IDAHO NATIONAL LABORATORY
2006 BREEDING BIRD SURVEYS

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EXECUTIVE SUMMARY

Annual breeding bird surveys have been conducted on the Idaho National Laboratory (INL) since 1985 to monitor changes in bird populations. Surveys were conducted in in 2006 during May and June. A total of 5,974 individuals representing 66 species of birds were recorded along 13 permanent routes. Horned lark (n=1616), western meadowlark (n=1055), Brewer's sparrow (n=794), sage thrasher (n=458), sage sparrow (n=333) and mourning dove (n=333) are the top six most abundant species on the INL. Nine species indicated as Species of Greatest Conservation Need recorded include Brewer's sparrow (n=794), sage grouse (n=46), Franklin's gull (n=41), ferruginous hawk (n=10), western burrowing owl (n=5), long-billed curlew (n=5), short-eared owl (n=4), Wilson's phalarope (n=4), and Merlin (n=1). This is only the second year that a Merlin was observed during the annual Breeding Bird Survey since the survey began in 1985.

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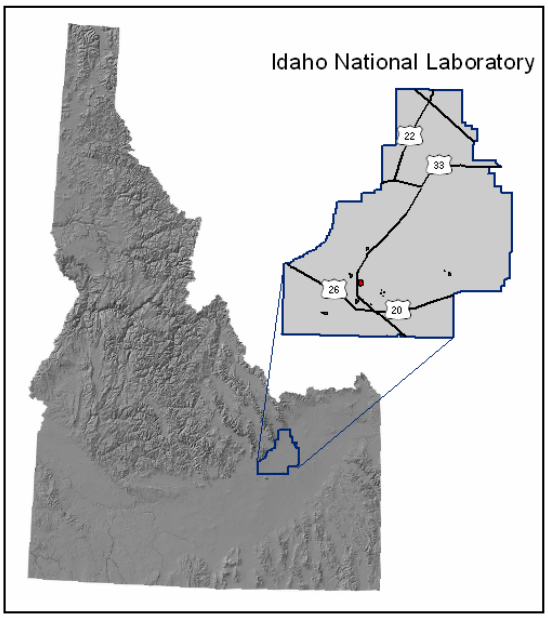
ACRONYMS

BBS	Breeding Bird Survey
BLR	Big Lost River
CB	Circular Butte
CFA	Central Facilities Area
CWCS	Comprehensive Wildlife Conservation Strategy
DOE	Department of Energy
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
KC	Kyle Canyon
MFC	Materials and Fuels Complex
NRF	Naval Reactor Facility
PBF	Power Burst Facility
RTC	Reactor Technology Complex
RWMC	Radioactive Waste Management Complex
SGCN	Species of Greatest Conservation Need
TAN	Test Area North
TB	Twin Butte
TF	Tractor Flats
TRA	Test Reactor Area
USGS	United States Geological Survey

INTRODUCTION

The Breeding Bird Survey (BBS) is a large-scale survey of North American birds. It is a roadside route survey of avifauna designed to monitor abundance and distribution of birds primarily covering the continental United States and southern Canada, although survey routes have recently been initiated in Alaska and northern Mexico (Sauer et al. 2003). The BBS was started in the eastern U.S. in 1966 with over 3,500 routes currently surveyed each June by experienced birders (USGS 2001a).

The primary objective of the BBS is the estimation of population change for songbirds. However, the data have many potential uses, and investigators have addressed a variety of research and management objectives.



The Idaho National Laboratory (INL), located in southeastern Idaho, is comprised of large expanses of relatively undisturbed shrub-steppe and grassland habitat. This area was designated as a National Environmental Research Park in 1975 and serves as an outdoor laboratory to assess environmental impacts of nuclear energy development technologies. Since 1985, official BBS and unofficial facility routes have been surveyed at the INL. These surveys yield useful information about population dynamics, effects of weather and fire on avian abundance, affects of INL facilities on avifauna, and the breeding status of a number of bird species of concern, including sagebrush obligate species and other species exhibiting declines throughout their range (e.g., see Belthoff and Ellsworth

1996, 1999 and 2000, Belthoff et al. 1998, and Ellsworth 2001).

This report summarizes results of surveys conducted in 2006 at the INL and compares findings to BBS surveys from previous years.

These annual surveys provide valuable long-term data for land managers and allow them to determine impacts of activities conducted at the INL and surrounding areas on breeding bird populations. These data also contribute to a nationwide database of bird population trends that is used by state and federal agencies.

STUDY AREA

The 894-mi² (2,315-km²) INL is located approximately 30 mi (48 km) west of Idaho Falls on the upper Snake River Plain in southeastern Idaho, and occupies portions of Bingham, Bonneville, Butte, Clark, and Jefferson counties. The area is a semi-arid, cold desert with an elevation of approximately 4921 ft (1500 m) above sea level. Anderson et al. (1996) detailed the climate, geology, and vegetation of the INL. Briefly, vegetation in the study area is typical of shrub-steppe ecosystems and is dominated by woody, mid-height shrubs and perennial bunchgrasses. Big sagebrush (*Artemisia tridentata*) dominates much of the vegetation on the site, but other primary shrubs include green rabbitbrush (*Chrysothamnus viscidiflorus*), shadscale (*Atriplex confertifolia*), and winterfat (*Krascheninnikovia lanata*). Native grasses that are dominant throughout the site are bottlebrush squirreltail (*Elymus elymoides*), thickspike wheatgrass (*Elymus lanceolatus*), needle-and-thread grass (*Hesperostipa comata*), Indian ricegrass (*Achnatherum hymenoides*), and bluebunch wheatgrass (*Pseudoroegneria spicata*). Basalt lava flows dominate the geology of the region, and the topography is flat to gently rolling, with the exception of East and Middle Buttes, which protrude from the southern

portion of the area. The southern extensions of two of the largest mountain ranges in Idaho (Lost River and Lemhi Mountains) rise above the INL site and Snake River Plain to the north and west. The area experiences hot, dry summers and cold winters (Short 1986). Annual precipitation averages approximately 8 in. (20 cm), and most of this occurs during the spring. Surface water in the summer is limited to residual flows of the Big Lost River and Birch Creek, each of which are diverted upstream of the site for agriculture and flood prevention. During the spring, the Big Lost River may flow into an ephemeral wetland known as the Lost River Sinks, which can provide nesting and migratory stopover habitat for waterfowl and shorebirds. Several human-made wastewater treatment ponds are located near research facilities which attract birds that prefer aquatic habitats.

METHODS

Thirteen Breeding Bird Survey routes were surveyed once each from May 18 – June 16, 2006 (Figure 1). Five remote routes are standard 25-mi (40-km) BBS routes, data from which are reported to the USGS Biological Resources Division annually. These routes traverse the remote areas of the INL and include major habitat types throughout the site. Eight facility routes are located in and around major INL facility complexes.

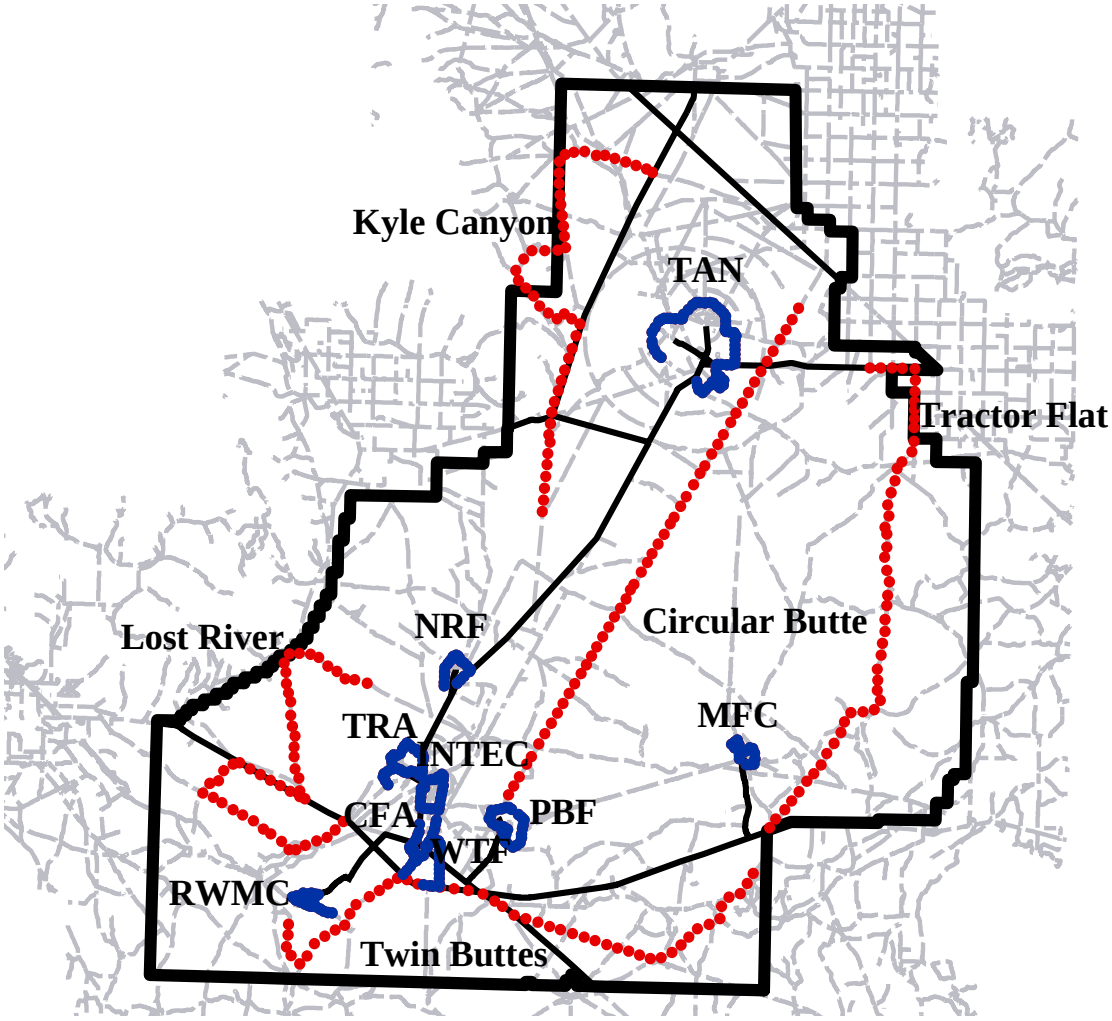


Figure 1. Facility (blue) and remote (red) breeding bird survey routes on the INL.

