Application for Scientific Study in Baxter State Park

Patch Occupancy, Habitat Use, and Population Performance of Spruce Grouse in Commercially Managed Conifer Stands

Name of Researchers:

Dr. Daniel Harrison, Professor, Department of Wildlife Ecology,5755 Nutting Hall, University of Maine, Orono, ME 04469-5755; Harrison@maine.edu.

Stephen Dunham, M.S. Student, Department of Wildlife Ecology, 5755 Nutting Hall, University of Maine, Orono, ME 04469-5755; stephen.dunham@maine.edu

Researcher Credentials:

Dr. Daniel Harrison has studied effects of forest harvest practices on forest wildlife in Maine's forests for more than 30 years and has long-term collaborative relationships with landowners on whose land many of the study plots in the proposed study will be conducted. He has 8 years of prior experience conducting research in Baxter State Park.

Mr. Stephen Dunham has 5 years of experience studying gallinaceous bird species at Moosehorn National Wildlife Refuge and on commercial forestlands in northern Maine. He has substantial experience with avian capture, handling, and banding techniques.

Benefits Expected From Proposed Research:

Spruce grouse (*Falcipennis canadensis*) are a species of forest grouse dependent on conifer dominated forests (Boag and Schroeder 1992, Storch 2000). Although abundant across Canada and Alaska, the southern border of their range extends only marginally into the northernmost of the contiguous United States. Coincidentally, a recent assessment by the International Association of Fish and Wildlife Agencies concluded that populations in the southeastern portion of the species' range, including those in New England and New York, are rare or declining (Williamson et al. 2008). The southeastern extent of the geographic range of spruce grouse coincides with southeastern distribution of red and black spruce within the Acadian forests of Maine, northern New Hampshire, northernmost Vermont, the Adirondack region of New York State, as well as the eastern maritime provinces of Canada. Within this region, spruce grouse are listed as endangered in Vermont and New York, and are a species of conservation concern in New Hampshire. Although there is no hunting season on the species in Maine, little else is known about their current status. Legaard and Sader (unpublished data, Maine Image Analysis Laboratory, University of Maine, Orono) have provided recent insights from satellite imagery that suggest mid-late successional coniferous forests and coniferous

forested wetlands are being harvested at accelerating rates in Maine, which could imply that the habitats that spruce grouse have been traditionally considered to inhabit may be declining. Thus, a better understanding of patterns of habitat occupancy across a range of stand conditions and a comparison of spruce grouse occupancy and population performance between residual mature and actively managed conifer stands is needed to assess the status of spruce grouse habitat in commercially managed forests in the southeastern portion of the species range.

Spruce-grouse inhabit mid-successional conifer forests and coniferous forested wetlands (Ross 2007). Clearcutting has been shown to reduce the survival and reproductive success of spruce grouse by causing movements into adjacent uncut buffer strips (Turcotte et al. 2000, Potvin and Courtois 2006). Additionally, Lycke et al. (2011) reported that male spruce grouse were less likely to occur in commercially thinned versus un-thinned stands in Quebec. To the contrary, populations of spruce grouse in protected portions of the Adirondack forest continue to decline as the forest matures within protected areas (Bouta and Chambers 1990, Ross 2007).

The goal of this project is to enhance understanding of the effects of commercial forest management in balsam fir- and red and black spruce-dominated stands on patterns of stand-scale occupancy, habitat use, home range area, survival and brood rearing success of spruce grouse. Further, the extent that some management approaches in conifer stands may maintain or increase habitat quality for spruce grouse is uncertain. Spruce grouse have been documented to occur in plantations and PCT stands (Boag and Schroeder 1992, Homyack 2003), and Rattie et al. (1984) reported that over half of sites occupied by grouse had lowest live limb heights between 1.5 and 4.5 meters. Although those conditions may be common in mature, uncut, lowland conifer stands, we hypothesize that favorable conditions for spruce grouse may also be created in some plantations and precommercially-thinned (PCT) fir-spruce stands within the Acadian Forest. Thus, a comparison of the probability of occupancy, habitat use patterns, home range area, survival and reproductive success of spruce grouse between managed and unmanaged conifer stands will provide insights into how habitat quality may be changing for spruce grouse across the Acadian forest region. To establish our benchmark for unmanaged conifer stands, our study approach requires that we survey, tag, and acquire VHF-based radio locations on spruce grouse across 8 unmanaged conifer stands exceeding 30 acres in area. Given that such stand conditions are increasingly uncommon within commercial forestlands adjacent to Baxter State Park (BSP), we are proposing to study spruce grouse within 4-5 mature conifer stands in the Scientific Forest Management Area of BSP.

