2014-15 Annual Report

Bird communities of coniferous forests in the Acadian region; their habitat associations and responses to forest management

Brian Rolek[1], Daniel Harrison[1], Cynthia Loftin[1,2], Petra Wood[3]

[1]Department of Wildlife, Fisheries, and Conservation Biology, University of Maine;
[2]U.S. Geological Survey, Maine Cooperative Fish and Wildlife Research Unit;
[3]U.S. Geological Survey, West Virginia Cooperative Fish and Wildlife Research Unit

Abstract

Several bird species of concern are found in the coniferous forests of Northern New England. Cape May (*Setophaga tigrina*) and Bay-Breasted Warbler (*Setophaga castanea*) have been declining within the Acadian Region since region-wide monitoring began with the USGS Breeding Bird Survey in 1966, whereas, species such as Blackburnian Warbler (*Setophaga fusca*) remain stable (Sauer et al. 2014, Fig. 1). The United States Federal government has the authority to manage these species under the U.S. Migratory Bird Treaty Act. Maine contributes up to 96% of breeding habitat (e.g., Bay-Breasted Warbler, M. Hartley, USFWS, unpublished data) for some of these spruce-fir associated species in the Unites States, and the apparent population declines of some species are not well understood. The coniferous forests where these species reside are heavily managed by the timber industry with a variety of silvicultural and industrial prescriptions. Habitat requirements for these species are not well-defined, nor are the species' responses to forest management. We sampled birds across sites located within the Acadian Forest Region (Fig. 2), which coincides roughly with Bird Conservation Region 14 in the United States (Fig. 3). In 2013, we established survey points in the North Maine Woods (Clayton Lake and Telos), Baxter State Park, and four National Wildlife Refuges (Nulhegan Basin Division of Silvio Conte, Umbagog, Moosehorn, and Aroostook). We tested for bird community response to management with non-metric multidimensional scaling to group bird species within forest management types and across common vegetation measurements representing the structure and composition of stands (Fig. 4). Preliminary analyses suggest that both Bay-breasted and Cape May Warblers were associated with regenerating and pre-commercially thinned treatments, along with dense canopy cover, high proportion of spruce-fir composition, and mid-successional stand structure. All vegetation variables were associated with species abundance including harvest treatment (R^2=29%, Fig. 4A). Forest attributes that were important predictors of bird abundance included mature forest structure (measured by quadratic mean diameter) which was the strongest predictor of community bird abundance (R^2=63%, Fig. 4B), followed by canopy cover (R^2=50%, Fig. 4D), proportion spruce-fir trees (R^2=41%, Fig. 4C), ground cover (R^2=30%, Fig. 4G), midstory (R^2=28%, Fig. 4E), then shrubs (R^2=26%, Fig. 4F). Variation between year of survey, a potentially confounding factor, explained little of the variance in bird communities (R^2=2%, Fig. 4H). Mature forest structure is an important determinant for bird communities, which is ultimately influenced by forest management.

Introduction

Our goals are to investigate factors influencing the distribution and abundance of species that represent the Acadian coniferous forests and to assess the influence of prevalent forest

management practices on the Acadian forest bird community. Our objectives are to: (1) quantify the composition and forest associations of coniferous bird communities in four silvicultural treatments representing a gradient in mature canopy residuals compared to mature softwood reference sites; (2) model the influences of silvicultural practices on coniferous forest bird communities; (3) use data at both landscape and local scales to determine important habitat and beneficial forest management practices; (4) provide accessible and interpretable results for forest managers that can be used to manage for avian species of concern in managed forest landscapes and stands.

Methods

We conducted multi-species bird surveys and vegetation measurements within 117 forest stands located in Maine, New Hampshire, and Vermont (Fig. 2). We surveyed birds using standard point count survey methods at 657 point locations within our 117 focal stands (Tables 1 and 2). We selected sites representing five harvest treatments: clearcut, pre-commercially thinned, shelterwood, selection, and mature. We selected stands that were primarily composed of coniferous tree species (>70%). We preferentially chose stands that were larger and homogeneous in composition and age relative to the broader landscape. We sought to have relatively even sampling of harvest treatments over the geographic area (Fig. 3).

Avian point count surveys

We placed most survey sites (i.e., point count locations) >200m apart (Hagan et al. 1997) and >130m from edges to maximize number of points in each stand and to minimize effects from adjacent edges (referred to as "core points" herein). We placed one point count per stand at hard edges and one at soft edges to estimate the effects of edges on abundance. We defined hard edges as an abrupt change where the forest is not contiguous, such as roads, power line cuts, or lake edges. We defined soft edges as any edge where there was a transition in forest composition, silvicultural treatment, or forest age to another forested stand without a break in the canopy. Edges were designated visually from harvest maps and aerial photographs.

We conducted standardized multi-species point counts (Bibby et al. 2000) from 2013 to 2015. We surveyed birds during the breeding season, 1 June through 4 August. This period of the annual cycle represents territory establishment, breeding, and post-fledgling period for most species assessed here. Technicians were trained to identify birds by sight and sound for approximately three weeks prior to conducting surveys.

Prior to each point count survey, we recorded start time, sky conditions, wind conditions (Beaufort scale), temperature, date, and observer. We practiced distance estimation prior to the onset of data collection and recalibrated distance estimation with a flag placed 25 m from the center of the point on at least one count location per day. Distance intervals were estimated for each detection between 0-25m, >25-50m, >50-75m, >75-100, and >100m. Additionally, we recorded flyovers because these birds may not be using the habitat within the survey plot. Observers surveyed point counts for 10 minutes and detections were placed into 2-minute time intervals. The vast majority of points were surveyed three times each year. A small number of sites were visited twice in one day because of logistical and travel constraints.

For each bird detected, we recorded: species; estimated distance; estimated compass direction; whether the bird was a male, female, juvenile, or unknown; and type of detection (i.e., visual observation, audible call, or audible song). We rotated observers among repeated visits of

point counts and maximized the variation in time of surveys at each survey location by varying point count routes on repeated visits.

Vegetation surveys

We adapted methods from the Forest Inventory Analysis (http://www.fia.fs.fed.us/library/field-guides-methods-proc/) and Breeding Bird Research and Monitoring Database (Martin et al. 1997) to measure vegetation at each point count location. Data collected included 20 structural and compositional measurements (Appendix 1). We established two vegetation plots per point count location: one subplot at the center for each point count location, and a second subplot centered 30m from each point count location, located in a random direction (i.e. 0°, 90°, 180°, or 270°).

We used a two-factor metric prism to count the number of trees ≥10cm diameter at breast height (i.e. 1.37m high) within a plot and to estimate basal area. For borderline trees, we included every other tree as within the plot. If a tree was counted as within a plot, we identified the tree to species and measured the diameter at breast height using a Biltmore stick. Within 5m of each of the two vegetation plots, we visually estimated percent all-green ground cover <0.5m and percent shrub/regenerating cover 0.5 to <2m. We measured midstory (2m to <7.6m) and canopy cover (≥7.6m) using a clear plexiglass grid divided into 25 grid cells by holding the grid overhead and counting the number of grid cells obscured by vegetation. If midstory cover was obscuring canopy cover, we moved up to two paces from the center of the subplot to avoid visual interference with the canopy layer. We approximated height for vegetation measurements using an analog hypsometer along with measured distance to the outer subplot (30m).

Spruce budworm surveys

To determine the influence of habitat on arthropod communities and breeding index of Bay-breasted Warblers, we investigated whether occupied and unoccupied habitats differ in their biomass and abundance of arthropods and whether these variables influence breeding success. To accomplish this, we will use pheromone traps targeting spruce budworm capture.

Since spruce budworm abundance is increasing across the state of Maine (see Maine Forest Service website here: http://www.maine.gov/dacf/mfs/forest_health/insects/spruce_budworm_2014.htm) and have been shown as important prey for birds, we used pheromone traps to sample for adult male eastern spruce budworm moths during the peak period of moth emergence. We deployed covered funnel traps between 1 June to 15 August in 2015 and collected each approximately 20 days after deployment (3 collections). Pheromone attracts adult male budworm moths. We placed two traps (one for insurance since bears frequently destroy traps) in the centroid of each stand. The two traps were placed approximately 130 meters apart along the longest axis of the stand. After collection from the field, moths were stored in a freezer and returned to the lab for identification and counting. Traps and pheromone for eastern spruce budworm were consistent with methods used by the Maine Forest Service (traps from Solida and pheromone from Synergy Semiochemicals Corp.) and adult eastern spruce budworm moths captured were identified and counted by Maine Forest Service personnel.

Reproductive success surveys

We surveyed point count locations where Bay-breasted Warblers were detected previously in 2013, 2014, or 2015 to conduct detailed reproductive success surveys. Because

there were too many sites to survey adequately over a single field season, we sampled along a successional gradient using quadratic mean diameter calculated from vegetation surveys in 2014 as described below. We surveyed over an abundance gradient for BBWA based on point count survey data. We returned to point count locations and observed focal birds for one-hour search periods with two observers and repeatedly surveyed each site using at least three visits on different days during the middle and late breeding periods. Each 60 minute survey was divided into 10 minute intervals. For 10 minute intervals, the surveyor collected locations of birds using GPS units and noted the maximum breeding activity observed (see Table 3 for breeding index). All observed breeding activity was recorded and locations of all birds were recorded with a GPS or was estimated from the observer's location during observation using a compass direction and distance measure determined using a rangefinder.

Multivariate analysis

We used density plots of detection distances for bird species thought to sing with relatively loud (e.g., Ovenbird) and soft intensity (e.g., Cape May Warbler) to determine a truncation distance for point count data. We determined that after 50m, species singing at low volumes or high frequencies eluded detection; therefore, we only included detections within 50m of the point count center to reduce bias of observations. We excluded species that were detected at <10 point count locations and flyovers. In addition, we excluded species with large territories because point counts are not well designed for these species. 56 species met our criteria and were included in subsequent analyses (Table 4). We used maximum bird abundance of each species detected at point count locations during each breeding season. We then calculated the mean abundance within each stand for each year.

We used nonmetric multidimensional scaling (NMDS) to visualize relationships between avian communities, harvest treatments, and habitat characteristics with data that are not corrected for detection probability (Sheehan et al. 2014, Oksanen et al. 2012). NMDS is an unconstrained ordination technique that uses ranks to ordinate; therefore, this method is well suited for nonlinear data and data with many zeroes. To apply NMDS we used R and the metaMDS function in the vegan package. We used Bray-Curtis to calculate dissimilarity (also referred to as Steinhaus dissimilarity or Sørensen index). We used Shepard diagrams and scree plots to evaluate the goodness-of-fit from ordination while varying the number of dimensions between one and six. We considered stress <0.1 to be a good fit; between 0.1 and 0.2 interpret cautiously especially at higher values; >0.2 problematic add more axes (Zurr et al. 2007 AED). We used R^2 values and stress plots to assess whether point-level or stand-level data ordinated in a manner roughly consistent with previous literature and provided a reasonable fit.

