U.S. Department of the Interior
Bureau of Land Management

Strategic Plan for
Amphibian and Reptile Conservation

April 2022

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Rio Grande cooter *(Pseudemys gorzugi)* **by Kurt Buhlmann**

Contents

Executive Summary

The Bureau of Land Management (BLM) is responsible for managing approximately 245 million acres of public lands mostly in the Western United States and approximately 710 million acres of subsurface mineral estate nationwide. In accordance with the Federal Land Policy and Management Act (FLPMA) of 1976, the BLM manages public lands under the principles of multiple use and sustained yield. FLPMA requires that "the public lands be managed in a manner that will…provide food and habitat for fish and wildlife…" (Section 102(a)(8)). FLPMA also includes "fish and wildlife development and utilization" as one of the six "principal or major uses" of the public lands (Section 103(l)). BLM policy implements these provisions of law by, for example, directing the BLM "to manage habitat with emphasis on ecosystems to ensure self-sustaining populations and a natural abundance and diversity of wildlife, fish, and plant resources on the public lands" (BLM Manual 6500, "Wildlife and Fisheries Management").

This legal and policy framework applies to more than 100 BLM special status amphibian and reptile (herpetofauna) species, including herpetofauna species listed under the Endangered Species Act (ESA) of 1973, that occur on BLM-managed lands. The BLM requires a strategic commitment of resources to implement management, conservation, and protection activities for these species and their habitats. By proactively and collaboratively contributing to the management and sustainability of herpetofauna and their habitats, the BLM will enhance recovery of ESA-listed species, preclude the need for listing under the ESA, and develop and maintain partnerships, while promoting biodiversity and ecologically resilient landscapes.

The purpose of this strategy is to promote herpetofauna within the BLM; guide the state, district, and field offices in the efficient and effective management of habitats; and support the recovery of herpetofauna populations where they have declined on public lands. The strategy outlines five overarching goals:

1. Inventory BLM herpetofauna resources and identify needs.
2. Identify and address threats to BLM herpetofauna habitats and populations.
3. Increase the BLM's role in herpetofauna communication and collaboration.
4. Improve BLM business practices, policies, and planning with respect to herpetofauna management and conservation.
5. Increase science support tools and information for herpetofauna species and habitat management.

The BLM's objectives to achieve these goals are focused on management actions, best management practices, partnerships, collaborations, and increasing awareness of herpetofauna resources on BLM-managed lands.

Introduction

The Bureau of Land Management (BLM) is responsible for managing approximately 245 million acres of public lands mostly in the Western United States and approximately 710 million acres of subsurface mineral estate nationwide. The mission of the BLM is to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations. In accordance with the Federal Land Policy and Management Act (FLPMA) of 1976, the BLM manages public lands under the principles of multiple use and sustained yield. FLPMA requires that "the public lands be managed in a manner that will…provide food and habitat for fish and wildlife…" (Section 102(a)(8)). FLPMA also includes "fish and wildlife development and utilization" as one of the six "principal or major uses" of the public lands (Section 103(l)). BLM policy implements these provisions of law by, for example, directing the BLM "to manage habitat with emphasis on ecosystems to ensure self-sustaining populations and a natural abundance and diversity of wildlife, fish, and plant resources on the public lands" (BLM Manual 6500, "Wildlife and Fisheries Management").

The BLM's approach to amphibian and reptile (herpetofauna) conservation seeks to understand, predict, and address the wide-ranging threats that are impacting these species. This strategy is intended to implement effective management actions for conservation of herpetofauna habitats and populations through collaborative efforts across BLM programs and with BLM partners.

A Need for Conservation

Herpetofauna are the only terrestrial ectothermic (cold-blooded) vertebrates and thus have biological and ecological needs that differ from warm-blooded wildlife (Pough 1980). Many amphibians have a two-part life history, during which their habitat needs transfer from wetlands to uplands. As such, herpetofauna serve to transfer energy among aquatic and terrestrial environments and function as both predators and prey. Herpetofauna populations can also achieve remarkable densities and serve an important role in the uptake, retention, and distribution of nutrients. The presence of healthy herpetofauna populations has cascading effects on ecosystems, such as in predator-prey interactions and energy flow and nutrient cycling (Stebbins and Cohen 1995). Consequently, herpetofauna serve as indicators of environmental health, as well as significant contributors to biodiversity (Welsh and Ollivier 1998).

