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WILDLIFE MANAGEMENT INSTITUTE
EDWARD K. LOVE FOUNDATION

March 8, 2005

Wildlife Diversity Small Grants Program
ATTN: Doug Backlund
South Dakota Dept. of Game, Fish and Parks
523 E. Capitol-Foss Bldg.
Pierre, SD 57501

Dear Dr. Backlund,

Enclosed is a project report for our project "Association of Black-backed woodpeckers with mountain pine beetle infestations" which was funded by the 2004 Wildlife Diversity Small Grants Program. The project is a MS student project at the University of Missouri with funding support provided by the Rocky Mountain Research Station in Rapid City and the University of Missouri. The field portion of the project began last spring and will continue this spring and summer.

Thank you again for supporting our project. As indicated in our proposal, we will send you a final report at the conclusion of this study in spring 2006. If you have any questions about our update, please contact me.

Sincerely,

Joshua Millspaugh

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Fish & Parks
Pierre, SD 57501

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Association of Black-Backed Woodpeckers with Mountain Pine Beetle Infestations In The Black Hills, South Dakota

Interim Progress Report for Wildlife Diversity Small Grants Program
South Dakota Game, Fish, and Parks

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March 8, 2005

INTRODUCTION

Cavity-nesting birds, such as woodpeckers, are an integral part of forest ecosystems. The Black-backed woodpecker (BBWP) is of particular interest in northern North America because of its low population numbers across its distribution and its association with recently burned habitats. Currently, the U.S. Forest Service lists the BBWP as a "Sensitive, Management Indicator Species" for the Rocky Mountain Region.

Because of the extent with which the associations between BBWPs and post-fire habitat have been documented, some consider them to specialize in such habitat. However, high numbers of BBWPs are limited to a few years following fires, due to the short life cycles (1-3 years) and the emergence of the wood-boring insects (Cerambycidae and Buprestidae) and bark beetles, specifically the mountain pine beetle (*Dendroctonus ponderosae* Hopkins) (MPB), which are the BBWPs main foods. Preliminary studies in the Beaver Park area of the Black Hills in 2002 indicated a population density of BBWP associated with mountain pine beetles that equaled the BBWP population observed following a 33,601 ha wild fire.

In the Black Hills, MPB populations have endemic and epidemic levels and BBWPs have been observed nesting in these areas. It is possible through high food abundances and increased nesting habitat that MPB infestations provide suitable habitat during the interim between fire events. But, quantification of nest success and reproductive rates of BBWPs in such areas in the absence of fire is needed to evaluate hypotheses about BBWP dynamics, fire, and mountain pine beetles.

Our objective in this study is to locate and monitor BBWP nests in areas of MPB infestation to determine nest survival, fledging success, and nest site selection. These data

will enable land managers to better understand the role that MPB areas play in sustaining BBWP populations. Results obtained from nest selection analyses will aid land managers in focusing on important resources with the attempt to reduce the potential for future population declines.

OBJECTIVES

1. To estimate demographics of Black-backed Woodpeckers (BBWP) in MPB infested areas in the Black Hills, South Dakota.

2. To quantify nest site selection of BBWPs at landscape, territory (250 m radius sites compared at a distance of 750 m), and micro-site (12.5 m plots) scales for areas of MPB infestation in the Black Hills, South Dakota.

METHODS

We began field sampling in early May, 2004. We conducted area searches for BBWPs in over 50 sites previously identified throughout the Black Hills National Forest. We identified potential nest sites by aerial reconnaissance from transects, spaced 2 miles apart, over the central region of the Black Hills during spring 2004. Areas of trees infested and killed two years ago were identified by the discoloration of foliage on the ponderosa pines that results from tree mortality. Areas of infestation selected as having the greatest potential BBWP habitat were those containing large patches or multiple small patches of beetle-killed trees located in close proximity to one another. Most sites were located in the west central region of the Black Hills, primarily in the area between Deerfield Lake and Bear Mountain. Additional sites included several in the Beaver Park area and near Pactola Lake.

We conducted area searches in all sites, aided by the use of transects, spaced at approximately 100 m, and GPS units. We paused along transects at 100 m intervals to play recordings of BBWP calls in an attempt to elicit a response. Any BBWPs seen or heard were followed until occupied cavities or nests could be located. Multiple visits to a site were sometimes required before a nest of an identified pair was found.

