation; and non-native species.

## **2 Incompatible Agriculture**

Excessive grazing in riparian zones can lead to erosion and siltation that compromises the cool, clear waters and clean gravels that are required habitat conditions for the southern redbelly dace (Platts 1991; Belsky et al. 1999). Increased turbidity from erosion and siltation interferes with the ability of the southern redbelly dace to spawn, feed, and recognize color patterns of potential mates (Rieman and Clayton 1997; Stasiak 2007).

## **7 Natural System Modifications**

In the Arkansas River basin, the southern redbelly dace prefers small, cool, clear streams that are often spring-fed (Bestgen, Crockett, and Foutz 2013). Impoundments, dams, and diversions could degrade habitat for southern redbelly dace by altering flows, water chemistry and channel morphology (Stasiak 2007). Studies have shown that the species has a low tolerance to silt (Poff and Allan 1995) and does not survive well in reservoirs (Mammoliti 2002).

## **8 Invasives, Problematic Native Species, & Pathogens**

Introduced predatory fish species may pose a serious threat to dace populations as they will consume even the largest adults (Stasiak 2007). The nonnative northern pike (*Esox lucius*), a large predatory fish, has been shown to reduce dace populations (He and Kitchell 1990).

## **9 Pollution**

The southern redbelly dace has been reported as very sensitive to changes in water quality (Stagliano 2001). Pollutants and pesticides from agricultural runoff can degrade water quality, and these have been suggested as possible threats to the dace (Stasiak 2007).

### **Information Needs**

More surveys are needed to discover new populations in Colorado, and to identify suitable habitat for re-introduction (Bestgen, Crockett, and Foutz 2013). Better characterize status, demographics and metapopulation dynamics of known populations, particularly the population nearest to the Arkansas River near Florence.

### **Conservation Actions**

Securing water availability and habitat quality for existing populations (e.g., through easements and other landowner agreements) is a key priority. Continue efforts to identify additional potential re-introduction sites within the species' native range. Identify opportunities for habitat improvement to create or restore suitable habitat. Maintain the broodstock at NASRF and create additional populations through stocking when suitable habitat becomes available.

## **Stonecat (*Noturus flavus*)**

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### **Threats**

The stonecat (*Noturus flavus*) is widespread throughout the northern and central Great Plains, the Great Lakes region, and parts of the eastern United States. In Colorado, it is poorly documented with only two known sites. It has been reported from St. Vrain Creek, a tributary to the South Platte River, near the Longmont Wastewater Treatment Plant (Platania et al. 1986). It has also been collected from the North Fork of the Republican River in Yuma County, Colorado (Cancalosi 1980).

### **7 Natural System Modifications**

Few studies have investigated threats to the species, but the dewatering of occupied streams, dams and diversions that block fish passage, and high sediment concentrations characteristic of Colorado's eastern plains streams are likely the primary threats to the species in Colorado (Woodling 1985).

### **Information Needs**

Basic information on the life history, habitat preferences, and range in Colorado is needed.

### **Conservation Actions**

Secure water availability and habitat quality for existing populations (e.g., through easements and other landowner agreements) is a key priority, particularly in the Republican basin. Increased

fragmentation of the St. Vrain population by post-flood reconstruction needs to be avoided to the extent possible, and its impact evaluated. Identify potential re-introduction sites within the species' native range. Study metapopulation dynamics, to understand importance of barriers and seasonal connectivity in life history, to direct future conservation activities.

## **Suckermouth Minnow (*Phenacobius mirabilis*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: South Platte Native Fish Conservation Plan & Arkansas Native Fish Conservation Plan (in development).

### **Threats**

The suckermouth minnow (*Phenacobius mirabilis*) is widespread throughout the Great Plains, the upper Midwest, and the Mississippi River basin. Historically, the species occurred on the eastern plains of Colorado in the South Platte, Arkansas River, and Republican River basins. The suckermouth minnow is presently rare in all of these basins, and may be extirpated from the Republican River in Colorado (Bestgen, Zelasko, and Compton 2003). In 2011, the suckermouth minnow was stocked into the Arkansas River near Rocky Ford, Colorado (CPW 2011). Few studies have investigated threats to the species, but the dewatering of occupied streams, as well as dams and diversions that block fish passage, are likely the primary factors limiting the distribution and abundance of the species in Colorado (Bestgen, Zelasko, and Compton 2003).

### **7 Natural System Modifications**

Suckermouth minnows were commonly found in deep pools downstream of diversion dams on the South Platte River (Bestgen, Zelasko, and Compton 2003). Dewatering of streams has occurred on the Eastern Plains of Colorado, and naturally occurring deeper pools and runs have likely become rarer as a result. Presently, fish that rely on deep pools and eddies are often limited to those created by dams and impoundments. Therefore, dams likely have a complex effect on the species, at once blocking fish passage and creating deep pools that are favored by suckermouth minnow (Bestgen, Zelasko, and Compton 2003).

### **Information Needs**

More studies are needed on 1) movement dynamics, 2) the role of mainstem and tributaries in sustaining populations, 3) the effects of stream channel geometry and fluvial processes on habitat, 4) habitat use during drought, and 5) the effects of water management practices (Bestgen, Zelasko, and Compton 2003). Lastly, more information is needed on the impact of nonnative fish species on suckermouth minnow.

### **Conservation Actions**

Study movement and metapopulation dynamics, to understand importance of barriers and seasonal connectivity in life history, and to direct future conservation activities. Such studies are particularly important in the South Platte basin, to understand causes of dramatic population fluctuations not observed in the Arkansas basin. Identify potential re-introduction sites within the species' native range, emphasizing opportunities to protect or re-create mainstem-tributary connectivity, with availability of clean gravel substrate. Rigorously evaluate factors affecting success of current stocking to increase success of future efforts.

## **TIER 1 MAMMALS**

### **American Pika (*Ochotona princeps*)**

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#### **Threats**

##### **11 Climate Change & Severe Weather**

CPW surveys in 2008 found that pika are well distributed in Colorado's high country. CPW's Predicted Range Model indicates extensive and largely contiguous suitable pika habitat in the state, suggesting that Colorado pika populations should have patch size and connectivity to maintain a metapopulation structure sufficient to preserve populations (Seglund 2008). The main concerns for climate change are that warming patterns could impact pika foraging rates, increase thermal stress on the animals, reduce snow cover used for insulation in winter, and alter plant communities impacting food availability and quality. Currently in Colorado, there is abundant alpine and subalpine habitat that may serve as a stronghold for the species as impacts from global climate change continue.

#### **Information Needs**

Continued evaluation of pika distribution and population levels is warranted to monitor the impacts of climate change.

#### **Conservation Actions**

Since baseline information has been collected, the next step is implementation of a long-term monitoring program that can evaluate changes in occupancy. This effort will allow managers to correlate changes in climate with changes in the distributions of pikas, vegetation, and thermal stress parameters.

## **Black-footed Ferret (*Mustela nigripes*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: A Cooperative Plan for Black-footed Ferret Reintroduction and Management, Wolf Creek and Coyote Basin Management Areas, Moffat and Rio Blanco Counties (2001); Black-footed Ferret Recovery Plan (1988) (links in Appendix D).

### **Threats**

#### **1 Residential & Commercial Development**

The primary threat to black-footed ferrets is the loss of their prey base, prairie dogs (*Cynomys* spp.). There has been widespread conversion of native prairie dog habitat to residential and commercial development, particularly along the Front Range, but also throughout the ferret's historic range in Colorado.

#### **2 Incompatible Agriculture**

Approximately one-third of the overall historic range of ferrets has been converted to cropland that may accommodate ferrets but is inhospitable to prairie dogs (USFWS 2009). Prairie dogs have been lost to habitat conversion, rodenticide use and other eradication efforts, and disease (USFWS 2009).

#### **8 Invasives, Problematic Native Species, & Pathogens**

Sylvatic plague is a significant threat to remaining prairie dog colonies. Plague and canine distemper have impacted ferret re-introduction efforts and ferret prey populations. Both plague and canine distemper have motivated immunization strategies to improve success of re-introduction efforts.

#### **14 Natural Factors**

Ferrets are known to have undergone a genetic bottleneck when populations dwindled dramatically in the 1980s (Wisely et al. 2002). Despite re-introduction of 3,500 ferrets at 21 locations throughout the range (Black-footed Ferret Recovery Implementation Team, [www.blackfootedferret.org](http://www.blackfootedferret.org)), the species is still susceptible to genetic inbreeding limitations and stochastic demographic events that could impact populations.

### **Information Needs**

Being one of the most charismatic endangered species ever to receive conservation attention, the species has been well studied. In Colorado, the biggest information gap is where ferret populations could be re-established and successfully sustained. This requires an understanding of the health and stability of the prey base population to support ferrets.

## **Conservation Actions**

Conservation of the black-footed ferret in Colorado will depend on two main issues – control of disease and identification of relocation sites. There is on-going research into the development of a vaccine for sylvatic plague which is effective at protecting prairie dogs in the wild. This work will increase the success of ferret re-introduction rangewide. At the same time, it is important to work with various agencies and private landowners to identify potential re-introduction sites throughout the state. This will include both public outreach on the importance of prairie ecosystems and support for participating landowners. Overcoming social intolerance of prairie dogs is a hurdle. This can generally be overcome with large enough financial incentives such as those currently offered in the black-footed ferret Environmental Quality Incentives Program project occurring currently in Colorado.

## **Fringed Myotis (*Myotis thysanodes*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Colorado Bat Conservation Plan (2004); Fringed Myotis (*Myotis thysanodes*): a technical conservation assessment (2004) (links in Appendix D).

### **Threats**

#### **3 Energy Production & Mining**

In Colorado, mines are used by the fringed myotis for day and night roosts (Armstrong et al. 2011) as well as maternity and transition roosts, which have been documented during the CPW's Bats and Inactive Mines Project. Any loss of roosting habitat is detrimental. Renewed mining in historic districts, especially for uranium, has the potential to displace this species from current roosting sites.

#### **6 Human Intrusions & Disturbance**

The fringed myotis will use buildings, caves, and mines for maternity roosts, night roosts, and hibernacula (Keinath 2004; Armstrong et al. 2011). Disturbances to mines and caves, such as abandoned mine closure, recreational caving, and renewed mining, are a threat to this species and can take the form of. In some areas, the fringed myotis will use tree snags as roosts (Keinath 2004); thus, removal of these resources, especially on a large scale, could be detrimental to this species.

#### **Work & Other Activities**

As abandoned mines throughout Colorado are closed for hazard abatement, there is potential for loss of bat roosts. Improper gate designs or closure during the wrong season or with inadequate pre-closure survey has the potential to have large cumulative effects on fringed myotis.



### **Recreation**

Roosting bats are sensitive to disturbance and could leave roost sites following human visitation (Keinath 2004). Recreational caving can disrupt bats that use caves as roosts. Disturbance to roosting bats may not be intentional and may occur unbeknownst to the caver, but may cause abandonment of sites and the premature expenditure of critical fat reserves during hibernation (Thomas 1995).

### **8 Invasives, Problematic Native Species, & Pathogens**

White-nose syndrome is a disease of hibernating bats caused by an introduced fungus (*Pseudogymnoascus destructans*) (Lorch et al. 2011; Warnecke et al. 2012) that has severely impacted bat populations in eastern North America (Frick et al. 2010). The fringed myotis could be susceptible to white-nose syndrome. White-nose syndrome has not been observed in Colorado, but because of the devastating impact to bat populations in eastern North America and its expansion across the continent as far west as the Kansas/Missouri border, this disease is a formidable threat to hibernating bat species. All indications are that many bat roosts in Colorado could provide the conditions suitable for *P. destructans*.

### **9 Pollution**

The fringed myotis feeds on a wide variety of insects compared to many bat species (Keinath 2004; Armstrong et al. 2011). Large scale use of pesticides may reduce this species' prey base, but because of its broad diet, insect control programs focusing on one group of species may not have as severe of an effect. Bioaccumulation of toxins during foraging in bats may occur due to pesticide use. No studies have directly evaluated the effects of pesticide use on the fringed myotis, but work on other bat species in Colorado (O'Shea et al. 2001) and elsewhere have shown that bats accumulate high levels of contaminants in their tissues relative to other taxa (Clark and Shore 2001).

### **Information Needs**

In their list of suggested research needs for the bats of Colorado, Ellison et al. (1999) mention the need for an intraspecific genetic analysis of subspecies in addition to general information gaps for all bat species. Little is known regarding winter ecology at hibernacula, seasonal movements, and adult male life history for this species. Data specific to Colorado regarding distribution, population status, and trends are lacking.

### **Conservation Actions**

Protection of roosting bats from human disturbance, especially at significant winter hibernation sites and summer maternity sites, is important for the conservation of the fringed myotis. Developing a better understanding of the distribution and habitat use of the fringed myotis will better inform which sites are at greatest risk from human disturbance, as well as what threat white-nose syndrome presents to this species.

## **Gunnison's Prairie Dog (*Cynomys gunnisoni*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Colorado Gunnison's and White-tailed Prairie Dog Conservation Strategy (2010); Gunnison's Prairie Dog Conservation Assessment (2005) (links in Appendix D).

### **Threats**

#### **2 Incompatible Agriculture**

Prior to agricultural conversion of habitats in Colorado, many Gunnison's prairie dog populations occurred in habitats that provided deep soils and high quality forage – the same sites that agricultural producers preferred. Settlement of Colorado in the early 20th century saw rapid development of irrigated crops. As the century progressed, alfalfa and hay crops began to dominate the landscape. Replacement of native arid landscapes with highly nutritious legume and grass crops allowed prairie dog colonies in these areas to reach artificially high densities. However, these areas also resulted in the creation of more widely distributed, small colonies due to active eradication efforts and development of barriers such as fences, irrigation, roads, and urban predators. Though Gunnison's prairie dog colonies are being maintained in this new biological arrangement, their ecological function has been impaired.

#### **5 Biological Resource Use**

Recreational shooting results in direct mortality of targeted prairie dogs. Effects within individual colonies can be significant, but recreational shooting activity is irregularly dispersed across the range of Gunnison's prairie dogs. As a result, it is not expected that shooting alone can have a sufficient population level effect to move Gunnison's prairie dogs towards extinction. Nevertheless, where recreational shooting activity occurs regularly or at high intensity, shooting has the potential to locally reduce prairie dog densities and slow recovery rates of colonies impacted by plague or other disturbances, especially in the case of isolated colonies. Seasonal shooting closures have been implemented on public land to maintain recreational shooting mortality within acceptable limits for conservation of prairie dog populations.

#### **8 Invasives, Problematic Native Species, & Pathogens**

The primary factor limiting Gunnison's prairie dog populations and distribution in Colorado is sylvatic plague, an introduced, flea-transmitted disease caused by the bacterium *Yersinia pestis* (Seglund and Schnurr 2009). Plague is thought to be the most critical threat to sustained conservation of prairie dog species (Cully and Williams 2001; Pauli et al. 2006). CPW is currently testing an oral plague vaccine that can help protect prairie dogs from devastating outbreaks. In addition, CPW is dusting prairie dog colonies that are of conservation concern with an insecticide to reduce the potential of epizootics.

## **11 Climate Change & Severe Weather**

Gunnison's prairie dogs evolved to live in arid areas that experience periodic droughts. However, human-facilitated changes in ecosystems in the west, including altered plant species composition, ecosystem function, and ecosystem structure (Fleischner 1994) may cause prairie dogs to be more susceptible to drought conditions. In addition, climate change may be increasing the number and duration of drought events, making it more difficult for prairie dogs to survive. When Colorado experienced an extreme drought in 2002, many Gunnison's prairie dog colonies were lost.

### **Information Needs**

Methods for how to manage plague at a landscape scale and at colonies or complexes that are of conservation concern are needed.

### **Conservation Actions**

The primary conservation actions needed include continued dusting of colonies to protect against plague events, continued work on the oral plague vaccine, and continued occupancy surveys to evaluate status of the species statewide. Strategies outlined in the Colorado Gunnison's and White-tailed Prairie Dog Conservation Strategy (Seglund and Schnurr 2009) should be implemented. Management of rangelands needs to consider the relative influence of climate change. While there are many uncertainties about how climate change will affect certain habitats, an overall management strategy that maintains a larger intact landscape, and thereby increases the ability of the given species to adjust their range, should be incorporated in the overall conservation of the species.

## **Little Brown Myotis (*Myotis lucifugus*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Colorado Bat Conservation Plan (2004) (link in Appendix D).

### **Threats**

#### **5 Biological Resource Use**

Little brown myotis will use buildings and other structures during different times of the year (Armstrong et al. 2011), and are often found in close proximity to urban and suburban areas in Colorado. This is especially true during the maternity season, when nursery colonies are often found in the warm attics of buildings. Exclusion or extermination of bats from roost sites that are inhabited by humans and, if not done properly or during an appropriate time of year, can be a threat to this species.

## **8 Invasives, Problematic Native Species, & Pathogens**

White-nose syndrome is a disease of hibernating bats caused by an introduced fungus (*Pseudogymnoascus destructans*) (Lorch et al. 2011; Warnecke et al. 2012) that has severely impacted bat populations in eastern North America (Frick et al. 2010). To date, the little brown myotis is one of the species most impacted by white-nose syndrome, and is at risk of local extinction in eastern North America (Frick et al. 2010). Local population declines at hibernacula of over 50% per year, with some reaching as high as 99%, have been reported (Frick et al. 2010). White-nose syndrome has not been observed in Colorado, but because of the devastating impact to bat populations in eastern North America and its expansion across the continent as far west as the Kansas/Missouri border, this disease is a formidable threat to hibernating bat species. All indications are that many bat roosts in Colorado could provide the conditions suitable for *P. destructans*.

### **Information Needs**

The little brown myotis is one of the better studied bat species in North America, but information is still lacking on population dynamics and populations status, especially within Colorado. Most of the known roosts in Colorado are maternity colonies, which are comprised primarily of females and their young and typically contain fewer than 100 adult females (Armstrong et al. 2011). Little information is known regarding male roosting habits. Data on seasonal movements and hibernacula locations and status are needed. Large hibernacula, as might be found in eastern North America, are not known from Colorado, and more information is needed on the winter ecology of this species.

### **Conservation Actions**

Protection of roosting bats from human disturbance and take, especially at significant winter hibernation sites and summer maternity sites, is important for the conservation of the little brown myotis. Developing a better understanding of the distribution and habitat use of the little brown myotis will better inform which sites are at greatest risk from human disturbance, as well as what threat white-nose syndrome presents to this species. Sustained monitoring of summer colonies and acoustic monitoring statewide are needed to provide surveillance of the potential arrival of white-nose syndrome into the state.

## **Lynx (*Lynx canadensis*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Federal listing documents; Recovery outline (links in Appendix D).

## **Threats**

Lynx have successfully been re-established in Colorado and a self-sustaining population is believed to persist in the region. The management actions taken to re-establish the population to Colorado were done considering the landscape of the time – there is no intention of attempting to change, alter or remove historic and current land uses from the landscape. Many of these industries can and have developed practices that have the potential to allow the long term persistence of the lynx within the context of existing land use.

## **5 Biological Resource Use**

The characteristics of vegetation structure that makes habitat suitable for lynx have been shaped by fire, insects and diseases in the western United States (Ruggiero et al. 1999). When lynx ecology is not taken into consideration, commercial timber harvest within the range occupied by lynx has the potential, when done at relevant scales, to disrupt this structure, rendering the post-harvest habitat unsuitable for lynx and/or their primary prey, snowshoe hares. The establishment of dense small tree and shrub cover is essential for hare populations to reoccupy harvested areas.

Forest harvesting may contribute to fragmentation of lynx habitat, as does construction of highways and associated infrastructure, and mineral or energy development (Ruggiero et al. 1999). Fragmentation can affect lynx by reducing their prey base and by creating patches of foraging habitat that are too small and too distant from each other to support viable populations of lynx (Buskirk et al. 2000).

## **7 Natural System Modifications**

Natural wildfire has maintained a dynamic mosaic of varying age classes of forest stands that provides habitat for both snowshoe hare and lynx (Slough and Mowat 1996). In the Rocky Mountains, the historic fire regime was variable, with both frequent (35–100 years) stand-replacing or mixed-severity fires, and infrequent (200+ years) stand-replacement fires (Hardy et al. 1998). Starting about 100 years ago, this natural fire regime was disrupted by fire suppression efforts, leading to dense forests. This, combined with recent droughts and increasing temperatures, has resulted in a recent shift to uncharacteristically severe and intense wildfires in lower-elevation forests (Morgan et al. 1998). There is the potential for these fires to increase in frequency in the future and spread into adjacent areas occupied by lynx, causing the loss of large expanses of lynx habitat.

## **11 Climate Change & Severe Weather**

The impact of climate change on lynx is uncertain and unquantified. The predicted effects of climate change in the West include a reduced snowpack and shorter periods of snow cover, snowmelt that occurs earlier in the season, a hydrologic cycle that is more dynamic as extreme rainfall events occur with greater frequency and overall warmer, drier, and more drought-like

conditions (Melillo 2014). While it is uncertain when these effects may take place and the magnitude of their impact on lynx, the effects of these changes may include changes in population distribution and size, amount of habitat, demographic rates, and predator prey relationships (Ruggiero et al. 1999). The extent to which any of these possible changes may impact the population as a whole is unknown. Management actions have little ability to alter the predicted impacts or even mitigate the effects of climate change. However, assessments to identify possible avenues for adaptive management strategies to climate change should be considered (Ruggiero et al. 1999).

### **Information Needs**

High priorities for research include continued monitoring of lynx populations in suitable habitat to verify population trends, distribution, and population viability, as well as to validate core areas classified and mapped as suitable habitat for lynx. Other research needs include assessing the effect of climate change on lynx, lynx habitat and snowshoe hare; further refinement of survey protocols; researching what effect vegetation management has on lynx distribution and density; examining the limits to lynx dispersal; investigating how silvicultural practices impact snowshoe hares, evaluating how winter recreational activities impact lynx behavior and habitat use; and determining what role secondary and peripheral areas have in the conservation of lynx.

### **Conservation Actions**

The primary action needed for the recovery of lynx is the drafting and implementation of a Federal Recovery Plan. Establishing recovery goals, objectives, and funding sources with the ultimate goal of delisting the species is paramount. Related, identifying and implementing survey protocols to assess occupancy trends for the species throughout the state is an important task. Identifying important movement corridors and implementing appropriate land management within those areas is important to allow for further dispersal and colonization throughout the state.

## **New Mexico Meadow Jumping Mouse (*Zapus hudsonius luteus*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Federal listing documents (link in Appendix D).

### **Threats**

#### **7 Natural System Modifications**

The primary threat to New Mexico jumping mouse populations is the loss and fragmentation of habitat from human land uses, including: incompatible grazing, recreational development and activity, climatic variability and stochastic events (Frey and Malaney 2009), transportation development, suburban development, loss of beaver and beaver ponds, coalbed methane

development, and instream changes due to increased runoff and flood control efforts. These human land use activities affect this species by removing protective cover, nests, food resources, and hibernation sites; disrupting behavior; or acting as a barrier to movement (USFWS 2013b).

#### **14 Natural Factors**

Isolation of populations may disrupt gene flow and create unpredictable genetic effects that could impact meadow jumping mouse persistence in a given area. The distribution of the New Mexico jumping mouse is so limited that they are already known to be susceptible to stochastic events, such as wildfire (Frey and Malaney 2009).

#### **Information Needs**

There are limited data on the genetic diversity of New Mexico meadow jumping mouse populations in Colorado, and the degree of similarity between Colorado and New Mexico populations. Only two populations from one location each were assessed in Malaney et al. (2012). Additionally, there is little known about the overall distribution of this species in Colorado. Surveys to better document distribution in Colorado are needed, especially in the San Luis Valley.

#### **Conservation Actions**

Further genetic comparisons would illustrate the divergence or lack thereof among Colorado populations. Continued surveying (especially in areas with high probability of occurrence), as well as revisits to known Colorado locations, would be valuable to document distribution and stability, and to conduct population monitoring. Protection of known habitat from both human disturbance and increased natural changes, such as fire, is important to the continued persistence of this species in Colorado.

### **Olive-backed Pocket Mouse (*Perognathus fasciatus*)**

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There are two subspecies of olive-backed pocket mouse (*Perognathus fasciatus*) in Colorado. In the northwest corner of Moffat County, *P. f. calistus* is restricted to the area north of the Yampa River (Armstrong et al. 2011). *Perognathus f. infraluteus* is restricted to a narrow band that extends from the border of Wyoming in Larimer and Weld counties southward through Huerfano County (Armstrong et al. 2011). Through a targeted inventory, Siemers et al. (2003) were able to find two new populations of *P. f. infraluteus*, but did not find them to be particularly abundant in grassland habitats. *Perognathus f. calistus*' range is considerably smaller than *P. f. infraluteus*' only extending into the northeastern edge of Utah and the southwestern Wyoming. Finley and Bogan (1995) considered the *P. f. calistus* common at locales in northwestern Colorado; however, the range is restricted and alterations to grasslands and desert-scrub communities in this region may keep populations isolated.

## **Threats**

### **1 Residential & Commercial Development**

For *P. f. infraluteus*, much of the western range overlaps the urban corridor of the Front Range, and it is likely that much grassland habitat for this subspecies has been lost.

### **2 Incompatible Agriculture**

Little is known about either subspecies of *P. fasciatus* in Colorado, but conversion to cropland, prairie dog removal, and incompatible grazing patterns have likely altered grassland and desert-scrub habitats.

## **Information Needs**

Many less-common rodent species are poorly understood, but ecology and population structure data for *P. fasciatus* in Colorado is particularly scarce. Little to nothing is known about overall distribution, patterns in distribution, abundance and changes in abundance, and impacts from urban/suburban development, grazing, prairie dog removal, and grassland structure alterations (Manning and Knox 1988; Armstrong et al. 2011).

## **Conservation Actions**

The primary conservation actions needed for this species are development and implementation of a monitoring plan to improve understanding of population status, and protecting habitat from conversion to other uses.

## **Preble's Meadow Jumping Mouse (*Zapus hudsonius preblei*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Draft Recovery Plan Preble's Meadow Jumping Mouse (*Zapus hudsonius preblei*) (2003) (link in Appendix D).

## **Threats**

### **1 Residential & Commercial Development**

The primary threat to Preble's meadow jumping mouse populations is the loss and fragmentation of habitat from human land uses, including urban, suburban, and recreational development; highway and bridge construction; water development; instream changes due to increased runoff and flood control efforts; sand and gravel mining; and overgrazing. These human land use activities affect this species by directly destroying its protective cover, nests, food resources, and hibernation sites; disrupting behavior; or acting as a barrier to movement (PMJM Recovery Plan Draft 2010).



## 14 Natural Factors

### **Scarcity**

Isolation of populations may disrupt gene flow and create unpredictable genetic effects that could impact Preble's meadow jumping mouse persistence in a given area. While stochastic events are not known to be an immediate threat to jumping mouse populations, the tendency for Preble's numbers to vary widely over time heightens concern for small and isolated populations (PMJM Recovery Plan Draft 2010).

### **Competition**

The relative ranges, abundances, and relationship between Preble's meadow jumping mouse and native and non-native small mammals may lead to competitive disadvantages for Preble's meadow jumping mouse. Being greatly outnumbered in abundance by North American deer mice (*Peromyscus maniculatus*) and meadow voles (*Microtus pennsylvanicus*), the jumping mouse may experience competitive disadvantages as habitats are altered (Schorr 2012). Additionally, as habitats are fragmented and encroached upon, there will likely be greater influx of non-native mammals, such as house mice (*Mus musculus*) and Norway rats (*Rattus norvegicus*), that may compete for resources.

### **Predation**

As urban and suburban development encroaches on Preble's meadow jumping mouse habitat, there will be an increase in domesticated predators (domestic cats) and urban-associated meso-predators, such as red fox (*Vulpes vulpes*) and raccoon (*Procyon lotor*) (Woods et al. 2003, Ditchkoff et al. 2006). Increased predation from domestic and urban-associated carnivores diminishes the stability of jumping mouse populations.

### **Information Needs**

There are few studies that have investigated the impacts to Preble's meadow jumping mouse populations when habitat is removed by either human (e.g., development) or natural (e.g., floods) means. Most threats are attributed to the loss of habitat because jumping mouse populations are no longer found or are constricted in areas that have been impacted. Multi-year studies that assess the impacts to Preble's meadow jumping mouse populations when habitat is removed would clarify how habitat alterations change jumping mouse populations.

### **Conservation Actions**

Protection and improvement of existing habitat, especially through Best Management Practices, zoning, conservation easements, and habitat restoration, will improve the outlook for this species in Colorado. The revised recovery plan (currently in development and scheduled for completion in 2015) will inform the specific actions necessary for the long-term protection of individual populations throughout the state.

## **Spotted Bat (*Euderma maculatum*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Spotted Bat (*Euderma maculatum*): a technical conservation assessment (2007); Colorado Bat Conservation Plan (2004) (links in Appendix D).

Very little is known about the ecology and distribution of the spotted bat in Colorado. Spotted bats are difficult to capture and are often under-sampled in mist net surveys. Most information is from acoustic surveys of foraging sites (Navo et al. 1992; Storz 1995), but recent captures of this species have been made (Siemers and Schorr 2006; Bogan and Mollhagen 2010) and maternity colonies have been documented (O'Shea et al. 2011) in Colorado. Threats listed below are primarily speculative and based on potential activities that may adversely affect this apparently rare species. Roost sites are typically in remote locations that are isolated from most human activities. However, this species forages over many different habitat types that are adjacent to cliff and canyon roosting habitat, and the species is known to travel great distances during nightly foraging bouts. Therefore, potential threats to these other habitat types can potentially be impacting this species.

### **Threats**

#### **2 Incompatible Agriculture**

Large scale use of pesticides for control of grasshoppers or Mormon crickets may reduce the prey base for spotted bats. Additionally, bioaccumulation of toxins during foraging in spotted bats may occur due to pesticide use. No studies have directly evaluated the effects of pesticide use on spotted bats, but work on other bat species in Colorado (O'Shea et al. 2001) and elsewhere have shown that bats accumulate high levels of contaminants in their tissues relative to other taxa (Clark and Shore 2001).

#### **6 Human Intrusions & Disturbance**

Rock climbing may affect this species on a local level. Cliff faces and rock crevices where this species roosts could be disturbed by recreational activity. This species has been reported to abandon roosts because of noise (Easterala 1973), and continued disturbance near climbing routes that receive frequent use may cause spotted bats to abandon roosts.

### **Information Needs**

Basic life history and distributional information on the spotted bat is needed for Colorado. More information on reproduction, habitat use, seasonal movement patterns and abundance, among other factors, is needed for this species. Clarification of winter distribution is particularly needed.

## **Conservation Actions**

The primary conservation action needed for the spotted bat is research into the distribution, habitat use, and population parameters in Colorado. This information will better inform which roost sites are at greatest risk from human disturbance, as well as what other threats may arise for this species.

## **Townsend's Big-eared Bat (*Corynorhinus townsendii pallescens*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Townsend's Big-eared Bat (*Corynorhinus townsendii*): a technical conservation assessment (2006); Colorado Bat Conservation Plan (2004) (links in Appendix D).

## **Threats**

### **3 Energy Production & Mining**

Because mines are a critical resource for this species and loss of roosts is thought to be a limiting factor (Pierson et al. 1999), any loss of roosting habitat is detrimental. Hibernacula, maternity, day, night, and transition roosts have all been documented in mines and caves in Colorado. Renewed mining in historic districts, especially for uranium, has the potential to displace Townsend's big-eared bats from current roosting sites.

### **6 Human Intrusions & Disturbance**

Townsend's big-eared bat is most often associated with caves and mines, although it has been found to roost in abandoned buildings and rock crevices during some times of the year (Armstrong et al. 2011). Disturbances to mines and caves are the primary threat to this species, and can take the form of abandoned mine closure, renewed mining, and recreational caving.

### **Work & Other Activities**

As abandoned mines throughout Colorado are closed for hazard abatement, there is potential for loss of bat roosts. Mines are a critical resource for Townsend's big-eared bats in Colorado. Improper gate design, and closure during the wrong season or with inadequate pre-closure survey, have the potential to have large cumulative effects on this species.

### **Recreation**

This species is sensitive to disturbance and will leave roost sites following human visitation (Armstrong et al. 2011, Pierson et al. 1999). Disturbance to roosting bats may not be intentional and may occur unbeknownst to the caver, but can cause abandonment of maternity sites (Pierson et al. 1999 and references therein) and the premature expenditure of critical fat reserves during hibernation (Thomas 1995).

