

Kerri Vierling - Lewis WP & Burns

Sel. criteria:

Wilderness related - ⊖ hasn't been done in Nat, ^{landsc}

+3.0

Impt Idaho - ⊕ sensitive species

Part of Long Term - ⊖ Not stream or carnivores

Key processes - ⊕ Fire

Regional topic - ⊕⊕ fire, sensitive species

Interdisc - ⊖ no connection (future connect to Golden)

Proposal Eval.

Sci Merit: ⊕⊕ fire & deciduous riparian

+3.5

Likely success: ⊕⊕ simple study design & ^{MGR} needed ^{results}

? Compound benefits: ⊕⊕ ^{Idaho} Sensitive species

Budget N/A

Addl. funding N/A

DV Goals N/A

Advantages: Fire topic, Birds - new area, New faculty, Study design simplicity

Disadv: Lack of connections - agencies, places
Topic of local interest

Project title: Lewis's Woodpecker nest-site selection and reproduction in burned riparian forests within a wilderness setting

Applicant:

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Abstract

Lewis's Woodpeckers (*Melanerpes lewis*) have been experiencing population declines across their range, and are listed by the Idaho Fish and Game Department as a Species of Greatest Conservation Need (SGCN). Lewis's Woodpeckers are aerial insectivores that nest in large snags dispersed within open woodlands such as burned ponderosa pine (*Pinus ponderosa*) forests or riparian woodlands. Both of these habitats typically have large snags and an abundant prey (i.e. insect) base. However, while multiple studies have been conducted in burned pine forests, less is known about the relative importance of riparian woodlands to this species. The major goal of this project is to better understand the factors that affect nest-site selection and reproduction of Lewis's Woodpeckers in burned riparian woodlands within a wilderness setting. Beginning in May, 2007, a M.S. student will search for nests along Big Creek and its tributaries. Nests will be monitored every 3-4 days, and once nests have fledged young or failed, vegetation measurements will be taken at and around the nest tree. Similar measurements will be gathered from random sites. Both nest-site selection and daily nest survival rates will be examined using an information-theoretic approach. Because Lewis's Woodpeckers are a species of concern at the state, regional, and national level, information pertaining to their reproduction and nest-site selection will provide important data for wildlife managers. Additionally, a broader understanding of how birds respond to a "natural" landscape is important to gain a perspective on the relative importance of these settings for sensitive species.

Objectives

The objectives of this project are to 1) examine nest-site selection of Lewis's Woodpeckers in burned, riparian environments within a wilderness setting, and 2) examine the environmental factors that influence nestling survival rates in burned riparian environments within a wilderness setting.

Justification

Lewis's Woodpeckers have been experiencing population declines across their range (Sauer et al. 2005), and are designated by the Idaho Department of Fish and Game as a Species of Greatest Conservation Need (SGCN). Lewis's Woodpeckers are aerial flycatchers whose typical nesting habitats include riparian woodlands and open, park-like, ponderosa pine (*Pinus ponderosa*) forests in the western United States (Bock 1970). Due to its weak excavation abilities, this species requires large, heavily-decayed snags located within open, park-like woodlands (Bock 1970, Vierling 1997).

Fire is an important process for creating suitable habitat for this species. Saab and Vierling (2001) note that burned ponderosa pine forests are likely source habitats for Lewis's Woodpeckers whereas riparian habitats in agriculturally-dominated landscapes are likely sink habitats. Source habitats are habitats in which reproduction exceeds mortality, whereas sink habitats are habitats in which mortality exceeds reproduction (Pulliam 1988). The source function of burned forests is likely the result of three interacting factors: 1) fires create the snags which this species relies upon, 2) the resulting high productivity of the understory following fire likely creates an abundant prey base for this species, and 3) nest predator densities are initially low following a fire due to lack of cover and/or forage (Saab and Vierling 2001).

