LOCAL AND REGIONAL WILDLIFE IMPACTS OF BIOMASS REMOVALS

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NARA is led by Washington State University and supported by the Agriculture and Food Research Initiative Competitive Grant no. 2011-68005-30416 from the USDA National Institute of Food and Agriculture.

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COMPLETED 2017

EXECUTIVE SUMMARY

This work reviewed silvicultural regimes proposed to reduce fire hazard and improve forest health. The existing data from the Pacific Northwest (PNW) on the relationship between species and stand structures (e.g., downed woody material, snags) was used to estimate the potential impact of regimes on vertebrate abundance. Also, using existing published research, we conducted a meta-analysis that tests the influence of species life-history traits on sensitivity to proposed silvicultural regimes. We also reviewed landscape patterns resulting from regional models of biomass collection and removal. We also implemented two empirical studies to test the influence of biomass removal on potentially sensitive species groups – birds, and pollinators. Niether of these groups showed sensitivity to biomass removal over the short term.

TASK 1: ANALYSIS OF PRELIMINARY REGIONAL MODELS COMPLETED TO PROVIDE METRICS FOR REGIONAL RUNS AND TO INFORM FUTURE REGIONAL MODEL RUNS

Betts and Root published a manuscript in January 2016 titled *Managing Moist Temperate Forests for Bioenergy and Biodiversity* (http://dx.doi.org/10.5849/jof.14-114). In this manuscript, we describe the range of management practices used to harvest biomass, and the types of forest organisms known or expected to be impacted. We review the tradeoffs between habitat alteration and potential for global climate change mitigation. Furthermore, we place biomass harvesting in a landscape context and discuss the potential for thresholds in species responses to biomass management at stand and landscape scales. After framing the issues and current knowledge, we propose a research plan for the future.

We are continuing to conduct a meta-analysis examining the effects of intensive forest management practices on bird communities across North America. We have compiled 14,000 bird community observations from Oregon, California, Ontario, New Brunswick, British Columbia, Saskatchewan, and Alberta. Preliminary occupancy models have been run for stand-level and landscape-level impacts of intensive forest management on species richness, cavity-dwellers, and individual bird species from 8 study regions, including 2 in the Pacific Northwest.

We have determined there are insufficient data available to develop population viability analyses for indicator species as proposed originally. As a result, we are focusing our work on (1) the review above and (2) collection of field data on the impacts of biofuel removal (Task 2).

TASK 2: SYNTHESIS OF LOCAL WILDLIFE IMPACTS FROM WY LTSP FIELD WORK, FOREST HEALTH TREATMENTS AND SUMMARIZE REGIONAL WILDLIFE IMPACTS FROM REGIONAL BIOMASS SIMULATION

Betts and Rivers (in collaboration with former postdoc Root) established a field study in western Oregon to examine the relationship between slash measures and survival of nests and fledglings of the White-crowned Sparrow at sites with experimentally manipulated management intensity. Our observations suggest fledglings are using fine and coarse slash as cover between the times that they leave the nest and gain the ability to fly. This effort will dovetail with an AFRI-supported project investigating the effects of intensive forest management. During June-August 2014 we collected data to measure the association between nest and fledgling survival rates and woody debris.

Within a multi-model framework, the best-supported model for daily survival rate of sparrow nests included slash cover + nest-site concealment + patch-site concealment. Survival rates were similar among treatments ($X^2 = 1.97$, $P = 0.578$), and we found no evidence for a relationship between daily survival rate and slash cover ($X^2 = 0.04$, $P = 0.844$), nest-site concealment ($X^2 = 0.17$, $P = 0.679$), or patch-site concealment ($X^2 = 2.12$, $P = 0.145$). To evaluate sparrow post-fledging survival, we sought to assess the effect of vegetation measures and slash cover on post-fledging survival, but our initial analysis found that these covariates were related to treatment and resulted in problems of interpretation because of the confounding between their effects and treatment effects.

In addition to our research on birds, we also initiated a field study during summers 2014-2015 to examine the influence of biomass removal and site prep on invertebrate pollinators. During summer 2014 we captured a large number of bees (>1800 individuals) and we have been able to identify nearly all (>95%) specimens to individual species; additional identification of some especially difficult groups took place during fall 2015 by loaning specimens to taxonomic specialists. To date, we have identified 48 distinct species/morpho-species that were captured on study sites. Our initial results from 2014 found that species richness and abundance were similar across treatments, with the exception that both measures were higher in the forest floor removal treatment. As many of the species that were captured are ground-nesting, we hypothesize that this treatment may have provided additional nesting opportunities not present in other treatments.

During summer 2015, we continued sampling bees using blue vane traps and captured >5600 individuals of 48 bee species/morphospecies. Although the number of bee species was the same as 2014, there was some species turnover between years such that not all species encountered in the study were captured in both years. It is worth noting that the number of individuals sampled was quite large and >3x than the number captured in 2014. We suspect these differences may have been linked to inter-annual variation in weather patterns and/or because bee populations have increased on the stand with time since harvest. We are currently analyzing bee data from both years to determine the influence of soil compaction and biomass removal on native bee communities.

NARA OUTPUTS

Refereed Publications

Published

Root, H. and Betts M.G. (2016). Managing moist temperate forests for bioenergy and biodiversity. *Journal of Forestry,* 114(1): 66-74.

Root, H.T., Verschuyl, J., Hammond, P., Stokely, T. Scherr, M. and Betts, M.G. (2017). Plant diversity enhances moth diversity in an intensive forest management experiment. *Ecological Applications,* 27(1): 134-142

In prep/review

Rivers, J. W., J. Verschuyl, A. J. Kroll, C. J. Schwarz, and M. G. Betts. In Review. Dynamic response in breeding productivity to experimental herbicide treatments by an early-successional forest songbird. For *Biological Conservation*.

Rivers, J. W., C. L. Mathis, A. R. Moldenke, and M. G. Betts. Evaluating the influence of removal of forest harvest residuals on bee diversity and pollination services. For *Journal of Insect Conservation*.

Research Presentations

Oral presentations

Rivers, J. W., M. G. Betts, A. J. Kroll, C. J. Schwarz, and J. Verschuyl. 2015. 133rd meeting of the American Ornithologists' Union, Norman, OK.

Rivers, J. W., J. Verschuyl, A. J. Kroll, and M. G. Betts. 2015. Oregon Chapter of The Wildlife Society, Eugene, OR.

Rivers, J. W., J. Verschuyl, A. J. Kroll, and M. G. Betts. 2015. Washington Chapter of The Wildlife Society, Grand Mound, WA.

Poster presentations

Mathis, C. L., J. W. Rivers, and M. G. Betts. 2015. Poster presentation at the Oregon Chapter of The Wildlife Society, Eugene, OR.

FUTURE DEVELOPMENT

Our review manuscript examines current knowledge about the utilization of dead wood by wildlife. We summarize the abundant literature on the importance of coarse woody debris for wildlife within a stand and identify knowledge gaps in the areas of fine woody debris and impacts at a landscape scale, which may be more important than local impacts.

Our paper on intensive forest management (credited partially to this grant) has been published in *Ecological Applications*. We have submitted a manuscript that includes the influence of woody biomass on survival rates of the White-Crowned Sparrows to *Biological Conservation*. Within the next 1 month, we plan to submit a manuscript focused on understanding the influence of forest harvest residue removal and soil compaction on wild bee communities to the *Journal of Insect Conservation*. Finally, in the coming months we will complete the meta-analysis of intensive forest management effects on bird communities.