

COLORADO PLATEAU ECOREGION

The Colorado Plateau Ecoregion is a complex of badlands, sheer-walled canyons, buttes, mesas, plains, dunes, and isolated mountain ranges that encompasses the Four Corners region of Arizona, Colorado, New Mexico, and Utah. The Colorado, Little Colorado, San Juan, and Escalante rivers carve large canyons as they pass through the plateau. The ecoregion contains 48.5 million ac (19.6 million ha) of mostly public and tribal lands. One million ac (0.4 million ha), or 2% of the ecoregion are in the northwestern corner of New Mexico. Elevations range from 1,200 ft (370 m) within the Grand Canyon to 12,700 ft (3,870 m) in the La Sal Mountains.

This wide range of elevations produces diverse habitats. The more prevalent habitats are piñon-juniper/juniper savanna, riparian, big sagebrush shrublands, steppe, and grasslands. The ecological significance of this ecoregion is its diverse flora and fauna. More than 300 plant species are unique to the area and found nowhere else in the world (Tuhy *et al.* 2002). The climate within the Colorado Plateau ecoregion is often described as “desert” because annual precipitation averages less than 10 in (25 cm). Most of this occurs in the winter as snow and subsequently infiltrates the soil (Tuhy *et al.* 2002). The Intermountain Basins Big Sagebrush Shrubland is the only key terrestrial habitat type occurring in the Colorado Plateau Ecoregion (Fig. 5-4).

Sage grouse (*Centrocercus urophasianus*) once occupied sagebrush habitats in this ecoregion. Around 1919 they were apparently extirpated from New Mexico. Reintroduction efforts have failed, likely because habitat conditions are no longer suitable. The California kingsnake (*Lampropeltis getula californiae*) is rare in New Mexico, and has only been found near the Colorado border. Little is known on the ecology of this species in New Mexico. The Gunnison's prairie dog (*Cynomys gunnisoni*) is one of the two species of prairie dogs that occurs in New Mexico. The Gunnison's prairie dog occurs in the Four Corners area of Arizona, New Mexico, Colorado, and Utah and is considered a keystone species of the sagebrush ecosystem. Gunnison's prairie dog populations have declined across their New Mexico range, in part due to historic and current poisoning and shooting, sylvatic plague (*Yersinia pestis*), and habitat destruction (Miller *et al.* 1994).

Species of Greatest Conservation Need

Although there were only 15 Species of Greatest Conservation Need (SGCN) (excluding arthropods other than crustaceans) associated with the Colorado Plateau Ecoregion (Table 5-6), this ecoregion has ecological importance due to its geologic features and diverse and unique fauna and flora. More than 300 plant species alone are found nowhere else in the world (Tuhy *et al.* 2002). Of the 15 SGCN, only 6 (40%) species were considered vulnerable, imperiled, or critically imperiled both statewide and nationally. Five (33%) species are nationally secure, but are considered vulnerable, imperiled, or critically imperiled in New Mexico, and four other species (27%) are secure both statewide and nationally. Conservation status codes (abundance estimates) for each SGCN are provided in Appendix H. Additional conservation concerns for taxa associated with this ecoregion are addressed in 1) Statewide Distributed Ephemeral Habitats and Perennial Tanks, 2) Statewide Distributed Riparian Habitats, or 3) Watersheds with aquatic key habitats sections.

