

Santa Fe National Forest
Management Indicator Species
Assessment

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Santa Fe National Forest Management Indicator Species Assessment

Report prepared by:

Lee Johnson

Mary Orr

Sean Ferrell

GIS Mapping and Data

Al Sandoval

Debbie Sarabia

Contributors

Darrel Weybright

James Simino,

Katrina Lund

Chris Gatton

Kendall Brown

Josephine Wargo

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Rocky Mountain Bighorn Sheep (*Ovis canadensis canadensis*)
Rocky Mountain Elk (*Cervis canadensis*)
Pinyon Jay (*Gymnorhinus cyanocephalus*)
Mourning Dove (*Zenaida macroura*)

Listed Threatened or Endangered Species

Mexican Spotted Owl (*Strix occidentalis lucida*)

Sensitive Species

Rio Grande Cutthroat Trout (*Oncorhynchus clarki virginalis*)

References

FOREST PLAN MANAGEMENT INDICATOR SPECIES SUMMARY

The Land and Resource Management Plan for the Santa Fe National Forest, adopted in 1987, identified 8 Management Indicator Species (MIS). These species are Bighorn sheep, elk, Mexican spotted owl, Merriam's turkey, hairy woodpecker, Rio Grande Cutthroat Trout, Pinyon Jay and the Mourning Dove.

The reason these species were selected as MIS species is described in the Environmental Impact Statement, Santa Fe National Forest Plan, 1987. The objective was to select species that would indicate possible wildlife effects of changing plant communities and associated seral habitats. These species were selected for their association with plant communities or seral stages which management activities are expected to affect. Other factors considered in the selection of these species were monitoring feasibility, migratory habits and habitat versatility. (LMP EIS page 96).

The Forest Plan identified the habitat types and the projected influences of management actions for each species. Information pertinent to the management indicator species are described as follows:

Bighorn Sheep

Changes in bighorn sheep habitat capability result from changes in the health of alpine and meadow areas and from encroaching canopy closure. Little or no effects were expected on Bighorn sheep due to plan implementation.

Mexican Spotted Owl

Changes in Spotted owl habitat capability result primarily from changing the seral stage of mixed conifer habitat. The Forest Plan projected most changes in habitat capability would be caused by the harvest of trees. Harvested acres were expected to decrease in habitat capability. Unharvested areas were expected to improve over time. Since the Forest Plan was written major changes have occurred in both the amount, and type of timber harvest that occurs on the Forest. The primary factor influencing spotted owl habitat has been fire.

Elk

Elk habitat capability was modeled based on forage availability during winter months. Harvest in mid elevation areas, and improving range conditions was expected to increase habitat capability for elk. The loss of grasslands to a forested ecosystem through succession was modeled to be a negative effect on elk habitat.

Hairy Woodpecker

Hairy woodpecker habitat quality was expected to increase over time as young stands of forest mature. Activities that reduce the older tree component reduce habitat capability.

Merriam's Turkey

Merriam's turkey habitat capability was modeled based on winter habitat. Feeding habitat was the primary limiting factor. Timber harvest particularly in the Ponderosa Pine zone was the primary factor modeled to affect turkey habitat. Activities that opened the forest canopy allowing grass, forbs and mast producing vegetation to grow, improve turkey habitat.

Rio Grande Cutthroat Trout

The Cutthroat trout is influenced by riparian habitat and water quality. The primary factors expected to influence cutthroat trout habitat were grazing, roads, other resource activities, and investments in habitat improvements.

Pinyon Jay

Habitat capability for the pinyon jay was expected to benefit from increasing foraging areas. Activities that favor a variety of mast producing plants, found in early forest seral stage increase habitat capability. The Forest Plan projected minimal changes in pinyon jay habitat over time.

Mourning Dove

Mourning Dove habitat capability is influenced by improved ecological condition in low elevation grasslands, and harvesting within woodland, and Ponderosa pine areas. Activities that improve the amount of feed available have a positive influence on mourning doves.

Forest Wide Vegetation Summary

In order to evaluate vegetation and changes in seral conditions, associated with the above MIS species, information from the RMRIS database was used to generate a vegetation database and map for the Forest. The information on Forest Vegetation is displayed below in Table FV-1.

In general, natural succession is a slow process and it takes many years for vegetation types to change seral conditions. The exception to this is changes caused by the result of wildland fire, disease, insects, and human related activities. In order to evaluate habitat changes associated with the above MIS species, a review of all activities having the potential to dramatically change vegetation conditions, and associated seral stages, was conducted.

Insects/Disease

Since 1987, we have experienced some noticeable western pine beetle and Ips beetle infestations. These insects have resulted in large areas of bug kill across the Forest. However, there are generally only small pockets of tree mortality within the larger areas influenced. In general, effects on vegetation seral stages have been insignificant. Table FV-1 displays the acres of bug kill by vegetation type for the Santa Fe National Forest.

Wildland Fire

Since 1987, Wildland fires have been the primary influence on forest succession on the Santa Fe National Forest. Approximately 113,000 acres have burned. In the larger fires such as the Dome, Cerro Grande and Viveash, significant areas burned with stand replacing crown fires. Table FV-1 provides an estimate of acres burned by vegetation type.

Grazing

Since 1987, there have been significant improvements in grazing practices on the Santa Fe National Forest. Improving the distribution of cattle and controlling the amount of forage use in both riparian and upland areas has been a major emphasis. In 1996, the Forest Plan was amended with a focus on achieving proper forage use.

Timber

Since 1987, significant changes have occurred in the Timber harvest program. When the Forest plan was first implemented, harvest focused on the larger trees and removal of the overstory. Beginning in about 1993, the focus of the harvest program changed to thinning from below or the removal of larger trees. Harvest that focused on removing the overstory, results in stands being modified to an early seral condition. Harvest that focuses on removal of the smaller trees moves a stand towards a later seral condition. Both types of harvest tend to open the Forest up to allow more understory vegetation to grow. Table FV-1 shows the acres of timber harvest by vegetation type on the Santa Fe National Forest from 1987-1992 and those acres harvested since 1992. The 1987-1992 acres are primarily overstory removal type harvest. Acres from 1992 through the present are primarily acres thinned from below.

Figure FV-1 is a graphical illustration of the total vegetation types on the Forest and the relative influence of the various impacts to vegetation since the inception of the Forest Plan.

Spatial distributions of different vegetation types across the Santa Fe National Forest are displayed on MAP FV-1.

TABLE FV-1

Vegetation and Vegetation Impacts for the Santa Fe National Forest 1987-2002

Includes total acres of vegetation by dominant cover type from time of Forest plan implementation; and major impacts to vegetation type by impact type since that time.

Dominant Vegetation Type	Total Acres in 1987	Burned Acres	Insect and Disease	Timber	Timber	Total Impacted Acres as of 2002	Total Percent of Impacted Acres as of 2002
				Harvest 1987-1992	Harvest 1992-2002		
Aspen (birch)	42,339	4,410	3,775	307	50	8,542	20.2%
Blue Spruce	3,731	52	933	0	0	985	26.4%
Bristlecone Pine	386	283	5	0	0	288	74.6%
Douglas Fir	202,687	21,048	12,490	5,031	564	39,133	19.3%
Engelmann Spruce	149,192	9,578	9,575	764	10	19,927	13.4%
Engelmann Spruce and Subalpine Fir	8,825	1,988	606	0	0	2,594	29.4%
Grass	98,156	3,983	1,341	0	21	5,345	5.4%
Juniper Woodland	60	0	0	0	0	0	0.0%
Limber Pine	1,375	51	41	0	0	92	6.7%
Lodgepole Pine	31	0	0	0	0	0	0.0%
Nonvegetated Sites (cover not identified)	27,196	232	702	0	18	952	3.5%
Oak Woodland	32,266	4,039	1,504	0	81	5,624	17.4%
Other Hardwoods	366	66	46	0	0	112	30.6%
Other Softwoods	1,308	0	75	0	0	75	5.7%
Pinyon/Juniper	465,665	3,343	307	1	14	3,665	0.8%
Ponderosa Pine	420,002	50,395	9,212	15,285	6,709	81,601	19.4%
Rockland talus scree	63	0	11	0	0	11	17.5%
Rocky Mountain Juniper	3,415	574	49	0	0	623	18.2%
Sagebrush (other than sand sagebrush)	2,695	23	0	0	0	23	0.9%
Southwestern White Pine	336	0	153	0	0	153	45.5%
Strip mines quarries and gravel pits	7	0	3	0	0	3	46.0%
Unidentified	92,069	4,265	10,665	0	890	15,820	17.2%
White Fir	100,376	8,352	9,847	0	1,177	19,376	19.3%
Total Acres	1,652,545	112,682	61,340	21,388	9,534	204,944	12.4%

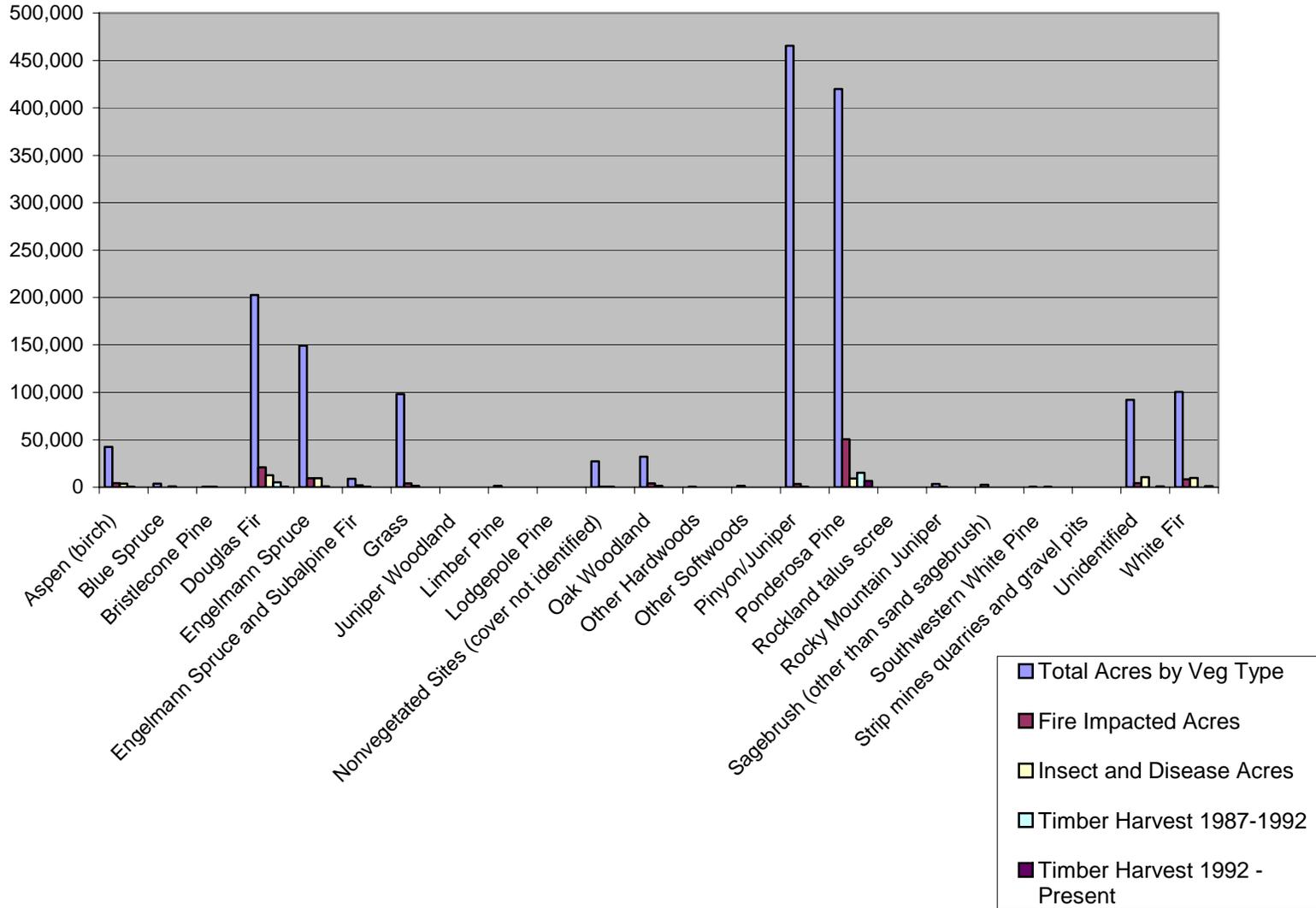
Acres Harvested 1987-1992 are primarily Overstory Removal and Clearcuts.

Acres Harvested 1992 - Present are primarily thinning from below.

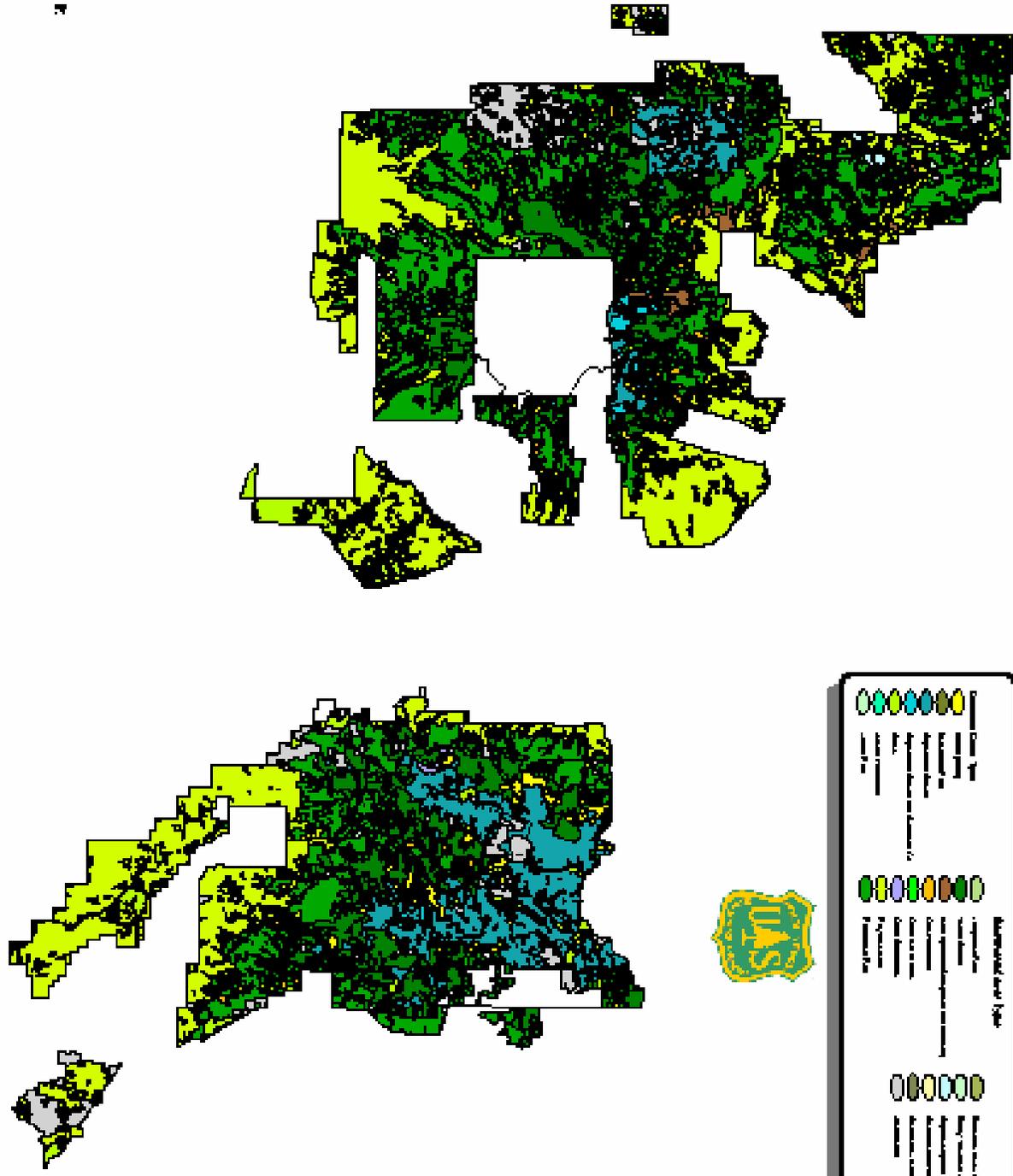
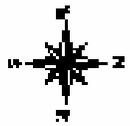
Impacted acres generally do not change vegetation type. However, they will often change to an earlier VSS class.

FIGURE FV-1

Vegetation and Impacts to Vegetation on the Santa Fe National Forest from 1987 to 2002



MAP FV-1



	Open Space
	Water
	Low Density Residential
	Medium Density Residential
	High Density Residential
	Commercial
	Industrial
	Public Use
	Other

	Approved and Other
	Open Space
	Water
	Low Density Residential
	Medium Density Residential
	High Density Residential
	Commercial
	Industrial
	Public Use
	Other

	Other
	Water
	Low Density Residential
	Medium Density Residential
	High Density Residential
	Commercial
	Industrial
	Public Use
	Other



FOREST WIDE POPULATION AND TREND ASSESSMENT

Population Estimates for Management Indicator Species

Populations of wildlife are extremely difficult to quantify; and in some cases can vary substantially from year to year. Environmental factors can dramatically influence recruitment of young and survival of adults. A precise figure on the number of animals is very difficult if not impossible to attain; and would only be valid for a short time period. In order to estimate populations for MIS species we evaluated a number of sources for each species; and then ranked the population into descriptive categories. Populations of MIS species would be expected to fluctuate within a category from year to year. However, we would not expect a species to switch from category to category without some long-term change in environmental conditions. For instance a change in ranking from uncommon to rare would be a cause for concern; and would warrant intensive evaluation of a species. A ranking system is based on the predicted number of breeding pairs; or adult females depending on which is most appropriate for the species addressed.

The ranking system for the FOREST-WIDE evaluation is as follows:

CATEGORY	BREEDING PAIR/ADULT FEMALE
Not Present	0
Extremely Rare	1-10
Rare	10-100
Uncommon	100-1,000
Common	1,000-10,000
Abundant	10,000-100,000
Very Abundant	>100,000

POPULATION TREND

Population trend is most appropriately addressed at scales above the project. Many of these selected MIS species 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 is at the scale of the Santa Fe 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. For this reason, it is not appropriate to determine population trend at the local level.

MERRIAM'S TURKEY (*Meleagris gallopavo*)

INDICATOR SPECIES HABITAT

The Merriam's turkey has the widest distribution and is the most common subspecies of turkey. It is found in many mountainous areas of northern New Mexico. The bird utilizes ponderosa pine, a source of mast and its favorite roosting tree. The ponderosa pine is an essential component of its permanent habitat, while surface water is a range requirement. Turkeys prefer to roost in tall mature or over-mature ponderosa pines with relatively open crowns and large horizontal branches starting at 20 to 30 feet from the ground. Trees with a diameter at breast height (DBH) of over 14 inches are used as roosts. These trees must have excellent protection from the wind, and must be located in sites with an open ridge or rocky ledge nearby to provide ease in entering and exiting the roost site. Hens normally nest within ½ mile radius of water. A good healthy ponderosa pine understory provides the turkey cover, as well as, forage. Turkeys forage in grasslands, brush communities, deciduous tree-brush and in ponderosa pine. They eat grasses and grasshoppers in the summer. They eat oak supply mast and mature ponderosa pine seeds in fall. Tall grasses are eaten in the winter when the heavy snows come. Piñon nut crops are the turkey's "corn" of the southwestern forest (BISON-M 2000). The Santa Fe Forest plan modeling determined that feeding habitat was the primary limiting factor for turkey; and harvest patterns that promoted early seral stages or provided an open canopy allowing grass, forb and mast providing vegetation were the most beneficial for turkey.

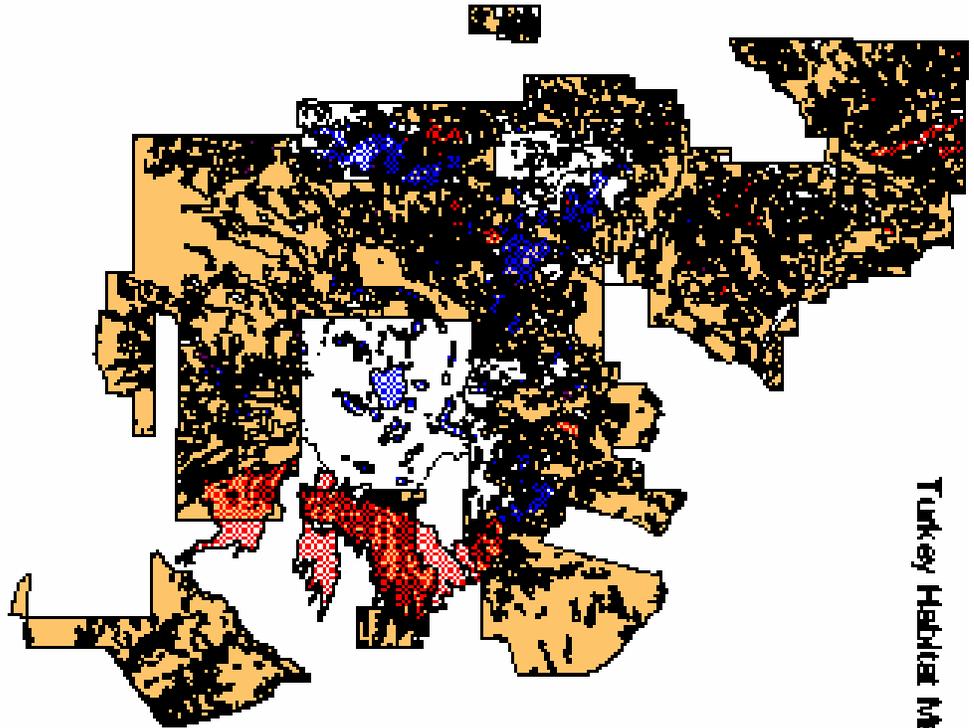
Santa Fe National Forest Habitat

In the mid-elevation portions of the Santa Fe National Forest, Merriam's turkey habitat is abundant. The habitat consists of mature ponderosa pine stands along ridge tops, which is essential for roosting. The habitats found on the Forest also meet the feeding requirements for the turkey. Piñon, juniper and Gambel oak are found on the south-facing slopes for winter forage requirements. During the spring and summer months, turkeys depend on the sprouting herbage and insects for forage, which are also available to the turkey. The Forest Service has done many habitat improvement projects with the turkey in mind, including many water developments, underburning in ponderosa, and creating slash piles for nesting structure. The abundance of nesting and cover opportunities on the Santa Fe contribute to maintaining viable populations of turkey. Table T-1 shows estimated acres of turkey habitat on the forest at the time of forest plan completion; and acres of habitat disturbed by wildfire, bug kill, disease, or timber harvest since implementation of the Forest plan. Map T-1 shows the spatial arrangement of this habitat and disturbance across the forest. In general, habitat affected by disturbance will have the canopy opened up allowing for the growth of more understory vegetation, improving turkey habitat. Acres that were unaffected by disturbance are gradually declining in quality as encroachment of forest habitat on meadows and other open areas occurs over time. On balance **the estimated habitat trend for turkey is relatively stable** based on disturbed acres providing additional feeding habitat and undisturbed areas declining in quality due to forest encroachment issues.

