“NEOTROPICAL MIGRATORY BIRDS”

for the

SUGARBERRY PROJECT

Feather River Ranger District
Pumas National Forest

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I. INTRODUCTION

This report documents the effects of the No Action (Alternative A) the proposed action (Alternative B), and other action alternative (Alternatives C) on Neotropical Migratory Birds as a result of implementation of the Sugarberry Project. Description of the Sugarberry Project and all alternatives is found in Chapter 2 of the Sugarberry Project Environmental Impact Statement. General effects of the proposed action and the action alternatives (in terms of impacts to various CWHR types as a result of implementing fuel reduction, group selection, individual trees selection and biomass removal) has been described in detail in the Sugarberry Project BA/BE. This report tiers to that document. Refer to **Attachments #1** for the Region 5 and Plumas National Forest, directions and discussions.

Threatened, endangered and Forest Service Sensitive (TES) species are discussed in the Biological Assessment/Biological Evaluation (BA/BE) due to their USFWS listing or as Forest Service Sensitive status, however, Neotropical Migratory Birds (NTMBs) are species that also require special management attention because of viability and diversity concerns.

II. AFFECTED ENVIRONMENT

Neotropical Migratory Birds are of special concern because they breed in North America. Due to their sensitivity to environmental change, NTMB species serve as an "early warning" system for alteration of ecosystem structure and function. By closely monitoring NTMB habitat associations and population trends within California habitats, we can track the integrity and resilience of California ecosystems.

Neotropical Migratory Birds are defined as species whose breeding area includes the North American temperate zones and that migrate in many cases south of the continental United States during nonbreeding seasons (Hunter et al 1993). These species are protected under the Migratory Bird Treaty Act (1918) based on their international importance. The list of neotropical migratory birds within the California region is large and includes a broad number of habitat associations. The Breeding Bird Survey (BBS) coordinated by the US Fish and Wildlife Service indicates that certain populations of NTMB species in California have been declining over the past 26 years (1996 data). Although there appear to be multiple causes for declines, habitat fragmentation and decreases in habitat quantity and quality, caused by changes in land use, seem to be largely responsible (Sherry and Holmes 1993, Terborgh 1992).

Saab and Rich (1997, as cited in HFQLG Act FEIS) found that neotropical migrant species with decreasing population trends tend to be those which nest in shrub layers, and species with increasing population trends tend to nest in tree canopies. Within the RDEIS Managing California Spotted Owl Habitat in the Sierra Nevada National Forests of California An Ecosystem approach, a summary table of Sierran Neotropical Migratory Bird species with measurable population declines based on Breeding Bird Surveys conducted in coordination with the U.S. Fish and Wildlife Service indicates that 32 species showing population declines have some habitat association with grassland/shrubland/open forest and/or riparian.

In 1996 the R5 "Partners In Flight Program" group developed a list of "High-Priority Land Bird Species for Monitoring Efforts" for the Sierra Nevada Bioregion. This list identified three species that are within the pilot project area. They are the **great gray owl, willow flycatcher** and **Swainson's thrush**. The great gray owl and willow flycatcher are addressed as FS Sensitive species.

The overall effect of management activities on neoptropical migrant species populations has not been specifically studied, unless a species falls within the category of Threatened, Endangered, Forest Service Sensitive (TES). The Forest Service has a legal mandate to provide habitat for viable populations of NTMBs. If any NTMBs were not well distributed or had viability concerns they would have been included on the Forest Service Sensitive Species List, 1998, appended March 2001 and May 2003. Current management guidelines ensure that habitat would be protected for these species, but not that the presence of these species will be guaranteed throughout the landscape.

Habitat modification would be expected to effect neotropical migratory bird, some more than others. Timber harvest, road construction, hand treatments and pile burning could include but are not limited to: 1) mortality of young in the nest that are too young to escape activities or when adults abandon nests due to disturbance and 2) loss of nesting, roosting or foraging habitat.

In 2001, Executive Order 13186 was issued to outline responsibilities of federal agencies to protect migratory birds under the Migratory Bird Treaty Act (66 FR 3853-3856). This order directs federal agencies to work with the USFWS to promote conservation of migratory bird populations. The Forest Service and the USFWS entered into an interim memorandum of understanding (MOU) to strengthen migratory bird conservation. This interim MOU expired on January 15, 2003, yet the conservation measures that are contained within the MOU are still applicable for use in environmental planning (SNFPA SFEIS, 2004, Ch. 3, p.172). The MOU recognized that direct and indirect actions taken by the Forest Service in the execution of duties and activities as authorized by Congress may result in the take of migratory birds, and that short-term negative impacts are balanced by long-term benefits.

The PSW (Region 5) Land Bird Monitoring Implementation Plan (USDA Forest Service 1996) identified certain migratory birds as having a high priority for monitoring and mitigation efforts. Within the SNFPA EIS, terrestrial birds were classified as having high, moderate and low vulnerability (high vulnerability species are at greatest risk to loss of viability within the Sierra Nevada bioregion (SNFPA EIS, APP. R). Forty land bird species (not all neo-tropical migrants) that are of particular concern and are a high priority for monitoring efforts in the Sierra Nevada bioregion were identified within the SNFPA SFEIS (chapter 3, page 173). Twelve neo-tropical migrants identified on this list are analyzed below.

Table 1 provides a list of selected neotropical migratory bird species that occur within the analysis area that are included in the above-mentioned categories. They have been grouped according to habitat type. Some species fall into more than one group. The assumption is that, if the effects on several species within one group are analyzed, the effects on all species that belong to that group are analyzed. Habitat suitability ratings for the selected Sierra Mixed Conifer CWHR seral stages within the Sugarberry Project area are provided for these bird species and discussed in this report. For each habitat suitability rating listed for each species in this report, the rating is the sum of all high, moderate and low quality habitat, using the composite index for reproduction, foraging, and cover habitat combined.

