ANNUAL PROGRESS REPORT
Birds and Burns Network
Payette National Forest, Idaho
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Investigating the Use of Prescribed Fire to Restore Wildlife Habitat In the South Fork Salmon River (SFSR) Sub-basin

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Project Description: Fire has been an important ecological process in shaping forested landscapes and animal distributions in the SFSR sub-basin. Alterations in the structure and composition of forests in the sub-basin as a result of 60-70 years of fire suppression have also changed the structure of animal populations. Yet we do not have an understanding of the implications of fire exclusion on wildlife populations or their habitats. Objectives of the project are to use prescribed fire for three purposes: (1) restore fire to the ponderosa pine ecosystem; (2) reduce accumulation of fuels; and (3) improve wildlife and fish habitat. Effectiveness monitoring is conducted to quantitatively evaluate whether objectives of reducing fuels are met, and to assess effects of the potential fuel reductions on habitat and populations of focal wildlife species. The SFSR sub-basin provides habitat for both wildlife and fish TES species, including three Sensitive Species of woodpeckers (white-headed, black-backed and Lewis's woodpeckers) and four listed TES salmonid species. Little is known about how these species respond to prescribed fire treatments for ecosystem restoration, fire exclusion, or stand-replacing fire. The project will address information gaps by monitoring forest vegetation characteristics, woodpecker nesting densities and nest success, composition and abundance of songbirds, and abundance of two amphibian species (tailed frog & Idaho giant salamander) before and after prescribed fire treatments, and by comparing that data to existing information on bird and amphibian responses to stand-replacement fires. This project will help managers display trade-offs associated with different fire conditions (no fire, prescribed fire, and stand-replacing fire), identify potential conflicts in TES management, and assess potential benefits of habitat restoration. During Fiscal Year (FY) 2002, the Joint Fire Sciences Program (01-1-3-25: Prescribed fire strategies to restore wildlife habitat in ponderosa pine forests of the Intermountain West [Saab, Kotliar, Block]) and the National Fire Plan (02.RMS.C.2: Effects of wildland fire and fuel treatments on populations and habitats of terrestrial vertebrates in Intermountain forests [Block and Saab]) awarded matching funds for 3-5 years to help continue this work and implement the protocol and design on forests in seven other states across the western United States, known as the "*Birds and Burns Network*" (see web page http://www.fs.fed.us/rm/boise/teams/terrestrial/Joint%20Fire%20Sciences%20Project.htm). The project implements the Forest Service Natural Resource Agenda by increasing prescribed fire and forest fuel treatments in a critical watershed (under "Watershed Health and Restoration"), and by working with state, local and other partners toward sustainable forest ecosystem management (under "Sustainable Forest Ecosystem Management").

Partners: Partners in FY 2002 include the Payette NF (PNF), Rocky Mountain Research Station (RMRS), Forest Service Intermountain Region (R4) Fire Program, Pacific Northwest Research Station (PNW-Wenatchee Lab), Idaho Dept. of Fish & Game (IDFG), and Montana State University (MSU) Ecology Department. The following is a description of each partner's contribution. PNF fire program (Sam Hescock) provides funding, field housing, transportation, and equipment. PNF is also integrating field information with Forest Service management needs. PNW provides funding for field crews and for purchasing equipment. RMRS is responsible for the design and supervision of the field studies, development of a monitoring plan, collecting and analyzing field data, providing field equipment, and completing technical reports and publications. IDFG provides funding for field assistants. R4 fire program (Dave Thomas) provides funding for vehicles and data collection. Lisa Bate (contract biologist

with the Pacific Northwest Research Station) provides assistance with the sampling design and analyses of the vegetation data. MSU provided facilities for graduate students and is assisting with database management and data analysis. The project builds a sustainable partnership among agencies, research community, and conservation groups.