Detailed Description of Research:

Project Objectives:

Objective 1: Survey occupancy and densities of spruce grouse using a combination of audio calls and color mark-resighting methods. Compare probability of occupancy and densities among 1) regenerating clearcuts (25-30 years post-cutting); 2) stands that have been clearcut (25-35 years previous), herbicided, and precommercially thinned; 3) "classic" stands of mid- and late-successional spruce, fir, and tamarack; and mixed stands that have been selectively harvested.

Objective 2: Equip a sample of adult female spruce grouse with radio transmitters to evaluate their home range characteristics, habitat selection, habitat composition, and patterns of patch occupancy. Compare these patterns among spruce grouse in the clearcut, intensively managed, and residual, uncut habitats.

Objective 3: Evaluate and compare survival and reproductive success of spruce grouse among the clearcut, intensively managed, selectively harvested, and classic habitat patches to evaluate relative quality among these 4 patch types.

Our previously established research sites outside the Park are part of an ongoing study on forest harvest effects on forest carnivores and are 30-60 acres in area. These areas include 27 stands partitioned into harvest selection intensity and age categories ranging from no harvest, to selection harvest, PCT-treated stands, and regenerating clearcuts (17-40 years post-cut). This design allows data to be analyzed along a compositional and structural continuum to avoid arbitrary binning of data among harvest categories. These sites represent regenerating clearcuts 17-40 years post-harvest (n=9), selection harvests (n=4), PCT-treated stands (n=10) and mature, unharvested stands (n=4). Overstory removal within clearcut stands was 0-98%, and the harvest history spans clearcuts that were harvested as early as 1973 to selection harvests as recent as 2003. Given that 11 of 13 stands representing mature mixed and conifer conditions have been harvested since our last vegetation surveys in 2008, we would like to add 4-5 additional stands of mature forest that have not been harvested for >60 years within the SFMA of Baxter Park. Additionally, we established 2 additional mature conifer benchmark sites on commercial forestlands in 2012, which the landowner has agreed to retain until our study is completed.

We would like to establish 4-5 study areas in the Scientific Forest Management Area (SFMA) of Baxter State Park that are mature softwood and mixed stands >60 years post-harvest. Because few sites remain elsewhere on the landscape that meet this age criteria, sites on Baxter are critical to allow assessment of the mature forest end of the disturbance gradient that exists on the landscape. In concert with the forest bird project, we will collect vegetation structure and composition data (e.g., overstory basal area, canopy closure, species, understory composition and structure, coarse woody debris condition) during mid-June - August (estimated time on ground for vegetation surveys is 1-2 days per stand), and we will not remove or cut vegetation during these surveys.

Sampling Methods:

For spruce grouse, surveys will be conducted during the breeding season (April-May) using a territorial female call (i.e., cantus surveys), and again during the early brood rearing season (June-July) using a chick distress call. Calls will be played over a period of six minutes: one minute of settling time followed by two rounds of playing a one minute clip followed by one minute of listening with an additional minute of listening at the end (adapted from Worland et al. 2009). All responding individuals, except chicks, will be recorded and captured with a 20' telescoping fiberglass fishing rod (Shakespeare WonderPole®) fitted with a sliding noose made of 80-lb test fishing line (Zwickel and Bendell 1967). Captured grouse will be weighed, mouth swabbed, and individually marked with a numbered aluminum butt-end leg band and a unique pattern of 1-3 plastic colored leg bands (Schroeder and Boag 1989, Keppie 1992). A subset of 4-8 responding females will also be equipped with an ATS A3950 necklace mounted radio transmitter (~12 grams) if they weigh >400g. These birds will be tracked via radio telemetry until brood break-up in the fall (~October). Cantus surveys will be conducted 3 times in each stand and previously banded individuals will be resighted during surveys.

Telemetry locations will be taken no less than 6 hours apart and at least twice a week on each radioed female during the period June – September. Additional locations (approximately 1 per month) will be obtained from October – March. We will attempt to recapture females with radios in early May 2014 to remove their necklaces. Female grouse will be located by homing and direct observation. Locations will be taken with a hand-held Garmin GPS using location averaging to maximize accuracy. The date, time and behavior of marked females will be recorded, as well as the number of chicks observed. The location, date, and apparent cause of all mortalities or brood failures will also be recorded.

Areas of the Park for the Research:

We propose to conduct our research within 4-5 mature (>60 years old), conifer dominated stands in the SFMA, where we will conduct audio surveys in 2013 and 2014 during May and June. Further, we propose to capture and band up to 8 adult female grouse in those stands and to attempt to capture and leg-band all responding male spruce grouse. We will share sites and vegetation surveys with a concurrent study of forest songbirds, which was proposed and considered at the previous meeting of the Scientific Advisory Committee. Site selection will be in consultation with Richard Morrill.