Table 1. Selected "High Priority" neotropical migratory birds within the project area.

HABITAT GROUP	SPECIES	KEY HABITAT FEATURES	CWHR Suitability Rating*
Open water obligate	Osprey	Uses large snags and trees near fish-bearing river or lake[1]	SMC1 = 0.11 SMC2 = 0.22 SMC3P = 0.55 SMC4P = 0.89 SMC4M = 0.89 SMC4D = 0.89 SMC5P = 0.89 SMC5M = 0.89
Riparian bird assemblages	Belted kingfisher	Usually excavates a burrow in a steep bank of sandy or other friable soil for nest, usually near water, but can be up to 1 mile away[1]	No values for SMC
	Swainson's thrush	Rare in Sierras; prefers large tree (≥24" dbh), moderate to dense (≥40% canopy closure) stands; nest is an open cup in willow or alder, 2-20 feet above ground; eats mostly insects and spiders in litter under shrubs or on forest floor; gleans from shrubs; rarely flycatches[1]	SMC1 = 0 SMC2 = 0 SMC3P = 0 SMC4P = 0 SMC4M = 0.55 SMC4D = 0.55 SMC5P = 0 SMC5M = 0.55
	Warbling vireo	Prefers small to large tree (≥6" dbh), sparse to moderately dense (<70% canopy closure) stands; frequents wooded areas with tall trees, open to intermediate canopy, and a substantial shrub understory; nest usually 4-12 feet above ground; gleans insects and spiders from foliage; sometimes eats aerial insects[1]	SMC1 = 0 SMC2 = 0.33 SMC3P = 0.89 SMC4P = 0.89 SMC4M = 0.89 SMC4D = 0.33 SMC5P = 0.89 SMC5M = 0.89
	Yellow warbler	Prefers small to medium tree (6-24" dbh), open to moderate (20-69% canopy closure) stands; substantial shrub understory usually present; nest is an open cup 2-16 feet above ground in a deciduous sapling or shrub; gleans and hovers for insects and spiders; occasionally eats aerial insects [1]	SMC1 = 0 SMC2 = 0.75 SMC3P = 0.89 SMC4P = 0.89 SMC4M = 0.89 SMC4D = 0.66 SMC5P = 0.55 SMC5M = 0.55
	Yellow-breasted chat	Prefers sapling tree (<6" dbh), moderate to dense (≥40% canopy closure) stands; nest usually 2-8 feet above ground in dense brush along stream or river; gleans insects and berries from foliage[1]	No values for SMC

	White-crowned sparrow	Breeds in montane meadows and along stream courses with shrubs or conifers; seed-eater; nest on ground or at base of shrub or on limb, usually within 1.3 feet of ground; winters in open areas near shrubs or other cover; eats primarily seeds; also eats insects; feeds on ground[1]	SMC1 = 0.22 SMC2 = 0.22 SMC3P = 0 SMC4P = 0 SMC4M = 0 SMC4D = 0 SMC5P = 0 SMC5M = 0
Brush species			
	Common poorwill	Inhabits all stages of shrub areas, preferring clearings and open stages for foraging; insects for prey; nest is a scrape on the ground; feeds on insects caught in the air, also some on insects on the ground[1]	SMC1 = 0.33 SMC2 = 0.33 SMC3P = 0.33 SMC4P = 0.33 SMC4M = 0.11 SMC4D = 0.11 SMC5P = 0.33 SMC5M = 0.11
	Lazuli bunting	Occupies open brush lands and thickets of willows, other shrubs or trees, tall weeds, or vines; eats insects and seeds taken from foliage or ground; sometimes takes aerial insects; nest usually 1.5-4 feet above ground[1]	SMC1 = 0.11 SMC2 = 0.33 SMC3P = 0.33 SMC4P = 0 SMC4M = 0 SMC4D = 0 SMC5P = 0 SMC5M = 0
Forest Species	Olive-sided flycatcher	Prefers large tree ($\geq$24" dbh) stands; most numerous in montane conifer forest where tall trees overlook canyons, meadows, lakes, or other open terrain; nests 5-70 feet above ground; feeds on aerial insects, especially honey bees[1]	SMC1 = 0.33 SMC2 = 0.33 SMC3P = 0.77 SMC4P = 0.77 SMC4M = 0.77 SMC4D = 0.77 SMC5P = 1.0 SMC5M = 1.0
	Western wood-peewee	Prefers medium to large tree ($\geq$12" dbh) stands; most numerous in woodlands or forests, with sparse to moderate canopy cover, which border on meadows, streams, lakes, and other moist, open areas; nest usually 13-80 feet above ground; feeds mostly on flying insects; occasionally gleans insects from foliag[1]	SMC1 = 0.33 SMC2 = 0.44 SMC3P = 0.77 SMC4P = 1.0 SMC4M = 1.0 SMC4D = 1.0 SMC5P = 1.0 SMC5M = 1.0
	Red crossbill	Prefers large tree ($\geq$24" dbh), open to moderate (20-69% canopy closure) stands; availability of mature conifer seeds more important than kind of conifer; in Sierra Nevada, most numerous where conifer canopy with open to moderate	SMC1 = 0 SMC2 = 0 SMC3P = 0.22 SMC4P = 0.44 SMC4M = 0.44 SMC4D = 0.44 SMC5P = 0.77 SMC5M = 0.77

