Reproductive Success of Lewis's Woodpeckers in the Frank Church Wilderness

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Abstract:

Reproductive success of the Lewis's woodpecker (*Melanerpes lewis*) was previously studied in landscapes composed of an agricultural matrix and areas of greater human influence. These studies provide the relative probability of future success for a given population. Monitoring of the Big Creek population in the Frank Church-River of No Return Wilderness provided data for a population with low human impact. The results of these surveys do not provide adequate data for accurate statistical analysis. These data are compared to similar studies from populations existing in areas of higher human influence. No significant difference exists between the Big Creek population and other similar populations. It is vitally important future research on this population occur in order to acquire adequate data for more statistically accurate comparisons with other studies.

Key Terms: Lewis's woodpecker, *Melanerpes lewis*, feeding rates, reproductive success, fledging

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Definitions

Aerial Flycatching - the act of foraging and catching insects while in flight.

BBIRD Protocol - field protocols created by the University of Montana for collecting data on cavity nesting birds.

Burn Specialist - an organism that tends to live in post-burn areas.

CWCS - Comprehensive Wildlife Conservation Strategy.

DBH - diameter at breast height, measured in centimeters.

Densiometer - dome shaped instrument with squares engraved on the surface to determine canopy cover.

Feeding Rate - the rate at which adult birds feed their young, measured over an hour.

GPS - Global Positioning System.

Nest Success - the proportion of nests to produce at least one young to fledging.

Ocular Tube - a 1 inch diameter tube held at hip height to determine the degree of ground coverage.

Productivity - the number of young to survive to fledging.

SGCN - Species of Greatest Conservation Need.

Tributary - a smaller stream feeding into a larger stream.

Executive Summary

The listing of the Lewis's woodpecker (*Melanerpes lewis*) as a species of greatest conservation need (SGCN) in the Idaho Comprehensive Wildlife Conservation Strategy (ICWCS) requires up to date information on current populations for more effective conservation management. This listing was due to declining populations throughout most of its range within the state. Previous studies on reproductive success of this species occurred where human activities may have influenced results. It is difficult to assess whether these populations are affected positively or negatively by human factors such as agriculture, pesticides, and introduced predators such as domestic cats. To ascertain the effect of human proximity on this species it is important to determine the base line of reproduction without human influence.

During the summer of 2002, Stephanie Jenkins, a student of the University of Idaho, located nests along the Big Creek corridor in the Frank Church-River of No Return Wilderness. These nest sites were monitored by interns of Taylor Ranch Wilderness Research Station of the College of Natural Resources in the summers of 2003 through 2007. In the summer of 2008 new nest locations were recorded while some old nest sites remained inactive. Snow on June 10th and 11th resulted in nest failure and re-nesting of only five previously noted nests. This limited the quantity of data available. Results from summer 2008 have been compared to similar studies and noted that there is no significant difference between the Big Creek and alternate populations.

These results show further research on the Big Creek population is necessary due to the interruption of nesting and low quantity of data. Long term monitoring of this population as well as others within the Frank Church Wilderness would greatly assist in future comparisons.

I. Introduction

Background

In the face of continuing population declines throughout its range, the Idaho Department of Fish and Game listed the Lewis's woodpecker (*Melanerpes* lewis) as a species of greatest conservation need (SGCN) in the Comprehensive Wildlife Conservation Strategy (CWCS) (Idaho Department of Fish and Game 2005). Required by the federal government, each state must write up a CWCS to address at-risk species. A CWCS is not a conservation plan, but merely provides useful information concerning species of interest. These strategies provide a very good source of information for the development of future conservation plans and efforts (Idaho Department of Fish and Game 2005). Congress requires eight key elements for the development of an SGCN conservation plan. These requirements include a need to describe distribution and abundance of current populations, indications of current health, and factors that may assist in the restoration of declining species. Decline of Lewis's woodpecker populations within Idaho are not as severe as the national level, but they still follow this trend and have done so for several decades (Saab & Vierling 2001, Gentry & Vierling 2007). Reasons for these declines included loss of suitable habitat, pesticides, and competition for nest sites. Information, such as reproductive success in areas of differing stress, provides important information for future conservation and plan development.

