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).

Appendix B- Plumas NF BBS Population Analysis

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 ≤ n ≤ 13	Tr ≤ -1%	0.01 < P ≤ 0.05
“” “” “ “ “	5 ≤ n ≤ 8	Tr ≤ -1%	P ≤ 0.01
Possibly decreasing	n ≥ 14	Tr ≤ -1%	P > 0.1
“” “” “ “ “	9 ≤ n ≤ 13	Tr ≤ -1%	0.05 < P ≤ 0.1
“” “” “ “ “	5 ≤ n ≤ 8	Tr ≤ -1%	0.01 < P ≤ 0.05
“” “” “ “ “	1 ≤ n ≤ 4	Tr ≤ -1%	P ≤ 0.01
Decreasing tendency	9 ≤ n ≤ 13	Tr ≤ -1%	P > 0.1
“” “” “ “ “	5 ≤ n ≤ 8	Tr ≤ -1%	0.05 < P ≤ 0.1
“” “” “ “ “	5 ≤ n ≤ 8	Tr ≤ -5%	P > 0.1
“” “” “ “ “	1 ≤ n ≤ 4	Tr ≤ -1%	0.01 < P ≤ 0.05
Definitely stable	n ≥ 14	-0.5% < Tr < 0.5%	--
Likely stable	n ≥ 14	-1.0% < Tr ≤ 0.5%	--
“” “” “ “ “	n ≥ 14	0.5% ≤ Tr < 1.0%	--
Possibly stable	9 ≤ n ≤ 13	-1.0%< Tr < 1.0%	--
Stable tendency	5 ≤ n ≤ 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).