We monitored nests every other day using "nest peepers" (real-time video cameras mounted to tele-extending poles). We observed video images using portable, handheld monitors. We recorded the number of eggs or young present in the nest, any parental activity, and the development of the young (size and plumage development) during each visit.

Following the nesting period we sampled vegetation in a manner as to address habitat selection at approximately the territory scale (Figure 1). We characterized resources in 81-12.5 m fixed radius plots positioned along radiating transects located inside a 250 m radius from each nest site. We also took measurements from vegetation plots located at 24 random sites paired to the 12 individual nests for quantification of resource selection. Vegetation plots were sampled from late July through September.

Additionally, to quantify micro-site selection, subsets of the previously mentioned vegetation plots at each nest were randomly selected for the acquisition of additional data (Figure 1). The data collected focused on tree composition, size, density, condition (live or dead and cause of death), and infestation indices. We also recorded ground cover and overstory canopy cover (OCC).

Analysis

We used the Mayfield method to estimate daily nest survival and overall nest success (Mayfield 1961, 1975). Because of the lack of data in the literature, we used mean stage lengths derived from our own data in estimating nest success.

Currently, we are developing new techniques to interpret mountain pine beetle infestation patterns within the previously mentioned 250 m radius surrounding the nests and random points (Figure 2). By using an ArcGIS interface we can interpolate levels of infestation between plots from the numbers of infested trees within the plots, similar to how elevation contours are derived.

PRELIMINARY RESULTS

We found 12 BBWP nests and 1 three-toed woodpecker nest between May and July. The use of call playbacks (PBR) provided the highest success in locating individuals (7 of the 12 BBWP nest located using PBR). The times of day when the birds were most active were morning (half hour after sunrise, lasting approximately 4 hours) and evening (3 hours up to sunset). When monitoring the nest, we experienced occasional difficulty in accurately describing the contents of the nests. As nestlings reached larger sizes, it became increasingly difficult to distinguish one from another.

Two of the 12 BBWP nests failed; one during incubation and the other during the nestling period. Both nests failed due to predation. The daily nest survival rate was slightly lower for the incubation period (0.987, n=10) than it was for the nestling period (0.995, n=11) (Mayfield 1961, 1975). Nesting success was estimated at 79.2% over the incubation and nestling periods. We did not observe any re-nesting attempts following

the two failed nests. However, one pair was relocated in the area numerous times following the predation event.

Clutch sizes for BBWPs ranged from 3 to 5 eggs with a mean of 4 eggs per nest ± 0.15 SE. Hatching rates were 64%. The mean number of fledged individuals was 2.4 young per nest ± 0.22 SE (n=10). The average length of the incubation stage was 9.4 days ± 0.6 SE (n=5). The nestling stage lasted 22.1 days ± 1.38 SE (n=8). All nests had fledged by the 10th of July.

Nest Site Selection

We sampled a total of 2,916-12.5 m radius plots to quantify resource selection at the territory and micro-site scales. At some sites over 5,000 trees were recorded. Despite the ability of BBWPs to excavate live trees, all nests were found in dead trees. The average diameter of nest trees was 25.1 cm DBH ± 1.5 SE. Four of the 12 nests were in quaking aspen (*Populus tremuloides*); the remaining nests were found in ponderosa pine (*Pinus ponderosa*) snags, either currently infested or previously infested by mountain pine beetles. Seventy-five percent of the nest trees had heart rot. Excavation of dead trees with heart rot may be selection for easier excavation. Nest plots contained an average of 3.6 pines with heart rot ± 4.7 SE (n=12); random plots contained an average of 2.75 pines with heart rot ± 0.6 SE (n=48). The mean OCC for the 12.5 m nest plots was 32% ± 4.7 SE (n=12), while the random vegetation plots averaged 45.4 % OCC ± 2.4 SE (n=48).

FUTURE PLANS

Prior to the 2005 field season we will have conducted the resource selection analysis for BBWPs using the 2004 data. We will begin working on a landscape analysis

encompassing BBWP nest sites and unused sites (sites that were sampled with no nest found) from our study as well as previous studies. These analyses will examine landscape features including stand structure and composition, patch size, as well as fire and infestation proximities.

We will have also finalized the interpolation methods to analyze the nest site infestation patterns. With results from that analysis we will be able to estimate total numbers of infested trees within a nest site, mean infestation patch sizes, and distances from nests to infestation patches. This information will ultimately give us insight into how BBWPs associate with an important food resource. The same methods may also be used to look at stem and snag densities and OCC.