The North American Breeding Bird Survey protocol provided by USGS Patuxent Wildlife Research Center (USGS 2001b), was followed during these surveys. On remote routes, we located 50 stops at approximately 0.5 mile (0.8 km) intervals and counted all individual birds (except dependent young) of all species seen or heard during a 3-minute period within 0.25 mile (0.4 km) of the stop. Facility routes consist of 18–60 stop locations at approximately 0.2 mile (0.32 km) intervals and individual birds were recorded if they were within 0.1-mile (0.16 km) from the observer (i.e., half the distance between stops). Individuals known or strongly suspected to have been counted at a previous stop were not recounted. Surveys began

approximately ½ hour before official sunrise as given by the Astronomical Applications Department, U.S. Naval Observatory (2005). A certified BBS observer relayed counts verbally from outside the vehicle to an assistant who recorded the information on an official data sheet. Each route took approximately 1- 6 hours to complete.

Temperature, wind speed, and cloud cover were recorded at the start and end of each survey route. Surveys were conducted only under satisfactory weather conditions including good visibility, little or no precipitation, and light winds in order to be comparable to previous years. Survey dates for each route are in Appendix A.

Single Factor Analysis of Variance was used to test the differences among years for all routes, and facility and remote routes for both abundance and species diversity. Even though comparisons between remote routes were conducted comparisons between facility routes, and facility and remote routes are problematic since the areas surveyed are not consistent. A level of 0.05 was used to determine significance. Appendix A contains summaries of the data and results from the analysis of variance. Trends for selected species were calculated by using least squares. Trend data is used to display what populations of selected species have been doing over time and their responses to habitat change.

RESULTS

Bird abundance and species richness

Abundance — A total of 5,974 individual birds were recorded along the 13 survey routes. This is above the annual mean of 4,970 birds (no surveys were conducted in 1992 or 1993). Approximately 68 mi^2 (177 km^2) total area was surveyed (Table 1) during the BBS, representing approximately 8 percent of the INL. Total bird abundance on the INL varied

significantly among years ($p=1.2^{-07}$) with the greatest number of birds observed in 1998 (n=6805) and the lowest in 1988 (n=2119).

Table 1. Number of species, number of individual birds, and average number of individuals per km² along Remote Routes (n = 5) and Facility Complex Routes (n = 8) at the INL in 2006.

Route	Stops	Area Surveyed (km²)	Species	n	Birds/ km²
		Remote Routes			
Big Lost River	50	25	23	655	26.2
Circular Butte	50	25	20	553	22.1
Kyle Canyon	50	25	27	571	22.8
Tractor Flats	50	25	31	762	30.5
Twin Buttes	50	25	26	644	25.8
Subtotal	**250**	**125**	**48***	**3185**	**27.3**
		Facility Complex Routes			
CFA	42	10	28	469	46.9
INTEC	25	5	23	233	46.6
MFC	18	4	25	204	51.0
NRF	20	4	25	265	66.2
PBF	28	6	19	351	58.5
RWMC	20	4	25	223	55.7
TAN	60	12	25	695	57.3
RTC (TRA)	32	7	26	349	49.3
Subtotal	**245**	**52**	**55***	**2789**	**44.5**
TOTAL	**495**	**177**	**66***	**5974**	**33.7**

*** Many similar species are observed on multiple routes, thus this number reflects one documented occurrence of each species observed.**

During the 2006 BBS approximately 10 mi^2 (25 km^2) was surveyed and an average of 27 birds was seen per 0.4 mi^2 (1 km^2) on each remote route. The Tractor Flats route continues to have the highest density of birds with 31 birds detected per 0.4 mi^2 (1 km^2) (Table 1). Bird abundance on remote routes varied significantly from 1985 to 2006 ($p=3.7^{-07}$). The highest

number of birds recorded on remote routes was counted during the 1998 BBS with 3,638 (Figure 2). The fewest number of birds recorded on the remote routes was in 1988 with only 1,092 (Figure 2).

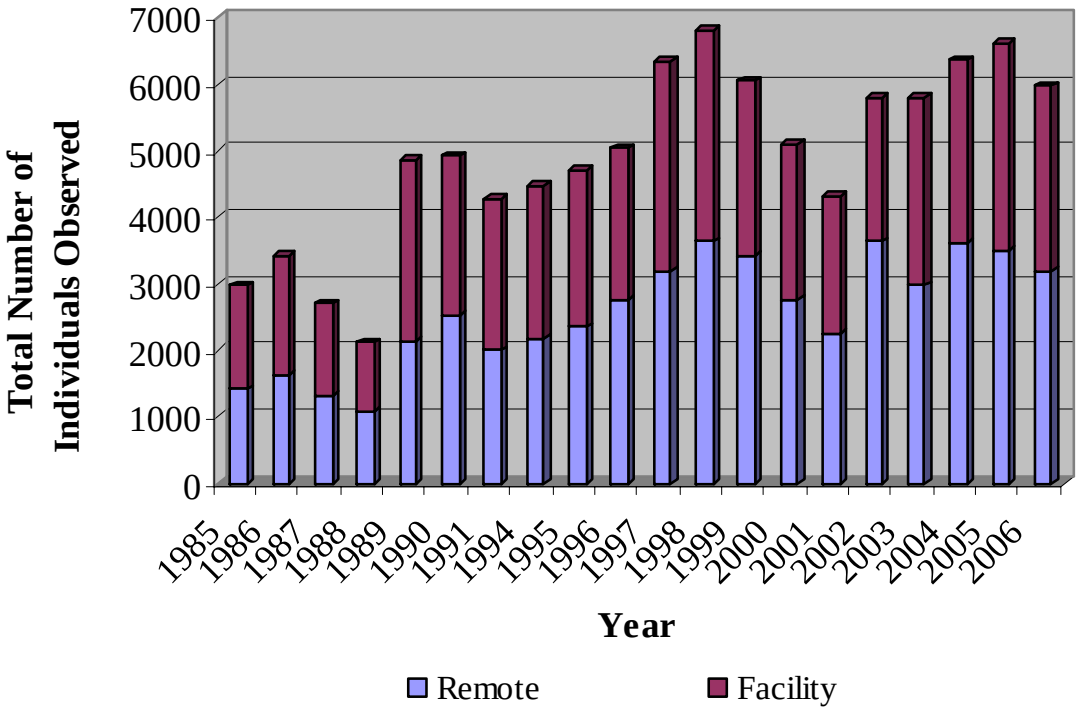


Figure 2. Total number of individuals recorded by year (1985-2006) along 13 permanent survey routes at the Idaho National Laboratory.

A significant difference in bird abundances ($p=0.0005$) is also detected between the five remote routes. The Tractor Flats route has on average the greatest number of individuals ($n=704$) seen per year as well as the greatest fluctuations over time (Figure 3).