## **8 Invasives, Problematic Native Species, & Pathogens**

White-nose syndrome is a disease of hibernating bats caused by an introduced fungus (*Pseudogymnoascus destructans*) (Lorch et al. 2011; Warnecke et al. 2012) that has severely impacted bat populations in eastern North America (Frick et al. 2010). The Townsend' big-eared bat could be susceptible to white-nose syndrome. White-nose syndrome has not been observed in Colorado, but because of the devastating impact to bat populations in eastern North America and its expansion across the continent as far west as the Kansas/Missouri border, this disease is a formidable threat to hibernating bat species. All indications are that many bat roosts in Colorado could provide the conditions suitable for *P. destructans*.

## **9 Pollution**

Townsend's big-eared bat is a moth specialist (Pierson et al. 1999); thus, large scale use of pesticides for control of lepidopterans such as spruce budworms or gypsy moths, may reduce this species' prey base. Additionally, bioaccumulation of toxins during foraging in bats may occur due to pesticide use. No studies have directly evaluated the effects of pesticide use on Townsend's big-eared bat, but work on other bat species in Colorado (O'Shea et al. 2001) and elsewhere have shown that bats accumulate high levels of contaminants in their tissues relative to other taxa (Clark and Shore 2001).

## **Information Needs**

The identification and protection of significant roost sites, especially maternity roosts and hibernacula, are needed for this species. Basic life history information such as foraging requirements, roost switching, and seasonal movement patterns within Colorado is also lacking. Of the known maternity and hibernation sites in Colorado, most support relatively few individuals (less than 25) (Pierson et al. 1999), which makes population monitoring a challenge. Information on trends and population status in Colorado is needed.

## **Conservation Actions**

Protection of roosting bats from human disturbance and take, especially at significant winter hibernation sites and summer maternity sites, is important for the conservation of the Townsend's big-eared bat. Developing a better understanding of the distribution, habitat use, and population trend of the Townsend's big-eared bat will better inform which sites are at greatest risk from human disturbance, as well as what threat white-nose syndrome presents to this species. The development of a coordinated monitoring strategy/plan by relevant state and federal agencies for the protected mines and caves should be considered. There are currently over 800 bat gates installed in the state, under stewardship of state and federal agencies, which need to be monitored for conditions and status. Without this coordinated and cooperative conservation action, the benefit of past conservation actions could be lost.

## **White-tailed Prairie Dog (*Cynomys leucurus*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Colorado Gunnison's and White-tailed Prairie Dog Conservation Strategy (2010); White-tailed Prairie Dog (*Cynomys leucurus*): a technical conservation assessment (2006) (links in Appendix D).

### **Threats**

#### **1 Residential & Commercial Development**

Urbanization causes direct eradication and permanent loss of prairie dogs and their colonies, resulting in fragmentation and isolation of populations. Indirect effects of urbanization are poisoning or other control efforts deemed appropriate for human health and safety, predation from domestic pets, and increased vigilance and concealment behavior by prairie dogs in response to recurring disturbance in and around colonies (Magle et al. 2005).

#### **3 Energy Production & Mining**

Impacts due to energy development, particularly oil and gas, on white-tailed prairie dogs are not fully understood. It is thought, however, that there can be both indirect and direct impacts to the species from energy development activities, and that entire localized prairie dog systems may be affected. Due to the pace of energy development and the potential risk to the species, management actions need to be developed and implemented to protect these species and their habitats. Adaptive management will be needed to determine if management actions are effective or if modifications need to be made to ensure maintenance of the species and system health. See Colorado Gunnison's and White-tailed Prairie Dog Conservation Strategy (Seglund and Schnurr 2009) for a detailed list of strategies to implement for oil and gas.

#### **5 Biological Resource Use**

Recreational shooting results in direct mortality of targeted prairie dogs. Effects within individual colonies can be significant, but recreational shooting activity is irregularly dispersed across the range of white-tailed prairie dogs. As a result, it is not expected that shooting alone can have a sufficient population level effect to move white-tailed prairie dogs towards extinction. Nevertheless, where recreational shooting activity occurs regularly or at high intensity, shooting has the potential to locally reduce prairie dog densities and slow recovery rates of colonies impacted by plague or other disturbances, especially in the case of isolated colonies. Seasonal shooting closures have been implemented on public land to maintain recreational shooting mortality within acceptable limits for conservation of prairie dog populations.

## **7 Natural System Modifications**

Alteration in fire regimes within the range of the white-tailed prairie dogs has produced changes in structure and function of plant communities. Fire is thought to be beneficial for prairie dogs because it can: (1) reduce the shrub component of shrub-steppe communities, leading to more open tracts of habitat and increased visibility; (2) release plant nutrients, temporarily increasing the nutrient content of forage; (3) stimulate fruit and seed production and increase the yield and quality of herbaceous vegetation; and (4) remove unwanted vegetative litter, which can increase the suitability of an area for prairie dogs (CNHP 2000; BLM 2001b; NRCS 2001; BLM 2002d in Buys and Associates Inc. 2005).

## **8 Invasives, Problematic Native Species, & Pathogens**

The primary factor limiting white-tailed prairie dog populations and distribution in Colorado is sylvatic plague, an introduced, flea-transmitted disease caused by the bacterium *Yersinia pestis* (Seglund and Schnurr 2009). Plague is thought to be the most critical threat to sustained conservation of prairie dog species (Cully and Williams 2001; Pauli et al. 2006b).

Rangeland condition has been altered due to the introduction of non-native plant species including, but not limited to, cheatgrass. Cheatgrass is an aggressive species that can become a monoculture due to its ability to deplete soil moisture and out-compete native perennials. The proliferation of cheatgrass over native perennial grasses and forbs may impact the ability of prairie dogs to meet their dietary needs, resulting in increased mortality rates and decreased productivity (Ritchie 1999). Cheatgrass may not provide sufficient above- or below-ground forage or water stores, which white-tailed prairie dogs need to subsist. In addition, the early green-up of cheatgrass may be beneficial to prairie dogs in spring, but as it goes to seed and dries out, prairie dogs may have few options to supplement their diets. During drought conditions, vast monocultures of cheatgrass may be detrimental to prairie dog populations. This is because cheatgrass seeds will remain dormant during dry years, and thus prairie dog colonies located in cheatgrass-dominated sites will have their forage severely depleted, resulting in an inability to develop fat stores to survive over the winter or to produce litters.

## **11 Climate Change & Severe Weather**

White-tailed prairie dogs evolved to live in arid areas that experience periodic droughts. However, human-facilitated changes in ecosystems in the west, including plant species composition, ecosystem function, and ecosystem structure (Fleischner 1994), may cause prairie dogs to be more susceptible to drought conditions. In addition, climate change may be increasing the number and duration of drought events, making it more difficult for prairie dogs to survive. Management of rangelands needs to consider the relative influence of climate change. While there are many uncertainties about how climate change will affect certain habitats, an overall management strategy that maintains a larger landscape, and thereby increases the ability

of the given species to adjust their range, should be incorporated in the overall conservation of the species.

### **Information Needs**

Methods for managing plague on a landscape level, and at complexes and colonies important for conservation, are needed.

### **Conservation Actions**

Continue dusting colonies to protect against plague events, continue work on the oral plague vaccine, and continue using occupancy surveys to evaluate status of the species statewide. Implement strategies from the Colorado Gunnison's and White-tailed Prairie Dog Conservation Strategy (Seglund and Schnurr 2009).

## **Wolverine (*Gulo gulo*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Federal listing documents (link in Appendix D).

### **Threats**

#### **4 Transportation & Service Corridors**

Transportation corridors including interstates and secondary roads, although uncommon in wolverine habitat, are known to negatively impact wolverine movements and can cause mortality from vehicle collisions (Austin 1998; Krebs et al. 2004). Increasing road and housing development continue to fragment mountain landscapes, disrupting wolverine dispersal corridors. Preserving connectivity corridors for wolverine movement will be critical for their rangewide long-term conservation (Inman et al. 2013).

#### **6 Human Intrusions & Disturbance**

Wolverines occupy alpine environments because, among other factors, physiologically they require colder temperatures, and because they face less competition from other large mammals that are absent from these environs in the winter. The impact that winter alpine recreation has on wolverines is unknown, but such recreation is increasing and may be affecting wolverine productivity (Krebs et al. 2007). However, studies in Idaho indicate that there may not be a negative relationship at the home range scale (Heinemeyer and Squires 2013). The incidental loss of wolverines in the United States to trapping targeting other furbearers is not currently considered a threat to wolverine population viability (USFWS 2013c).

## **11 Climate Change & Severe Weather**

Uncertainty persists around the relationship between climate change and wolverine ecology. The predicted effects of climate change in the West include a reduced snowpack and shorter periods of snow cover, snowmelt that occurs earlier in the season, a hydrologic cycle that is more dynamic as extreme rainfall events occur with greater frequency, and overall warmer, drier, and more drought-like conditions (Melillo 2014). These predicted changes could impact the wolverine given their presumed association with, and reliance on, persistent spring snow cover as a consistent component of reproductive denning habitat, and their need for low summer temperatures to maintain thermoneutrality (Copeland et al. 2010). These physiographic changes are thought to be less severe in the southern Rockies portion of the historic range of the species.

The effects of climate change on wolverine include the potential for a decrease in area of suitable habitat, increased isolation of remaining habitat, and the disruption of ability of wolverines to disperse between patches of suitable habitat (McKelvey et al. 2011). It has been postulated that Colorado may retain some of the higher quality wolverine habitat in the lower 48 states. This has been described and further examined through USFWS processes including a proposed rule to list the species, and a subsequent withdrawal of the proposed rule<sup>14</sup>.

## **14 Natural Factors**

There is evidence that wolverines in the Rocky Mountains of the U.S. exist in small semi-isolated subpopulations without enough movement between subpopulations to maintain genetic diversity (Cegelski et al. 2006). Currently, no deleterious effects have been documented to the U.S. wolverine population from this genetic isolation, but low genetic diversity is still a concern (IDFG 2014).

### ***Information Needs***

Given that wolverines are potentially at risk due to changes in climate, a better understanding of the ecology, behavior, and physiology of wolverines with respect to temperature thresholds and dependence on snow cover and/or depth is needed (IDFG 2014). Research is also needed on wolverine distribution and abundance; natal and maternal den selection; and on how landscape scale disturbances including wildfire, insect outbreaks, timber harvest, forest seral stages, and travel corridor location impact the wolverines use of forests (IDFG 2014). Additionally, stand-level studies on wolverine habitat use are needed in order to understand if it is necessary to develop management recommendations for forest harvest prescriptions, road densities, and human footprint thresholds (IDFG 2014).

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<sup>14</sup> <https://www.fws.gov/mountain-prairie/species/mammals/wolverine>



## **Conservation Actions**

Currently, there is not a population of wolverine in Colorado. Prior to the recent (2009) exploration of an individual male, the last confirmed wolverine sighting in Colorado was in 1919. We believe that the state had a population in the late 1800–early 1900's, but that it was extirpated in the early 1900's. Through geographical and biological analyses, it is felt that Colorado offers a substantial amount of suitable, previously occupied habitat (CPW 2010b). Preliminary discussions regarding the potential for a wolverine re-introduction to Colorado have occurred with wildlife managers, conservation partners and stakeholders. The social and political aspects of restoring a population of wolverine to the Southern Rockies have been discussed, but are not currently satisfactorily addressed. At this point in time, the primary conservation action for this species is to continue these discussions when appropriate, and then to develop the tools and social and political support necessary to undertake a restoration with the ultimate goal of re-establishing a self-sustaining population of wolverine to the state.

## **TIER 1 REPTILES**

### **Colorado Checkered Whiptail (*Aspidoscelis neotesselata*)**

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#### **Threats**

#### **1 Residential & Commercial Development**

Expanding urban zones within the vicinity of Pueblo, Colorado, has caused the loss of suitable habitat for the Colorado checkered whiptail and resulted in its extirpation from, or greatly reduced populations in, some areas as a result (Walker et al. 1996, 1997). Within the distribution of the whiptail (Sovell 2007), continued urbanization in the vicinity of Pueblo and Cañon City, and along the Arkansas River and its tributaries, has potential to cause future loss of habitat for the whiptail.

#### **2 Incompatible Agriculture**

For other species of *Aspidoscelis*, habitat alteration and conversion to cropland, excessive grazing, chemical brush control, alteration of riparian habitat, invasion of non-native plant species and mining are threats (NMGFD 2012; BLM 2013). This species has been extirpated from, or has greatly declined in, some areas around Pueblo, Colorado, as a result of conversion of habitat to agricultural uses (Walker et al. 1996, 1997). The activities affecting other *Aspidoscelis* species also occur within the distribution of the Colorado checkered whiptail, but their impacts on this subspecies require further investigation. However, Colorado checkered whiptails can tolerate some disturbance and populations are known to exist in moderately or heavily disturbed areas, including around buildings in parks, at rural landfills, and on flats above floodplains that are dominated by kochia (*Kochia scoparia*) (Walker et al. 1996, 1997, 2012).

## **7 Natural System Modifications**

Throughout much of its range in Colorado, the Colorado checkered whiptail is often associated with pinyon-juniper woodlands dominated by *Pinus edulis* and/or *Juniperus monosperma*, and shrublands with sagebrush (*Artimesia tridentata*), fourwing saltbush (*Atriplex canescens*) or rabbitbrush (*Ericameria nauseosa*) (Sovell 2007). Any increase in the frequency and intensity of fire in these habitats could threaten persistence of this subspecies. There are studies suggesting that *Aspidoscelis* lizards tolerate fire well (Rochester et al. 2010; Brown et al. 2014), but what impact fire has on this subspecies requires further research.

### **Information Needs**

Further research is required on distribution of Colorado checkered whiptail populations and how they respond to landscape scale changes to habitat structure from activities including grazing, urbanization, fire, conversion of habitat to cropland, and invasion of non-native plant species. Improved understanding of how alterations to riparian habitat affect Colorado checkered whiptail population stability is also needed.

### **Conservation Actions**

The primary conservation action needed for the Colorado checkered whiptail is research into the distribution, habitat use, and population parameters in Colorado. This information will better inform which areas are at greatest risk from habitat loss, as well as what other threats may arise for this species.

## **Massasauga (*Sistrurus catenatus*)**

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For detailed information on threats and conservation actions needed for this species, refer to the following resources: Desert Massasauga Rattlesnake (*Sistrurus catenatus edwardsii*): a technical conservation assessment (2005) (link in Appendix D).

### **Threats**

#### **2 Incompatible Agriculture**

In Colorado, large expanses of suitable habitat within the massasauga's range have been converted to cropland, while other areas have been degraded by incompatible grazing (Mackessy 2005). Grazing can lead to changes in vegetation structure, including altered plant species composition, percent of vegetative cover, and physical habitat structure, which can cause declines in animal abundance and diversity (Bock et al. 1984). Declines in rodent and lizard populations in grazed grasslands deprive massasauga of important populations of their prey. Water withdrawal for agricultural and urban uses lowers water tables, causing temporal ponds and streams to become even more ephemeral, which can further depress prey populations (Mackessy

2005). Ultimately, such xerification might stress massasauga beyond their tolerances for dry landscapes, causing the loss of some populations (Mackessy 2005).

#### **4 Transportation & Service Corridors**

Massasauga are particularly susceptible to mortality from vehicular strikes because they use road surfaces for warming, tend to sit for long periods on road surfaces, and are active during the night (Holycross 2003). The mortality of massasauga from vehicle strikes can be a significant cause of mortality (USFWS 2012), particularly during periods of migration to (autumn) and from (spring) hibernacula. Approximately 39 percent of massasaugas encountered by researchers are road-killed individuals (Mackessy 2005).

#### **5 Biological Resource Use**

The massasauga is a venomous rattlesnake, which encourages persecution by humans. The mortality associated from direct human take can have an impact on population sizes, but because massasauga are cryptically colored, small, and somewhat secretive, human encounter rates are limited. Subsequently, the impact suffered by massasauga populations from human persecution is probably limited (Mackessy 2005).

#### **11 Climate Change & Severe Weather**

Climate change scenarios predict increasing drought and temperatures (Melillo et al. 2014) within the range of the massasauga in the West, which could accelerate xerification processes, further facilitating declines in massasauga populations (Mackessy 2005).

#### **Other Threats**

Suitable habitat within the range of the massasauga has been lost to urbanization, desertification, water diversion and depletion and proliferation of noxious weeds (Mackessy 2005).

#### **Information Needs**

Additional information on many aspects of massasauga ecology, biology, natural history and biogeography are needed, including presence/absence and relative abundance surveys; long-term monitoring of existing populations; sensitivity and threshold levels to habitat disturbance; birthing habitat requirements, mating phenology; whether foraging and hibernating habitat availability is limiting; what factors are important to successful re-establishment of recovered habitats; and population age structure and longevity.

#### **Conservation Actions**

Protection and improvement of existing and historic habitat, especially through Best Management Practices, conservation easements, and habitat restoration, will improve the outlook for massasauga in Colorado. Development of a recovery plan for massasauga will better inform the specific actions necessary for the long-term protection of individual populations through out the state.

**Table 7. Species of Greatest Conservation Need Threats and Conservation Actions  
Vertebrates and Mollusks.**

Sorted by priority (Tier 1 and 2), then by Taxonomic Group, then by Common Name.

		<b>Tier 1</b>		<b>Amphibians</b>				
<b>Boreal toad (Southern Rocky Mountain Population)</b> <i>Anaxyrus boreas boreas</i> Tier 1 Amphibians	Population Status and Trend		Distribution		Type	Habitat	Primary	
	Low	D	Stable	D	Southern Rocky Mountains	P	Lakes	<input checked="" type="checkbox"/>
	Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.						Mountain Streams	<input checked="" type="checkbox"/>
							Riparian Woodlands and Shrublands	<input checked="" type="checkbox"/>
							Wetlands	<input checked="" type="checkbox"/>
							Aspen	<input type="checkbox"/>
							Lodgepole Pine	<input type="checkbox"/>
							Mixed Conifer	<input type="checkbox"/>
						Spruce - Fir	<input type="checkbox"/>	
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority			
07.3 Other Ecosystem Modifications	Altered native vegetation (loss of riparian zone cottonwood and aspen due to encroachment of coniferous forest)	2.3 Habitat & Natural Process Restoration		Restore riparian vegetation (deciduous hardwoods)	H			
08.4 Pathogens	Pathogen - chytrid fungus	2.2 Invasive/Problematic Species Control		Follow established protocols for species research to avoid spread of pathogens	H			
08.4 Pathogens	Pathogen - chytrid fungus	3.4 Ex-situ Conservation		Create captive breeding program	H			
08.4 Pathogens	Pathogen - chytrid fungus	3.4 Ex-situ Conservation		Create gene-banking program	H			
08.4 Pathogens	Pathogen - chytrid fungus	4.3 Awareness & Communications		Publish educational material/sponsor educational programs to raise public awareness	H			
08.4 Pathogens	Pathogen - chytrid fungus	8.0 Research & Monitoring		Research chytrid transmission mechanisms and factors conferring chytrid resistance	H			
11.2 Droughts	Drying out of breeding habitat	8.0 Research & Monitoring		Research population parameters and/or monitor status	H			
11.3 Temperature Extremes	Alteration of breeding phenology	8.0 Research & Monitoring		Research population parameters and/or monitor status	H			
14.1 Scarcity (leading to inbreeding depression)	Low population numbers	3.3 Species Re-Introduction		Re-introduce locally extirpated native species	H			
06.1 Recreational Activities	Campsite and hiking or ORV trail development and use	2.1 Site/Area Management		Manage public use to be compatible with biodiversity	M			
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer)	2.3 Habitat & Natural Process Restoration		Restore or maintain suitable hydrological regime	M			
07.3 Other Ecosystem Modifications	Altered animal community (loss of beaver)	2.3 Habitat & Natural Process Restoration		Maintain and restore natural ponds and small mountain lakes	M			
02.3 Livestock Farming & Ranching	Altered native riparian and wetland vegetation	2.1 Site/Area Management		Implement compatible grazing practices	L			
04.1 Roads & Railroads	Local impacts from roadkill	2.3 Habitat & Natural Process Restoration		Maintain appropriate patch size and habitat mosaic	L			
07.2 Dams & Water Management/Use	Altered hydrological regime - siltation and sedimentation	2.3 Habitat & Natural Process Restoration		Improve excess sedimentation conditions	L			

**Table 7 - Continued.**

**Northern leopard frog**

*Lithobates pipiens*

Tier 1 Amphibians

Population Status and Trend	Distribution	Type	Habitat	Primary
Low X   Declining X	Central Shortgrass Prairie	P	Colorado Plateau - Wyoming Basins Rivers	<input checked="" type="checkbox"/>
Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.	Colorado Plateau	p	Colorado Plateau - Wyoming Basins Streams	<input checked="" type="checkbox"/>
	Front Range	p	Eastern Plains Rivers	<input checked="" type="checkbox"/>
	Southern Rocky Mountains	P	Eastern Plains Streams	<input checked="" type="checkbox"/>
	Utah High Plateau	P	Lakes	<input checked="" type="checkbox"/>
	Wyoming Basin	P	Mountain Streams	<input checked="" type="checkbox"/>
			Riparian Woodlands and Shrublands	<input checked="" type="checkbox"/>
			Transition Streams	<input checked="" type="checkbox"/>
			Wetlands	<input checked="" type="checkbox"/>
			Mixed Conifer	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	H
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	H
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations	Promote zoning that concentrates use and protects habitat	H
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.3 Private Sector Standards & Codes	Implement Best Management Practices for transportation projects, urban development, landscaping, etc.	H
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	6.4 Conservation Payments	Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)	H
08.1 Invasive Non-Native/Alien Species	Invasive animals - bullfrogs	2.2 Invasive/Problematic Species Control	Control bullfrogs using accepted integrated pest management techniques for aquatic habitats	H
08.4 Pathogens	Pathogen - chytrid fungus	2.2 Invasive/Problematic Species Control	Follow established protocols for species research to avoid spread of pathogens	H
08.4 Pathogens	Pathogen - chytrid fungus	8.0 Research & Monitoring	Research Bd transmission mechanisms and factors conferring Bd resistance	H
02.3 Livestock Farming & Ranching	Altered native riparian and wetland vegetation	2.1 Site/Area Management	Implement compatible grazing practices	M
04.1 Roads & Railroads	Local impacts from roadkill	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	M
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) and water management infrastructure	2.3 Habitat & Natural Process Restoration	Restore habitat and maintain suitable hydrological regime	M
09.5 Air-Borne Pollutants	Air and water pollution	2.3 Habitat & Natural Process Restoration	Identify and control point-source and non-point source pollution	M
11.2 Droughts	Drying out of breeding habitat	8.0 Research & Monitoring	Research population parameters and/or monitor status	M
11.3 Temperature Extremes	Alteration of breeding phenology	8.0 Research & Monitoring	Research population parameters and/or monitor status	M
03.1 Oil & Gas Drilling	Fragmentation of habitat (roads, culverts, etc.); impact on quality, impact on ground water availability; sedimentation of ponds; loss of habitat	2.1 Site/Area Management	Work with state and federal partners to limit oil/gas leasing and development	L
06.1 Recreational Activities	Potential for localized impacts (behavioral avoidance, habitat degradation) near high-use trails	2.1 Site/Area Management	Manage public use to be compatible with biodiversity	L
08.1 Invasive Non-Native/Alien Species	Predaceous game fish	2.2 Invasive/Problematic Species Control	Avoid stocking predaceous game fish in occupied habitat	L
13.1 Complete distribution in Colorado unknown	Identification of occupied wetlands needed to guide conservation easement and land protection	8.0 Research & Monitoring	Conduct additional inventory for occupied wetland habitats.	L

Table 7 - Continued.

		Tier 1				Birds			
<b>Brown-capped rosy-finch</b>  <i>Leucosticte australis</i>  Tier 1 Birds	Population Status		and Trend		Distribution	Type	Habitat	Primary	
	Unknown	X	Unknown	X	Southern Rocky Mountains	P	Alpine	<input checked="" type="checkbox"/>	
							Cliffs and Canyons	<input type="checkbox"/>	
							Desert Shrub	<input type="checkbox"/>	
							Sagebrush	<input type="checkbox"/>	
							Saltbush	<input type="checkbox"/>	
						Upland Shrub	<input type="checkbox"/>		
<b>General Threat</b>	<b>Specific Threat</b>			<b>General Conservation Action</b>		<b>Specific Conservation Action</b>		<b>Priority</b>	
11.1 Habitat Shifting & Alteration	Habitat shifting and alteration due to climate change			8.0 Research & Monitoring		Conduct primary research on species and habitat responses to changing climate		H	
13.4 Population status unknown	Lack of data on population status			8.0 Research & Monitoring		Research population parameters and/or monitor status, including threats at both summer breeding and wintering sites.		H	
13.5 Population trend unknown	Lack of data on population trend			8.0 Research & Monitoring		Research population parameters and/or monitor status; develop and implement monitoring plan		H	
02.3 Livestock Farming & Ranching	Destruction of shrubland understory (winter habitat) due to sheep grazing			2.3 Habitat & Natural Process Restoration		Restore native habitat using site-specific techniques and context		L	
06.1 Recreational Activities	Rock climbing, hiking near cliffs and crevices			2.1 Site/Area Management		Manage public use to be compatible with biodiversity		L	
<b>Burrowing owl</b>  <i>Athene cunicularia</i>  Tier 1 Birds	Population Status		and Trend		Distribution	Type	Habitat	Primary	
	Medium	D	Stable	D	Central Shortgrass Prairie	P	Desert Shrub	<input checked="" type="checkbox"/>	
					Colorado Plateau	P	Sandsage	<input checked="" type="checkbox"/>	
					Front Range	P	Shortgrass Prairie	<input checked="" type="checkbox"/>	
					Southern Rocky Mountains	P	Mixed and Tallgrass Prairies	<input type="checkbox"/>	
					Utah High Plateau	P	Sagebrush	<input type="checkbox"/>	
						Saltbush	<input type="checkbox"/>		
<b>General Threat</b>	<b>Specific Threat</b>			<b>General Conservation Action</b>		<b>Specific Conservation Action</b>		<b>Priority</b>	
08.4 Pathogens	Loss of prairie dog colonies due to sylvatic plague			8.0 Research & Monitoring		Research and develop effective vaccine and delivery system for prairie dogs		H	
08.4 Pathogens	Loss of prairie dog colonies due to sylvatic plague			8.0 Research & Monitoring		Research species/habitat response to plague management		H	
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development			1.2 Resource & Habitat Protection		Acquire conservation easement for habitat protection		M	
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development			2.3 Habitat & Natural Process Restoration		Maintain appropriate patch size and habitat mosaic		M	
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development			5.2 Policies & Regulations		Promote zoning that concentrates use and protects habitat		M	
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development			5.3 Private Sector Standards & Codes		Implement Best Management Practices for transportation projects, urban development, landscaping, etc.		M	
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development			6.4 Conservation Payments		Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)		M	
02.3 Livestock Farming & Ranching	Altered native vegetation (sagebrush removal, incompatible timing, intensity, duration of grazing)			5.2 Policies & Regulations		Encourage use of Farm Bill and other incentive programs		M	
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure			5.3 Private Sector Standards & Codes		Implement Best Management Practices for energy development and mining		M	
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Loss of habitat (prairie dog colonies) due to plague and prairie dog control			3.1 Species Management		Write and implement management/recovery plan		M	
02.3 Livestock Farming & Ranching	Poisoning (indirect effect of prairie dog control)			4.3 Awareness & Communications		Implement landowner outreach/education program		L	
06.1 Recreational Activities	Recreational shooting of prairie dogs			2.1 Site/Area Management		Implement shooting closures/seasons where local conditions warrant		L	

**Table 7 - Continued.**

		Population Status and Trend		Distribution	Type	Habitat	Primary		
<b>Columbian sharp-tailed grouse</b> <i>Tympanuchus phasianellus columbianus</i> Tier 1 Birds	Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.	Medium	D	Stable	D	Southern Rocky Mountains	P	Conservation Reserve Program	<input checked="" type="checkbox"/>
						Wyoming Basin	P	Oak and Mixed Mountain Shrublands	<input checked="" type="checkbox"/>
								Sagebrush	<input checked="" type="checkbox"/>
								Agriculture	<input type="checkbox"/>
								Foothill and Mountain Grasslands	<input type="checkbox"/>
								Riparian Woodlands and Shrublands	<input type="checkbox"/>
								Upland Shrub	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration	Restore historic cropland and Conservation Reserve Program lands, including native understory species and sagebrush	H
02.1 Annual & Perennial Non-Timber Crops	Loss of compatible Conservation Reserve Program lands	5.2 Policies & Regulations	Encourage use of Farm Bill programs - optimize incentives for maintaining CRP that is compatible with habitat requirements	H
02.1 Annual & Perennial Non-Timber Crops	Poor quality Conservation Reserve Program lands	5.2 Policies & Regulations	Encourage use of Farm Bill programs - require existing CRP within species range to meet specific habitat standards; renovate poor quality fields	H
07.3 Other Ecosystem Modifications	Loss of mountain shrub and grassland habitats	5.2 Policies & Regulations	Establish mitigation requirements for developments and other projects that impact species/habitats	H
07.3 Other Ecosystem Modifications	Rangewide species decline	3.3 Species Re-Introduction	Re-introduce extirpated native species; translocate species to historic range	H
08.1 Invasive Non-Native/Alien Species	Invasive plants - cheatgrass	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	H
08.1 Invasive Non-Native/Alien Species	Weeds on the State's A list	2.2 Invasive/Problematic Species Control	Control non-native plants using accepted techniques appropriate to site-specific conditions	H
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations	Promote zoning that concentrates use and protects habitat	M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.3 Private Sector Standards & Codes	Implement Best Management Practices for transportation projects, urban development, landscaping, etc.	M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	6.4 Conservation Payments	Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)	M
02.3 Livestock Farming & Ranching	Altered native vegetation (grazing intensity)	2.1 Site/Area Management	Implement compatible grazing practices	M
02.3 Livestock Farming & Ranching	Altered native vegetation (sagebrush removal, incompatible timing, intensity, duration of grazing)	2.1 Site/Area Management	Employ grazing as a tool for compatible vegetation cover, structure, composition	M
02.3 Livestock Farming & Ranching	Grazing intensity on reclaimed mine lands	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	M
02.3 Livestock Farming & Ranching	Grazing intensity on reclaimed mine lands	5.3 Private Sector Standards & Codes	Implement Best Management Practices for livestock grazing	M
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	2.3 Habitat & Natural Process Restoration	Restore native habitat, including restoration of understory species, sagebrush, and riparian vegetation, reseeding of native species, and maintenance of appropriate patch size and habitat mosaic	M
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	M
06.1 Recreational Activities	Motorized and non-motorized recreation, proximal non-recreation disturbance on leks	2.1 Site/Area Management	Manage public use to be compatible with biodiversity	M

**Table 7 - Continued.**

07.3 Other Ecosystem Modifications	Loss of mountain shrub and grassland habitats	7.3 Conservation Finance	Provide economic assistance for private land habitat improvements and/or species conservation	M
08.2 Problematic Native Species	Grazing impacts from deer and elk	3.1 Species Management	Maintain deer and elk populations within carrying capacity for healthy habitat	M
07.1 Fire & Fire Suppression	Altered fire regime	2.3 Habitat & Natural Process Restoration	Restore natural fire regime	L



**Table 7 - Continued.**

**Golden eagle**

*Aquila chrysaetos*

Tier 1 Birds

Population Status and Trend		Distribution	Type	Habitat	Primary		
Medium	X	Unknown	X	Central Shortgrass Prairie	P	Cliffs and Canyons	<input checked="" type="checkbox"/>
				Colorado Plateau	P	Foothill and Mountain	<input checked="" type="checkbox"/>
				Front Range	p	Grasslands	
				Southern Rocky Mountains	p	Mixed and Tallgrass Prairies	<input checked="" type="checkbox"/>
				Utah High Plateau	p	Oak and Mixed Mountain Shrublands	<input checked="" type="checkbox"/>
				Utah-Wyoming Rocky Mountains	P	Pinyon - Juniper	<input checked="" type="checkbox"/>
				Wyoming Basin	p	Sagebrush	<input checked="" type="checkbox"/>
						Shortgrass Prairie	<input checked="" type="checkbox"/>
						Alpine	<input type="checkbox"/>
						Aspen	<input type="checkbox"/>
						Colorado Plateau - Wyoming Basins Rivers	<input type="checkbox"/>
						Colorado Plateau - Wyoming Basins Streams	<input type="checkbox"/>
						Conservation Reserve Program	<input type="checkbox"/>
						Desert Shrub	<input type="checkbox"/>
						Eastern Plains Rivers	<input type="checkbox"/>
						Eastern Plains Streams	<input type="checkbox"/>
						Greasewood	<input type="checkbox"/>
						Lodgepole Pine	<input type="checkbox"/>
						Mixed Conifer	<input type="checkbox"/>
						Mountain Streams	<input type="checkbox"/>
						Playas	<input type="checkbox"/>
						Ponderosa Pine	<input type="checkbox"/>
						Saltbush	<input type="checkbox"/>
						Sandsage	<input type="checkbox"/>
						Spruce - Fir	<input type="checkbox"/>
						Subalpine Limber - Bristlecone Pine	<input type="checkbox"/>
						Transition Streams	<input type="checkbox"/>
						Upland Shrub	<input type="checkbox"/>
						Wetlands	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations	Promote consideration of biodiversity issues in transportation and land use planning processes	M
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	M
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	8.0 Research & Monitoring	Develop and prioritize standardized raptor nest monitoring with pre- and post-development data	M
03.3 Renewable Energy	Collision with wind turbines	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	M
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Mortality and prey reduction through rodent control	4.3 Awareness & Communications	Implement landowner outreach/education program	M
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Secondary poisoning (anticoagulants, lead shot)	5.2 Policies & Regulations	Monitor for potential impacts and respond as warranted by local conditions	M
06.1 Recreational Activities	Recreational climbing, hiking, and biking trails	2.1 Site/Area Management	Implement seasonal closures	M
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	M
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	L