We used the ordisurf function with the resulting ordination scores in the vegan package to fit generalized additive models and test for associations between habitat measurements and axes of ordination, which fits a smooth surface using penalized splines (Oksanen et al. 2012). We determined the combination of axes that explained the most variance for each habitat variable by retaining those with the largest adjusted R^2 value. We used the 'envir' function from the 'vegan' package to test for a linear fit between ordinated scores and forestry treatments.

Results and Discussion

Avian point count surveys

In 2013, we surveyed 110 forest stands (Figure 3, Table 1) with approximately 3 to 8 survey points per stand for a total of 609 sampled points. In 2014 and 2015, we added 48 points

in 7 stands to increase sample size in shelterwood harvests, increasing total samples to 657 points in 117 stands. Across all study areas, we recorded 19,431 detections of 123 bird species in 2013; 22,784 detections of 106 bird species in 2014; and 23,608 of 118 bird species in 2015; this represented a total of 65,435 detections and 137 species across the three years. Bird abundance for each species is summarized by treatment and site in Appendix 2.

Vegetation surveys

Vegetation data collected included an array of structural and compositional measurements. We completed 1,320 vegetation plots and measured 15,024 trees during those surveys (Appendix 1). Vegetation is summarized by treatment and site in Appendix 3.

Multivariate analyses

Higher abundances of declining spruce-fir species such as Bay-breasted Warbler and Cape May Warbler were associated with mid-successional regenerating and pre-commercially thinned treatments (Fig. 4A) with tree species composition dominated by spruces and balsam fir (Fig. 4C).

From our multivariate analysis, harvest treatment (R^2=29%, Fig. 4A) was an important predictor for bird abundance and composition. Avian species composition within the mature stands extensively overlapped selection and shelterwood treatment stands. Forest attributes that were important predictors of bird abundance included mature forest structure (measured by quadratic mean diameter) which was the strongest predictor of community bird abundance (R^2=63%), followed by canopy cover (R^2=50%), proportion spruce-fir (R^2=41%), ground cover (R^2=30%), midstory (R^2=28%), then shrubs (R^2=26%). Variation between year of survey, a potentially confounding factor, explained little of the variance in bird communities (R^2=2%). Results suggest that mature forest structure is an important determinant for bird communities, which is ultimately influenced by forest management.

In future analyses, we will correct for the probability of detection to obtain abundance estimates in a Bayesian framework. We will also test whether adult spruce budworm captures in pheromone traps are correlated with Bay-breasted Warbler reproductive success. Additionally, we will conduct more in-depth analyses on the abundance of focal species such as Bay-breasted and Cape May Warbler.

Spruce budworm surveys

We deployed 234 multipher (pheromone) spruce budworm traps consistent with Maine Forest Service protocols and conducted reproductive surveys for Bay-breasted Warbler in >100 stands during 2015 to test for the influence of spruce budworm on warbler reproduction. All samples were identified and counted.

Research Reports:

Rolek, B., D. Harrison, C. Loftin, and P. Wood. 2015. Bird communities of coniferous forests in the Acadian Region: Habitat associations and response of birds to forest management. Pages 80-88 in B.E. Roth, editor, Cooperative Forestry Research Unit: 2015 Annual Report, University of Maine, Orono.

Rolek, B., D. Harrison, C. Loftin, and P. Wood. 2015. Bird communities of coniferous forests in the Acadian Region: Habitat associations and response of birds to forest management: Annual report to Baxter State Park.

Rolek, B., D. Harrison, C. Loftin, and P. Wood. 2015. Bird communities of coniferous forests in the Acadian Region: Habitat associations and response of birds to forest management: Annual report to Fish and Wildlife Service and National Wildlife Refuges.

Rolek, B., D. Harrison, C. Loftin, and P. Wood. 2015. Bird communities of coniferous forests in the Acadian Region: Habitat associations and response of birds to forest management: Annual report to USGS Maine Cooperative Fish and Wildlife Research Unit.

Presentations / Workshops / Meetings / Field Tours:

Rolek, B.W., C. Loftin, D. Harrison, and P. Wood. 2015. Softwood Forest Birds and Silviculture in New England. Baxter State Park Annual Meeting. Augusta, ME, USA. Spring 2015.

Rolek, B.W., C. Loftin, D. Harrison, and P. Wood. 2015. Softwood Forest Birds and Silviculture in New England. USGS Coordinating Committee Meeting. Orono, ME, USA. 25 March 2015.

Rolek, B.W., C. Loftin, D. Harrison, and P. Wood. 2015. Habitat Associations, Forestry, and Coniferous Forest Birds. Downeast Birding Festival. Machias, ME, USA. 22 May 2015.

Rolek, B.W., C. Loftin, D. Harrison, and P. Wood. 2015. Effects of Forest Management on Avian Abundance in Spruce-fir Forests of New England. Joint Meeting of the Canadian Ornithological Society, Association of Field Ornithologists, and Wilson Ornithological Society. Wolfville, NS, CA. 16-18 July 2015.

Rolek, B.W., C. Loftin, D. Harrison, and P. Wood. 2015. Methods, Data, Analysis, and Future Directions of the Northern New England Forest Birds Project. Workshop. USFWS Migratory Bird Division. Hadley, MA, USA. 8 October 2015.

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Oksanen, A. J., F. G. Blanchet, R. Kindt, P. R. Minchin, R. B. O. Hara, G. L. Simpson, P. Soly-, M. H. H. Stevens, and H. Wagner. 2012. Package " vegan ": Community Ecology Package.

Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2014. The North American Breeding Bird Survey, Results and Analysis 1966 - 2013. Version 01.30.2015 USGS Patuxent Wildlife Research Center, Laurel, MD
Sheehan, J., P. B. Wood, D. A. Buehler, P. D. Keyser, J. L. Larkin, A. D. Rodewald, T. B. Wigley, T. J. Boves, G. A. George, M. H. Bakermans, T. A. Beachy, A. Evans, M. E. McDermott, F. L. Newell, K. A. Perkins, and M. White. 2014. Avian response to timber harvesting applied experimentally to manage Cerulean Warbler breeding populations. Forest Ecology and Management 321:5–18.
Zuur, A., Ieno, E. N., & Smith, G. M. 2007. Analysing ecological data. Springer Science & Business Media. New York, New York, USA

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Figures and Tables:

Figure 1. Three species of conservation concern and their estimated population trends in Bird Conservation Region 14 from USGS Breeding Bird Survey data. Photo credits: Bay-breasted Warbler by Bill Majoros, Cape May Warbler and Blackburnian Warbler were used from USGS Breeding Bird Survey data.

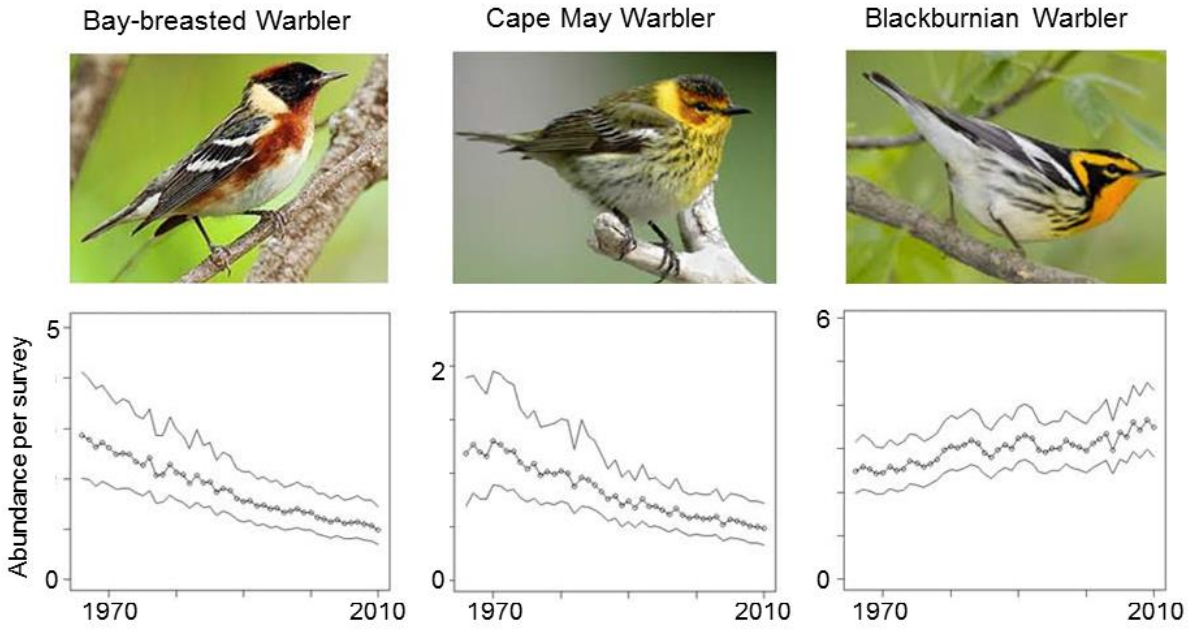


Figure 2. James (Mack) McGraw, an undergraduate student at The University of Maine, conducting bird surveys at Moosehorn National Wildlife Refuge during 2015. Photo credit James McGraw.

Figure 3. Survey areas in Northern New England. The size of each pie chart is proportional to the number of stands surveyed in each area; pie charts show the proportion of stands in each treatment category; and the shaded gray area is Bird Conservation Region 14. We detected 65,435 birds during 6,129 surveys.