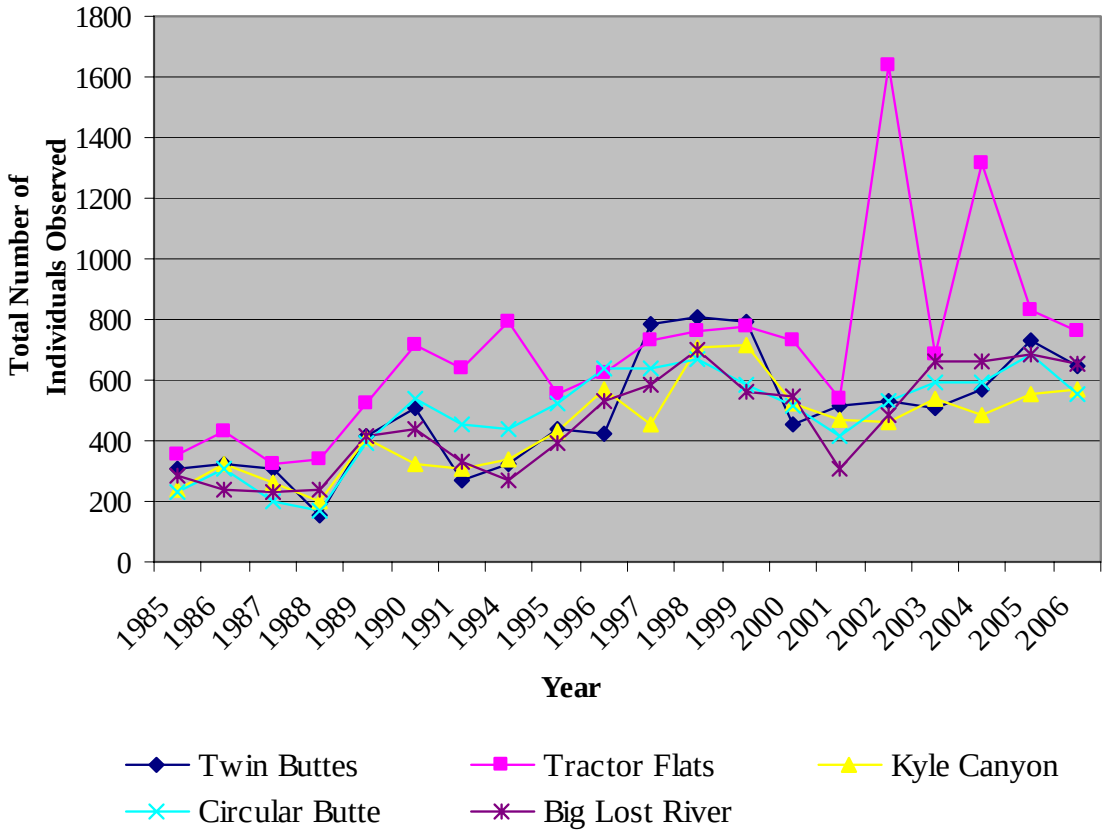


Figure 3. Total number of individuals recorded by year (1985-2006) along the 5 remote routes at the Idaho National Laboratory.

The area surveyed on the eight facility complex routes range from approximately 1.5 mi^2 (4 km^2) at MFC, NRF, and RWMC to more than 4.6 mi^2 (12 km^2) at TAN. This is a total of roughly 20 mi^2 (52 km^2) surveyed at the facilities. Total bird abundance on facility routes varied significantly from 1985 to 2006 ($p=4.92^{-04}$). In 1998 bird numbers peaked on facility routes with 3,167 birds counted. Only 1,027 birds were detected in 1988, the fewest numbers of birds recorded on the facility routes. The highest density of birds observed per 0.4 mi^2 (km^2) on a facility route during the 2006 BBS was at NRF which averaged 66 birds. The area surveyed on each facility routes differs, so comparisons between facility routes are not analogous.

Horned larks (scientific names of all species are provided in Table 2) were the most abundant species recorded on the INL during 2006. Horned larks totaled 27 percent of all birds counted, occurred on all routes, and on more than 85 percent of stops (Table 2). Other common species include western meadowlark, Brewer's sparrow, sage thrasher, and sage sparrow, each of which occurred at more than 200 stops along all 13 routes (Table 2). These five species account for approximately 71 percent of all birds counted. The common raven and brown-headed cowbird also occurred along each of the 13 routes but with lower abundances. Mourning dove and vesper sparrow occurred in high numbers but were only recorded on 12 of the 13 routes.

The high numbers of birds counted in 2006 does not necessarily reflect large numbers of birds counted among all taxa. Many species observed were neither widespread nor abundant. Of the 66 species recorded in 2006, 18 species (27 percent) occurred along only one of the 13 routes, and 34 species (51 percent) were represented by fewer than ten individuals (Table 2). Additionally, many species were at or below long-term averages and a few species observed frequently in previous years were absent in 2006 including: bank swallow, eastern kingbird, and mountain bluebird as well as many waterfowl and wading species. Instead, the total count was inflated by high counts of horned lark and western meadowlark. Several species recorded during 2006 do not actively nest on the INL, including Canada goose, and Franklin's gull. The six most numerous species in order of abundance were horned larks, western meadowlarks, Brewer's sparrows, sage thrasher, and sage sparrows and mourning dove. More than 76 percent of all birds detected in 2006 are the above six species. Appendix B contains a list of species observed and their relative abundance along the 13 survey routes.

Table 2. Species and number of birds observed along all 13 Breeding Bird Survey routes at the Idaho National Laboratory during the 2006 census.

Common Name	Scientific Name	n	percent	Routes[1]	Stops[2]	percent
Horned Lark	*Eremophila alpestris*	1616	27.0	5,8	423	85.4
Western Meadowlark	*Sturnella neglecta*	1055	17.7	5,8	411	83.0
Brewer's Sparrow	*Spizella breweri*	794	13.3	5,8	364	73.5
Sage Thrasher	*Oreoscoptes montanus*	458	8.0	5,8	316	63.8
Sage Sparrow	*Amphispiza belli*	333	5.5	5,8	239	48.3
Mourning Dove	*Zenaida macroura*	333	5.5	5,7	143	28.9
Vesper Sparrow	*Pooecetes gramineus*	227	3.8	5,7	134	27.1
Brown-headed Cowbird	*Molothrus ater*	196	3.3	5,8	113	22.8
Brewer's Blackbird	*Euphagus cyanocelphalus*	93	1.6	1,6	27	5.4
Common Raven	*Corvus corax*	77	1.3	5,8	67	13.5
Barn Swallow	*Hirundo rustica*	64	1.1	2,8	28	5.7
European Starling	*Sturnus vulgaris*	62	1.0	0,8	24	4.8
Canada Goose[3]	*Branta canadensis*	50	0.8	0,1	2	0.4
Sage Grouse	*Centrocercus urophasianus*	46	0.8	2,1	5	1.0
Franklin's Gull[3]	*Larus pipixcan*	41	0.6	1,0	2	0.4
Loggerhead Shrike	*Lanius ludovicianus*	38	0.6	5,4	33	6.7
Red-tailed Hawk	*Buteo Jamaicensis*	34	0.6	5,5	31	6.3
Rock Wren	*Salpinctes obsoletus*	33	0.5	4,7	27	5.4
House Finch	*Carpodacus mexicanus*	32	0.5	1,4	16	3.2
Killdeer	*Charadrius vociferus*	32	0.5	0,6	23	4.6
Rock Pigeon	*Columba livia*	32	0.5	0,2	4	0.8
Common Nighthawk	*Chordeiles minor*	23	0.4	3,3	6	1.2
Lark Sparrow	*Chondestes grammacus*	22	0.4	4,3	19	3.8
Black-billed Magpie	*Pica pica*	21	0.3	3,1	14	2.8
American Robin	*Turdus migratorius*	19	0.3	3,5	16	3.2

Table 2. Continued.

Common Name	Scientific Name	n	percent	Routes[1]	Stops[2]	percent
Chipping Sparrow	*Spizella passerina*	19	0.3	4,5	18	3.6
Mallard	*Anas platyrhynchos*	19	0.3	1,5	10	2.0
Gray Flycatcher	*Empidonax wrightii*	17	0.3	2,0	11	2.2
Say's Phoebe	*Sayornis saya*	16	0.3	0,8	16	3.2
Lark Bunting	*Calamospiza melanocorys*	15	0.2	3,3	14	2.8
N. Rough-winged Swallow	*Stelgidopteryx serripennis*	15	0.2	2,4	9	1.8
Ferruginous Hawk	*Buteo regalis*	10	0.2	3,0	7	1.4
American Kestrel	*Falco sparverius*	9	0.1	2,2	8	1.6
Unknown Swallow		9	0.1	0,1	1	0.2
Yellow-head Blackbird	*Xanthocephalus xanthocephalus*	9	0.1	0,4	8	1.6
Grasshopper Sparrow	*Ammodramus savannarum*	8	0.1	3,2	8	1.6
House Sparrow	*Passer domesticus*	8	0.1	0,4	5	1.0
Northern Harrier	*Circus cyaneus*	8	0.1	4,2	8	1.6
Swainson's Hawk	*Buteo swainsoni*	7	0.1	2,1	6	1.2
Gadwall	*Anas Strepera*	6	0.1	0,2	3	0.6
Western Kingbird	*Tyrannus verticalis*	6	0.1	2,1	4	0.8
Burrowing Owl	*Athene cunicularia*	5	<0.1	2,2	5	1.0
Green-tailed Towhee	*Pipio chlorurus*	5	<0.1	1,2	4	0.8
Long-billed Curlew	*Numenius americanus*	5	<0.1	1,0	4	0.8
Black-throated Sparrow	*Amphispiza bilineata*	4	<0.1	2,0	3	0.6
Short-eared Owl	*Asio flammeus*	4	<0.1	2,0	3	0.6
Wilson's Phalarope	*Phalaropus tricolor*	4	<0.1	0,2	2	0.4
American Crow	*Corvus brachyrhynchos*	3	<0.1	1,0	3	0.6
Bullock's Oriole	*Icterus galbula*	3	<0.1	1,1	3	0.6
Cliff Swallow	*Hirundo pyrrhonota*	3	<0.1	0,1	2	0.4
Prairie Falcon	*Falco mexicanus*	3	<0.1	1,2	3	0.6

Table 2. Continued.

