

**LIFE HISTORY AND ANALYSIS OF  
ENDANGERED, THREATENED,  
CANDIDATE, SENSITIVE, AND  
MANAGEMENT INDICATOR  
SPECIES  
OF THE  
DIXIE NATIONAL FOREST**

**VERSION 4.0, REVISED February 2004**

**Formerly called: Life History of Threatened, Endangered, and Sensitive Species of the Dixie National Forest.**

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# Forest Plan Management Indicator Species Summary

The Land and Resource Management Plan (LRMP) for the Dixie National Forest, adopted in 1986, identified 12 management indicator species (MIS). In addition to this list all Federally listed endangered or threatened plant or animal species that might be affected by management activities are also included. The following MIS are included in this document: Mule Deer, Rocky Mountain Elk, Wild Turkey, Northern Goshawk, Northern Flicker, Bonneville Cutthroat Trout, Resident Trout: Rainbow, Brook, Brown, and Cutthroat trout. In addition to this list the following species are listed species, or candidate species and are included in this document: California Condor, Virgin River Chub, Woundfin, Mexican Spotted Owl, Bald Eagle, Utah Prairie Dog, Desert Tortoise, Last Chance Townsendia, and the Yellow-billed Cuckoo, Aquarius Paintbrush, and Rabbit Valley Gilia, which are Candidate species. The peregrine falcon was delisted in 1999 and placed on the sensitive species list and carried in that section of this document.

The reason these species were selected as MIS is described in the Dixie LRMP Chapter II page 14-17. The objective was to select species that through monitoring their populations and habitat relationships we could measure the effects of Forest Service management activities on all the fish, and wildlife that occur on the Forest.

The Dixie LRMP identifies the vegetation types these species represent in Table II-12, on page II-14. These include:

**Mule Deer:** Grass-forb, sagebrush, mountain brush, pinyon-juniper, sapling-mature aspen, sapling-mature conifer

**Rocky Mountain Elk:** Grass-forb, sapling-mature aspen, sapling-old growth conifer

**Wild Turkey:** Mountain brush, pole-mature aspen, mature-old growth conifer

**Northern Goshawk:** Riparian tree, mature aspen, mature-old growth conifer

**Northern Flicker:** Mature aspen, mature conifer

**Bonneville Cutthroat Trout:** Pristine headwater streams

**Resident Trout: Rainbow, Brook, Brown, Cutthroat Trout:** Streams, rivers, 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 16a of the Dixie LRMP, acreage estimates for existing habitat, and potential habitat were documented for all MIS. This document makes similar acreage estimates based on the most current data in the Forest's geographic information system (GIS) database located in the Supervisors Office (SO), Cedar City, Utah. The habitat estimates by acres for existing and potential habitat contained within the plan were used to compare against current habitat estimates based on more current data. 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 such events include: fire, flood, wind events, drought, cold, wet winter conditions, geologic movement, human caused changes such as effects from hunting seasons, or fish population contamination (whirling disease), predators or other rapid large scale vegetation changes on the landscape.

## Forest Wide Vegetation Summary

The dominant vegetation types on the Forest are discussed in the Dixie LRMP (II-18) in terms of quality and quantity as they relate to specific habitats for MIS. The total acres displayed in the plan (II-19, table II-14) 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, turkey, goshawk and northern flicker.

**Mountain Brush:** MIS for this type are: mule deer, and wild turkey.

**Spruce-fir:** The MIS most closely associated with this type are elk and goshawk.

**Mixed Conifer:** MIS most closely associated with this vegetation type are elk and goshawk.

**Pinyon-Juniper:** Mule deer make more use of this type than any other MIS.

**Sagebrush:** Mule deer make more use of this type than any other MIS.

**Ponderosa Pine:** Wild turkeys are more closely associated with this type than any other MIS.

**Riparian Areas:** These areas attract many species of wildlife, including all MIS.

## **Population Estimates and Scale of Analysis**

Populations of wildlife are extremely difficult to quantify, and in many cases can vary substantially from year to year. Environmental factors can dramatically influence the recruitment of young and 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 Dixie 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, and 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 they 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, and the United State Geological Survey, Breeding Bird Survey (BBS) were used in the discussions on trend. For far ranging species such as elk who can range across multiple forest boundaries and land ownerships, broad scale data was obtained from the Division of Wildlife Resources, Southern Region (36 CFR 219.19 (6)).

# ENDANGERED SPECIES

## California Condor (*Gymnogyps californianus*)

The California condor was federally listed as endangered on March 11, 1967 (32 FR 4001), and state listed as endangered on June 27, 1971. Critical habitat was designated on September 24, 1976 (41 FR 187), in Tulare, Kern, Los Angeles, Ventura, Santa Barbara, and San Luis Obispo Counties. The *Condor Recovery Plan* was revised in 1996. To assist in the recovery of condors, a captive breeding program was established in 1981 to provide captive-reared condors to release to the wild. The Service began reintroducing California condors to the wild in 1992, and as of March 26, 1999, 34 birds in California and 22 birds in Arizona are being closely monitored in the wild. Because of deaths from contact with power lines, condors started undergoing power line aversion training in 1995 before their release. In 1997, two more condors died as a result of power line collisions (Service 1998).

The California condor is a member of the Cathartidae family or new world vultures. With a wingspan of nearly 3 meters (10 feet) and weighing approximately 10 kilograms (22 pounds), it is one of the largest flying birds in the world, as well as one of the most rare. Adults are black except for white underwing linings and edges of the upper secondary coverts. The head and neck are mostly naked; the skin on the neck area is gray, grading into various shades of yellow, red, and orange on the head. Males and females cannot be distinguished by size or plumage characteristics. Condors do not kill for food but feed on available carrion.

During the Pleistocene era (10,000 to 100,000 years ago) the California condor ranged from British Columbia, Canada to Baja California, Mexico and through the southwest to Florida and north to New York State. With the extinction of the large Pleistocene Era mammals, condors declined in range and numbers. Another large decline occurred when European settlers arrived on the West Coast, and accelerated during the gold rush of 1849. Condors were wantonly shot and poisoned, and eggs and adults were collected. By 1940, the condors' range was reduced to a horseshoe-shaped area in southern California that included the coastal mountain ranges of San Luis Obispo, Santa Barbara and Ventura Counties; a portion of the Transverse Range in Kern and Los Angeles Counties; and the Southern Sierras in Tulare County. The last wild condor was captured in 1987; young birds raised in captivity have been reintroduced into the wild in western Monterey County, eastern San Luis Obispo County, and eastern Santa Barbara County in California, and near the Grand Canyon in Arizona.

The principal foraging regions used by condors since the late 1970s have been the foothills bordering the southern San Joaquin Valley and axillary valleys in San Luis Obispo, Santa Barbara, Kern, and Tulare Counties. Typically, foraging sites are in grasslands or oak-savannah regions at lower elevations, and roosting and nesting sites are located at higher elevations on cliffs. The important foraging areas are primarily private grazing lands.

The California condor declined over the past century to such a low level that only 21 individuals existed in 1982. Reasons for decline include human persecution, egg collecting, pesticides, lead poisoning, habitat loss, and the decline of its prey base of large and medium-size native mammals due to encroachments of agriculture and urbanization. Since reintroduction, five birds have died from colliding with power lines.

The reintroduced birds in Arizona are being carefully monitored and have been detected as far north as Flaming Gorge Reservoir and as far east as Moab. No observations have been reported on the Dixie or Fishlake National Forests.

## **Virgin River Chub (*Gila seminuda*)**

The Virgin River chub is a rare minnow, endemic to the Virgin River system of southwestern Utah, southern Nevada, and northwestern Arizona. The Virgin River chub is currently listed as a federal and state endangered species, and critical habitat was designated in 2000. At present, the Virgin River chub is found within the mainstem Virgin River from Pah Tempe Springs, Utah, downstream to the Mesquite Diversion (near the Arizona-Nevada border) (USFWS 2000). There are no known populations of Virgin River chub on the Dixie National Forest.

Virgin River chubs are generally associated with deep, protected pools and runs with sand substrate (USFWS 2000). Spawning generally occurs in late spring and early summer over a gravel substrate. They are opportunistic feeders, whose diet is composed of zooplankton, aquatic macroinvertebrates, debris, and algae. The diets of many adults are almost exclusively composed of algae.

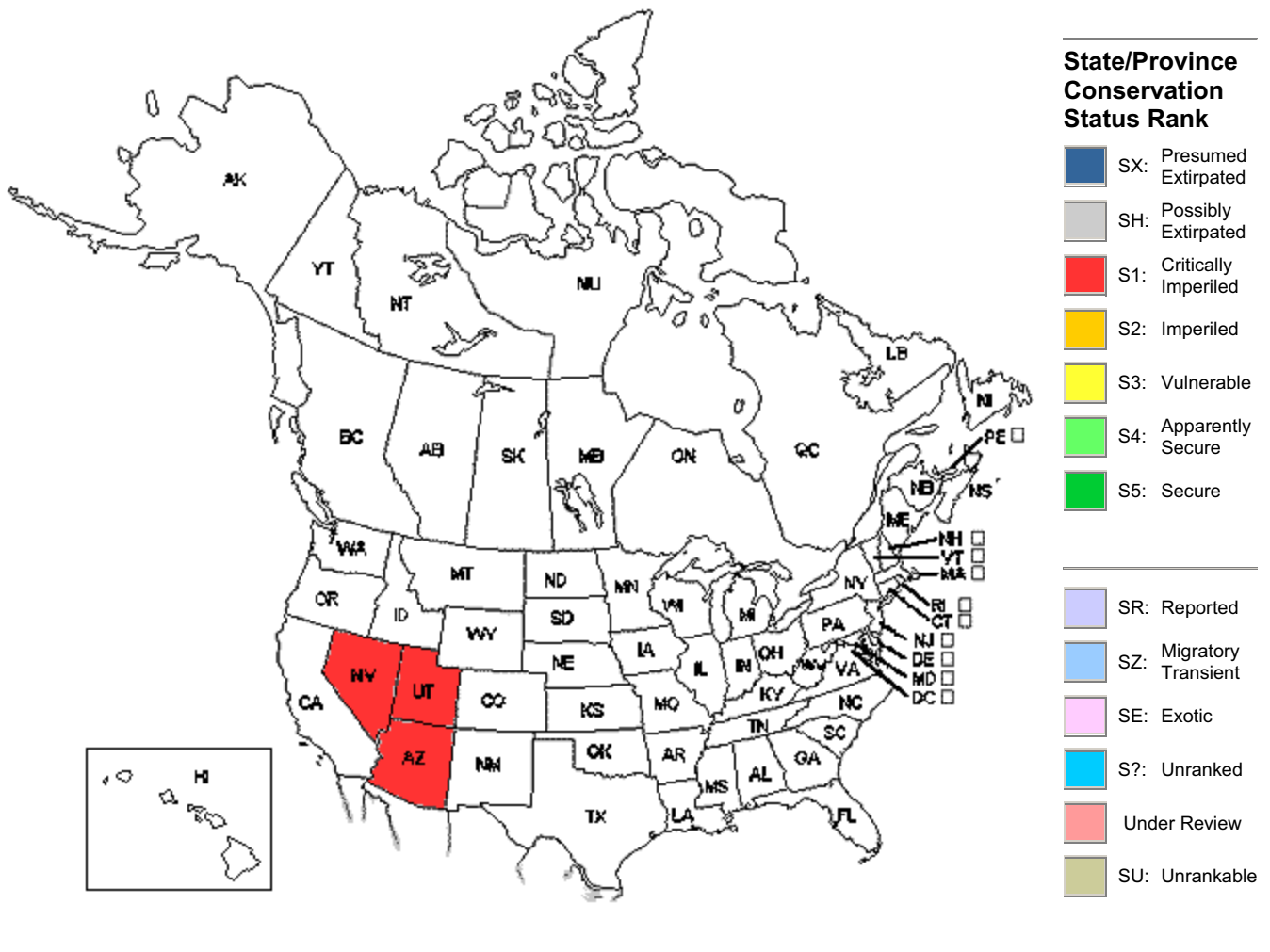
Major threats that have led to the decline in Virgin River chub populations, and their subsequent listing under the Endangered Species Act of 1973, include, exotic species and flow alterations. The red shiner (*Cyprinella lutrensis*) has been a particular nuisance, by out competing native fish for food and space (Sigler and Sigler 1996). Flow alterations (diversions, impoundments) have decreased the range of the species, and the connectivity of the Virgin River system.

### **Trend**

Virgin River chub habitat is limited due to alterations in the natural flow regime of the Virgin River system. Critical habitat has been designated along 140.1 kilometers of the mainstem Virgin River for the Virgin River chub (65.3 percent of its historical range) (USFWS 2000). Based on the Nature Conservancy status map displayed below, this species has been identified to be critically imperiled. The map displayed represents data from the Nature Conservancy 2002 database. Based on these data and this species federal listed status, trends for the Virgin River chub are presumed to be down.



Virgin River Chub *Gila seminuda*



NatureServe Explorer; an online encyclopedia of life. [web application]. 2002. Version1.6. Arlington, Virginia, USA: NatureServe. Available: <http://www.natureserve.org/explorer> (Accessed: May 6, 2003).

## **Woundfin (*Plagopterus argentissimus*)**

The woundfin is a rare minnow, endemic to the Colorado River system, specifically the Virgin and Gila River basins. The woundfin is currently listed as a federal and state endangered species, and critical habitat was designated in 2000. At present, the woundfin is restricted to the Virgin River mainstem from Pah Tempe Springs (Utah) downstream to Lake Mead (USFWS 2000). There are no known populations of woundfin on the Dixie National Forest.

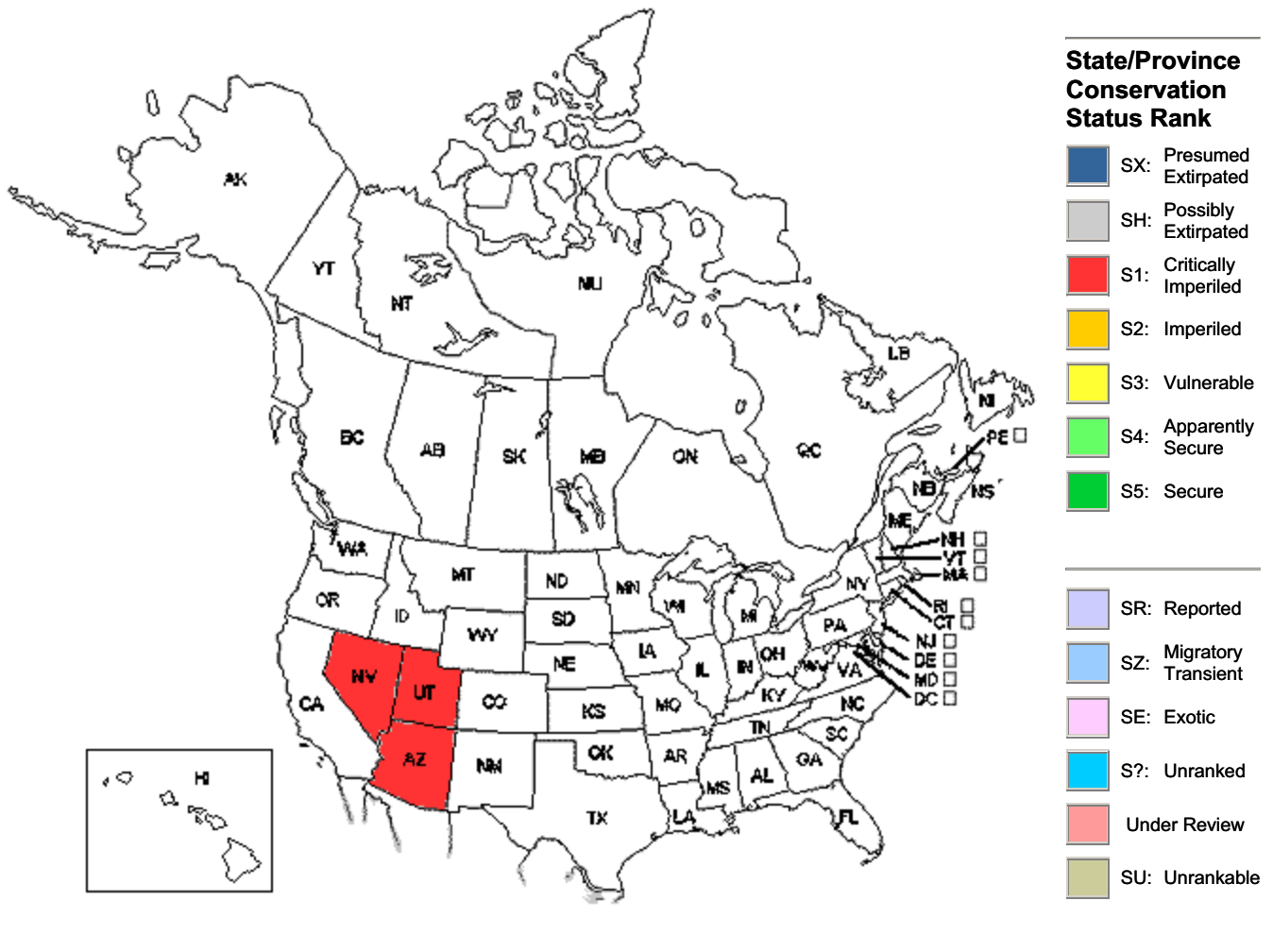
Adult woundfin may reach lengths of 3.5 inches, however, many are no more than 2.0 inches in total length (Sigler and Sigler 1996). Adults and juveniles are generally associated with runs and quiet waters adjacent to riffles with sand or sand/gravel substrates (USFWS 2000). Spawning occurs in the spring (April/May), when flows are optimum (between 60 and 200 cfs). Eggs are scattered randomly, and no parental care is provided. They are omnivorous and opportunistic feeders, whose diet is predominately composed of insect larvae and filamentous algae (Sigler and Sigler 1996).

Major threats that have led to the decline in woundfin populations, and their subsequent listing under the Endangered Species Act of 1973, include, exotic species and flow alterations. Dams, reservoirs, and water diversions have appreciably altered historic woundfin habitat. Flow alterations (diversions, impoundments) have decreased the range of the species, and the connectivity of the Virgin River system. The non-native red shiner (*Cyprinella lutrensis*) has been a particular nuisance, by out competing native fish for food and space (Sigler and Sigler 1996).

### **Trend**

The woundfin has been extirpated from the Gila River basin, and is only found in a portion of its historically occupied Virgin River basin habitat. Woundfin habitat in the Virgin River system is limited due to alterations in the natural flow regime and exotic species. Critical habitat has been designated along 140.1 kilometers of the mainstem Virgin River for the woundfin (12.5 percent of its historical range) (USFWS 2000). Based on the Nature Conservancy status map displayed below, this species has been identified to be critically imperiled. The map displayed represents data from the Nature Conservancy 2002 database. Based on these data and this species federal listed status, trends for the woundfin are presumed to be down.

Woundfin *Plagopterus argentissimus*



NatureServe Explorer; an online encyclopedia of life. [web application]. 2002. Version 1.6. Arlington, Virginia, USA: NatureServe. Available: <http://www.natureserve.org/explorer> (Accessed: May 6, 2003).

# THREATENED SPECIES

## **Mexican Spotted Owl (*Strix occidentalis lucida*)**

The Mexican spotted owl is listed as Threatened (USFWS 1993a) under the Endangered Species Act and is managed under the Mexican Spotted Owl Recovery Plan (USFWS 1995a). Also, according to Parrish et al. (1999), the Mexican spotted owl is listed as a Priority species due to a number of criteria, including relative abundance, population trend uncertainty, breeding distribution, and others. Critical habitat has been designated on the Escalante and Teasdale Ranger Districts on the Dixie National Forest.

Spotted owls in Utah are generally found in the pinyon-juniper zone, below the mixed conifer forests, not typical of owl habitat in Arizona and New Mexico. These birds select steep, narrow, cool canyons for roosting and nesting. These sites are characterized by small clumps of fir (*Abies* spp.) and deciduous trees growing within cool canyons or on steep north-facing slopes. 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 it supports. Spotted owls apparently use a wider array of habitat types for foraging than for nesting and roosting, including fairly open and non-contiguous forest, small openings, and pure ponderosa pine stands. Little is known about the habitat requirements for dispersal. Two Mexican spotted owls were detected on the Forest during winter months. Both locations were the results of a telemetry study, which was monitoring dispersal. In both cases the owls did not stay on the Forest.

Mexican spotted owls are mostly solitary outside of the breeding season. They have a low reproductive success of 0.5 young/pair. Age at first breeding is usually two years. Mexican spotted owls show high nest site fidelity.

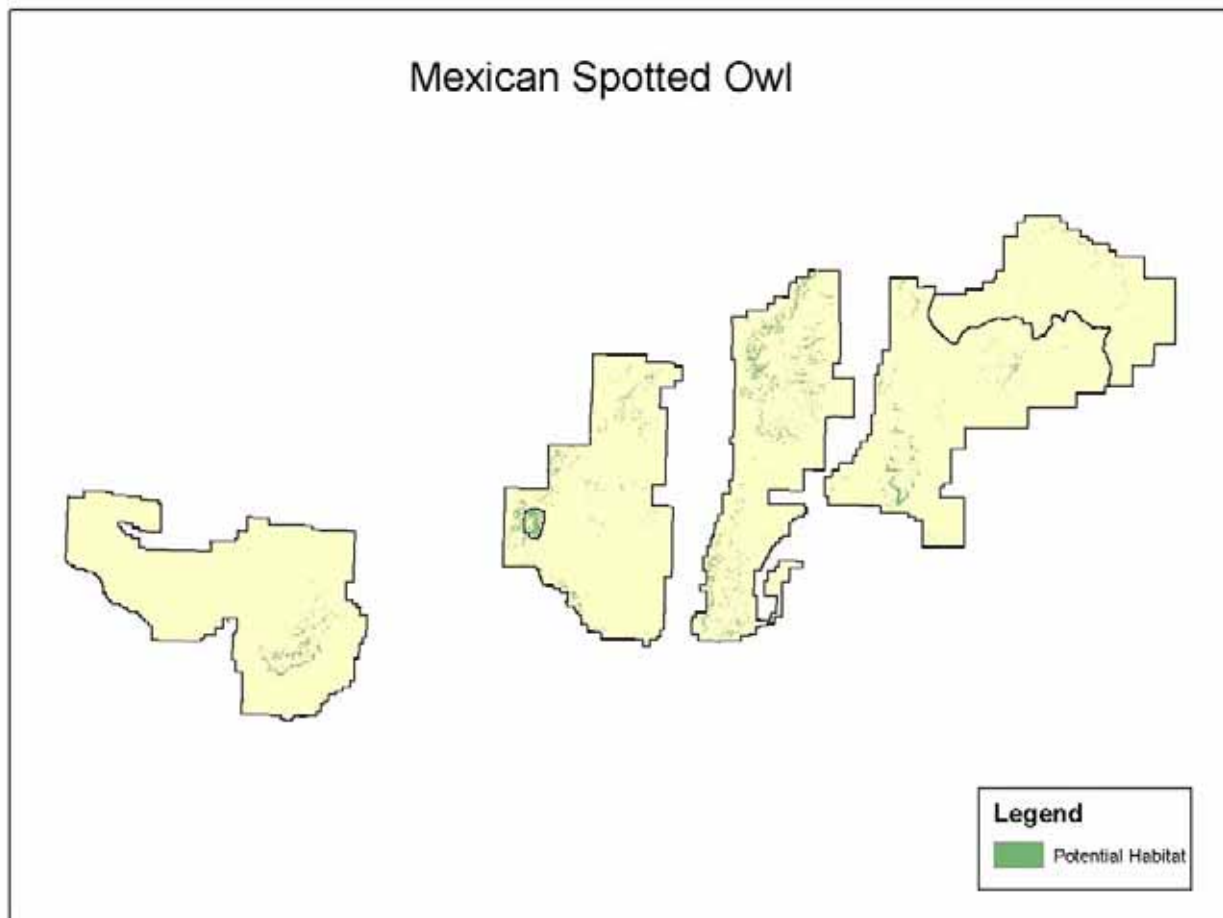
Reproductive season begins in early March when pair formation occurs. Two to four eggs are laid in mid-April, incubated 30 days and hatch mid-May. Owlets are fledged early- to mid-June (Spahr et al. 1991).

The earliest recorded spotted owls in Utah were in Zion National Park in June 1928 (Hayward et al. 1976). The most northerly occurrence was in 1958 in the Book Cliffs of northeast Utah. The largest population of Mexican spotted owls in Utah occurs in Zion National Park where surveys confirmed 17 sites in and around Zion National Park (Rinkevich 1991). Mexican spotted owls are generally absent from high elevations above 8,000 ft., with the only sightings in high elevations having been in June 1958 in an aspen grove (Behle 1960) and in 1990, a response at 10,000 feet on the Manti-LaSal National Forest (Willey 1990). Current Mexican spotted owl records in Utah indicate there are approximately 60 locations (Rodriguez 1996).

Spotted owls have been confirmed on the Cedar City (winter location), Teasdale, and Escalante Ranger Districts. No nesting Mexican spotted owls have been located anywhere on the Dixie National Forest. Birds located on the Cedar City Ranger District in the winter were found in non-canyon areas within a mixed conifer cover type; however, they were never relocated on the Forest. One of these birds was a radio-collared individual from Zion National Park that moved up onto the south end of the Forest, however, when tracked with telemetry equipment it did not return to the Forest. In addition, an audio response from a male, and possibly a female spotted owl was detected on BLM land near the southeast end of the Cedar City District. The Escalante and Teasdale birds were both located in steep-walled canyon complexes and despite numerous follow-up visits no nests were located. All survey efforts have been following the USFS Region 3 (Southwestern Region, Arizona and New Mexico) protocol, Interim

Directive Number 2 (USDA Forest Service Southwest Region 1990). There are two Protected Activity Center's (PAC's) on the Forest. One PAC was established on the Escalante and Teasdale Ranger Districts. These PAC's were established after several responses to a playback tape conducted by contracted calling efforts. After numerous follow-up visits over multiple years no nests have been located. In 2003 1,417 acres were surveyed in PACs with no birds detected. Potentially suitable habitat was mapped on the Forest based on habitat models developed by Dr. David Willey (1997, 2000). This model combined with Forest vegetation data identified areas that contained mixed conifer slopes occurring on slopes greater than 40%. There could be 41% or 90%. To verify these areas, a habitat validation process was initiated. The product of this effort will be a validated map of suitable MSO habitat across the Forest. Habitat validation was conducted on 247,382 acres across the Forest. New presence or absence surveys were conducted on 6,031 acres on the Escalante and Teasdale Ranger Districts. No responses were detected in 2003.

The map displayed below identifies approximately 36,300 acres of potentially suitable Mexican spotted owl habitat (as determined by Dixie National Forest models) that occurs across the Forest. Suitable habitat consisted of steep walled canyon complexes and canyon rims, which may be used as foraging areas.



## Trend

The spotted owl is one of the bird species in which information is collected and compiled on a large-scale basis located in the Nature Conservancy 2001 database. The map displayed below ranks the trend for the Mexican spotted owl in Utah to be critically imperiled. Nesting spotted owls have been located in steep walled canyon complexes in Zion National Park and in Capitol Reef National Monument, which border the Dixie National Forest. Over 20 nests have been located in southwestern Utah on National Park Service administered lands since survey efforts began. In addition to these data, the Forest Service has collected site-specific data on the three National Forests in southern Utah that may have nesting spotted owls. These survey efforts covered 816,400 acres of habitat statewide, and over 492,554 acres on the Dixie National Forest. Despite extensive survey efforts across southwestern Utah (Dixie and Fishlake National Forests), no nesting Mexican spotted owls have been located on Forest Service administered lands. Contracted survey efforts were initiated in 1990 and continued through 1995. Contracted survey efforts have been replaced with forest level surveys in suitable habitat as needed to determine owl presence in proposed project areas. In 2003 6,031 acres were surveyed on the Teasdale and Escalante Ranger Districts with no detections. The large-scale contracted survey efforts provided important data to help the Forest determine that Mexican spotted owls in southwestern Utah occur in steep-walled canyon complexes. These data helped scientists fine-tune the search image for Mexican spotted owls in southwestern Utah. As a result of these findings the large-scale surveys efforts in rolling forested landscapes were halted and efforts focused on steep walled canyon areas where owls had been located. As a result of these refocused survey efforts, two locations were identified for the identification of protected activity centers (PAC's).














Low elevation lands administered by the BLM in southwestern Utah have also been surveyed with minimum success. Nesting spotted owls have been located in steep walled canyon complexes in Zion National Park and in Capitol Reef National Monument, which border the Dixie National Forest. Over 20 nests have been located in southwestern Utah on National Park Service administered lands since survey efforts began. Because no nesting Mexican spotted owls have been located on National Forest System administered lands in southwestern Utah, population trend will not be assessed.