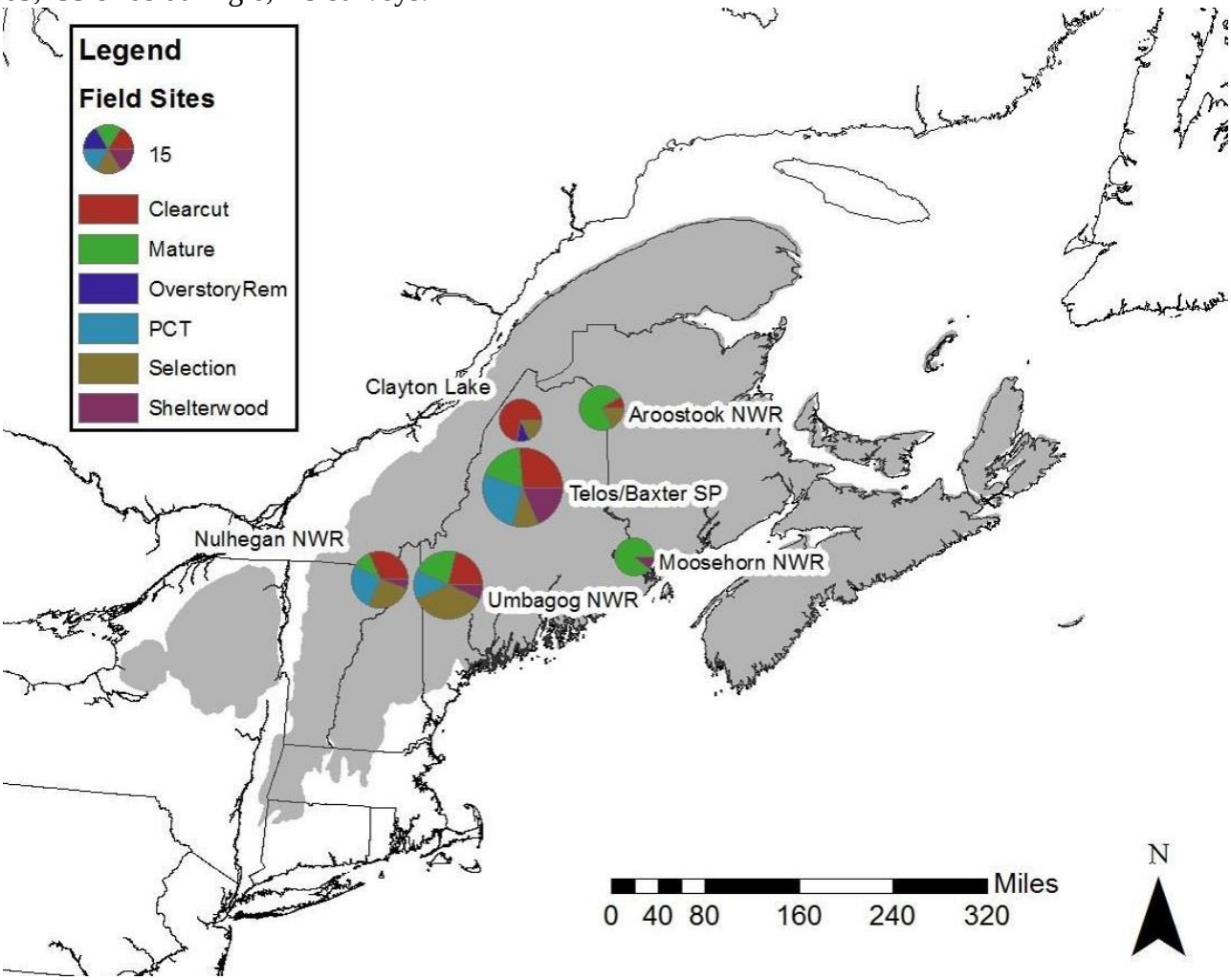
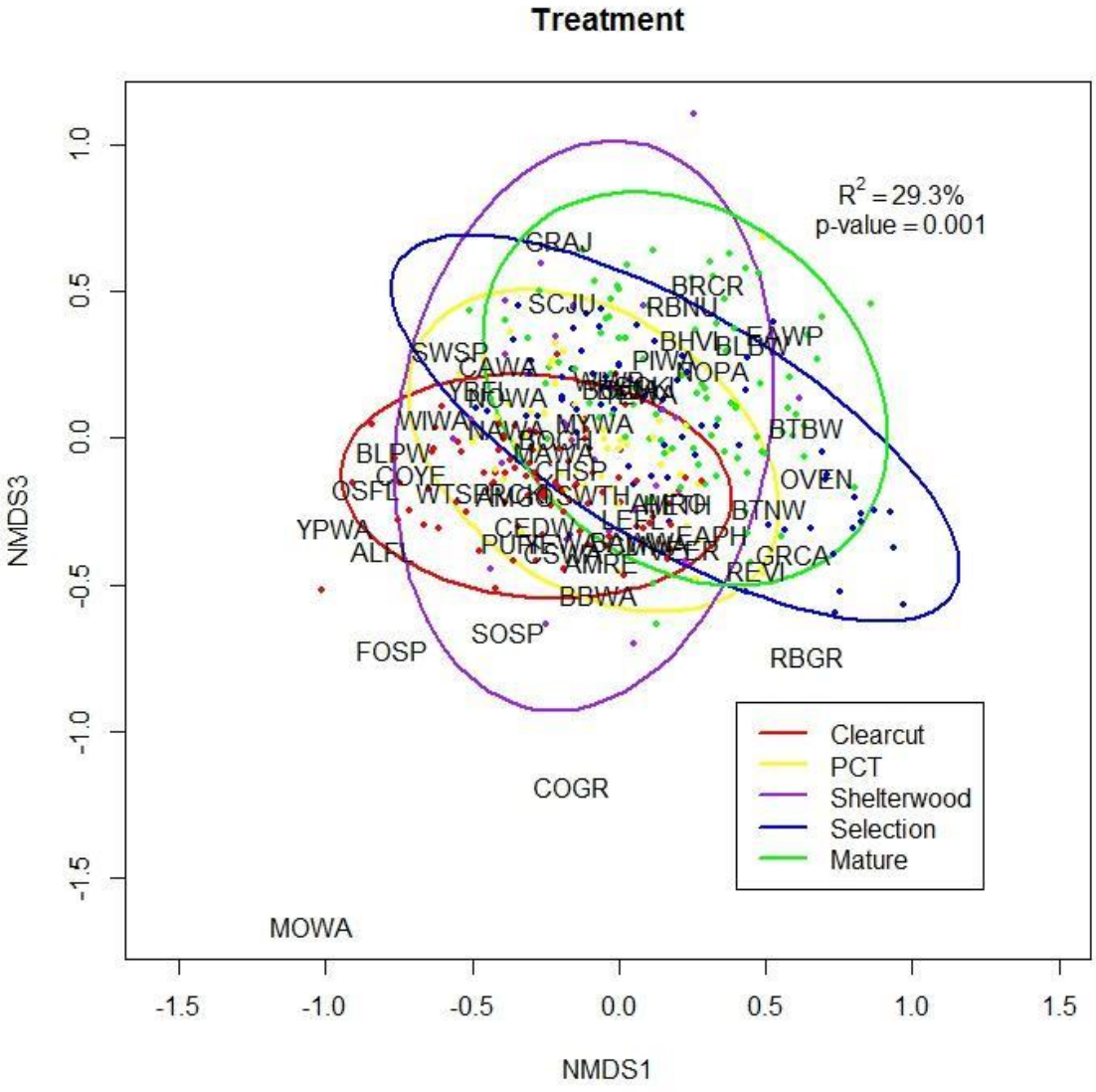
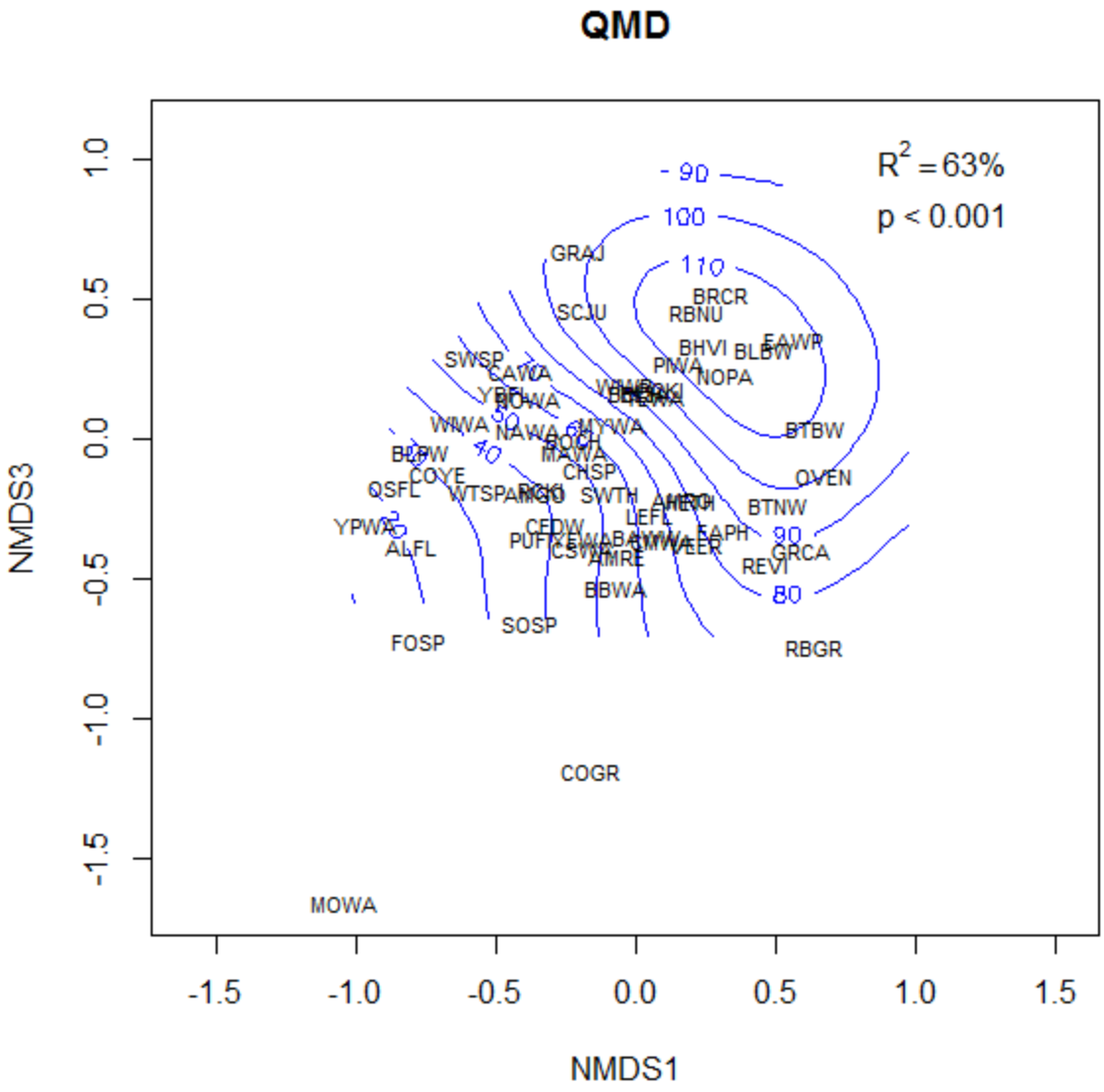


Figure 4. NMDS ordinations of bird species abundance fit to generalized additive models for (A) harvest treatment, (B) quadratic mean diameter, (C) proportion of spruce-fir trees >10cm, (D) canopy cover, (E) midstory cover, (F) shrubs and regenerating cover, (G) ground cover, and (H) year. Note that axes with largest R^2 values are shown here for each variable. Species abbreviations are described in Table 3.