Common Name	Scientific Name	n	percent	Routes[1]	Stops[2]	percent
Violet-green Swallow	*Tachycineta thalassina*	3	<0.1	1,1	2	0.4
American Wigeon	*Anas americana*	2	<0.1	0,1	2	0.4
Golden Eagle	*Aquila chrysaetos*	2	<0.1	1,1	2	0.4
Northern Flicker	*Colaptes auratus*	2	<0.1	1,0	2	0.4
Northern Shoveler	*Anas clypeata*	2	<0.1	0,1	1	0.2
Redhead	*Aythya americana*	2	<0.1	0,1	1	0.2
Western Tanager	*Piranga ludoviciana*	2	<0.1	2,0	2	0.4
American Coot	*Fulica americana*	1	<0.1	0,1	1	0.2
Green-wing Teal	*Anas crecca*	1	<0.1	0,1	1	0.2
Merlin	*Falco columbarius*	1	<0.1	1,0	1	0.2
Northern Mockingbird	*Mimus polyglottos*	1	<0.1	1,0	1	0.2
Red-winged Blackbird	*Agelaius phoeniceus*	1	<0.1	1,0	1	0.2
Savannah Sparrow	*Passerculus sandwichensis*	1	<0.1	1,0	1	0.2
Willet	*Catoptrophorus semipalmatus*	1	<0.1	0,1	1	0.2
Unknown Raptor		1	<0.1	0,1	1	0.2
TOTAL	**5,974 Individuals**					
	66 Species					

[1] Number of remote routes along which species occurred, number of facility routes along which species occurred.
[2] Number of stops at which species were detected; total stops =495.
[3] Species not known to actively nest on the INL.

Species Richness - In 2006, 66 species were detected during the surveys. Although there were slightly fewer species observed than in 2005 (Figure 3) it is above the average of 58 (SE=1.8) recorded from 1985 to 2005. In 2006, the mean number of species per route was 25 (SE=0.9), with many similar species recorded along remote routes (mean=25 SE=1.8) and facility routes (mean=24 SE=0.9). The fewest number of species (19) was observed along the

PBF route while the Tractor Flat route had the greatest number of species (31).

Species richness varied significantly from 1985 to 2006 ($p=1.9^{-14}$). On average, more species (mean=25) were observed per route during the 2006 survey than in previous years (Figure 4). The fewest number of species per route (mean=15) was observed during the 1987 BBS. Data analysis also showed a significant difference in the number of species between all routes ($p=1.2^{-15}$), remote routes ($p=1.8^{-08}$), and facility routes ($p=2.3^{-08}$). The greatest average annual number of species occurred on the Kyle Canyon route (mean=25.4) while the PBF route (mean=15.3) had the least number of species detected.

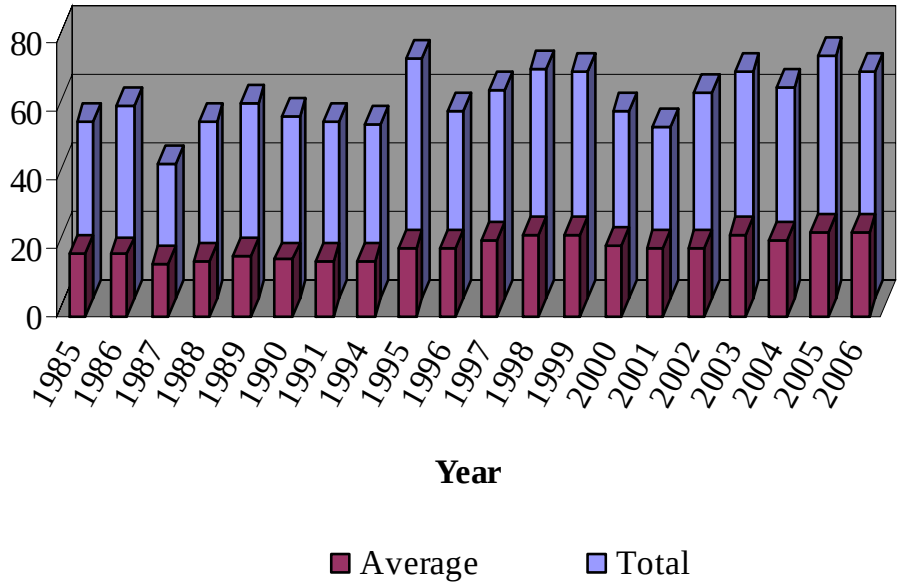


Figure 4. Total number of species and the average number of species per route recorded by year (1985-2006) along 13 permanent survey routes at the Idaho National Laboratory.

Species assemblages

In addition to the density of individuals and the number of species recorded on the INL, the composition of species in relation to habitat is an important indicator to ecological health.

Waterfowl - Seven species of waterfowl (order Anseriformes, family Anatidae) were observed during the 2006 survey which contributed approximately 1 percent (Figure 5) to the total individuals observed. Even though Canada goose was the most abundant species only a single flock was observed flying over TAN. Waterfowl have limited distribution on the INL and occur either in natural areas along the Big Lost River or in man-made ponds near facilities. Waterfowl counts at the INL were slightly below the long term average and observed at the facility wastewater treatment ponds or in transit to nearby areas where water is more abundant. Although water was present in the river channel of the Big Lost River during the 2006 BBS, it was not abundant enough to reach the Big Lost River Sinks or the Spreading Area near RWMC.

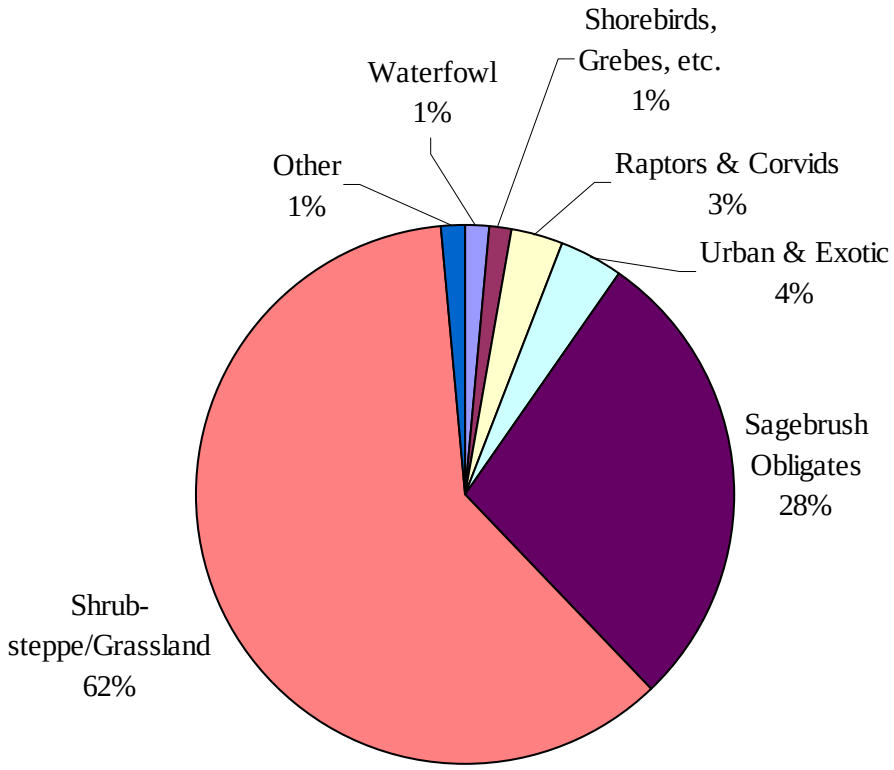


Figure 5. Percentage of species assemblages observed during 2006 BBS.

Shorebirds, Grebes, Gulls, Pelicans and Waders - Five species of shorebirds/gulls, terns/grebes/pelicans and wading birds were observed (Table 2). Of these, Franklin's gull and long-billed curlew were only observed on the Tractor Flat route. American coot, killdeer, Wilson's phalarope, and willet were observed only on facility routes.

Like waterfowl, many shorebirds and wading birds are closely tied to water, which is available at waste-water ponds near facilities, natural waterways (The Big Lost River, Sinks, and Spreading Areas), and adjacent agricultural fields. Shorebirds/gulls and terns/grebes/pelicans and wading birds represent 1 percent of all individual birds observed (Figure 5).

Raptors and Corvids - Ten species of raptors (eagles, falcons, hawks, and owls) were observed along the survey routes. Red-tailed hawk was the most abundant species on both facility (n=10) and remote routes (n=24) and in the greatest numbers since 1986 when 35 red-tails were recorded. The second observation of a Merlin seen during a BBS route was recorded in 2006. Both were spotted on the Kyle Canyon route.

Corvidae is a family of birds which contains the ravens and crows (Genus *Corvus*), magpies (Genus *Pica*), and jays (Genus *Perisoreus*, *Gymnorhinus,* and *Nucifraga*). Common ravens (*Corvus corax*) were the most abundant corvid (n=77) and were observed on all routes. More ravens were observed on remote (n=43) than facility (n=34) routes. Raptors and corvids constituted 3 percent of the total individuals observed (Figure 5).