Study Site Selection

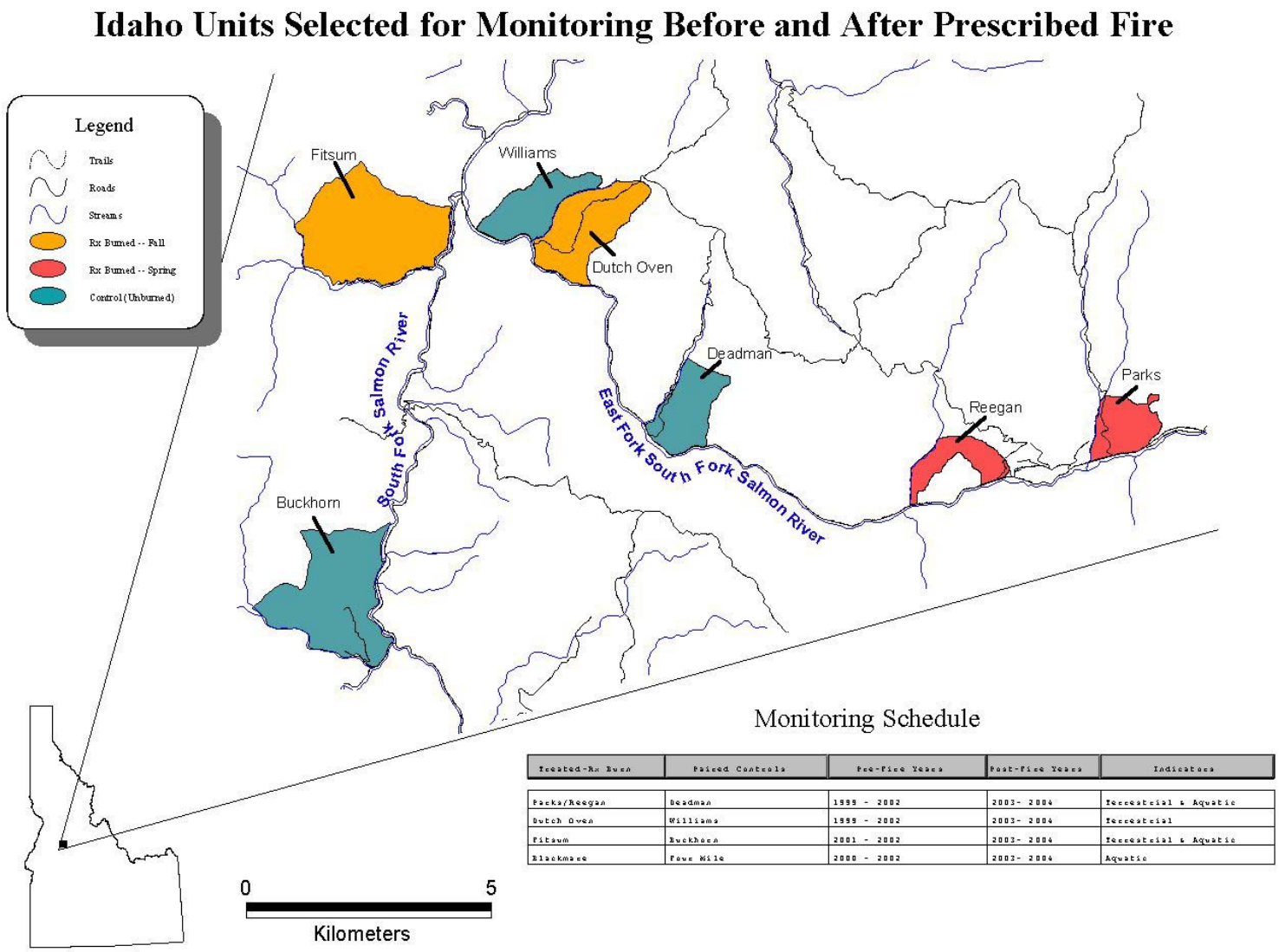
The study area is encompassed by the South Fork of the Salmon River Sub-basin on the PNF in Valley County, Idaho (Fig. 1). A common sampling design is shared for monitoring all indicators, including wildlife populations and upland vegetation. Areas identified for prescribed fire were at about ~500 acres (300 ha) in size, dominated by ponderosa pine cover types (i.e., working group strata identified by the PNF), between 3,500'-6,500' (1,060 m – 2,000 m), and with streams that provide habitat for amphibians. The 500-acre units were selected in pairs. One of the paired units was selected for burning, while the other unit will remain unburned. This provides a design with a control plot that remains unburned, and a treated plot that is monitored before and after prescribed fire. Three paired units or replicates were selected for pre-treatment monitoring in 1999 through 2002. The units were selected on the basis of prescribed fire opportunities/priorities that were identified by the Payette National Forest. We used maps produced by Brad Sanders (PNF) that identified the areas for restoration priority (spring followed by a fall application of prescribed fire) or maintenance priority (fall application of prescribed fire). From west to east, the paired units include Fitsum (FC) and Buckhorn (BH), Williams (WM) and Dutchoven (DO), and Deadman (DM) and Parks/Reegan (PC) (Fig. 1).

Methods

Pre-treatment data have been collected during May-September 1999-2002. With the initiation of the Birds and Burns Network (BBN) in 2002, field protocols were refined based on input from our collaborators in the BBN. Detailed instructions and field forms our available upon request from vsaab@fs.fed.us. Field season 1999 was a pilot effort in which we conducted an inventory of cavity-nesting birds, cursory nest surveys, and vegetation sampling. During 2000-2002, nest surveys and monitoring, point count surveys, and vegetation sampling were conducted at six units in the study area (Reegan used for vegetation monitoring only) (Fig. 1). Methods for nest surveys and monitoring are outlined in Dudley and Saab (*in press*). Point counts were located in each stratum (open vs. closed canopy) within the six study units. Point counts were conducted for 5 minutes and birds were recorded at 5 distance categories. Numbers of individuals by species were recorded within distances of 0-10 m; 10 - 25 m; 25-50 m; 50-75 m; 75-100 m; >100 m from the center of the point count station. Point count data from 2000-2001 were analyzed to determine the sample sizes needed to obtain reasonable precision levels (20-30% of the true mean with a 90% confidence level) for ground- and shrub- nesting bird species (Buckland et al. 2000). Twenty point count stations were established in each of five units, and 10 stations at Williams Creek unit, for a total of 110 point count stations. Stations were located at least 200 m apart. A global positioning system (GPS) was used at each point count location and nest to determine topographical position, recorded as latitude/longitude (later converted to UTMs), and elevation accurate within 3 m.

From 1999-2002, vegetation measurements were taken once at 20 stratified random locations in each of five units, and 10 locations at Williams Creek, for a total of 110 vegetation plots (corresponding to point count stations), and at 93 nest sites. Random locations were stratified by cover type/structural stage as defined by the PNF working-group strata. These random stations are being used to describe the habitats available to birds for the analysis of habitat selection and to describe the vegetation before and after prescribed fire.

Figure 1. Study units on the Payette National Forest in central Idaho.