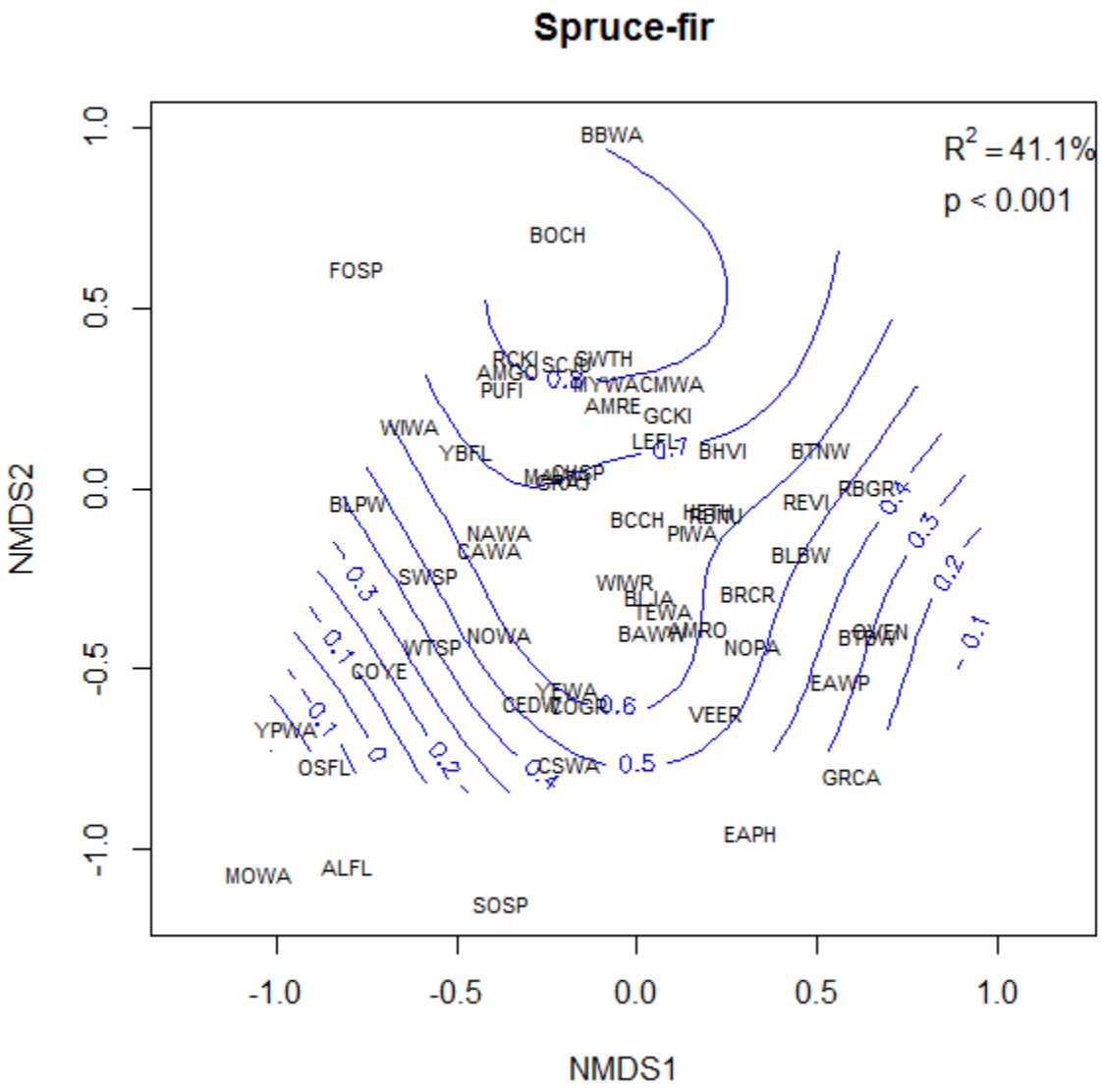
(A)



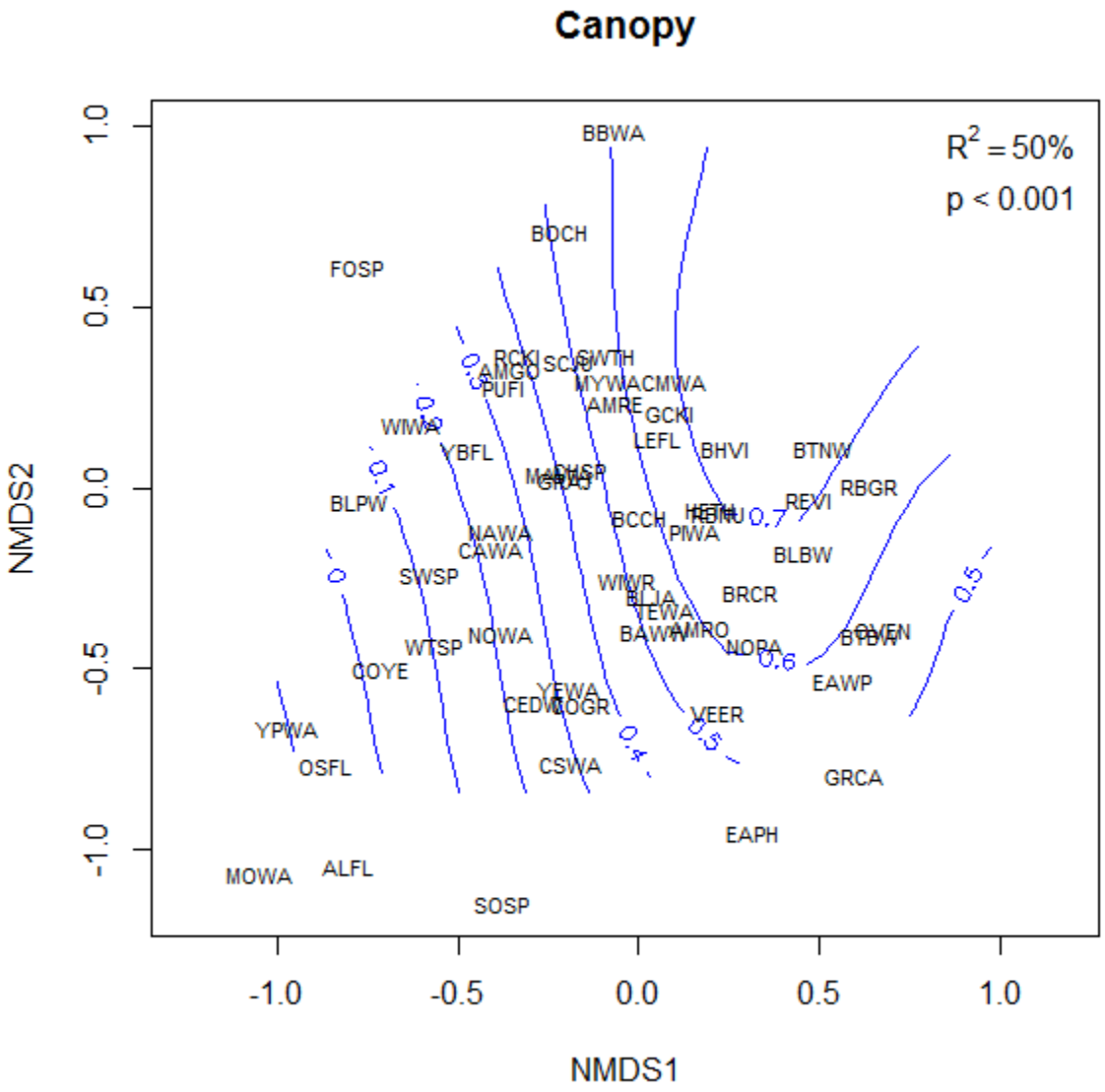
(B)


QMD
$R^2 = 63\%$
$p < 0.001$
NMDS1
NMDS3
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
90
100
110
80
GRAJ
SCJU
BRCR
RBNU
BHVI
BLBW
EAWP
PIWA
NOPA
SWSP
CAWA
WIWA
NAWA
MYWA
BTBW
OVEN
BLPW
COYE
QSFL
WTSP
CHSP
SWTH
BTNW
YPWA
ALFL
CEDW
PUFI
LEFL
EAPH
GRCA
REVI
BBWA
SOSP
FOSP
RBGR
COGR
MOWA