The 2005 field season will be conducted in the same manner as the previous season. New field sites will be selected for the upcoming field season. Area searches will begin in April of 2005. We expect to find more nests in 2005 than in 2004 through increased greater searching experience and increased knowledge of the study area.

LITERATURE CITED

Mayfield. 1961. Nesting success calculated from exposure. Wilson Bulletin 73:255-261.

Mayfield. 1975. Suggestions for calculating nest success. Wilson Bulletin 87:456-466.

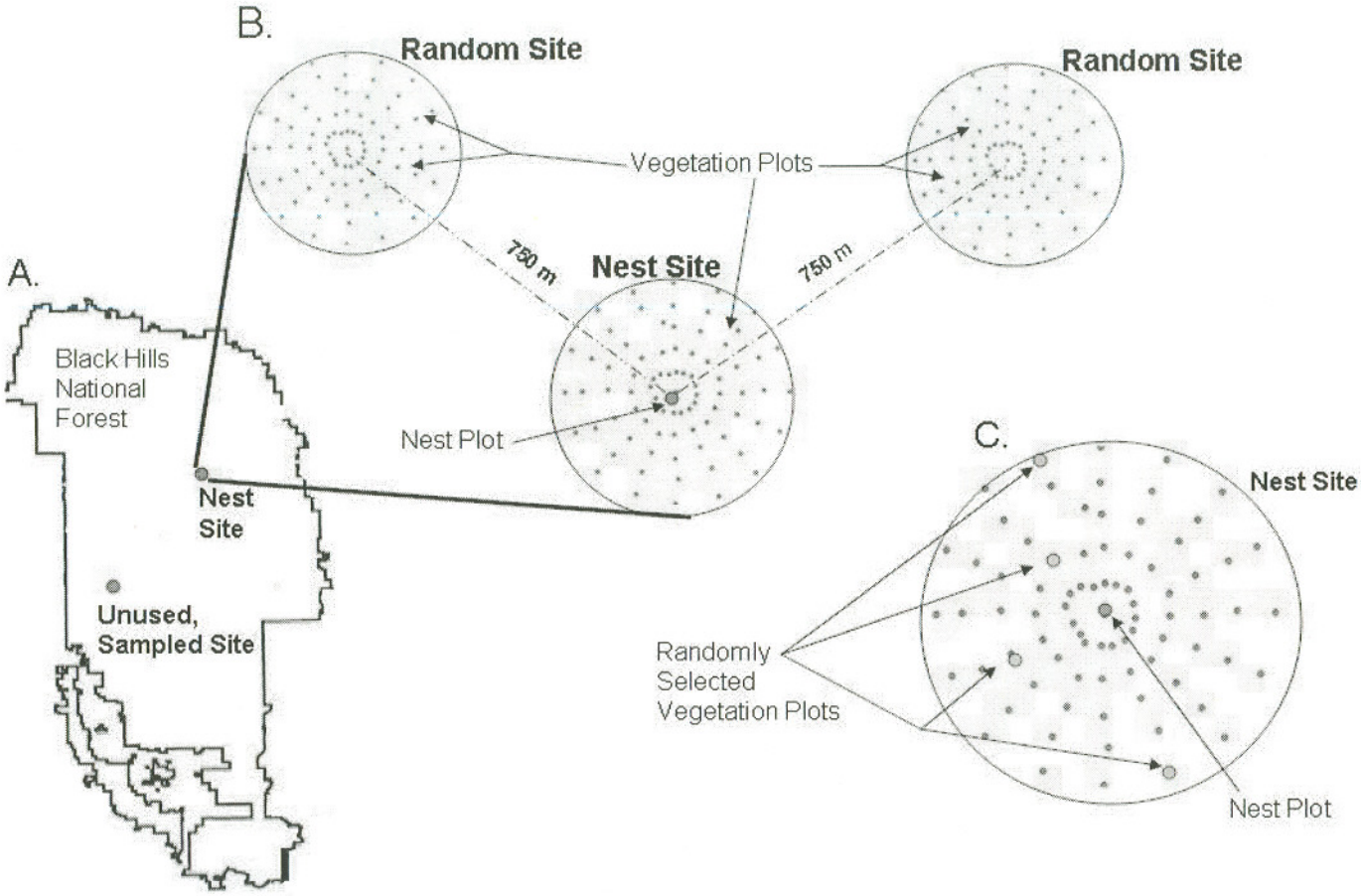

Figure 1. Scales of resource selection that will be analyzed for Black-backed woodpeckers in the Black Hills of South Dakota in 2004 and 2005 shown as A., landscape analysis comparing variables at nest site and unused site; B, sampling design to determine selection at a territory scale; and C., measurements at the nest plot and 4 random plots quantifying micro-site resource selection.