Fire is a natural process in ponderosa pine forests, and while fire can have similar mechanistic effects in riparian zones, we have a limited understanding of how fire might influence the breeding biology of a sensitive species such as Lewis's Woodpeckers. Due to the linear nature of riparian zones and the availability of emergent insects, the effects of fire likely differ in burned riparian zones compared to effects noted in large scale ponderosa pine forest burns. The overall goal of this project is to gain a better understanding of the factors that affect nest-site selection and reproduction within burned riparian habitats in a wilderness setting. This goal addresses many of the priorities outlined by the DeVlieg-Taylor Ranch call for proposals. First, this project would enhance our understanding of fire effects on the biology of a sensitive species. Additionally, this project would incorporate a broader understanding of how stream and watershed characteristics influence nest-site selection and reproduction for an aerial insectivorous species. Finally, few studies have been conducted on this species in riparian settings (see Vierling 1997, Saab and Vierling 2001), and understanding the relative importance of landscape context (i.e. wilderness) is important both from an ecological perspective as well as from a management perspective.

Methods

Nest searching and monitoring

A MS graduate student will begin searching for Lewis's Woodpecker nests along Big Creek and its tributaries beginning in mid-late May, when Lewis's Woodpeckers

typically initiate breeding activities. Riparian woodlands near Taylor Ranch have burned during two distinct time periods: some burned between 1998-2000 and some have burned more recently between 2005-2006. Due to the differences in post-fire succession that might influence nest-site selection, the student will balance search efforts between tributaries that burned during those two time periods. The MS student will GPS all nest tree locations and will monitor all nests every 3-4 days until they fail or young fledge. Where possible, nest monitoring will occur with TreeTop cavity viewers; these cavity viewers telescope up to 50 feet and allow a view of nest contents and are commonly used in cavity nester studies (Dudley and Saab 1998). If nest cavities are inaccessible, we will observe parental activity as an indicator of nest stage.

Nest-site selection

In order to determine factors influencing nest-site selection, the student will record a suite of vegetation measurements at both nest and random sites following BBIRD protocol (Martin et al. 1997). Measurements at nest trees will not be taken until the nest either fails or fledges young. The student will record tree height and cavity height, cavity age (new vs. old), tree species, decay class, and diameter at breast height (dbh). Within a 5 m radius of the nest tree, the student will record the number of shrub stems <2.5 cm dbh, 2.5-5.0 cm dbh, and 5-8 cm dbh. The student will also record the number of live trees and >23 cm dbh within 11.3 m of the nest (0.04 ha; Martin et al. 1997). These same characteristics will be measured at random sites centered upon a random tree. Random trees will be a minimum of 100 m from the nest tree, and will be in the same tributary as the nest tree.

Once data are gathered, the student will run multiple binary logistic models to examine the factors affecting nest-site selection. The student will use an information-theoretic approach [Akaike's Information Criterion (AIC); Burnham and Anderson 2002] to determine the best model among an *a priori* set consisting of a fully parameterized global model and its reduced forms. The student will apply the Hosmer-Lemeshow goodness-of-fit test to the global model to ensure that it adequately fits the data (Hosmer and Lemeshow 2000), and will also determine the overdispersion parameter (\hat{c} ; Pearson's χ^2 divided by the degrees of freedom) to assess whether a quasi-likelihood correction is necessary (Burnham and Anderson 2002).

The student will examine habitat selection in the context of multiple covariates, including: diameter at breast height (dbh) of the cavity tree, density of shrubs within a 5 m radius of the nest tree, density of snags > 23 cm within 0.04 ha of the focal tree, width of the riparian zone, and position of the nest within the riparian zone and/or watershed. The student will also likely incorporate some measure of burn severity, which has been noted elsewhere to influence nest-site selection (Vierling and Lentile 2006). In general, these variables were chosen because they have been reported as potentially important determinants of nest-site selection for Lewis's Woodpeckers or have been suggested to be important for aerial insectivores in riparian habitats.

Daily nest survival (DNS)

The student will examine the environmental factors that affect Lewis's Woodpecker nest survival in burned riparian habitats. Daily nest survival will be examined using many of the same covariates utilized in the nest-site selection portion of

the study. Similar to the nest-site selection portion of the study, the student will use an information-theoretic approach. The student will follow methods outlined by Shaffer (2004) to build models that assess daily survival rates as a function of various covariates. These models will be compared using AIC to determine the best model among the global model and its reduced forms. Based on the PI's previous visits to Taylor Ranch and existing data provided by Jim and Holly Akenson, a sample size of approximately 20-30 nests per field season appears reasonable.