Urbanized and Exotic Species - Species associated with human activities (introduced species, or species associated with human-altered landscapes) typically occur on facility routes rather than remote routes. European starlings, Say's phoebes, house sparrows, and rock pigeons were only observed on facility routes. Although barn swallows, American robins, and

house finches were observed on both facility and remote routes they occurred in much smaller numbers on the remote routes. Urbanized and exotic species made up 4 percent of all individual birds observed during the 2006 survey (Figure 5).

Sagebrush Obligates - Even though sagebrush obligate numbers continue to be below the long term average, the trend in population abundance remains stable for both facility and remote routes (Figure 6). On remote routes, sagebrush obligates were most often observed (per km²) on the Kyle Canyon route during the 2006 survey (Table 3). Over the long term, sagebrush obligates occurred most often on the Big Lost River route, but since the 2000 Tin Cup fire their numbers have dramatically declined. Brewer's sparrow was the most abundant sagebrush-obligate species on both remote and facility routes (Table 3). Twenty-eight percent of the total number of birds observed during the 2006 Breeding Bird Survey was sagebrush obligates (Figure 5).

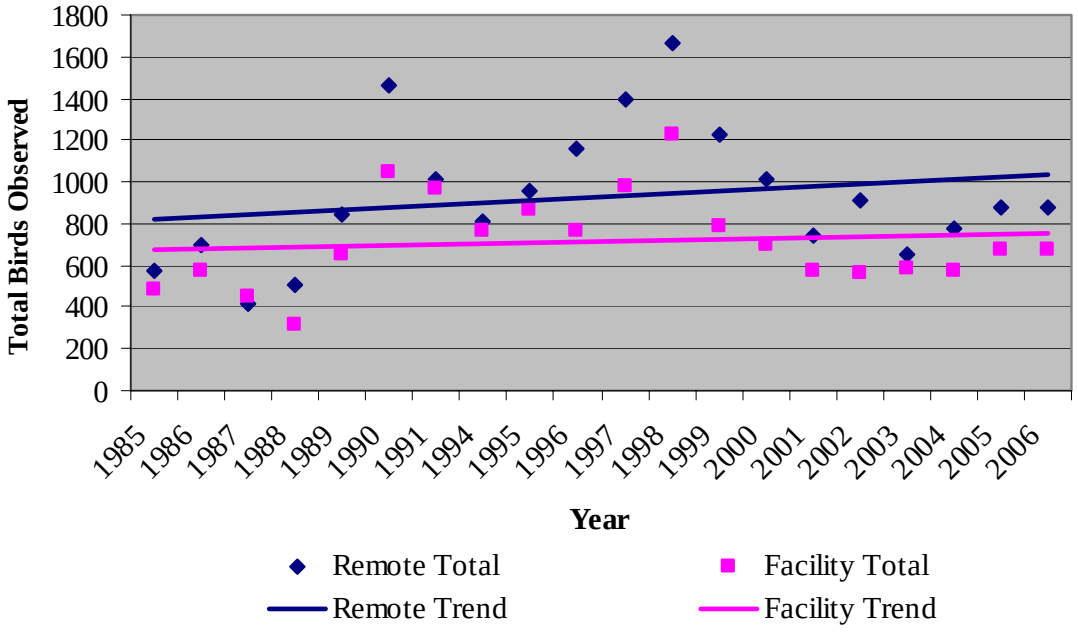


Figure 6. Total number of sage brush obligates and their population trend since 1985.

Table 3. Species abundance per route for selected species at the INL. For each species, the 1st line represents the total number recorded during 2006 on that route, the 2nd line is the number recorded per km² during 2006, and the 3rd line is the total number recorded since 1985 (no counts were conducted during 1992 and 1993).

	Remote routes						Facility complex routes								
Species	BLR	CB	KC	TB	TF	Total	CFA	INTEC	MFC	NRF	PBF	RWMC	TAN	TRA	Total
SAGEBRUSH OBLIGATES															
Brewer's Sparrow	76	82	77	89	64	388	52	35	13	34	95	31	102	44	406
	(3.0)	(3.3)	(3.1)	(3.6)	(2.6)		(5.2)	(7.0)	(3.2)	(8.5)	(15.8)	(7.7)	(8.5)	(6.3)	
	1548	1425	1047	1112	1583	6715	814	1047	408	504	1059	471	1049	1123	6475
Sage Sparrow	24	49	62	45	21	201	21	14	5	15	19	6	46	6	132
	(1.0)	(2.0)	(2.5)	(1.8)	(0.8)		(2.1)	(2.8)	(1.2)	(3.7)	(3.2)	(1.5)	(3.8)	(0.9)	
	1423	1258	1264	1314	1178	6437	719	517	354	455	738	334	1271	819	5207
Sage Thrasher	35	47	47	50	38	217	39	22	9	24	41	22	62	22	241
	(1.5)	(1.9)	(1.9)	(2.0)	(1.5)		(3.9)	(4.4)	(2.2)	(6.0)	(6.8)	(5.5)	(5.2)	(3.1)	
	989	972	878	971	950	4760	696	537	299	354	677	390	1017	604	4574
Sage Grouse	1	0	0	0	44	45	0	0	0	0	0	1	0	0	1
	-	-	-	-	(1.8)		-	-	-	-	-	-	-	-	
	11	33	1	8	164	217	12	0	2	0	2	5	0	23	44
OTHER COMMON SHRUBSTEPPE/GRASSLAND SPECIES															
Horned Lark	287	161	108	145	175	876	63	63	36	59	55	43	283	138	740
	(11.5)	(6.4)	(4.3)	(5.8)	(7.0)		(6.3)	(12.6)	(9.0)	(14.7)	(9.2)	(10.7)	(23.6)	(19.7)	
	2112	2234	1427	1973	3468	11214	790	809	575	744	465	466	3143	1152	8144
Western Meadowlark	134	119	95	161	155	664	63	39	43	36	92	35	25	58	391
	(5.4)	(4.8)	(3.8)	(6.4)	(6.2)		(6.3)	(7.8)	(10.7)	(9.0)	(15.3)	(8.7)	(2.1)	(8.3)	
	1601	2131	1363	1919	2206	9220	1111	818	886	724	1115	632	637	1253	7176
Brown-headed	8	17	3	33	23	84	28	6	20	17	21	7	5	8	112
Cowbird	(0.3)	(0.7)	(0.1)	(1.3)	(0.9)		(2.8)	(1.2)	(5.0)	(4.2)	(3.5)	(1.7)	(0.4)	(1.1)	
	328	421	71	377	506	1703	511	166	296	193	327	94	172	288	2047
Brewer's Blackbird	0	0	0	3	0	3	49	4	24	5	1	0	7	0	90
	-	-	-	(0.1)	-		(4.9)	(0.8)	(6.0)	(1.2)	(0.2)	-	(0.6)	-	
	108	40	67	83	51	349	720	116	281	115	140	50	137	243	1802

Table 3. Continued

Species	Remote routes						Facility complex routes								
	BLR	CB	KC	TB	TF	Total	CFA	INTEC	MFC	NRF	PBF	RWMC	TAN	TRA	Total
OTHER COMMON SHRUBSTEPPE SPECIES															
Vesper Sparrow	31	9	48	8	15	111	15	8	2	17	6	0	48	20	116
	(1.2)	(0.4)	(1.9)	(0.3)	(0.6)		(1.5)	(1.6)	(0.5)	(4.2)	(1.0)	-	(4.0)	(2.9)	
	127	84	736	356	81	1384	44	33	24	131	48	9	886	80	1255
Common Nighthawk	0	4	1	15	0	20	0	0	1	0	1	0	1	0	3
	-	(0.2)	-	(0.6)	-		-	-	(0.2)	-	(0.2)	-	(0.1)	-	
	104	174	29	168	241	717	69	53	112	89	59	89	20	37	528
Mourning Dove	10	41	61	49	129	290	16	0	10	7	4	1	4	1	43
	(0.4)	(1.6)	(2.4)	(1.9)	(5.2)		(1.6)	-	(2.5)	(1.7)	(0.7)	(0.2)	(0.3)	(0.1)	
	333	481	541	1015	791	3161	197	53	114	163	185	163	373	211	1459
SPECIES OF SPECIAL CONCERN															
Ferruginous Hawk	0	1	6	3	0	10	0	0	0	0	0	0	0	0	0
	-	-	(0.2)	(0.1)	-		-	-	-	-	-	-	-	-	
	21	25	146	31	6	229	3	2	1	0	3	0	15	4	28
Loggerhead Shrike	6	3	12	1	5	27	4	2	0	0	2	3	0	0	11
	(0.2)	(0.1)	(0.5)	-	(0.2)		(0.4)	(0.4)	-	-	(0.3)	(0.7)	-	-	
	46	62	158	141	48	412	43	5	28	7	53	53	12	16	178
Long-billed Curlew	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0
	-	-	-	-	(0.2)		-	-	-	-	-	-	-	-	
	0	0	2	0	38	40	0	0	0	1	0	0	0	0	1
Franklin's Gull	0	0	0	0	41	41	0	0	0	0	0	0	0	0	0
	-	-	-	-	(1.6)		-	-	-	-	-	-	-	-	
	0	10	62	0	1349	1421	54	0	88	0	0	1	487	0	577
Burrowing Owl	0	1	1	0	0	2	2	0	0	0	0	0	0	1	3
	-	-	-	-	-		(0.2)	-	-	-	-	-	-	(0.1)	
	1	2	1	4	10	18	3	1	6	0	0	0	8	2	20
Lark Bunting	6	3	0	0	1	10	0	0	0	1	0	0	0	3	4
	(0.2)	(0.1)	-	-	-		-	-	-	(0.2)	-	-	-	(0.4)	
	21	66	2	1	45	125	4	5	6	28	14	0	3	3	63

Other Common Shrub-steppe/Grassland Species - Common shrub-steppe/grassland species that occur on the INL include horned lark, western meadowlark, Brewer's blackbird, brown-headed cowbird, common nighthawk, mourning dove and vesper sparrow. Of all individual birds observed, more than 60 percent are shrub-steppe/grassland species (Figure 5). Although more shrub-steppe/grassland species were observed on remote routes, the number per km² was much greater on facility routes with the most species observed per km² at NRF. Horned lark and western meadowlark were the most common species recorded and occurred on all routes. Although, horned lark populations dropped from record numbers recorded in 2005 horned larks are still greater than in years preceding wildfires that occurred across the INL landscape during the mid 1990's and early 2000's (Figure 7).