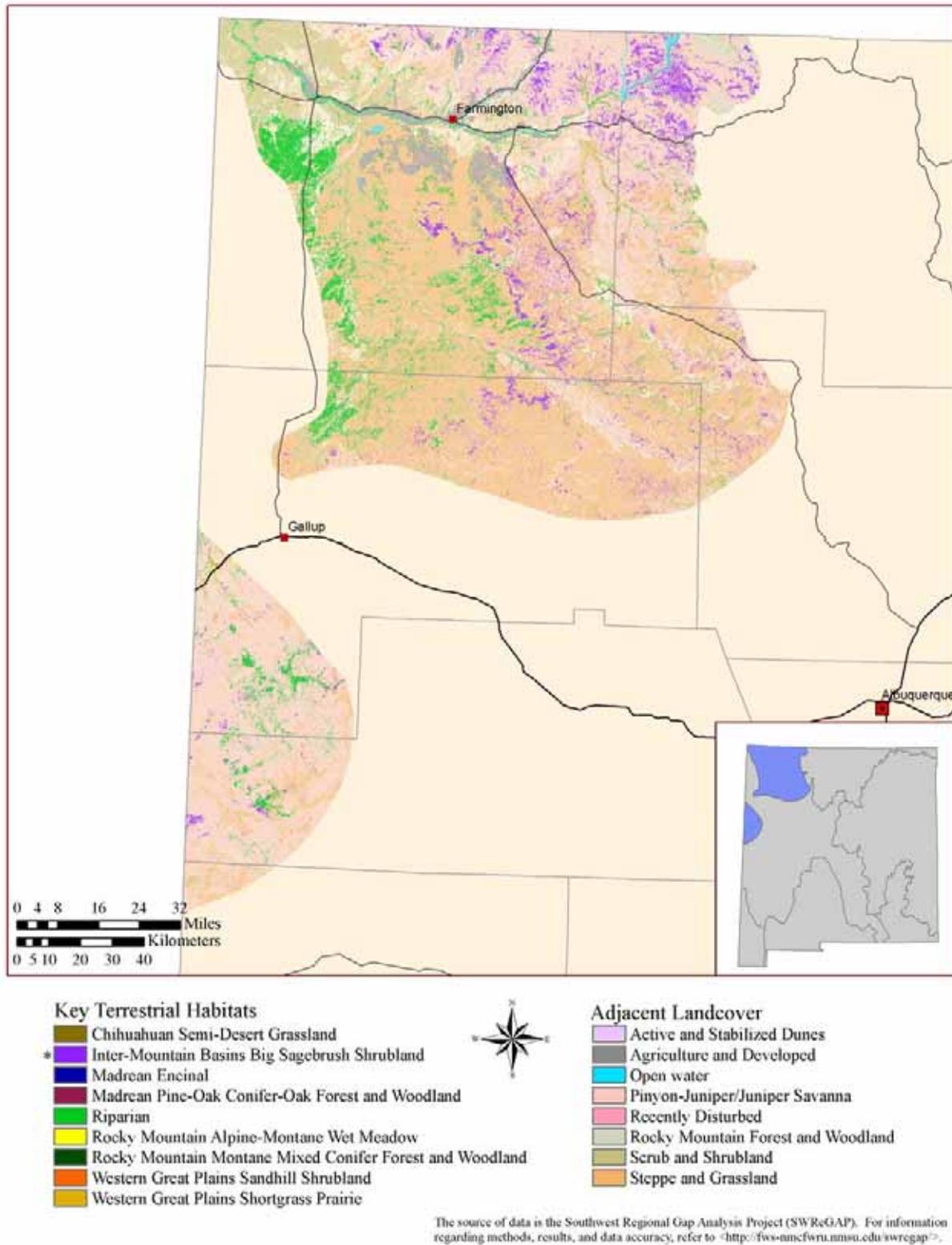


Figure 5-4. Key terrestrial habitats in the Colorado Plateau Ecoregion in New Mexico. Adjacent land cover types are given to provide an indication of vegetation surrounding key habitats. Key habitats are designated with an asterisk (*)

Table 5-6. Species of Greatest Conservation Need in the Colorado Plateau Ecoregion in New Mexico.

Common Name	Intermountain Basins Big Sagebrush Shrubland
Birds	
Ferruginous Hawk	X
Golden Eagle	X
Scaled Quail	X
Mourning Dove	X
Loggerhead Shrike	X
Sage Thrasher	X
Bendire's Thrasher	X
Sage Sparrow	X
Mammals	
Arizona Myotis Bat	X
White-Tailed Jack Rabbit	X
Gunnison's Prairie Dog	X
Black Bear	X
Mule Deer	X
Reptiles	
Collared Lizard	X
California Kingsnake	X

Intermountain Basins Big Sagebrush Shrubland

Habitat Condition

The Intermountain Basins Big Sagebrush Shrubland occurs in northern New Mexico in both the Colorado Plateau and the Southern Rocky Mountains ecoregions. Cole (1995) studied vegetation changes over the last 5,450 years using pollen profiles in the Capitol Reef National Park, Hartnett Draw area of the Colorado Plateau. Vegetation composition appears to have been fairly stable until the last few hundred years. After this time, plants preferred by cattle and sheep, such as winterfat (*Krascheninnikovia lanata* or *Ceratoides lanata*) and ricegrass (*Oryzopsis hymenoides*), disappeared from pollen profiles and were replaced by plants associated with improper grazing practices, such as rabbitbrush (*Chrysothamnus* spp.), snakeweed (*Gutierrezia* spp.), and greasewood (*Sarcobatus* spp.) (Cole 1995).