Monitoring Schedule

Treated-Rx Burn	Paired Controls	Pre-Fire Years	Post-Fire Years	Indicators
Parks/Reegan	Deadman	1999 - 2002	2003- 2004	Terrestrial & Aquatic
Dutch Oven	Williams	1999 - 2002	2003- 2004	Terrestrial
Fitsum	Buckhorn	2001 - 2002	2003- 2004	Terrestrial & Aquatic
Blackmare	Four Mile	2000 - 2002	2003- 2004	Aquatic

January 2001

Vegetation sampling is nested at each nest and point count (stratified random) location and measured within two 20 m x 100 m rectangular plots that cross in the center (Fig. 2). Tree and snag measurements follow methods outlined by Bate et al. (1999), and logs by Bate et al. (*in press*). Methods for ground, shrub, and canopy cover follow those described for BBIRD (Martin and Guepel 1993, Ralph et al. 1993) with some modifications. Vegetation measurements for tree canopy, ground cover, and shrub densities are measured in three 5-m radius circular plots. Plant species composition is recorded for all woody vegetation (Appendix 1). Nest tree measurements included nest height, cavity age, species that excavated the cavity, orientation of the cavity (cf. Raphael and White 1984).

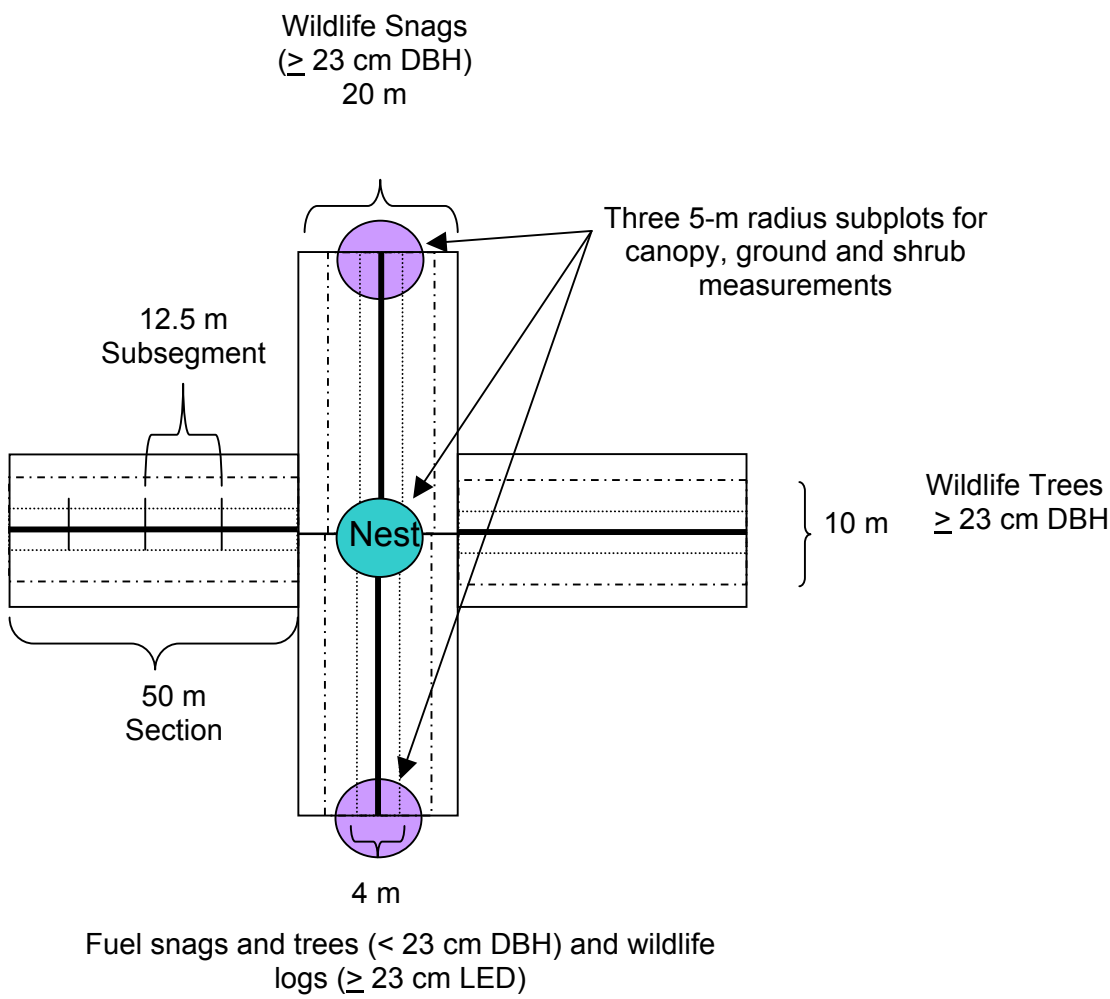


Figure 2. Sample design surrounding nest and random trees.

Preliminary Results
Vegetation

Vegetation data were collected in two strata that correspond to the working group strata defined by the Payette National Forest. Stratum 1 was typically 10%--35% crown closure, dominated by ponderosa pine (see Appendix 1 for scientific names of woody vegetation). Stratum 2 was generally >35%--70% crown closure, composed of mixed conifer tree species. Snag, tree, log, ground, shrub and canopy cover data were collected at all units during 2002, but data reported here are from earlier years (Tables 1-8). Snag density estimates are reported for data collected from 1999-2001 at three units (Tables 3-4). Snag density estimates for >23 cm dbh had moderate precision compared to our pilot study in 1999. Precision was poor on estimates of snag densities for > 53 cm dbh (Table 4). Strikingly, snag densities are nearly doubled at nest locations compared to random locations. In 2002, our sampling effort increased to improve data precision for large snags. Live tree densities are estimated for Dutchoven, Reegan, and Parks (Table 5). Log data were combined for units Parks, Deadman, Dutchoven, and Williams (Tables 6-8). Ground cover, shrub-stem densities, canopy cover, snag densities, and live tree densities were typically higher in Stratum 2 (closed canopy) compared to Stratum 1 (open canopy).