		canopy border meadows, lakes, or streams; nests 5-80 feet above ground, usually high up[1]	
	Evening grosbeak	Prefers medium to large tree (≥12" dbh), moderate to dense (≥40% canopy closure) stands; usually nests in forests dominated by firs; most important foods are seeds of fir, pine, and other conifers, and buds of hardwoods such as oak, willow, and maple; usually nests more than 35 feet above ground, but can nest 7-100 feet above ground[1]	SMC1 = 0 SMC2 = 0.11 SMC3P = 0.22 SMC4P = 0.77 SMC4M = 1.0 SMC4D = 1.0 SMC5P = 0.77 SMC5M = 1.0
	Vaux's swift	Prefers large tree (≥24" dbh), moderate to dense (≥40% canopy closure) stands; feeds exclusively on flying insects [1]; minimum tree size for nesting is 20" dbh; minimum nesting height is 31 feet [2]	SMC1 = 0.44 SMC2 = 0.44 SMC3P = 0.44 SMC4P = 0.44 SMC4M = 0.44 SMC4D = 0.44 SMC5P = 0.44 SMC5M = 0.44
	Western bluebird	Prefers medium to large tree (≥12" dbh), open (<40% canopy closure) stands; usually nests in old woodpecker cavity in snag, tree, or stump; availability of snags frequently limits population density; captures insects on ground or foliage; occasionally eats aerial insects[1]	SMC1 = 0.22 SMC2 = 0.22 SMC3P = 0.33 SMC4P = 0.66 SMC4M = 0.44 SMC4D = 0 SMC5P = 0.66 SMC5M = 0.44
	Band-tailed pigeon	Prefers medium to large tree (≥12" dbh) stands; prefers multi-layered forests with a light understory; dense thickets often used for breeding; feeds on acorns and fruits of several species[1]	SMC1 = 0 SMC2 = 0 SMC3P = 0.55 SMC4P = 0.77 SMC4M = 1.0 SMC4D = 1.0 SMC5P = 1.0 SMC5M = 1.0
Forest and grassland species	Common nighthawk	Prefers open (<40% canopy closure) stands; breeders most common where suitable nesting sites (e.g., barrens, burns, lava flows) occur near favorable foraging areas (e.g., meadows, lakes, other mesic, insect-rich habitats); eats aerial insects; lays eggs on bare ground; trees usually in vicinity of nest[1]	SMC1 = 1.0 SMC2 = 0.89 SMC3P = 0.89 SMC4P = 0.89 SMC4M = 0.33 SMC4D = 0.33 SMC5P = 0.89 SMC5M = 0.33
	Chipping sparrow	Prefers open (<40% canopy closure) stands; frequents woodlands with sparse herbaceous cover and few	SMC1 = 0.55 SMC2 = 0.75 SMC3P = 0.89 SMC4P = 1.0

		shrubs, if any, for breeding; often forages in open shrub or grassland habitat nearby; gleans insects and seeds from ground and foliage; usually nests 1-6 feet above ground[1]	SMC4M = 0.66 SMC4D = 0.33 SMC5P = 0.66 SMC5M = 0.66

*CWHR Suitability rating: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence.
[1]California Department of Fish and Game 1999, and CWHR Version 8.0
[2]Thomas *et al*. 1979.

III. ENVIRONMENTAL CONSEQUENCES

Alternatives B and C (Action Alternatives)

Direct, Indirect and Cumulative Effects: Actions that open up forest stands thru thinning, such as with the proposed DFPZ - thinning prescriptions, would result in projected increases in habitat trends for several species listed in the table above (warbling vireo, chipping sparrow, lazuli bunting, white-crowned sparrow, western bluebird, common nighthawk and common poorwill). These species respond favorably to opening up the forested canopy, allowing for increased understory plant diversity. Of the birds listed in the table above, Swainson's thrush appears to be adversely affected by thinning that convert closed forested stands to open forested stand. Olive-sided flycatcher and evening grosbeak also appear to have projected decrease in habitat suitability. Most of the rest of the species have changes in habitat suitability that are relatively neutral. Alternatives C (1,020 acres of group selection) would create less open stands across the analysis area and subsequently maintains more habitat for Swainson's thrush, olive- sided flycatcher and evening grosbeak than Alternative B (1,040 acres of group selection).

Actions that create openings within the forested landscape with group selection harvests to the point that they have projected declines in species habitat trends include osprey, Swainson's thrush, warbling vireo, yellow warbler, western wood-peewee, evening grosbeak, red crossbill, and band-tailed pigeon. Approximately 3 species listed in table above have projected increase in habitat suitability, that is they respond favorably to habitat conditions that create small gaps in the forest landscape (white-crowned sparrow, lazuli bunting, and common nighthawk).

It is unknown at what threshold the amount of edge to interior habitat results in use, marginal use or non-use by neotropical bird species. Within the project area there is only a 20 acres difference in group openings between Alternative B (1,040 acres) and Alternative C (1,020 acres). Within stand fragmentation caused by high density placement of groups would increase edge effects created by groups, reducing effective interior forest habitat and potentially create unsuitable forest interior habitat within that planning area for certain neotropical migrants. Neotropical migrants favoring forest interior habitat (Swainson's thrush, western wood-peewee, evening grosbeak, red crossbill, and band-tailed pigeon) would have reduced habitat capability with all action alternatives implementing groups with alternative C providing slightly more interior forest between groups than alternative B.

The cumulative effect of Group Selections, ITS and DFPZ on forested conditions supporting neotropical birds listed in the table above would be that habitat capability would overall be improved for birds that prefer openings and open canopied habitat across the landscape. Based on the CWHR model Swainson's thrush, evening grosbeak and red crossbill would have decreased habitat suitability. The remainder of the listed birds are relatively unaffected by the proposed

action. If DFPZ treatments remove shrubs and are managed to minimize shrub regeneration through maintenance activities, it would be expected that the benefits of creating an open forest with a shrub understory component would be minimized and that there would be a decline in shrub nesting species (USDA< PSW, 2006). Allowing group selection treatments to naturally regenerate would ensure that shrub habitat would remain on the landscape longer than with intensive regeneration efforts.

In addition to habitat modification and its affect on neotropical migratory birds, direct effects on nesting birds can occur as a result of tree removal, mastication, and prescribed burning, killing young birds in the nest that cannot fly. It is recognized that the proposed project, when implemented during the breeding season (April-September) could directly impact nesting birds. It is unknown as to what the overall effect on neotropical migrant species populations might be.