Livestock use of New Mexico rangelands in the late nineteenth century exceeded the grazing capacity of the big sagebrush shrublands and precipitated the loss of native perennial grasses and an expansion of shrubs within 10 to 15 years (Hull 1976). As a result of grazing pressure and prolonged drought, the forbs component of today's big sagebrush shrublands is not especially diverse.

It is likely that bird and small mammal assemblages have been affected by this change in the structure and composition of the vegetative community. Greater sage grouse are obligate residents of the sagebrush ecosystem, usually inhabiting sagebrush-grassland or juniper sagebrush-grassland communities. Efforts to re-introduce this species, extirpated in 1919, probably failed because habitat conditions were no longer suitable. Many small mammals also rely on the native grass component of sagebrush habitats. A study of Townsend's ground squirrel on the Snake River Birds of Prey Study Area of southeastern Idaho showed that squirrel density generally increased with increasing native grass cover (Knick 1993).

The greatest historic alteration in this sagebrush habitat type has occurred through the invasion of cheatgrass (*Bromus tectorum*). Although grazing pressure in sagebrush communities throughout the western United States has declined in recent times, virtually no remnant virgin sagebrush steppe exists in New Mexico. Many sites have lost their native perennial grasses altogether and have been invaded by cheatgrass and introduced perennials.

The Intermountain Basins Big Sagebrush Shrubland has been significantly affected by energy development in the form of oil and natural gas extraction and surface coal mining. Coal bed methane development in the San Juan Basin is currently a major land use. The *Farmington Resource Management Plan and Environmental Impact Statement* (BLM 2003) estimated that there are currently approximately 18,000 active wells in the San Juan Basin. Depending on the scale, density, and arrangement of each well site in relation to other sites, habitat loss and fragmentation in the portions of this habitat type subjected to energy development are extensive. At this high level of development, effects may not be successfully mitigated.

Much of the big sagebrush shrubland is found on erosive sandy clays and receives most of its precipitation in the winter as snow. Wind and water erosion play a major role in degrading this habitat type. In these arid lands, microscopic soil organisms are essential to system productivity (Belnap 1994). In the Colorado Plateau, *Microcolues vaginatus* (cyanobacteria) dominates the crust structure. Lichens (*Collema* spp.) and mosses (*Tortula* spp.) are common (Belnap *et al.* 2001). These organisms have likely been adversely affected by disturbances to the soil crust caused by off-road vehicle use and energy development.

It is probable that the combined effects of drought, improper grazing, invasion of annual grasses and noxious weeds, and a changing fire regime have affected the prey base of top-level predators, such as raptors, carnivores, and rattlesnakes. A study in Idaho found that small mammal biomass was highest in habitats characterized by tall sage cover, low grass cover, and high biological crust cover. Rattlesnakes appeared to select areas with high small-mammal densities (Jenkins *et al.* 2004). Large predators such as grizzly bears, wolves, lynx, and river otters have been extirpated from this habitat for decades.

Problems Affecting Habitats or Species

Literature review and assessment of factors that influence habitats and SGCN suggest that abiotic resource use, habitat conversion activities, and consumptive biological use are the primary factors affecting big sagebrush habitats. Of particular concern are energy development, the invasion of non-native species, and improper livestock grazing practices.

Energy Development

In addition to the 18,000 active gas and oil wells currently in the San Juan Basin, approximately 12,500 new wells are anticipated in the northern and eastern part of San Juan County within the next 10 years (BLM 2003). Another 750 new wells are anticipated in the Jicarilla Ranger District of the Carson National Forest in Rio Arriba County. The new development will allow gas wells at one well per 160 ac (65 ha), an anticipated 50% increase in density.

Energy development infrastructure including roads, tanks, equipment staging areas, compressor stations, shops, pipelines, power line corridors, associated traffic, and human activity have the potential to affect wildlife more than just the wells themselves. For example, when impact zones surrounding each well pad, facility, and road corridor begin to overlap, habitat effectiveness is reduced over a much larger contiguous area. Development at this level reduces the ability of wildlife to use the habitat. Mule deer in particular are precluded from accessing their winter ranges.

Current mitigation policy on the Jicarilla Ranger District of the Carson National Forest requires that re-vegetation meet current US Forest Service standards. Reclamation will be approved when vegetative cover is equal to 70% of the adjacent areas and soil has been stabilized. This policy allows a post development decrease of 30% in forage availability and quality.