**Table 7 - Continued.**

<b>Greater sage-grouse</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
Tier 1	Birds	Medium D   Increasing D Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.	Southern Rocky Mountains	P	Sagebrush	<input checked="" type="checkbox"/>
			Utah High Plateau	P	Agriculture	<input type="checkbox"/>
			Utah-Wyoming Rocky Mountains	P	Colorado Plateau - Wyoming Basins Streams	<input type="checkbox"/>
			Wyoming Basin	P	Conservation Reserve Program	<input type="checkbox"/>
			Colorado Plateau	O		
<b>General Threat</b>		<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>		<b>Priority</b>
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	2.3 Habitat & Natural Process Restoration	Restore native habitat, including restoration of understory species, sagebrush, and riparian vegetation, reseedling of native species, and maintenance of appropriate patch size and habitat mosaic			H
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	5.2 Policies & Regulations	Work with state and federal partners to limit density of oil/gas leasing and development			H
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining, including reduction of infrastructure and associated traffic and noise			H
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection			M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic			M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations	Promote zoning that concentrates use and protects habitat			M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.3 Private Sector Standards & Codes	Implement Best Management Practices for transportation projects, urban development, landscaping, etc.			M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	6.4 Conservation Payments	Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)			M
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration	Restore native habitat, including restoration of understory species, sagebrush, and riparian vegetation, reseedling of native species, and maintenance of appropriate patch size and habitat mosaic			M
02.3 Livestock Farming & Ranching	Altered native vegetation (sagebrush removal, incompatible timing, intensity, duration of grazing)	2.1 Site/Area Management	Employ grazing as a tool for compatible vegetation cover, structure, composition			M
02.3 Livestock Farming & Ranching	Altered native vegetation (sagebrush removal, incompatible timing, intensity, duration of grazing)	2.3 Habitat & Natural Process Restoration	Restore native habitat, including restoration of understory species, sagebrush, and riparian vegetation, reseedling of native species, and maintenance of appropriate patch size and habitat mosaic			M
02.3 Livestock Farming & Ranching	Altered native vegetation (sagebrush removal, incompatible timing, intensity, duration of grazing)	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs			M
07.1 Fire & Fire Suppression	Altered fire regime	2.3 Habitat & Natural Process Restoration	Restore natural fire regime and include treatment of pinyon-juniper to restore sagebrush habitat			M
08.1 Invasive Non-Native/Alien Species	Invasive plants - cheatgrass	2.2 Invasive/Problematic Species Control	Write and/or implement integrated weed/pest management plan			M
08.1 Invasive Non-Native/Alien Species	Invasive plants - cheatgrass	2.3 Habitat & Natural Process Restoration	Restore native understory species			M
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production			M
06.1 Recreational Activities	Motorized and non-motorized recreation	2.1 Site/Area Management	Manage public use to be compatible with biodiversity (e.g., seasonal closures, managed lek viewing)			L
06.1 Recreational Activities	Motorized and non-motorized recreation	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness			L

**Table 7 - Continued.**

<b>Greater sandhill crane</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>		
Tier 1	Birds	Medium	D	Stable	D	Southern Rocky Mountains	P	Agriculture	<input checked="" type="checkbox"/>
						Utah-Wyoming Rocky Mountains	P	Wetlands	<input checked="" type="checkbox"/>
						Wyoming Basin	P	Colorado Plateau - Wyoming Basins Rivers	<input type="checkbox"/>
						Colorado Plateau	O	Foothill and Mountain Grasslands Mountain Streams	<input type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.							
<b>General Threat</b>		<b>Specific Threat</b>		<b>General Conservation Action</b>	<b>Specific Conservation Action</b>		<b>Priority</b>		
04.2 Utility & Service Lines		Collision with wind turbines and utility lines		5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and utility line development/placement		M		
07.2 Dams & Water Management/Use		Loss or degradation of wetland habitat		2.3 Habitat & Natural Process Restoration	Maintain wetlands in San Luis Valley that support migrating cranes		M		
07.3 Other Ecosystem Modifications		Natural system modification - wetland filling		5.4 Compliance & Enforcement	Enforce 404 wetlands regulations		M		
13.1 Complete distribution in Colorado unknown		Need improved knowledge of breeding distribution		8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)		M		
02.1 Annual & Perennial Non-Timber Crops		Reduction in food resources - loss of small grain fields		3.1 Species Management	Develop collaborative management agreements		L		
02.1 Annual & Perennial Non-Timber Crops		Reduction in food resources - loss of small grain fields		5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs		L		
02.1 Annual & Perennial Non-Timber Crops		Reduction in food resources - loss of small grain fields		7.2 Alliance & Partnership Development	Develop partnerships to help maintain small grain farming in the Yampa Valley		L		
06.1 Recreational Activities		Motorized and non-motorized recreation		2.1 Site/Area Management	Manage public use to be compatible with biodiversity, including seasonal closures where necessary		L		
06.1 Recreational Activities		Motorized and non-motorized recreation		4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness		L		
14.2 Low annual recruitment		Low annual recruitment		8.0 Research & Monitoring	Research population parameters and/or monitor status		L		

**Table 7 - Continued.**

<b>Gunnison sage-grouse</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
Tier 1	Birds	Low D   Stable D Rangewide population is stable, but some satellite populations have declined. Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.	Colorado Plateau	P	Conservation Reserve Program	<input checked="" type="checkbox"/>
			Southern Rocky Mountains	P	Sagebrush	<input checked="" type="checkbox"/>
					Agriculture	<input type="checkbox"/>
<b>General Threat</b>		<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>	
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	H		
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	H		
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations	Promote zoning that concentrates use and protects habitat	H		
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.3 Private Sector Standards & Codes	Implement Best Management Practices for transportation, urban development, landscaping, etc.	H		
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	6.4 Conservation Payments	Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)	H		
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	H		
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration	Restore historic cropland and Conservation Reserve Program lands, including native understory species and sagebrush	H		
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration	Restore native habitat, including restoration of understory species, sagebrush, and riparian vegetation, reseedling of native species, and maintenance of appropriate patch size and habitat mosaic	H		
02.1 Annual & Perennial Non-Timber Crops	Loss of compatible Conservation Reserve Program lands	5.2 Policies & Regulations	Encourage use of Farm Bill programs - optimize incentives for maintaining CRP that is compatible with habitat requirements	H		
02.1 Annual & Perennial Non-Timber Crops	Poor quality Conservation Reserve Program lands	5.2 Policies & Regulations	Encourage use of Farm Bill programs - optimize incentives for maintaining CRP that is compatible with habitat requirements	H		
02.3 Livestock Farming & Ranching	Altered native vegetation (sagebrush removal, incompatible timing, intensity, duration of grazing)	2.1 Site/Area Management	Employ grazing as a tool for compatible vegetation cover, structure, composition	M		
02.3 Livestock Farming & Ranching	Altered native vegetation (sagebrush removal, incompatible timing, intensity, duration of grazing)	2.3 Habitat & Natural Process Restoration	Restore native habitat, including restoration of understory species, sagebrush, and riparian vegetation, reseedling of native species, and maintenance of appropriate patch size and habitat mosaic	M		
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	2.3 Habitat & Natural Process Restoration	Restore native habitat, including restoration of understory species, sagebrush, and riparian vegetation, reseedling of native species, and maintenance of appropriate patch size and habitat mosaic	M		
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	5.2 Policies & Regulations	Work with state and federal partners to limit density of oil/gas leasing and development	M		
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	M		
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining, including reduction of infrastructure and associated traffic and noise	M		
04.1 Roads & Railroads	Fragmentation	2.3 Habitat & Natural Process Restoration	Restore sagebrush	M		

**Table 7 - Continued.**

06.1 Recreational Activities	Motorized and non-motorized recreation	2.1 Site/Area Management	Manage public use to be compatible with biodiversity (e.g., seasonal closures, managed lek viewing)	M
07.1 Fire & Fire Suppression	Altered fire regime	2.3 Habitat & Natural Process Restoration	Restore natural fire regime and include treatment of pinyon-juniper to restore sagebrush habitat	M
07.3 Other Ecosystem Modifications	Habitat degradation from a variety of sources	2.3 Habitat & Natural Process Restoration	Restore native habitat, including restoration of understory species, sagebrush, and riparian vegetation, reseeding of native species, and maintenance of appropriate patch size and habitat mosaic	M
08.1 Invasive Non-Native/Alien Species	Invasive plants - cheatgrass	2.2 Invasive/Problematic Species Control	Control non-native plants using accepted techniques appropriate to site-specific conditions	M
08.1 Invasive Non-Native/Alien Species	Invasive plants - cheatgrass	2.2 Invasive/Problematic Species Control	Write and/or implement integrated weed/pest management plan	M
08.1 Invasive Non-Native/Alien Species	Invasive plants - cheatgrass	2.3 Habitat & Natural Process Restoration	Restore native understory species	M
06.1 Recreational Activities	Motorized and non-motorized recreation	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	L
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	L

**Table 7 - Continued.**

<b>Lesser prairie-chicken</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
Tier 1	Birds	Low D   Increasing D	Central Shortgrass Prairie	P	Conservation Reserve Program	<input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.			Mixed and Tallgrass Prairies	<input checked="" type="checkbox"/>
					Sandsage	<input checked="" type="checkbox"/>
					Agriculture	<input type="checkbox"/>
General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority		
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	H		
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	H		
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration	Restore historic cropland and Conservation Reserve Program lands, including native understory species and sagebrush	H		
02.1 Annual & Perennial Non-Timber Crops	Loss of compatible Conservation Reserve Program lands	5.2 Policies & Regulations	Encourage use of Farm Bill programs - optimize incentives for maintaining CRP that is compatible with habitat requirements	H		
02.1 Annual & Perennial Non-Timber Crops	Poor quality Conservation Reserve Program lands	5.2 Policies & Regulations	Encourage use of Farm Bill programs - require existing CRP within species range to meet specific habitat standards; renovate poor quality fields	H		
02.3 Livestock Farming & Ranching	Altered native vegetation	2.1 Site/Area Management	Implement compatible grazing practices	H		
02.3 Livestock Farming & Ranching	Altered native vegetation	8.0 Research & Monitoring	Research species/habitat response to management	H		
02.3 Livestock Farming & Ranching	Incompatible timing, intensity, duration of grazing or improved range	2.1 Site/Area Management	Implement compatible grazing practices	H		
02.3 Livestock Farming & Ranching	Incompatible timing, intensity, duration of grazing or improved range	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs	H		
02.3 Livestock Farming & Ranching	Incompatible timing, intensity, duration of grazing or improved range	6.4 Conservation Payments	Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)	H		
02.3 Livestock Farming & Ranching	Incompatible timing, intensity, duration of grazing or improved range	8.0 Research & Monitoring	Research species/habitat response to management	H		
02.3 Livestock Farming & Ranching	Reduced grass/forb diversity	8.0 Research & Monitoring	Research species/habitat response to management	H		
03.1 Oil & Gas Drilling	Behavioral avoidance of oil & gas development and associated infrastructure	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	H		
03.1 Oil & Gas Drilling	Fragmentation of native habitat due to oil & gas development and associated infrastructure	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	H		
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	5.2 Policies & Regulations	Establish mitigation requirements for developments and other projects that impact species/habitats	H		
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	H		
03.3 Renewable Energy	Behavioral avoidance of renewable energy development and associated infrastructure	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	H		
03.3 Renewable Energy	Fragmentation of native habitat due to renewable energy development and associated infrastructure	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	H		
03.3 Renewable Energy	Renewable energy development	5.2 Policies & Regulations	Establish mitigation requirements for developments and other projects that impact species/habitats	H		
11.2 Droughts	Lack of water for habitat	8.0 Research & Monitoring	Conduct primary research on species and habitat responses to changing climate	H		
14.1 Scarcity (leading to inbreeding depression)	Small number of birds left in Colorado	3.3 Species Re-Introduction	Re-introduce extirpated native species	H		

**Table 7 - Continued.**

03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	6.4 Conservation Payments	Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)	M
03.3 Renewable Energy	Wind farms	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
03.3 Renewable Energy	Wind farms	6.4 Conservation Payments	Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)	M
08.1 Invasive Non-Native/Alien Species	Invasive plants - cheatgrass	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	M
08.2 Problematic Native Species	Predation and parasites	8.0 Research & Monitoring	Research impact of parasites on bird survival	M
08.2 Problematic Native Species	Predation and parasites	8.0 Research & Monitoring	Research population parameters and/or monitor status	M
11.1 Habitat Shifting & Alteration	Habitat shifting and alteration due to climate change	8.0 Research & Monitoring	Conduct primary research on species and habitat responses to changing climate	M
11.2 Droughts	Lack of water due to drought and exacerbated by climate change	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	M
11.2 Droughts	Reduced production and survival	2.3 Habitat & Natural Process Restoration	Restore native habitats adapted to drought conditions where possible	M
11.4 Storms & Flooding	Blizzards and impact of hail and flooding on chicks and adults	8.0 Research & Monitoring	Conduct primary research on species and habitat responses to changing climate	M
02.3 Livestock Farming & Ranching	Egg trampling	8.0 Research & Monitoring	Research species/habitat response to management	L
04.2 Utility & Service Lines	Transport of energy & resources (e.g., electrical and phone wires, oil and gas pipelines, electrocution of wildlife)	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	L
04.2 Utility & Service Lines	Transport of energy & resources (e.g., electrical and phone wires, oil and gas pipelines, electrocution of wildlife)	6.4 Conservation Payments	Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)	L
08.2 Problematic Native Species	Predation and parasites	3.2 Species Recovery	Reduce nest predators	L
14.4 Predation	Nest predation	3.1 Species Management	Reduce nest predators	L

**Table 7 - Continued.**

<b>Mountain plover</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>		
<i>Charadrius montanus</i>	Tier 1 Birds	Low	D	Stable	D	Central Shortgrass Prairie	P	Shortgrass Prairie	<input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.				Southern Rocky Mountains	P	Agriculture	<input type="checkbox"/>
								Desert Shrub	<input type="checkbox"/>
								Foothill and Mountain Grasslands	<input type="checkbox"/>
								Mixed and Tallgrass Prairies	<input type="checkbox"/>
								Playas	<input type="checkbox"/>
								Saltbush	<input type="checkbox"/>
<b>General Threat</b>		<b>Specific Threat</b>		<b>General Conservation Action</b>		<b>Specific Conservation Action</b>		<b>Priority</b>	
08.4 Pathogens		Loss of prairie dog colonies due to sylvatic plague		8.0 Research & Monitoring		Research and develop effective vaccine and delivery system for prairie dogs		H	
08.4 Pathogens		Loss of prairie dog colonies due to sylvatic plague		8.0 Research & Monitoring		Research species/habitat response to plague management		H	
02.1 Annual & Perennial Non-Timber Crops		Conversion to cropland		1.2 Resource & Habitat Protection		Acquire conservation easement for habitat protection		M	
02.1 Annual & Perennial Non-Timber Crops		Farm equipment running on fallow fields late in season (e.g. sunflower and millet fields)		5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production		M	
02.3 Livestock Farming & Ranching		Altered native vegetation (degradation of native shortgrass prairie)		2.1 Site/Area Management		Implement compatible grazing practices		M	
02.3 Livestock Farming & Ranching		Altered native vegetation (incompatible timing, intensity, duration of grazing)		5.2 Policies & Regulations		Encourage use of Farm Bill and other incentive programs		M	
03.1 Oil & Gas Drilling		Fragmentation of native habitat due to oil & gas development and associated infrastructure		5.3 Private Sector Standards & Codes		Implement Best Management Practices for energy development and mining		M	
05.1 Control of Nuisance Species & Collecting Terrestrial Animals		Loss of habitat (prairie dog colonies) due to plague and prairie dog control		2.3 Habitat & Natural Process Restoration		Restore native habitat using site-specific techniques and context		M	
05.1 Control of Nuisance Species & Collecting Terrestrial Animals		Loss of habitat (prairie dog colonies) due to plague and prairie dog control		3.1 Species Management		Develop collaborative management agreements		M	
05.1 Control of Nuisance Species & Collecting Terrestrial Animals		Loss of habitat (prairie dog colonies) due to plague and prairie dog control		4.3 Awareness & Communications		Implement landowner outreach/education program		M	
07.1 Fire & Fire Suppression		Lack of fire to create bare ground		2.3 Habitat & Natural Process Restoration		Conduct controlled burns where and when appropriate to create beneficial habitat		M	
01.1 Housing & Urban Areas		Urban, suburban, and ex-urban development		1.2 Resource & Habitat Protection		Acquire conservation easement for habitat protection		L	
01.1 Housing & Urban Areas		Urban, suburban, and ex-urban development		2.3 Habitat & Natural Process Restoration		Maintain appropriate patch size and habitat mosaic		L	
01.1 Housing & Urban Areas		Urban, suburban, and ex-urban development		5.2 Policies & Regulations		Promote zoning that concentrates use and protects habitat		L	
01.1 Housing & Urban Areas		Urban, suburban, and ex-urban development		5.3 Private Sector Standards & Codes		Implement Best Management Practices for transportation projects, urban development, landscaping, etc.		L	
01.1 Housing & Urban Areas		Urban, suburban, and ex-urban development		6.4 Conservation Payments		Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)		L	
02.1 Annual & Perennial Non-Timber Crops		Accidental nest destruction from tillage of crop fields		4.3 Awareness & Communications		Implement landowner outreach/education program		L	



**Table 7 - Continued.**

Plains sharp-tailed grouse		Population Status and Trend		Distribution	Type	Habitat	Primary			
		Low	D		Stable	D	Central Shortgrass Prairie	P	Conservation Reserve Program	<input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.				Sandsage				<input checked="" type="checkbox"/>
						Mixed and Tallgrass Prairies				<input type="checkbox"/>
<i>Tympanuchus phasianellus jamesi</i>										
Tier 1 Birds										
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority					
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection		Acquire conservation easement for habitat protection	H					
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	2.3 Habitat & Natural Process Restoration		Maintain appropriate patch size and habitat mosaic	H					
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations		Promote zoning that concentrates use and protects habitat	H					
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.3 Private Sector Standards & Codes		Implement Best Management Practices for transportation projects, urban development, landscaping, etc.	H					
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	6.4 Conservation Payments		Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)	H					
02.1 Annual & Perennial Non-Timber Crops	Loss of compatible Conservation Reserve Program lands	5.2 Policies & Regulations		Encourage use of Farm Bill programs - optimize incentives for maintaining CRP that is compatible with habitat requirements	H					
02.3 Livestock Farming & Ranching	Altered native vegetation (grazing intensity)	2.1 Site/Area Management		Implement compatible grazing practices	M					
03.1 Oil & Gas Drilling	Altered native vegetation	2.3 Habitat & Natural Process Restoration		Restore native habitat using site-specific techniques and context	M					
03.3 Renewable Energy	Collision with wind turbines	5.3 Private Sector Standards & Codes		Implement Best Management Practices for energy development and mining	M					
04.1 Roads & Railroads	Roads associated with energy development - collision and fragmentation	2.3 Habitat & Natural Process Restoration		Maintain appropriate patch size and habitat mosaic	M					
06.1 Recreational Activities	Motorized and non-motorized recreation	4.3 Awareness & Communications		Publish educational material/sponsor educational programs to raise public awareness	M					
07.1 Fire & Fire Suppression	Altered fire regime	2.3 Habitat & Natural Process Restoration		Restore natural fire regime	M					
08.1 Invasive Non-Native/Alien Species	Invasive plants	2.2 Invasive/Problematic Species Control		Write and/or implement integrated weed/pest management plan	M					
11.1 Habitat Shifting & Alteration	Habitat shifting and alteration due to climate change	8.0 Research & Monitoring		Conduct primary research on species and habitat responses to changing climate	M					
14.1 Scarcity (leading to inbreeding depression)	Scarcity	8.0 Research & Monitoring		Research population parameters and/or monitor status	L					

**Table 7 - Continued.**

**Southern white-tailed ptarmigan**

*Lagopus leucura altipetens*

Tier 1 Birds

Population Status and Trend		Distribution	Type	Habitat	Primary
Medium	D   Stable	Southern Rocky Mountains	P	Alpine	<input checked="" type="checkbox"/>
Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.				Riparian Woodlands and Shrublands	<input type="checkbox"/>
				Wetlands	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
11.1 Habitat Shifting & Alteration	Habitat shifting and alteration due to climate change	8.0 Research & Monitoring	Continue monitoring species and habitat responses to changing climate	H
11.1 Habitat Shifting & Alteration	Habitat shifting and alteration due to climate change	8.0 Research & Monitoring	Continue primary research on species and habitat responses to changing climate	H
02.3 Livestock Farming & Ranching	Degradation of alpine habitats from sheep grazing & disturbance by guard dogs	2.1 Site/Area Management	Implement compatible grazing practices	M
06.1 Recreational Activities	Hiking, destruction of willows by ATVs and snowmobiles, and roads that affect hydrological system	2.3 Habitat & Natural Process Restoration	Restore and/or close overused trails and tracks	M
08.2 Problematic Native Species	Elk grazing/browsing in alpine & subalpine willow habitat	2.3 Habitat & Natural Process Restoration	Manage natural herbivory	M
01.3 Tourism & Recreation Areas	Recreation area developments	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	L
06.1 Recreational Activities	Hiking, destruction of willows by ATVs and snowmobiles, and roads that affect hydrological system	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	L

**Southwestern willow flycatcher**

*Empidonax traillii extimus*

Tier 1 Birds

Population Status and Trend		Distribution	Type	Habitat	Primary
Low	D   Stable	Southern Rocky Mountains	P	Riparian Woodlands and Shrublands	<input checked="" type="checkbox"/>
Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.					

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
07.2 Dams & Water Management/Use	River flow management and riverbank protection	2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	H
07.3 Other Ecosystem Modifications	Altered native vegetation (cottonwood/willow degradation)	2.3 Habitat & Natural Process Restoration	Remove invasive species (tamarisk, Russian olive) and restore natural willow and cottonwood riparian systems, using techniques that are sensitive to temporary impacts to flycatchers inhabiting degraded woodlands	M
12.1 Lack of coordination	Continued collaboration among stakeholders is warranted	3.1 Species Management	Implement existing management/recovery plan	M

**Table 7 - Continued.**

**Western yellow-billed cuckoo**

*Coccyzus americanus occidentalis*

Tier 1 Birds

Population Status and Trend	Distribution	Type	Habitat	Primary
Low D   Unknown X	Colorado Plateau Colorado Plateau	P p	Riparian Woodlands and Shrublands	<input checked="" type="checkbox"/>
Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.				

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	H
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	M
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	M
07.2 Dams & Water Management/Use	River flow management and riverbank protection	2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	M
07.3 Other Ecosystem Modifications	Altered native vegetation (cottonwood/willow degradation)	2.3 Habitat & Natural Process Restoration	Remove invasive species (tamarisk, Russian olive) and restore natural willow and cottonwood riparian systems, using techniques that are sensitive to temporary impacts to cuckoos inhabiting degraded woodlands	M
08.1 Invasive Non-Native/Alien Species	Invasive plants - tamarisk, leafy spurge	2.2 Invasive/Problematic Species Control	Write and/or implement integrated weed/pest management plan	M
07.2 Dams & Water Management/Use	Dam construction	2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	L
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	L

**Tier 1 Fish**

**Arkansas darter**

*Etheostoma cragini*

Tier 1 Fish

Population Status and Trend	Distribution	Type	Habitat	Primary
Medium D   Stable D	Central Shortgrass Prairie Front Range	P O	Eastern Plains Streams Eastern Plains Rivers Transition Streams	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.				

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - altered flow and fluctuating temperature	2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	H
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - groundwater pumping and surface water diversions	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural use (irrigation)	H
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - stream dewatering	2.3 Habitat & Natural Process Restoration	Attain adequate flows; Restore or maintain suitable hydrological regime	H
11.2 Droughts	Lack of water due to drought and exacerbated by climate change	1.2 Resource & Habitat Protection	Maintain habitat; Acquire water rights or instream flow rights, limit water use	H
12.2 Lack of funding	Lack of funding/resource	3.1 Species Management	Implement existing management/recovery plan	H
02.3 Livestock Farming & Ranching	Wetland degradation primarily from livestock grazing	2.3 Habitat & Natural Process Restoration	Implement streambank or in-stream restoration/improvements	M
08.1 Invasive Non-Native/Alien Species	Invasive animals	2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	M
14.6 Loss of species from suitable habitat	Loss of species from suitable habitat	3.3 Species Re-Introduction	Stock species into previously occupied or suitable habitat	M
02.3 Livestock Farming & Ranching	Wetland degradation primarily from livestock grazing	2.1 Site/Area Management	Implement compatible grazing practices	L

**Table 7 - Continued.**

<b>Bluehead sucker</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
Tier 1	Fish	Medium D   Unknown X	Colorado Plateau	P	Colorado Plateau - Wyoming Basins Rivers	<input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.	Southern Rocky Mountains Utah High Plateau	P O	Colorado Plateau - Wyoming Basins Streams	<input checked="" type="checkbox"/>
		<b>General Threat</b>	<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>
		07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - dewatering	2.3 Habitat & Natural Process Restoration	Adjust operation of dam	H
		08.1 Invasive Non-Native/Alien Species	Invasive animals - aquatic predators (smallmouth bass, northern pike, walleye, burbot)	2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	H
		08.1 Invasive Non-Native/Alien Species	Invasive animals - white sucker	2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	H
		07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - siltation and sedimentation	2.3 Habitat & Natural Process Restoration	Improve erosion and excess sedimentation conditions	M
		07.2 Dams & Water Management/Use	Natural system modification (hydrological) - Altered hydrological regime (surface or aquifer) – altered flow and/or temperature regimes	2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	M
		02.3 Livestock Farming & Ranching	Alteration of stream channel flows, increased sediment loads, degraded riparian habitat	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	L
		04.1 Roads & Railroads	Alteration of stream channel flows, increased sediment loads, degraded riparian habitat	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	L
		05.3 Logging & Wood Harvesting	Alteration of stream channel flows, increased sediment loads, degraded riparian habitat	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	L
<b>Bonytail chub</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
Tier 1	Fish	Low D   Increasing D	Colorado Plateau	P	Colorado Plateau - Wyoming Basins Rivers	<input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.	Southern Rocky Mountains Utah High Plateau Utah-Wyoming Rocky Mountains Wyoming Basin	P O O O		
		<b>General Threat</b>	<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>
		07.2 Dams & Water Management/Use	Habitat fragmentation due to water diversion structures lacking fish passage	2.3 Habitat & Natural Process Restoration	Maintain linkages and connectivity (e.g., wildlife over/under passes, habitat corridors, wildlife-friendly fences, fish passages)	H
		07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals	2.3 Habitat & Natural Process Restoration	Adjust operation of dam	H
		08.1 Invasive Non-Native/Alien Species	Invasive animals - aquatic predators (smallmouth bass, northern pike, walleye, burbot)	2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	H
		13.2 Critical life history/habitat components unknown	Critical life history/habitat components unknown	8.0 Research & Monitoring	Research critical life history/habitat components	H
		14.1 Scarcity (leading to inbreeding depression)	Scarcity	3.3 Species Re-Introduction	Re-introduce extirpated native species	H
		04.1 Roads & Railroads	Potential for hazardous materials spills	2.1 Site/Area Management	Coordinate efforts to prevent or minimize hazardous materials spills with existing state and federal emergency-response plans	M
		03.2 Mining & Quarrying	Potential for toxic discharges from uranium mining	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	L
		09.3 Agricultural & Forestry Effluents	Pollutants from agricultural runoff	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	L

**Table 7 - Continued.**

<b>Brassy minnow</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
Tier 1	Fish	Low D   Unknown X Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.	Central Shortgrass Prairie	P	Eastern Plains Streams	<input checked="" type="checkbox"/>
			Front Range	O	Transition Streams	<input checked="" type="checkbox"/>
					Eastern Plains Rivers	<input type="checkbox"/>

<b>General Threat</b>	<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - groundwater pumping and surface water diversions	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural use (irrigation)	H
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - stream dewatering	2.3 Habitat & Natural Process Restoration	Attain adequate flows; Restore or maintain suitable hydrological regime	H
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam, diversion, or drop structure construction or modification	2.3 Habitat & Natural Process Restoration	Remove, modify or retrofit barriers to fish migration (improve fish passage, e.g., rock ramps or fish passage structures)	H
11.2 Droughts	Lack of water due to drought and exacerbated by climate change	1.2 Resource & Habitat Protection	Maintain habitat; Acquire water rights or instream flow rights, limit water use	H
08.1 Invasive Non-Native/Alien Species	Invasive animals	2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	M
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, monitoring)	M
02.3 Livestock Farming & Ranching	Altered hydrological regime (surface or aquifer) - siltation and sedimentation	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	L

<b>Colorado pikeminnow</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
Tier 1	Fish	Medium D   Declining D Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.	Colorado Plateau	P	Colorado Plateau - Wyoming Basins Rivers	<input checked="" type="checkbox"/>
			Southern Rocky Mountains	P		
			Utah High Plateau	O		
			Utah-Wyoming Rocky Mountains	O		
			Wyoming Basin	O		

<b>General Threat</b>	<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>
07.2 Dams & Water Management/Use	Habitat fragmentation due to water diversion structures lacking fish passage	2.3 Habitat & Natural Process Restoration	Maintain linkages and connectivity (e.g., wildlife over/under passes, habitat corridors, wildlife-friendly fences, fish passages)	H
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals	2.3 Habitat & Natural Process Restoration	Adjust operation of dam	H
08.1 Invasive Non-Native/Alien Species	Invasive animals - aquatic predators (smallmouth bass, northern pike, walleye, burbot)	2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	H
03.2 Mining & Quarrying	Potential for toxic discharges from uranium mining	2.1 Site/Area Management	Coordinate efforts to prevent or minimize hazardous materials spills with existing state and federal emergency-response plans	M

**Table 7 - Continued.**

<b>Colorado River cutthroat trout</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
<i>Oncorhynchus clarkii pleuriticus</i> Tier 1 Fish	Medium	D   Increasing	Southern Rocky Mountains	P	Lakes	<input checked="" type="checkbox"/>
		D			Mountain Streams	<input checked="" type="checkbox"/>
					Colorado Plateau - Wyoming Basins Streams	<input type="checkbox"/>

Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.

<b>General Threat</b>	<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>
07.2 Dams & Water Management/Use	Habitat fragmentation due to water diversion structures lacking fish passage	2.3 Habitat & Natural Process Restoration	Maintain linkages and connectivity (e.g., wildlife over/under passes, habitat corridors, wildlife-friendly fences, fish passages)	H
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Hunting, trapping, fishing	5.4 Compliance & Enforcement	Enforce hunting, fishing, collecting regulations	M
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals	2.3 Habitat & Natural Process Restoration	Maintain linkages and connectivity (e.g., wildlife over/under passes, habitat corridors, wildlife-friendly fences)	M
08.1 Invasive Non-Native/Alien Species	Invasive animals	2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	M
02.3 Livestock Farming & Ranching	Alteration of stream channel flows, increased sediment loads, degraded riparian habitat	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	L
03.2 Mining & Quarrying	Heavy metal pollution	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	L
04.1 Roads & Railroads	Increased sediment loads, fish barriers (culverts)	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	L

<b>Common shiner</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
<i>Luxilus cornutus</i> Tier 1 Fish	Medium	D   Stable	Front Range	P	Transition Streams	<input checked="" type="checkbox"/>
		D	Central Shortgrass Prairie	O		

Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.