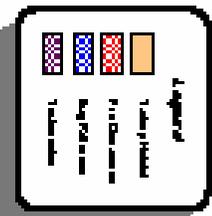
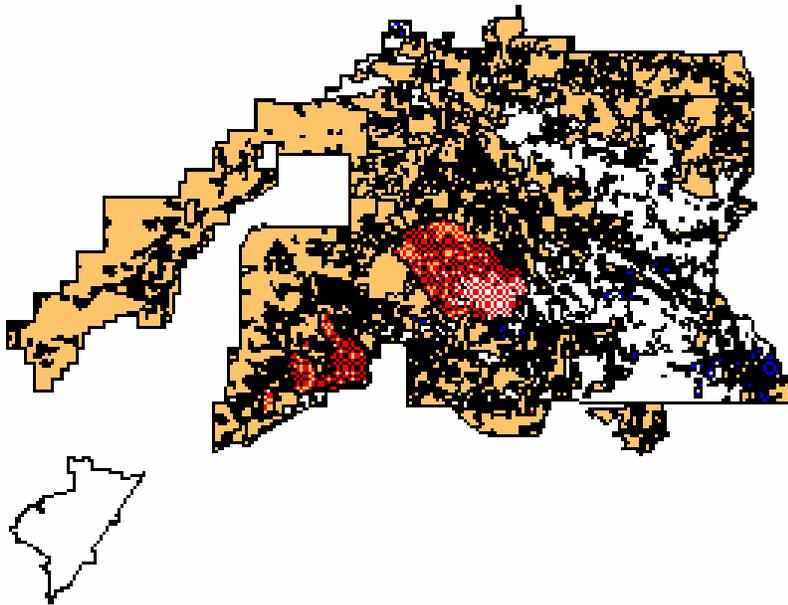
**TABLE T-1
 TURKEY HABITAT BY VEGETATION TYPE ON THE SANTA FE NATIONAL
 FOREST. ACRES BY VEGETATION TYPE ESTIMATED FOR TIME OF
 FOREST PLAN COMPLETION AND ACRES OF THOSE HABITATS
 AFFECTED BY ALL DISTURBANCE TYPES SINCE THAT TIME.**

TURKEY HABITAT BY VEGETATION TYPE	ACRES		PERCENT OF HABITAT AFFECTED
	Total	DISTURBANCES IMPACTED BY	
Aspen (birch)	42,335	7,923	18.7%
Blue Spruce	3,731	985	26.4%
Douglas Fir	202,286	33,341	16.5%
Grass	94,217	5,259	5.6%
Pinyon/Juniper	452,335	3,658	0.8%
Ponderosa Pine	419,156	64,148	15.3%
White Fir	100,053	18,029	18.0%
Total Acres	1,314,113	133,343	10.1%

MAP T 1



Turkey Health Map



Species status

When miners and stockmen came into New Mexico in the 1800s, they started to effectively kill turkeys. Wagonloads were hauled to market. Subsequently, turkeys were eliminated from many mountain ranges, and their populations depleted in other areas. The ebb was around 1924, and efforts of the NM Department of Game and Fish began to turn the numbers around by 1930. Birds were live-trapped and moved to other areas (BISON-M 2000). Transplants have adapted to the habitats on the Forest and turkeys are now widespread across the Forest. The Merriam's turkey is known to reside on all the Ranger Districts on the Santa Fe National Forest.

The Merriam's turkey population is ranked as common for the Santa Fe NF. This means that the estimated number of breeding female birds ranges between 1,000 and 10,000 individuals. The population may fluctuate from year to year based on a variety of environmental factors. This estimate is based on the amount of habitat available, hunter success information, breeding bird surveys and the professional judgment of Forest biologists.

The population trend for the Merriam's turkey is rated as stable to slightly increasing at the Forest level. This estimate is based on the amount of habitat available, hunter success information, breeding bird surveys and the professional opinion of local biologists.

New Mexico Department of Game and Fish recognizes that the toms are in a sense a "harvestable surplus", and sells separate licenses for wild turkey hunting, and in recent years has had both spring and fall seasons. The spring season is in late April and early May, and a second turkey may be taken in some areas (BISON-M 2000). FIGURE T-1 shows the estimated number of hunters and turkeys harvested on game management units for the Santa Fe National Forest. Years with no harvest or hunters are years for which data was not available. FIGURE T-2 shows the hunter success rate for turkey hunters on game management units for the Forest. The trend in hunter success rate, which is essentially stable, is a better reflection of population trend than hunter survey or turkey harvest.

FIGURE T-1

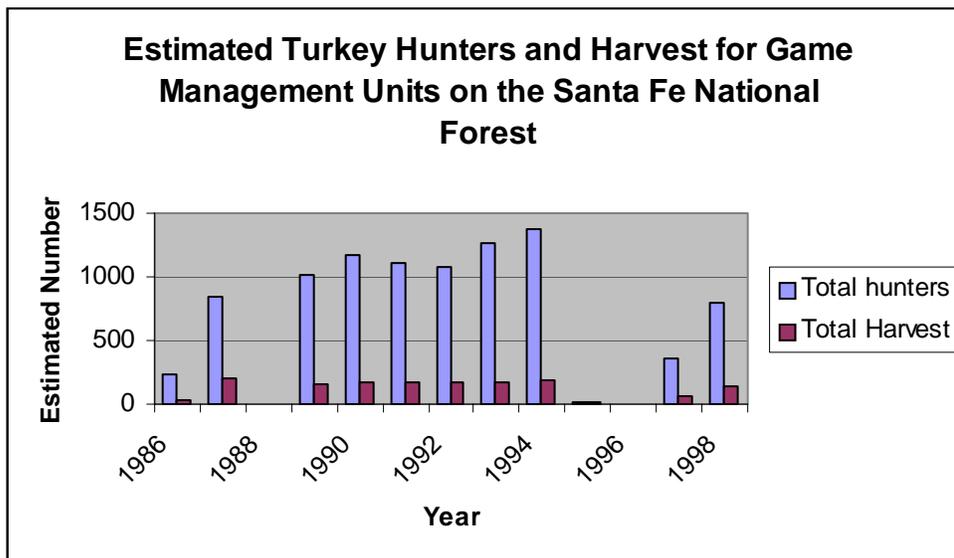
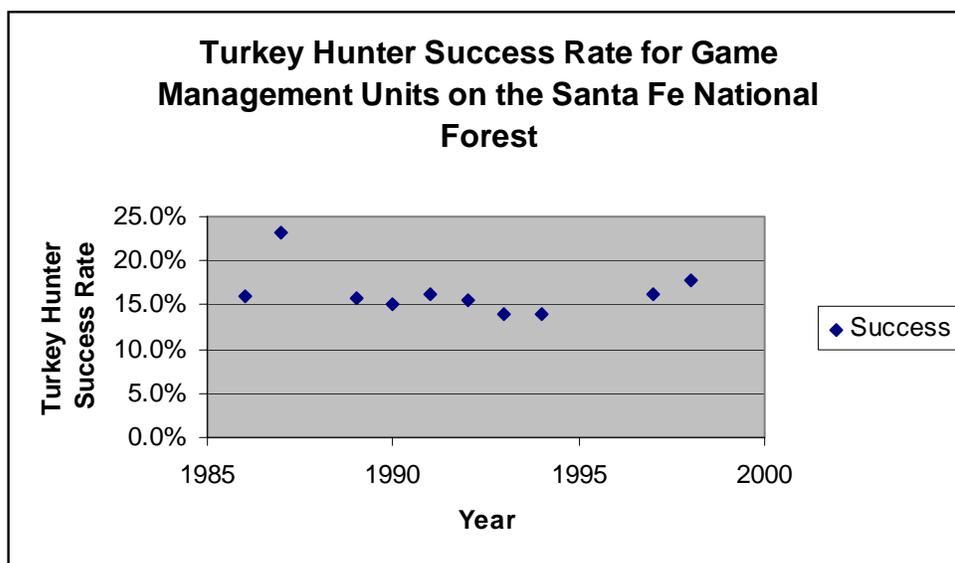


FIGURE T-2

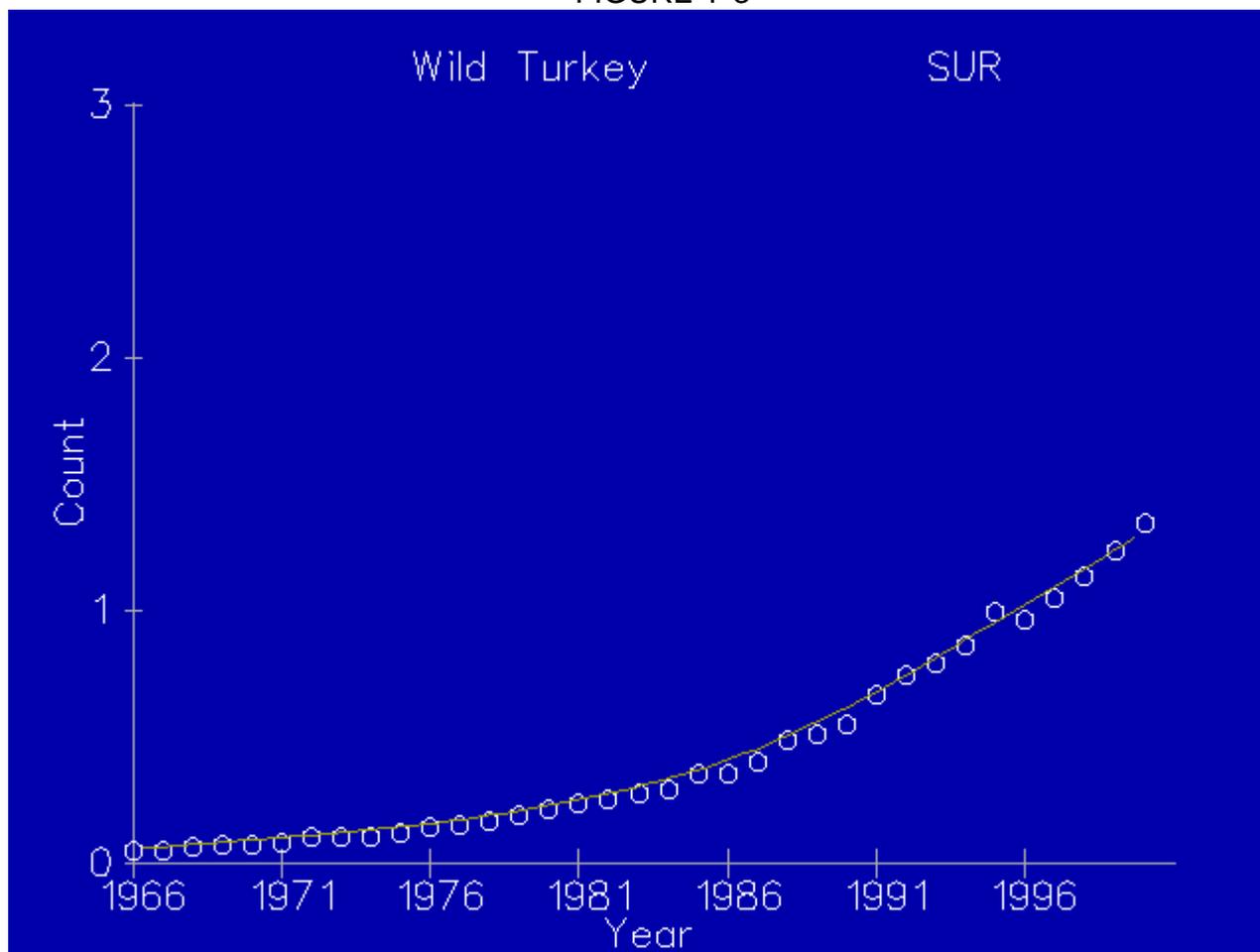


POPULATION TRENDS

Merriam’s turkey is one of the bird species which data is conducted and compiled on a large-scale breeding bird survey of North American birds. This breeding bird survey (BBS) is maintained by the Patuxent Research Center (US Geological Survey) and is found on a website (<http://www.mbr-pwrc.usgs.gov/bbs.html>). It is a roadside survey, primarily covering the continental United States. The BBS was started in 1966, and over 3,500 routes are surveyed in June by experienced birders. The primary objective of the BBS has been the estimation of population change for songbirds. However, the data have many potential uses, and investigators have used the data to address a variety of research and management objectives (Sauer 1997). Since 1966, the population trend of the Merriam’s turkey in the western part of the United States has increased by over 33 percent.

Surveys conducted by the USGS between 1968 and 1998 indicate an increasing population of Wild turkey within the region that includes New Mexico (Figure T-3) (www.mbr-pwrc.usgs.gov). The Wild turkey is listed as G5, N5, S5, S5B, and S5N (i.e. globally, nationally, and State of New Mexico secure and common, widespread and abundant (See box below for complete definitions.) based on the Nature Conservancy’s, 2001 database. On the following map (MAP (T-2), the Wild Turkey occurs across 47 states. It is secure in New Mexico and 22 other states and apparently secure in 10 other states (NatureServe, 2001).

FIGURE T-3



Global (G), National (N) and Subnational (S) Heritage Status Rank Definitions

G5	Secure-Common, widespread, and abundant (although it may be rare in parts of its range, particularly on the periphery). Not vulnerable in most of its range. Typically with considerably more than 100 occurrences and more than 10,000 individuals.
N5 S5 S5B S5N	Secure-Common, widespread, and abundant in the nation or subnation*. Essentially ineradicable under present conditions. Typically with considerably more than 100 occurrences and more than 10,000 individuals.

Breeding Status Qualifiers

Rank	Definitions
B	Basic rank refers to the breeding population of the element in the nation or subnation*.
N	Nonbreeding. Basic rank refers to the non-breeding population of the element in the nation or subnation*.

NatureServe Version 1.6 (03 December 2001) Data last updated: November 2001

Hairy Woodpecker (*Picoides villosus*)

INDICATOR SPECIES HABITAT

The hairy woodpecker is an indicator species for the presence of snags and down logs. The species is a forest generalist, keying in on available snags and live aspen. Nests are primarily in trees averaging 17 inch DBH and approximately 60 feet high. It forages primarily on tree trunks averaging 17 inch DBH and >30 feet high. Down logs are important to support insect populations for foraging. Scott and Church (1988) found that hairy woodpecker densities were negatively correlated with aspen basal area in west-central Colorado. Removal of snags, large snags, future snags and down logs increases the probability of decreased population numbers of hairy woodpeckers. The Santa Fe Forest plan modeling predicted that hairy woodpecker habitat quality would improve over time as young stands mature into diameter classes acceptable as cover. Nesting habitat was more limiting than feeding habitat.

Santa Fe National Forest Habitat

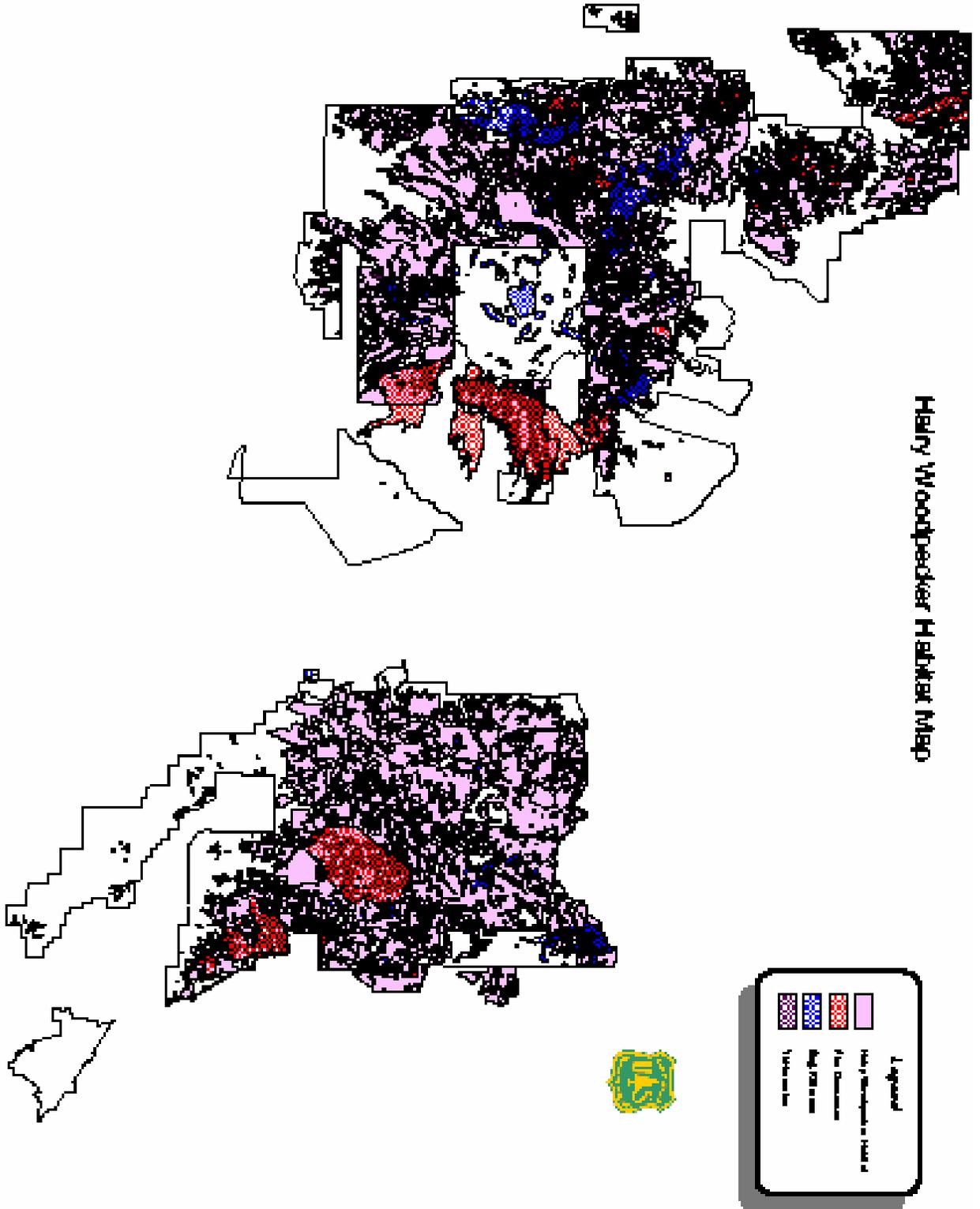
Large trees, which are future down logs and snags, are maintained across the Santa Fe National Forest in accordance with the Forest Plan¹ and the background matrix of current snags and down logs. Snags and down woody debris comprise an important element to the background matrix of the forested landscape. Road accessibility and increasing demand for firewood make snags and down woody debris susceptible to removal. Areas with high road density have a higher rate of snag removal than areas with low road densities. In areas inaccessible to the public, snags are maintained under normal conditions at far greater numbers than the Forest Plan guidelines of 2-3 snags per acre, thus the National Forest supports adequate numbers of snags and down logs for hairy woodpecker habitat. Prescribed burning and recent wildfires have created large snags in inaccessible areas (steep slopes) or areas with limited road access. Table HW-1 shows estimated acres of hairy woodpecker habitat on the forest and acres of habitat disturbed by wildfire, bug kill, disease, or timber harvest since implementation of the Forest plan. Map HW-1 shows the spatial arrangement of this habitat and disturbance across the forest. In general, habitat affected by fire, disease and bug kill will have many more snags than the minimum levels required by the Forest Plan. **The habitat trend for Hairy woodpecker is considered stable for the Forest.**

**TABLE HW-1
HAIRY WOODPECKER HABITAT BY VEGETATION TYPE ON THE SANTA FE
NATIONAL FOREST. ACRES BY VEGETATION TYPE ESTIMATED FOR TIME OF
FOREST PLAN COMPLETION AND ACRES OF THOSE HABITATS AFFECTED BY
ALL DISTURBANCE TYPES SINCE THAT TIME.**

HAIRY WOODPECKER HABITAT BY VEGETATION TYPE	TOTAL ACRES	ACRES IMPACTED BY OF HABITAT DISTURBANCES	PERCENT AFFECTED
Aspen (birch)	42,339	7,923	18.7%
Blue Spruce	3,731	985	26.4%
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Limber Pine	1,375	1,283	93.3%
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Other Hardwoods	366	112	30.6%
Other Softwoods	1,308	75	5.7%
Pinyon Juniper	465,665	3,665	0.8%
Southwestern White Pine	336	153	45.5%
White Fir	100,376	19,376	19.3%
Total Acres	976,231	95,226	9.8%

Mitigation measures of managing road densities across the forest, maintaining 2-3 or more snags per acre, large woody debris on the forest floor, and managing the aspen component for wildlife habitat will insure that hairy woodpecker habitat will be maintained across the forest over time. Past management, efforts have been consistent with the Forest Plan in improving and/or maintaining wildlife habitat.