Table 1. Preliminary results on counts of **shrub stems** (≤ 2.5 cm in diameter) measured in 5-m radius circular plots and percent canopy cover recorded at random locations during 1999-2000. Shrub species and tree species are listed Appendix 3. Stratum 1 stands are dominated by ponderosa pine; Stratum 2 is composed of mixed conifer trees.

Stratum	Avg. Shrub Count (± 1 S.E.)	Avg. % Canopy (± 1 S.E.)	Sample Size
1	65.7 ± 5.4	43.6 ± 1.5	164
2	99.4 ± 9.8	60.7 ± 1.6	127

Table 2. Preliminary pre-treatment results on percent **ground cover** measured in 5-m radius circular plots at random locations in five study sites during 1999-2001. Stratum 1 are stands dominated by ponderosa pine, while Stratum 2 is composed of mixed conifer trees. The vegetation component is shrub and herbaceous cover combined.

Stratum	Avg. Percent Ground Cover (± 1 S.E.)					Sample Size
	Shrub	Herbaceous	Bare Ground	Litter	Vegetation	
1	13.9 ± 1.3	7.3 ± 0.7	20.6 ± 2.1	78.7 ± 2.1	20.8 ± 1.4	133
2	13.0 ± 1.2	9.0 ± 0.8	12.8 ± 1.6	84.9 ± 1.7	21.5 ± 1.4	128

Table 3. Preliminary pre-treatment results on estimates of **snag densities** during 1999-2001 for snags > 23 cm (9") dbh, >1.4 m (3.5') tall, and all decay classes. Stratum 1 stands are dominated by ponderosa pine, while stratum 2 is composed of mixed conifer trees.

Deadman		Plot Size (m)	Avg. Snags/acre (SE)	Avg. Snags/hectare (± 90 % bound)	SE	Sample size (n)
Nest tree	Stratum 1	10 x 100	7.0 (1.9)	17.5 (8.2)	4.9	8
	Stratum 2	10 x 100	7.6 (1.5)	19 (6.3)	3.8	10
	Landscape		**7.3 (1.2)**	18.3 (5.04)	3.02	18
Random	Stratum 1	10 x 100	1.7 (0.8)	4.29 (3.38)	2.0	7
	Stratum 2	50 x 10	5.7 (1.9)	14.28 (8.16)	4.9	14
	Landscape		**3.9 (1.1)**	9.86 (4.78)	2.86	21

Dutchoven		Plot Size	Avg. Snags/acre (SE)	Avg. Snags/hectare (± 90 % bound)	SE	Sample size (n)
Nest tree	Stratum 1	50 x 10	5.2 (1.4)	12.9 (5.8)	3.5	32
	Stratum 2	100 x 20	10 (1.4)	25 (5.9)	3.5	4
	Landscape		**6.0 (1.2)**	15.1 (4.87)	2.92	36
Random	Stratum 1	100 x 10	1.9 (0.8)	4.72 (3.49)	2.1	36
	Stratum 2	100 x 10	5.8 (1.0)	14.5 (4.3)	2.6	20
	Landscape		**2.6 (0.7)**	6.47 (2.94)	1.76	56

Parks		Plot Size	Avg. Snags/acre (SE)	Avg. Snags/hectare (± 90 % bound)	SE	Sample size (n)
Nest tree	Stratum 1	10 x 100	7.0 (1.5)	17.5 (6.2)	3.7	16
	Stratum 2	10 x 50	13.0 (3.4)	32.7 (13.99)	8.4	22
	Landscape		**10.9 (2.2)**	27.3 (9.22)	5.52	38
Random	Stratum 1	10 x 100	4 (1.0)	10 (4.29)	2.6	17
	Stratum 2	10 x 50	6.3 (1.8)	15.8 (7.38)	4.4	33
	Landscape		**5.5 (1.2)**	13.71 (4.95)	2.96	50

Table 4. Preliminary pre-treatment results on estimates of **snag densities** during 1999-2001 for snags > 53 cm (21") dbh, >1.4 m (3.5') tall, and all decay classes. Stratum 1 stands are dominated by ponderosa pine; stratum 2 is composed of mixed conifer trees.

Deadman		Plot size (m)	Avg. Snags/acre (SE)	Mean density (± 90 % bound)	SE	Sample size (n)	Percent precision
Nest tree	Stratum 1	50 x 10	5.0 (1.2)	12.5 (5.17)	3.1	16	41
	Stratum 2	100 x 10	3.6 (1.5)	9 (6.27)	3.8	7	70
	Landscape		**4.2 (1.0)**	10.55 (4.17)	2.5	23	40
Random	Stratum 1	100 x 20	0.9 (0.6)	2.15 (2.48)	1.5	7	116
	Stratum 2	100 x 10	1.1 (0.7)	2.86 (3.08)	1.8	7	108
	Landscape		**1.0 (0.5)**	2.54 (2.03)	1.2	14	80

Dutchoven		Plot size (m)	Avg. Snags/acre (SE)	Mean density (± 90 % bound)	SE	Sample size (n)	Percent precision
Nest tree	Stratum 1	50 x 10	4.1 (1.1)	10.32 (4.61)	2.8	31	45
	Stratum 2	100 x 10	8.0 (1.6)	20 (6.81)	4.1	4	34
	Landscape		**4.8 (0.95)**	12.06 (3.97)	2.38	35	33
Random	Stratum 1	50 x 10	0.8 (0.3)	1.94 (1.17)	0.7	72	60
	Stratum 2	50 x 10	2.0 (0.7)	5 (2.87)	1.7	40	57
	Landscape		**1.0 (0.3)**	2.49 (1.08)	0.65	112	43