As mentioned earlier, increasing the amount of open forest, as well as small openings and increased edge may increase the risk of brood parasitism by brown-headed cowbirds on various bird species that nest in riparian habitat. Very little brown-headed cowbird presence within the National Forest portion of the analysis area has been documented, although they are present on private land in American Valley. Because cowbirds are present in American Valley there is some risk that brood parasitism could increase above existing levels within the project area as cowbirds respond to increased open habitat and edges.

Alternative A (No Action)

Direct, Indirect and Cumulative Effects: There would be no direct effect to neotropical migratory birds with this alternative. Indirect effects of the No Action Alternative include the potential for future wildfire and its impact on habitat maintenance and development. The high fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burnt. Given the fire return interval for this area, it is likely that National Forest system lands would burn again, resulting in the loss of the largest trees and snags, an increase in large scale fragmentation of forested landscapes, loss of large riparian structures, and simplification of habitat diversity.

Some neotropical migrants utilize early successional habitats that develop following wildfire. Burned forest, including stand replacing burns, provide important bird habitat, specifically in terms of abundance and diversity of woodpecker species; the olive-sided flycatcher has been shown to be strongly associated with burned forest as well (USDA, PSW, 2006). These early successional habitats would be at a much larger, homogenous pattern across landscapes as a result of wildfire; smaller, more heterogeneous patterns and patch sizes of this habitat would be created with the action alternatives, which should improve the distribution of this habitat type within the landscape (SNFPA SFEIS 2004).

Swainson's Thrush

Habitat Account: Swainson's thrush (*Catharus ustulatus*)(SWTH) breeding habitat in the Sierra Nevada bioregion (Modoc National Forest to Sequoia National Forest) typically consists of closed canopy riparian deciduous shrub thickets, of at least 1 acre in size, within a conifer matrix at elevations from 2,000 to 8,000 feet elevation (Stefani 1998, 2000). The SWTH occur in ephemeral drainages during the breeding season in the Sierra Nevada, although this species is more typically associated with perennial or intermittent stream channels for Sierran breeding

habitat (Stefani 2000). In a riparian buffer width study in boreal balsam fir (*Abies balsamea*) forests of Quebec Province, Canada, Darveau et al. (1995) report that SWTH were absent in 20-m-wide riparian strips but present in 60-m-wide strips. Swainson's Thrush, similar to other neotropical migrant bird species, occur in a wider variety of habitats in migration than during the breeding season (Evans Mack and Yong 2000). Breeding and spring migrating populations of SWTH tend to be insectivorous; fall migrating populations are more frugivorous (Evans Mack and Yong 2000).

Species Account: Swainson's thrushes have been found at several sites within the PNF. The HFQLGFRA FEIS/ROD and SNFPA FSEIS/ROD do not give specific guidance for this species. However, they do provide guidance about protecting its preferred habitat, which is in riparian areas (See Appendix B). In 1996 the R5 "Partners In Flight Program" group developed a list of "High-Priority Land Bird Species for Monitoring Efforts" for the Sierra Nevada Bioregion. This list identified three species that are within the HFQLG pilot project area. They are the great gray owl, willow flycatcher and Swainson's thrush.

In 1998 surveyors checked 59 sites on the PNF for this species, and reported that 36 of these were occupied. In 1998 surveyors checked 18 sites on the FRRD for this species. None of these sites were within the project boundary. The closest occupied site was approximately well beyond the Sugarberry project boundary. Suitable habitat exists for this species within the project area. Swainson's thrush surveys were not conducted in conjunction with the Sugarberry project because most Swainson's thrush habitat will be protected within RHCAs.

Direct, Indirect and Cumulative Effects: Direct effects on nesting birds can occur as a result of timber harvest killing young birds in the nest that cannot fly. It is recognized that such projects, when implemented during the breeding season (April-September) could directly affect nesting birds. However, the Sugarberry project would result in minimal direct effects to Swainson's thrushes because the majority of their breeding habitat would be protected within RHCAs.

Smoke from burning of piled debris in-group selections could indirectly affect Swainson's thrushes. However, this should be minimal since piles would be placed outside of RHCAs. Approximately 90% of pile burning is planned for fall and winter months when these birds are not present in the Sierra. Noise from vehicles and equipment and increased human activity and presence adjacent to the RHCAs could affect this species. These forms of disturbance would be limited to individual treatment units and last a few days to 2 weeks in any location. Affectss would be very limited and not substantially affect habitat use or reproductive capacity of this species.

Due to the management requirements in place and the limited scope of the project, it will not add to cumulative effects in a way that would affect the Swainson's thrush population as a whole or change the distribution of habitat. Management for the willow flycatcher under the proposed Willow Flycatcher Conservation Strategy may benefit the Swainson's thrush because habitat for the two species often overlaps.

ATTACHMENT #1

INTRODUCTION

NORTH AMERICAN BREEDING BIRD SURVEYS

Reference: Sauer, J. R., J. E. Hines, and J. Fallon. 2005. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2004. Version 2005.2. USGS Patuxent Wildlife Research Center, Laurel, MD.* ***In the MIS accounts, this information is cited as****: BBS. 2005. The North American Breeding Bird Survey-BBS, Version 2005.1 – 25 March 2005. United States Geologic Survey (USGS), Patuxent Wildlife Research Center. http://www.mbr-pwrcx.usgs.gov/bbs.*

The North American Breeding Bird Survey (BBS) is a cooperative effort between the U.S. Geological Survey's Patuxent Wildlife Research Center and the Canadian Wildlife Service's National Wildlife Research Centre to monitor the status and trends of North American bird populations. Following a rigorous protocol, BBS data are collected by thousands of dedicated participants along thousands of randomly established roadside routes throughout the continent. Professional BBS coordinators and data managers work closely with researchers and statisticians to compile and deliver these population data and population trend analyses on more than 400 bird species, for use by conservation managers, scientists, and the general public. Data from BBS provide one level of Management Indicator Species (MIS) population monitoring for bird MIS. Droege (1990) and Peterjohn & Sauer (1993) provide detailed descriptions of BBS methodology and rationale.