<b>General Threat</b>	<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - siltation and sedimentation	2.3 Habitat & Natural Process Restoration	Improve erosion and excess sedimentation conditions	H
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	M
02.3 Livestock Farming & Ranching	Altered hydrological regime (surface or aquifer) - siltation and sedimentation	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	L

**Table 7 - Continued.**

<b>Flannelmouth sucker</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>		
Tier 1	Fish	Medium	D	Unknown	X	Southern Rocky Mountains	P	Colorado Plateau - Wyoming Basins Rivers	<input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.				Colorado Plateau	O	Colorado Plateau - Wyoming Basins Streams	<input checked="" type="checkbox"/>
								Lakes	<input type="checkbox"/>
<b>General Threat</b>		<b>Specific Threat</b>		<b>General Conservation Action</b>		<b>Specific Conservation Action</b>		<b>Priority</b>	
07.2 Dams & Water Management/Use		Altered hydrological regime (surface or aquifer)		2.3 Habitat & Natural Process Restoration		Adjust operation of dam		H	
07.2 Dams & Water Management/Use		Habitat fragmentation due to water diversion structures lacking fish passage		2.3 Habitat & Natural Process Restoration		Maintain linkages and connectivity (e.g., wildlife over/under passes, habitat corridors, wildlife-friendly fences, fish passages)		H	
07.2 Dams & Water Management/Use		Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals		2.3 Habitat & Natural Process Restoration		Restore or maintain suitable hydrological regime		H	
08.1 Invasive Non-Native/Alien Species		Invasive animals - aquatic predators (smallmouth bass, northern pike, walleye, burbot)		2.2 Invasive/Problematic Species Control		Control non-native fish using integrated pest management techniques for aquatic habitats		H	
08.3 Introduced Genetic Material		Invasive animals - white sucker		2.2 Invasive/Problematic Species Control		Control non-native fish using integrated pest management techniques for aquatic habitats		H	
02.3 Livestock Farming & Ranching		Alteration of stream channel flows, increased sediment loads, degraded riparian habitat		2.3 Habitat & Natural Process Restoration		Restore native habitat using site-specific techniques and context		L	
04.1 Roads & Railroads		Alteration of stream channel flows, increased sediment loads, degraded riparian habitat		2.3 Habitat & Natural Process Restoration		Restore native habitat using site-specific techniques and context		L	

<b>Flathead chub</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>		
Tier 1	Fish	Medium	D	Stable	D	Central Shortgrass Prairie	P	Eastern Plains Rivers	<input checked="" type="checkbox"/>
								Eastern Plains Streams	<input checked="" type="checkbox"/>
								Transition Streams	<input checked="" type="checkbox"/>
<b>General Threat</b>		<b>Specific Threat</b>		<b>General Conservation Action</b>		<b>Specific Conservation Action</b>		<b>Priority</b>	
07.2 Dams & Water Management/Use		Altered hydrological regime (surface or aquifer) - dam, diversion, or drop structure construction or modification		2.3 Habitat & Natural Process Restoration		Remove, modify or retrofit barriers to fish migration (improve fish passage, e.g., rock ramps or fish passage structures)		H	
07.2 Dams & Water Management/Use		Altered hydrological regime (surface or aquifer) - dewatering		2.3 Habitat & Natural Process Restoration		Attain adequate flows; Restore or maintain suitable hydrological regime		H	
03.1 Oil & Gas Drilling		Wastewater from coalbed methane production reducing water quality & altering flows		5.3 Private Sector Standards & Codes		Implement Best Management Practices for energy development and mining		M	
03.2 Mining & Quarrying		Heavy metal contamination of streams		5.3 Private Sector Standards & Codes		Implement Best Management Practices for energy development and mining		M	
11.4 Storms & Flooding		Altered flows primarily from urban runoff		5.3 Private Sector Standards & Codes		Implement Best Management Practices for storm water management to minimize extreme peak flows		M	
11.4 Storms & Flooding		Altered flows primarily from urban runoff		7.2 Alliance & Partnership Development		Engage in collaborative, proactive planning and conservation programs to minimize extreme peak flows		M	
02.3 Livestock Farming & Ranching		Overgrazing leading to decreased channel depth, increased stream width & intermittency, waste altering O2 concentrations & ammonia		5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production		L	

**Table 7 - Continued.**

<b>Greenback cutthroat trout</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
		Medium D   Increasing D	Southern Rocky Mountains	P	Lakes	<input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.	Front Range	O	Mountain Streams	<input checked="" type="checkbox"/>
Tier 1	Fish					
		<i>Oncorhynchus clarkii stomias</i>				
<b>General Threat</b>	<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>		
07.2 Dams & Water Management/Use	Habitat fragmentation due to water diversion structures lacking fish passage	2.3 Habitat & Natural Process Restoration	Maintain linkages and connectivity (e.g., wildlife over/under passes, habitat corridors, wildlife-friendly fences, fish passages)	H		
13.3 Genetic relationship with other species and/or subspecies unknown	Taxonomic & status assessments of lineages are needed	8.0 Research & Monitoring	Complete ongoing taxonomic assessments	H		
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Hunting, trapping, fishing	5.4 Compliance & Enforcement	Enforce hunting, fishing, collecting regulations	M		
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals	2.3 Habitat & Natural Process Restoration	Maintain linkages and connectivity (e.g., wildlife over/under passes, habitat corridors, wildlife-friendly fences)	M		
08.1 Invasive Non-Native/Alien Species	Invasive animals	2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	M		
02.3 Livestock Farming & Ranching	Alteration of stream channel flows, increased sediment loads, degraded riparian habitat	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	L		
03.2 Mining & Quarrying	Heavy metal pollution, altered channel geometry, increased sedimentation	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	L		
06.1 Recreational Activities	Erosion, sedimentation, loss of vegetation along heavily-used trails	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	L		
<b>Humpback chub</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
		Low D   Declining D	Utah High Plateau	P	Colorado Plateau - Wyoming	<input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.	Wyoming Basin	P	Basins Rivers	
Tier 1	Fish		Utah-Wyoming Rocky Mountains	O		
		<i>Gila cypha</i>				
<b>General Threat</b>	<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>		
07.2 Dams & Water Management/Use	Habitat fragmentation due to water diversion structures lacking fish passage	2.3 Habitat & Natural Process Restoration	Maintain linkages and connectivity (e.g., wildlife over/under passes, habitat corridors, wildlife-friendly fences, fish passages)	H		
08.1 Invasive Non-Native/Alien Species	Invasive animals - aquatic predators (smallmouth bass, northern pike, walleye, burbot)	2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	H		
04.1 Roads & Railroads	Potential for hazardous materials spills from railroads	2.1 Site/Area Management	Coordinate efforts to prevent or minimize hazardous materials spills with existing state and federal emergency-response plans	M		
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals	2.3 Habitat & Natural Process Restoration	Adjust operation of dam	M		
08.1 Invasive Non-Native/Alien Species	Invasive animals	2.2 Invasive/Problematic Species Control	Control non-native invertebrates using integrated pest management techniques for aquatic habitats	M		
04.2 Utility & Service Lines	Potential for hazardous materials spills from oil pipelines	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	L		
09.3 Agricultural & Forestry Effluents	Pollutants from agricultural runoff	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	L		



**Table 7 - Continued.**

<b>Mountain sucker</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
Tier 1	Fish	Unknown	X	Unknown	X	Southern Rocky Mountains	P	Colorado Plateau - Wyoming Basins Rivers	<input checked="" type="checkbox"/>
						Utah-Wyoming Rocky Mountains	P	Colorado Plateau - Wyoming Basins Streams	<input checked="" type="checkbox"/>
						Wyoming Basin	P	Mountain Streams	<input type="checkbox"/>
						Colorado Plateau	O		
						Utah High Plateau	O		
				General Conservation Action	Specific Conservation Action	Priority			
07.2 Dams & Water Management/Use		Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals		2.3 Habitat & Natural Process Restoration	Adjust operation of dam	H			
08.3 Introduced Genetic Material		Invasive animals - competition, predation, and hybridization		2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	M			
04.1 Roads & Railroads		Potential for hazardous materials spills		2.1 Site/Area Management	Coordinate efforts to prevent or minimize hazardous materials spills with existing state and federal emergency-response plans	L			
<b>Northern redbelly dace</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
Tier 1	Fish	Low	D	Stable	D	Front Range	P	Transition Streams	<input checked="" type="checkbox"/>
								Lakes	<input type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.							
				General Conservation Action	Specific Conservation Action	Priority			
01.1 Housing & Urban Areas		Urban, suburban, and ex-urban development		2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	H			
07.2 Dams & Water Management/Use		Decreased water quality		5.2 Policies & Regulations	Monitor water quality standards	H			
07.2 Dams & Water Management/Use		Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals		2.3 Habitat & Natural Process Restoration	Implement streambank or in-stream restoration/improvements	M			
13.1 Complete distribution in Colorado unknown		Complete distribution in Colorado unknown		8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	M			
<b>Orangespotted sunfish</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
Tier 1	Fish	Medium	D	Declining	D	Central Shortgrass Prairie	P	Eastern Plains Rivers	<input checked="" type="checkbox"/>
						Front Range	O	Eastern Plains Streams	<input checked="" type="checkbox"/>
								Lakes	<input type="checkbox"/>
								Transition Streams	<input type="checkbox"/>
				General Conservation Action	Specific Conservation Action	Priority			
01.1 Housing & Urban Areas		Housing, urban, and ex-urban development		2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	H			
07.2 Dams & Water Management/Use		Altered hydrological regime (surface or aquifer)		2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	H			
08.1 Invasive Non-Native/Alien Species		Invasive animals		2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	M			

**Table 7 - Continued.**

<b>Orangethroat darter</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
	Low	D	Stable	D	Central Shortgrass Prairie	P	Eastern Plains Streams <input checked="" type="checkbox"/>
							Eastern Plains Rivers <input type="checkbox"/>
							Transition Streams <input type="checkbox"/>
<i>Etheostoma spectabile</i>							
Tier 1	Fish						
General Threat	Specific Threat			General Conservation Action	Specific Conservation Action		Priority
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - altered flow and fluctuating water temperature			2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime		H
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - groundwater pumping and surface water diversions			5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural use (irrigation)		H
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - stream dewatering			2.3 Habitat & Natural Process Restoration	Attain adequate flows; Restore or maintain suitable hydrological regime		H
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam, diversion, or drop structure construction or modification			2.3 Habitat & Natural Process Restoration	Remove, modify or retrofit barriers to fish migration (improve fish passage, e.g., rock ramps or fish passage structures)		H
11.2 Droughts	Lack of water due to drought and exacerbated by climate change			1.2 Resource & Habitat Protection	Maintain habitat; Acquire water rights or instream flow rights, limit water use		H
08.1 Invasive Non-Native/Alien Species	Invasive animals			2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats		M
<b>Plains minnow</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
	Low	D	Unknown	X	Central Shortgrass Prairie	P	Eastern Plains Rivers <input checked="" type="checkbox"/>
							Eastern Plains Streams <input type="checkbox"/>
<i>Hybognathus placitus</i>							
Tier 1	Fish						
	Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.						
General Threat	Specific Threat			General Conservation Action	Specific Conservation Action		Priority
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - stream dewatering			2.3 Habitat & Natural Process Restoration	Attain adequate flows; Restore or maintain suitable hydrological regime		H
07.2 Dams & Water Management/Use	Natural system modification (hydrological)			2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime		H
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam, diversion, or drop structure construction or modification			2.3 Habitat & Natural Process Restoration	Remove, modify or retrofit barriers to fish migration (improve fish passage, e.g., rock ramps or fish passage structures)		H
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - Altered flow and fluctuating water temperature			2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime		M
14.6 Loss of species from suitable habitat	Loss of species from suitable habitat			3.3 Species Re-Introduction	Stock species into previously occupied or suitable habitat		M
02.3 Livestock Farming & Ranching	Alteration of stream channel flows, increased sediment loads, degraded riparian habitat			2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context		L

**Table 7 - Continued.**

<b>Plains topminnow</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>	
	Low	D	Declining	D	Central Shortgrass Prairie	P	Eastern Plains Rivers	<input checked="" type="checkbox"/>
					Front Range	P	Eastern Plains Streams	<input checked="" type="checkbox"/>
							Transition Streams	<input checked="" type="checkbox"/>
<i>Fundulus sciadicus</i>								
Tier 1 Fish								
<b>General Threat</b>	<b>Specific Threat</b>			<b>General Conservation Action</b>	<b>Specific Conservation Action</b>		<b>Priority</b>	
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - altered flow and fluctuating water temperature			2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime		H	
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - groundwater pumping and surface water diversions			5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural use (irrigation)		H	
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - stream dewatering			2.3 Habitat & Natural Process Restoration	Attain adequate flows; Restore or maintain suitable hydrological regime		H	
01.1 Housing & Urban Areas	Housing, urban, and ex-urban development			2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime		M	
08.1 Invasive Non-Native/Alien Species	Invasive animals			2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats		M	
02.3 Livestock Farming & Ranching	Alteration of stream channel flows, increased sediment loads, degraded riparian habitat			2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context		L	
<b>Razorback sucker</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>	
	Low	D	Increasing	D	Utah High Plateau	P	Colorado Plateau - Wyoming Basins Rivers	<input checked="" type="checkbox"/>
					Utah-Wyoming Rocky Mountains	P		
					Colorado Plateau	O		
					Wyoming Basin	O		
<i>Xyrauchen texanus</i>								
Tier 1 Fish								
<b>General Threat</b>	<b>Specific Threat</b>			<b>General Conservation Action</b>	<b>Specific Conservation Action</b>		<b>Priority</b>	
07.2 Dams & Water Management/Use	Habitat fragmentation due to water diversion structures lacking fish passage			2.3 Habitat & Natural Process Restoration	Maintain linkages and connectivity (e.g., wildlife over/under passes, habitat corridors, wildlife-friendly fences, fish passages)		H	
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals			2.3 Habitat & Natural Process Restoration	Adjust operation of dam		H	
08.1 Invasive Non-Native/Alien Species	Invasive animals - aquatic predators (smallmouth bass, northern pike, walleye, burbot)			2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats		H	
03.2 Mining & Quarrying	Heavy metal contamination of streams			5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining		M	
04.1 Roads & Railroads	Potential for hazardous materials spills from railroads			2.1 Site/Area Management	Coordinate efforts to prevent or minimize hazardous materials spills with existing state and federal emergency-response plans		M	
09.3 Agricultural & Forestry Effluents	Elevated selenium concentrations			5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production		M	
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff and sources associated with resource extraction			2.3 Habitat & Natural Process Restoration	Identify and control point-source and non-point source pollution		M	
04.2 Utility & Service Lines	Potential for hazardous materials spills from oil pipelines			5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining		L	

**Table 7 - Continued.**

<b>Rio Grande chub</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
		Medium D   Stable D	Southern Rocky Mountains	P	Rio Grande Valley Rivers	<input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.			Rio Grande Valley Streams	<input checked="" type="checkbox"/>
<i>Gila pandora</i>					Lakes	<input type="checkbox"/>
Tier 1 Fish					Mountain Streams	<input type="checkbox"/>
<b>General Threat</b>	<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>		
02.1 Annual & Perennial Non-Timber Crops	Groundwater removal from center pivot irrigation systems	8.0 Research & Monitoring	Study impact of groundwater removal on stream flow in closed basin and impacts to native fish	H		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - stream dewatering	2.3 Habitat & Natural Process Restoration	Implement streambank or in-stream restoration/improvements	H		
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals	2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	H		
08.1 Invasive Non-Native/Alien Species	Invasive animals - fathead minnow, white sucker, red shiner	2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	H		
03.2 Mining & Quarrying	Heavy metals & cyanide contamination	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	M		
02.3 Livestock Farming & Ranching	Potential for elimination of microhabitats (woody debris, overhanging vegetation, aquatic macrophytes)	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	L		
<b>Rio Grande cutthroat trout</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
		Medium D   Increasing D	Southern Rocky Mountains	P	Lakes	<input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.			Mountain Streams	<input checked="" type="checkbox"/>
<i>Oncorhynchus clarkii virginalis</i>						
Tier 1 Fish						
<b>General Threat</b>	<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>		
07.3 Other Ecosystem Modifications	Altered native vegetation (streambank cover reduction) primarily from livestock grazing	2.3 Habitat & Natural Process Restoration	Implement streambank or in-stream restoration/improvements	H		
11.2 Droughts	De-watering & elevated stream temperature	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	H		
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Hunting, trapping, fishing	5.4 Compliance & Enforcement	Enforce hunting, fishing, collecting regulations	M		
07.1 Fire & Fire Suppression	Ash flows & debris from wildfire	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	M		
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals	2.3 Habitat & Natural Process Restoration	Maintain linkages and connectivity (e.g., wildlife over/under passes, habitat corridors, wildlife-friendly fences)	M		
07.3 Other Ecosystem Modifications	Fragmentation	3.2 Species Recovery	Maintain genetic connection/integrity within and between populations	M		
08.1 Invasive Non-Native/Alien Species	Invasive animals - brook trout, brown trout	2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	M		
08.4 Pathogens	Whirling disease	8.0 Research & Monitoring	Research and/or monitor status	L		

**Table 7 - Continued.**

<b>Rio Grande sucker</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
Tier 1	Fish	Low D   Increasing D	Southern Rocky Mountains	P	Mountain Streams	<input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.			Rio Grande Valley Rivers	<input checked="" type="checkbox"/>
					Rio Grande Valley Streams	<input checked="" type="checkbox"/>
General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority		
02.1 Annual & Perennial Non-Timber Crops	Groundwater removal from center pivot irrigation systems	8.0 Research & Monitoring	Study impact of groundwater removal on stream flow in closed basin and impacts to native fish	H		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - dewatering	2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	H		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - sedimentation	2.3 Habitat & Natural Process Restoration	Improve erosion and excess sedimentation conditions	H		
08.1 Invasive Non-Native/Alien Species	Invasive animals - white sucker	2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	H		
<b>Roundtail chub</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
Tier 1	Fish	Medium D   Declining D	Utah High Plateau	P	Colorado Plateau - Wyoming Basins Rivers	<input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.	Utah-Wyoming Rocky Mountains	P	Colorado Plateau - Wyoming Basins Streams	<input type="checkbox"/>
			Colorado Plateau	O		
		Wyoming Basin	O			
General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority		
07.2 Dams & Water Management/Use	Habitat fragmentation due to water diversion structures lacking fish passage	2.3 Habitat & Natural Process Restoration	Maintain linkages and connectivity (e.g., wildlife over/under passes, habitat corridors, wildlife-friendly fences, fish passages)	H		
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals	2.3 Habitat & Natural Process Restoration	Adjust operation of dam	H		
08.1 Invasive Non-Native/Alien Species	Invasive animals - aquatic predators (smallmouth bass, northern pike, walleye, burbot)	2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	H		
04.1 Roads & Railroads	Potential for hazardous materials spills from railroads	2.1 Site/Area Management	Coordinate efforts to prevent or minimize hazardous materials spills with existing state and federal emergency-response plans	L		
08.4 Pathogens	Asian tapeworm ( <i>Bothriocephalus acheilognathi</i> )	8.0 Research & Monitoring	Research population parameters and/or monitor status	L		

**Table 7 - Continued.**

<b>Southern redbelly dace</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
Tier 1 Fish <i>Chrosomus erythrogaster</i>	Low	D   Declining D	Central Shortgrass Prairie	P	Transition Streams	<input checked="" type="checkbox"/>
	Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.				Eastern Plains Streams	<input type="checkbox"/>
					Lakes	<input type="checkbox"/>
General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - altered flow and fluctuating water temperature	2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	H		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - groundwater pumping and surface water diversions	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural use (irrigation)	H		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - siltation and sedimentation	2.3 Habitat & Natural Process Restoration	Improve erosion and excess sedimentation conditions; restore proper stream hydromorphology	H		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - stream dewatering	2.3 Habitat & Natural Process Restoration	Attain adequate flows; Restore or maintain suitable hydrological regime	H		
07.2 Dams & Water Management/Use	Decreased water quality	5.2 Policies & Regulations	Monitor water quality standards	H		
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals	2.3 Habitat & Natural Process Restoration	Implement streambank or in-stream restoration/improvements	H		
11.2 Droughts	Lack of water due to drought and exacerbated by climate change	1.2 Resource & Habitat Protection	Maintain habitat; Acquire water rights or instream flow rights, limit water use	H		
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	M		
14.6 Loss of species from suitable habitat	Loss of species from suitable habitat	3.3 Species Re-Introduction	Stock species into previously occupied or suitable habitat	M		
02.3 Livestock Farming & Ranching	Wetland degradation primarily from livestock grazing	2.1 Site/Area Management	Implement compatible grazing practices	L		
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes	Identify and control point-source and non-point source pollution	L		
<b>Stonecat</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
Tier 1 Fish <i>Noturus flavus</i>	Low	D   Unknown X	Central Shortgrass Prairie	P	Eastern Plains Streams	<input checked="" type="checkbox"/>
					Front Range	<input checked="" type="checkbox"/>
					Eastern Plains Rivers	<input type="checkbox"/>
General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - altered flow and fluctuating water temperature	2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	H		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - groundwater pumping and surface water diversions	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural use (irrigation)	H		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - siltation	2.3 Habitat & Natural Process Restoration	Improve erosion and excess sedimentation conditions	H		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - stream dewatering	2.3 Habitat & Natural Process Restoration	Attain adequate flows; Restore or maintain suitable hydrological regime	H		
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals	2.3 Habitat & Natural Process Restoration	Improve erosion and excess sedimentation conditions	H		
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, monitoring)	M		

**Table 7 - Continued.**

<b>Suckermouth minnow</b>		Population Status and Trend	Distribution	Type	Habitat	Primary	
Tier 1	Fish	Low	D   Unknown	X	Central Shortgrass Prairie	P	Eastern Plains Rivers <input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.				Eastern Plains Streams <input checked="" type="checkbox"/>	
						Transition Streams <input type="checkbox"/>	
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - dewatering	2.3 Habitat & Natural Process Restoration		Attain adequate flows; Restore or maintain suitable hydrological regime	H		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - siltation and sedimentation	2.3 Habitat & Natural Process Restoration		Improve erosion and excess sedimentation conditions; restore proper stream hydromorphology	H		
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam, diversion, or drop structure construction or modification	2.3 Habitat & Natural Process Restoration		Remove, modify or retrofit barriers to fish migration (improve fish passage, e.g., rock ramps or fish passage structures)	H		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer)	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural use	M		
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, monitoring)	M		
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring		Research critical life history/habitat components	M		
14.6 Loss of species from suitable habitat	Loss of species from suitable habitat	3.3 Species Re-Introduction		Re-introduce species in suitable habitat	M		

**Tier 1 Mammals**

<b>American pika</b>		Population Status and Trend	Distribution	Type	Habitat	Primary	
Tier 1	Mammals	Medium	X   Stable	D	Southern Rocky Mountains	P	Alpine <input checked="" type="checkbox"/>
						Aspen <input type="checkbox"/>	
						Lodgepole Pine <input type="checkbox"/>	
						Mixed Conifer <input type="checkbox"/>	
						Spruce - Fir <input type="checkbox"/>	
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority		
11.1 Habitat Shifting & Alteration	Habitat shifting & alteration due to climate change	8.0 Research & Monitoring		Continue monitoring species and habitat responses to changing climate	H		
11.3 Temperature Extremes	Temperature extremes and precipitation changes	8.0 Research & Monitoring		Continue monitoring species and habitat responses to changing climate	H		
06.1 Recreational Activities	Hiking, ORVs, and domestic animals	4.3 Awareness & Communications		Publish educational material/sponsor educational programs to raise public awareness	L		

**Table 7 - Continued.**

<b>Black-footed ferret</b>		<b>Population Status and Trend</b>	<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
Tier 1	Mammals	Low D   Unknown X Status of released ferrets is unknown. Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.	Central Shortgrass Prairie	P	Shortgrass Prairie	<input checked="" type="checkbox"/>
			Wyoming Basin	P	Desert Shrub	<input type="checkbox"/>
					Foothill and Mountain Grasslands	<input type="checkbox"/>
					Mixed and Tallgrass Prairies	<input type="checkbox"/>
					Sagebrush	<input type="checkbox"/>
<b>General Threat</b>		<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>	
05.1 Control of Nuisance Species & Collecting Terrestrial Animals		Loss of habitat (prairie dog colonies) due to plague and prairie dog control	3.1 Species Management	Work with partner agencies, NGOs and private landowners to develop incentives and agreements for conservation benefit	H	
05.1 Control of Nuisance Species & Collecting Terrestrial Animals		Mortality and prey reduction through rodent control	5.2 Policies & Regulations	Continue implementing existing regulations at re-introduction sites	H	
08.4 Pathogens		Pathogen - sylvatic plague	3.1 Species Management	Develop and implement an active disease management program	H	
08.4 Pathogens		Pathogen - sylvatic plague	8.0 Research & Monitoring	Research and develop effective vaccine and delivery system	H	
13.4 Population status unknown		Lack of data on population status of released ferrets	8.0 Research & Monitoring	Research population parameters and/or monitor status	H	
14.1 Scarcity (leading to inbreeding depression)		Scarcity	3.3 Species Re-Introduction	Re-introduce extirpated native species	H	
05.1 Control of Nuisance Species & Collecting Terrestrial Animals		Loss of habitat (prairie dog colonies) due to plague and prairie dog control	2.3 Habitat & Natural Process Restoration	Manage for predator/prey balance	M	
05.1 Control of Nuisance Species & Collecting Terrestrial Animals		Loss of habitat (prairie dog colonies) due to plague and prairie dog control	4.3 Awareness & Communications	Implement landowner outreach/education and incentive programs	M	
05.1 Control of Nuisance Species & Collecting Terrestrial Animals		Loss of habitat (prairie dog colonies) due to plague and prairie dog control	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs	M	
05.1 Control of Nuisance Species & Collecting Terrestrial Animals		Loss of habitat (prairie dog colonies) due to plague and prairie dog control	6.4 Conservation Payments	Implement the NRCS Black-footed Ferret Initiative program	M	
08.4 Pathogens		Pathogen - sylvatic plague	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	M	
12.1 Lack of coordination		Lack of coordination	3.1 Species Management	Implement existing management/recovery plan	M	



**Table 7 - Continued.**

<b>Fringed myotis</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>		
Tier 1	Mammals	Unknown	D	Unknown	X	Colorado Plateau	P	Cliffs and Canyons	<input checked="" type="checkbox"/>
						Front Range	P	Mixed Conifer	<input checked="" type="checkbox"/>
						Wyoming Basin	P	Oak and Mixed Mountain Shrublands	<input checked="" type="checkbox"/>
						Central Shortgrass Prairie	O	Pinyon - Juniper	<input checked="" type="checkbox"/>
						Southern Rocky Mountains	O	Ponderosa Pine	<input checked="" type="checkbox"/>
								Aspen	<input type="checkbox"/>
								Colorado Plateau - Wyoming Basins Rivers	<input type="checkbox"/>
								Colorado Plateau - Wyoming Basins Streams	<input type="checkbox"/>
								Desert Shrub	<input type="checkbox"/>
								Foothill and Mountain Grasslands	<input type="checkbox"/>
								Lodgepole Pine	<input type="checkbox"/>
								Mountain Streams	<input type="checkbox"/>
								Sagebrush	<input type="checkbox"/>
								Spruce - Fir	<input type="checkbox"/>
								Transition Streams	<input type="checkbox"/>
		Upland Shrub	<input type="checkbox"/>						
<b>General Threat</b>		<b>Specific Threat</b>		<b>General Conservation Action</b>	<b>Specific Conservation Action</b>		<b>Priority</b>		
06.3 Work & Other Activities		Proximal non-recreation disturbance		2.1 Site/Area Management	Manage to limit disturbance, especially to roost sites, maternity colonies, and hibernacula		H		
13.1 Complete distribution in Colorado unknown		Complete distribution in Colorado unknown		8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)		H		
13.4 Population status unknown		Lack of data on population status		8.0 Research & Monitoring	Research population parameters and/or monitor status		H		
03.2 Mining & Quarrying		Uranium mining		5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining		M		
07.3 Other Ecosystem Modifications		Cave/mine closures and grating		2.3 Habitat & Natural Process Restoration	Employ appropriate site-specific and/or species-specific techniques for closures and safety enhancements		M		
08.4 Pathogens		Potential for White-nose Syndrome		2.2 Invasive/Problematic Species Control	Manage recreation, research, management, and other human disturbances to control the spread of pathogens		M		
09.3 Agricultural & Forestry Effluents		Prey reduction from herbicide/pesticide spraying or runoff		2.3 Habitat & Natural Process Restoration	Reduce herbicide/pesticide use		L		

**Table 7 - Continued.**

<b>Gunnison's prairie dog</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>		
Tier 1	Mammals	Medium	D	Stable	D	Colorado Plateau	P	Desert Shrub	<input checked="" type="checkbox"/>
						Southern Rocky Mountains	P	Foothill and Mountain Grasslands	<input checked="" type="checkbox"/>
								Sagebrush	<input checked="" type="checkbox"/>
								Greasewood	<input type="checkbox"/>
								Oak and Mixed Mountain Shrublands	<input type="checkbox"/>
								Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.	