Approximately 32% of the world's amphibians have been categorized as vulnerable, endangered, or critically endangered, and greater than 43% are in decline (Stuart et al. 2004). Reptiles also are in decline, and one in five of the world's reptile species may soon be extinct (Böhm et al. 2013), including more than 50% of all turtle species (Rhodin et al. 2011). In the United States, nearly all native amphibians inhabit only a portion of their historic range. More than 100 herpetofauna species that occur on BLM-managed lands are currently identified as BLM special status species, including those listed by the U.S. Fish and Wildlife Service under the Endangered Species Act (ESA) of 1973.

Threats to Herpetofauna Habitats and Populations

Habitat fragmentation, degradation, and loss are primary causes of herpetofauna species declines (Lesbarrères et al. 2014). When the lands and waters herpetofauna need to breed, disperse, migrate, feed, and rest are fragmented (i.e., become patchy or disconnected), these animals can experience increased mortality and declines in diversity and abundance. Habitat loss and degradation can disrupt population connectivity, diminishing the rate of dispersal and recolonization (Colino-Rabanal and Lizana 2012). Habitat connectivity allows for gene flow between subpopulations and colonization of newly available habitats and allows species to shift their ranges as environmental changes occur.

Effects of climate change, weather extremes, drought, and water availability substantially impact herpetofauna in a variety of ways. Increasing temperatures result in altered moisture and precipitation, saltwater intrusion into freshwater areas, higher intensity coastal storm surges, changing temperature patterns and growing seasons, changing hydroperiod, increased threats from large-scale wildfires, invasions of nonnative species and diseases, and changes to the quality and temperature of aquatic and wetland habitats that are critical to the survival of herpetofauna (Corn 2005; Wake 2007). Increased temperatures and reduced precipitation may also cause some herpetofauna species to be subject to decreases in fitness resulting from negative impacts to their energetics, growth, and reproduction (Zani and Rollyson 2011; Sadoti et al. 2017). Temperature fluctuations may also adversely affect some herpetofauna species by causing skewed sex ratios at hatching or birth (Wapstra et al. 2009). Changes in the timing, amount, and type of precipitation (e.g., snow vs. rain) are expected to negatively impact herpetofauna habitat, resulting in predicted range contractions for several reptile species (Hatten et al. 2016; Griffis-Kyle et al. 2018). Amphibian populations are negatively affected by altered flow events in creeks and rivers, especially

where exacerbated by the presence of dams and diversions, resulting in hydroperiods that are insufficient to allow for normal larval development and metamorphosis (Daszak et al. 2005).

Diseases and pathogens that affect amphibians and reptiles are also increasing. In the last decade, the growth and spread of harmful pathogens and diseases has resulted in population reductions, range contractions, regional extirpations, and even extinctions (Berger et al. 1998). Pathogens are expected to have increased transmission potential and effect on populations because of changing climatic conditions (Pounds et al. 2006). Some pathogens are easily spread to other areas through nonnative wildlife and/or improper decontamination procedures by field personnel or the public (Garner et al. 2006).

Invasive species negatively impact herpetofauna through the degradation and reduction of viable habitats for native species (Ostoja and Schupp 2009). Invasive plants can reduce food resources or other habitat components and can alter fire dynamics to the detriment of some herpetofauna species (Esque et al. 2003). For example, large-scale wildfires, often facilitated by invasive annual grass expansion, typically lead to a reduction of vegetation cover at landscape scales, reducing herpetofauna biodiversity and habitat structure and complexity in burned areas (Rochester et al. 2010).