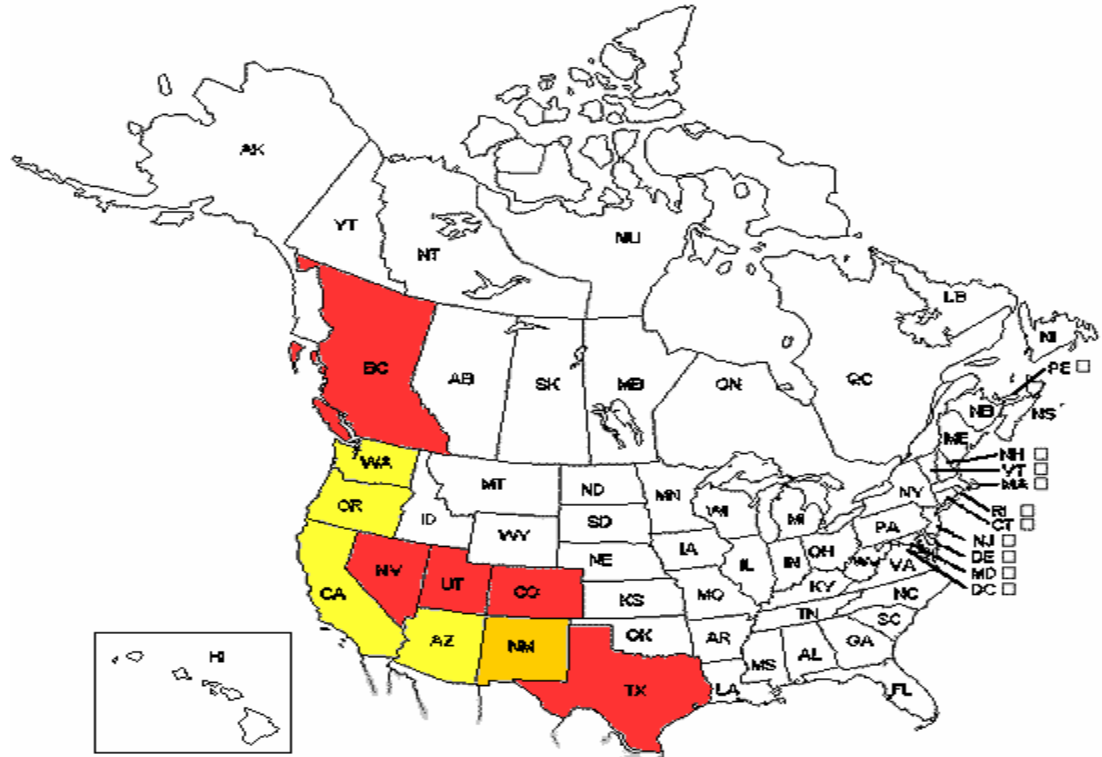
Based on this assessment and review of the owl habitat management, no adverse effects that would affect the viability of this species or FWS designated critical habitat have occurred on any lands administered by the Forest Service. These determinations have been made through the Biological Assessments (BA) process and informal consultations with the FWS conducted on each proposed action. Through this process the effects of all proposed projects have been assessed, determinations reviewed, and concurrences rendered by FWS, Salt Lake City Utah Field Office in Salt Lake City, Utah. No adverse effects that would affect critical habitat or species viability have or will occur. MSO surveys conducted in 1994 and 1995 detected two separate owl vocalizations on the Escalante and Teasdale Ranger Districts. As a result, protected activity centers were delineated based on recovery Plan direction. Based on the long-term monitoring of these two PAC's, these data suggest that these birds were transient, and not nesting on the Forest. Monitoring and survey efforts in these PACs continue annually. These data combined with the lack of positive detections during nest season surveys, spotted owl trends on the Dixie National Forest are unknown due to the lack of nesting birds or known foraging areas on the Forest.

Displayed below is a map that was selected from the NatureServe web site, which summarizes data from The Nature Conservancy, and the Natural Heritage Program database.

### Spotted Owl *Strix occidentalis*

#### State/Province Conservation Status Rank

	SX: Presumed Extirpated
	SH: Possibly Extirpated
	S1: Critically Imperiled
	S2: Imperiled
	S3: Vulnerable
	S4: Apparently Secure
	S5: Secure
	SR: Reported
	SZ: Migratory Transient
	SE: Exotic
	S?: Unranked
	Under Review
	SU: Unrankable



NatureServe Explorer; an online encyclopedia of life. [web application].2001.version1.6 Arlington, Virginia, USA: NatureServe. Available: <http://www.natureserve.org/explorer>.

## **Bald Eagle (*Haliaeetus leucocephalus*)**

The bald eagle was listed as a threatened species in 1978 and is managed under the Northern States Bald Eagle Recovery Plan (USFWS 1983). Parrish et al. (1999) found that the bald eagle did not rank high enough to be on their Priority list. However, they state that the bald eagle is very rare, a species that might not be encountered except by chance in several days of search. No critical habitat has been designated for the bald eagle on the Dixie 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 during 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 percent 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). Four nesting bald eagles have been located in Utah, with three found in the southeastern part of the state. Results of the National Wildlife Federation mid-winter bald eagle survey indicate that at least 627-743 bald eagles winter within Utah (USFWS 1983).

Bald eagles occur on and around the Dixie National Forest during the late fall and winter months. Winter habitat includes open water where fish and waterfowl can be caught from fall through early winter. After the open water freezes, eagles generally move to the foothills and valleys to feed on small mammals and carrion.

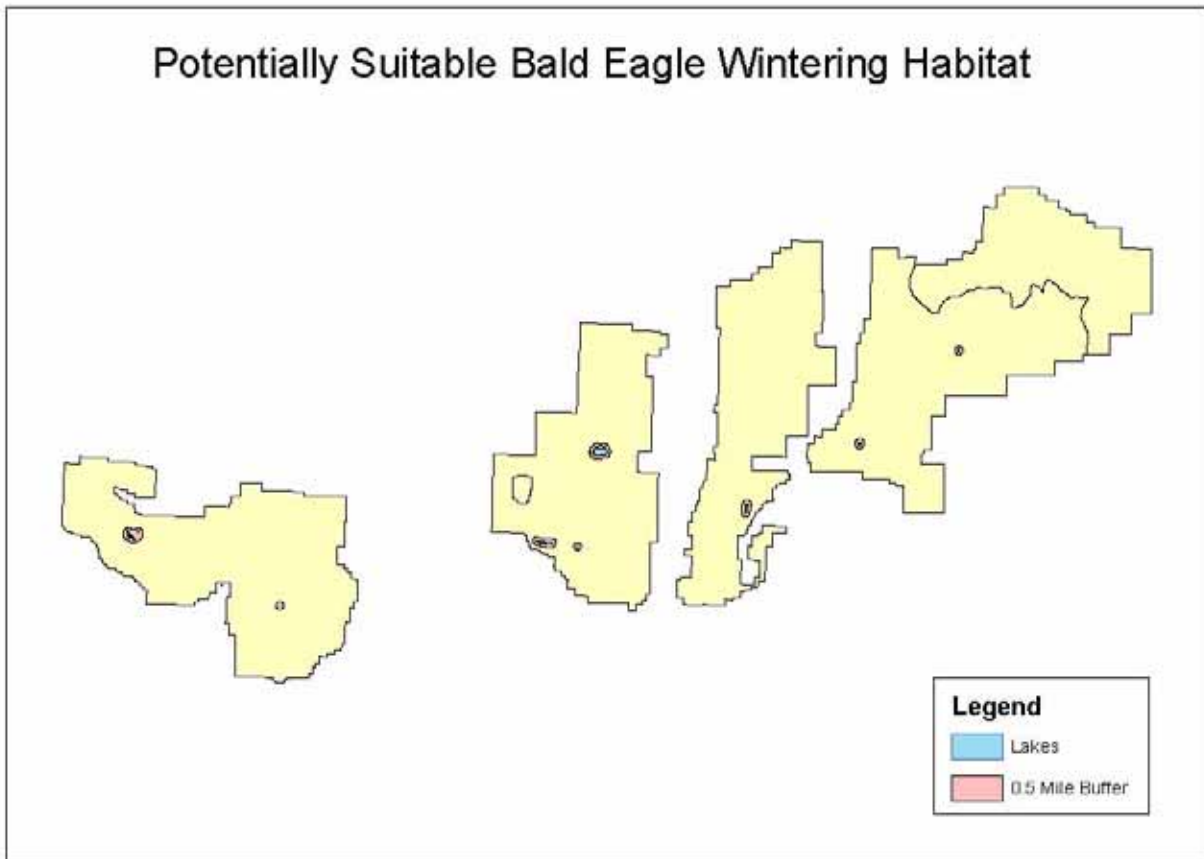
The Northern States Bald Eagle Recovery Plan (USFWS 1983) states that the primary characteristic of winter habitat is abundant and available food supply in conjunction with one or more suitable night roost sites. At winter areas, bald eagles commonly roost in large groups. In the Pacific Northwest, these 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. 1981). According to the recovery plan, 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 percent of the bald eagles in the northern states region occur in congregations; others are present in hundreds of locations that are used regularly by one to 20 birds (USFWS 1983). Collectively, these small groups are probably as important as the large concentration areas.

In the bald eagle, sexual maturity 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 February-March. One to three eggs are laid in March or April, incubated 35 days and young are fledged at 8-14 weeks. Bald eagles are long-lived (30 years) with a low reproduction rate. Mortality is high in the immature age classes but much lower after two years of age (Sherrod et al. 1977).

Bald eagles occur on Dixie National Forest during late fall, winter and spring months. Bald eagles forage and roost near open water bodies across the Forest. When these water bodies freeze in either late fall or early winter eagles move down in elevation off the Forest to forage.



The map displayed below identifies 13,987 acres of potentially suitable winter habitats across the Forest. These areas include winter foraging and roosting habitat surrounding lakes on the Dixie National Forest.

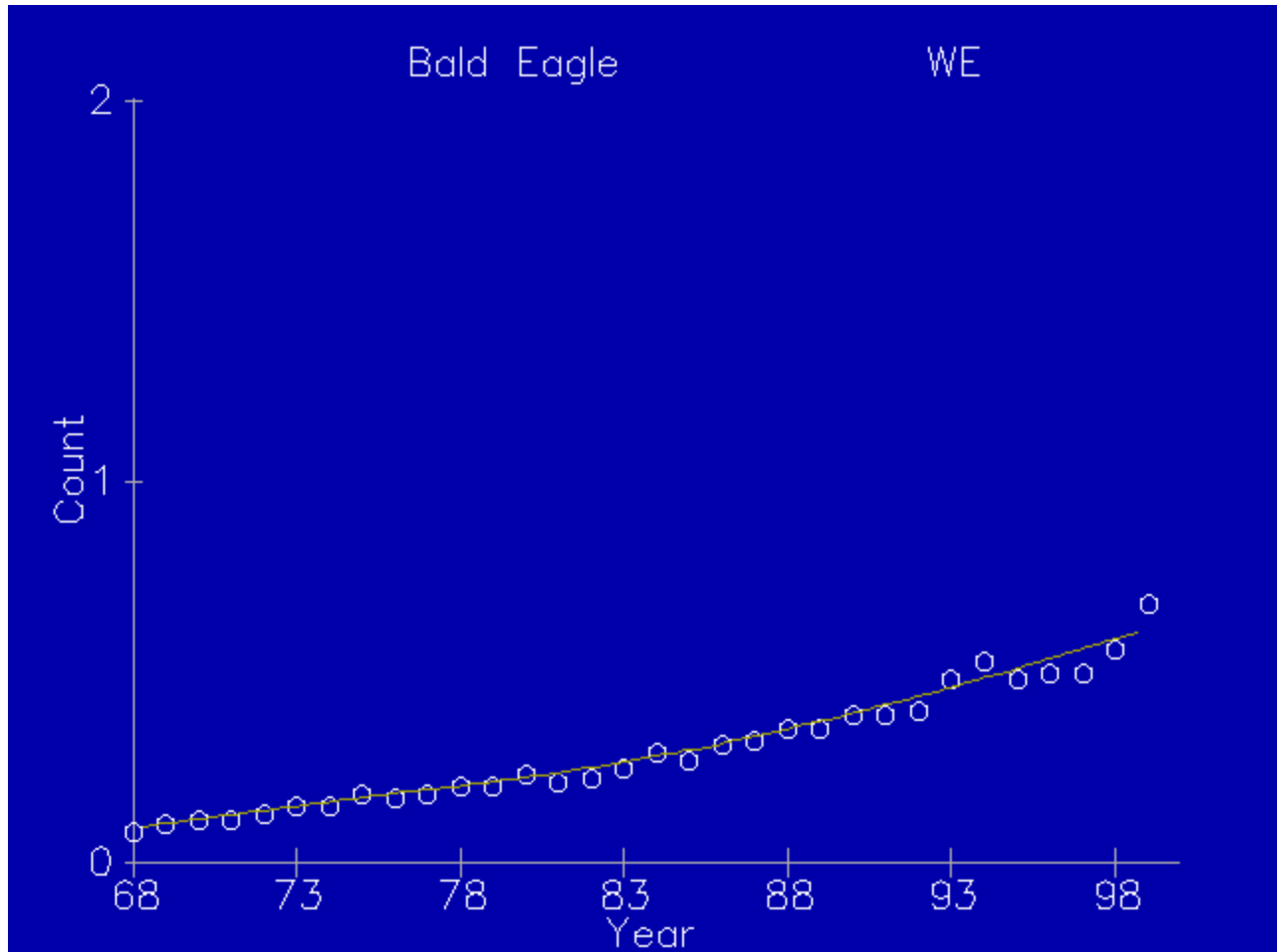


Essential habitat, defined by the Northern States Bald Eagle Recovery Plan, includes those locations which 1) are used annually for two weeks or longer by birds known to be from a nearby breeding area, 2) are used annually by 15 or more eagles for two weeks or longer, and 3) are used during periods of extremely harsh weather, when suitable feeding areas and night roost sites are limited. A bald eagle winter concentration area has been identified on the Teasdale Ranger District by UDWR. This area is the only concentration area that has been identified by the Forest Service or the Utah Division of Wildlife Resources on the Dixie National Forest. However, recent monitoring information collected on the Cedar City Ranger District indicates that a new "essential" wintering area may be identified in the future near Panguitch Lake. Intensive monitoring will continue to occur over the next few years to determine if this site meets the criteria to be designated as "essential" wintering habitat. Bald eagles have been documented overwintering in what appear to be roost sites on the Cedar City and Pine Valley Ranger Districts.

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

## Trend

The data displayed below have been obtained from the BBS database ([www.mbr-pwrc.usgs.gov](http://www.mbr-pwrc.usgs.gov)), which represents data collected from the Western United States from 1968 through 1998. These data demonstrate that bald eagle numbers are on a steady upward trend throughout the Western United States, including the Dixie National Forest in Utah.



There are approximately 13,987 acres of potentially suitable habitat on the Forest. These acres consist of all perennial lakes on the Forest with a 0.5-acre buffer around each. Monitoring wintering bald eagles on the Dixie National Forest has consisted of incidental sightings across the Forest in late fall, and winter, and intensive monitoring in 4 geographic areas, these areas include: Duck Creek, Panguitch Lake, Enterprise Reservoir, and Pinto. Intensive monitoring of these 4 sites has occurred since 1996. During this 7-year timeframe 599 eagles have been observed during 135 visits. Eagle observations have fluctuated along with the severity of the winter in all 4 areas. Displayed below is a table of eagle observations, by year in these 4 sites:

### Bald Eagle Monitoring 1996-2001

Year	Panguitch Lake Bird numbers/site visits	Pinto Bird numbers/site visits	Enterprise Res. Bird numbers/site visits	Duck Creek Bird numbers/site visits
2003	7(11)	5(6)	0(2)	0(6)
2002	6(4)	2(2)	0(3)	0(4)
2001	37 (7)	0 (2)	*	*
2000	87 (5)	16 (5)	13 (5)	1 (11)
1999	170 (14)	*	*	0 (1)
1998	101 (11)	*	*	1 (5)
1997	117 (12)	20 (7)	1 (3)	6 (5)
1996	9 (4)	*	*	*
Totals	534	43	14	8

\* Not Monitored

In addition to these data, DWR has been collecting winter raptor survey data since 1995 (Porter and Day 2002). Two survey routes are located through parts of the Dixie National Forest; these include the Cedar Valley and the Panguitch/Kanab routes. Bald eagle numbers on the Cedar Valley route were down from previous years during 1999-2002. Bald eagle population numbers were up in the Panguitch/Kanab route during 2002, compared to previous years.

It is my professional judgment that these overall numbers are down due to the mild winters across the western United States, and in particular, southern Utah. With these mild winters much more suitable winter habitat exists along migration routes, which provide suitable habitats for these birds to overwinter, making travel to southern Utah to winter not necessary.

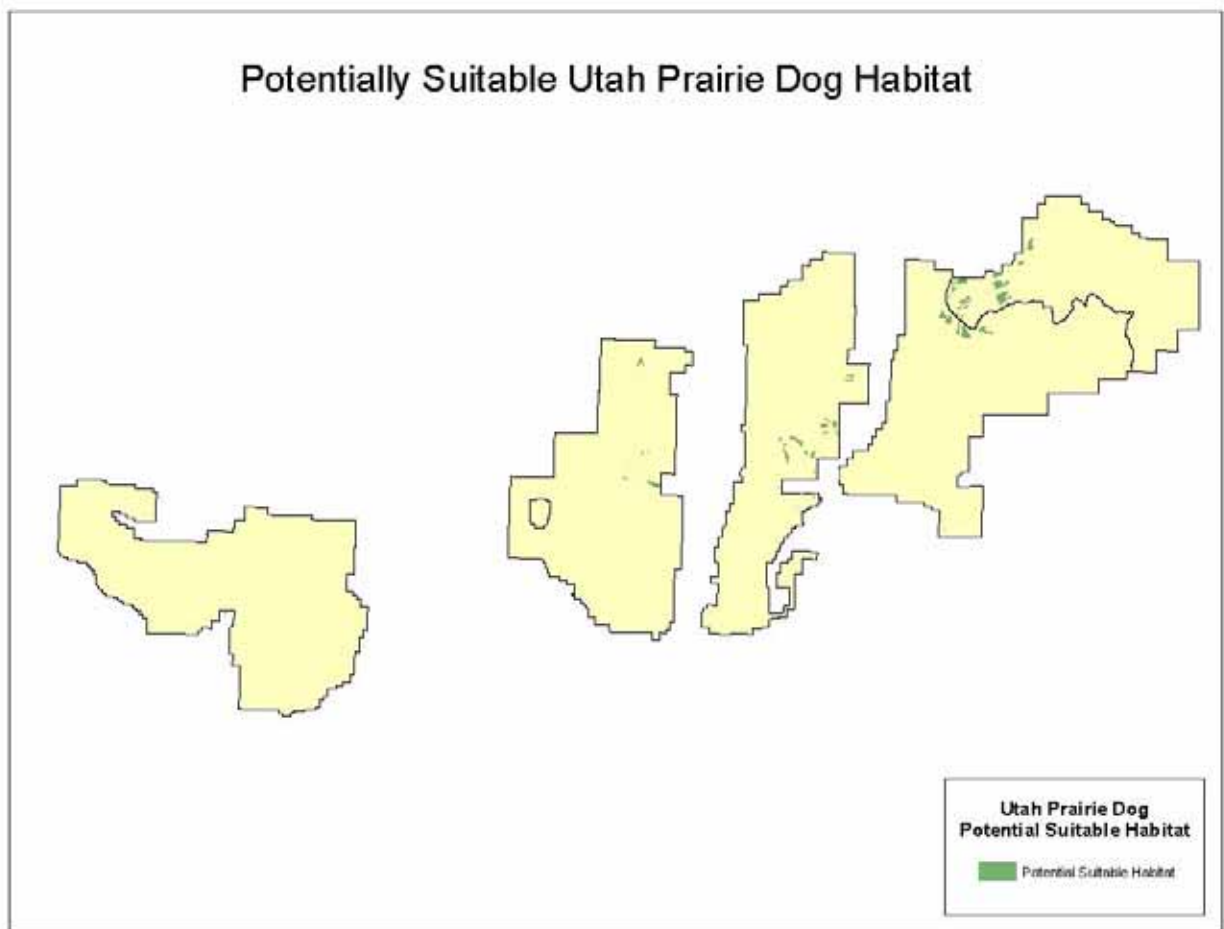
Based on the data presented above, bald eagle roosting occupancy is down from previous years. With the continuation of the drought mammal populations remain low. Monitoring data displayed in this section demonstrates an increase in occupancy over time and an upward trend throughout the western United States. Based on these data combined with local data, trends on the Dixie National Forest are likely stable, with the exception of the Panguitch Lake site and Pinto, which is slightly down. The Dixie National Forest data is difficult to interpret and determine trend from because population numbers are collected during in winter months only, and their presence or absence in a location are not necessarily a function of how suitable the habitat is or whether their trend is up, down or stable. However, based on these data, it is my professional judgment that trends of bald eagle use on lands administered by the Dixie National Forest are stable to slightly down over the past 7 years.

## Utah Prairie Dog (*Cynomys parvidens*)

The Utah prairie dog was listed as an endangered species in June of 1973 (USFWS 1991). 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 to Threatened in May of 1984. Since the reclassification in 1984 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 Dixie National Forest.

The Utah prairie dog's range is limited to five counties in south-central Utah (Iron, Garfield, Piute, Wayne, Sevier). Historically, Utah prairie dogs inhabited nine Utah counties and populations are estimated at 95,000 prior to 1920. By the 1960's, the 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 in 37 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, and the West Desert region of east Iron County. Displayed below is a map identifying approximately 13,100 acres of potentially suitable habitat across the Forest.



In 1975, the UDWR initiated biannual census counts; and annual counts in 1978. An upward trend was indicated. The 2001 data show approximately 4,217 total animals counted in the Southern Region, which is estimated to represent a total population of 8,400 adult prairie dogs. As of May 2001, counts in

the Awapa Plateau recovery area totaled 200 animals. This is a decrease in total numbers from 2000, when counts totaled 424 animals. Within the same year, population numbers in the Paunsaugunt recovery area decreased from 934 in 2000 to 735 in 2001. The West Desert Recovery area will not be addressed in this document because this unit does not occur on the Forest. The UDWR initiated a transplant program in 1972 to move animals from private to public lands. Over the past 28 years from 1972 to 2000, over 18,638 animals were live-trapped and transplanted. 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 this Strategy has been ongoing since 1997 when it was signed.

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

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 (Foster and Hygnstrom 1991, McDonald 1992). Members of a coterie are very sociable and maintain unity through physical contact (Foster and Hygnstrom 1991). Communication between coterie 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 1991).

Prairie dogs are sexually mature after their second winter and breed once a year in March or April (Foster and Hygnstrom 1991, Spahr et al. 1991). Three to five young are born in late April or early May after a gestation of about 30 days. Prairie dog adults emerge and begin foraging from mid-March to early April and enter dormancy from mid-July to mid-August (Spahr et al. 1991). 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 so that prairie dogs can see over or through, and suitable forage (Spahr et al. 1991). Moist forage available throughout the summer is also needed.

The Utah prairie dog is classified as an herbivore; however, insects (particularly cicadas) are its preferred food (Spahr et al. 1991). The preferred vegetative food is alfalfa. Except for a few forbs in certain growth stages (leafy aster, European glorybind, and some wild buckwheat in seed) Utah prairie dogs prefer grasses to forbs and shrubs. They usually select a plant's flowers or seeds over its leaves and their 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 1991).

Predation is a major cause of mortality. Badgers are a serious threat to prairie dogs because they can dig deep into the burrows. Other predators include weasels, coyotes, bobcats, foxes, eagles, hawks, and snakes (Foster and Hygnstrom 1991).

Prairie dogs are vulnerable to mortality from several diseases, the most notable being the plague; a severe infectious disease caused by the bacterium *Yersinia pestis* (Foster and Hygnstrom 1991, McDonald 1992). The plague usually occurs when populations increase to high densities causing

increased stress among individuals and easier transmission of disease between individuals (McDonald 1992).

Drought is thought to be one of the most important factors influencing the distribution of the Utah prairie dog (McDonald 1992). Colonies lacking moist vegetation are decimated by drought because prairie dogs are unable to obtain sufficient water and nutrients (McDonald 1992).

### **Trend**

The DWR initiated a transplant program in 1972 to move animals from private to public lands. Over the past 28 years from 1972 to 2000, over 18,638 animals were live-trapped and transplanted. 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 this Strategy has been ongoing since 1997 when it was signed. Spring counts of Utah prairie dogs (UPD) are conducted by the DWR on an annual basis. The 2001 data show approximately 4,217 total animals counted in the Southern Region, which is estimated to represent a total population of 8,400 adult prairie dogs. As of May 2001, counts in the Awapa Plateau recovery area totaled 200 animals. This is a decrease in total numbers from 2000, when counts totaled 424 animals. Population numbers in the Paunsaugunt recovery area decreased from 934 in 2000 to 735 in 2001.

Based on a cooperative research project between the FWS, DWR, BLM, Syracuse University, Utah State University, and the USGS Biological Resource Division, plague is present in both the Paunsaugunt and Awapa Recovery Units. The plague data helps to explain the cyclic variation in the populations observed over time in both of these Recovery Units, and will help agency managers to try and manage for this situation. Based on these data, trends on both Recovery units are down, both on and off Forest Service administered lands. As a result of plague being present in these Recovery Units, and the very large population variations, my professional judgment is that these populations fluctuate in and out of viability. Based on these data, this population is likely not viable, but if history repeats itself it will cycle back into viability. If this population declines further it will not remain so.

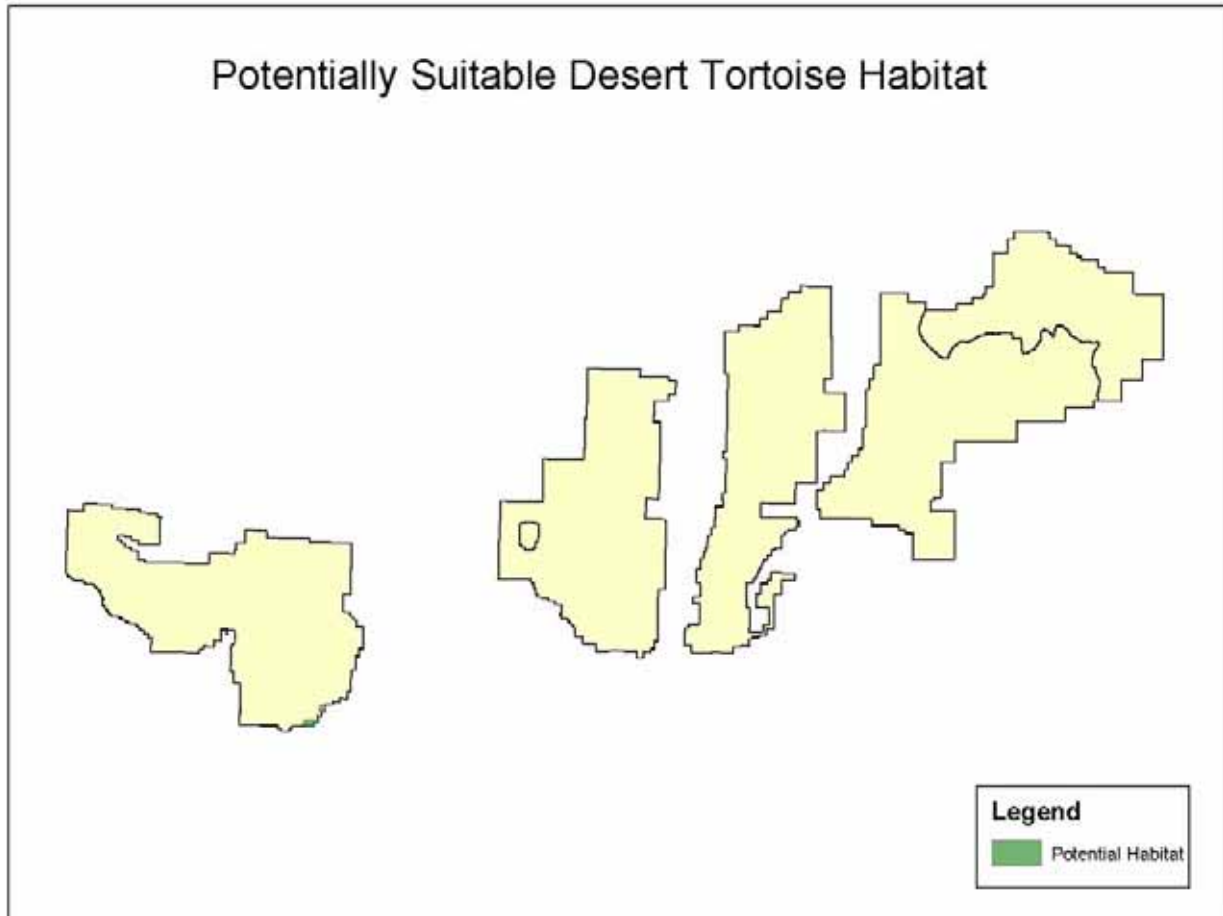
## **Desert Tortoise (*Gopherus agassizii*)**

The desert tortoise has been designated as Threatened in the entire range of its distribution, except in Arizona, and south and east of Colorado River and Mexico. The U.S. Fish & Wildlife Service Pacific Region (Region 1) is the lead region for this entity. The desert tortoise was designated as Similarity of Appearance to a Threatened Taxon in the Arizona south and east of Colorado River, and Mexico, when found outside of Mexico or the said range in Arizona. Within the area covered by this listing, this species is known to occur in Arizona, California, Nevada, and Utah. The U.S. Fish & Wildlife Service is the lead region for this entity (USFWS 2002).