Ranging from Arizona to British Columbia and from the Pacific Coast to Colorado, the Lewis's woodpecker remains in smaller, scattered populations. The woodpeckers breed in post-burn forests dominated by ponderosa pine (*Pinus ponderosa*) and riparian areas dominated by cottonwood (*Populus* spp.) (Saab & Vierling 2001). Nest trees are generally snags or trees with soft wood, as these are easier to drill into (Saab & Vierling 2001). As weak cavity excavators,

Lewis's woodpeckers typically use existing cavities or excavate into dead or decaying wood due to their weak skull morphology (Bock 1970, Vierling 1997). Rate of cavity reuse after establishment remains high as well. In winter, Lewis's migrate to areas containing high concentrations of oak trees for the acorn crop (Vierling 1997).

While most woodpecker species excavate insects through wood boring, the Lewis's woodpecker is noted as an aerial flycatcher. Another possible reason for an increased preference for burn areas may result from increased insect populations in these areas. The presence of a more open canopy and greater shrub development assists in the greater production of insect populations (Linder & Anderson 1998, Saab et al. 2007). Increased shrub cover provides greater food availability for insects leading to increased insect abundance. However, increased foliage also leads to greater cover for predators (Saab & Vierling 2001).

Increased cover around nest trees allows predators to access nests more easily, thereby increasing nest predation. Nest predators, such as squirrels and snakes, are thought to be the main cause of nest failure in most studies (Saab & Vierling 2001, Saab et al. 2004, Gentry & Vierling 2007). Open canopy also results in better perch sites, good visibility and foraging maneuverability (Linder & Anderson 1998, Saab & Vierling 2001).

While a number of studies focus on breeding activities of Lewis's woodpeckers in riparian areas, most simultaneously occur within agricultural matrices heavily influenced by flood control and pesticide/herbicide spraying (Vierling 1997, Saab & Vierling 2001). This human activity likely impacts Lewis's woodpecker productivity and reproductive success. Such impacts include reduction in prey abundance, changes in predator community, alteration of nest site selection, and possible effects from pesticides (Saab & Vierling 2001).

Research concerning the reproductive success of Lewis's woodpeckers in a habitat setting away from human influences has not yet taken place. Information from this study can be used as a baseline for both past and future studies. Data collected from the Frank Church Wilderness population, including feeding rates and productivity, is compared to other studies in differing habitat types to gain a better picture of the current influence of human activities on these populations. The population of Lewis's woodpeckers along Big Creek provides a good study population away from agricultural areas and is minimally impacted by humans.

Taylor Ranch Wilderness Field Station is situated in the Frank Church Wilderness. The wilderness has a history of fires that provide a variety of burn severities across the landscape, creating excellent habitat for the Lewis's woodpecker. Only one other undergraduate study on Lewis's woodpecker has taken place in the Frank Church on determining nest location from satellite data on vegetation. No studies exist concerning reproductive success of these populations.

Problem

The Idaho Department of Fish and Game must produce a CWCS and conservation plans for all SGCN. Updating these plans requires current research and information on the state of many Lewis's woodpecker populations and current trends throughout the state of Idaho. An effort must take place to find factors that influence restoration and conservation of the species and to assess current population trends in differing habitat types and levels of human stress. In order to understand the reason for population decline, factors influencing the decline must first be determined. There remains a lack of information concerning reproductive success across various isolated Lewis's woodpecker populations. This information could greatly assist

managers in future efforts with Lewis's that live in differing habitat types and under different stresses.

Purpose

This report addresses three issues concerning the reproductive success of Lewis's woodpeckers on a local and state level. The first issue addressed covers the results of data collected in the summer of 2008 on the reproductive success of a small population of Lewis's woodpeckers in the Frank Church Wilderness. The second issue takes these results and compares them with similar studies that also review reproductive success from differing habitat types and levels of human influence. This comprises the main purpose behind the paper in addressing the similarities and differences between pre-existing data and data recently acquired. Finally, this report will draw conclusions concerning the comparison stated previously. Solutions to the continuing problem of population decline will not be addressed here, only possible explanations for discrepancies found between the various data sets. This data may provide useful information to future researchers concerned with habitat conservation, or how best to limit human influence on various populations.

Scope

Results acquired from the research and comparisons presented here may provide assistance to managers on both local and state levels within the state of Idaho. It is possible this study could also apply to other areas of the Northwest throughout the range of the species. Likely, this report will provide the most useful information to managers involved in conservation planning of the Lewis's woodpecker. While this report does compare results found in multiple

studies, it does not attempt to address solutions and only provides needed information on how reproductive success differs between populations in differing habitat types.