Parks		Plot size (m)	Avg. Snags/acre (SE)	Mean density (± 90 % bound)	SE	Sample size (n)	Percent precision
Nest tree	Stratum 1	50 x 10	4.0 (1.2)	10 (5)	3	30	50
	Stratum 2	50 x 10	4.4 (1.4)	10.9 (5.7)	3.4	22	52
	Landscape		**4.2 (0.96)**	10.58 (4.05)	2.42	52	38
Random	Stratum 1	50 x 20	0.8 (0.3)	2.06 (1.37)	0.8	34	67
	Stratum 2	100 x 10	0.9 (0.6)	2.35 (2.69)	1.6	17	114
	Landscape		**0.9 (0.4)**	2.25 (1.78)	1.07	51	79

Table 5. Preliminary results on estimates of **live tree** densities during 1999 for trees > 23 cm (9") dbh, >1.4 m (3.5') tall. Numbers in the Stratum column are the working group strata defined by the Payette National Forest, followed by the percent canopy and cover type of Pipo (ponderosa pine) or mixed conifer. Stratum 1 stands are dominated by ponderosa pine, while stratum 2 is composed of mixed conifer trees.

SITE	STRATUM	PLOT SIZE	AVG. TREES/ACRE (± 1 S.E.)	AVG. TREES/HECTARE (± 1 S.E.)	SAMPLE SIZE
Dutch Oven	925, 941; 10-35% Canopy; Pipo	20 x 100 m	20.4 ± 3.19	50.50 ± 7.89	20
Dutch Oven	324, 924; 35-50% Canopy; Mixed Con	10 x 100 m	43.6 ± 7.2	107.6 ± 17.9	14
Dutch Oven	Landscape		24.6 ± 2.9	60.73 ± 7.17	34
Reagan	925, 941; 10-35% Canopy; Pipo	20 x 100 m	34.6 ± 3.1	85.50 ± 7.68	10
Reagan	824; 10-35% Canopy; Mixed Con	10 x 100 m	54.7 ± 4.3	135.0 ± 10.6	6
Reagan	Landscape		45.7 ± 2.74	112.9 ± 6.76	16
Parks	925, 941; 10-35% Canopy; Pipo	10 x 100 m	45.7 ± 3.8	113.0 ± 9.47	10
Parks	724, 824; 35-70% Canopy; Mixed Con	10 x 100 m	70.4 ± 7.0	174.0 ± 17.3	10
Parks	Landscape		61.6 ± 4.69	152.26 ± 11.59	20

Table 6. Preliminary pretreatment results on estimates of **log densities** during 1999-2000 for logs with large end diameter (LED) ≥ 8 cm (3.15"), > 0.1 m (3.94") length, and decay sound/hard or rotten. Numbers in the Stratum column are the working group strata defined by the Payette National Forest, followed by the percent canopy and cover type of Pipo (ponderosa pine) or mixed conifer. Stratum 1 stands are dominated by ponderosa pine, while stratum 2 is composed of mixed conifer trees.

SITE	STRATUM	PLOT SIZE	AVG. LOGS/ACRE (± 1 S.E.)	AVG. LOGS/HECTARE (± 1 S.E.)	SAMPLE SIZE
Deadman	925, 941; 10-35% Canopy; Pipo	4 x 12.5 m	20.3 ± 6.3	50.0 ± 15.5	56
Deadman	324, 924; 35-50% Canopy; Mixed Con	4 x 50 m	39.0 ± 8.7	96.4 ± 21.5	28
Deadman	Landscape		30.7 ± 5.6	75.7 ± 13.8	84
Parks	925, 941; 10-35% Canopy; Pipo	4 x 12.5 m	35.7 ± 6.4	88.2 ± 15.9	136
Parks	724, 824; 35-70% Canopy; Mixed Con	4 x 12.5 m	46.5 ± 8.0	114.7 ± 19.9	136
Parks	Landscape		42.7 ± 5.6	105.4 ± 13.9	272

Table 7. Preliminary pretreatment results on estimates of **log volumes** during 1999-2000 for logs with large end diameter (LED) ≥ 8 cm (3.15”), > 0.1 m (3.94”) length, and decay sound/hard or rotten. Numbers in the Stratum column are the working group strata defined by the Payette National Forest, followed by the percent canopy and cover type of Pipo (ponderosa pine) or mixed conifer. Stratum 1 stands are dominated by ponderosa pine, while stratum 2 is composed of mixed conifer trees.

SITE	STRATUM	PLOT SIZE	AVG. FT^3/ACRE (± 1 S.E.)	AVG. M^3/HECTARE (± 1 S.E.)	SAMPLE SIZE
Deadpan	925, 941; 10-35% Canopy; Pipo	4 x 50 m	897.4 ± 321.5	62.8 ± 22.5	28
Deadpan	324, 924; 35-50% Canopy; Mixed Con	4 x 12.5 m	934.6 ± 270.1	65.4 ± 18.9	56
Deadpan	Landscape		918.8 ± 206.6	64.3 ± 14.5	84
Parks	925, 941; 10-35% Canopy; Pipo	4 x 12.5 m	828.8 ± 252.9	58.0 ± 17.7	136
Parks	724, 824; 35-70% Canopy; Mixed Con	4 x 12.5 m	478.7 ± 87.2	33.5 ± 6.1	136
Parks	Landscape		603.0 ± 106.0	42.2 ± 7.4	272

Table 8. Preliminary pretreatment results on estimates of **percent log cover** during 1999-2000 for logs with large end diameter (LED) ≥ 8 cm (3.15”), > 0.1 m (3.94”) length, and decay sound/hard or rotten. Numbers in the Stratum column are the working group strata defined by the Payette National Forest, followed by the percent canopy and cover type of Pipo (ponderosa pine) or mixed conifer. Stratum 1 stands are dominated by ponderosa pine, while stratum 2 is composed of mixed conifer trees.