Impact on the Park:

There will be a slight risk to spruce grouse during the capture, handing, leg-banding, and necklace collar attachment. The capture and handling methods that we propose resulted in injury

or mortality to ~2% of handled birds based on >1200 captures in a previous study (Zwickel and Bendell 1967), and was used with substantial success by Whitcomb et al. (1996) in Acadia National Park, Maine. During our pilot studies in northern Maine during 2012, we captured and leg-banded 17 males and 16 females (15 females were leg-banded and equipped with necklace-mounted transmitters). One bird was injured and euthanized during capture and 32 birds were handled without incident and released unharmed. Survival of radioed females was exceptional; 14 of 15 marked females survived to fall and the only mortality of a radioed female was natural-caused. There will minimal effects of our marking, monitoring, and vegetation protocol on the Park's resources. We will mark our survey points and telemetry locations with wooden stakes and/or surveyors flagging to quickly relocate study plots; these stakes and flags will be removed at the end of the study. No flagging will be placed within view of existing roads and walking trails.

Budget:

Our project is funded by the Maine Cooperative Forestry Research Unit, the Maine Agricultural and Forest Experiment Station, and the Department of Wildlife Ecology at The University of Maine. We are not requesting funds from Baxter State Park, but may request overnight accommodations for periods not to exceed 4 consecutive nights, when available (convenience and efficiency, not a requirement, as we have lodging at CFRU facility at the Telos camp).

Timetable for Research and Completion of Application:

Field research will begin during May 2013 and will be completed by April 2015. The final project report and student M.S. thesis are scheduled for completion by December 2015.

Date: 25 March 2013

Literature Cited:

Boag, D. A., and M. A. Schroeder. 1992. Spruce grouse. Pages 1-28 In A. Poole, P. Stettenheim, and F. Gill, editors. The Birds of North America, No. 5. The Academy of Natural Sciences, Philadelphia, PA and The American Ornithology Union, Washington, DC, USA.

Bouta, R. P., and R. E. Chambers. 1990. Status of threatened spruce grouse populations in New York: a historical perspective. Pages 82-91 In Ecosystem management: rare species and significant habitats. New York State Museum Bulletin 471.

Homyack, J.A. 2003. Effects of precommercial thinning on snowshoe hares, small mammals, and forest structure in northern Maine. M.S. Thesis. University of Maine, Orono, USA. 196 pp.

Keppie, D.M. 1992. An audio index for male spruce grouse. Canadian Journal of Zoology 70:307-313.

Lycke, A., L. Imbeau, and P. Drapeau. 2011. Effects of commercial thinning on site occupancy and habitat use by spruce grouse in boreal Quebec. Canadian Journal of Forest Research 41:501-508.

Potvin, F., and R. Courtois. 2006. Incidence of spruce grouse in residual forest strips within large clear-cut boreal forest landscapes. Northeastern Naturalist 13:507-520.

Ratti, J.T., D.L. Mackey, and J.R. Alldredge. 1984. Analysis of spruce grouse habitat in north-central Washington. The Journal of Wildlife Management 48: 1188-1196.

Ross, A.M. 2007. Spruce grouse distribution, movements, and habitat selection: a mid successional species in an aging forested landscape. Masters Thesis, SUNY-ESF, Syracuse, New York, USA.

Schroeder, M.A., and D.A. Boag. 1989. Evaluation of a density index for territorial male spruce grouse. Journal of Wildlife Management 53:475-478.

Storch, I. 2000. Grouse. Status and Conservation Action Plan 2000-2004. IUCN, Cambridge, UK. 112 pp.

Turcotte , F., R. Courtois, R. Couture, and J. Ferron. 2000. Impact à court terme de l'exploitation forestière sur le tétras du Canada (Falcipennis canadensis). Canadian Journal of Forest Research 30:202-210.

Whitcomb, S.D., F.A. Servello, and A.F. O'Connell Jr. 1996. Patch Occupancy and dispersal of spruce grouse on the edge of its range in Maine. Canadian Journal of Zoology 74: 1951-1955.

Williamson, S. J., D. Keppie, R. Davison, D. Budeau, S. Carriere, D. Rabe, and M. Schroeder. 2008. Spruce Grouse Continental Conservation Plan. Association of Fish and Wildlife Agencies. Washington, DC. 60pp.

Worland, M., K.J. Martin, and L. Gregg. 2009. Spruce Grouse Distribution and Habitat Relationships in Wisconsin. The Passenger Pigeon 71: 5-18.

Zwickel, F.C., and J.F. Bendell. 1967. A snare for capturing blue grouse. Journal of Wildlife Management 31: 202-204.