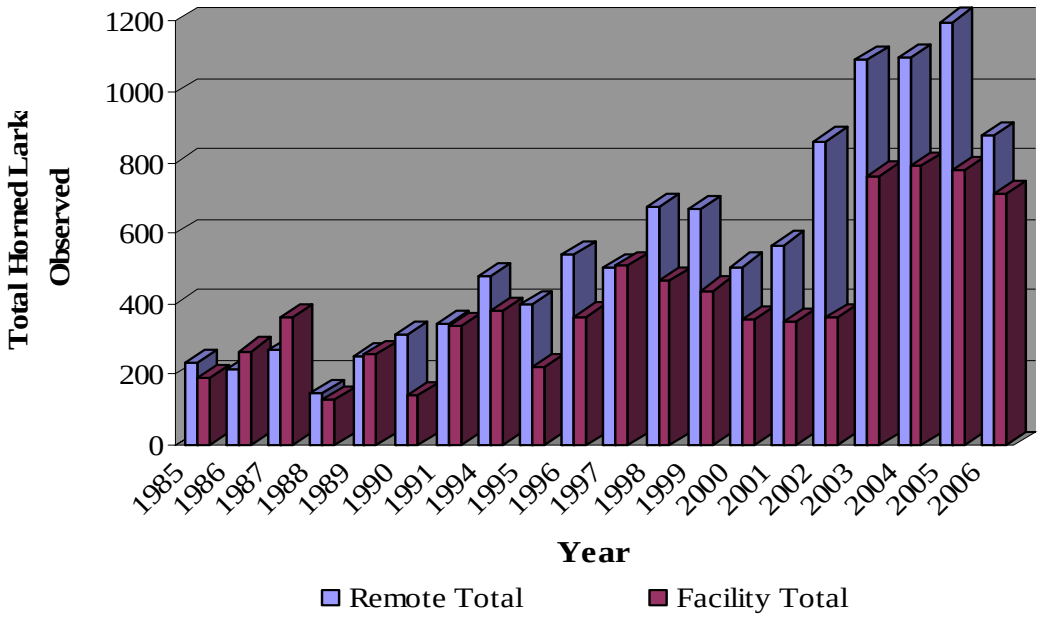


Figure 7. Horned Lark abundance from 1985-2006 on facility and remote routes.

Species of special concern - The sagebrush steppe habitat on the INL continues to support species of birds that are low or declining in number throughout the Intermountain West. In February of 2006 the U.S. Fish and Wildlife Service accepted the Idaho Comprehensive Wildlife Conservation Strategy (CWCS) submitted by Idaho Department of Fish and Game

(2005). The aim of the CWCS is to provide a long-term approach for the benefit of Species of Greatest Conservation Need (SGCN). The CWCS evaluated all animals thought by experts to be a candidate for SGCN. Even though species identified in their list contained many previously considered species of concern, several species were not listed such as loggerhead shrike, lark bunting, and northern mockingbird. Species that are new to this list include Brewer's sparrow, short-eared owl, and Wilson's phalarope. Nine species indicated as SGCN were recorded during the 2006 BBS. These species include Brewer's sparrow (794), sage grouse (46), Franklin's gull (41), ferruginous hawk (10), western burrowing owl (5), long-billed curlew (5), short-eared owl (4), Wilson's phalarope (4), and Merlin (1). This is only the second year that a Merlin was observed during the annual BBS.

Summary and Recommendations

Birds counted during the 2006 BBS continue to remain well above the annual mean at the INL. Species closely associated with shrub-steppe/grassland habitats were detected in the greatest numbers. Horned larks continue to be the most common species detected on both remote and facility routes, boosting the overall total of birds. Western meadowlark, Brewer's sparrow, sage thrasher, and sage sparrow continue to be the top 5 species observed. The Tractor Flats route had the most species recorded during 2006 as well as the most individuals identified than any other route.

Data analysis shows a significant difference in the total number of birds detected from 1985 to 2006 over the entire INL. This difference was also noticed in remote areas as well as facility areas. Factors that affect a population range from natural events, such as drought, wildfires and normal population fluctuations, to non-natural events such as the removal of resources through development or chemical application, and observer bias and experience.

A significant difference was also detected in the number of species detected from 1985 to 2006 using data from all routes, and the combination of data from remote and facility routes. Factors that influence species richness range from a change in habitat (creation or destruction) to the dispersion of individuals from nearby habitats looking for new places to nest. Overall, the most species seen per year occurs on the Kyle Canyon route, while PBF has the least number of species detected per year. Although the total number of species recorded during 2006 was slightly down from last year, more species per route were observed in 2006 than any other year.

Due to the expanding activities on the INL, we would recommend further analysis to determine factors that may be influencing abundance and species diversity on individual routes. This will provide insight to the impacts that activities on the INL are having on breeding bird populations.

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Appendix A

SINGLE FACTOR ANALYSIS OF VARIANCE RESULTS

1985-2006

INL comparison of the total number of individuals for years 1985-2006 (no surveys were conducted in 1992 & 1993)

ANOVA: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
1985	13	2972	228.6153846	7199.75641
1986	13	3426	263.5384615	10110.26923
1987	13	2703	207.9230769	5069.74359
1988	13	2119	163	4818.333333
1989	13	4853	373.3076923	30106.5641
1990	13	4924	378.7692308	26557.85897
1991	13	4279	329.1538462	22135.47436
1994	13	4468	343.6923077	38121.5641
1995	13	4713	362.5384615	20274.26923
1996	13	5037	387.4615385	24564.76923
1997	13	6346	488.1538462	29547.64103
1998	13	6805	523.4615385	48943.60256
1999	13	6055	465.7692308	38128.52564
2000	13	5091	391.6153846	30031.25641
2001	13	4318	332.1538462	18093.47436
2002	13	5807	446.6923077	144852.7308
2003	13	5792	445.5384615	26312.60256
2004	13	6366	489.6923077	81685.39744
2005	13	6606	508.1538462	37592.80769
2006	13	5974	459.5384615	39568.26923

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2639891.092	19	138941.6364	4.064314946	1.22488E-07	1.63005609
Within Groups	8204578.923	240	34185.74551			
Total	10844470.02	259				

Remote comparison of the total number of individuals for years 1985-2006 (no surveys were conducted in 1992 & 1993)

ANOVA: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
1985	5	1421	284.2	2667.7
1986	5	1618	323.6	4893.3
1987	5	1320	264	2661.5
1988	5	1092	218.4	5678.8
1989	5	2150	430	2934
1990	5	2519	503.8	20911.7
1991	5	2001	400.2	22135.7
1994	5	2164	432.8	44924.7
1995	5	2346	469.2	4643.7
1996	5	2773	554.6	7363.8
1997	5	3191	638.2	16363.7
1998	5	3638	727.6	2883.3
1999	5	3423	684.6	11664.8
2000	5	2772	554.4	11109.3
2001	5	2249	449.8	8979.7
2002	5	3634	726.8	259800
2003	5	2976	595.2	5895.2
2004	5	3628	725.6	113032
2005	5	3488	697.6	10057.3
2006	5	3185	637	6852.5

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2553133.76	19	134375.4611	4.752841121	3.69543E-07	1.718024834
Within Groups	2261812.8	80	28272.66			
Total	4814946.56	99				

Remote comparison of the total number of individuals for years 1985-2006 (no surveys were conducted in 1992 & 1993) between routes.

ANOVA: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Twin Buttes	20	9788	489.4	35229.83158
Tractor Flats	20	14077	703.85	97130.23947
Kyle Canyon	20	8863	443.15	20986.76579
Circular Butte	20	9667	483.35	24249.71316
Big Lost River	20	9193	459.65	27881.08158

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	910871.56	4	227717.89	5.541184416	0.000471414	2.467494653
Within Groups	3904075	95	41095.52632			
Total	4814946.56	99				

Facility comparison of the total number of individuals for years 1985-2006 (no surveys were conducted in 1992 & 1993).

