Determining The Ecological Effects Of Fire Suppression, Fuels Treatment, And Wildlife Through Bird Monitoring In The Klamath Ecoregion Of Southern Oregon And Northern California

(Joint Fire Sciences Program # 01B-3-2-10)

Principal Investigators:
John D. Alexander[a*], C. John Ralph[b], Stewart Janes[c]

Research Associate:
Nathaniel E. Seavy[a,d]

[a]Klamath Bird Observatory, PO Box 758, Ashland, Oregon 97520, jda@KlamathBird.org, (541) 201-0866
([*]corresponding investigator)
[b]USDA Forest, Service Redwood Sciences Laboratory, Pacific Southwest Research Station
[c]Southern Oregon University
[d]Department of Zoology, University of Florida

FINAL REPORT

Introduction

With funding from the Joint Fire Sciences Program (JFSP) we investigated ecological effects of fire management by implementing a comprehensive study of bird distribution as it relates to fire suppression, fuels treatment, and wildfire rehabilitation in the Klamath Ecoregion of southern Oregon and northern California. This project augmented data from other studies to: address new fire-related questions, analyze historical bird and vegetation data, and provide resources for analysis of fire-related data funded by cooperators. By coordinating efforts of management-related bird monitoring programs of the USDA Forest Service, USDI Bureau of Land Management, National Park Service, and others, this project was intended to enable agencies to expedite scientifically sound and effective monitoring programs that cross agency jurisdictions and fuel types. This project was designed to demonstrate the utility of bird monitoring as a tool for measuring the ecological effects of fire management.

Our JFSP research efforts have resulted in 5 peer-reviewed manuscripts that have been accepted for publication, an additional paper that has been submitted, and 5 draft manuscripts that will be submitted in 2006 (Attachment 1). Our progress has been chronicled in 16 reports. We presented results from our research at 13 scientific meetings, 4 land management agency meetings, and 9 land management workshops. Information about our efforts was disseminated to our partners and the public through 4 popular presentation and 8 outreach products (Attachment 1).

Our work through the Joint Fire Sciences Program allowed us to gain a better understanding of the effects of fire suppression and wildfire on bird communities and develop and test cost-effective bird and habitat monitoring techniques that can be used to

measure site-specific and landscape-level ecological effects of fuels reduction projects (e.g. controlled-burning, pre-commercial thinning, and mastication).

Fuels Treatment and Bird Distribution

Klamath National Forest – We monitored bird abundance and vegetation structure and composition at 6 under-burn sites in mixed-conifer/hardwood habitats from 2000 (pre-treatment) to 2004 (1-4 years post treatment). Results from this project have been summarized in a manuscript that will be presented at the 1st Fire Behavior and Fuels Conference in March 2006 and will be submitted for publication in the conference proceedings. See Attachment 2 for the manuscript abstract. This study suggests that in some conditions, fuels treatments may have relatively minor consequences for bird communities. However, if the goal of treatments includes restoring conditions in such a way that it changes the quality of wildlife habitat for disturbance-dependent birds, then our results suggest that prescribed fire in the Klamath National Forest would need to be modified into to achieve the desired conditions.

Lakeview District, Bureau of Land Management – From (pre-treatment) to 2004 we completed bird and habitat surveys in association with a juniper control project in shrub steppe habitats on the BLM's Klamath Falls Resource area. Using baseline data we completed a manuscript that demonstrates statistical methods that can be used to analyze data collected using standardized techniques, to measure the effects of fuels treatments with regards to evaluating a land manager's ability to meet desired ecological conditions (Attachment 3).

Pre- and post- treatment data were used to identify indicators of current and desired conditions and demonstrate how indicator species can be used to evaluate the ecological effects of juniper treatments. These results were summarized in a Southern Oregon University master's thesis (Attachment 4). The response of bird abundance to treatments described in this thesis can be used to assess future juniper treatment effectiveness in south-central Oregon.

Crater Lake National Park and Lava Beds National Monument – We tested standard bird and habitat monitoring techniques to determine their effectiveness with regards to monitoring the ecological effects of fuels treatments in pine and shrub steppe habitats on 2 National Park Units. Results from control burn monitoring at Lava Beds have been summarized in a manuscript that will be submitted to *Restoration Ecology* (Attachment 5). The focus of this manuscript is to demonstrate the use of standard bird and habitat monitoring techniques to measure management effectiveness as it relates to the Park Service's experimental prescribed fire program that was established to reduce fuels and alter plant composition with site-specific prescriptions with the overall objective of restoring plant communities to more natural conditions.

Medford Bureau of Land Management – In 2002 and 2003 data were collected in oak woodland, grass, and shrub habitats that have undergone manual fire hazard reduction treatments. This two-year data set has been analyzed and submitted for publication in

Forest Ecology and Management (Attachment 6). This manuscript demonstrates how standard bird and habitat monitoring techniques can be used to evaluate the effectiveness of fuels treatments, specifically with regards to integrating bird conservation objectives into fuels management projects.

In 2004 and 2005 we collected an additional data on larger-scale fuels treatments in oak woodland habitats with support from Medford BLM. These data are currently being analyzed.

Bird Community Composition and Wildfire Occurrence and Rehabilitation

Our wildfire research has been focused on the Megram Fire Complex that burned in northern California in 1999, and the Quartz Fire, that burned in southern Oregon in 2001. We collected bird and habitat data in areas affected by these burns, and in adjacent areas before and after the wildfires burned.

Our analysis of these before and after data provide some of the best information available on the role of fire in structuring bird communities in this mixed severity fire regime. Draft manuscripts have been completed as a part of a Ph.D. dissertation at the University of Florida is currently analyzing these data as part of his dissertation research. The first uses pre-burn data to develop models to predict patterns of bird distribution as described by the interactive effects of floristics and physiognomics (Attachment 7). The second uses these models to predict the response bird communities to wildfire (Attachment 8). The results from this research have important implications for the management and conservation of mixed-forest ecosystems with regards to anthropogenic or naturally occurring disturbance.