Invasive Species

Cheatgrass threatens to dominate 62 million ac (25 million ha), an area greater than 50% of today's total sagebrush range. In New Mexico, other significant non-native invasive species of sagebrush habitats include leafy spurge (*Euphorbia esula*), thistles (*Cirsium* spp.) and knapweed (*Centaurea* spp.). These species uniformly reduce the vegetative productivity, diversity, and cover of the Intermountain Basins Big Sagebrush type and, in the case of cheatgrass, influence the intensity and frequency of fires (West 1988, Kurdila 1995, Vitousek *et al.* 1997). The *Resource Management Plan for the Farmington Field Office* (BLM 2003) identified 25 invasive and non-native plant species of concern.

Grazing Practices

Livestock grazing has occurred in this habitat type for decades, with the greatest numbers of animals and associated disturbance occurring in the second half of the nineteenth century. Since then, grazing pressure in these sagebrush communities has declined. There are currently few remaining examples of intact sagebrush steppe in New Mexico. These are found as relict stands in the foothills of the Sangre de Cristo Mountains of Taos County. In this habitat type, even moderate levels of livestock grazing can remove the herbaceous understory that in turn, releases sagebrush seedlings from competition with herbaceous and graminaceous plants. This process results in excessively dense sagebrush stands with a sparse understory of annuals and unpalatable perennials (Havstad and Vavra 2004). However, studies in northern New Mexico have indicated that the total elimination of grazing for 22 years did not improve range condition on upland or lowland sites when compared with adjacent moderately grazed areas (Holechek and Stephenson 1985).

Fire Management

Prior to European settlement, wildfires probably occurred less than once every 100 years in this and other arid sagebrush habitats. However, in the last century, fire frequency has increased in sagebrush communities throughout the west. Today, frequent wildfires in the Intermountain Basins Big Sagebrush Shrubland promote the decline of native grasses in favor of non-native annual grasses (Whisenant 1990). Control of these fires and reduction of livestock grazing will not result in a return to historic conditions because much of the soil seed bank has been lost (Anderson and Holte 1981).

Off-Road Vehicles

Recreational off-road vehicle use has increased in this habitat type in the Colorado Plateau. Most of this use occurs in San Juan County where large-scale off-road vehicle activities have become organized annual events. While the specific extent of these activities is unknown, off-road vehicles may destroy and fragment habitat, cause direct mortality of wildlife, and alter wildlife behavior through stress and disturbance (Busack and Bury 1974, Brattstrom and Bondello 1983).

Information Gaps

Although there is a large body of literature on the sagebrush communities in the West, particularly in reference to sage grouse, remaining information gaps that constrain our ability to make informed conservation decisions include:

- The implementation and effectiveness of energy development mitigation in conserving habitats and species within the northern portions of the Intermountain Basins Big Sagebrush is unknown. This precludes evaluation of industry impacts and subsequent improvement of land management agency energy development policies.
- The effects of energy development in big sagebrush shrubland on resident SGCN, especially mule deer (*Odocoileus hemionus*), black bear (*Ursus americanus*), and ferruginous hawk (*Buteo regalis*) are unknown.
- The specific effects of human-caused habitat fragmentation on SGCN within the Intermountain Basins Big Sagebrush Shrubland are poorly understood.
- The extent to which invasive species may alter big sagebrush shrubland and limit populations of SGCN is unclear.
- Information is needed on grazing management practices that produce sustainable levels, composition, and structure of native vegetation associated with SGCN.
- The extent to which off-road vehicle use is impacting big sagebrush shrubland SGCN populations is unknown.
- Our understanding of the role of fire in sustaining the big sagebrush shrubland and appropriate fire management protocols is poor.

Research, Survey, and Monitoring Needs

The historic land management of the Intermountain Basins Big Sagebrush Shrubland and the relatively new invasion of non-native vegetation, combined with increasingly extensive energy development hasten the need for the following research:

- Studies are needed on how oil and gas development and associated road construction affects habitat fragmentation and influences habitat patch size, edge effect, and use of Intermountain Basins Big Sagebrush Shrubland by wildlife. This information is also important in understanding how fragmentation and patch dynamics affect small mammal species, avifauna, and herpetofauna.
- Collection of basic life history information is needed for SGCN whose basic biology is poorly understood to develop effective monitoring and conservation actions.
- In order to develop effective habitat manipulation activities, studies are needed on how the invasion of cheatgrass has affected SGCN habitat structure, foraging behaviors, nutrition, and reproductive success.
- Investigate invasive species early detection protocols and estimate vectors and pathways of potential invasive species.
- Increase monitoring and research regarding appropriate grazing practices and habitat restoration methods in the Intermountain Basins Big Sagebrush Shrubland. With a large percentage of this land cover type under federal management, efforts should be made to identify modifications that will improve range condition and be economically feasible for permittees. Both monitoring and research efforts should include consideration of biological soil crusts.
- Useful descriptions of habitat condition and health require that consistent language and survey monitoring protocols be used. There is a need to establish standardized national indicators that would be used for the inventory, survey, and monitoring of the condition and health of this and other rangeland habitat types. Indicators along with standardizing methods of measuring site health and condition have been advocated by the National Research Council (1994) but have not been uniformly adopted.

