LIFE HISTORY AND ANALYSIS OF

ENDANGERED, THREATENED,

CANDIDATE, SENSITIVE, AND

MANAGEMENT INDICATORSPECIES

OF THE

FISHLAKE NATIONAL FOREST

VERSION 4.0 April, 2005

Formerly called: Life History Endangered, Threatened, and Sensitive Species of Fishlake National Forest.

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Forest Plan Management Indicator Species Summary

The Land and Resource Management Plan (LRMP) for the Fishlake National Forest, adopted in 1986, identified 10 Management Indicator Species (MIS). The objective was to select species that through monitoring of populations and habitat relationships, the effects of management activities on the fish, plants, and wildlife could be evaluated. Two categories of MIS have been established for this Forest Plan: one to represent ecological indicators and another to represent species of high interest. Ecological indicator species or guilds of species were selected using the following criteria:

1. A strong (but not exclusive) affinity for a vegetative type
2. A life cycle that is keyed to a vegetative type
3. Sensitivity to habitat change
4. Relative ease of monitoring, i.e. easily recognized and present in adequate numbers
5. Somewhat representative of other species that use the same vegetation types

Within the Environmental Impact Statement prepared for the Fishlake Forest Plan (III-38) representative species for the cavity-nesting guild, sage nesting guild, and the riparian guild were discussed. These species included Three-toed woodpecker, bluebirds, Sage thrasher, and MacGillivray's warbler. In order to monitor the habitats that these species represent, the forest selected additional species under each of these guilds to ensure that monitoring efforts would be sufficient to detect changes in habitat. The forest identified these specific species to be monitored over time to meet the objectives of the monitoring plan described in the Fishlake LRMP chapter V-6. Biologists working on the Fishlake and Dixie National Forests collaborated to develop a list of additional species to monitor based on the vegetation types or habitat needs for these groups as identified in the Fishlake LRMP chapter II, table II-8A. The selection of these representative species for riparian, sage, and cavity habitats were based on direction found in the Forest Plan (III-38). It is this direction that helped biologists to select the following species for monitoring purposes:

1. Sage nesters: Brewer's sparrow, Vesper sparrow, and Sage Thrasher
2. Cavity nesters: Hairy woodpecker, Western and Mountain Bluebirds
3. Riparian guild: Lincoln's sparrow, Yellow Warbler, MacGillivray's Warbler, and Song Sparrow

The following is a complete list of MIS that are included in this document: Mule Deer, Rocky Mountain Elk, Northern Goshawk, Sage Nesters: Brewer's sparrow, Vesper's sparrow, and Sage Thrasher, Cavity Nesters: Hairy woodpecker, Western and Mountain bluebirds, Riparian Guild: Lincoln's sparrow, Yellow Warbler, MacGillivray's Warbler and Song Sparrow, Rydberg's Milkvetch, Bonneville Cutthroat Trout, Resident Trout; Rainbow, Brook, Brown, Lake, and Cutthroat trout.

The Fishlake LRMP identifies the vegetation types these species represent in Table II-8A and II-10, on page II-29-35. These include:

Mule Deer: Sagebrush, mountain brush, aspen, conifer, meadow, riparian, and pinyon-juniper

Rocky Mountain Elk: Sagebrush, mountain brush, aspen, conifer, meadow, and pinyon-juniper

Northern Goshawk: Mature-old growth conifer

Sage Nesters: Mature sagebrush

Cavity Nesters: Snags

Riparian Guild: Riparian communities

Rydberg's Milkvetch: This species was a federally listed species at the time that the plan was developed and has since been delisted. It was selected as an MIS in part due to its Federal status, and it represented a selected habitat type of igneous intrusive and volcanic gravels between 8,000 to 11,000 feet.

Bonneville Cutthroat Trout: Cool, clear water with high oxygen content

Resident Trout: Rainbow, Brook, Brown, Cutthroat: Streams, lakes, and reservoirs

Data used in this analysis have been collected since the plan was adopted in 1986. These data reside in files on each Ranger District across the forest. In chapter II, page 29 of the Fishlake LRMP, estimated population numbers are given for elk, deer, Bonneville cutthroat trout, and Rydberg's milkvetch. The population estimates for deer and elk were based upon animals that occupied winter ranges found on the Forest in 1986. Current trends were identified in chapter II page II-32. Habitat estimates by acres for existing and potential habitat are contained within this document. These habitat estimates on existing conditions represent the most current data available to the Forest. It should be noted that the data included in this document could change very rapidly due to a number of environmental events, some examples of which include; fire, flood, wind events, drought, cold wet winter conditions, geologic movement, human caused changes such as effects from hunting seasons, fish population contamination (whirling disease), predation, or rapid large scale vegetation changes on the landscape.

Forest Wide Vegetation Summary

The dominant vegetation types on the forest are discussed in the Fishlake LRMP (II-32) in terms of community types that support vertebrate MIS. The total acres displayed in the plan (II-66, Table II-19) were approximate figures at the time the plan was adopted in 1986. The following vegetation types and the MIS that are associated with each type from the plan are displayed below:

Aspen: MIS making heavy use of aspen are mule deer, elk, cavity nesters, and Rydberg's milkvetch. It should be noted that the Fishlake LRMP II-29, Table II-8B characterizes Rydberg's milkvetch as occurring in harsh sites at upper elevations.

Mountain Brush: MIS for this type are mule deer and cavity nesters.

Mixed-Conifer: MIS most closely associated with this vegetation type are deer, elk, and Rydberg's milkvetch. It should be noted that the Fishlake LRMP II-29, Table II-8B characterizes Rydberg's milkvetch as occurring in harsh sites at upper elevations.

Pinyon-Juniper: Mule deer, elk, and cavity nesters.

Sagebrush: Mule deer, elk, and sage nesters.

Meadow: MIS making heavy use of this type are mule deer, elk, and cavity nesters.

Riparian Areas: These areas attract many species of wildlife, such as mule deer, cavity nesters, riparian guild, and Rydberg's milkvetch. It should be noted that the Fishlake LRMP II-29, Table II-8B characterizes Rydberg's milkvetch as occurring in harsh sites at upper elevations.

Aquatic: MIS making use of these areas addressed in this document include Bonneville cutthroat trout and resident trout.

Population Estimates and Scale of Analysis

Populations of wildlife are extremely difficult to quantify and, in some cases, can vary substantially from year to year. Environmental factors can dramatically influence the recruitment of young and the survival of adults. A precise figure on the number of animals is very difficult (if not impossible) to determine, and would only be valid for a short period of time.

Population trend is most appropriately addressed at a scale above the project or planning area level. Many of the selected MIS occur and range far beyond a local scale such as a project analysis area. Individuals, family groups, or herds such as elk, annually use areas much larger than a typical analysis area, and population trend must be examined on a much larger scale to be meaningful. For National Forest Management Act implementation, this scale is the Fishlake National Forest. At a site-specific project level, there is a great deal of fluctuation in wide ranging populations. For most species, it would be technically and practically inappropriate to conduct population trend sampling at the scale of individual projects. Individual projects contribute to the total population trend but do not usually make up the entire population or trend unless they are a locally endemic species. For this reason, it is not appropriate to determine population trend at a local level.

Population trend for threatened, endangered, and candidate species is addressed using Recovery Plans or Conservation Assessments, Strategies, and Agreements. These broad-scale documents are used because the species of concern occur and range far beyond the scale of the forest.

Because population trend is best addressed at a much larger scale than the project level, data from organizations such as the Nature Conservancy (NatureServe Explorer), the Division of Wildlife Resources (DWR), and the United States Geological Survey Breeding Bird Survey (BBS) were used in the discussions on trend. For far ranging species, such as elk that can range across multiple Forest boundaries and land ownerships, broad scale data were obtained from the Division of Wildlife Resources, Southern Region.

ENDANGERED SPECIES

San Rafael Cactus *(Pediocactus despainii)*

P. despainii was listed as an endangered species under the authority of the Endangered Species Act of 1973, as amended on September 16, 1987 (USFWS 1987). This member of the cactus family (Cactaceae) is a small depressed-hemispheric plant between 3.8 and 6 cm tall. Its spines are pale yellowish in color and relatively short (up to 6 mm long), though they are not obscured by the pale yellow, woolly hairs. The fruit is green in color, drying to reddish brown, smooth in texture, and of obovoid shape. Its seeds are shiny black. The flowers range from yellow to peach in color (Welsh et al. 2003).

This species is endemic to central Utah in Emery County. It prefers open pinyon-juniper and salt desert shrub communities on limestone gravels between 6,000 and 6,700 feet (Welsh et al. 2003). This cactus is found mainly on the tops and sides of hills and benches and on the flats, and favors full or partial sunlight. It blooms from late April to mid-May, and fruit matures in late May. Reproduction is sexual and pollination is achieved by flying insects (Heil 1984).

During much of the year, this species will shrink underground, defending itself against the harsh climatic conditions. It resurfaces in the spring depending on winter or spring moisture. This species is closely related to *P. winkleri* (Clark 2002).

Threats to this plant may include insect damage, trampling, damage from OHVs, and specimen collecting (Heil 1984, USFWS 1987).

P. despainii was found in Wayne County, on the Loa Ranger District of the Fishlake National Forest in 1997. Another separate population was discovered on the Loa Ranger District during the 1999 field season (Clark 2002).

THREATENED SPECIES

Mexican Spotted Owl (*Strix occidentalis lucida*)

The Mexican spotted owl was listed as threatened in 1993 (USFWS 1993a) under the Endangered Species Act, and the species is managed under the Mexican Spotted Owl Recovery Plan (USFWS 1995b). Also, according to Parrish et al. (2002), the Mexican spotted owl is listed as a Utah Partners in Flight priority species due to a number of criteria including relative abundance, population trend uncertainty, and breeding distribution. Critical habitat has not been designated on the Fishlake National Forest.

Mixed-conifer forests are commonly used throughout the range, and owls occur at higher densities within mixed-conifer forests (USFWS 1995b). However, in the absence of suitable forest habitat, Mexican spotted owls can occupy steep canyon terrain for roosting and nesting (Willey and Willey 1990). The sites are characterized by steep vertical and overhanging walls, nearly all with mixed-conifer or pinyon-juniper stands along the steep north slopes (Willey 1992). Humidity was found to be higher in owl-use canyons than in otherwise available canyons (Rinkevich 1991). During winter months, the owls tend to move out of the canyons and onto mesa-tops, benches, and warmer slopes (Willey 1992).

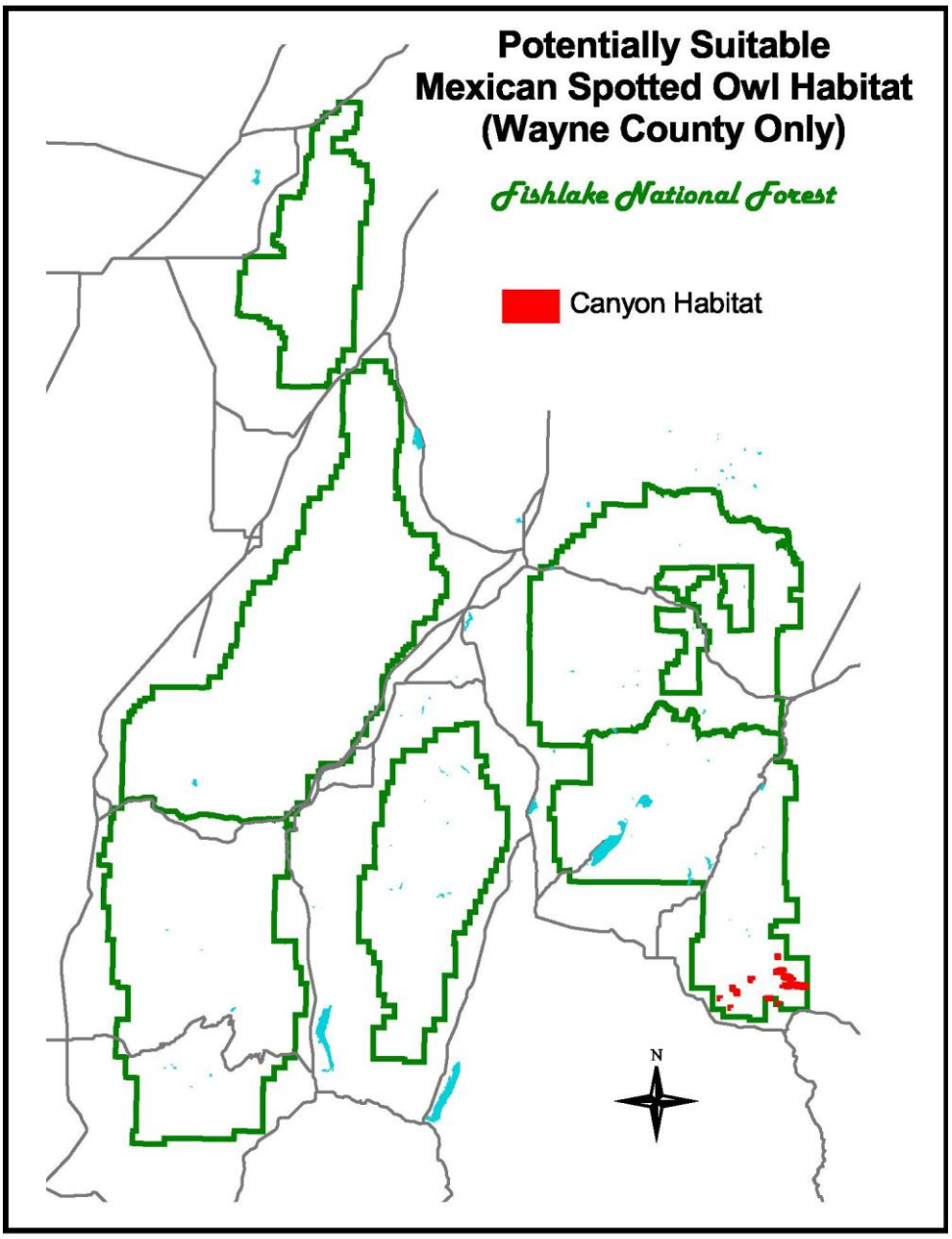
Structural characteristics associated with forested Mexican spotted owl habitat vary depending on the behavioral function the habitat supports. Spotted owls apparently use a wider array of habitat types for foraging than for nesting and roosting, since they feed on a diversity of prey that inhabit a diversity of habitats (USFWS 1995b). Research in Zion National Park showed that mammals made up 80% of the diet of spotted owls (Rinkevich 1991). Little is known about the habitat requirements for dispersal.

Mexican spotted owls are mostly solitary outside of the breeding season. They have a low reproductive success of 0.5 young per pair. Age at first breeding is usually two years old. The reproductive season begins in early March, when pair formation occurs. 2-4 eggs are laid in mid-April, incubated for thirty days, and hatch mid-May. Owlets are fledged in early to mid-June. Mexican spotted owls show high nest site fidelity (Spahr et al. 1991, USFWS 1995b). The presence of suitable caves and nest ledges could be a primary limiting factor in the distribution of spotted owls in the canyon lands (Willey 1992).

The earliest recorded spotted owl in Utah was found in Zion National Park in June of 1928, and the most northerly occurrence was in 1958 in the Book Cliffs of northeast Utah (Hayward et al. 1976). In 1992, the largest population of Mexican spotted owls in Utah occurred in and around Zion National Park, where MSO had been located at over seventeen sites (Willey 1992). Mexican spotted owls are generally absent from elevations above 8,000 feet, with only two sightings in high elevations in Utah having been recorded. The first was the same Book Cliffs occurrence noted above, and was observed in September of 1958, in an aspen grove near 8,200 feet (Behle 1981), The second was a response on the Manti-LaSal National Forest near the Colorado border in 1990 (Willey and Willey 1990). Current records indicate that there are approximately 131 locations of pairs of Mexican spotted owls in Utah (Howe 2003, unpublished data).

No nesting spotted owls have been located on the Fishlake National Forest. All survey efforts have followed the USFS Region 3 (Southwestern Region, Arizona and New Mexico) protocol, Interim Directive Number 2 (USDA Forest Service 1990). Survey efforts on the Loa Ranger District have included being air lifted by helicopter into remote canyons and following calling protocol. No Mexican spotted owls were detected during these survey conducted in 2004.

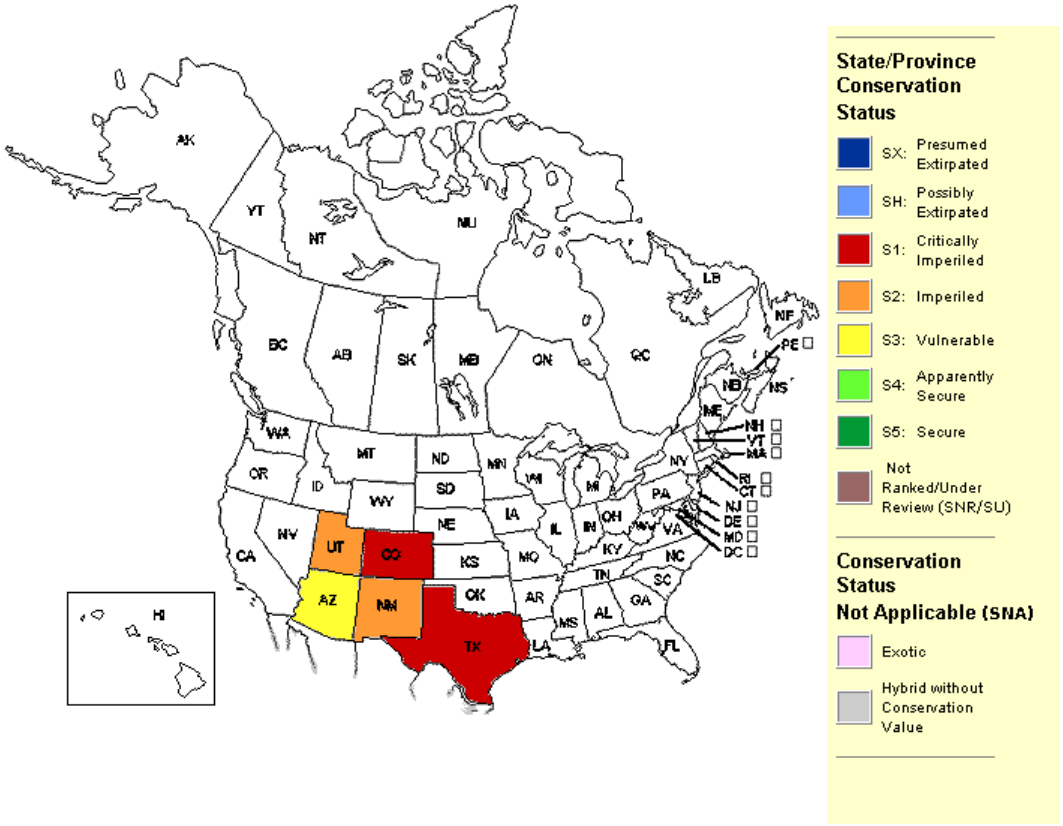
The map below displays the potential suitable nesting habitat on the Fishlake National Forest. There are approximately 2,208 acres of potential nesting habitat on the forest, which only includes the Loa Ranger District



Mexican spotted owls on the Fishlake National Forest have limited, potentially suitable, nesting habitat. The Loa Ranger District is the only area on the forest that has been identified by the US Fish and Wildlife Service as being potentially suitable for nesting. Based on field data the Forest collected since 1991, this species is not known to nest on the Forest, but rather appears to occur in low elevation, steep-walled canyon habitats such as those found in Capitol Reef National Monument. No Critical Habitat occurs on the Fishlake National Forest.

The Mexican spotted owl is one of the bird species for which information is collected and compiled on a large-scale basis, and can be accessed in the Nature Conservancy 2004 database. The map displayed below ranks the trend for the Mexican spotted owl in Utah to be imperiled.

Mexican Spotted Owl *(Strix occidentalis lucida)*



NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 16, 2005).

Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle was listed as an endangered species in 1978 (USFWS 1978a), and reclassified as threatened in 1995 (USFWS 1995a). The bald eagle is managed under the Northern States Bald Eagle Recovery Plan (USFWS 1983). Parrish et al. (2002) found that the bald eagle did not rank high enough to be on the Utah Partners in Flight priority list; however, they state that the bald eagle is a very rare species that might not be encountered, except by chance, in several days of searching. No critical habitat has been designated for the bald eagle on the Fishlake National Forest.

Bald eagles range across North America, breeding from south of the Arctic tundra to the southern United States and Baja, California. They generally move south to open water during winter. Bald eagles can be found in every state for all or part of the year (Spahr et al. 1991).

The breeding range of the bald eagle has receded throughout the 19th and 20th centuries. Historic records indicate that bald eagles formerly nested in at least 45 of the contiguous 48 states. As of 1981, only 30 states had nesting birds, with 90% of the 1,250 known pairs occurring in just 10 states. Parts of Alaska and Canada have 10 times that number of nesting bald eagles (USFWS 1983). As of June 2004, five nesting bald eagles had been found in Utah, with three located in the southeastern part of the state (UDWR). Results of the National Wildlife Federation mid-winter bald eagle survey from 1986–2000 show an average of 547 bald eagles observed wintering in Utah.

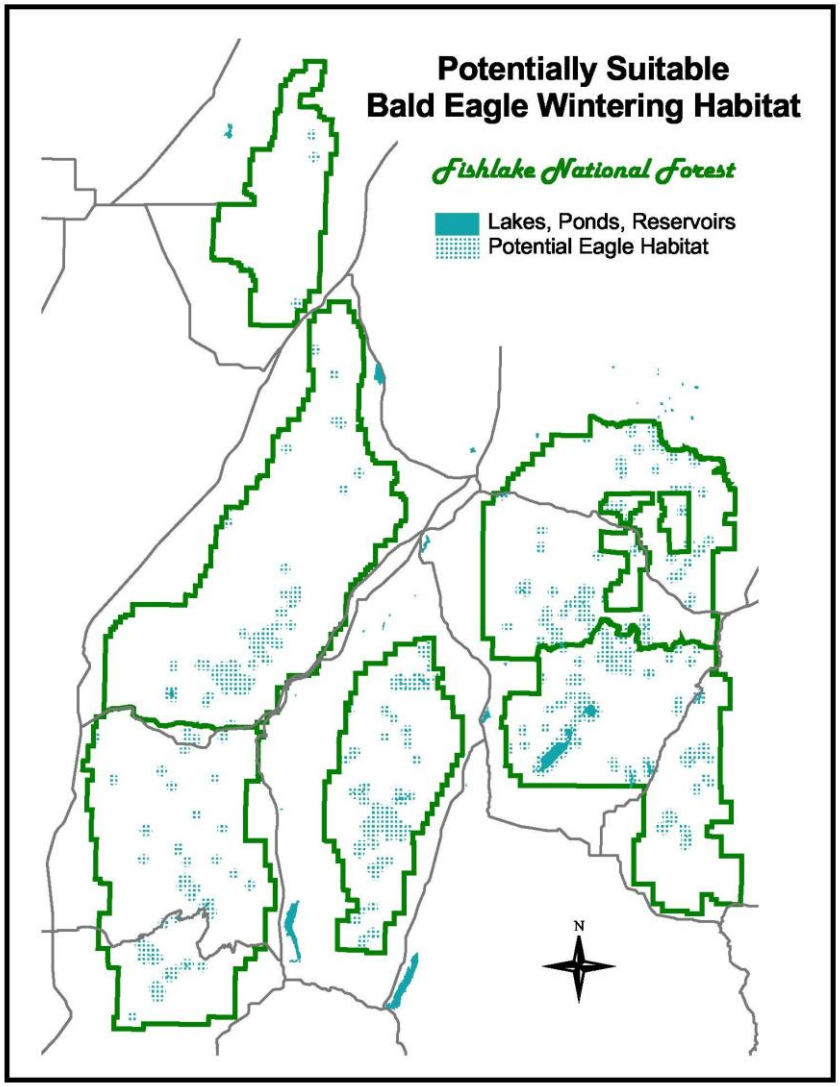
Winter habitat includes open water where fish and waterfowl can be caught throughout the fall and early winter. After the open water freezes, eagles generally move to the foothills and valleys to feed on small mammals and carrion (Spahr et al. 1991).

The Northern States Bald Eagle Recovery Plan (1983) states that the primary characteristic of winter habitat is abundant and available food supply in conjunction with one or more suitable night roost sites. At winter areas, bald eagles commonly roost in large groups. In the Pacific Northwest, these communal roosts are usually located in mature multi-layered forest stands with mean tree diameters ranging from 20-24 inches and heights between 81 and 91 feet. Predominant cover type is usually ponderosa pine, mixed-conifer, or black cottonwood (Anthony et al. 1982). According to the Recovery Plan (1983), locations that are protected from wind by vegetation or terrain provide a more favorable thermal environment. In addition to the natural features, roost sites generally are isolated from humans. It is estimated that 50% of the bald eagles in the northern states region occur in congregations; others are present in hundreds of locations that are used regularly by 1-20 birds. Collectively, these small groups and individuals are probably as important as the large concentration areas (USFWS 1983).

Sexual maturity for the bald eagle is reached at four to six years of age, but the birds may be considerably older before they breed (USFWS 1983). Bald eagles establish pair bonds in winter and initiate nesting in February or March. 1-3 eggs are laid in March or April, incubated for 35 days, and young are fledged after 8-14 weeks (Spahr et al. 1991). Bald eagles are long-lived at about 30 years (USFWS 1983) with a low reproduction rate (Spahr et al. 1991). Mortality is high in the immature age classes, but much lower after adulthood is reached at 4-6 years of age (Sherrod et al. 1976).

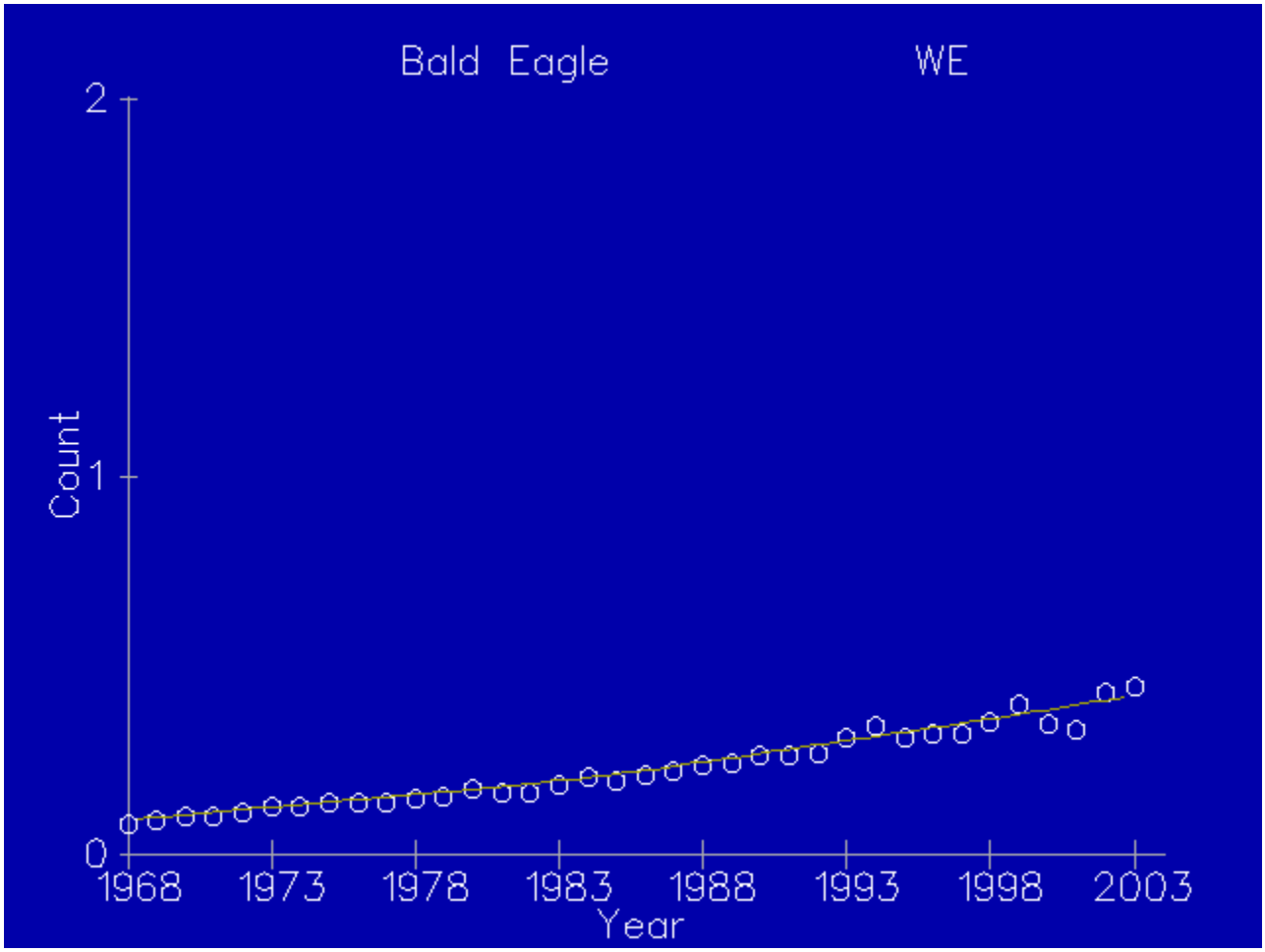
Bald eagles occur on Fishlake National Forest during the fall, winter, and spring months. Essential habitat defined by the Northern States Bald Eagle Recovery Plan (1983) includes those locations which; 1) are used annually for two weeks or longer by birds known to be from a nearby breeding area; 2) are used annually by 15 or more eagles for two weeks or longer; and 3) are used during periods of extremely harsh weather, when suitable feeding areas and night roost sites are limited. No bald eagle winter concentration areas have been identified by the UDWR or the Forest Service on the Fishlake National Forest. Single birds and/or pairs of bald eagles have been documented overwintering on the Fillmore, Loa, Richfield, and Beaver Ranger Districts.

Displayed below is a map of potentially suitable habitat across the Forest. There are approximately 160,000 acres of potentially suitable habitat on the Fishlake National Forest. Suitable habitat consists of lakes, ponds, and reservoirs, which may be used as wintering habitat.



The main threats to the bald eagle population are: 1) loss of suitable habitat, 2) mortality from shooting, trauma, poisoning, disease, electrocution, and trapping, and 3) reduced reproduction caused by environmental contaminants (USFWS 1983).

The data displayed below have been obtained from the BBS database (www.mbr-pwrc.usgs.gov), which represents data collected from the western United States from 1968 through 2003. These data demonstrate that bald eagle numbers are on a steady upward trend throughout the western United States, including the Fishlake National Forest in Utah.



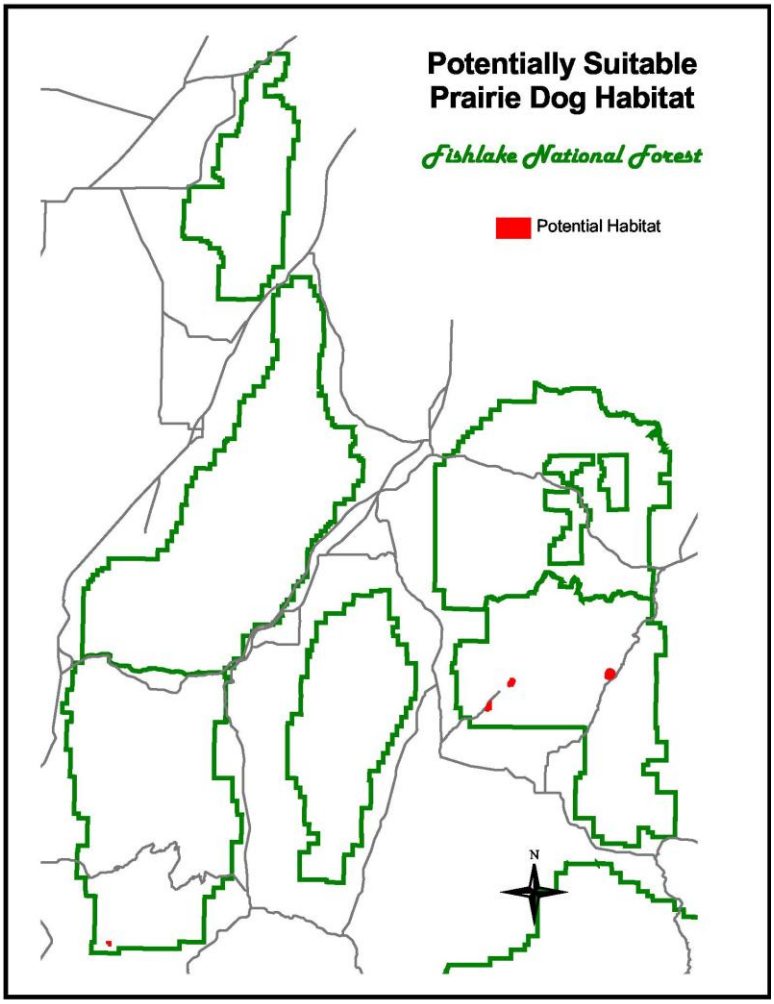
Utah Prairie Dog (*Cynomys parvidens*)

The Utah prairie dog was listed as an endangered species in June of 1973 (38 FR 14678). Because of the improved status of the species and the overwhelming increases seen on private lands since 1976, the U.S. Fish and Wildlife Service reclassified the species as threatened in May of 1984 (USFWS 1984b). Since the reclassification, population numbers have fluctuated on private and public lands, and the species still remains threatened. No critical habitat has been designated for the Utah prairie dog on the Fishlake National Forest.

The Utah prairie dog's range is limited to five counties in south-central Utah: Iron, Garfield, Piute, Wayne, and Sevier. Historically, Utah prairie dogs inhabited nine Utah counties (Spahr et al. 1991), and population numbers are estimated at 95,000 for years prior to 1920. By the 1960's, Utah prairie dog numbers and distribution were reduced due to disease, poisoning, drought, and habitat alteration due to cultivation and grazing. By 1972, there were an estimated 3,300 prairie dogs residing in 37 separate colonies (USFWS 1991).

The Utah prairie dog presently occurs in three areas: the Awapa Plateau, the Paunsaugunt region along the East Fork of the Sevier River, and the West Desert region of east Iron County (USFWS 1991).

Displayed below is a map identifying approximately 423 acres of potentially suitable habitat across the forest.



The UDWR initiated biannual census counts in 1975 and annual counts in 1978. An upward trend was indicated. The UDWR started a transplant program in 1972 to move animals from private to public lands (USFWS 1991). Translocations continued annually each summer from 1972 through 1992, were halted in 1993, and resumed in 1996. From 1972 through 2002, over 19,561 Utah prairie dogs were removed from private lands and relocated to lands managed by the BLM, USFS, NPS, and State of Utah (Bonzo and Day 2003). Overall success of this program has been poor. A Conservation Assessment, Strategy, and Agreement have been developed to aid in the management of this species. Implementation of the Strategy has been ongoing since it was signed in 1997.

The Fishlake National Forest has four transplant populations located on the Forest. Three are in the Fishlake Basin of the Loa Ranger District and one is in the Rocky Pond area of the Beaver Ranger District. To date, these transplants have been considered unsuccessful with low reproductive rates as well as no dogs currently occupying the sites. These sites are being evaluated by the UDWR, and will be addressed in a future Habitat

Conservation Plan (HCP) that will be developed in Wayne County, Utah. In addition to these sites, several “towns” are located adjacent to the Forest boundary in the Koosharem area near Monroe Mountain, and on private lands in Gooseberry Valley.

Like other species of prairie dogs, the Utah prairie dog lives in organized colonies, called "towns.” Towns are distinguished by several mounds, which mark the openings to burrows. Burrows are about six inches in diameter, go straight down for about ten or fifteen feet, and then branch into two or three horizontal tunnels (Spahr et al. 1991). The size and complexity of the burrow systems may vary greatly (Foster and Hygnstrom 1990). Smaller chambers are sometimes excavated just below the surface, where the prairie dogs sit and listen for aboveground activity. The deeper chambers are used for nesting, sleeping, and caring for their young (Foster and Hygnstrom 1990).

Each family or "coterie" of prairie dogs occupies a territory of about one acre. A coterie usually consists of a single adult male, one to four adult females, and any of their offspring less than two years old. Members of a coterie are very sociable and maintain unity through physical contact. Communication between coteries is an important social behavior in prairie dog towns, the primary purpose being to alarm others of danger and calling to one another when the danger has passed (Foster and Hygnstrom 1990).

Prairie dogs are sexually mature after their first winter and breed once a year in March or April (Foster and Hygnstrom 1990, Spahr et al. 1991). Three to five young are born in late April or early May after a gestation of about thirty days (McDonald 1993). Prairie dog adults emerge and begin foraging from mid-March to early April, and enter dormancy from mid-July to mid-August. Juveniles emerge to forage when they are about six weeks old and become dormant from early October to mid-November. These dates may vary according to elevation, with lower elevation colonies (under 7,000 feet) generally two weeks earlier than the higher elevation colonies (Spahr et al. 1991).

Basic habitat requirements considered for the Utah prairie dog are deep, well-drained soil, vegetation low enough that prairie dogs can see over or through, and suitable forage. Moist forage must also be available throughout the summer (Spahr et al. 1991).

The Utah prairie dog is classified as an herbivore; however, insects (particularly cicadas) are its preferred food. The preferred vegetative food is alfalfa. Except for a few forbs in certain growth stages (leafy aster, European glorybind, and some wild buckwheats in seed), Utah prairie dogs prefer grasses to forbs and shrubs. They usually select a plant's flowers or seeds over the leaves, and use of leaves is generally negligible (Spahr et al. 1991). Prairie dogs are most active during the day, feeding mostly in the early morning and late afternoon in the summer (Foster and Hygnstrom 1990).

Prairie dogs are also vulnerable to mortality from several diseases, the most notable being the plague. The plague is a severe infectious disease caused by the bacterium *Yersinia pestis* (Foster and Hygnstrom 1990), and is usually spread through fleas (McDonald 1993). The plague usually occurs when populations increase to high densities, causing increased stress among individuals and easier transmission of disease between individuals (McDonald 1993).

Drought is thought to be one of the most important factors influencing the distribution of the Utah prairie dog. Colonies lacking moist vegetation are decimated by drought because prairie dogs are unable to obtain sufficient water and nutrients (McDonald 1993).

Maguire Daisy *(Erigeron maguirei)*

Maguire daisy was listed as an endangered species in 1985 (USFWS 1985b) and reclassified as threatened in 1996 (USFWS 1996). Maguire daisy, a member of the sunflower family (Asteraceae), is an herbaceous perennial that results from a branched caudex. Caudex branches have brown to straw colored marcescent leaf bases while herbage is spreading hirsute. The stems are 7-28 cm long. The basal leaves are 2-5 cm long, 3-8 mm wide, and oblanceolate to spatulate in shape with a round apex. Cauline leaves are well developed, but somewhat reduced upward. Flowers are solitary or in clusters of 2-5, with bracts imbricate and green or yellowish. The inner bracts are often less pubescent, with scarious purple tips. The ray flowers are white or pinkish and 12-20 in number (Welsh et al. 2003). It commonly blooms from early June through late July (Clark 2002). Maguire daisy can be distinguished from the typical variety by its more numerous heads per stem, its narrower ray corollas, and shorter disk corollas (Welsh et al. 2003).

This species is found in cliff faces or sandy canyon bottoms on Navajo and Wingate sandstone. An endemic species of Wayne and Emery Counties, this daisy has been reported primarily on Bureau of Land Management (BLM) and Capitol Reef National Park lands (Clark 2002). The range of elevation is between 5,300 and 7,100 feet (Welsh et al. 2003). Common associated species are little-leaf mountain mahogany (*Cercocarpus intricatus)*, pinyon pine (*Pinus edulis*), and Utah juniper (*Juniperus osteosperma*) (Clark 2002).

Plants are protected from threats such as livestock grazing by their occurrence on cliff faces. However, erosion and recreational traffic are two potential threats to certain populations.

The 1999 field season placed two populations on the Fishlake National Forest, Loa Ranger District (Clark 2002).

Last Chance Townsendia *(Townsendia aprica)*

T. aprica was listed as a federally threatened species in September of 1985. Due to the vulnerability of this species, publication of critical habitat descriptions and maps would further endanger the species. Therefore, critical habitat has not been determined (USFWS 1985a). This species is endemic to central Utah in Emery, Wayne, and Sevier counties. It prefers salt desert shrub and pinyon-juniper communities on clay or clay-silt soils of the Mancos Shale formations between 6,100 and 8,000 feet (Welsh et al. 2003).

This member of the Sunflower family (Asteraceae) is a pulvinate caespitose perennial that is approximately 1.5-2.5 cm tall. *T. aprica* has 13-21 ray flowers that are golden yellow in color, and disk flowers of the same color. Involucres are 4-8 mm high (Welsh et al. 2003). Reproduction requires that bees native to North America carry pollen between flowers, or seeds will not be produced (Tepedino et al. 2004). Common associate plants include galleta grass *(Hilaria jamesii*), Utah juniper *(Juniperus osteosperma*), blue gramma grass *(Bouteloua gracilis*), and shadscale (*Atriplex confertifolia*) (Clark 2002).

T. aprica flowers from late April to early June. The fruit is a compressed achene that is 2-2.5 mm long. Plants overwinter underground (Spahr et al. 1991).

Threats to *T. aprica* include mineral and energy development, road development, road building, and livestock trampling (USFWS 1993b).

T. aprica has been found at nine sites on the Fishlake National Forest (Clark 2002).

CANDIDATE SPECIES

Yellow-billed Cuckoo (*Coccyzus americanus*)

The yellow-billed cuckoo has been identified by the FWS to possibly have potentially suitable habitat on the Fishlake National Forest. According to Parrish et al. (2002), Utah contains 11-25 % of the yellow-billed cuckoo's total breeding distribution. This species has not been confirmed on the Forest, and its presence is unlikely because it is associated with low elevation cottonwood riparian areas with dense understories. Because the lower elevations of the Forest are much higher than this species is known to occur, limited habitat exists on the Forest. Therefore, it is highly unlikely that this species will be located. However, a specific search image for this species has been developed in cooperation with DWR Avian Program Manager Dr. Frank Howe, FWS wildlife biologist Laura Romin, and Ron Rodriguez, Dixie and Fishlake National Forest Wildlife Fish and Rare Plant Program Manager. The Forest is in its third year of survey efforts and has not located any birds to date.

The yellow-billed cuckoo is named for the striking yellow base of the lower mandible. Adults are about 12 inches long and slender in profile. They weigh about two ounces. The cuckoo is brownish-gray from above, with white undersides and tail, which is boldly marked with large black spots. The bill is stout, slightly down-curved, and generally blue-black. Like all members of the Cuculidae family, the cuckoo has zygodactyl feet with two forward and two rearward pointing toes (USFWS 2001).

Western yellow-billed cuckoos formerly ranged across southern Canada (British Columbia), northern Mexico (Sonora and Chihuahua), and all states west of the Continental Divide/eastern Rio Grande Basin. The eastern boundary of the western yellow-billed cuckoo, as defined by the U.S. Fish & Wildlife Service (2001), is the crest of the Continental Divide in Montana, Wyoming, and northern and central Colorado. In southern Colorado, New Mexico, and Texas, the crests of mountain ranges forming the eastern edge of the Rio Grande watershed define the eastern boundary.

Though limited interactions may possibly occur between eastern and western yellow-billed cuckoos across the Rocky Mountains in the northern part of the range, the probability is limited because cuckoos do not nest at high elevations, and the species is scarce on both the eastern and western slopes of the Rockies. At the southern extent of its range in Texas, mixing of eastern and western cuckoos is more likely, as geographic barriers are not as pronounced.

The current breeding range is much smaller than the historic range. As a breeding species, the cuckoo was extirpated from British Columbia in the 1920's, Washington State in the 1930's, and Oregon in the 1940's. Three populations totaling about forty pairs of birds remain in California on the Sacramento River (between Colusa and Red Bluff), the South Fork of the Kern River, and the lower Colorado River. Breeding pairs inhabit rivers throughout Arizona and New Mexico. Scattered populations remain in western Texas. The cuckoo is extremely rare in the rest of the interior west. Cuckoos breed locally in Mexico, but recent or quantitative information for the area is lacking (USFWS 2001).

Biologists have generally distinguished western (*Coccyzus americanus occidentalis*) and eastern (*Coccyzus americanus americanus*) subspecies (Franzreb and Laymon 1993, Pruett et al. 2001). The western subspecies is alternatively called the "California" yellow-billed cuckoo. Other biologists, however, have questioned whether the difference between the eastern and western birds is sufficient to declare them separate subspecies (Fleischer 2001, USFWS 2001).

In the FWS determination that the western yellow-billed cuckoo warrants listing as a federally threatened species, the U.S. Fish & Wildlife Service concluded that the subspecific status of the cuckoo remains unknown, but that it qualifies as a "distinct population segment" due to the following differences:

1. The western population is separated from the eastern population by the Rocky Mountains in Montana, Wyoming, and the northern and central parts of Colorado, and by the eastern crest of the Rio Grande watershed in southern Colorado, New Mexico, and western Texas.

2. Western yellow-billed cuckoos arrive in the U.S. from their South American wintering grounds and begin to nest at least 3-4 weeks later than eastern yellow-billed cuckoos. The western population's nesting period is shorter. The eggs of the western population are larger, heavier, and have a thicker shell, possibly as an evolved protection against desiccation in the West's drier climate.