The desert tortoise is found in the Mohave Desert of Nevada and California. Most breeding occurs in April and May, and from August to November. Female tortoises hold shelled eggs within two weeks after they emerge from hibernation, suggesting that the first clutch is fertilized from the fall mating during the previous year. Females exercise choice in selection of mates, and males and females can share burrows. Nesting occurs from May to July (BRRC 2001).

The desert tortoise is herbivorous, feeding on many different kinds of plant life. Dangers to the desert tortoise include upper respiratory tract disease (URTD), habitat loss, competition with domestic livestock for forage, replacement of forage plants by invading species, drought and its attendant water balance problems, losses due to predators, and automobiles, especially off-road vehicles. Effective efforts to preserve the desert tortoise will focus on, among other things, maintaining the integrity of their burrows (BRRC 2001).

Potentially suitable habitat on the Dixie National Forest only exists on the Pine Valley Ranger District. This habitat includes 80 acres of Critical Habitat as defined by the Desert Tortoise Recovery Plan. Radio collared tortoise were monitored near the Forest boundary in this area. The map below displays the potentially suitable that exists on the Pine Valley Ranger District.



### Trend

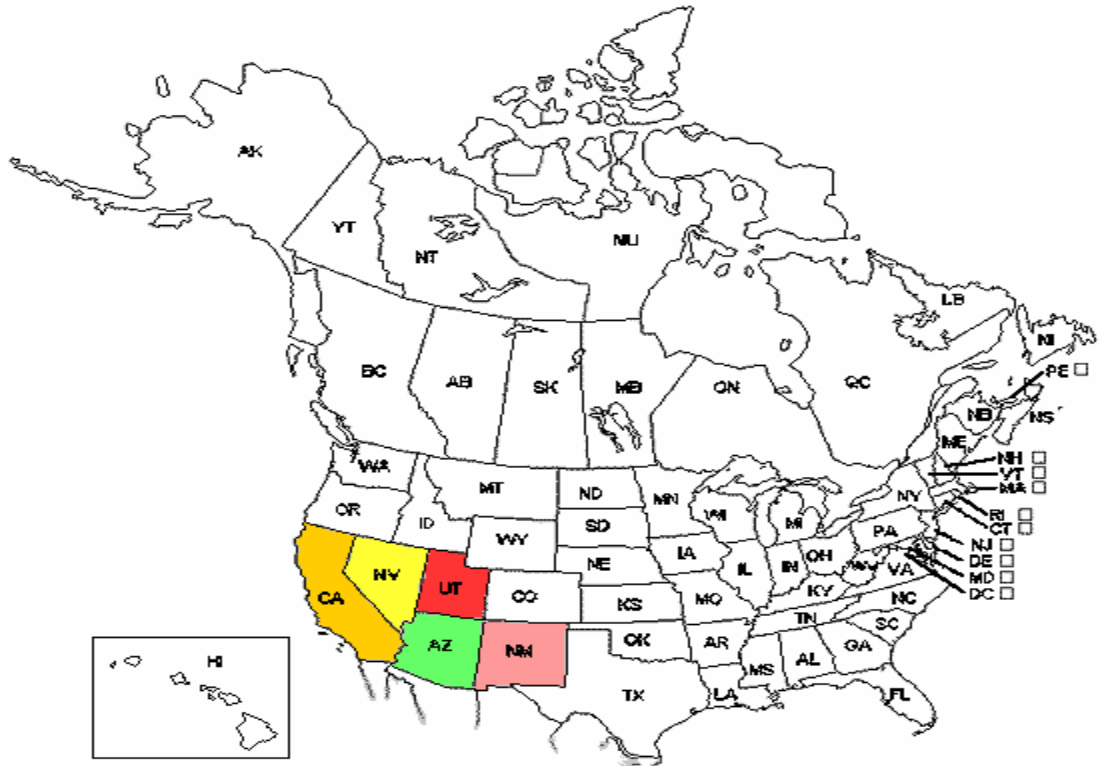
Desert tortoise habitat is limited to a very small section of the Pine Valley Ranger District. The recovery Plan identifies approximately 80 acres of habitat on the Forest. Little is known about the status of this species on the Forest because they are very difficult to monitor and they occur in an area that is rarely frequented. Monitoring for this species has occurred in cooperation with DWR tortoise biologists, however, no tortoise were located. Based on the Nature Conservancy status map displayed below, this species has been identified to be critically imperiled. The map displayed represents data from the Nature Conservancy 2001 database, which ranks the desert tortoise as critically imperiled. Based on these data and this species federal listed status, trends in southwestern Utah are presumed to be down.



**Desert Tortoise** *Gopherus agassizii*

**State/Province  
Conservation  
Status Rank**

- SX: Presumed Extirpated
- SH: Possibly Extirpated
- S1: Critically Imperiled
- S2: Imperiled
- S3: Vulnerable
- S4: Apparently Secure
- S5: Secure
- SR: Reported
- SZ: Migratory Transient
- SE: Exotic
- S?: Unranked
- Under Review
- SU: Unrankable



NatureServe Explorer; an online encyclopedia of life. [web application].2001.version1.6 Arlington, Virginia, USA: NatureServe. Available: <http://www.natureserve.org/explorer>.

## **Last Chance townsendia (*Townsendia aprica*)**

This member of the sunflower family (Asteraceae) is a pulvinate caespitose perennial that is approximately 1.5-2.5 cm tall. *T. aprica* has involucre bracts that are 4-8mm long and 7-13 mm wide. The stems have persistent leaf bases and ray flowers that are golden yellow in color. This species is easily distinguished by a pulvinate caespitose acaulescent growth form, yellow rays, and a short pappus of ray flowers (Atwood et al. 1991).

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 Arapien and Mancos Shale formations between 6,100-8,000 feet in elevation. It blooms in April and May (Atwood et al. 1991). Reproduction is sexual, and *T. aprica* is bee and/or fly pollinated. Common associate plants include *Hilaria jamesii* (galleta grass), *Juniperus osteosperma* (Utah Juniper), *Bouteloua gracilis* (blue gramma grass), and *Atriplex confertifolia* (shadscale) (Clark 2002).

Threats to Last Chance Townsendia include mineral and energy development, road development, road building, and livestock trampling (USFWS 1993b-).

There has been one documented location on Miner's Mountain on the Teasdale Ranger District. It was located by an interagency plant crew in a pinyon-juniper, low shrub community. Plants were located in open areas in yellowish soils. According to interagency botanists, this population is healthy and viable.

## CANDIDATE SPECIES

One candidate species, the yellow-billed cuckoo, has been identified by the FWS to possibly have potentially suitable habitat on the Dixie National Forest. According to Parrish et al. (1999), 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 occur much higher than this species is known to occur, limited habitat exists on the Forest and 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, Laura Romin FWS wildlife biologist, and Ron Rodriguez, Dixie and Fishlake National Forest Wildlife and Fish Program Manager. Since this is the first year that this species has been identified as possibly occurring on the Forest, surveys are ongoing, with no birds being located yet.

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

Western yellow-billed cuckoos are stunning birds not soon forgotten even if seen only once. Adults are about 12" long and slender in profile. They weigh about two ounces. Brownish from above, they have white undersides including their exceptionally long and beautiful tail. The tail is boldly marked with three large black spots. The spots are most conspicuous when the bird is in flight. The bill is stout, slightly down-curved, and generally blue-black. The species is named for the striking yellow base of the lower mandible. Like all members of the Cuculidae family, it has "zygodactyl" feet with two forward and two rearward pointing toes.

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 40 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. About 400 pairs probably inhabit rivers throughout Arizona and New Mexico. Another several hundred remain in western Texas. The cuckoo is extremely rare in the rest of the interior west, with a total population that may not exceed 50 pairs. There may be several hundred birds in northern Mexico, but reports are conflicting.

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 was alternatively called the "western" or "California" yellow-billed cuckoo. Others, however, have questioned whether the difference between the eastern and western birds is sufficient to declare them separate subspecies (American Ornithologists Union 2000, Fleischer 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. Their 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. 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 provided by these forests 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 to 100 acres in extent. Habitat use and selection in South American wintering grounds is not well known.

Arriving on their western breeding grounds in mid-June and leaving for South America by late August, western yellow-billed cuckoos have the shortest combined incubation/nestling period of any bird species. To find a mate, build a nest, lay eggs, fledge their young, and teach them to fend for themselves in such an incredibly short period of time, western yellow-billed cuckoos have evolved a unique breeding strategy. They typically lay two or three large, heavy, blue eggs. They are among the heaviest eggs of any nidicolous bird. The energy expended to produce such eggs is high—up to 30% of the female's daily intake. The trade-off, however, is that the large eggs allow rapid development of both embryos and nestlings. Indeed, only 17 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.

Though they occasionally follow the breeding strategy of their European cousins by laying their eggs in the nests of other birds (cuckoos included), this behavior is rare and thus far has not been correlated with

any ecological pressures or conditions. Males do up to 30% of the egg incubation. Though unable to fly, the newly fledged young are adept crawlers and may travel up to 150 feet on their first day out of the nest. They are fed for three to four weeks by their parents before beginning their migration to South America.

While yellow-billed cuckoos have been known to eat beetles, cicadas, bugs, wasps, flies, katydids, dragonflies, damselflies, praying mantids, lacewings, mosquito hawks, cankerworms, fall webworms, and even tree frogs, more than 75% of their diet is made up of grasshoppers and caterpillars. The yellow-billed cuckoo is unique among birds in its ability to eat toxic hairy and spiny caterpillars. The tent caterpillar, another insect too hairy for most palates, is commonly eaten as well. The cuckoo's dependence on these insects indicates a highly specialized evolution. They sometimes shear the spines or hair off caterpillars before swallowing them, but not always. Stomachs are often lined with a carpet of caterpillar hairs and numerous spines often pierce intestines.

### **Trend**

Approximately 115 acres of potentially suitable habitat has been identified on the Dixie National Forest. The trend for this species is unknown at this time because it has not been identified on the Forest. However, because this species has been ranked by the FWS as a "Candidate" species the trend for this species is presumed to be down throughout its range.

## **Castilleja aquariensis (Aquarius Paintbrush)**

Aquarius paintbrush is an herbaceous member of the figwort family (Scrophulariaceae), which grows erect, 1.2-2.6 dm tall. There are several unbranched stems, which are irregular in length and often blue-purple in color. The leaves are linear-lanceolate with fine hairs and arise erectly along the stem. The inflorescence is pale yellow except for the reddish margins of the galea, hairy, and glandular. The bracts are broadly lanceolate to ovate, the lower ones are entire. The sepals are cleft, deeper in front than in back. The petals are 1.3-1.6 cm long. The anthers have basal tufts of hair and the stigmas are black and spherical (Spahr et al. 1991).

Flowering begins soon after snowmelt, mid-June through mid-August. It produces a capsule 7-10 mm long with about 100 seeds. Seed is set in 15-20 days and is scattered by the wind, small birds and mammals. Surviving plants overwinter by a perennial root (Spahr et al. 1991).

Aquarius paintbrush is restricted to the Aquarius Plateau and the top of Boulder Mountain in Garfield and Wayne Counties, Utah. Its entire known distribution is on lands administered by the Teasdale and Escalante Ranger Districts of the Dixie National Forest. It was first collected in 1905, and was recognized and described as a new species by Noel Holmgren in 1973 (Holmgren 1973).

On the Aquarius Plateau, the Aquarius paintbrush is found at elevations ranging from 9,150 to 10,500 feet, on gently rolling terrain, often forming broad, shallow swales, and on clay loam or clay sand soils, usually with high gravel content. Tuhy (1991) found that this species occurs in two types of habitats on the Aquarius Plateau:

1. Silver sagebrush meadows in which the ground has few or no sizeable rocks or boulders scattered on the surface, moderate amounts of bare ground exposed, and moderate pedestaling of sheep fescue plants. The dominant plants in these communities are silver sagebrush (*Artemisia cana* spp. *viscidula*) and sheep fescue (*Festuca ovina*). *Antennaria rosulata*, *Cymopterus lemmonii*, *Penstemon procerus*, *Potentilla concinna*, *Potentilla hippiana*, and *Taraxacum officinale* are also usually present.
2. Within the sagebrush/grass meadows on the Aquarius Plateau are local areas with large amounts of angular cobbles and rocks on the ground surface, with grass-forb turf growing in the rock interspaces. These rockier sites have the same species composition as in the non-rocky sites described above.

The Aquarius paintbrush was also observed less frequently in centers of certain large meadows that otherwise appear to have suitable habitat such as in upper Dark Valley, upper Rock Spring Draw, and near Big Lake. In many locations it also grows along the edges of the sagebrush/grass meadows adjacent to the conifer-aspen forest patches. It has never been observed growing in the understories of the forest communities on the Aquarius Plateau.

Important habitat on Aquarius Plateau has been designated in three areas: 1) the eastern portion of Davis Flat, on both sides of the main Bicknell-Escalante Road, 2) the low summit or divide along the primitive road between Big Lake and Lake Philo, and 3) inside the Big Lake Enclosure (Tuhy 1991).

In 1993, a management plan for *Castilleja aquariensis* was prepared and approved in cooperation with the FWS. A single permanent monitoring plot on the Aquarius Plateau was established, and general locations of this species mapped. Fieldwork by Atwood (1989) found that there was a large discrepancy between abundance of *Castilleja aquariensis* between July (before grazing) and August (late in grazing season) and cast doubts on the immediate survival and long-term viability of the species. In 1990 a cooperative cost-share project between the Dixie National Forest and the Utah Natural Heritage Program investigated the distribution, status, and habitat characteristics of this species, the effects of land uses,

and recommendations for future action (Tuhy 1991). In 1992 a cooperative education project was initiated with Brigham Young University to further study this species. This study showed that 1) ungrazed plants were significantly larger than grazed plants, 2) fruiting success of individual plants was significantly greater when plants were grazed after flowers had appeared rather than before flowering, and 3) ungrazed plants usually set more fruits than plants grazed after the onset of flowering (Whittekiend 1992).

The current number of Aquarius paintbrush plants is estimated to be about 45,000. At present, there are seven apparently viable populations of the species, containing 93 percent of the total number of plants. By far the largest of these populations, in terms of area and paintbrush numbers, are on the Boulder Top (Tuhy 1991).

Limiting factors to this species' survival include: road realignment or other construction activity, which destroys, modifies, or curtails habitat and grazing and trampling by livestock and big game (Tuhy 1991).

### **Gilia caespitosa (Rabbit Valley Gilia)**

Rabbit Valley gilia, 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 (Spahr et al. 1991). Herbage is glandular, often with adherent sand grains (Atwood et al. 1991). 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 (Spahr et al. 1991). Flowering occurs from June through July with seed set in late July into the end of August.

Rabbit valley gilia 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, to less commonly sandy wash bottoms between 5,100-9,000 feet elevation. This gilia occurs in association with open pinyon-juniper woodlands, which are often mixed with some elements of mountain brush, sagebrush steppe or ponderosa pine forests (USDA et al. 1996).

The Rabbit Valley Gila is restricted to scattered occurrences from the northern Waterpocket Fold to Thousand Lakes Mountain and Rabbit Valley in Wayne County, Utah. It is found on the Teasdale Ranger District of the Dixie National Forest (Atwood 1996). This species is a very narrow endemic, known only from unstable and faulting soils.

Threats to this species include off-road use, recreational use, road and trail building/maintenance, mining, pesticide use, collection, livestock use and disease and predation (USDA et al. 1996). Rabbit Valley Gila is not affected by grazing as it occurs on Carmel Limestone and Navajo sandstone on steep slopes where cattle grazing does not occur (Atwood et al. 1991).

Rabbit Valley gilia is currently a candidate for federal listing under the Endangered Species Act. A conservation agreement and strategy was written for this species by the Bureau of Land Management, USDA Forest Service, Fish and Wildlife Service, 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.



## SENSITIVE VERTEBRATE SPECIES

This discussion of Forest Service Sensitive species is a detailed discussion to life history information.

### **Peregrine Falcon (*Falco peregrinus anatum*)**

The peregrine falcon was delisted as an Endangered species nationally in 1999, and is now listed by USFS as a Regionally Sensitive species. There are eight known nest sites on the Dixie National Forest. The activity of these nests varies from year to year. In addition, there have been three nest sites located on private/BLM lands, which are adjacent to the Forest. Although no formal Forest-wide surveys have been initiated, site-specific surveys are conducted on all proposed projects. Numerous other sightings have occurred throughout the Forest, and suitable habitat is abundant; however, no other nest sites have been located on the Forest.

Peregrine falcons usually forage along marshes, streams, and lakes within a 10-mile radius around the nest (Spahr et al. 1991). Due to the number of sightings across the Forest, additional active eyries are likely.

A recovery plan for the Rocky Mountain/Southwest population of the American peregrine falcon was approved December 1984. 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 on high ledges on mountain cliff faces and river gorges. There are records of peregrines nesting on low dikes in Utah marshes but these are exceptions due to the abundant prey and lack of human disturbance (Porter and White 1973). Nests are usually located on open ledges or potholes with a southern exposure. Cliffs are generally composed of 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.

Prey is the major factor in nest site selection. Prey species include primarily small to medium-sized terrestrial birds, shorebirds, and waterfowl, which are normally found within ten miles of the eyrie (known extreme is 17 miles). Nest sites are often adjacent to water courses and impoundments due to prey abundance in these areas (USFWS 1984).

Marshes, croplands, meadows, river bottoms, and lakes are important components of peregrine hunting sites. The wet areas provide food for the peregrines year-round but are especially important during the nesting season.

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.

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) effect 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 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 1984). Disturbances such as harassment, vandalism, photographers, removing of birds/eggs, and certain land-use practices such as road construction, control burning, habitat alterations, etc. during critical reproduction periods all have potential severe disturbance.

The Recovery Plan (USFWS 1984) 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, 3) discourage/eliminate the use of pesticides and other environmental pollutants which are harmful and would adversely affect the peregrine or its food source.

With the recent delisting a Proposed Monitoring Plan for the American Peregrine Falcons in the United States (66 F. R. 39523) prescribes monitoring of peregrine falcon territories every third year beginning in 2002 and ending in 2014. Portions of this plan are still under scrutiny. The Dixie National Forest is continuing to monitor the nest sites on the Forest annually.

## **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 in rock crevices, located high on steep rock faces in limestone or sandstone cliffs. Crevices range from 0.8 to 2.2 inches in width. Roost sites are usually in relatively remote and undisturbed areas. Availability of suitable roost sites and human disturbance are the limiting factors to this species' success (Spahr et al. 1991). Spotted bats are known to be rare and limited to relatively remote and undisturbed areas. Surveys conducted on six sites on the Dixie National Forest in 1994 resulted in documented occurrence on the Cedar City Ranger District (Lengas 1994). Further surveys have identified 4 individuals from 1997 through 1998. No spotted bats were detected in surveys conducted in 1995 (Foster et al. 1996).

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 on grasshoppers (Toone 1992).

Spotted bats breed in late February to early April and give birth to one young in late May to early June. Spotted bats are territorial and avoid each other while foraging. There is some evidence that they exhibit roost site fidelity. Moths are thought to be their main prey species. Little is known about their seasonal movements, but they are thought to migrate south for winter hibernation (Spahr et al. 1991).

Spotted bats occur in scattered areas in British Columbia, Idaho, southeast Oregon, southwest Montana, western Wyoming, Nevada, Utah, western Colorado, southeastern California, Arizona, New Mexico, and south to the Mexican state of Queretaro (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 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 supplies and subjects them to contaminated prey (Clark 1981).

Population densities are poorly understood because this species is very difficult to monitor and rabies vaccinations are needed against rabies to handle this species.

## **Townsend's big-eared bat (*Corynorhinus townsendii*)**

The Townsend's big-eared bat inhabits pinyon/juniper forests, shrub/steppe grasslands, deciduous forests, and mixed conifer forests located at elevations between sea level and 10,000 feet elevation. 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 human disturbance are considered limiting factors for this species (Spahr et al. 1991).

Western 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 North America, from British Columbia to southern Mexico, and east to South Dakota and western Texas and Oklahoma. Isolated populations exist in southern Missouri, northwestern Arkansas, and northeastern Oklahoma, and in eastern Kentucky, West Virginia, and western Virginia (Spahr et al. 1991). They are widely distributed throughout the Intermountain Region. Surveys were conducted at six sites on the Dixie National Forest in 1994 (Lengas 1994) and 1995 (Foster et al. 1996), with no bats of this species located. However, from 1997 through 2001 this species has been monitored and several individuals located. Mammoth Cave and Bowers Cave contained Townsend's, as these areas are being used as hibernacula. As winter months progress numbers increase in these areas. Based on these data, the known occurrences of this species are on the increase.

## **Northern Goshawk (*Accipiter gentilis*)**

Northern goshawks are associated with coniferous and mixed forest through much of the Northern hemisphere (Wattel 1981). Studies of nesting habitat show that goshawks nest in older-aged forests with variable tree species (Shuster 1980, Reynolds and Wight 1978, Saunders 1982, Moore and Henny 1983, and Hall 1984). The most consistent vegetative characteristic of goshawk nest sites is high percent canopy closure. Studies on habitat characteristics at goshawk nest sites have reported average canopy closure measurements ranging from 60 percent in eastern Oregon and 77 percent in northern California, to 94 percent in northwestern California (Reynolds and Wight 1978, Saunders 1982, and Hall 1984). Stand structure ranges from dense multi-layered stands in Oregon (Reynolds 1975, Reynolds and Wight 1978) to open park-like understories in Colorado and California (Shuster 1980, Saunders 1982, Hall 1984). Average 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 18 inches in northwestern California (Hall 1984).

Goshawks appear to prefer north to east aspects for nest sites, as stands on these aspect are typically denser and more suitable (Reynolds 1983, Shuster 1980, Hall 1984). Slope also appears important as nests are usually placed on flat to moderately sloped land where trees are able to grow larger and at a higher density (1-39 percent) (Reynolds 1983, Shuster 1980, Hall 1984).

The importance of the proximity of the nest area to water is not known. Saunders (1982) and Moore and Henny (1983) found that the distances of water from nests averaged approximately 650 feet. Reynolds (1979) suggested that 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, shrub-canopy, and layers. Bloom et al. (1986) stress the importance of meadows, streams, and aspen stands, which may be important to prey species on which the goshawk feeds. However, Reynolds (1979) observed that goshawks forage in a variety of habitats probably along edge as well as in deep forests, provided that there is available prey and vegetation is not too dense to prevent flight. 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, arched trees, rocks, or horizontal tree limbs below the canopy (Bartelt 1974, Reynolds and Wight 1978). In Oregon and California studies, goshawks were found to forage primarily on birds and mammals (Reynolds and Wight 1978, Reynolds 1979, Bloom et al. 1986). In northern Arizona, Boal and Mannon (1991) found that Steller's jay, northern flicker, golden-mantled ground squirrel, and the least chipmunk were the primary prey species.

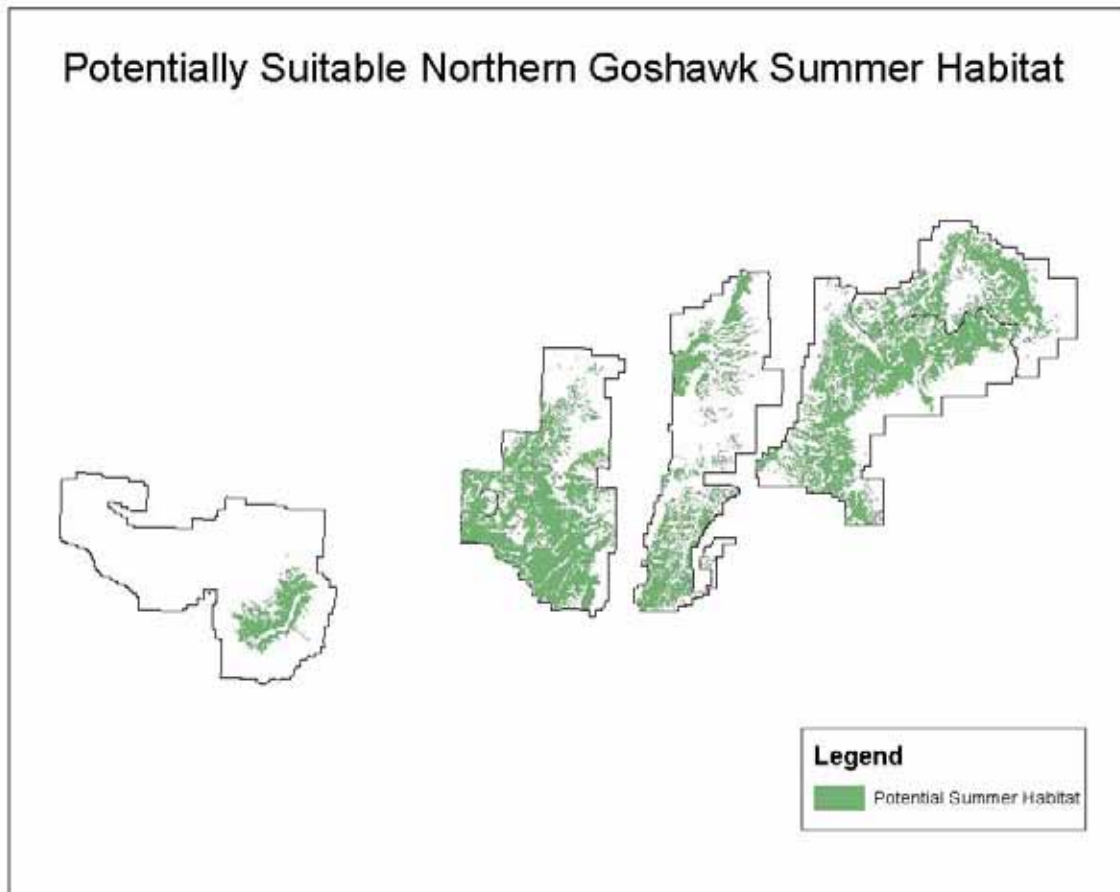
Available evidence suggests that two important resources, food and nest habitat, are the principle mechanisms limiting goshawk densities (Newton 1989, 1991, Village 1990). Specifically, populations may be limited by shortage of nest sites; and where nest sites are readily available, densities may be limited by food abundance and availability.

Goshawks begin breeding activities in April. Clutches of three to five eggs are laid in mid-June with the nestling period extending through mid-July. 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, 30-40 feet from the ground in the lower two-thirds of the crown (Eng and Gullion 1962, McGowan 1975, Reynolds 1975, Bartelt 1974, Moore 1980, Hall 1984, McCarthy et al. 1989, Hennessy 1978, Shuster 1980, Reynolds and Wight 1978). Young are fledged between July 15-August 15 and may be dependent on adults for food until September 30. Goshawks typically build more than one nest in adjacent trees or as far as one mile from the active nest tree. Goshawks may alternate between one or more of these alternate nests on an annual or semi-annual basis.

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 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 western United States. The goshawk is partly migratory in the northern portion of its range, where in winters of food shortage it migrates southward. In high elevations and montane areas, some goshawks descend to lower elevations into woodlands, riparian areas, and scrublands during the winter (Kennedy, unpubl. data).

According to data collected on the Dixie National Forest over the past twelve years, approximately 174 nests occur on the Forest as of the 2001 nesting season. This number can vary as a result of high winds and other natural events that can affect nests. Recent data shows there are 111 known goshawk territories as of 2003. Nesting activity generally ranges across the Forest from 20-30 nests annually. An active nest is defined as, a nest where adults are present and incubating or where young are present in or at the nests.

Displayed below is a map of potentially suitable goshawk habitat across the Forest. There are approximately 654,4473 acres of potentially suitable habitat on the Forest.



The Utah Northern Goshawk Conservation Strategy and Agreement are being implemented on the Dixie National Forest. The Forest recognizes this document for its sound ecological base and is implementing these principals. Furthermore, the Forest recognizes this publication as the best science available on goshawk management in Utah. As stated in this document, 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 Utah Northern Goshawk Project Environmental Assessment 1999, which provide standards and guidelines for individual forest plan amendments.

For a detailed discussion on goshawks refer to the MIS portion of this document beginning on page 85.

## **Flammulated Owl (*Otus flammeolus*)**

Flammulated owls appear to be associated with mature pine and mixed conifer habitat types (Reynolds and Linkhart 1984). Within Montana forests, they typically occur with the yellow pine belt, which includes ponderosa pine (*Pinus ponderosa*) and Jeffrey pine (*P. jeffreyi*) (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 decurrens*) (Marshall 1939, Reynolds and Linkhart 1984). An 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) showed the owl's 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 (1986) 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. 1985). Possible limitations to this species include the loss of suitable habitat by logging of mature forest stands and availability of snags for nesting.

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. Flammulated owls are obligate secondary cavity nesters. 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 fledged 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 (Spahr et al. 1991).

Flammulated owls are distributed from southern British Columbia south to Veracruz, 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). Flammulated owl surveys have been conducted on the Dixie National Forest along with Mexican spotted owl surveys, which detected numerous flammulated owls across the Forest. The Mexican spotted owl inventory in 1991-1996 as well as multiple species owl inventory conducted by Anne Shafer in 1989-1991 has recorded flammulated owl vocalizations throughout the Dixie 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 and lodgepole pine (Gabrielson and Jewett 1940, Farner 1952, Larrison and Sonnenberg 1968, Marshall 1969). 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 5-12 feet above ground in dead spruce, tamarack, pine, cedar, and aspen trees. 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 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. They are major predators of the spruce bark beetle and may contribute to its control. 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).