Using pre-burn vegetation data we developed models to describe vegetation and topographical correlates of fire severity. The results of this research are summarized in a manuscript that has been accepted for publication in the *International Journal of Wildland Fire* (Attachment 9). These results, in combination with previous studies of fire severity in the Klamath-Siskiyou region carry management implications relating to choosing sites for fuels reduction projects; developing fuels reduction prescriptions, and the timing and spatial scale for fuels treatments.

Bird Distribution and Fire History

To better understand the relationship with fire and birds in the coniferous forests we completed a review of fire and birds in the Pacific Northwest. In a published manuscript we summarize information on fire effects on major vegetation types and bird/fire relations within, and pose management related questions and research considerations, to inform resource managers faced with the challenge of understanding how numerous factors, including fire and fire suppression, influence habitat composition and animal communities (Attachment 10).

We have compiled Klamath Demographic Monitoring Network bird abundance, habitat, and GIS data from over 10,000 locations in northern California. These are be used in an analysis of the relationship between fire history and bird distribution. We are using the results from the above studies to generate hypotheses that will be tested using this chrono-sequence. An additional analysis comparing vegetation data collected at bird monitoring stations with LANSAT derived habitat data is also underway. Results from preliminary analyses. Expenses associated with data compilation and preliminary analyses exceeded our expectations and therefore we have not yet completed a manuscript from this aspect of our project. We have received funds to supplement the JFSP resources that have gone into this effort and intend to complete analyses and a manuscript in 2006. the data that were compiled will be contributed to the National Landfire Project.

Conclusion

This project has resulted in the development of monitoring tools, which are based on standardized bird and habitat sampling techniques. These tools will better able land managers to evaluate the ecological effects of fire suppression, fuels treatments and wildfire. The Healthy Forest Restoration Act refers to the Collaborative Forest Restoration Program that recommends birds as good wildlife habitat indicators, and the Handbook for Ecological Monitoring that suggests the use of bird monitoring techniques to measure the success of projects designed to restore fire-adapted ecosystems. As a result of our JFSP research land managers in the Klamath Ecoregion are using our tools and implementing effectiveness monitoring efforts that continue to provide information about the effects of land management on ecosystems at both the local and regional scales. The tools that were further developed and tested as a part of this JFSP are helping land managers: employ inexpensive techniques to track the effectiveness of fire related management actions with regards to meeting desired ecological conditions; and identify opportunities to integrate national bird integrate conservation objectives with fuels reduction and landscape restoration efforts, as required by the Migratory Bird Treaty Act and related Executive Order.

Attachment 1. List of accomplishments associated with Joint Fire Sciences Program Project # 01B-3-2-10 (Determining the ecological effects of fire suppression, fuels treatment, and wildlife through bird monitoring in the Klamath Ecoregion of southern Oregon and northern California)

Publications

Accepted

Alexander, J. D., C. J. Ralph, B. Hogoboom, N. E. Seavy, and S. Janes. 2004. Understanding effects of fire suppression, fuels treatment, and wildfire on bird communities in the Klamath-Siskiyou Ecoregion. Pp. 42-66 in K. L. Mergenthaler, J. E. Williams, and E. S. Jules (Eds.). *Proceedings of the Second Conference on Klamath-Siskiyou Ecology*. Siskiyou Field Institute, Cave Junction, Oregon.

Alexander, J. D., N. E. Seavy, and C. J. Ralph. In Press. Vegetation and topographical correlates of fire severity from two fires in the Klamath-Siskiyou region of Oregon and California. *International Journal of Wildland Fire.*

Huff, M. H., N. E. Seavy, J. D. Alexander, and C. J. Ralph. 2005. Fire and birds in the maritime Pacific Northwest. *Studies in Avian Biology*. 30:46-62.

Sabol, T. D. 2005 Effects of western juniper (*Juniperus occidentalis*) removal on avian species composition in shrub-steppe habitat in south-central Oregon. 2005. Master's thesis, Southern Oregon University, Ashland, Oregon.

Seavy, N. E., S. Quader, J. D. Alexander, and C. J. Ralph. 2005. Generalized linear models and point count data: Statistical considerations for the design and analysis of monitoring studies. Pp 744-753 in C. J. Ralph and T. D. Rich (Eds.). *Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference.* 2002 March 20-24; Asilomar, California; Volume 2. Gen. Tech. Rep. PSW-GTR-191. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 643 p.

Submitted

Alexander, J. D., N. E. Seavy and P. E. Hosten. Using taxa-based conservation plans to evaluate ecological effects of fuels reduction: insights from bird monitoring in southwest Oregon oak woodlands and chaparral. Submitted to *Forest Ecology and Management*.

Draft

Alexander, J. D., M. C. Rasmussen, J. L. Stephens, N. E. Seavy. Restoring fire in Lava Beds National Monument, California: short-term effects of prescribed fire on bird diversity and abundance. Intended for submission to *Restoration Ecology*.

Seavy, N. E. and J. D. Alexander. Measuring ecological effects of prescribed fire using birds as indicators of forest conditions. Klamath Bird Observatory. Ashland, Oregon.

Seavy, N. E. and J. D. Alexander. Interactive effects of floristics and physiognomics on patterns of bird distribution. Intended for submission to *Ecological Applications*.

Seavy, N. E. and J. D. Alexander. Wildfire effects on passerine bird habitat use in a mixed-conifer forest. Intended for submission to *Ecological Applications*.

Seavy, N. E. Wildfire effects on passerine bird habitat use in a mixed-conifer forest. Ph. D. dissertation, University of Florida, Gainesville, Florida.

