

# V. RANGELAND MANAGEMENT PRACTICES

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Rangelands are natural communities dominated by grasses, forbs, and shrubs that are typically uncultivated and sustain grazing and browsing animals (Holechek et al. 2010). Rangeland management is the manipulation of rangeland components to obtain the optimum combination of goods and services for society on a sustained basis and is driven by 2 major principles: 1. Protection and enhancement of the soil and vegetation complex; and 2. Maintaining or improving the output of consumable range products (Holechek et al. 2010). In Colorado, approximately 40% of the state is rangeland with much of it in the eastern plains Shortgrass Prairie Ecoregion and the western parts of the state within the Colorado Plateau, Utah High Plateau, and Wyoming Basins ecoregions (see Introduction chapter; TNC 1999). An estimated 47.5 million acres of Colorado is grazed, with 22 million acres managed by federal agencies (Mitchell 1993).

Bats use rangelands for many life history needs, including feeding, drinking, roosting, and rearing young (Armstrong et al. 2011). Because some bat species frequently use rangelands as roosting and foraging habitat (Chung-MacConbrey 1996), there are several major rangeland management issues that have relevance for bat conservation. The issues addressed in this chapter include, riparian vegetation management, vegetation structure of pinyon-juniper forests and sagebrush rangelands, pesticide use, and



Mist nets set over stock pond utilized as a water source by bats. Photo by D. Neubaum.

conservation of drinking sites. These practices can impact the health of individuals and alter the availability and quality of water resources, prey production, and roosting habitats. There are additional range management issues that are likely to impact bats and bat populations, including abandon mine management, oil and gas development, and wind energy development, which are addressed in other sections of this Conservation Plan (see chapters I. Mining Issues and VIII. Energy Development).

We address the following four categories of issues resulting from rangeland management practices in Colorado: loss and degradation of riparian habitat associated with feeding and drinking resources; loss of vegetative structure in pinyon-juniper and sagebrush rangelands; impacts from pesticide and herbicide spraying; and alteration of availability and quality of water sources.

## LOSS AND DEGRADATION OF RIPARIAN HABITAT

In arid regions like Colorado rangelands, the availability of water resources can influence bat distribution and habitat use (Williams et al. 2006; Ober and Hayes 2007; Razgour et al. 2010). Riparian habitats provide roosting, drinking and foraging habitat for bats, as well as breeding habitat for their prey (Grindal et al. 1999; Williams et al. 2006). Riparian areas are important resources because of the high diversity and density of insect prey and the availability of clean water (Fukui et al. 2006). Riparian areas provide important resources for foraging females because of nutrient requirements related to reproduction and lactation (Wilkinson and Barclay 1997; Grindal et al. 1999). The loss or degradation of these habitats, especially in xeric settings, may adversely affect bat populations using these sites. Riparian habitat may be compromised on rangelands because of disruption of hydrologic regimes via dams and water diversions, excessive grazing pressure that changes hydrology and vegetation structure, and increased recreation use at or near streams (Kauffman and Krueger 1984; Armour et al. 1991; Lee et al. 1997). Because riparian habitats in rangeland environs are vital to conservation for a suite of bat species (Calvert and Neiswenter 2012), it is important to proactively manage and conserve these habitats (Briggs 1996).

### GOAL

**PRESERVE AND RESTORE RIPARIAN HABITATS THROUGH THE PROMOTION OF SOUND GRAZING AND RECREATION MANAGEMENT PRACTICES, RIPARIAN BUFFERS, AND CONSERVATION EASEMENTS.**

**Objective 1:** Implement grazing management practices to maintain or improve riparian habitats for foraging and flyways. There are various rangeland management techniques that can improve or maintain quality riparian habitats (Kauffman et al. 1997; Holechek et al. 2010). Because excessive grazing pressure can compact soil, change hydrologic regimes, increase surface runoff, alter vegetation structure, and preclude some wildlife species (Warren et al. 1986; Sedgewick and Knopf 1987; Schulz and Leininger 1990; Giuliano and Homyack 2004), it is important to manage stocking rates that maintain natural rainfall infiltration, sedimentation, and vegetative structure for bat habitat. The Grazing Response Index is a helpful metric for assessing the impacts of grazing by focusing on the frequency of grazing, the intensity of the grazing pressure, and the amount of time allowed for plants to regenerate after grazing (Reed et al. 1999).