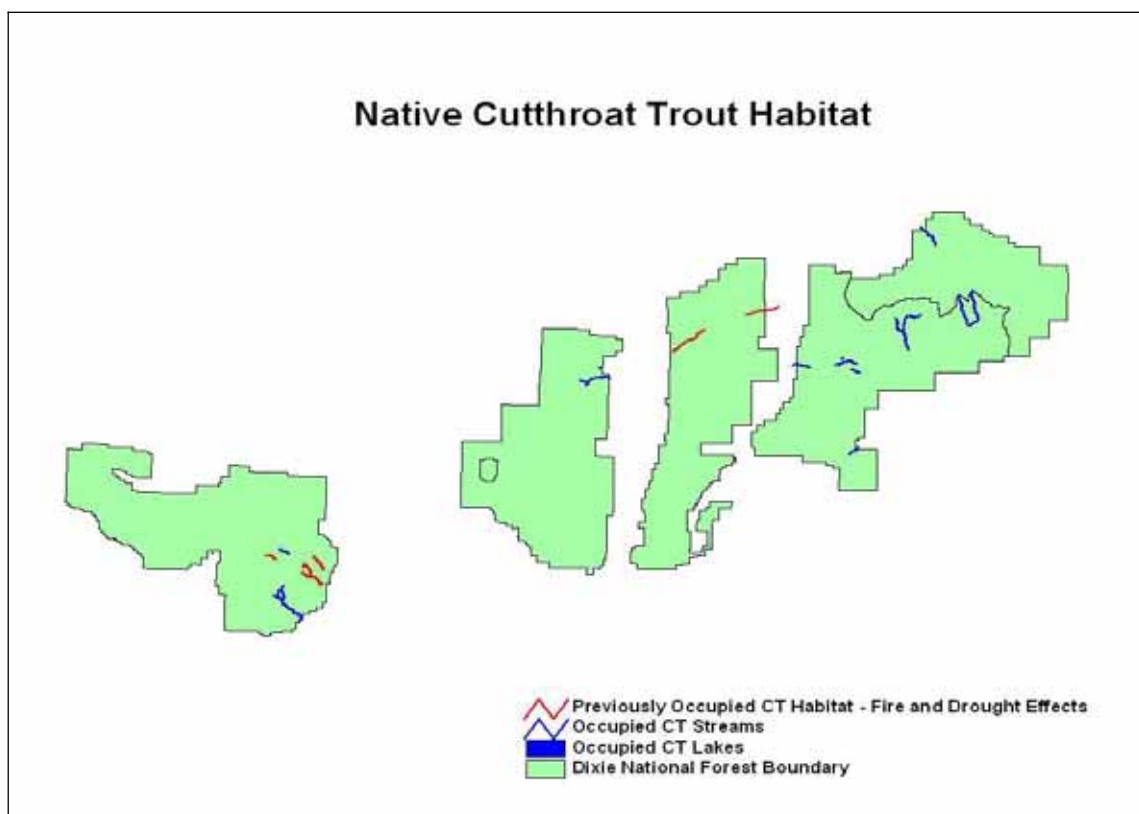
Three-toed woodpeckers range across North America from tree line south to southern Oregon and through Idaho and Utah to New Mexico and Arizona. In eastern North America they are found south to Minnesota, southern Ontario, New York, and northern New England. They also occur across northern Europe and Asia (Spahr et al. 1991). In the Intermountain Region, densities are presumed to be low; however, little information is available. Formal surveys for this species have been conducted on the Forest. A total of 131 locations have been documented since 1996 and the numbers of individuals are increasing due to the increase of spruce bark beetle infestations. Utah has a high importance to three-toed woodpeckers because 26-50 % of the species' total breeding distribution is in Utah (Parrish et al. 1999).

The three-toed woodpecker is a Priority species according to Parrish et al. (1999). The reason is based on a number of criteria, some of which include: population trend uncertainty, non-breeding threats, and winter distribution. Also, there is extensive threat in breeding range due to habitat loss, which ranges between 26 % and 50 %. This species also has been identified as an ecological specialist.

## 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 2002). There are 10 known populations of pure strain Bonneville cutthroat trout on the Dixie National Forest inhabiting approximately 24.6 miles of stream habitat.

The map below displays 49.4 miles of stream and 24.4 acres of lake habitat occupied by Bonneville and Colorado River cutthroat trout on the Dixie National Forest.



The amount of existing habitat identified in the LRMP (II-16a) in 1986 when it was signed was 7 acres, with the total potential habitat at 2500 acres. Since 1986, the amount of Bonneville cutthroat trout occupied habitat on the Dixie National Forest has increased, due to an aggressive stream renovation program. Stream renovation and native cutthroat trout expansion projects have been accomplished cooperatively with the Utah Division of Wildlife Resources.

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 (Kershner 1995). As such, Bonneville cutthroat trout have adapted to a broad spectrum of habitat conditions throughout their range.

Sexual maturity is typically reached during the second year from 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 usually occurs in the spring and early summer at elevations (Behnke 1980) at temperatures ranging from 4-10 degrees Celsius (May et al. 1978). 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).

Fecundity is typically between 1,800-2,000 eggs per kilogram of bodyweight (Behnke 1992). Incubation times for wild Bonneville cutthroat trout have not been verified but probably average 30 days (Gresswell and Varley 1988). 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. Because Bonneville cutthroat trout may be adapted to the rigorous conditions of high elevation headwater streams, these fish may have a competitive edge over nonnative salmonids in those areas (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, Binns 1981). Their diet was diverse during the summer in Birch Creek (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.

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.

Stream renovation projects are planned in cooperation with the Utah Division of Wildlife Resources, which will further increase the numbers and distribution of this species on the Dixie National Forest.

## **Trend**

Based on discussions with Dale Hepworth, DWR Regional Fish Program Manager, Bonneville cutthroat trout populations are increasing throughout the Southern Region. When DWR stated to restore the native Bonneville trout approximately 25 years ago there were approximately 5 miles of occupied stream habitat in the Southern Region. Based on information provided by DWR through personal communication, there are currently more than 50 miles of occupied stream habitat throughout southern Utah. This success has been the direct result of stream restoration work occurring from cooperative relations between DWR and the Forest Service. In addition to information collected by DWR, the total number of miles of occupied habitat on the Forest has increased since 1986 from 7 acres of habitat to 24.6 miles of occupied habitat, a 17.6-mile increase.

During the summer of 2002 two large fires impacted habitat and Bonneville cutthroat trout in the Mount Dutton area, which is on the Powell Ranger District, and Pine Valley Mountain area, on the Pine Valley Ranger District. Although these fire events affected this species and occupied habitat, numerous other quality occupied streams remain on the Forest. Restoration actions have and will continue to be

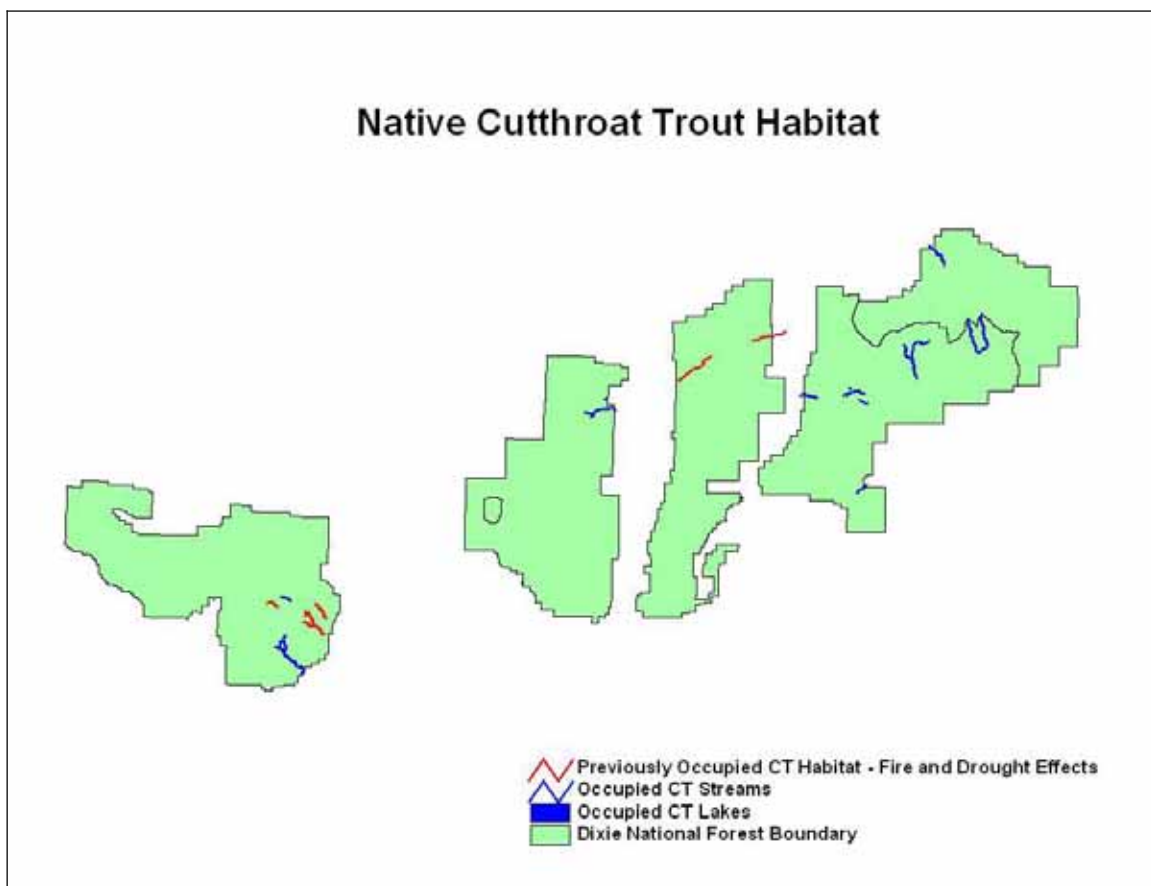
implemented to try and mitigate the negative effects from the fire to the trout, and their habitat. Plans have been discussed to rehabilitate all of these stream systems and reintroduce Bonneville cutthroat trout back into these systems in the future. Both the DWR and Forest Service have committed to this management action.

Based on the fisheries program on the Forest, and the excellent cooperative relations between the Forest and DWR, the Bonneville cutthroat has experienced a downward trend due to wildland fire. The remaining occupied streams contain stable populations and remain viable.

## 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, upstream of the Grand Canyon, in Wyoming, Colorado, Utah, Arizona, and New Mexico (Behnke 2002). Though it is now restricted to headwater streams and lakes, its original distribution included portions of the Colorado, Green, and San Juan River drainages. Although reduced in range and numbers, pure populations of Colorado River cutthroat trout still exist in their native drainages. There are 13 (7 stream, and 6 lake) known populations of pure strain Colorado River cutthroat trout on the Dixie National Forest, inhabiting 24.8 miles of stream habitat and 24.4 acres of lake habitat.

The map below displays 49.4 miles and 24.4 acres of occupied Bonneville and Colorado River cutthroat trout habitat on the Dixie National Forest.



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 over 400mm (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 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 (Young 1995). Small population size and restricted habitat areas confound most conclusions on habitat requirements.

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).

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.

Stream and lake renovation projects are planned in cooperation with the Utah Division of Wildlife Resources, which will further increase the numbers and distribution of this species on the Dixie National Forest.

## **Pygmy Rabbit (*Brachylagus idahoensis*)**

Pygmy rabbits are generally limited to areas on deep soils with tall, dense sagebrush, which they use for cover and food (Flath 1994, Green et al. 1980b). Individual sagebrush plants in areas inhabited by pygmy rabbits are often 6 feet (1.8 m) or more in height (Flath 1994). Extensive, well-used runways interlace the sage thickets and provide travel and escape routes (Green et al. 1980b). Dense stands of big sagebrush along streams, roads, and fencerows provide dispersal corridors for pygmy rabbits (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 (*Taxidea taxus*) and marmots (*Marmota flaviventris*) (Bradfield 1975, Green et al. 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 (Green et al. 1980b). Some researchers have found that pygmy rabbits never venture further than 60 feet (21.3 m) from their burrows (Bradfield 1975). However, Bradfield (1975) observed pygmy rabbits range up to 328 feet (100 m) from their burrows.

Some areas inhabited by pygmy rabbits are covered with several feet of snow for up to 2 or more months during the winter. 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 et al. 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. Isolated populations occur 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 et al. 1980b), and in Utah they have been located up to 8,400 feet.

The primary food of pygmy rabbits is big sagebrush, which may comprise up to 99% of the food eaten in the winter. Grasses and forbs are also eaten from mid- to late summer (Bradfield 1975, Green et al. 1980a, Green et al. 1980b).

Pygmy rabbits are capable of breeding when they are about 1 year old (Green et al. 1980b). The gestation period 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 (Green et al. 1980b). 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 (Green et al. 1980b). The mortality of adults is highest in late winter and early spring.

Weasels (*Mustela* spp.) are the principal predators of pygmy rabbits. Coyote (*Canis latrans*), red fox (*Vulpes vulpes*), badger, bobcat (*Felis rufus*), great horned owl (*Bubo virginianus*) and marsh hawk (*Circus cyaneus*) also prey on pygmy rabbits (Bradfield 1975, Green et al. 1980b).

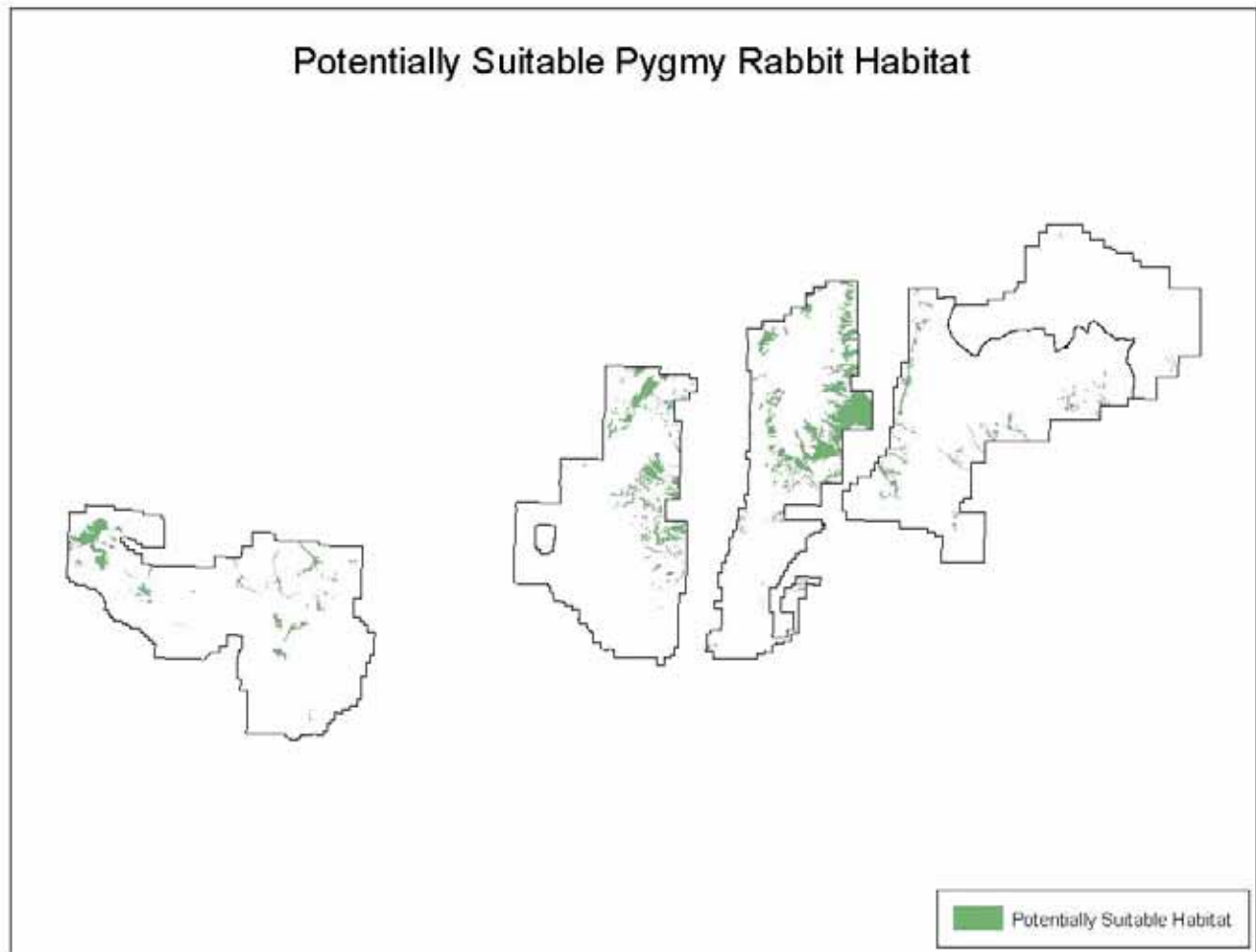
Some populations of pygmy rabbits are susceptible to rapid declines and possibly local extirpation. Some studies suggest that pygmy rabbits are a "high inertia" species with low capacity for rapid increase in density (Weiss and Verts 1984). The loss of habitat is probably the most significant factor 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).

There are only two known locations documented on the Fishlake National Forest. One location has been identified on the Loa Ranger District and the second location on the Richfield Ranger District.

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. Detections of this species have been made on the Fishlake National Forest in areas where historic habitat have not been identified. In addition, the elevational range has been increased beyond what was originally thought to be suitable pygmy rabbit habitat. The search image on the Dixie will include historic distribution habitat characteristics as well as the new information found on the Fishlake National Forest. Surveys will be continued to determine range, distribution, and health of this species.



The map below displays approximately 118,972 acres of potentially suitable pygmy rabbit habitat on the Dixie National Forest.



## Greater Sage Grouse (*Centrocercus urophasianus*)

There are two sub-species of the greater sage grouse: the eastern sage grouse (*Centrocercus urophasianus* ssp. *urophasianus*), and the western sage grouse (*Centrocercus urophasianus* ssp. *phaios* Aldrich). Greater sage grouse are distributed from north-central Oregon, southern Idaho, and southern Alberta and Saskatchewan south to eastern California and extreme western North and South Dakota. Isolated populations also occur in eastern Washington (Johnsgard 1983, Wallestad 1975).

Sage grouse are solely dependent on sagebrush-dominated habitats (Benson et al. 1991). 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 to 50% sagebrush cover, with sagebrush no more than 1 foot (30.5 cm) tall.

Males gather on the lek or strutting grounds in late February to April, as soon as the lek is relatively free of snow. Only a few dominant males, usually 2, breed. Within a week to 10 days following breeding, the hen builds a nest in the vicinity of the lek (Autenrieth 1985). Clutch size ranges from 6 to 8 eggs; incubation time is 25 to 27 days. Chicks fly by 2 weeks of age, although their movements are limited until they are 2 to 3 weeks old (Wallestad 1975). They can sustain flight by 5 to 6 weeks of age. Juveniles are relatively independent by the time they have completed their first molt at 10 to 12 weeks of age (Johnsgard 1983).

Sage grouse lack a muscular gizzard and cannot grind and digest seeds; they must consume soft-tissue foods (Wallestad 1975). Sage grouse eat sagebrush throughout the year. Apart from sagebrush, the adult sage grouse diet consists largely of herbaceous leaves, which are utilized primarily in late spring and summer (Edminster 1947). Additionally, sage grouse use perennial bunchgrasses for food (Barnett and Crawford 1994). They are highly selective grazers, choosing only a few plant genera. Insects are a minor diet item for adult sage grouse. 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 1st week of life, sage grouse chicks consume primarily insects, especially beetles from the family Scarabaeidae (Klebenow and Gray 1968). Their diet then switches to forbs, with sagebrush gradually assuming primary importance.

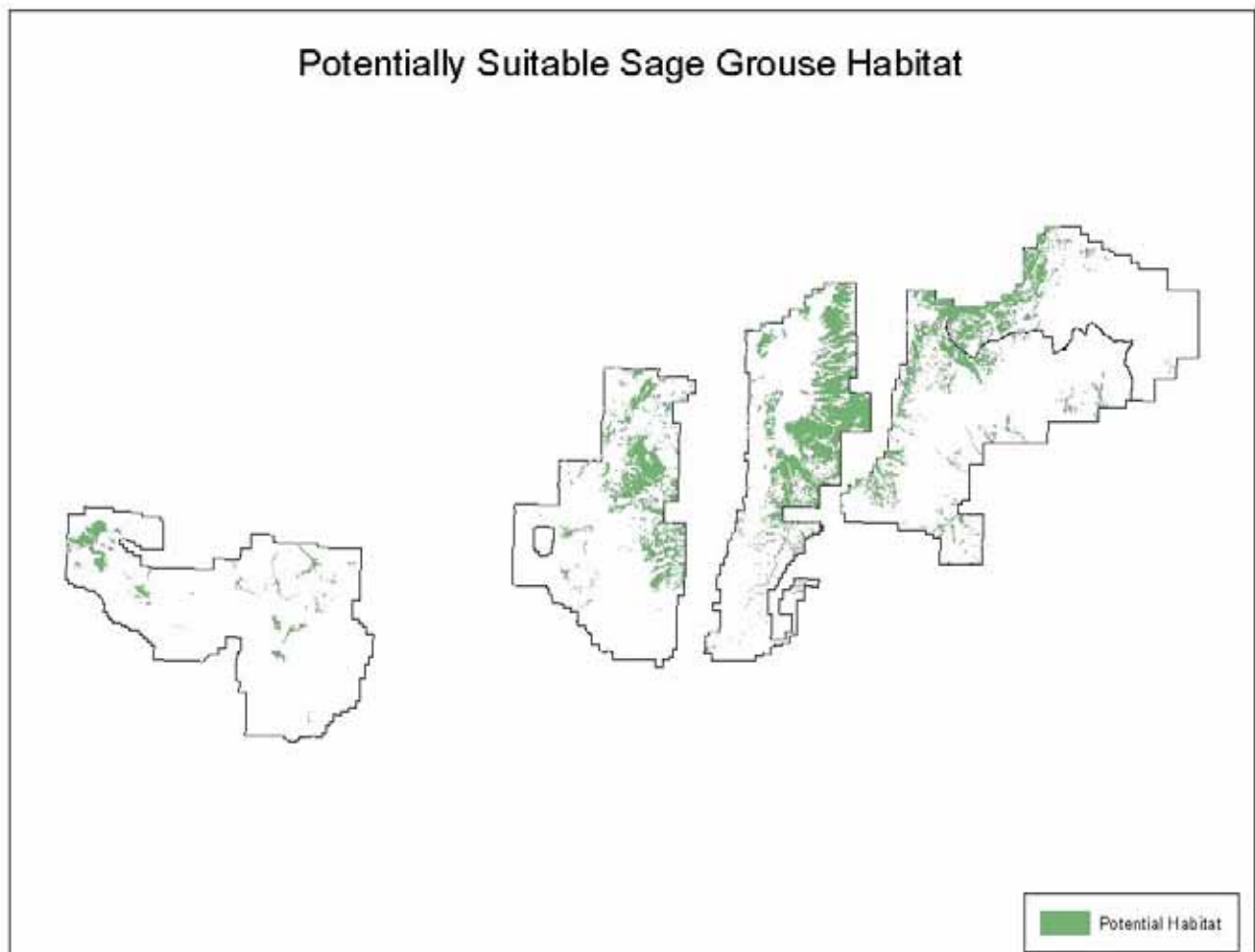
Sage grouse apparently do not require open water for day-to-day survival if succulent vegetation is available, however, they utilize free water if it is available. Sage grouse distribution is apparently seasonally limited by water in some areas. In summer, sage grouse in desert regions occur only near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

Sveum and others (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 (Braun 1998). Tall, dense vegetation may provide visual, scent, and physical barriers between predators and nests of ground-nesting birds. Generally, quantity and quality of habitats used by sage grouse control the degree of predation. Thus, predation would be expected to be most important as habitat size and herbaceous cover within sagebrush decreases (Braun 1998). Predator species include Coyote (*Canis latrans*) (Kindschy 1986), bobcat (*Lynx rufus*), badger (*Taxidea taxus*), falcons (Falconidae), and hawks, kites, and eagles (Accipitridae) (Dunkle 1977) prey on adult and juvenile sage grouse. Crows consume juvenile birds (Kindschy 1986). Coyote, ground squirrels

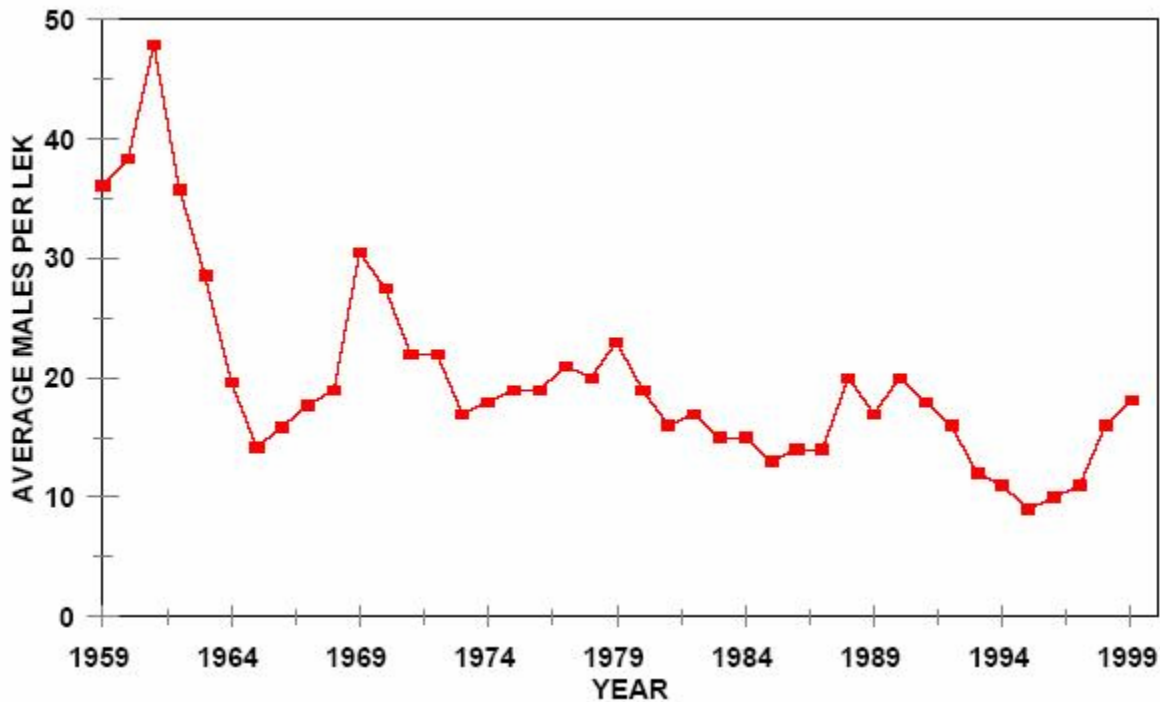
(*Spermophilus* spp.), and badger are the most important mammalian nest predators.

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

The map below displays potentially suitable sage grouse habitat on the Dixie National Forest. There are approximately 277,598 acres of potentially suitable sage grouse habitat on the Dixie National Forest.



Sage grouse data has been collected by DWR in the Southern Region since 1951. Below is a chart displaying statewide trends of average sage grouse males per lek from 1959 to 1999.



As demonstrated in the data displayed above, sage grouse numbers have fluctuated over the past 40 years. Prolonged drought, reductions of habitat from urban development, and decreases in sagebrush habitat have all been identified as contributing factors. Since this species was recently added to the region’s Sensitive species list, DWR data is the primary source of information for this species. Forest Service data collection will be coordinated with DWR. Based on the data displayed above, sage grouse have declined over the past 40 years, but are increasing since 1994, when numbers reached an all time low in the Southern Region.

## SENSITIVE PLANT SPECIES

### *Astragalus henrimontanensis* (Dana Milkvetch)

Dana milkvetch is a perennial herb and member of the pea family (Fabaceae). It grows 4-15 cm tall from a branching base, which is clothed with coarse persistent leaf bases. The leaves contain 7-17 elliptic to oblanceolate leaflets, which are hairy on both sides. The yellowish flowers occur 2-11 per cluster; the sepals form a long cylindrical hairy tube. The petals are yellow-white with a purple tip. This species flowers from April to May and produces a slightly curved, unilocular, 22-35 mm hairy pod (Spahr et al. 1991).

Dana milkvetch occurs in washouts and gravelly loam soil in mixed ponderosa pine, juniper, and sagebrush communities in areas between 7,000 and 9,200 feet elevation. This species is endemic to the Henry Mountains and Aquarius plateau in Garfield County, Utah (Spahr et al. 1991) and is located in the Escalante and Teasdale Ranger Districts.

The major threats and limitations to this species' habitat and population are reclamation of vegetation on the Henry Mountains, chaining, wind throw, and reseeding with introduced old world plants (Spahr et al. 1991). Effects of grazing on this species are unknown (Atwood 1995a).