Proposed timeline:

Date	Activity
May 1, 2007	Hire student; preview activities necessary for 1 st field season
May 15, 2007	Begin field work at Taylor Ranch
May – July, 2007	Find nests and monitor them every 3-4 days
July 2007 – early August, 2007	Complete vegetation data collection
Mid-August, 2007 through mid-May, 2008	1 st academic year at UI
May 15, 2008	Begin field work at Taylor Ranch
May – July, 2008	Find nests and monitor them every 3-4 days
July 2008 – mid-August, 2008	Complete vegetation analyses
Mid-August, 2008 through mid-May, 2009	2 nd academic year at UI
Mid-May, 2009	Anticipated graduation

Expected results

It is anticipated that the student will successfully complete a Master's degree at the University of Idaho. Additionally, it is expected that there will be one (if not two) peer-reviewed publications resulting from this work.

Benefits of research to understanding the Salmon River Mountains ecosystem and society at large

Because Lewis's Woodpeckers are a species of concern at the state, regional, and national level, information pertaining to their reproduction and nest-site selection will be important for this species management. Additionally, a broader understanding of how birds respond to a "natural" landscape is important to gain a perspective on the relative importance of these settings for sensitive species. Finally, limited information exists pertaining to cavity nester responses to fire in riparian woodland, and managers require more data than are currently available.

Additional funding availability:

I request funding to cover the MS student's stipend, tuition and fees, and the maximum allowed for living expenses. I currently have an NSF grant addressing fires and cavity nester populations, and while I have no money currently budgeted for a stipend or fees on this grant, it can be used to assist in travel-related expenses. I currently have all of the necessary equipment (cavity viewers, etc.) for the M.S. student to conduct the work. The end of the NSF grant is February 2008, with the possibility of a one-year

no-cost extension granted by NSF until February 2009. Because Lewis's Woodpeckers are classified as a Species of Greatest Conservation Need within Idaho, I will also encourage the graduate student to write a grant for the State Wildlife Grant program to cover any expenses not covered by this DeVlieg Foundation grant.

Literature cited

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- Vierling, K.T. 1997. Habitat selection of the Lewis' woodpecker (*Melanerpes lewis*) in southeastern Colorado. *Wilson Bulletin* 109: 121-130.

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EDUCATION

Ph.D., Department of Environmental, Population, and Organismic Biology, University of Colorado, Boulder, Colorado. 1998

M.A., Department of Environmental, Population, and Organismic Biology, University of Colorado, Boulder, Colorado. 1994

B.A., Biology, The Colorado College, Colorado Springs, Colorado. 1990

PROFESSIONAL SOCIETY MEMBERSHIPS

Ecological Society of America
The Wildlife Society
American Ornithologists Union
The Cooper Society
Phi Beta Kappa Society

SCIENTIFIC POSITIONS HELD

Assistant Professor. University of Idaho. Responsible for teaching ornithology and wildlife related courses in addition to conducting an active research program. 9/04 - present

Associate Professor. South Dakota School of Mines and Technology. Responsible for teaching ecological, environmental science, human anatomy, and human physiology courses in addition to maintaining an active research program. 9/98 – 9/04.

Wildlife Biologist. City of Boulder Open Space Department. Responsible for monitoring the fauna on Boulder's 26,000 acres of Open Space property, designing management strategies which protect and preserve the fauna on this Open Space, coordinating/conducting research projects in conjunction with local and state agencies, and developing public education programs on wildlife issues. 10/97 - 8/98

Graduate teaching and research assistant. The University of Colorado, Boulder, Colorado. 1993-1998.

RELATED PUBLICATIONS

1. Vierling, K.T. and D.J. Gentry. Post-fire succession and source-sink dynamics of Red-headed Woodpeckers. *American Midland Naturalist*. *In review*.
2. Vierling, K.T., L.B. Lentile, and N. Nielsen-Pincus. Pre-fire characteristics and post-fire woodpecker use in burned coniferous forests. *Journal of Wildlife Management*. *In review*.
3. Clawges, R., K.T. Vierling, Vierling, L. A., Rowell, E. Use of airborne lidar for assessment of avian habitat and estimation of select vegetation indices in the Black Hills National Forest, South Dakota, USA. *Remote Sensing of the Environment*. *In review*.
4. Gentry, D.J. and K.T. Vierling. Old burns as source habitats for Lewis's Woodpeckers in the Black Hills. *The Condor*. *In press*.
5. Vierling, K.T. and L.B. Lentile. 2006. Red-headed Woodpecker nest-site selection and reproduction in a mixed ponderosa pine and aspen woodland following fire. *The Condor*. 108: 957-962.