Scientific Presentations

Alexander, J. D., C. J. Ralph, , N. E. Seavy, and S. Janes. Determining the ecological effects of fire suppression, Fuels Treatment, and wildfire through bird monitoring in the Klamath Ecoregion of southern Oregon and northern California. (Paper Presentation). *Joint Fire SciencesProgram Principal Investigators Workshop*, San Diego, California. 2005

Alexander, J. D., C. J. Ralph, B. Hogoboom, J. Menke, and N. E. Seavy. Determining the ecological effects of fire suppression, fuels treatment, and wildfire through bird monitoring in the Klamath

Ecoregion of Southern Oregon and Northern California. (Poster presentation). *Cooper Ornithological Society*, Flagstaff, Arizona. 2004

Alexander, J. D., C. J. Ralph, B Hogoboom, N. E. Seavy, and S. Janes. Understanding effects of fire suppression, fuels treatment, and wildfire on bird communities in the Klamath-Siskiyou Ecoregion. (Paper Presentation). *Second Conference on Klamath-Siskiyou Ecology*. Siskiyou Field Institute. Cave Junction, Oregon. 2003

Alexander, J. D., N. E. Seavy, and C. J. Ralph. Quantifying the effects of wildfire on birds: a before and after comparison from the Quartz fire in southern Oregon. (Paper Presentation). *Western Bird Banding Association, Western Field Ornithologists,* and *Oregon Field Ornithologists* joint meeting, Ashland, Oregon, 2004.

Alexander, J. D., J. L. Stephens, N. E. Seavy, and D. A. Sarr. Bird monitoring in Crater Lake National Park. (Paper Presentation). *AAAS Pacific Division* annual meeting, Ashland, Oregon, 2005.

Ralph, C. J., P. A. Herrera, and S. L. Miller. Serendipity and Bird Responses to Silvicultural Treatments Pre- and Post- Biscuit Fire: Bird Habitat Associations and Population Trends. (Poster Presentation). *Southwest Oregon Wildfire Research Symposium*, Gold Beach, Oregon, 8 February 2006.

Seavy, N. E. Is everything related to everything else? Applying spatial statistics to coral reefs and forest fires. (Paper Presentation). *Ecolunch Seminar Series*, Department of Zoology, University of Florida. 2004.

Seavy, N. E., and J. D. Alexander. Effects of prescribed burning on bird community composition in coniferous forest of northern California. (Paper Presentation). *Cooper Ornithological Society*, Arcata, California, 2005.

Seavy, N. E., J. D. Alexander, and P. C. Hosten. Using taxa-based conservations plans to evaluate ecological effects of fire management: Insights from bird monitoring in oak woodlands. Invited presentation to the Society for Northwest Vertebrate Biology and Northwest Science Association, Ellensburg, Washington, 2004.

Seavy, N. E., J. D. Alexander, and C. J. Ralph. Effects of mixed-severity fire on bird communities: A before and after comparison from southern Oregon. (Paper Presentation). *Ecological Society of America*, Portland, Oregon, 2004.

Seavy, N. E., J. D. Alexander, and C. J. Ralph. Effects of mixed-severity fire on bird communities: A before and after comparison from southern Oregon. (Paper Presentation). *Eco Think-Tank Seminar Series*, Department of Wildlife Ecology and Conservation, University of Florida. 2004.

Seavy, N. E., Alexander, J. D., and C. J. Ralph. Fire effects in mixed-conifer forest: Does fire diversify or homogenize vegetation structure and bird communities? Invited presentation to the *Society for Northwest Vertebrate Biology* and *The Wildlife Society* joint meeting, Corvalis, Oregon, 2005.

Seavy, N. E., J. D. Alexander, C. J. Ralph, S. Janes, and S. Norman. Wildfire effects on bird abundance in a mixed-severity fire regime: Treating fire severity as a continuous variable. (Paper Presentation). *Second International Wildland Fire Ecology and Fire Management Congress*, Orlando, Florida, 2003.

Land Management Agency Presentations

Alexander, J. D. and N. E. Seavy. A future for our partnership. (Oral Presentation). Medford BLM Wildlife Biologist Meeting. Grants Pass, Oregon. 2004

Alexander, J. D., N. E. Seavy, C. J.Ralph, and S. W. Janes. Objective Driven Monitoring on the Klamath National Forest. (Oral Presentation). Klamath National Forest Wildlife Biologist Meeting. Yreka, California. 2005

Seavy, N. E., J. D. Alexander, P. E. Hosten. 2005. Using bird conservation plans to plan and evaluate ecological effects of fuels reduction in southwest Oregon oak woodlands and chaparral. (Oral Presentation). Meeting with Medford BLM Wildlife Biologist and Fuels Manager. Klamath Bird Observatory. Ashland, Oregon. February 8, 2005

Workshop Presentations

Alexander, J. D. Using PIF Products to Integrate Bird Conservation and Land Management Plans. *Tools for bird conservation in coniferous forests: California Partners in Flight and Oregon/Washington Partners in Flight Meeting*. Ashland, Oregon. 2005.

Alexander, J. D., N. E. Seavy, and P. E. Hosten. Ecological effects of fuels treatments on bird abundance, Applegate Valley, southern Oregon. Creating fire-resilient landscapes: Improving our understanding and application. Medford, Oregon. 2004. Alexander, J. D., N. E. Seavy and P. E. Hosten. Using bird conservation plans to plan and evaluate ecological effects of fuels reduction in southwest Oregon oak woodlands and chaparral. *Tools for bird conservation in coniferous forests: California Partners in Flight and Oregon/Washington Partners in Flight Meeting*. Ashland, Oregon. 2005.

Alexander, J. D., N. E. Seavy, M. Pitkin and C. J. Ralph. Wildfire management and landbird conservation: an integrative program. *Partners In flight Western Working Group Meeting*. Pacific City, Oregon. 2004.