The BBS, which has been conducted annually since 1966, consists of a continent-wide array of roadside point-count routes. Each route is 39.4 km (24.5 miles) long, and includes 50 3-minute point counts at 0.8 km (.5 mile) intervals. Expert observers conduct point-counts once each year during the peak of the breeding season (June in the Sierra Nevada), recording numbers of every bird species detected within a 0.4 km (.25 mile) radius. BBS routes occur on each of the National Forests in the Sierra Nevada.

BBS data provide the most extensive, long-term data set available on landbird population trends (Siegel and DeSante 1999), and have been used in a wide variety of management and scientific applications (Table 6). More than 270 scientific publications have relied heavily, if not entirely, on BBS data. However, BBS data have some important limitations. Reliable information is produced only for the more common species. Additionally, BBS data are problematic because point counts are conducted exclusively at roadsides, which often include a large proportion of fragmented and edge habitats, and may not be representative of the larger habitat matrix. Nevertheless, BBS data are a tremendously valuable resource for conservation planning (Siegel and DeSante 1999).

Table 6. Applications in which BBS data have been used.

Organization / Agency	Application
U.S. Fish and Wildlife Service and Partners in Flight	Use BBS trends along with other indicators to assess national and regional bird conservation priorities.
Land Management Agencies	BBS data were instrumental in focusing research and management action on neotropical migrant species in the late 1980s, and on grassland species in the mid-1990s.
State Natural Heritage programs and Breeding Bird Atlas projects	BBS data is used to enrich local databases.
Educators	BBS data is often used as a tool to teach biological, statistical, and GIS concepts.

USDI Geologic Survey (USGS) has utilized BBS data to generate indices of population trend, estimates of relative abundance, and contour maps of bird abundance. Although trend is calculated for all scales with data, caution should be used in interpreting any result that was based on fewer than 50 routes. At the regional scale, BBS personnel suggest that a species must be detected on at least 14 different routes to provide enough data to reliably assess the regional population trend of that species (Siegel and DeSante 1999). The BBS data are edited to remove data that are of questionable quality or represent birds that are thought to be migrating rather than breeding (see the metadata for the BBS dataset for more information on editing and quality control of the BBS data).

Indices of Population Trend. *Breeding bird surveys, which have been conducted since 1966, provide an index of population trends for many species. Trend analysis is conducted on these data at a variety of scales, including Survey-Wide, California-wide, and Sierra Nevada-Wide. BBS data are collect from routes within and near each National Forest in Region 5 (Table 9).*

Based on the BBS data collected over time, trend and relative abundance is calculated for each species. Most calculations are done at each special scale (survey-wide within the species range, Statewide (e.g., California), and Bioregion-wide (e.g., Sierra Nevada). The Trend data is calculated for three time periods: 1966-2005, 1966-1979, and 1980-2005.

Trends are calculated as estimates, and a statistical test is conducted to determine whether the trend is significantly different from 0. The lower the "P value," the less likely that a particular estimated trend would have occurred by chance alone (e.g., a "0.01" indicates a 1% probability that a trend estimate would have occurred by chance). A very low number indicates that the null hypothesis cannot be rejected that the trend is different from 0.

In addition, each estimated trend is calculated with a 95% Confidence Interval (CI) for the trend estimate. The CI is estimated as a multiplicative (constant rate) change in counts over time, with co-variables to adjust for differences in observer quality.
The BBS data set for each species is ranked as to its "regional credibility" (e.g., at the Sierra Nevada scale) (Table 7).

Table 7. BBS data Regional Credibility ranking system (BBS 2005).

Red	This category reflects data with an important deficiency. In particular:	1. The regional abundance is less than 0.1 birds/route (very low abundance),
		2. The sample is based on less than 5 routes for the long term, or is based on less than 3 routes for either subinterval (very small samples), or
		3. The results are so imprecise that a 5%/year change would not be detected over the long-term (very imprecise).
Yellow	This category reflects data with a deficiency. In particular:	1. The regional abundance is less than 1.0 birds/route (low abundance),
		2. The sample is based on less than 14 routes for the long term (small sample size),

		3. The results are so imprecise that a 3%/year change would not be detected over the long-term (quite imprecise), or
		4. The sub-interval trends are significantly different from each other (P less than 0.05, based on a z-test). This suggests inconsistency in trend over time).
Blue	This category reflects data with at least 14 samples in the long term, of moderate precision, and of moderate abundance on routes	

Bird Relative Abundance. Relative abundance for the species, in birds/route is also calculated for each species at each spatial scale, for 3 timeframes. This number is an approximate measure of how many birds are seen on a route in the region.

Contour Maps of Bird Abundance. USGS has also used the BBS bird survey data to develop contour maps of bird abundance based on mean counts on survey routes. These maps are simple summaries of the raw BBS data, with only a minimal interpolation of information from nearby survey routes. Birds encountered on routes are not necessarily breeding in the area in which they are observed, and many factors can influence the distribution of birds in early summer. Users of these maps should be aware of the limitations of simple counts of birds. These maps are based on exactly the same data that are used in the BBS trend analyses, and route summaries are simple averages of counts on routes over time. However, these are simple averages that do not account for observer differences in counting ability or for other factors that could be controlled in more sophisticated analyses.

Siegel and DeSante (1999) used a population trend classification system (Table 8), which is also referenced in the bird MIS Accounts.

Table 8. Breeding Bird Survey (BBS) population trend classification system (from Siegel and DeSante 1999).