Description of Study Area

The study was preformed along the Big Creek drainage in the Frank Church-River of No Return Wilderness. Big Creek as well as its tributaries between Cabin Creek on the west end and Goat Creek were surveyed for presence of woodpecker nests. The creeks surveyed in this study included Big Creek upstream and downstream from Taylor Ranch, Rush Creek to the West, Cliff Creek directly North of Taylor, Pioneer Creek directly South of Taylor and Goat Creek to the East. Each of the tributaries examined varied in flow, topography, vegetative cover and snag cover. Big Creek and its tributaries were chosen as a study area due to an expansive forest fire that burned 170,000+ acres down Big Creek and other drainages in August of 2000. The fire left extensive, suitable habitat for nesting of Lewis's woodpeckers along riparian zones.

II. Results and Comparisons

Methods

Standardization of methods both in the field and in data analysis was imperative to accurately compare sets of data. Previously accepted field protocol provided the restrictions on data acquisition in order to minimize the degree of human error both in locating and observing nests, as well as in comparing data.

Field Protocol

In surveying for and observing nests, field practices from the Breeding Biology Research and Monitoring Database (BBIRD) provided protocol necessary to gather accurate and

comparable results. Three main aspects of the project that required the application of these protocols were locating nests and establishing study plots, observation of bird activity at the nest, and measurement of vegetation characteristics within study plots.

Establishment of study areas followed Big Creek and its tributaries from Cabin Creek to Goat Creek. The establishment of six well separated areas provided limited probability of interference between established nesting pairs. These areas included upstream Big Creek, downstream Big Creek, Rush Creek, Pioneer Creek, Cliff Creek, and Goat Creek. Surveys along each stream took place every two to three days as suggested by the BBIRD protocol. Identifying birds identified visually as they did not actively vocalize until much later in the summer. Notation of initial locations of single birds and pairs in May and early June led to further observation until a nest was confirmed or no birds inhabited the area. Previously existing nest locations also aided in the establishment of nest sites for the study.

An initial distance of about 50 m was maintained to minimize any disturbance caused by human presence. Once nesting activity became apparent in a particular area, observation of cavities in that area took place every 2-3 days for half hour to hour periods. In this time, the sight of an adult entering a cavity with food, or switching places with its mate signified an active nest. Once confirmed, observations on nests took place every three days for one hour between 9:00AM and 7:00PM to record all feeding events. Observations for each nest covered the span of these hours to negate time of day effects on feeding rate analysis.

Procedure for data collection of vegetation characteristics of study sites was also standardized through the BBIRD protocols. Vegetation measurements occurred on both nest trees and random trees within a 50 m x 150 m plot that did not overlap with other plots. Plot size differs from the BBIRD protocol due to the fact that river flats where nests occurred were

smaller than the advised plot size. Plots were 11.3 m in radius for large stem counts with a smaller 5 m radius circle for small stem counts, ground cover, and canopy cover. Data collected involved nest tree/random tree location and height, overstory cover, ground cover, small stem counts and large stem counts. Use of a handheld GPS units using NAD 83 provided locations on all nest trees and plot boundaries.

Determination of canopy cover resulted from use of a densitometer at the base of the nest tree in the four cardinal directions. Ground cover percentages took place at 1 m, 3 m, and 5 m in the four cardinal directions through an ocular tube. Categories of ground cover include the percentage of shrub, herbaceous, litter, and bare ground or rock. Small stem counts occurred within the smaller 5 m radius circle. To count stems, they needed to fit the criteria of taller than 50 cm and less than 12 cm in diameter. Stems dividing lower than 10 cm equated to two stems. Large stem counts took place within the larger 11.3 m radius circle. Those woody stems greater than 8 cm in diameter were counted. Notations on these stems included decay class, species, diameter at breast height (DBH), height, and woodpecker or insect presence.

Analysis

Statistical analysis for vegetation data as well as feeding rates consisted of mean, standard deviation, and range. This provides a better understanding of the general average for these factors and makes them easier to compare with related data. Specific data analyzed includes nest tree height and diameter, nest height, and feeding rate. These data were compared to comparative studies performed by Carl Bock (1970) and Kerri Vierling (1994) to assess the degree of similarity regarding wilderness and human influenced populations.