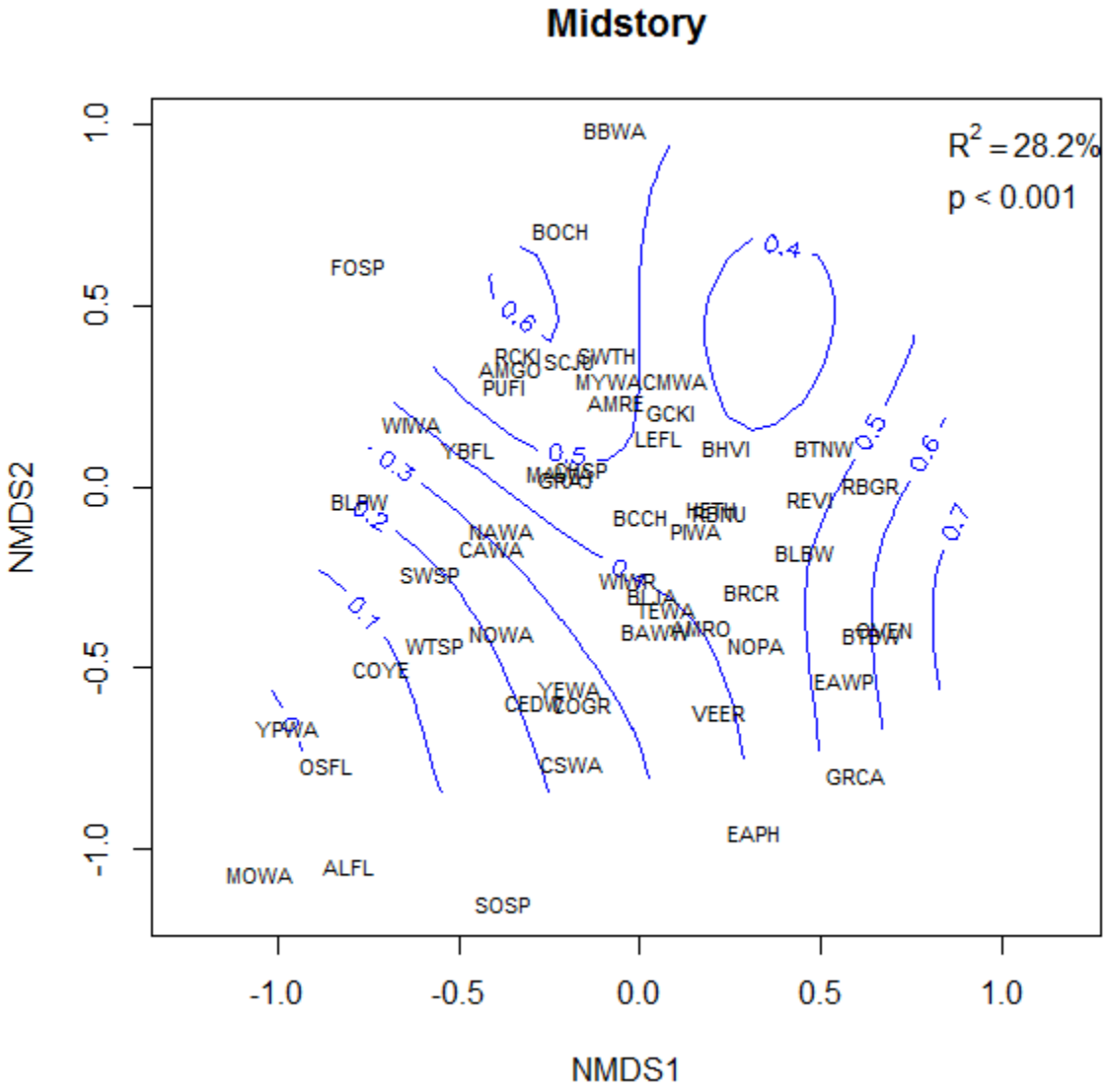
(C)


Spruce-fir
$R^2 = 41.1\%$
$p < 0.001$
NMDS1
NMDS2
BBWA
BOCH
FOSP
RCKI
SCJU
GWTH
AMGO
PUFI
MYWA
CMWA
AMRE
GCKI
WIWA
YBFL
LEFL
BHVI
BTNW
RBGR
REVI
BLPW
BCCH
PIWA
NAWA
CAWA
BLBW
SWSP
WIWR
BRCR
TEWA
NOWA
BAWW
AMRO
NOPA
WTSP
COYE
EAWP
YEWA
CEDW
COGR
VEER
YPWA
OSFL
CSWA
GRCA
EAPH
MOWA
ALFL
SOSP

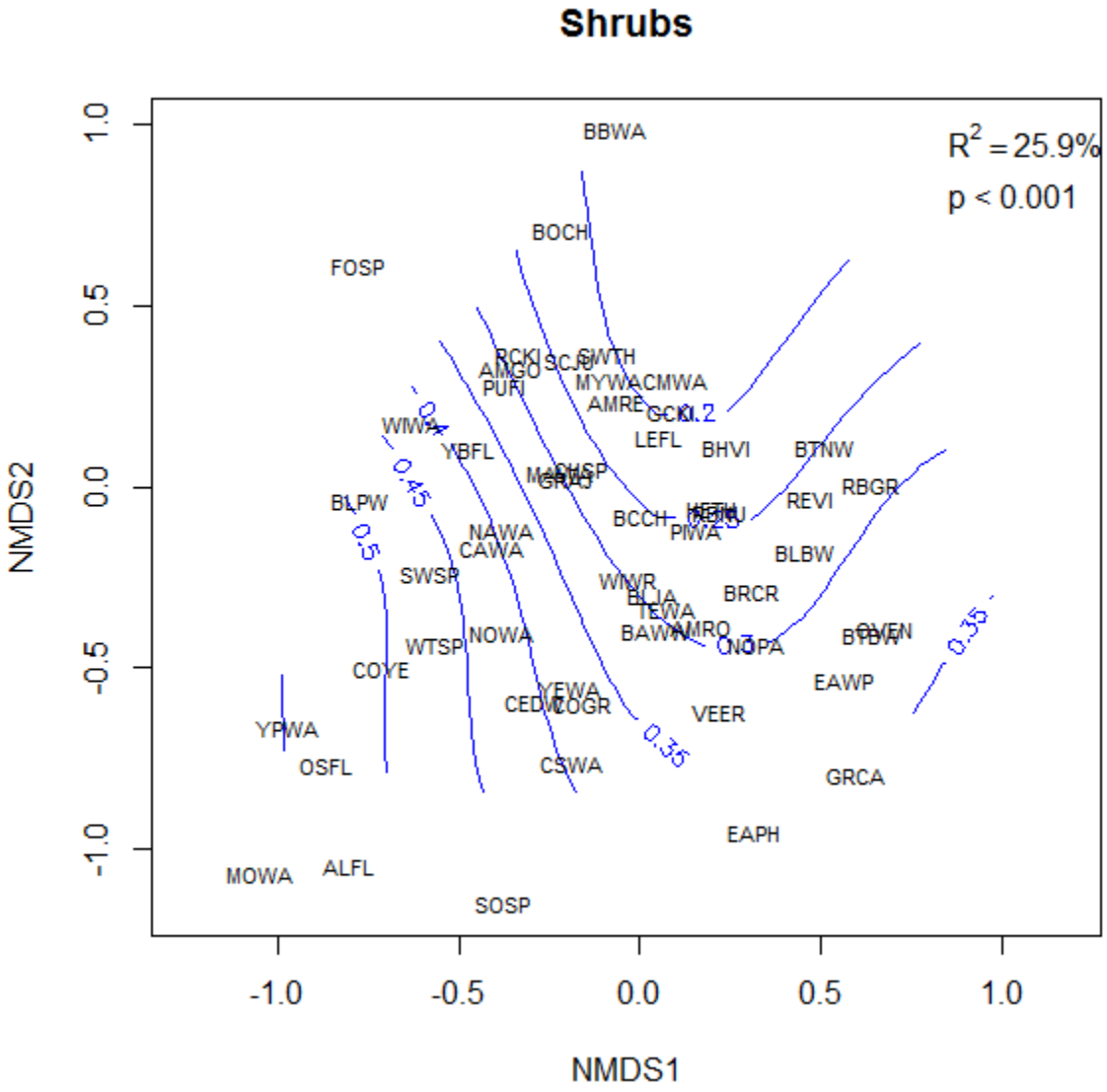
(D)


Canopy
$R^2 = 50\%$
$p < 0.001$
NMDS1
NMDS2
BBWA
BOCH
FOSP
RCKI
SCJU
SWTH
AMGO
PUFI
MYWA
CMWA
AMRE
GCKI
WIWA
LEFL
BHVI
BTNW
YBFL
RBGR
BLPW
REVI
BCCH
PIWA
NAWA
CAWA
BLBW
SWSP
WIWR
BRCR
YEWA
NOWA
WTSP
NOPA
COYE
EAWP
YEWA
CEDW
COGR
VEER
YPWA
OSFL
CSWA
GRCA
EAPH
MOWA
ALFL
SOSP
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0

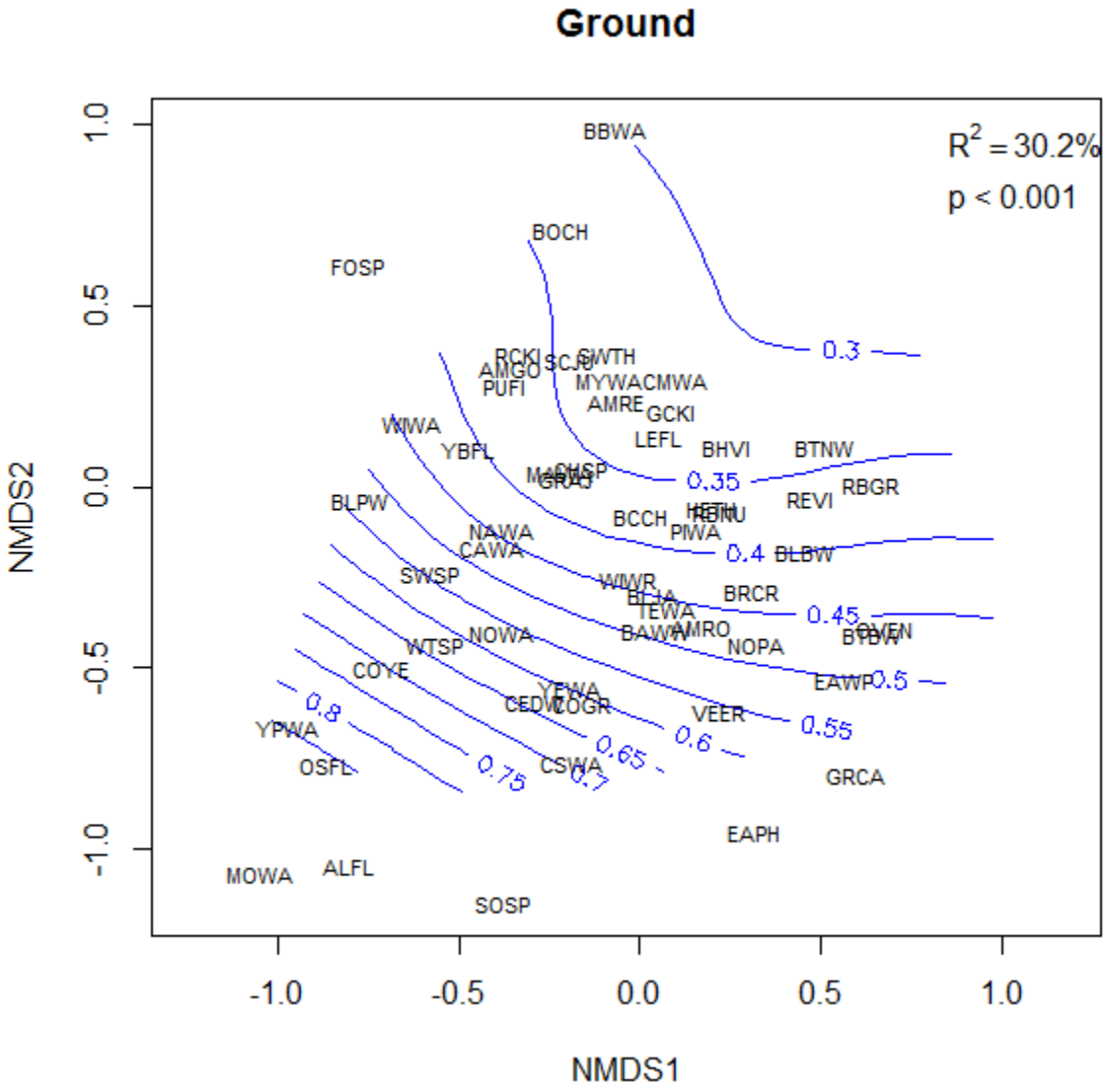
(E)