Nonnative herpetofauna, often the result of importations for the pet trade, can outcompete and extirpate native species. Other nonnative animals, whether domesticated or wild, can increase predation pressure on herpetofauna populations and alter habitats. For example, the American bullfrog *(Rana catesbeiana)*, a large frog native to eastern North America, is considered one of the most harmful invasive species globally, can outcompete and prey on native amphibians, and consistently serves as a vector for infectious amphibian diseases (Garner et al. 2006; Ficetola et al. 2007).

Pesticides, fertilizers, and other terrestrial and aquatic contaminants have also been implicated in the decline of native herpetofauna species and contribute to the decline of the biomass

American bullfrog *(Rana catesbeiana)* **by Chris Petersen**

and diversity of invertebrate species that serve as their prey (Johnson et al. 2007; Lesbarrères et al. 2014). These types of contaminants, including pharmaceuticals, have also been found to have deleterious developmental effects (e.g., deformities and reproductive abnormalities) on native amphibians (Taylor et al. 2005; Brühl et al. 2013).

Mining, energy development, logging, ungulate grazing, and other land use activities that reduce vegetative cover and soil stability can contribute to direct habitat loss and fragmentation and may contribute to sedimentation and other water quality issues (Ross et al. 2000; Beever and Brussard 2004; Colino-Rabanal and Lizana 2012; Kay et al. 2017; Chalfoun 2021). Sedimentation can threaten stream amphibians by filling in habitat spaces between rocks and other cover items, reducing access to key refugia, and increasing exposure to predation. Sedimentation can also cover and smother egg masses, potentially reducing egg and larvae success by reducing oxygen exchange (Pilliod et al. 2003). In addition, the presence of chemical contaminants and increased water temperatures associated with some land use activities can directly and indirectly affect survival, development, and metamorphosis of amphibian larvae; can increase rates of disease transmission; can reduce reproductive success and fitness in reptiles; and was found to have a positive correlation with amphibian limb malformations

in the Northeast, Southeast, and Pacific regions of the United States (Gunderson et al. 2001; Metts et al. 2005; Pounds et al. 2006; Haas et al. 2018).

Lastly, exposed vertical, hollow pipes with open tops that are 12-inches or less in diameter have been identified as an inadvertent trapping hazard to herpetofauna (Brattstrom 1995; Harris et al. 2019). For example, lizards and snakes enter the pipes from uncapped tops and/or perforated sides; become trapped inside; and die from starvation, dehydration, and heat. In addition to open topped fence pipes, posts, survey markers, outbuilding vents, and other structures, approximately 10-20 million mining claim markers exist on BLM-managed lands, many of which are open vertical pipes. Identifying and capping or replacing these open, uncapped hollow pipes present a unique opportunity for the BLM and associated permittees/claimants to prevent wildlife mortalities.

San Joaquin coachwhip *(Coluber flagellum ruddocki)* **by Michael Westphal**

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Benefits of a Herpetofauna Strategy

As a federal land management agency and public resource steward, the BLM faces increasing responsibilities to be proactive, productive, and accountable to the public, local communities, and policy makers. It is crucial that the BLM remain purposeful and innovative in its work and effectively respond to continually changing resource conditions.

A strategic BLM effort for the conservation of amphibians and reptiles will serve to increase on-the-ground conservation efforts and, in doing so, will help prevent or slow population declines and will enhance, restore, and promote healthy public lands. This effort will also help to enhance proactive communication, collaboration, and partnerships for herpetofauna habitat management, including through providing the BLM a clear vision, promoting greater awareness, facilitating cross-program engagement, and encouraging the development of tools and trainings.

Desert tortoise *(Gopherus agassizii)* **by Fiana Shapiro**

BLM Herpetofauna Strategy Goals, Objectives, and Actions

The BLM will work to implement the following goals, objectives, and actions to support the BLM mission for the benefit of herpetofauna species and habitat.

Goal 1: Inventory BLM herpetofauna resources and identify needs.

Objective 1.1. Develop and maintain current herpetofauna species inventories on public lands.

Action 1.1.1. Identify and implement herpetofauna inventory protocols on BLM-managed lands, using "Inventory and Monitoring: Recommended Techniques for Reptiles and Amphibians" (Graeter et al. 2013), or future updated versions.