Results

Frank Church

In the course of the study period from May 21 to August 6, 2008 data on feeding rates and general vegetation consisted of the majority of data collected. On June 10 and 11 an unexpected drop in temperature and snow storm resulted in the failure of previously established nests. Prior this event, ten pairs exhibited nesting behavior. This behavior ended abruptly after June 11 resulting in the return of early pre-nesting behavior. Five nests of the previously expected ten established after June 11. Of the nests, two resided along Big Creek upstream of Taylor Ranch on separate flats, a third located on Taylor property, the forth found on Rush Creek and the final some distance from the creeks at the junction of Rush Creek and Big Creek.

Two of the five nest trees were Douglas fir (*Pseudotsuga* spp.), while the remaining three were Cottonwood (*Populus* spp.). The majority of nests did not show signs of new excavation and remained oriented between 166° and 324°. The average nest tree height was 24 m with a standard deviation of 6.2 m, while average nest height was 9.4 m with a standard deviation of 5.3 m. Average DBH was 60.5 cm with a standard deviation of 21.9 cm. Decay class of nest trees was either 3 or 4 (See Appendix).

Recording of feeding rates for Lewis's woodpeckers took place over a period of three weeks averaging 17.5 feedings of young per hour (n=29) with a standard deviation of 10.4 and range of 4 to 41. Sufficient data does not exist to compare feeding rates at different times of day. In comparing feeding rates from week to week, there remains a positive trend from the first to the third week (Appendix: Figure 1).

No data concerning productivity or nest success could be recorded due to late re-nesting and inability to extend the study period past August 6. Observation resulting from the managers

and assistant managers of Taylor ranch prove that fledglings did survive. The origin and number of fledglings produced is not known.

Comparison

Only two prior studies concerning Lewis's woodpeckers have recorded feeding rates. The first study by C. E. Bock (1970) recorded an average feeding rate of 15.1 feedings of young per hour (n=110) with a standard deviation of 10.1 and range of 2 to 62. Bock also recorded no visible correlation between feeding rate and age of the young. The second study by K. T. Vierling (1994) recorded an average feeding rate of 20.0 feedings of young per hour (n=23.5) for Lewis's woodpeckers in foothills of the Wet Mountains and 15.0 feedings of young per hour (n=79.4) for birds on the plains both of Southeastern Colorado.

Discussion

Feeding rates recorded for the population of Lewis's woodpeckers along the Big Creek corridor correspond very closely with previous rates taken by Bock and Vierling from differing locations. The increasing trend seen in feeding rates from the Frank Church population likely results from the forced re-nesting. This re-nesting event forced all pairs to establish nests at nearly the exact same time in order to optimize the amount of time remaining in the season to raise young. The trends seen in Bock's data likely result from staggered start dates for each nest dampening the visible increase in feeding rates as the time passes.

Vegetation measurements also correlate well to previous data exhibited by other studies. One nest was established comparatively close to the ground when considering other nests in this study as well as the average nest height for this species. It is uncertain whether this nest produced

fledglings for reasons stated above and it may have seen increase rates of predation due to close proximity to the ground and vegetative cover.

III. Conclusion

Due to the unforeseen weather and the resultant effects upon nesting and productivity of the Frank Church population, these data cannot be reliably compared due to small sample size and inadequate data regarding nests success and productivity. The absence of data on fledgling success creates a lot of uncertainty concerning the true reproductive success of this population. No difference was observed between feeding rates of the wilderness population and feeding rates of the previous study populations. This close association points to little to no impact of human proximity or disturbance upon feeding of nestlings. It can be approximated as well that in a "normal" summer if pairs initiated nesting within a day of each other, a positive trend in feeding rates could be observed. However, due to the snow event occurring June 10 and 11, the possibility of re-nesting so late in the season is now evident. Due to later observation on behalf of residents at Taylor Ranch, this re-nesting event also points to some success, though the degree of success is unknown.

V. Recommendations

When applying this information to future studies, caution should be used due to the small sample size and late start time of nesting. One major recommendation for this project is to repeat the study during a average summer to better understand the true average feeding rate and reproductive success of the population. While this data provides useful information regarding timing of re-nesting and trend of feeding rates over the nesting period, more data would provided

a better average. Studying other populations of Lewis's within the Frank Church Wilderness may also provided a better average feeding rate and fledgling success than just along Big Creek. Due to the staggered burning throughout the Frank Church wilderness, it may also benefit future researchers to look at the reproductive success based upon time after a burn and relative vegetation recolonization. This could provide useful information on the necessity of fire size and intensity for Lewis's woodpecker breeding habitat.