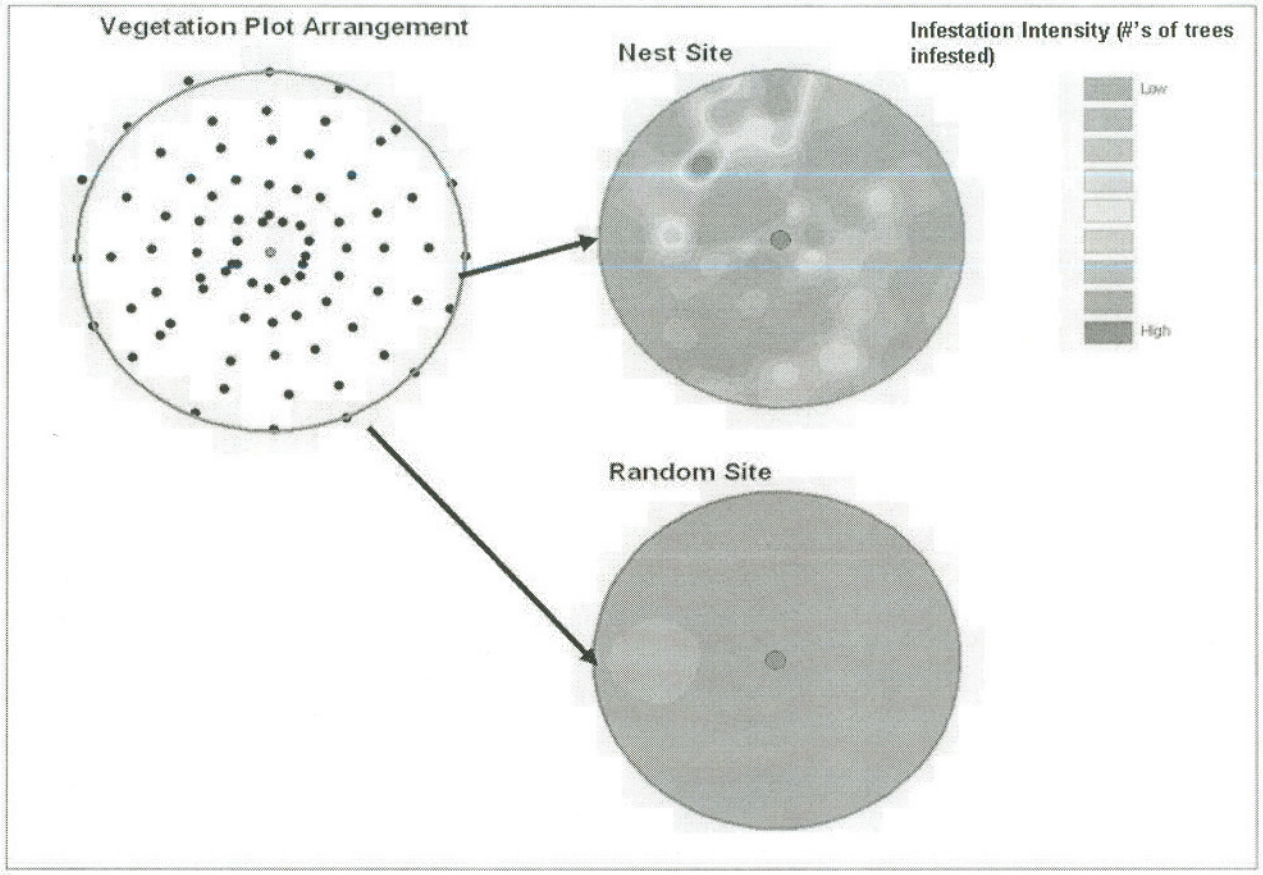

Figure 2. Results from interpolating infestation levels from within vegetation plots. The visualization of the patterns of intensity in infestation allow us to form ideas of possible selection processes.