Alexander, J. D., N. E. Seavy, C. J. Ralph, S. W. Janes. Determining the Ecological Effects of Fire Suppression, Fuels Treatment, and Wildfire through Bird Monitoring in the Klamath Ecoregion of Southern Oregon and Northern California. *Joint Fire Sciences Principal Investigators Workshop*. San Diego, California, 2005

Seavy, N. E. Data analysis and statistics: Using bird monitoring to inform management. *Partners In Flight Bird Identification and Monitoring Techniques Workshop.* Ashland, Oregon. 2004.

Seavy, N. E. Fire, Birds, and Fuels Treatments in oak woodland and chaparral habitats of southern Oregon. *Applegate River Watershed Council Oak Woodland Fuels Treatments Workshop*, Ruch, Oregon. 2005.

Seavy, N. E. Trial by fire: wildfire, experimental design, and bird conservation. *Tools for bird conservation in coniferous forests: California Partners in Flight and Oregon/Washington Partners in Flight Meeting.* Ashland, Oregon. 2005,

Seavy, N. E., J. D. Alexander, S. Quader, and C. J. Ralph. Monitoring ecological effects of juniper removal in shrubsteppe habitats. *Shrubbsteppe Bird Conservation Network Workshop*, Olympia, Washington, November 2-3, 2004.

Popular Presentations

Pitkin, M. Our environment, what birds can tell us. Invited presentation to the Rogue Valley Audubon Society, September 2004.

Seavy, N. E. Fire ecology in the Klamath/Siskiyou Ecoregion of Oregon and California. Invited presentation to the SOU Senior Program (Elderhostel), April 2004.

Seavy, N. E. Rogue Valley Audubon Society, 2003. Ecological effects of fire suppression, fuels treatment, and wildfire in the Klamath/Siskiyou Ecoregion of Oregon and California. Invited presentation to the Rogue Valley Audubon Society, 2003.

Seavy, N. E. Fire ecology in the Klamath/Siskiyou Ecoregion of Oregon and California. Invited presentation to the SOU Senior Program (Elderhostel), April 2004.

Reports

Alexander, J. D. 2004. Klamath Bird Observatory 2003 Final Effort Report to The Forest Service Region 5 Partners In Flight Program and the Klamath National Forest. Klamath Bird Observatory, Ashland, Oregon.

Alexander, J. D. 2004. Upper Klamath Basin bird monitoring program: 2003 effort summary. Klamath Bird Observatory. Ashland, Oregon

Alexander, J. D. 2004. Southwest Oregon bird monitoring program: 2003 effort summary. Klamath bird Observatory. Ashland, Oregon

Alexander, J. D. and R. I. Frey. 2004. Northern California bird monitoring program: 2003 effort summary. Klamath Bird Observatory. Ashland, Oregon

Alexander, J. D., S. L. Kies and C. J. Ralph. 2003. 2002 Upper Klamath Basin Bird Monitoring Project Efforts. Klamath Bird Observatory. Ashland, Oregon. (Draft Report submitted to Fremont-Winema National Forest and Lakeview BLM Klamath Falls Resource Area)

Alexander, J. D., C. J. Ralph, S. W. Janes. 2004. JFSP 2004 Principal Investigator Workshop: Determining the ecological effects of fire suppression, fuels treatment, and wildlife through bird monitoring in the Klamath Ecoregion of southern Oregon and northern California. Joint Fire Sciences Program. Boise, Idaho

Alexander, J. D., C. J. Ralph, S. W. Janes. 2005. JFSP 2005 Principal Investigator Workshop: Determining the ecological effects of fire suppression, fuels treatment, and wildlife through bird monitoring in the Klamath Ecoregion of southern Oregon and northern California. Joint Fire Sciences Program. Boise, Idaho

Alexander J. D., N. E. Seavy, and C. J. Ralph. 2004. Bird and Vegetation Monitoring in the Little Applegate Valley of Southern Oregon, 2001-2003.
Frey, R. I. and J. D. Alexander. 2005. Summary Report on Long-term Bird Monitoring Efforts by the Klamath Bird Observatory in 2004. Klamath Bird Observatory, Ashland, Oregon.
Herrera, P. A., C. J. Ralph and S. L. Miller. 2004. Post-fire Avian Monitoring of the Long-Term Ecosystem Productivity Chetco Ranger District Integrated Research Site Locations 2003 Progress Report. Draft Report submitted to Long-Term Ecosystem Productivity Program, USDA Forest Service, Region 6, Chetco Ranger District, Brookings, Oregon.
Seavy, N. E. 2003. Ecological Effects of Prescribed Fire in the Klamath National Forest: Summarizing 2000-2002 Bird Surveys and 2001-2002 Vegetation Surveys. Report for the Joint Fire Science Program and the Klamath National Forest. Klamath Bird Observatory, Ashland, Oregon
Seavy, N. E., and J. D. Alexander. 2004. Effects of the Quartz Fire in on vegetation structure and bird abundance: preliminary analysis. Klamath Bird Observatory. Ashland, Oregon.
Seavy, N. E., J. L. Stephens, and J. D. Alexander. 2005. Effects of Prescribed Fire on Bird Communities in Lava Beds National Monument: Preliminary Analysis. Klamath Bird Observatory, Ashland, Oregon.
Stephens, J. L. and J. D. Alexander. 2004. Bird abundance in the Ashland Watershed: results from 2004 bird monitoring. Klamath Bird Observatory, Ashland, Oregon.
Stephens, J. L. and J. D. Alexander. 2004. Bird Abundance at the Klamath Marsh National Wildlife Refuge: Results From 2003 and 2004 Bird Monitoring. Klamath Bird Observatory, Ashland, Oregon.
Stephens, J. L., S. L. Kies and J. D. Alexander. 2004. Klamath Bird Observatory Census Effort Report: 2004 Spring and Fall Effort Summary. Klamath Bird Observatory, Ashland, Oregon.