Future studies with regards to Lewis's woodpeckers may include research on the reproductive success on other populations around the state. Data on a broader number of populations and habitats could provide needed information on influencing factors for future researchers. More studies on both this population as well as others within the Frank Church would provide a much more stable and solid base for statistical analysis and comparison with other studies done with agricultural landscapes. A greater number of studies throughout the Lewis's range may also allow insight into the characteristics of source habitat and reasons for national decline. Most of all, it is highly recommended that more studies, whether along Big Creek, within the entire state of Idaho or throughout the Western United States, should take place to better understand the reproductive success of Lewis's woodpeckers.

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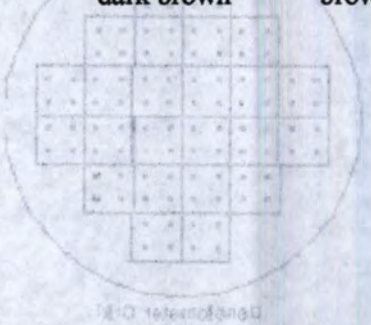
Appendix A: Decay Classification

	DECAY CLASS				
CHARACTERISTICS	1	2	3	4	5
Limbs	all present	few limbs no fine branches	stubs only	few/no stubs	none
Top	pointed	broken			
Diameter, broken top	----------increasing at decreasing rate----------				
Height	----------decreasing at decreasing rate----------				
% Bark remaining	100 ----------variable----------<20				
Sapwood presence	intact ----------sloughing----------gone				
Sapwood condition	sound, hard	firm to soft light brown advanced decay	fibrous soft reddish brown	cubical soft dark brown	gone
Heartwood condition	sound, hard	sound at base hard Incipient decay	decay at base advanced decay fibrous	sloughing advanced decay dark brown	sloughing dark brown



Appendix B: Figures

Figure 1

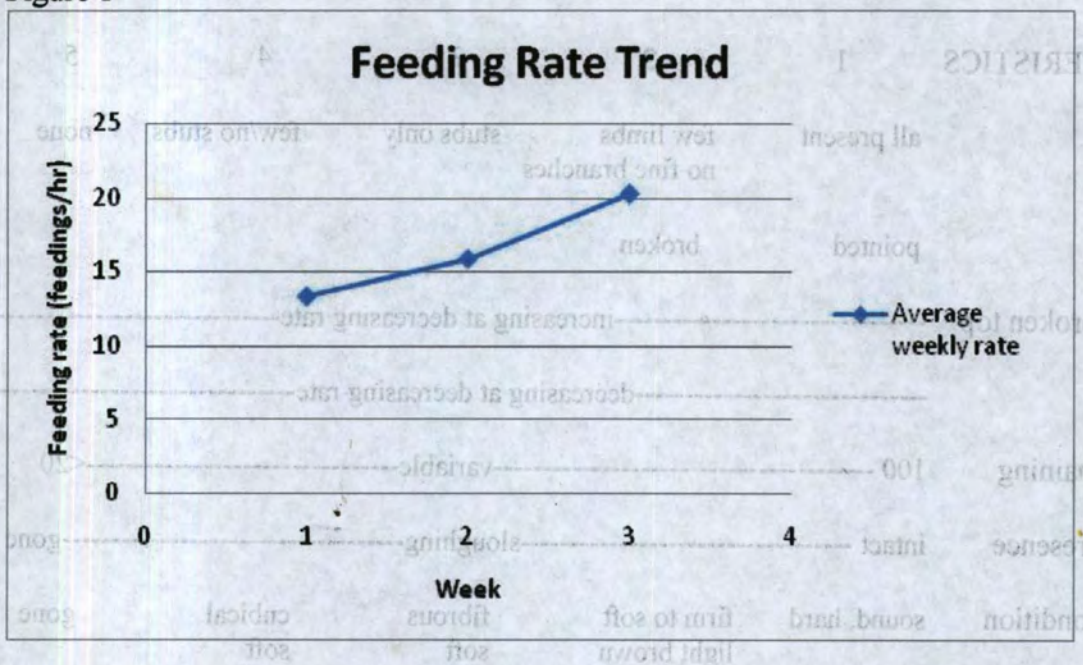


Figure 2