<b>General Threat</b>	<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining as per Colorado Gunnison's and White-tailed Prairie Dog Conservation Strategy for Oil and Gas	H
08.4 Pathogens	Pathogen - sylvatic plague	3.1 Species Management	Develop and implement an active disease management program	H
08.4 Pathogens	Pathogen - sylvatic plague	8.0 Research & Monitoring	Research and develop effective vaccine and delivery system	H
08.4 Pathogens	Pathogen - sylvatic plague	8.0 Research & Monitoring	Research species/habitat response to plague management	H
07.3 Other Ecosystem Modifications	Loss and degradation of habitat	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
07.3 Other Ecosystem Modifications	Loss and degradation of habitat	1.2 Resource & Habitat Protection	Maintain healthy colonies on public lands and on private land with large acreage	M
07.3 Other Ecosystem Modifications	Loss and degradation of habitat	2.3 Habitat & Natural Process Restoration	Restore native habitat and wet areas (controlled burning, weed control)	M
11.2 Droughts	Potential for increasing number and duration of drought events	2.3 Habitat & Natural Process Restoration	Maintain landscape connectivity to allow for species movement	M
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Poisoning	4.3 Awareness & Communications	Implement landowner outreach/education program	L
06.1 Recreational Activities	Recreational shooting of prairie dogs	2.1 Site/Area Management	Implement shooting closures/seasons where local conditions warrant	L

**Table 7 - Continued.**

**Little brown myotis**

*Myotis lucifugus*

Tier 1 Mammals

Population Status and Trend		Distribution	Type	Habitat	Primary
Unknown	X	Colorado Plateau	P	Mixed Conifer	<input checked="" type="checkbox"/>
		Southern Rocky Mountains	P	Ponderosa Pine	<input checked="" type="checkbox"/>
		Central Shortgrass Prairie	O	Aspen	<input type="checkbox"/>
				Cliffs and Canyons	<input type="checkbox"/>
				Colorado Plateau - Wyoming Basins Rivers	<input type="checkbox"/>
				Colorado Plateau - Wyoming Basins Streams	<input type="checkbox"/>
				Desert Shrub	<input type="checkbox"/>
				Eastern Plains Rivers	<input type="checkbox"/>
				Eastern Plains Streams	<input type="checkbox"/>
				Foothill and Mountain Grasslands	<input type="checkbox"/>
				Lodgepole Pine	<input type="checkbox"/>
				Mountain Streams	<input type="checkbox"/>
				Oak and Mixed Mountain Shrublands	<input type="checkbox"/>
				Pinyon - Juniper	<input type="checkbox"/>
				Riparian Woodlands and Shrublands	<input type="checkbox"/>
				Sagebrush	<input type="checkbox"/>
				Transition Streams	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
06.1 Recreational Activities	Proximal non-recreation disturbance	2.1 Site/Area Management	Manage to limit disturbance, especially to roost sites, maternity colonies, and hibernacula	H
08.4 Pathogens	Potential for White-nose Syndrome	2.2 Invasive/Problematic Species Control	Manage recreation, research, management, and other human disturbances to control the spread of pathogens	H
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	H
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring	Research critical life history/habitat components	H
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status; conduct surveillance for potential arrival of white-nose syndrome	H
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Exterminations/evictions in urban settings	2.3 Habitat & Natural Process Restoration	Develop alternative roost sites	M
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Exterminations/evictions in urban settings	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	M
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Exterminations/evictions in urban settings	5.2 Policies & Regulations	Provide incentives for homeowners to increase tolerance of bats	M
09.3 Agricultural & Forestry Effluents	Prey reduction from herbicide/pesticide spraying or runoff	2.3 Habitat & Natural Process Restoration	Reduce herbicide/pesticide use	L

**Table 7 - Continued.**

<b>Lynx</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>	
Tier 1	Mammals	Medium	X	Unknown	X	Southern Rocky Mountains	P	Lodgepole Pine <input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.						Mixed Conifer <input checked="" type="checkbox"/>
								Spruce - Fir <input checked="" type="checkbox"/>
<b>General Threat</b>		<b>Specific Threat</b>		<b>General Conservation Action</b>		<b>Specific Conservation Action</b>		<b>Priority</b>
12.3 Lack of common goals		Lack of Recovery Plan		3.1 Species Management		Write and implement management/recovery plan		H
13.5 Population trend unknown		Lack of data on population trend		8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)		H
04.1 Roads & Railroads		Fragmentation		2.3 Habitat & Natural Process Restoration		Maintain linkages and connectivity (e.g., wildlife over/under passes, habitat corridors, wildlife-friendly fences)		M
05.3 Logging & Wood Harvesting		Fragmentation		2.3 Habitat & Natural Process Restoration		Maintain habitat connectivity so that natural movement between occupied and unoccupied habitat can be maintained to support a naturally expanding population		M
06.1 Recreational Activities		Unregulated backcountry winter recreation		8.0 Research & Monitoring		Research species/habitat response to management		M
11.1 Habitat Shifting & Alteration		Habitat shifting due to climate change		8.0 Research & Monitoring		Conduct primary research on species and habitat responses to changing climate		M
11.1 Habitat Shifting & Alteration		Loss of snow		2.3 Habitat & Natural Process Restoration		Maintain connectivity and improve resilience		M
<b>New Mexico jumping mouse</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>	
Tier 1	Mammals	Low	X	Unknown	X	Central Shortgrass Prairie	O	Eastern Plains Streams <input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.						Mountain Streams <input checked="" type="checkbox"/>
								Riparian Woodlands and Shrublands <input checked="" type="checkbox"/>
						Eastern Plains Rivers	<input type="checkbox"/>	
						Transition Streams	<input type="checkbox"/>	
<b>General Threat</b>		<b>Specific Threat</b>		<b>General Conservation Action</b>		<b>Specific Conservation Action</b>		<b>Priority</b>
11.2 Droughts		Lack of water due to drought and exacerbated by climate change		8.0 Research & Monitoring		Conduct primary research on species and habitat responses to changing climate		H
13.1 Complete distribution in Colorado unknown		Complete distribution in Colorado unknown		8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)		H
13.2 Critical life history/habitat components unknown		Biology, ecology, and habitat poorly known		8.0 Research & Monitoring		Research critical life history/habitat components		H
13.5 Population trend unknown		Lack of data on population trend		8.0 Research & Monitoring		Research population parameters and/or monitor status		H
07.1 Fire & Fire Suppression		Wildfires exacerbated by climate change		2.3 Habitat & Natural Process Restoration		Restore natural fire regime		M
07.2 Dams & Water Management/Use		Scouring floods		2.3 Habitat & Natural Process Restoration		Restore or maintain suitable hydrological regime		M
07.3 Other Ecosystem Modifications		Altered native vegetation (streambank cover reduction)		2.3 Habitat & Natural Process Restoration		Restore riparian vegetation		M
12.1 Lack of coordination		Lack of management/recovery plan		3.1 Species Management		Write and implement management/recovery plan		M
12.1 Lack of coordination		Lack of management/recovery plan		7.2 Alliance & Partnership Development		Coordinate with related agencies to align goals, policies, measures of success, etc.		M
12.2 Lack of funding		Lack of dedicated funding source		7.2 Alliance & Partnership Development		Coordinate with related agencies to identify and secure funding		M
14.1 Scarcity (leading to inbreeding depression)		Scarcity		3.2 Species Recovery		Maintain genetic connection/integrity within and between populations		M

**Table 7 - Continued.**

		Population Status and Trend		Distribution	Type	Habitat	Primary
		Unknown	X				
<b>Olive-backed pocket mouse</b>		Unknown	X	Central Shortgrass Prairie	P	Foothill and Mountain Grasslands	<input checked="" type="checkbox"/>
<i>Perognathus fasciatus</i>				Utah-Wyoming Rocky Mountains	P	Mixed and Tallgrass Prairies	<input checked="" type="checkbox"/>
Tier 1	Mammals			Wyoming Basin	P	Shortgrass Prairie	<input checked="" type="checkbox"/>
				Front Range	O		
General Threat	Specific Threat			General Conservation Action	Specific Conservation Action		Priority
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown			8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)		H
13.4 Population status unknown	Lack of data on population status			8.0 Research & Monitoring	Develop and implement monitoring plan		H
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development			1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection		M
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland			1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection		M
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland			5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production		M
<b>Prebles meadow jumping mouse</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
		Low	D	Front Range	P	Eastern Plains Streams	<input checked="" type="checkbox"/>
<i>Zapus hudsonius preblei</i>		Declining D		Central Shortgrass Prairie	O	Mountain Streams	<input checked="" type="checkbox"/>
Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.				Southern Rocky Mountains	O	Riparian Woodlands and Shrublands	<input checked="" type="checkbox"/>
Tier 1	Mammals					Transition Streams	<input checked="" type="checkbox"/>
						Eastern Plains Rivers	<input type="checkbox"/>
General Threat	Specific Threat			General Conservation Action	Specific Conservation Action		Priority
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development			1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection		H
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development			2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic		H
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development			5.2 Policies & Regulations	Promote zoning that concentrates use and protects habitat		H
07.2 Dams & Water Management/Use	Habitat degradation from alteration of flows			2.3 Habitat & Natural Process Restoration	Implement streambank or in-stream restoration/improvements, restore riparian vegetation and hydrological regime		H
12.1 Lack of coordination	Lack of USFWS conservation plan			3.1 Species Management	Write and implement management/recovery plan		H
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development			5.3 Private Sector Standards & Codes	Implement Best Management Practices for transportation projects, urban development, landscaping, etc.		M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development			6.4 Conservation Payments	Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)		M
12.1 Lack of coordination	Lack of USFWS conservation plan			7.2 Alliance & Partnership Development	Engage in collaborative, proactive planning and conservation programs		M
12.3 Lack of common goals	Lack of USFWS conservation plan			7.2 Alliance & Partnership Development	Coordinate with related agencies to align goals, policies, measures of success, etc.		M
14.1 Scarcity (leading to inbreeding depression)	Scarcity			3.2 Species Recovery	Maintain genetic connection/integrity within and between populations		M
07.3 Other Ecosystem Modifications	Altered animal community - change in predator/prey balance (domestic cat & bullfrog predation)			2.3 Habitat & Natural Process Restoration	Manage for predator/prey balance		L

**Table 7 - Continued.**

**Spotted bat**

		Population Status and Trend		Distribution	Type	Habitat	Primary	
Tier 1	Mammals	Low	D	Stable	D	Utah-Wyoming Rocky Mountains	P	Cliffs and Canyons <input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.		Wyoming Basin	P	Aspen	<input type="checkbox"/>	
						Colorado Plateau - Wyoming Basins Rivers	<input type="checkbox"/>	
						Colorado Plateau - Wyoming Basins Streams	<input type="checkbox"/>	
						Desert Shrub	<input type="checkbox"/>	
						Mixed Conifer	<input type="checkbox"/>	
						Pinyon - Juniper	<input type="checkbox"/>	
						Ponderosa Pine	<input type="checkbox"/>	
				Upland Shrub	<input type="checkbox"/>			

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown; information on winter distribution is needed	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	H
14.1 Scarcity (leading to inbreeding depression)	Scarcity	8.0 Research & Monitoring	Research population parameters and/or monitor status	H
13.2 Critical life history/habitat components unknown	Biology, ecology, and habitat poorly known	8.0 Research & Monitoring	Research critical life history/habitat components	M
09.3 Agricultural & Forestry Effluents	Prey reduction from herbicide/pesticide spraying or runoff	2.3 Habitat & Natural Process Restoration	Reduce herbicide/pesticide use	L

**Table 7 - Continued.**

**Townsend's big-eared bat ssp.**

*Corynorhinus townsendii pallescens*

Tier 1 Mammals

Population Status and Trend	Distribution	Type	Habitat	Primary
Low D   Unknown X	Colorado Plateau	P	Cliffs and Canyons	<input checked="" type="checkbox"/>
Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.	Front Range	P	Mixed Conifer	<input checked="" type="checkbox"/>
	Southern Rocky Mountains	P	Pinyon - Juniper	<input checked="" type="checkbox"/>
	Utah High Plateau	P	Ponderosa Pine	<input checked="" type="checkbox"/>
	Utah-Wyoming Rocky Mountains	P	Aspen	<input type="checkbox"/>
	Wyoming Basin	O	Colorado Plateau - Wyoming Basins Rivers	<input type="checkbox"/>
			Colorado Plateau - Wyoming Basins Streams	<input type="checkbox"/>
			Desert Shrub	<input type="checkbox"/>
			Foothill and Mountain Grasslands	<input type="checkbox"/>
			Mountain Streams	<input type="checkbox"/>
			Oak and Mixed Mountain Shrublands	<input type="checkbox"/>
			Sagebrush	<input type="checkbox"/>
			Spruce - Fir	<input type="checkbox"/>
			Transition Streams	<input type="checkbox"/>
			Upland Shrub	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
03.2 Mining & Quarrying	Uranium mining	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	H
06.1 Recreational Activities	Recreational caving	2.1 Site/Area Management	Manage to limit disturbance, especially to roost sites, maternity colonies, and hibernacula	H
06.3 Work & Other Activities	Proximal non-recreation disturbance	2.1 Site/Area Management	Manage to limit disturbance, especially to roost sites, maternity colonies, and hibernacula	H
07.3 Other Ecosystem Modifications	Cave/mine closures and grating	2.3 Habitat & Natural Process Restoration	Employ appropriate site-specific and/or species-specific techniques for closures and safety enhancements	H
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	H
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	H
08.4 Pathogens	Potential for White-nose Syndrome	2.2 Invasive/Problematic Species Control	Manage recreation, research, management, and other human disturbances to control the spread of pathogens	M
13.2 Critical life history/habitat components unknown	Biology, ecology, and habitat poorly known	8.0 Research & Monitoring	Research critical life history/habitat components	M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	L
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	L
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations	Promote zoning that concentrates use and protects habitat	L
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.3 Private Sector Standards & Codes	Implement Best Management Practices for transportation projects, urban development, landscaping, etc.	L
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	6.4 Conservation Payments	Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)	L
09.3 Agricultural & Forestry Effluents	Prey reduction from herbicide/pesticide spraying or runoff	2.3 Habitat & Natural Process Restoration	Reduce herbicide/pesticide use	L

**Table 7 - Continued.**

<b>White-tailed prairie dog</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
<i>Cynomys leucurus</i> Tier 1 Mammals		Medium	D   Stable	Colorado Plateau	P	Desert Shrub	<input checked="" type="checkbox"/>
			D	Utah-Wyoming Rocky Mountains	P	Foothill and Mountain Grasslands	<input checked="" type="checkbox"/>
				Wyoming Basin	P	Sagebrush	<input checked="" type="checkbox"/>
				Southern Rocky Mountains	O		
				Utah High Plateau	O		
	Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.						
<b>General Threat</b>	<b>Specific Threat</b>			<b>General Conservation Action</b>	<b>Specific Conservation Action</b>		<b>Priority</b>
08.4 Pathogens	Pathogen - sylvatic plague			3.1 Species Management	Develop and implement an active disease management program		H
08.4 Pathogens	Pathogen - sylvatic plague			8.0 Research & Monitoring	Research and develop effective vaccine and delivery system		H
08.4 Pathogens	Pathogen - sylvatic plague			8.0 Research & Monitoring	Research species/habitat response to plague management		H
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland			1.2 Resource & Habitat Protection	Maintain healthy colonies on public lands and on private land with large acreage		M
02.3 Livestock Farming & Ranching	Historic grazing with incompatible timing, intensity, duration			2.3 Habitat & Natural Process Restoration	Restore native habitat and wet areas (controlled burning, weed control)		M
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure			5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining as per Colorado Gunnison's and White-tailed Prairie Dog Conservation Strategy for Oil and Gas		M
07.1 Fire & Fire Suppression	Altered fire regime (changes in fire frequency) and pinyon-juniper encroachment			2.3 Habitat & Natural Process Restoration	Restore native habitat and wet areas (controlled burning, weed control)		M
07.3 Other Ecosystem Modifications	Loss and degradation of habitat			1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection		M
07.3 Other Ecosystem Modifications	Loss and degradation of habitat			1.2 Resource & Habitat Protection	Maintain healthy colonies on public lands and on private land with large acreage		M
07.3 Other Ecosystem Modifications	Loss and degradation of habitat			2.3 Habitat & Natural Process Restoration	Restore native habitat and wet areas (controlled burning, weed control)		M
08.1 Invasive Non-Native/Alien Species	Non-native plants - cheatgrass			2.3 Habitat & Natural Process Restoration	Restore native habitat and wet areas (controlled burning, weed control)		M
11.2 Droughts	Potential for increasing number and duration of drought events			2.3 Habitat & Natural Process Restoration	Maintain landscape connectivity to allow for species movement		M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development			1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection		L
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Poisoning			4.3 Awareness & Communications	Implement landowner outreach/education program		L
06.1 Recreational Activities	Recreational shooting of prairie dogs			2.1 Site/Area Management	Implement shooting closures/seasons where local conditions warrant		L



**Table 7 - Continued.**

<b>Wolverine</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>	
Tier 1	Mammals	Unknown	X	Unknown	X	Southern Rocky Mountains	P	Alpine <input checked="" type="checkbox"/>
		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.						Aspen <input type="checkbox"/>
								Lodgepole Pine <input type="checkbox"/>
								Mixed Conifer <input type="checkbox"/>
								Subalpine Limber - Bristlecone Pine <input type="checkbox"/>
<b>General Threat</b>		<b>Specific Threat</b>		<b>General Conservation Action</b>	<b>Specific Conservation Action</b>		<b>Priority</b>	
12.5 Legislation/policy changes		No tools to grant public assurances for support of re-introduction		5.2 Policies & Regulations	Develop robust tool/policy to grant assurances		H	
14.1 Scarcity (leading to inbreeding depression)		Scarcity		3.3 Species Re-Introduction	Initiate roundtable discussions and develop a timeline		H	
14.1 Scarcity (leading to inbreeding depression)		Scarcity		3.3 Species Re-Introduction	Re-introduce extirpated native species		H	
11.1 Habitat Shifting & Alteration		Habitat shifting due to climate change		8.0 Research & Monitoring	Conduct primary research on species and habitat responses to changing climate		M	
11.1 Habitat Shifting & Alteration		Loss of snow		2.3 Habitat & Natural Process Restoration	Maintain connectivity and improve resilience		M	
13.4 Population status unknown		Lack of data on population status		8.0 Research & Monitoring	Research population parameters and/or monitor status		M	
04.1 Roads & Railroads		Fragmentation		2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic		L	
13.1 Complete distribution in Colorado unknown		Complete distribution in Colorado unknown		8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)		L	

Table 7 - Continued.

		Tier 1				Reptiles			
Colorado checked whiptail	Population Status and Trend				Distribution	Type	Habitat	Primary	
	Medium	X	Stable	X					
<i>Aspidoscelis neotesselata</i>					Central Shortgrass Prairie	P	Cliffs and Canyons	<input checked="" type="checkbox"/>	
							Greasewood	<input checked="" type="checkbox"/>	
							Playas	<input checked="" type="checkbox"/>	
Tier 1	Reptiles						Conservation Reserve Program	<input type="checkbox"/>	
							Shortgrass Prairie	<input type="checkbox"/>	
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority				
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	H				
13.2 Critical life history/habitat components unknown	Biology, ecology, and habitat poorly known	8.0 Research & Monitoring		Research critical life history/habitat components	H				
13.3 Genetic relationship with other species and/or subspecies unknown	Genetic relationship with other subspecies unknown	8.0 Research & Monitoring		Research genetic relation to other (sub)species	H				
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection		Acquire conservation easement for habitat protection	M				
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	2.3 Habitat & Natural Process Restoration		Maintain appropriate patch size and habitat mosaic	M				
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations		Promote consideration of biodiversity issues in transportation and land use planning processes	M				
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.3 Private Sector Standards & Codes		Implement Best Management Practices for transportation projects, urban development, landscaping, etc.	M				
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	6.4 Conservation Payments		Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)	M				
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	1.2 Resource & Habitat Protection		Acquire conservation easement for habitat protection	M				
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration		Maintain appropriate patch size and habitat mosaic	M				
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.2 Policies & Regulations		Encourage use of Farm Bill and other incentive programs	M				
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production	M				
12.1 Lack of coordination	Lack of conservation plan	3.1 Species Management		Develop proactive conservation program to prevent species from becoming a concern in the future	M				
12.1 Lack of coordination	Lack of management plan	3.1 Species Management		Write and implement management/recovery plan	M				

**Table 7 - Continued.**

<b>Massasauga</b>		Population Status and Trend		Distribution	Type	Habitat	Primary	
		Medium	D   Stable	D	Central Shortgrass Prairie	P	Mixed and Tallgrass Prairies	<input checked="" type="checkbox"/>
							Shortgrass Prairie	<input checked="" type="checkbox"/>
							Conservation Reserve Program	<input type="checkbox"/>
<i>Sistrurus catenatus</i>		Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.						
Tier 1	Reptiles							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority			
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	1.2 Resource & Habitat Protection		Acquire conservation easement for habitat protection	M			
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration		Maintain appropriate patch size and habitat mosaic	M			
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.2 Policies & Regulations		Encourage use of Farm Bill and other incentive programs	M			
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production	M			
04.1 Roads & Railroads	Collision (e.g., auto)	5.2 Policies & Regulations		Promote consideration of biodiversity issues in transportation and land use planning processes	M			
12.1 Lack of coordination	Lack of conservation effort coordination	3.1 Species Management		Write and implement management/recovery plan	M			
12.3 Lack of common goals	Lack of common conservation goals	7.2 Alliance & Partnership Development		Engage in collaborative, proactive planning and conservation programs	M			
04.1 Roads & Railroads	Collision (e.g., auto)	4.3 Awareness & Communications		Publish educational material/sponsor educational programs to raise public awareness	L			
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	L			
13.2 Critical life history/habitat components unknown	Biology, ecology, and habitat poorly known	8.0 Research & Monitoring		Research critical life history/habitat components	L			

**Tier 2 Amphibians**

<b>Blanchard's cricket frog</b>		Population Status and Trend		Distribution	Type	Habitat	Primary	
		Low	D   Declining	D	Central Shortgrass Prairie	P	Eastern Plains Rivers	<input checked="" type="checkbox"/>
							Eastern Plains Streams	<input checked="" type="checkbox"/>
							Wetlands	<input type="checkbox"/>
<i>Acris crepitans</i>		Possibly extirpated in CO (edge of range)						
Tier 2	Amphibians							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority			
13.1 Complete distribution in Colorado unknown	Complete distribution unknown	8.0 Research & Monitoring		Develop and implement monitoring plan	H			
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer)	5.3 Private Sector Standards & Codes		Implement Best Management Practices for water resource development	L			
08.1 Invasive Non-Native/Alien Species	Invasive animals - bullfrogs	2.2 Invasive/Problematic Species Control		Control bullfrogs using accepted integrated pest management techniques for aquatic habitats	L			
11.1 Habitat Shifting & Alteration	Climate variability (intensification or alteration of normal weather patterns, e.g., droughts)	8.0 Research & Monitoring		Conduct primary research on species and habitat responses to changing climate	L			

**Table 7 - Continued.**

<b>Canyon tree frog</b>		Population Status and Trend		Distribution	Type	Habitat	Primary	
	Unknown	X	Unknown	X	Central Shortgrass Prairie	P	Colorado Plateau - Wyoming Basins Rivers	<input checked="" type="checkbox"/>
<i>Hyla arenicolor</i>					Colorado Plateau	P		
Tier 2	Amphibians				Southern Rocky Mountains	O	Colorado Plateau - Wyoming Basins Streams	<input checked="" type="checkbox"/>
							Cliffs and Canyons	<input type="checkbox"/>
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority			
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring		Research population parameters and/or monitor status; develop and implement monitoring plan	H			
06.1 Recreational Activities	Non-motorized recreation	4.3 Awareness & Communications		Publish educational material/sponsor educational programs to raise public awareness	M			
11.1 Habitat Shifting & Alteration	Climate variability (intensification or alteration of normal weather patterns, e.g., droughts)	8.0 Research & Monitoring		Conduct primary research on species and habitat responses to changing climate	M			
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	M			
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	M			
08.1 Invasive Non-Native/Alien Species	Invasive animals - bullfrogs	2.2 Invasive/Problematic Species Control		Control bullfrogs using accepted integrated pest management techniques for aquatic habitats	L			
<b>Couch's spadefoot</b>		Population Status and Trend		Distribution	Type	Habitat	Primary	
	Medium	X	Stable	X	Central Shortgrass Prairie	P	Shortgrass Prairie	<input checked="" type="checkbox"/>
<i>Scaphiopus couchii</i>							Wetlands	<input checked="" type="checkbox"/>
Tier 2	Amphibians							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority			
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing); develop and implement monitoring plan	H			
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	1.2 Resource & Habitat Protection		Acquire conservation easement for habitat protection	M			
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration		Maintain appropriate patch size and habitat mosaic	M			
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.2 Policies & Regulations		Encourage use of Farm Bill and other incentive programs	M			
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production	M			
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - threat is not well understood	8.0 Research & Monitoring		Research species/habitat response to management	M			
11.2 Droughts	Climate variability (intensification or alteration of normal weather patterns, e.g., droughts)	8.0 Research & Monitoring		Conduct primary research on species and habitat responses to changing climate	L			

**Table 7 - Continued.**

<b>Great Basin spadefoot</b>		Population Status and Trend		Distribution	Type	Habitat	Primary	
	Unknown	Unknown		Colorado Plateau		Desert Shrub	<input checked="" type="checkbox"/>	
				Utah High Plateau		Pinyon - Juniper	<input checked="" type="checkbox"/>	
<i>Spea intermontana</i>				Utah-Wyoming Rocky Mountains		Sagebrush	<input checked="" type="checkbox"/>	
Tier 2	Amphibians			Wyoming Basin				
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority			
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring		Research population parameters and/or monitor status; develop and implement monitoring plan	H			
03.1 Oil & Gas Drilling	Fragmentation of habitat (roads, culverts, etc.); impact on quality, impact on ground water availability; sedimentation of ponds; loss of habitat	2.1 Site/Area Management		Work with state and federal partners to limit oil/gas leasing and development	M			
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	M			
11.1 Habitat Shifting & Alteration	Climate variability (intensification or alteration of normal weather patterns, e.g., droughts)	8.0 Research & Monitoring		Conduct primary research on species and habitat responses to changing climate	L			
<b>Great Plains narrowmouth toad</b>		Population Status and Trend		Distribution	Type	Habitat	Primary	
	Unknown	X	Unknown	X	Central Shortgrass Prairie	P	Eastern Plains Streams	<input checked="" type="checkbox"/>
							Wetlands	<input checked="" type="checkbox"/>
<i>Gastrophryne olivacea</i>								
Tier 2	Amphibians							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority			
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring		Research population parameters and/or monitor status; develop and implement monitoring plan	H			
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	M			
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration		Maintain appropriate patch size and habitat mosaic	L			
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production	L			
09.3 Agricultural & Forestry Effluents	Pesticide runoff	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production	L			
11.1 Habitat Shifting & Alteration	Climate variability (intensification or alteration of normal weather patterns, e.g., droughts)	8.0 Research & Monitoring		Conduct primary research on species and habitat responses to changing climate	L			
<b>Green toad</b>		Population Status and Trend		Distribution	Type	Habitat	Primary	
	Unknown	X	Unknown	X	Central Shortgrass Prairie	P	Eastern Plains Streams	<input checked="" type="checkbox"/>
							Shortgrass Prairie	<input type="checkbox"/>
<i>Anaxyrus debilis</i>								
Tier 2	Amphibians							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority			
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring		Research population parameters and/or monitor status; develop and implement monitoring plan	H			
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration		Maintain appropriate patch size and habitat mosaic	M			
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production	M			
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production	M			
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	M			

**Table 7 - Continued.**

<b>Plains leopard frog</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
	Medium	X	Declining	X	Central Shortgrass Prairie	P	Eastern Plains Rivers <input checked="" type="checkbox"/>
							Eastern Plains Streams <input checked="" type="checkbox"/>
							Riparian Woodlands and Shrublands <input checked="" type="checkbox"/>
							Wetlands <input checked="" type="checkbox"/>

*Lithobates blairi*

Tier 2 Amphibians

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
13.6 Response to change, disturbance, & other threats poorly understood	Lack of monitoring plan	8.0 Research & Monitoring	Develop and implement monitoring plan	H
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - threat is not well understood	8.0 Research & Monitoring	Research species/habitat response to management	M
08.1 Invasive Non-Native/Alien Species	Invasive animals - bullfrogs	2.2 Invasive/Problematic Species Control	Control bullfrogs using accepted integrated pest management techniques for aquatic habitats	M
09.3 Agricultural & Forestry Effluents	Water pollution	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	M
11.2 Droughts	Climate variability (intensification or alteration of normal weather patterns, e.g., droughts)	8.0 Research & Monitoring	Research population parameters and/or monitor status	L

**Wood frog**

		Population Status and Trend		Distribution	Type	Habitat	Primary
	Medium	D	Stable	D	Southern Rocky Mountains	P	Lakes <input checked="" type="checkbox"/>
							Mountain Streams <input checked="" type="checkbox"/>
							Riparian Woodlands and Shrublands <input checked="" type="checkbox"/>
							Wetlands <input checked="" type="checkbox"/>
							Aspen <input type="checkbox"/>
							Lodgepole Pine <input type="checkbox"/>
							Mixed Conifer <input type="checkbox"/>
							Spruce - Fir <input type="checkbox"/>

*Lithobates sylvatica*

Tier 2 Amphibians

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
13.6 Response to change, disturbance, & other threats poorly understood	Lack of monitoring plan	8.0 Research & Monitoring	Develop and implement monitoring plan	H
02.3 Livestock Farming & Ranching	Incompatible grazing	2.1 Site/Area Management	Implement compatible grazing practices	M
05.3 Logging & Wood Harvesting		2.1 Site/Area Management	Implement compatible forest management practices	M
11.2 Droughts	Climate variability (intensification or alteration of normal weather patterns, e.g., droughts)	8.0 Research & Monitoring	Conduct primary research on species and habitat responses to changing climate	L

Table 7 - Continued.

		Tier 2		Birds					
<b>American bittern</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
		Unknown	X	Unknown	X	Central Shortgrass Prairie	P	Wetlands	<input checked="" type="checkbox"/>
						Southern Rocky Mountains	P		
						Colorado Plateau			
						Front Range			
						Utah High Plateau			
						Utah-Wyoming Rocky Mountains			
						Wyoming Basin			
<i>Botaurus lentiginosus</i>									
Tier 2	Birds								
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority				
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations		Promote consideration of biodiversity issues in transportation and land use planning processes	M				
06.1 Recreational Activities	Motorized and non-motorized recreation	4.3 Awareness & Communications		Publish educational material/sponsor educational programs to raise public awareness	M				
07.3 Other Ecosystem Modifications	Natural system modification - wetland filling, eutrophication, siltation	2.3 Habitat & Natural Process Restoration		Restore native habitat (wetlands)	M				
07.3 Other Ecosystem Modifications	Natural system modification - wetland filling, eutrophication, siltation	5.4 Compliance & Enforcement		Enforce 404 wetlands regulations	M				
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production	M				
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring		Research population parameters and/or monitor status	L				
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	L				
<b>American peregrine falcon</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
		Medium	D	Increasing	D	Central Shortgrass Prairie	P	Cliffs and Canyons	<input checked="" type="checkbox"/>
						Colorado Plateau	P	Colorado Plateau - Wyoming	<input type="checkbox"/>
						Southern Rocky Mountains	P	Basins Rivers	<input type="checkbox"/>
						Utah High Plateau	P	Colorado Plateau - Wyoming	<input type="checkbox"/>
						Utah-Wyoming Rocky Mountains	P	Basins Streams	<input type="checkbox"/>
						Wyoming Basin	P	Eastern Plains Rivers	<input type="checkbox"/>
							p	Eastern Plains Streams	<input type="checkbox"/>
								Mountain Streams	<input type="checkbox"/>
								Pinyon - Juniper	<input type="checkbox"/>
								Playas	<input type="checkbox"/>
								Ponderosa Pine	<input type="checkbox"/>
								Transition Streams	<input type="checkbox"/>
								Wetlands	<input type="checkbox"/>
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority				
06.1 Recreational Activities	Rock climbing, hiking near cliffs and crevices	2.1 Site/Area Management		Establish exclusionary/boundary fencing, formal wildlife viewing stations/areas, signage to raise public awareness, seasonal closures	M				
06.1 Recreational Activities	Rock climbing, hiking near cliffs and crevices	4.3 Awareness & Communications		Publish educational material/sponsor educational programs to raise public awareness	M				

**Table 7 - Continued.**

<b>American white pelican</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
Tier 2	Birds	Low	D	Stable	D	Central Shortgrass Prairie	P	Reservoirs and Shorelines	<input checked="" type="checkbox"/>
						Southern Rocky Mountains	P	Colorado Plateau - Wyoming Basins Rivers	<input type="checkbox"/>
								Eastern Plains Rivers	<input type="checkbox"/>
<b>General Threat</b>		<b>Specific Threat</b>		<b>General Conservation Action</b>		<b>Specific Conservation Action</b>	<b>Priority</b>		
06.1 Recreational Activities		Motorized and non-motorized recreation		4.3 Awareness & Communications		Publish educational material/sponsor educational programs to raise public awareness	M		
07.2 Dams & Water Management/Use		Altered hydrological regime (fluctuating water levels)		3.1 Species Management		Develop collaborative management agreements	M		
09.3 Agricultural & Forestry Effluents		Herbicide/pesticide spraying or runoff		5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production	M		
14.4 Predation		Nest predation		8.0 Research & Monitoring		Research population parameters and/or monitor status	L		

<b>Bald eagle</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
Tier 2	Birds	Low	D	Increasing	D	Central Shortgrass Prairie	P	Colorado Plateau - Wyoming Basins Streams	<input checked="" type="checkbox"/>
						Colorado Plateau	p	Eastern Plains Rivers	<input checked="" type="checkbox"/>
						Front Range	p	Eastern Plains Streams	<input checked="" type="checkbox"/>
						Southern Rocky Mountains	p	Riparian Woodlands and Shrublands	<input checked="" type="checkbox"/>
						Utah High Plateau	p	Transition Streams	<input checked="" type="checkbox"/>
						Utah-Wyoming Rocky Mountains	P	Agriculture	<input type="checkbox"/>
						Wyoming Basin	p	Foothill and Mountain Grasslands	<input type="checkbox"/>
								Mixed and Tallgrass Prairies	<input type="checkbox"/>
		Mountain Streams	<input type="checkbox"/>						
		Playas	<input type="checkbox"/>						
		Shortgrass Prairie	<input type="checkbox"/>						
		Wetlands	<input type="checkbox"/>						

<b>General Threat</b>		<b>Specific Threat</b>		<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>
01.1 Housing & Urban Areas		Urban, suburban, and ex-urban development		2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	M
01.1 Housing & Urban Areas		Urban, suburban, and ex-urban development		5.3 Private Sector Standards & Codes	Implement Best Management Practices for transportation projects, urban development, landscaping, etc.	M
03.1 Oil & Gas Drilling		Oil & gas development, pipelines, and infrastructure		5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	M
03.3 Renewable Energy		Collision with wind turbines		5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	M
06.1 Recreational Activities		Motorized and non-motorized recreation		1.2 Resource & Habitat Protection	Establish exclusionary/boundary fencing, formal wildlife viewing stations/areas, signage to raise public awareness, seasonal closures	M
06.1 Recreational Activities		Motorized and non-motorized recreation		2.1 Site/Area Management	Coordinate on ecologically sensitive design of recreational facilities	M
06.3 Work & Other Activities		Flight paths, proximal non-recreation disturbance		4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	M
07.3 Other Ecosystem Modifications		Altered native vegetation (loss of shoreline nesting, roosting, and perching habitat)		2.3 Habitat & Natural Process Restoration	Plant native trees/shrubs	L
09.3 Agricultural & Forestry Effluents		Herbicide/pesticide spraying or runoff		5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	L