Outreach Products

Bird Response To Fire and Fuels Treatment- website: www.klamathbird.org/Projects/fire.htm

Burning Issues-Birds, Wildfire, Fuels Treatment, and Fire Suppression in the Klamath Siskiyou. Public handout. Klamath Bird Observatory, Ashland, Oregon (available at www.klamathbird.org).

Bird conservation and fuels reduction in oak woodland and chaparral habitats of southwest Oregon. Decision support tool for land managers. Klamath Bird Observatory, Ashland, Oregon (available at www.klamathbird.org).

The Klamath Bird, Summer 2005. This issue of the Klamath Bird Observatory's newsletter was devoted to summarizing our work that has been supported by the Joint Fire Sciences Projects. (available on-line at www.klamathbird.org).

Site-fidelity in the Quartz Fire: Differences between residents and migrants. Newsletter article in the Klamath Bird, Winter 2005. (available on-line at www.klamathbird.org).

Predicting fire severity: Preliminary analyses from the 2001 Quartz Fire. Newsletter article in the Klamath Bird, Spring 2004. (available on-line at www.klamathbird.org)

Work in the watershed. Newsletter article submitted to the Applegator, newsletter of the Applegate River Watershed Council.

Trial by fire: research design, wildfire, and bird conservation. Newsletter article in the Flight Log, Newsletter of California Partners in Flight (available on-line at http://www.prbo.org/calpif/pdfs/Flight_Log_15.pdf)

Attachment 2. Abstract form draft manuscript summarizing results from prescribed fire monitoring on the Klamath National Forest.

Measuring Ecological Effects of Prescribed Fire Using Birds as Indicators of Forest Conditions

Nathaniel E. Seavy[a,b], John D. Alexander[a]
[a]Klamath Bird Observatory
[b]Department of Zoology, University of Florida

To evaluate the ecological effects of prescribed fire, we established bird and habitat census stations in four study areas of the Klamath National Forest where prescribed fires are being applied as a management tool. In each area, bird and vegetation data were collected at sites treated with prescribed fire and nearby untreated control sites. Data were collected at stations from 2000 (pre-treatment) to 2004 (1-4 years post treatment). Over this time period, we found no consistent change in the volume of vegetation in either the tree or shrub strata. Similarly, we found no measurable effect of prescribed burning on the overall bird community. Spatial variation (probably associated with habitat characteristics) and annual variation in abundance (associated with stochastic populations dynamics) appear to be more important than the change induced by prescribed burning. We also investigated the abundance of eight individual species that have been identified as conservation focal species for coniferous forests. There were no consistent changes in the abundance of these species that we could attribute to the application of prescribed fire. Our results suggest that the prescribed fire applied in these treatment units had negligible effects on landbird community composition.

Attachment 3. Abstract from published manuscript demonstrating statistical methods that can be used to analyze data collected using standardized techniques, to measure the effects of fuels treatments with regards to evaluating a land manager's ability to meet desired ecological conditions.

Generalized Linear Models and Point Count Data: Statistical Considerations for the Design and Analysis of Monitoring Studies

Nathaniel E. Seavy[a,b], Shuhel Quader [b], John D. Alexander[a], C. John Ralph[c]
[a]Klamath Bird Observatory
[b]Department of Zoology, University of Florida
[c]USDA Forest, Service Redwood Sciences Laboratory, Pacific Southwest Research Station

The success of avian monitoring programs to effectively guide management decisions requires that studies be efficiently designed and data be properly analyzed. A complicating factor is that point count surveys often generate data with non-normal distributional properties. In this paper we review methods of dealing with deviations from normal assumptions, and we focus on the application of generalized inear models (GLMs). We also discuss problems associated with overdispersion (more variation than expected). In order to evaluate the statistical power of these models to detect differences in bird abundance, it is necessary for biologists to identify the effect size they believe is biologically significant in their system. We illustrate one solution to this challenge by discussing the design of a monitoring program intended to detect changes in bird abundance as a result of Western juniper (Juniperus occidentalis) reduction projects in central Oregon. We estimate biologically significant effect sizes by using GLMs to describe variation in bird abundance relative to natural variation in juniper cover. These analyses suggest that for species typically positively associated with juniper cover, a 60-80 percent decrease in abundance may be expected as a result of juniper reduction projects. With these estimates of expected effect size and preliminary data on bird abundance, we use computer simulations to investigate the power of GLMs. Our simulations demonstrate that when data

are not overdispersed and sample sizes are relatively large, the statistical power of GLMs is approximated well by formulas that are currently available in the bird literature for other statistical techniques. When data are overdispersed, as may be the case with most point count data, power is reduced.

Seavy, N. E., S. Quader, J. D. Alexander, and C. J. Ralph. 2005. Generalized linear models and point count data: Statistical considerations for the design and analysis of monitoring studies. Pp 744-753 in C. J. Ralph and T. D. Rich (Eds.). Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference. 2002 March 20-24; Asilomar, California; Volume 2. Gen. Tech. Rep. PSW-GTR-191. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 643 p.

Attachment 4. Abstract from Master's Thesis summarizing results from pre- and post- treatment data used to identify indicators of current and desired conditions and demonstrate how indicator species can be used to evaluate the ecological effects of juniper treatments.