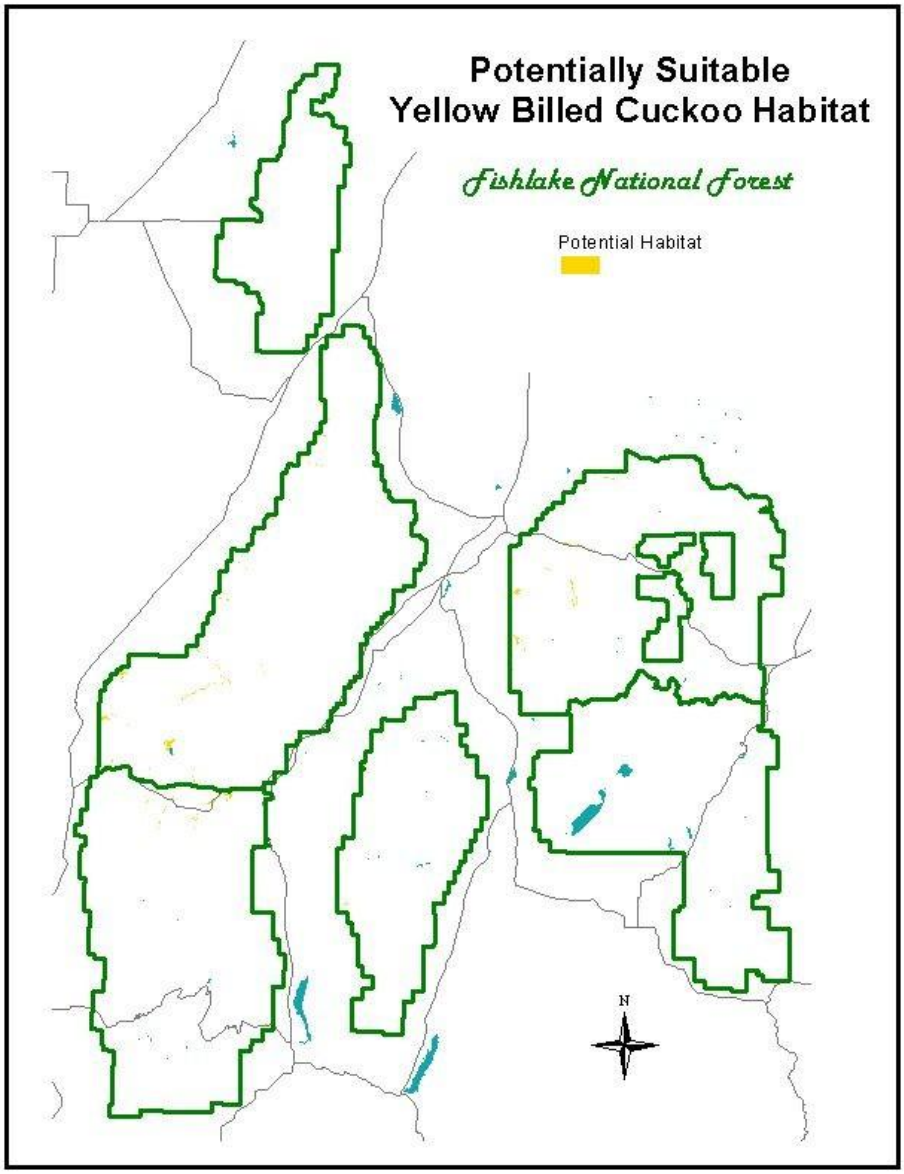
Western birds are generally larger and heavier, with orange rather than yellow mandibles. Western juveniles have yellow bills, whereas young eastern birds appear to have black bills. Western cuckoos are sharply limited to narrow streamside forests within an otherwise unsuitably arid landscape, while eastern birds occur in broad flood plains, humid upland forests, and occasionally even in suburban areas (USFWS 2001).

There is genetic evidence of long-term (Pruett et al. 2001) and short-term (Fleischer 2001) isolation between eastern and western birds.

Western yellow-billed cuckoos are obligate riparian nesters; they only breed in streamside forests, especially those dominated by willow and cottonwood stands. The humid, shady environment provides a protective microclimate, protecting nesting birds, eggs, and fledglings from the desiccating heat and dryness prevalent in late summer across the western U.S. East of the Continental Divide, where nesting occurs 3-4 weeks earlier and within landscapes which are generally more humid, eastern yellow-billed cuckoos use a broader range of nesting habitats, including some areas of upland forests and parks. Most nesting in the west occurs within relatively large patches of riparian forest, usually 25-100 acres in extent. Habitat use and selection in South American wintering grounds is not well known (USFWS 2001).

They typically lay two or three eggs, and development of the young is very rapid, with only seventeen days pass between egg laying and fledging. This very short time period allows western yellow-billed cuckoos to time their nesting around localized outbreaks of cicadas and tent caterpillars (USFWS 2001).

The map displayed below identifies 4,226 acres of potentially suitable habitat for the yellow-billed cuckoo on the Fishlake National Forest. The search image for this map was developed based on a conversation with Dr. Frank Howe, Avian Program Manager with the Division of Wildlife Resources in Salt Lake City, Utah. The search image that was agreed upon was to survey riparian habitats below 7,000 thousand feet with a cottonwood/willow over-story and dense brushy understories with slopes less than 10%.



Despite surveys conducted during the field season of 2002, 2003, and 2004 no birds were located. Although no birds have been detected during field reviews, it would be premature to determine that this species does not occur on the Fishlake National Forest, therefore, survey are ongoing.

Wonderland Alice-flower (*Alicellia caespitosa*)

A. caespitosa, a member of the Phlox family (Polemoniaceae), grows in clumps from a taproot and branching caudex. It is clothed with persistent leaf bases and is terminated in rosettes of leaves. Herbage is glandular, often with adherent sand grains. The basal leaves are oblanceolate to linear and 3-20 mm long. Flowering stems (3-8 cm tall) are solitary or few to several per stalk. The petals are scarlet, fading maroon, or blue-purple with a 9-17 mm long tube (Welsh et al. 2003). Flowering occurs from June through July, with seed setting from late July into the end of August (Spahr et al. 1991).

A. caespitosa is associated with cliffs, ledges, and exposed outcrops, representing eroded or detrital Navajo and Wingate sandstones. Plants occur in full sun or in shady canyons, on exposed sandstones, cliff walls, and less commonly, sandy wash bottoms, all between 5,100 and 9,000 feet. This flower occurs in association with open pinyon-juniper woodlands, which are often mixed with some elements of mountain brush, sagebrush steppe, or ponderosa pine forests. It is restricted to scattered occurrences, from the northern Waterpocket Fold to Thousand Lakes Mountain and Rabbit Valley in Wayne County. This species is a very narrow endemic, known only from unstable and faulting soils (USDA et al. 1996).

Threats to this species include off-road use, recreational use, road and trail building/maintenance, mining, pesticide use, and collection. *A. caespitosa* is not affected by grazing as it occurs on steep slopes where cattle grazing does not occur (USDA et al. 1996).

A. caespitosa is currently a candidate species for federal listing under the Endangered Species Act (69 FR 24900). A Conservation Agreement and Strategy for this species was written by the BLM, USFS, FWS, and National Park Service (USDA et al. 1996). Protection measures described in the Agreement were designed to achieve long-term conservation of the species so that formal listing would not be warranted.

Wonderland Alice-flower is only known to occur in 2 locations on the Loa Ranger District of the Fishlake National Forest (Clark 2002). Recent changes in plant nomenclature have suggested that the plant be named *Aliciella caespitosa* instead of the previous *Gilia caespitosa* (Rabbit Valley gilia).

SENSITIVE VERTEBRATE SPECIES

Peregrine Falcon (*Falco peregrinus anatum*)

The peregrine falcon was delisted as an endangered species nationally in 1999 (USFWS 1999), and is now listed by the USFS as a regionally sensitive species. A Recovery Plan for the Rocky Mountain/Southwest population of the American peregrine falcon was approved in December 1984. The Recovery Plan (USFWS 1984a) outlines General Protective Measures, which include: 1) discouraging land-use practices and development which adversely alter or eliminate the character of the hunting habitat or prey base within ten miles and the immediate habitats within one mile of the nesting cliff, 2) restricting human activities and disturbances between February 1 and August 31 (in excess of those which have historically occurred at the sites) which occur within one mile of the nesting cliff, and 3) discouraging/eliminating the use of pesticides and other environmental pollutants which are harmful and would adversely affect the peregrine or its food sources.

Suitable habitat for peregrine falcons may be divided into three parts: 1) cliff or substrata upon which eggs are laid and young are reared (nest sites), 2) surrounding territory where food is obtained (hunting sites), and 3) migration and wintering areas. Most peregrine eyries in Utah are situated upon high ledges on mountain cliff faces and river gorges (USFWS 1984a). There are records of peregrines nesting on low dikes in Utah marshes, but these are exceptions due to the abundance of prey and lack of human disturbance. Nests are usually located on open ledges or potholes with a southern exposure. Cliffs are generally composed on one of the following rock types: sandstone, limestone, quartzite, or volcanic rock. The heights of cliffs range from 40-400 feet and average 178 feet (Porter and White 1973). Peregrines nest from the lowest elevations in the region to above 9,000 feet. In the Rocky Mountain Region, the majority of known pairs are near ponderosa pine forests or pinyon-juniper woodlands (USFWS 1984a).

Prey is the major factor in nest site selection. Nest sites are often adjacent to water courses and impoundments due to prey abundance in these areas. Marshes, croplands, meadows, river bottoms, and lakes are important components of peregrine hunting sites. Prey species are primarily small to medium-sized terrestrial birds, shorebirds, and waterfowl, and are normally found within ten miles of the eyrie (known extreme is 17 miles) (USFWS 1984a). The wet areas provide food for the peregrines year-round, but are especially important during the nesting season (Porter and White 1973).

Peregrines generally breed at two to three years of age. Territories are established in March. Three to four eggs are laid mid-April in a scrape on a cliff ledge. Young are hatched in mid-May and fledge after six weeks (Spahr et al. 1991). Porter and White (1973) believed some peregrines winter in marshes adjacent to the Utah and Great Salt Lakes.

Several factors have led to past population declines in the peregrine falcon: 1) effects of DDT, its metabolites, and other chlorinated hydrocarbons on peregrine reproduction, 2) drying up of marshes which support the peregrines' prey base, 3) killing of individuals by firearms, 4) death due to botulism, 5) predation of eggs or young, 6) destruction of

nesting cliffs for mining and construction, and 7) general human encroachment (Porter and White 1973).

Peregrines are most susceptible to disturbance during the courtship and nest establishment period with susceptibility decreasing as the young are raised (USFWS 1984a). Disturbances such as pollution, shooting, nest site and habitat destruction, photographers, removing of birds/eggs, botulism, and effects of DDT during critical reproduction periods all have potentially severe consequences (Porter and White 1973).

With the recent delisting, a Monitoring Plan for the American Peregrine Falcons in the United States prescribes monitoring of peregrine falcon territories every third year beginning in 2003 and ending in 2015 (USFWS 2003). The Fishlake National Forest continues to survey suitable habitat on the Forest annually, however there have been no eyries located on the Forest.

Spotted Bat (*Euderma maculatum*)

Spotted bats inhabit a variety of communities including open ponderosa pine, desert scrub, pinyon-juniper, open pastures, and hay fields. They roost alone in rock crevices located high on steep rock faces in limestone or sandstone cliffs. Crevices range from 0.8-2.2 inches in width. Roost sites are usually in relatively remote and undisturbed areas. There is some evidence that spotted bats exhibit roost site fidelity. Availability of suitable roost sites and impacts of human disturbance are the limiting factors to this species' success.

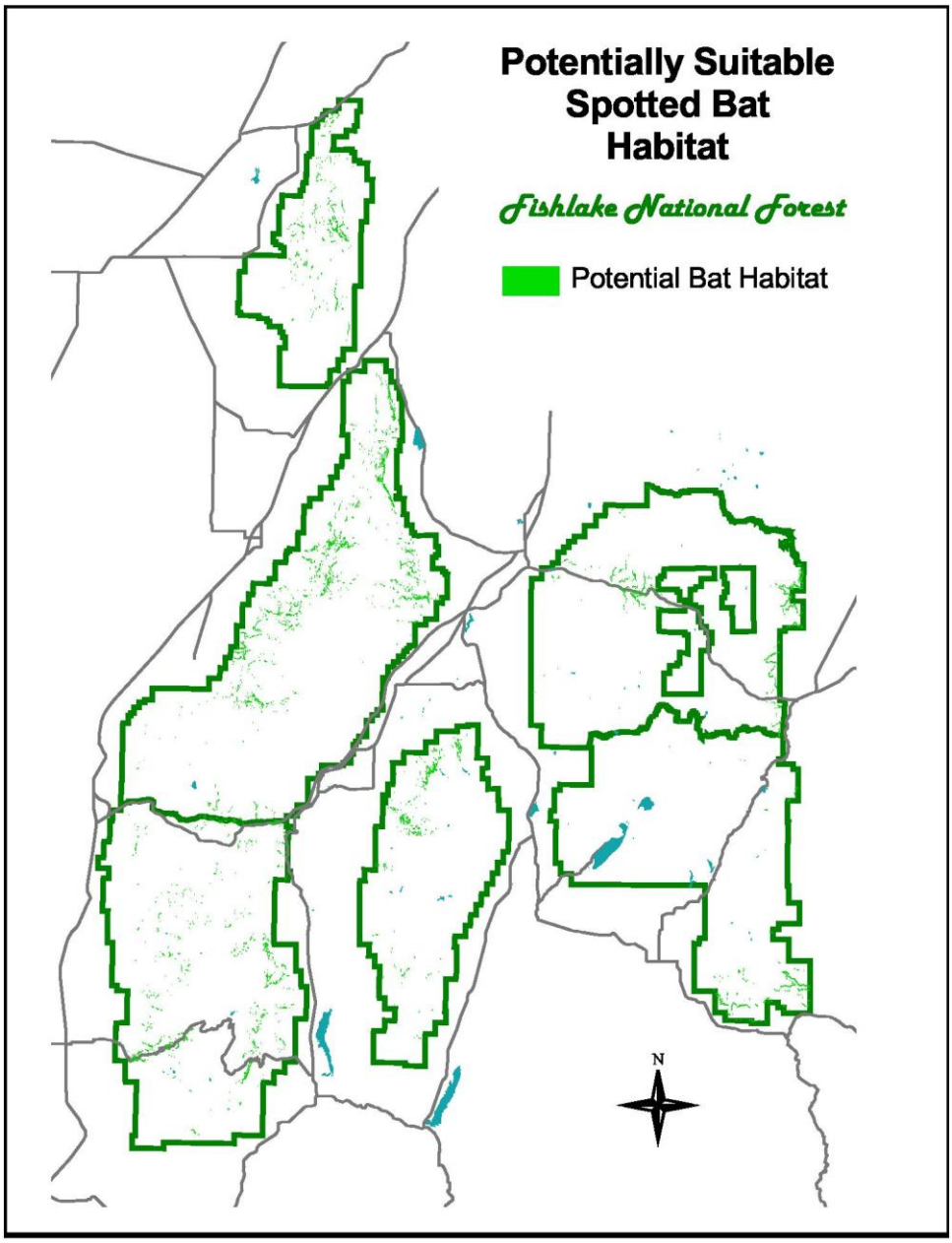
Spotted bats are known to be rare. They breed from late February to early April and give birth to one young in late May or early June (Spahr et al. 1991). Spotted bats are strong fliers and have been observed to move up to 10 km from roosts or capture sites. Spotted bats forage primarily in flight on larger insects such as Lepidoptera, but have also been seen foraging on the ground for grasshoppers (Toone 1992). They use echolocation to avoid flying into each other while foraging. Moths are thought to be their main prey species (Spahr et al. 1991).

Spotted bats occur in scattered areas in British Columbia, Idaho, southeastern Oregon, southwestern Montana, western Wyoming, Nevada, Utah, western Colorado, southeastern California, Arizona, western New Mexico, and south to the Mexican state of Queretaro. Little is known about their seasonal movements, but they are thought to migrate south for winter hibernation (Spahr et al. 1991).

Human disturbance to hibernacula from cave exploration and bat banding has been found to cause significant declines of bat populations (Gillette and Kimbrough 1970, Mohr 1972, both cited in Christy and West 1993). Other threats to bats are the establishment of dams that flood hibernacula (DeBlase et al. 1965, Griffin 1953, Hall 1962, all cited in Christy and West 1993) and the application of pesticides, which reduces food abundance and subjects the bats to contaminated prey (Clark 1981).

Surveys conducted on several sites on the Fishlake National Forest in 1996 resulted in no documented occurrences of this species (Foster et al. 1996). However, to date no forest-wide surveys have been conducted and the species is only a suspected resident.

Displayed below is a map of potentially suitable habitat across the forest.



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

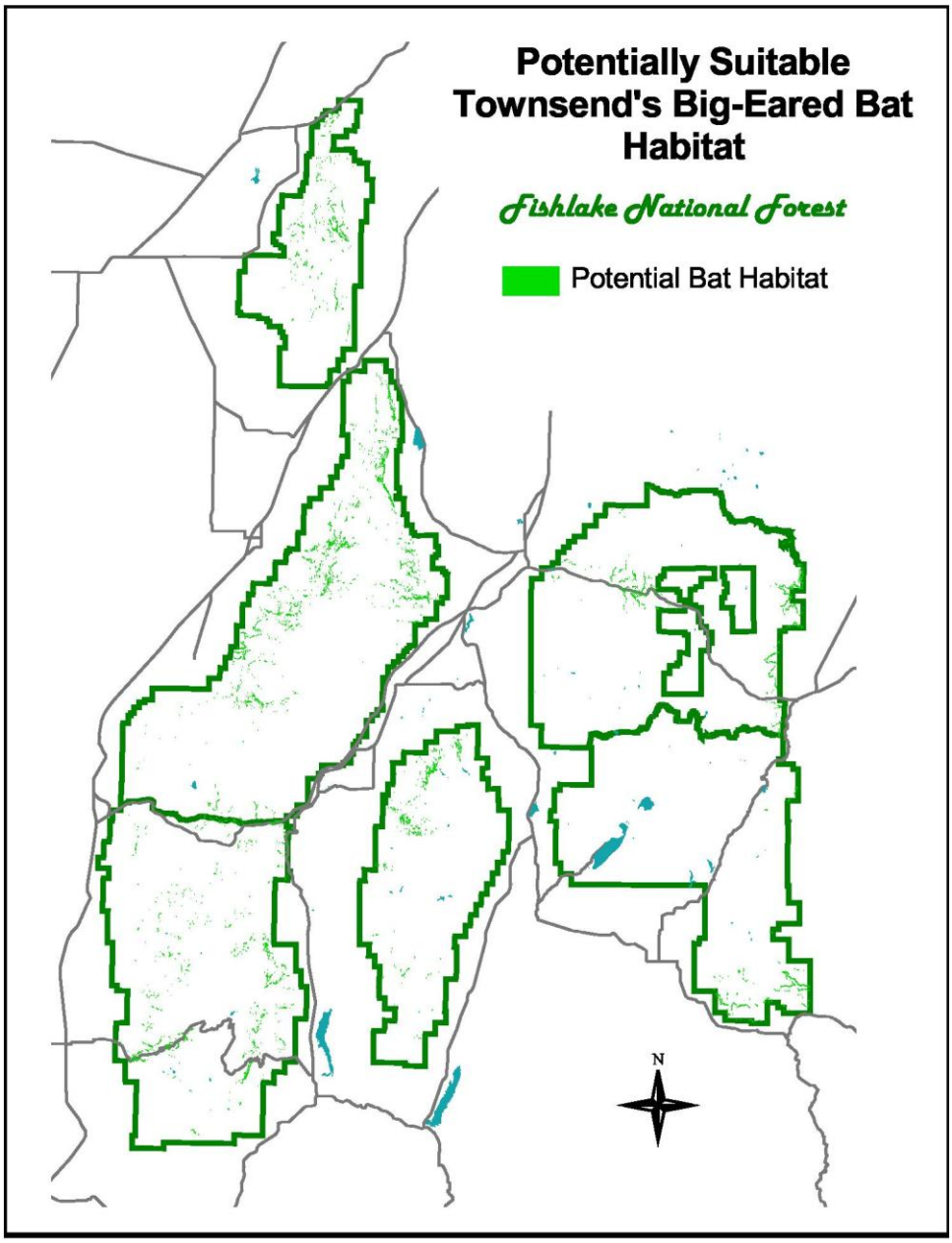
The Townsend's big-eared bat inhabits juniper/pine forests, shrub/steppe grasslands, deciduous forests, and mixed-conifer forests located at elevations between sea level and 10,000 feet. Caves, rocky outcrops, old buildings, and mine shafts provide suitable roost sites for this species. The low reproductive rate, limited availability of roost sites, and effects of human disturbance are considered limiting factors for this species (Spahr et al. 1991).

Western (Townsend's) big-eared bats are insectivores, eating mostly moths. Breeding occurs at winter roost sites between October and February. Because fertilization occurs during winter months, females do not give birth until late spring or early summer. Each female usually gives birth to one offspring. Females and young roost in communal nurseries, which range in size from 12-200 individuals. The offspring fly at three weeks and are weaned in six to eight weeks. Nurseries break up by August. During the winter, bats of this species roost singly or in small clusters in hibernacula from October to February. They do not migrate, but occasionally move to different roosts or hibernacula, presumably in response to temperature changes (Spahr et al. 1991).

The western big-eared bat occurs throughout western North America, from British Columbia to southern Mexico, and east to South Dakota, and west to Texas and Oklahoma. Isolated populations exist in southern Missouri, northwestern Arkansas, northeastern Oklahoma, eastern Kentucky, West Virginia, and western Virginia. They are widely distributed throughout the Intermountain Region (Spahr et al. 1991).

Surveys were conducted at several sites on the Fishlake National Forest in 1996 (Foster et al. 1996) with no bats of this species located. However, in 2003, Townsend's big-eared bats were found roosting in an abandoned mine in Millard County on the Fishlake National Forest. Possible day roosts, night roosts, hibernation roosts, and staging roosts for maternity colonies of this species were evaluated. Ten of thirty-four mine openings evaluated appeared to serve as roost sites for the Townsend's big-eared bat (Diamond and Diamond 2003).

Displayed below is a map of potentially suitable habitat across the forest.



Northern Goshawk (*Accipiter gentilis*)

Northern goshawks are associated with coniferous, deciduous, and mixed forest throughout much of the Northern hemisphere (Reynolds et al. 1992). Studies of nesting habitat show that goshawks nest in older-aged forests with variable tree species (Shuster 1980, Reynolds 1975, 1978, Saunders 1982, Moore and Henny 1983, Hall 1984). The principal forest types occupied by the goshawk in the Southwest are ponderosa pine, mixed-species, and spruce-fir (Reynolds et al. 1992). The most consistent vegetative characteristic of goshawk nest sites is a high percent canopy closure (Reynolds et al. 1992). Goshawks typically nest in stands with canopy cover between 60% and 80% (Crocker-Bedford and Chaney 1988). Studies of habitat characteristics at goshawk nest sites have reported average canopy closure measurements from 75% in northern California to 88% in northwestern California (Saunders 1982, Hall 1984). Stand structure ranges from dense multi-layered stands in Oregon (Reynolds 1978) to open park-like understories in Colorado and California (Shuster 1980, Saunders 1982, Hall 1984). Average nest tree size is just as variable, with mean tree diameters ranging from 8-20 inches in Colorado (Shuster 1980), 20 inches in Oregon (Moore and Henny 1983), and 36 inches in northwestern California (Hall 1984).

Goshawks appear to prefer north to east aspects for nest sites (Moore and Henny 1983, Reynolds 1978, Shuster 1980, Hall 1984), as tree stands within these aspects are typically denser and more suitable (Reynolds 1987). Slope also appears important, as nests are usually placed on flat to moderately sloped (1-40 % grade) land where trees are larger and grow at a higher density (Reynolds 1978, Shuster 1980, Reynolds et al. 1992). Hennessy (1978) observed that there was a tendency for goshawks to build nests near or on trails, edges, dirt roads, or other clearings such that clear flight lanes were provided to and from the nest.

The importance of the proximity of the nest area to water is not known. Moore and Henny (1983) found that the distance of water from nests averaged approximately 650 feet. Hall (1984) found an average distance of 500 feet. Shuster (1980) found that nests were rarely further than 900 feet from water. Hennessy (1978) found an average of 1300 feet in Utah. Crocker-Bedford and Chaney (1988) suggested that a permanent water source is not required, but there may be a preference for this condition.

Reynolds and Meslow (1984) found that the goshawk is a height-zone generalist, taking prey from the ground-shrub and shrub-canopy layers. Bloom et al. (1986) stress the importance of meadows, streams, and aspen stands, which may be important for prey species on which the goshawk feeds. However, Bartelt (1977) observed that goshawks forage in a variety of habitats, probably along edge as well as in deep forests, and Schnell (1958) even observed a goshawk wading through water to prey on ducklings. Moore (1980) also noted use of edge. The presence of prey plucking sites within the nesting territory is also a habitat characteristic related to foraging. Prey plucking sites usually consist of stumps, fallen logs, snags, or arched trees (Bartelt 1977, McCarthy et al. 1989, Schnell 1958). In Oregon and California studies, goshawks were found to forage primarily on birds and mammals (Reynolds 1975, 1978, Bloom et al. 1986). In northern Arizona, Boal and Mannan (1991) found that the golden-mantled ground squirrel, cottontail rabbit, Steller's jay, and northern flicker were the primary prey species.

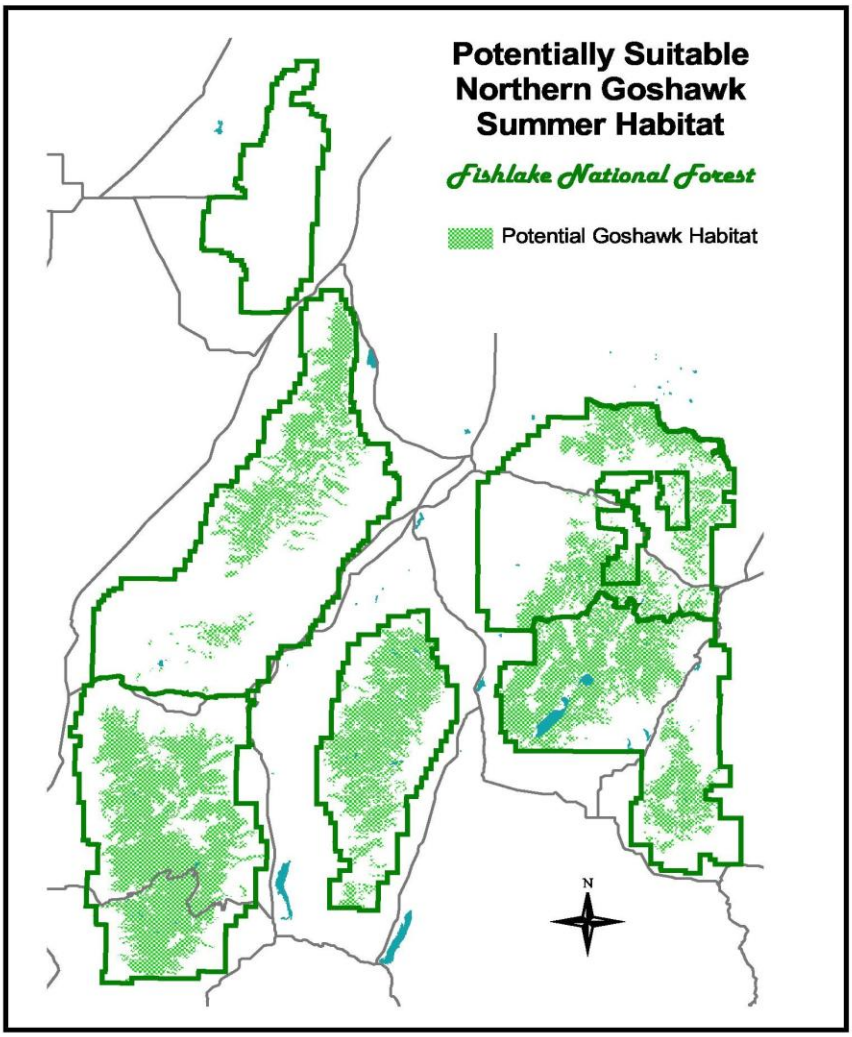
Available evidence suggests that two important resources, food and nest habitat, are the principle mechanisms limiting goshawk densities (Newton 1989, 1991). Specifically, populations may be limited by shortage of nest sites; and where nest sites are readily available, densities may be limited by food abundance and availability (Newton 1991).

Goshawks begin breeding activities in April (McGowan 1973, Moore 1980, Hennessy 1978). Nests are typically large stick platform structures built in a fork near the trunk of the tree, on a large branch, or on top of a mistletoe whorl, 15-50 feet from the ground, just below the crown (Eng and Gullion 1962, McGowan 1973, Bartelt 1977, Moore 1980, Saunders 1982, Hall 1984, Hennessy 1978, Shuster 1980, Reynolds 1987, Bloom et al. 1986). Clutches of 2-4 eggs are laid in mid-May, and incubation lasts about 30 days, with the nestling period extending through mid-July (Reynolds 1975, Moore 1980). Young are fledged between July 15 and August 15 and may be dependent on adults for food until September 30 (Hennessy 1978, Reynolds 1975). Goshawks typically build more than one nest, placing alternates in adjacent trees or up to half a mile away (Reynolds et al. 1992, McGowan 1973). Goshawks may alternate between these nests on an annual or semi-annual basis, may use the same nest for years in a row, or build a new nest in the same area (Reynolds 1975, Reynolds and Wight 1978, Reynolds et al. 1992, McGowan 1973).

The northern goshawk is Holarctic in distribution. In North America it occurs primarily in boreal forests, but it also occurs far to the south in montane forests of the western United States and Mexico. The most widespread subspecies (*A. g. atricapillus*) occurs from the northeastern United States across the boreal forests of Canada to Alaska and southward through the upland forests of the western United States (Reynolds et al. 1992). The goshawk is partly migratory in the northern portion of its range, where in winters of food shortage it migrates southward (Mueller and Berger 1967). In high elevations and montane areas, some goshawks descend into lower elevations of woodlands, riparian areas, and scrublands during the winter (Kennedy unpublished data cited in Reynolds et al. 1992).

Surveys have been conducted on all Ranger Districts across the forest following the Region 4 protocol. 44 nests have been documented on the Fishlake National Forest. This number can vary as a result of high winds and other natural events that can affect nests. The 44 known nests comprise 26 territories. Nesting activity across the Forest generally averages from 8-12 nests annually. An active nest is defined, as nests where adults are present and incubating, or where young are present in or at the nests. An occupied territory is when birds have been monitored in the larger territory but no nesting activity has been confirmed. In this case nesting may have occurred, however, it was not confirmed.

Displayed below is a map of potentially suitable goshawk summer habitat across the Forest. There are approximately 1,454,356 acres of potentially suitable habitat on the Forest.



The Utah Northern Goshawk Conservation Strategy and Agreement are being implemented on the Fishlake National Forest. The Forest recognizes this document for its sound ecological base, and is implementing the principals contained within. Furthermore, the Forest recognizes this publication as the best science available on goshawk management in Utah. Based on the data evaluated for this Strategy and the publication The Northern Goshawk in Utah: Habitat Assessment and Management Recommendations by Graham et al. (1999), goshawk populations are stable in Utah. In addition to these programmatic sources of science, the Forest is implementing the 1999 Utah Northern Goshawk Project Environmental Assessment**,** which provides standards and guidelines for individual forest plan amendments.

Flammulated Owl (*Otus flammeolus*)

Flammulated owls appear to be associated with mature pine and mixed-conifer habitat types (Reynolds and Linkhart 1984). In the West, they typically occur within the yellow pine belt, which includes ponderosa pine (*Pinus ponderosa*) and Jeffrey pine (*Pinus jeffreyi*) (Reynolds et al. 1989, Marshall 1957, Marcot and Hill 1980). Flammulated owls have also been found in stands of fir (*Abies* spp.), Douglas fir (*Pseudotsuga menziesii*), and incense cedar (*Libocedrus decurrensen*) (Marshall 1939, Reynolds and Linkhart 1984). Undergrowth of oak/pine mix may be a required habitat component in some portions of its range (Phillips et al. 1964).

Radio-telemetry studies of foraging and habitat use by flammulated owls in Colorado (Linkhart 1984, Reynolds and Linkhart 1987) and nesting studies in Oregon (Bull and Anderson 1978) showed the owls' preference to forage in old-growth (>200 years old) ponderosa pine/Douglas fir stands over other forest types and ages available within the study area. Goggans (1985) found that flammulated owls monitored in Oregon foraged in edge habitat between forests and grasslands significantly more than these types occurred within their home range, and that the relative proportions of arthropods (flammulated owls' main prey species) were greatest in grassland habitat.

Flammulated owls are obligate secondary cavity nesters, and rely on previously excavated cavities in large diseased or dead trees for nest habitat (Bull and Anderson 1978, Reynolds et al. 1989). Possible limitations to this species include the availability of suitable habitat, which is decreasing due to logging of mature forest stands, and loss of prey associated with such practices (Reynolds et al. 1989).

Flammulated owls are almost exclusively insectivorous, preying on small to medium-sized moths, beetles, caterpillars, crickets, spiders, scorpions, and other arachnids. Breeding begins in May when pair formation and nest site selection take place. Clutches of two to three eggs are laid in natural or flicker-sized woodpecker holes in early June. Young are hatched after a 21-22 day incubation period and fledge in late July. They disperse from the natal area by September. In mid-October, flammulated owls migrate to wintering grounds in Mexico and Central America. Flammulated owls are distributed from southern British Columbia south to Vera Cruz, Mexico and from the Rocky Mountains to the Pacific during breeding. In winter, their range is thought to extend from central Mexico to Guatemala and El Salvador (Spahr et al. 1991).

No inventory specific to the flammulated owl has been conducted on the Fishlake National Forest. A Mexican spotted/multi-species owl inventory conducted in 1992 did record flammulated owl vocalizations on the Loa Ranger District. To date no nests have been documented on the Fishlake National Forest.

Three-toed Woodpecker (*Picoides tridactylus*)

Three-toed woodpeckers are found in northern coniferous and mixed forest types located at elevations up to 9,000 feet and composed of Engelmann spruce, sub-alpine fir, Douglas fir, grand fir, ponderosa pine, tamarack, aspen, and lodgepole pine (Spahr et al. 1991, Gabrielson and Jewett 1940, Farner 1952, Larrison and Sonnenberg 1968, Marshall 1969, Bent 1939). This species is attracted to areas where there are numerous dead trees due to a fire, insect epidemic, blow-down, or other die-off (Bent 1939, Spring 1965, Larrison and Sonnenberg 1968). Nests are found in cavities located 3-50 feet above ground in spruce, tamarack, pine, cedar, and aspen trees (Bent 1939, Spahr et al. 1991). This species uses a variety of tree species as foraging substrata; fire-killed trees appear to be preferred. In Colorado, this woodpecker was found to prefer old growth and mature trees for foraging; in Oregon they have been observed foraging on lodgepole pine trees with an average breast height diameter (DBH) of 9.4 inches and height of 59 feet. Because this species requires snags for feeding, perching, nesting, and roosting, it is threatened by activities such as logging and fire suppression, which remove or eliminate snags (Spahr et al. 1991).

This species feeds off of wood-boring insect larvae, mostly beetles, but they also eat moth larvae and occasionally sap at sapsucker pits (Spahr et al. 1991). They are major predators of the spruce bark beetle and may contribute to its control (Bent 1939). Three-toed woodpeckers breed in May and June. Both sexes excavate the nest cavity in a dead or occasionally live tree where they incubate an average of four eggs for 12-14 days. Young fledge at 22-26 days and remain with the parents for another month (Spahr et al. 1991).

Three-toed woodpeckers range across North America from tree line south to southern Oregon and through Idaho and Utah to New Mexico and Arizona. In eastern North America they are found south to Minnesota, southern Ontario, New York, and northern New England. They also occur across northern Europe and Asia (Spahr et al. 1991). In the Intermountain Region, densities are presumed to be low; however, little information is available. Utah is of high importance to three-toed woodpeckers because 26-50 % of the species' total breeding distribution is in Utah (Parrish et al. 2002).

The three-toed woodpecker is a Utah Partners in Flight priority species according to Parrish et al. (2002). The classification is based on a number of criteria, some of which include: population trend uncertainty, non-breeding threats, and winter distribution. They list the three-toed woodpecker as an ecological specialist, with extensive threat to breeding range due to a 26-50 % loss of habitat.

Formal Forest-wide inventories for this species have been conducted on the Richfield, Loa and Beaver Ranger Districts. As a result of these inventories, numerous nests were located on Monroe Mountain. Monitoring of nest success as well as the success of mitigation measures was part of a study conducted by Brigham Young University. In the Engelmann spruce habitat type of Monroe Mountain, 71 of 251 survey points showed occurrences of three-toed woodpeckers (Hill et al. 2002). Monitoring data resulted in improved mitigation measure recommendations for snag retention.

Greater Sage grouse (*Centrocercus urophasianus*)

Greater sage grouse are distributed from central Washington, southern Idaho, Montana, southern Alberta and Saskatchewan, north-central Oregon, western North Dakota south to eastern California, Nevada, Utah, Colorado, and Wyoming (Johnsgard 1983).

Sage grouse are dependent on sagebrush-dominated habitats (Klebenow 1973). Sagebrush is an essential part of sage grouse brood habitat, nesting cover, and year-round diet (Call 1979). Open areas such as swales, irrigated fields, meadows, burns, roadsides, and areas with low, sparse sagebrush cover are used as leks (Klebenow 1973). Leks are usually surrounded by areas with 20-50 % sagebrush cover (Call 1979).

Males gather on the leks (strutting grounds) early in March, and claim territories before breeding begins (Wallestad 1975). Within 7-10 days following copulation, the hen builds a nest in the vicinity of the lek (Autenrieth 1981, Johnsgard 1983, Wallestad 1975). Clutch size ranges from 7-8 eggs, with incubation lasting about 26 days. Chicks fly by 2 weeks of age, although their movements are limited until they are 2-3 weeks old (Wallestad 1975). Juveniles are relatively independent by the time they have completed their first molt at 10-12 weeks of age (Johnsgard 1983).

Sage grouse lack a muscular gizzard and cannot grind and digest seeds; they must consume soft-tissue foods. The year-round diet consists of leafy vegetation with the exception of some insects taken during the summer. Sage grouse will eat the evergreen sagebrush throughout the year (Wallestad 1975). Additionally, sage grouse will use forbs and rarely perennial bunchgrasses for food. They are highly selective grazers, choosing only a few plant genera. Insects are a minor diet item for adult sage grouse (Barnett and Crawford 1994). In a Utah study, Welch et al. (1991) found that sage grouse, while expressing preference for big sagebrush, are capable of shifting their eating habits. In their first week of life, sage grouse chicks consume primarily insects, especially beetles from the family Scarabeidae. Their diet then switches to forbs, with sagebrush gradually assuming primary importance (Klebenow and Gray 1968).

Sage grouse apparently do not require open water for day-to-day survival if succulent vegetation is available. However, they utilize free water if it is available. Sage grouse distribution is apparently seasonally limited by water in some areas. In summer, sage grouse in desert regions occur only near streams, springs, and water holes (Call 1979).

Sveum et al. (1998) in Washington suggest that nest success is related to herbaceous cover near the nest site. Lack of adequate nesting and brooding cover may account for high juvenile losses in many regions (Kindschy 1986). Taller, denser herbaceous cover apparently reduces nest predation and likely increases early brood survival. Generally, the quantity and quality of habitats used by sage grouse control the degree of predation. Thus, predation would be expected to increase as habitat size and herbaceous cover within sagebrush decrease (Braun 1998). Predator species including coyote (*Canis latrans*), bobcat (*Lynx rufus*), badger (*Taxidea taxus*), eagles, crows, ravens, magpies, and hawks (Dunkle 1977) prey on adult and juvenile sage grouse (Kindschy 1986).

Sage grouse are habitat-specific to one particular plant type in meeting their life requirements. Destruction of habitat has been the basic cause of sage grouse decrease throughout the West. Sage grouse once occurred virtually everywhere sagebrush did

(Call 1979). Sage grouse have declined primarily because of loss of habitat due to overgrazing, elimination of sagebrush, and land development (Hamerstrom and Hamerstrom 1961).

There are known populations of sage grouse on the Richfield and Loa Ranger Districts. Sage grouse have been documented on the south end of Monroe Mountain near the Hell's Hole and Forshea Mountain areas. Sage grouse have been documented using these areas in spring through winter with one documented lek. Sage grouse have also been documented on the lower Mytoge Mountain near the Forest boundary and also near Forsyth Reservoir near Highway 72. They have been documented during the summer months on the upper Mytoge, Sevenmile, and the Tidwell Slopes. Because little information exists on the Fishlake National Forest, a determination concerning trend is difficult. However, low population numbers have been documented throughout the West; therefore, it is assumed that Forest populations are in similar condition. Ongoing surveys will continue in cooperation with the Utah Division of Wildlife Resources.

Pygmy Rabbit *(Brachylagus idahoensis)*

Pygmy rabbits are generally limited to areas of deep soils with tall, dense sagebrush, which they use for cover and food (Flath 1994, Green and Flinders 1980a, Green and Flinders 1980b, Campbell et al. 1982, Weiss and Verts 1984). Individual sagebrush plants in areas inhabited by pygmy rabbits are often 6 feet (1.8 m) or more in height (Flath 1994). Dense stands of big sagebrush along streams, roads, and fencerows provide dispersal corridors for pygmy rabbits (Green and Flinders 1980b, Weiss and Verts 1984). Pygmy rabbits are seldom found in areas of sparse vegetative cover, and seem to be reluctant to cross open space (Bradfield 1975).

The pygmy rabbit is the only native Leporid that digs burrows. Juveniles use burrows more than other age groups. When pygmy rabbits can utilize sagebrush cover, burrow use is decreased. Burrows are usually located on slopes at the base of sagebrush plants, and face north to east. Tunnels widen below the surface, forming chambers, and extend to a maximum depth of about 3.3 feet (1 m). In areas where soil is shallow, pygmy rabbits live in holes among volcanic rocks, in stone walls, around abandoned buildings, and in burrows made by badgers and marmots (*Marmota flaviventris*) (Bradfield 1975, Green and Flinders 1980b).

Pygmy rabbits may be active at any time of day; however, they are generally most active at dusk and dawn. They usually rest near or inside their burrows during midday (Janson 1946 in Green and Flinders 1980b). Some researchers have found that pygmy rabbits never venture further than 70 feet (21.3 m) from the burrows (Bradfield 1975). However, Bradfield (1975) observed pygmy rabbits range up to 328 feet (100 m) from the burrows.

Some areas inhabited by pygmy rabbits are covered with several feet of snow for up to 2 or more months during the winter (Green and Flinders 1980b). Pygmy rabbits will use tunnels beneath the snow (Flath 1994), and during periods when the snow has covered most of the sagebrush, pygmy rabbits tunnel beneath the snow to find food. Snow tunnels are approximately the same height and width as underground burrows. Aboveground movement during the winter months is restricted to these tunnel systems (Bradfield 1975).

The range of the pygmy rabbit includes most of the Great Basin and some of the adjacent intermountain areas of the western United States (Green and Flinders 1980b). Pygmy rabbits are found in southwestern Montana from the extreme southwest corner near the Idaho border north to Dillon and Bannack in Beaverhead County (Flath 1994). Distribution continues east to southern Idaho and southern Oregon and south to northern Utah, northern Nevada, and eastern California as well as isolated populations occurring in east-central Washington (Bradfield 1975) and Wyoming (Campbell et al. 1982).

The elevational range of pygmy rabbits in Nevada extends from 4,494 to over 7,004 feet (1,370-2,135 m) and in California from 4,986 to 5,298 feet (1,520-1,615 m) (Green and Flinders 1980b). In Utah they have been located as high as 8,400 feet (Kreig Rasmussen per. Com).

The primary food of pygmy rabbits is big sagebrush, which may comprise up to 99% of the food eaten in the winter and 51% in the summer (Bradfield 1975, Green and Flinders

1980a). Grasses and forbs are also eaten from mid to late summer (Green and Flinders 1980a, Green and Flinders 1980b).