**Astragalus limnocharis var. limnocharis (Navajo Lake Milkvetch)**

A member of the pea family (Fabaceae), Navajo Lake milkvetch grows only one to five cm tall from a branched caudex. The lanceolate, elliptic, or oblong leaflets number 7-13, have enrolled margins, and are hairy underneath and along the margins. Flowers appear from June to August in clusters of 2-10. The hairy sepals form a tube around the yellow-white or pinkish purple petals. The unilocular pod is hairy and ovoid and matures through October.

The plant is found between 8,800 and 10,500 ft in southeast Iron, and northwest Kane Counties on poor sites characterized by loose rocks and clay soils. It is found on the Cedar City Ranger District. It most often occurs in association with bristlecone pine on the slopes of the pink Wasatch Limestone formation and along terrace below the high water mark at Navajo Lake.

Threats include timber harvesting with associated roads and skid trails and recreation related disturbances at Navajo Lake beaches (Spahr et al. 1991). Navajo Lake milkvetch is not affected by grazing as it occurs on the exposed member of the Wasatch Limestone formation on steep slopes where livestock grazing does not occur (Atwood et al. 1991).

***Astragalus limnocharis* var. *tabulaeus* (Table Cliff Milkvetch)**

Table Cliff milkvetch is an herbaceous perennial that is a member of the pea family (Fabaceae). The plant arises from a branched caudex, one to five cm tall with greenish herbage and connate stipules. The leaves are composed of 7-13 oblong leaflets with enrolled margins. The leaflets are hairy beneath and exhibit long hairs along their margins. The flowers arise in clusters of 2-10 and are pink-purple. The sepals form a tube around the petals. This milkvetch is soboliferous, allowing it to survive on steep slopes. The Table Cliff milkvetch flowers from June to August. Its unilocular pods are ovoid and inflated. Plants spread by underground runners. Surviving plants overwinter by the perennial taproot (Spahr et al. 1991).

Table Cliff milkvetch occurs on steep, unstable limestone slopes on the pink member of the Wasatch Limestone Formation between 9,200 and 10,170 feet elevation, on and in the vicinity of the Table Cliff Plateau in the Escalante Ranger District (Spahr et al. 1991). This species is not affected by grazing as it occurs on exposed Wasatch Limestone on steep, unstable slopes where livestock grazing does not occur (Atwood et al. 1991).

**Astragalus zionis var. vigulus (Guard Milkvetch)**

The guard milkvetch is also a member of the pea family (Fabaceae). It arises 3-23 cm from a branched caudex, which is sometimes covered with a persistent thatch of leaf bases. The internodes are often covered by stipules, and the leaves are up to 15 cm long with 13-25 ovate or elliptic, villous leaflets. Pink-purple or pale flowers appear late April-July along racemes with a tubular calyx. Fruit pods are sessile, oblong, mottled, and unilocular.

The subspecies range is confined to between 5,000 and 8,200 feet on the east side of the Pine Valley Mountains in the Pine Valley Ranger District, in pinyon-juniper, mountain mahogany, and oak-Garrya communities. Guard milkvetch is not palatable to grazing animals, and other effects on it are unknown (Atwood 1995b).



### **Botrychium paradoxum (Paradox Moonwort)**

The paradox moonwort is a member of the Adder's-tongue Family, the Ophioglossaceae. It is a succulent plant with short tuberous erect rhizomes. The leaves (one per stem) are approximately nine cm tall with two fertile segments present and erect. Its texture varies from delicately herbaceous to robust and fleshy and has a glaucous color (Wagner and Wagner 1981).

Three populations have been recorded on the eastern portion of the Dixie National Forest. One was recorded near Cyclone Lake on the Aquarius Plateau, Escalante Ranger District. The other was recorded southeast of Big Lake along Rock Spring Draw on the Aquarius Plateau, Teasdale Ranger District (Utah Natural Heritage Program 1994), and the third was recorded near Jacobs Valley on the Teasdale and Escalante Ranger Districts (Teasdale District Files). Plants have been found in diverse habitats from wet meadow habitat and along intermittent draws, to exposed grassy fields on south facing slopes in association with lodgepole pine to closed fireweed clones. Populations have been found up to 9,870 feet (Wagner and Wagner 1981, Wagner et al. 1984). This plant may be affected by grazing.

**Castilleja parvula var. parvula (Tushar Paintbrush)**

Tushar paintbrush is a member of the figwort family (Scrophulariaceae). Its many stems reach between 5 and 15 cm in height and support lanceolate leaves, which are one to two cm long. The small, brown bracts have short lobes, which are equally cleft above. The flowers appear June to August with purple-fringed, green petals. Capsules break open to allow dispersion of seeds by wind or gravity.

This taxa is distributed almost exclusively through the alpine meadows and igneous rockbeds of the Tushar Mountains between 10,000 and 12,000 feet. It is suspected to occur on the Cedar City Ranger District (Atwood 1996).

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).

***Castilleja parvula* var. *revealii* (Reveal Paintbrush)**

Reveal paintbrush, a perennial member of the figwort family (Scrophulariaceae), has a soft woody caudex above a cluster of roots. It has one or two, rarely three or more; unbranched erect stems (0.8-1.5 dm tall) often reddish-purple. The old stems persist on the plant with leaves 2.0-3.5 cm long, linear-lanceolate, and entire, the uppermost with small lateral lobes. The inflorescence is magenta to rose, with broadly lanceolate to ovate lobes. Sepals are green at the base, magenta-rose above, and 16-27 mm long with glandular hairs. Petals are green with magenta-rose on the margins and slight glandular hairs on the back. The Reveal paintbrush begins flowering in mid-June and continues until mid-July. The fruit is a capsule about one cm long with seeds that are dispersed by wind, small birds, and mammals. The perennial roots overwinter for several years (Spahr et al. 1991).

Reveal paintbrush occurs in heavy clay soils derived from the pink limestone member of the Wasatch Formation in ponderosa pine, bristlecone pine, and manzanita plant communities. It is commonly located on west to southwest facing slopes with little vegetation cover. Elevation ranges between 7,800 to 8,500 feet (Spahr et al. 1991). Reveal paintbrush is located on the Cedar City and Powell Ranger Districts (Atwood 1996).

This species is one of several *Castilleja* species that occupy narrow ecological and edaphic situations. Trampling could be a potential threat to this species (Spahr et al. 1991). This species is not affected by grazing as it occurs on exposed Wasatch Limestone on steep slopes where livestock grazing does not occur (Atwood et al. 1991).

### **Cryptantha ochroleuca (Yellow-White Catseye)**

The yellow-white catseye is a long-lived perennial and member of the borage family (Boraginaceae). It is low-growing (2-13 cm tall) with mat-forming characteristics. It has several hairy stems with linear-oblong leaves (1.0-2.5 cm long and 1-3 mm wide). The basal leaves are covered with dense hairs and the petioles have white hairs. Stem leaves are hairy with bristles. The narrow inflorescences have pale yellow petals with a 2.0-2.5 mm long tube. Flowering begins in May and continues into late June. It produces only one mature nutlet (2.5-3.0 mm long) with no elevated margin (Spahr et al. 1991).

The yellow-white catseye is associated with pinyon-juniper, ponderosa pine and bristlecone pine communities on the pink limestone member of the Wasatch Formation, between 6,500 and 9,000 feet. Plants prefer dry open sites on southern, warm slopes that are relatively stable, having some soil development among rocks and boulders. Yellow-white catseye is found on the Powell and Escalante Ranger Districts (Atwood 1996).

Threats to this plant include off-road vehicle use and trampling from other recreation use. Yellow-white catseye is not affected by grazing as it occurs on exposed Wasatch Limestone on steep slopes where livestock grazing does not occur (Atwood et al. 1991).

### **Cymopterus minimus (Cedar Breaks Biscuitroot)**

The Cedar Breaks biscuitroot is a member of the parsley family (Apiaceae) that grows from a deep-seated taproot with few to several branches. Stems, mostly subterranean, are white and often elongated. The leaves are two to three times pinnately dissected, with three to four opposite pairs of lateral primary leaflets. The petioles are 0.5-2.0 cm long or longer with etiolated subterranean portions. Rays of the umbel are mostly 5-10, 2-18 mm long. Bractlets of the involucrel are three to four, two to four mm wide. Pedicels are either lacking or to three mm long. The petals are creamy pink or pale purple with whitish margins. Fruit is four to eight mm long with wings up to one mm wide. The Cedar Breaks biscuitroot flowers from July-August (Welsh et al. 1993.)

Cedar Breaks biscuitroot occurs in bristlecone, ponderosa pine and spruce-fir communities on Wasatch Limestone between 8,000-10,400 feet elevation (Atwood et al. 1991). It is located on the Cedar City Ranger District of the Dixie National Forest (Atwood 1996).

This species is not affected by grazing as it occurs on exposed Wasatch Limestone on steep slopes where livestock grazing does not occur (Atwood et al. 1991).

### **Draba sobolifera (Creeping Draba)**

A member of the mustard family (Brassicaceae), creeping draba has a branched caudex and tall, slender flower stalks with one or no leaves. The obovate leaves are up to two cm long and covered with star-shaped hairs. Flowering July-August, this draba sports on each stalk 5-20 yellow petals measuring four to five mm long. The fruit is a silicle up to eight mm long with 4-12 seeds.

The creeping draba grows mostly on igneous gravels and talus as a member of alpine tundra or spruce-fir communities between 10,000 and 12,000 feet on the Tushar Mountains south of Marysvale. It is suspected to occur on the Cedar City Ranger District (Atwood 1996).

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 (Atwood et al. 1991).

### **Eriogonum aretioides (Widtsoe Buckwheat)**

The Widtsoe buckwheat, a member of the family (Polygonaceae), is a distinct pulvinate-caespitose perennial, which grows 20-30 rosettes of leaves forming mounds resembling half a cantaloupe (one to four dm across). Leaves are oblanceolate to elliptic (three to eight mm long) with a slightly thickened, rolled margin, and covered with a soft white wool. Stems are leafless and erect with a single flowering head atop. The yellow flowers are 1.8-2.5 mm long with four lobed involucre (Spahr et al. 1991). This buckwheat flowers from late May and into June.

The Widtsoe buckwheat is endemic to Garfield County, Utah. It is most often associated with bristlecone pine, ponderosa pine, Douglas fir, and Rocky Mountain juniper communities. It prefers dry open ridge tops on the Pink Limestone member of the Wasatch Formation between 7,500 to 9,000 feet elevation (Atwood et al. 1991). It is found on the Powell and Escalante Ranger Districts (Atwood 1996).

This buckwheat is one of the rarest in Utah, and is one of the most endangered. Development of roads and increased recreation use in the Bryce Canyon area will have an impact on its survival (Spahr et al. 1991). This species is not affected by grazing as it occurs on exposed Wasatch Limestone on steep slopes where livestock grazing does not occur (Atwood et al. 1991).

**Haplopappus crispus (Pine Valley Goldenbush)**

A woody member of the sunflower family (Asteraceae) growing 30-50 cm (12-20 in) tall, Pine Valley goldenbush has many branches covered with short-stalked glands. Alternate, wavy-margined leaves are spatulate to oblong-oblongate and measure 1.5 to 3 cm long. Flower heads are 12.5-16 mm long and occur one or two or more per branch. Ray flowers are absent and bracts resemble green leaves and are 1 nerved. Stramineous inner bracts also narrow to a green tip and are erose-ciliate apically. The 14-24 pale yellow disk flowers appears in August and the fruit--sparsely hairy, 6.5-8.5 mm long achenes follow through October.

This species is endemic to the Pine Valley Mountains in the Pine Valley Ranger District at an elevation of 5,970-9,200 feet. It is found generally in moderately open areas in association with ponderosa pine, manzanita, fir, and aspen (Spahr et al. 1991).

This species is not palatable to grazers and other effects on it are unknown (Atwood 1995b).



### **Heterotheca jonesii (Jones Goldenaster)**

Jones goldenaster is a member of the sunflower family (Asteraceae). It grows in tufts from a creeping subrhizomatous caudex. The stems are four to eight cm tall. The leaves are 5-11 mm long and obovate to spatulate. The heads are solitary or two to three with soft hairs, 5.0-7.5 mm high. The bracts are narrowly lance-oblong and hairy with translucent reddish margins. There are 5-13 yellow ray flowers, 4-6 mm long and hairy. Jones goldenaster is a long-lived perennial herb. It begins flowering in mid-May and continues until frost in mid-September. Seed is set in 7-10 days and dispersed throughout the growing season (Spahr et al. 1991).

Jones goldenaster occurs in ponderosa pine, manzanita, pinyon pine, oakbrush, and Douglas fir communities on sandstone or in sand on south and west facing slopes at elevations between 4,000 and 9,400 feet. This plant is endemic to Utah with populations scattered in Garfield, Kane, and Washington Counties (Spahr et al. 1991). Known populations occur along Hell's Backbone Road and within the Death Hollow Wilderness Area on the Escalante Ranger District (Utah Heritage Program 1994).

The major threats and limitations to this species' habitat and populations are losses of habitat by road building and off-road vehicle use (Spahr et al. 1991). This plant is not affected by grazing as it occurs on sandstone slopes and in sand where livestock grazing does not occur (Atwood et al. 1991).

***Jamesia americana* var. *zionis* (Zion Jamesia)**

A woody member of the saxifrage family (Saxifragaceae) up to 1.5 m (five feet) tall, the Zion jamesia has hairy twigs and foliage and reddish or whitish bark which exfoliates in whitish or translucent strips. Ovate or elliptic leaves are serrated, green and one to four cm long. Flowers are in small cymes, having five sepals and five white, clawed petals. Fruit capsules are four to five mm long with sepals three to four mm long (Welsh et al. 1993).

Welsh et al. (1993) report this jamesia as a member of pinyon-juniper, oak, and ponderosa pine communities along cliffsides at 4,200-6,000 feet in Kane and Washington Counties. If populations of the species occur on lands administered by the Dixie National Forest, they are most likely found on the Kolob Terrace at the extreme southern end of the Cedar City Ranger District.

This plant is not affected by grazing as it occurs on cliffs, sandstone slopes, and rocky places where livestock grazing does not occur (Atwood et al. 1991).

**Lepidium montanum var. neeseae (Neese's Peppergrass)**

Neese's peppergrass is a member of the mustard family (Brassicaceae). It grows from a somewhat woody base, two to five cm tall. The leaves are entire or some divided and mostly basal. The sepals are green or variously tinged. The petals are white, 2.5-3.5 mm long. There are six stamens. Neese's peppergrass is a perennial herb, which flowers from May to early June. It produces 2.8-4.1 mm long, ovate to elliptic silicles. The perennial roots overwinter for several seasons (Spahr et al. 1991).

Neese's peppergrass occurs in dry, sandy sites, mostly open with little cover in ponderosa pine, manzanita, and spruce-fir plant communities mainly on the pink and white limestone members of the Wasatch Formation and also on the Navajo Sandstone Formations at elevations of 7,300-9,000 feet. This plant is endemic to south-central Utah in Garfield County (Spahr et al. 1991) and is found in the Escalante Ranger District.

The major threats and limitations to this species' habitat and populations are loss of essential habitat by road building, logging, and CO<sub>2</sub> gas development (Spahr et al. 1991). This plant is not affected by grazing as it occurs on Navajo sandstone on barren slopes where livestock grazing does not occur (Atwood et al. 1991).

**Pediomelum pariense (Paria Breadroot)**

This member of the pea family (Fabaceae) somewhat resembles a clover. Deep tuberous roots give rise to a thin rootstock supporting hairy stems with short internodes. Each leaf has three glandular leaflets, which are yellow-green above and hairy and gray-green beneath. Cream to yellow-white flowers with purple wings and keel appear in clusters of 6-15 from June through July. Pods ripen late July and August and measure slightly less than one cm long.

The species' range is restricted to Garfield and Kane Counties. It grows at an elevation of 5,500-8,000 feet as a member of the ponderosa pine and juniper communities in calcareous or sandy soils on Pink Limestone of the Wasatch Formation, Navajo sandstone, and Quaternary alluvium. It is suspected to occur on the Powell Ranger District of the Dixie National Forest, but has not been confirmed (Atwood 1996).

Spahr et al. (1991) list off-road vehicle use, mineral exploration, industrial development, and intensive livestock grazing as potential threats to the species. This plant is not affected by grazing as it occurs on barren calcareous or sandy soils where livestock grazing does not occur (Atwood et al. 1991).

**Penstemon bracteatus (Red Canyon Beardtongue)**

The Red Canyon beardtongue, a member of the figwort family (Scrophulariaceae), arises 3-12 cm tall from a rhizomatous root system. Thick, spatulate to obovate leaves are 0.3 to 4.0 cm long, narrowing to petioles low on the stem and becoming sessile and clasping toward the top. The plant flowers May through early June in one to four whorls on flowering stalks. Lobed flower sepals are three to five mm long and are ovate to lanceolate with thin, dry margins. The blue to blue-violet petals are 14-17 mm long with a sparsely bearded pallet. The outer third of the staminode is golden bearded. By mid-July the fruit capsule has ripened and scattered seed.

This penstemon grows most commonly in pine needle duff on clay loam soils of calcareous, gravelly slopes and rock slides along the pink Wasatch Limestone Formation. Ponderosa pine, manzanita, limber pine, and bristlecone pine are associates. The species is restricted to Bryce Canyon and Red Canyon on the Powell Ranger District, where road building, logging, and recreational uses have threatened the species habitat (Spahr et al. 1991). This penstemon is not affected by grazing as it occurs on exposed Wasatch Limestone on steep slopes where livestock grazing does not occur (Atwood et al. 1991).

### **Penstemon parvus (Little Penstemon)**

A member of the Scrophulariaceae family, little penstemon has several stems, 5-10 cm tall, from a relatively long, slender root system. The leaves are green, obscurely veined, 2.0-2.5 cm long, and reduced in size upwards. The flowering stalk has one to two whorls consisting of one to two single flowered branches. The sepals are four mm long with fine glandular hairs. The petals are blue and 20 mm long, with soft, straight hairs. Little penstemon flowers from late June to August. The fruit is a several-seeded capsule.

Little penstemon grows in sagebrush-grass, pinyon-juniper, and spruce communities on tertiary volcanic gravels in sandy, gravelly loam at elevations between 8,200 and 11,500 feet. It is endemic to Utah in Piute, Garfield, and Wayne counties and apparently endemic to the Fishlake and Dixie National Forests.

According to the status report by Atwood (1981), there are five known populations with 30-100+ plants per population on the Dixie National Forest. Peters (1990) found extensive populations of this plant on the Aquarius Plateau between Cyclone and Big Lake of the Teasdale and Escalante Districts. Historic populations are located mostly in the Dog Lake area of the Teasdale Ranger District (Atwood 1981).

Reclamation projects, roads, and excessive grazing in the past, currently threaten this species' survival (Spahr et al. 1991). This plant is affected by sheep grazing but not by other animals.

**Penstemon pinorum (Pinyon or Pine Valley Mountain Penstemon)**

A member of the figwort family (Scrophulariaceae) which emerges from a loosely branched woody base, the pinyon penstemon has short, vegetative branches bearing hairy, glandular leaves (4-8 cm long) larger than those of the flowering stems. Flowering stems vary from 7 to 21 cm in length and support five to seven whorls of two to seven flowered branches. Blue-violet petals (10-15 mm) with bearded palate and lanceolate sepals (7-8 mm) appear from May to early June. The ovoid capsule is about four mm long.

The species range is scattered over less than 600 acres in five populations. Four are just southwest of Newcastle, Utah, and appear stable. The other population is entirely on Forest Service administered land southeast of Old Irontown. All plants are found between 5,620 and 6,700 feet elevation on gravelly soils and volcanic rubble of foothills to the north of the Pine Valley Mountains in the Pine Valley Ranger District. Pinyon penstemon grows in association with mountain brush, pinyon pine, and juniper as well as in open areas (Spahr et al. 1991).

A draft Conservation Assessment, Strategy, and Agreement with the Bureau of Land Management, and the FWS has been prepared and is under review.

Pinyon penstemon is not affected by grazing but could potentially be affected by trampling of wild horses (Atwood 1995b).

### **Potentilla angelliae (Angel Potentilla)**

Angel potentilla (Rosaceae) is a perennial herb consisting of a branched caudex surmounting a long taproot. The herbage is nonglandular, ascending-strigose, with the underside of the leaves having a fine, dense, whitish tomentum. The flowering stems are spreading to prostrate and are approximately 0.4-1.1 dm long. The leaves are mostly basal, pinnately five-foliate, and 2.5-4 cm long. Flowers are a one or two flowered cyme with 4-6.5 mm long yellow petals. The fruit is an achene (1.7 mm long).

Angel potentilla is known to occur in several locations on Boulder Top near Bluebell Knoll on the Teasdale Ranger District. This is the type location for the species and area where it was first discovered and described by Holmgren (1987). *Potentilla angelliae* grows in open, sparsely vegetated rocky subalpine meadows, often associated with *Potentilla concinna* Richardson. No research has been conducted on habitat requirements for this species.

This species is not affected by grazing; it may be affected by trampling (Atwood 1995a).



## **Salix arizonica (Arizona Willow)**

The Arizona willow (Salicaceae) is a small shrub up to two feet tall that can be scraggly, rounded, and prostrate or thicket formed (Galeano-Popp 1988). Leaves, 0.4-1.8 in long and 0.2-0.9 in wide, are rounded or nearly heart-shaped at the base, with fine-toothed margins. The current year's stems are bright red but become lighter as the season progresses. Stems commonly have two to six leaves (USFWS 1992a). Male catkins are one to three cm long, with brown to black pubescent scales and female catkins are between one to four cm long. This species is related to and can be confused with Salix boothii in morphology (Kearney and Peebles 1960).

According to Arizona documents, Salix arizonica occurs at elevations above 8,500 feet in wet meadows, streamsides and cienegas on volcanic soils (Galeano-Popp, 1988). 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, serviceberry, Bebb willow, blue and Engelmann spruce, shrubby cinquefoil, monkeyflower, tufted hairgrass, sheep fescue and Carex species (USFWS 1992a).

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. In 1993, a specimen was discovered in the Forest Service National collection that had been collected in 1913 from the Sevier National Forest, now administered by the Powell Ranger District, Dixie National Forest. Since formal surveys began in July 1994, five verified populations of this species have been recorded in Utah. Confirmed sightings occur in Sidney Valley and Rainbow Meadows (Cedar City District), East Fork of the Sevier River (Powell Ranger District), the Teasdale Ranger District, Cedar Breaks National Monument, in Sevenmile Creek and UM Creek on the Fishlake National Forest, and now in New Mexico. 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 was signed by state and federal agencies to manage the species under a common agreement. 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 known. 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 1992a).

### **Senecio malmstenii (Podunk Groundsel)**

A member of the sunflower family (Asteraceae), the Podunk groundsel arises from a slender stalk 4.5-7 cm tall. Basal leaves are petiolate, 0.4-1.8 cm long, obovate, and rarely lobed. Narrowly lance-subulate flower bracts number 12-16. Ray flowers and outer bracts are lacking. The pappus is white and the achenes glabrous.

The Podunk groundsel is associated with bristlecone pine, spruce, fir, and other conifers on talus slopes of the Claron Limestone at 8,000-10,000 feet elevation along the Markagunt and Paunsaugunt Plateaus, and on Canaan Mountain (Welsh et al. 1993). It is found on the Powell, Cedar City, and Escalante Ranger Districts of the Dixie National Forest (Atwood 1996).

This species is not affected by grazing because plants are generally on steep Claron limestone talus slopes where grazing does not occur.

### ***Silene petersonii* (Maguire Champion)**

The Maguire champion, a member of the pink family (Caryophyllaceae), grows from creeping, sub-rhizomatous root branches and tap roots. The stems are three to five cm tall, hairy and more or less glandular. The leaves are mainly along the stem in pairs of 2-6, 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. Sepals are bell-shaped, 13-19 mm long, 10-veined, and green or purple. Petals are 15-33 mm long and pink to purplish. The Maguire champion is a perennial that flowers in late July and August. Seeds are brown and 2-2.5 mm wide. Small birds, mammals, and winds will disperse the seed. The creeping rhizomes and perennial taproots persist for several seasons (Spahr et al. 1991).

Maguire champion occurs between 7,000 and 11,200 feet elevation on open calcareous limestone and igneous gravels. Preferred sites are in ponderosa pine, aspen, and spruce-fir communities (Spahr et al. 1991). Maguire champion is found on the Cedar City, Powell, and Escalante Ranger Districts (Atwood 1996).

Potential threats to the Maguire champion include limestone and mineral exploitation, timber harvest and off-road vehicle use. Livestock do not use this plant as it occurs on open calcareous and igneous gravels where livestock grazing does not occur (Atwood et al. 1991, Spahr et al. 1991).

### **Cymopterus beckii (Pinnate spring-parsley)**

Pinnate spring-parsley is a member of the parsley family (Apiaceae) that grows 5-40 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. There are 3-7 leaflets, 0.5-4.0 cm long, or the terminal one 1.0-5.5 cm long. There are 1-3 flower clusters per stem. The bractlets are greenish with dry, thin margins. The petals are bright yellow when fresh, fading to white when dried (Spahr et al. 1991). Pinnate spring-parsley flowers from April-June.

Pinnate spring-parsley occurs in pinyon-juniper, mountain brush, and ponderosa pine communities in sandy or stony places (Atwood et al. 1991) between 5,500-9,000 feet elevation. This plant is endemic to Wayne and San Juan counties and can be found on the Teasdale Ranger District.

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).

### **Sphaeromeria capitata (Rock-Tansy)**

The rock-tansy is a long-lived perennial and member of the sunflower family (Asteraceae). It grows in mats from a woody rootstock with stems between 2-12 cm long. Leaves are mainly basal (4-10 mm long) and palmately lobed. The few stem leaves are reduced upwards. Flower heads are few to numerous in a compact cluster. Flowering occurs in July with achenes maturing in August (Spahr et al. 1991).

The rock-tansy occurs with bristlecone pine on exposed slopes of the Cedar Breaks Limestone Formation between 5,000-7,800 feet elevation (Atwood et al. 1991). Distribution of the rock-tansy occurs in parts of Montana and Wyoming, and disjunctively in southcentral Utah in Garfield County (Spahr et al. 1991). Rock-tansy is located on the Powell Ranger District (Atwood 1996).

Threats to the Utah population include off-road vehicle use, livestock grazing and land disturbances associated with timber harvest. Additional data are needed for establishing management needs for the species.

**Thelesperma subnudum var. alpinum (Bicknell Thelesperma)**

The Bicknell thelesperma is a perennial herb and member of the sunflower family (Asteraceae). It grows from a taproot and less commonly with a caudex and creeping rootstock. Stems are between three to seven cm tall (Atwood et al. 1991). The leaves occur mainly at the base and are between 1.5-9.0 cm long. Flowering disks are bright yellow and lack rays. Plants flower in late June and into July (Welsh et al. 1993).

The Bicknell thelesperma, a Wayne County endemic, is restricted to the Navajo Sandstone and Carmel limestone on peculiar vari-colored phase in pinyon-juniper, mountainbrush, and bristlecone pine communities between 7,380-9,000 feet elevation (Atwood et al. 1991). It is found on the Teasdale Ranger District of the Dixie National Forest (1996).

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 (Atwood et al. 1991).

# MANAGEMENT INDICATOR SPECIES

## **Elk (*Cervus canadensis*)**

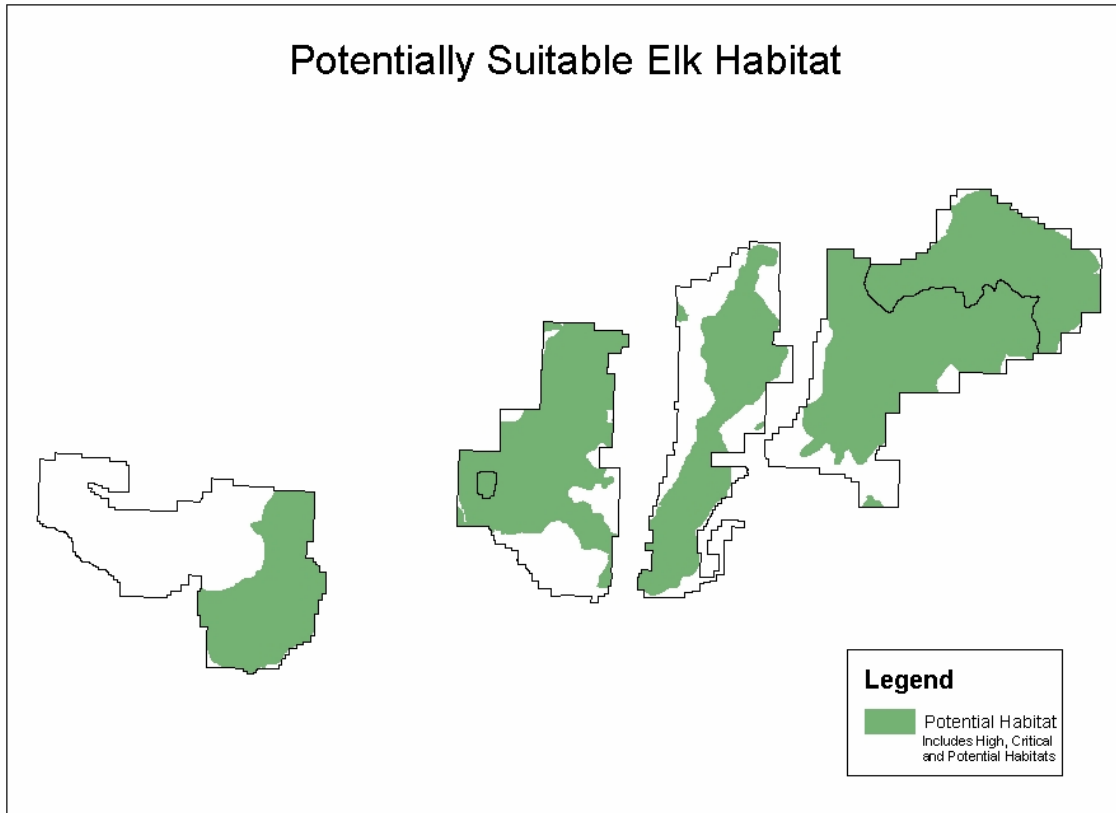
The habitat of elk includes semi-open forest, mountain meadows in the summer, foothills, plains, and valleys. Elk formerly ranged over much of the continent, but are now restricted in distribution. They occur in parts of the western and central United States (Burt and Grossenheider 1976). Roosevelt and Rocky Mountain elk require mature stands of deciduous and conifer 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 and into shrubs, and up to 1.8 m (6 ft) 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. Gestation period is about 255 days. Usually one calf is born, but occasionally two and rarely three. Young are born in secluded areas with good cover. Cows become sexually mature at about two years. In sedentary herds, female calves usually remain with 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 Dixie National Forest. The map below displays approximately 1,316,712 acres of potentially suitable summer and winter habitat across the Forest.