**Table 7 - Continued.**

<b>Band-tailed pigeon</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Tier 2	Birds	Low	D	Unknown	X	Front Range	<input checked="" type="checkbox"/>
						Southern Rocky Mountains	<input checked="" type="checkbox"/>
						Colorado Plateau	<input type="checkbox"/>
						Utah High Plateau	<input checked="" type="checkbox"/>
						Utah-Wyoming Rocky Mountains	<input checked="" type="checkbox"/>
						Wyoming Basin	<input type="checkbox"/>
							<input type="checkbox"/>
							<input type="checkbox"/>
							<input type="checkbox"/>
							<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
02.1 Annual & Perennial Non-Timber Crops	Conversion of grain crops to alfalfa	7.2 Alliance & Partnership Development	Develop partnerships to help maintain small grain farming	M
07.3 Other Ecosystem Modifications	Habitat degradation	2.3 Habitat & Natural Process Restoration	Restore native habitat (mountain shrublands)	M
05.3 Logging & Wood Harvesting	Forest and woodland management	2.1 Site/Area Management	Implement compatible forest management practices	L
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	L

<b>Barrow's goldeneye</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Tier 2	Birds	Low	D	Stable	D	Southern Rocky Mountains	<input checked="" type="checkbox"/>
							<input checked="" type="checkbox"/>
						Colorado Plateau - Wyoming Basins Rivers	<input type="checkbox"/>
						Colorado Plateau - Wyoming Basins Streams	<input type="checkbox"/>
						Mountain Streams	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
06.1 Recreational Activities	Motorized and non-motorized recreation	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	M
05.3 Logging & Wood Harvesting	Altered native vegetation (salvage logging removing cavity trees)	2.1 Site/Area Management	Implement compatible forest management practices	L

<b>Black rosy-finch</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Tier 2	Birds	Low	D	Unknown	X	Southern Rocky Mountains	<input checked="" type="checkbox"/>
						Utah-Wyoming Rocky Mountains	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
03.2 Mining & Quarrying	Mining operations	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	M
07.3 Other Ecosystem Modifications	Habitat degradation	2.3 Habitat & Natural Process Restoration	Restore mixed conifer winter habitat, including fire mitigation and insect outbreak mitigation	M
11.1 Habitat Shifting & Alteration	Habitat shifting and alteration due to climate change	8.0 Research & Monitoring	Conduct primary research on species and habitat responses to changing climate	M
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	L
14.4 Predation	Nest predation (increased by Common Ravens drawn above treeline by trash)	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	L

**Table 7 - Continued.**

**Black swift**

Population Status and Trend		Distribution	Type	Habitat	Primary	
Low	D	Stable	D	Southern Rocky Mountains	P	Cliffs and Canyons <input checked="" type="checkbox"/>
						Colorado Plateau - Wyoming Basins Streams <input checked="" type="checkbox"/>
						Mountain Streams <input checked="" type="checkbox"/>

*Cypseloides niger*

Tier 2 Birds

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
06.1 Recreational Activities	Rock climbing	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	M
11.1 Habitat Shifting & Alteration	Potential for degradation of nesting habitat related to climate impacts on water resources	8.0 Research & Monitoring	Conduct primary research on species and habitat responses to changing climate	M
13.6 Response to change, disturbance, & other threats poorly understood	Lack of monitoring plan	8.0 Research & Monitoring	Research population parameters and/or monitor status	M

**Black tern**

Population Status and Trend		Distribution	Type	Habitat	Primary	
Low	X	Stable	X	Southern Rocky Mountains	P	Wetlands <input checked="" type="checkbox"/>

*Chlidonias niger*

Tier 2 Birds

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
02.1 Annual & Perennial Non-Timber Crops	Drainage of wetlands for agriculture	5.4 Compliance & Enforcement	Enforce 404 wetlands regulations	M
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	M

**Bobolink**

Population Status and Trend		Distribution	Type	Habitat	Primary	
Low	D	Stable	D	Central Shortgrass Prairie	P	Agriculture <input checked="" type="checkbox"/>
				Southern Rocky Mountains	P	Foothill and Mountain <input checked="" type="checkbox"/>
				Utah High Plateau	P	Grasslands <input checked="" type="checkbox"/>
				Wyoming Basin	O	Mixed and Tallgrass Prairies <input checked="" type="checkbox"/>
						Conservation Reserve Program <input type="checkbox"/>

*Dolichonyx oryzivorus*

Tier 2 Birds

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
07.3 Other Ecosystem Modifications	Decrease in hay field area, earlier/more frequent hay-cropping, shift in vegetative structure	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context (e.g., delayed haying)	M

**Boreal owl**

Population Status and Trend		Distribution	Type	Habitat	Primary	
Medium	X	Declining	X	Southern Rocky Mountains	P	Lodgepole Pine <input checked="" type="checkbox"/>
						Spruce - Fir <input checked="" type="checkbox"/>
						Aspen <input type="checkbox"/>
						Pinyon - Juniper <input type="checkbox"/>
						Ponderosa Pine <input type="checkbox"/>
						Subalpine Limber - Bristlecone Pine <input type="checkbox"/>

*Aegolius funereus*

Tier 2 Birds

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
11.1 Habitat Shifting & Alteration	Potential for heat stress & habitat degradation related to increased temperatures, worsening wildfires	8.0 Research & Monitoring	Conduct primary research on species and habitat responses to changing climate	M
13.4 Population status unknown	Status estimated as medium, but additional data are needed	8.0 Research & Monitoring	Research population parameters and/or monitor status	M
05.3 Logging & Wood Harvesting	Altered native vegetation	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	L

**Table 7 - Continued.**

**Brewer's sparrow**

*Spizella breweri*

Tier 2 Birds

Population Status and Trend		Distribution	Type	Habitat	Primary	
Abundant	D	Declining	D	Central Shortgrass Prairie	P	Sagebrush <input checked="" type="checkbox"/>
				Colorado Plateau	P	Agriculture <input type="checkbox"/>
				Front Range	P	Conservation Reserve Program <input type="checkbox"/>
				Southern Rocky Mountains	P	Desert Shrub <input type="checkbox"/>
				Utah High Plateau	P	Greasewood <input type="checkbox"/>
				Utah-Wyoming Rocky Mountains	P	Saltbush <input type="checkbox"/>
				Wyoming Basin	P	Sandsage <input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	H
02.3 Livestock Farming & Ranching	Altered native vegetation (burning, herbicide, or mechanical sagebrush removal)	2.1 Site/Area Management	Implement compatible grazing practices	H
02.3 Livestock Farming & Ranching	Altered native vegetation (incompatible timing, intensity, duration of grazing)	2.1 Site/Area Management	Employ grazing as a tool for compatible vegetation cover, structure, composition	H
07.3 Other Ecosystem Modifications	Habitat degradation from a variety of sources	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	H
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations	Promote consideration of biodiversity issues in transportation and land use planning processes	M
02.3 Livestock Farming & Ranching	Altered native vegetation (sagebrush removal, incompatible timing, intensity, duration of grazing)	2.3 Habitat & Natural Process Restoration	Restore native habitat, including restoration of understory species, sagebrush, and riparian vegetation, reseeding of native species, and maintenance of appropriate patch size and habitat mosaic	M
02.3 Livestock Farming & Ranching	Altered native vegetation (sagebrush removal, incompatible timing, intensity, duration of grazing)	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs	M
03.1 Oil & Gas Drilling	Oil & Gas development, pipelines, and infrastructure	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	M
07.1 Fire & Fire Suppression	Altered fire regime	2.3 Habitat & Natural Process Restoration	Restore natural fire regime	M
07.3 Other Ecosystem Modifications	Habitat degradation from a variety of threats	2.3 Habitat & Natural Process Restoration	Restore native habitat, including restoration of understory species, sagebrush, and riparian vegetation, reseeding of native species, and maintenance of appropriate patch size and habitat mosaic	M
08.1 Invasive Non-Native/Alien Species	Invasive plants - cheatgrass	2.2 Invasive/Problematic Species Control	Write and/or implement integrated weed/pest management plan	M
02.3 Livestock Farming & Ranching	Range improvement operations	2.1 Site/Area Management	Implement compatible grazing practices	L
06.1 Recreational Activities	Motorized and non-motorized recreation	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	L

**Table 7 - Continued.**

**Cassin's finch**

Population Status and Trend		Distribution	Type	Habitat	Primary		
Medium	D	Declining	D	Colorado Plateau	P	Aspen	<input checked="" type="checkbox"/>
				Front Range	P	Lodgepole Pine	<input checked="" type="checkbox"/>
				Southern Rocky Mountains	P	Mixed Conifer	<input checked="" type="checkbox"/>
				Utah High Plateau	P	Pinyon - Juniper	<input checked="" type="checkbox"/>
				Utah-Wyoming Rocky Mountains	P	Ponderosa Pine	<input checked="" type="checkbox"/>
				Central Shortgrass Prairie	O	Spruce - Fir	<input checked="" type="checkbox"/>
				Wyoming Basin	O	Subalpine Limber - Bristlecone Pine	<input checked="" type="checkbox"/>

*Peucaea cassinii*  
Tier 2 Birds

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
13.6 Response to change, disturbance, & other threats poorly understood	Threats are poorly understood	8.0 Research & Monitoring	Research population parameters and/or monitor status	M

**Cassin's sparrow**

Population Status and Trend		Distribution	Type	Habitat	Primary		
Medium	D	Declining	D	Central Shortgrass Prairie	P	Mixed and Tallgrass Prairies	<input checked="" type="checkbox"/>
				Front Range	O	Sandsage	<input checked="" type="checkbox"/>
						Shortgrass Prairie	<input checked="" type="checkbox"/>
						Agriculture	<input type="checkbox"/>
						Conservation Reserve Program	<input type="checkbox"/>
						Sagebrush	<input type="checkbox"/>
						Upland Shrub	<input type="checkbox"/>

*Aimophila cassinii*  
Tier 2 Birds

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
02.3 Livestock Farming & Ranching	Altered native vegetation (sagebrush removal, incompatible timing, intensity, duration of grazing)	2.1 Site/Area Management	Implement compatible grazing practices	M
02.3 Livestock Farming & Ranching	Altered native vegetation (sagebrush removal, incompatible timing, intensity, duration of grazing)	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs	M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations	Promote zoning that concentrates use and protects habitat	L

**Chestnut-collared longspur**

Population Status and Trend		Distribution	Type	Habitat	Primary		
Low	D	Unknown	X	Central Shortgrass Prairie	P	Mixed and Tallgrass Prairies	<input checked="" type="checkbox"/>
						Shortgrass Prairie	<input checked="" type="checkbox"/>
						Agriculture	<input type="checkbox"/>
						Conservation Reserve Program	<input type="checkbox"/>

*Calcarius ornatus*  
Tier 2 Birds

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	H
02.3 Livestock Farming & Ranching	Altered native vegetation (incompatible timing, intensity, duration of grazing)	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs	M
02.3 Livestock Farming & Ranching	Incompatible timing, intensity, duration of grazing or improved range	2.1 Site/Area Management	Implement compatible grazing practices	M
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	M
11.4 Storms & Flooding	Climate variability (prolonged rain events and cold weather can cause nest failure)	8.0 Research & Monitoring	Research population parameters and/or monitor status	L
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	L
14.4 Predation	Predation	8.0 Research & Monitoring	Research population parameters and/or monitor status	L

**Table 7 - Continued.**

<b>Ferruginous hawk</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
		Low	D				
Tier 2	Birds			Central Shortgrass Prairie	P	Foothill and Mountain Grasslands	<input checked="" type="checkbox"/>
				Utah-Wyoming Rocky Mountains	P	Mixed and Tallgrass Prairies	<input checked="" type="checkbox"/>
				Wyoming Basin	P	Shortgrass Prairie	<input checked="" type="checkbox"/>
				Colorado Plateau	O	Agriculture	<input type="checkbox"/>
				Front Range	O	Cliffs and Canyons	<input type="checkbox"/>
				Southern Rocky Mountains	O	Conservation Reserve Program	<input type="checkbox"/>
				Utah High Plateau	O	Desert Shrub	<input type="checkbox"/>
						Greasewood	<input type="checkbox"/>
						Pinyon - Juniper	<input type="checkbox"/>
						Sagebrush	<input type="checkbox"/>
						Saltbush	<input type="checkbox"/>
						Sandsage	<input type="checkbox"/>
						Upland Shrub	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	M
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Secondary poisoning (anticoagulants, lead shot)	5.2 Policies & Regulations	Monitor for potential impacts and respond as warranted by local conditions	M
08.4 Pathogens	Loss of prairie dog colonies due to sylvatic plague	8.0 Research & Monitoring	Research species/habitat response to plague management	M
03.3 Renewable Energy	Collision with wind turbines	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	L
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Mortality and prey reduction through rodent control	4.3 Awareness & Communications	Implement landowner outreach/education program	L
06.1 Recreational Activities	Motorized and non-motorized recreation, proximal non-recreation disturbance of nest locations	4.3 Awareness & Communications	Implement landowner outreach/education program	L
08.1 Invasive Non-Native/Alien Species	Invasive plants - cheatgrass, Russian thistle	2.2 Invasive/Problematic Species Control	Write and/or implement integrated weed/pest management plan	L

<b>Flammulated owl</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
		Unknown	X				
Tier 2	Birds			Colorado Plateau	P	Aspen	<input checked="" type="checkbox"/>
				Southern Rocky Mountains	P	Ponderosa Pine	<input checked="" type="checkbox"/>
				Utah High Plateau	P	Mixed Conifer	<input type="checkbox"/>
				Front Range	O	Spruce - Fir	<input type="checkbox"/>
				Utah-Wyoming Rocky Mountains	O	Subalpine Limber - Bristlecone Pine	<input type="checkbox"/>
				Wyoming Basin	O		

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	M
05.3 Logging & Wood Harvesting	Altered native vegetation (salvage logging removing cavity trees)	2.1 Site/Area Management	Implement compatible forest management practices	L
08.1 Invasive Non-Native/Alien Species	Invasive animals - European starlings	2.2 Invasive/Problematic Species Control	Maintain appropriate patch size and habitat mosaic	L
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring	Research population parameters and/or monitor status	L
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	L
14.3 Low reproductive rate	Low reproductive rate	8.0 Research & Monitoring	Research population parameters and/or monitor status	L

**Table 7 - Continued.**

<b>Grace's warbler</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Low	D	Unknown	X	Colorado Plateau	P	Oak and Mixed Mountain Shrublands	<input checked="" type="checkbox"/>
				Southern Rocky Mountains	O	Ponderosa Pine	<input checked="" type="checkbox"/>

*Setophaga graciae*

Tier 2 Birds

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
07.1 Fire & Fire Suppression	Altered fire regime (fire suppression leading to high intensity fires)	2.3 Habitat & Natural Process Restoration	Restore natural fire regime and mountain shrub/ponderosa pine habitats	M
05.3 Logging & Wood Harvesting	Altered native vegetation (clearcutting)	5.3 Private Sector Standards & Codes	Implement Best Management Practices for forestry	L
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	L

<b>Grasshopper sparrow</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Medium	D	Declining	D	Central Shortgrass Prairie	P	Conservation Reserve Program	<input checked="" type="checkbox"/>
				Front Range	O	Shortgrass Prairie	<input checked="" type="checkbox"/>

*Ammodramus savannarum*

Tier 2 Birds

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	H
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs	H
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	L

<b>Gray vireo</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Low	D	Unknown	X	Central Shortgrass Prairie	P	Pinyon - Juniper	<input checked="" type="checkbox"/>
				Colorado Plateau	P		
				Utah High Plateau	P		
				Southern Rocky Mountains	O		
				Utah-Wyoming Rocky Mountains	O		
				Wyoming Basin	O		

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
02.3 Livestock Farming & Ranching	Altered native vegetation (grazing intensity, tree/shrub clearing)	2.1 Site/Area Management	Implement compatible grazing practices	M
02.3 Livestock Farming & Ranching	Altered native vegetation (incompatible timing, intensity, duration of grazing)	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs	M
05.3 Logging & Wood Harvesting	Natural system modification - illegal firewood cutting	5.4 Compliance & Enforcement	Enforce hunting, fishing, collecting regulations	L
08.2 Problematic Native Species	Habitat loss due to insect damage and fire	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	L
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	L

**Table 7 - Continued.**

<b>Greater prairie-chicken</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
	Medium	D	Stable	D	Central Shortgrass Prairie	P	Agriculture <input checked="" type="checkbox"/>
							Sandsage <input checked="" type="checkbox"/>
							Conservation Reserve Program <input type="checkbox"/>
<i>Tympanuchus cupido</i>							
Tier 2 Birds							
General Threat	Specific Threat			General Conservation Action	Specific Conservation Action		Priority
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland			2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic		H
02.3 Livestock Farming & Ranching	Incompatible timing, intensity, duration of grazing or improved range			2.1 Site/Area Management	Implement compatible grazing practices		H
02.3 Livestock Farming & Ranching	Incompatible timing, intensity, duration of grazing or improved range			5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs		H
02.3 Livestock Farming & Ranching	Incompatible timing, intensity, duration of grazing or improved range			6.4 Conservation Payments	Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)		H
03.1 Oil & Gas Drilling	Behavioral avoidance of oil & gas development and associated infrastructure			5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining		H
03.1 Oil & Gas Drilling	Fragmentation of native habitat due to oil & gas development and associated infrastructure			5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining		H
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure			5.2 Policies & Regulations	Establish mitigation requirements for developments and other projects that impact species/habitats		H
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure			5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining		H
03.3 Renewable Energy	Behavioral avoidance of renewable energy development and associated infrastructure			5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining		H
03.3 Renewable Energy	Fragmentation of native habitat due to renewable energy development and associated infrastructure			5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining		H
03.3 Renewable Energy	Renewable energy development			5.2 Policies & Regulations	Establish mitigation requirements for developments and other projects that impact species/habitats		H
03.3 Renewable Energy	Renewable energy development			5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining		H
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland			1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection		M
07.3 Other Ecosystem Modifications	Fragmentation of native prairie			1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection		M
08.1 Invasive Non-Native/Alien Species	Invasive plants - cheatgrass			2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context		M
08.2 Problematic Native Species	Predation and parasites			8.0 Research & Monitoring	Research population parameters and/or monitor status		M
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff			5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production		M
11.1 Habitat Shifting & Alteration	Habitat shifting and alteration due to climate change			8.0 Research & Monitoring	Conduct primary research on species and habitat responses to changing climate		M
11.2 Droughts	Lack of water due to drought and exacerbated by climate change			2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic		M

**Table 7 - Continued.**

**Juniper titmouse**

Population Status and Trend		Distribution	Type	Habitat	Primary	
Medium	D	Declining	D	Central Shortgrass Prairie Colorado Plateau Southern Rocky Mountains Utah High Plateau Utah-Wyoming Rocky Mountains Wyoming Basin	P P P P P P	Pinyon - Juniper <input checked="" type="checkbox"/>

*Baeolophus ridgwayi*

Tier 2 Birds

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
02.3 Livestock Farming & Ranching	Altered native vegetation (grazing intensity, tree/shrub clearing)	2.1 Site/Area Management	Implement compatible grazing practices	M
02.3 Livestock Farming & Ranching	Altered native vegetation (incompatible timing, intensity, duration of grazing)	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs	M
05.3 Logging & Wood Harvesting	Natural system modification - illegal firewood cutting, commercial pinon nut collecting	5.4 Compliance & Enforcement	Enforce hunting, fishing, collecting regulations	L
08.2 Problematic Native Species	Habitat loss due to insect damage and fire	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	L

**Lark bunting**

Population Status and Trend		Distribution	Type	Habitat	Primary		
Low	D	Declining	D	Central Shortgrass Prairie Front Range Southern Rocky Mountains Utah High Plateau Wyoming Basin Colorado Plateau Utah-Wyoming Rocky Mountains	P P P P P O O	Agriculture Desert Shrub Mixed and Tallgrass Prairies Shortgrass Prairie Conservation Reserve Program Foothill and Mountain Grasslands Playas Sagebrush	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

*Calamospiza melanocorys*

Tier 2 Birds

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
02.1 Annual & Perennial Non-Timber Crops	Intensive agricultural operations	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	M
02.3 Livestock Farming & Ranching	Altered native vegetation (sagebrush removal, incompatible timing, intensity, duration of grazing)	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs	M
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff (grasshopper control)	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	M
02.3 Livestock Farming & Ranching	Mortality at stock tanks from drowning	5.3 Private Sector Standards & Codes	Implement Best Management Practices for livestock grazing	L



**Table 7 - Continued.**

<b>Lazuli bunting</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
		Medium	D				
Tier 2	Birds			Central Shortgrass Prairie	P	Oak and Mixed Mountain Shrublands	<input checked="" type="checkbox"/>
						Front Range	<input checked="" type="checkbox"/>
						Southern Rocky Mountains	<input checked="" type="checkbox"/>
						Utah High Plateau	<input checked="" type="checkbox"/>
						Utah-Wyoming Rocky Mountains	<input checked="" type="checkbox"/>
						Wyoming Basin	<input type="checkbox"/>
						Colorado Plateau - Wyoming Basins Rivers	<input type="checkbox"/>
						Colorado Plateau - Wyoming Basins Streams	<input type="checkbox"/>
						Eastern Plains Rivers	<input type="checkbox"/>
						Eastern Plains Streams	<input type="checkbox"/>
						Mountain Streams	<input type="checkbox"/>
						Transition Streams	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
07.3 Other Ecosystem Modifications	Altered native vegetation	2.3 Habitat & Natural Process Restoration	Plant native trees/shrubs	L

<b>Least tern</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
		Low	D				
Tier 2	Birds			Central Shortgrass Prairie	P	Playas	<input checked="" type="checkbox"/>
						Reservoirs and Shorelines	<input checked="" type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
08.1 Invasive Non-Native/Alien Species	Invasive plants - tamarisk	2.2 Invasive/Problematic Species Control	Remove tamarisk through biological, chemical, mechanical means and prevent re-establishment via water management and physical/chemical control	H
02.3 Livestock Farming & Ranching	Altered native vegetation (incompatible timing, intensity, duration of grazing)	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs	M
02.3 Livestock Farming & Ranching	Egg trampling	2.1 Site/Area Management	Implement compatible grazing practices	M
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer)	5.3 Private Sector Standards & Codes	Implement Best Management Practices for water resource development	M
09.1 Household Sewage & Urban Waste Water	Water pollution	5.2 Policies & Regulations	Monitor water quality standards	M
06.1 Recreational Activities	Motorized and non-motorized recreation	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	L
07.2 Dams & Water Management/Use	Decreased water quality and/or quantity (water level, desalination projects)	1.2 Resource & Habitat Protection	Acquire water rights or instream flow rights	L
14.4 Predation	Predation	8.0 Research & Monitoring	Research population parameters and/or monitor status	L

**Table 7 - Continued.**

<b>Lewis's woodpecker</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
Tier 2	Birds	Medium	D	Declining	X	Central Shortgrass Prairie	P	Colorado Plateau - Wyoming Basins Streams	<input checked="" type="checkbox"/>
						Front Range	p	Eastern Plains Rivers	<input checked="" type="checkbox"/>
						Southern Rocky Mountains	p	Eastern Plains Streams	<input checked="" type="checkbox"/>
						Utah-Wyoming Rocky Mountains	O	Pinyon - Juniper	<input checked="" type="checkbox"/>
						Wyoming Basin	O	Ponderosa Pine	<input checked="" type="checkbox"/>
								Riparian Woodlands and Shrublands	<input checked="" type="checkbox"/>
								Transition Streams	<input checked="" type="checkbox"/>
		Agriculture	<input type="checkbox"/>						

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
05.3 Logging & Wood Harvesting	Altered native vegetation (removal of snags)	2.1 Site/Area Management	Implement compatible forest management practices	M
07.1 Fire & Fire Suppression	Altered fire regime	2.3 Habitat & Natural Process Restoration	Restore natural fire regime	M
07.3 Other Ecosystem Modifications	Habitat degradation	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	M
02.3 Livestock Farming & Ranching	Incompatible timing, intensity, duration of grazing or improved range	2.1 Site/Area Management	Implement compatible grazing practices	L
08.1 Invasive Non-Native/Alien Species	Invasive plants - tamarisk	2.2 Invasive/Problematic Species Control	Control non-native plants using accepted techniques appropriate to site-specific conditions	L

<b>Loggerhead shrike</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
Tier 2	Birds	Medium	D	Stable	D	Central Shortgrass Prairie	P	Desert Shrub	<input checked="" type="checkbox"/>
						Colorado Plateau	P	Foothill and Mountain Grasslands	<input checked="" type="checkbox"/>
						Front Range	p	Grasslands	<input checked="" type="checkbox"/>
						Southern Rocky Mountains	p	Greasewood	<input checked="" type="checkbox"/>
						Utah High Plateau	p	Mixed and Tallgrass Prairies	<input checked="" type="checkbox"/>
						Utah-Wyoming Rocky Mountains	p	Sagebrush	<input checked="" type="checkbox"/>
						Wyoming Basin	P	Saltbush	<input checked="" type="checkbox"/>
		Sandsage	<input checked="" type="checkbox"/>						
		Shortgrass Prairie	<input checked="" type="checkbox"/>						
		Agriculture	<input type="checkbox"/>						

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	M

**Table 7 - Continued.**

<b>Long-billed curlew</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
		Low	D				
Tier 2	Birds					Playas	<input checked="" type="checkbox"/>
						Shortgrass Prairie	<input checked="" type="checkbox"/>
						Agriculture	<input type="checkbox"/>
						Eastern Plains Rivers	<input type="checkbox"/>
						Eastern Plains Streams	<input type="checkbox"/>
						Mixed and Tallgrass Prairies	<input type="checkbox"/>
						Sandsage	<input type="checkbox"/>
Wetlands	<input type="checkbox"/>						

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection. Playa conservation would benefit this species.	M
02.3 Livestock Farming & Ranching	Altered native vegetation (degradation of native shortgrass prairie)	2.1 Site/Area Management	Implement compatible grazing practices	M
02.3 Livestock Farming & Ranching	Altered native vegetation (incompatible timing, intensity, duration of grazing)	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs	M
09.3 Agricultural & Forestry Effluents	General water pollution, herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	M
06.1 Recreational Activities	Motorized and non-motorized recreation	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	L

<b>McCown's longspur</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
		Low	D				
Tier 2	Birds					Shortgrass Prairie	<input checked="" type="checkbox"/>
						Agriculture	<input type="checkbox"/>
						Conservation Reserve Program	<input type="checkbox"/>
						Playas	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
02.3 Livestock Farming & Ranching	Altered native vegetation (degradation of native shortgrass prairie)	2.1 Site/Area Management	Implement compatible grazing practices	M
02.3 Livestock Farming & Ranching	Altered native vegetation (incompatible timing, intensity, duration of grazing)	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs	M
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	M
14.4 Predation	Nest predation	2.1 Site/Area Management	Implement compatible grazing practices	M
06.1 Recreational Activities	Motorized and non-motorized recreation	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	L
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	L

**Table 7 - Continued.**

**Mexican spotted owl**

		Population Status and Trend		Distribution	Type	Habitat	Primary		
Tier 2	Birds	Low	D	Unknown	X	Colorado Plateau	P	Cliffs and Canyons	<input checked="" type="checkbox"/>
						Southern Rocky Mountains	P	Mixed Conifer	<input checked="" type="checkbox"/>
						Central Shortgrass Prairie	O	Pinyon - Juniper	<input checked="" type="checkbox"/>
						Front Range	O	Ponderosa Pine	<input checked="" type="checkbox"/>
								Transition Streams	<input checked="" type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
03.2 Mining & Quarrying	Rock mining in nesting & winter habitat in El Paso and Fremont counties	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	M
04.4 Flight Paths	Low-flying military jets and helicopters	7.2 Alliance & Partnership Development	Engage in collaborative, proactive planning and conservation programs - work with the Army on Integrated Natural Resource Management Plan	M
07.1 Fire & Fire Suppression	Altered fire regime	2.3 Habitat & Natural Process Restoration	Restore natural fire regime	M
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	M
05.3 Logging & Wood Harvesting	Altered native vegetation (even-age timber management)	5.3 Private Sector Standards & Codes	Implement Best Management Practices for forestry	L

**Table 7 - Continued.**

<b>Northern bobwhite</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>	
		Low	X	Declining	X	Central Shortgrass Prairie	P	Agriculture <input checked="" type="checkbox"/>
						Riparian Woodlands and Shrublands		<input checked="" type="checkbox"/>
						Sandsage		<input checked="" type="checkbox"/>
						Conservation Reserve Program		<input type="checkbox"/>
						Eastern Plains Streams		<input type="checkbox"/>
						Mixed and Tallgrass Prairies		<input type="checkbox"/>
<i>Colinus virginianus</i>								
Tier 2	Birds							
<b>General Threat</b>	<b>Specific Threat</b>	<b>General Conservation Action</b>		<b>Specific Conservation Action</b>	<b>Priority</b>			
02.3 Livestock Farming & Ranching	Altered native vegetation	2.1 Site/Area Management		Implement compatible grazing practices	H			
02.3 Livestock Farming & Ranching	Incompatible timing, intensity, duration of grazing or improved range	2.1 Site/Area Management		Implement compatible grazing practices	H			
02.3 Livestock Farming & Ranching	Reduced grass/forb diversity	2.1 Site/Area Management		Implement compatible grazing practices	H			
08.1 Invasive Non-Native/Alien Species	Invasive plants - tamarisk, cheatgrass, Canada thistle, leafy spurge	2.2 Invasive/Problematic Species Control		Write and/or implement integrated weed/pest management plan	H			
11.2 Droughts	Lack of water for habitat	8.0 Research & Monitoring		Conduct primary research on species and habitat responses to changing climate	H			
11.4 Storms & Flooding	Blizzards and impact of hail and flooding on chicks and adults	8.0 Research & Monitoring		Conduct primary research on species and habitat responses to changing climate	H			
02.3 Livestock Farming & Ranching	Altered native vegetation	8.0 Research & Monitoring		Research species/habitat response to management	M			
02.3 Livestock Farming & Ranching	Altered native vegetation (incompatible timing, intensity, duration of grazing)	5.2 Policies & Regulations		Encourage use of Farm Bill and other incentive programs	M			
02.3 Livestock Farming & Ranching	Incompatible timing, intensity, duration of grazing or improved range	8.0 Research & Monitoring		Research species/habitat response to management	M			
02.3 Livestock Farming & Ranching	Reduced grass/forb diversity	8.0 Research & Monitoring		Research species/habitat response to management	M			
07.2 Dams & Water Management/Use	Seral state imbalance - suppression of early seral stages	2.3 Habitat & Natural Process Restoration		Employ grazing as a tool for compatible vegetation cover, structure, composition	M			
07.3 Other Ecosystem Modifications	Altered native vegetation (riparian area deforestation, denuding of wetland vegetation)	2.3 Habitat & Natural Process Restoration		Plant native trees/shrubs	M			
08.2 Problematic Native Species	Predation and parasites	8.0 Research & Monitoring		Research impact of parasites on bird survival	M			
02.3 Livestock Farming & Ranching	Egg trampling	8.0 Research & Monitoring		Research species/habitat response to management	L			
08.2 Problematic Native Species	Predation and parasites	3.2 Species Recovery		Reduce nest predators	L			



**Table 7 - Continued.**  
**Olive-sided flycatcher**

Population Status and Trend		Distribution	Type	Habitat	Primary		
Medium	D	Unknown	X	Colorado Plateau	P	Aspen	<input checked="" type="checkbox"/>
				Southern Rocky Mountains	P	Lodgepole Pine	<input checked="" type="checkbox"/>
				Front Range	O	Mixed Conifer	<input checked="" type="checkbox"/>
				Utah High Plateau	O	Pinyon - Juniper	<input checked="" type="checkbox"/>
						Ponderosa Pine	<input checked="" type="checkbox"/>
						Spruce - Fir	<input checked="" type="checkbox"/>
						Subalpine Limber - Bristlecone Pine	<input checked="" type="checkbox"/>
<b>General Threat</b>		<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>		
01.1 Housing & Urban Areas		Urban, suburban, and ex-urban development	5.2 Policies & Regulations	Promote zoning that concentrates use and protects habitat	M		
07.1 Fire & Fire Suppression		Altered fire regime	2.3 Habitat & Natural Process Restoration	Restore natural fire regime	M		
05.3 Logging & Wood Harvesting		Altered native vegetation (removal of snags)	2.1 Site/Area Management	Implement compatible forest management practices	L		
13.5 Population trend unknown		Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	L		