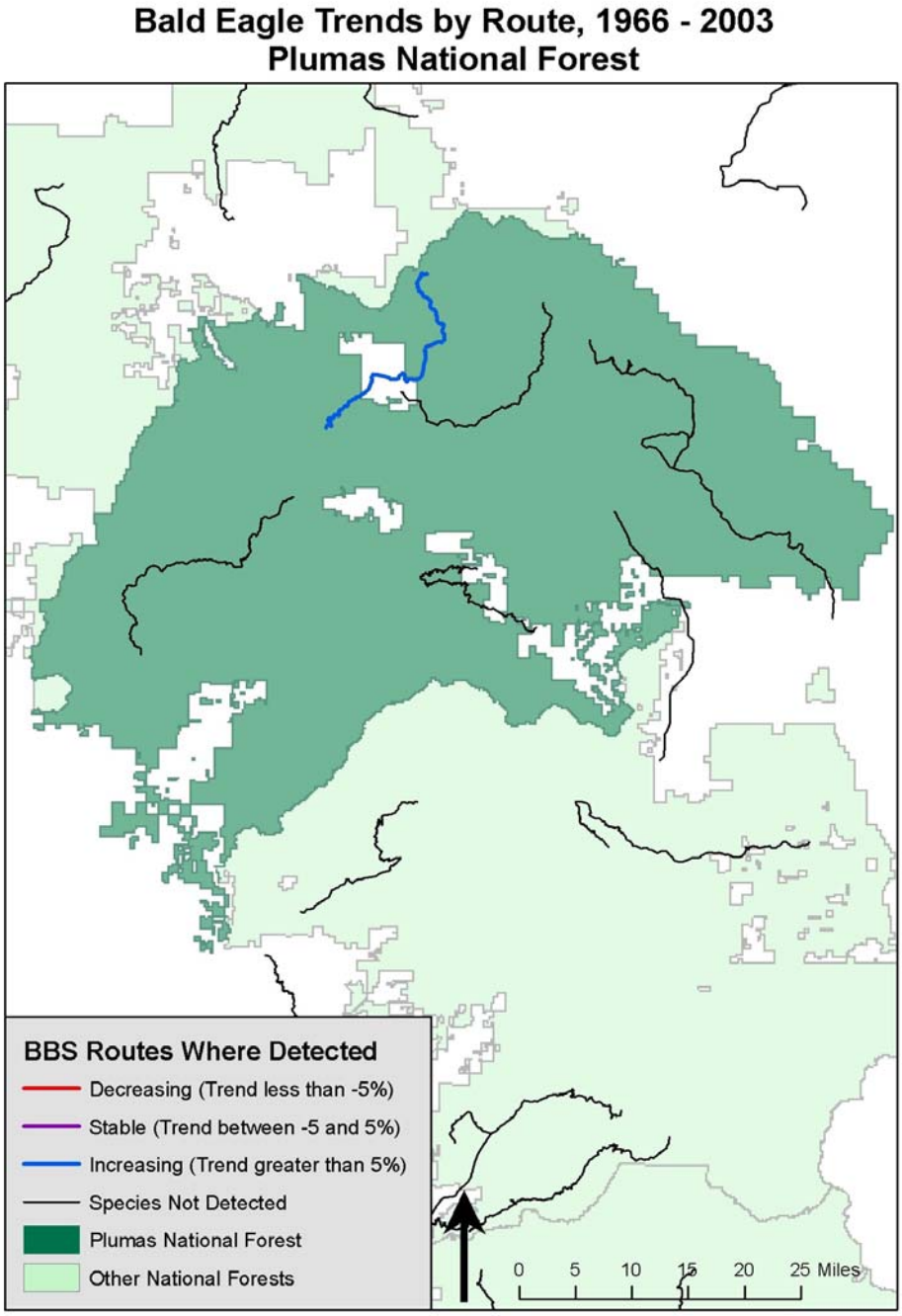

Figure 1. Bald eagle detection on BBS routes within and near the Plumas NF, 1966-2003 (BBS 2005).

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.

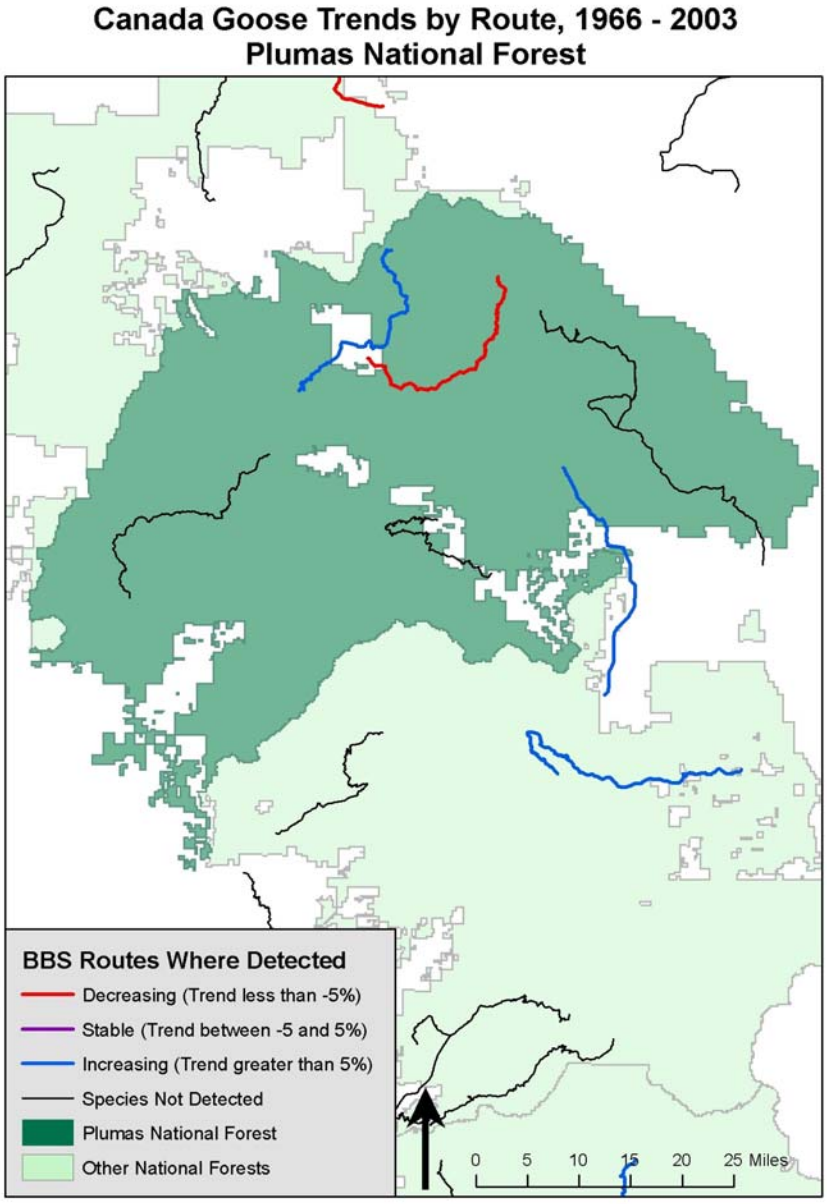

Figure 2. Canada goose detection on BBS routes within and near the Plumas NF, 1966-2003.