MAP HW 1



SPECIES STATUS

Hairy woodpeckers are year-round residents of nearly all forest types from central Canada to the southern United States (Scott et al. 1977). This species is one of the most common woodpeckers in the Southwest, particularly in riparian habitats and in ponderosa pine, mixed species and spruce-fir forests (Hubbard 1978). Overall, the US population is stable. This species is widespread across the Santa Fe National Forest and can be found in any of the suitable habitat types.

The Hairy Woodpecker population is ranked as abundant for the Santa Fe NF. This means that the estimated number of breeding pairs, ranges between 10,000 and 100,000 pair. The population may fluctuate from year to year based on a variety of environmental factors. This estimate is based on the amount of habitat available, breeding bird surveys, local studies and the professional opinion of local biologists. A study conducted by Eagle Environmental in the spring and summer of 1985 in an area west of the Questa Ranger District on public lands administered by the Bureau of Land Management (Stahlecker et al. 1989) evaluated woodpecker populations. Data for this species comes from the wooded canyon benches (WCB) habitat, which is similar to the transition zone between the piñon-juniper and ponderosa pine type common across the Santa Fe National Forest. This habitat type contains a mix of juniper, piñon and ponderosa pine. The survey also includes the upland forest (UF) habitat, which is similar to the lower elevation mixed conifer habitats on the Santa Fe, but is generally a more open canopy than most of the Santa Fe's forested stands. The UF habitat contains ponderosa pine, but Douglas fir is the dominant tree species. The WCB habitat had not been harvested, while the UF habitat was historically harvested. Population densities for the WCB average 11 breeding pair per square kilometer. The UF habitat type averaged 12 breeding pair per square kilometer. Based on this study, 0 to 22 breeding pair per square kilometer can be estimated across mixed conifer vegetation type of the Santa Fe National Forest. Competition from other woodpecker species for cavity sites could affect populations of this management indicator species, however, in this study Northern flickers averaged almost identical population densities by habitat type. The Santa Fe NF has over 900,000 acres of forested habitats suitable for use by the hairy woodpecker.

POPULATION TREND

Surveys conducted by the USGS between 1968 and 1998 indicate a stable or increasing trend for Hairy woodpecker within the state of New Mexico (www.mbr-pwrc.usgs.gov). Figure HW-1 approximates this trend. The Hairy woodpecker is listed as G5, N5, S5, S5B, S5N (i.e. globally, Nationally, and State of New Mexico secure and common, widespread and abundant (See box below for complete definitions.) based on the Nature Conservancy's, 2001 database. On the map (Map HW-2) that follows, the Hairy woodpecker occurs across 47 states. It is secure in New Mexico and 31 other states (Natureserve, 2001). **The population of hairy woodpeckers is considered stable to increasing on the Santa Fe National Forest** based on the trends seen within the State of New Mexico, observations on breeding bird surveys in or adjacent to the Forest; and habitat conditions within the Forest.

Global, National and Subnational* Heritage Status Rank Definitions

Elements are assigned a numeric rank of relative imperilment based on standard rank factors applied at national or subnational (e.g. state or provincial) levels as appropriate. A subnational rank cannot imply the element is more abundant at the subnational level than it is nationally or globally (e.g., a G1/S2 rank should not occur). The same basic ranks and qualifiers used for subnational ranks are used for national ranks. Therefore, the definitions below may be used interchangeably for national and subnational ranks. In general, NatureServe scientists assign global, U.S., and Canadian national ranks with guidance from local data centers, especially for endemic elements, and from experts on particular taxonomic groups. Local data centers assign subnational ranks for elements in their respective jurisdictions.

Global (G), National (N) and Subnational (S) Heritage Status Rank Definitions

G5	Secure-Common, widespread, and abundant (although it may be rare in parts of its range, particularly on the periphery). Not vulnerable in most of its range. Typically with considerably more than 100 occurrences and more than 10,000 individuals.
N5 S5 S5B S5N	Secure-Common, widespread, and abundant in the nation or subnation*. Essentially ineradicable under present conditions. Typically with considerably more than 100 occurrences and more than 10,000 individuals.

Breeding Status Qualifiers

Rank	Definitions
B	Basic rank refers to the breeding population of the element in the nation or subnation.*
N	Nonbreeding. Basic rank refers to the non-breeding population of the element in the nation or subnation.*

NatureServe Version 1.6 (03 December 2001) Data last updated: November 2001

FIGURE HW-1

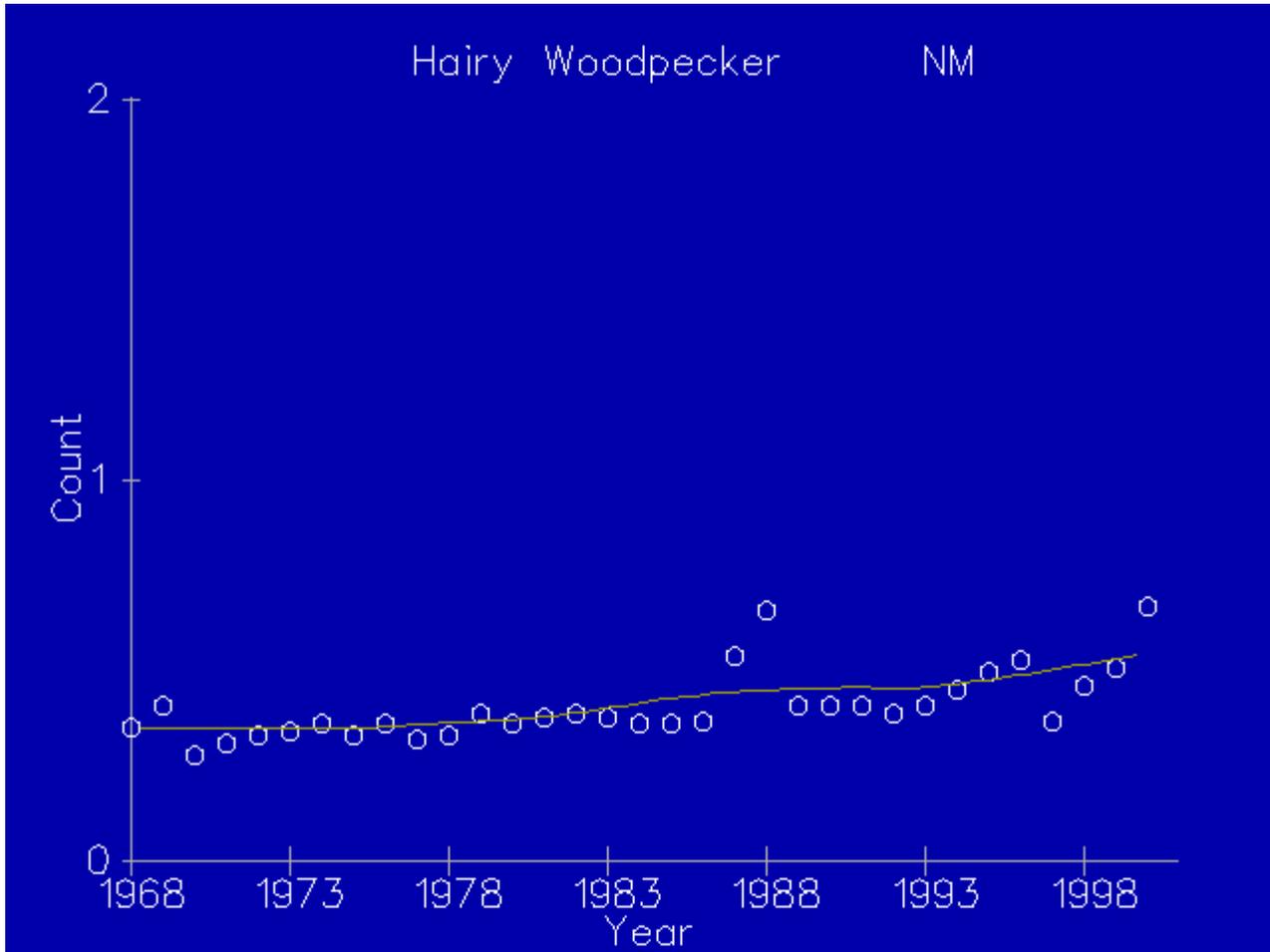
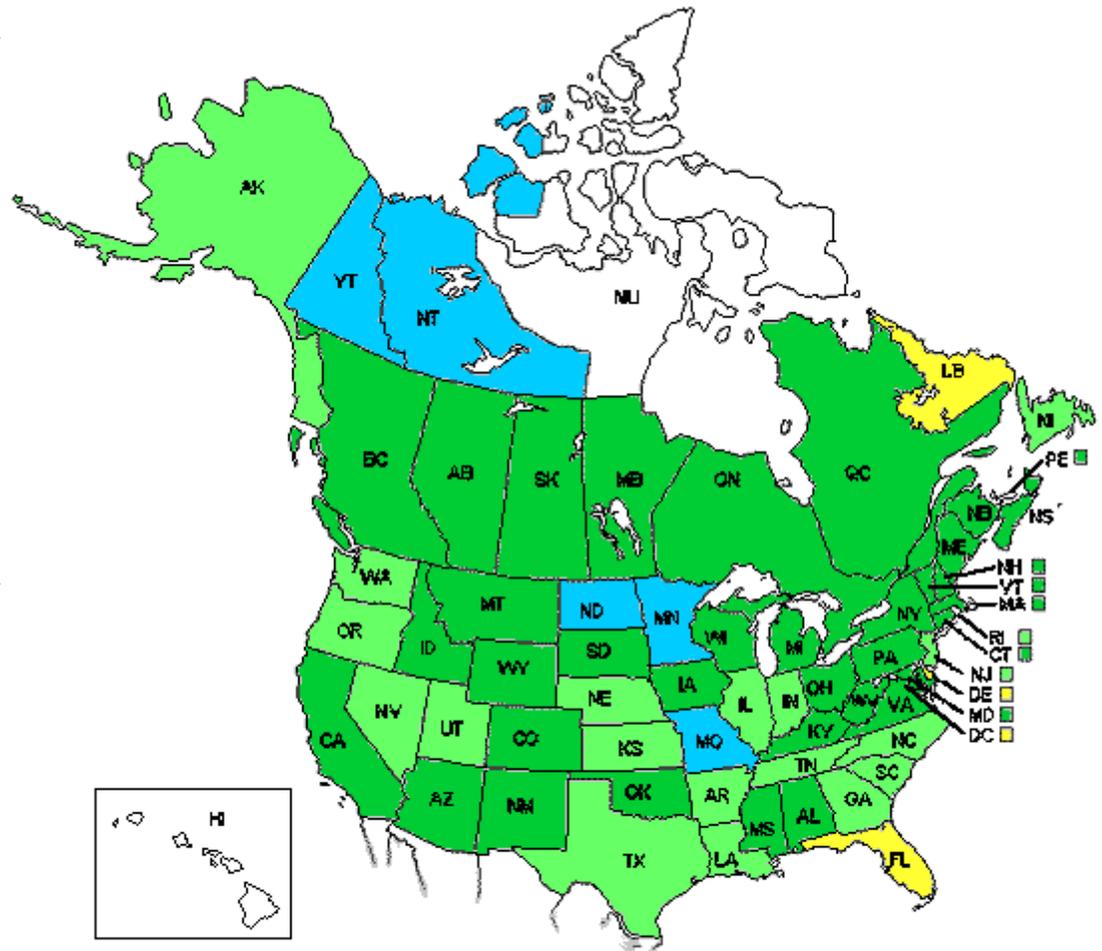
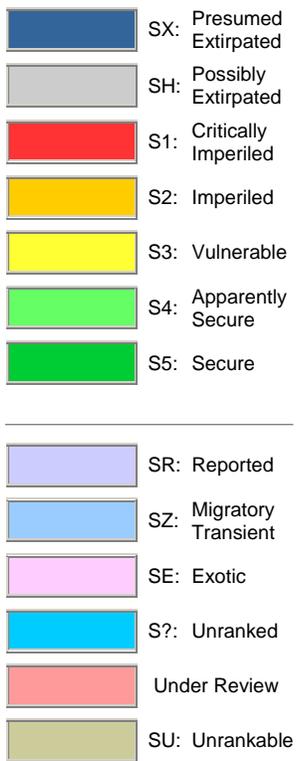


Figure HW 1 USGS New Mexico Hairy woodpecker trend data.

**State/Province
Conservation
Status Rank**



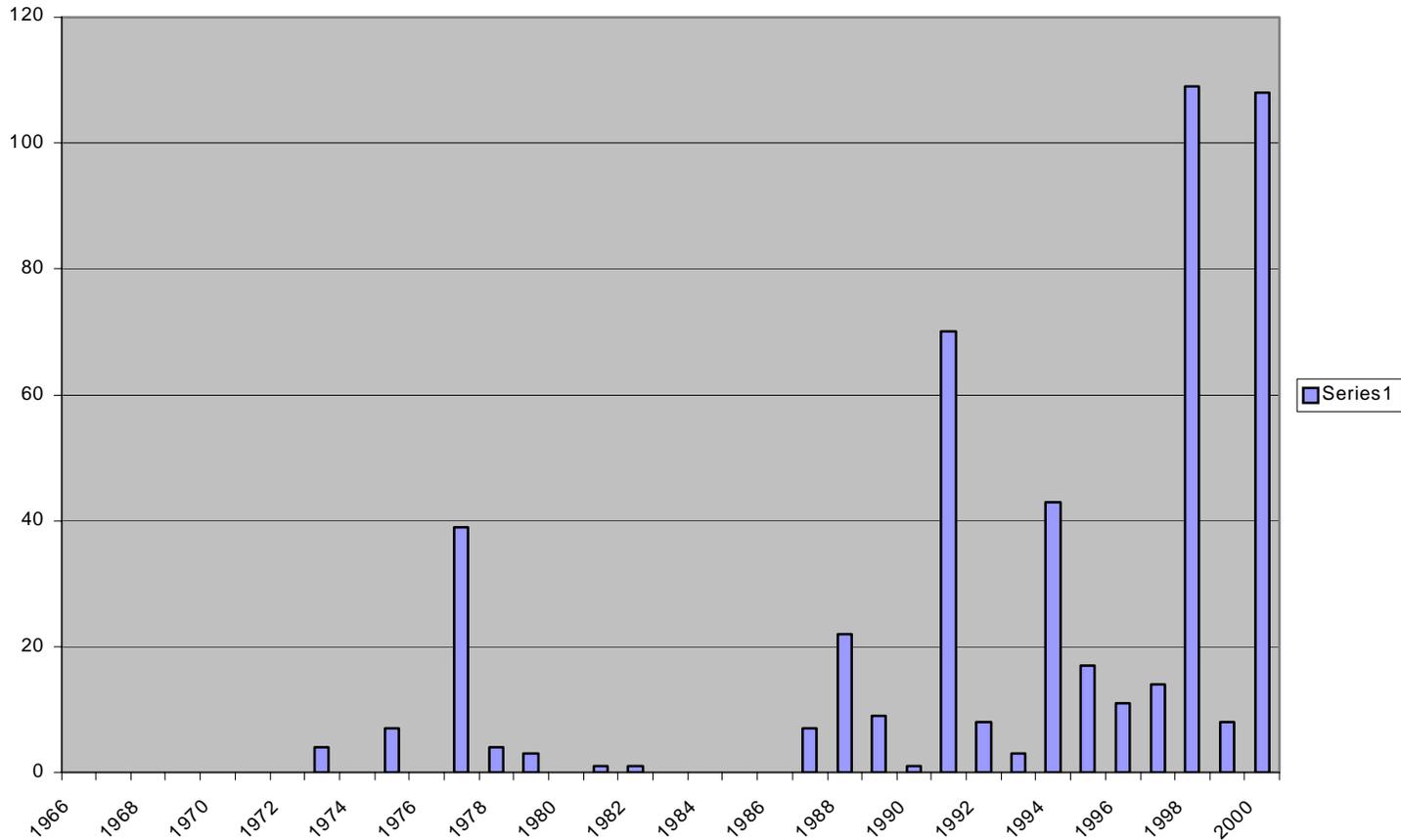
MAP HW-2

Hairy Woodpecker *Picoides villosus*

NatureServe Explorer: An online encyclopedia of life [web application]. 2001. Version 1.6
Arlington, Virginia, USA

FIGURE HW-2

Hairy woodpecker BBR on or Near the Santa Fe NF



The chart above (Figure HW-2) displays the number of Hairy woodpecker counted on Breeding Bird Routes on or near the Santa Fe National Forest. While the number of Hairy woodpecker seen, cannot be directly attributed to the Forest habitat, the chart indicates that woodpecker numbers have increased. This can be attributed to many factors such as weather, food supply increased number of snags due to fires and observer ability.

Monitoring recommendations

Monitor as per Partners in Flight recommendations for habitat types where the species is found.

ROCKY MOUNTAIN BIGHORN SHEEP (*Ovis canadensis canadensis*)

Indicator Species Habitat

Rocky Mountain bighorn sheep inhabit the cliffs and crags or other extremely rocky areas in tundra and alpine areas from the summit peaks to around 200 meters below the treeline of the Sangre de Cristo Mountains. Bighorn prefer precipitous terrain adjacent suitable feeding sites of high mountain meadows with grasses, forbs and browse species. Since bighorn are highly susceptible to the diseases carried by domestic sheep, the viability of the species is dependent on whether or not domestic sheep are present within their occupied habitat. The Santa Fe Forest Plan estimated habitat capability for bighorn sheep habitat based on the health of alpine and meadow areas and effects of encroaching canopy closure.

Santa Fe National Forest Habitat

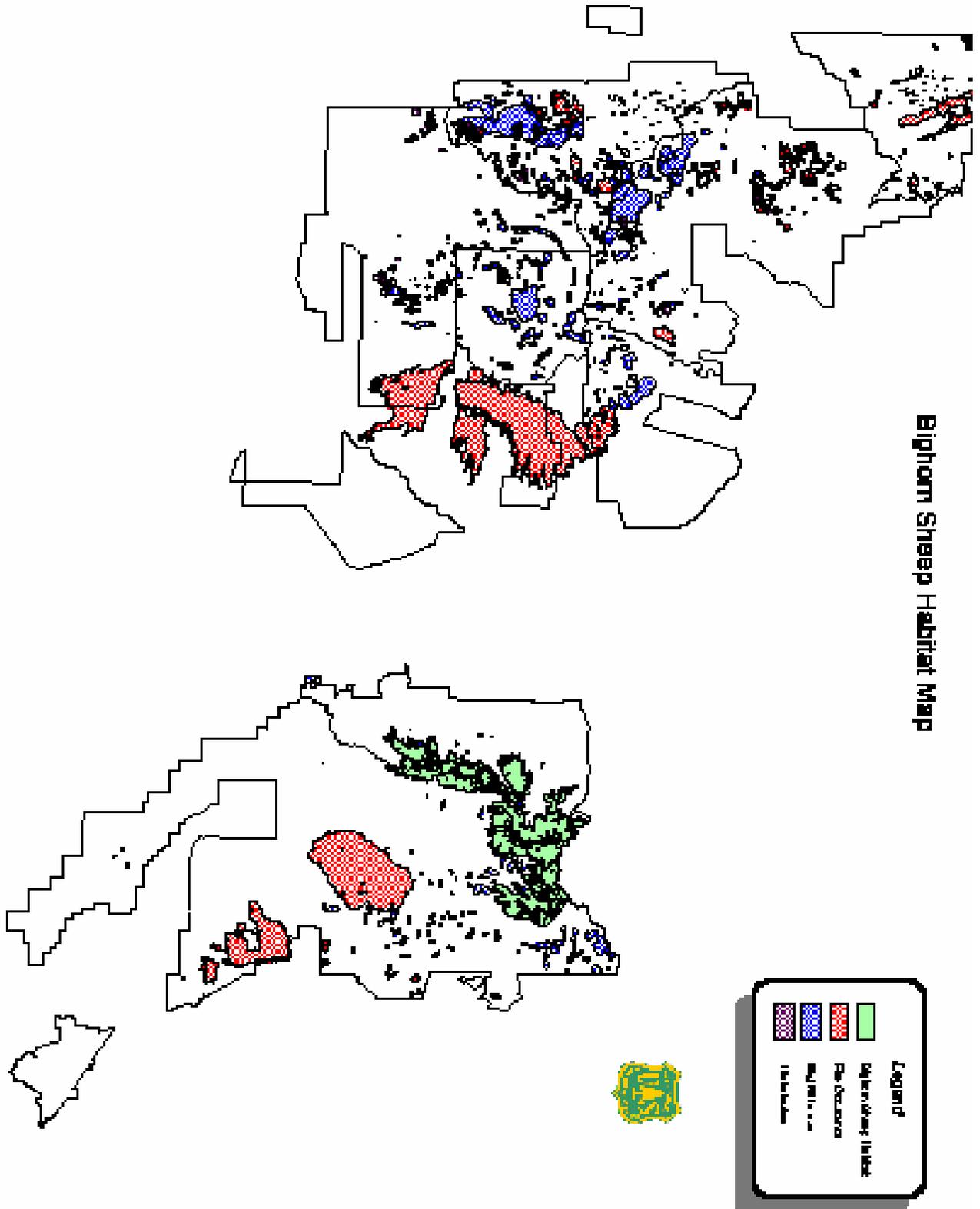
This species was reintroduced to the Pecos Wilderness in the 1960's. An extensive habitat distribution and food habits evaluation was conducted from 1976 to 1978. The estimated continuous alpine habitat is estimated at 71 km sq. The estimated carrying capacity, based on winter range, was thought to be 175 to 330 animals. A lack of natural salt deposits resulted in sheep and human interactions that were not considered healthy. Salting in remote locations by the Department of Game and Fish seems to be the solution to that problem. Table BH-1 shows estimated acres of bighorn sheep habitat on the forest and acres of this habitat disturbed by wildfire, bug kill, or disease since implementation of the Forest plan. Map BH-1 shows the spatial arrangement of this habitat and disturbance across the forest.

Habitat condition in the Pecos Wilderness Area is generally fair to good, but the limiting factor is severe winter conditions where quality and quantity of forage can fluctuate significantly. There are a few locations where utilization is heavy, but these are isolated. Since the class of livestock for the grazing allotment overlapping bighorn habitat was changed from sheep to cattle, the cows rarely if ever access the sheep habitat. The west slopes of the Sangre de Cristo Mountains on the Santa Fe National Forest are heavily forested and lack the high elevation, rugged cliffs, crags and rocky areas required to support a viable population of bighorn sheep. **The habitat trend for bighorn sheep on the Santa Fe Forest is considered stable** based on the small amount of change that has occurred in the alpine habitat since implementation of the Forest Plan.