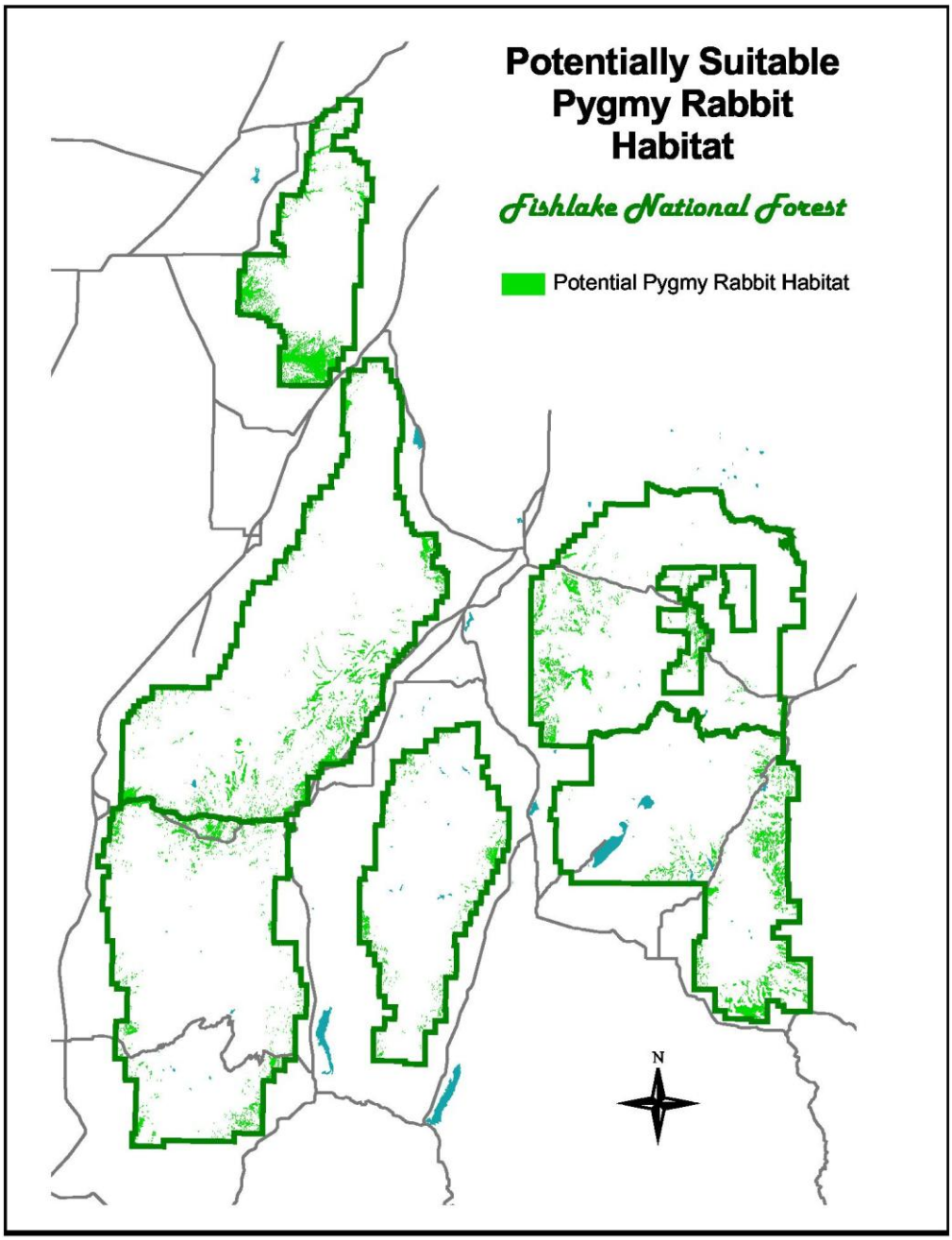
The gestation period of the pygmy rabbit is unknown; however, it is between 27 and 30 days in various species of cottontails (*Sylvilagus* spp.). An average of six young are born per litter and a maximum of three litters are produced per year. The growth rates of juveniles are dependent on the date of birth. Young from early litters grow larger due to a longer developmental period prior to their first winter. The mortality of adults is highest in late winter and early spring (Green and Flinders 1980b).

Weasels (*Mustela* spp.) are the principal predators of pygmy rabbits. Coyote, red fox (*Vulpes vulpes*), badger, bobcat, owls (*Bubo* spp.) and marsh hawk (*Circus cyaneus*) also prey on pygmy rabbits (Bradfield 1975, Green and Flinders 1980b).

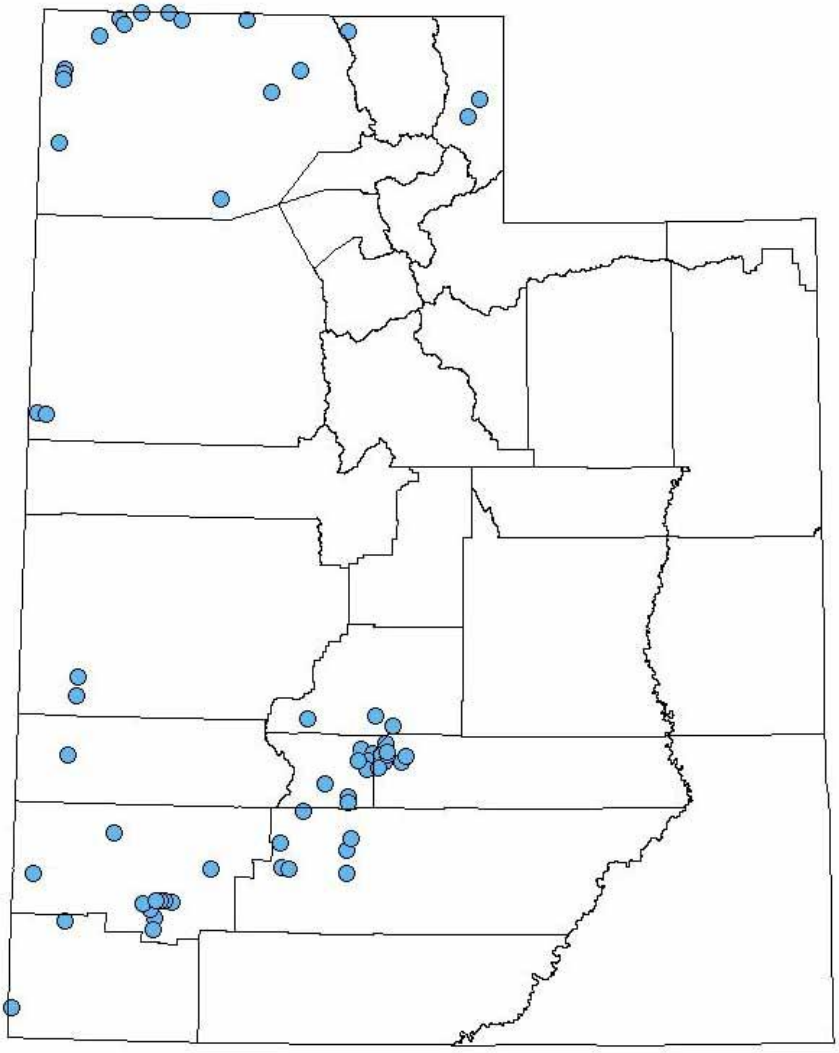
Some populations of pygmy rabbits are susceptible to rapid declines, and possible local extirpation. Some studies suggest that pygmy rabbits are a "high inertia" species with low capacity for rapid increase in density (Weiss and Verts 1984). The loss of habitat is probably the most significant factor contributing to pygmy rabbit population declines. Protection of sagebrush, particularly on floodplains and where high water tables allow growth of tall, dense stands, is vital to the survival of pygmy rabbits (Flath 1994). Fragmentation of sagebrush communities also poses a threat to populations of pygmy rabbits (Weiss and Verts 1984) because dispersal potential is limited (Tesky 1994).

Because surveys are new and ongoing, a discussion addressing the health and distribution of this species is difficult. Therefore, a determination regarding trend and viability of pygmy rabbits on the Forest cannot be made at this time. Research is currently underway in cooperation with Brigham Young University to help obtain more information concerning distribution on the Fishlake Forest. Detections of this species have been made in areas where historic habitat had not been previously identified. In addition, the elevational range has been increased beyond what was originally thought to be suitable pygmy rabbit habitat. Surveys will be continued to determine range, distribution, and health of this species.

Displayed below is a map of potentially suitable pygmy rabbit habitat.



Below is a map of pygmy rabbit detections in Utah, 2003 (Natural Heritage Program data, 2003).

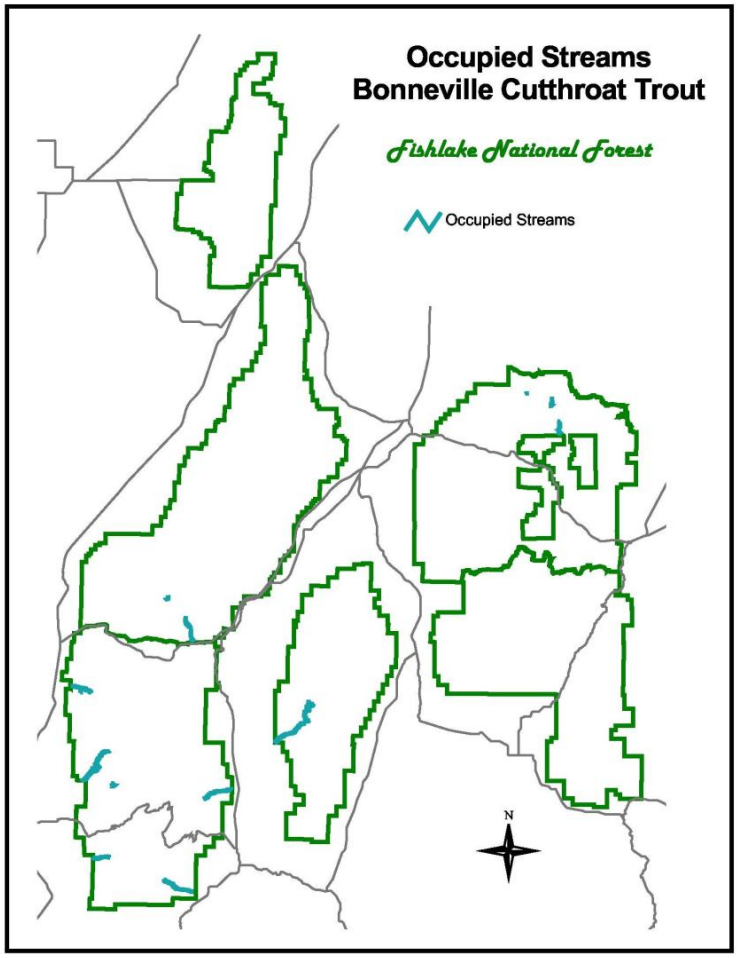


SENSITIVE FISH SPECIES

Bonneville Cutthroat Trout *(Oncorhynchus clarki utah)*

Bonneville cutthroat trout is one of three cutthroat trout subspecies native to Utah. Bonneville cutthroat trout historically occurred in the Pleistocene Lake Bonneville basin, which included portions of Idaho, Nevada, Utah, and Wyoming (Kershner 1995). The desiccation of Lake Bonneville into the smaller Great Salt Lake and fragmentation of other stream and lake habitats may have led to three slightly differentiated groups of Bonneville cutthroat trout. These groups are found in the Bonneville basin proper, the Bear River drainage, and the Snake Valley (Behnke 1992). There are 8 known populations of pure strain Bonneville cutthroat trout on the Fishlake National Forest, inhabiting approximately 38 miles of stream habitat. There are several recently reintroduced populations, and several small potential remnant populations.

The map below displays 38 miles of occupied Bonneville cutthroat trout habitat on the Fishlake National Forest.



Habitat for the Bonneville cutthroat trout is widely distributed and variable. It ranges from high elevation (3,500 m mean sea level) streams with coniferous and deciduous riparian trees to low elevation (1,000 m mean sea level) streams in sage-steppe grasslands containing herbaceous riparian zones. As such, Bonneville cutthroat trout have adapted to a broad spectrum of habitat conditions throughout their range (Kershner 1995).

Sexual maturity is typically reached during the second year for males and the third year for females (May et al. 1978). Both the age at maturity and the annual timing of spawning vary geographically with elevation, temperature, and life history strategy. Lake resident trout may begin spawning at two years of age and usually continue throughout their lives, while adfluvial individuals may not spawn for several years. Annual spawning of Bonneville cutthroat trout occurs in the spring and early summer (Binns 1981). May et al. (1978) reported Bonneville cutthroat trout spawning in Birch Creek, Utah beginning in May and continuing into June. The native brood stock at Manning Meadow Reservoir (2,900 m elevation) spawn from late June to early July (Hepworth and Ottenbacher 1995).

Fry emerge in mid-July through mid-August (depending on time of spawn) and migrate to channel margin habitats associated with stream banks. Growth of resident fish is highly dependent on stream productivity. Growth rates of Bonneville cutthroat trout tend to be slower in headwater drainages than in lacustrine environments (Binns 1981).

Bonneville cutthroat trout require relatively cool, well-oxygenated water, and the presence of clean, well-sorted gravels with minimal fine sediments for successful spawning.

Both terrestrial and aquatic invertebrates are important food items for stream-dwelling Bonneville cutthroat trout (May et al. 1978). Dipterans and debris were the dominant food items for immature trout and terrestrial insects were the dominant prey for mature individuals (Kershner 1995).

There are numerous threats to Bonneville cutthroat trout. These include hybridization and/or competition with nonnative salmonids, degradation of habitat from diversions, livestock grazing, road building, fire, mining and timber harvest activities, as well as angling (Binns 1981).

Colorado River Cutthroat Trout *(Oncorhynchus clarki pleuriticus*)

Colorado River cutthroat trout is one of three cutthroat subspecies native to Utah. Historically, this subspecies occupied portions of the upper Colorado River basin in Wyoming, Colorado, Utah, and New Mexico (Behnke 1992). Though it is now restricted to headwater streams and lakes, its original distribution included portions of the Colorado, Green, Yampa, White, and San Juan Rivers (Young 1995). Although reduced in range and numbers, pure populations of Colorado River cutthroat trout still exist in their native drainages. There are three known populations of pure strain Colorado River cutthroat trout on the Fishlake National Forest inhabiting approximately 8 miles of stream habitat.

Colorado River cutthroat trout populations may be lake resident, fluvial, or adfluvial, and life history characteristics vary somewhat between these strategies. Colorado River cutthroat trout appear to be slower growing than other subspecies, with few fish over 200 mm, probably because of the short growing season. However, Colorado River cutthroat trout transplanted to lower elevation ponds grew to nearly 400 mm in two years, and were commonly over 250 mm in tributaries to the Green River in Wyoming, especially where fish were associated with beaver ponds (Young 1995). Some individuals from the wild brood stock of Colorado River cutthroat trout in Dougherty Basin Lake reach lengths of over 400 mm (Hepworth et al. 2002).

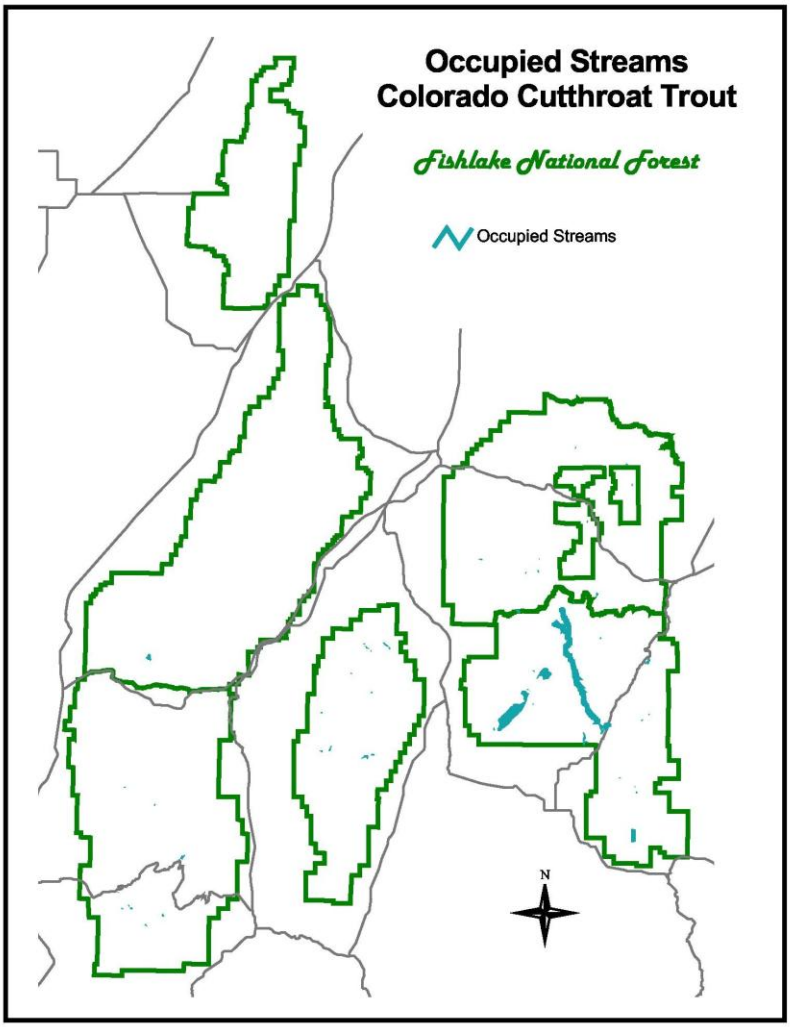
Colorado River cutthroat trout spawning usually begins when spring floods begin to recede in late spring and early summer, and is possibly cued by changes in water temperature. Fecundity varies with individual size and location as well as life history. Water temperature, elevation, and climatic variation determine fry emergence. In known populations, emergence usually occurs in late summer. Maturity is reached at approximately three years of age for fluvial populations (Young 1995).

Habitat requirements for Colorado River cutthroat trout are poorly understood, and results of studies are frequently conflicting. Typical of most cutthroat species, Colorado River cutthroat trout inhabit habitats with cold, clean water and spawn over gravel substrates with good water through-flow. Coarse woody debris, greater depth, and lower velocities are positively associated with Colorado River cutthroat trout presence; however, these conditions are not readily available within many streams containing Colorado River cutthroat trout. Small population size and restricted habitat areas confound most conclusions on habitat requirements (Young 1995).

Colorado River cutthroat trout do not compete well with introduced salmonids. This is possibly due to having evolved with the mottled sculpin and several endemic Colorado River minnows and suckers, and not with other salmonids (Young 1995).

Diets of sub-adult Colorado River cutthroat trout are comprised mainly of macroinvertebrates and plankton, whereas adults can be piscivorous with a larger proportion of large macroinvertebrates and terrestrial insects in their diets than that of sub-adults (Young 1995).

The Colorado River cutthroat trout only occurs on the Loa Ranger District of the Fishlake National Forest, as displayed below.



There are numerous threats to Colorado River cutthroat trout. These include hybridization and/or competition with nonnative salmonids, degradation of habitat from diversions, livestock grazing, road building, fire, mining and timber harvest activities, as well as angling (Binns 1981).

SENSITIVE PLANT SPECIES

Barneby Woody Aster (*Aster kingii var. barnebyana)*

Barneby woody aster is a member of the sunflower family (Asteraceae) and it grows from a well-developed taproot. There are persistent blackish or dark brown old leaf bases at the base of the plant. The stems are short (3-12 cm long) and the herbage is covered with glandular hairs. The leaves are basal, 0.8-12 cm long, and oblanceolate to spatulate in shape (Welsh et al. 2003) with 1-10 pronounced teeth (Atwood et al. 1991). Flowers occur in clusters of 1-5, standing 8-11 mm high. The inner bracts are often purplish and at least the outer tips are bent backward. The ray flowers are white, often fading to pale pink (Welsh et al. 2003). This plant flowers between August and September (Atwood et al. 1991).

This species is found in mountain mahogany and oak communities on rock outcrops composed of Precambrian quartzite (Franklin 1990, Atwood et al. 1991). These scattered occurrences indicate a total population of 600+ plants. The range of elevation is between 6,000 and 10,000 feet (Welsh et al. 2003). Major associated species are mountain spray (*Holodiscus dumosus*), red alumroot *(Huechera rubescens),* mountain snowberry *(Symphoricarpos oreophilus*), and shortstem buckwheat (*Eriogonum brevicaule*) (Franklin 1990).

Barneby woody aster is present within 15-quarter sections, all on the Fillmore Ranger District of the Fishlake National Forest (Madsen 2002). Plants are harbored from threats such as livestock grazing by their occurrence on steep rock outcrops.

Bicknell Milkvetch (*Astragalus consobrinus)*

Bicknell milkvetch is a member of the pea family (Fabaceae). *A. consobrinus* is an acaulescent perennial, growing 1-5 cm tall, essentially lacking stems. The leaves with 3-11 leaflets are densely hairy on both sides. Flowers occur 2-10 per stem. The sepals are whitish, sometimes faintly purple tinged. The pods are 11-19 mm long, ovoid, and unilocular (Welsh et al. 2003). This species is found only on volcanic gravel, gravelly or sandy knolls, and barren stony hillsides (Atwood et al. 1991). It appears in pinyon-juniper and sagebrush communities between 6,000 and 8,500 feet (Welsh et al. 2003). Flowering occurs from mid-May to mid-July with hairy pods produced later (Atwood et al. 1991).

Bicknell milkvetch occurs in Sevier, Wayne, Piute, Garfield, and Emery Counties (Welsh et al. 2003). To date, there are 23-quarter sections known to have Bicknell Milkvetch within their boundaries. These all occur on the Loa Ranger District (Madsen 2002).

Tushar Paintbrush (*Castilleja parvula var. parvula*)

Tushar paintbrush is a member of the Figwort family (Scrophulariaceae). Its many stems reach between 9 and 21 cm in height with the old stems persisting and supporting entire lanceolate leaves. The inflorescence is dense and crimson or magenta colored, with a 1-2 cm calyx with unequal lobes (Welsh et al. 2003). The flowers appear from June to July, and the capsules break open to allow dispersion of seeds by wind or gravity (Spahr et al. 1991).

This taxa is distributed almost exclusively through the alpine meadows and igneous rockbeds of the Tushar Mountains between 10,000 and 12,000 feet (Spahr et al. 1991). This location is under the jurisdiction of the Beaver Ranger District of the Fishlake National Forest. Within Forest boundaries, it occurs in Beaver and Piute Counties (Madsen 2002). This species is one of several *Castilleja* species that occupy narrow ecological and edaphic sites. Mining claims and mineral exploration have impacted habitat of this plant. Grazing may also affect this species (Spahr et al. 1991). Evidence of grazing had been observed during surveys (Clark 2002).

Castilleja parvula var. *parvula* occurs on the Beaver Ranger District of the Fishlake National Forest, currently known in 45-quarter sections (Madsen 2002). The species has been found to be very locally common, although it is very geographically restricted.

Pinnate Spring-parsley (*Cymopterus beckii*)

Pinnate spring-parsley is a member of the Parsley family (Apiaceae) that grows up to 40 cm tall. The leaves extend up the stem from a taproot, which is often clothed at the base with persistent leaf bases. The leaves are once or twice pinnate, with 2-3 opposite pairs of lateral leaflets. The leaflets are 0.5-4 cm long, or the terminal one may be up to 5.5 cm long. There are 1-3 flower clusters per stem. The bractlets are greenish with narrow margins. The petals are bright yellow when fresh, fading to white when dried (Welsh et al. 2003). Pinnate spring-parsley flowers from late May into July (Spahr et al. 1991). *C. beckii* can be distinguished from the closely related *C. lemmoni* by *C. beckii*'s entire leaflets, glabrous peduncles and rays, and slightly longer fruit (Welsh et al. 2003).

Pinnate spring-parsley occurs in pinyon-juniper, mountain brush, and ponderosa pine communities in sandy or stony places between 5,500 and 8,600 feet. This plant is endemic to Wayne and San Juan counties (Welsh et al. 2003).

Possible impacts to this species may come from road construction, mining, and/or oil and gas exploration. This plant grows mostly on sites inaccessible to large grazing animals (Spahr et al. 1991).

Pinnate spring-parsley is found in cliff crevices or sandy canyon bottoms of Navajo Sandstone and Cutler formations. Common associate plants species include little–leaf mountain mahogany *(Cercocarpus intricatus*), pinyon pine *(Pinus edulis*), Utah juniper *(Juniperus osteosperma*), and virgin-bower *(Clematis ligusticifolia*). At the lower elevation, pinnate spring-parsley is restricted to north-facing, shady slot canyons in Navajo Sandstone. Pinnate spring-parsley is found in less protected areas such as cracks and crevices of sandstone domes at higher elevations (Clark 2002).

Currently there are 10 known locations of *C. beckii* on the Loa Ranger District of the Fishlake National Forest, containing approximately 2,760 – 27,100 individuals (Clark 2002).

Creeping Draba (*Draba sobolifera)*

A member of the Mustard family (Brassicaceae), creeping draba has a branched caudex and tall, slender flower stalks with some or no leaves. The obovate leaves are up to 2 cm long and covered with star-shaped hairs. Flowering in July and August (Spahr et al. 1991), each stalk sports 5-20 yellow flowers measuring 4-5 mm in length. The fruit is a silicle up to 8 mm long with 4-12 seeds (Welsh et al. 2003).

The creeping draba grows mostly on igneous gravels of the Tushar Mountains (Spahr et al. 1991) as a member of alpine tundra or spruce-fir communities between 10,000 and 12,100 feet (Welsh et al. 2003).

Activities associated with mineral exploration and extractions have impacted the species (Spahr et al. 1991). This species is not affected by grazing as it occurs in igneous soils and on talus slopes where livestock grazing does not occur.

Creeping draba is known from 24-quarter sections on the Beaver Ranger District of the Fishlake National Forest (Madsen 2002)**.** It is also reported to be on the Markaguant Plateau, Dixie National Forest. Further efforts to pinpoint a known location for the Dixie National Forest are necessary.

Nevada Willowherb *(Epilobium nevadense)*

Nevada willowherb is a member of the evening primrose family (Onagraceae). Nevada willowherb is shrubby with persistent, woody branches and a stout taproot. The stems are more or less upright, leafy, and 15-40 cm tall. The leaves are narrow, mostly alternate, 4-20 mm long, and folded. There are few to several flowers in a terminal cluster. The hypanthium is 2.0-4.5 mm long. The sepals are 2-4 mm long and purplish, with united 4-lobed pink and purple petals (Welsh et al. 2003). This species flowers from late June through September (Atwood et al. 1991).

Preferred habitat for this species includes pinyon-juniper and mountain brush communities on limestone cliffs and gravels at the base of cliffs (Spahr et al. 1991) at elevations between 5,100 and 8,800 feet in Iron, Millard, and Washington Counties in Utah (Welsh et al. 2003). Common associates of the Fishlake National Forest populations include mountain spray (*Holodiscus dumosus*), Gambel's oak (*Quercus gambelii*), hairy goldenaster (*Heterotheca villosa*), bluebunch wheatgrass (*Elymus spicatus*), Watson's goldenbush (*Haplopappus watsoni*), curl-leaf mountain mahogany (*Cercocarpus ledifolius*), alder-leaf mountain mahogany (*C. montanus*), big or common sagebrush (*Artemisia tridentata*), pinyon pine (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), and shortstem buckwheat *(Eriogonum brevicaule*) (Franklin 1990).

Little is known about this species. Livestock and wildlife grazing and off-road vehicle use could threaten populations. Few roads exist in areas where this species is found. Populations often occur on Precambrian quartzite parent material (Franklin 1990).

Presently there are 10-quarter sections known to have occurrences of Nevada willowherb on the Fillmore Ranger District of the Fishlake National Forest (Madsen 2002). Previous records indicated a total population size of 425+ plants for the Fishlake National Forest. While concentrated in the Canyon Mountains on the Fishlake National Forest, this Utah/Nevada endemic has a fairly large overall distribution (Franklin 1990).

Elsinore Buckwheat (*Eriogonum batemanii var. ostlundii)*

Elsinore buckwheat is a member of the buckwheat family (Polygonaceae) that grows 10-45 cm tall. The stems are glabrous and erect with five branched flowering stalks. The leaves are basal, elliptic to spatulate, 1-3 cm long, and white tomentose underneath. The flowers are 1.5-2.8 mm long and white in coloration. Fruit consists of several pale brown achenes that are 2.5-3.0 mm long (Welsh et al. 2003). This species flowers between June and September (Atwood et al. 1991).

Elsinore buckwheat prefers igneous outcrops and gravels in shadscale, ponderosa pine, mixed desert shrub, and juniper communities between 5,500 and 6,500 feet. This sensitive plant is endemic to Piute and Sevier Counties in central Utah (Welsh et al. 2003).

Presently, there are 5 quarter sections with known occurrences on the Richfield Ranger District, 7 quarter sections with known occurrences on the Fillmore Ranger District, and 3 quarter sections with known occurrences on the Beaver Ranger District of the Fishlake National Forest. Thirteen known occurrences exist on private, State, and BLM administered lands within one mile of the Fishlake National Forest boundary (Madsen 2002).

Fishlake Naiad (*Najas caespitosa)*

The Fishlake naiad is a member of the naiad or water-nymph family (Najadaceae). This species is a submerged aquatic plant. The stems are stout, densely branching, and 2-4 cm long. Leaves are narrow and linear, about 3-12 mm long. Male florets are 2.0-2.5 mm long with a single, one-celled anther, while female florets are 2.0-2.5 mm long with three stigmas. The fruit is 2-2.5 mm long, with one shiny seed (Welsh et al. 2003). This species flowers and fruits in July and August (Atwood et al. 1991).

This naiad prefers habitats in shallow water of 12 inches or less with sand or gravel bottoms at 8,600 feet. In addition, this species is endemic to Pelican Point, Fishlake, in Sevier County (Spahr et al. 1991, Welsh et al. 2003).

The only known population of this species is located on the Loa Ranger District of the Fishlake National Forest; however, presence of this species has not been verified since the type collection of August 3, 1940 (Madsen 2002).

Little Penstemon *(Penstemon parvus)*

A member of the Figwort family (Scrophulariaceae), little penstemon has several stems 7-20 cm tall, from a relatively long, slender root system. The leaves are 0.7-6 cm long, entire, and often folded. The cymes are one to two flowered. The petals are blue and up to 20 mm long (Welsh et al. 2003). Little penstemon flowers from late June to August (Spahr et al. 1991).

Little penstemon grows in sagebrush and grass-forb communities at elevations between 8,500 and 10,500 feet. It is endemic to Utah in Piute, Garfield, and Sevier counties and apparently endemic to the Aquarius Plateau (Welsh et al. 2003).

There were 10 known populations of this species on the Loa Ranger District of the Fishlake National Forest in 1988 (Tew 1988). There are 18 quarter sections known to have occurrences on the Loa Ranger District, and 1 suspected on the Richfield Ranger District, which has not yet been verified (Madsen 2002).

Reclamation projects, roads, and the effects of excessive grazing in the past currently threaten this species' survival. This plant has been affected by sheep grazing (Spahr et al. 1991).

Ward Beardtongue *(Penstemon wardii)*

Ward beardtongue is a member of the figwort family (Scrophulariaceae). *P. wardii* has stems that are 15-43 cm tall and covered with small, rough hairs and dust. The leaves are entire, both basal and cauline, and oblong-lanceolate. Basal leaves are 1.5-9 cm long. The cymes hold one to several flowers, which are 2-3 cm long and blue with purple-red guidelines (Welsh et al. 2003). Flowering for this species occurs from May through July (Atwood et al. 1991).

This species prefers habitats in the desert shrub, pinyon-juniper, sagebrush, shadscale, and greasewood communities on the Bald Knoll and Arapien Shale formations (Atwood et al. 1991) at elevations between 5,500 and 6,800 feet (Welsh et al. 2003).

Increased utilization of gypsum will tend to reduce the habitat availability and population size of this species. Gypsum mining has and may continue to pose the major threat to endemic plants on the Arapien Shale Formation (Spahr et al. 1991).

Ward beardtongue can be found in Sanpete, Sevier, and Millard Counties and presently is known to occur on all districts of the Fishlake National Forest in 30-quarter sections (Madsen 2002).

Arizona Willow (*Salix arizonica*)

A member of the Willow family (Salicaceae), Arizona willow is a shrub the grows from ½ inch to 10 feet tall that can be scraggly, rounded, prostrate, or thicket formed (Galeano-Popp 1988). Leaves are 0.4-1.8 inches long and 0.2-0.9 inches wide and are rounded or nearly heart-shaped at the base with fine-toothed margins (USFWS 1992). The previous season's stems are bright red, while the current year's stems are yellow-green, red-brown, or brownish (Atwood 1996). Male catkins are 1-3 cm long, and female catkins are 1-4 cm long, both with brown to black pubescent scales. This species is related to and can be confused with *Salix boothii* in morphology (Fletcher 1987).

According to Arizona documents, *S. arizonica* occurs at elevations above 8,500 feet in wet meadows and streamsides, on volcanic soils (Galeano-Popp 1988, Mead 1996). In Utah, Arizona willow has also been found as low as 8,300 feet on calcareous soils (Mead 1996). Most plants have been found adjacent to perennial water, and less commonly in meadows adjacent to forest edges or meadows with sparse stands of spruce. Species associated with the Arizona willow include Geyer willow, Utah serviceberry, Bebb willow, blue and Engelmann spruce, shrubby cinquefoil, monkeyflower, tufted hairgrass, and *Carex* species (Galeano-Popp 1988).

Until recently, Arizona willow was known only to exist in the White Mountains of Arizona on land managed by the Apache-Sitgreaves National Forest and the White Mountain Fort Apache Indian Reservation (Galeano-Popp 1988). In 1993, a specimen was discovered in the Forest Service national collection that had been collected in 1913 from the "Sevier Forest," (Mead 1996) now administered by the Powell Ranger District, Dixie National Forest. Since formal surveys were begun in July 1994, numerous verified populations of this species have been recorded in Utah. Confirmed sightings occur in Sevenmile Creek and UM Creek on the Fishlake National Forest, Sidney Valley, Rainbow Meadows, Navajo Lake, and the East Fork of the Sevier River, Teasdale Ranger District, and Cedar Breaks National Monument. In addition to the areas listed above, one population has been recorded on the Manti-LaSal National Forest.

In 1995, a Conservation Assessment, Strategy, and Agreement were signed by state and federal agencies to manage the species under a common agreement (USDA 1995). Since the development of this document, management strategies have been implemented range-wide, which has led to the species not needing federal status.

Recent surveys have indicated that the species has a wider distribution and greater abundance than previously thought. The main threat to this species is the degradation of its habitat by livestock/big game, off-road vehicle use, road and pond construction, and timber harvesting. Weakened plants become more prone to rust infection, with increased risks of mortality from other environmental factors (USFWS 1992).

Beaver Mountain Groundsel (*Senecio castoreus*)

This member of the sunflower family (Asteraceae) is a perennial herb between 7-16 cm tall, erect or ascending. The leaf blades are 1-1.5 cm long and 5-10 mm wide. Herbage is woolly-tomentose; basal leaves are petiolate and are usually the largest in size. The upper leaves are smaller and clasping. The inflorescence is subumbellately corymbose with 1-5 heads and with involucres and bracts. The outer bracts are short and rays are lacking. Fruit is a glabrous achene (Welsh et al. 2003). This species flowers between July and August (Madsen 2002).

Beaver Mountain groundsel is endemic to Piute and Beaver Counties. It is often found on windswept ridges or less commonly downward to the spruce-fir community ranging in elevation from 11,000 to 12,700 feet (Welsh et al. 2003).

This species is known from 7 occurrences, within 9-quarter sections on the Beaver Ranger District of the Fishlake National Forest (Clark 2002, Madsen 2002).

Maguire Campion (*Silene petersonii*)

Maguire campion, a member of the Pink family (Caryophyllaceae), grows from creeping, sub-rhizomatous root branches and tap roots. The stems are 3-5 cm tall, hairy, and more or less glandular. The leaves are mainly along the stem in 2-6 pairs, are 1-5 cm long, and hairy like the stems. The upper petal is bent backwards and the flower is nodding both in bud and when open. Calyx are bell-shaped, 13-19 mm long, 10-veined, and green or purple. Petals are 15-33 mm long and pink to purplish. Maguire campion is a perennial (Welsh et al. 2003) that flowers 5-10 days after snow leaves the site (Spahr et al. 1991). Seeds are brown and 2-2.5 mm wide (Welsh et al. 2003). Small birds, mammals, and wind will disperse the seeds. The creeping rhizomes and perennial taproots persist for several seasons (Spahr et al. 1991).

Maguire campion occurs between 7,000 and 11,300 feet on limestone soils, and preferred sites include ponderosa pine, aspen, and spruce-fir communities (Welsh et al. 2003).

Potential threats to Maguire campion include limestone and mineral exploitation, timber harvest, and off-road vehicle use. Livestock do not use this plant (Spahr et al. 1991).

There are presently no known populations of Maguire campion on the Fishlake National Forest. However, the species does occur in Sevier County on the adjacent Manti-LaSal National Forest (Madsen 2002).

Bicknell Thelesperma (*Thelesperma subnudum var. alpinum*)

Bicknell thelesperma is a perennial herb and member of the Sunflower family (Asteraceae). It grows from a taproot, or less commonly with a caudex and creeping rootstock. Stems are 2-7 cm tall. The leaves occur mainly at the base of the stem and are between 1.5 and 9.0 cm long. Flowering disks are bright yellow (Welsh et al. 2003). Plants flower in late June and into July (Atwood 1996).

A Wayne County endemic, Bicknell thelesperma is restricted to the Navajo and Entrada sandstones and Carmel limestone in pinyon-juniper, mountainbrush, and bristlecone pine communities between 6,900 and 9,000 feet (Welsh et al. 2003).

This plant is not affected by grazing, as it occurs on Navajo sandstone and Carmel limestone on barren slopes where livestock grazing does not occur.

There are presently 13 known locations, within 15-quarter sections on the Loa Ranger District of the Fishlake National Forest (Madsen 2002, Clark 2002).

Sevier Townsendia (*Townsendia jonesii var. lutea*)

A member of the sunflower family (Asteraceae), Sevier Townsendia has stems that are subcaulescent to acaulescent caespitose and rising about 2-4 cm. Leaves are 1-4 cm long and oblanceolate. Flowers are mostly solitary. There are 13-21 yellow ray flowers, and disk flowers are about 3 cm long and yellow. The achene is 3-6 cm long and pubescent (Welsh et al. 2003).

This species prefers habitats in the salt desert shrub and juniper communities from 5,500 to 6,300 feet (Welsh et al. 2003). It occurs in Arapien shale and clays in volcanic rubble, and flowers from May through June (Atwood et al. 1991).

Sevier Townsendia occurs in Juab, Sevier, Sanpete, and Piute Counties. There are presently 2 quarter sections with known occurrences on the Fillmore Ranger District, and 7 quarter sections with known occurrences on the Richfield Ranger District of the Fishlake National Forest (Madsen 2002).

MANAGEMENT INDICATOR SPECIES

Elk (*Cervus canadensis)*

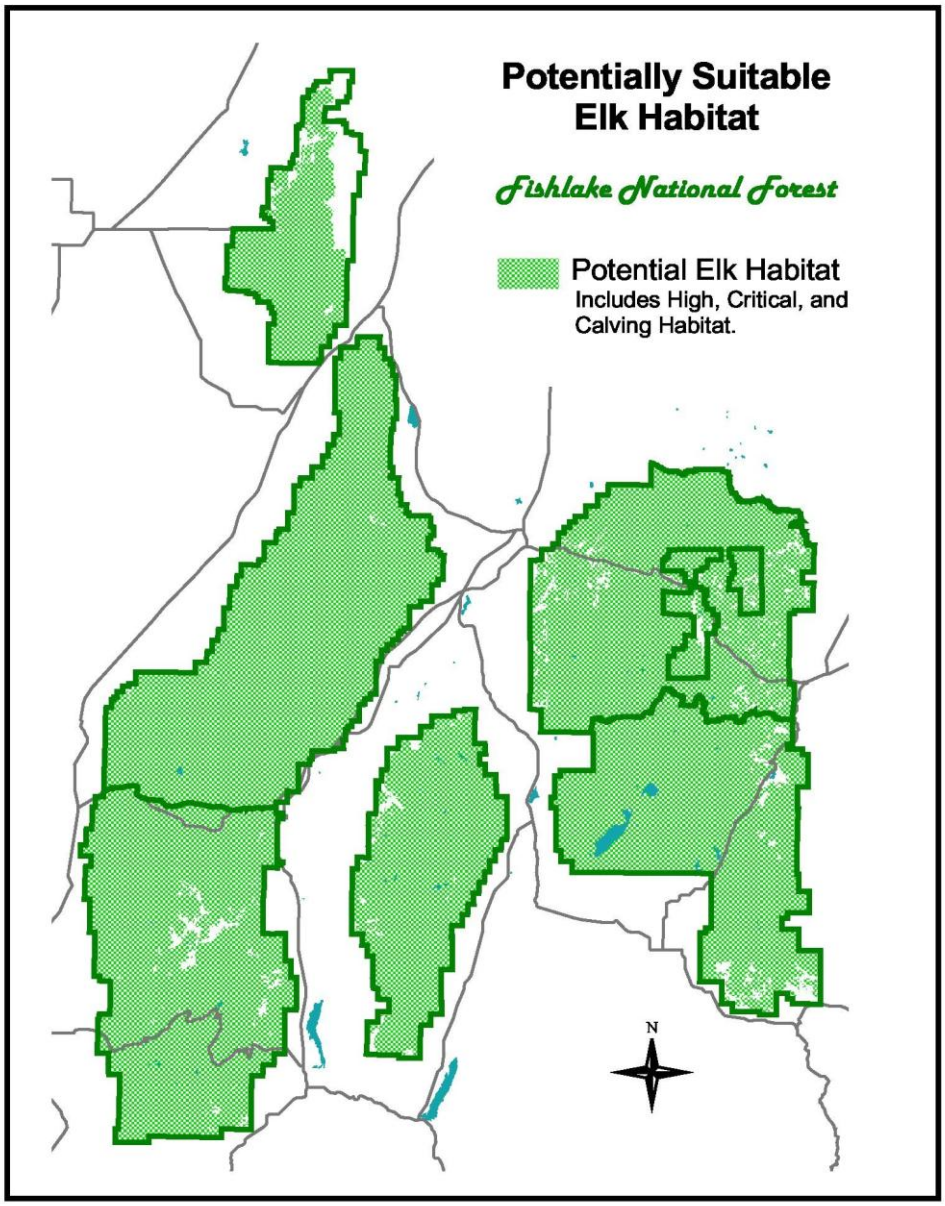
The habitat of elk includes semi-open forest, mountain meadows in the summer, foothills, plains, and valleys. Elk formerly ranged over much of the continent, but are now restricted in distribution. They occur in parts of the western and central United States (Burt and Grossenheider 1976). Roosevelt and Rocky Mountain elk require mature stands of deciduous and coniferous forest habitats. Dense brush understory is used for escape and thermal cover. These habitats are particularly important on south-facing slopes for cover in winter. Roosevelt and Rocky Mountain elk use uneven-aged forest stands that include old growth, herbaceous openings, and water. These elk do not travel far from cover of the forest (Ahlborn 1990).

Elk are herbivorous and feed in riparian areas, meadows, open parklands, and herbaceous and brush stages of forest habitats. They graze and browse, eating grasses, forbs, tender twigs and leaves of shrubs and trees, fungi, some mast, and aquatic vegetation. They forage on the ground, into shrubs, and up to 1.8 m (6 feet) in trees (Ahlborn 1990).

Calving occurs in areas with available water and brushy vegetation that provide dense cover near openings and seclusion from human impacts. The rut occurs from late August to November. The gestation period is about 255 days. Usually one calf is born, but occasionally two, or rarely three. Young are born in secluded areas with good cover. Cows become sexually mature at about two years old. In sedentary herds, female calves usually remain with their mothers to form the cow-calf herds to which they belong throughout their lives. Adult males live separately in bull herds, and join cows only during the rut (Ahlborn 1990).

Humans, mountain lions, and coyotes are the major predators of elk, although black bears, bobcats, and feral dogs probably kill a few (mostly young). Some competition for food and cover may occur between elk and domestic livestock, wild horses, and deer. Populations require seclusion from human interference, protection from poaching, and management to prevent local overpopulation. Proper management of forest and recreational activities can provide these requirements and the mixture of habitats essential to the health of the subspecies (Ahlborn 1990).

Elk habitat occurs across the entire Fishlake National Forest. The map below displays approximately 1,458,049 acres of potentially suitable summer and winter habitat across the forest.

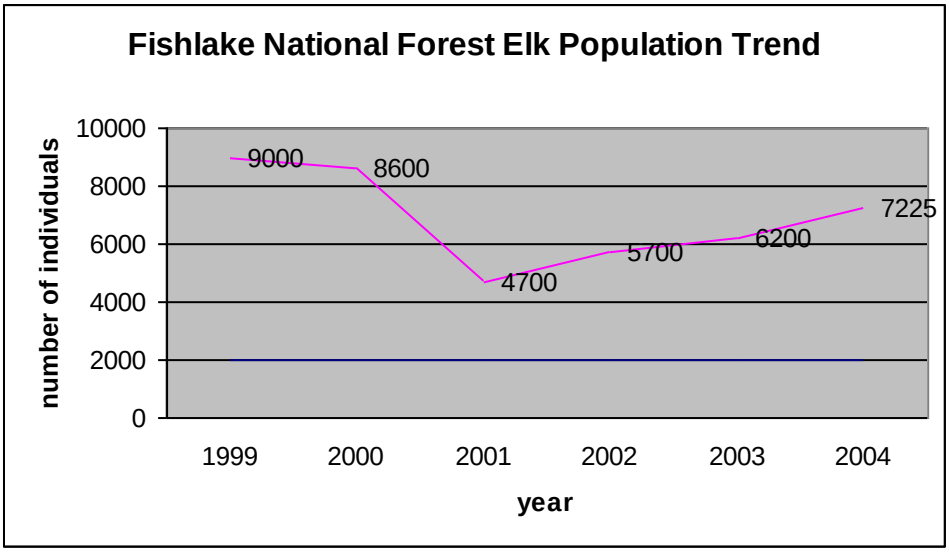


Trend

There are approximately 1,458,049 acres of potentially suitable habitat on the Fishlake National Forest. Within the Fishlake LRMP II-29, table II-8B, the estimated population size of elk on the Fishlake National Forest was 2,000 head in 1986 when the LRMP was signed. The Division of Wildlife Resources counts elk via aerial census in Utah in 3-year rotations. Based on data collected in cooperation with the Division of Wildlife Resources, there were approximately 7225 elk in the winter of 2004/2005. This number represents the Fishlake being at 80% of objective recognized in State herd unit management plans. Elk are actively managed in Utah, as there were over 300 antlerless hunting permits offered for 2005, and the Fishlake is still at 80% of objective. These data were collected during the winter, by helicopter. As a result of habitat improvement projects across the forest, these data display a 5225 head increase since 1986 when the plan was signed.