SITE	STRATUM	PLOT SIZE	AVG. PERCENT COVER (± 1 S.E.)	SAMPLE SIZE
Deadpan	925, 941; 10-35% Canopy; Pipo	4 x 12.5 m	1.22 ± 0.39	56
Deadpan	324, 924; 35-50% Canopy; Mixed Con	4 x 12.5 m	2.46 ± 0.61	56
Deadpan	Landscape		1.91 ± 0.39	112
Parks	925, 941; 10-35% Canopy; Pipo	4 x 12.5 m	1.63 ± 0.37	136
Parks	724, 824; 35-70% Canopy; Mixed Con	4 x 12.5 m	1.48 ± 0.23	136
Parks	Landscape		1.53 ± 0.20	272

Preliminary Results
Avifauna

We recorded fifty-seven bird species during point count surveys in 2002 (Appendix 2; scientific names are listed in Appendix 3). A total of 73 bird species have been observed in the study area since 1999 (Appendix 3). For species with at least 10 detections during point counts in 2002, Yellow-rumped Warbler was the most abundant (Fig. 3). Eighteen of the 25 most abundant bird species were detected in greater abundance in the open canopy stratum. The five most abundant species in the open stratum included: Yellow-rumped Warblers, Western Tanager, Chipping Sparrow, Hammond's Flycatcher, and the Red-Breasted Nuthatch. The point counts we conducted will allow us to estimate the density, relative abundance, and composition of songbirds at various spatial scales in two strata. In addition, our long-term approach will allow us to examine temporal variation in this system as well.

Thirty-six nests of seven species were monitored during 2002 (Table 9). Successful nests fledged at least one young. The most common nesting species are Northern Flicker, Hairy Woodpecker, and Pileated Woodpecker (Table 10). Black-backed woodpeckers were observed in the Deadman unit on several occasions during 2002, whereas no White-headed or Lewis's woodpeckers were observed in the study units. Black-backed woodpeckers were also observed foraging in the Nick Peak Burn to the west of Krassel Work Station. These three species are expected to respond favorably to physical and biological changes after prescribed fire.

Table 9. Number of **nests** monitored during the 2002 field season.

	Unit						No. Nests	No. Nests
Species	BH	DM	DO	FC	PC	WM	Total	Successful
Hairy Woodpecker	2	2	3	3	1	1	12	8
Mountain Bluebird				1			1	1
Northern Flicker	4	1	3	2	2	3	15	9
Pileated Woodpecker		1		1	1		3	3
Red-naped Sapsucker			1			1	2	2
Western Bluebird			1	1			2	0
Williamson's Sapsucker					1		1	1
Total	6	4	8	8	5	5	36	24

Table 10. Species and number of **nests** monitored during 1999-2002.

Species	1999	2000	2001	2002	Total
Northern Flicker	5	9	15	15	44
Hairy Woodpecker	1	7	6	12	26
Pileated Woodpecker		2	3	3	8
Red-naped Sapsucker	1		2	2	5
Williamson's Sapsucker		1	1	1	3
Western Bluebird			2	2	4
Mountain Bluebird		1	1	1	3
Total	7	20	30	36	93