Action 1.1.2. Develop and apply low-cost environmental DNA (eDNA) methodology to conduct inventory and assessment activities.

Objective 1.2. Inventory, monitor, and assess herpetofauna species- and community-level baseline habitat condition.

Action 1.2.1. Identify and implement baseline species- and community-level habitat condition inventory, monitoring, and assessment protocols on BLM-managed lands.

Objective 1.3. Identify on-the-ground activities, projects, and habitat management needs to address and accomplish herpetofauna conservation.

Action 1.3.1. Compile a herpetofauna activity, project, and habitat management needs summary document at multiple scales.

Objective 1.4. Understand the distribution and trend of those invasive species that affect herpetofauna on BLM-managed lands.

Action 1.4.1. Inventory and monitor invasive species occurrences that affect herpetofauna on BLM-managed lands.

Objective 1.5. Contribute to collaborative disease and pathogen monitoring.

Action 1.5.1. Identify and implement disease and pathogen monitoring and early detection and rapid response preparedness efforts, in coordination with BLM partners.

Ensatina *(Ensatina eschscholtzii)* **by Paul Block**

Goal 2: Identify and address threats to BLM herpetofauna habitats and populations.

Objective 2.1. Ensure that the BLM incorporates herpetofauna best management practices (BMPs) into its core business practices.

Action 2.1.1. Provide policy and guidance for use of the Partners in Amphibian and Reptile Conservation's (PARC's) regionally specific "Habitat Management Guidelines for Amphibians and Reptiles" during land use planning and project-level analysis (in accordance with the National Environmental Policy Act).

Action 2.1.2. Develop and apply additional herpetofauna species-, habitat-, or impact-specific BMPs, as needed.

Objective 2.2. Restore, enhance, connect, and protect herpetofauna habitat on BLM-managed lands.

Action 2.2.1. Implement herpetofauna habitat restoration, enhancement, connectivity, or protection projects on BLM-managed lands.

Action 2.2.2. Reduce habitat fragmentation and loss of connectivity through the thoughtful consideration and siting of BLM-approved authorizations (e.g., realty actions) and enforcement of laws regarding trespass development.

Action 2.2.3. Reduce the likelihood of adverse impacts to reptiles and amphibians by removing or permanently capping open, uncapped hollow pipes.

Action 2.2.4. Develop a system to track the number, acres, and/or miles of herpetofauna treatments (incorporated into existing BLM data systems, as feasible).

Objective 2.3. Where affecting herpetofauna, control, prevent the establishment of, and eradicate invasive, feral, and nuisance species, and control the spread of diseases and pathogens.

Action 2.3.1. Identify and implement invasive animal species and disease control efforts, as they relate to conserving native herpetofauna, especially where the BLM can engage with partners.

Action 2.3.2. Implement invasive plant species treatments, as they relate to conserving native herpetofauna habitat, on BLM-managed lands.

Objective 2.4. Maintain and restore species composition and diversity of plant communities, as they relate to herpetofauna habitat, to sustain physical complexity and habitat connectivity.

Action 2.4.1. Implement herpetofauna-related plant community restoration, enhancement, connectivity, and protection projects on BLM-managed lands.

Mojave black-collared lizard *(Crotaphytus bicinctores)* **by Tim Torell**

Goal 3: Increase the BLM's role in herpetofauna communication and collaboration.

Objective 3.1. Increase the BLM's engagement in herpetofauna-related partnerships at multiple scales to advance mutual priorities and promote efficiency.

Action 3.1.1. Contribute to PARC and other partnership efforts to develop and implement herpetofauna strategic planning initiatives, such as identifying additional Priority Amphibian and Reptile Conservation Areas (PARCAs) on BLM-managed lands.

Action 3.1.2. Participate in internal and external workgroups to promote herpetofauna conservation.

Objective 3.2. Increase information exchange across the BLM and with other stakeholders to share expertise and knowledge on herpetofauna science and habitat management.