TABLE BH-1

ROCKY MOUNTAIN BIGHORN SHEEP HABITAT BY VEGETATION TYPE ON THE SANTA FE NATIONAL FOREST. ACRES BY VEGETATION TYPE ESTIMATED FOR TIME OF FOREST PLAN COMPLETION AND ACRES OF THOSE HABITATS AFFECTED BY ALL DISTURBANCE TYPES SINCE THAT TIME.

BIGHORN SHEEP HABITAT BY VEGETATION TYPE	TOTAL ACRES	ACRES IMPACTED BY DISTURBANCES	PERCENT OF HABITAT AFFECTED
Aspen (birch)	2,151	69	3.2%
Douglas Fir	2,648	75	2.8%
Engelmann Spruce	42,172	1,134	2.7%
Engelmann Spruce and Subalpine Fir	109	0	0.0%
Grass	7,051	71	1.0%
Other Softwoods	332	29	8.7%
Ponderosa Pine	59	0	0.0%
Unidentified	3,814	126	3.3%
White Fir	169	0	0.0%
Total	58,505	1,504	2.6%



Species status

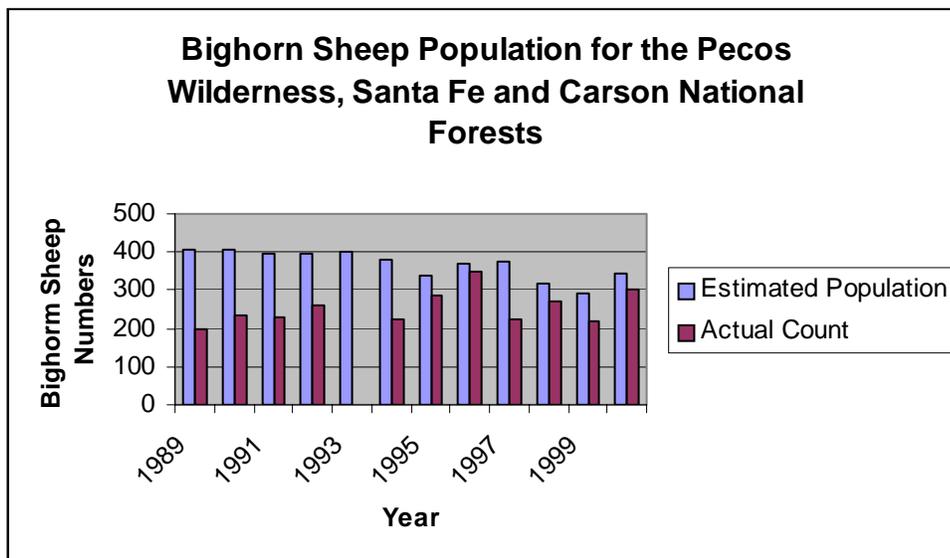
Rocky Mountain bighorn sheep are characterized by low reproduction rates, long life spans and populations that remain stable near carrying capacity (Dunn 1996). Dunn has observed that populations with more than 100 animals normally have the best chance for long-term persistence. Most mortality in alpine populations occurs during winter when weather is severe and forage quality and availability are low. Declines in low-elevation populations are associated with low precipitation that adversely affects forage production.

Bighorn were never widespread in New Mexico, historically occurring in only four to six populations. Currently, five populations comprised of about 570 animals are found in the state, but the status of the sub-species is not secure. A variety of impacts can adversely affect bighorn including recreation use, roads, fences, poor range conditions, fire suppression, diseases, illegal harvest and predation (Dunn 1997).

On the Santa Fe National Forest, Bighorn sheep are found in the upper elevations of the Pecos Wilderness. The sheep range primarily in the alpine areas between Pecos Baldy and Jicarita peak.

The bighorn sheep population is ranked as uncommon for the Santa Fe NF. This means that the estimated number of breeding females ranges between 100 and 1,000 individuals. The population may fluctuate from year to year based on a variety of environmental factors. Figure BH-1 shows actual counts of Bighorn sheep and estimated populations based on these counts in the Pecos Wilderness. In 1993, it was determined by the NM Department of Game and Fish that the Pecos population is a point to be used as a source to reintroduce sheep to other areas thought to be suitable. Several transplants have occurred since then, where sheep were removed from the Pecos Wilderness and moved to other areas.

FIGURE BH-1



The population trend for the Rocky Mountain bighorn sheep is ranked as stable or increasing on the Forest. The Pecos population of bighorn is at capacity for the available habitat. The transplants out of the Pecos wilderness have been used both to keep the

population in check and to augment or create new populations in other areas. It is likely that this population will remain the primary source of sheep for transplants in the near future. A long-range management plan (1996 – 2002) published in 1996 described the Pecos population as healthy, stable and at carrying capacity with the population be regulated by winter weather and the forage availability during severe winters.

Since the population is of a reasonably large size, predation is not considered to be a major limiting factor. The only serious threat to the population is disease. In 1996, a closure order for any domestic goats or sheep was put into effect to prevent any infection of *Pasturella* bacteria. The highest actual count was 349 sheep in 1996.

Monitoring recommendations

Continue surveys by NMDGF.

ROCKY MOUNTAIN ELK (*Cervis canadensis*)

Indicator Species Habitat

Rocky Mountain elk inhabit most forest types with good forage and cover. These ungulates utilize a variety of habitat types, during the course of their life. They appear to be extremely adaptable to both secondary successional and specific successional vegetation types.

Certain types are of limited value to elk due to aspect, elevation, snow depth, lack of water availability and/or vegetation components. The Forest plan modeling predicted that elk were limited primarily by low forage availability. Creating a greater proportion of early seral stage habitat and associated forage improved elk habitat.

Santa Fe National Forest Habitat

In general, there is more than enough habitat to support the current population of elk on the Forest. However, there are conflicts with grazing permittees due to the allocation of forage between livestock and elk. Many grazing permittees on the Forest believe the number of elk are increasing on their allotments, therefore causing higher utilization levels on their allotments. Much of the conflict comes from the fact that canopy closure is rapidly occurring across much of the Forest, reducing understory forage production. The problem is not so much an increase in elk populations, as it is a decrease in resource condition. The NMDGF has provided a limited number of late season cow permits to help hold the population at current levels and help prevent depredation of hay fields on private lands. In the long term, however, good habitat for elk is dependent on projects specifically designed to provide understory forage recovery, away from streams and riparian vegetation, and to improve small parks and openings through meadow maintenance and thinning near these sites. Wintering areas should have a schedule established to conduct prescribed burning and maintenance in the spring.

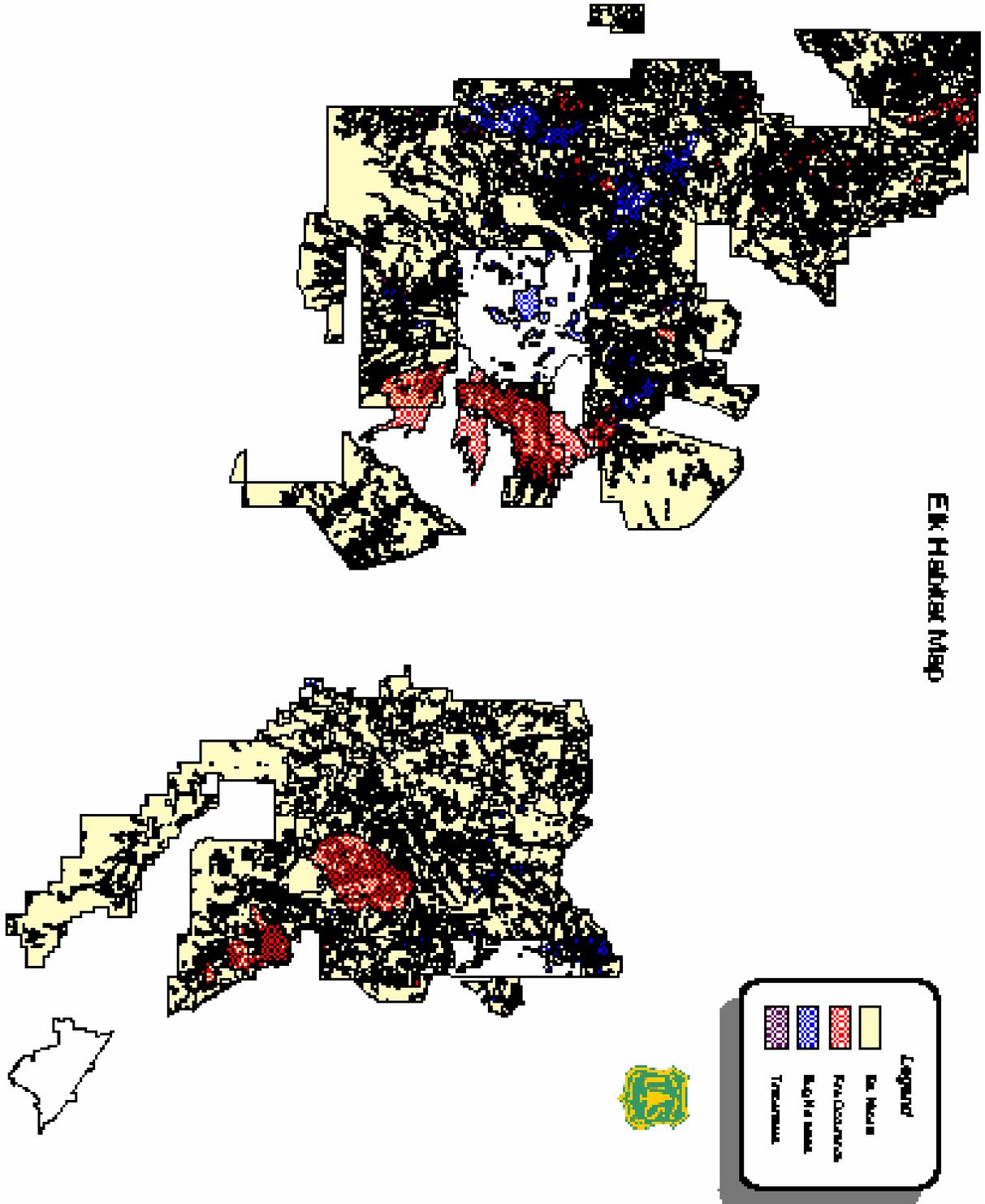
The elk utilize and frequent almost every habitat type found on the Forest. Recent habitat improvement projects such as water developments, prescribed burns, timber harvest, and the thinning of piñon-juniper woodlands have greatly contributed to the expansion of existing herds into previously unoccupied habitats. Table E-1 shows estimated acres of elk habitat on the forest and acres of habitat disturbed by wildfire, bug kill, disease, or timber harvest since implementation of the Forest plan. Map E-1 shows the spatial arrangement of this habitat and disturbance across the forest. In general, habitat affected by disturbance will have the canopy opened up allowing for the growth of more understory vegetation, improving elk habitat. **The trend for elk habitat on the Forest is rated as stable.** This is based on recent large fires creating large amounts of early seral stage habitat. These changes caused by fire are being offset by the forest habitat encroaching on historic meadow habitat in unburned areas.

TABLE E-1

ROCKY MOUNTAIN ELK HABITAT BY VEGETATION TYPE ON THE SANTA FE NATIONAL FOREST. ACRES BY VEGETATION TYPE ESTIMATED FOR TIME OF FOREST PLAN COMPLETION AND ACRES OF THOSE HABITATS AFFECTED BY ALL DISTURBANCE TYPES SINCE THAT TIME.

ELK HABITAT BY VEGETATION TYPE	TOTAL ACRES	ACRES IMPACTED BY DISTURBANCES	PERCENT OF HABITAT AFFECTED
Aspen (birch)	42,335	7,923	18.7%
Blue Spruce	3,731	985	26.4%
Bristlecone Pine	386	288	74.7%
Douglas Fir	202,687	39,133	19.3%
Engelmann Spruce	149,174	19,927	13.4%
Engelmann Spruce and Subalpine Fir	8,825	2,594	29.4%
Grass	94,217	5,259	5.6%
Juniper Woodland	60	0	0.0%
Limber Pine	1,375	92	6.7%
Lodgepole Pine	31	0	0.0%
Nonvegetated Sites (cover not identified)	27,153	944	3.5%
Oak Woodland	32,255	5,563	17.2%
Other Hardwoods	366	112	30.6%
Other Softwoods	1,308	75	5.7%
Pinyon/Juniper	452,335	3,658	0.8%
Ponderosa Pine	419,156	64,148	15.3%
Rockland Scree	64	11	17.2%
Rocky Mountain Juniper	3,409	623	18.3%
Sagebrush	2,695	23	0.9%
Southwestern White Pine	336	153	45.5%
Unidentified	81,752	14,989	18.3%
White Fir	100,376	18,029	18.0%
TOTAL	1624026	184,529	11.4%

MAP E 1



Species status

Elk were extirpated from New Mexico by 1909. In 1911, efforts to restore elk to New Mexico began with transplants near Raton and Las Vegas (Bison 2000)

Elk populations in the Sangre de Cristo and Jemez Mountains are primarily migratory herds. There are numerous small herds that come together and use the high elevation areas of the Pecos Wilderness, Jemez Mountains, San Pedro Parks and the Valles Caldera National Preserve as summer range. These small herds migrate to lower elevation winter ranges when the snows come. The population is healthy and is generally considered to be growing. There are many areas where use now occurs that is reported not to have occurred 20 to 30 years ago. There is no concern with population viability of elk on the Forest. Elk numbers have steadily increased over the past two decades.

The Rocky Mountain elk population is ranked as common for the Santa Fe NF. This means that the estimated number of breeding females ranges between 1,000 and 10,000 individuals. The population may fluctuate up and down from year to year based on hunting pressure, and a variety of environmental factors. This estimate is based on actual counts and surveys conducted periodically by the New Mexico Department of Game and Fish. The New Mexico Department of Game and Fish manages the elk herd by unit. The existing units that are present on the Forest are Units 5B, 6A, 6C, 44 and 45. Unit 6B is the Valles Caldera National Preserve. Population numbers of elk are based on estimates derived from aerial surveys conducted by the NMDGF. A 1999 pre-hunt population of 4,000+ elk is estimated for Unit 6A, B, and C. Units 44 and 45 are estimated to be 1,200. The total number of elk for the Santa Fe NF is estimated to be between 6,000 – 10,000 elk.

The population trend for the Rocky Mountain elk is ranked as increasing on the Forest.

The objective is to maintain the herd at about its current level. The number of cow elk permits for hunters has been increasing over the past decade to keep the elk population at the desired number. Figure E-1 shows the elk hunter numbers and harvest for game management units on the Santa Fe National Forest. Figure E-2 shows the success rate by year for elk hunters on the Santa Fe NF. Figure E-3 shows the elk counted by hunt unit for game management units on the Santa Fe NF. Figure E-4 shows the Elk counted, and hours of aerial survey on game management units for the Santa Fe NF.

The Forest has some of the best elk habitat in New Mexico. The past and future management practices have not had, and are not anticipated to have, a negative effect on the viability of elk populations in northern New Mexico. Most management practices are designed to improve elk habitat.

FIGURE E-1

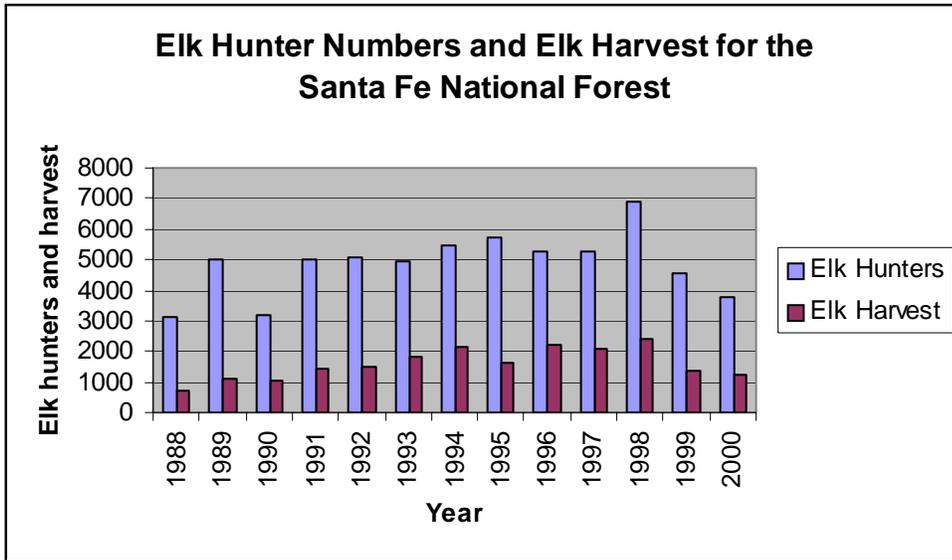


FIGURE E-2

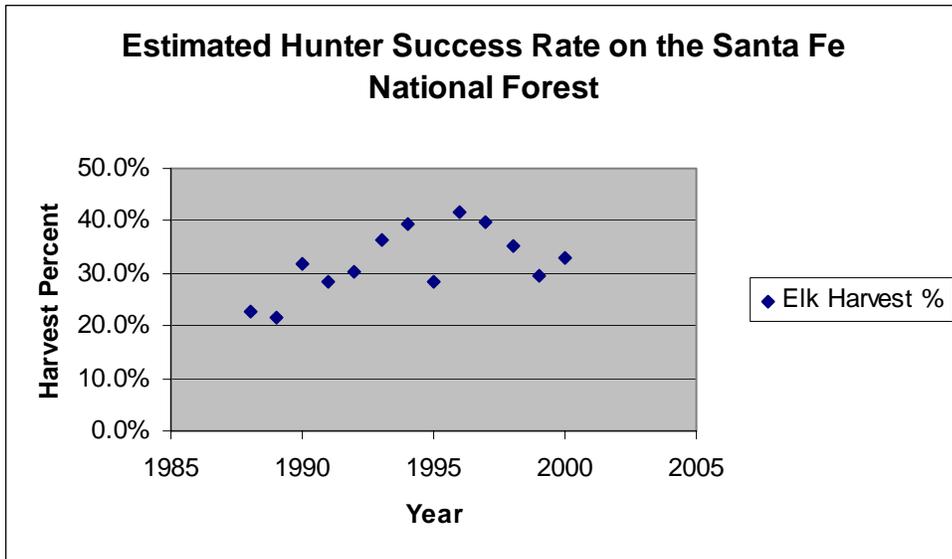


FIGURE E-3

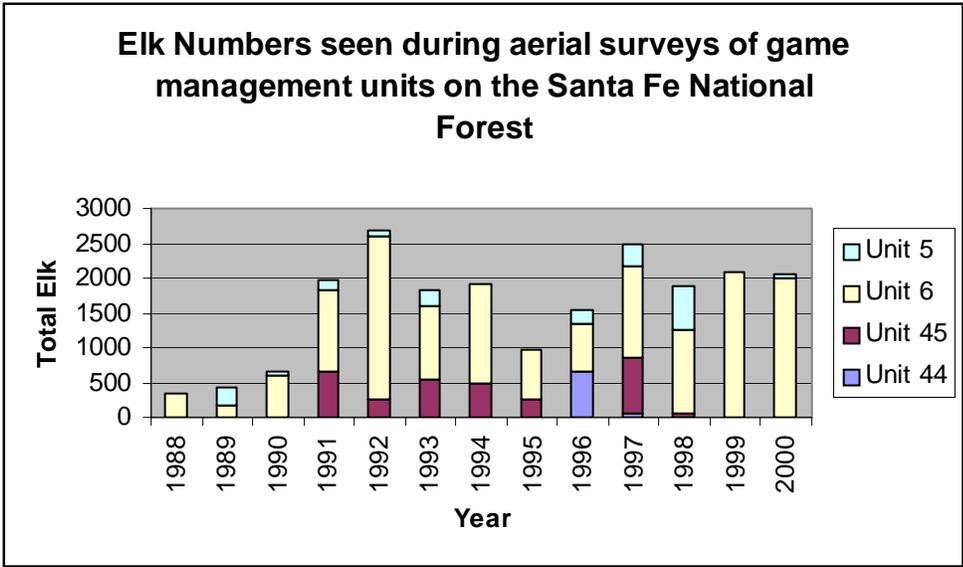
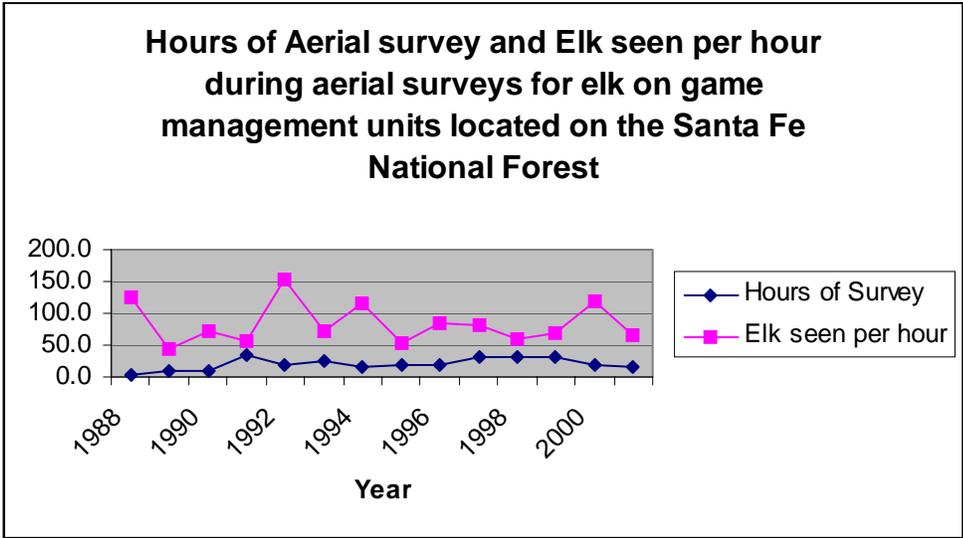


FIGURE E-4



Monitoring recommendations

Continue to support the current elk studies in conjunction with Los Alamos National Laboratory and Bandelier National Monument. These studies are underway to better quantify the elk populations, movements and distribution on the Forest. Continue to cooperate with the NMDG&F to evaluate population and habitat data to improve elk management.