**Objective 2:** Implement recreation management that minimizes impacts to riparian systems. Similar to some of the riparian habitat impacts from grazing, recreation can impact riparian zones negatively by compacting soils, reducing vegetative cover, reducing infiltration rates, reducing soil organic matter, and increasing soil density (Johnson and Carothers 1982). Because the severity of recreational impacts can depend on the vegetation type and intensity, scale, and frequency of disturbance, it is recommended that land managers identify the vegetation types and riparian conditions that are most susceptible to recreation impacts, and then concentrate recreational activity in areas least impacted (Johnson and Carothers 1982). Additionally, discouraging human

activity that impacts animal behavior patterns can minimize recreation impacts (Johnson and Carothers 1982). Most recreation impact assessments for bats have focused on cave visitation (see chapter II. Cave Management Practices; Boyle and Samson 1985), but recreation around riparian zones that impacts the vegetation, hydrology, or nocturnal behavior of bats can be detrimental for bat conservation.

**Objective 3:** Maintain riparian habitat in a manner that will encourage the restoration of native riparian species and historic hydrologic regimes. Dams and water diversions can greatly alter the hydrology and riparian habitats along the affected rivers (Nilsson and Berggren 2000; Anderson et al. 2007). Riparian habitats and waterways are invaluable resources for rangeland bats, and it is likely that modified river systems are unable to provide the roosting and feeding requirements needed by some western bats (Holloway and Barclay 2000). It is important to contrast bat habitat and resources along altered waterways and natural waterways, as has been done for other wildlife species (Breck et al. 2001). Such comparisons might elucidate how dams and water diversions create or eliminate habitat for bats.

**Objective 4:** Substantiate the importance of cottonwood galleries and other riparian ecosystems for foraging, roosting and migration in Colorado. Riparian cottonwood galleries near rangeland systems are valuable habitat for bats (Holloway and Barclay 2000; Swier 2003; Calvert and Neiswenter 2012), and given how water flow alterations can degrade riparian cottonwood forests (Rood et al. 2003), it is valuable to accurately assess the importance of cottonwood galleries to migratory and resident bat populations.

**Objective 5:** Support the establishment of conservation easements at properties that have intact riparian ecosystems in rangelands. There are financial and ecological advantages to conserving natural habitats, such as riparian zones, before they have undergone alteration (Balmford et al. 2002). In those areas where native riparian systems are intact, support efforts by local and regional conservation organizations to enter into easement agreements that maintain such habitats.

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## MANAGEMENT RECOMMENDATIONS

- Implement steps to maintain or improve riparian and wetland habitat on rangelands systems. This would include restricting grazing and recreation access to riparian areas that show degradation (Kauffman et al. 1997), conducting restoration efforts to return degraded riparian systems to native conditions, restoring waterways to native flow regimes that create quality bat habitat, and maintaining stands of native cottonwood galleries along waterways (Poff et al. 1997, Wyman 2006).
- Restore riparian habitats and the species they support by maintaining or introducing beaver (*Castor Canadensis*; McKinstry et al. 2007). Beaver are valuable creators of feeding habitat for bats because they create wetlands that are conducive for insect prey populations (Nummi et al. 2011). In riparian areas, dormant or growing season livestock grazing utilization should not

exceed an average of 30% use on the native woody riparian species or 50% on herbaceous species (Mosley et al. 1999; Holechek et al. 2010).

- Utilize existing resources, such as the various habitat conservation programs through the Natural Resources Conservation Service (Wetland Reserve Program; [www.nrcs.usda.gov](http://www.nrcs.usda.gov)) and Colorado Parks and Wildlife (Wetland Wildlife Conservation Program; [www.cpw.state.co.us](http://www.cpw.state.co.us)) in order to facilitate and support mitigation of degraded riparian areas.

## RESEARCH NEEDS

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- Investigate the importance of riparian habitats on rangelands by assessing bat activity in these areas.
- Investigate the impacts of exotic riparian species, such as salt-cedar (*Tamarix ramosissima*) and Russian-olive (*Elaeagnus angustifolia*), on insect communities and bat activity in riparian areas.
- Investigate differences in bat habitat and resources between grazed and ungrazed or restored systems.