Effects Of Western Juniper (Juniperus Occidentalis) Removal On Avian Species Composition In Shrub-Steppe Habitat In South-Central Oregon

Thomas D. Sabol[a]
[a]Southern Oregon University

Western juniper (Juniperus occidentalis) is a native component of the shrub-steppe and ponderosa pine (Pinus ponderosa) habitats in south-central Oregon and has been expanding its range in the western United States during the twentieth century. In response to juniper expansion, the Bureau of Land Management implemented habitat restoration projects from 2001 to 2003 on large areas of BLM land in south-central Oregon. The purpose of this study was to document the avian community response to those removals. Juniper treatments were shown to have decreased the coverage of juniper in large areas. Different indicator bird species were shown to be associated with juniper covered areas, historical shrub-steppe areas and juniper treatment areas after treatment. These bird associations can be used to assess future juniper treatment effectiveness in south-central Oregon.

Citation: Sabol, T. D. 2005 Effects of western juniper (Juniperus occidentalis) removal on avian species composition in shrub-steppe habitat in south-central Oregon. 2005. Master's thesis, Southern Oregon University, Ashland, Oregon.

Attachment 5. Abstract from draft manuscript demonstrating the use of standard bird and habitat monitoring techniques to measure management effectiveness as it relates to the Park Service's experimental prescribed fire program that designed to restore plant communities to more natural conditions.

Restoring Fire in Lava Beds National Monument, California: Short-term Effects of Prescribed Fire on Bird diversity and Abundance

John D. Alexander[a], Mary C. Rasmussen[b], Jaime L. Stephens[a], Nathaniel E. Seavy[a,b]
[a]Klamath Bird Observatory, P.O. Box 758, Ashland, OR, 97520, U.S.A.
[b]Grand Canyon National Park, P.O. Box 129, Grand Canyon, AZ 86023, U.S.A.
[c]Department of Zoology, University of Florida, 223 Bartram Hall, Gainesville, FL 32611-8525, U.S.A.

In an effort to restore natural disturbance regimes to shrubsteppe and pine habitats of Lava Beds National Monument in northern California, the National Park Service is using prescribed fire. In May 2003, the "South Boundary" prescribed fire burned 570 ha (1409 acres) of the monument. To evaluate the effects of this prescribed fire on shrubsteppe bird communities, we collected data on bird abundance in the fall (1 year pre-fire and 2 years post-fire) and spring (2 years post-fire). In addition, we collected vegetation

structure data one year before the fire, and two years post-fire. Before the fire, tree, shrub, and herb cover did not differ between the burned and unburned stations. After the fire shrub cover of burned stations was less than at unburned stations in both the first and second year, and herbaceous cover of burned stations was less than at unburned stations in the first year, but not the second. In both the spring and fall there was no evidence that prescribed fire influenced the average number of bird species detected per station. Nor was there an obvious effect on the total number of species detected in burned and unburned areas during spring, but during fall, more species were observed on the burned area in both years following the fire than the year before the fire. In regards to individual species, during spring, in the first year after the fire, there was no evidence that any species were more or less common at burned stations than at unburned stations. However, in the second year after the fire, Rock Wrens and Brewer's Blackbirds were more common at the burned stations. In the fall, Dark-eyed Juncos were more abundant at burned stations during both years after the fire. These results suggest that prescribed fire in Lava Beds National Monument has created conditions used by bird species that are characteristics of early successional conditions that are created by natural disturbances.

Attachment 6. Abstract from manuscript, that has been submitted for publication, focusing on the use of standard bird and habitat monitoring techniques to evaluate the effectiveness of fuels treatments, with regards to integrating bird conservation objectives into fuels management projects.

Using Bird Conservation Plans To Evaluate Ecological Effects Of Fuels Reduction In Southwest Oregon Oak Woodlands And Chaparral

John D. Alexander[a], Nathaniel E. Seavy[a,b], Paul E. Hosten[c]
[a]Klamath Bird Observatory
[b]Department of Zoology, University of Florida
[c]Bureau of Land Management

To evaluate ecological effects of fuels reduction in southwest Oregon oak woodlands and chaparral, we used bird monitoring to test predictions generated from a Partners in Flight regional conservation plan. Over a two-year period, we compared bird abundance in untreated stands to stands where shrub-cover had been reduced to lower the risk of fire. Two of 12 Partners in Flight oak woodland and chaparral focal species showed consistent differences in abundance between treated and untreated units in both years of the study; western wood-pewee (*Contopus sordidulus*) and white-breasted nuthatch (*Sitta carolinensis*) were more abundant in treated units. Among non-focal species, greater numbers of mourning dove (*Zenaida macroura*), olive-sided flycatcher (*Contopus cooperi*), purple finch (*Carpodacus purpureus*), and Cassin's vireo (*Vireo casinnii*) occurred at treated stations during both years. These species are associated with edges, providing evidence that bird response to increased edge habitat may be an important consideration for these treatments. Our data on bird communities suggest that the ecological effects of these treatments (as measured by bird abundance) are generally consistent with the goals and objectives of a regional conservation plan. We suggest that this is a result of the spatial scale of treatments and the retention of shrub patches in treated areas. This project illustrates the application of regional bird conservation plans in understanding the effectiveness of various treatments in mimicking the effect of fire disturbance as it relates to the maintenance of diversity and processes associated with fire-adapted ecosystems.

Attachment 7. Abstract from draft manuscript and PhD dissertation chapter describing models that can be used to predict bird distribution as described by interactive effects of floristics and physiognomics.