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.

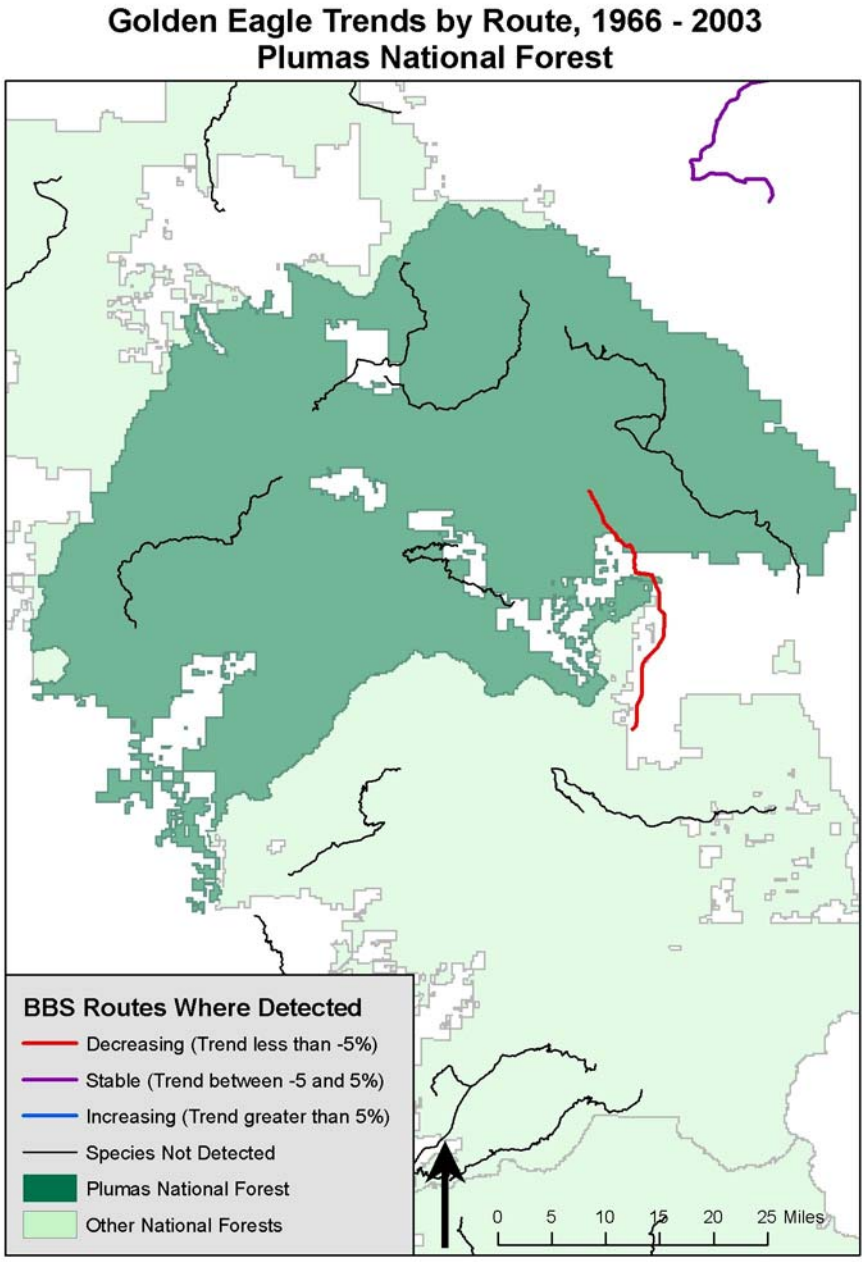

Figure 3. Golden eagle detection on BBS routes within and near the Plumas NF, 1966-2003 (BBS 2005).

Literature Cited.

Droege, S. 1990. The North American Breeding Bird Survey. Pgs. 1-4 in J. R. Sauer and S. Droege, eds. Survey designs and statistical methods for the estimation of avian population trends. U.S. Fish and Wildlife Service, Biol. Rep. 90(1).

Peterjohn, B. G. and J. R. Sauer. 1993. North American Breeding Bird Survey annual summary 1990-1991. Bird Populations 1:1-15.

Siegel, R.B. and D.F. DeSante. 1999. Version 1.0. The draft avian conservation plan for the Sierra Nevada Bioregion: conservation priorities and strategies for safeguarding Sierra bird populations. Institute for Bird Populations report to California Partners in Flight.