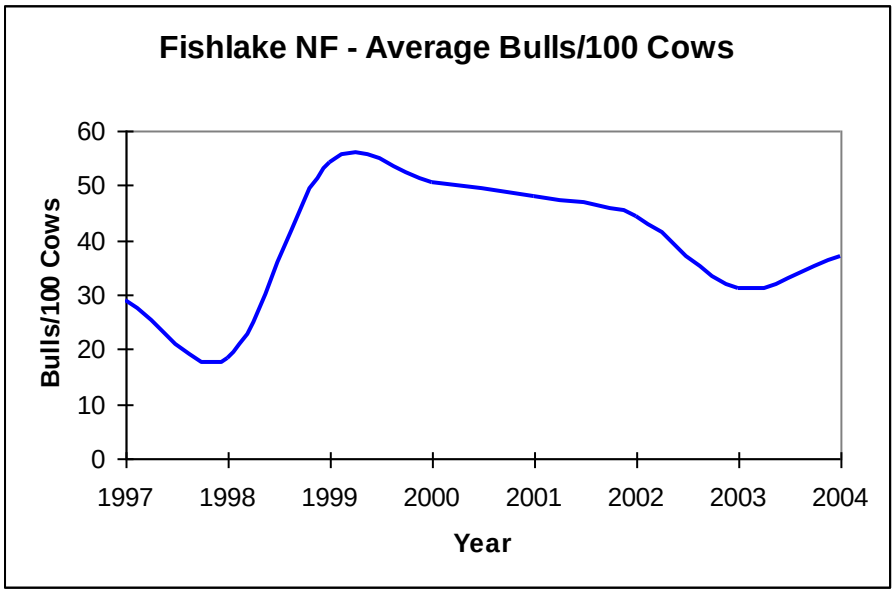
The Division of Wildlife Resources collects population data and monitors harvest levels and trends of elk populations.

Displayed below are population graphs that describe population trends on the Fishlake National Forest.

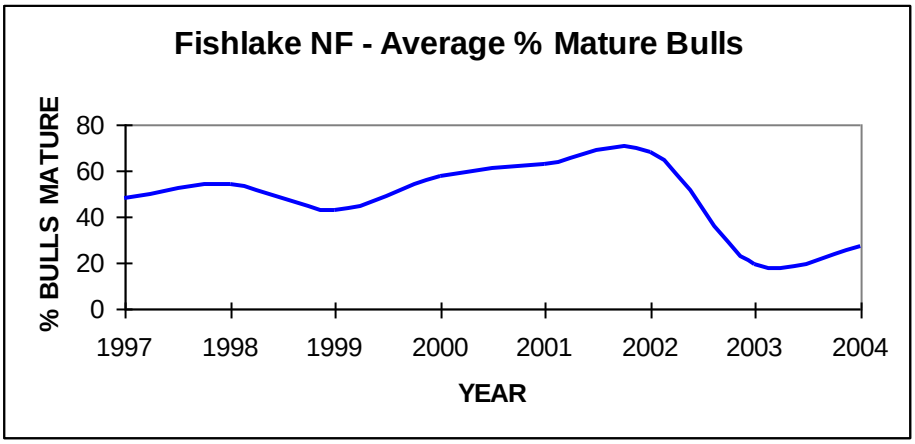


These data indicate a population decline from 2000 to 2001, but an increase from 2001 to 2004. This decline is apart of an overall DWR management strategy to reduce the total number of elk in elk management units that do not comply with approved elk management plans. These reductions will only occur in units where management objectives need to be manipulated to meet unit objectives. This includes cow elk management to keep total numbers in compliance to meet herd unit objectives in the future. In the Southern Region of DWR's jurisdiction, DWR was significantly over herd unit objectives on the Fishlake portion of the Plateau unit. As a result of the 2001 hunting season, a substantial reduction in the number of antlerless elk occurred on this unit. Consequently, the total cow elk numbers are down below herd unit objectives, and the area will be counted again this coming year to obtain a more accurate count.

The number of bull elk per 100 cows in 2004 is up slightly from 1997, which demonstrates a fairly stable to upward trend based on this ratio of bulls to cows.



Presently, elk are in an upward trend, in the percentage of total number of bulls that are mature.



Hunting strategies and overall population control in Utah are made through the Regional Advisory Council and Wildlife Board process. This process has been designed to involve the people in public meetings and cover a wide range of interests in Utah. Decisions for all hunting season bag limits and season dates are rendered based on political as well as biological input. This process demonstrates that the Forest Service does not control hunted game species in the State of Utah. Based on the DWR data presented above, the population trend for elk across the Forest (located in the DWR designated Southern Region) is stable to slightly up, and populations are viable. This determination does not mean that some units may have site-specific areas that are considerably higher than approved herd unit numbers or some that may be slightly lower. It does mean that the trends of elk on the Fishlake in the Southern Region are stable to slightly up in numbers.

Mule Deer (*Odocoileus hemionus)*

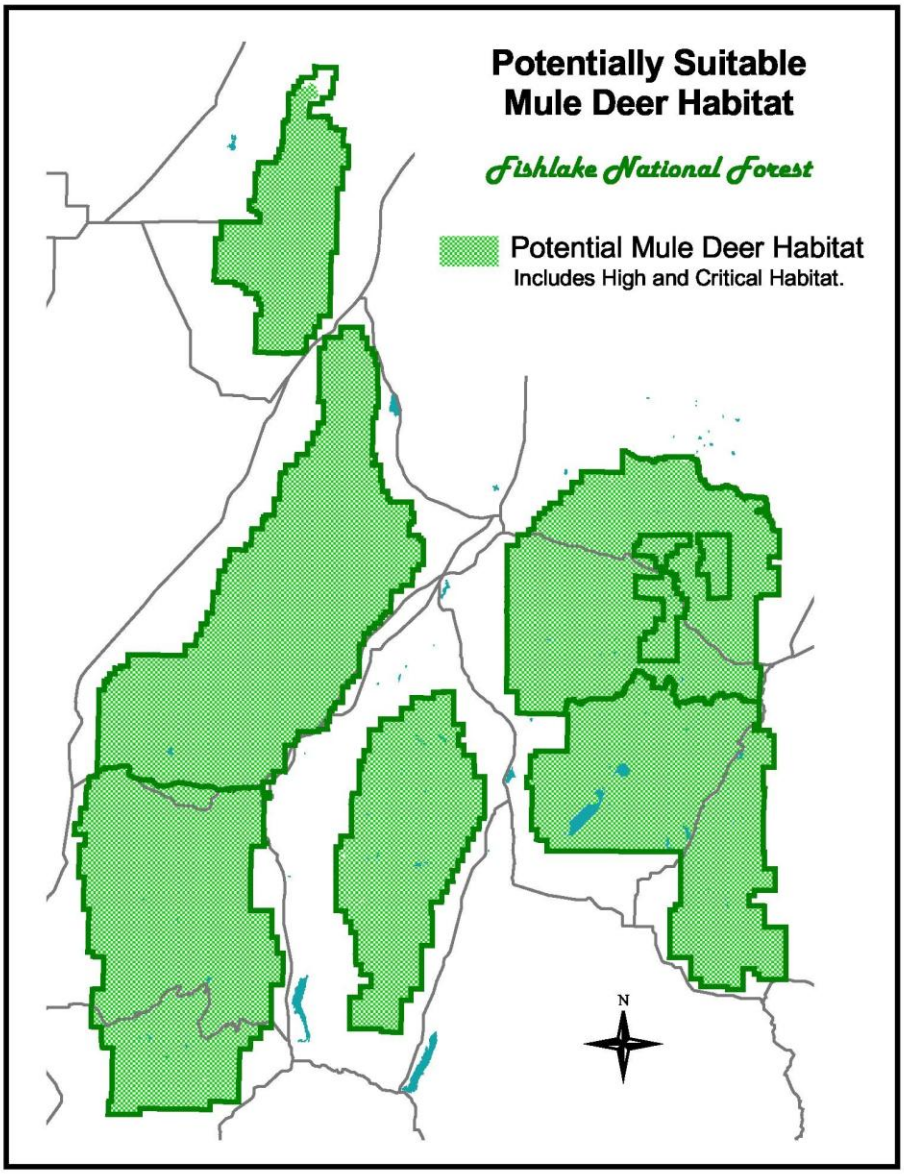
The mule deer occupies several types of habitat throughout the west. Mule deer occur in coniferous forests, desert shrubs, chaparral, and grassland with shrubs (Burt and Grossenheider 1976). They are found in early to intermediate successional stages of most forest, woodland, and brush habitats. Mule deer prefer a mosaic of various-aged vegetation that provides woody cover, meadow and shrubby openings, and free water. Brushy areas and tree thickets are important for escape cover. Vegetative cover is critical for thermal regulation in winter and summer. Mule deer use various aspects of habitat to aid in thermal regulation throughout the year; they use south-facing slopes more in cold weather, and north-facing slopes more in hot weather (Ahlborn 1990).

Mule deer browse, graze, and commonly frequent salt or mineral licks. They prefer tender new growth of various shrubs, many forbs, and a few grasses (Wallmo 1978, 1981). They forage from the ground surface into bushes and trees as high as they can reach. Mule deer also dig out subterranean mushrooms to eat. Food preferences vary with season, forage quality, and availability. Forbs and grasses are important in spring, and they feed heavily on acorns where available, primarily in the fall. Various shrubs are critical in summer and winter (Ahlborn 1990).

Fawning occurs in moderately dense shrublands and forests, dense herbaceous stands, and high-elevation riparian and mountain shrub habitats with available water and abundant forage. Mule deer are serially polygynous. The rutting season occurs in autumn. The gestation period is between 195 and 212 days. Fawns are born from early April to midsummer, varying geographically. Fawning peaks from late April through mid-June. Both males and females become sexually mature at 1.5 years old (Ahlborn 1990).

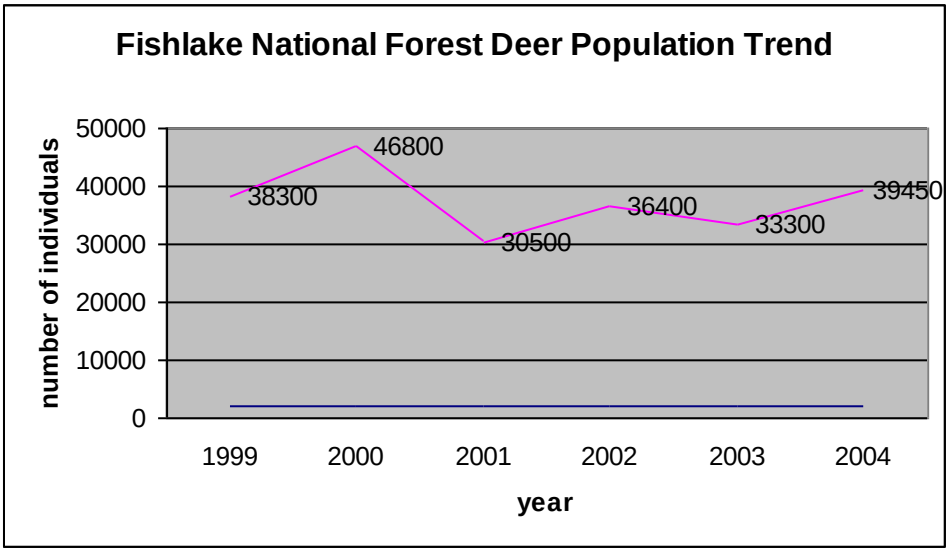
The number of natural predators of deer has been reduced in most areas. Overpopulation, with resultant winter die-offs and destruction of habitat, occurs periodically. Mule deer are preyed upon regularly by mountain lions and coyotes, and occasionally by bobcats, black bears, and domestic dogs. Deer populations can respond rapidly to habitat management. However, populations can decline in response to fragmentation, degradation or destruction of habitat caused by urban expansion, incompatible use of land resources (e.g. timber, water, rangeland), and disturbances by humans. Mule deer compete potentially for food with domestic cattle and sheep, wild horses, wild pigs, and black bears (Ahlborn 1990).

Potentially suitable mule deer habitat has been mapped across the entire Fishlake National Forest and is displayed below. This habitat consists of approximately 1,556,358 acres of potentially suitable summer and winter habitats across the forest.

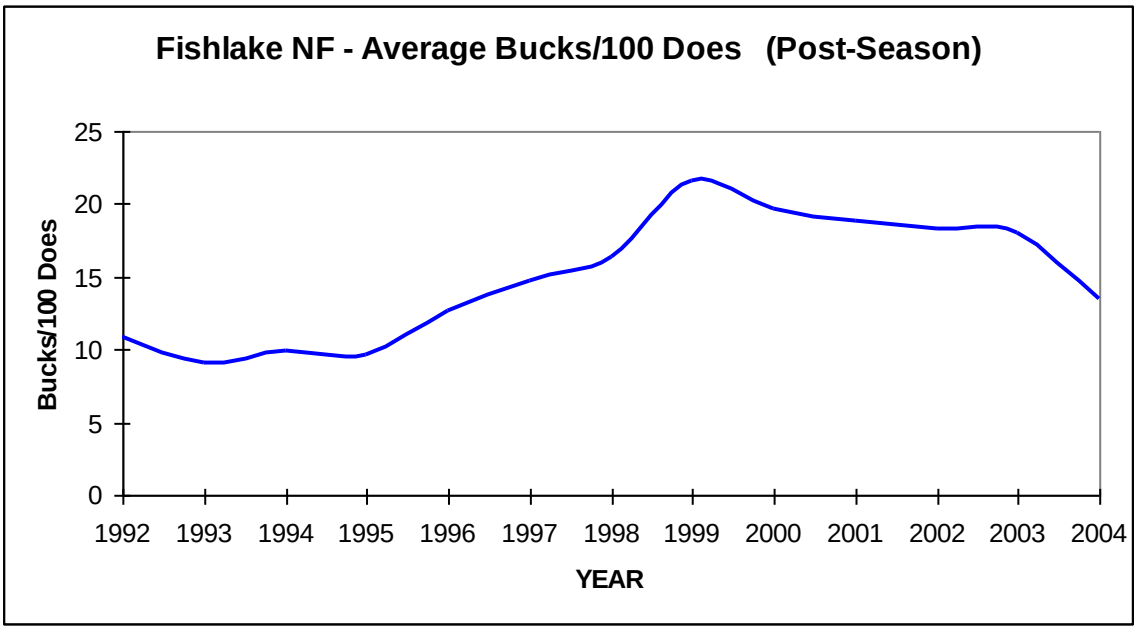


Trend

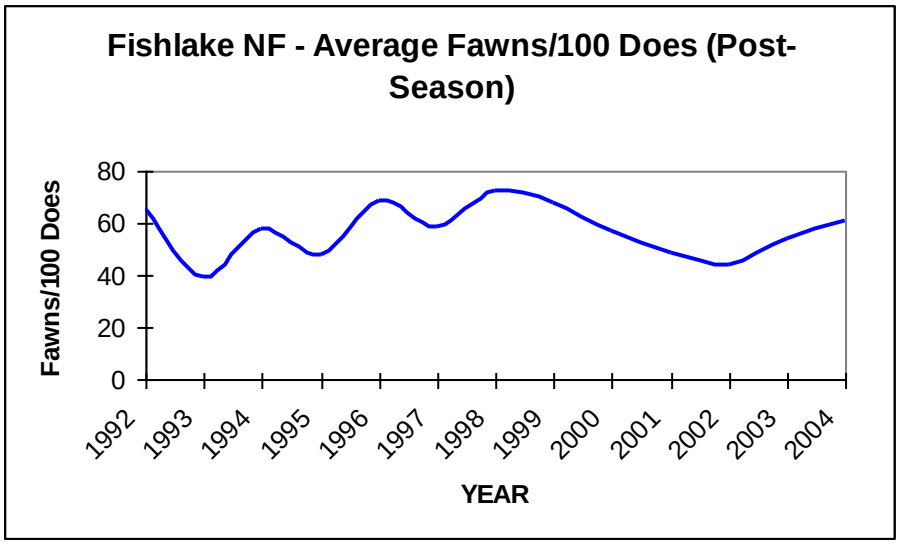
The DWR collects post-season population data and monitors harvest levels and population trends of all big game species, such as mule deer. Displayed below are population graphs that describe population trends in the Southern Region after hunting season. These data display a increase in the total number of deer over the past 3 years on the Fishlake National Forest. These data represent the Fishlake deer populations being at 70% of the herd unit objective.



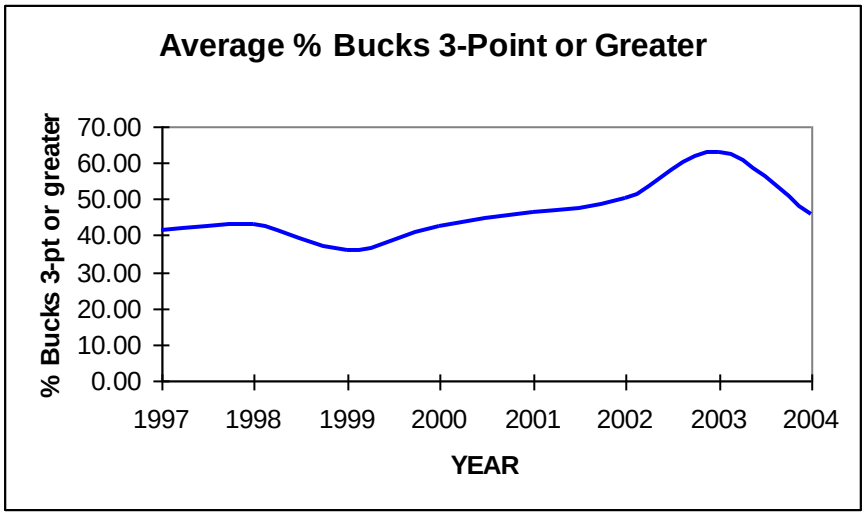
The graph below displays an overall upward trend since 1992 in the number of bucks to does.



The data presented below demonstrate a fairly stable trend in the number of deer produced on the Fishlake National Forest since 1992. These data are consistent with the past several years of drought that the Southern Region has experienced. As stated earlier, some herd units are at objective while others are below.



The data presented below demonstrates a slight increase in the number of mature buck deer since 1997. A decline was observed in 1999, and rebounded in 2003.



Hunting strategies in Utah are made through the Regional Advisory Council and Wildlife Board process. This process has been designed to involve the people in public meetings and cover a wide range of interests in Utah. Decisions for all hunting season bag limits and season dates are rendered based on political as well as biological input. This process

demonstrates that the Forest Service does not control hunted game species in the State of Utah. The data presented above demonstrate that deer populations fluctuate throughout the Southern Region. These fluctuations have been the result of numerous influences including drought, cold winters, and increased predation from large mammals, habitat modifications and degradation. Based on these data, mule deer populations and trends are stable on the Fishlake National Forest, and appear to be recovering from an extended drought.

Northern Goshawk (*Accipiter gentilis*)

Northern goshawks are associated with coniferous, deciduous, and mixed forest throughout much of the Northern hemisphere (Reynolds et al. 1992). Studies of nesting habitat show that goshawks nest in older-aged forests with variable tree species (Shuster 1980, Reynolds 1975, 1978, Saunders 1982, Moore and Henny 1983, Hall 1984). The principal forest types occupied by the goshawk in the Southwest are ponderosa pine, mixed-species, and spruce-fir (Reynolds et al. 1992). The most consistent vegetative characteristic of goshawk nest sites is a high percent canopy closure (Reynolds et al. 1992). Goshawks typically nest in stands with canopy cover between 60% and 80% (Crocker-Bedford and Chaney 1988). Studies of habitat characteristics at goshawk nest sites have reported average canopy closure measurements from 75% in northern California to 88% in northwestern California (Saunders 1982, Hall 1984). Stand structure ranges from dense multi-layered stands in Oregon (Reynolds 1978) to open park-like understories in Colorado and California (Shuster 1980, Saunders 1982, Hall 1984). Average nest tree size is just as variable, with mean tree diameters ranging from 8-20 inches in Colorado (Shuster 1980), 20 inches in Oregon (Moore and Henny 1983), and 36 inches in northwestern California (Hall 1984).

Goshawks appear to prefer north to east aspects for nest sites (Moore and Henny 1983, Reynolds 1978, Shuster 1980, Hall 1984), as tree stands within these aspects are typically denser and more suitable (Reynolds 1987). Slope also appears important, as nests are usually placed on flat to moderately sloped (1-40 % grade) land where trees are larger and grow at a higher density (Reynolds 1978, Shuster 1980, Reynolds et al. 1992). Hennessy (1978) observed that there was a tendency for goshawks to build nests near or on trails, edges, dirt roads, or other clearings such that clear flight lanes were provided to and from the nest.

The importance of the proximity of the nest area to water is not known. Moore and Henny (1983) found that the distance of water from nests averaged approximately 650 feet. Hall (1984) found an average distance of 500 feet. Shuster (1980) found that nests were rarely further than 900 feet from water. Hennessy (1978) found an average of 1300 feet in Utah. Crocker-Bedford and Chaney (1988) suggested that a permanent water source is not required, but there may be a preference for this condition.

Reynolds and Meslow (1984) found that the goshawk is a height zone generalist, taking prey from the ground-shrub and shrub-canopy layers. Bloom et al. (1986) stress the importance of meadows, streams, and aspen stands, which may be important for prey species on which the goshawk feeds. However, Bartelt (1977) observed that goshawks forage in a variety of habitats, probably along edge as well as in deep forests, and Schnell (1958) even observed a goshawk wading through water to prey on ducklings. Moore (1980) also noted use of edge. The presence of prey plucking sites within the nesting territory is also a habitat characteristic related to foraging. Prey plucking sites usually consist of stumps, fallen logs, snags, or arched trees (Bartelt 1977, McCarthy et al. 1989, Schnell 1958). In Oregon and California studies, goshawks were found to forage primarily on birds and mammals (Reynolds 1975, 1978, Bloom et al. 1986). In northern Arizona, Boal and Mannan (1991) found that the golden-mantled ground squirrel, cottontail rabbit, Steller's jay, and northern flicker were the primary prey species.

Available evidence suggests that two important resources, food and nest habitat, are the principle mechanisms limiting goshawk densities (Newton 1989, 1991). Specifically, populations may be limited by shortage of nest sites; and where nest sites are readily available, densities may be limited by food abundance and availability (Newton 1991).

Goshawks begin breeding activities in April (McGowan 1973, Moore 1980, Hennessy 1978). Nests are typically large stick platform structures built in a fork near the trunk of the tree, on a large branch, or on top of a mistletoe whorl, 15-50 feet from the ground, just below the crown (Eng and Gullion 1962, McGowan 1973, Bartelt 1977, Moore 1980, Saunders 1982, Hall 1984, Hennessy 1978, Shuster 1980, Reynolds 1987, Bloom et al. 1986). Clutches of 2-4 eggs are laid in mid-May, and incubation lasts about 30 days, with the nestling period extending through mid-July (Reynolds 1975, Moore 1980). Young are fledged between July 15 and August 15 and may be dependent on adults for food until September 30 (Hennessy 1978, Reynolds 1975). Goshawks typically build more than one nest, placing alternates in adjacent trees or up to a half mile away (Reynolds et al. 1992, McGowan 1973). Goshawks may alternate between these nests on an annual or semi-annual basis, may use the same nest for years in a row, or build a new nest in the same area (Reynolds 1975, Reynolds and Wight 1978, Reynolds et al. 1992, McGowan 1973).

The northern goshawk is holarctic in distribution. In North America it occurs primarily in boreal forests, but it also occurs far to the south in montane forests of the western United States and Mexico. The most widespread subspecies (*A. g. atricapillus*) occurs from the northeastern United States across the boreal forests of Canada to Alaska and southward through the upland forests of the western United States (Reynolds et al. 1992). The goshawk is partly migratory in the northern portion of its range, where in winters of food shortage it migrates southward (Mueller and Berger 1967). In high elevations and montane areas, some goshawks descend into lower elevations with woodlands, riparian areas, and scrublands during the winter (Kennedy unpublished data cited in Reynolds et al. 1992).

The Utah Northern Goshawk Conservation Strategy and Agreement is being implemented on the Fishlake National Forest. The Forest recognizes this document for its sound ecological base, and is implementing the principals contained within. Furthermore, the Forest recognizes this publication as the best science available on goshawk management in Utah. Based on the data evaluated for this Strategy and the publication The Northern Goshawk in Utah: Habitat Assessment and Management Recommendations by Graham et al. (1999), goshawk populations are stable in Utah. In addition to these programmatic sources of science, the Forest is implementing the 1999 Utah Northern Goshawk Project Environmental Assessment**,** which provides standards and guidelines for individual forest plan amendments.

Trend

Goshawk populations on the Fishlake National Forest fluctuate within reproductive seasons, and from season to season. They are affected by a number of factors such as drought; cold and wet early spring conditions, low prey densities, significant wind events, fire, modified vegetation in the landscape and predators. As a result of a combination of these events across the forest over the past several years, the 26-goshawk territories across the forest have experienced a decline in nesting activity, and occupancy.

According to data collected on the Fishlake National Forest, approximately 26 nest territories occur on the Forest as of the 2004 nesting season. Forty-four nests have been documented within these territories. The number of nests found in a year can vary as a result of high winds and other natural events that can affect nests. Nesting activity ranges across the Forest from 8-12 nests annually. Ten nests were confirmed active in 2004. Although the numbers of active nests have been down, occupied territories (birds in the nest area, but not confirmed as nesting) have been commonly observed.

The data used in this determination was obtained by annual field reviews from District wildlife biologists. While the population of nesting goshawks on the Fishlake is experiencing a dip in trend, this population is still under review. This review is based on additional surveys in adjacent available and suitable habitats across the Forest, the number of occupied territories (birds in the territory but not nesting), and overall population numbers. Poor reproductive success due to severe sustained drought conditions in southern Utah has been a primary concern. This situation is not repeated on other National Forests in Utah, such as the Dixie where higher amounts of precipitation have been obtained and territory occupancy is up.

SAGE NESTERS

Brewer's Sparrow (*Spizella breweri*)

The Brewer's sparrow commonly breeds in arid sagebrush steppes of western North America (Wiens and Rotenberry 1981, Baicich and Harrison 1997). The distribution of Brewer's sparrows generally coincides with the distribution of sagebrush in the West, from British Columbia, southeast to Saskatchewan, south to California, and east to New Mexico (Colorado Partners in Flight 2000). They breed in the northern Rocky Mountains of the Yukon and British Columbia, and in the Great Basin south to southern California and New Mexico. The species winters in the southwestern United States, though they are absent from the Pacific Coast (Udvardy 1994).

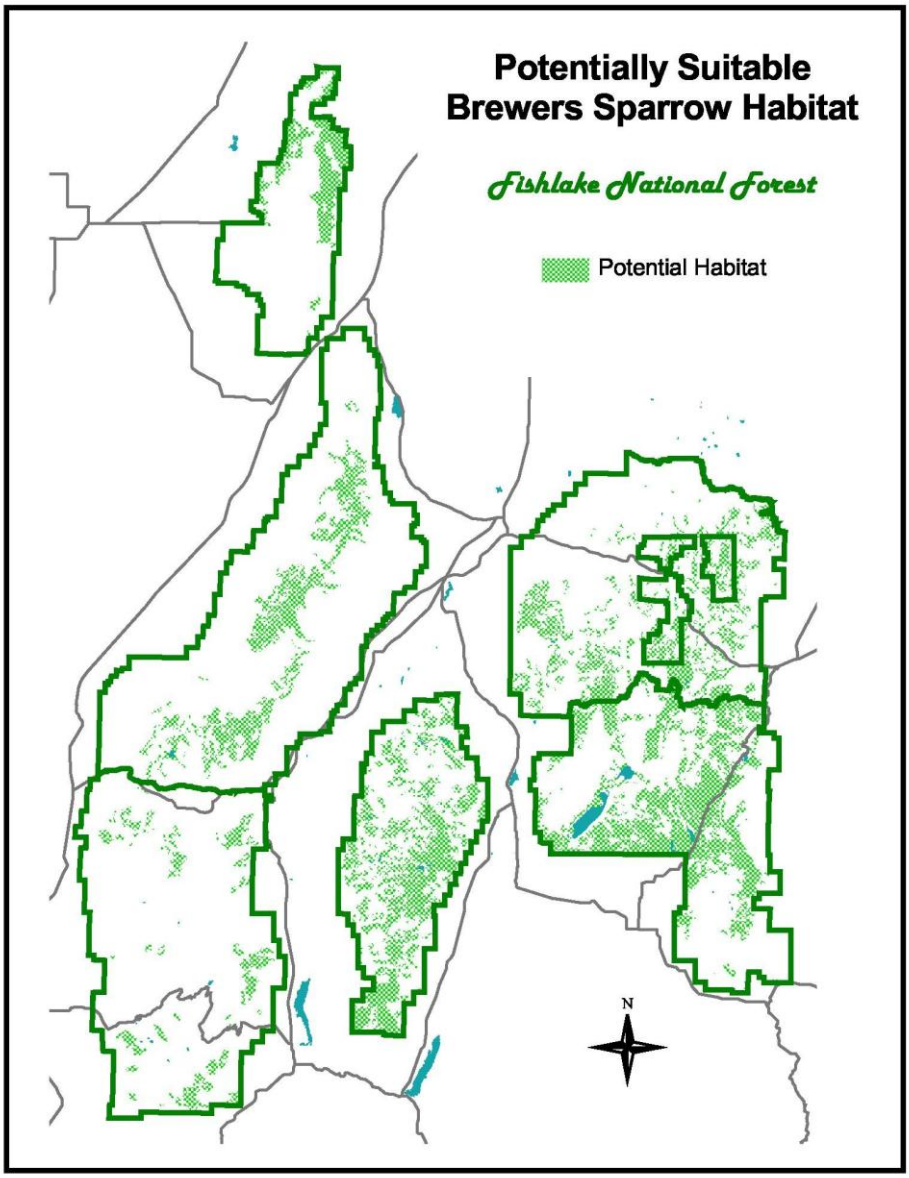
A Brewer's sparrow is approximately 5 inches (13 cm) long. It has light brown upper-parts with black streaks, and pale unmarked undersides. It has a brown crown that is finely streaked with black. The ear patch is darker and well defined, and bordered by a fine black eye line. The Brewer's sparrow song usually consists of alternating trills that can be musical or buzzy.

In Montana, Best (1972) found 45-50 pairs per 100 acres in unsprayed sagebrush, and 15-33 pairs per 100 acres in the first year after herbicide spraying that killed all sagebrush. Gashwiler (1977) reported 27-36 pairs per 100 acres in Oregon sagebrush. In successional brushfields in Sierra County, California, Bock and Lynch (1970) reported 3.6 pairs per 100 acres. In the same area, Savidge (1978) found 45 pairs per 100 acres in unsprayed brush, and 22.3 pairs per 100 acres in a matched plot sprayed heavily with herbicide.

This species builds cup-shaped nests in sagebrush, with nests between 20 and 50 cm from the ground. Brewer's sparrows prefer shrubs tall enough (about 69 cm) and dense enough to provide sufficient cover (Rich 1980, Peterson and Best 1985, Best 1972). They often build their nests in the outer branches. The nest is a cup of dry grass stems, forbs, and rootlets lined with find grasses, rootlets, and hairs (Harrison 1978). Brewer's sparrows breed primarily from late May though June (Biermann et al. 1987, Rich 1980). There are usually 3 or 4 eggs per clutch (Reynolds 1981), though occasionally 5 are laid. Incubation is between 11 and 13 days, and the altricial young fledge in 8-9 days (Ehrlich et al. 1988, Reynolds 1981, Baicich and Harrison 1997). A study in Idaho indicated nesting success to be quite low at 14% (Reynolds 1981).

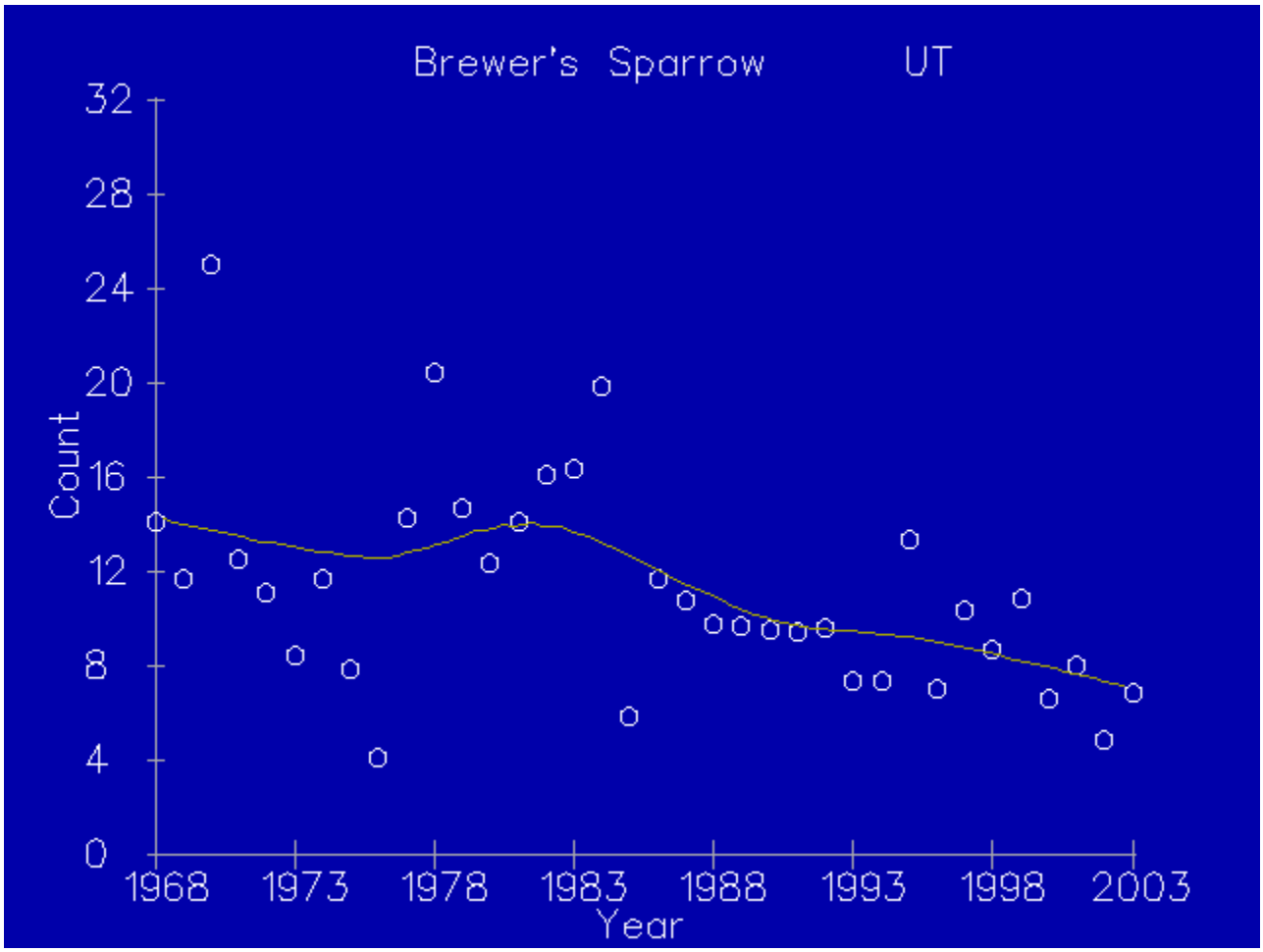
The diet of this sparrow primarily consists of insects and spiders in the summer and seeds and grasses of forbs in the winter. This species will commonly drink and bathe, but may not require free water (Bent 1968). They are able to meet water needs by eating insects (Ohmart and Smith 1970), and can subsist on dry seeds for up to 3 weeks (Ehrlich et al. 1988).

Potentially suitable Brewer's sparrow habitat has been mapped across the entire Fishlake National Forest and is displayed below. This habitat consists of approximately 213,491 acres of potentially suitable habitat.



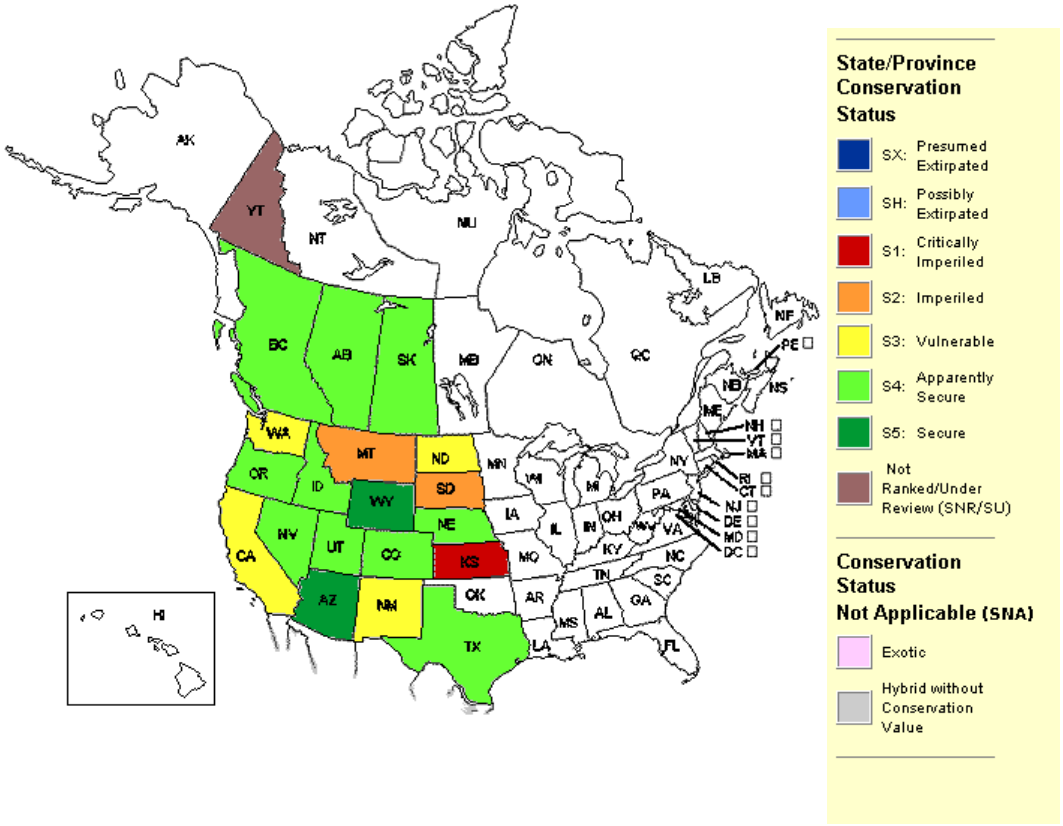
Trend

In addition to these data, the BBS database (www.mbr-pwrc.usgs.gov) displays an upward trend of Brewer's sparrows in Utah. These data represent a 35-year trend between 1968 and 2003. These data were collected throughout the entire state of Utah, including points on the Fishlake National Forest.



The map below displays the status ranking from the Nature Conservancy database (NatureServe Explorer). The Brewer's sparrow has been ranked as "apparently secure".

Brewer's Sparrow (*Spizella breweri*)



NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 18, 2005).

Surveys for avian MIS have been conducted on the Fishlake National Forest since the mid 1980's. Additional studies by "expert birders" were conducted in 1994, 1998, 2002, 2003, and 2004. These surveys have targeted cavity nesting, riparian, and sage nesting species. All other avian species were also recorded while conducting these surveys.

Data has been collected between 1994-2004. In 1994 the number of presence/absence observations of this species along each transect line-totaled 4 observations. It is important to note that this does not mean 4 birds were observed, rather, along 4 transects brewers sparrows were observed. This data was collected in the Burnt Flat area only. In 1998 forest wide surveys detected brewers sparrows along 6 transect lines. In 2002 the total number of transects with the brewers sparrow totaled 14. In 2004 Brewers were observed along 4 transect lines where 85 birds were detected. While the detection rate on transects is lower than in 2004 than 2002, the number of individuals detected was up. Data collected in 2004 was limited and not all transects monitored in 2003 were revisited in 2004. Further data is being collected to fine-tune the status of the population on the Fishlake National Forest. However, based on these data, and data from the BBS and the

Nature Conservancy, which display an upward and an “apparently secure” rating, as well as my professional interpretation of these data, the trend of this species across the Fishlake National Forest is stable, and viable.

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Vesper Sparrow (*Pooecetes gramineus*)

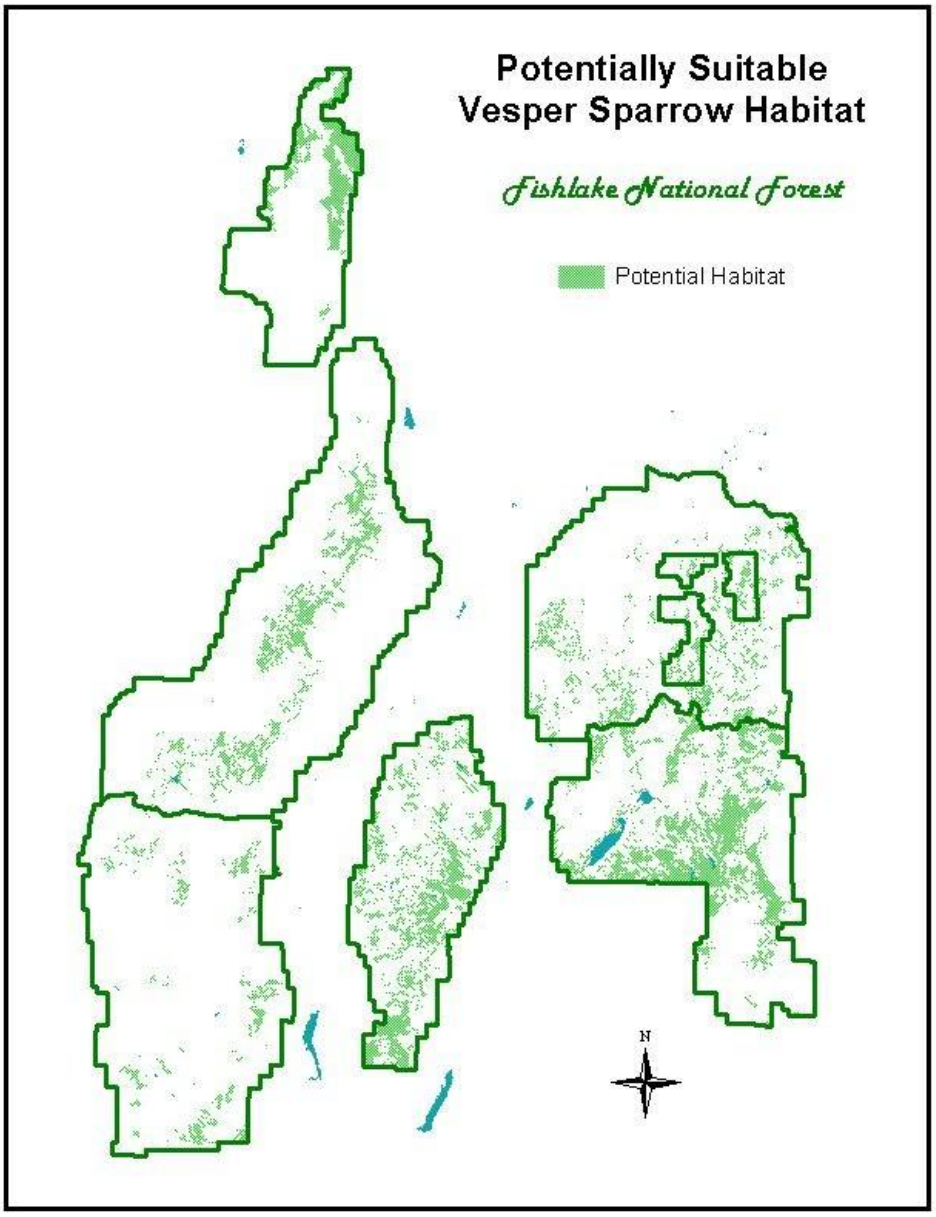
The vesper sparrow is found in fields, pastures, and roadsides in farming country. This species breeds from British Columbia, Ontario, and Nova Scotia south to California, Texas, Tennessee, and western North Carolina. It winters in California, Oklahoma, New Jersey, and Long Island (Udvardy 1994).

This species is approximately 5-6 1/2" (13-17 cm) in length. It is grayish and streaked, though there is a patch of chestnut color on the bend of the wing. It has a white eye ring and white outer tail feathers. Its song begins with 4 whistles followed by a descending trill (Udvardy 1994).

Breeding density was reported as 17.5 to 32.5 pairs per 100 acres in sagebrush-grassland in Montana (Best 1972), and 5 pairs in the Missouri River Breaks (Walcheck 1970). Breeding season starts mid-April to mid-May. Double and treble broods have been observed. Clutch size is 3-6 eggs, usually 4 or 5. Incubation lasts 11-13 days. Altricial young are tended by both parents, and leave the nest at 9-13 days, still unable to fly. Young are dependent on parents an additional 20-22 days (Baicich and Harrison 1997). This species builds a nest on the ground (Udvardy 1994). The vesper sparrow breeds in sagebrush and other shrub habitats with sparse vegetation (Wray et al. 1982, Baicich and Harrison 1997).