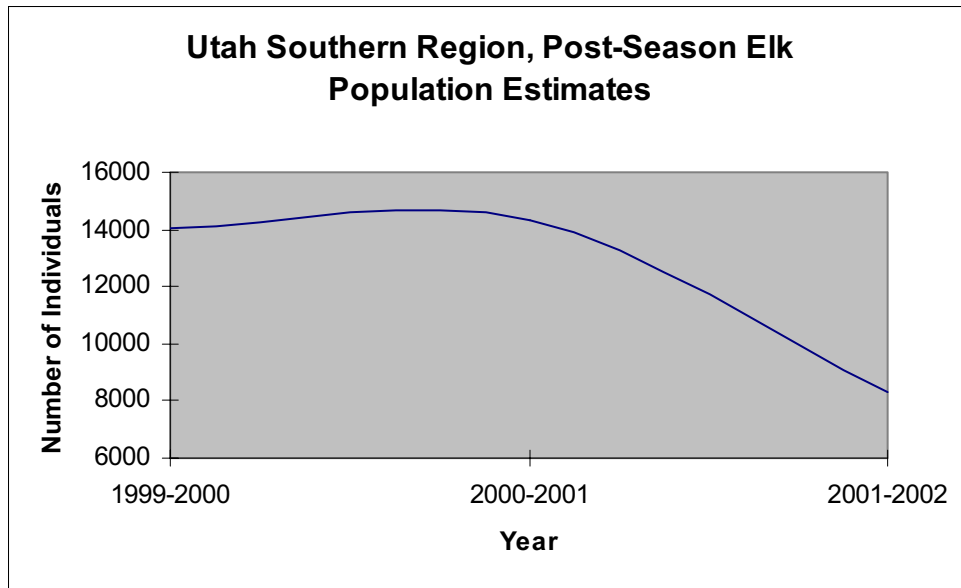


### Trend

The Dixie National Forest Land and Resource Management Plan (LRMP, II 16a) identified 800,960 acres of existing habitat across the Forest, and 1,019,346 acres of maximum potential habitat. The current number of potentially suitable habitat acres is 1,316,712 acres. This number exceeds the number of acres identified in the plan for both existing and maximum potential acres. The Division of Wildlife Resources collects population data and monitors harvest levels and trends of all big game populations, such as elk.

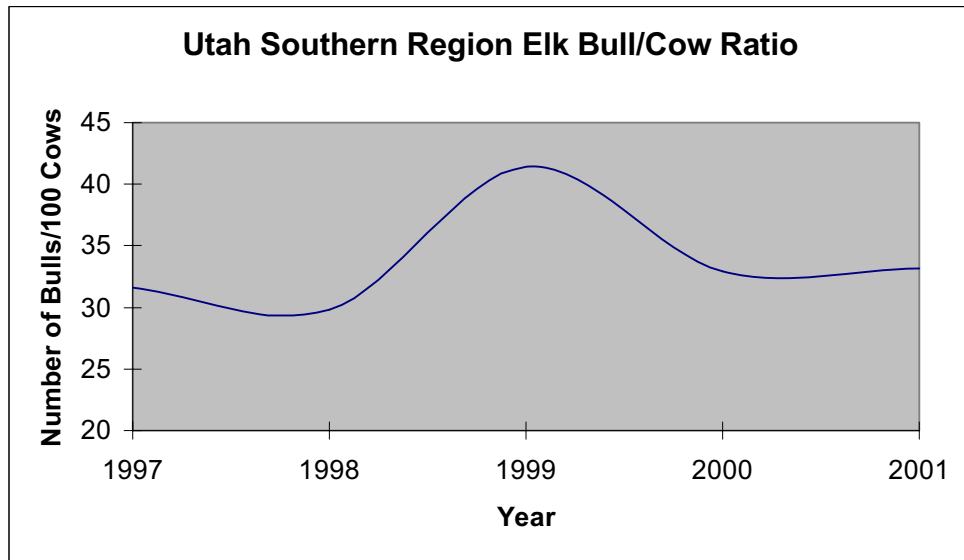


Displayed below are population graphs that describe population trends since 1997 in the Southern Region after elk hunting season.

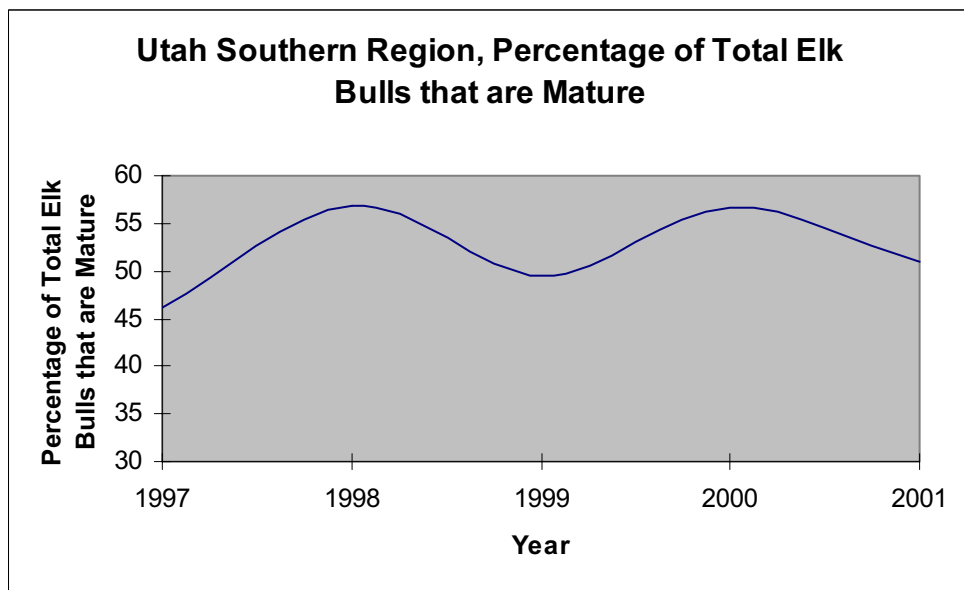


These data indicate a population decline between the years of 1999 to 2001. This decline is apart of an overall DWR management strategy to reduce the total number of elk in elk management units that do not comply with approved elk management plans. These reductions will only occur in units where management 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 2001 is up slightly from 1997, which demonstrates a fairly stable to upward trend based on this ratio of bulls to cows.



These data demonstrate an upward trend in the percentage of total elk, bulls that are mature.



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, with 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, (which is located in the DWR designated Southern Region), is stable to slightly up and viable. This determination does not mean that some units may have site-specific areas that are significantly higher than approved herd unit numbers or some that may be slightly lower. It does mean that the trends of elk on the Dixie, in the Southern Region are stable to slightly up in numbers.

## **Mule Deer (*Odocoileus hemionus*)**

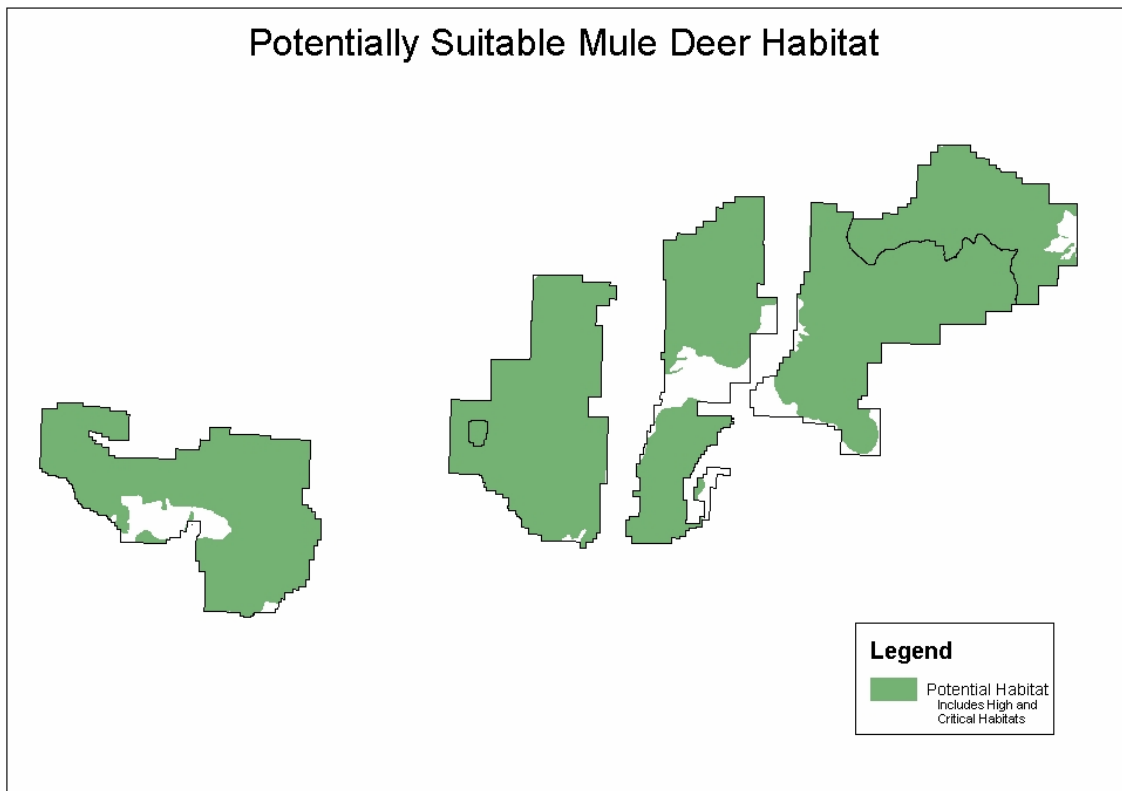
The Mule deer occupies several types of habitat throughout the west. Mule deer occur in coniferous forests, desert shrubs, chaparral, and grassland with shrubs (Burt and Grossenheider 1976). They occur in early to intermediate successional stages of most forest, woodland, and brush habitats. Mule deer 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. Frequent various aspects of habitat during the year aid in thermal regulation. For example, they use south-facing slopes more in cold weather, and north-facing slopes more in hot weather (Ahlborn 1990).

Mule deer browse and 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 yr (Ahlborn 1990).

Natural predators of deer have been reduced in numbers in most areas. Overpopulation, with resultant winter die-offs and destruction of habitat, occurs periodically in California, as in other states. 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 Dixie National Forest and is displayed below. This habitat consists of approximately 1,883,770 acres of potentially suitable summer and winter habitats across the Forest.

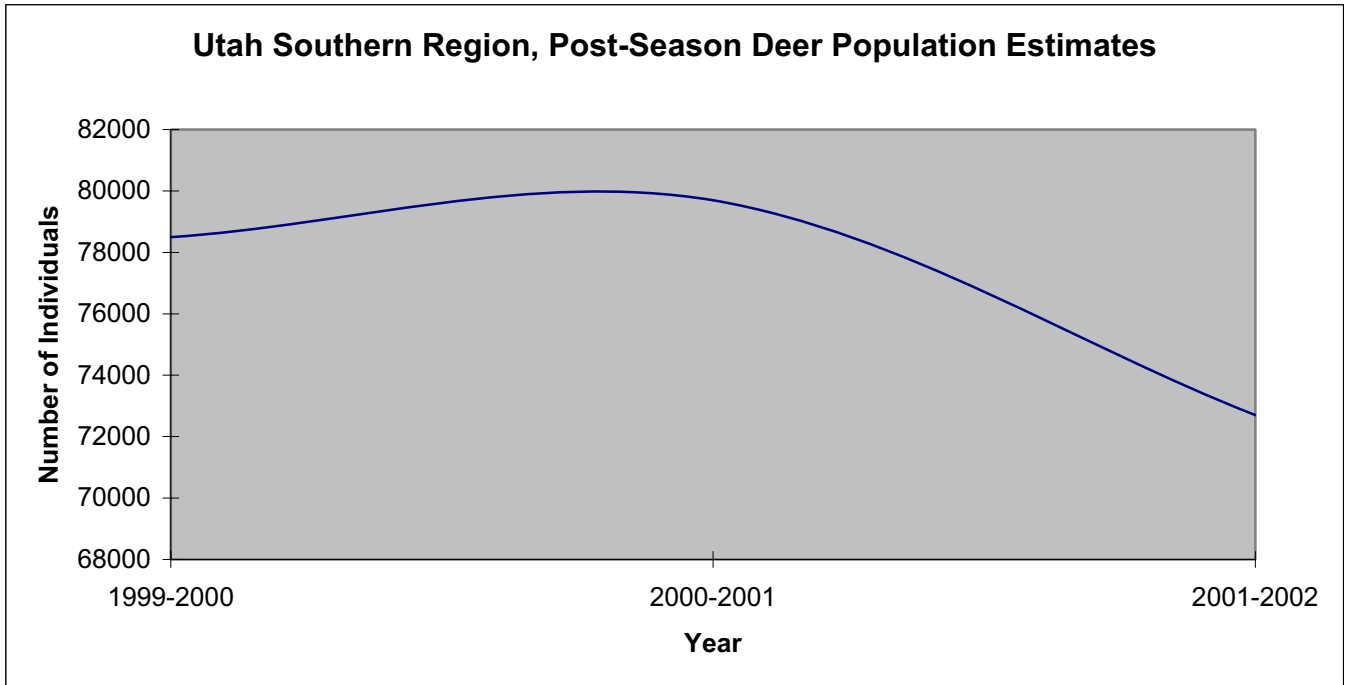


### Trend

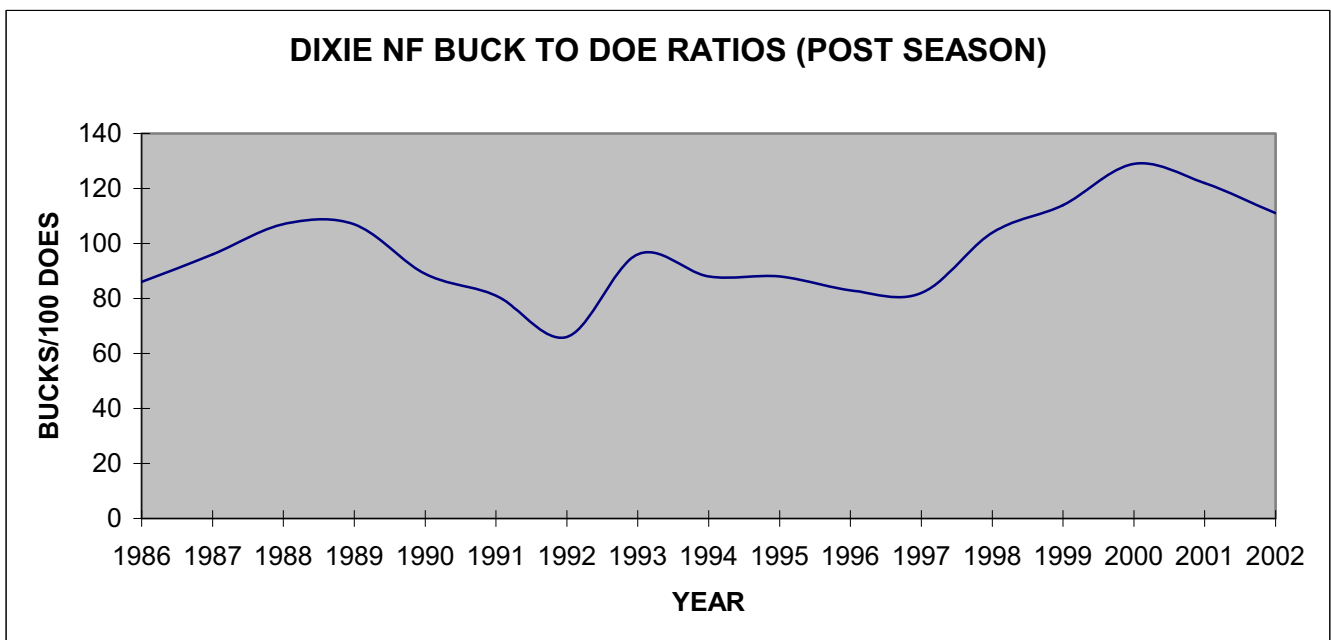
There are approximately 1,883,770 acres of potentially suitable habitat on the Dixie National Forest. These data are identical to those represented in the Dixie LRMP, (II 16a)

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 since 1999 in the Southern Region after hunting season.

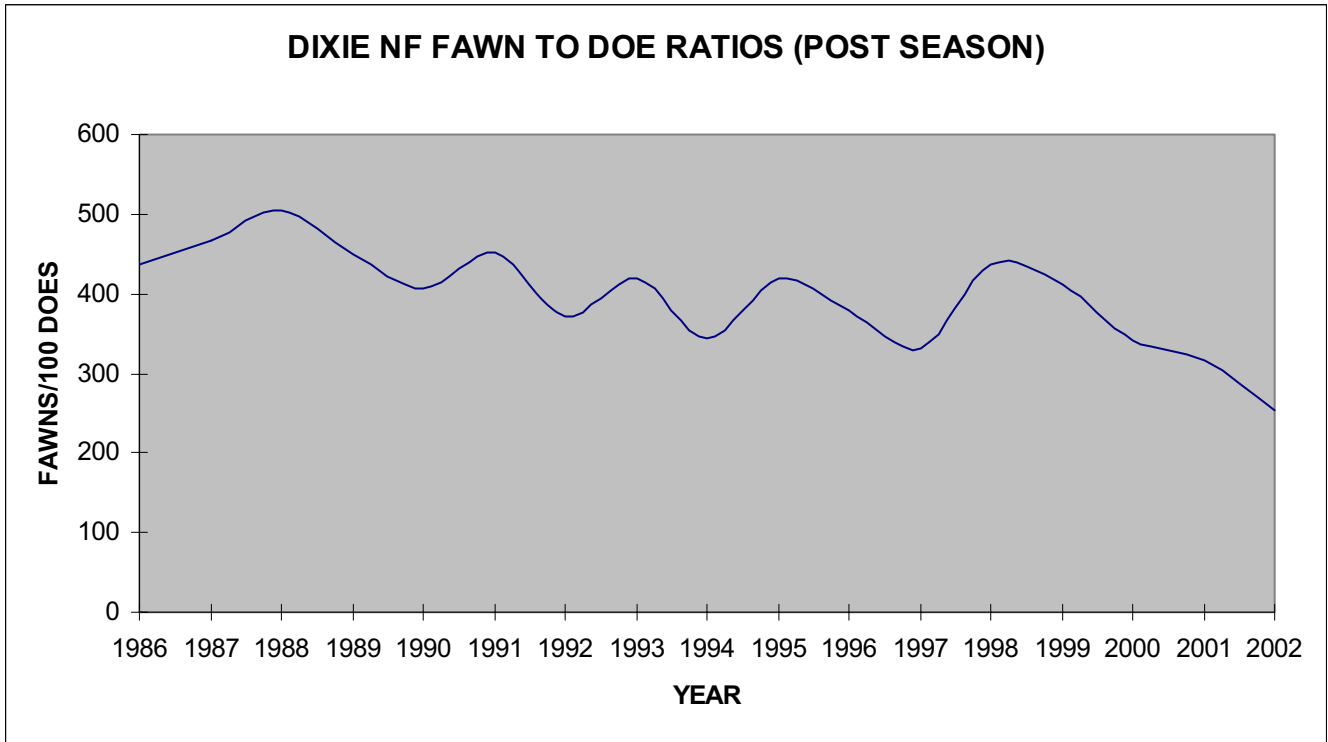
These data display a decline in the total number of deer in the entire Southern Region. It should be noted that a hunting unit may be within approved herd unit objectives and as a result of management strategies population numbers may be reduced. There are units throughout this area that are at herd unit objective and active management is in the process of reducing total numbers.



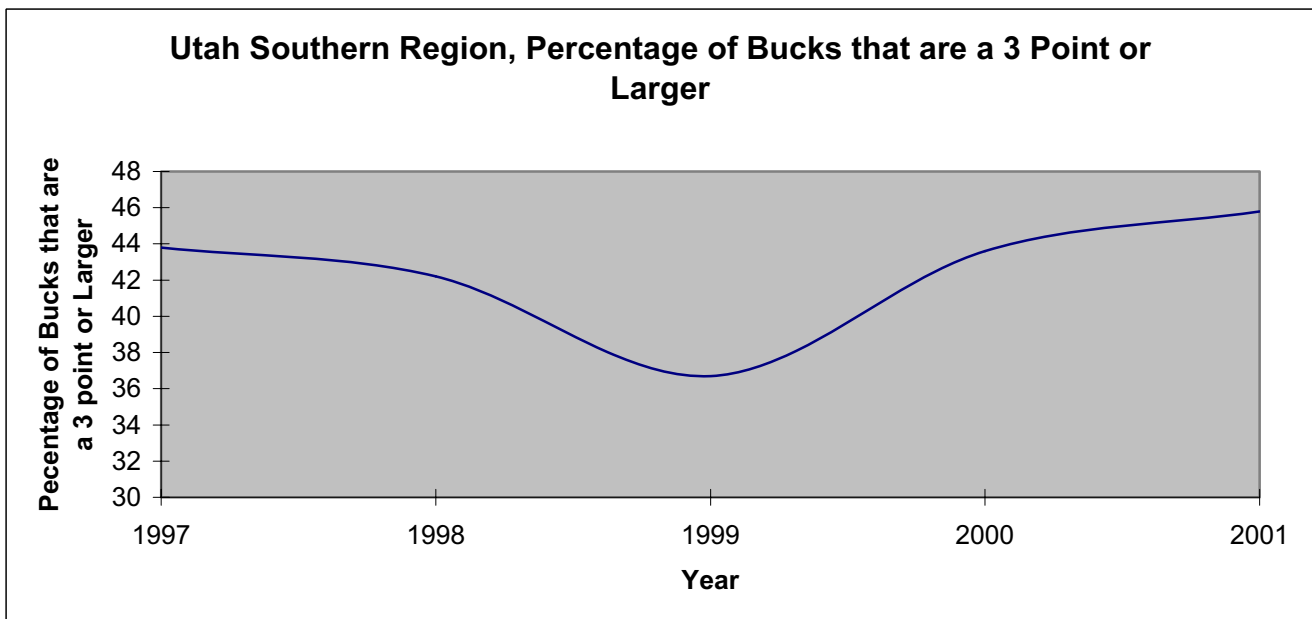
This graph displays fluctuation in the trend of buck to doe ratios in the Southern Region.



The data presented below demonstrates a decline in the number of individuals being recruited into the population. These fluctuations and the downward trend correlate with drought conditions in the Southern Region. As stated earlier, some herd units are at objective while others are below.



The data presented below demonstrates an increase in the number of buck deer that are 3 point or larger since 1997. A decline was observed in 1999; however, populations rebounded and increased higher than previous years.



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, with 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, increased predation from large mammals, habitat modifications and winter range degradation. The Dixie National Forest provides primarily summer and transitional ranges for big game with only limited winter range across the Forest. Winter ranges have been severely impacted due to sagebrush die off. These areas are located primarily on state SITLA and BLM administered lands. Because winter range is a vital component in managing for viable mule deer herds, the Dixie National Forest has very little influence over winter survival. Although the numbers of young being recruited into the population are on a decline, the data show an increase in mature bucks into the population. Based on these data, mule deer populations on the Dixie National Forest are viable, while some site specific areas are in a continuing downward trend.

## **Northern Goshawk (*Accipiter gentilis*)**

Northern goshawks are associated with coniferous and mixed forest through much of the Northern hemisphere (Wattel 1981). Studies of nesting habitat show that goshawks nest in older-aged forests with variable tree species (Shuster 1980, Reynolds and Wight 1978, Saunders 1982, Moore and Henny 1983, and Hall 1984). The most consistent vegetative characteristic of goshawk nest sites is high percent canopy closure. Studies on habitat characteristics at goshawk nest sites have reported average canopy closure measurements ranging from 60 percent in eastern Oregon and 77 percent in northern California, to 94 percent in northwestern California (Reynolds and Wight 1978, Saunders 1982, and Hall 1984). Stand structure ranges from dense multi-layered stands in Oregon (Reynolds 1975, Reynolds and Wight 1978) to open park-like understories in Colorado and California (Shuster 1980, Saunders 1982, Hall 1984). Average 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 18 inches in northwestern California (Hall 1984).

Goshawks appear to prefer north to east aspects for nest sites, as stands on these aspect are typically denser and more suitable (Reynolds 1983, Shuster 1980, Hall 1984). Slope also appears important as nests are usually placed on flat to moderately sloped land where trees are able to grow larger and at a higher density (1-39 percent) (Reynolds 1983, Shuster 1980, Hall 1984).

The importance of the proximity of the nest area to water is not known. Saunders (1982) and Moore and Henny (1983) found that the distances of water from nests averaged approximately 650 feet. Reynolds (1979) suggested that 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, shrub-canopy, and layers. Bloom et al. (1986) stress the importance of meadows, streams, and aspen stands, which may be important to prey species on which the goshawk feeds. However, Reynolds (1979) observed that goshawks forage in a variety of habitats probably along edge as well as in deep forests, provided that there is available prey and vegetation is not too dense to prevent flight. 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, arched trees, rocks, or horizontal tree limbs below the canopy (Bartelt 1974, Reynolds and Wight 1978). In Oregon and California studies, goshawks were found to forage primarily on birds and mammals (Reynolds and Wight 1978, Reynolds 1979, Bloom et al. 1986). In northern Arizona, Boal and Mannon (1991) found that Steller's jay, northern flicker, golden-mantled ground squirrel, and the least chipmunk 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, Village 1990). 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.

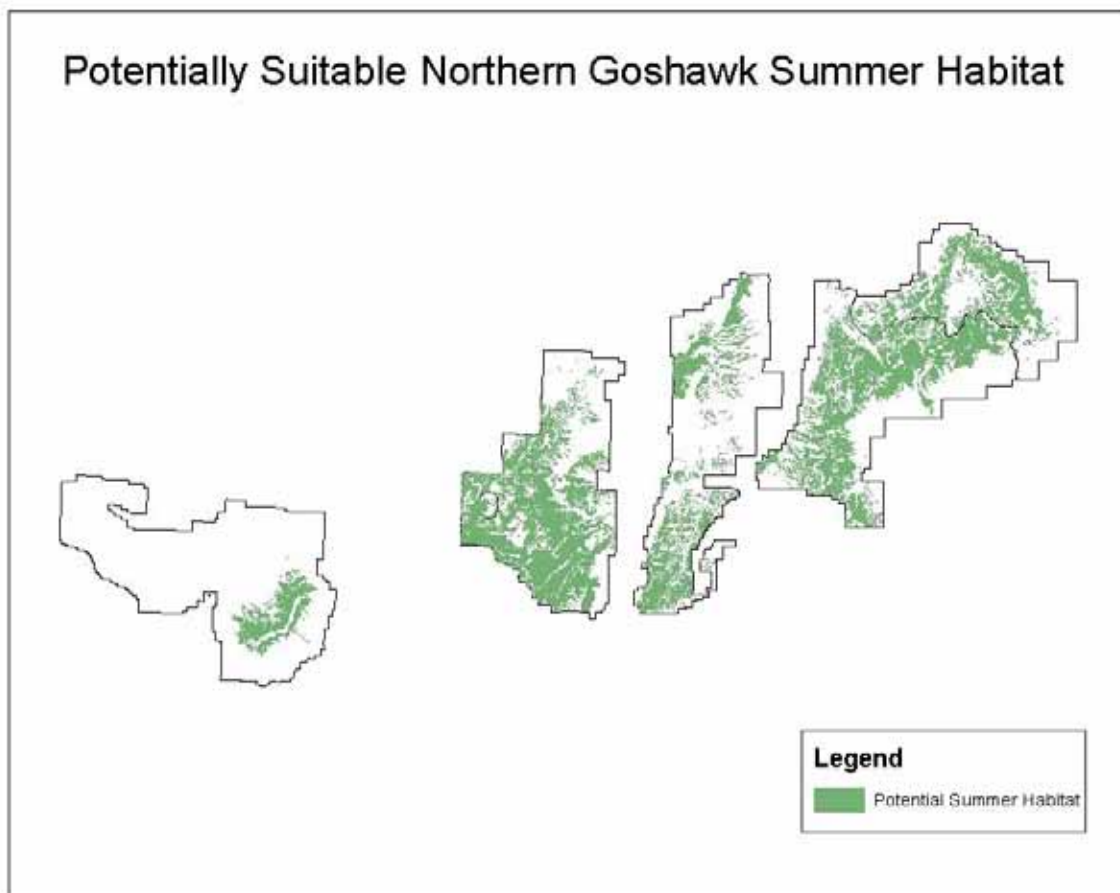
Goshawks begin breeding activities in April. Clutches of three to five eggs are laid in mid-June with the nestling period extending through mid-July. Nests are typically large stick platform structures built in a fork near the trunk of the tree, on a large branch, or on top of a mistletoe whorl, 30-40 feet from the ground in the lower two-thirds of the crown (Eng and Gullion 1962, McGowan 1975, Reynolds 1975, Bartelt 1974, Moore 1980, Hall 1984, McCarthy et al. 1989, Hennessy 1978, Shuster 1980, Reynolds and Wight 1978). Young are fledged between July 15-August 15 and may be dependent on adults for food until September 30. Goshawks typically build more than one nest in adjacent trees or as far as one mile from the active nest tree. Goshawks may alternate between one or more of these alternate nests on an annual or semi-annual basis.