Action 3.2.1. Share and utilize scarce herpetofauna skills across BLM programs and with other stakeholders.

Action 3.2.2. Develop a centralized inventory and monitoring database and document, photograph, and video depositories for shared use across BLM programs (incorporated into existing BLM data systems, as feasible).

Objective 3.3. Increase internal awareness of herpetofauna resources on BLM-managed lands and motivate conservation actions.

Action 3.3.1. Increase the awareness and consideration of herpetofauna in BLM management actions by creating internal education, outreach, and interpretation materials that share information on BLM herpetofauna population and habitat management policies, guidance, and objectives.

Objective 3.4. Increase partner and public awareness of herpetofauna resources on BLM-managed lands.

Action 3.4.1. Communicate BLM herpetofauna strategic goals and objectives to partners, biologists, stakeholders, and cooperators.

Action 3.4.2. Increase public awareness of BLM herpetofauna resources by creating public education, outreach, and interpretation materials that share information on BLM herpetofauna population and habitat management activities, including invasive species control efforts.

Objective 3.5. Increase coordination of resources and funding across BLM programs and with partners to support mutual priorities.

Action 3.5.1. Identify and facilitate opportunities for additional coordination across BLM programs to implement herpetofauna conservation efforts.

Action 3.5.2. Work actively across BLM administrative boundaries to implement herpetofauna conservation efforts.

Action 3.5.3. Identify new and creative opportunities for local community participation in BLM resource management activities relative to herpetofauna.

Arizona mountain kingsnake *(Lampropeltis pyromelana)* **by Polly Conrad**

Goal 4: Improve BLM business practices, policies, and planning with respect to herpetofauna management and conservation.

Objective 4.1. Ensure BLM policy and guidance are updated and effective at prioritizing the conservation and management of herpetofauna species and habitats.

Action 4.1.1. Update or renew BLM policy and guidance regarding the conservation and management of herpetofauna species and habitats, such as BLM Manuals 6500 and 6840 and Instruction Memorandum No. 2016-023, "Reducing Preventable Wildlife Mortalities."

Action 4.1.2. Develop and issue decontamination protocols to reduce the risk of pathogen spread during field work.

Objective 4.2. Increase internal BLM awareness of herpetofauna research and conservation activities occurring on public lands.

Action 4.2.1. Develop and submit annual herpetofauna research and conservation activity summary reports to BLM Headquarters for broad distribution efforts.

Southwestern pond turtle *(Actinemys pallida)* **by Jeff Lovich**

Goal 5: Increase science support tools and information for herpetofauna species and habitat management.

Objective 5.1. Increase the availability of technical resources for BLM personnel regarding herpetofauna management.

Action 5.1.1. Develop, publish, and distribute herpetofauna technical references and guides.

Objective 5.2. Design, promote, and fund scientific research efforts that address herpetofauna conservation on BLM-managed lands.

Action 5.2.1. Provide internal and external funding opportunities for herpetofauna research efforts that will benefit BLM management.

Objective 5.3. Maintain and make available current biological information relevant to the management of native herpetofauna species.

Action 5.3.1. Identify and share biological information available through internal BLM databases and community science applications, including HerpMapper and iNaturalist.

Objective 5.4. Ensure emerging techniques and technologies are available to the BLM to address herpetofauna conservation.

Action 5.4.1. Promote the development of emerging technologies, such as unmanned aircraft systems (UAS), artificial intelligence, radiotelemetry, and remote sensing with specific application to herpetofauna.

Conclusion

Amphibians and reptiles face ever-increasing challenges to their survival. From habitat loss and expanding human populations to rise in disease and impacts from climate change, the Nation's herpetofauna populations are undergoing unprecedented declines. This strategy provides a framework for bureauwide conservation of amphibians, reptiles, and their habitats. These goals, objectives, and actions are part of a comprehensive effort to manage resources in ways that reduce land resource conflicts, increase ecological resiliency, and protect herpetofauna for their ecological and economic value and the enjoyment of future generations.