6. Vierling, L.A. and K.T. Vierling. 2006. Creating undergraduate community ambassadors of earth system science. *Journal of Geoscience Education*. 54: 283-286.
7. Stubblefield, C., M. Rumble, and K.T. Vierling. 2006. Landscape scale attributes of elk centers of activity in the central Black Hills of South Dakota. *Journal of Wildlife Management*. 70: 1060-1069.
8. Vierling, K.T., J. Bolman, and K. Lane. 2005. Tethering modern field ecology in a culturally significant context: a learning module illustrating woodpecker habitat selection and fire ecology. *The Science Teacher* 72(3): 26-31.
9. Vierling, K.T. and B.L. Winternitz. 2003. Western Scrub-Jay Breeding Biology in Central Colorado. *Western North American Naturalist*. 63(4): 513-516.
10. Bock, C.E., K.T. Vierling, S. Haire, and W.W. Merkle. 2002. Patterns of rodent abundance on open space grasslands in relation to urban edges. *Conservation Biology* 16: 1653-1658
11. Saab, V. and K. Vierling. 2001. Reproductive success of Lewis' Woodpecker in cottonwood riparian and burned pine forests. *The Condor* 103: 491-501.
12. Vierling, K.T. 2000. Source and sink population dynamics of Red-winged blackbirds in a suburban/rural landscape. *Ecological Applications*. 10: 1211-1218.
13. Vierling, K.T. 1999. Habitat quality, population density, and habitat-specific productivity of Red-winged blackbirds (*Agelaius phoeniceus*) in Boulder County, Colorado. *American Midland Naturalist* 142: 401-409
14. Vierling, K.T. 1998. Interactions between European starlings and Lewis' woodpeckers at nest cavities. *Journal of Field Ornithology* 69: 376-379.
15. Vierling, K.T. 1997. Habitat selection of the Lewis' woodpecker (*Melanerpes lewis*) in southeastern Colorado. *Wilson Bulletin* 109: 121-130.

GRANTS AND AWARDS

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| 2006 | United States Department of Agriculture. \$180,000. Enhancing the spatial heterogeneity of grazed landscapes: implications for the fire fuel matrix and insects and birds. |
| 2005 | Idaho Fish and Game Department. \$26,900. Assessment of avian community composition and reproduction within juniper/aspen stands in the Owyhees. |
| 2004 | NSF Gender in Science and Engineering. \$200,000. Implementation of a women's mentoring program to increase retention of female science and engineering students at the South Dakota School of Mines and Technology. |
| 2004 | South Dakota Game, Fish, and Parks Department \$26,250; Post-fire reproduction of Black-backed Woodpeckers and Lewis's Woodpeckers in the Jasper Fire. |
| 2003 | National Aeronautics and Space Administration. \$19,000. Funds acquired for investigation of the uses of Light Detection and Ranging (LiDAR) remote sensing as it applies to avian habitat modeling. |
| 2003 | South Dakota Game, Fish, and Parks Department \$30,000; Post-fire reproduction of Black-backed Woodpeckers and Lewis's Woodpeckers in the Jasper Fire. |
| 2002 | NSF grant: \$6000; supplemental grant for CAREER grant undergraduate research assistants. |
| 2002-2007 | NSF CAREER grant: \$500,000 over 5 years; A keystone species approach to determining post-fire successional influence on cavity user communities in the Black Hills, South Dakota |
| 2001-2006 | United States Forest Service. \$50,000/year for 5 years (dependent on year to year funding cycle). Evaluation of a model examining post-fire impacts of the Jasper fire on primary cavity nesters |
| 1991-1994 | Patricia Roberts Harris Fellowship. \$39,000. United States Department of Education. Funding for minorities in the sciences. |