Classification	No. of Routes (n)	Trend (Tr)	Significance of Trend (P)
Definitely increasing	$n \geq 14$	$Tr \geq 1\%$	$P \leq 0.05$
“” “” “ “ “	$9 \leq n \leq 13$	$Tr \geq 1\%$	$P \leq 0.01$
Likely increasing	$n \geq 14$	$Tr \geq 1\%$	$0.05 < P \leq 0.1$
“” “” “ “ “	$9 \leq n \leq 13$	$Tr \geq 1\%$	$0.01 < P \leq 0.05$

“” “” “ “ “	$5 \leq n \leq 8$	$Tr \geq 1\%$	$P \leq 0.01$
Possibly increasing	$n \geq 14$	$Tr \geq 1\%$	$P > 0.1$
“” “” “ “ “	$9 \leq n \leq 13$	$Tr \geq 1\%$	$0.05 < P \leq 0.1$
“” “” “ “ “	$5 \leq n \leq 8$	$Tr \geq 1\%$	$0.01 < P \leq 0.05$
“” “” “ “ “	$1 \leq n \leq 4$	$Tr \geq 1\%$	$P \leq 0.01$
Increasing tendency	$9 \leq n \leq 13$	$Tr \geq 1\%$	$P > 0.1$
“” “” “ “ “	$5 \leq n \leq 8$	$Tr \geq 1\%$	$0.05 < P \leq 0.1$
“” “” “ “ “	$5 \leq n \leq 8$	$Tr \geq 5\%$	$P > 0.1$
“” “” “ “ “	$1 \leq n \leq 4$	$Tr \geq 1\%$	$0.01 < P \leq 0.05$
Definitely decreasing	$n \geq 14$	$Tr \leq -1\%$	$P \leq 0.05$
“” “” “ “ “	$9 \leq n \leq 13$	$Tr \leq -1\%$	$P \leq 0.01$
“” “” “ “ “			
Likely decreasing	$n \geq 14$	$Tr \leq -1\%$	$0.05 < P \leq 0.1$
“” “” “ “ “	$9 \leq n \leq 13$	$Tr \leq -1\%$	$0.01 < P \leq 0.05$
“” “” “ “ “	$5 \leq n \leq 8$	$Tr \leq -1\%$	$P \leq 0.01$
Possibly decreasing	$n \geq 14$	$Tr \leq -1\%$	$P > 0.1$
“” “” “ “ “	$9 \leq n \leq 13$	$Tr \leq -1\%$	$0.05 < P \leq 0.1$
“” “” “ “ “	$5 \leq n \leq 8$	$Tr \leq -1\%$	$0.01 < P \leq 0.05$

“” “” “ “ “	$1 \leq n \leq 4$	$Tr \leq -1\%$	$P \leq 0.01$
Decreasing tendency	$9 \leq n \leq 13$	$Tr \leq -1\%$	$P > 0.1$
“” “” “ “ “	$5 \leq n \leq 8$	$Tr \leq -1\%$	$0.05 < P \leq 0.1$
“” “” “ “ “	$5 \leq n \leq 8$	$Tr \leq -5\%$	$P > 0.1$
“” “” “ “ “	$1 \leq n \leq 4$	$Tr \leq -1\%$	$0.01 < P \leq 0.05$
Definitely stable	$n \geq 14$	$-0.5\% < Tr < 0.5\%$	--
Likely stable	$n \geq 14$	$-1.0\% < Tr \leq 0.5\%$	--
“” “” “ “ “	$n \geq 14$	$0.5\% \leq Tr < 1.0\%$	--
Possibly stable	$9 \leq n \leq 13$	$-1.0\% < Tr < 1.0\%$	--
Stable tendency	$5 \leq n \leq 8$	$-1.0\% < Tr < 1.0\%$	--

Table 9. BREEDING BIRD SURVEY ROUTES WITHIN AND NEAR (10 MILE RADIUS) THE PLUMAS NATIONAL FOREST
Plumas

RTENO	SEQNO	SRTENAME
14413	2246	CHESTER
14433	2251	CHILCOOT
14185	2168	DOWNIEVILLE
14181	2162	GENESEE
14414	2244	GOUMAZ
14184	2167	HIGGINS CORN
14078	2045	JOHNSVILLE
14078	2046	JOHNSVILLE
14436	2250	LAST CHANCE
14417	2255	LITTLE TRUCKEE
14416	2252	MEADOW VALLEY
14416	2253	MEADOW VALLEY
14415	2249	PAXTON
14158	2133	SATTLEY
14536	174	SQUAW VALLEY

BBS Analysis for Plumas National Forest MIS

Bald Eagle:

Bald eagles have been detected on 1 BBS route on this Forest (Figure 1). This route shows an increasing trend along this BBS route for the Bald Eagle from 1966 to 2003. Bald Eagles have not been detected on the other BBS routes shown in Figure 1).