PINON JAY (*Gymnorhinus cyanocephalus*)

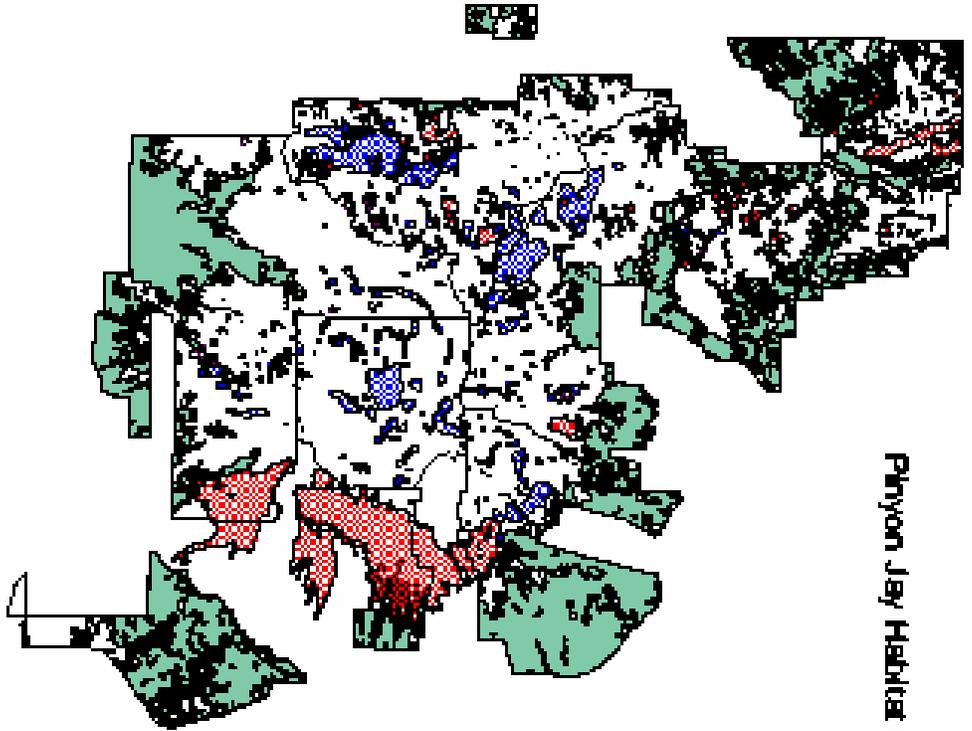
Indicator Species Habitat

Piñon jays nest mainly in stands of piñon-juniper. It needs open woodlands for nesting and an adequate supply of seeds, especially nuts. They are gregarious and breed in colonies up to 150. They spend the winters in large flocks of 10's or 1000's moving in search of piñon stands with a successful crop of piñon nuts that are a primary food source along with other seeds, fruits and insects. The Forest Plan modeling predicted that pinon jay habitat would improve by increasing foraging areas. Alternatives which favored a variety of mast producing plants found in early seral stage forests were best for pinon jays.

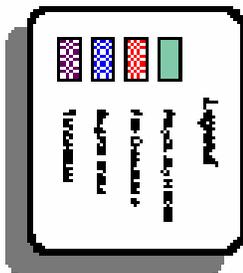
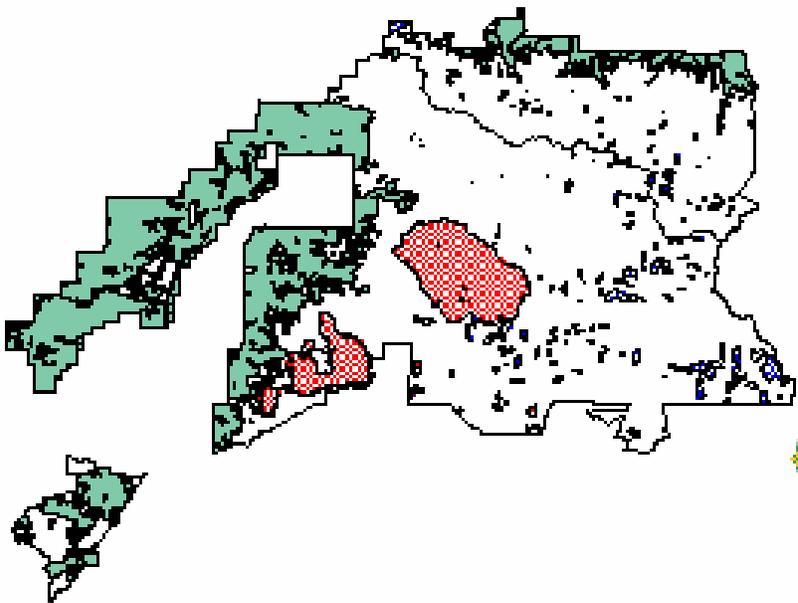
Santa Fe National Forest Habitat

Stands of piñon-juniper provide the habitat for the piñon jay on the Santa Fe National. Stand improvements to grow nut producing, large piñon trees and reduce the risk of crown fires in the piñon-juniper type continues through managed fuelwood programs to thin dense stands. Prescribed fire is used to reduce woody debris after thinning. No threats to the Piñon jay are known except for human encroachment in their habitat or wildfires that destroy extensive acreage of piñon-juniper stands. **The habitat trend for pinon jay is ranked as stable on the Forest.** Very little change has occurred in the habitat for this species since implementation of the Forest Plan. Table PJ-1 shows estimated acres of Pinyon jay habitat on the forest and acres of habitat disturbed by wildfire, bug kill, disease, or timber harvest since implementation of the Forest plan. Map PJ-1 shows the spatial arrangement of this habitat and disturbance across the forest.

TABLE PJ-1 PINON JAY HABITAT BY VEGETATION TYPE ON THE SANTA FE NATIONAL FOREST. ACRES BY VEGETATION TYPE ESTIMATED FOR TIME OF FOREST PLAN COMPLETION AND ACRES OF THOSE HABITATS AFFECTED BY ALL DISTURBANCE TYPES SINCE THAT TIME.			
PINON JAY HABITAT BY VEGETATION TYPE	TOTAL ACRES	ACRES IMPACTED BY DISTURBANCES	PERCENT OF HABITAT AFFECTED
Juniper Woodland	60	0	0.0%
Pinyon/Juniper	465,665	3,658	0.8%
Total Acres	465,725	3,658	0.8%



Pinyon Jay Habitat Map



MAP PJ-1

Species status

The species occupies New Mexico as a breeding and winter resident. They are variably residents in mainly middle elevation areas containing piñon-juniper woodlands almost statewide, and are considered uncommon to locally abundant. Even within these habitats, however, their occurrence may be very unpredictable and seasonally sporadic. In mass movements during years of poor seed crop especially piñon nuts, flocks may move hundreds of miles.

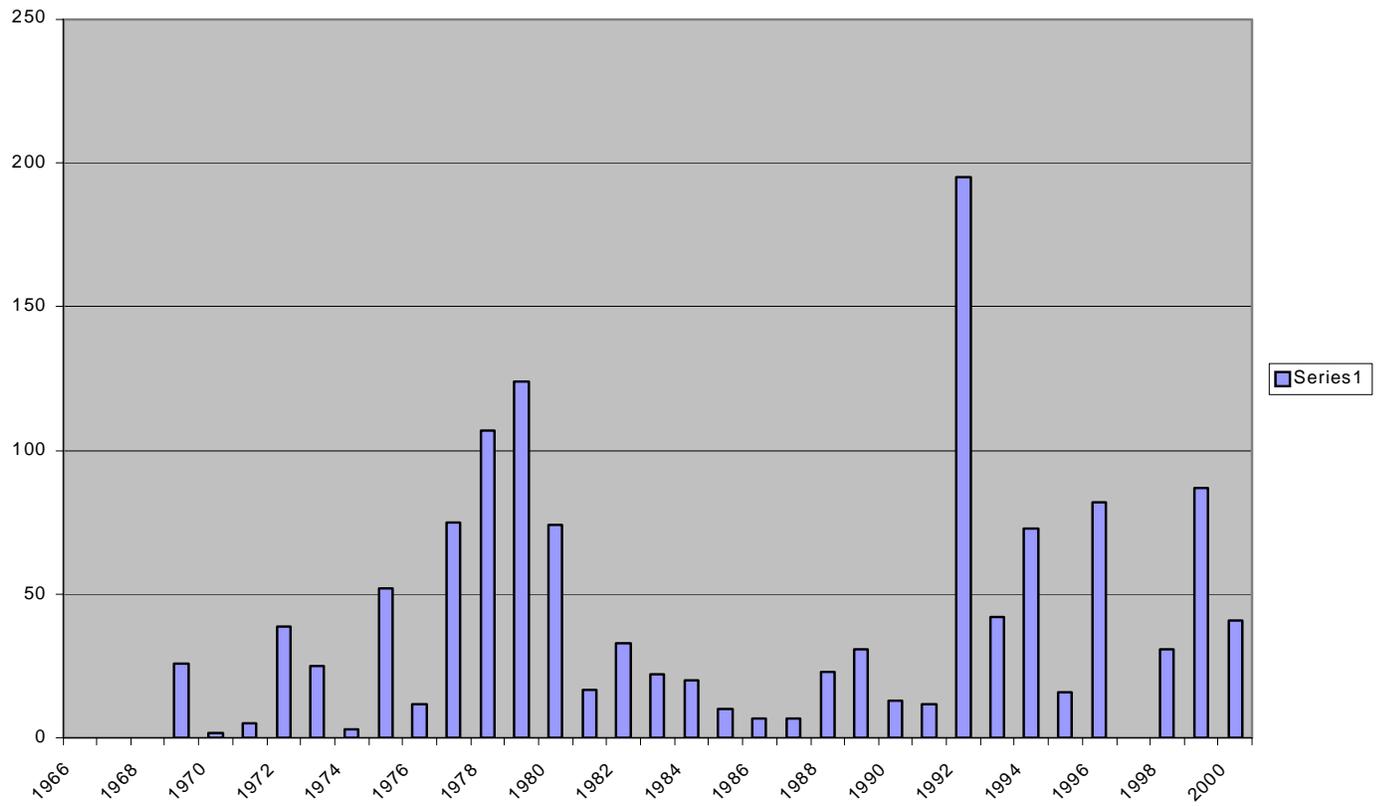
The Santa Fe NF contains over 450,000 acres of piñon-juniper woodlands distributed across all Ranger Districts. Piñon jay use would be widespread across this area with actual use varying by season and year.

The Piñon jay population is ranked as common for the Santa Fe NF. This means that the estimated number of breeding pairs, ranges between 1,000 and 10,000. The population may fluctuate from year to year based on a variety of environmental factors. This estimate is based on the amount of habitat available, breeding bird surveys and the professional opinion of local biologists.

Figure PJ-1 displays the number of Piñon jay counted on Breeding Bird Routes on or near the Santa Fe National Forest. While the number of seen Piñon jay cannot be directly attributed to the Forest habitat the chart indicates that jay numbers fluctuate with no discernible trend. This can be attributed to many factors such as weather, food supply and observer ability.

FIGURE PJ-1

Pinyon Jay on BBR on or Near Santa Fe NF



POPULATION TRENDS

Surveys conducted by the USGS between 1968 and 1998 indicate a stable or downward trend for Piñon jay within the state of New Mexico (www.mbr-pwrc.usgs.gov). **The trend for the Santa Fe National Forest is ranked as stable to downward** based on the State trend; and the breeding survey routes located near the Forest. Figure PJ-2 approximates this trend. Although the USGS data indicate a downward trend in New Mexico for this species, the Piñon jay is listed as G5, N5, S5, S5B, and S5N (i.e. globally, nationally, and State of New Mexico secure and common, widespread and abundant, (See box below for complete definitions.) based on the Nature Conservancy’s, 2001 database. Map PJ-2, shows the Piñon jay occurs across 15 states. It is secure in New Mexico and 4 other states and apparently secure in 4 other states (NatureServe, 2001).

Global (G), National (N) and Subnational (S) Heritage Status Rank Definitions

G5	Secure-Common, widespread, and abundant (although it may be rare in parts of its range, particularly on the periphery). Not vulnerable in most of its range. Typically with considerably more than 100 occurrences and more than 10,000 individuals.
N5 S5 S5B S5N	Secure-Common, widespread, and abundant in the nation or subnation*. Essentially ineradicable under present conditions. Typically with considerably more than 100 occurrences and more than 10,000 individuals.

Breeding Status Qualifiers

Rank	Definitions
B	Basic rank refers to the breeding population of the element in the nation or subnation*.
N	Nonbreeding. Basic rank refers to the non-breeding population of the element in the nation or subnation*.

NatureServe Version 1.6 (03 December 2001) Data last updated: November 2001

FIGURE PJ-2

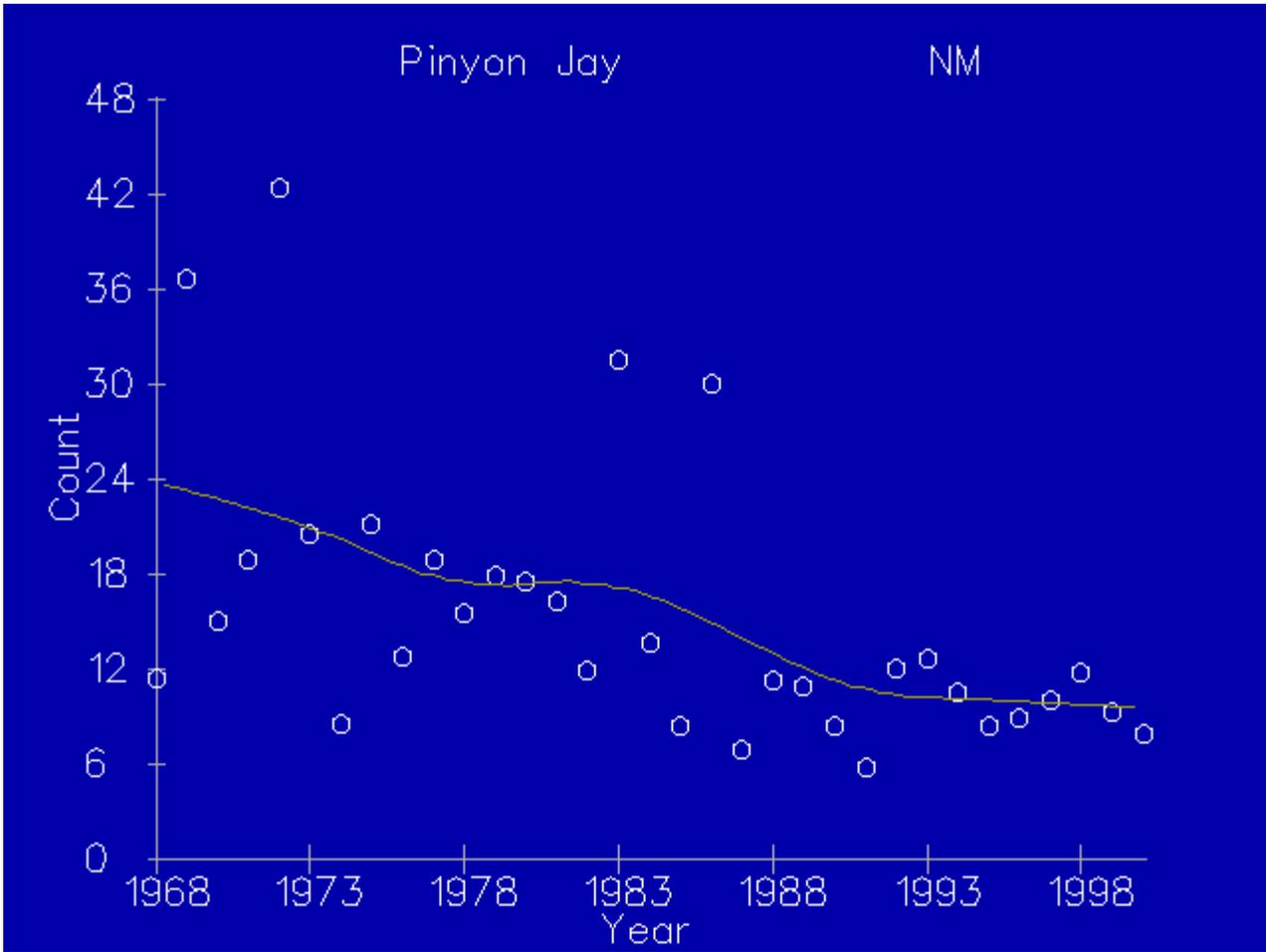
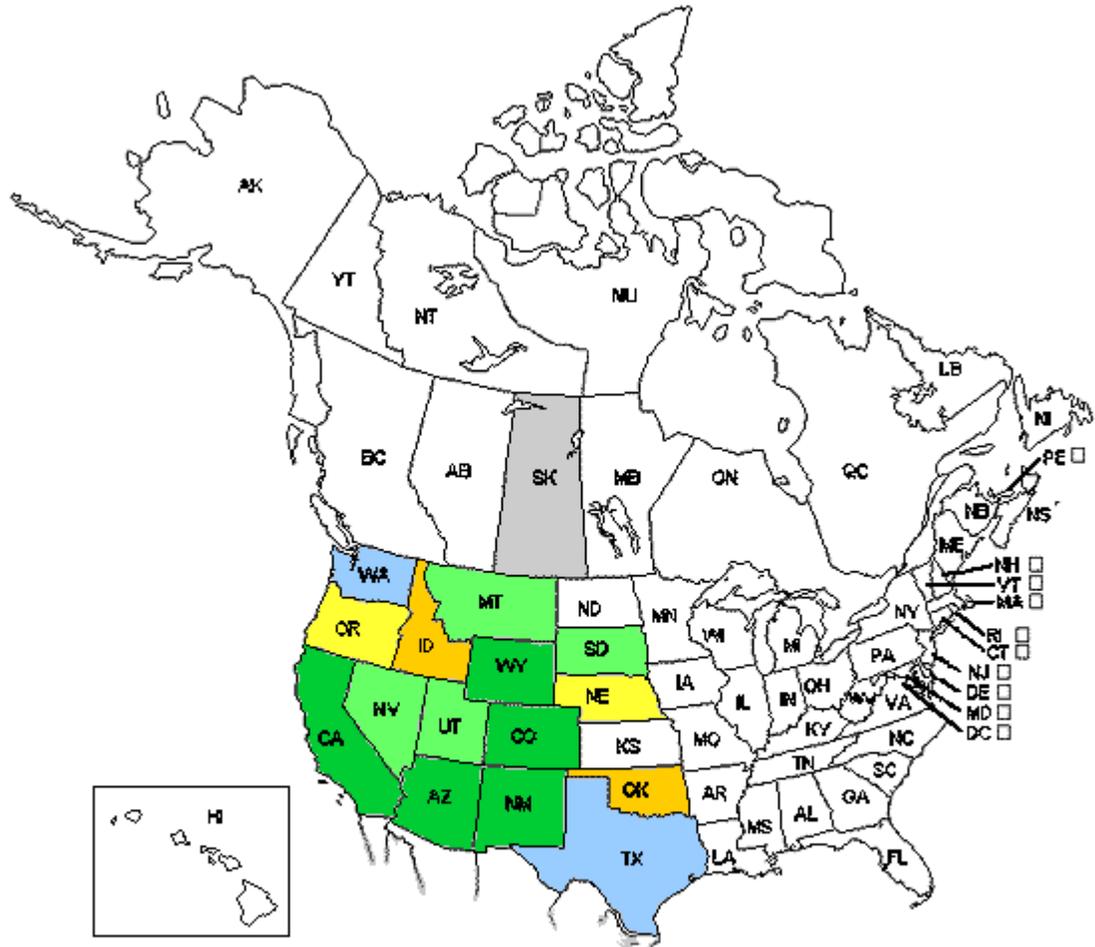


Figure PJ-2 USGS New Mexico Pinyon jay trend data.

MAP PJ-2

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



PINYON JAY *Gymnorhinus cyanocephalus*

NatureServe Explorer: An online encyclopedia of life [web application]. 2001. Version 1.6
Arlington, Virginia, USA.

Monitoring Recommendations

None or locate breeding colonies and monitor occasionally. Statewide monitoring may be more effective due to the unpredictable movement of flocks.

MOURNING DOVE (*Zenaida macroura*)

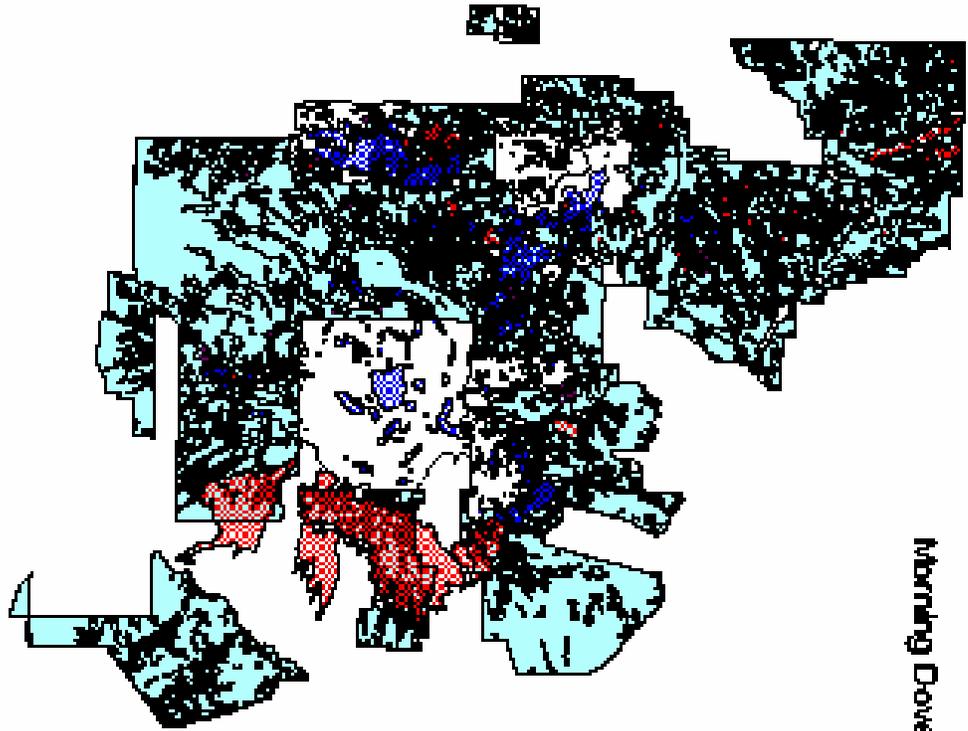
Indicator Species Habitat

The mourning dove is found across North America in many types of habitat including most forest types. It is wide spread except in the Arctic and closed forests. It is abundant and increasing near farms and suburbs; and frequents backyard feeders, suburbs and towns. They are common to abundant in most counties in New Mexico. The Santa Fe Forest plan predicted that Mourning Dove habitat would improve through improving the ecological condition of low elevation grassland and by harvesting in woodland and ponderosa pine areas.