Desired Future Outcomes

Desired future outcomes for the Intermountain Basins Big Sagebrush Shrubland include:

- The Intermountain Basins Big Sagebrush Shrublands persist in the condition, connectivity, and quantity necessary to sustain viable and resilient populations of SGCN and host a variety of land uses with reduced resource use conflicts.

- Close monitoring and collaboration between NMDGF, BLM, USFS, private landowners and the energy industry result in minimal adverse effects upon SGCN as a result of oil and gas development.
- Grazing practices that are cost effective are implemented that ensure the sustainability and integrity of the Intermountain Basins Big Sagebrush Shrubland.
- A fully funded, comprehensive, statewide noxious weed control program is established and implemented. Colonization of noxious weed species is stopped and extant weed populations are controlled or eliminated.
- Protected areas have been established as wildlife corridors to reduce habitat fragmentation and provide SGCN access to necessary habitat.
- Local communities are involved in and support decisions related to conserve the SGCN and biodiversity of the Intermountain Basins Big Sagebrush Shrubland.
- Consistent reclamation standards that ensure future habitat integrity and functionality for Intermountain Basins Big Sagebrush Shrublands are jointly established and adopted by private landowners, counties, municipalities, and federal and state land management agencies.

Prioritized Conservation Actions

Approaches for conserving New Mexico's biological diversity at the species or site-specific level are inadequate for long-term conservation of SGCN. Conservation strategies should be ecosystem-based and include public input and support (Galeano-Popp 1996). Monitoring of species and habitat will be employed to evaluate the effectiveness of the conservation actions described below. Those found to be ineffective will be modified in accordance with the principles of adaptive management. Conservation actions, in order of priority, which assist in achieving desired future outcomes, are outlined below.

1. Define an effective process to work with all stakeholders to conserve the biodiversity of the Intermountain Basins Big Sagebrush Shrubland.
2. Collaborate with public and private land managers to identify and protect wildlife corridors necessary to maintain or restore the connectivity of Intermountain Basins Big Sagebrush Shrubland habitats. Particular attention should be given to sagebrush habitats in rapidly urbanizing areas northeast of the city of Farmington and in those areas under extensive oil and gas development. All factors affecting habitat connectivity and fragmentation, such as off-road vehicles and road management, should be considered.
3. Investigate opportunities to improve conditions of approval and reclamation standards for oil and gas development and develop partnership programs and funding mechanisms for their implementation with the oil and gas industry.

4. Work with public and private land managers and the energy industry to adopt adaptive management strategies that minimize disturbance to SGCN caused by industrial infrastructure, grazing, and recreation in Intermountain Basins Big Sagebrush Shrubland habitats.
5. Work with federal and state agencies, private landowners, research institutions, and universities to design and implement projects that will provide information about SGCN and the Intermountain Basins Big Sagebrush Shrubland habitats outlined in the Research, Survey, and Monitoring Needs section above.
6. Pursue partnerships with affected communities and federal and state land management agencies to facilitate and encourage restoration of Intermountain Basins Big Sagebrush Shrubland habitats.
7. Collaborate with public and private land managers to develop, adopt, fund, and implement a program to aggressively eradicate and stop the spread of noxious weeds, regardless of jurisdictional boundaries. Programs should be based on the *New Mexico Strategic Plan for Managing Noxious Weeds 2000-2001*; BLM, *Partners Against Weeds Action Plan*; USFS, *Stemming The Invasive Tide*; National Interagency Strategy, *Pulling Together* and the *National Invasive Species Management Plan*.
8. Convene *ad hoc* working groups composed of municipal, county, state, and federal land management agencies and affected publics to resolve conservation issues at wildland/urban interface areas. Additional funding should be identified for conservation planning, on-the-ground projects, education, and technical assistance.
9. Develop an education program to impart understanding of the fragility of the Intermountain Basins Big Sagebrush Shrubland habitat and its importance to a wide array of species.