**Pinyon jay**

Population Status and Trend		Distribution	Type	Habitat	Primary		
Medium	D	Declining	D	Central Shortgrass Prairie	P	Pinyon - Juniper	<input checked="" type="checkbox"/>
				Colorado Plateau	P	Ponderosa Pine	<input checked="" type="checkbox"/>
				Southern Rocky Mountains	P	Subalpine Limber - Bristlecone Pine	<input checked="" type="checkbox"/>
				Utah High Plateau	P		
				Front Range	O		
				Utah-Wyoming Rocky Mountains	O		
				Wyoming Basin	O		
<b>General Threat</b>		<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>		
02.3 Livestock Farming & Ranching		Altered native vegetation (incompatible timing, intensity, duration of grazing)	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs	M		
02.3 Livestock Farming & Ranching		Tree removal	2.1 Site/Area Management	Implement compatible grazing practices	M		
08.2 Problematic Native Species		Habitat loss due to insect damage and fire	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	L		

**Piping plover**

Population Status and Trend		Distribution	Type	Habitat	Primary		
Low	D	Stable	D	Central Shortgrass Prairie	P	Playas	<input checked="" type="checkbox"/>
						Reservoirs and Shorelines	<input checked="" type="checkbox"/>
						Wetlands	<input type="checkbox"/>
<b>General Threat</b>		<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>		
08.1 Invasive Non-Native/Alien Species		Invasive plants - tamarisk	2.2 Invasive/Problematic Species Control	Remove tamarisk through biological, chemical, mechanical means and prevent re-establishment	H		
06.1 Recreational Activities		Motorized and non-motorized recreation	3.1 Species Management	Implement existing management/recovery plan	M		
06.1 Recreational Activities		Motorized and non-motorized recreation	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness (e.g., use beach-nesting bird signs)	M		
07.2 Dams & Water Management/Use		Altered hydrological regime (surface or aquifer)	5.3 Private Sector Standards & Codes	Implement Best Management Practices for water resource development	M		
09.3 Agricultural & Forestry Effluents		General water pollution, herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	M		
14.4 Predation		Predation	8.0 Research & Monitoring	Research population parameters and/or monitor status	L		

**Table 7 - Continued.**

<b>Prairie falcon</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
		Medium	D				
Tier 2	Birds					Central Shortgrass Prairie	<input checked="" type="checkbox"/>
						Colorado Plateau	<input checked="" type="checkbox"/>
						Front Range	<input type="checkbox"/>
						Southern Rocky Mountains	<input checked="" type="checkbox"/>
						Utah High Plateau	<input type="checkbox"/>
						Utah-Wyoming Rocky Mountains	<input type="checkbox"/>
						Wyoming Basin	<input type="checkbox"/>
						Basins Rivers	<input type="checkbox"/>
						Colorado Plateau - Wyoming Basins Streams	<input type="checkbox"/>
						Conservation Reserve Program	<input type="checkbox"/>
						Desert Shrub	<input type="checkbox"/>
						Eastern Plains Rivers	<input type="checkbox"/>
						Eastern Plains Streams	<input type="checkbox"/>
						Greasewood	<input type="checkbox"/>
						Mixed and Tallgrass Prairies	<input type="checkbox"/>
						Mountain Streams	<input type="checkbox"/>
						Pinyon - Juniper	<input type="checkbox"/>
						Playas	<input type="checkbox"/>
						Sagebrush	<input type="checkbox"/>
						Saltbush	<input type="checkbox"/>
						Sandsage	<input type="checkbox"/>
						Transition Streams	<input type="checkbox"/>
						Wetlands	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
02.3 Livestock Farming & Ranching	Altered native vegetation (grazing intensity)	2.1 Site/Area Management	Implement compatible grazing practices	M
06.1 Recreational Activities	Motorized and non-motorized recreation	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	M
06.1 Recreational Activities	Rock climbing, hiking near cliffs and crevices	2.1 Site/Area Management	Establish exclusionary/boundary fencing, formal wildlife viewing stations/areas, signage to raise public awareness, seasonal closures	M
08.1 Invasive Non-Native/Alien Species	Invasive plants - cheatgrass	2.2 Invasive/Problematic Species Control	Write and/or implement integrated weed/pest management plan	M
03.3 Renewable Energy	Collision with wind turbines	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	L
07.1 Fire & Fire Suppression	Altered fire regime	2.3 Habitat & Natural Process Restoration	Restore natural fire regime	L
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	L

<b>Purple martin</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
		Low	D				
Tier 2	Birds					Aspen	<input checked="" type="checkbox"/>
						Colorado Plateau	<input type="checkbox"/>
						Southern Rocky Mountains	<input type="checkbox"/>
						Utah High Plateau	<input type="checkbox"/>
						Wyoming Basin	<input type="checkbox"/>
						Mountain Streams	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
03.1 Oil & Gas Drilling	Altered native vegetation (loss of older aspen stands from gas development)	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	L
05.3 Logging & Wood Harvesting	Altered native vegetation (loss of older aspen stands from logging)	5.3 Private Sector Standards & Codes	Implement Best Management Practices for forestry	L
07.3 Other Ecosystem Modifications	Altered native vegetation (loss of older aspen stands from logging and gas development)	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	L
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	L



**Table 7 - Continued.**

<b>Rufous hummingbird</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
<i>Selasphorus rufus</i>	Tier 2 Birds	Medium	D	Unknown	X	Central Shortgrass Prairie	O	Alpine	<input checked="" type="checkbox"/>
						Colorado Plateau	O	Foothill and Mountain	<input checked="" type="checkbox"/>
						Front Range	O	Grasslands	
						Southern Rocky Mountains	O	Oak and Mixed Mountain Shrublands	<input checked="" type="checkbox"/>
						Utah High Plateau	O	Upland Shrub	<input checked="" type="checkbox"/>
						Utah-Wyoming Rocky Mountains	O		
						Wyoming Basin	O		
General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority					
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	L					

<b>Sage sparrow</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
<i>Amphispiza belli</i>	Tier 2 Birds	Medium	X	Declining	X	Colorado Plateau	P	Greasewood	<input checked="" type="checkbox"/>
						Southern Rocky Mountains	P	Sagebrush	<input checked="" type="checkbox"/>
						Utah High Plateau	P	Conservation Reserve Program	<input type="checkbox"/>
						Utah-Wyoming Rocky Mountains	P		
						Wyoming Basin	P		
General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority					
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	H					
02.3 Livestock Farming & Ranching	Altered native vegetation (burning, herbicide, or mechanical sagebrush removal)	2.1 Site/Area Management	Implement compatible grazing practices	H					
02.3 Livestock Farming & Ranching	Altered native vegetation (sagebrush removal, incompatible timing, intensity, duration of grazing)	2.1 Site/Area Management	Employ grazing as a tool for compatible vegetation cover, structure, composition	H					
07.3 Other Ecosystem Modifications	Habitat degradation from variety of sources	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	H					
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations	Promote consideration of biodiversity issues in transportation and land use planning processes	M					
02.3 Livestock Farming & Ranching	Altered native vegetation (sagebrush removal, incompatible timing, intensity, duration of grazing)	2.3 Habitat & Natural Process Restoration	Restore native habitat, including restoration of understory species, sagebrush, and riparian vegetation, reseeded of native species, and maintenance of appropriate patch size and habitat mosaic	M					
02.3 Livestock Farming & Ranching	Altered native vegetation (sagebrush removal, incompatible timing, intensity, duration of grazing)	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs	M					
07.1 Fire & Fire Suppression	Altered fire regime	2.3 Habitat & Natural Process Restoration	Restore natural fire regime	M					
08.1 Invasive Non-Native/Alien Species	Invasive plants - cheatgrass	2.2 Invasive/Problematic Species Control	Write and/or implement integrated weed/pest management plan	M					

**Table 7 - Continued.**

**Short-eared owl**

Population Status and Trend		Distribution	Type	Habitat	Primary		
Low	D	Declining	D	Central Shortgrass Prairie	P	Foothill and Mountain Grasslands	<input checked="" type="checkbox"/>
				Southern Rocky Mountains	P	Mixed and Tallgrass Prairies	<input checked="" type="checkbox"/>
				Colorado Plateau	O	Sagebrush	<input checked="" type="checkbox"/>
				Front Range	O	Sandsage	<input checked="" type="checkbox"/>
						Shortgrass Prairie	<input checked="" type="checkbox"/>
						Upland Shrub	<input checked="" type="checkbox"/>
						Wetlands	<input checked="" type="checkbox"/>
						Agriculture	<input type="checkbox"/>

*Asio flammeus*  
Tier 2 Birds

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
05.3 Logging & Wood Harvesting	Altered native vegetation	5.3 Private Sector Standards & Codes	Implement Best Management Practices for forestry	M
14.5 Competition	Predation and competition (Barn owls)	8.0 Research & Monitoring	Research population parameters and/or monitor status	M
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	L
07.3 Other Ecosystem Modifications	Altered native vegetation (wetland loss)	5.4 Compliance & Enforcement	Enforce 404 wetlands regulations	L

**Swainson's hawk**

Population Status and Trend		Distribution	Type	Habitat	Primary		
Medium	D	Declining	D	Central Shortgrass Prairie	P	Agriculture	<input checked="" type="checkbox"/>
				Colorado Plateau	P	Colorado Plateau - Wyoming Basins Streams	<input checked="" type="checkbox"/>
				Front Range	P	Desert Shrub	<input checked="" type="checkbox"/>
				Southern Rocky Mountains	P	Eastern Plains Streams	<input checked="" type="checkbox"/>
				Wyoming Basin	P	Foothill and Mountain Grasslands	<input checked="" type="checkbox"/>
				Utah High Plateau	O	Mixed and Tallgrass Prairies	<input checked="" type="checkbox"/>
						Oak and Mixed Mountain Shrublands	<input checked="" type="checkbox"/>
						Playas	<input checked="" type="checkbox"/>
						Sagebrush	<input checked="" type="checkbox"/>
						Saltbush	<input checked="" type="checkbox"/>
						Sandsage	<input checked="" type="checkbox"/>
						Shortgrass Prairie	<input checked="" type="checkbox"/>
						Upland Shrub	<input checked="" type="checkbox"/>
						Conservation Reserve Program	<input type="checkbox"/>

*Buteo swainsoni*  
Tier 2 Birds

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations	Promote zoning that concentrates use and protects habitat	M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.3 Private Sector Standards & Codes	Implement Best Management Practices for transportation projects, urban development, landscaping, etc.	M
06.1 Recreational Activities	Motorized and non-motorized recreation	4.3 Awareness & Communications	Implement landowner outreach/education program	M
03.3 Renewable Energy	Collision with wind turbines	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	L
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Mortality and prey reduction through rodent control	4.3 Awareness & Communications	Implement landowner outreach/education program	L

**Table 7 - Continued.**

<b>Upland sandpiper</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Low	D	Unknown	X	Central Shortgrass Prairie	P	Mixed and Tallgrass Prairies	<input checked="" type="checkbox"/>
						Agriculture	<input type="checkbox"/>
						Sandsage	<input type="checkbox"/>
<i>Bartramia longicauda</i>							
Tier 2 Birds							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority		
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	1.2 Resource & Habitat Protection		Acquire conservation easement for habitat protection	M		
02.1 Annual & Perennial Non-Timber Crops	Early/often pasture and hayfield cutting (nest destruction)	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production	M		
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production	M		
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	L		

<b>Veery</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Low	D	Unknown	X	Southern Rocky Mountains	P	Riparian Woodlands and	<input checked="" type="checkbox"/>
				Front Range	O	Shrublands	
<i>Catharus fuscescens</i>							
Tier 2 Birds							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority		
07.3 Other Ecosystem Modifications	Habitat degradation	2.3 Habitat & Natural Process Restoration		Restore native habitat using site-appropriate techniques and context	M		
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	L		

<b>Virginia's warbler</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Medium	D	Stable	D	Colorado Plateau	P	Mixed Conifer	<input checked="" type="checkbox"/>
				Front Range	P	Oak and Mixed Mountain Shrublands	<input checked="" type="checkbox"/>
				Southern Rocky Mountains	P	Pinyon - Juniper	<input checked="" type="checkbox"/>
				Utah High Plateau	P	Ponderosa Pine	<input checked="" type="checkbox"/>
				Utah-Wyoming Rocky Mountains	P	Upland Shrub	<input checked="" type="checkbox"/>
				Central Shortgrass Prairie	O	Aspen	<input type="checkbox"/>
				Wyoming Basin	O	Subalpine Limber - Bristlecone Pine	<input type="checkbox"/>
						Transition Streams	<input type="checkbox"/>
<i>Oreothlypis virginiae</i>							
Tier 2 Birds							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority		
07.3 Other Ecosystem Modifications	Habitat degradation	2.3 Habitat & Natural Process Restoration		Restore native habitat using site-appropriate techniques and context	M		
14.4 Predation	Predation	8.0 Research & Monitoring		Research population parameters and/or monitor status	M		

<b>Western snowy plover</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Low	D	Unknown	X	Central Shortgrass Prairie	P	Reservoirs and Shorelines	<input checked="" type="checkbox"/>
				Southern Rocky Mountains	P		
<i>Charadrius alexandrinus nivosus</i>							
Tier 2 Birds							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority		
06.1 Recreational Activities	Motorized and non-motorized recreation	4.3 Awareness & Communications		Publish educational material/sponsor educational programs to raise public awareness (e.g., use beach-nesting bird signs)	M		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer)	5.3 Private Sector Standards & Codes		Implement Best Management Practices for water resource development	M		
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	L		

**Table 7 - Continued.**

**White-faced ibis**

Population Status and Trend		Distribution	Type	Habitat	Primary		
Low	D	Increasing	D	Central Shortgrass Prairie	P	Agriculture	<input checked="" type="checkbox"/>
				Colorado Plateau	P	Colorado Plateau - Wyoming Basins Rivers	<input checked="" type="checkbox"/>
				Southern Rocky Mountains	P	Lakes	<input checked="" type="checkbox"/>
				Utah-Wyoming Rocky Mountains	P	Playas	<input checked="" type="checkbox"/>
						Reservoirs and Shorelines	<input checked="" type="checkbox"/>
						Wetlands	<input checked="" type="checkbox"/>
<b>General Threat</b>		<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>		
06.1 Recreational Activities		Motorized and non-motorized recreation	4.3 Awareness & Communications	Implement landowner outreach/education program	M		
07.2 Dams & Water Management/Use		Altered hydrological regime (fluctuating water levels)	3.1 Species Management	Develop collaborative management agreements	M		
07.3 Other Ecosystem Modifications		Natural system modification - wetland degradation	5.2 Policies & Regulations	Encourage use of Farm Bill programs for playas	M		
07.3 Other Ecosystem Modifications		Natural system modification - wetland degradation	5.4 Compliance & Enforcement	Enforce 404 wetlands regulations	M		
09.1 Household Sewage & Urban Waste Water		Water pollution	5.2 Policies & Regulations	Monitor water quality standards	M		

**Whooping crane**

Population Status and Trend		Distribution	Type	Habitat	Primary		
		Central Shortgrass Prairie	O	Agriculture	<input checked="" type="checkbox"/>		
				Wetlands	<input checked="" type="checkbox"/>		
<i>Grus americana</i>		Not known to have breeding population in Colorado (no primary habitat, status, or trends).					
Tier 2	Birds						
<b>General Threat</b>		<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>		
04.2 Utility & Service Lines		Collision with wind turbines	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	L		

**Tier 2 Fish**

**Iowa darter**

Population Status and Trend		Distribution	Type	Habitat	Primary		
Medium	D	Stable	D	Central Shortgrass Prairie	P	Eastern Plains Rivers	<input checked="" type="checkbox"/>
				Front Range	P	Eastern Plains Streams	<input checked="" type="checkbox"/>
						Transition Streams	<input checked="" type="checkbox"/>
<i>Etheostoma exile</i>							
Tier 2	Fish						
<b>General Threat</b>		<b>Specific Threat</b>	<b>General Conservation Action</b>	<b>Specific Conservation Action</b>	<b>Priority</b>		
07.2 Dams & Water Management/Use		Altered hydrological regime (surface or aquifer) - wetland drainage	2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	H		
09.3 Agricultural & Forestry Effluents		Herbicide/pesticide spraying or runoff	2.3 Habitat & Natural Process Restoration	Identify and control point-source and non-point source pollution	M		
08.1 Invasive Non-Native/Alien Species		Invasive animals	2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	L		

**Table 7 - Continued.**

**Lake chub**

Population Status and Trend		Distribution	Type	Habitat	Primary	
Medium	D	Stable	D	Front Range Southern Rocky Mountains	P P	Lakes <input checked="" type="checkbox"/>

*Couesius plumbeus*

Tier 2 Fish

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer)	2.3 Habitat & Natural Process Restoration	Improve erosion and excess sedimentation conditions	H
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer) - stream dewatering	2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	H
08.1 Invasive Non-Native/Alien Species	Invasive animals	2.2 Invasive/Problematic Species Control	Control non-native fish using integrated pest management techniques for aquatic habitats	M
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff and nonpoint source pollution	2.3 Habitat & Natural Process Restoration	Identify and control point-source and non-point source pollution	M
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	M
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Gathering for bait or aquarium trade	5.4 Compliance & Enforcement	Enforce hunting, fishing, collecting regulations	L

**Tier 2 Mammals**

**Abert's squirrel**

Population Status and Trend		Distribution	Type	Habitat	Primary
Unknown	Unknown	Southern Rocky Mountains Colorado Plateau	P O	Ponderosa Pine	<input checked="" type="checkbox"/>

*Sciurus aberti*

Tier 2 Mammals

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring	Research population parameters and/or monitor status	M
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	M
08.2 Problematic Native Species	Habitat loss / degradation due to beetle kill	8.0 Research & Monitoring	Research population parameters and/or monitor status	L

**Allen's big-eared bat**

Population Status and Trend		Distribution	Type	Habitat	Primary
Unknown	X	Colorado Plateau		Oak and Mixed Mountain Shrublands	<input checked="" type="checkbox"/>
	X	Recently documented in Colorado.		Pinyon - Juniper	<input checked="" type="checkbox"/>

*Idionycteris phyllotis*

Tier 2 Mammals

				Ponderosa Pine	<input checked="" type="checkbox"/>
				Cliffs and Canyons	<input type="checkbox"/>
				Colorado Plateau - Wyoming Basins Rivers	<input type="checkbox"/>
				Colorado Plateau - Wyoming Basins Streams	<input type="checkbox"/>
				Mixed Conifer	<input type="checkbox"/>
				Sagebrush	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	H
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring	Research population parameters and/or monitor status	M
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	M

**Table 7 - Continued.**

<b>American marten</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
	Unknown	X	Unknown	X	Southern Rocky Mountains	P	Lodgepole Pine <input checked="" type="checkbox"/>
							Spruce - Fir <input checked="" type="checkbox"/>
							Alpine <input type="checkbox"/>
<i>Martes americana</i>							
Tier 2 Mammals							
General Threat	Specific Threat			General Conservation Action	Specific Conservation Action		Priority
05.3 Logging & Wood Harvesting	Clearcutting and even-aged forest management			2.1 Site/Area Management	Implement compatible forest management		M
05.3 Logging & Wood Harvesting	Replacement of mature/old growth with younger, more even-aged stands			2.1 Site/Area Management	Implement compatible forest management		M
08.2 Problematic Native Species	Habitat loss / degradation due to beetle kill			8.0 Research & Monitoring	Research species/habitat response to management		M
11.1 Habitat Shifting & Alteration	Habitat shifting and alteration due to climate change			8.0 Research & Monitoring	Conduct primary research on species and habitat responses to changing climate		M
13.4 Population status unknown	Lack of data on population status			8.0 Research & Monitoring	Research population parameters and/or monitor status		M
13.5 Population trend unknown	Lack of data on population trend			8.0 Research & Monitoring	Research population parameters and/or monitor status		M
<b>Big free-tailed bat</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
	Unknown		Unknown	Central Shortgrass Prairie	O	Cliffs and Canyons	<input checked="" type="checkbox"/>
				Colorado Plateau	O	Desert Shrub	<input checked="" type="checkbox"/>
				Front Range	O	Pinyon - Juniper	<input checked="" type="checkbox"/>
				Southern Rocky Mountains	O		
<i>Nyctinomops macrotis</i>							
Tier 2 Mammals							
General Threat	Specific Threat			General Conservation Action	Specific Conservation Action		Priority
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown			8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)		H
13.4 Population status unknown	Lack of data on population status			8.0 Research & Monitoring	Research population parameters and/or monitor status		M
13.5 Population trend unknown	Lack of data on population trend			8.0 Research & Monitoring	Research population parameters and/or monitor status		M

**Table 7 - Continued.**

<b>Bighorn sheep</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
		Medium	D				
				Southern Rocky Mountains	P	Cliffs and Canyons	<input checked="" type="checkbox"/>
				Central Shortgrass Prairie	O	Alpine	<input type="checkbox"/>
				Colorado Plateau	O	Foothill and Mountain	<input type="checkbox"/>
				Wyoming Basin	O	Grasslands	
<i>Ovis canadensis</i>							
Tier 2	Mammals						

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
01.1 Housing & Urban Areas	Transmission of pathogens by hobby livestock	4.3 Awareness & Communications	Implement landowner outreach/education program	H
01.1 Housing & Urban Areas	Transmission of pathogens by hobby livestock	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	H
01.1 Housing & Urban Areas	Transmission of pathogens by hobby livestock	5.2 Policies & Regulations	Promote zoning that concentrates use and prevents disease transmission	H
02.3 Livestock Farming & Ranching	Altered native vegetation (riparian area deforestation, woody encroachment, chaining sagebrush, seral stage imbalance, etc.)	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	H
02.3 Livestock Farming & Ranching	Transmission of pathogens	2.1 Site/Area Management	Implement compatible grazing practices	H
08.4 Pathogens	Pathogen - respiratory disease caused by Pasteurellacea and Mycoplasma bacteria	8.0 Research & Monitoring	Research and develop effective vaccine and delivery system	H
02.3 Livestock Farming & Ranching	Transmission of pathogens	5.2 Policies & Regulations	Allow authorities to remove stray domestic sheep and goats	M
02.3 Livestock Farming & Ranching	Transmission of pathogens	5.3 Private Sector Standards & Codes	Implement Best Management Practices for livestock grazing	M
06.1 Recreational Activities	Climbing, back country skiing	2.1 Site/Area Management	Manage public use to be compatible with biodiversity	M
07.1 Fire & Fire Suppression	Altered fire regime	2.3 Habitat & Natural Process Restoration	Restore natural fire regime	M
08.2 Problematic Native Species	Mountain lion predation	2.3 Habitat & Natural Process Restoration	Manage for predator/prey balance	M
14.5 Competition	Competition with other native ungulates	2.3 Habitat & Natural Process Restoration	Manage natural herbivory	L

<b>Bison</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
				Central Shortgrass Prairie		Foothill and Mountain Grasslands	<input checked="" type="checkbox"/>
				Southern Rocky Mountains		Shortgrass Prairie	<input checked="" type="checkbox"/>
<i>Bison bison</i>							
Tier 2	Mammals						

Wild populations extirpated. Currently classified as domestic species by Wildlife Commission Regulation – Ch. 11, Art. II, Sct 1103 A. US Fish & Wildlife Service lists possible re-introduction sites Baca NWR and Great Sand Dunes NP in Colorado.

**Table 7 - Continued.**

<b>Black-tailed prairie dog</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>	
<i>Cynomys ludovicianus</i>	Tier 2	Mammals	Medium	D	Central Shortgrass Prairie Front Range	P	Shortgrass Prairie	<input checked="" type="checkbox"/>
			Stable	D		P	Mixed and Tallgrass Prairies	<input type="checkbox"/>
			Refer to existing conservation, management, and recovery plans or assessments for detailed discussion of threats and conservation actions needed.					
General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority				
08.4 Pathogens	Pathogen - sylvatic plague	3.1 Species Management	Develop and implement an active disease management program	H				
08.4 Pathogens	Pathogen - sylvatic plague	8.0 Research & Monitoring	Research and develop effective vaccine and delivery system	H				
08.4 Pathogens	Pathogen - sylvatic plague	8.0 Research & Monitoring	Research species/habitat response to plague management	H				
01.1 Housing & Urban Areas	Urban, suburban, and exurban development	6.4 Conservation Payments	Support development and implementation of statewide habitat mitigation tool	M				
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M				
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	M				
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations	Promote zoning that concentrates use and protects habitat	M				
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.3 Private Sector Standards & Codes	Implement Best Management Practices for transportation projects, urban development, landscaping, etc.	M				
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	6.4 Conservation Payments	Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)	M				
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M				
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	M				
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.2 Policies & Regulations	Encourage use of Farm Bill and other incentive programs	M				
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	M				
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	7.3 Conservation Finance	Provide economic assistance for private land habitat improvements and/or species conservation	M				
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M				
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	M				
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Poisoning	3.1 Species Management	Develop collaborative management agreements	M				
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Poisoning	4.3 Awareness & Communications	Implement landowner outreach/education program	M				
08.4 Pathogens	Pathogen - sylvatic plague	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	M				
12.3 Lack of common goals	Greater collaboration among state and local agencies, and private industry, is warranted	5.2 Policies & Regulations	Improve alignment of conservation and management goals and practices across stakeholder groups	M				
06.1 Recreational Activities	Recreational shooting of prairie dogs	2.1 Site/Area Management	Implement shooting closures/seasons where local conditions warrant	L				



**Table 7 - Continued.**

**Botta's pocket gopher  
(rubidus ssp)**

Population Status and Trend				Distribution	Type	Habitat	Primary
Medium	X	Unknown	X	Central Shortgrass Prairie Southern Rocky Mountains	P P	Foothill and Mountain Grasslands Pinyon - Juniper	<input checked="" type="checkbox"/>  <input type="checkbox"/>

*Thomomys bottae rubidus*

Tier 2 Mammals

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	H
13.3 Genetic relationship with other species and/or subspecies unknown	Genetic relationship with other subspecies unknown	8.0 Research & Monitoring	Research genetic relation to other (sub)species	H
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection	M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations	Promote zoning that concentrates use and protects habitat	M
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.3 Private Sector Standards & Codes	Implement Best Management Practices for transportation projects, urban development, landscaping, etc.	M
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	M
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Poisoning	4.3 Awareness & Communications	Implement landowner outreach/education program	L

**Common hog-nosed  
skunk**

Population Status and Trend				Distribution	Type	Habitat	Primary
Unknown	X	Unknown	X	Central Shortgrass Prairie Front Range	P P	Pinyon - Juniper Upland Shrub Desert Shrub	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>

*Conepatus leuconotus*

Tier 2 Mammals

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring	Research critical life history/habitat components	H
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	H
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	M
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	L

**Table 7 - Continued.**

<b>Dwarf shrew</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
		Unknown	X	Unknown	X	Southern Rocky Mountains	P	Aspen	<input checked="" type="checkbox"/>
				Colorado Plateau		O	Lodgepole Pine	<input checked="" type="checkbox"/>	
				Utah High Plateau		O	Mixed Conifer	<input checked="" type="checkbox"/>	
Tier 2	Mammals							Ponderosa Pine	<input checked="" type="checkbox"/>
								Spruce - Fir	<input checked="" type="checkbox"/>
								Pinyon - Juniper	<input type="checkbox"/>
								Subalpine Limber - Bristlecone Pine	<input type="checkbox"/>
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority				
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	H				
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring		Research critical life history/habitat components	H				
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	H				
<b>Gray wolf</b>		Population Status and Trend				Habitat	Primary		
						Aspen	<input checked="" type="checkbox"/>		
						Lodgepole Pine	<input checked="" type="checkbox"/>		
						Mixed Conifer	<input checked="" type="checkbox"/>		
						Oak and Mixed Mountain Shrublands	<input checked="" type="checkbox"/>		
						Pinyon - Juniper	<input checked="" type="checkbox"/>		
						Ponderosa Pine	<input checked="" type="checkbox"/>		
						Spruce - Fir	<input checked="" type="checkbox"/>		
						Upland Shrub	<input checked="" type="checkbox"/>		
						Foothill and Mountain Grasslands	<input type="checkbox"/>		
						Sagebrush	<input type="checkbox"/>		
						Subalpine Limber - Bristlecone Pine	<input type="checkbox"/>		
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority				
07.3 Other Ecosystem Modifications	Fragmentation	2.3 Habitat & Natural Process Restoration		Maintain linkages and connectivity (e.g., wildlife over/under passes, habitat corridors, wildlife-friendly fences)	H				
12.3 Lack of common goals	Lack of common goals	4.3 Awareness & Communications		Implement landowner outreach/education program	M				
<b>Grizzly bear</b>		Population Status and Trend				Habitat	Primary		
						Alpine	<input checked="" type="checkbox"/>		
						Aspen	<input checked="" type="checkbox"/>		
						Foothill and Mountain Grasslands	<input checked="" type="checkbox"/>		
						Lodgepole Pine	<input checked="" type="checkbox"/>		
						Mixed Conifer	<input checked="" type="checkbox"/>		
						Oak and Mixed Mountain Shrublands	<input checked="" type="checkbox"/>		
						Ponderosa Pine	<input checked="" type="checkbox"/>		
						Spruce - Fir	<input checked="" type="checkbox"/>		
						Upland Shrub	<input checked="" type="checkbox"/>		
						Mountain Streams	<input type="checkbox"/>		
						Subalpine Limber - Bristlecone Pine	<input type="checkbox"/>		
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority				
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring		Research population parameters and/or monitor status	L				

**Table 7 - Continued.**

**Hoary bat**

		Population Status and Trend		Distribution	Type	Habitat	Primary	
Tier 2	Mammals	Low	X	Unknown	X	Central Shortgrass Prairie	Aspen	<input checked="" type="checkbox"/>
						Colorado Plateau	Mixed Conifer	<input checked="" type="checkbox"/>
						Front Range	Pinyon - Juniper	<input checked="" type="checkbox"/>
						Southern Rocky Mountains	Ponderosa Pine	<input checked="" type="checkbox"/>
						Utah High Plateau	Riparian Woodlands and Shrublands	<input checked="" type="checkbox"/>
						Utah-Wyoming Rocky Mountains	Spruce - Fir	<input checked="" type="checkbox"/>
						Wyoming Basin		

*Lasiurus cinereus*

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
03.3 Renewable Energy	Collision with wind turbines	5.3 Private Sector Standards & Codes	Implement Best Management Practices for energy development and mining	H
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	H
08.2 Problematic Native Species	Loss of roost sites (localized) due to beetle kill	2.3 Habitat & Natural Process Restoration	Restore native habitat using site-specific techniques and context	M
08.4 Pathogens	Potential for White-nose Syndrome	2.2 Invasive/Problematic Species Control	Manage research, management, and recreation activities to control the spread of pathogens	M
08.2 Problematic Native Species	Habitat loss / degradation due to loss of roost sites (localized) due to beetle kill	5.3 Private Sector Standards & Codes	Implement Best Management Practices for forestry	L

**Kit fox**

		Population Status and Trend		Distribution	Type	Habitat	Primary
Tier 2	Mammals			Colorado Plateau	P	Desert Shrub	<input checked="" type="checkbox"/>
						Greasewood	<input checked="" type="checkbox"/>
						Sagebrush	<input checked="" type="checkbox"/>
						Saltbush	<input checked="" type="checkbox"/>
						Extensive surveys have failed to detect this species. It may be extirpated from the state.	