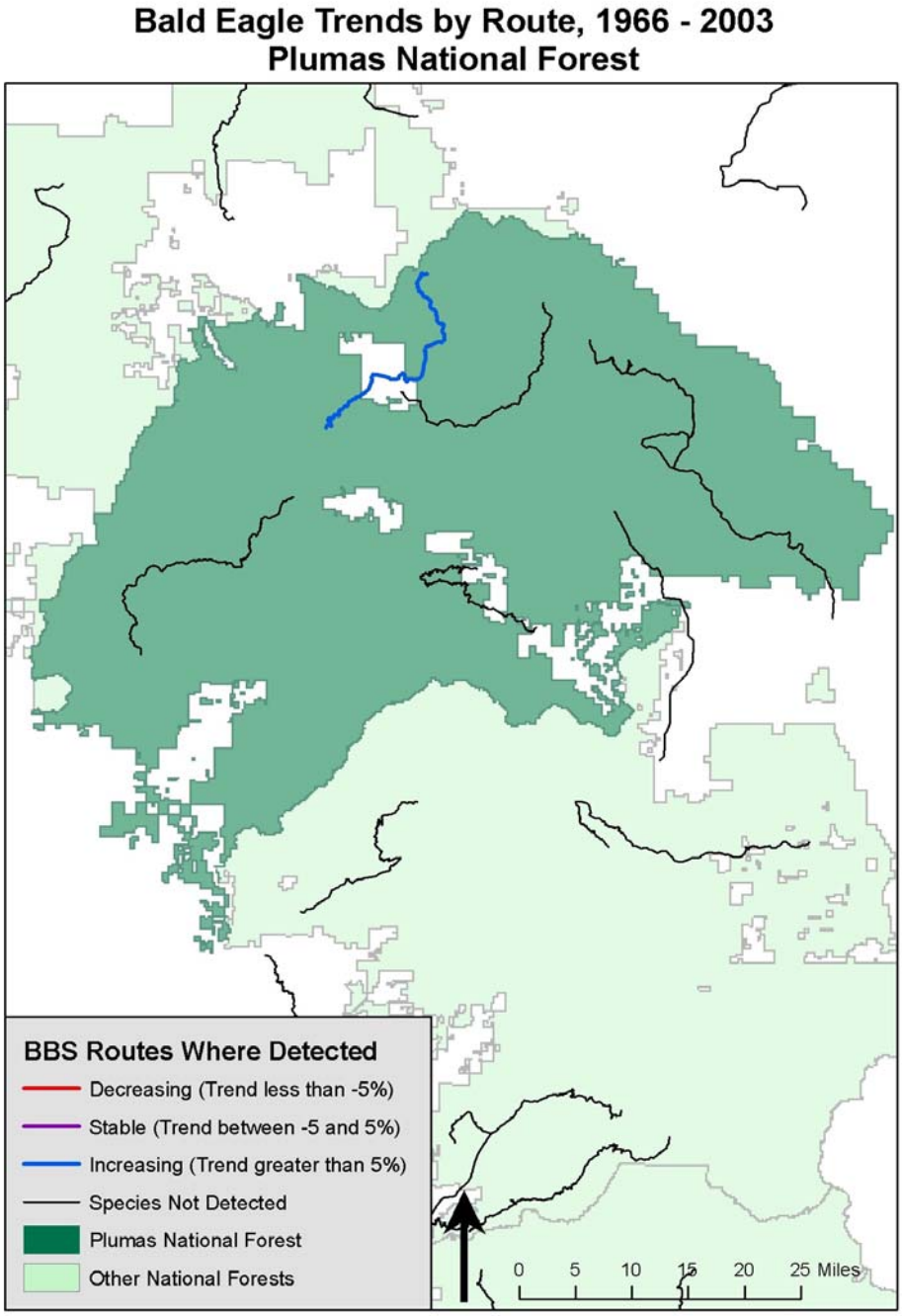

Figure 1. Bald eagle detection on BBS routes within and near the Plumas NF, 1966-2003 (BBS 2005).

Canada Goose:

This species has been detected on 39 BBS routes within California, 6 BBS routes within the Sierra Nevada, 3 BBS routes on the Modoc NF and 3 BBS routes on the Plumas NF (see the introduction for more information on BBS data).

Current population status and trend – Range-wide

Range-wide Population Trend Index. Survey-wide (range-wide) BBS data for the period 1966-2004 classifies Canada goose as "Definitely increasing" (Siegel and DeSante 1999), with a significant increase of 9% (range -0.8 to 2.3) per year over 1565 routes. The Regional Credibility ranking is "Yellow", due to significantly different sub-interval trends.

Range-wide Relative abundance and detection rates. Between 1966-2004, survey-wide (range-wide) relative abundance of Canada goose on BBS routes is 2.65 birds/route. For this same period, throughout most of its range, and within most of the Sierra Nevada, Canada goose had a percent change in detection rate of greater than +1.5 birds/route.

The Canada goose on the Plumas NF has been monitored as part of the National BBS, with the species detected on 3 of the routes within the Forest (Figure 2). Two of the routes show an increasing trend, while one of the routes shows a decreasing trend, and on the remainder of the routes Canada goose have not been detected.