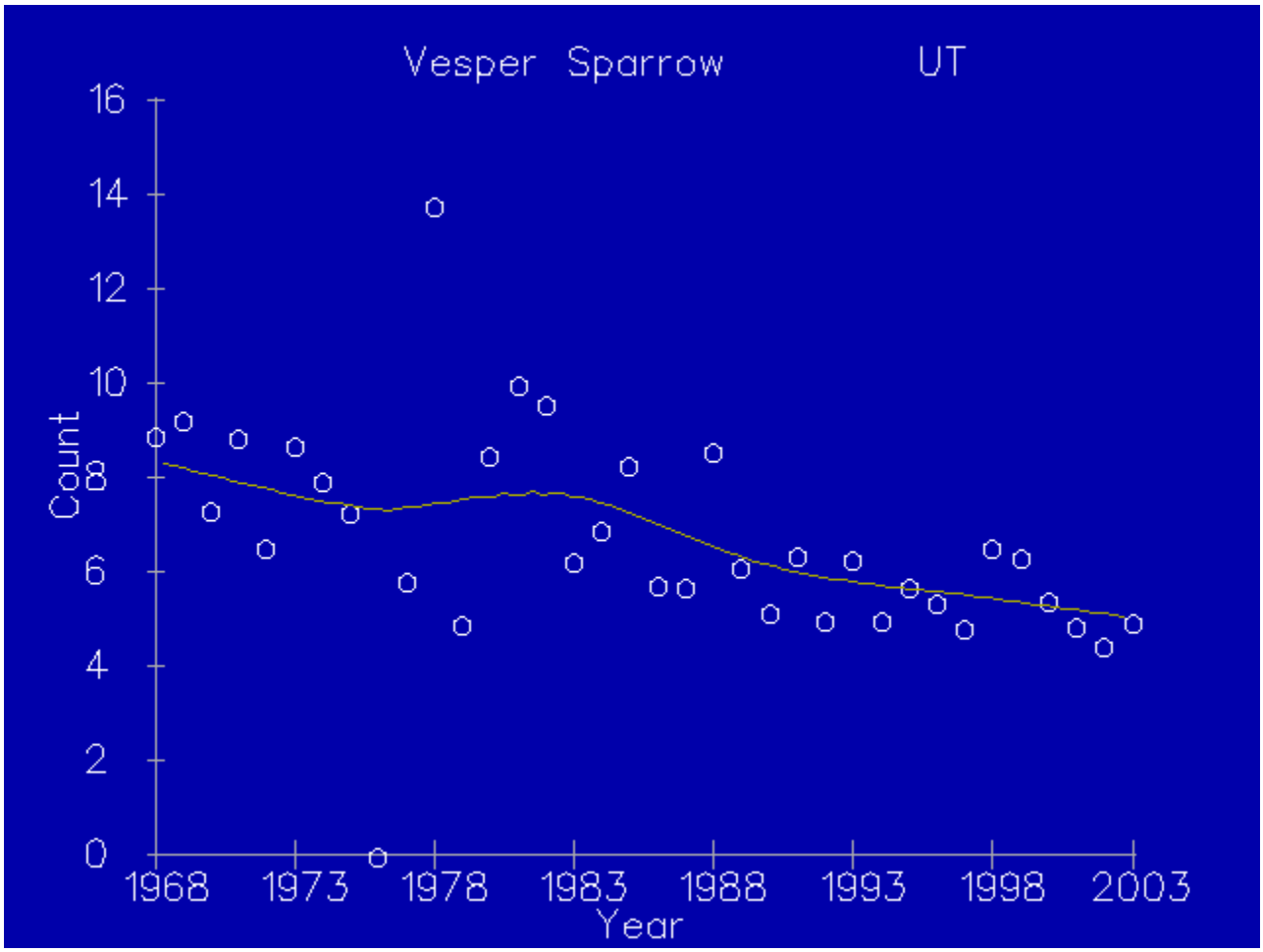
Annual diet is about half insects and spiders, and half grass and forb seeds (Bent 1968, Ehrlich et al. 1988). Ohmart and Smith (1971) observed drinking, but also recorded individuals 10-15 miles away from known surface water. Captives drank 19.7% of body weight per day, but could survive on dry seeds without water.

On the Fishlake National Forest suitable habitat occurs for the Vesper sparrow across all four Ranger Districts. The map below displays approximately 213,491 acres of potentially suitable habitat across the forest.



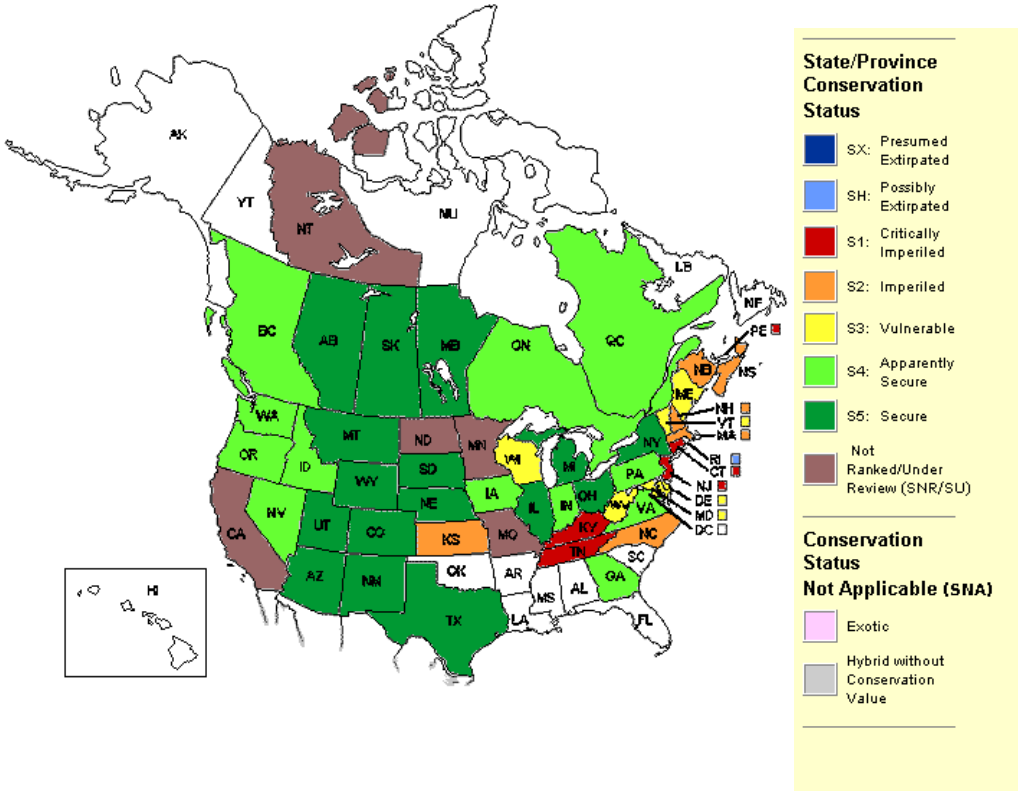
Trend

In addition to these data, the BBS database (www.mbr-pwrc.usgs.gov) display a slight upward trend of Vesper sparrows in Utah. These data represent a 35-year trend between 1968 and 2003. These data were collected throughout the entire state of Utah, including points on the Fishlake National Forest.



The map below displays the status ranking from the Nature Conservancy database (NatureServe Explorer). The Vesper sparrow in Utah has been ranked as "secure".

Vesper Sparrow *(Pooecetes gramineus)*



NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 18, 2005).

Surveys for avian MIS have been conducted on the Fishlake National Forest since the mid 1980's. Additional studies by "expert birders" were conducted in 1994, 1998, 2002, 2003, and 2004. These surveys have targeted cavity nesting, riparian, and sage nesting species. All other avian species were also recorded while conducting these surveys.

Data has been collected between 1994-2004. In 1994 this species was not detected along transect lines in the Burnt Flat area. In 1998 the number of presence/absence observations of this species along each transect line totaled 6. In 2002 the total number of observations along transect lines forest wide totaled 9. In 2004 this species was detected along 4 transect lines on the Richfield Ranger District, with 154 bird observations. As a result of these data collected over the past 10 years, this species has increased in total numbers of birds detected at collection points along the line, however, detections along transect lines were down in 2004. Data collected in 2004 was limited and not all transects monitored in 2002, and 2003 were revisited in 2004. Further data is being collected to fine-tune the status of the population on the Fishlake National Forest. However, considering all the data presented in this document, and my professional interpretation of these data, this population is stable, and viable across the forest.

Sage Thrasher (*Oreoscoptes montanus*)

The sage thrasher breeds from southern British Columbia, central Idaho, and southern Montana, south to southern California, southern Nevada, New Mexico, and western Oklahoma. It winters mainly in the southwestern United States and southern Texas (Udvardy 1994). The sage thrasher breeds primarily in semiarid sagebrush plains, but may extend into shrubby or open woodland growth on foothills (Baicich and Harrison 1997). In an Idaho study, 7 breeding territories in sagebrush averaged 0.96 ha (2.3 ac), ranging from 0.64-1.64 ha (1.6-4.0 ac) (Reynolds and Rich 1978).

Sage thrashers eat insects and other small, terrestrial arthropods. They also eat berries when the fruit is in season. The sage thrasher gleans prey, including great numbers of grasshoppers and Mormon crickets from the ground beneath and between shrubs (Knowlton and Harmston 1942). The sage thrasher apparently reduces nest parasitism by removing cowbird eggs from its nest (Rich and Rothstein 1985).

The sage thrasher breeds in late April and early May (Rich 1980). A clutch usually consists of 1-5 eggs (Reynolds 1981). Incubation ranges from 13-17 days (Reynolds 1981), averaging 15 days (Baicich and Harrison 1997). Killpack (1970) reported an 11-day nestling period in a Colorado study. Both parents tend their altricial young (Killpack 1970). Nests are built either on the ground below sagebrush or in the branches near the main axis of the plant (Reynolds 1981, Rich 1980). When built in a sagebrush, the nest is well concealed in a plant about 83.6 cm high, with the nest 23 cm above the ground (Rich 1980). It may be lined with rootlets and grass, and often with fur or feathers (Udvardy 1994). The sage thrasher requires some foliage for cover above the nest (Rich 1980).

The Fishlake National Forest has expanded the search for sage related species to include the sage thrasher. In 2003 there were 14 detections of sage thrasher on transect lines on the Fishlake National Forest. In 2004 there were 12 detections. These detections occurred on the Richfield Ranger District. Data collected in 2004 was limited and not all transects monitored in 2003 were revisited in 2004. Further data is being collected to fine-tune the status of the population on the Fishlake National Forest. Additional field surveys will continue to add to the knowledge concerning trend on the Fishlake National Forest.

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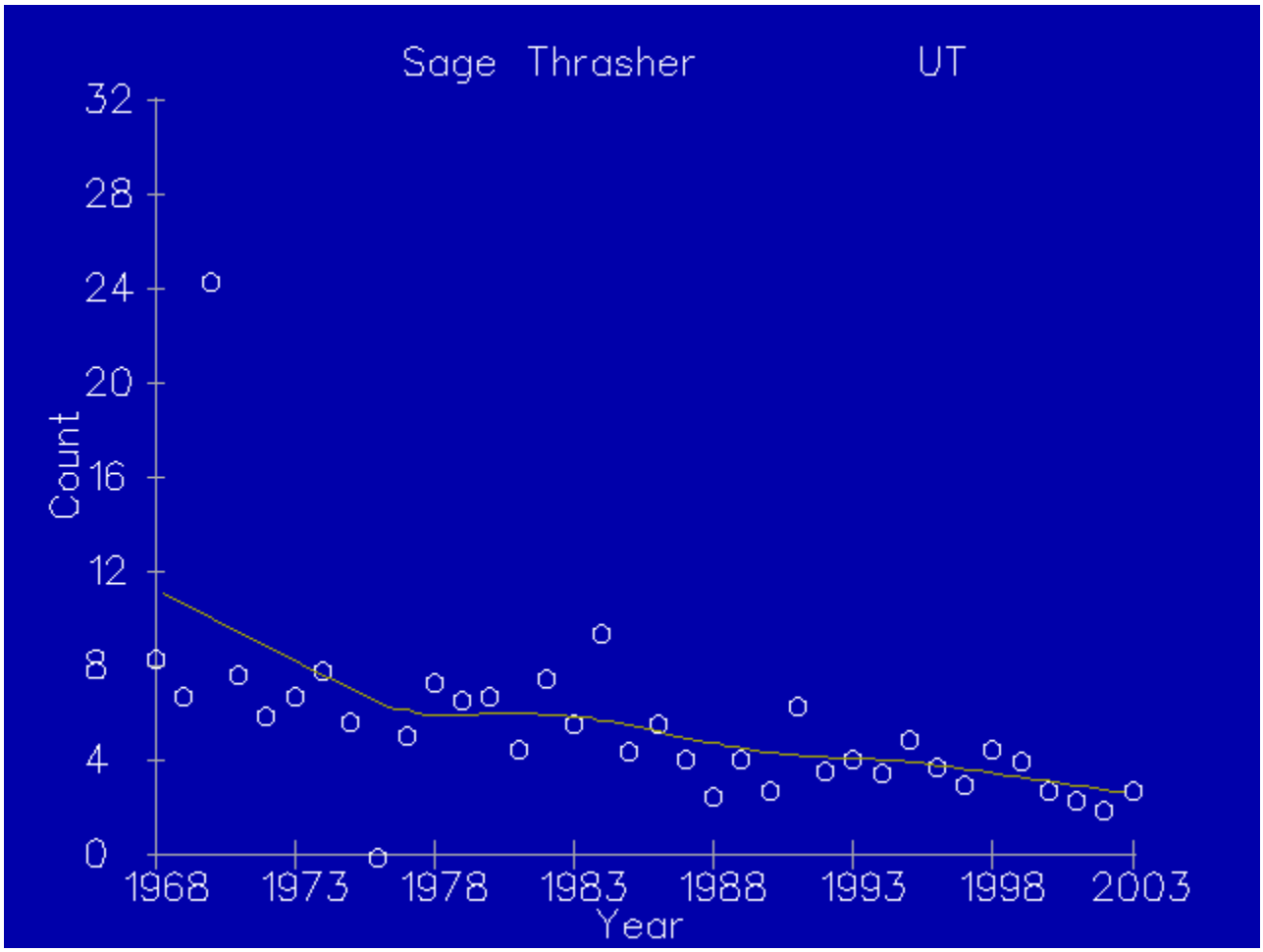
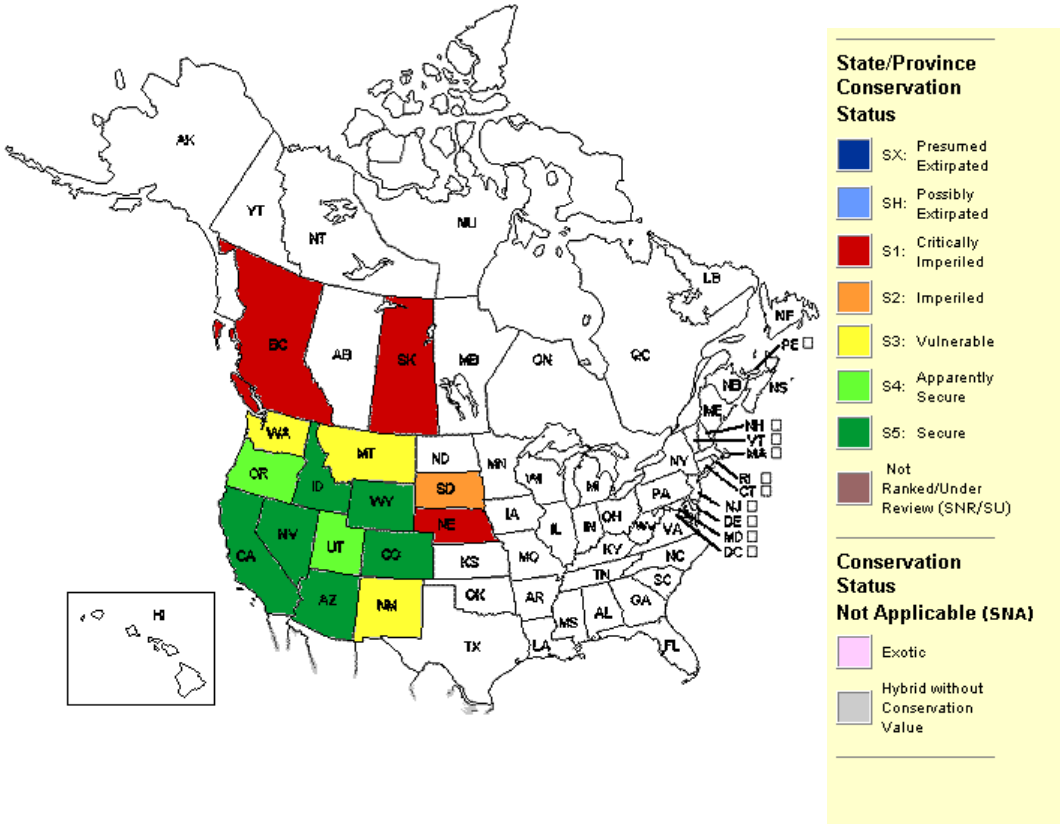
Trend

The BBS database (www.mbr-pwrc.usgs.gov) displays a downward trend of sage thrashers in Utah. These data represent a 35-year trend between 1968 and 2003. These data were collected throughout the entire state of Utah, including points on the Fishlake National Forest.



The map below displays the status ranking from the Nature Conservancy database (NatureServe Explorer). The sage thrasher in Utah has been ranked as "apparently secure".

Sage Thrasher *(Oreoscoptes montanus)*



NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 18, 2005).

CAVITY NESTERS

Hairy Woodpecker (*Picoides villosus*)

The hairy woodpecker is a fairly common, permanent resident of mixed-conifer and riparian deciduous habitats at elevations up to 9,500 feet (Bent 1939). The whole of temperate North America is occupied by one or another of its various subspecies (Beal 1911).

This species uses stands of large mature trees and snags. The hairy woodpecker uses relatively open or patchy stands of conifers with abundant snags (Shackelford and Conner 1997). In the Blue Mountains of Oregon and Washington, Thomas (1979) estimated that 446 snags per 100 ha (180 per 100 ac) of 25 cm (10 in) dbh minimum would support maximum populations. The hairy woodpecker exhibits defense of the nest (Dawson 1923), and intraspecific defense of feeding sites (Bendire 1895).

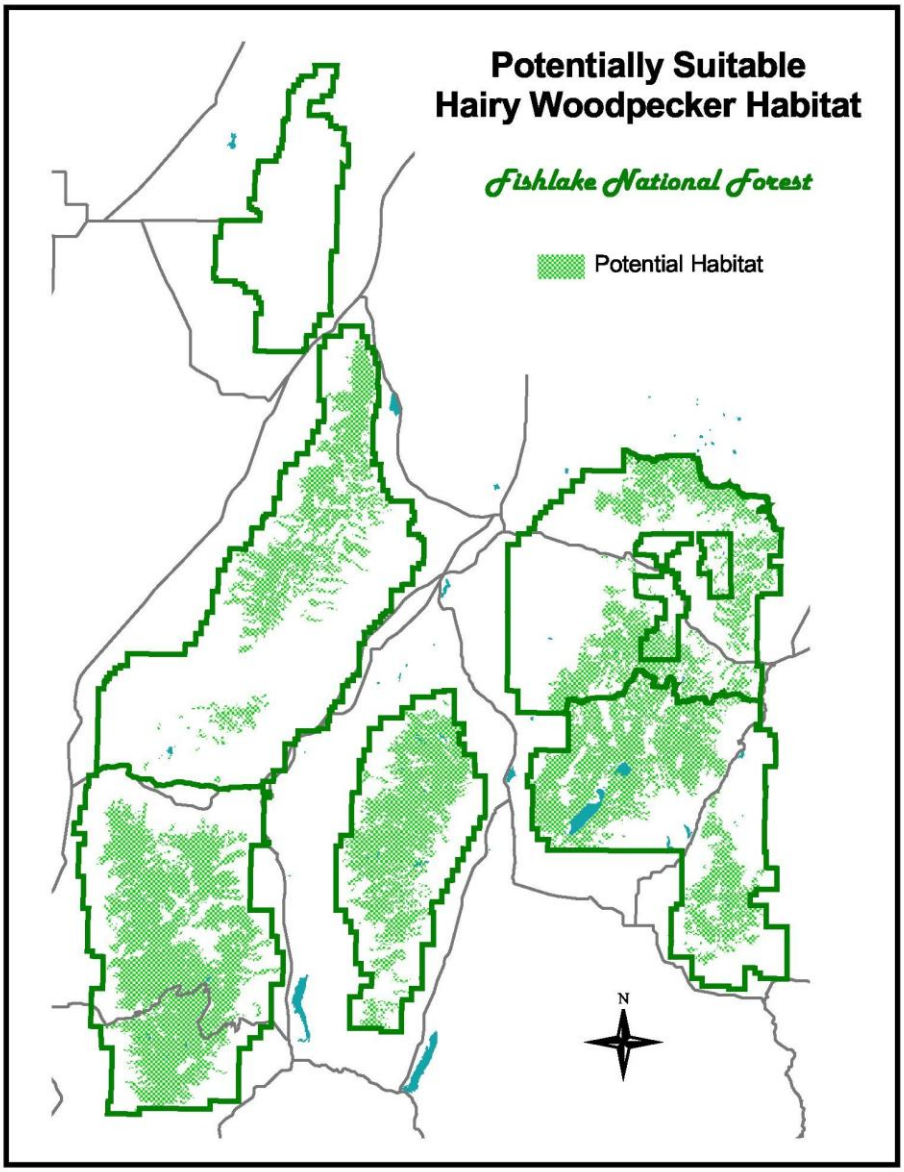
The hairy woodpecker excavates a nest cavity from 3-55 feet above ground in the soft interior of a snag or dead branch (Raphael and White 1984) of aspen, sycamore, pine, or other tree species (Baicich and Harrison 1997, Bendire 1895, Bent 1939). Nest tree diameter (dbh) averaged 32.3 cm (about 12.5 in) in Wyoming (Loose and Anderson 1995). The hairy woodpecker begins breeding from late March to late May (Baicich and Harrison 1997). The male drums on dry, resonant limbs to attract the female (Bendire 1895). Average clutch is 4 eggs, though the range is 3-5. They have one brood per year. Both the male and female dig a cavity, incubate the eggs about two weeks, and care for altricial young (Bendire 1895). Young leave the nest at 28-30 days (Baicich and Harrison 1997). A pair may remain together for several years (Willard 1918, Carpenter 1919).

Most of the hairy woodpecker's food comes from trees (Beal 1911). The food consists of larvae, beetles, spiders, flies, ants, and in the winter, seed, grains, nuts, and acorns (Bendire 1895).

Approximately 80% of this species' annual diet is animal matter, mainly wood borers, but including beetles, ants, caterpillars, spiders, millipedes, aphids, and other larvae (Beal 1911, Dawson 1923). They also eat mast (acorns, hazelnuts, beechnuts), berries, seeds and cambium (Beal 1911, Bent 1939). It often congregates to feed in insect-infested or burned areas (Koplin 1969). The hairy woodpecker frequents riparian habitats year-round (Anthony et al. 1996).

Interspecific competition for food between hairy woodpeckers and other birds, including those of their own species, is apparently reduced by feeding on different species of tree, or in different locations in same tree. Most foraging takes place on the trunk of the tree (Kisiel 1972, Kilham 1965). Hairy woodpeckers may be important in reducing populations of adult and larval bark beetles (Bendire 1895, Otvos 1979).

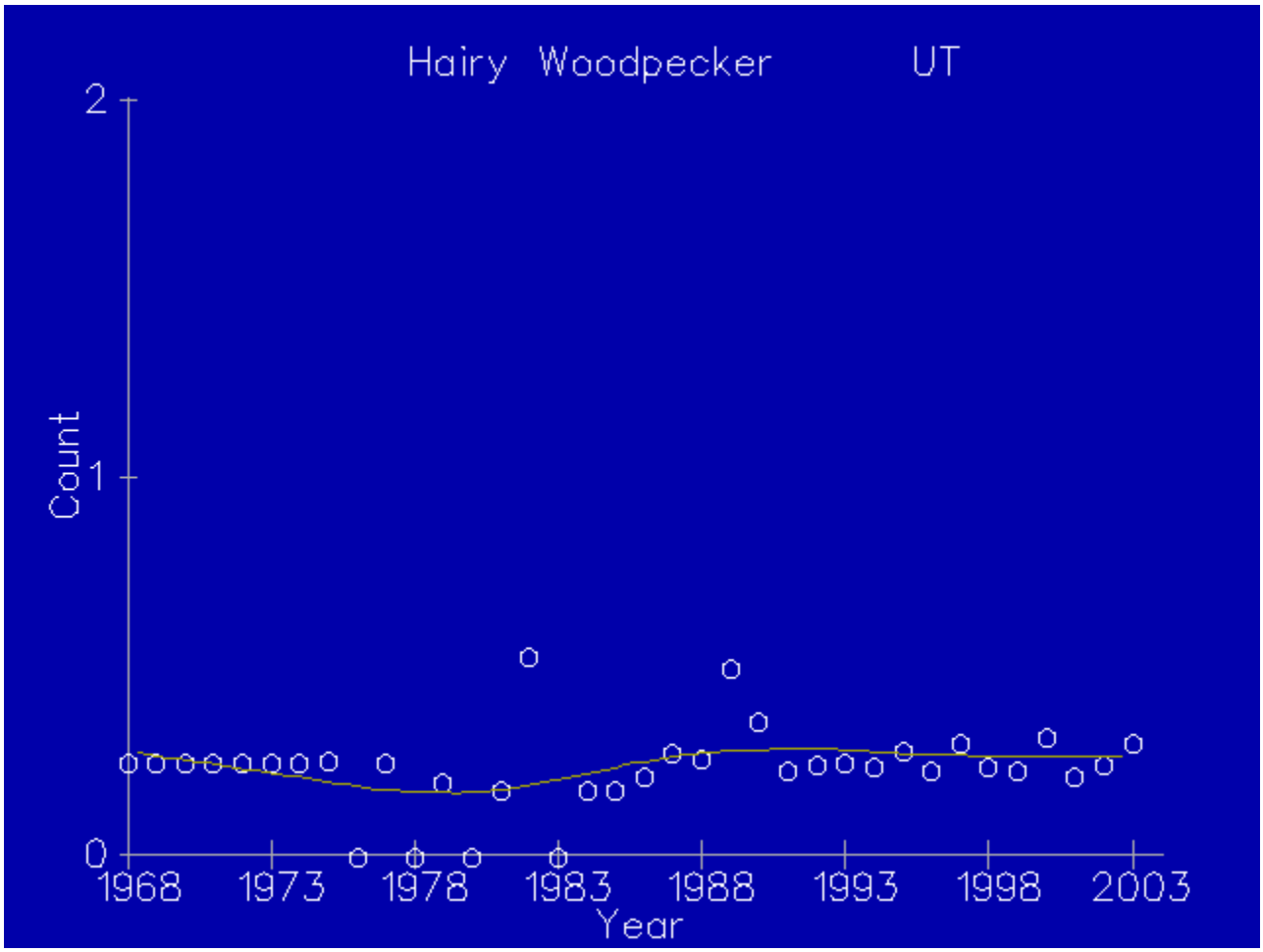
On the Fishlake National Forest, the hairy woodpecker occurs on all four Ranger Districts. This species is wide-ranging and easily detectable. Below is a map that displays potentially suitable habitat across the forest. This area totals approximately 423,432 acres.



Trend

On the Fishlake National Forest, woodpecker surveys have been conducted in forest cover types prior to vegetation treatments. Formal forest-wide inventories outside of proposed project areas have been conducted on the Richfield, Loa, and Beaver Ranger Districts. As a result of these inventories, the nests of several woodpecker species have been located on Monroe Mountain, including those of the hairy woodpecker. These monitoring efforts were in conjunction with a study conducted by a graduate student attending Brigham Young University.

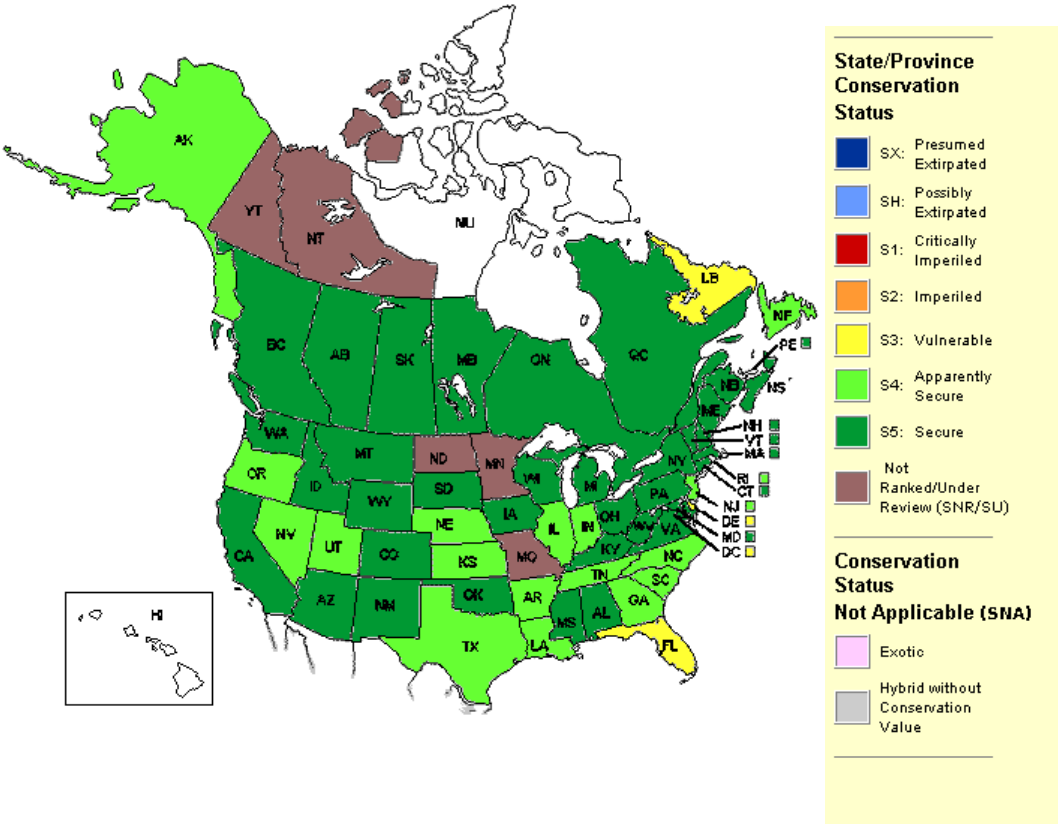
In addition to these data, the BBS database (www.mbr-pwrc.usgs.gov) displays a stable trend of hairy woodpeckers in Utah. These data represent a 35-year trend between 1968 and 2003. These data were collected throughout the entire state of Utah, including points on the Fishlake National Forest.



Surveys for avian MIS have been conducted on the Fishlake National Forest since the mid 1980's. Additional studies by "expert birders" were conducted in 1994, 1998, 2002, 2003, and 2004. These surveys have targeted cavity nesting species, riparian species, and sage nesting species. All other avian species were also recorded while conducting survey routes. In addition to these data, Utah State University has collected data across the forest in aspen/conifer habitat types. Cavity nesting bird species were the focus of these efforts. These data were collected between 2001 and 2002.

The map below displays the status ranking from the Nature Conservancy database (NatureServe Explorer). The Hairy Woodpecker in Utah has been ranked as "apparently secure".

Hairy Woodpecker *(Picoides villosus)*



NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 18, 2005).

Data collection specific to cavity nesters has been collected on the forest between 1994-2004. In 1994 there were no observations of Hairy woodpeckers along transect lines in the Burnt Flat area. In 1998, the number of presence/absence observations of this species along each transect line totaled 4. In 2001 a Utah State University cavity nesting study located 13 transects with birds present. In 2002 a total of 8 transects supported hairy woodpeckers across the forest. In 2004 a total of 7 transect lines supported Hairy woodpeckers. Although these numbers are similar to previous years detections, the 7 detections would likely have been high if all transect lines monitored in 2002, and 2003 were monitored in 2004. Further data is being collected to fine-tune the status of the population on the Fishlake National Forest. Considering all the data presented in this document, and my professional interpretation of these data, this population is stable, and viable across the forest.

Western Bluebird (*Sialia mexicana*)

The western bluebird prefers open woodlands and pastures where old trees provide nest sites (Udvardy 1994). The western bluebird is most abundant in open ponderosa pine forests of the Transition Zone, but may also be found in oak woodlands, pinyon-juniper, mixed-conifer, and subalpine forests (Scott et al. 1977, Gaines 1977). They breed from southern British Columbia south to Baja and east, throughout the mountains of the West to New Mexico and Texas. It winters over most of the breeding range, though populations in the north may move southward (Udvardy 1994).

The rusty breast, which both the male and female exhibit, can be used to identify the western bluebird. The male is deep blue on the head and upperparts, while the female is sooty gray above, and has bluish wings and tail. Both sexes have white underparts (Udvardy 1994).

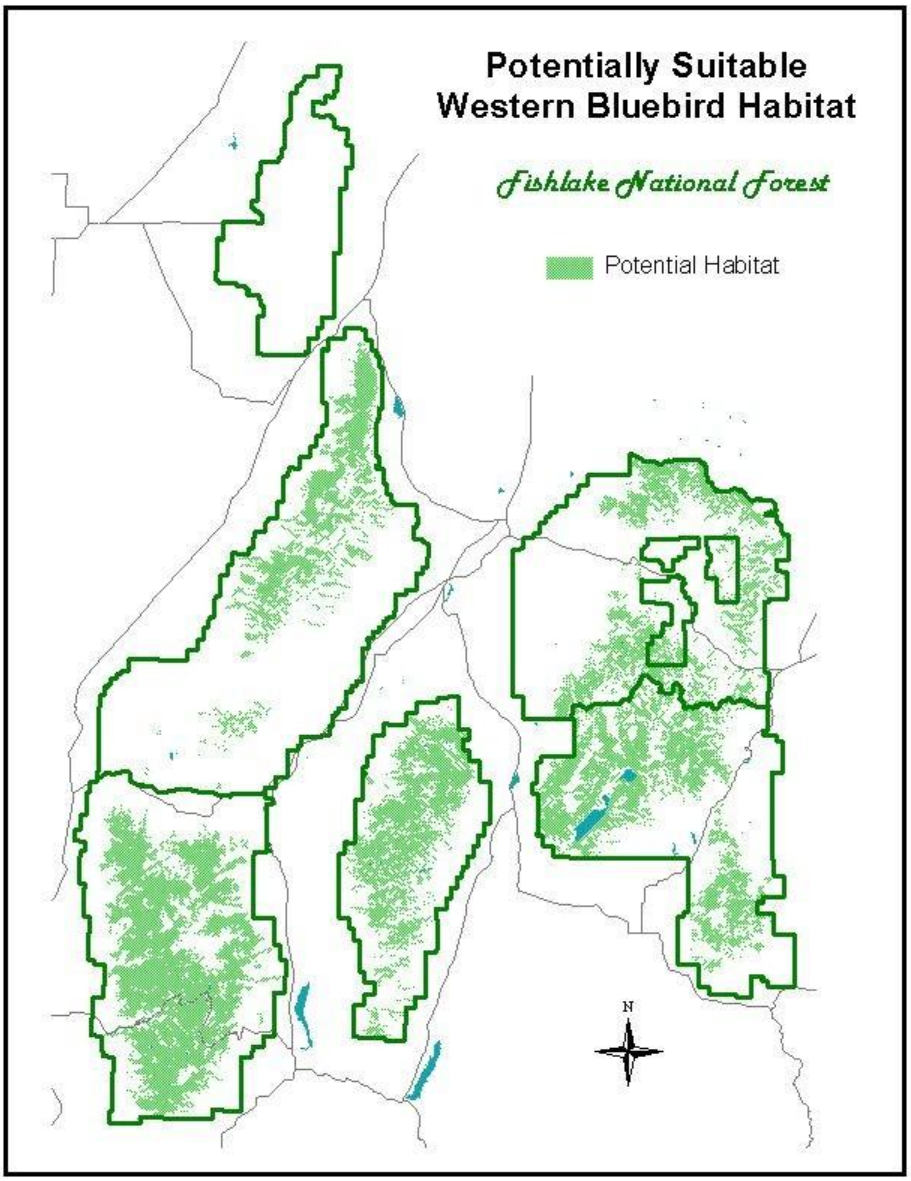
This species requires nest cavities, low perches to hunt from, and insect prey at lower understory and ground levels (Germaine and Germaine 2002). It can be found in open country (Jewett et al. 1953). Availability of snags frequently limits population density (Ross 1933, Ehrlich et al. 1988). In the Yosemite Sierra, small flocks move upslope in late summer and fall to feed on mistletoe berries (Gaines 1977). Breeding density in a ponderosa pine study area in Arizona was 15 pairs per 100 acres (Haldeman et al. 1973). Anderson (1970) reported a wintering population of 8-20 birds per 100 acres in an Oregon white oak forest.

The western bluebird usually nests in old woodpecker holes or natural cavities, in oak, sycamore, and pine tress. It has been known to also use other cavity or nest boxes (Scott et al. 1977). It occasionally uses nests of cliff swallows or other species (Bent 1949). Nests are usually 5-40 feet above ground (Baicich and Harrison 1997). The western bluebird breeds from early April into May (Harrison 1978). Clutch size was 4-5 in a northern Arizona study from 1998-2000 (Germaine and Germaine 2002). Incubation lasts 12 days. Both parents tend altricial young. This species is frequently double-brooded. The male may tend fledglings while the female re-nests (Harrison 1978).

The western bluebird primarily eats insects, including grasshoppers, moths, caterpillars, beetles, and ants; it also eats earthworms, snails, and other small arthropods (Gander 1960, Bent 1949). It flies out from a low perch to capture prey on the ground or herbage; it sometimes hovers before pouncing. The western bluebird also hawks aerial insects (Bent 1949). It perches on a low branch of a tree or shrub, fence, or tall herb, often adjacent to a medium to large opening in a wooded or brushy habitat (Gander 1960). In nonbreeding season, this species supplements its diet with berries of mistletoe, poison oak, elderberry, and other species (Bent 1949). The presence of mistletoe berries may govern local occurrence in winter (Grinnell and Miller 1944). The western bluebird has been observed to drink water frequently (Smyth and Coulombe 1971, Gander 1960).

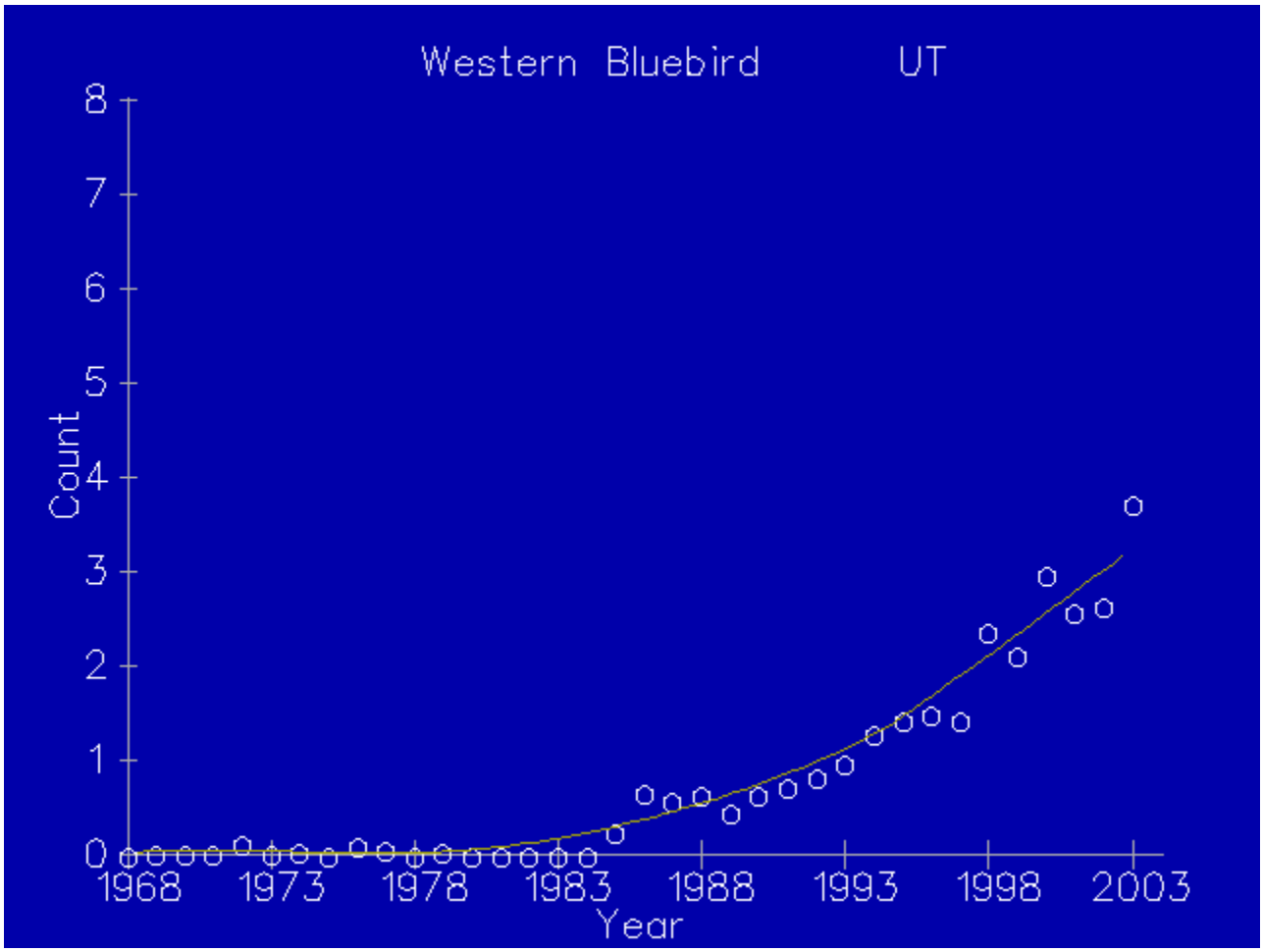
Competition from European starlings and house sparrows has reduced eastern bluebird populations in parts of the eastern U.S., and threatens western bluebirds. Western bluebirds also compete for nest sites with violet-green swallows, house wrens, and other native species; generally they are more capable of defending their nest against native species (Bent 1949). Competition with woodpeckers for nest sites may be strong (Miller and Bock 1972). Western bluebirds are also threatened by predation by snakes, small corvids, and ground squirrels (Germaine and Germaine 2002).

On the Fishlake National Forest, the western bluebird occurs on all four Ranger Districts. This species is wide-ranging and easily detectable. Below is a map that displays potentially suitable habitat across the forest. This area totals approximately 423,432 acres.



Trend

In addition to these data, the BBS database (www.mbr-pwrc.usgs.gov) displays an upward trend of western bluebirds in Utah. These data represent a 35-year trend between 1968 and 2003. These data were collected throughout the entire state of Utah, including points on the Fishlake National Forest.



Surveys for avian MIS have been conducted on the Fishlake National Forest since the mid 1980's. Additional studies by "expert birders" were conducted in 1994, 1998, 2002, 2003, and 2004. These surveys have targeted cavity-nesting species, riparian species, and sage-nesting species. All other avian species were recorded while conducting survey routes. In addition to these data, collection efforts by Utah State University have collected data across the forest in aspen/conifer habitat types. Cavity nesting bird species were the focus of these efforts. These data were collected between 2001 and 2002.

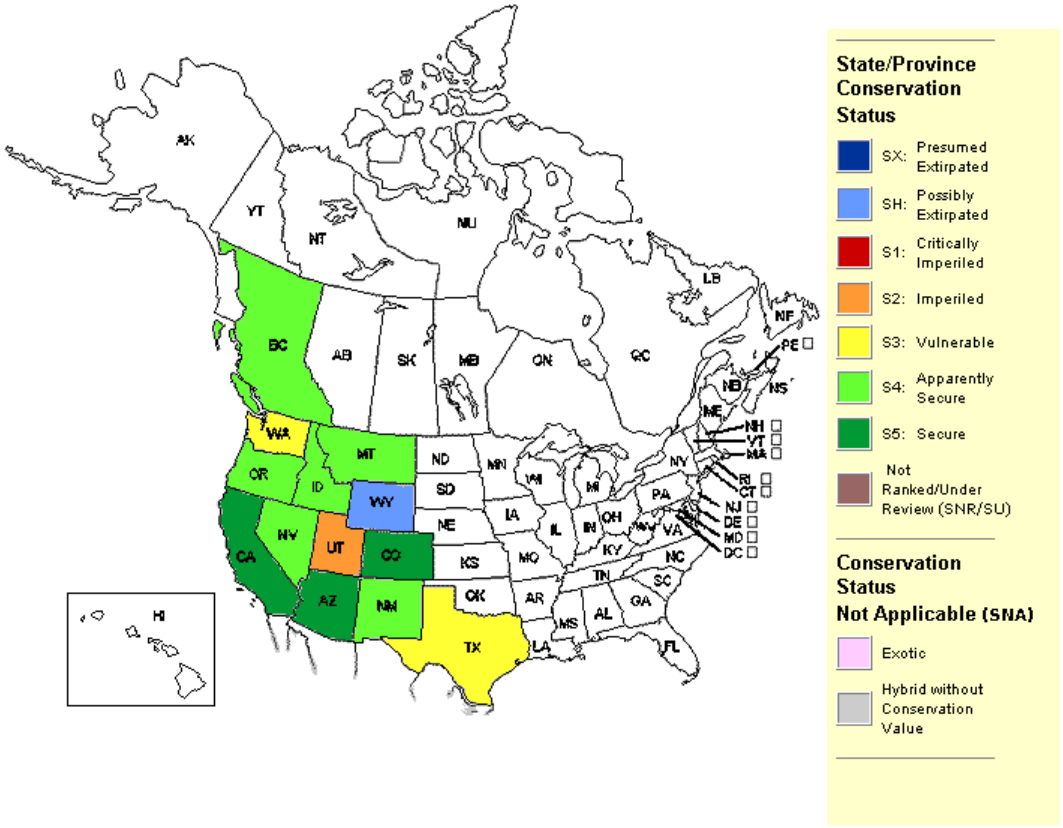
In 1994 and 1998, surveys were conducted in the Burnt Flat area, and other areas of the forest. No birds were encountered in the Burnt Flat area. However, in 2001 this species was detected by Utah State University along 3 transect lines while conducting specific cavity nesting surveys. In 2002 the presence of bluebirds were detected along 1 transect line. The number of detections increased to 14 in 2003. In 2004 only 7 transects were

visited across the entire forest due to limited resources. As a result of these limited efforts there were no detections of Western bluebirds.