*Vulpes macrotis*

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
06.1 Recreational Activities	OHV use in Peach Valley	2.1 Site/Area Management	Manage public use to be compatible with biodiversity	L
07.3 Other Ecosystem Modifications	Decline of white-tailed prairie dogs, which provide den habitat and significant food source	2.3 Habitat & Natural Process Restoration	Improve status of white-tailed prairie dogs	L
14.1 Scarcity (leading to inbreeding depression)	Lack of wild populations	8.0 Research & Monitoring	Conduct primary research on potential for habitat restoration	L

**Preble's shrew**

		Population Status and Trend		Distribution	Type	Habitat	Primary
Tier 2	Mammals	Unknown	X	Unknown	X	Southern Rocky Mountains	<input checked="" type="checkbox"/>
						Colorado Plateau	
						Foothill and Mountain Grasslands	<input type="checkbox"/>
						Sagebrush	<input type="checkbox"/>

*Sorex preblei*

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	H
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring	Research critical life history/habitat components	H
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	H

**Table 7 - Continued.**

<b>Pygmy rabbit</b>		Population Status and Trend	Distribution	Type	Habitat	Primary
		Unknown	Wyoming Basin	P	Sagebrush	<input checked="" type="checkbox"/>
<i>Brachylagus idahoensis</i>						
Tier 2 Mammals						
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority	
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	M	
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring		Research population parameters and/or monitor status	M	
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	M	
02.3 Livestock Farming & Ranching	Reduced grass/forb diversity	2.3 Habitat & Natural Process Restoration		Re-seed native species	L	
02.3 Livestock Farming & Ranching	Reduced grass/forb diversity	5.3 Private Sector Standards & Codes		Implement Best Management Practices for livestock grazing	L	
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	5.3 Private Sector Standards & Codes		Implement Best Management Practices for energy development and mining	L	
07.1 Fire & Fire Suppression	Altered fire regime and juniper encroachment	2.3 Habitat & Natural Process Restoration		Restore natural fire regime	L	
<b>Pygmy shrew</b>		Population Status and Trend	Distribution	Type	Habitat	Primary
		Unknown	Southern Rocky Mountains	P	Spruce - Fir Wetlands	<input checked="" type="checkbox"/>
<i>Sorex hoyi montanus</i>						
Tier 2 Mammals						
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority	
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring		Research population parameters and/or monitor status	H	
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	H	
<b>Red-backed vole</b>		Population Status and Trend	Distribution	Type	Habitat	Primary
		Unknown	Southern Rocky Mountains	P	Lodgepole Pine	<input checked="" type="checkbox"/>
			Utah High Plateau	O	Mixed Conifer	<input checked="" type="checkbox"/>
<i>Clethrionomys gapperi</i>						
Tier 2 Mammals						
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority	
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring		Research population parameters and/or monitor status	H	
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	H	

**Table 7 - Continued.**

<b>River otter</b>		Population Status and Trend		Distribution	Type	Habitat	Primary	
		Medium	D	Increasing	D	Colorado Plateau	<input checked="" type="checkbox"/>	
						Southern Rocky Mountains		
						Utah-Wyoming Rocky Mountains	<input checked="" type="checkbox"/>	
						Central Shortgrass Prairie	<input type="checkbox"/>	
						Front Range	<input type="checkbox"/>	
						Eastern Plains Rivers	<input type="checkbox"/>	
						Eastern Plains Streams	<input type="checkbox"/>	
						Transition Streams	<input type="checkbox"/>	
						Wetlands	<input type="checkbox"/>	
<b>General Threat</b>		<b>Specific Threat</b>		<b>General Conservation Action</b>		<b>Specific Conservation Action</b>		<b>Priority</b>
05.1 Control of Nuisance Species & Collecting Terrestrial Animals		Potential for landowner "control" related to river otter impacts on fish ponds		4.3 Awareness & Communications		Implement landowner outreach/education program		M
07.2 Dams & Water Management/Use		Impact of reduced water quality on prey species (fish)		8.0 Research & Monitoring		Research population parameters and/or monitor status		L

<b>Sagebrush vole</b>		Population Status and Trend		Distribution	Type	Habitat	Primary	
		Unknown		Unknown		Southern Rocky Mountains	<input checked="" type="checkbox"/>	
						Utah High Plateau		
						Utah-Wyoming Rocky Mountains		
						Wyoming Basin		
<b>General Threat</b>		<b>Specific Threat</b>		<b>General Conservation Action</b>		<b>Specific Conservation Action</b>		<b>Priority</b>
07.3 Other Ecosystem Modifications		Habitat degradation from variety of sources		2.3 Habitat & Natural Process Restoration		Maintain appropriate patch size and habitat mosaic		H
13.4 Population status unknown		Lack of data on population status		8.0 Research & Monitoring		Research population parameters and/or monitor status		H
13.5 Population trend unknown		Lack of data on population trend		8.0 Research & Monitoring		Research population parameters and/or monitor status		H
02.3 Livestock Farming & Ranching		Reduced grass/forb diversity		2.3 Habitat & Natural Process Restoration		Re-seed native species		M
02.3 Livestock Farming & Ranching		Reduced grass/forb diversity		5.3 Private Sector Standards & Codes		Implement Best Management Practices for livestock grazing		M
03.1 Oil & Gas Drilling		Oil & gas development, pipelines, and infrastructure		5.3 Private Sector Standards & Codes		Implement Best Management Practices for energy development and mining		M
07.1 Fire & Fire Suppression		Altered fire regime and juniper encroachment		2.3 Habitat & Natural Process Restoration		Restore natural fire regime		M
07.3 Other Ecosystem Modifications		Habitat degradation from variety of sources		2.3 Habitat & Natural Process Restoration		Restore native habitat, including restoration of understory species, sagebrush, and riparian vegetation, reseedling of native species, and maintenance of appropriate patch size and habitat mosaic		M

**Table 7 - Continued.**

<b>Snowshoe hare</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
	Medium	X	Unknown	X	Southern Rocky Mountains	P	Lodgepole Pine <input checked="" type="checkbox"/>
<i>Lepus americanus</i>							Riparian Woodlands and Shrublands <input checked="" type="checkbox"/>
Tier 2	Mammals						Spruce - Fir <input checked="" type="checkbox"/>
							Wetlands <input type="checkbox"/>
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority		
05.3 Logging & Wood Harvesting	Clearcutting	8.0 Research & Monitoring		Research species/habitat response to management	M		
05.3 Logging & Wood Harvesting	Clearcutting and even-aged forest management	2.1 Site/Area Management		Implement compatible forest management	M		
11.1 Habitat Shifting & Alteration	Habitat shifting and alteration due to climate change	8.0 Research & Monitoring		Conduct primary research on species and habitat responses to changing climate	M		
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	M		
06.1 Recreational Activities	Unregulated backcountry winter recreation	8.0 Research & Monitoring		Research species/habitat response to management	L		
08.2 Problematic Native Species	Habitat loss / degradation due to beetle kill	8.0 Research & Monitoring		Research species/habitat response to management	L		
<b>Swift fox</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
	Medium	D	Stable	D	Central Shortgrass Prairie	P	Shortgrass Prairie <input checked="" type="checkbox"/>
<i>Vulpes velox</i>					Front Range	O	Agriculture <input type="checkbox"/>
Tier 2	Mammals						Conservation Reserve Program <input type="checkbox"/>
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority		
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	1.2 Resource & Habitat Protection		Acquire conservation easement for habitat protection	H		
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.3 Private Sector Standards & Codes		Implement Best Management Practices for transportation, urban development, landscaping, etc.	H		
04.1 Roads & Railroads	Fragmentation	2.3 Habitat & Natural Process Restoration		Maintain linkages and connectivity (e.g., wildlife over/under passes, habitat corridors, wildlife-friendly fences)	H		
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	6.4 Conservation Payments		Mitigate species/habitat loss (e.g., grass banking, mitigation banking, credits for off-site habitat protection)	M		
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	1.2 Resource & Habitat Protection		Acquire conservation easement for habitat protection	L		
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration		Maintain appropriate patch size and habitat mosaic	L		
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.2 Policies & Regulations		Encourage use of Farm Bill and other incentive programs	L		
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production	L		
08.4 Pathogens	Loss of prairie dog colonies due to sylvatic plague	8.0 Research & Monitoring		Research species/habitat response to plague management	L		

**Table 7 - Continued.**

<b>White-tailed jackrabbit</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
		Medium	X	Unknown	X	Central Shortgrass Prairie	P	Foothill and Mountain Grasslands	<input checked="" type="checkbox"/>
<i>Lepus townsendii</i>						Front Range	p	Mixed and Tallgrass Prairies	<input checked="" type="checkbox"/>
Tier 2	Mammals					Southern Rocky Mountains	p	Shortgrass Prairie	<input checked="" type="checkbox"/>
						Utah High Plateau	p	Desert Shrub	<input type="checkbox"/>
						Utah-Wyoming Rocky Mountains	p	Greasewood	<input type="checkbox"/>
						Wyoming Basin	P	Oak and Mixed Mountain	<input type="checkbox"/>
						Colorado Plateau	O	Shrublands	<input type="checkbox"/>
								Sagebrush	<input type="checkbox"/>
								Saltbush	<input type="checkbox"/>
								Sandsage	<input type="checkbox"/>
								Upland Shrub	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	2.3 Habitat & Natural Process Restoration	Maintain appropriate patch size and habitat mosaic	H
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	H
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	H
14.5 Competition	Competition	2.3 Habitat & Natural Process Restoration	Monitor/control competition with other species	M

**Tier 2 Mollusks**

<b>Cloche ancylid</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
		Unknown	X	Declining	X	Front Range	P	Lakes	<input checked="" type="checkbox"/>
<i>Ferrissia walkeri</i>						Utah High Plateau	P	Colorado Plateau - Wyoming Basins Rivers	<input type="checkbox"/>
Tier 2	Mollusks							Reservoirs and Shorelines	<input type="checkbox"/>

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
13.2 Critical life history/habitat components unknown	Habitat affinities unknown	8.0 Research & Monitoring	Research critical life history/habitat components	H
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring	Research population parameters and/or monitor status	H
13.4 Population status unknown	Referenced in literature, but current populations are unknown. Colorado surveys conducted from 2001-2004 did not record this species.	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	H
14.1 Scarcity (leading to inbreeding depression)	Scarcity (limited distribution)	8.0 Research & Monitoring	Research population parameters and/or monitor status	H
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals	2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime	M
08.1 Invasive Non-Native/Alien Species	Invasive animals	2.2 Invasive/Problematic Species Control	Control non-native invertebrates using integrated pest management techniques for aquatic habitats	M

**Table 7 - Continued.**

**Cockerell**

Population Status and Trend		Distribution	Type	Habitat	Primary	
Low	X	Declining	X	Southern Rocky Mountains	P	Lakes <input checked="" type="checkbox"/>
						Mountain Streams <input type="checkbox"/>
						Wetlands <input type="checkbox"/>

*Promenetus umbilicatellus*

Tier 2 Mollusks

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
07.3 Other Ecosystem Modifications	Altered native vegetation (riparian area deforestation, woody encroachment, chaining sagebrush, seral stage imbalance, etc.)	2.3 Habitat & Natural Process Restoration	Improve erosion and excess sedimentation conditions	H
13.4 Population status unknown	Referenced in literature, but current populations are unknown. Colorado surveys conducted from 2001-2004 did not record this species.	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	H
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	H
07.3 Other Ecosystem Modifications	Natural system modification - wetland filling	2.3 Habitat & Natural Process Restoration	Maintain and restore natural ponds and small mountain lakes	M
08.1 Invasive Non-Native/Alien Species	Invasive animals	2.2 Invasive/Problematic Species Control	Control non-native invertebrates using integrated pest management techniques for aquatic habitats	M
14.1 Scarcity (leading to inbreeding depression)	Scarcity (limited distribution)	3.1 Species Management	Develop collaborative management agreements	M
14.1 Scarcity (leading to inbreeding depression)	Scarcity (limited distribution)	8.0 Research & Monitoring	Research population parameters and/or monitor status	M

**Cylindrical papershell**

Population Status and Trend		Distribution	Type	Habitat	Primary	
Low	D	Declining	D	Central Shortgrass Prairie	P	Eastern Plains Streams <input checked="" type="checkbox"/>
				Front Range	O	Lakes <input checked="" type="checkbox"/>
				Southern Rocky Mountains	O	

*Anodontoides ferussacianus*

Tier 2 Mollusks

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
07.2 Dams & Water Management/Use	Nutrient loads (runoff from agricultural activities)	2.3 Habitat & Natural Process Restoration	Implement streambank or in-stream restoration/improvements	H
07.3 Other Ecosystem Modifications	Altered native vegetation (riparian area)	2.3 Habitat & Natural Process Restoration	Restore riparian vegetation	H
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	H
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	H
14.1 Scarcity (leading to inbreeding depression)	Known from only 2 locations in Colorado. Colorado surveys conducted from 1996-2004 recorded this species at Valmont Lake and the St. Vrain Creek in Boulder County.	8.0 Research & Monitoring	Research population parameters and/or monitor status	H
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration	Restore native prairie	M
02.3 Livestock Farming & Ranching	Decreased water quality (nutrient load from cattle)	2.1 Site/Area Management	Implement compatible grazing practices	M
08.1 Invasive Non-Native/Alien Species	Invasive animals	2.2 Invasive/Problematic Species Control	Control non-native invertebrates using integrated pest management techniques for aquatic habitats	M



**Table 7 - Continued.**

<b>Fragil ancylid</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
		Low	X   Declining D	Central Shortgrass Prairie	P	Eastern Plains Rivers	<input checked="" type="checkbox"/>
				Wyoming Basin	P	Eastern Plains Streams	<input checked="" type="checkbox"/>
<i>Ferrissia fragilis</i>				Front Range	O	Colorado Plateau - Wyoming Basins Rivers	<input type="checkbox"/>
Tier 2	Mollusks					Lakes	<input type="checkbox"/>
						Reservoirs and Shorelines	<input type="checkbox"/>
<b>General Threat</b>	<b>Specific Threat</b>			<b>General Conservation Action</b>	<b>Specific Conservation Action</b>		<b>Priority</b>
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development			1.2 Resource & Habitat Protection	Acquire conservation easement for habitat protection		H
07.3 Other Ecosystem Modifications	Altered native vegetation (riparian area deforestation, woody encroachment, chaining sagebrush, seral stage imbalance, etc.)			2.3 Habitat & Natural Process Restoration	Employ grazing as a tool for compatible vegetation cover, structure, composition		H
07.3 Other Ecosystem Modifications	Altered native vegetation (riparian area deforestation, woody encroachment, chaining sagebrush, seral stage imbalance, etc.)			2.3 Habitat & Natural Process Restoration	Restore riparian vegetation		H
13.1 Complete distribution in Colorado unknown	Known from only 3 locations in Colorado. Colorado surveys conducted from 2001-2004 recorded this species at Bear Canyon Creek and Sliver Lake Ditch in Boulder County, and Banner Lake No. 5 in Weld County, Colorado.			8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)		H
14.1 Scarcity (leading to inbreeding depression)	Scarcity			8.0 Research & Monitoring	Research population parameters and/or monitor status		H
07.2 Dams & Water Management/Use	Altered native vegetation (riparian area deforestation, woody encroachment, chaining sagebrush, seral stage imbalance, etc.)			2.3 Habitat & Natural Process Restoration	Improve erosion and excess sedimentation conditions		M
07.2 Dams & Water Management/Use	Decreased water quality			2.3 Habitat & Natural Process Restoration	Implement streambank or in-stream restoration/improvements		M
07.2 Dams & Water Management/Use	Natural system modification (hydrological) - dam construction, riprap, levees, bank stabilization, channelization, irrigation canals			2.3 Habitat & Natural Process Restoration	Restore or maintain suitable hydrological regime		M
<b>Hot Springs physa</b>		<b>Population Status and Trend</b>		<b>Distribution</b>	<b>Type</b>	<b>Habitat</b>	<b>Primary</b>
		Low	X   Unknown X	Southern Rocky Mountains	P	Hot Springs	<input checked="" type="checkbox"/>
<i>Physa cupreonitens</i>							
Tier 2	Mollusks						
<b>General Threat</b>	<b>Specific Threat</b>			<b>General Conservation Action</b>	<b>Specific Conservation Action</b>		<b>Priority</b>
06.3 Work & Other Activities	Proximal non-recreation disturbance			4.3 Awareness & Communications	Implement landowner outreach/education program		H
13.3 Genetic relationship with other species and/or subspecies unknown	Clarification of taxonomy is needed			8.0 Research & Monitoring	Research genetic relation to other (sub)species		H
14.1 Scarcity (leading to inbreeding depression)	Scarcity (limited distribution) physid snails have been reported from only 6 hot springs in Colorado			8.0 Research & Monitoring	Research population parameters and/or monitor status		H
08.1 Invasive Non-Native/Alien Species	Invasive animals			2.2 Invasive/Problematic Species Control	Control non-native invertebrates using integrated pest management techniques for aquatic habitats		M
13.4 Population status unknown	Lack of data on population status			8.0 Research & Monitoring	Research population parameters and/or monitor status		M

**Table 7 - Continued.**

<b>Pondhorn</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Low	D	Declining	D	Central Shortgrass Prairie	P	Eastern Plains Streams	<input checked="" type="checkbox"/>
						Lakes	<input checked="" type="checkbox"/>
<i>Uniomerus tetralasmus</i>							
Tier 2 Mollusks							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority		
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	2.3 Habitat & Natural Process Restoration		Restore native prairie	H		
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer)	2.3 Habitat & Natural Process Restoration		Restore or maintain suitable hydrological regime	H		
09.3 Agricultural & Forestry Effluents	Nutrient loads (runoff from agricultural activities)	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production	H		
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown. Colorado surveys conducted from 1996-2002 recorded this species at 1 location, Queens (Neeskah) Reservoir, Kiowa County.	8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	H		
14.1 Scarcity (leading to inbreeding depression)	Scarcity (limited distribution)	8.0 Research & Monitoring		Research population parameters and/or monitor status	H		
08.1 Invasive Non-Native/Alien Species	Invasive animals	2.2 Invasive/Problematic Species Control		Control non-native invertebrates using integrated pest management techniques for aquatic habitats	M		
<b>Rocky Mountain capshell</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Low	D	Unknown	X	Southern Rocky Mountains	P	Lakes	<input checked="" type="checkbox"/>
						Mountain Streams	<input type="checkbox"/>
<i>Acroloxus coloradensis</i>							
Tier 2 Mollusks							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority		
08.1 Invasive Non-Native/Alien Species	Invasive animals	2.2 Invasive/Problematic Species Control		Control non-native invertebrates using integrated pest management techniques for aquatic habitats	H		
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	H		
13.4 Population status unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	H		
14.1 Scarcity (leading to inbreeding depression)	Scarcity (limited distribution)	8.0 Research & Monitoring		Research population parameters and/or monitor status	H		
<b>Sharp sprite</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Low	X	Declining	X	Southern Rocky Mountains	P	Lakes	<input checked="" type="checkbox"/>
				Wyoming Basin	O	Colorado Plateau - Wyoming Basins Rivers	<input type="checkbox"/>
						Mountain Streams	<input type="checkbox"/>
						Wetlands	<input type="checkbox"/>
<i>Promenetus exacuouus</i>							
Tier 2 Mollusks							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority		
07.3 Other Ecosystem Modifications	Natural system modification - wetland filling	2.3 Habitat & Natural Process Restoration		Maintain and Restore natural ponds and small mountain lakes	H		
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown (reported only from 11 Colorado locations, Colorado surveys conducted from 2001-2004 did not record this species.	8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	H		
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring		Research population parameters and/or monitor status	H		
14.1 Scarcity (leading to inbreeding depression)	Scarcity	8.0 Research & Monitoring		Research population parameters and/or monitor status	H		
08.1 Invasive Non-Native/Alien Species	Invasive animals	2.2 Invasive/Problematic Species Control		Control non-native invertebrates using integrated pest management techniques for aquatic habitats	M		

**Table 7 - Continued.**

<b>Utah physa</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
		Unknown	X	Unknown	X	Front Range	P	Lakes	<input checked="" type="checkbox"/>
						Utah High Plateau	P	Transition Streams	<input checked="" type="checkbox"/>
<i>Physa gyrina utahensis</i>		The taxonomy of the North American Physidae both at the generic and specific level needs attention and revision. Validity of this species requires genetic verification.							
Tier 2	Mollusks								
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action		Priority			
13.3 Genetic relationship with other species and/or subspecies unknown	Clarification of taxonomy is needed	8.0 Research & Monitoring		Research genetic relation to other (sub)species		H			
13.4 Population status unknown	Referenced in literature, but current populations are unknown. Colorado surveys conducted from 2001-2004 did not record this species.	8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)		H			
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status		H			
14.1 Scarcity (leading to inbreeding depression)	Scarcity (limited distribution)	8.0 Research & Monitoring		Research population parameters and/or monitor status		H			
07.2 Dams & Water Management/Use	Altered hydrological regime (surface or aquifer)	2.3 Habitat & Natural Process Restoration		Maintain linkages and connectivity		M			
08.1 Invasive Non-Native/Alien Species	Invasive animals	2.2 Invasive/Problematic Species Control		Control non-native invertebrates using integrated pest management techniques for aquatic habitats		M			

**Tier 2 Reptiles**

<b>Blacknecked gartersnake</b>		Population Status and Trend		Distribution	Type	Habitat	Primary		
		Low	X	Unknown	X	Central Shortgrass Prairie	P	Colorado Plateau - Wyoming Basins Rivers	<input checked="" type="checkbox"/>
						Colorado Plateau	O	Colorado Plateau - Wyoming Basins Streams	<input checked="" type="checkbox"/>
<i>Thamnophis cyrtopsis</i>									
Tier 2	Reptiles								
						Eastern Plains Rivers			<input checked="" type="checkbox"/>
						Eastern Plains Streams			<input checked="" type="checkbox"/>
						Desert Shrub			<input type="checkbox"/>
						Oak and Mixed Mountain Shrublands			<input type="checkbox"/>
						Pinyon - Juniper			<input type="checkbox"/>
						Shortgrass Prairie			<input type="checkbox"/>
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action		Priority			
14.1 Scarcity (leading to inbreeding depression)	Scarcity	8.0 Research & Monitoring		Research population parameters and/or monitor status		M			
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	2.3 Habitat & Natural Process Restoration		Maintain appropriate patch size and habitat mosaic		L			
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations		Promote consideration of biodiversity issues in transportation and land use planning processes		L			
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.3 Private Sector Standards & Codes		Implement Best Management Practices for transportation projects, urban development, landscaping, etc.		L			
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production		L			
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status		L			

**Table 7 - Continued.**

<b>California kingsnake</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Low	X	Unknown	X	Central Shortgrass Prairie	P	Desert Shrub	<input checked="" type="checkbox"/>
				Colorado Plateau	P	Mixed and Tallgrass Prairies	<input type="checkbox"/>
						Playas	<input type="checkbox"/>
<i>Lampropeltis californiae</i>							
Tier 2 Reptiles							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority		
04.1 Roads & Railroads	Collision (e.g., auto)	4.3 Awareness & Communications		Publish educational material/sponsor educational programs to raise public awareness	L		
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	L		

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<b>Common gartersnake</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Medium	X	Declining	X	Front Range	P	Eastern Plains Rivers	<input checked="" type="checkbox"/>
				Central Shortgrass Prairie	O	Eastern Plains Streams	<input checked="" type="checkbox"/>
				Southern Rocky Mountains	O	Riparian Woodlands and Shrublands	<input checked="" type="checkbox"/>
						Wetlands	<input checked="" type="checkbox"/>
<i>Thamnophis sirtalis</i>							
Tier 2 Reptiles							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority		
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	2.3 Habitat & Natural Process Restoration		Maintain appropriate patch size and habitat mosaic	M		
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations		Promote zoning that concentrates use and protects habitat	M		
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.3 Private Sector Standards & Codes		Implement Best Management Practices for transportation projects, urban development, landscaping, etc.	M		
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.2 Policies & Regulations		Monitor water quality standards	M		
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	M		

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<b>Desert nightsnake</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Low	X	Unknown	X	Central Shortgrass Prairie	P	Desert Shrub	<input checked="" type="checkbox"/>
				Colorado Plateau	P	Greasewood	<input checked="" type="checkbox"/>
				Southern Rocky Mountains		Pinyon - Juniper	<input checked="" type="checkbox"/>
				Utah High Plateau		Eastern Plains Streams	<input type="checkbox"/>
						Sagebrush	<input type="checkbox"/>
						Shortgrass Prairie	<input type="checkbox"/>
<i>Hypsiglena chlorophaea</i>							
Tier 2 Reptiles							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority		
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	M		
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	M		
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations		Promote consideration of biodiversity issues in transportation and land use planning processes	L		

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<b>Desert spiny lizard</b>		Population Status and Trend		Distribution	Type	Habitat	Primary
Unknown		Unknown		Colorado Plateau	P	Desert Shrub	<input checked="" type="checkbox"/>
<i>Sceloporus magister</i>							
Tier 2 Reptiles							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority		
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring		Research population parameters and/or monitor status	M		
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	M		

**Table 7 - Continued.**

<b>Long-nosed leopard lizard</b>		Population Status and Trend		Distribution	Type	Habitat	Primary	
	Unknown	X	Unknown	X	Colorado Plateau	P	Desert Shrub	<input checked="" type="checkbox"/>
							Greasewood	<input checked="" type="checkbox"/>
							Pinyon - Juniper	<input checked="" type="checkbox"/>
							Sagebrush	<input checked="" type="checkbox"/>
							Saltbush	<input checked="" type="checkbox"/>
<i>Gambelia wislizenii</i>								
Tier 2	Reptiles							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority			
08.1 Invasive Non-Native/Alien Species	Invasive plants - cheatgrass	2.3 Habitat & Natural Process Restoration		Restore native habitat using site-specific techniques and context	M			
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring		Research population parameters and/or monitor status	M			
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	M			
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development	5.2 Policies & Regulations		Promote consideration of biodiversity issues in transportation and land use planning processes	L			
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production	L			
<b>Long-nosed snake</b>		Population Status and Trend		Distribution	Type	Habitat	Primary	
	Low	X	Unknown	X	Central Shortgrass Prairie	P	Sandsage	<input checked="" type="checkbox"/>
							Shortgrass Prairie	<input checked="" type="checkbox"/>
							Conservation Reserve Program	<input type="checkbox"/>
							Eastern Plains Rivers	<input type="checkbox"/>
							Sagebrush	<input type="checkbox"/>
<i>Rhinocheilus lecontei</i>								
Tier 2	Reptiles							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority			
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring		Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	M			
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	M			
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes		Implement Best Management Practices for agricultural production	L			
<b>Midget faded rattlesnake</b>		Population Status and Trend		Distribution	Type	Habitat	Primary	
	Unknown	X	Unknown	X	Colorado Plateau	P	Cliffs and Canyons	<input checked="" type="checkbox"/>
					Southern Rocky Mountains	P	Desert Shrub	<input checked="" type="checkbox"/>
					Utah High Plateau	P	Pinyon - Juniper	<input checked="" type="checkbox"/>
							Greasewood	<input type="checkbox"/>
							Sagebrush	<input type="checkbox"/>
							Saltbush	<input type="checkbox"/>
<i>Crotalus oreganus concolor</i>								
Tier 2	Reptiles							
General Threat	Specific Threat	General Conservation Action		Specific Conservation Action	Priority			
03.1 Oil & Gas Drilling	Oil & gas development, pipelines, and infrastructure	5.3 Private Sector Standards & Codes		Implement Best Management Practices for energy development and mining	M			
06.1 Recreational Activities	Off-road and trail development and use	2.1 Site/Area Management		Manage public use to be compatible with biodiversity	M			
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Illegal take	5.4 Compliance & Enforcement		Enforce hunting, fishing, collecting regulations	L			
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring		Research population parameters and/or monitor status	L			
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring		Research population parameters and/or monitor status	L			

**Table 7 - Continued.**

**New Mexico  
threadsnake**

Population Status and Trend	Distribution	Type	Habitat	Primary
Unknown X   Unknown X = Leptotyphlops dissectus	Central Shortgrass Prairie	P	Pinyon - Juniper	<input checked="" type="checkbox"/>
			Shortgrass Prairie	<input checked="" type="checkbox"/>
			Eastern Plains Streams	<input type="checkbox"/>

*Rena dissectus*

Tier 2 Reptiles

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	M
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring	Research population parameters and/or monitor status	M
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	M

**Round-tailed horned  
lizard**

Population Status and Trend	Distribution	Type	Habitat	Primary
Unknown X   Unknown X	Central Shortgrass Prairie	P	Pinyon - Juniper	<input checked="" type="checkbox"/>
			Shortgrass Prairie	<input checked="" type="checkbox"/>

*Phrynosoma modestum*

Tier 2 Reptiles

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	M
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff	5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	M
09.3 Agricultural & Forestry Effluents	Poisoning (fire ant insecticides)	4.3 Awareness & Communications	Implement landowner outreach/education program	M
14.1 Scarcity (leading to inbreeding depression)	Scarcity (Colorado occurrences known only from two sites apparently disjunct from core range)	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	M
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Illegal take	5.4 Compliance & Enforcement	Enforce hunting, fishing, collecting regulations	L
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring	Research population parameters and/or monitor status	L
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	L

**Smith's black-headed  
snake**

Population Status and Trend	Distribution	Type	Habitat	Primary
Unknown X   Unknown X	Colorado Plateau	P	Desert Shrub	<input checked="" type="checkbox"/>
	Southern Rocky Mountains	O	Greasewood	<input checked="" type="checkbox"/>
			Pinyon - Juniper	<input checked="" type="checkbox"/>
			Sagebrush	<input checked="" type="checkbox"/>
			Saltbush	<input checked="" type="checkbox"/>
			Conservation Reserve Program	<input type="checkbox"/>

*Tantilla horbartsmithi*

Tier 2 Reptiles

General Threat	Specific Threat	General Conservation Action	Specific Conservation Action	Priority
13.1 Complete distribution in Colorado unknown	Complete distribution in Colorado unknown	8.0 Research & Monitoring	Improve understanding of species/habitat distribution (field inventory, modeling, ground-truthing)	M
13.4 Population status unknown	Lack of data on population status	8.0 Research & Monitoring	Research population parameters and/or monitor status	M
13.5 Population trend unknown	Lack of data on population trend	8.0 Research & Monitoring	Research population parameters and/or monitor status	M
04.1 Roads & Railroads	Collision (e.g., auto)	4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	L

**Table 7 - Continued.**

<b>Texas horned lizard</b>		Population Status and Trend		Distribution	Type	Habitat	Primary	
	Medium	D	Stable	X	Central Shortgrass Prairie	P	Mixed and Tallgrass Prairies	<input checked="" type="checkbox"/>
							Shortgrass Prairie	<input checked="" type="checkbox"/>
							Conservation Reserve Program	<input type="checkbox"/>
<i>Phrynosoma cornutum</i>								
Tier 2 Reptiles								
General Threat	Specific Threat			General Conservation Action	Specific Conservation Action	Priority		
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland			5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	H		
09.3 Agricultural & Forestry Effluents	Poisoning (fire ant insecticides)			4.3 Awareness & Communications	Implement landowner outreach/education program	M		
04.1 Roads & Railroads	Collision (e.g., auto)			4.3 Awareness & Communications	Publish educational material/sponsor educational programs to raise public awareness	L		
05.1 Control of Nuisance Species & Collecting Terrestrial Animals	Illegal take			5.4 Compliance & Enforcement	Enforce hunting, fishing, collecting regulations	L		
<b>Utah milksnake</b>		Population Status and Trend		Distribution	Type	Habitat	Primary	
	Unknown		Unknown	Central Shortgrass Prairie	P	Oak and Mixed Mountain Shrublands	<input checked="" type="checkbox"/>	
				Colorado Plateau	P	Pinyon - Juniper	<input checked="" type="checkbox"/>	
				Front Range	P	Sandsage	<input checked="" type="checkbox"/>	
				Southern Rocky Mountains	O	Shortgrass Prairie	<input checked="" type="checkbox"/>	
				Wyoming Basin	O			
<i>Lampropeltis triangulum taylori</i>								
Tier 2 Reptiles								
General Threat	Specific Threat			General Conservation Action	Specific Conservation Action	Priority		
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development			5.2 Policies & Regulations	Promote consideration of biodiversity issues in transportation and land use planning processes	M		
01.1 Housing & Urban Areas	Urban, suburban, and ex-urban development			5.3 Private Sector Standards & Codes	Implement Best Management Practices for transportation projects, urban development, landscaping, etc.	M		
13.4 Population status unknown	Lack of data on population status			8.0 Research & Monitoring	Research population parameters and/or monitor status	M		
13.5 Population trend unknown	Lack of data on population trend			8.0 Research & Monitoring	Research population parameters and/or monitor status	M		
<b>Yellow mud turtle</b>		Population Status and Trend		Distribution	Type	Habitat	Primary	
	Low	X	Unknown	X	Central Shortgrass Prairie	P	Eastern Plains Streams	<input checked="" type="checkbox"/>
							Lakes	<input checked="" type="checkbox"/>
							Sandsage	<input checked="" type="checkbox"/>
							Wetlands	<input type="checkbox"/>
<i>Kinosternon flavescens</i>								
Tier 2 Reptiles								
General Threat	Specific Threat			General Conservation Action	Specific Conservation Action	Priority		
02.1 Annual & Perennial Non-Timber Crops	Conversion to cropland			5.3 Private Sector Standards & Codes	Implement Best Management Practices for agricultural production	M		
09.3 Agricultural & Forestry Effluents	Herbicide/pesticide spraying or runoff			2.3 Habitat & Natural Process Restoration	Reduce herbicide/pesticide use	M		
13.5 Population trend unknown	Lack of data on population trend			8.0 Research & Monitoring	Research population parameters and/or monitor status	M		