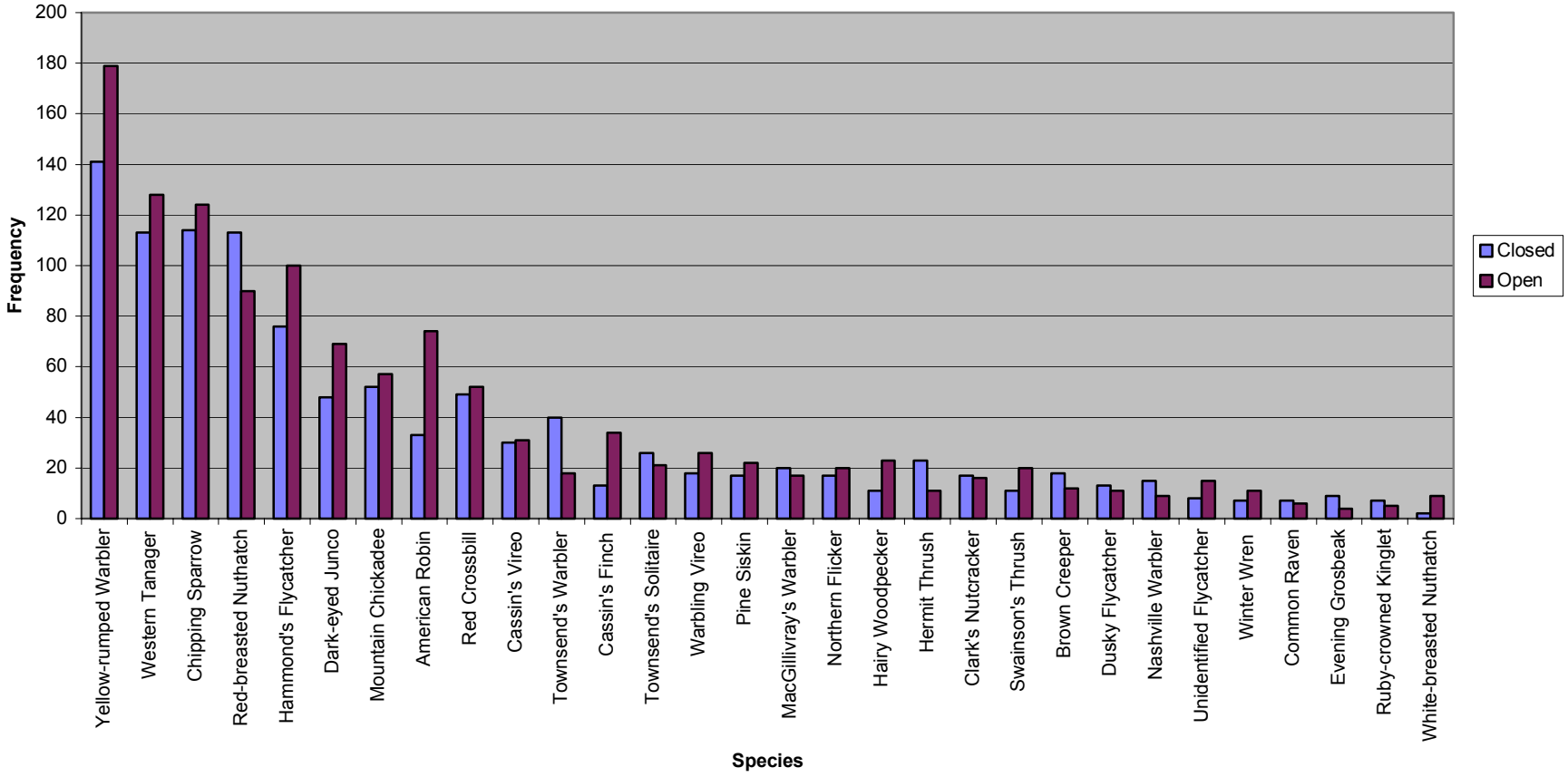


Figure 3. Frequency of detection for those species with > 10 detections during point count surveys in 2002.

Future Plans

Plans for 2003 include a spring burn for Parks and Reagan units, and fall burning for Fitsum and Dutchoven units. Vegetation and bird monitoring will continue for at least two field seasons (2004-2005) after application of prescribed fire. Bird monitoring in the Parks Creek Unit during the 2003 field season will depend on the duration of the prescribed fire. We will monitor only if we are able to enter the unit by mid-June, otherwise data collection would be compromised.

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Appendix 1. Common and scientific names of woody vegetation recorded within the South Fork Salmon study areas during 1999-2000.

Common name	Scientific name
Grand Fir	*Abies grandis*
Subalpine Fir	*Abies lasiocarpa*
Rocky Mountain Maple	*Acer glabrum*
Mountain Alder	*Alnus incana*
Sitka Alder	*Alnus sinuata*
Western Serviceberry	*Amelanchier alnifolia*
Bearberry, Kinnikinnick	*Arctostaphylos uva-ursi*
Creeping Oregongrape	*Berberis repens*
Mountain Balm	*Ceanothus velutinus*
Curleaf Mountain-Mahogany	*Cercocarpus ledifolius*
Red-osier Dogwood	*Cornus stolonifera*
Black Hawthorn	*Crataegus douglasii*
Utah Honeysuckle	*Lonicera utahensis*
Fool's Huckleberry	*Menziesia ferruginea*
Mock Orange	*Philadelphus lewisii*
Mallow Ninebark	*Physocarpus malvaceus*
Lodgepole Pine	*Pinus contorta*
Engelman Spruce	*Picea engelmannii*
Ponderosa Pine	*Pinus ponderosa*
Quaking-aspen	*Populus tremuloides*
Bittercherry	*Prunus emarginata*
Common Chokecherry	*Prunus virginiana*
Douglas-fir	*Pseudotsuga menziesii*
Bitterbrush	*Purshia tridentate*
Squaw Currant	*Ribes cereum*
Swamp Gooseberry	*Ribes lacustre*
Sticky Currant	*Ribes viscosissimum*
Currant	*Ribes spp.*
Baldhip Rose	*Rosa gymnocarpa*
Wood's Rose	*Rosa woodsii*
Rose	*Rosa spp.*
Thimbleberry	*Rubus parviflorus*
Elderberry	*Sambucus cerulea*
Scouler Willow	*Salix scouleriana*
Salix	*Salix spp.*
Buffaloberry	*Shepherdia Canadensis*
Mountain Ash	*Sorbus scopulina*
White Spirea	*Spirea betulifolia*
Common Snowberry	*Symphoricarpos albus*
Mountain Snowberry	*Symphoricarpos oreophilus*
Snowberry	*Symphoricarpos spp.*
Big Huckleberry	*Vaccinium membranaceum*

Appendix 2. Total number of detections of bird species by strata (closed and open canopy point stations) recorded during the 2002 study season. The list was sorted from highest to lowest in rank using the Open category.