As a result of the data presented in this document, few locations have been monitored and additional monitoring sites should be in 2005. Data collected by the BBS indicate a significant population increase staring in about 1985. Data presented by the Nature Conservancy however demonstrate an "imperiled" population in Utah. Considering all of the data presented in this document, as well as my professional interpretation of these data, this population is stable and viable across the forest; however, additional monitoring efforts are needed to continue to evaluate the trend and viability of this species.

The map below displays the status ranking from the Nature Conservancy database (NatureServe Explorer). The Western bluebird in Utah has been ranked as "imperiled".

Western Bluebird (*Sialia mexicana*)



NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 18, 2005).

Mountain Bluebird (*Sialia currucoides*)

The mountain bluebird is differentiated from the western bluebird by the lack of red on the breast. Males are pure sky blue above and lighter below. The females are similar, though duller and grayer (Udvardy 1994). The bluebird nests in nearly all timber types of the Rocky Mountain region, and is usually found between 7,000-11,000 feet in open forests or edges (Scott et al. 1977, Bent 1949).

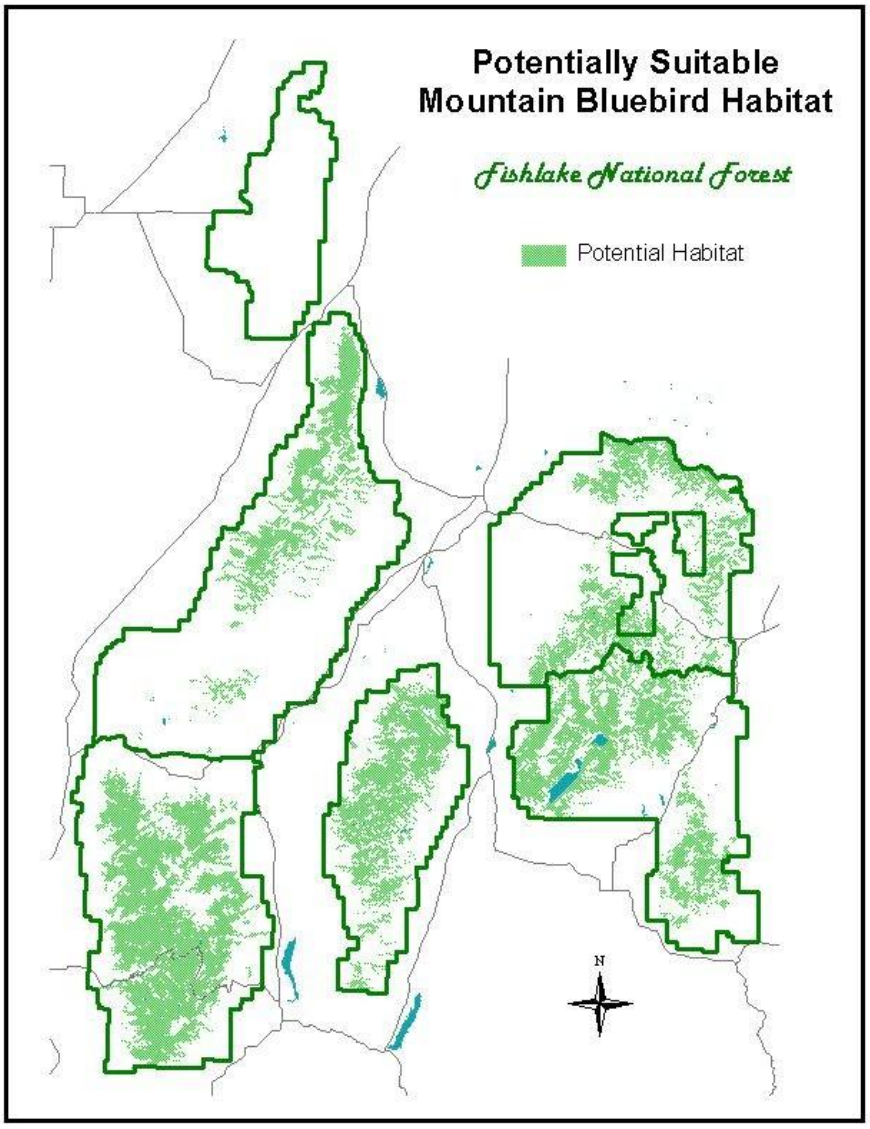
This species prefers open terrain (Jewett et al. 1953) with an occasional tree, rock, fence post, power line, or similar perches (Power 1966). It requires suitable cavities for roosting and nesting, usually in a snag or dead portion of tree. In winter, this species occurs in virtually any open or sparsely wooded habitat (Bent 1949). The mountain bluebird usually moves southward for the winter (Jewett et al. 1953). Most males returned to Washington territories in early April, and the females about two weeks later (Power 1966). Estimates of breeding density include 30 birds per 100 acres in Wyoming aspen forest (Salt 1957) and 15.2 pairs per 100 acres in a Sierra Nevada conifer forest (Bock and Lynch 1970). At Mt. Rainier, Washington, Jewett et al. (1953) reported that a nesting female foraged over about 6.5 acres.

The mountain bluebird builds a nest in a natural cavity or woodpecker hole in a snag or dead portion of a tree (Gaines 1977). Less frequently it nests in a crevice or cavity in a rock (Gaines 1977, Harrison 1978), building or other human structure; it also uses nest boxes (Jewett et al. 1953, Power 1966) or the nest of a cliff swallow or other species (Baicich and Harrison 1997). In Arizona, nests ranged from 12-35 feet above ground in ponderosa pine snags. These nests were in abandoned woodpecker holes and natural cavities (Scott et al. 1977). The mountain bluebird is monogamous; it lays eggs mid-May to mid-June in Washington. It may be double brood, with each brood clutch containing 5-6 eggs (Power 1966). Incubation is 13-14 days (Power 1966, Harrison 1978), and both sexes care for altricial young (Jewett et al. 1953). Fledging age is 22-23 days (Power 1966).

From a low, exposed perch, the mountain bluebird hovers and stoops on insects on foliage or ground, and hawks flying insects (Power 1966). Beetles and weevils make up a large part of the diet, with grasshoppers, crickets, ants, caterpillars, and bugs being eaten as well (Martin et al. 1961). The bluebird also eats berries and other small fruits (Scott et al. 1977). No bluebird was ever seen drinking fresh water; this need was probably satisfied by animal juices and green plant food (Power 1966).

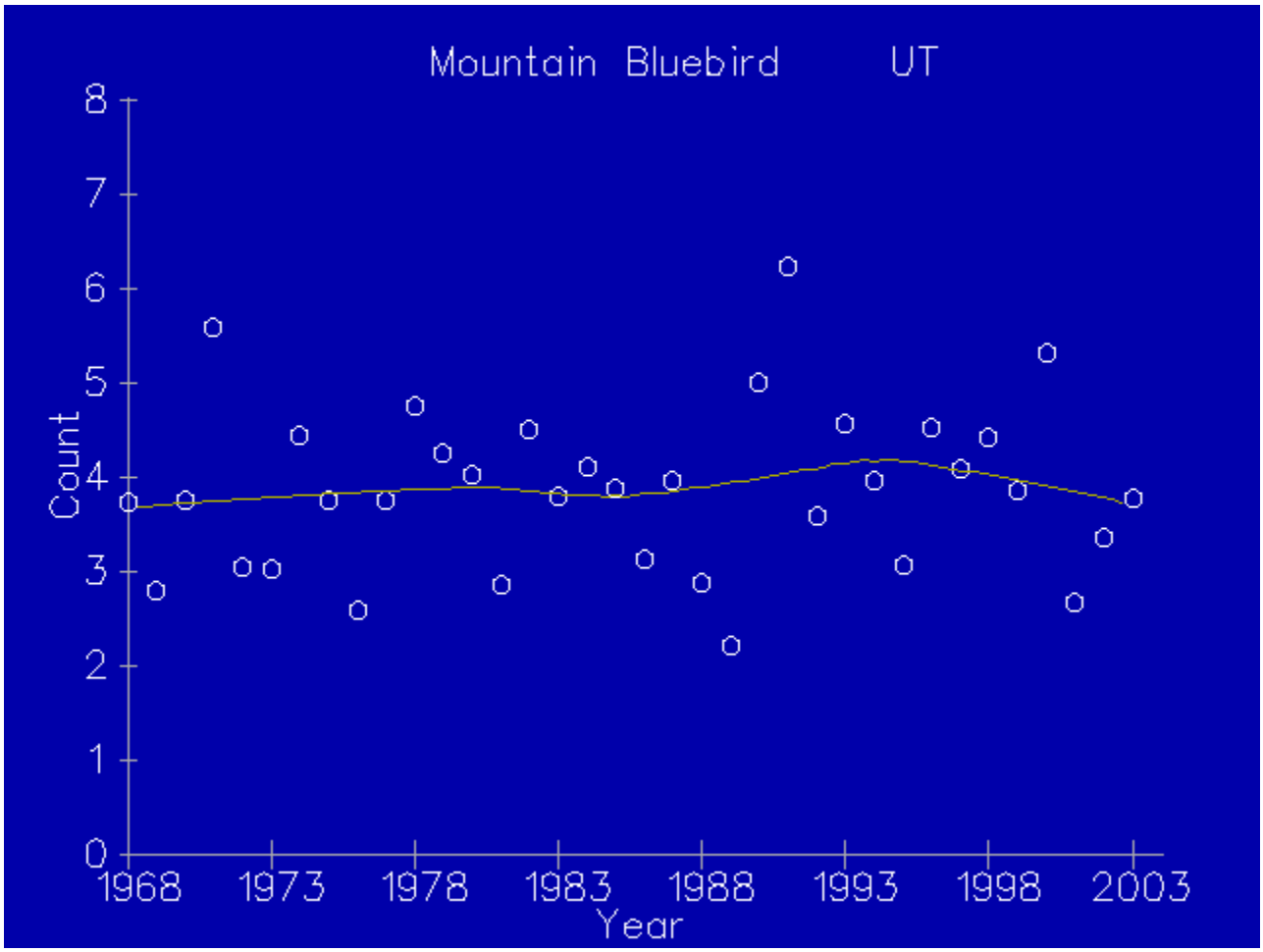
Tree swallows; house wrens, northern flickers, and rodents compete for nest boxes. Raptors and corvids have been observed to prey upon these bluebirds (Power 1966, Munro 1940).

Potentially suitable mountain bluebird habitat has been mapped across the Fishlake National Forest, and is displayed below. This habitat consists of approximately 423,432 acres of potentially suitable habitat.



Trend

In addition to these data, the BBS database (www.mbr-pwrc.usgs.gov) display an upward stable trend of the mountain bluebird in Utah. These data represent a 35-year trend between 1968 and 2003. These data were collected throughout the entire state of Utah, including points on the Fishlake National Forest.



Surveys for avian MIS have been conducted on the Fishlake National Forest since the mid 1980's. Additional studies by "expert birders" were conducted in 1994, 1998, 002, 2003, and 2004. These surveys have targeted cavity nesting species, riparian species, and sage nesting species. All other avian species were also recorded while conducting survey routes. In addition to these data collection efforts, Utah State University has collected data across the forest in aspen/conifer habitat types. Cavity nesting bird species were the focus of these efforts. These data were collected between 2001 and 2002.

Data has been collected between 1994-2004. In 1994 the number of presence/absence observations of this species along each transect line totaled 24 in the Burnt Flat area. In 1998 a total of 13 transects recorded this species being present, and in 2002 14 transects recorded this species being present. In 2004 39 observations along 4 transects were

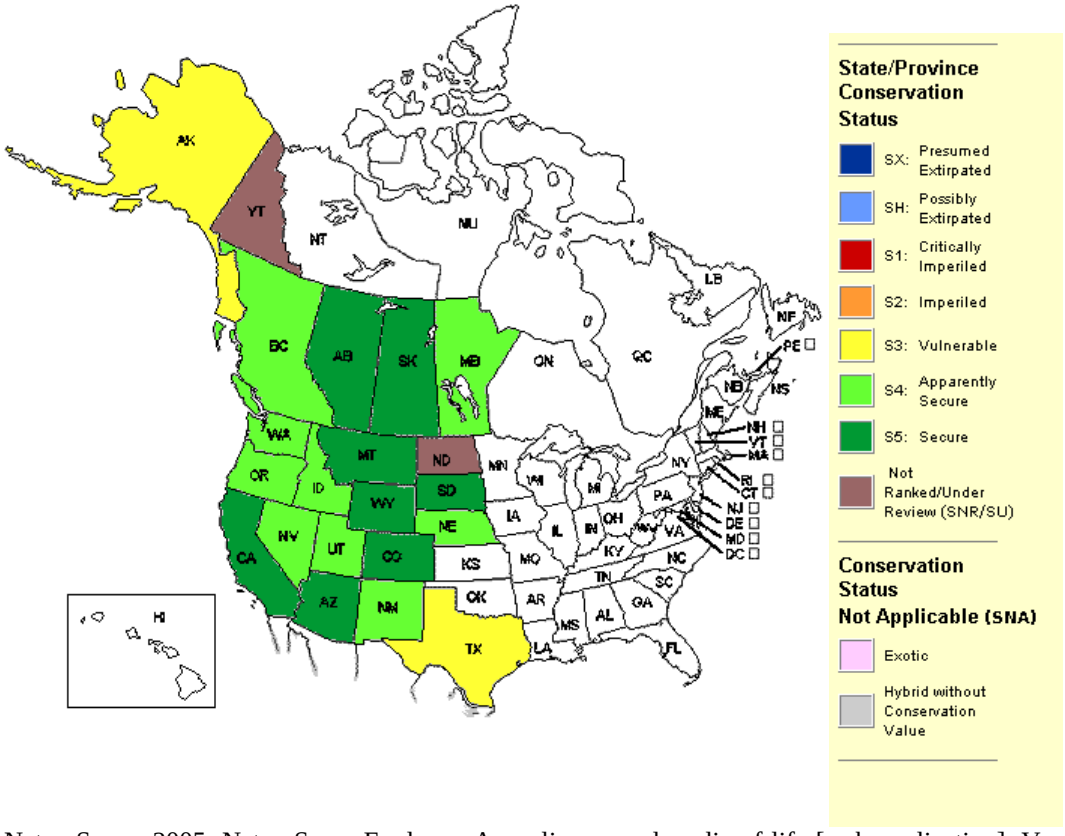
observed. Data collected in 2004 was limited and not all transects monitored in 2002 and 2003 were revisited in 2004. Further data is being collected to fine-tune the status of the population on the Fishlake National Forest. Additional field surveys will continue to add to the knowledge concerning trend on the Fishlake National Forest.

Additional surveys were conducted in 2001 by Utah State University during a cavity species survey. This species was detected at 13 transects across the forest.

Based on these data and that collected through BBS, and the Nature Conservancy routes, the trend for this species is stable on the forest.

The map below displays the status ranking from the Nature Conservancy database (NatureServe Explorer). The mountain bluebird in Utah has been ranked as "apparently secure".

Mountain Bluebird *(Sialia curricoides)*



NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 18, 2005).

RIPARIAN GUILD

Lincoln's Sparrow (*Melospiza lincolnii*)

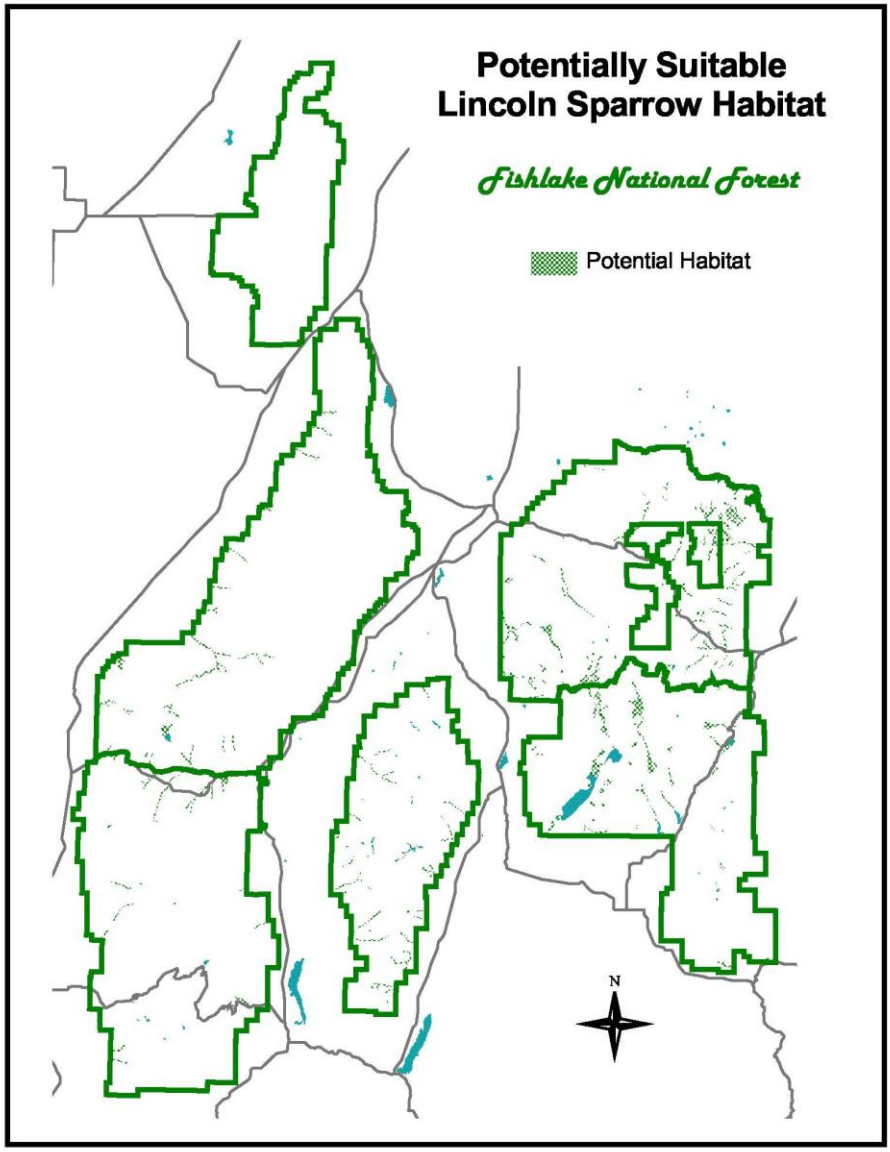
The Lincoln's Sparrow breeds from Alaska, northern Quebec, Labrador, and Newfoundland south to California, New Mexico, and northern New England. It can be found in brushy bogs and willow and alder thickets. It winters across the southern tier of the United States in woodland thickets and brushy pastures (Udvardy 1994, Bond 1937).

The Lincoln's sparrow breeds very locally in wet montane meadows of corn lily, sedges, and low willows (Garrett and Dunn 1981). The nest is often on the edge of wet areas, or in wet places on drier raised mounds (Harrison 1978). The nest is a grass tussock or sunk in shallow depression on sphagnum or moss (Bent 1968, Bond 1937). It is a cup made of grass or sedge and lined with fine grass and hair.

Breeding season begins late in May in the south areas and mid-June in the north (Harrison 1978). Typically 4-5 eggs are laid, though 3-6 has been observed. Incubation is carried out by the female and lasts between 12 and 14 days. The altricial young are cared for by both parents, and fledge in 9-12 days (Bent 1968).

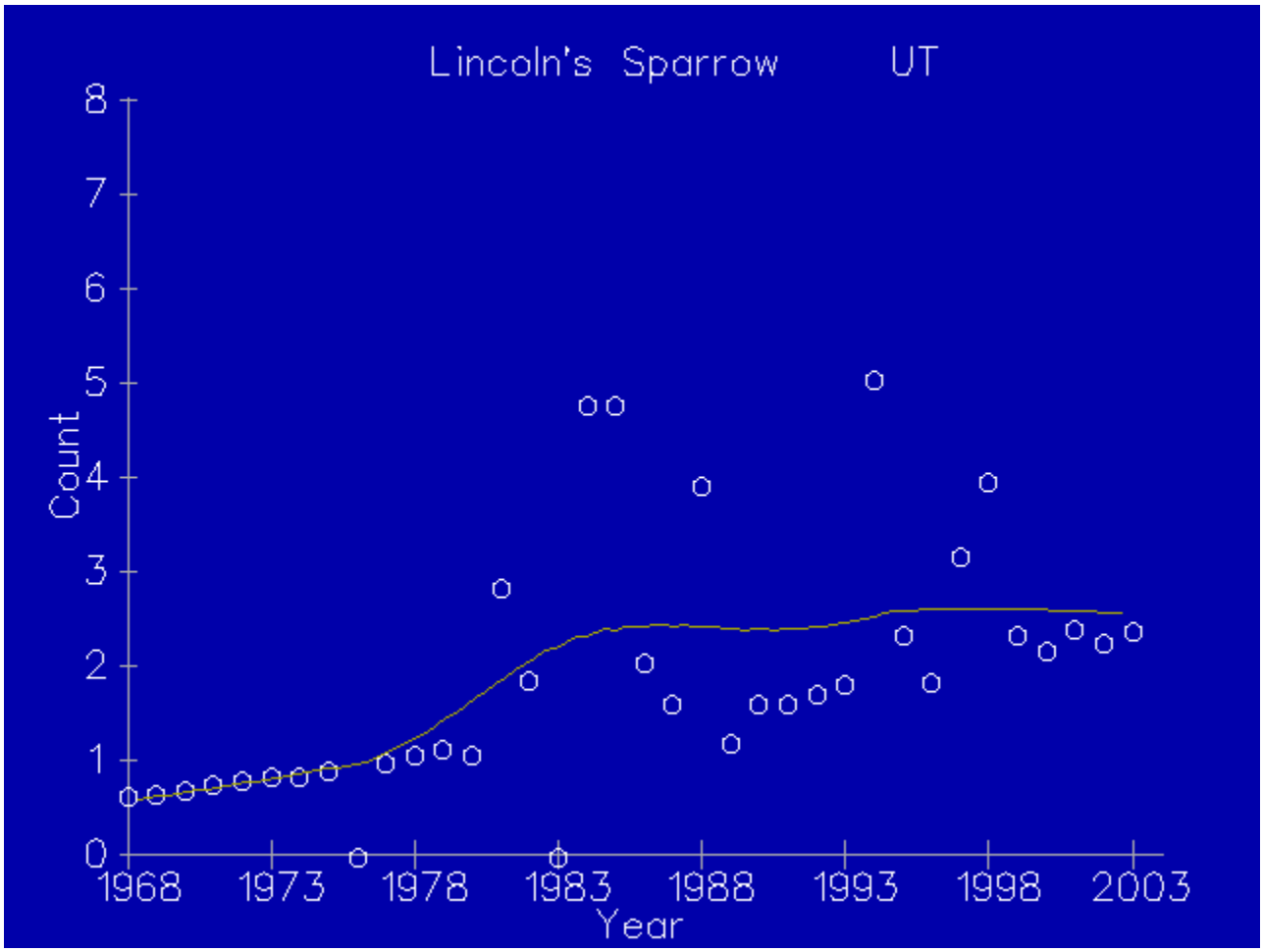
The diet consists mainly of insects, but spiders and millipedes will also be eaten. Grass and forb seed are also consumed (Bent 1968).

On the Fishlake National Forest, the Lincoln's sparrow occurs on all four Ranger Districts. This species is wide-ranging and easily detectable. Below is a map that displays potentially suitable habitat across the forest. This area totals approximately 423,432 acres.



Trend

In addition to these data, the BBS database (www.mbr-pwrc.usgs.gov) display an upward trend of Lincoln's sparrows in Utah. These data represent a 35-year trend between 1968 and 2003. These data were collected throughout the entire state of Utah, including points on the Fishlake National Forest.



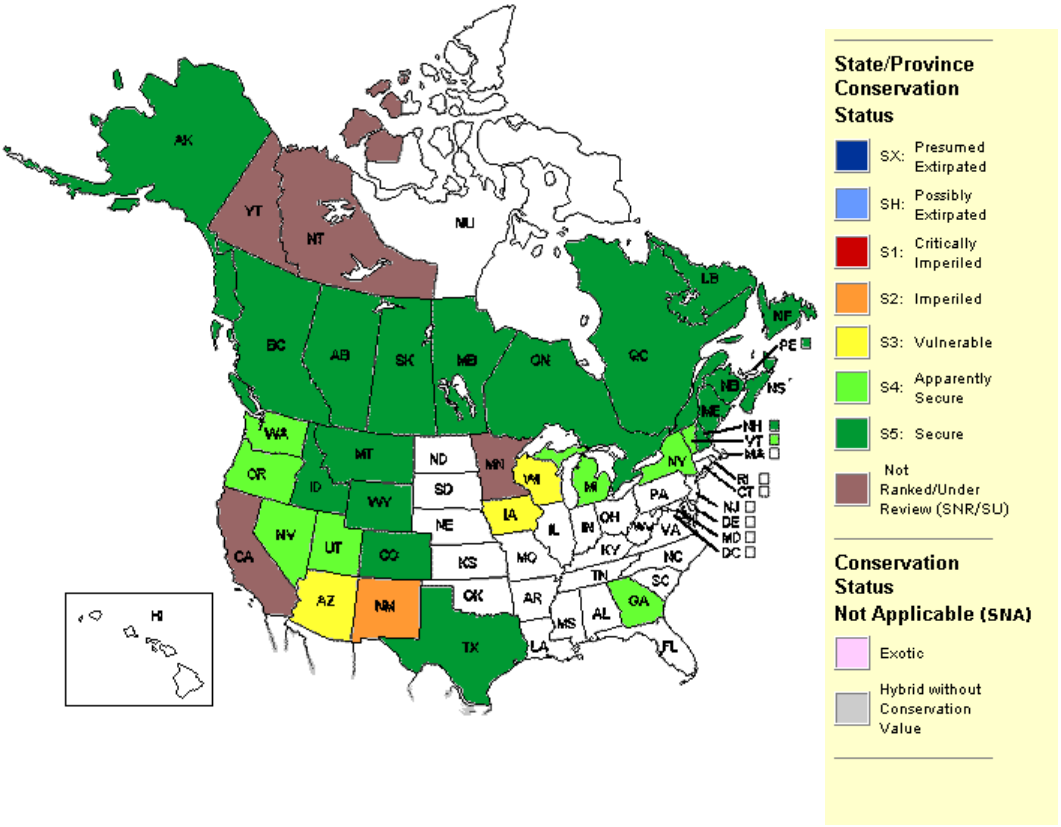
Surveys for avian MIS have been conducted on the Fishlake National Forest since the mid 1980's. Additional studies by "expert birders" were conducted in 1994, 1998, 2002, and 2003. These surveys targeted cavity nesting species, riparian species, and sage nesting species. All other avian species were also recorded while conducting survey routes.

Data has been collected between 1998-2004. No birds were detected in the Burnt Flat area transects during 1994, 3 transects in 1998 and 8 transects in 2002. In 2004 14 observations were detected. As a result of these data collected over the past 10 years, this species trend is stable. Data collected in 2004 was limited and not all transects monitored in 2002 and 2003 were revisited in 2004. Further data is being collected to fine-tune the status of the population on the Fishlake National Forest. Additional field surveys will

continue to add to the knowledge concerning trend on the Fishlake National Forest. Data presented by the Nature Conservancy indicates this species is "apparently secure". Based on the BBS data, which demonstrates a strong increase in trend beginning as far back as 1978, as well as my professional interpretation of these data, the population across the forest is stable and viable.

The map below displays the status ranking from the Nature Conservancy database (NatureServe Explorer). The Lincoln's sparrow in Utah has been ranked as "apparently secure".

Lincoln's Sparrow (*Melospiza lincolnii*)



NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 18, 2005).

Song Sparrow (*Melospiza melodia*)

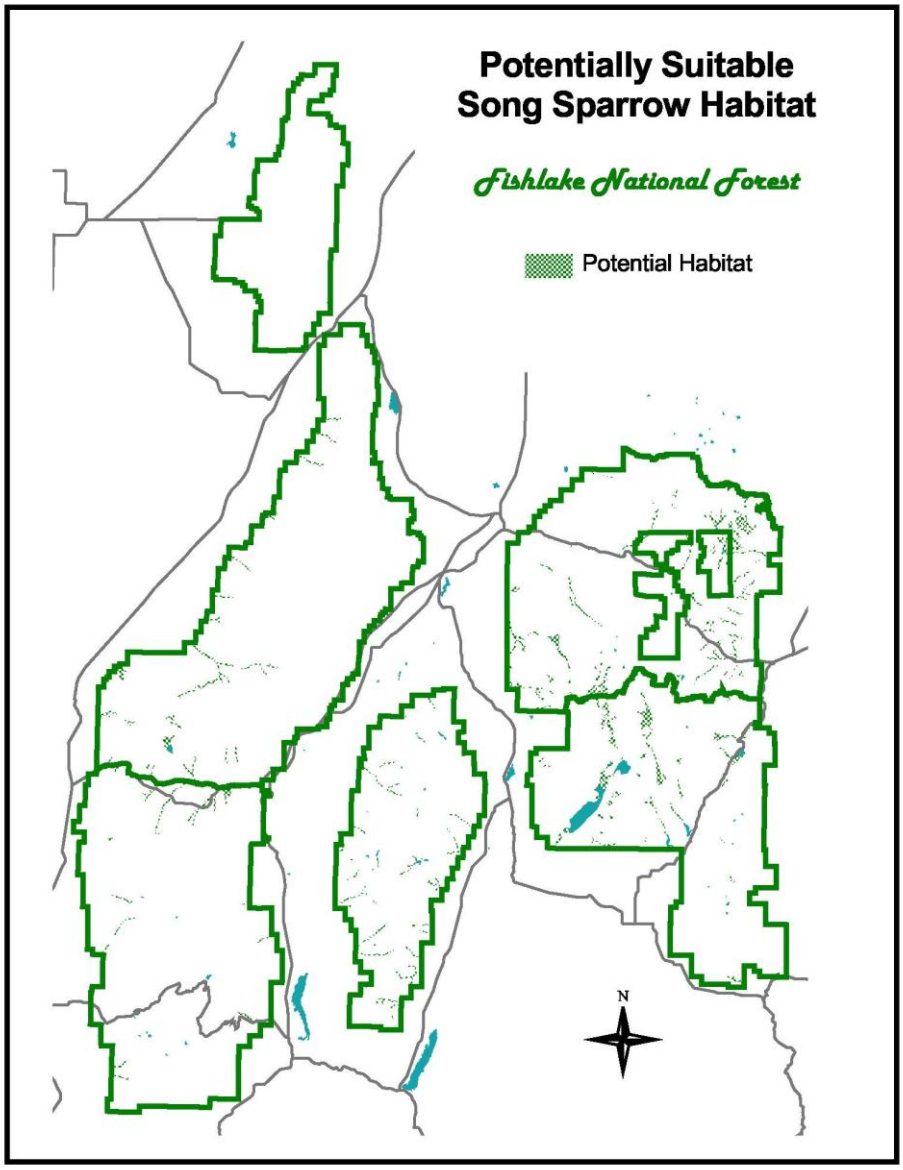
The song sparrow is one of the most widespread, diverse, and geographically variable of North American birds. There are 34 recognized subspecies, covering a breeding range from the Aleutians and mainland Alaska east to Newfoundland and south to California North Dakota, and the Carolinas. They winter from southern Canada throughout the United States to the Gulf Coast and Mexico (Udvardy 1994). The song sparrow is a common permanent resident in riparian thickets and a variety of other wet, brushy situations throughout California (Garrett and Dunn 1981).

In Kansas, Fitch (1958) measured a winter home range of 8.9 acres, and estimated 29 home ranges as averaging about 6.8 acres. Breeding territory in salt marshes of San Francisco Bay in the 1950's averaged 9.7 breeding pairs per acre (Johnston 1956b). Adults rarely shifted location from year to year (Johnston 1956a). Along Minnesota lakeshores, territories varied from 0.22-0.49 per acre (McCarty 1975). Habitat characteristics may explain spatial variation in abundance. Song sparrows do not appear to respond to vegetation height and density of plant stems, but do respond positively to shrub cover (Nur and Spautz 2002). Territories may also be delineated by food resources (Lindsey 2003)

The song sparrow builds its nest on the ground (Bent 1968); however, it also nests in shrub, thicket, emergent vegetation, and small trees, usually within 4 feet of the ground (Harrison 1978). The ground nest is hidden under low, dense vegetation, usually near water, in emergent vegetation, or in other moist sites. The breeding season occurs from March to June, with a peak at the end of March (Johnston 1956a). Clutch size is 3 or 5, rarely 2 or 6. They will often double-brood, or sometimes brood three times a year to replace lost clutches. Incubation lasts 12-14 days. The altricial young are tended by both parents, leave the nest after about ten days, and become independent about 25 days later (Harrison 1978). Predation is the major cause of nest failure in San Francisco Bay (Nur and Spautz 2002).

Seeds are the most important foods in the annual diet of song sparrows, but insects, beetles, and other small invertebrates make up part of their diet (Martin et al. 1961). Numerous insects may be available for forage, especially in the summer (Lindsey 2003). The song sparrow usually forages on the ground or in low vegetation, under cover of dense thickets or wetland vegetation. It gleans from the ground or low plants and often scratches in litter. Water is also required in a song sparrow territory (Marshall 1948). The song sparrow is commonly host to nest parasitism by brown-headed cowbirds (Hauber 2000).

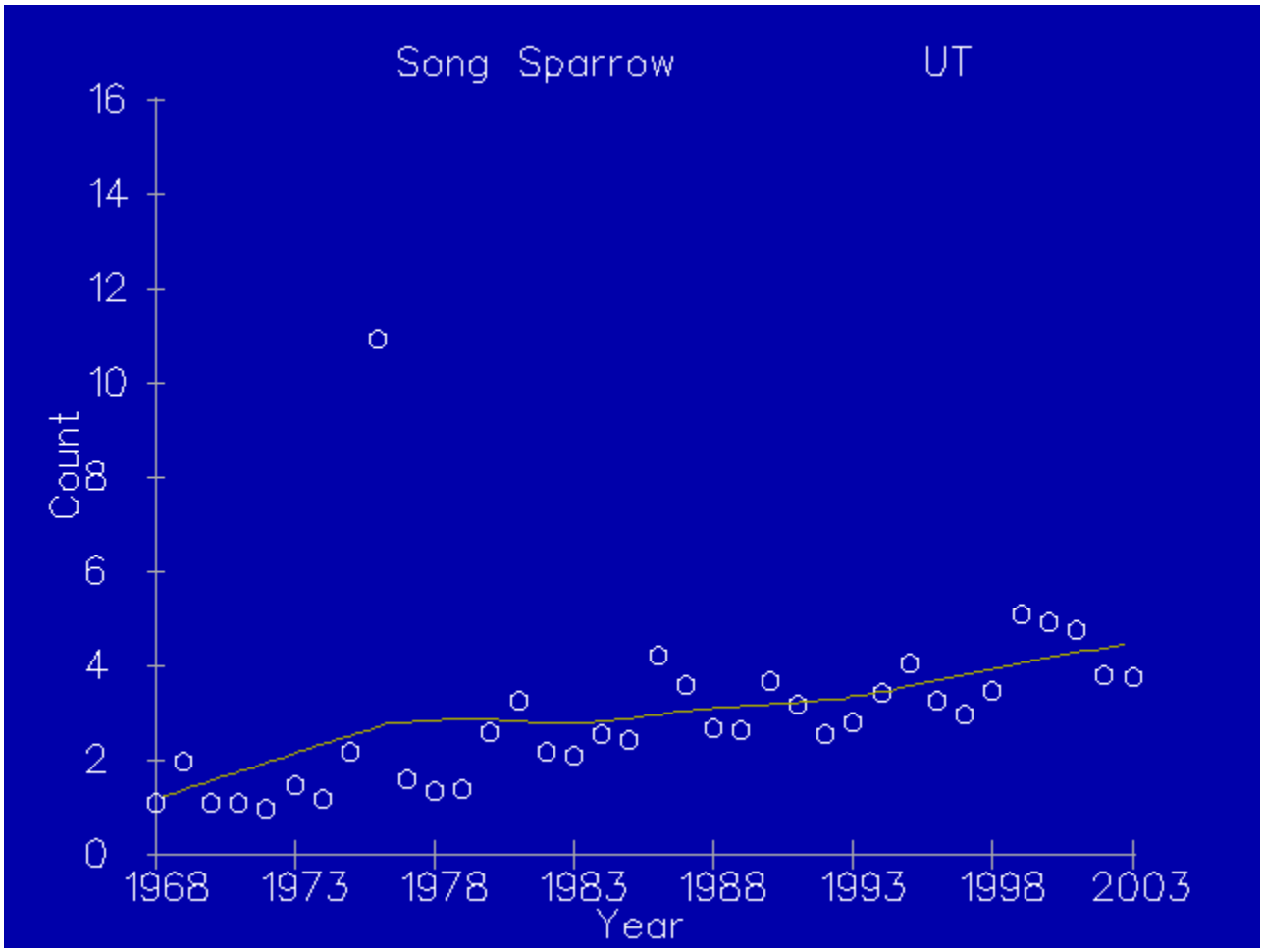
On the Fishlake National Forest the Song sparrow occurs on all four Ranger Districts. This species is wide-ranging and easily detectable. Below is a map that displays potentially suitable habitat across the forest. This area totals approximately 423,432 acres.



Surveys for avian MIS have been conducted on the Fishlake National Forest since the mid 1980's. Additional studies by "expert birders" have been conducted in 1994, 1998, 2002, 2003 and 2004. These surveys have targeted cavity nesting species, riparian species, and sage nesting species. All other avian species were also recorded while conducting survey routes.

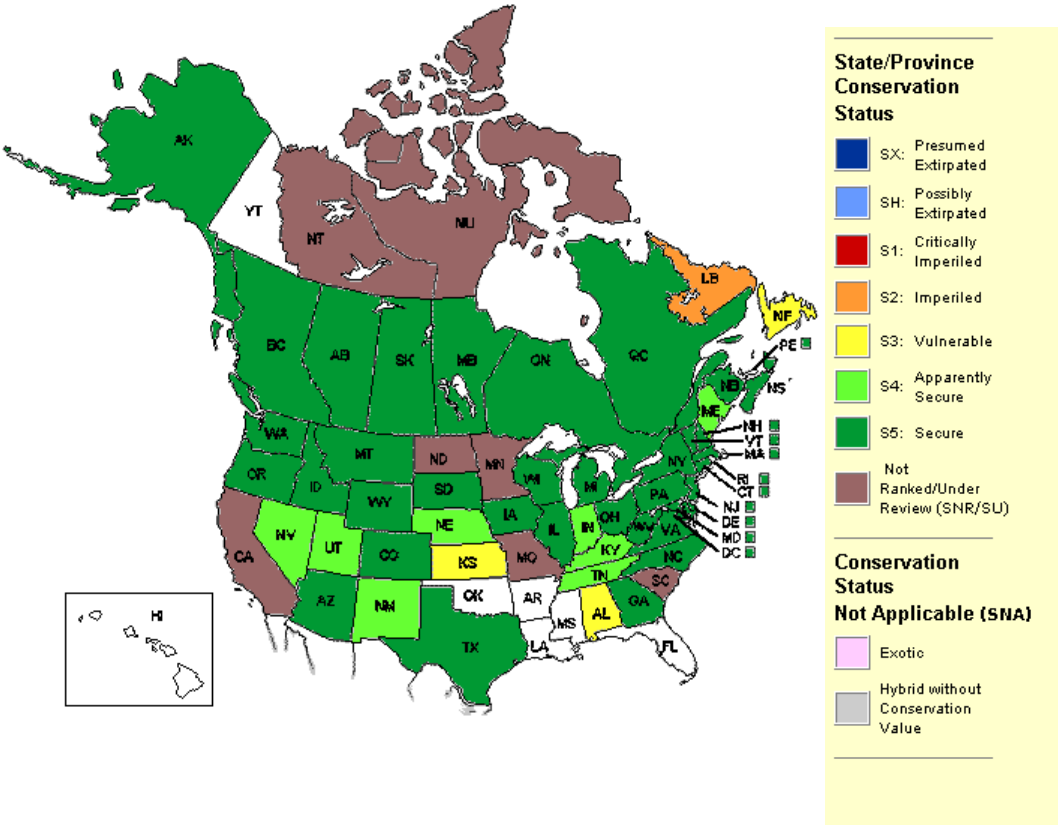
Trend

In addition to these data, the BBS database (www.mbr-pwrc.usgs.gov) displays a slightly upward trend of song sparrows in Utah. These data represent a 35-year trend between 1968 and 2003. These data were collected throughout the entire state of Utah, including points on the Fishlake National Forest.



The map below displays the status ranking from the Nature Conservancy database (NatureServe Explorer). The song sparrow in Utah has been ranked as "apparently secure".

Song Sparrow (*Melospiza melodia*)



NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 18, 2005).

Data has been collected between 1998-2004. No birds were located during survey efforts in the Burnt Flat area. However in 1998, 6 transects recorded individuals, and 3 transects recorded this species in 2002. In 2004 no song sparrow detections were recorded. Data collected in 2004 was limited and not all transects monitored in 2002 and 2003 were revisited in 2004. Although these numbers have decreased, the sample size is small, and further data is needed to evaluate the status of the population on the Fishlake National Forest. Further data is being collected to fine-tune the status of the population on the Fishlake National Forest. Additional field surveys will continue to add to the knowledge concerning trend on the Fishlake National Forest. These data differ from that collected by the BBS, which demonstrates a steady increase in song sparrow numbers in Utah, including the Fishlake National Forest. The Nature Conservancy data indicates the population in Utah to be "apparently secure". Based on all the data presented in this discussion and my interpretation of these data, the population across the forest is stable or in a slightly downward trend, however still viable.

Yellow Warbler *(Dendroica petechia)*

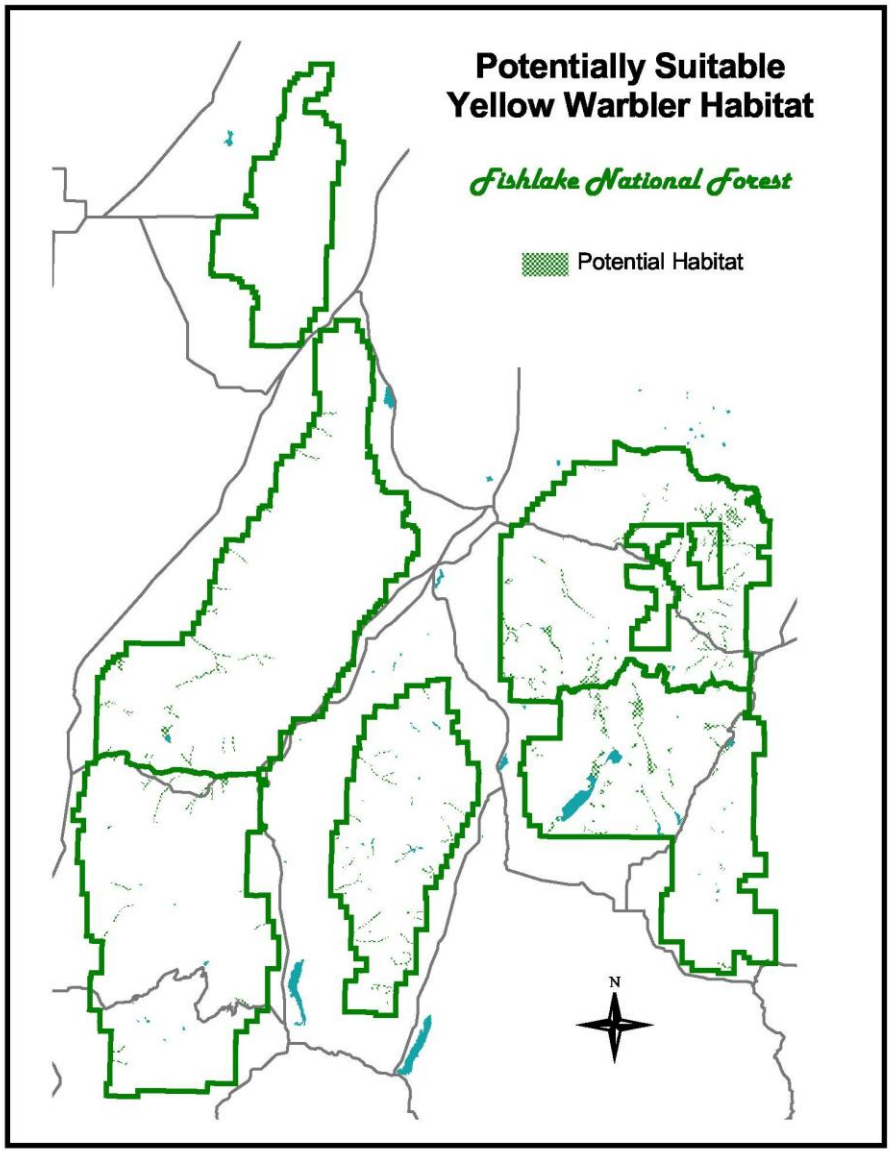
The yellow warbler breeds throughout most of Alaska across Canada, and south to southern California, northern Oklahoma, and northern Georgia. It winters in the tropics. They are found nesting in moist thickets, especially along streams and swampy areas (Udvardy 1994).