Midstory
$R^2 = 28.2\%$
$p < 0.001$
NMDS1
NMDS2
BBWA
BOCH
FOSP
RCKI
SCJA
SWTH
AMGO
PUFI
MYWA
CMWA
AMRE
GCKI
WIWA
YBFL
LEFL
BHVI
BTNW
RBGR
REVI
BLBW
BCCH
PIWA
NAWA
CAWA
SWSP
BRCR
TEWA
NOPA
EAWP
WTSP
NOWA
COYE
YEWA
CEDW
COGR
VEER
YPWA
OSFL
CSWA
GRCA
EAPH
MOWA
ALFL
SOSP
0.1
0.2
0.3
0.4
0.5
0.6
0.7

(F)


Shrubs
$R^2 = 25.9\%$
$p < 0.001$
NMDS1
NMDS2
-1.0
-0.5
0.0
0.5
1.0
BBWA
BOCH
FOSP
RCKI
SCJU
SWTH
AMGO
PUFI
MYWA
CMWA
AMRE
GCKI
LEFL
BHVI
BTNW
WIWA
YBFL
RBGR
REVI
BLPW
BCCH
PIWA
NAWA
CAWA
BLBW
SWSP
WIWR
BRCR
TEWA
NOWA
WTSP
COYE
EAWP
YEWA
COGR
VEER
YPWA
OSFL
CSWA
GRCA
EAPH
MOWA
ALFL
SOSP
0.2
0.4
0.45
0.5
0.35

(G)


Ground
$R^2 = 30.2\%$
$p < 0.001$
BBWA
BOCH
FOSP
RCKI
SCJU
SWTH
AMGO
PUFI
MYWA
CMWA
AMRE
GCKI
WIWA
YBFL
LEFL
BHVI
BTNW
RBGR
REVI
BLPW
BCCH
PIWA
NAWA
CAWA
BLBW
SWSP
WWR
BRCR
TEWA
AMRO
NOPA
BTBW
EAWP
WTSP
NOWA
COYE
YEWA
VEER
YPWA
OSFL
CSWA
GRCA
EAPH
MOWA
ALFL
SOSP
0.3
0.35
0.4
0.45
0.5
0.55
0.6
0.65
0.7
0.75
0.8
NMDS1
NMDS2
-1.0
-0.5
0.0
0.5
1.0

(H)

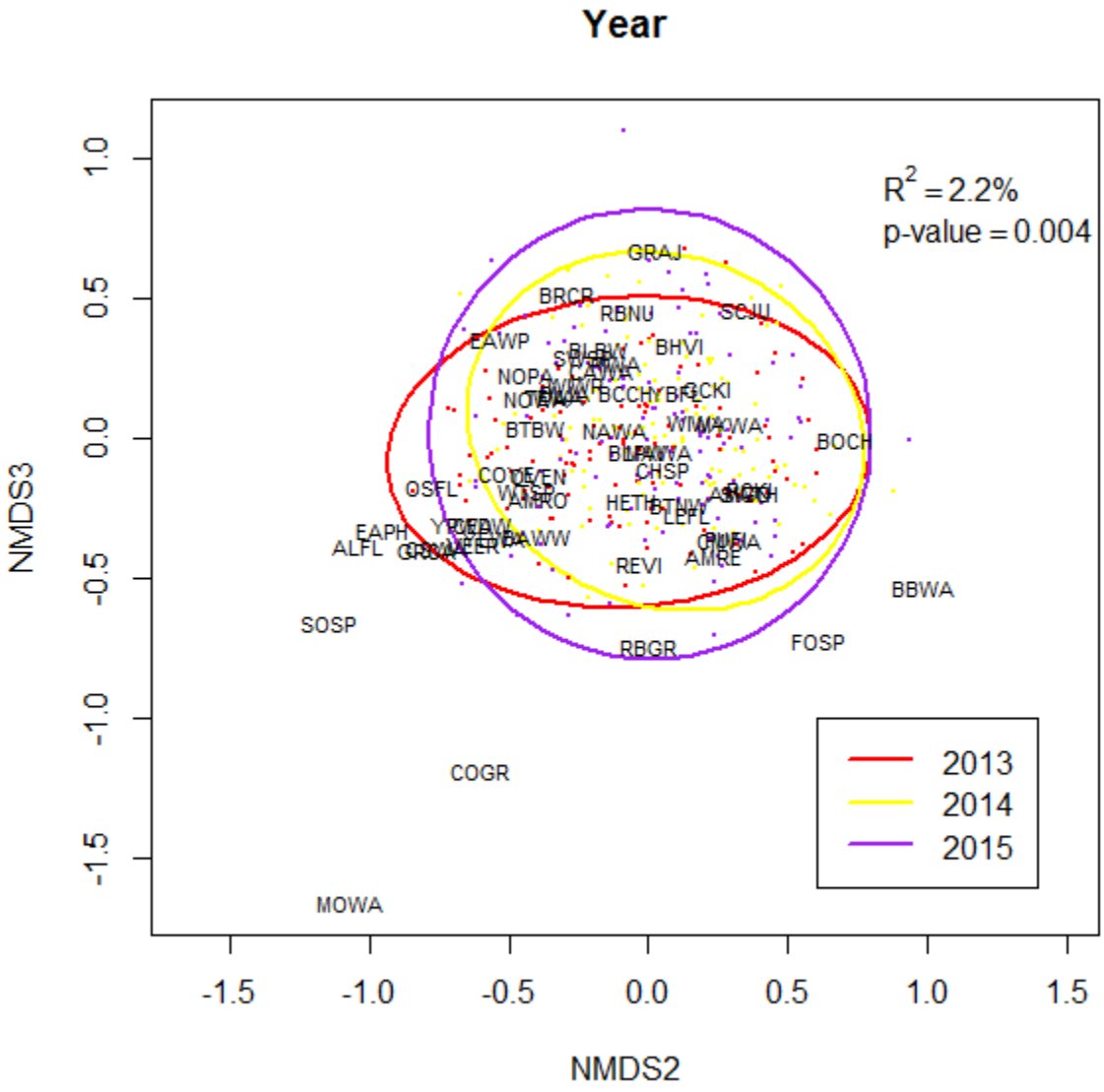

Year
$R^2 = 2.2\%$
p-value = 0.004
GRAJ
BRCR
RBNU
SCJU
EAWP
BHVI
NOPA
BCCH
YBFL
CCKI
BTBW
NAWA
MOWA
BOCH
CHSP
OSFL
AMRO
HETH
LEFL
EAPH
ALFL
REVI
AMRE
BBWA
SOSP
RBGR
FOSP
COGR
MOWA
2013
2014
2015
NMDS3
NMDS2
1.0
0.5
0.0
-0.5
-1.0
-1.5
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5

Table 1. The number of stands in each treatment class at each property that were surveyed in 2013, 2014, and/or 2015 and the total at all sites combined. PCT=pre-commercially thinned.

Property	Number of stands in each treatment						
	Conifer Regen	Mature	Overstory Removal	PCT	Selection	Shelterwood	Total
Aroostook NWR	1	9	0	0	2	0	12
Baxter State Park	0	2	0	0	0	7	9
Clayton Lake	8	0	1	0	2	0	11
Moosehorn NWR	0	8	0	0	0	1	9
Nulhegan NWR	6	2	0	5	5	1	19
Telos	10	5	0	10	4	0	29
Umbagog NWR	6	6	0	4	10	2	28
Total	31	32	1	19	23	11	117

Table 2. The number of point count locations in each treatment class at each property that were surveyed in 2013, 2014, and/or 2015.

Property	Number of point counts in each treatment						
	Conifer Regen	Mature	Overstory Removal	PCT	Selection	Shelterwood	Total
Aroostook NWR	3	28	0	0	9	0	40
Baxter State Park	0	25	0	0	0	33	58
Clayton Lake	50	0	5	0	12	0	67
Moosehorn NWR	0	46	0	0	0	6	52
Nulhegan NWR	54	11	0	33	31	3	132
Telos	55	27	0	47	23	0	152
Umbagog NWR	23	51	0	20	54	8	156
Total	185	188	5	100	129	50	657

Table 3. Breeding indices for assessment of reproductive success of Bay-breasted Warbler from Ebird protocols.

Breeding index		
Code	Description	Level
NY	NEST WITH YOUNG	CONFIRMED
NE	NEST WITH EGGS	CONFIRMED
ON	OCCUPIED NEST	CONFIRMED
FL	RECENTLY FLEDGED YOUNG	CONFIRMED
FY	FEEDING YOUNG	CONFIRMED
CS	CARRYING FECAL SAC	CONFIRMED
CF	CARRYING FOOD	CONFIRMED
DD	DISTRACTION DISPLAY	CONFIRMED
PE	BROOD PATCH AND PHYSIOLOGICAL EVIDENCE	CONFIRMED
NB	NEST BUILDING	CONFIRMED/PROBABLE
CN	CARRYING NESTING MATERIAL	CONFIRMED/PROBABLE
T	TERRITORY HELD FOR 7+ DAYS	PROBABLE
C	COURTSHIP, DISPLAY, OR COPULATION	PROBABLE
N	VISITING PROBABLE NEST SITE	PROBABLE
A	AGITATED BEHAVIOR	PROBABLE
P	PAIR IN SUITABLE HABITAT	PROBABLE
S	SINGING MALE	POSSIBLE
H	IN APPROPRIATE HABITAT	POSSIBLE
NR	NOT RECORDED	NO INFO

Table 4. Passerine birds at all study areas detected > 10 times within 50m of survey locations during point count surveys conducted in 2013, 2014 and 2015 (data pooled). Codes were used in figure 3. Column A) is the total number detected, B) is the number of locations where detected, C) is mean abundance per point and standard deviation, and D) is the proportion of locations where a bird was detected.