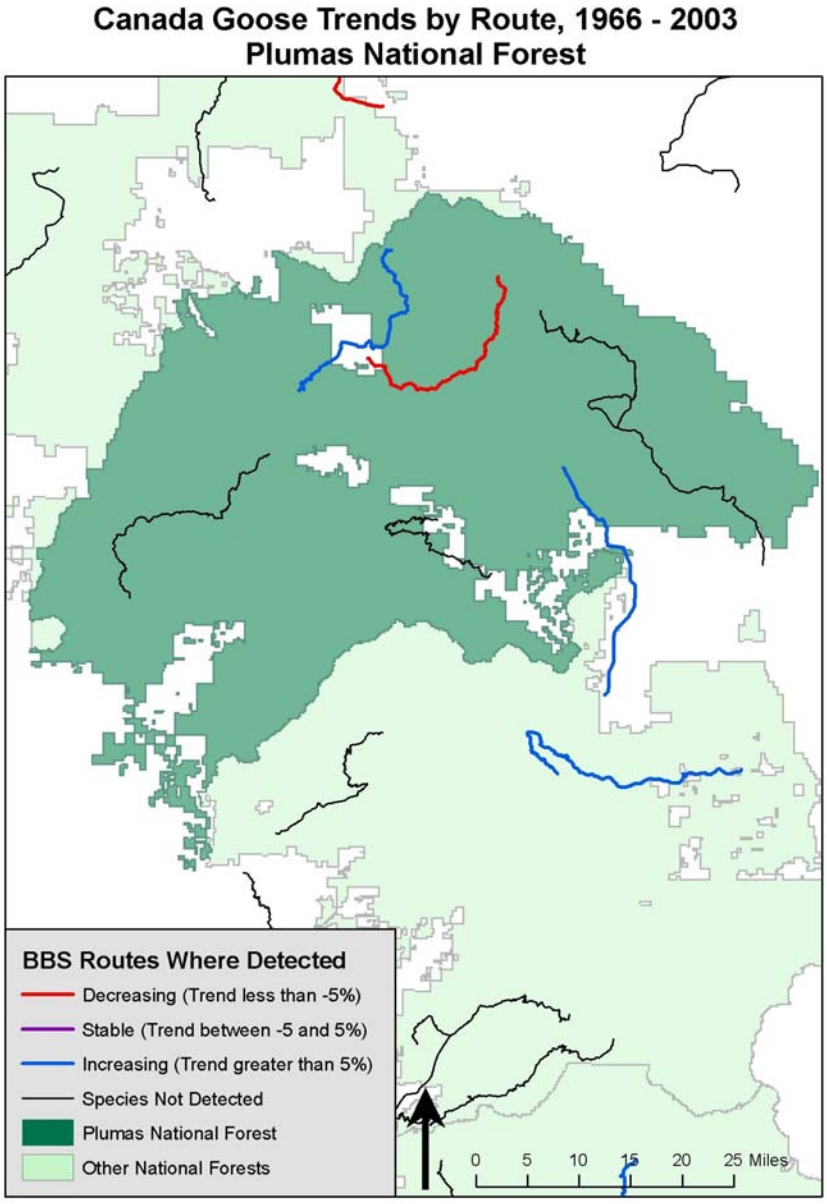

Figure 2. Canada goose detection on BBS routes within and near the Plumas NF, 1966-2003.

Golden Eagle:

Population information for the golden eagle has been obtained at the following scales: range-wide (global and national), California, Sierra Nevada, and Forest (BBS 2005, NatureServe 2005). This species has been detected on 49 BBS routes within California, 2 BBS routes within the Sierra Nevada, as well as on routes within and near the Inyo, Modoc, and Plumas (see the introduction for more information on BBS data). Population status and trend information specific to this species is summarized below. These data infer a stable trend for Golden eagle at these scales, including on the Inyo, Modoc, and Plumas NFs. The Golden eagle has been monitored across 1 BBS route within or near the Plumas NF (Figure 3). This route indicates a decreasing trend for the Golden Eagle from 1966 to 2003.

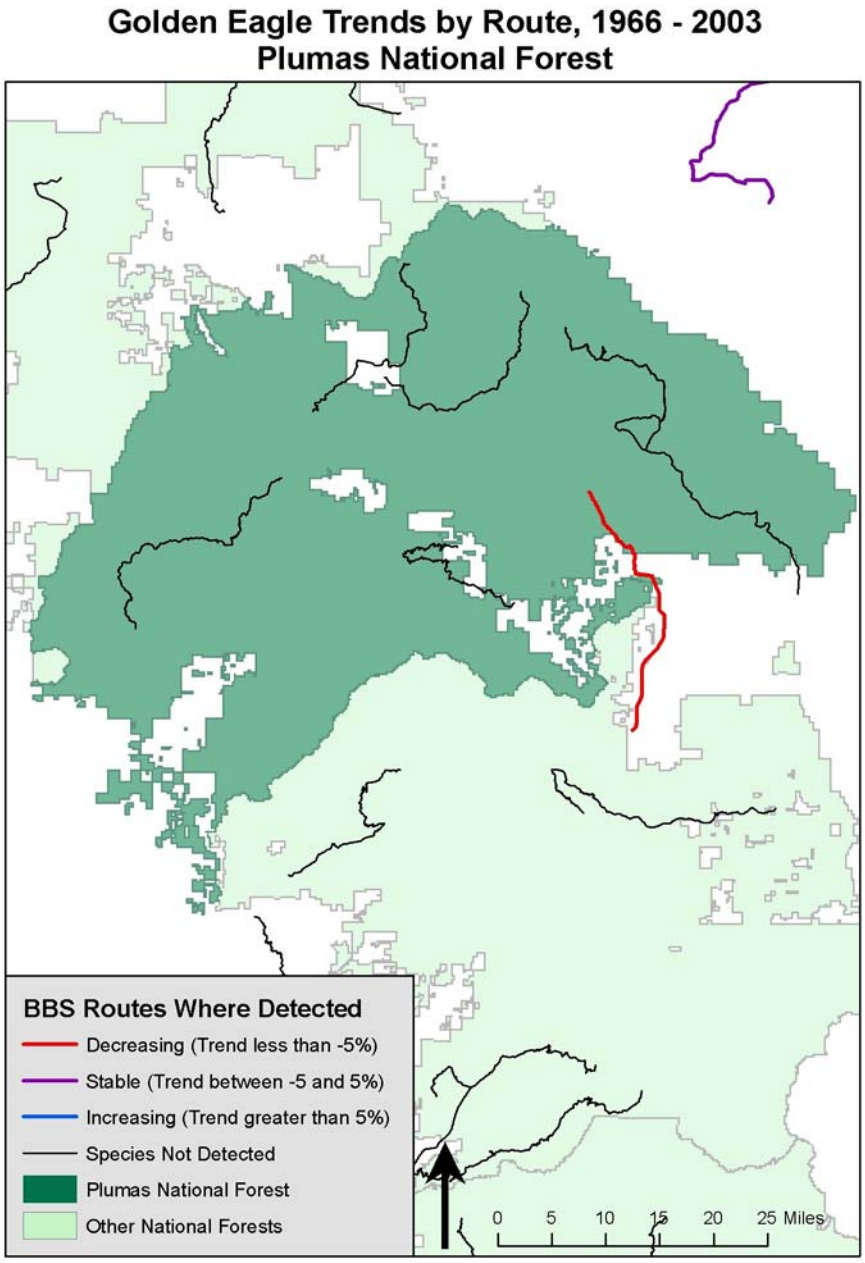

Figure 3. Golden eagle detection on BBS routes within and near the Plumas NF, 1966-2003 (BBS 2005).

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