Western spadefoot *(Spea hammondii)* **by Marisa Ishimatsu**

Laws and Policies
Guiding Herpetofauna Management

Federal Laws

Endangered Species Act
Federal Land Policy and Management Act
Federal Noxious Weed Act
Fish and Wildlife Coordination Act
John D. Dingell, Jr. Conservation, Management, and Recreation Act
National Environmental Policy Act
National Invasive Species Act
Nonindigenous Aquatic Nuisance Prevention and Control Act
Plant Protection Act
Public Rangelands Improvement Act
Surface Mining Control and Reclamation Act

Administrative Policies

Executive Order 11990 – Protection of Wetlands
Executive Order 13112, as amended by Executive Order 13751 – Safeguarding the Nation from the Impacts of Invasive Species
Executive Order 13175 – Consultation and Coordination with Indian Tribal Governments
Executive Order 14008 – Tackling the Climate Crisis at Home and Abroad
Department of the Interior Manual
  • Part 517: Pesticides
  • Part 524: Invasive Species Management

California tiger salamander *(Ambystoma californiense)* **by Michael Robinson**

BLM Policies

Manual 1601 – Land Use Planning
Manual 1626 – Travel and Transportation Management
Manual 1737 – Riparian-Wetland Area Management
Manual 1740 – Renewable Resource Improvements and Treatments
Manual 1745 – Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife and Plants
Manual 6100 – National Landscape Conservation System Management
Manual 6340 – Management of Designated Wilderness Areas
Manual 6400 – Wild and Scenic Rivers
Manual 6500 – Wildlife and Fisheries Management
Manual 6521 – State Agencies (cooperative relations)
Manual 6522 – Federal Agencies (cooperative relations)
Manual 6523 – Nongovernmental Organizations (cooperative relations)
Manual 6524 – Research
Manual 6525 – Sikes Act Wildlife Programs
Manual 6600 – Fish, Wildlife, and Special Status Plant Resources Inventory and Monitoring
Manual 6602 – Integrated Habitat Inventory and Classification System
Manual 6720 – Aquatic Resource Management
Manual 6721 – Reservoirs
Manual 6780 – Habitat Management Plans
Manual 6840 – Special Status Species Management
Manual 7200 – Water Resources
Manual 7240 – Water Quality
Manual 9011 – Chemical Pest Control
Handbook H-9011-1 – Chemical Pest Control
Manual 9015 – Integrated Weed Management

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Common chuckwalla *(Sauromalus ater)* **by Rob Nixon**

1. Colorado river toad *(Bufo alvarius)* by Richard Whittle
2. Mojave black-collared lizard *(Crotaphytus bicinctores)* by Tim Torell
3. Texas horned lizard *(Phrynosoma cornutum)* by Ron Drummond
4. Colorado desert sidewinder *(Crotalus cerastes laterorepens)* by Joshua Pierce
5. Coastal giant salamander *(Dicamptodon tenebrosus)* by David Leer
6. Desert tortoise *(Gopherus agassizii)* by Christy Klinger
7. Rough-skinned newt *(Taricha granulosa)* by Vikki Jackson
8. Dixie Valley toad *(Anaxyrus williamsi)* by Kris Urquhart
9. Western painted turtle *(Chrysemys picta)* by Steve Reed
10. Western terrestrial garter snake *(Thamnophis elegans)* by Danny Martin
11. Mountain short-horned lizard *(Phrynosoma hernandesi)* by Chris Petersen
12. Common snapping turtle *(Chelydra serpentina)* by Marty DeLong
13. Gila monster *(Heloderma suspectum)* by Kevin Stohlgren
14. Prairie rattlesnake *(Crotalus viridis)* by Danny Martin
15. Foothill yellow-legged frog *(Rana boylii)* by Alan St. John
16. Barred tiger salamander *(Ambystoma mavortium)* by J.D. Willson
17. Long-nosed leopard lizard *(Gambelia wislizenii)* by Michael S. Kellett
18. Red-eared slider *(Trachemys scripta elegans)* and western pond turtle *(Actinemys marmorata)* by Susan Thomas