Common Name	Closed	Open	Total
Yellow-rumped Warbler	142	180	322
Western Tanager	113	128	241
Chipping Sparrow	114	124	238
Hammond's Flycatcher	76	100	176
Red-breasted Nuthatch	113	90	203
American Robin	33	74	107
Dark-eyed Junco	48	69	117
Mountain Chickadee	53	59	112
Red Crossbill	49	52	101
Cassin's Finch	13	34	47
Cassin's Vireo	30	31	61
Warbling Vireo	18	26	44
Hairy Woodpecker	11	23	34
Pine Siskin	17	22	39
Townsend's Solitaire	26	21	47
Northern Flicker	17	20	37
Swainson's Thrush	11	20	31
Townsend's Warbler	40	18	58
MacGillivray's Warbler	20	17	37
Clark's Nutcracker	17	16	33
Unidentified Flycatcher	8	15	23
Brown Creeper	18	12	30
Dusky Flycatcher	13	11	24
Hermit Thrush	23	11	34
Winter Wren	7	11	18
Nashville Warbler	15	9	24
White-breasted Nuthatch	2	9	11
Common Raven	7	6	13
Rock Wren	1	6	7
Stellar's Jay	1	6	7
Ruby-crowned Kinglet	7	5	12
Evening Grosbeak	9	4	13
House Wren		4	4
Blue Grouse	1	3	4
Mountain Bluebird		3	3
Orange-crowned Warbler	3	3	6
Black-headed Grosbeak		2	2
Calliope Hummingbird	4	2	6
Pileated Woodpecker	2	2	4
Ruffed Grouse	1	2	3
American Dipper		1	1
Broad-tailed Hummingbird		1	1
Canyon Wren		1	1

Common Nighthawk	1	1	2
Lazuli Bunting		1	1
Northern Goshawk	1	1	2
Northern Pygmy-Owl		1	1
Song Sparrow		1	1
Spotted Sandpiper	1	1	2
Spotted Towhee	1	1	2
Unidentified Woodpecker		1	1
Western Wood-Peewee	3	1	4
Cooper's Hawk	1		1
Flammulated Owl	1		1
Golden-crowned Kinglet	1		1
Gray Jay	2		2
Olive-sided Flycatcher	1		1
Red-tailed Hawk	2		2
Unidentified Warbler	1		1
Williamson's Sapsucker	2		2

Appendix 3. Common and scientific names of birds observed in the South Fork Salmon study area during 1999-2002.

Common name	Scientific name
Bald Eagle	*Haliaeetus leucocephalus*
Sharp-shinned Hawk	*Accipiter striatus*
*Cooper's Hawk	*Accipiter cooperii*
*Red-tailed Hawk	*Buteo jamaicensis*
*American Kestrel	*Falco spaverius*
Chukar	*Alectoris chukar*
*Blue Grouse	*Dendragapus obscurus*
Ruffed Grouse	*Bonasa umbellus*
Mourning Dove	*Zenaida macroura*
*Flammulated owl	*Otus flammeolus*
*Great-horned Owl	*Bubo virginianus*
*Northern Pygmy-Owl	*Glaucidium gnoma*
*Common Nighthawk	*Chordeiles minor*
Vaux's Swift	*Chaetura vauxi*
*Calliope Hummingbird	*Stellula calliope*
Broad-tailed Hummingbird	*Selasphorus platycercus*
Belted Kingfisher	*Ceryle alcyon*
*Red-naped Sapsucker	*Sphyrapicus nuchalis*
*Williamson's Sapsucker	*Sphyrapicus thyroideus*
*Hairy Woodpecker	*Picoides villosus*
Black-backed Woodpecker	*Picoides arcticus*
Three-toed Woodpecker	*Picoides tridactylus*
*Northern Flicker	*Colaptes auratus*
*Pileated Woodpecker	*Dryocopus pileatus*
Olive-sided Flycatcher	*Contopus borealis*
Western Wood-Peewee	*Contopus sordidulus*
*Hammond's Flycatcher	*Empidonax hammondii*
*Dusky Flycatcher	*Empidonax oberholseri*
Cordilleran Flycatcher	*Empidonax occidentalis*
Gray Jay	*Perisoreus canadensis*
Stellar's Jay	*Cyanocitta stelleri*
Clark's Nutcracker	*Nucifraga columbiana*
Common Raven	*Corvus corax*
*Mountain Chickadee	*Parus gambeli*
*Red-breasted Nuthatch	*Sitta Canadensis*
White-breasted Nuthatch	*Sitta carolinensis*
*Brown Creeper	*Certhia Americana*
*Rock Wren	*Salpinctes obsoletus*
Canyon Wren	*Catherpes mexicanus*
*House Wren	*Troglodytes aedon*
*Winter Wren	*Troglodytes troglodytes*

American Dipper	*Cinclus mexicanus*
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
*Western Bluebird	*Sialia mexicana*
*Mountain Bluebird	*Sialia currucoides*
*Townsend's Solitaire	*Myadestes townsendi*
Swainson's Thrush	*Catharus ustulatus*
*Hermit Thrush	*Catharus guttatus*
*American Robin	*Turdus migratorius*
Cedar Waxwing	*Bombycilla cedrorum*
Cassin's Vireo	*Vireo cassinii*
Warbling Vireo	*Vireo gilvus*
Orange-crowned Warbler	*Vermivora celata*
Nashville Warbler	*Vermivora ruficapila*
*Yellow-rumped Warbler	*Dendroica coronata*
Townsend's Warbler	*Dendroica townsendi*
*MacGillivray's Warbler	*Oporornis tolmiei*
Wilson's Warbler	*Wilsonia pusilla*
*Western Tanager	*Piranga ludoviciana*
Lazuli Bunting	*Passerina amoena*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Spotted Towhee	*Pipilo maculatus*
*Chipping Sparrow	*Spizella passerina*
Brewer's Sparrow	*Spizella breweri*
Song Sparrow	*Melospiza melodia*
*Dark-eyed Junco	*Junco hyemalis*
Common Grackle	*Quiscalus quiscula*
Brown-headed Cowbird	*Molothrus ater*
Red Crossbill	*Loxia curvirostra*
Cassin's Finch	*Carpodacus cassinii*
Pine Siskin	*Carduelis pinus*
Evening Grosbeak	*Coccothraustes vespertinus*

*Confirmed nesting within the study area.