Code	Common name	Genus species	A	B	C	D
ALFL	ALDER FLYCATCHER	Empidonax alnorum	84	68	0.13 (0.4)	0.1
AMGO	AMERICAN GOLDFINCH	Spinus tristis	24	22	0.04 (0.2)	0.03
AMRE	AMERICAN REDSTART	Setophaga ruticilla	256	222	0.39 (0.59)	0.34
AMRO	AMERICAN ROBIN	Turdus migratorius	345	273	0.53 (0.72)	0.42
BAWW	BLACK-AND-WHITE WARBLER	Mniotilta varia	314	270	0.48 (0.63)	0.41
BBWA	BAY-BREASTED WARBLER	Setophaga castanea	162	140	0.25 (0.51)	0.21
BCCH	BLACK-CAPPED CHICKADEE	Parus atricapillus	766	483	1.17 (1.05)	0.74
BHVI	BLUE-HEADED VIREO	Vireo solitarius	402	355	0.61 (0.62)	0.54
BLBW	BLACKBURNIAN WARBLER	Setophaga fusca	354	288	0.54 (0.68)	0.44
BLJA	BLUE JAY	Cyanocitta cristata	347	284	0.53 (0.7)	0.43
BLPW	BLACKPOLL WARBLER	Setophaga striata	70	54	0.11 (0.4)	0.08
BOCH	BOREAL CHICKADEE	Poecile hudsonicus	385	272	0.59 (0.86)	0.41
BRCR	BROWN CREEPER	Certhia americana	188	174	0.29 (0.5)	0.26
BTBW	BLACK-THROATED BLUE WARBLER	Setophaga caerulescens	319	264	0.49 (0.65)	0.4
BTNW	BLACK-THROATED GREEN WARBLER	Setophaga virens	537	396	0.82 (0.82)	0.6
CAWA	CANADA WARBLER	Cardellina canadensis	339	259	0.52 (0.73)	0.39
CEDW	CEDAR WAXWING	Bombycilla cedrorum	343	247	0.52 (0.85)	0.38
CHSP	CHIPPING SPARROW	Spizella passerina	57	49	0.09 (0.33)	0.07
CMWA	CAPE MAY WARBLER	Setophaga tigrina	29	27	0.04 (0.22)	0.04
COGR	COMMON GRACKLE	Quiscalus quiscula	17	15	0.03 (0.18)	0.02
COYE	COMMON YELLOWTHROAT	Geothlypis trichas	370	277	0.56 (0.76)	0.42
CSWA	CHESTNUT-SIDED	Setophaga pensylvanica	123	104	0.19 (0.47)	0.16

	WARBLER					
EAPH	EASTERN PHOEBE	Sayornis phoebe	15	14	0.02 (0.16)	0.02
EAWP	EASTERN WOOD-PEWEE	Contopus virens	33	31	0.05 (0.23)	0.05
FOSP	FOX SPARROW	Passerella iliaca	58	49	0.09 (0.33)	0.07
GCKI	GOLDEN-CROWNED KINGLET	Regulus satrapa	799	581	1.22 (0.71)	0.88
GRAJ	GRAY JAY	Perisoreus	150	102	0.23 (0.65)	0.16
GRCA	GRAY CATBIRD	Dumetella carolinensis	22	21	0.03 (0.19)	0.03
HETH	HERMIT THRUSH	Catharus guttatus	839	537	1.28 (0.87)	0.82
LEFL	LEAST FLYCATCHER	Empidonax minimus	183	156	0.28 (0.55)	0.24
MAWA	MAGNOLIA WARBLER	Setophaga magnolia	1084	596	1.65 (0.93)	0.91
MOWA	MOURNING WARBLER	Geothlypis philadelphia	14	14	0.02 (0.14)	0.02
MYWA	MYRTLE WARBLER	Setophaga coronata	659	485	1 (0.8)	0.74
NAWA	NASHVILLE WARBLER	Vermivora ruficapilla	710	469	1.08 (0.88)	0.71
NOPA	NORTHERN PARULA	Setophaga americana	465	370	0.71 (0.72)	0.56
NOWA	NORTHERN WATERTHRUSH	Parkesia noveboracensis	222	177	0.34 (0.62)	0.27
OSFL	OLIVE-SIDED FLYCATCHER	Contopus cooperi	58	49	0.09 (0.33)	0.07
OVEN	OVENBIRD	Seiurus aurocapilla	498	336	0.76 (0.89)	0.51
PIWA	PINE WARBLER	Sylvia cantillans	204	171	0.31 (0.57)	0.26
PUFI	PURPLE FINCH	Carpodacus purpureus	171	164	0.26 (0.46)	0.25
RBGR	ROSE-BREASTED GROSBEAK	Pheucticus ludovicianus	33	31	0.05 (0.23)	0.05
RBNU	RED-BREASTED NUTHATCH	Sitta canadensis	609	459	0.93 (0.76)	0.7
RCKI	RUBY-CROWNED KINGLET	Regulus calendula	253	212	0.39 (0.61)	0.32
REVI	RED-EYED VIREO	Vireo olivaceus	503	408	0.77 (0.7)	0.62
SCJU	DARK-EYED JUNCO	Junco hyemalis	316	257	0.48 (0.67)	0.39
SOSP	SONG SPARROW	Melospiza melodia	28	25	0.04 (0.22)	0.04
SWSP	SWAMP SPARROW	Melospiza georgiana	34	26	0.05 (0.27)	0.04
SWTH	SWAINSON'S THRUSH	Catharus ustulatus	814	528	1.24 (0.86)	0.8
TEWA	TENNESSEE WARBLER	Oreothlypis peregrina	12	12	0.02 (0.13)	0.02
VEER	VEERY	Catharus fuscescens	73	63	0.11 (0.36)	0.1

WIWA	WILSON'S WARBLER	Cardellina pusilla	37	32	0.06 (0.26)	0.05
WIWR	WINTER WREN	Nannus troglodytes	596	454	0.91 (0.74)	0.69
WTSP	WHITE-THROATED SPARROW	Zonotrichia albicollis	701	436	1.07 (1.05)	0.66
YBFL	YELLOW-BELLIED FLYCATCHER	Empidonax flaviventris	458	362	0.7 (0.73)	0.55
YEWA	YELLOW WARBLER	Iduna natalensis	11	11	0.02 (0.13)	0.02
YPWA	PALM WARBLER	Setophaga palmarum	164	114	0.25 (0.61)	0.17

Appendix 1. Vegetation variables and descriptions.

Measurement	Description
dbh	Diameter at breast height of all trees within a prism plot
qmd	Quadratic mean diameter of all trees within a prism plot
ba	Basal area of all trees within a prism plot
trees	Number of trees within a prism plot
elev	Elevation from GPS
mid	Proportion of midstory 2 to <7.6m from clear plexiglass grid
canopy	Proportion of canopy cover >=7.6m from clear plexiglass grid
ground	Proportion of ground cover <0.5m from visual estimate
moss	Proportion of ground covered by moss from visual estimate
shrubs	Proportion of shrubs and regenerating cover >=0.5 to <2m from visual estimate
dshrubs	Proportion of deciduous shrubs and regenerating cover >=0.5 to <2m from visual estimate
cshrubs	Proportion of coniferous shrubs and regenerating cover >=0.5 to <2m from visual estimate
litter	Proportion of ground covered by leaf litter
dwd	Downed woody debris located within 10m of plot center
tipups	Tipups located within 10m of plot center
AvgOfheight	Average height of the 2 tallest trees within a prism plot
p_gaps	Proportion of canopy gaps >5 m in diameter across canopy
water_pa	Water presence or absence
conif	Proportion of coniferous trees
sp_fir	Proportion of spruce-fir trees

Appendix 2. Bird abundance summarized by study site and treatment. Values are mean and SE of counts within 50m radius. NA indicates that the treatment was not present at the study site.

Site	Species	Clearcut	Mature	Overstory Removal	PCT	Selection	Shelterwood
Aroostook NWR	ALFL	1 (0)	0.21 (0.5)	NA (NA)	NA (NA)	0.33 (0.5)	NA (NA)
	AMGO	0 (0)	0.14 (0.36)	NA (NA)	NA (NA)	0.22 (0.67)	NA (NA)
	AMRE	0.67 (0.58)	0.57 (0.57)	NA (NA)	NA (NA)	0.56 (0.53)	NA (NA)
	AMRO	1.33 (0.58)	1.93 (1.02)	NA (NA)	NA (NA)	1.22 (0.67)	NA (NA)
	BAWW	0.33 (0.58)	0.61 (0.57)	NA (NA)	NA (NA)	0.56 (0.73)	NA (NA)
	BBWA	0 (0)	0 (0)	NA (NA)	NA (NA)	0 (0)	NA (NA)
	BCCH	1 (1)	1.25 (1.11)	NA (NA)	NA (NA)	1 (0)	NA (NA)
	BHVI	0.67 (0.58)	0.64 (0.56)	NA (NA)	NA (NA)	0.33 (0.5)	NA (NA)
	BLBW	0.67 (0.58)	0.64 (0.56)	NA (NA)	NA (NA)	0.22 (0.44)	NA (NA)
	BLJA	0.33 (0.58)	0.71 (0.71)	NA (NA)	NA (NA)	0.78 (0.67)	NA (NA)
	BLPW	0 (0)	0 (0)	NA (NA)	NA (NA)	0 (0)	NA (NA)
	BOCH	0 (0)	0.11 (0.31)	NA (NA)	NA (NA)	0.22 (0.44)	NA (NA)
	BRCR	0 (0)	0.5 (0.51)	NA (NA)	NA (NA)	0.44 (0.53)	NA (NA)
	BTBW	0 (0)	1.14 (0.8)	NA (NA)	NA (NA)	0.67 (0.71)	NA (NA)
	BTNW	0.67 (0.58)	1 (0.67)	NA (NA)	NA (NA)	0.67 (0.71)	NA (NA)
	CAWA	0.67 (0.58)	0.14 (0.45)	NA (NA)	NA (NA)	0.11 (0.33)	NA (NA)
	CEDW	2 (1)	1.18 (0.82)	NA (NA)	NA (NA)	0.67 (0.5)	NA (NA)
	CHSP	1 (0)	0.21 (0.5)	NA (NA)	NA (NA)	0.11 (0.33)	NA (NA)
	CMWA	0.67 (0.58)	0.11 (0.31)	NA (NA)	NA (NA)	0 (0)	NA (NA)
	COGR	0 (0)	0.14 (0.36)	NA (NA)	NA (NA)	0 (0)	NA (NA)
	COYE	1.33 (0.58)	0.75 (0.84)	NA (NA)	NA (NA)	0.44 (0.53)	NA (NA)
	CSWA	2.33 (0.58)	0.61 (0.69)	NA (NA)	NA (NA)	1 (1)	NA (NA)
	EAPH	0 (0)	0.11 (0.31)	NA (NA)	NA (NA)	0.11 (0.33)	NA (NA)
	EAWP	0 (0)	0.36 (0.49)	NA (NA)	NA (NA)	0 (0)	NA (NA)
	FOSP	0 (0)	0 (0)	NA (NA)	NA (NA)	0 (0)	NA (NA)
	GCKI	1.33 (0.58)	1.21 (0.5)	NA (NA)	NA (NA)	1.56 (0.88)	NA (NA)
	GRAJ	0 (0)	0.14 (0.45)	NA (NA)	NA (NA)	0.44 (1.01)	NA (NA)
	GRCA	0 (0)	0.14 (0.36)	NA (NA)	NA (NA)	0 (0)	NA (NA)
	HETH	1 (1)	1.75 (0.89)	NA (NA)	NA (NA)	1.33 (0.71)	NA (NA)
	LEFL	0 (0)	0.39 (0.92)	NA (NA)	NA (NA)	0.33 (0.5)	NA (NA)
	MAWA	2.33 (0.58)	0.96 (0.74)	NA (NA)	NA (NA)	1.22 (0.44)	NA (NA)
	MOWA	0.33 (0.58)	0.07 (0.26)	NA (NA)	NA (NA)	0 (0)	NA (NA)