Interactive Effects Of Floristics And Physiognomics On Patterns Of Bird Distribution

Nathaniel E. Seavy[a,b], and John D. Alexander[b]
[a]Department of Zoology, University of Florida
[b]Klamath Bird Observatory

Patterns of bird distribution have often been investigated within the context of physignomic and floristic characteristics of vegetation. These patterns are especially useful when they can be expressed as thresholds that distinguish between occupied and unoccupied habitat. To investigate the ability of physiognomy and floristics to predict bird distribution, we sampled vegetation characteristics and bird abundance at nearly a thousand stations in a watershed in southern Oregon. At each station, we described vegetation characteristics using a structural measurement (vegetation volume) and a compositional measurement (proportion of the vegetation composed of conifer vegetation). We then used logistic regression to model the probability of occurrence of bird species as a function vegetation volume, conifer composition, and the interaction of these terms. We used receiver-operating characteristics (ROC) analysis to evaluate model performance and establish thresholds that distinguished between the characteristics of occupied and unoccupied habitats. Of the 44 species we investigated, 24 had models that performed well enough to warrant additional investigation. The interaction term between vegetation volume and composition was significant for 7 of these species. For the species with significant main effects, 4 had a significant effect of both characteristics, 8 had a significant composition term only, and 3 had a significant structural term only. As a result of interactive effects, structural thresholds varied depending on compositional characteristics; species associated with conifer vegetation often persisted in lower volume dominated by conifers, but were absent mixed-conifer stands of a similar vegetation volume. These results demonstrate the importance of considering the interactive effects of physiognomics and floristics on patterns of habitat use. We propose that investigating the interactive effects of physiognomic and floristic characteristics will provide novel insights into the response of birds to habitat changes created by forest management and large-scale disturbances, such as wildfires.

Attachment 8. Abstract from draft manuscript and PhD dissertation chapter using models to predict the ecological effects of wildfire as described by the relationship between bird distribution and the interactive effects of floristics and physiognomics.

Wildfire Effects On Passerine Bird Habitat Use In A Mixed-Conifer Forest

Nathaniel E. Seavy[a,b], and John D. Alexander[b]
[a]Department of Zoology, University of Florida
[b]Klamath Bird Observatory

In the mixed-conifer forests of western North America, fire is an important force that changes the structure and composition of forest vegetation. In 2001, data were collected on bird abundance and vegetation at almost 1,000 stations in the Little Applegate Valley in Southern Oregon as part of a watershed inventory. Later that summer, the Quartz Fire burned 2,500 ha of this area, including xx survey stations. Subsequently, these stations and 52 stations that were not burned were resampled each spring, providing one year of data before the fire and four years of data after the fire. Using these before and after data at burned and unburned station, we evaluated the degree to which the proportion of stations occupied by 29 passerine bird species. We found that eight decreased as a result of the fire. The magnitude of these changes varied through time, the difference between burned and unburned areas was greatest in the second and third year after the fire and much less in the first and fourth year after the fire. Most of the species that

decreased after the fire were those associated with mature coniferous species. In contrast, there was statistical evidence for an increase in only a single species (Pine Siskin). The absence of species that increase after fire suggests that recolonization of burned areas may be limited by dispersal. For 16 species, we compared the observed differences between burned and unburned areas with differences predicted by habitat models. The correlation of observed and predicted differences increased over the study period, and by the fourth year there was good correspondence. For large-scale changes that are difficult or impossible to replicate, the use of models to verify the results increases the ability that these changes were caused by the fire and are not an artifact of stochastic fluctuations in abundance.

Attachment 9. Abstract from manuscript, that has been accepted for publication, describing vegetation and topographical correlates of fire severity.

Vegetation and topographical correlates of fire severity from two fires in the Klamath-Siskiyou region of Oregon and California

John D. Alexander[a], Nathaniel E. Seavy[a,b], C. John Ralph[c], and Bill Hogoboom[c]
[a]Klamath Bird Observatory, P.O. Box 758, Ashland, OR 97520, USA.
[b]Department of Zoology, University of Florida, Gainesville, FL 32611-8029, USA.
[c]USDA Forest Service, Redwood Sciences Laboratory, Pacific Southwest Research Station, 1700

We used vegetation data collected in areas before they were burned by the 2,500 ha Quartz fire in southern Oregon and the 50,600 ha Big Bar complex in northern California to evaluate the ability of vegetation and topographic characteristics to predict patterns of fire severity. Fire severity was characterized as high, moderate, or low based on crown scorch and consumption and changes in soil structure. In both fires vegetation plots with south aspects were more likely to burn with high severity than plots with east, north, or west aspects. This was the only consistent predictor across both fires. In the Quartz fire we found that plots at higher elevations and with larger diameter trees were more likely to burn with low or moderate severity. These correlations may have been influenced in part by the effects of unmeasured weather conditions. We found few strong correlates in the Big Bar complex, owing in part to the fact that most (75%) of our plots were in the low severity category, providing relatively little variation. These results, in combination with previous studies of fire severity in the Klamath-Siskiyou region, suggest that areas with southern aspects tend to burn with greater severity than those of other aspects, areas with large trees burn less severely than those with smaller trees, and that correlates of fire severity vary extensively among fires.

Citation: Alexander, J. D., N. E. Seavy, and C. J. Ralph. In Press. Vegetation and topographical correlates of fire severity from two fires in the Klamath-Siskiyou region of Oregon and California. *International Journal of Wildland Fire*.

Attachment 10. Abstract from published manuscript summarizing information on fire effects on major vegetation types and bird/fire relations, and posing management related questions and research considerations, to inform resource managers.