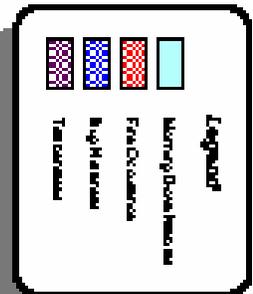
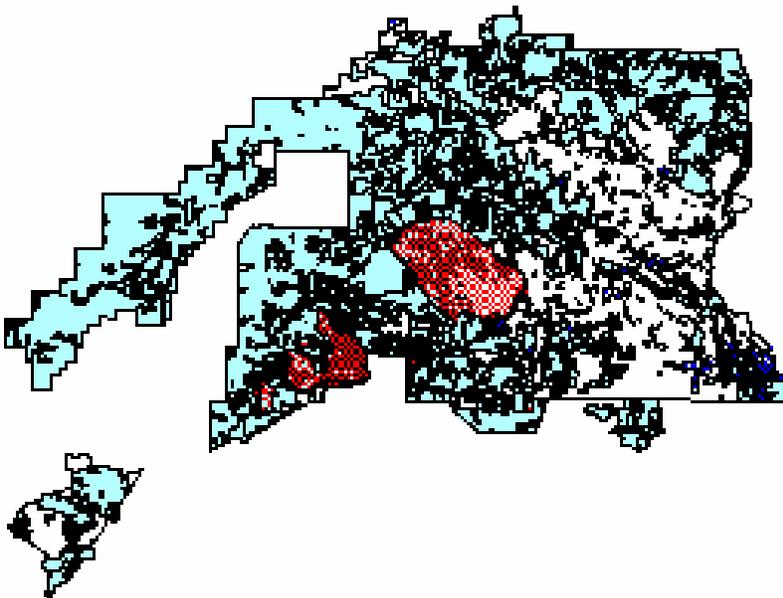
Santa Fe National Forest Habitat

Throughout the Santa Fe National Forest, mourning dove habitat is abundant. They are found in, ponderosa pine, spruce-fir, aspen, and piñon-juniper forest types. Coniferous trees and ground sites are preferred in the year before deciduous trees have developed leaves. In all situations however, abundant food and water must be available within 20-30 km. These habitats and grassland habitats found on the Forest meet the feeding requirements for the mourning dove. Water developments and under burning in ponderosa create favorable feeding areas. Most nesting occurs in lower elevation habitats. The abundance of nesting and cover opportunities on the Santa Fe contribute to maintaining viable populations of mourning dove. Table MD-1 shows estimated acres of mourning dove habitat on the forest and acres of habitat disturbed by wildfire, bug kill, disease, or timber harvest since implementation of the Forest plan. Map MD-1 shows the spatial arrangement of this habitat and disturbance across the forest. In general, habitat affected by disturbance will have the canopy opened up allowing for the growth of more understory vegetation, improving Mourning dove habitat. **The habitat trend for the mourning dove is considered stable to increasing across the Forest.**

TABLE MD-1 MOURNING DOVE HABITAT BY VEGETATION TYPE ON THE SANTA FE NATIONAL FOREST. ACRES BY VEGETATION TYPE ESTIMATED FOR TIME OF FOREST PLAN COMPLETION AND ACRES OF THOSE HABITATS AFFECTED BY ALL DISTURBANCE TYPES SINCE THAT TIME.			
MOURNING DOVE HABITAT BY VEGETATION TYPE	TOTAL ACRES	ACRES IMPACTED BY DISTURBANCES	PERCENT OF HABITAT AFFECTED
Grass	98,156	5,345	5.4%
Rocky Mountain Juniper	3,415	623	18.2%
Juniper Woodland	60	0	0.0%
Pinyon/Juniper	465,665	3,665	0.8%
Ponderosa Pine	420,003	81,601	19.4%
Sagebrush	2,695	23	0.9%
Total Acres	989,993	91,257	9.2%



Morning Dove Habitat Map



MAP MD 1

Species Status

This species occupies New Mexico as breeding resident; and can be found year round in the southern counties of the state. This species is widespread across the Santa Fe NF; and can be found in most habitat types. However, most use occurs in the lower elevation grassland and piñon-juniper forest type.

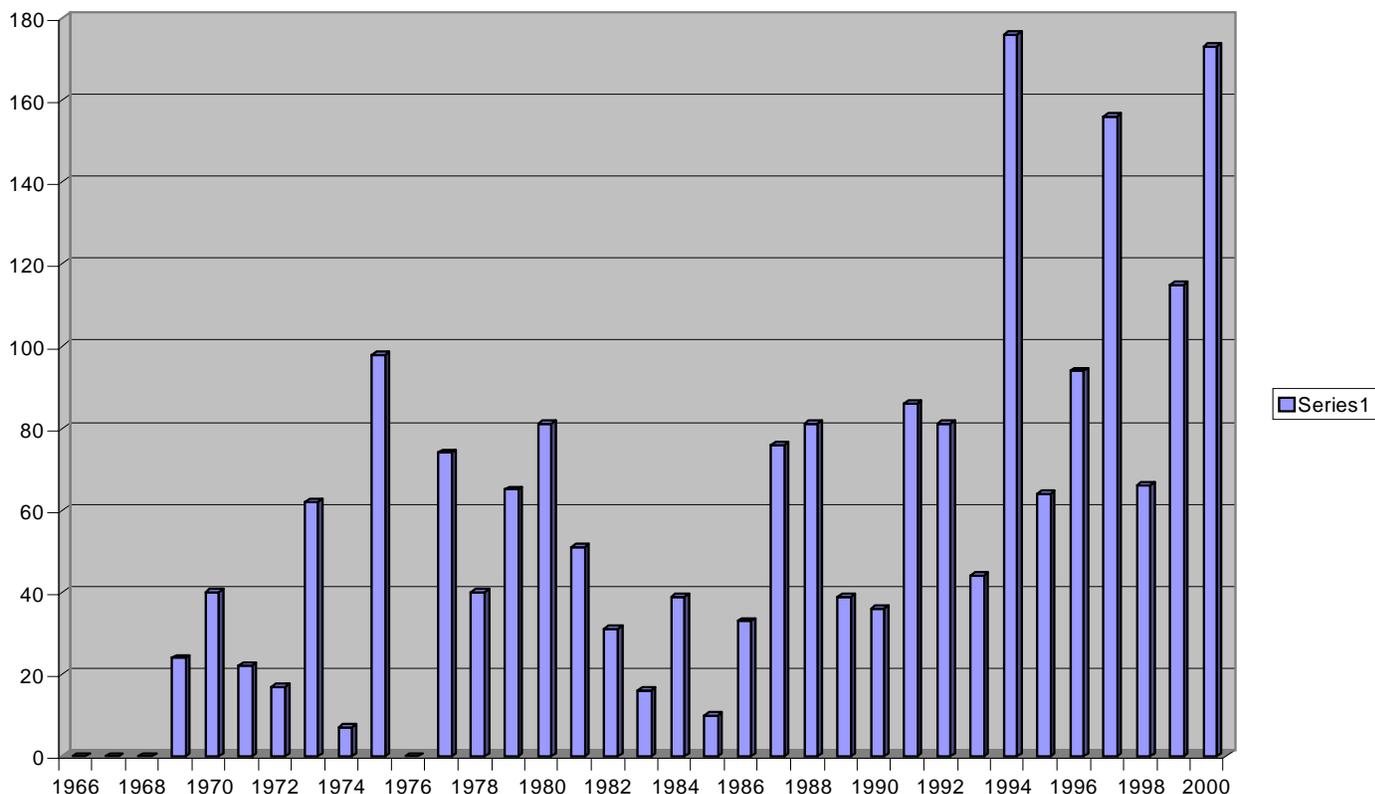
The mourning dove population is ranked as common for the Santa Fe NF. This means that the estimated number of breeding pairs, ranges between 1,000 to 10,000 individuals. The population may fluctuate from year to year based on a variety of environmental factors. This estimate is based on the amount of habitat available, hunter success statistics, breeding bird surveys and the professional opinion of local biologists.

No threats to the mourning dove are known except for human encroachment or over hunting. The New Mexico Natural Heritage Program ranked populations of mourning dove in New Mexico as "Demonstrably Secure" in October 1997. It is a multiple brooder and the most abundant dove in North America and the most widely hunted and harvested game bird. Natural mortality factors include predation of adults and free-flying young by avian and mammalian predators and destruction of eggs and nestlings.

Figure MD-1 displays the number of mourning dove counted on Breeding Bird Routes on or near the Santa Fe National Forest. While the number of mourning dove seen cannot be directly attributed to the Forest habitat, the chart indicates that dove numbers appear to have increased. Fluctuation can be attributable to many factors such as weather, food supply and observer ability.

FIGURE MD-1

Mourning Doves on BBR on or Near Santa Fe NF



POPULATION TREND

Surveys conducted by the USGS between 1968 and 1998 indicate a stable or slightly downward trend for Mourning dove within the state of New Mexico (www.mbr-pwrc.usgs.gov). Figure MD-2 approximates this trend. Although the USGS data indicate a downward trend in New Mexico for this species, the Mourning dove is listed as G5, N5, S5, S5B and S5N (i.e. globally, Nationally, and State of New Mexico secure and common, widespread and abundant. On the following map(MAP MD-2), the Mourning dove occurs across 43 states. It is secure in New Mexico and 42 other states and apparently secure in 1 another state (Natureserve, 2001). **The population trend for the mourning dove on the Santa Fe Forest is ranked as stable** based on the statewide trend and breeding bird surveys in and adjacent to the Forest.

G5	Secure-Common, widespread, and abundant (although it may be rare in parts of its range, particularly on the periphery). Not vulnerable in most of its range. Typically with considerably more than 100 occurrences and more than 10,000 individuals.
N5 S5 S5B S5N	Secure-Common, widespread, and abundant in the nation or subnation*. Essentially ineradicable under present conditions. Typically with considerably more than 100 occurrences and more than 10,000 individuals.

NatureServe Version 1.6 (03 December 2001) Data last updated: November 2001

FIGURE MD-2

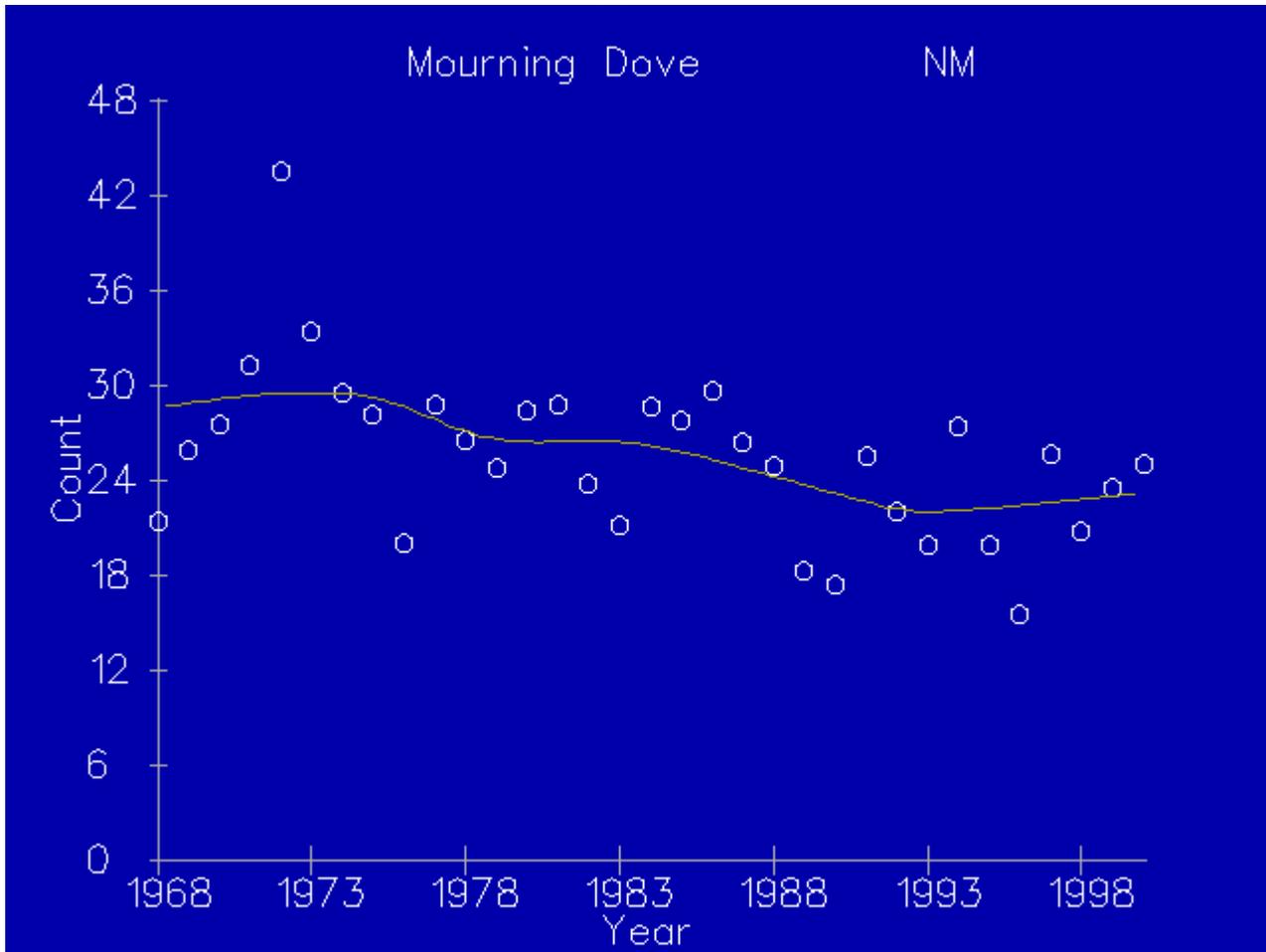
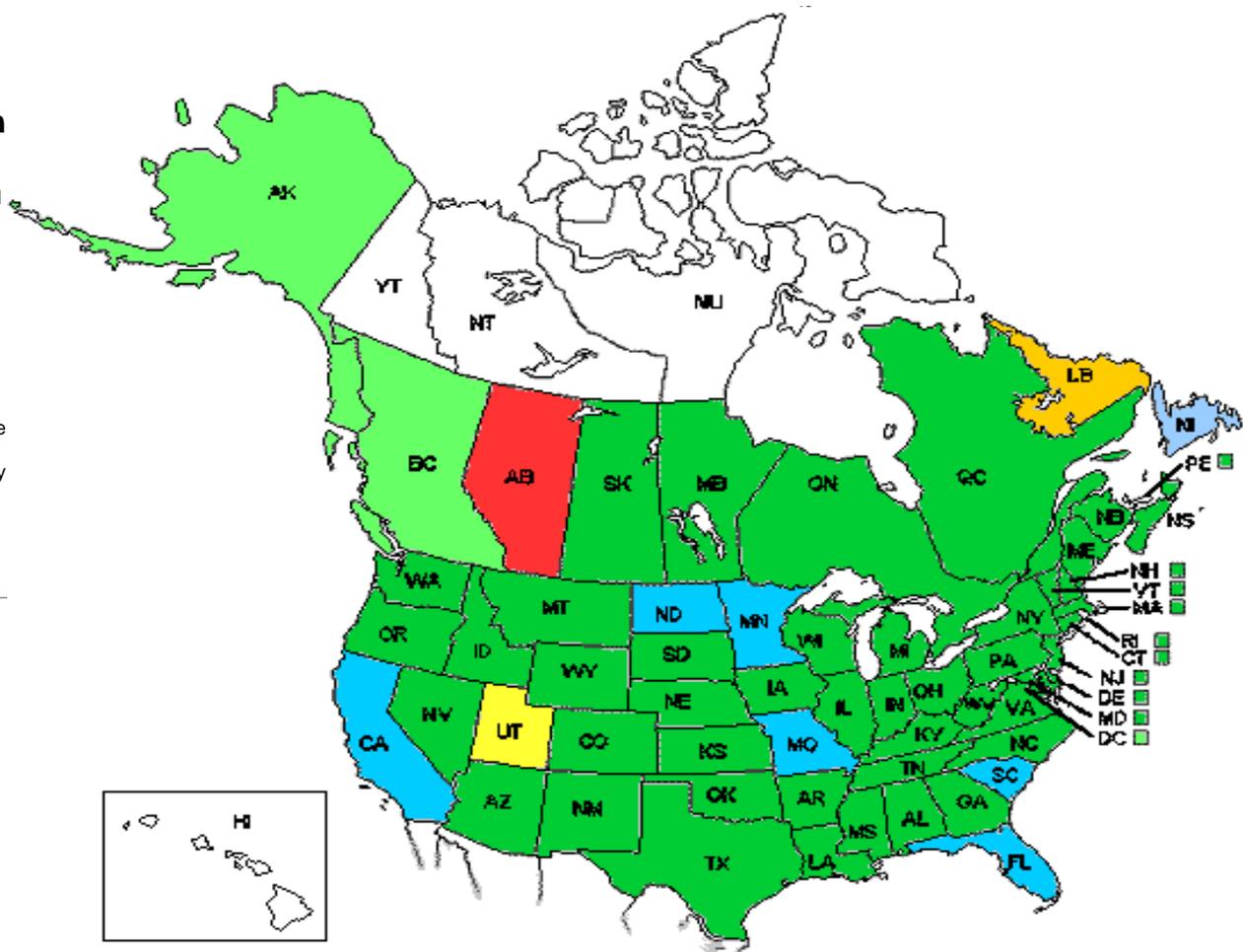
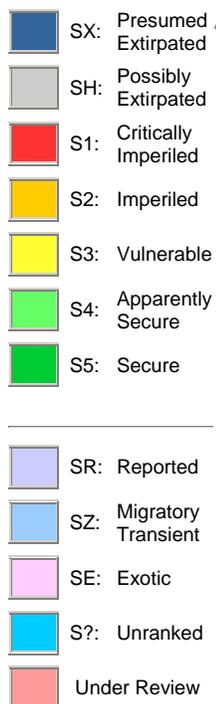


Figure MD-2 USGS New Mexico Mourning dove trend data.

Province Conservation Status Rank



Mourning Dove *Zenaida macroura*

NatureServe Explorer: An online encyclopedia of life [web application]. 2001. Version 1.6
Arlington, Virginia, USA.

Monitoring recommendations

Use Fish and Wildlife Service Central Management Units data.

Listed as Federally Threatened Species

MEXICAN SPOTTED OWL (*Strix occidentalis lucida*)

Indicator Species Habitat

The vegetation communities occupied by the Mexican spotted owl (MSO) consist primarily of warm-temperate and cold-temperate forests, and, to a lesser extent, woodlands and riparian deciduous forest. The MSO uses a variety of forest types ranging from deciduous riparian woodlands, through piñon-juniper, pine-oak, mixed conifer, and spruce-fir (USDI, FWS 1993). The mixed-conifer community appears to be most frequently used habitat type. The most common overstory trees associated with these owls in these communities are white fir, Douglas-fir and ponderosa pine. Less common species are southwestern white pine, limber pine, aspen, and corkbark fir. The understory, providing important roosting sites for MSO, usually contains the same conifer species found in the overstory, plus Gambel oak, maples and New Mexico locust. The pine-oak community (not found on the Santa Fe NF) is generally composed of ponderosa pine and tree form Gambel oak. Other species of pine and oak may also provide this habitat type on other forests. Montane riparian canyon bottoms used by owls in the mixed-conifer zone may contain box elder, narrowleaf cottonwood, maples and alders (USDI, FWS 1993).

In addition to the forested areas, MSO also inhabit a variety of canyons. These vary from those with a high degree of forest structure on at least one of the slopes above the canyon wall, to little or no tree cover present. The one common character among these is steep to vertical rock walls being present in all or part of the canyon. When available, these canyons are often used extensively. Rock-walled canyons are generally found at elevations below 7,500 feet, and are occupied as low as 3,750 feet (Ganey et al. 1989).

The MSO is most common in mature and old-growth forests throughout much of its range (Ganey 1992). The most highly sought habitat characteristics include high canopy closure, high stand density, a multi-layered canopy, uneven-aged stands, numerous snags, and downed woody matter. Dominant and co-dominant trees in the main canopy are often 18 inch DBH or larger, with 18 inch DBH or greater in the mature and old forest types -- best expressed in old-growth mixed-conifer forests (usually more than 200 years old). These characteristics may also develop in younger stands that are unmanaged or minimally managed, especially when the stands contain remnant large trees or patches of large trees from earlier stands (USDI, FWS 1993).

Nesting occurs most frequently in mixed-conifer, followed by the pine-oak community type. "Witches-broom" and tree stick platforms are frequently used nesting substrates, as well as, tree cavities (mostly in Gambel oak) and on cliff ledges.