Yellow warblers select nest sites based upon characteristics surrounding the nest bush rather than the nest bush itself. Dense growth may be preferred in order to reduce nest predation and brood parasitism (Knopf and Sedgwick 1992). It is subject to predation by jays, predatory birds, small mammals, and snakes, and is apparently quite rarely parasitized by cowbirds (Bent 1953).

Yellow warblers nest in shrubs, willows, or low trees near water (Headstrom 1951). They breed in shrubby growth by swamps and watercourses, in wet scrub, tree foliage, mangroves, gardens, shrubberies and berry patches. The males are sometimes polygamous. The female builds a neat, compact cup nest in an upright twig fork 2-12 feet up, sometimes up to 40 or even 60 feet. The cup is made of plant down, dry weed stem fibers, and fine grass stems, then lined with plant fibers, cotton, plant down, and sometimes feathers. Incubation of the 3-6 (usually 4 or 5) whitish spotted eggs is for 11 days. Both parents tend the nestlings until fledging occurs at 9 to 12 days (Baicich and Harrison 1997). Yellow warblers are insectivorous, with larger bugs being ingested as the birds grow (Biermann and Sealy 1982).

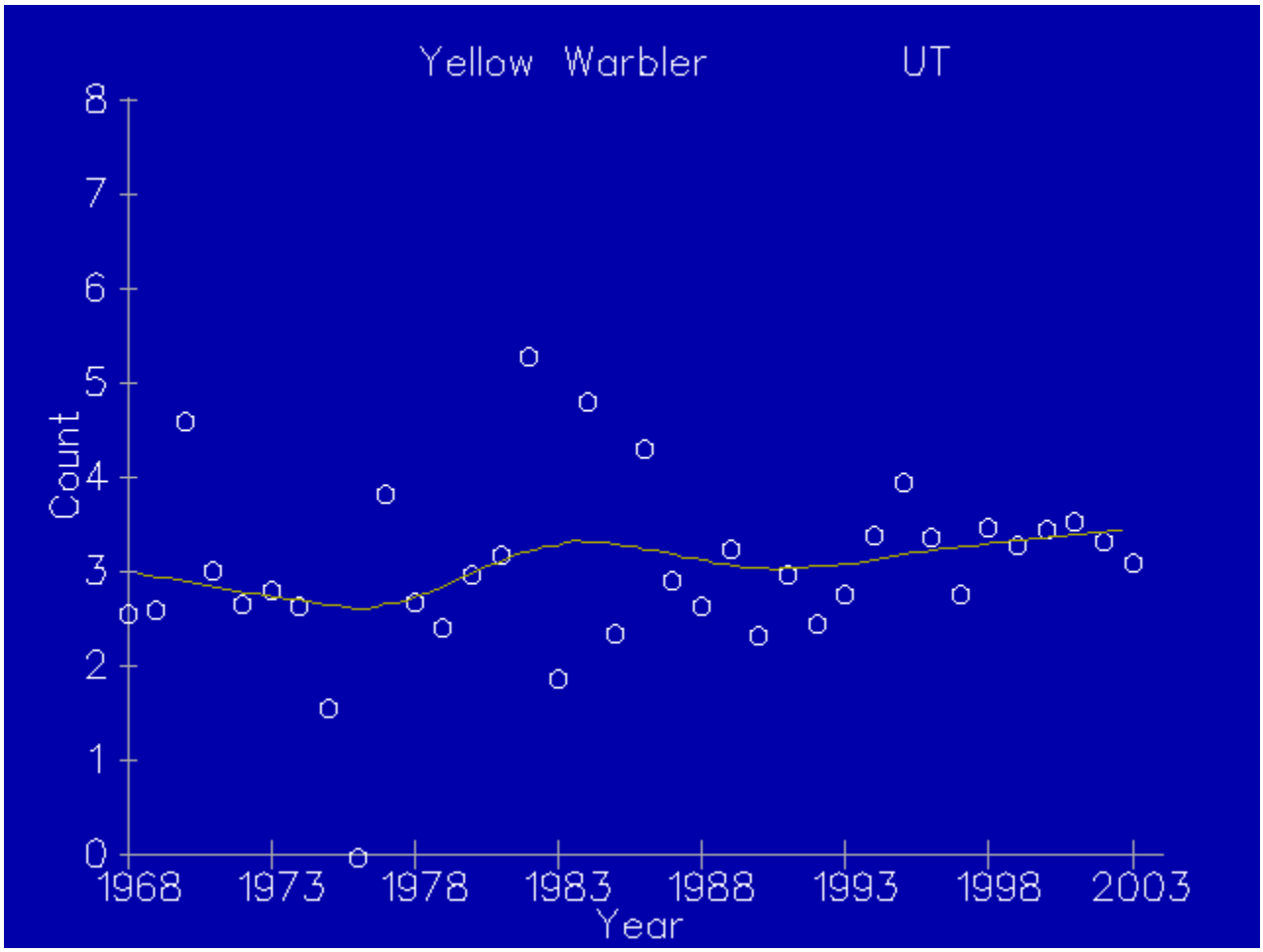
The male yellow warbler has golden yellow plumage with rusty streaks on the breast. The male's back may have a slight greenish tint. The females have plain yellow plumage and breast streaks are absent (Udvardy 1994). This species is known to occur within riparian areas on the Fishlake National Forest.

On the Fishlake National Forest, the yellow warbler occurs on all four Ranger Districts. This species is wide-ranging and easily detectable. Below is a map that displays 423,432 acres of potentially suitable habitat across the forest.



Trend

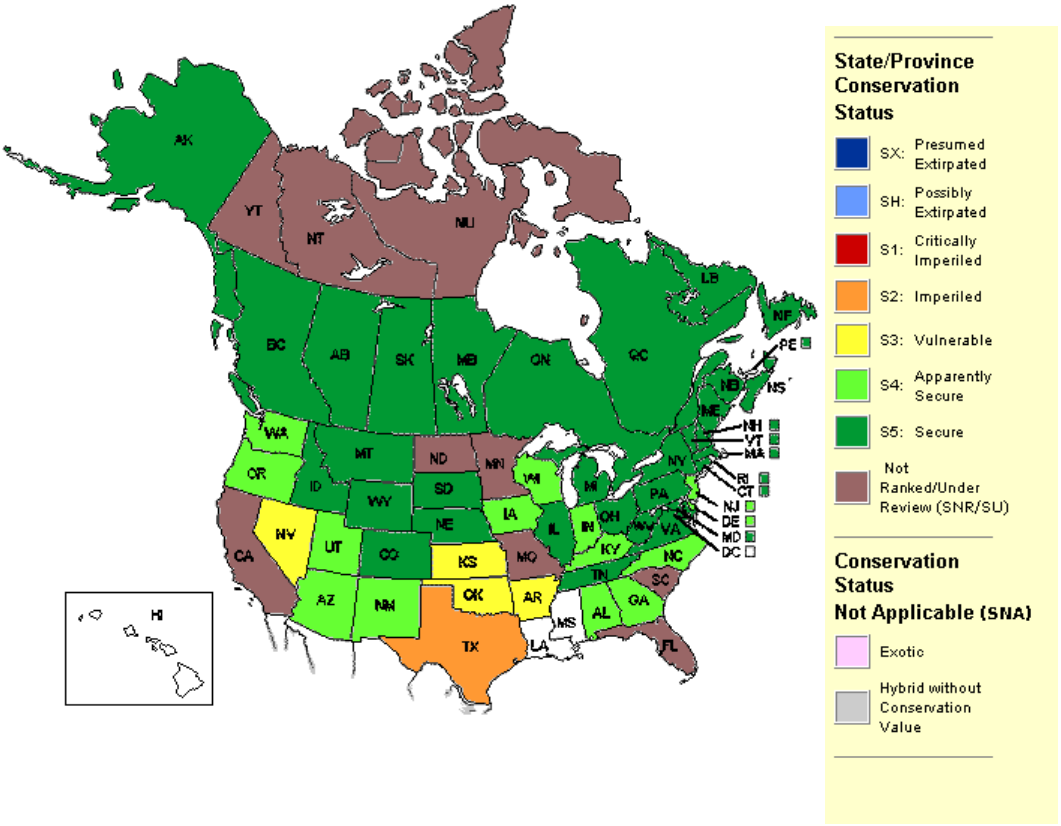
This BBS data (www.mbr-pwrc.usgs.gov) displays a stable to slightly upward trend of yellow warblers in Utah. These data represent a 35-year trend between 1968 and 2003. These data were collected throughout the entire state of Utah, including points on the Fishlake National Forest.



Surveys for avian MIS have been conducted on the Fishlake National Forest since the mid 1980's. Additional studies by "expert birders" were conducted in 1994, 1998, 2002, 2003, and 2004. These surveys targeted cavity nesting species, riparian species, and sage nesting species. All other avian species were also recorded while conducting survey routes.

The map below displays the status ranking from the Nature Conservancy database (NatureServe Explorer). The yellow warbler in Utah has been ranked as "apparently secure".

Yellow Warbler *(Dendroica petechia)*



NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 18, 2005).

Data has been collected between 1998-2004. In 1998 the number of presence/absence observations of this species along each transect line totaled 14. In 2002 the total number of transects recording this species totaled 19. In 2004 4 detections were recorded. Data collected in 2004 was limited and not all transects monitored in 2002 and 2003 were revisited in 2004. Although these numbers have decreased, the sample size is small, and further data is needed to evaluate the status of the population on the Fishlake National Forest. Further data is being collected to fine-tune the status of the population on the Fishlake National Forest. These data differ from that collected by the BBS, which demonstrates a steady increase in the song sparrow in Utah, including the Fishlake National Forest. Based on all the data presented in this discussion and professional interpretation of these data, the population across the forest is in a stable trend and viable.

MacGillivray's Warbler (*Oporornis tolmiei*)

The MacGillivray's warbler is found in coniferous forest edges, burns, brushy cuts, or streamside growth. It breeds from Alaska and Yukon south to California and central New Mexico. Winters are spent in the tropics (Udvardy 1994).

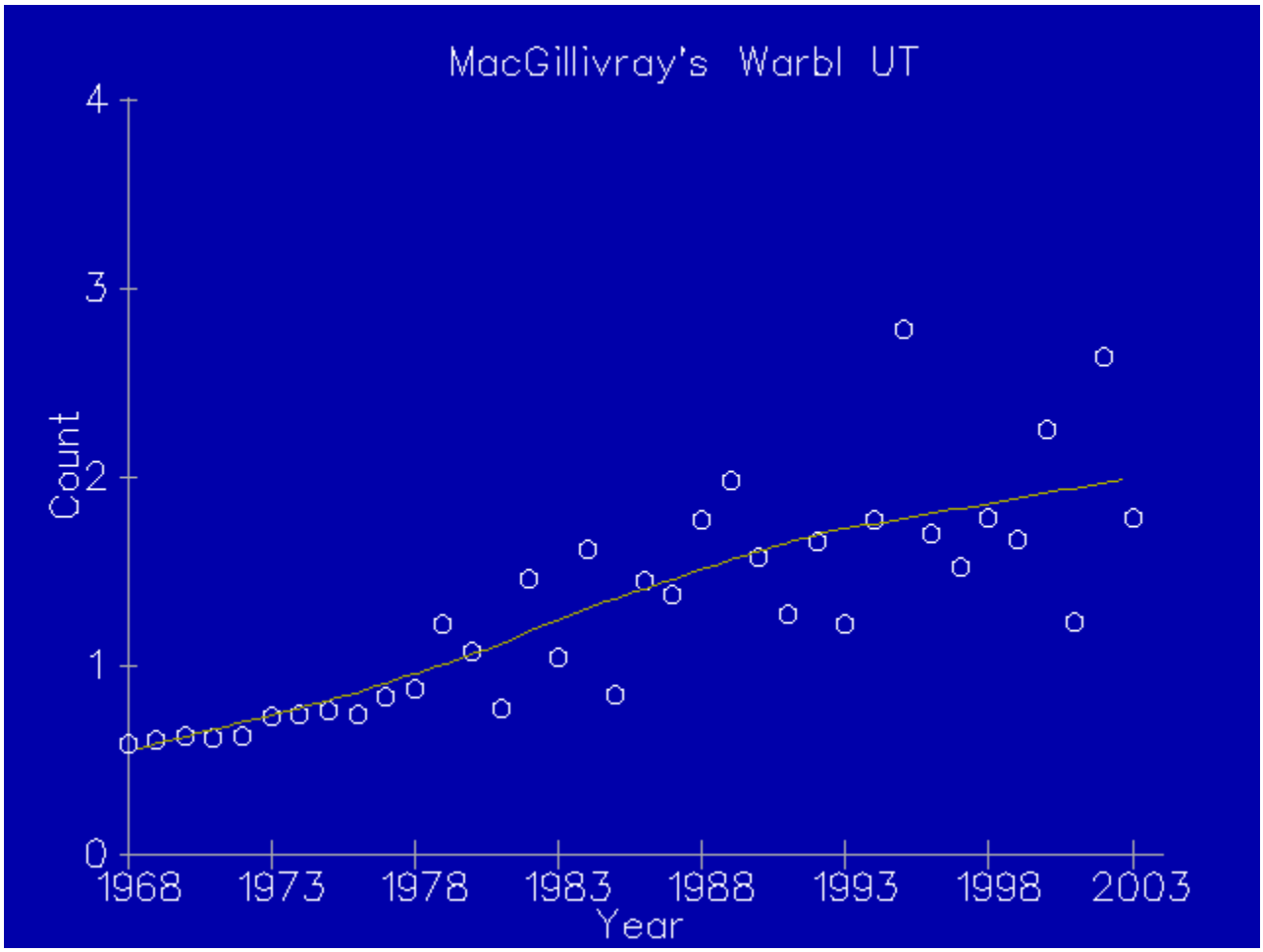
The MacGillivray's warbler apparently eats mostly insects (Bent 1953), though young may take sap from sapsucker drillings in willows (Ehrlich et al. 1988). Willow, alder, and other dense shrubs in riparian areas or in moist woodlands provide cover at all seasons. Drier shrub habitats near water are used to a lesser extent (Bent 1953).

The MacGillivray's warbler nests between May and early August. It lays 3-6 eggs, usually 4 (Baicich and Harrison 1997). Incubation is 11-13 days, by the female only. Both parents tend altricial nestlings until the fledging stage in eight or nine days (Baicich and Harrison 1997, Bent 1953). This species prefers dense, moist, brushy habitat, or areas with tall weeds or ferns for nesting (Bent 1953). The nest is usually placed 0.5-2 feet above ground in a shrub, up to 6 feet in saplings or juniper trees (Headstrom 1951), or is attached to several stalks of plants (Bent 1953).

Density in Wyoming was 10 per 100 acres in a willow-sedge swamp, 30 per 100 acres in a flatland aspen stand, and 85 per 100 acres in a scrub-meadow (Salt 1957). This species may be territorial on wintering ground (Ehrlich et al. 1988). These warblers are rarely parasitized by cowbirds (Bent 1953).

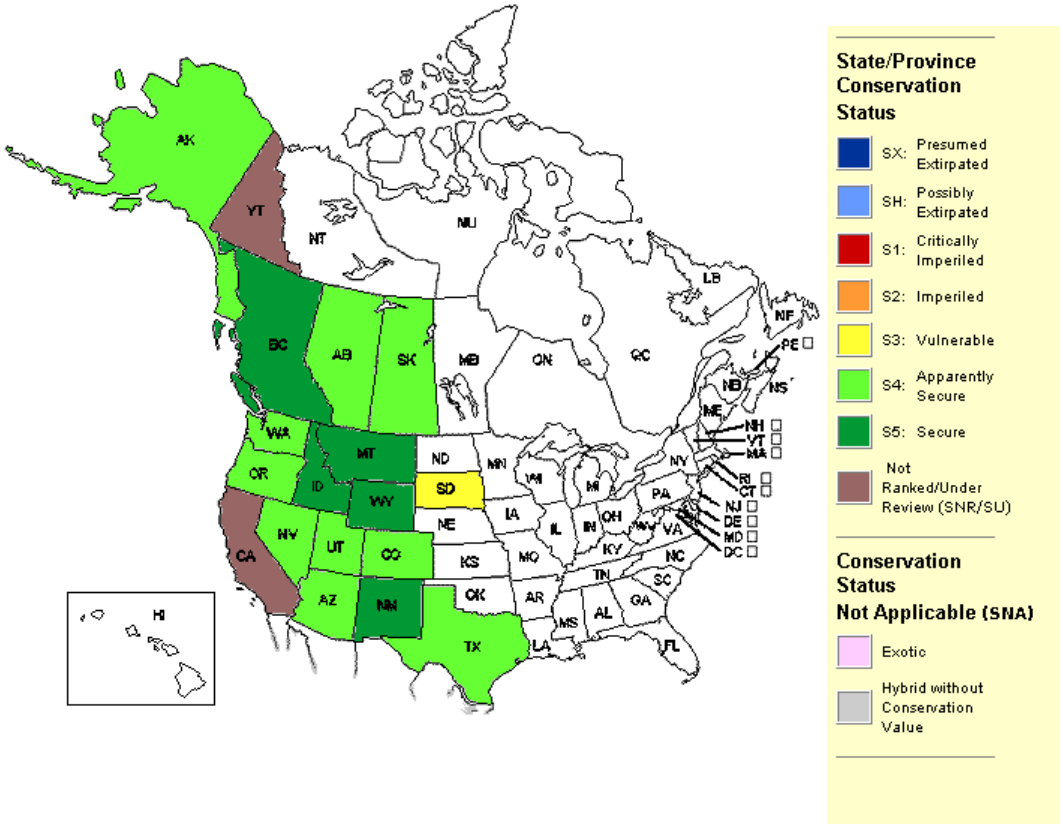
Trend

This BBS data (www.mbr-pwrc.usgs.gov) displays an upward trend of MacGillivray's warblers in Utah. These data represent a 35-year trend between 1968 and 2003. These data were collected throughout the entire state of Utah, including points on the Fishlake National Forest.



The map below displays the status ranking from the Nature Conservancy database (NatureServe Explorer). The MacGillivray's warbler in Utah has been ranked as "apparently secure".

MacGillivray's Warbler *(Oporornis tolmiei)*



NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 18, 2005).

The Fishlake National Forest has expanded the search for riparian related species to include the MacGillivray's warbler. Between 2002-2003 there were 6 incidental detections of MacGillivray's warbler on the Richfield Ranger District of the Fishlake National Forest. Due to limited surveys for this species no detections were recorded in 2004. Data collected in 2004 was limited and not all transects monitored in 2002 and 2003 were revisited in 2004. Although these numbers have decreased, the sample size is small, and further data is needed to evaluate the status of the population on the Fishlake National Forest. Further data is being collected to fine-tune the status of the population on the Fishlake National Forest. However, according to the BBS data, the estimated trend in Utah for this species between 1966-2002 has increased by 5.6% annually. It is my professional interpretation of these data that the trend of this species is stable and viable on the Fishlake National Forest.

PLANTS

Rydberg's Milkvetch (*Astragalus perianus* Barneby)

Rydberg's milkvetch belongs to the pea family (Fabaceae) and is an herbaceous perennial from a subterranean, branching caudex. The stems are 3-15 cm long and prostrate. Leaves are 1-3 cm long and have 7-19 leaflets. Flowers are whitish and tinged with pink or purple. The pods are ascending to declined, bladdery-inflated, sessile, ovoid, and unilocular. This species occupies tertiary igneous gravels, often on barrens in alpine or montane sites in tundra and spruce-fir communities. However, it can also be found in sagebrush stands. It can be found in Beaver, Garfield, Iron, Kane, Piute, and Sevier Counties at elevations between 7,000 and 11,400 feet (Welsh et al. 2003).

Tew (1988) provided the following information about this species' description and life history. The flowering and fruiting period extends from June to September, and the pods are water and wind dispersed. Fire does not kill the plants and may even be used to improve habitat for Rydberg's milkvetch. Substrate and elevation appear to be dominant factors affecting distribution. Associated vegetation is typically sparse with an open appearance because of shallow rocky soils.

A. perianus populations could be threatened by off-road vehicle use, grazing, mining, or severe erosion. However, most existing populations do not appear to be in serious danger. Some populations are near salting grounds where grazing and trampling occur. Other individuals of Rydberg's milkvetch may be found growing in the middle of gravel roads where competition has been eliminated. Too much cover has a tendency to crowd this species out of its niche. Mining activities are limited in all areas where the populations are presently known to exist (Tew 1988).

Rydberg's milkvetch was first collected in the mountains north of Bullion Creek near Marysvale, Piute County, Utah in 1905 (USFWS 1978B). Because of the lack of collections of this plant and general lack of information on its distribution, the Smithsonian Institution noted that this plant could possibly be extinct in their 1975 report (USFWS 1978B). In June of 1975, Welsh and Murdock collected this species in Garfield County. This population was found on Mt. Dutton of the Dixie National Forest. In 1976, specimens from the 1905 locality in the Tushar Mountains (Fishlake National Forest) were rediscovered and collected (USFWS 1988). In 1978, Rydberg's milkvetch was federally listed as threatened by the U.S. Fish and Wildlife Service (USFWS 1978B). At this time, this plant was only known from two populations.

In 1981, Rupert C. Barneby reevaluated specimens of *A. perianus* and a species it closely resembles, *A. serpens*. Upon re-examination, he concluded that several of the specimens previously identified as *A. serpens* were misidentified. Barneby annotated these specimens to *A. perianus*. These collections were from Kane, Iron, and Piute Counties and greatly expanded the distribution of Rydberg's milkvetch. In 1982 and 1983, a management plan for Rydberg's milkvetch was created and approved by the U.S. Forest Service. Inventories and monitoring studies were established and implemented over the next several years. From 1984 through 1987, twelve major population centers were located and mapped. These populations cover over 2,000 acres in six counties on six

major mountains and plateaus in south-central Utah: the Tushar Mountains, Sevier Plateau, Markagunt Plateau, Fish Lake Plateau, Mount Dutton, and Thousand Lake Mountain (USFWS 1988). In 1986, Rydberg's milkvetch was listed as MIS in the Fishlake National Forest Land Resource Management Plan because it was federally listed as threatened (Fishlake LRMP II-32, Table II-10). At the time the Fishlake LRMP was prepared, only 4,000 individuals were known to occur on the forest (Fishlake LRMP II-29).

On October 11, 1988, delisting of Rydberg's milkvetch was proposed by the U.S. Fish and Wildlife Service. This proposal was based on a much wider distribution than previously known for this species. Conservative estimates for the 12 known populations indicated well over 75,000 individuals and could possibly have been closer to 200,000 individuals (USFWS 1988). In 1989, 13 populations of Rydberg's milkvetch had been found with over 300,000 individuals estimated. Rydberg's milkvetch was subsequently delisted from its threatened status on September 14, 1989 by the U.S. Fish and Wildlife Service (USFWS 1989). Rydberg's milkvetch was then immediately placed on the USFS Intermountain Region Sensitive Species List for approximately 5 years. On April 29, 1994, Rydberg's milkvetch was removed from the Intermountain Region Sensitive Species List.

Trend

As a result of the U.S. Forest Service Management Plan approved in 1983, two Rydberg's milkvetch monitoring transects were established and monitored by Dr. Duane Atwood and Bud Alford. These were located in the Bullion Canyon and Mt. Brigham area of the Tushar Mountain Range on the Fishlake National Forest.

The Bullion Canyon transect was read on September 1, 1983. A total of 77 Rydberg's milkvetch plants were counted in monitoring 10 plots along a transect line. All age classes were represented. This transect was re-monitored on August 5, 2002 by Mark Madsen and Jeremy Gwin. A total of 21 young and mature age class Rydberg's milkvetch plants were counted in 10 monitoring plots along the transect line. Two of the designated age classes (seedling and decadent) were absent from the monitoring plots.

The Mt. Brigham transect (on privately-owned land) was read on September 2, 1983. A total of 194 Rydberg's milkvetch plants were counted in 10 monitoring plots along the transect line. All age classes (except for decadent) were represented. This transect was re-monitored on August 6, 2002 by Mark Madsen and Jeremy Gwin. A total of 69 Rydberg's milkvetch plants were counted in 10 monitoring plots along the transect line. All age classes (except for decadent) were represented.

Between 1983 and 2003, Rydberg's milkvetch has declined in numbers along both monitoring transects indicating a downward trend. However, both 5-10 acre populations in Bullion Canyon and Mt. Brigham were noted as having an estimated 100 – 1000 of individuals in each in area 2002. The population in Bullion Canyon was estimated to be between 800 – 1000 individuals in 1983.

A new monitoring transect for Rydberg's milkvetch was established on August 13, 2002 by Mark Madsen, Steve Walters, and Jeremy Gwin. This transect was placed on Fishlake National Forest land in the Edna Peak area of the Tushar Mountains. A total of 86 plants

were counted in 10 monitoring plots along the transect line. All age classes (except for decadent) were represented. The population size was estimated at 10 acres with 500+ individuals.

The following paragraphs documented additional monitoring completed by Terry Miller in collaboration with David Tait and Robert Campbell (2002).

Surveys were conducted for *Astragalus perianus*, Rydberg's milkvetch, during the months of June and July, 2002. Known populations were relocated and resurveyed in order to establish trend data for the species. Surveys consisted of surveying polygons delineated by previous botanists who worked with the species. Completing the rare species element occurrence form and taking photographs and GPS locations documented population visits.

Populations located on the Richfield District were in the Dry Creek Canyon area (7/29/85, Higgins) and above Willow Spring (7/29/85, Higgins). The Dry Creek Canyon population was estimated to have approximately the same population size (about 2,000 individuals) as previously determined. The population above Willow Spring was also found to have a stable population size (at least 10,000+ individuals). A large amount of potential habitat was found for the species in the general area. One new population of this species was located in the general area of Dry Creek Canyon during the current surveys.

Populations were searched for on the Loa District in two separate locations: the Mytoge Mountain area (8/21-22/85, Atwood) and west of Mill Meadow Reservoir (8/21-22/85, Atwood). Population size for the Mytoge Mountain population was estimated to be lower (about 2,000 to 3,000 individuals) than the estimated 10,000+ individuals located during the delisting process (delisted effective 10/16/89). The recent survey of the population west of Mill Meadow Reservoir did not locate any plants even though a large area at the site was searched. The original estimate of this population size was 1,000-10,000 individuals. Large parts of this area had been chained in 1987 as part of a range rehabilitation treatment. Although given the habitat preference for *A. perianus*, this treatment is not thought to be solely responsible for the disappearance of individuals from this population. Two days were spent surveying for this population.

One day was spent surveying for the population at Lousy Jim Creek on the Beaver District. This small population (about 500 individuals, 8/26/84, Taye) was not relocated. Possibly a more intensive survey could relocate this population. The area contained a significant amount of potential habitat that was not searched during this 2002 survey.

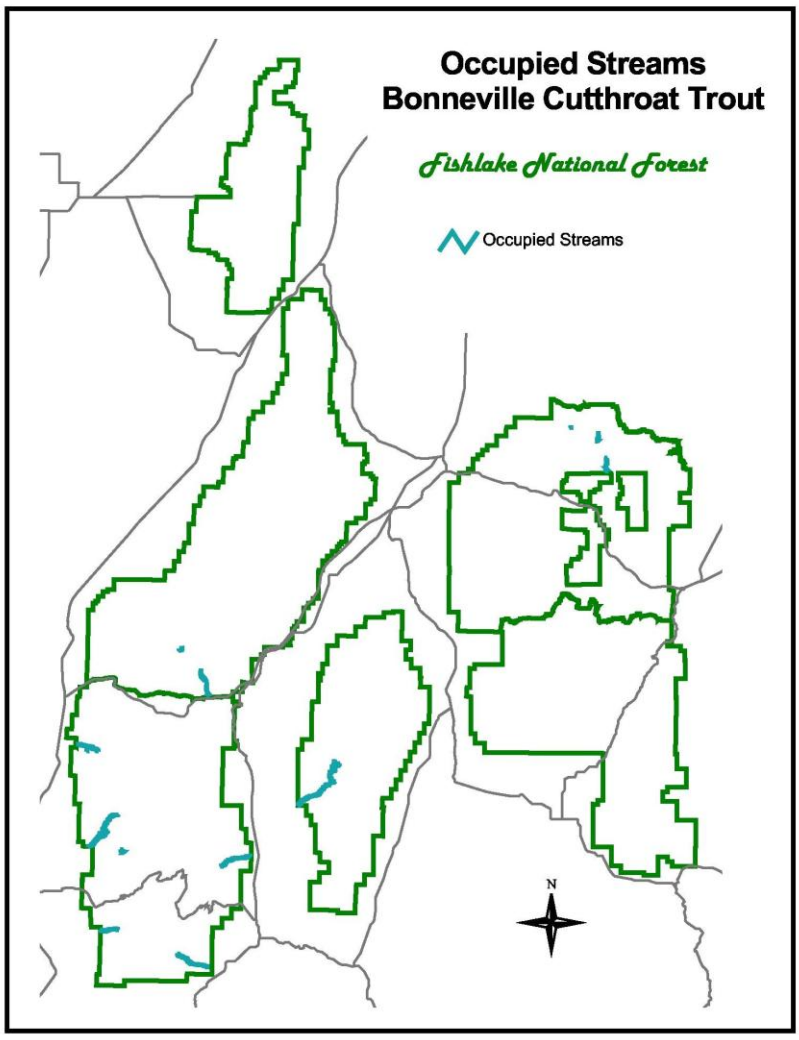
While some populations are stable, others had fewer plants of *A. perianus*. Some populations were not even relocated. However, the dry weather this summer may be a contributing factor to the lower numbers. Populations of other common species seem to be smaller than those expected for years of more normal precipitation (T.R. Miller, personal observations).

There are 31 known locations on the Beaver, Loa, and Richfield Ranger Districts, which contain approximately 95,000+ individuals. Based on the data discussed above, Rydberg's milkvetch is stable and viable across the Forest.

FISH

Bonneville Cutthroat Trout *(Oncorhynchus clarki utah)*

Bonneville cutthroat trout is one of three cutthroat trout subspecies native to Utah. Bonneville cutthroat trout historically occurred in the Pleistocene Lake Bonneville basin, which included portions of Idaho, Nevada, Utah, and Wyoming (Kershner 1995). The desiccation of Lake Bonneville into the smaller Great Salt Lake and fragmentation of other stream and lake habitats may have led to three slightly differentiated groups of Bonneville cutthroat trout. These groups are found in the Bonneville basin proper, the Bear River drainage, and the Snake Valley (Behnke 1992). There are five known populations of pure strain Bonneville cutthroat trout on the Fishlake National Forest inhabiting approximately 38 miles of stream habitat. There are several recently reintroduced populations, and several small potential remnant populations.



Habitat for the Bonneville cutthroat trout is widely distributed and variable. It ranges from high elevation (3,500 m mean sea level) streams with coniferous and deciduous riparian trees to low elevation (1,000 m mean sea level) streams in sage-steppe grasslands containing herbaceous riparian zones. As such, Bonneville cutthroat trout have adapted to a broad spectrum of habitat conditions throughout their range (Kershner 1995).

Sexual maturity is typically reached during the second year for males and the third year for females (May et al. 1978). Both the age at maturity and the annual timing of spawning vary geographically with elevation, temperature, and life history strategy. Lake resident trout may begin spawning at two years of age and usually continue throughout their lives, while adfluvial individuals may not spawn for several years. Annual spawning of Bonneville cutthroat trout occurs in the spring and early summer (Binns 1981). May et al. (1978) reported Bonneville cutthroat trout spawning in Birch Creek, Utah beginning in May and continuing into June. The wild brood stock at Manning Meadow Reservoir (2,900 m elevation) spawn from late June to early July (Hepworth and Ottenbacher 1995).

Fry emerge in mid July through mid August (depending on time of spawn) and migrate to channel margin habitats associated with stream banks. Growth of resident fish is highly dependent on stream productivity. Growth rates of Bonneville cutthroat trout tend to be slower in headwater drainages than in lacustrine environments (Binns 1981).

Bonneville cutthroat trout require relatively cool, well-oxygenated water, and the presence of clean, well-sorted gravels with minimal fine sediments for successful spawning.

Both terrestrial and aquatic invertebrates are important food items for stream-dwelling Bonneville cutthroat trout (May et al. 1978). Dipterans and debris were the dominant food items for immature trout and terrestrial insects were the dominant prey for mature individuals (Kershner 1995).

There are numerous threats to Bonneville cutthroat trout. These include hybridization and/or competition with nonnative salmonids, degradation of habitat from diversions, livestock grazing, road building, fire, mining and timber harvest activities, as well as angling (Binns 1981).

Trend

Based on discussions with Dale Hepworth, DWR Regional Fish Program Manager, Bonneville cutthroat trout populations are increasing throughout the Southern Region. When the DWR started to restore the native Bonneville trout about 25 years ago, there were approximately 5 miles of occupied stream habitat in the Southern Region. Based on information provided by the DWR through personal communication, there are currently more than 75 miles of occupied stream habitat throughout southern Utah. This success has been the direst result of stream restoration work occurring from cooperative relations between the DWR and the Forest Service. In addition to information collected by the DWR, the total number of miles of occupied habitat on the forest has increased since 1986 from approximately 13 miles of habitat to 38 miles of occupied habitat, a 25-mile increase.

As a result of cooperative state and federal actions, an increase of suitable and occupied Bonneville trout habitat has occurred on the Forest and in the Southern Region. The Bonneville cutthroat trout is experiencing an upward trend and is viable on the Fishlake National Forest.

Colorado River Cutthroat Trout *(Oncorhynchus clarki pleuriticus*)

Colorado River cutthroat trout is one of three cutthroat subspecies native to Utah. Historically, this subspecies occupied portions of the upper Colorado River basin in Wyoming, Colorado, Utah, and New Mexico (Behnke 1992). Though it is now restricted to headwater streams and lakes, its original distribution included portions of the Colorado, Green, Yampa, White and San Juan rivers (Young 1995). Although reduced in range and numbers, pure populations of Colorado River cutthroat trout still exist in their native drainages. There are three known populations of pure strain Colorado River cutthroat trout on the Fishlake National Forest inhabiting approximately 8 miles of stream habitat.

Colorado River cutthroat trout populations may be lake resident, fluvial, or adfluvial, and life history characteristics vary somewhat between these strategies. Colorado River cutthroat trout appear to be slower growing than other subspecies with few fish over 200 mm, probably because of the short growing season. However, Colorado River cutthroat trout transplanted to lower elevation ponds grew to nearly 400 mm in two years, and were commonly over 250 mm in tributaries to the Green River in Wyoming, especially where fish were associated with beaver ponds (Young 1995). Some individuals from the wild brood stock of Colorado River cutthroat trout in Dougherty Basin Lake reach lengths of over 400 mm (Hepworth et al. 2002).

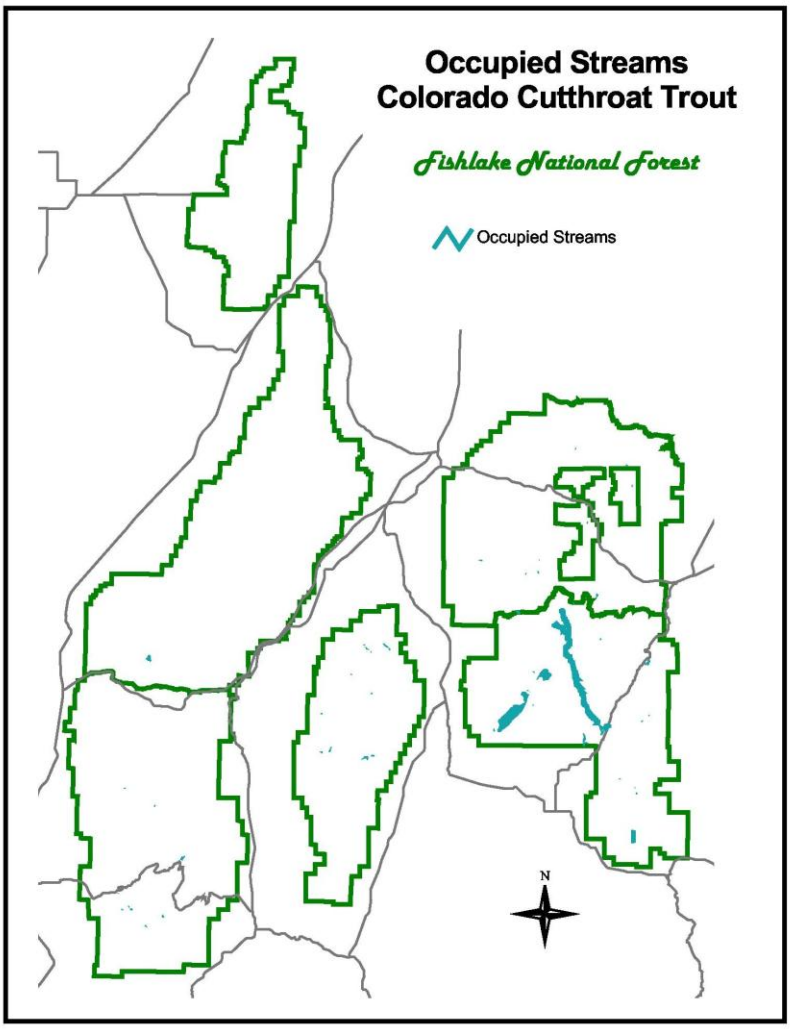
Colorado River cutthroat trout spawning usually begins when spring floods begin to recede in late spring and early summer, possibly cued by changes in water temperature. Fecundity varies with individual size and location as well as life history. Water temperature, elevation, and climatic variation determine fry emergence. In known populations, emergence usually occurs in late summer. Maturity is reached at approximately three years of age for fluvial populations (Young 1995).

Habitat requirements for Colorado River cutthroat trout are poorly understood, and results of studies are frequently conflicting. Typical of most cutthroat species, Colorado River cutthroat trout inhabit habitats with cold, clean water and spawn over gravel substrates with good water through-flow. Coarse woody debris, greater depth, and lower velocities are positively associated with Colorado River cutthroat trout presence; however, these conditions are not readily available within many streams containing Colorado River cutthroat trout. Small population size and restricted habitat areas confound most conclusions on habitat requirements (Young 1995).

Colorado River cutthroat trout do not compete well with introduced salmonids. This is possibly due to having evolved with the mottled sculpin and several endemic Colorado River minnows and suckers, and not with other salmonids (Young 1995).

Diets of subadult Colorado River cutthroat trout are comprised mainly of macroinvertebrates and plankton, whereas adults can be piscivorous with a larger proportion of large macroinvertebrates and terrestrial insects in their diets than that of subadults (Young 1995).

The Colorado River cutthroat trout only occurs on the Loa Ranger District of the Fishlake National Forest.



There are numerous threats to Colorado River cutthroat trout. These include hybridization and/or competition with nonnative salmonids, degradation of habitat from diversions, livestock grazing, road building, fire, mining and timber harvest activities, as well as angling.

Rainbow Trout (Oncorhyncus mykiss)

Because of the vast variation among rainbow trout populations, government agencies classify rainbow trout forms as Evolutionary Significant Units (ESU). This means that each ESU has an individualized genetic composition that is significant to the *Oncorhyncus mykiss* species as a whole.

Behnke (1992) describes four types of habitat that rainbow trout need during their life. The first is spawning habitat, which is typically small, cool-water streams. The spawning habitat must have adequate gravel beds. This means that there must be enough gravel for the redd, and the gravel must not be too fine or it will not let oxygen to the eggs. The water flow must not be too rapid. Very rapid water flow will carry the gravel of the redd, and the eggs, downstream.

The second necessary habitat type for rainbow trout is rearing habitat. This habitat must have adequate protective cover. At this stage of life, the fish is extremely susceptible to predation. The area must have water of low velocity. The fish are not yet strong enough to fight heavy currents for long periods of time. There must also be adequate food sources. A large amount of growth occurs during this time. Trout will usually stay in rearing habitat from birth to the second year of life.

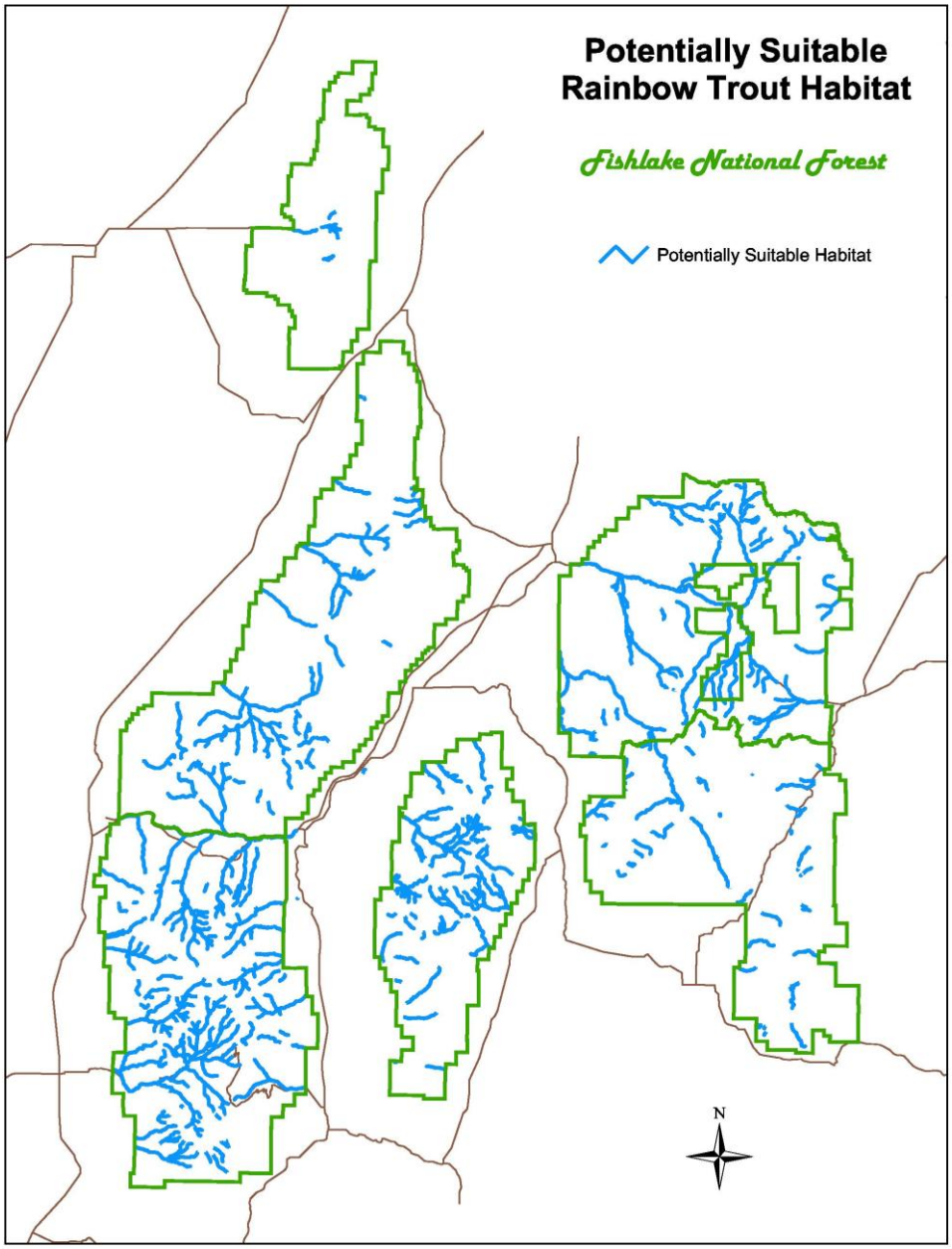
The third necessary habitat type is adult habitat. Trout tend to move to these areas during the second year of life. This habitat usually has water depths of 0.3 meters or greater. It is usually an area in which rapid-flow water meets calm water. This allows the fish to rest in the calm water and search for food and cover in the faster water. The cover in these areas often includes boulders, logs, vegetation, and undercut stream banks.

The fourth necessary habitat type is overwintering habitat. These areas are usually in deep waters. Stream fish move down to larger rivers, while lake fish move into deeper parts of the lake. The water tends to be low velocity in these areas. There has to be a large amount of protective cover. These areas also need to have an adequate amount of food.

Regardless of the habitat they are in, rainbow trout can utilize a high amount of dissolved oxygen in the water (up to 80% saturation) (Van Dam 1938 in Moyle and Cech 2000). Optimal temperature is between 7 and 17 degrees Celsius. Rainbow trout will die at temperatures above 28 degrees Celsius. Optimal pH for trout survival is between 7 and 8 (Mills 1971).

The native range of rainbow trout (*Oncorhyncus mykiss*) is the drainages of the United States Pacific Coast from Alaska to Mexico, the waters of the Pacific Ocean, and the eastern coast of Asia. Except for several small cases, rainbow trout are not native east of the continental divide.

On the Fishlake National Forest, rainbow trout occur on all four Ranger Districts. The map displayed below identifies approximately 1,053 miles of potentially occupied stream habitat and 4,680 acres of lake habitat across the forest.



The Fishlake LRMP (II-34) identifies 66 streams and over 380 miles of habitat, and 49 lakes and reservoirs with 4,200 acres of suitable habitat across the forest. Recent GIS analysis has estimated about 1,053 miles of potentially occupied stream miles and 4,680 acres of lake habitat. This new, more accurate estimate indicates that there is more potential habitat than originally estimated in the Forest Plan. Along with rainbow trout, the forest supports populations of Bonneville, Brown, Brook, Colorado, and Cutthroat trout.

Today, through extensive hatchery outplanting, rainbow trout (and many other species of trout) are found in all of the provinces of Canada, the majority of the U.S. states, and all of the continents except Antarctica. Most of the worldwide rainbows are stocks from Coastal rainbow trout (*Oncorhyncus mykiss irideus*) (Behnke 1992).