## LOSS OF VEGETATIVE STRUCTURE IN PINYON-JUNIPER AND SAGEBRUSH RANGELANDS

A host of Colorado bats use pinyon-juniper forests and sagebrush shrublands for foraging and roosting (Armstrong et al. 2011). In an effort to restore some grassland systems, or increase rangeland or agricultural acreage, sagebrush and pinyon-juniper forests have been cleared using various methods (Evans 1988; Miller et al. 2000). Additionally, the sagebrush ecosystem is one of the most imperiled in the U.S. (Thompson 2007). The sagebrush steppe once occupied large expanses of the western U.S., but has been converted to conifer woodlands, exotic annual and introduced grasslands, and croplands, and is being degraded and fragmented by anthropogenic development (Davies et al. 2011). Conversion of pinyon-juniper and sagebrush lands can have ramifications for the nongame wildlife and wildlife habitat that rely on these systems (O'Meara et al. 1981; Baker 2006; Redmond et al. 2013). The pinyon-juniper and sagebrush habitats comprises only 7% of the Colorado landscape, yet provides the highest bat species diversity of all habitat types in the state (Armstrong et al. 2011). Bats forage and roost in pinyon-juniper forests and sagebrush steppe (Gitzen et al. 2002; Chung-MacCoubrey 2003; Snider et al. 2013) and conversion of these native systems via fire, fire suppression, mechanical manipulation, chemical control, and grazing can lead to a loss of vegetative structure that may impact bats (see chapter IV. Forest and Woodland Management Practices). Native, healthy sagebrush habitats provide essential insect prey for other wildlife species (Connelly et al. 2000), so it is likely that alterations to these habitats will impact bat insect prey abundance and diversity, which can alter bat behavior, diversity, and population health. Even habitat alterations to benefit rare species, such as reducing pinyon-juniper overstory to increase sagebrush cover and herbaceous understories for Gunnison sage grouse (*Centrocercus minimus*), can have unexpected impacts on other non-game species (Lukacs et al. 2015).

## GOAL

### LIMIT LARGE-SCALE DECLINES IN ROOSTING AND FEEDING HABITATS IN PINYON-JUNIPER FORESTS AND SAGEBRUSH LANDSCAPES BY LIMITING CONVERSION TO GRASSLANDS.

**Objective 1:** Promote awareness of the importance of shrublands and pinyon-juniper habitats to the roosting ecology and feeding behavior of bats with management agencies and landowners.

Encourage vegetation and/or seral stage restoration projects appropriate to the scale of the local ecological sites (Natural Resources Conservation Service Ecological Site Description, [www.nrcs.usda.gov](http://www.nrcs.usda.gov)).

**Objective 2:** Provide information and recommendations to management agencies during major planning efforts to incorporate the need for diversity of vegetative structure in pinyon-juniper and shrub-steppe habitats.

## MANAGEMENT RECOMMENDATIONS

- Consult the standards regarding vegetation treatments used in the Species Conservation Assessment and Conservation Strategy for the Townsend's big-eared bat (*Corynorhinus townsendii*; Pierson et al. 1999). These standards recommend caution when conducting prescribed burning or vegetative alteration in shrub-steppe or pinyon-juniper habitats "within a 1.5 mile radius of Townsend's big-eared bat roost sites" or "within the 0.5 mile radius of Townsend's big-eared bats roost sites, no more than half of the forested habitat can be subjected to prescribed burning per decade, and only at a time when the roost is not occupied". Apply this same consideration to lands where colonies of bats are of conservation concern.
- Maintain expanses of pinyon-juniper and sagebrush lands to provide habitat for the bats that use these systems.

## RESEARCH NEEDS

- Investigate bat use, diversity and abundance in pinyon-juniper and sagebrush systems at various seral stages in Colorado.
- Investigate the scale and patterns of rangeland vegetation alterations that support viable bat populations.

## IMPACTS FROM PESTICIDE SPRAYING

Insects are known to be pests on rangeland systems (Watts et al. 1982), and bats contribute substantial financial benefit to agriculture by consuming large amounts of insects (Cleveland et al. 2006; Boyles et al. 2011). Most efforts to control insect pests have been aided by the use of insecticides; however there are known toxicity side-effects that can be detrimental to wildlife, including bats (Thies et al. 1996;

O'Shea and Johnston 2009). The use of insecticides on rangelands and agricultural lands may cause direct poisoning of bats through the consumption of affected insects (Clark 1988). Bats are especially at risk of poisoning from large-scale use of insecticides because of their diet, high metabolic rates, high food intake, and high rates of fat mobilization during migration, hibernation, and lactation (Clark 1988; O'Shea and Clark 2002). Additionally, there are potential impacts to bat populations when insect-prey populations decrease.

## GOAL

LIMIT BROAD-SCALE USE OF INSECTICIDES ON RANGELANDS, AND PROMOTE AWARENESS OF POTENTIAL HARM TO BATS ON AGRICULTURAL LANDS THROUGH EDUCATIONAL EFFORTS, INPUT INTO LAND USE PLANNING EFFORTS, AND INTERACTION WITH FARMING COMMUNITIES.