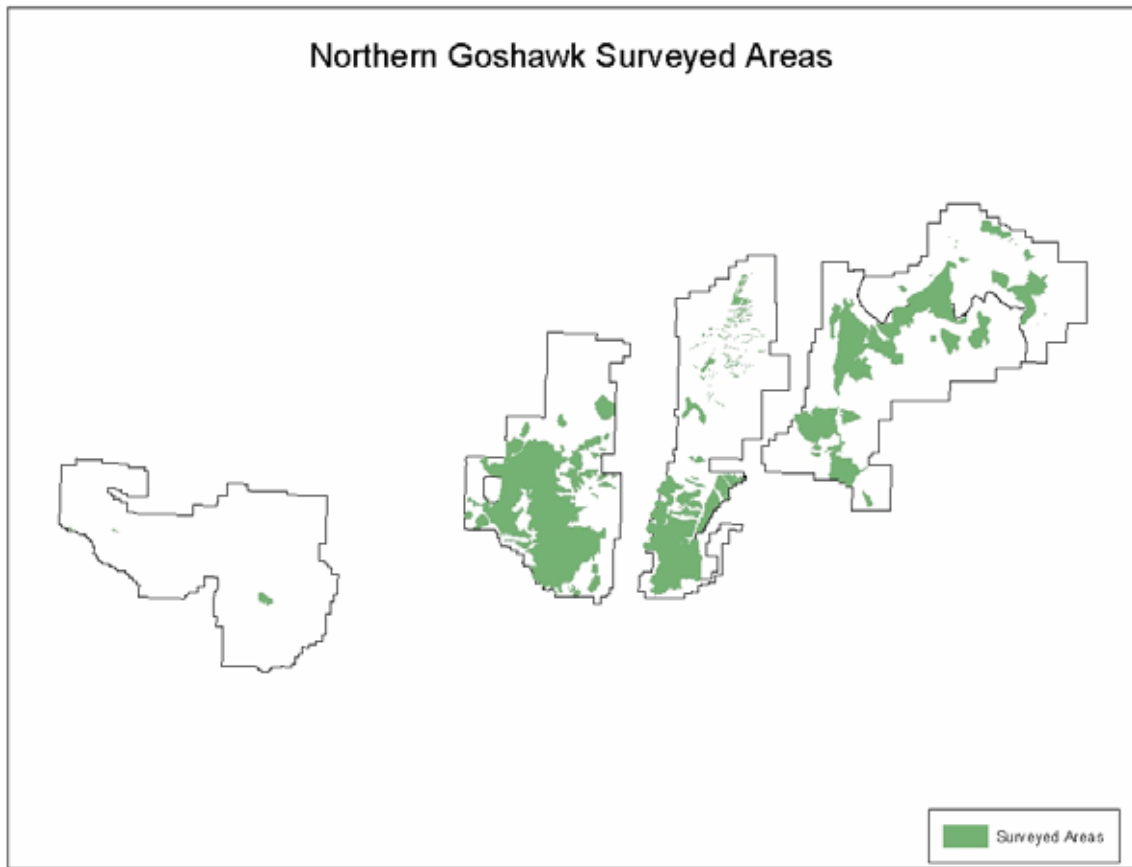
The Northern goshawk is holarctic in distribution. In North America it occurs primarily in boreal forests, but it also occurs far to the south in montane forests of western United States and Mexico. The most widespread subspecies (*A. g. atricapillus*) occurs from the northeastern United States across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

According to data collected on the Dixie National Forest over the past twelve years, approximately 174 nests occur on the Forest, which represents 111 territories. This number can vary as a result of high winds and other natural events that can affect nests. Historical nesting activity ranges across the Forest from 20-30 nests annually. An active nest is defined as, a nest where adults are present and incubating or where young are present in or at the nests.

Displayed below is a map of potentially suitable goshawk habitat across the Forest. There are approximately 654,473 acres of potentially suitable habitat on the Forest.



Since 1989, approximately 411,622 acres of suitable habitat have been surveyed on the Forest.

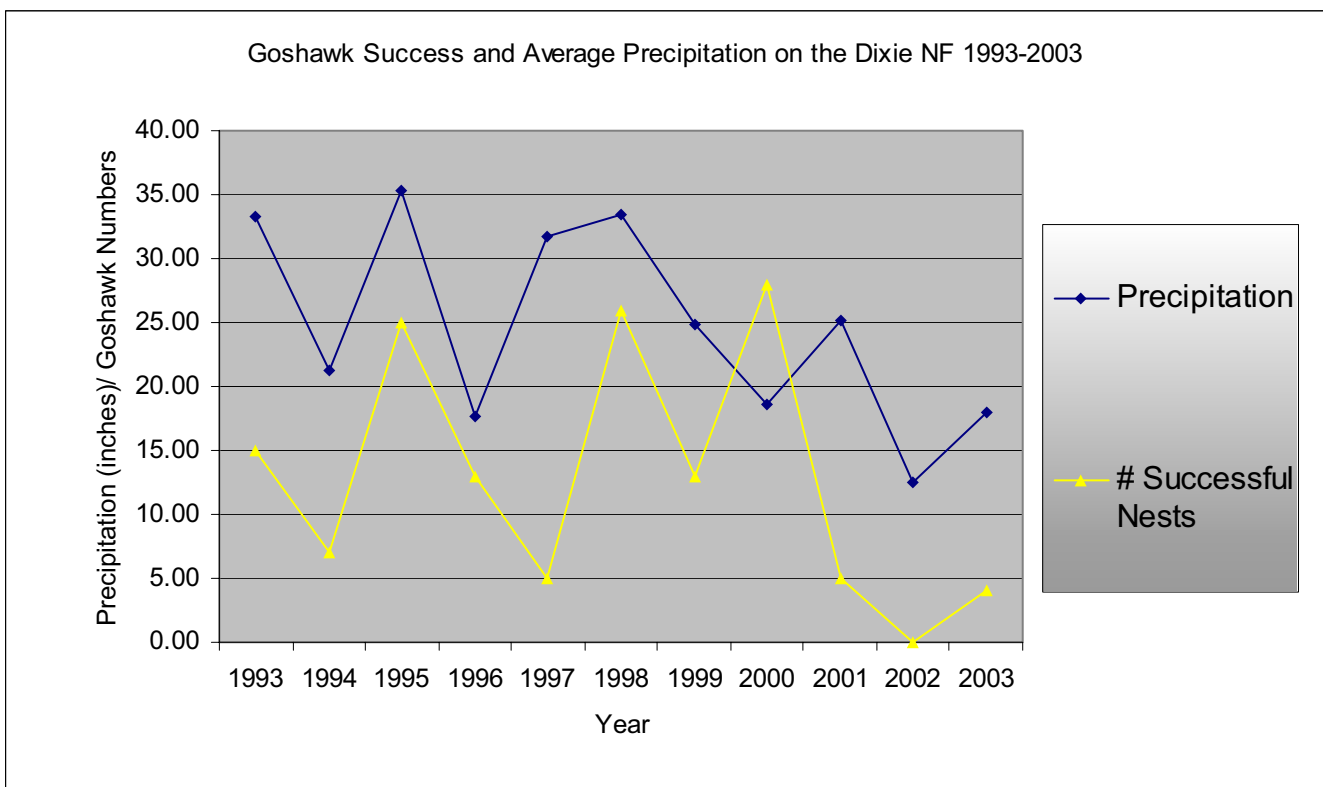


The Utah Northern Goshawk Conservation Strategy and Agreement are being implemented on the Dixie National Forest. The Forest recognizes this document for its sound ecological base and is implementing these principals. Furthermore, the Forest recognizes this publication as the best science available on goshawk management in Utah. As stated in this document, 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 Utah Northern Goshawk Project Environmental Assessment 1999, which provide standards and guidelines for individual forest plan amendments.

## Trend

Goshawk populations on the Dixie 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.

Poor reproductive success due to severe sustained drought conditions in Southern Utah has been a primary concern. This graph displayed below demonstrates the relationship between drought and reproductive success between 1993-2003. The spike in success was likely due to the timing of the precipitation and its effect on prey species abundance. This situation is not repeated on other National Forests in Utah where higher amounts of precipitation have occurred. The data used in this determination was obtained by filed reviews from District wildlife biologists.



As a result of a combination of these events across the Forest over the past several years, goshawk populations have been demonstrating a downward trend across the Forest. Although the number of active nests has been down, occupied territories (bird in the nest area, but not nesting) have been commonly observed across the Forest.

While the population of nesting goshawks on the Dixie National Forest is experiencing a downward trend, the viability of this population is still under review. As of 2003, approximately 63 % of the 654,473 acres of suitable habitat has been surveyed. The acres that comprise this 63 % consist of proposed projects and surrounding areas. Surveys outside of proposed project areas have been ongoing; however, beginning in 2004 this effort will expand.

## **Northern Flicker (*Colaptes auratus*)**

This bird is 30 to 35 cm in length (Palmer and Fowler 1975, Winkler et al. 1995). Its wingspan is 54.1 cm, tail length is 12.2 cm, and bill length is 4.2 cm (Palmer and Fowler 1975). This is the only woodpecker to have a gray-brown barred back and white rump. The male has a tan head, gray crown, red nape, black moustache, and a black crescent on the breast. Underneath, the male is light tan with heavy black spotting. The tail is black on top. In the Eastern form, Yellow-shafted Flicker, the male has yellow underwings and under the tail, while the Western form, the Red-shafted Flicker, has reddish underwings (Palmer and Fowler 1975, Farrand, Jr. 1988).

These woodpeckers are found in wooded areas that have stands of dead trees (Palmer and Fowler 1975). They are also found in open areas, forest edges, clear-cut areas, burnt areas, agricultural lands, and residential areas (Winkler et al. 1995). This woodpecker ranges from Alaska eastward to Quebec, then south throughout the entire United States. Northern Flickers are migratory and winter in the southern part of this range and in northern Mexico (Palmer and Fowler 1975, Farrand, Jr. 1988, Winkler et al. 1995). In addition, these woodpeckers are found on Grand Cayman, Cuba, and range as far south as the highlands of Nicaragua (Winkler et al. 1995).

The breeding season occurs from February to July (Winkler et al. 1995). The nest is excavated in dead tree trunks, dead parts of live trees, or telephone poles (Palmer and Fowler 1975, Winkler et al. 1995). These woodpeckers will build nests in nest boxes (Palmer and Fowler 1975). Nests are usually built below 3 m (Winkler et al. 1995).

There are 3 to 12 white, glossy eggs per clutch (Winkler et al. 1995). Larger clutches have been reported (Palmer and Fowler 1975), but these clutches are the result of eggs from more than one female (Winkler et al. 1995). The eggs are approximately 3 cm by 2.2 cm and weigh 7 g. Both parents incubate the eggs for 11 to 16 days. One or two annual broods occur (Palmer and Fowler 1975).

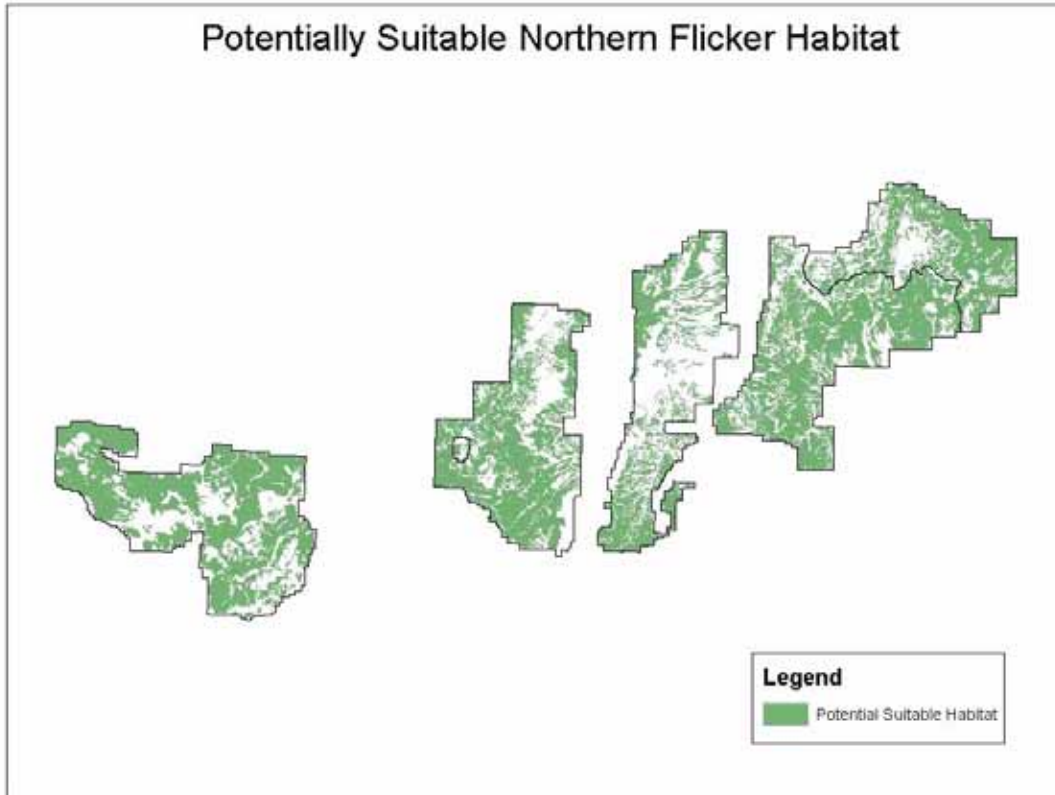
Male flickers recognize females by sight. To protect his mate or territory, birds of the same sex become aggressive toward each other (Palmer and Fowler 1975). Flickers use aggressive displays such as "bill directing" or "bill poking". That is, a flicker may point his bill at a rival with his head inclined forward, or actually peck at an opponent. A more aggressive display is "head swinging," whereby a flicker will use side-to-side movements of his head and body against an opponent. There is also a "head bobbing" display that may be used. Sometimes tail spreading accompanies head swinging or bobbing displays (Short 1982).

Young flickers will molt to adult plumage from June to October (Palmer and Fowler 1975). After the nestling period of 25 to 28 days, the young remain with the parents for some time, calling to the parents to be fed (Winkler et al. 1995).

Their chief food is ants. Other insects they consume include grasshoppers, crickets, termites, wasps, aphids, beetles and their larvae, caterpillars, and spiders. Cherries and the berries of dogwood, Virginia creeper, poison ivy, sumac, hackberry, and blackgum are also important foods as well as weed seeds, acorns, and other types of nut kernels (Palmer and Fowler 1975, Winkler et al. 1995). In the fall and winter, greater than half their food intake is in the form of fruit (Palmer and Fowler 1975).

These woodpeckers are very useful destroyers of insect pests, including the European corn borer. Since they have a particular taste for ants, these woodpeckers also eliminate plant-injuring aphids, which provide "honeydew" for ants (Palmer and Fowler 1975).

On the Dixie National Forest the northern flicker occurs on all 5 Ranger Districts in all forest cover types. This species is very wide-ranging and easily detectable. Below is a map that displays potentially suitable habitat across the Forest. This area totals approximately 1,196,146 acres.

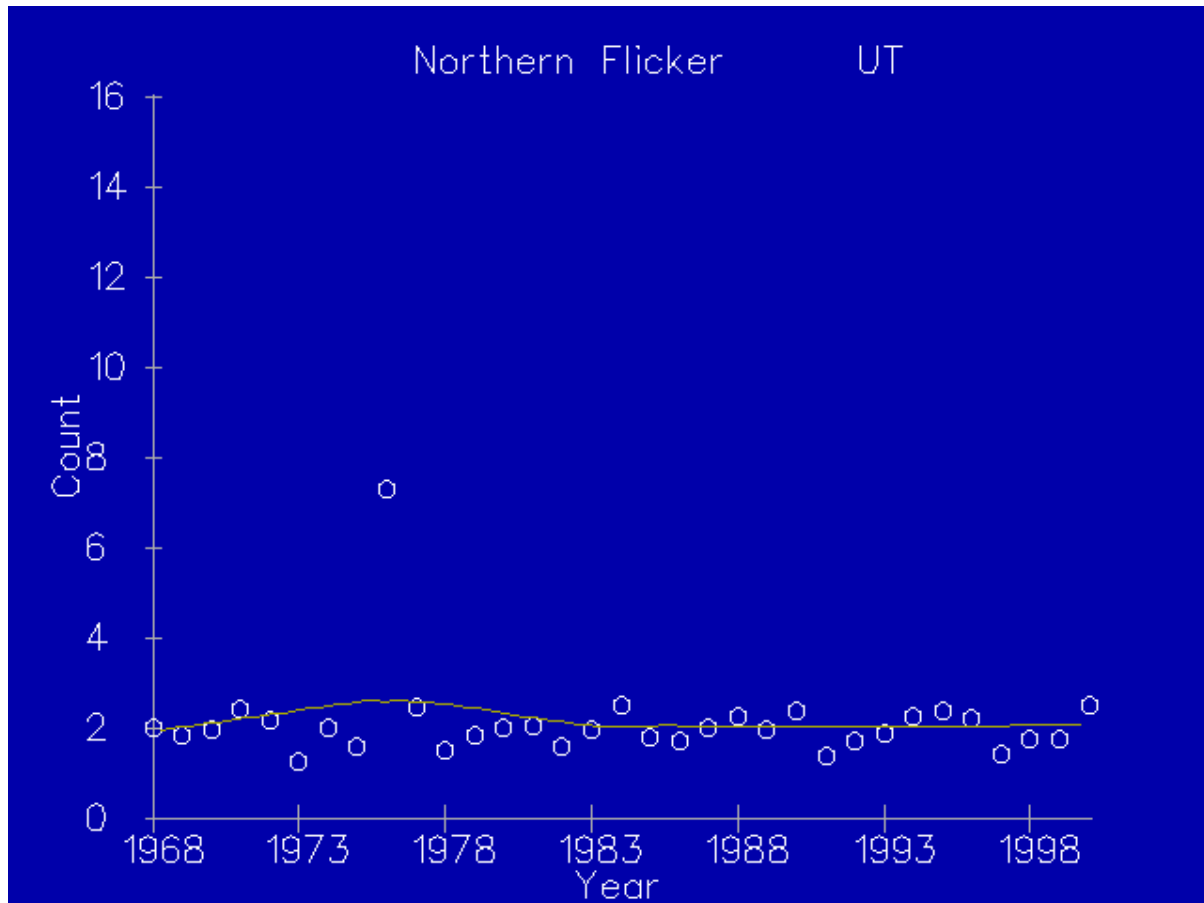


### Trend

On the Dixie National Forest flicker surveys have been conducted on all 5 Ranger districts across the Forest. To date approximately 112 line transects have been monitored in 2003, locating 287 birds. In addition to these survey efforts flicker surveys have also been conducted randomly across the Forest in conjunction with other multi species wildlife surveys. Survey data has been recorded as early as 1967, however, the majority of the survey efforts started in 1986. The Dixie LRMP (II-16a) identifies the existing population of flickers on the Forest at the time the plan was signed in 1986 as being 11,900 pairs on 476,000 acres of suitable habitat. Based on site-specific forest data, which includes 524-point locations, and 112 line transects, approximately 1.1 % of the potentially suitable habitat on the Forest has been surveyed. Based on these data, there are approximately 36,000 pairs of flicker on the Forest, or 1 flicker every 16.6 acres of habitat. Therefore, the numbers of flickers have increased since 1986 by approximately 24,100 pairs.

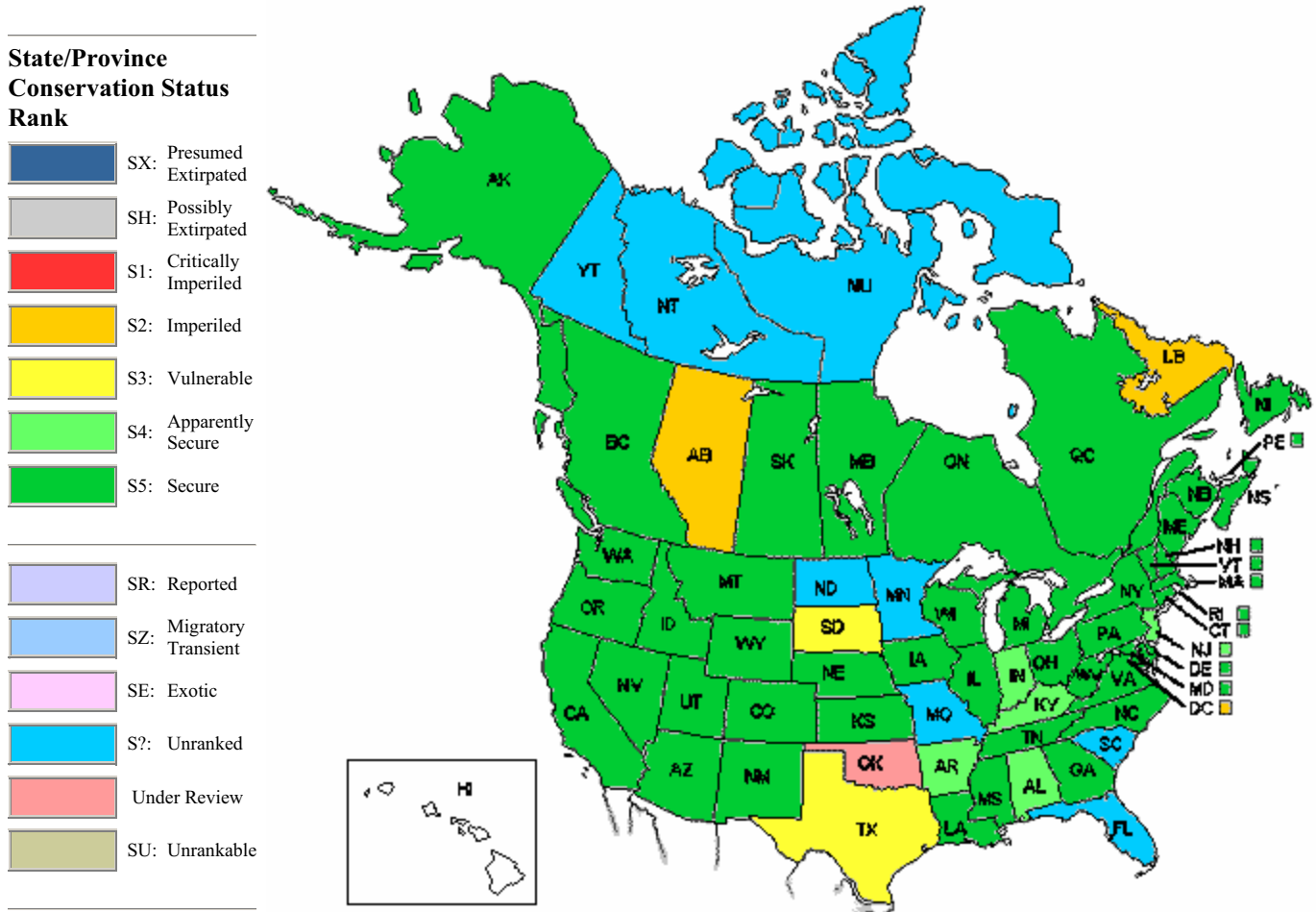
In addition to these data, the BBS database ([www.mbr-pwrc.usgs.gov](http://www.mbr-pwrc.usgs.gov)) displayed a stable trend of Northern flickers in Utah. These data represent a 30-year trend between 1968 and 1998. These data were collected throughout the entire state including points on the Dixie National Forest.

To add to these data, Parrish et al. (1999) stated that the northern flicker is abundant; it is a species that can be observed in quantity in its habitat any day in the proper season without any special search. Flickers are widespread, meaning they breed in 51-75 % of North America, including Mexico. In addition, threats in the breeding range to flickers are minor. Habitat loss is between 1 % and 25 %, or they are moderate ecological generalists. Also, according to Parrish et al. (1999), Utah has a very low importance to this species, meaning less than 1 % of the species' total breeding distribution is in Utah.



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

### Northern Flicker (*Colaptes auratus*)



NatureServe Explorer: An online encyclopedia of life. [web application]. 2001.version 1.6 Arlington, Virginia, USA: NatureServe. Available: <http://www.natureserve.org/explorer>.

Due to the increase in flickers across the Forest, as well as additional data such as the BBS data ([www.mbr-pwrc.usgs.gov](http://www.mbr-pwrc.usgs.gov)) for the state of Utah, these data support that there is an upward trend in number of flickers across the Dixie National Forest, and that this species is viable.

## **Wild Turkey (*Meleagris gallopavo*)**

Wild turkeys are part of a group of birds that include pheasants, grouse and quail. Wild turkeys are the largest of the North American game birds with an adult male weighing 17 to 30 pounds. An adult hen will weigh from 8 to 12 pounds.

Turkeys use distinct habitats during different periods of the year. Turkeys spend about one-half the year (October to March) in winter habitat, which must provide adequate and reliable food, plus cover from bad weather. Prime winter habitat has at least 50 percent mature forest for Merriam's and about 50 % cottonwood species for Rio Grand's. For the Merriam's ponderosa pine trees, if mature, produce large quantities of seeds, or mast. Masts such as ponderosa seeds or oak acorns are the staple of the turkey's winter diet. In agricultural areas, turkeys often depend on crop fields with waste grain for winter food. They also scratch through snow for other seeds. Therefore, supplemental feeding is not needed.

Summer and fall habitats consist of mowed hay fields, grazed pastures, glades or open woods. These areas are extremely important to hens and their poults. Low plant cover provides abundant insects and seeds.

In comparison to winter habitat, the size of summer and fall areas used by turkeys is relatively small, but vital. Acreage in openings may vary, but should make up more than 10 percent of the total annual range, with 30 percent approaching the optimum.

Abandoned fields surrounded by timber are an essential component of annual wild turkey Rio grand range. Because Merriam's, are mountain birds, they occur in ponderosa pine, mixed conifer, and spruce-fir stands

Wild turkeys require water and are not found in areas without permanent water. Construction of one small pond per square mile, or preferably one per quarter section, where no permanent water exists, improves turkey habitat and provides additional nesting sites. Wildlife ponds built in timbered areas need not be large, but should be deep to provide water during the driest part of the summer. A good size pond to construct is approximately 30 to 40 feet across and 8 feet in depth.

In the winter, gobblers flock together and separate from hens and jakes (young males). Occasionally jakes are found with gobblers, but typically they remain with the hens until spring. In early spring, the winter flocks begin to break up and courtship and mating begin. Males travel greater distances seeking mates. Gobbling and strutting activity increases. Strutting displays are spectacular, with tail fanning and wing-dragging. Older, dominant birds do most of the breeding and one gobbler is capable of breeding with many females.

Peak time for gobbling in most years is late April. By this time most of the hens are laying eggs or incubating. The average clutch for wild turkeys is about 11 eggs and incubation takes 28 days. In Missouri, most young turkeys hatch in late May and turkey nests are often located near the edge of woods, old fields and roadsides, but can be found in almost any habitat. As soon as the last turkey has hatched, the hen leads her brood away from the nest. During the first 3 weeks of life, young turkeys (or poults) are vulnerable to cold, rainy weather and must depend on the hen for protection and warmth. In addition, foxes, coyotes, bobcats, mink or great-horned owls may prey on young turkeys.

Young turkeys grow rapidly and need a diet high in protein. For the first week, approximately 80 percent of the poult's diet consists of insects. As they grow, their diet broadens to include grass seeds, dogwood fruits, wild grapes, acorns, corn, oats and wheat.