Fire And Birds In Maritime Pacific Northwest

Mark H. Huff[a], Nathaniel E. Seavy[b,c], John D. Alexander[b,c], And C. John Ralph[d]

[a]USDI Fish and Wildlife Service, Office of Technical Support – Forest Resources
[b]Klamath Bird Observatory
[c]Department of Zoology, University of Florida
[d]USDA Forest Service, Redwood Sciences Laboratory, Pacific Southwest Research Station

Resource managers face the challenge of understanding how numerous factors, including fi re and fire suppression, influence habitat composition and animal communities. We summarize information on fi re effects on major vegetation types and bird/fi re relations within the maritime Pacific Northwest, and pose management related questions and research considerations. Information on how fi re affects birds is limited for the maritime Pacific Northwest, even though fi re is an essential process within natural vegetation communities throughout the region. We describe fi re regimes, vegetation succession patterns, bird communities, and fire effects on birds for 12 major vegetation types in the region. Fire regimes and fi re effects vary considerably within this region due to its diverse topography and climate. Seven of the types have a low- to moderate-severity fire regime and five have a high-severity fire regime with fi re-return intervals that span several centuries. Bird communities and effects of fi re are best known from the western hemlock type, which has a high-severity fi re regime. The postfire stand-initiation stage in this type supports a reasonably distinct avifauna compared to other successional stages, a phenomenon that has been documented for high-severity fi re regimes in other regions. In general, there is a high turnover of species after high-severity fi res, with a shift primarily from canopy-dwelling to ground-,shrub-, and snag-dwelling species that mostly are not associated with other successional stages. No studies exist that directly address how bird communities are affected by habitat changes from fi re suppression in this region. The most likely bird communities vulnerable to these changes are in low-severity, high-frequency fi re regimes that include the Douglas-fi r type, drier portions of the white fi r type, Oregon-oak woodlands and savannas, native grasslands and sclerophyllous shrublands. In general, prescribed fi re is not being used for bird conservation in this region. Where prescribed fi re is being used to restore fi re as an ecological process or more often for reducing potentially hazardous fuels, bird conservation objectives can be achieved as a secondary benefit. New land management polices that will greatly accelerate fuel reduction activities throughout the Pacific Northwest, including use of prescribed fi re, are currently being undertaken with limited scientific information on the ecological consequences for bird communities.

Citation: Huff, M. H., N. E. Seavy, J. D. Alexander, and C. J. Ralph. 2005. Fire and birds in the maritime Pacific Northwest. Studies in Avian Biology. 30:46-62.

Appendix A. Comparison of deliverables specified in Joint Fire Sciences Program proposal *Determining The Ecological Effects Of Fire Suppression, Fuels Treatment, And Wildlife Through Bird Monitoring In The Klamath Ecoregion Of Southern Oregon And Northern California* and related products that resulted from Joint Fire Sciences Project # 01B-3-2-10.

Proposed	**Delivered**
Fire history and bird distribution in the Klamath Ecoregion	Accepted Publications: Alexander, J. D., C. J. Ralph, B. Hogoboom, N. E. Seavy, and S. Janes. 2004. Understanding effects of fire suppression, fuels treatment, and wildfire on bird communities in the Klamath-Siskiyou Ecoregion. Pp. 42-66 in K. L. Mergenthaler, J. E. Williams, and E. S. Jules (Eds.). Proceedings of the Second Conference on Klamath-Siskiyou Ecology. Siskiyou Field Institute, Cave Junction, Oregon.;Huff, M. H., N. E. Seavy, J. D. Alexander, and C. J. Ralph. 2005. Fire and birds in the maritime Pacific Northwest. Studies in Avian Biology. 30:46-62.
The effects of controlled under-burns on bird abundance and distribution in mixed conifer habitats in northern California	Draft Publication: Seavy, N. E. and J. D. Alexander. Measuring ecological effects of prescribed fire using birds as indicators of forest conditions. Klamath Bird Observatory. Ashland, Oregon.
Effects of juniper encroachment on bird distribution and abundance in ponderosa pine and shrub-steppe habitats of southern Oregon	Accepted Publications: Sabol, T. D. 2005 Effects of western juniper (Juniperus occidentalis) removal on avian species composition in shrub-steppe habitat in south-central Oregon. 2005. Master's thesis, Southern Oregon University, Ashland, Oregon.; Seavy, N. E., S. Quader, J. D. Alexander, and C. J. Ralph. 2005. Generalized linear models and point count data: Statistical considerations for the design and analysis of monitoring studies. Pp 744-753 in C. J. Ralph and T. D. Rich (Eds.). Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference. 2002 March 20-24; Asilomar, California; Volume 2. Gen. Tech. Rep. PSW-GTR-191. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 643 p.
Effects the reintroduction of fire on birds in true fir, mixed conifer and ponderosa pine habitats in Crater Lake and Lava Beds National Parks	Submitted Publication: Alexander, J. D., M. C. Rasmussen, J. L. Stephens, N. E. Seavy. Restoring fire in Lava Beds National Monument, California: short-term effects of prescribed fire on bird diversity and abundance. Intended for submission to Restoration Ecology.
Effects of manual fuel reduction treatments on birds in oak, grassland and shrub habitats of southern Oregon	Submitted Publication: Alexander, J. D., N. E. Seavy and P. E. Hosten. Using taxa-based conservation plans to evaluate ecological effects of fuels reduction: insights from bird monitoring in southwest Oregon oak woodlands and chaparral. Submitted to Forest Ecology and Management.
Effects of wildfire and wildfire restoration and recovery on birds of the Megram/Onion Fire in northern California	Report: Ralph, C.J., N.E. Seavy, J.D. Alexander. 2004. Effects of the Megram Fire on Bird Abundance: Preliminary Analysis. USDA Forest Service, Pacific Southwest Research Station. Redwood Sciences Laboratory. Arcata, CA
The relationship between of habitat condition on fire intensity in the Quartz Fire of southern Oregon	Accepted Publications:Alexander, J. D., N. E. Seavy, and C. J. Ralph. In Press. Vegetation and topographical correlates of fire severity from two fires in the Klamath-Siskiyou region of Oregon and California. International Journal of Wildland Fire.
Effects of wildfire and wildfire restoration and recovery on birds of the Quartz Fire in southern Oregon	Draft Publication: Seavy, N. E. and J. D. Alexander. Interactive effects of floristics and physiognomics on patterns of bird distribution. Intended for submission to Ecological Applications.; Seavy, N. E. and J. D. Alexander. Wildfire effects on passerine bird habitat use in a mixed-conifer forest. Intended for submission to Ecological Applications.