In a study carried out on three sites in northern Arizona, MSO generally foraged more than or as frequently as expected in virgin mixed-conifer and ponderosa pine forests, and less than expected in forests managed by people. Some of these owls showed a preference for foraging in either virgin mixed-conifer or ponderosa pine forests (or both), however all studied owls roosted primarily in virgin mixed-conifer forests. Because roosting owls showed the strongest affinity for these virgin mixed-conifer forests, their association with this habitat type may, therefore, be driven primarily by availability of suitable roosting (and nesting) habitat. This habitat type may be more limiting than suitable foraging habitat in northern Arizona. Owls roosted primarily in decadent stands with closed-canopy, high densities of trees and

snags, and numerous big logs. Meanwhile, foraging was not limited to such sites. This also suggests a greater selectivity for roosting habitat (Ganey et al. 1994).

The MSO dietary needs are also closely associated with medium and small mammals, particularly wood rats (*Neotoma* spp.) and mice (*Peromyscus* spp.). Not being selective feeders, the MSO also forages on other small mammal species, birds, reptiles, etc.

Availability and opportunity could very well be more important than species. Woodrats, as described in the literature, are nocturnal and closely associated with rock outcrops and cliffs.

The Santa Fe Forest Plan predicted that Mexican spotted owl habitat would improve over time as unharvested acres mature. Harvested acres would decrease habitat capability.

Santa Fe National Forest Habitat

Fletcher (1990) reported 3,365,000 acres of currently suitable habitat exist in New Mexico and Arizona National Forests (USDI, FWS 1993). Approximately 20 percent of owl habitat has been rendered no longer suitable, with one-half of this habitat loss occurring within the last decade, representing a habitat loss rate close to one percent a year (USDI, FWS 1993). Suitable habitat is defined as meeting the year-round requirements of the MSO, providing sites for nesting, day roosting and foraging. Suitable forested habitat often exhibits the following characteristics:

- Multiple canopy layers of conifer and hardwood trees, and shrubs.
- Canopy closures greater than 70 percent in mixed conifer and 50 percent or greater in pine/oak, pine and hardwood types.

Tree stands are generally mid-aged, mature and old forest development types.

In 1995, the US Fish and Wildlife Service released its final *Recovery Plan for the Mexican Spotted Owl* (USDI, FWS 1995). It includes three general strategies for forest management. General recommendations are proposed for three levels of habitat management, depending on the owl's needs and habitat use. These are protected areas, restricted areas and other forest and woodland types. Protected areas are established for known MSO sites. Restricted areas are unoccupied habitats managed for MSO nesting and roosting conditions. On the Santa Fe National Forest, these are the mixed conifer and forested riparian habitats. There are no specific guidelines for managing for "other forest and woodland" types.

The second strategy is a detailed program to monitor owl populations and habitats, in order to obtain data needed before the owl can be removed from federal listing. The third strategy includes recommendations for research to enhance understanding of MSO biology and to assess impacts of land management practices on owl. The plan allows timber harvests and controlled burns in most forested areas.

Suitable mixed conifer habitat for the MSO is available on the Santa Fe National Forest. During the past 11 years, over 285,000 acres of the Santa Fe National Forest have been surveyed for the presence of MSO. All surveys followed the Southwest Region's (Region 3) protocol methodologies by certified contractors and/or Forest Service wildlife biologists. On the Santa Fe National Forest, most of the MSO have been located on the Jemez, and Pecos Ranger Districts. Most owls have been located in the canyon habitat on the Jemez District.

With the exception of the Jemez Ranger District, MSO use in the mixed conifer type is limited to very specific areas. It may be that the local climatic conditions on other parts of the Santa

They are too high in elevation and/or too cold during the mating and nesting season. The duration and depth of snow pack could make over-wintering difficult. During the breeding season, the availability of prey in these suitable habitats is usually not very abundant. Possibly, this is because of the cold micro-climatic conditions and remaining snow still present, discouraging prey activity in these habitats. Without a food source, the MSO cannot successfully breed and raise young. Historical records suggest no real high abundance of Mexican spotted owls occurring in north-central New Mexico. Therefore, this area may be at the edge of its historic range. This scenario has been discussed between biologists on the Forest and with biologists with the US Fish and Wildlife Service. Logic dictates that conditions are just not favorable enough to provide large amounts of suitable yearlong habitat. Table MSO-1 shows estimated acres of MSO habitat on the forest and acres of habitat disturbed by wildfire, bug kill, disease, or timber harvest since implementation of the Forest plan. Map MSO-1 shows the spatial arrangement of this habitat and disturbance across the forest. In general, disturbances that significantly affect the overstory vegetation will have a negative effect on the suitability of MSO habitat.

The habitat trend on the Forest is declining since implementation of the Forest Plan.

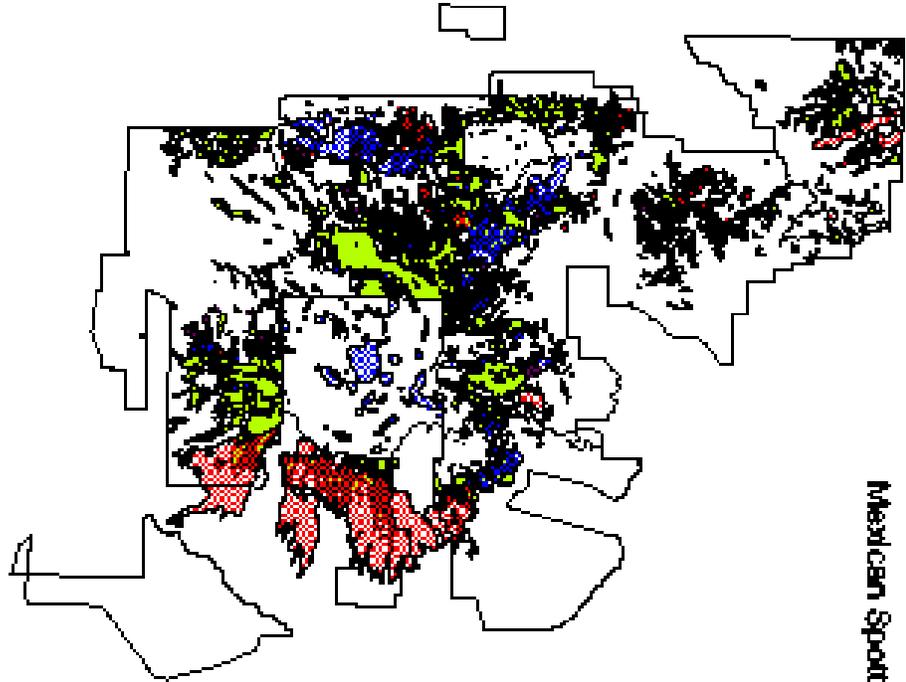
The large amount of disturbance related to catastrophic type fire is the primary reason for this decline.

TABLE MSO-1

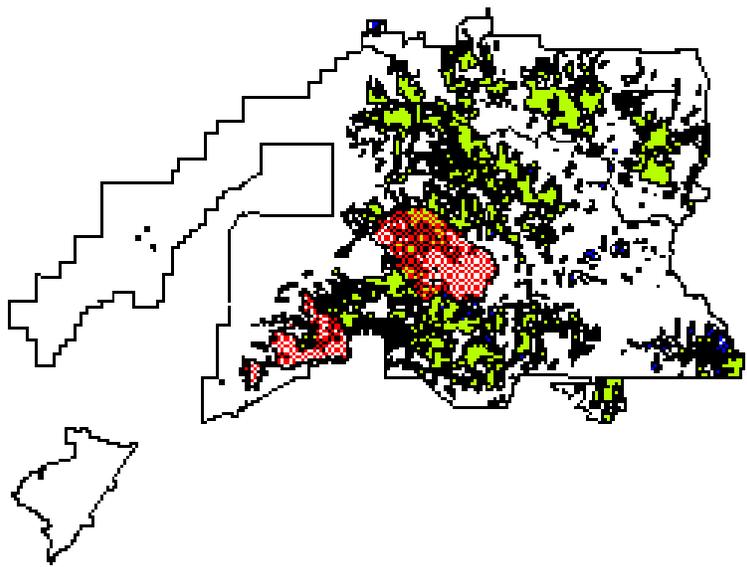
MEXICAN SPOTTED OWL HABITAT BY VEGETATION TYPE ON THE SANTA FE NATIONAL FOREST. ACRES BY VEGETATION TYPE ESTIMATED FOR TIME OF FOREST PLAN COMPLETION AND ACRES OF THOSE HABITATS AFFECTED BY ALL DISTURBANCE TYPES SINCE THAT TIME.

MEXICAN SPOTTED OWL HABITAT BY VEGETATION TYPE	TOTAL ACRES	ACRES IMPACTED BY DISTURBANCES	PERCENT OF HABITAT AFFECTED
Douglas Fir	202,687	39,133	19.3%
White Fir	100,376	19,376	19.3%
Total Acres	303,063	58,509	19.3%

MAP MSO 1



Mexican Spotted Owl Habitat Map



Legend

	Lowland Spotted Owl Habitat
	Fire Scarred Area
	High Altitude
	Unsuitable Area

Species status

The Mexican spotted owl is found from parts of central Colorado and Utah, south through Arizona, New Mexico, and west Texas, then south through northwestern Mexico to the State of Michoacan. It has the largest geographic range of the three spotted owl species. Its range extends from the southern Rocky Mountains in Colorado and the Colorado Plateau in southern Utah, southward through Arizona and New Mexico and, discontinuously, through the Sierra Madre Occidental and Oriental to the mountains at the south end of the Mexican Plateau (USDI, FWS 1993).

MSO are residents in the mountains of New Mexico, being most regular in the south. They can be found in the San Juan, Jemez, Sangre de Cristo, Mount Taylor, Sandia, Manzano, San Francisco, Tularosa, Mogollon, San Mateo, Pinos Altos, Black, White, Sacramento, Guadalupe and Animas mountains (Hubbard 1978). In the Rocky Mountain region, the MSO is considered uncommon to rare, local in distribution and relatively habitat-specific (Finch 1992). The MSO is threatened by destruction and modification of habitat caused by timber harvest and fires. Fuel accumulation and forests overstocked with trees place spotted owl habitat at risk to stand-replacing and catastrophic fires. Lack of small-scale, low intensity ground fires has increased this risk.

There are several historical records of MSO in northern New Mexico that were on or near the Santa Fe National Forest. In 1985, Johnson and Johnson evaluated a total of 49 separate locations across the northern half of the state, including the historical records in a NM Game and Fish contract. The earliest dated from 1886, when Henshaw reported taking a specimen in the Sangre de Cristo Mountains in 1883. Other records include those referenced by Ligon (1926) reporting locations of owls on the eastside of the Sangre de Cristo Mountain range and one MSO claimed to be found eight miles northeast of Taos, New Mexico. All of these records, however, were identified as questionable in Johnson's report.

In 1993, an estimated 2,160 MSO were known to exist. In 1994, studies of two populations, one in Arizona and one in New Mexico, demonstrated population decline rates of one and four percent, respectively. However, estimates are not significantly different from 1.0, or "stable" population (Gutierrez, et al. 1995).

Santa Fe National Forest

The MSO has limited distribution across the Santa Fe National Forest. There are historical records from all Ranger Districts; but the currently known to occupy only the Jemez and Pecos/Las Vegas Ranger Districts. Within these Districts, it is found in very specific habitat types.

The MSO population is ranked as rare for the Santa Fe NF. This means that the estimated number of breeding pairs, ranges between 10 and 100 pair. The population may fluctuate from year to year based on a variety of environmental factors. This estimate is based on the amount of habitat available, Mexican spotted owl surveys, and the professional opinion of local biologists. To date, 46 PAC's have been identified in response to Mexican spotted owls located on the Forest. Given the amount of mixed conifer habitat this is not a large amount of owls. The total population of MSO on the Forest probably would not exceed 100 breeding pairs even if all the owls on the Forest were located. MSO are widely distributed on the

Lincoln National Forest in southern New Mexico, but the species does not seem to favor the mixed conifer habitat found on the Santa Fe. Johnson (1999) reported on the status of the Spotted Owl in the Jemez Mountains. In this study, 22 of 28 MSO territories in the Jemez Mountains were visited in 1998 and 19 were visited in 1999. Counting pairs and single owls 64% of territories were occupied in 1998 and 79% were occupied in 1999. Figure MSO-1 summarizes PAC's on the Santa Fe National Forest; and occupancy information collected by Forest Service Biologists since 1988. Figure MSO-2 displays the percent occupancy of PAC's observed during these surveys.

Figure MSO-1

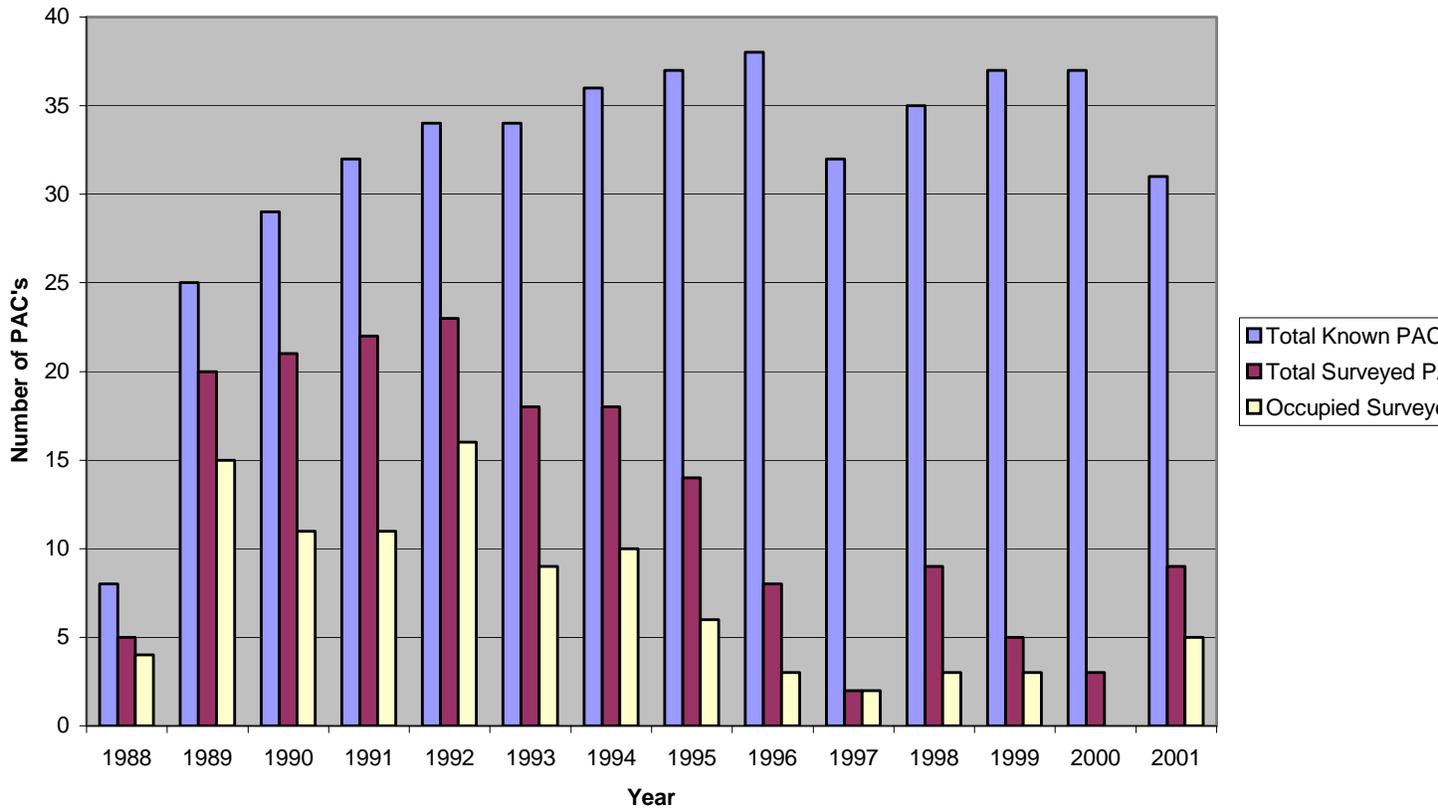
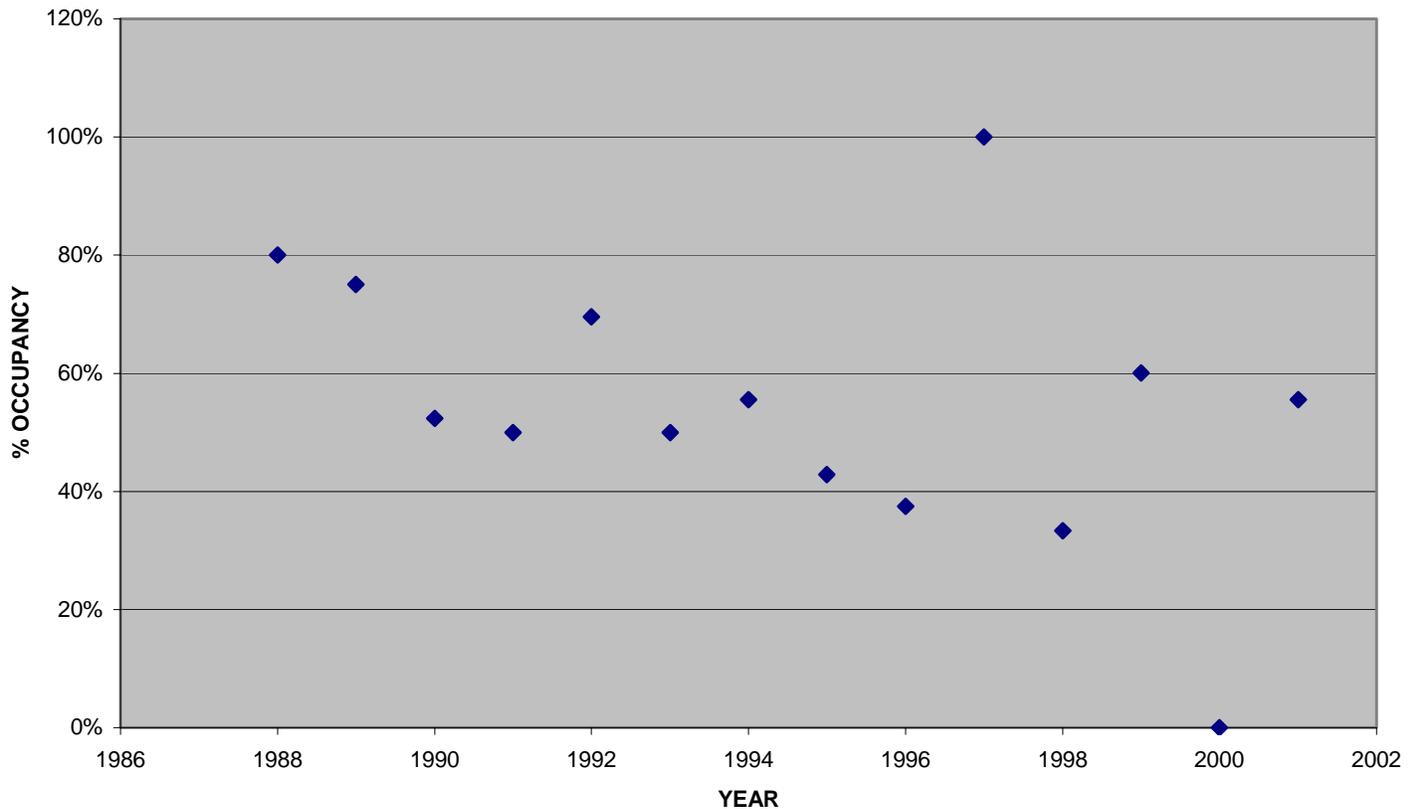


FIGURE MSO-2



POPULATION TREND

The population trend for the MSO is rated as stable to increasing on the Santa Fe National Forest. Recent surveys indicated the percentage of occupied PAC’s has been increasing. The Johnson (1999) study indicates that productivity and occupancy of MSO in the Jemez Mountains declined in the 1984-1990 period; and has increased in recent years. This estimate is based on surveys of existing PAC’s and other suitable habitat. On the negative side, recent wildfires (Dome 1996, Viveash and Cerro Grande 2000) have burned 12 of the 46 PAC’s on the Forest. Many of these burned PAC’s no longer provide suitable MSO habitat.

Global range-wide abundance is 1,000-3,000 individuals. Total population size is not reliably known, but the minimum number in the early 1990’s was 800-1,500 individuals (USFWS, 1995). The Arizona –New Mexico population has been estimated at around 2,000 individuals (USFWS, 1995). “No undisputable evidence is available indicating that the population is declining or is significantly less than historical levels” (USFWS, 1995). Surveys conducted throughout the range of the species are too isolated to present a trend for Mexican spotted owl in the State of New Mexico. The Mexican spotted owl is listed as GT3, N3, S2B, and S2N (i.e. globally, nationally-vulnerable, and State of New Mexico –imperiled). See below for complete definitions based on the Nature Conservancy’s, 2001 database.

Global (G), National (N) and Subnational (S) Heritage Status Rank Definitions

GT3	Vulnerable; Vulnerable in the nation or subnation* either because rare and uncommon, or found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extirpation. Typically 21 to 100 occurrences or between 3,000 and 10,000 individuals. T -denotes Intraspecific taxon or more than one form of the species included within the rank.
N3	Vulnerable; Vulnerable in the nation or subnation* either because rare and uncommon, or found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extirpation. Typically 21 to 100 occurrences or between 3,000 and 10,000.
S2B S2N	Imperiled; Imperiled in the nation or subnation* because of rarity or because of some factor(s) making it very vulnerable to extirpation from the nation or subnation*. Typically 6 to 20 occurrences or few remaining individuals (1,000 to 3,000).

Breeding Status Qualifiers

Rank	Definitions
B	Basic rank refers to the breeding population of the element in the nation or subnation*.
N	Non-breeding. Basic rank refers to the non-breeding population of the element in the nation or subnation*.

NatureServe Version 1.6 (03 December 2001) Data last updated: November 2001.

Monitoring recommendations

Continue inventories on an as needed basis. Follow recommendations in the *Recovery Plan for the Mexican Spotted Owl*.

Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*)

INDICATOR SPECIES HABITAT

Rio Grande cutthroat trout (RGCT) is one of 14 subspecies of cutthroat trout native to the western United States (Behnke 1987). RGCT are found primarily in clear, cold mountain lakes and streams in Colorado and New Mexico within the Rio Grande Basin (Sublette et al. 1990). One disjunct population is found in the Canadian Drainage (part of the Arkansas Basin); another in the landlocked Tularosa Basin in southern New Mexico. RGCT feed opportunistically on aquatic and terrestrial invertebrates, mainly that are found in stream drift.