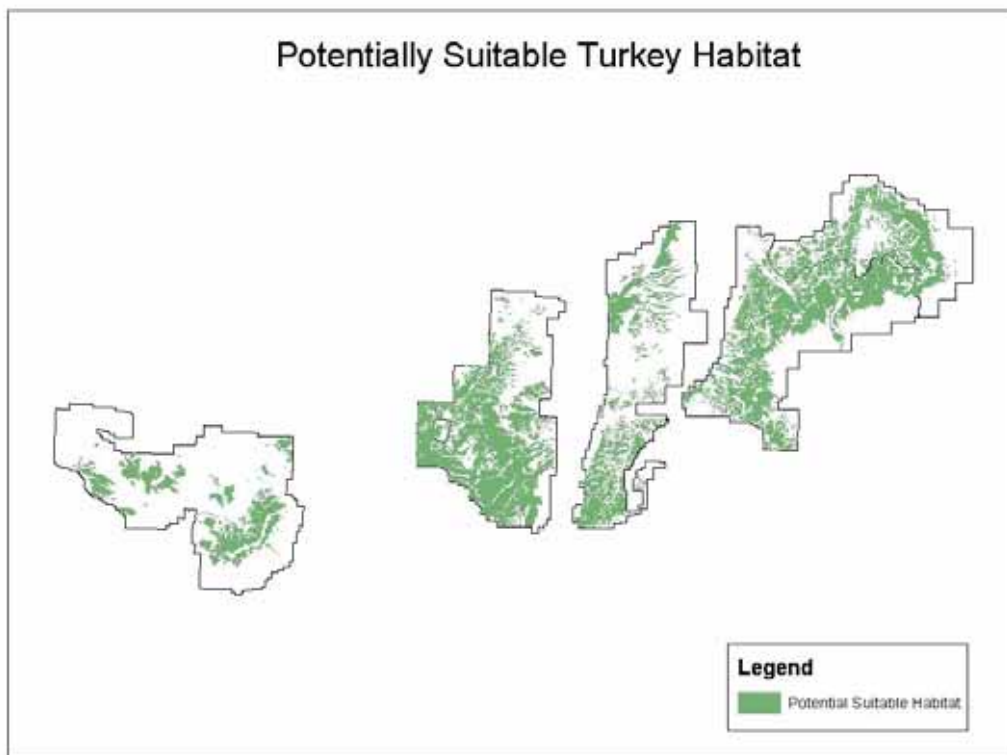


While too young to fly, the poults roost on the ground at night and the hen roosts with them. At approximately two weeks of age, the poults fly short distances and are soon roosting in trees with the hen. By 16 weeks, the young poults are hard to distinguish from adults at a distance.

Nesting habitat is quite varied, but hens usually nest near the edges of old fields, along trails, in hay fields or in patches of briar or similar vegetation. Also, most turkey nests are located close to a source of permanent water. Turkeys are considered skittish nesters at best. During incubation, hens often abandon their nests if disturbed even once. However, adult hens (and sometimes juveniles) often attempt to establish another nest.

Wild turkeys are susceptible to many of the diseases of domestic turkeys and chickens: fowl diphtheria, fowl typhoid, cholera, blackhead, trichomoniasis and coccidiosis. Fortunately, wild and domestic birds seldom come into contact with each other, thereby reducing the opportunity for disease to spread. Potential for the transmission of disease is a major reason why releasing domestic birds into the wild is not only discouraged, but is illegal.

The map displayed below identifies approximately 712,834 acres of potentially suitable habitat across the Forest for both sub-species that occur on the Forest.



### Trend

The Dixie LRMP (II-16a) identified approximately 640,000 acres of potentially suitable habitat across the Forest. Current data indicates approximately 712,834 acres of potentially suitable habitat across the Forest. The increase in potentially suitable habitat has been exceeded by approximately 72,800 acres.

In 1983 the DWR initiated an aggressive transplant program for wild turkeys statewide, and since that point population numbers have been on the increase statewide. Merriam's turkey populations have been stable on the Forest, with hunting opportunities provided on all populations on the Forest. Rio Grand turkeys have increased in numbers over the past 10 years primarily on the Pine Valley Ranger District.

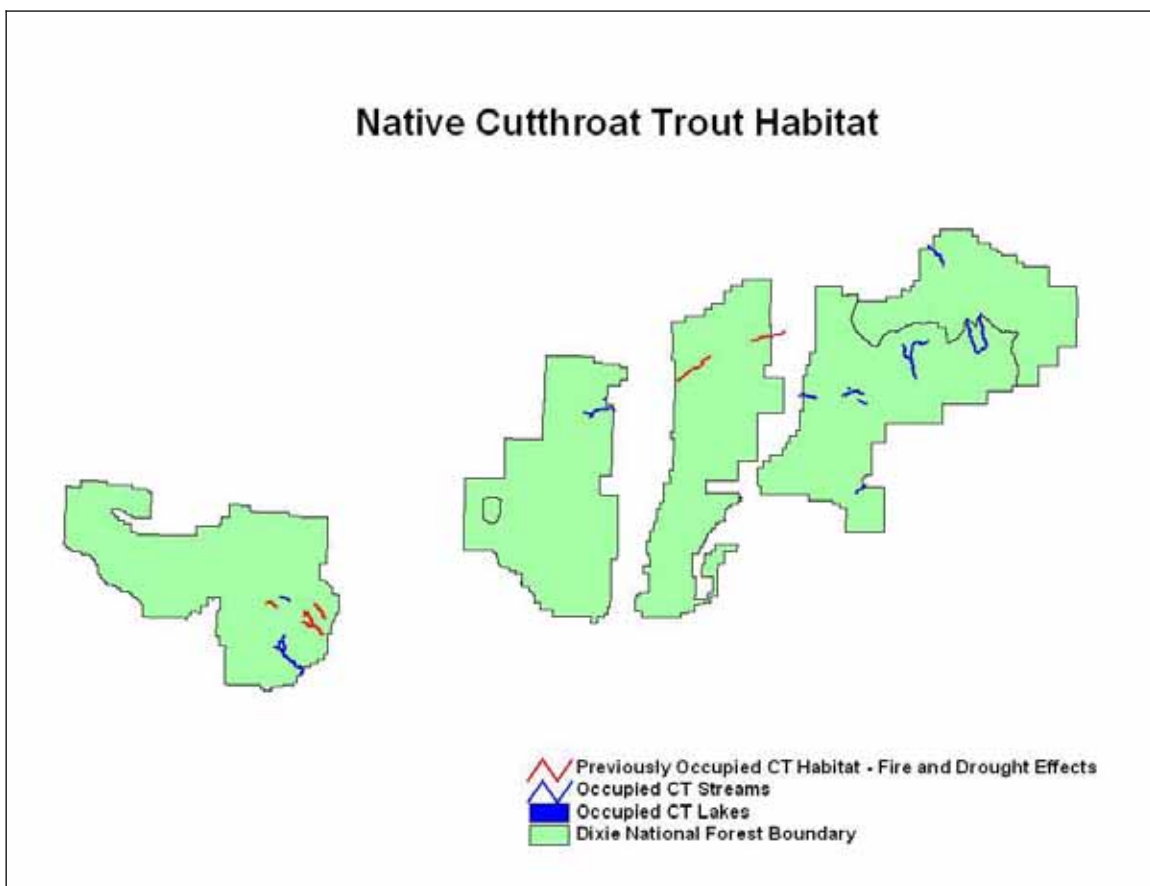
Based on the hunting statistics provided by the DWR, the total harvest of Merriam's turkey in Utah (much of the suitable Merriam's habitat is in southern Utah) since 1968 is on the increase. Since 1997 hunter success rates have been on the increase from a total of 80 birds to 120 birds in a 3-year period. In combination with these numbers, the total numbers of hunter days in the field to harvest a bird have dropped drastically. This suggests that birds are more prevalent to harvest in a shorter time period. Since 1991 the total numbers of Rio Grand turkeys harvested have also increased steadily. Based on these data, turkey populations are increasing, or are in an upward trend, and therefore populations are viable in the Southern Region.

Hunting strategies in Utah are made through the Regional Advisory Council and Wildlife Board process. This process has been designed to involve a wide range of interests in Utah, and decisions for all hunting season bag limits and overall take 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.

## 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 2002). There are 10 known populations of pure strain Bonneville cutthroat trout on the Dixie National Forest inhabiting approximately 24.6 miles of stream habitat.

The map below displays 49.4 miles and 24.4 acres of occupied Bonneville and Colorado River cutthroat trout habitat on the Dixie National Forest.



The amount of existing habitat identified in the LRMP (II-16a) in 1986 when it was signed was 7 acres, with the total potential habitat at 2500 acres. Since 1986, the amount of Bonneville cutthroat trout occupied habitat on the Dixie National Forest has increased, due to an aggressive stream renovation program. Stream renovation and native cutthroat trout expansion projects have been accomplished cooperatively with the Utah Division of Wildlife Resources.

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

(Kershner 1995). As such, Bonneville cutthroat trout have adapted to a broad spectrum of habitat conditions throughout their range.

Sexual maturity is typically reached during the second year from 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 usually occurs in the spring and early summer at elevations (Behnke 1980) at temperatures ranging from 4-10 degrees Celsius (May et al. 1978). 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).

Fecundity is typically between 1,800-2,000 eggs per kilogram of bodyweight (Behnke 1992). Incubation times for wild Bonneville cutthroat trout have not been verified but probably average 30 days (Gresswell and Varley 1988). 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. Because Bonneville cutthroat trout may be adapted to the rigorous conditions of high elevation headwater streams, these fish may have a competitive edge over nonnative salmonids in those areas (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, Binns 1981). Their diet was diverse during the summer in Birch Creek (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.

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.

Stream renovation projects are planned in cooperation with the Utah Division of Wildlife Resources, which will further increase the numbers and distribution of this species on the Dixie National Forest.

## **Trend**

Based on discussions with Dale Hepworth, DWR Regional Fish Program Manager, Bonneville cutthroat trout populations are increasing throughout the Southern Region. When DWR started to restore the native Bonneville trout approximately 25 years ago there were approximately 5 miles of occupied stream habitat in the Southern Region. Based on information provided by DWR through personal communication, there are currently more than 50 miles of occupied stream habitat throughout southern Utah. This success has been the direct result of stream restoration work occurring from cooperative relations between DWR and the Forest Service. In addition to information collected by DWR, the total number of miles of occupied habitat on the Forest has increased since 1986 from 7 acres of habitat to 24.6 miles of occupied habitat, a 17.6-mile increase.

During the summer of 2002 two large fires impacted habitat and Bonneville cutthroat trout in the Mount Dutton area, which is on the Powell Ranger District, and Pine Valley Mountain area, on the Pine Valley Ranger District. Although these fire events affected this species and occupied habitat, numerous other quality occupied streams remain on the Forest. Restoration actions have and will continue to be implemented to try and mitigate the negative effects from the fire to the trout, and their habitat. Plans have been discussed to rehabilitate all of these stream systems and reintroduce Bonneville cutthroat trout back into these systems in the future. Both the DWR and Forest Service have committed to this management action.

As a result of the proactive fisheries program on the Forest, and the excellent cooperative relations between the Forest and DWR, the Bonneville cutthroat has experienced a downward trend due to wildland fire. The remaining occupied streams contain stable populations and remain viable.

## **Rainbow Trout (*Oncorhynchus mykiss*)**

Because 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 *Oncorhynchus 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 very 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. It also must have 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.

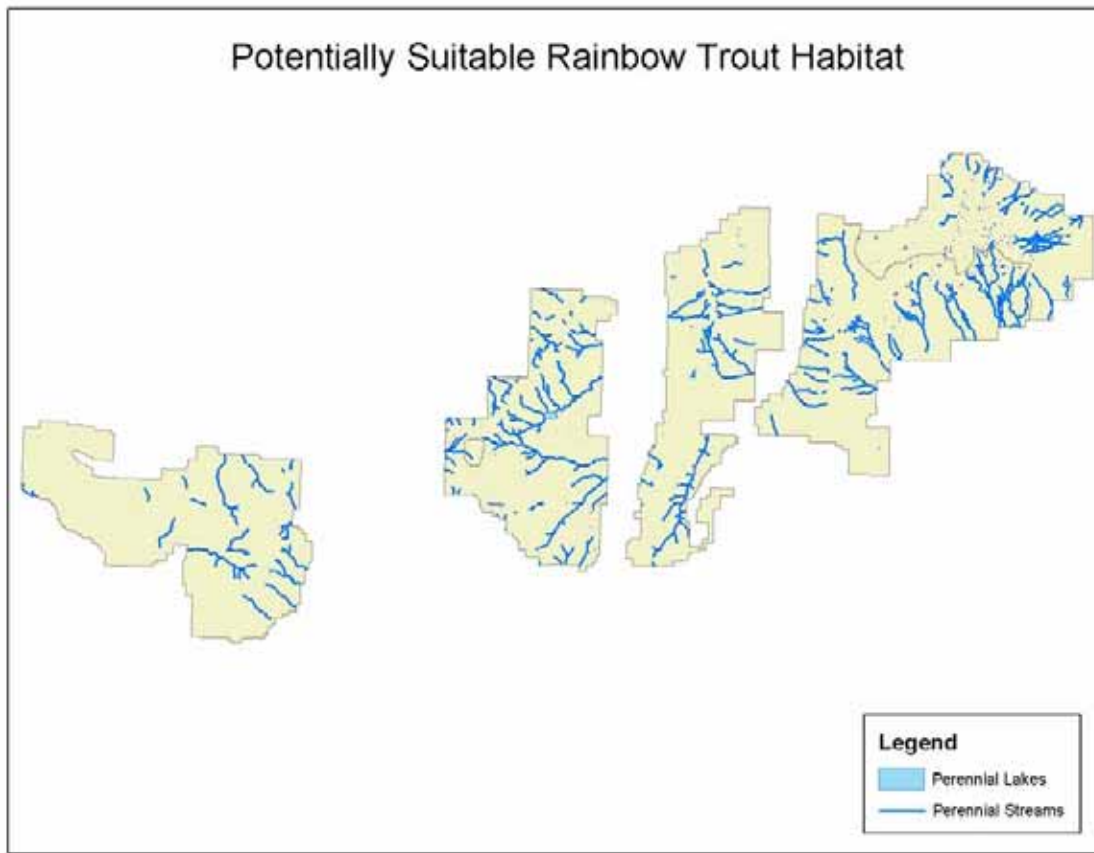
The third necessary habitat type is adult habitat. Trout tend to move to these areas during the second year of life. This habitat usually has water depths of 0.3 meters or greater. It is usually an area in which rapid-flow water meets calm water. This allows the fish to rest in the calm water and search 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 require high amount of dissolved oxygen in the water (at least 80% saturation) (Mills 1971). Optimal temperature is between 7 and 17 degrees Celsius. Rainbow trout will die at temperatures above 28 degrees Celsius (Mills 1971). Optimal pH for trout survival is between 7 and 8.

The native range of rainbow trout (*Oncorhynchus 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 Dixie National Forest rainbow trout occur on all 5 Ranger Districts. The map displayed below identifies approximately 960 miles of occupied stream habitat and 3,268 acres of lake habitat across the Forest.



The Dixie LRMP (II-16a) identifies approximately 33,000 acres of suitable habitat across the Forest. Based on the current 959 miles of occupied habitat on the Forest, the total miles of stream habitat have increased. Along with rainbow trout, the Forest supports populations of Bonneville, Brown, Brook, Colorado River, 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 (*Oncorhynchus mykiss irideus*) (Behnke 1992)

Rainbow trout are typically diurnal, opportunistic feeders. They are carnivores, which 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 and 16 degrees Celsius. They will usually cease feeding between temperatures of 22 and 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 will also prey upon developing rainbow trout, including salmon, steelhead, and larger trout. There are also numerous predators on land and in the air. Bears, Martins, Fishers, Otters, Osprey, and Eagles are just a few of the non-aquatic species that consider the 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). The majority of rainbow trout die after spawning. Only 5-20% of steelhead runs are repeat spawners (Behnke 1992). Usually the majority of repeat spawners are 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). When the temperature is correct, the water flow is elevated (if in moving water), and the amount of daylight in a day is adequate, the rainbow trout begin their spawning migrations. 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 1996). 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 1996).

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). This 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**

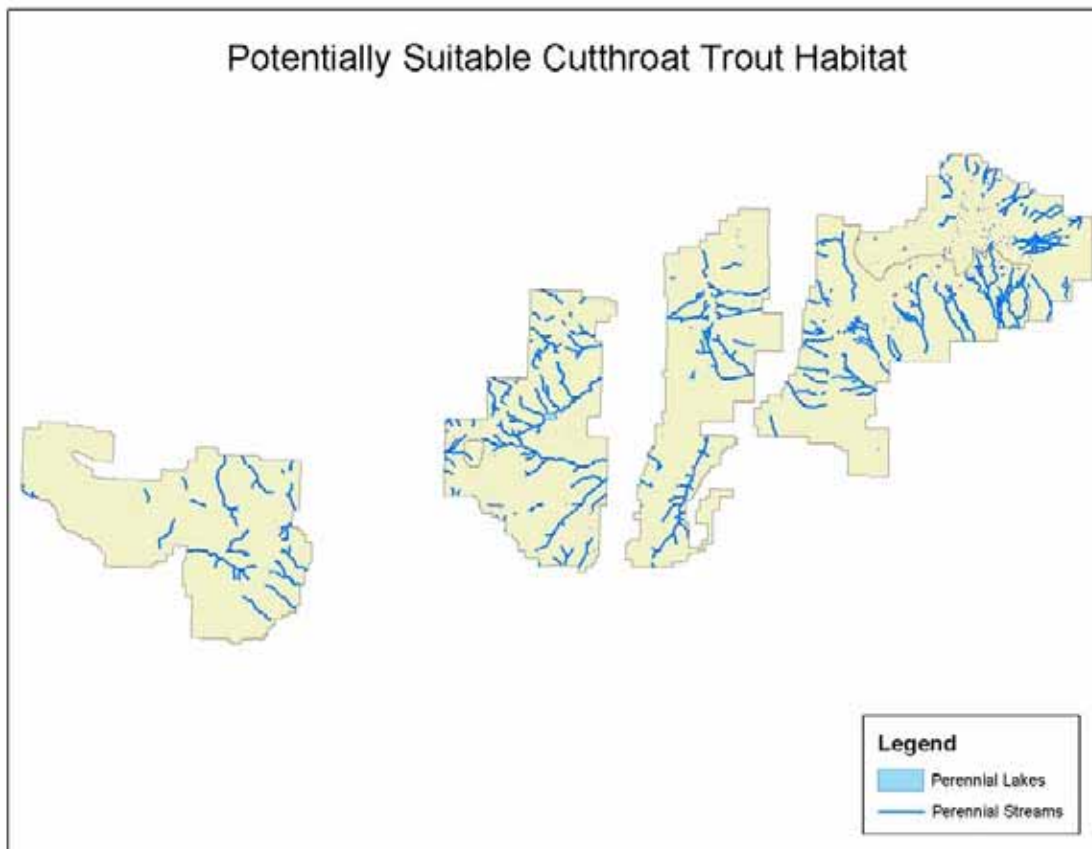
The population trend of rainbow trout on the Dixie National Forest is stable. As a result of a good hatchery program in the DWR Southern Region, a very successful fish-planting program for recreational use is in place. As a result of this program, fish populations are always fluctuating slightly, but remain stable, and viable across the Forest. Dale Hepworth, DWR Fish Program Manager, Southern Region supported 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 more difficult and expensive to raise to seven-inch size in a hatchery than rainbow trout. Cutthroat trout are in certain high mountain lakes and streams and thrive better than rainbow trout.

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 South Saskatchewan River, Alberta, Canada, but is likely extinct now. 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 Dixie National Forest cutthroat trout occur on all 5 Ranger Districts. The map displayed below identifies approximately 960 miles of occupied stream habitat and 3,268 acres of lake habitat across the Forest. A population of Colorado cutthroat trout has been established on the Escalante Ranger District in which eggs from this population are used to expand addition populations within the native range of the species.



The average length of this species is 12-15 inches and generally one-half to 17 pounds. A short, conical head with a somewhat pointed to rounded snout and a rather large mouth with well-developed teeth on both jaws characterize the fish. In breeding males the kype is slightly developed in the anadromous population and the lower jaw appears extremely long. One of the main color characteristics is two

yellow or orange to red lines in the skin folds of each side of the lower jaw. The coastal form is colored dark to olive-green with numerous black spots and may appear bluer with silvery sides. The interior form (Yellowstone cutthroat) has a body of yellow-green with red on the sides of the head and front of the body and the belly.

Adult anadromous forms return to freshwater spawning streams in late autumn and early winter but spawning takes place there in February to May. In both forms of cutthroat trout spawning takes place in small, gravelly streams where the male courts the female by nudging and quivering. The female prepares the redd where she lays 1100-1700 eggs. Hatching occurs 6-7 weeks later.

### **Trend**

The population trend of cutthroat trout on the Dixie National Forest is stable, according to Dale Hepworth, DWR Fish Program Manager, Southern Region. Fish populations are always fluctuating slightly, but remain stable and viable across the Forest.

## **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. Brown trout in Utah are in most streams and reservoirs at the foot of many mountain ranges. Some of the best brown trout fishing waters in the United States are the larger coldwater streams of Utah.

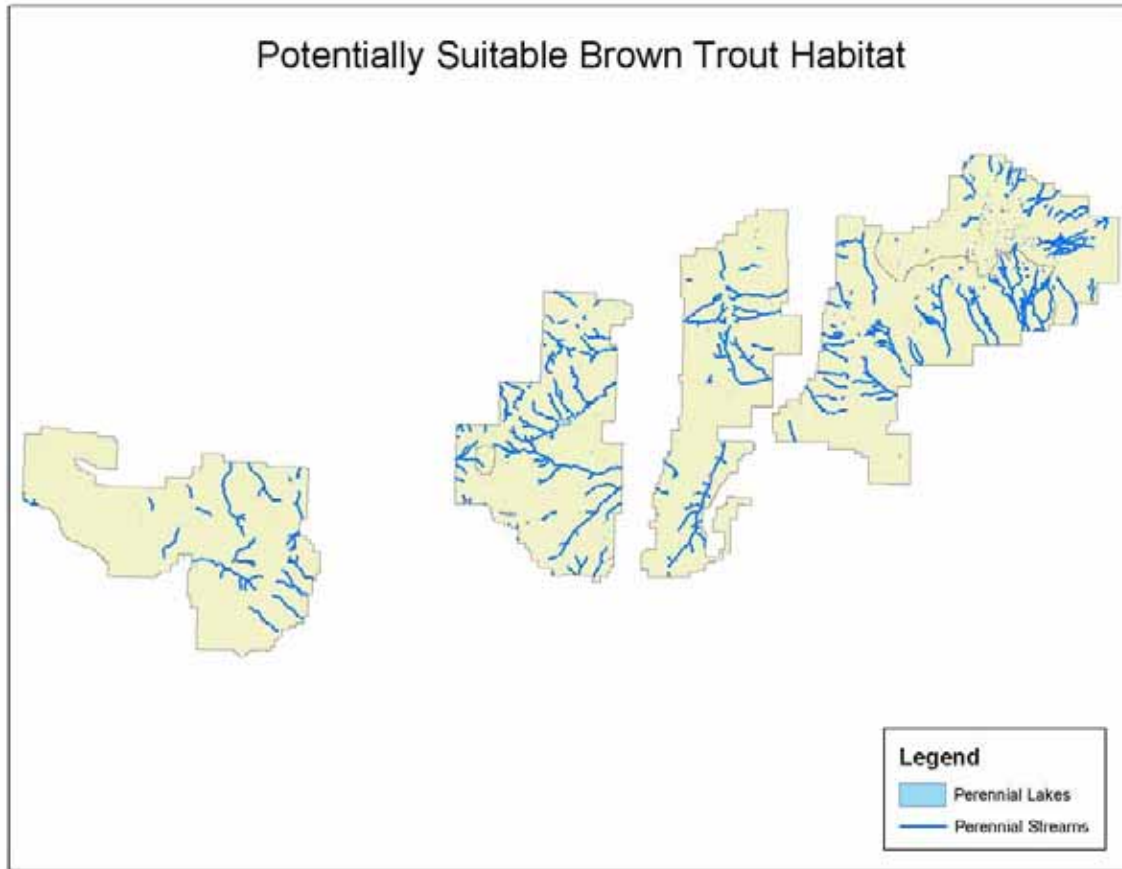
Brown trout are brown to gold on their back with a cream to slate-colored belly. Most fish have black, gray, yellow and occasionally red spots all surrounded by a white halo. This species has a prominent spotted adipose fin between the dorsal and caudal fin. There are no spots on the squarish tail or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

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, live largely on such insects as mayflies, caddisflies, and stoneflies. The larger brown trout readily feed on fish, both game and nongame.

Brown trout prefer cool lakes and streams, 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 than most of the other trout, the brown trout have effectively extended the good fishing waters of Utah.

Below is a map displaying potentially suitable habitat for the brown trout on the Dixie National forest. On the Dixie National Forest rainbow trout occur on all 5 Ranger Districts. The map displayed below identifies approximately 960 miles of occupied stream habitat and 3,268 acres of lake habitat across the Forest.



Brown trout populations are managed by the DWR in Utah, as are all fish and wildlife on the Dixie National Forest. All regulations for the management of this species are developed through an 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.

### **Trend**

The population trend of brown trout on the Dixie National Forest is stable. Fish populations are always fluctuating slightly, but remain stable to slightly increasing, and viable across the Forest. Existing brown trout populations on the Forest are sustained through natural reproduction. Dale Hepworth, DWR Fish Program Manager, Southern Region supported this determination.

## **Brook Trout (*Salvelinus fontinalis*)**

The brook trout is one of the most popular game fish in the United States. Even though it has not achieved eminence in Utah, it affords fishing to many anglers. The brook trout is present in numbers in high mountain waters and beaver ponds above 6,000 feet. It is common at these altitudes in the Uinta and Wasatch mountains.

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.

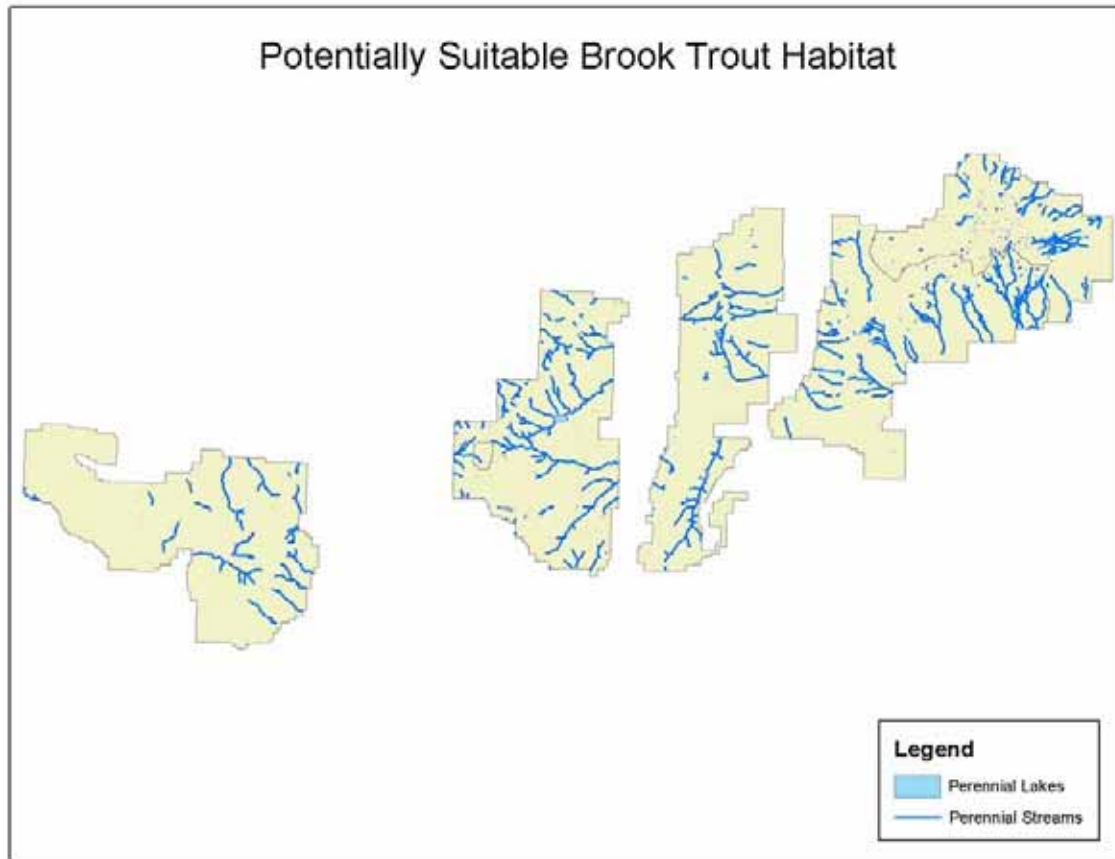
Under favorable conditions they grow to lengths of three to six inches the first year. During the second summer they grow to six to ten inches, and during the third to eight to 13 inches. Trout attains the best growth from streams with an abundance supply of spring water, which keeps the stream relatively warm in the winter. In lakes the growth rate may also be fast with lengths of 18 inches possible in 4 years. the rate of increase.

These trout are voracious feeders. They feed on insects throughout their lives. Terrestrial insects are also taken. 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 Teasdale Ranger District with good success. However, during drought years and low water, winterkill is a problem.

Displayed below is a map of potentially suitable habitat across the Forest. On the Dixie National Forest rainbow trout occur on all 5 Ranger Districts. The map displayed below identifies approximately 960 miles of occupied stream habitat and 3,268 acres of lake habitat across the Forest.



### **Trend**

The population trend of brook trout on the Dixie National Forest is stable. 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 supported this determination.

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