Rainbow trout are typically diurnal, opportunistic feeders. They are carnivores that feed in a rover-predator style. The majority of their diet consists of aquatic insects, although they will eat crayfish, grasshoppers, winged bugs, worms, salamanders, and other fish (including other trout). They will also occasionally feed on benthic invertebrates when the benthic food supply is great and/or the competition for epipelagic food is increased (Behnke 1992).

Rainbow trout optimal feeding temperature is between 13-16 degrees Celsius. They will usually cease feeding between temperatures of 22-25 degrees Celsius. Rainbows in streams usually occupy a "station" which they have obtained through dominance and/or battle. This station usually has some sort of cover so the trout can hide from predators while it searches the water for food.

Dominance plays an important role in the feeding behavior of rainbow trout. Johnsson (1993) showed that larger rainbows tend to have dominance over the quantity and quality of food sources in limited food environments. He also showed that larger rainbows are more likely to feed in the risk of predation than smaller rainbows. He believes that this has to do with the increased ability of escape of the larger fish, which in turn may enable the fish to feed in more productive areas (high risk-high gain feeding). On the other hand, rainbow trout are preyed upon by a number of organisms. Squawfish (*Ptychocheilus* spp.), bass (*Morone* spp.), and pike (*Esox lucius*) are three well-known trout predators. The first two often feed on trout that are stopped by dams and other artificial barriers. Other salmonids, such as salmon, steelhead, and larger trout, will also prey upon developing rainbow trout. There are numerous predators on land and in the air as well. Bears, martins, fishers, otters, osprey, and eagles are just a few of the non-aquatic species that consider rainbow trout a food source.

Rainbow trout usually spawn from 2-4 years after their parents spawned. This age can vary greatly depending on size and genetics (Behnke 1992). Trout that have a territory that is very productive will usually have a large body size at an early age, and therefore will often breed sooner than a fish that lives in a less productive area. On the other hand, anadromous and lacustrine populations of rainbow trout have a genetic disposition for an older age at first breeding. Increased fecundity in these populations offsets disadvantages of later breeding. The relative fecundity ranges from 1,200 to 3,200 eggs per kilogram of body weight (Behnke 1992).

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20 % of steelhead runs are repeat spawners (Behnke 1992). The majority of repeat spawners are usually female trout.

Rainbow trout spawning behavior typically begins during the spring (December - April). The actual spawning times vary greatly among regions with temperature and water flow. Temperatures of 3-6 degrees Celsius often initiate spawning behavior, although actual spawning does not usually occur until temperatures reach 6-9 degrees Celsius (Behnke 1992). In lacustrine populations, this often means moving from the lake waters into the in-current stream in which they were hatched. If the lake is not stream-fed, the trout will usually move into shallow waters near the shore (Moyle and Cech 2000). In freshwater river populations, migration means moving from the feeding-grounds of a large river or stream into a smaller, cool-water tributary (Moyle and Cech 2000).

Mining, logging, and irrigation practices have contributed to the decline of rainbow trout in the Pacific Northwest. These practices increase stream sedimentation, increase water temperature by removing vegetation, add harmful chemicals to the water, and deplete the volume of water moving through the streams and rivers of the area.

Hatcheries were developed as an artificial propagation tool to supplement the dwindling native populations (DiSilvestro 1997). The idea seemed great in theory, but it had varied effects. There is a high mortality rate among hatchery strain of rainbow trout. If the hatchery strains do establish themselves in an environment, they will often displace the native trout species (Behnke 1992). Hatchery reared rainbows may also introduce disease and/or parasites to the native populations. And probably the most important factor, the gene pool of the native populations may be depleted through interbreeding with hatchery stock (Behnke 1992).

Conservation projects are being conducted to preserve the landlocked rainbow trout habitat. Stream restoration is currently the main emphasis. Regulations on logging, mining, and grazing practices are ever increasing to preserve riparian habitat and decrease sediment in the streams.

Utah's trout populations are managed by the DWR and season time frames and bag limits recommended to the RAC councils at public meetings and approved by the Utah wildlife board, a governors appointed board. Through this process all game fish regulations are established and codified.

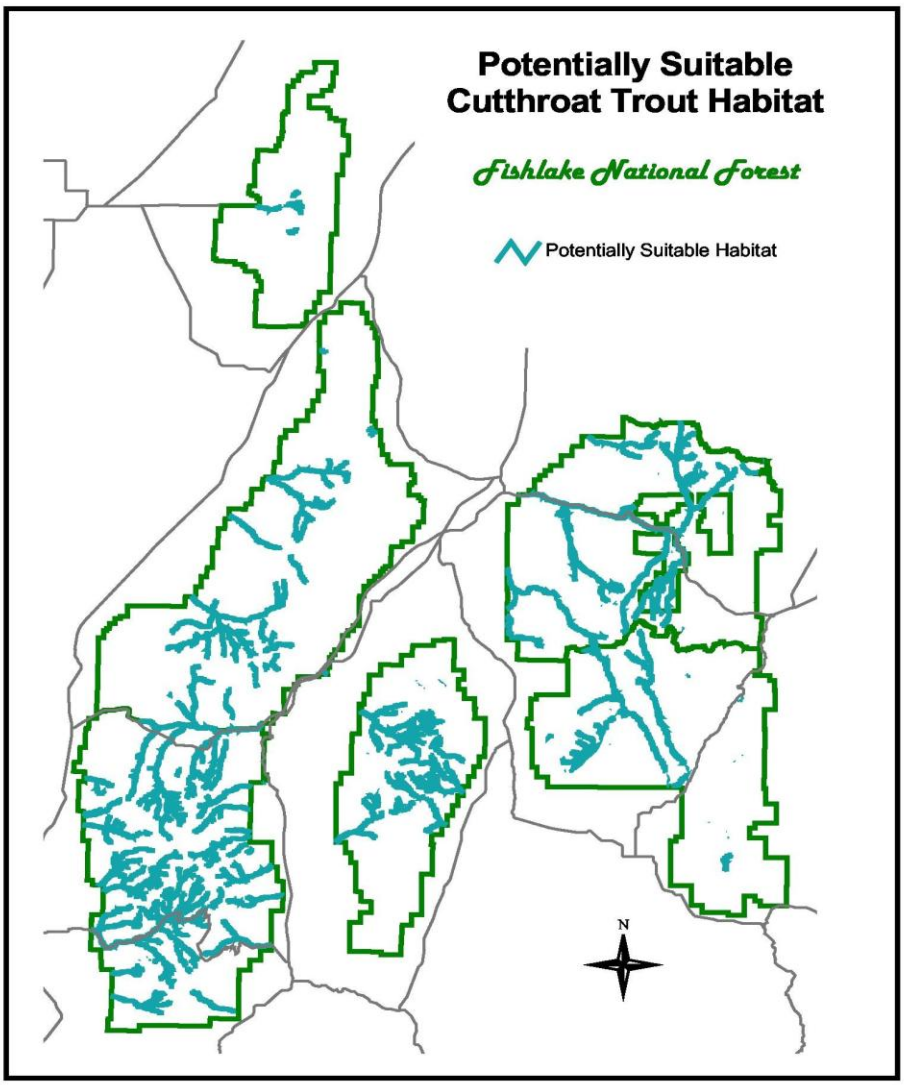
Trend

The population trend of rainbow trout on the Fishlake National Forest is stable. As a result of a good hatchery program in the DWR Southern Region, a very successful fish-planting program for recreational use is in place. Wild self-sustaining populations of rainbow trout also occur in many of the streams on the Forest. As a result of this, fish populations are always fluctuating slightly, but remain stable, and viable across the forest. Dale Hepworth, DWR Fish Program Manager, Southern Region, provided information and support for this determination.

Cutthroat Trout *(Oncorhynchus clarkii)*

Cutthroat trout are economically important over virtually all of their range. Their flesh is excellent for consumption and fishermen consider them a valuable prize. They are the only trout native to Utah. The range of the cutthroat trout extends from coastal streams of Alaska to northern California throughout the Intermountain area and east to the upper Missouri, Platte, Colorado, and Rio Grande Rivers. The cutthroat can be found in fresh, brackish, or salt water in North America mostly west of the Rocky Mountains. A central area in which the rainbow trout occurs separates the coastal and Yellowstone varieties. The inland form lives in western Alberta in the headwaters of river systems.

On the Fishlake National Forest cutthroat trout occur on all four Ranger Districts. The map displayed below identifies approximately 1,053 miles of potentially occupied stream habitat and 4,680 acres of lake habitat across the forest.



Cutthroat trout are the only species of trout native to the interior west of the United States. The species is characterized by the red cutthroat mark located below the jaw. Cutthroat trout are generally more colorful than rainbow trout, and can develop colorations of bronze to bright red. Additionally, dark spots located along the body are well defined and more concentrated towards the caudal fin. Cutthroat trout spawn annually in the spring or early summer. Spawning generally occurs in cold, clear streams with ample clean gravel substrate. Loss of suitable habitat and competition with non-native salmonids are two major limiting factors facing cutthroat trout within their native range (Sigler and Sigler 1996).

Trend

The population trend of cutthroat trout on the Fishlake National Forest is stable. As a result of a good hatchery program the DWR Southern Region, has a very successful fish-planting program for recreational use. Wild self-sustaining populations of cutthroat trout also occur in many streams on the Forest. As a result of this, fish populations are always fluctuating slightly, but remain stable to slightly increasing, and viable across the forest. Dale Hepworth, DWR Fish Program Manager, Southern Region, provided information and support for this determination.

Brown Trout (Salmo trutta)

In 1883, the brown trout was introduced into the United States from Europe and soon adapted itself to trout waters throughout most of the country except some areas of the southeastern United States. The brown trout's ability to adapt itself to a wide variety of ecological conditions has helped to expand its range. Some of the best brown trout fishing waters in the United States are the larger coldwater steams of Utah.

Brown trout are brown to gold on their back with a cream to slate colored belly. Most fish have black, gray, yellow, and occasionally red spots all surrounded by a white halo. This species has a prominent spotted adipose fin between the dorsal and caudal fin. There are no spots on the squarish tail or vermiculation --wormy marks-- on the back. The average brown trout ranges from 10-13 inches in size. The state record brown trout weighed 14.65 pounds and measured 25.25 inches in length (Sigler and Sigler 1996).

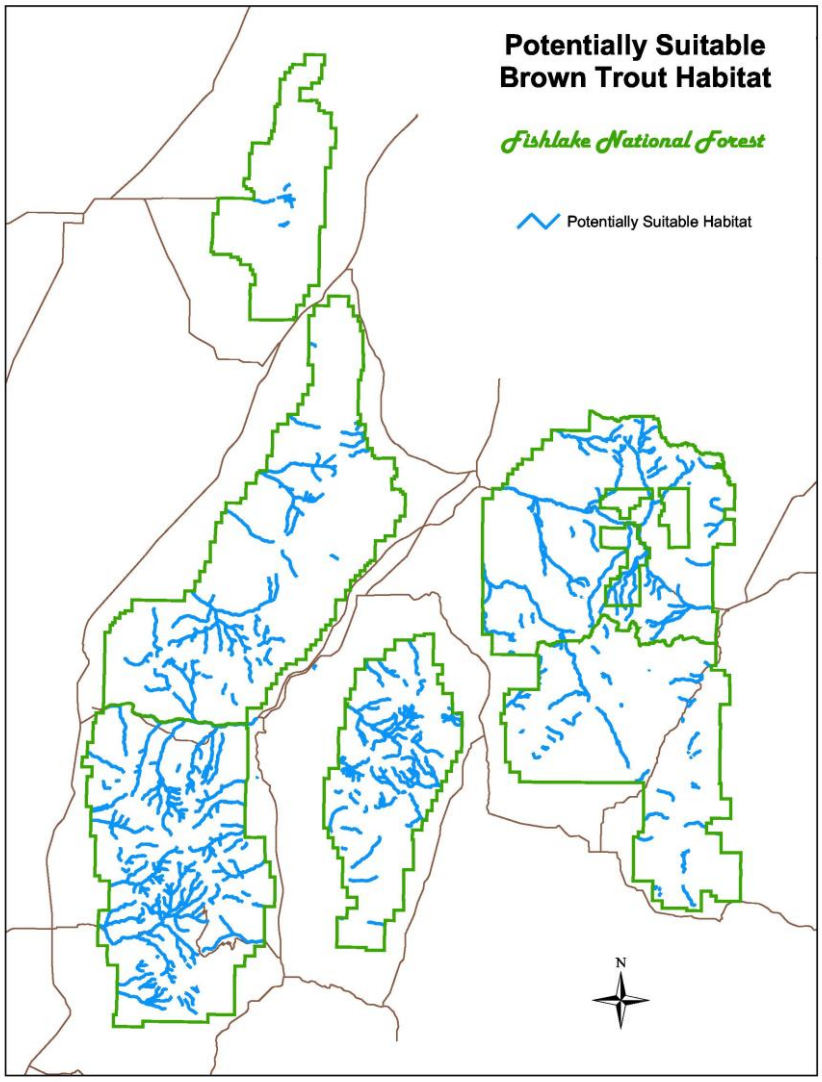
They prefer cold water with temperatures ranging up to 26°C. Preferred habitat includes areas of boulders, cobble, logs, rootwads and overhead cover. Brown trout will feed in riffles containing rock as small as gravel.

They feed actively in the morning and evening. The smaller brown trout, less than 2 pounds, prey primarily on insects. The larger brown trout readily feed on fish, both game and non-game.

Brown trout prefer cool lakes and streams, though they are present in many of the lower elevation waters which are at times quite warm and in some cases polluted. Since they are able to withstand warmer and less-clear waters, brown trout have effectively established strong populations in areas that are not occupied by other trout species.

Brown trout populations are managed by the DWR in Utah, as are all fish and wildlife on the Fishlake National Forest. All regulations for the management of this species are developed through and interagency process, presented to RAC committees, and then approved by the Utah wildlife board. As a result of this process the Forest Service does not have direct control over the fate of brown trout on the forest. However, this species has stable populations across the forest. Drought conditions are serious and the effects to fish are still unknown. However, the above normal precipitation received during the winter of 2004 has began to replenish depleted aquifers that all trout species.

Below is a map displaying potentially suitable habitat for the brown trout on the Fishlake National forest. On the Fishlake National Forest brown trout occur on all four Ranger Districts. The map displayed below identifies approximately 1,053 miles of potentially occupied stream habitat and 4,680 acres of lake habitat across the forest.



Trend

The population trend of brown trout on the Fishlake National Forest is stable. As a result of a good hatchery program the DWR Southern Region, has a very successful fish-planting program for recreational use. Wild self-sustaining populations of brown trout also occur in many of the streams on the Forest. As a result of this, fish populations are always fluctuating slightly, but remain stable to slightly increasing, and viable across the forest. Dale Hepworth, DWR Fish Program Manager, Southern Region, provided information and support for this determination.

Brook Trout *(Salvelinus fontinalis)*

The brook trout is one of the most popular game fish in the United States. They are native to the eastern United States and have been widely introduced in the western United States (Sigler and Sigler 1996). The brook trout has been studied more than almost any other trout. The small fish are readily caught on both live baits and artificial lures; the large ones are exceptionally wary. Spinning and fly-casting are the more popular methods of catching them.

The brook trout has a streamlined, somewhat compressed body, which is about five times as long as it is deep. The color of the brook trout ranges from olive, blue-gray, or black on the back to white on the belly. Red spots, with or without bluish rings around them, are evident on side though they are not numerous.

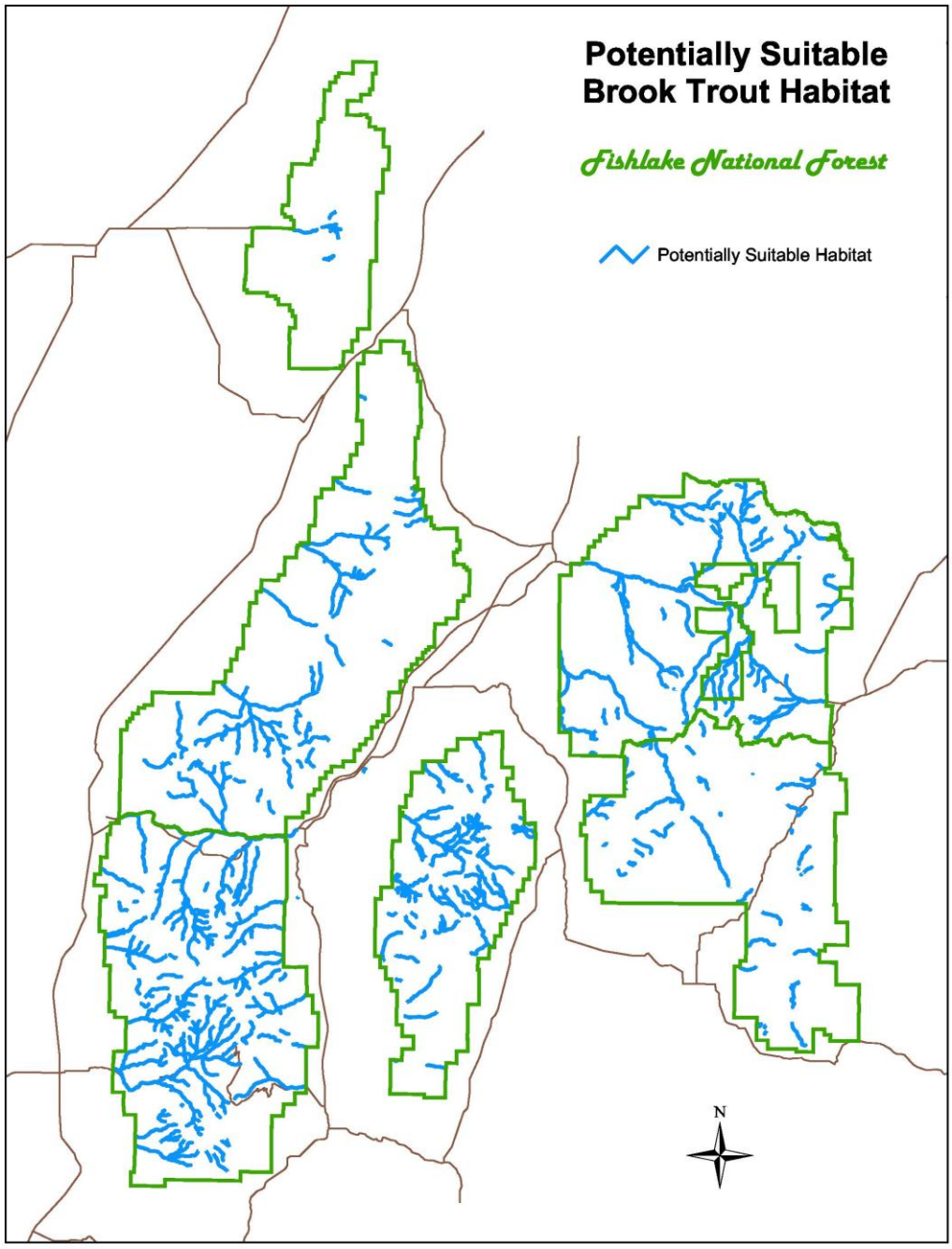
Brook trout growth rates are highly variable. Under favorable conditions (moderate temperatures, ample food supply) the species can grow very rapidly (Sigler and Sigler 1996). Brook trout attain the best growth from streams with an abundant supply of spring water, which keeps the stream relatively warm in the winter. In lakes, the growth rate may also be fast with lengths of 18 inches possible in 4 years.

These trout are voracious feeders. They feed primarily on insects throughout their lives. Occasionally, brook trout eat worms, mollusks, crustaceans, or other fish.

The spawning season occurs as early as late summer in the northern part of the range and as late as early winter in the southern portion. As the spawning season approaches, brook trout seek gravel riffles in spring-fed tributaries or spring seepage areas in lakes.

Brook trout attain their greatest abundance in cool, clear, headwater ponds and spring-fed streams. The species has been successfully stocked in lakes having cool, well-oxygenated lower layers of water. Stocking has occurred in lakes on the Richfield and Loa Ranger Districts with good success. However, during drought years and low water, winterkill is a problem. There are also stream populations on the Richfield and Loa Ranger Districts.

Displayed below is a map of potentially suitable habitat across the forest. On the Fishlake National Forest brook trout occur on all four Ranger Districts. The map displayed below identifies approximately 1,053 miles of potentially occupied stream habitat and 4,680 acres of lake habitat across the forest.



Trend

The population trend of brook trout on the Fishlake National Forest is stable. As a result of a good hatchery program the DWR Southern Region, has a very successful fish-planting program for recreational use. Wild self-sustaining populations of brook trout also occur in several Forest streams. As a result of this, fish populations are always fluctuating slightly, but remain stable or slightly increasing, and viable across the forest. Dale Hepworth, DWR Fish Program Manager, Southern Region, provided information and support for this determination.

Lake trout (Salvelinus namaycush)

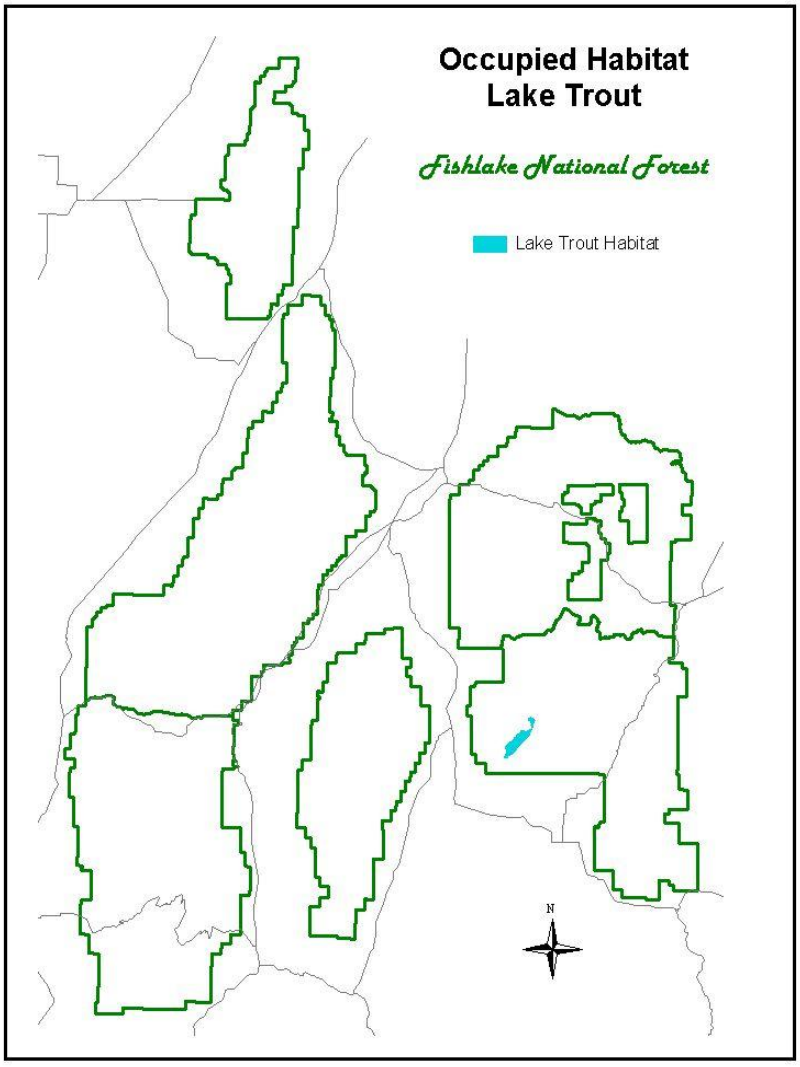
Lake trout are a medium to dark gray or olive color with white worm-like wavy marks on their backs and on top of the head. Occasionally, they have bars or spots along the side mainly tinged with red.

This species is native to the Great Lakes and prefer deep, coldwater lakes throughout North America. They are usually found offshore in deep, well oxygenated water. In Lake Erie, lake trout are usually not found in Ohio waters, but can be found in low numbers in the East Central and Eastern basins. These populations are maintained by annual stockings in Pennsylvania and New York.

On the Fishlake National Forest, they spawn on reefs in the fall. Eggs hatch in the spring and young lake trout usually move to deeper water after a short time. Adult fish are opportunistic feeders their diet consisting of aquatic insects, crustaceans, and a range of fish species, including small lake trout and other trout species. The lake trout is a slow growing, long-lived species that does not become sexually mature until age seven or eight. Lake trout populations in Fishlake have been present since the early 1940's

Lake trout average between 20 and 24 inches and 3 to 6 pounds, but are capable of reaching in excess of 50 pounds.

Displayed below is a map of occupied habitat that only occurs in Fish Lake.



Trend

The following information is from Chamberlain (Utah Division of Wildlife Resources fisheries biologist, personal communication 2002), which will be released in a UDWR publication in the near future. Lake trout were first stocked into Fish Lake shortly after the turn of the century. Lake trout numbers were maintained by periodic stocking until about 1991. The original prey species for lake trout in Fish Lake was the Utah chub. Two changes have occurred since lake trout were introduced which has changed the ecology of this species. The first was the accidental introduction of Eurasian milfoil, which has chocked out the native bottom growing weed bed that occurred around the lake. The second was the illegal introduction of yellow perch to Fish Lake in the early 1970s. Towards the end of the 20th century yellow perch began to out compete and displace the Utah chub, reducing forage biomass for lake trout (which do not eat the

spiny fish). This was likely exacerbated by the thick, non-native weed growth that protects perch from other fish predators in the lake.

Stocking was ceased in about 1991. Data to that date indicated stocking was unnecessary to maintain lake trout numbers. Due to concern about the reported decline of large lake trout and to ensure a viable lake trout fishery, trend netting (fall gill netting over spawning reefs) by the Utah Division of Wildlife Resources has continued every other year since then. Some food analysis work has also occurred. This work has shown that there are still high numbers of smaller lake trout below 22 inches that primarily feed on aquatic insects and crustaceans. There are few lake trout from 22-26 inches, which is a critical size where lake trout switch to feeding on fish. Suitable sized Utah chub needed for prey are now limited. The fewer number of lake trout which are able find sufficient smaller fish prey to grow to 26 inches then do quite well, as lake trout over 26 inches are large enough to prey on the stocked rainbow trout.

In summary, lake trout numbers have remained relatively stable, but a reduced number make it through the 22-26 inch bottleneck to become trophy lake trout. The Utah Division of Wildlife is analyzing the data to determine if management changes, such as increased harvest of smaller lake trout, could increase numbers of larger trophy lake trout in Fish Lake. Dale Hepworth, DWR Fish Program Manager, Southern Region, provided information and support for this determination.

AQUATIC MACROINVERTEBRATE BIOTIC CONDITION INDEX (BCI) TREND 1986-2002

The following information concerning aquatic macroinvertebrate monitoring discusses trend from 1996-2002. Data was collected in 2003 and 2004, however, due to the 2-year analysis time that these samples take from the laboratory, current data is still not available.

Aquatic macroinvertebrates are invertebrates that live in water and can be seen by the unaided human eye. They provide an important ecological link between microscopic food organisms and fish. Because of their strict habitat requirements they are useful indicators of aquatic habitat conditions and changes (Mangum 1986). Aquatic macroinvertebrates include insects, such as the commonly thought of mayflies, stoneflies, caddisflies, and diptera (two-winged flies), crustaceans, mollusks, and freshwater earthworms (Mangum 1986). Many of these groups are most highly developed in running water environments, as still water lakes and ponds are generally short-lived geologically (Hynes 1970). Stony fast water streams have remarkably similar major fauna groups throughout the world (Hynes 1970). The current force exerted by fast water streams is one of the most significant characteristics of their habitat, and aquatic macroinvertebrates have evolved a variety of anatomical and behavioral adaptations to it. These include a flattened body, streamlined shape, suckers, friction pads and hooks, small size, secretions, ballast (such as caddisfly houses), living in slow water among vegetation or friction layers on the stream bottom, upstream movement in the water, and upstream dispersal of winged adults (Hynes 1970). Many small insect stages utilize habitat deep in the gravel of streams (the hyporheic zone). For example, a study in southern Colorado found the nymphs of many chlorperlid stoneflies were not available in surface sediments until just before emergence; the authors surmised their use of hyporheic habitat (DeWalt and Stewart 1995).

Hafele and Roederer (1987) provide a short summary of aquatic insect life cycles in a stream. Aquatic insects go through a series of life stages in a stream. Insects with incomplete metamorphosis go through three stages: egg, nymph, and adult. This group includes the mayflies and stoneflies. Insects with complete metamorphosis go through four stages: egg, larva, pupa, and adult. This group includes the caddisflies and dipteria. The eggs hatch into young nymphs and larva. The majority of their life will be spent in the nymph or larva stages. While growing these go through a variety of stages called instars. It is these nymph and larval stages that are usually collected in aquatic macroinvertebrate samples. The nymphs and larva (which go through a pupal stage first) then leave the water through emergence to become winged adults. The adults reproduce and lay eggs, completing the cycle.

The most resistant life stage of many aquatic insects is the egg. Hynes (1970) noted eggs of many aquatic insects could survive dry for many months and gave an example of several taxa that survived a D.D.T. treatment of a tropical stream, presumably as eggs. According to Hynes (1970) extended hatching periods are common in many aquatic stream insects. Aquatic insects have a variety of life cycles with a few having multiple generations per year, many having one generation per year and some taking more than a year for each generation. Even with species that have annual generations, there may be

overlapping generations (Hynes 1970). These factors increase the likelihood that the more resistant egg stages are present over prolonged periods, reducing the impacts of a short-term environmental disturbance such as flooding. These cyclic and highly variable populations also mean that monitoring of individual taxon populations is unfeasible for land management monitoring purposes.

Aquatic macroinvertebrates are responsive to changes in aquatic habitat condition due to land management actions. Mangum (1975) found a reduction in numbers and biomass of aquatic macroinvertebrates in the North Fork of Three Creeks, Utah, likely due to sedimentation from construction. In the Provo River, Utah, low numbers of macroinvertebrates were attributed by Mangum (1975) to artificially low winter streamflow and scouring from artificially high summer flows resulting from interbasin water transfers. In the Fremont River, Utah, Mangum (1975) found very low numbers of taxa at the station below Johnson Reservoir. Water chemistry, low winter flows, and siltation were likely causes of the depauperate flora at this site. Many land management actions have resulted in chronic impacts. These chronic impacts likely have long-term impacts on macroinvertebrate community structure.

Evaluations of aquatic invertebrates are complicated by the naturally dynamic nature of their communities. For example, Hynes (1970) found large variations in species composition for no apparent reason. He described a nine-year study where composition of the fauna varied considerably among years despite consistent sampling, timing of samples to avoid emergence, and a lack of obvious change in the stream. Seven years into the study *Baetis* became very abundant and several other species quite scarce. This change persisted for two more years.

Biomass and numbers of aquatic insects can undergo patterns of seasonal change. Losses are caused by predation and emergence of adults (Hynes 1970). A study in eastern Idaho found large unexplained changes in aquatic macroinvertebrate numbers over 3 years (Platts and Andrews 1980). In some cases natural disturbances can result in new taxa being found. Hynes (1970) relates two examples of streams that dried up and then refilled which had new species appear for a while and then disappear again.

Robinson et al. (1993) noted a loss of 10 taxa (almost a third of all taxa) during the spring runoff season of a snowmelt stream subject to high seasonal runoff. The snowmelt stream had more mobile taxa compared to a stable flow groundwater stream.

Hynes (1970) discussed how summer high water flows had reduced the macroinvertebrate fauna in a stream. Cloudburst flood in early August left the streambed barren two weeks later. Macroinvertebrate numbers increased dramatically, peaking about 2 months later, with the initial recovery dominated by Chironomidae and Simuliidae. The Ephemeroptera, Trichoptera, and Plecoptera reappeared more slowly. While flooding may lead to an upstream decrease of insects, it can increase drift and numbers of insects downstream, which can rapidly recolonize lower stream reaches (Hynes 1970).

Low streamflows are another natural factor that affects aquatic macroinvertebrates. Winget and Mangum (1979) describe macroinvertebrate samples from the West Fork of the Duchesne River, Utah, which dropped from 36 taxa to 30 taxa over the course of one year. Analysis showed clean water species were eliminated by drought conditions.

Hynes (1970) discussed a rapid resurgence of aquatic macroinvertebrates (Chironomidae) after a drought. Fire is also a natural disturbance that affects aquatic macroinvertebrates. A study in central Idaho showed that wildfire disturbed streams had lower species richness than streams in nearby undisturbed watersheds (Richards and Minshall 1992).

Biotic Condition Index (BCI)

The Biotic Condition Index (BCI), developed by Winget and Mangum (1979), provides a quantitative measure of aquatic health due to overall watershed condition, land management activities, and natural disturbances. The BCI incorporates water quality (sulfate and alkalinity), stream habitat (substrate and gradient), and a database of environmental tolerances of aquatic macroinvertebrate taxa. The environmental tolerances database is a rating of each taxon's tolerance to organic enrichment and sedimentation. The BCI is calculated by dividing the predicted community tolerance quotient based on the water quality and stream habitat by the actual sampled community tolerance quotient. Advantages of the BCI is that it is sensitive to different types of stress, gives a linear assessment of conditions from unstressed through all levels of stressed, and it evaluates a streams condition against its own potential (Winget and Mangum 1979). A BCI rating above 90 is considered excellent, 80-90 good, 72-79 fair, and below 72 poor.

Since the BCI measures the average community tolerance quotient based on all of the taxa found at a site, it is robust to changes in individual taxon population levels. While one taxon may be temporarily absent due to the recent emergence of adults and reproduction, other taxa with similar tolerance quotients will still be collected. Averaging the individual tolerance quotients to obtain the community tolerance quotient then obtains a mean representative value which has minimal fluctuation despite changes in individual taxon population levels.

The intent of the Fishlake N.F. Forest Plan to use the BCI rather than population as the trend indicator is shown in the Forest Plan Standard and Guideline "Maintain a Biologic Condition Index (BCI) of 75 or greater" (page IV-19). This is also why the "Macroinvertebrate" estimated population level in MIS Table II-8A (page II-29) is listed as N/A, or Not Applicable.

Aquatic macroinvertebrates respond to natural events, which can affect the BCI values and confound making interpretations of changes due to land management actions. This can be dealt with both through good study design (such as including a control station above a study area where management changes will occur) and detailed notes taken during sampling noting both ongoing land management activities and natural events and changes.

Aquatic Macroinvertebrate Sampling

Sample collection has followed the standard R-4 protocol in the Forest Service Handbook (FSH) 2609.23, also described in Mangum (1986). Three similar riffle sites within a 100-foot stream section are selected for sampling. At each site a 250 micron Surber frame is placed over the gravel/cobble substrate with the net on the downstream side. Rocks

within the frame are hand scrubbed and the current carries the macroinvertebrates into the net. After the larger rocks are scrubbed the underlying gravel within the frame is stirred by hand to a depth of 3-4 inches. The net is then inverted into a pan containing a saturated saline solution to help float organisms to the top for easier collection. Larger, heavier items such as caddisfly cases are collected separately and placed in a sample bottle. The sample is gently stirred and the saline solution is poured through a sieve several times. Finally, the sample in the sieve is placed in the sample bottle and preserved in an alcohol solution. Additional data is collected at each station including alkalinity, sulfate, gradient, and substrate composition, which are used to calculate the BCI.

The Forest Plan monitoring schedule is to sample macroinvertebrates in 5 streams/year. This has been met on average. Sampling location selection has primarily been driven by interest in key watersheds on the Forest or for baseline data or monitoring for specific project activities. In other words, sampling has been more tactically oriented than strategically oriented.

Laboratory Analysis

The 1986-1997 samples were sent to the Aquatic Ecosystem Laboratory (AEL) located at Brigham Young University in Provo, Utah. Laboratory analyses procedures are described in Mangum (1997). The macroinvertebrates were keyed to species when keys were available (generally mayflies), and others generally to genus, but some groups were keyed only to family, class, or order. The BCI index was then calculated. By 1999 the AEL was no longer in operation, requiring a change in laboratories. The 1999-2001 samples were sent to the National Aquatic Monitoring Center at Utah State University in Logan, Utah. Methodology is similar but does not include the DAT diversity index.

Loa Ranger District

Loa RD	**YEAR**																
STATION	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**
7 mile 1	88	-	-	-	-	-	-	-		70/83	81/83	-	-	-	76	-	-
7 mile 2	89	89/100	85/100	79	80/95	-	-	78	-	75/86	73/83	-	-	-	74	73	-
7 mile 3	88	89/82	79/79	88	78/81	-	-	70	-	67/72	71/71	-	-	-	82	-	-
7 mile 4	85	92/81	72/81	76	61/74	-	-	-	-	-	-	-	-	-	69	-	-
UM Cr	-	92	81/96	82	82/91	-	-	57	-	-	-	61	-	59	60	-	-
RF UM	-	-	-	-	-	-	-	-	-	-	-	-	-	72	74	77	-
LF UM	-	-	-	-	-	-	-	66	-	-	-	65	-	-	-	-	-
UM Dan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70	-
UM Can	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	65	-
UM For	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	77	-

Note: BCI data for the table is found in Mangum (various dates) and Vinson (various dates). These reports are on file at the Fishlake N.F. Supervisor's Office.

Overall trend on the Loa Ranger District is down slightly after peaking in the late 1980s, with generally static trend since the early 1990s.

The Loa Ranger District has one of the best long-term aquatic macroinvertebrate data sets on the Fishlake N.F. on Seven mile and UM Creeks. BCI values on both creeks peaked in the late 1980s, and have since been on a downward trend. Three of the four sites on Seven mile Creek are basically still at or above Forest Plan standards in the most recent samples. One site is slightly below standards. UM Creek has been basically static at below standards since the early 1990s, including one of the two headwater stations. The other headwater station is slightly below standards. UM Creek has been visually observed to be in relatively poor condition. In addition, rotenone treatments in the early 1990s may have had an effect on BCI values. Whelan (2002) found another Forest creek to rebound after treatment, but notes that poor habitat conditions might delay recovery after treatments.

Richfield Ranger District

Richfield RD	**YEAR**																
STATION	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**
Salina 1	-	75/70	72	71/75	65/67	-	-	-	-	-	-	-	-	67	-	-	-
Beaver trib	-	-	-	-	-	-	-	-	-	-	-	-	-	64	-	-	-
Salina 2	-	76/91	74	82/71	71/71	-	-	-	-	-	-	-	-	71	-	-	-
Manning T	-	-	81	-	77/84	-	-	-	-	76	-	73	-	79	-	-	-
Manning 7.0	-	-	-	-	-	-	-	-	-	-	-	-	-	79	-	-	-
Manning L	-	-	-	-	-	-	-	-	-	66	-	65	-	63	-	-	-
Manning 3	-	-	-	-	-	-	-	-	-	-	-	70	-	-	-	-	-
Willow Up	-	-	-	-	-	-	-	-	-	76	-	-	-	65	-	-	-
Willow Lo	-	-	-	-	-	-	-	-	-	78	-	-	-	70	-	-	-
Box Cr 1	-	-	-	-	-	-	-	-	-	67	-	-	-	-	-	-	-
SF Box 2	-	-	-	-	-	-	-	-	-	-	-	-	-	53	-	-	-
NF Box 2	-	-	-	-	-	-	-	-	-	-	-	-	-	69	63	65	-
NF Box 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76	73/78	-
NF Box 4	-	-	-	-	-	-	-	-	-	-	-	-	-	--	73	73/76	-
Gooseberry5	-	-	-	-	-	-	-	-	-	74/71	77/82	-	-	-	79	-	-
Gooseberry7	-	-	-	-	-	-	-	-	-	-	71/75	-	-	-	-	-	-
Gooseberry8	-	-	-	-	-	-	-	-	-	-	70/76	-	-	-	-	-	-
Goose FSB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	77	-	-
Goose.URdC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	65	-	-

Goose.BelSC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	-	-
Niotche 4	-	-	-	-	-	-	-	-	-	71/85	81/82	-	-	-	-	-	-
NiotcheL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	83	-	-
NiotcheU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	-	-

Note: BCI data for the table is found in Mangum (various dates) and Vinson (various dates). These reports are on file at the Fishlake N.F. Supervisor's Office.

Overall trend on the Richfield Ranger District is down slightly after peaking in the late 1980s, with generally static trend since the early 1990s. Long-term data sets are limited to the upper Salina Creek and Manning Creek watersheds.

Salina Creek peaked at levels at or slightly above Forest Plan standards in the late 1980s. Trend between 1990-1999 was static at slightly below standards.

Upper Manning Creek peaked in the late 1980s. The BCI declined in 1997 following the 1995 and 1996 rotenone treatments, which indicated a loss of some of the more sensitive invertebrate species. The BCI index basically recovered to pre-treatment levels (above standards) by 1999. It is believed other land management activities may have prevented the BCI recovery of a more recent downstream station that was below standards and declined slightly following treatment (Whelan 2002).

Other streams sampled on the district have only been sampled in 1995 or later. Willow Creek declined in trend and is now below standards. Other creeks appear to be static in trend, with lower North and South Forks of Box Creek below standards and the remaining creeks at or above standards.

Fillmore Ranger District

Fillmore RD	**YEAR**																
STATION	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**
Corn FSbdr	-	-	-	-	-	-	-	-	-	-	65/68	-	-	-	-	-	-
Corn Cr 1	-	90/79	70/72	71/82	73	-	-	-	-	-	-	65	-	-	59	-	-
Corn Cr 2	-	77/75	79/78	82/86	80	-	-	-	-	-	-	74	-	-	61	-	-
Chalk Cr 1	-	-	-	80	67	-	-	-	-	-	-	-	70	-	-	-	-
Chalk Cr 2	-	-	-	78	73	-	-	-	-	-	-	-	99	-	-	-	-
SamStowe	-	-	-	-	78/71	-	-	85	75	-	-	-	-	64	-	-	-
Meadow 1	-	-	-	-	-	-	-	-	70	-	-	-	59	56	-	-	-
Meadow 2	-	-	-	-	-	-	-	-	68	-	-	-	70	65	66	-	-
Oak Cr 1	-	-	-	-	-	-	-	-	-	-	-	-	67	-	-	-	-
Oak Cr 2	-	-	-	-	-	-	-	-	-	-	-	-	64	-	-	-	-

BCI data for the table is found in Mangum (various dates) and Vinson (various dates). These reports are on file at the Fishlake N.F. Supervisor's Office.

Overall trend on the Fillmore Ranger District is down slightly after peaking in the late 1980s, with generally static trend since the early 1990s.

Corn Creek BCI values peaked in the late 1980s. More recent samples in the late 1990s have declined to below standards, probably showing continued after effects from the severe 1996 wildfire in the drainage. Chalk Creek showed a downward trend at one station, but an upward trend at the other station. One station was above standards and the other slightly below.

Sam Stowe Creek had relatively static trend through the early 1990s, but a drop in trend to below standards by 1999. This could be due to long-term drought effects, possibly in combination with the stream renovation treatment. One Meadow Creek station showed downward trend, but the other station was basically static. Both were below standards.

Beaver Ranger District

Beaver RD	**YEAR**																
STATION	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**
Birch Cr	-	75/85	74/85	82	-	-	-	-	-	-	-	-	63	69	-	-	-
Birch Cr 2	-	-	-	-	-	-	-	-	-	-	-	-	66	68	-	-	-
Merchant	-	96/94	91	94	-	-	-	72	-	-	-	-	79	86/76	-	-	-
Merchant2	-	-	-	-	-	-	-	79	-	-	-	-	-	-	-	-	-
WF Merc.	-	91/92	92	98	100	-	-	-	-	-	-	-	-	72	-	-	-
NF 3Cr 1	-	-	98/82	100	100/100	-	-	-	-	-	-	-	-	79	-	-	-
NF 3Cr 2	-	-	78/91	91	100/94	-	-	-	-	-	-	-	-	87	-	-	-
Indian Cr1	-	-	-	-	-	-	-	72	-	-	-	-	-	75	-	-	-
Indian Cr2	-	-	-	-	-	-	-	66	-	-	-	-	-	-	-	-	-
Whisky 1	-	-	-	-	-	-	-	-	-	61	-	-	-	-	-	-	-
Pine 1	-	-	-	-	-	-	-	-	-	-	-	-	62	71	-	-	-
Pine 2	-	-	-	-	-	-	-	-	-	-	-	-	-	71	-	-	-
NFNC 1	-	-	-	-	-	-	-	-	-	-	-	-	68	68	-	-	-
NFNC 2	-	-	-	-	-	-	-	-	-	-	-	-	73	71	-	-	-
Beaver R	-	-	-	-	-	-	-	-	-	-	-	-	-	78	-	-	-
10Mile UP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	81	-	-
10Mile Lo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	94	-	-
Birch E 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76	-
Birch E 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70	-

Note:

BCI data for the table is found in Mangum (various dates) and Vinson (various dates). These reports are on file at the Fishlake N.F. Supervisor's Office.

Overall trend on the Beaver Ranger District is down slightly after peaking in the late 1980s, with generally static trend since the early 1990s.

The upper Beaver River watersheds of Merchant Creek, West Fork of Merchant Creek, and North Fork of Three Creeks all peaked in the late 1980s, and have declined slightly since, but generally remain at or above Forest Plan standards.

Birch Creek (W) also peaked in the late 1980s, and has declined to slightly below standards by the late 1990s. Visual observation has noted both habitat problems and reduced water flows due to drought, which are both probably responsible for the decline. The district has taken recent action in 2001-2002 to rebuild and repair exclosure fences, which should result in improved habitat conditions on the creek.

Other streams sampled on the district have only been sampled from 1993 on and are generally only 1 sample per station or two samples in back to back years precluding long-term trend analysis. One Indian Creek station with two samples showed slightly improving trend, reaching the Forest Plan standard.

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