## MANAGEMENT RECOMMENDATIONS

- Implement the standards regarding pesticide spraying in Pierson et al. (1999).
- Identify all bat roosts within potential spray areas through surveys or literature review.
- Intensify target insect sampling to identify specific outbreak species and times to decrease spray block size and intensity. Outside of established no-spray buffer zones, use application methods that minimize the potential for spray drift that affects non-target areas.
- Consider utilizing a 2-mile radius no-spray buffer zone around all bat roost sites. Within a 10-mile radius of known bat roost sites, strip spray 0.25 mile strips (Pierson et al. 1999).
- When available, utilize species-specific insect control measures (e.g., Nosema, a specific pesticide, or other specific biological control; Pierson et al. 1999).
- Work with local, state, and federal agencies to obtain information on the impacts of pesticide use on bats.
- Communicate the value of bat-based pest management, which saves the agricultural industry approximately \$23 billion annually (Boyles et al. 2011).

## RESEARCH NEEDS

- Investigate alternative pest control options that are safer to bats and other wildlife species.

## CONSERVATION AND MANAGEMENT OF DRINKING WATER SOURCES

In the arid regions of Colorado rangelands, availability and access to open water for drinking and prey habitat may be a limiting resource for bat populations (Geluso and Geluso 2012; Hagen and Sabo 2012). The availability and quality of water has implications for habitat use and bat health (Rainho and Palmeirim 2011). For hydration and essential nutrients, water availability has been shown to influence the reproductive success in some bats (Kurta et al. 1990; McLean and Speakman 1999). During periods when water is scarce, bats can use artificial water resources for hydration, but some water resources can be traps for bats if they inadvertently fall into containment sites or may have obstacles that can

make containment sites difficult to access (Tuttle et al. 2006; Taylor and Tuttle 2007; Korine et al. 2016).

Simple mitigation measures at stock tanks and water troughs can alleviate the threat of entrapment for bats (Taylor and Tuttle 2007). Additionally, some artificial water resources, such as water or effluent detention ponds at energy development facilities, can be detrimental to bats due to contamination (O'Shea et al. 2001, West 2011). For more information on this issue see chapter VI. Urban Development.



Stock tank utilized by bats as a water source. Photo by K. Navo.

## GOAL

PROMOTE AVAILABILITY OF OPEN WATER FOR BATS IN ARID RANGELANDS AND IDENTIFY KEY DRINKING SITES FOR BAT COLONIES. PROTECT RANGELAND WATER RESOURCES, SUCH AS EPHEMERAL POOLS, SEEPS, AND SPRINGS, WHICH PROVIDE BAT RESOURCE NEEDS. WHEN LAKES, RESERVOIRS, RIVERS AND STREAMS ARE NOT NEARBY, SOME BATS MAY RELY ON SMALLER OR MORE-EPHEMERAL WATER SOURCES, SUCH AS STOCK TANKS, DRAINAGE DITCHES, SPRINGS, AND SEEPS (CHUNG-MACCOUBREY 1997).

**Objective 1:** Promote awareness among land managers of the importance of open water for bats, and the need for bat accessibility at existing and planned water developments for other wildlife and livestock (Taylor and Tuttle 2007).

**Objective 2:** Develop and promote designs for stock tanks, water troughs, and guzzlers that allow easy access and egress by bats. Encourage the use and maintenance of wildlife escape ramps in stock tanks and water troughs.

**Objective 3:** Encourage land management agencies to maintain bat access to abandoned mines with associated water resources, such as pools from springs or rainfall, because they can be valuable water resources near roosting habitat.

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## MANAGEMENT RECOMMENDATIONS

- Implement a database that monitors the location of stock tanks/water troughs on public lands. Where feasible, advocate for continuity in maintaining water bodies that are accessible to bats in arid environments.
- Install and maintain escape ramps at troughs and other water structures.
- Avoid barbed-wire fencing near water features when possible.



Hoary bat caught on barbed-wire fence. Photo by D. Neubaum.

## RESEARCH NEEDS

- Develop and test designs for wildlife guzzlers and troughs that allow easy use by bats.
- Determine drinking water chemistry requirements of maternity colonies and identify and conserve water sources near these roosts, especially for Townsend's big-eared bat and other species of concern.
- Investigate bat dependence on ephemeral water sources, both natural and developed, in arid environments to understand how home ranges (and energy budgets) are altered with the availability of such water resources.
- Investigate bat use of oil and gas development water impoundments to understand how their availability alters habitat use, how use of such resources may concentrate toxic materials in bat tissues, and if bat mortality occurs at such detention ponds.

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