ANOVA: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
1985	8	1551	193.875	7231.839286
1986	8	1808	226	10348.57143
1987	8	1383	172.875	3520.125
1988	8	1027	128.375	1452.553571
1989	8	2703	337.875	46204.125
1990	8	2405	300.625	15433.125
1991	8	2278	284.75	19438.78571
1994	8	2304	288	30463.71429
1995	8	2367	295.875	18897.26786
1996	8	2264	283	5478.285714
1997	8	3155	394.375	15170.26786
1998	8	3167	395.875	33885.83929
1999	8	2632	329	3114.571429
2000	8	2319	289.875	14376.41071
2001	8	2069	258.625	9821.125
2002	8	2173	271.625	8791.696429
2003	8	2816	352	15740.28571
2004	8	2738	342.25	10845.64286
2005	8	3118	389.75	17039.92857
2006	8	2789	348.625	27361.69643

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	802064.78	19	42213.93553	2.683522433	0.000492554	1.661327076
Within Groups	2202311	140	15730.79286			
Total	3004375.8	159				

INL comparison of the total number of species for years 1985-2006 (no surveys were conducted in 1992 & 1993)

ANOVA: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
1985	13	239	18.3846154	21.92307692
1986	13	233	17.9230769	30.24358974
1987	13	193	14.8461538	16.30769231
1988	13	203	15.6153846	22.75641026
1989	13	229	17.6153846	12.42307692
1990	13	213	16.3846154	9.423076923
1991	13	210	16.1538462	28.80769231
1994	13	211	16.2307692	15.52564103
1995	13	257	19.7692308	27.85897436
1996	13	255	19.6153846	13.75641026
1997	13	285	21.9230769	14.41025641
1998	13	312	24	29.83333333
1999	13	311	23.9230769	51.24358974
2000	13	266	20.4615385	7.602564103
2001	13	255	19.6153846	4.08974359
2002	13	257	19.7692308	9.025641026
2003	13	310	23.8461538	23.47435897
2004	13	285	21.9230769	9.576923077
2005	13	315	24.2307692	30.35897436
2006	13	323	24.8461538	9.974358974

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2543.0615	19	133.845344	6.888319373	1.8634E-14	1.63005609
Within Groups	4663.3846	240	19.4307692			
Total	7206.4462	259				

Remote comparison of the total number of species for years 1985-2006 (no surveys were conducted in 1992 & 1993)

ANOVA: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
1985	5	88	17.6	10.3
1986	5	92	18.4	42.8
1987	5	83	16.6	24.3
1988	5	88	17.6	21.8
1989	5	92	18.4	8.8
1990	5	81	16.2	3.2
1991	5	80	16	14.5
1994	5	78	15.6	11.3
1995	5	116	23.2	25.7
1996	5	105	21	26.5
1997	5	117	23.4	22.8
1998	5	135	27	54
1999	5	144	28.8	88.2
2000	5	109	21.8	13.7
2001	5	98	19.6	8.8
2002	5	98	19.6	9.8
2003	5	117	23.4	7.8
2004	5	107	21.4	14.3
2005	5	124	24.8	34.2
2006	5	127	25.4	17.3

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1420.19	19	74.7468421	3.24915636	0.000118855	1.718024834
Within Groups	1840.4	80	23.005			
Total	3260.59	99				

Facility comparison of the total number of species between (across) years 1985-2006 (no surveys were conducted in 1992 & 1993)

ANOVA: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
1985	8	151	18.875	30.98214286
1986	8	141	17.625	27.125
1987	8	110	13.75	10.5
1988	8	115	14.375	21.98214286
1989	8	137	17.125	15.55357143
1990	8	132	16.5	14.28571429
1991	8	130	16.25	41.07142857
1994	8	133	16.625	19.69642857
1995	8	141	17.625	19.41071429
1996	8	150	18.75	6.214285714
1997	8	168	21	9.142857143
1998	8	177	22.125	9.839285714
1999	8	167	20.875	9.839285714
2000	8	157	19.625	3.125
2001	8	157	19.625	1.982142857
2002	8	159	19.875	9.839285714
2003	8	193	24.125	35.55357143
2004	8	178	22.25	7.928571429
2005	8	191	23.875	32.125
2006	8	196	24.5	6.857142857

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1472.06875	19	77.4773026	4.65254297	3.5637E-08	1.661327076
Within Groups	2331.375	140	16.6526786			
Total	3803.44375	159				

Appendix B

SUMMARY OF SPECIES BY ROUTE
2006

Survey Route: **BIG LOST RIVER**
Survey Date: **May 30, 2006**

Species	Abundance	Percentage
Horned Lark	287	43.8
Western Meadowlark	134	20.5
Brewer's Sparrow	76	11.6
Sage Thrasher	35	5.3
Vesper Sparrow	31	4.7
Sage Sparrow	24	3.7
Common Raven	11	1.7
Red-tailed Hawk	11	1.7
Mourning Dove	10	1.5
Brown-headed Cowbird	8	1.2
Loggerhead Shrike	6	0.9
Lark Bunting	6	0.9
Short-eared Owl	3	0.5
Northern Rough-winged Swallow	3	0.5
Grasshopper Sparrow	2	0.3
Mallard	1	0.1
Greater Sage Grouse	1	0.1
Prairie Falcon	1	0.1
Barn Swallow	1	0.1
American Robin	1	0.1
Chipping Sparrow	1	0.1
Lark Sparrow	1	0.1
Red-winged Blackbird	1	0.1

Total Individuals =	***655***
Total Species =	***23***

Survey Route: CIRCULAR BUTTE
Survey Date: June 12, 2006

Species	Abundance	Percentage
Horned Lark	161	29.1
Western Meadowlark	119	21.5
Brewer's Sparrow	82	14.8
Sage Sparrow	49	8.9
Sage Thrasher	47	8.5
Mourning Dove	41	7.4
Brown-headed Cowbird	17	3.1
Vesper Sparrow	9	1.6
Common Raven	6	1.1
Common Nighthawk	4	0.7
Loggerhead Shrike	3	0.5
Lark Sparrow	3	0.5
Lark Bunting	3	0.5
Rock Wren	2	0.4
Red-tailed Hawk	2	0.4
Grasshopper Sparrow	1	0.2
Chipping Sparrow	1	0.2
Burrowing Owl	1	0.2
Northern Harrier	1	0.2
Ferruginous Hawk	1	0.2

Total Individuals =	***553***
Total Species =	***20***

Survey Route: KYLE CANYON
Survey Date: June 16, 2006

Species	Abundance	Percentage
Horned Lark	108	18.9
Western Meadowlark	95	16.7
Brewer's Sparrow	77	13.5
Sage Sparrow	62	10.9
Mourning Dove	61	10.7
Vesper Sparrow	48	8.4
Sage Thrasher	47	8.2
Loggerhead Shrike	12	2.1
Gray Flycatcher	10	1.7
Black-billed Magpie	8	1.4
Ferruginous Hawk	6	1.0
Red-tailed Hawk	6	1.0
Swainson's Hawk	5	0.9
Common Raven	4	0.7
Lark Sparrow	4	0.7
Chipping Sparrow	3	0.5
Brown-headed Cowbird	3	0.5
Rock Wren	2	0.3
Black-throated Sparrow	2	0.3
Common Nighthawk	1	0.2
Northern Mockingbird	1	0.2
Northern Harrier	1	0.2
Western Kingbird	1	0.2
American Robin	1	0.2
Merlin	1	0.2
Burrowing Owl	1	0.2

Total Individuals =	***570***
Total Species =	***26***

Survey Route: TRACTOR FLATS
Survey Date: June 1, 2006

Species	Abundance	Percentage
Horned Lark	175	23.0
Western Meadowlark	155	20.3
Mourning Dove	129	17.0
Brewer's Sparrow	64	8.4
Greater Sage Grouse	44	5.8
Franklin's Gull	41	5.4
Sage Thrasher	38	5.0
Brown-headed Cowbird	23	3.0
Sage Sparrow	21	2.8
Vesper Sparrow	15	2.0
Common Raven	9	1.2
Black-billed Magpie	8	1.0
Long-billed Curlew	5	0.7
Loggerhead Shrike	5	0.7
Northern Harrier	3	0.4
American Crow	3	0.4
Western Kingbird	3	0.4
Red-tailed Hawk	2	0.3
Violet-green Swallow	2	0.3
American Kestrel	2	0.3
Rock Wren	2	0.3
Bullock's Oriole	2	0.3
Black-throated Sparrow	2	0.3
Northern Rough-winged Swallow	2	0.3
Barn Swallow	1	0.1
Golden Eagle	1	0.1
Savannah Sparrow	1	0.1
Chipping Sparrow	1	0.1
Lark Bunting	1	0.1
Western Tanager	1	0.1
Swainson's Hawk	1	0.1
Total Individuals =	***762***	
Total Species =	***31***	