Rio Grande cutthroat trout spawn on the descending limb of the snowmelt hydrograph, which is typically from the middle of May to the middle of June in New Mexico (New Mexico Game & Fish 2001). An average water temperature of about 10°C (50°F) appears to be a key factor initiating spawning of RGCT (Stumpff 1998). Male cutthroat trout typically mature sexually at two years of age; whereas, females usually mature at three years (Irving 1954, Drummond and McKinney 1965). Depending on size, an individual female may deposit 2000-4500 eggs into a gravel nest, or redd. Sediment-free depositional gravel beds that have a continuous flow of well-oxygenated water are required for successful development of the embryos. Suitable gravels range from 6-40 mm in diameter (Magee et al. 1996, Harig and Fausch 1999). Hatching of RGCT is temperature dependent, occurring in 21 days at about 11°C (52°F). Juveniles need shallow calm water that is protected by the elements. Side channels, undercut banks and overhanging vegetation or exposed roots along margins provide this type of habitat. Adult RGCT need pools with residual depth greater than 1' in order to survive harsh winter conditions (Harig and Fausch 2000).

EXISTING HABITAT CONDITION

Historically the Rio Grande Cutthroat trout was the only trout occupying the streams on the Santa Fe National Forest. It occupied most stream reaches capable of supporting trout. In New Mexico, the RGCT exist only in mountain streams in the Sangre de Cristo and Jemez Mountain ranges from the headwaters of the Rio Grande to tributaries in northern New Mexico, which include the Pecos, Chama, and Jemez rivers. Isolated populations persist in southern New Mexico on the Gila National Forest in the Black Range (Sublette et al. 1990) and on the Mescalero Apache Indian Reservation in the Tularosa Basin. The Santa Fe National Forest (SFNF) hosts a stronghold of RGCT in the Jemez and Sangre de Cristo mountains. The decline in RGCT numbers in New Mexico is attributed to many factors which include but are not limited to: 1) Introduction of non-native trout species who either prey upon or hybridize with RGCT; 2) Dewatering of streams for irrigation; and 3) Altered stream habitat.

Non-native trout introductions are the major culprit for decline of RGCT. German brown trout (*Salmo trutta*) were introduced in the early 1900's. They currently occupy most perennial streams on SFNF, but are no longer stocked. They are piscivorous and prey upon RGCT. This aggressive behavior limits productivity of RGCT and eventually leads to extirpation of the native fish in a given stream segment. Rainbow trout (*Oncorhynchus mykiss*) have been stocked in New Mexico since 1896 and are distributed throughout the state (Sublette et al. 1990) in cold-water streams and lakes. New Mexico Game and Fish (NMG&F) continually supplement populations with stocking. Rainbow trout hybridize with cutthroat trout and compete for food. Genetic introgression debilitates the gene pool, again limiting the productivity of RGCT. Rio Grande cutthroat trout cannot genetically survive when mixed with rainbow trout.

While the introduction of non-native fish and dewatering of streams have had direct effects on the range of RGCT, alteration of stream habitat rarely excludes populations of RGCT from persisting but can limit the size of a population. In stream sections where there are no non-native fish, further discussed as secure populations, RGCT population size is directly affected by availability and quality of habitat. In stream sections where non-native fish persist with RGCT, further discussed as non-secure populations, this limiting factor is exponential by competition, predation and hybridization from non-native fish. Combined, these stresses quickly reduce a RGCT population segment with a high likelihood of extirpation. In high quality habitat locations with introduced trout, RGCT populations have a lower probability of extirpation or can hold on for a longer period of time.

Altered stream habitat is attributed but not limited to: 1) Fire suppression altering riparian habitats, delivery of large wood and nutrient cycling; 2) Timber harvest and fuelwood consumption, removing current and potential stream habitat as well as delivering non-point source pollutants; 3) Grazing practices which alter floodplain dynamics and riparian habitats, destabilize streambanks, widen streams, introduce sediments, and increase nutrient loading; 4) Road construction which encroaches on stream structure and floodplain dynamics, straightens channels, introduces non-point source pollutants, and hardens stream banks; and 5) Dispersed and developed recreational practices which alter riparian habitats, harden floodplains, widen streams, increase non-point source pollutants and remove stream structure.

In 1999, whirling disease, a debilitating and fatal parasite introduced by unsanitary hatchery practices, was discovered in waters in New Mexico. This includes waters on the SFNF (Pecos River, Rio Cebolla, Cañones Creek, Jacks Creek). It is unclear at this time what effects this may have on the overall population of RGCT over the long-term.

Quality of habitat conditions is generally less than moderate across the SFNF. In high elevation locations where access is limited by topography and wilderness regulations, stream habitat is moderate to excellent. Poor habitat conditions and water quality in the lower elevations are limiting factors to the size of RGCT populations. Decreased water quality can be attributed but not limited to soil compaction, road run-off, unstable banks, and delivery of pollutants from non-point sources. Poor habitat conditions can be attributed but not limited to a lack of in-stream large woody debris, sediment-filled pools, loss of undercut banks, depletion of beaver populations, lack of side channel development and poor riparian health.

SPECIES STATUS

The United States Forest Service Regional Forester has designated Rio Grande cutthroat trout as a sensitive species in New Mexico. Petitions for listing the species as threatened or endangered with the U.S Fish and Wildlife Service have been denied as not warranted.

In order to develop a historic picture of current and potential Rio Grande cutthroat trout distribution, the forest has divided its landbase into four significant Geographical Management Units (GMU's) as defined by the SFNF: 1) Jemez Mountains (Rio Grande); 2) Sangre de Cristo Mountains (Rio Grande); 3) Pecos River; and 4) Canadian River. Within each GMU, stream corridors are defined into three distinct Rio Grande Cutthroat Trout Management Areas (MA's): 1) Known Occupied; 2) Suspected Occupied (or unconfirmed); and 3) Proposed Occupied (Appendix for tables that specifically outlines stream corridors with these MA's).

Known Occupied are segments of stream, which are currently known to be inhabited and have populations that are considered genetically intact. The mileage from these populations represents what SFNF publishes as stream miles occupied by RGCT. Suspected Occupied populations are unconfirmed and need further analysis to determine if cutthroat trout looking species are present and if so conducting genetic analysis to determine if the population is genetically intact RGCT. Proposed Occupied is where SFNF will assess these corridors to determine whether or not RGCT could be re-introduced to these segments in the long term, forming extensive, more connected metapopulations.

SFNF manages 1,072 miles of perennial stream length. Approximately 965 miles were thought to be historically occupied prior to stocking of non-native trout (the first stocking record noted in New Mexico was in 1896 (Sublette et al. 1990)). As of data collected (NMG&F, USFS) up until October 2001, 31 streams have been identified to be occupied with RGCT, occupying 149.7 miles of stream (see Table RGCT 1). Of these occupied stream miles, 84.9 miles are currently considered secure. In addition, 118.3 miles are suspected to be occupied and 338.5 miles are proposed to be occupied. In total, SFNF manages over 606 miles of stream for Rio Grande cutthroat trout. While this is only 63% of historic habitat, it is a realistic figure considering that remaining historic habitat has been altered by dewatered channels, burdened by permanent road features, tied up in private inholdings, and/or occupied by non-native trout and managed for sport fishing purposes.

Table RGCT 1. Historic, Known, Suspected and Proposed Stream Miles of RGCT on SFNF

Genetic Management Unit	Total Known Occupied	Total Suspected Occupied	Total Proposed Occupied	Total Managed	Historic Occupied w/in SFNF Boundary (approximate)
Jemez Mountains	83.6 miles	31.8 miles	166.6 miles	241.0 miles	402 miles
Sangre de Cristo	12.6	35.6	34.7	82.9	141
Pecos	53.5	26.3	137.2	217.0	339
Canadian	0.0	24.6	0.0	24.6	83.0
Total	149.7	118.3	338.5	606.5	965

While today, total known occupied stream miles are nearly 150 miles, only approximately 100 miles were known to be occupied in the early 1990's (Lee Johnson, personal communication). This number has jumped for two reasons: 1) Further data collection has located previously unknown occupied sites that were once listed as suspected (or unconfirmed); 2) Completion of efforts to re-introduce, secure and/or expand the range of RGCT in streams where they were completely or nearly extirpated (i.e. Rio Cebolla, Rio de las Vacas, Jacks Creek, Doctor Creek, Valdez Creek, Rito del Padre and Pecos River).

NMG&F staff has collected population estimates over the last decade through electrofishing surveys. Much of the work has been done to determine baseline population for a given stream. Most of the data has been collected in the Jemez Mountain and Pecos River GMU's. On average, Jemez Mountain has 1,287 RGCT per stream mile in secure populations (see Table RGCT 2). In comparison, Pecos has nearly 573 RGCT per stream mile. This difference is likely attributable to varying geomorphology and stream productivity.

Table RGCT 2. Estimated Populations of Rio Grande Cutthroat for a Significant Geographic Management Unit

RGCT/Stream Mile	Jemez Mountains	Pecos
Avg (n)	1287 (9)	573 (5)
Minimum	784	160
Maximum	2384	1424
TOTAL POPULATION*	145,850	24,560

n=number of streams with a 3-pass depletion electrofishing population survey conducted

*-based on tabulations for estimates for n streams plus overall average for streams that have not had population surveys; average is based on secure populations; this is a high-end estimate given that a portion of the miles are insecure.

Overall the both the population and habitat for Rio Grande cutthroat trout on the Forest has been stable since implementation of the Forest Plan. New populations have been established on some streams. However, observations by field biologists (USFS, NMG&F) note that RGCT populations have declined in areas where they are unprotected from brown and rainbow trout. Secure populations seem to be stable in low elevation, front country and high elevation, wilderness areas.

MONITORING RECOMMENDATIONS

In May 2001, SFNF adopted the most updated Hankin Reeves stream habitat inventory methodology, modifying the survey so that it meshed with geologic conditions related to RGCT. The survey is utilized to assess fish habitat condition and floodplain function as well as establishing baseline for future monitoring. Each data set is analyzed and an extensive report is authored. Data interpretation includes utilizing factors and indicators for specific habitat and water quality elements that are properly functioning, at risk or not properly functioning within the range of natural variability as it relates to Rio Grande cutthroat trout historic and currently occupied streams (see Table 1). The Matrix of Factors and Indicators was developed through a peer and literature review process while incorporating similar formats developed by U.S. Fish & Wildlife Service and National Marine Fisheries Service for Section 7 project review. In addition water temperature standards related to coldwater fisheries as established by the State of New Mexico Environment Department were incorporated as part of the matrix. For specific stream conditions related to the Matrix of Factors and Indicators, see Appendix A (for localized conditions, see Stream Inventory Reports for each stream).

USFS has and will continue to establish monumented transects that will be monitored periodically to determine population trend in reference and concern watersheds.

NMG&F and USFS are working together on a range-wide as well as state-wide conservation agreement which documents the type of monitoring effort each agency will put forth to support NMG&F's Rio Grande Cutthroat Trout Management Plan (pending). In addition, this partnership will work towards expanding the range of the fisheries by prioritizing watersheds, which can support metapopulations of each GMU. Both agencies only recently have been building their fisheries program to support this type of effort.

APPENDIX A

Table 1. Canadian Geographic Management Unit. Populations of Rio Grande Cutthroat Trout.

CANADIAN GMU	STREAM	MILEAGE	SECURE	COMMENTS
KNOWN	None	0.0		Could be upgraded, depending on findings in la Casa and others
SUSPECTED	Rio la Casa	17.2		Including all forks and tribs
	Rito San Jose	1.8		FS Boundary to upper limits; needs to be confirmed
	Left Hand Sapello River/Johns Canyon	5.6		Mouth to upper limits; needs to be confirmed
	Total	24.6		
PROPOSED	None	0.0		Could be upgraded, depending on findings in la Casa and others

Table 2. Sangre de Cristo Geographic Management Unit. Populations of Rio Grande Cutthroat Trout.

SANGRE DE CRISTO GMU	STREAM	MILEAGE	SECURE	COMMENTS
KNOWN	Rio Frijoles	7.1		Brown trout, rainbow trout. Includes tribs
	Rio Medio	5.5		Brown trout throughout. Includes tribs
	TOTAL	12.6		
SUSPECTED	Apache Canyon	9.2		FS Boundary to upper limits
	Santa Fe River	8.5		Wilderness boundary to upper limits; uncertain as to genetic integrity (but unlikely)
	N.Fk. Rio Quemado	4.3		Mouth to upper limits
	S.Fk. Rio Quemado	5.8		Mouth to upper limits
	RITO CON AQUA	2.8		Mouth to upper limits; will be surveyed in 2002
	RITO QUEMADO	2.7		Mouth to upper limits; will be surveyed in 2002
	RIO MOLINO	2.6		Mouth to upper limits; will be surveyed in 2002
	TOTAL	35.9		
PROPOSED	Capulin Creek	6.5		From mouth to Capulin Meadows
	Rio Nambe	8.6		Nambe Falls to Nambe Lake
	Rio Frijoles	6.8		From Wilderness boundary to just below Rito Frijoles
	Rio Medio	8.7		From FS Boundary to Rito Canejo
	Santa Fe River	4.1		From Nichols Reservoir to wilderness boundary (also including Santa Fe Lake)
	TOTAL	34.7		

Table 3. Jemez Mountains Geographic Management Unit. Populations of Rio Grande Cutthroat Trout.

JEMEZ MTNS GMU	STREAM	MILEAGE	SECURE	COMMENTS
KNOWN	Rio de Las Vacas	11.1		Above barrier, including tributaries, brown trout found above barrier (2001) to Rito Anastacio
	Rito de las Palomas	4.5		Needs further investigation to determine upper limits
	Rio Cebolla	5.1	X	McKinney Pond to upper limit; whirling disease
	Peralta	5.6	X	Barrier in lower canyon to upper limit
	Clear Creek	2.9		Rainbow trout; above San Gregorio Reservoir
	Resumidero Creek	2.6	X	Above point of diversion
	Rio Puerco de Grande	8.7	X	Includes unnamed trib (Cowhump)
	Canones Creek	11.1	X	FS Boundary to upper limits; barrier; whirling disease; will be surveyed in 2002
	Chihuahueros Creek	9.5	X	Entire length; will be surveyed in 2002
	Polvadera Creek	17.8		Cañada del Ojito to upper limits; will be surveyed in 2002
	American Creek	2.3		Brown trout, rainbow trout
	Rito Cafe	2.4		Brown trout found above barrier (2001)
	TOTAL	83.6		
SUSPECTED	Cecilia Creek	0		Likely extirpated; no RGCT found in 2001 survey; explore potential
	Rio Gallinas	0		Need to investigate genetic integrity
	Rio Capulin	3.3		Need to investigate
	Cochiti Creek	5.2		Brook trout; explore potential
	Rio del Oso de Chama	9.4		Lower section subterranean
	Vallecitos Creek de Chama	5.2		Lower section subterranean
	Rito de Abiquiu	0		Unlikely; mouth to waterfall barrier
	Cañoncito Seco	0	X	Undefined; lower section subterranean
	Dove Creek	1.1		Mouth to upper limits
	Rito de los Pinos	3.9		San Pedro Parks; FS Boundary to upper limits
	La Jara Creek	3.7		San Pedro Parks; FS boundary to upper limits
	Medio Dia	0		Unlikely; explore potential
	Cave Creek	0		Unlikely
	TOTAL	31.8		
PROPOSED	Rio de Las Vacas	17.8		Confluence w/Rio Cebolla to barrier
	Rito Peñas Negras	9.5		Mouth to upper limits
	Clear Creek	5.2		Mouth to San Gregorio Reservoir
	Rio Cebolla	12.3		Confluence w/Las Vacas to McKinney
	Rio Guadalupe	8.2		Down to Gilman Tunnels
	East Fork Jemez River	21.4		Confluence to springs
	Jaramillo Creek	11.1		Valles Caldera National Preserve; mouth up to 9000 feet
	La Jara Creek	2.8		Valles Caldera National Preserve; mouth to above Headquarters
	Jemez River	4.0		Down to Soda Dam
San Antonio Creek	28.2		Confluence up to 9000 ft.	

Table 3 Cont. Jemez Mountains Geographic Management Unit. Populations of Rio Grande Cutthroat Trout.

JEMEZ MTNS GMU	STREAM	MILEAGE	SECURE	COMMENTS
	Redondo Creek	6.7		Valles Caldera National Preserve; mouth up to 9000 feet
	Rito de los Indios	3.1		Valles Caldera National Preserve; mouth up to 9000 feet
	Rio Puerco de Chama	5.2		Jarosa Canyon to San Pedro Parks
	Resumidero Creek	1.8		Confluence to Resumidero Falls
	Rito Redondo	1.6		Confluence to springs
	Los Alamos Canyon	1.6		Reservoir to Forks
	Guaje Canyon	9.1		Perennial stream length, from Sec. 35/36 bdy (R6E) to headwater source
	Capulin Canyon	4.9		Park Service Boundary to Los Utes Springs
	Paliza Canyon	8.0		Ponderosa Ditch Pond to upper limits
	Polvadera Creek	4.1		Mouth to Cañada del Ojito
	TOTAL	166.6		

Table 4. Pecos Geographic Management Unit. Populations of Rio Grande Cutthroat Trout.

PECOS GMU	STREAM	MILEAGE	SECURE	COMMENTS
KNOWN	Pecos River	4.2	X	Above Pecos Falls; will be surveyed in 2002
	Cave Creek	1.9		Suspected barrier in section 18; needs to be evaluated
	Dalton Creek	3.6	X	Barrier and sections 22/27 boundary; needs to be evaluated
	Doctor Creek	3.5	X	Restored in 1996. Enhanced barrier; needs to be evaluated
	Indian Creek	4.4	X	Suspected barrier in section 6; needs to be evaluated
	Macho Creek	4.6	X	Waterfall barrier; needs to be evaluated
	Jacks Creek	6.8	X	Restored in 1992; enhanced barrier; needs to be evaluated; whirling disease
	Rito Azul	3.3	X	Includes South Fork; needs to be evaluated
	Rito de los Chimayosos	3.6	X	Good waterfall barriers; needs to be evaluated
	Rito del Padre	4.2	X	Good waterfall barriers; needs to be evaluated
	Rito Maestas	2.1	X	Good waterfall barriers; needs to be evaluated
	Rio Mora	1.2	X	T20N, R13E, Sec. 25; will be surveyed in 2002
	Rio Valdez	3.1	X	Barrier
	Rito Los Esteros	1.7		Above barrier in section 21
	Unnamed tributary to Mora	2.3		T19N, R13E, Sec. 2
	Bear Creek	2.0	X	Suspected barrier around confluence with unnamed trib; needs to be evaluated
	Cow Creek	1.0	X	Relict population remains after Viveash Fire; genetic analysis pending
	TOTAL	53.5		
SUSPECTED	Rito Manzaneras	4.3		Unlikely; will be surveyed in 2002; includes unnamed trib
	Rito Atascuso	1.2		Mouth to upper limits; will be surveyed in 2002
	Rito Torito	2.8		Mouth to upper limits; will be surveyed in 2002
	Rito Quemazon	2.5		Mouth to upper limits; will be surveyed in 2002

Table 4 Cont. Pecos Geographic Management Unit. Populations of Rio Grande Cutthroat Trout.

PECOS GMU	STREAM	MILEAGE	SECURE	COMMENTS
SUSPECTED	Falls Creek	2.3		State Boundary to upper limits; brook trout; needs to be confirmed.
	Tecolote Creek	6.1		FS Boundary to upper limits; brook trout, rainbow trout; needs to be confirmed
	Youngs Canyon	2.6		Mouth to upper limits; will be surveyed in 2002.
	Jarosa Creek	2.8		Mouth to upper limits; will be surveyed in 2002
	Rito Sebadillosos	1.7		Mouth to upper limits; needs to be confirmed.
	TOTAL	26.3		
PROPOSED	Cow Creek	15.0		Being monitored for re-introduction timing (Viveash Burn); Honey Boy Falls up to headwaters
	Elk Creek	2.9		Being monitored for re-introduction timing (Viveash Burn); mouth to upper limits; includes short portion of Sheep
	Rito de la Osha	4.0		Confirmed no fish (Viveash Burn)
	Soldier Creek	4.1		Needs to be investigated (Viveash)
	Bull Creek	10.0		Being evaluated for re-introduction potential (Viveash Burn); survey will be completed in 2002
	Porvenir Canyon	3.3		Wilderness boundary to forks; will be surveyed in 2002
	Hollinger Canyon	4.7		Mouth to upper limits; will be surveyed in 2002
	Beaver Canyon	6.1		Mouth to upper limits; will be surveyed in 2002
	Pecos River	18.7		Upstream from Terrero to Pecos Falls, including all unlisted tributaries; will be surveyed in 2002; whirling disease
	Willow Creek	4.2		Mouth to upper limits; brown trout
	Holy Ghost	7.2		Holy Ghost Summer Home Area to Spirit Lake
	Doctor Creek	0.2		Mouth to barrier (Sec. 24)
	Indian Creek	2.2		FS Boundary to barrier
	Winsor Creek	6.4		Mouth to Katherine Lake, including Stewart Lake
	Dalton Canyon	5.5		Mouth to barrier
	Macho Canyon	2.7		FS Boundary to barrier
	Panchuela	7.2		Mouth to upper limits; Waterfall barrier
	Rito Perro	2.5		Mouth to upper limits
	Horsethief Creek	3.7		Mouth to Horsethief Meadows; brook trout
	Cave Creek	2.1		Mouth to Barrier
	Rito Oscura	2.5		Mouth to Katherine Lake (including Lake Johnson); brown trout above & below barrier
	Rito del Padre	1.1		Mouth to barrier
	Rito Chimayosos	0.7		Mouth to barrier
	Rio Mora	16.2		Mouth to T20N, R13E, Sec. 25, including all tributaries; will be surveyed in 2002
Bear Creek	4.0		Needs to be fully evaluated for current species composition and barriers	
TOTAL	137.2			

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