Survey Route: TWIN BUTTES
Survey Date: June 9, 2006

Species	Abundance	Percentage
Western Meadowlark	161	25.0
Horned Lark	145	22.5
Brewer's Sparrow	89	13.8
Sage Thrasher	50	7.7
Mourning Dove	49	7.6
Sage Sparrow	45	7.0
Brown-headed Cowbird	33	5.1
Common Nighthawk	15	2.3
Common Raven	13	2.0
Vesper Sparrow	8	1.2
Gray Flycatcher	7	1.1
Rock Wren	3	0.5
Red-tail Hawk	3	0.5
Green-tailed Towhee	3	0.5
Ferruginous Hawk	3	0.5
American Kestrel	3	0.5
Brewer’s Blackbird	3	0.5
Northern Flicker	2	0.3
Lark Sparrow	2	0.3
Loggerhead Shrike	1	0.1
Short-eared Owl	1	0.1
Northern Harrier	1	0.1
Black-billed Magpie	1	0.1
American Robin	1	0.1
Western Tanager	1	0.1
Grasshopper Sparrow	1	0.1
House Finch	1	0.1
Total Individuals =	***645***	
Total Species =	***27***	

Survey Route: CFA
Survey Date: June 2, 2006

Species	Abundance	Percentage
Horned Lark	63	13.4
Western Meadowlark	63	13.4
Brewer's Sparrow	52	11.1
Brewer's Blackbird	49	10.4
Sage Thrasher	39	8.3
Brown-headed Cowbird	28	6.0
European Starling	28	6.0
Sage Sparrow	21	4.5
House Finch	17	3.6
Mourning Dove	16	3.4
Barn Swallow	16	3.4
Vesper Sparrow	15	3.2
Killdeer	11	2.3
Common Raven	8	1.7
American Robin	7	1.5
Loggerhead Shrike	4	0.8
Rock Pigeon	4	0.8
House Sparrow	4	0.8
Grasshopper Sparrow	3	0.6
Say's Phoebe	3	0.6
Chipping Sparrow	3	0.6
American Kestrel	3	0.6
Rock Wren	3	0.6
Mallard	3	0.6
Northern Rough-wing Swallow	2	0.4
Burrowing Owl	2	0.4
Green-tailed Towhee	1	0.2
Swainson's Hawk	1	0.2

Total Individuals =	***469***
Total Species =	***28***

Survey Route: INTEC
Survey Date: May 29, 2006

Species	Abundance	Percentage
Horned Lark	63	27.0
Western Meadowlark	39	16.7
Brewer's Sparrow	35	15.0
Sage Thrasher	22	9.4
Sage Sparrow	14	6.0
Vesper Sparrow	8	3.4
Common Raven	7	3.0
Brown-headed Cowbird	6	2.6
European Starling	6	2.6
Barn Swallow	5	2.1
House Finch	5	2.1
Brewer's Blackbird	4	1.7
Black-billed Magpie	4	1.7
Killdeer	3	1.3
American Robin	3	1.3
Loggerhead Shrike	2	0.9
Northern Harrier	1	0.4
Say's Phoebe	1	0.4
Chipping Sparrow	1	0.4
Red-tailed Hawk	1	0.4
Lark Sparrow	1	0.4
Yellow-headed Blackbird	1	0.4
House Sparrow	1	0.4
Total Individuals =	***233***	
Total Species =	***23***	

Survey Route: **MFC**
Survey Date: **May 31, 2006**

Species	Abundance	Percentage
Western Meadowlark	43	21.1
Horned Lark	36	17.6
Brewer's Blackbird	24	11.8
Brown-headed Cowbird	20	9.8
Brewer's Sparrow	13	6.4
Mourning Dove	10	4.9
Sage Thrasher	9	4.4
Killdeer	6	2.9
European Starling	5	2.4
Sage Sparrow	5	2.4
Mallard	5	2.4
House Finch	5	2.4
American Robin	4	2.0
Common Raven	3	1.5
American Widgeon	2	1.0
Red-tailed Hawk	2	1.0
Say's Phoebe	2	1.0
Vesper Sparrow	2	1.0
Rock Wren	2	1.0
Green-winged Teal	1	0.5
Barn Swallow	1	0.5
Common Nighthawk	1	0.5
Green-tailed Towhee	1	0.5
Yellow-headed Blackbird	1	0.5
Violet-green Swallow	1	0.5

Total Individuals =	***204***
Total Species =	***25***

Survey Route: NRF
Survey Date: May 25, 2006

Species	Abundance	Percentage
Horned Lark	59	22.3
Western Meadowlark	36	13.6
Brewer's Sparrow	34	12.8
Sage Thrasher	24	9.1
Vesper Sparrow	17	6.4
Brown-headed Cowbird	17	6.4
Sage Sparrow	15	5.7
Barn Swallow	14	5.3
Mourning Dove	7	2.6
Killdeer	5	1.9
Brewer’s Blackbird	5	1.9
Mallard	4	1.5
House Finch	4	1.5
Common Raven	4	1.5
Yellow-headed Blackbird	3	1.1
Wilson's Phalarope	3	1.1
Redhead	2	0.7
European Starling	2	0.7
Western Kingbird	2	0.7
House Sparrow	2	0.7
Gadwall	2	0.7
Grasshopper Sparrow	1	0.4
Say’s Phoebe	1	0.4
Rock Wren	1	0.4
Lark Bunting	1	0.4

Total Individuals =	***265***
Total Species =	***25***

Survey Route: PBF
Survey Date: May 19, 2006

Species	Abundance	Percentage
Brewer's Sparrow	95	27.1
Western Meadowlark	92	26.2
Horned Lark	55	15.7
Sage Thrasher	41	11.7
Brown-headed Cowbird	21	6.0
Sage Sparrow	19	5.4
Vesper Sparrow	6	1.7
Mourning Dove	4	1.1
Chipping Sparrow	4	1.1
Loggerhead Shrike	2	0.6
Common Raven	2	0.6
Rock Wren	2	0.6
Northern Rough-wing Swallow	2	0.6
Brewer’s Blackbird	1	0.3
Common Nighthawk	1	0.3
Say's Phoebe	1	0.3
Barn Swallow	1	0.3
Lark Bunting	1	0.3
European Starling	1	0.3

Total Individuals =	***351***
Total Species =	***19***

Survey Route: RWMC
Survey Date: May 22, 2006

Species	Abundance	Percentage
Horned Lark	43	19.3
Western Meadowlark	35	15.7
Brewer's Sparrow	31	13.9
Sage Thrasher	22	9.9
Barn Swallow	21	9.4
European Starling	14	6.3
Rock Wren	11	4.9
Brown-headed Cowbird	7	3.1
Sage Sparrow	6	2.7
Mallard	5	2.2
Say's Phoebe	4	1.8
Killdeer	3	1.3
Rough-wing Swallow	3	1.3
Cliff Swallow	3	1.3
Loggerhead Shrike	3	1.3
Red-tailed Hawk	2	0.9
Northern Shoveler	2	0.9
Mourning Dove	1	0.4
Common Raven	1	0.4
Wilson’s Phalarope	1	0.4
American Coot	1	0.4
Prairie Falcon	1	0.4
Greater Sage Grouse	1	0.4
Lark Sparrow	1	0.4
Bullock’s Oriole	1	0.4
Total Individuals =	***223***	
Total Species =	***25***	

Survey Route: TAN
Survey Date: May 18, 2006

Species	Abundance	Percentage (2006)
Horned Lark	283	40.7
Brewer's Sparrow	102	14.7
Sage Thrasher	62	8.9
Canada Goose	50	7.2
Vesper Sparrow	48	6.9
Sage Sparrow	46	6.6
Rock Pigeon	28	4.0
Western Meadowlark	25	3.6
Lark Sparrow	10	1.4
Brewer's Blackbird	7	1.0
Brown-headed Cowbird	5	0.7
Mourning Dove	4	0.6
Red-tailed Hawk	4	0.6
Rock Wren	4	0.6
Common Raven	3	0.4
Say's Phoebe	2	0.3
European Starling	2	0.3
Chipping Sparrow	2	0.3
Barn Swallow	1	0.1
Northern Harrier	1	0.1
American Robin	1	0.1
Golden Eagle	1	0.1
Willet	1	0.1
Prairie Falcon	1	0.1
Unknown Raptor	1	0.1
Common Nighthawk	1	0.1

Total Individuals =	***695***
Total Species =	***26***

Survey Route: RTC (TRA)
Survey Date: May 24, 2006

Species	Abundance	Percentage
Horned Lark	138	39.5
Western Meadowlark	58	16.6
Brewer's Sparrow	44	12.6
Sage Thrasher	22	6.3
Vesper Sparrow	20	5.7
Brown-headed Cowbird	8	2.3
Sage Sparrow	6	1.7
Common Raven	6	1.7
Gadwall	4	1.1
Yellow-headed Blackbird	4	1.1
Killdeer	4	1.1
European Starling	4	1.1
Barn Swallow	3	0.9
Chipping Sparrow	3	0.9
Northern Rough-wing Swallow	3	0.9
Lark Bunting	3	0.9
Say's Phoebe	2	0.6
Rock Wren	1	0.3
Mourning Dove	1	0.3
American Kestrel	1	0.3
Mallard	1	0.3
Red-tail Hawk	1	0.3
Burrowing Owl	1	0.3
American Robin	1	0.3
House Sparrow	1	0.3
Unknown Swallow	9	2.6
Total Individuals =	***349***	
Total Species =	***26***	