	MYWA	0.67 (0.58)	1.04 (0.79)	NA (NA)	NA (NA)	1.56 (1.24)	NA (NA)
	NAWA	1.33 (0.58)	1.39 (1.1)	NA (NA)	NA (NA)	2.44 (1.33)	NA (NA)
	NOPA	1.33 (0.58)	1.36 (0.56)	NA (NA)	NA (NA)	1 (0.71)	NA (NA)
	NOWA	0.33 (0.58)	0.57 (0.69)	NA (NA)	NA (NA)	0.33 (0.5)	NA (NA)
	OSFL	0.33 (0.58)	0.21 (0.42)	NA (NA)	NA (NA)	0.22 (0.44)	NA (NA)
	OVEN	1.33 (0.58)	1.79 (0.96)	NA (NA)	NA (NA)	1.67 (0.71)	NA (NA)
	PIWA	1.67 (0.58)	0.18 (0.39)	NA (NA)	NA (NA)	0.89 (0.78)	NA (NA)
	PUFI	0.33 (0.58)	0.21 (0.5)	NA (NA)	NA (NA)	0.11 (0.33)	NA (NA)
	RBGR	0.33 (0.58)	0.14 (0.36)	NA (NA)	NA (NA)	0 (0)	NA (NA)
	RBNU	1 (0)	1.11 (0.69)	NA (NA)	NA (NA)	1 (0.5)	NA (NA)
	RCKI	1 (1)	0.14 (0.36)	NA (NA)	NA (NA)	0.11 (0.33)	NA (NA)
	REVI	1 (1)	0.89 (0.42)	NA (NA)	NA (NA)	0.78 (0.67)	NA (NA)
	SCJU	0.33 (0.58)	0.11 (0.31)	NA (NA)	NA (NA)	0.33 (0.5)	NA (NA)
	SOSP	1 (1)	0.18 (0.39)	NA (NA)	NA (NA)	0.33 (0.71)	NA (NA)
	SWSP	0 (0)	0.07 (0.38)	NA (NA)	NA (NA)	0.33 (0.71)	NA (NA)
	SWTH	1.33 (0.58)	0.71 (0.66)	NA (NA)	NA (NA)	0.67 (0.5)	NA (NA)
	TEWA	0 (0)	0 (0)	NA (NA)	NA (NA)	0.22 (0.44)	NA (NA)
	VEER	0 (0)	0.36 (0.56)	NA (NA)	NA (NA)	0.22 (0.44)	NA (NA)
	WIWA	0 (0)	0 (0)	NA (NA)	NA (NA)	0 (0)	NA (NA)
	WIWR	0 (0)	0.96 (0.84)	NA (NA)	NA (NA)	0.67 (0.71)	NA (NA)
	WTSP	1.33 (0.58)	1.46 (0.84)	NA (NA)	NA (NA)	1.11 (0.6)	NA (NA)
	YBFL	0 (0)	0.14 (0.36)	NA (NA)	NA (NA)	0.22 (0.44)	NA (NA)
	YEWA	0 (0)	0.07 (0.26)	NA (NA)	NA (NA)	0 (0)	NA (NA)
	YPWA	0 (0)	0 (0)	NA (NA)	NA (NA)	0 (0)	NA (NA)

Site	Species	Clearcut	Mature	Overstory Removal	PCT	Selection	Shelterwood
Baxter State Park	ALFL	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0.03 (0.17)
	AMGO	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0.03 (0.17)
	AMRE	NA (NA)	0.04 (0.2)	NA (NA)	NA (NA)	NA (NA)	0.12 (0.33)
	AMRO	NA (NA)	0.16 (0.37)	NA (NA)	NA (NA)	NA (NA)	0.12 (0.33)
	BAWW	NA (NA)	0.2 (0.41)	NA (NA)	NA (NA)	NA (NA)	0.03 (0.17)
	BBWA	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0.06 (0.24)
	BCCH	NA (NA)	1.08 (1.38)	NA (NA)	NA (NA)	NA (NA)	1.15 (1.03)
	BHVI	NA (NA)	0.56 (0.58)	NA (NA)	NA (NA)	NA (NA)	0.64 (0.65)
	BLBW	NA (NA)	0.72 (0.79)	NA (NA)	NA (NA)	NA (NA)	0.21 (0.42)
	BLJA	NA (NA)	0.2 (0.41)	NA (NA)	NA (NA)	NA (NA)	0.27 (0.57)
	BLPW	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0.03 (0.17)
	BOCH	NA (NA)	0.36 (0.76)	NA (NA)	NA (NA)	NA (NA)	0.39 (0.56)
	BRCR	NA (NA)	0.36 (0.49)	NA (NA)	NA (NA)	NA (NA)	0.24 (0.44)
	BTBW	NA (NA)	0.76 (0.83)	NA (NA)	NA (NA)	NA (NA)	0.58 (0.61)
	BTNW	NA (NA)	0.56 (0.65)	NA (NA)	NA (NA)	NA (NA)	0.3 (0.53)
	CAWA	NA (NA)	0.04 (0.2)	NA (NA)	NA (NA)	NA (NA)	0.27 (0.63)
	CEDW	NA (NA)	0.4 (0.58)	NA (NA)	NA (NA)	NA (NA)	0.12 (0.33)
	CHSP	NA (NA)	0.12 (0.44)	NA (NA)	NA (NA)	NA (NA)	0.03 (0.17)
	CMWA	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	COGR	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	COYE	NA (NA)	0.32 (0.48)	NA (NA)	NA (NA)	NA (NA)	0.15 (0.36)
	CSWA	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	EAPH	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	EAWP	NA (NA)	0.16 (0.37)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	FOSP	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0.12 (0.33)
	GCKI	NA (NA)	1.36 (0.76)	NA (NA)	NA (NA)	NA (NA)	0.97 (0.53)
	GRAJ	NA (NA)	0.16 (0.37)	NA (NA)	NA (NA)	NA (NA)	0.15 (0.36)
	GRCA	NA (NA)	0.04 (0.2)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	HETH	NA (NA)	0.76 (0.78)	NA (NA)	NA (NA)	NA (NA)	0.85 (1)
	LEFL	NA (NA)	0.28 (0.61)	NA (NA)	NA (NA)	NA (NA)	0.21 (0.48)
	MAWA	NA (NA)	0.8 (0.58)	NA (NA)	NA (NA)	NA (NA)	1.58 (0.79)
	MOWA	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	MYWA	NA (NA)	0.68 (0.63)	NA (NA)	NA (NA)	NA (NA)	0.48 (0.67)

	NAWA	NA (NA)	0.44 (0.82)	NA (NA)	NA (NA)	NA (NA)	0.45 (0.62)
	NOPA	NA (NA)	0.4 (0.5)	NA (NA)	NA (NA)	NA (NA)	0.36 (0.49)
	NOWA	NA (NA)	0.12 (0.44)	NA (NA)	NA (NA)	NA (NA)	0.39 (0.66)
	OSFL	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0.06 (0.35)
	OVEN	NA (NA)	0.96 (0.79)	NA (NA)	NA (NA)	NA (NA)	0.61 (0.75)
	PIWA	NA (NA)	0.28 (0.54)	NA (NA)	NA (NA)	NA (NA)	0.18 (0.46)
	PUFI	NA (NA)	0.24 (0.44)	NA (NA)	NA (NA)	NA (NA)	0.06 (0.24)
	RBGR	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	RBNU	NA (NA)	1.56 (0.71)	NA (NA)	NA (NA)	NA (NA)	1.12 (0.65)
	RCKI	NA (NA)	0.24 (0.44)	NA (NA)	NA (NA)	NA (NA)	0.03 (0.17)
	REVI	NA (NA)	0.44 (0.71)	NA (NA)	NA (NA)	NA (NA)	0.24 (0.44)
	SCJU	NA (NA)	0.88 (0.78)	NA (NA)	NA (NA)	NA (NA)	0.61 (0.7)
	SOSP	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	SWSP	NA (NA)	0.08 (0.28)	NA (NA)	NA (NA)	NA (NA)	0.03 (0.17)
	SWTH	NA (NA)	1.16 (0.9)	NA (NA)	NA (NA)	NA (NA)	1.18 (0.77)
	TEWA	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	VEER	NA (NA)	0.04 (0.2)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	WIWA	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	WIWR	NA (NA)	0.84 (0.75)	NA (NA)	NA (NA)	NA (NA)	0.39 (0.5)
	WTSP	NA (NA)	0.68 (0.85)	NA (NA)	NA (NA)	NA (NA)	1.3 (0.98)
	YBFL	NA (NA)	0.28 (0.68)	NA (NA)	NA (NA)	NA (NA)	0.15 (0.44)
	YEWA	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	YPWA	NA (NA)	0.04 (0.2)	NA (NA)	NA (NA)	NA (NA)	0 (0)

Site	Species	Clearcut	Mature	Overstory Removal	PCT	Selection	Shelterwood
Clayton Lake	ALFL	0.06 (0.31)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)
	AMGO	0.08 (0.27)	NA (NA)	0.2 (0.45)	NA (NA)	0 (0)	NA (NA)
	AMRE	0.86 (0.73)	NA (NA)	0.4 (0.55)	NA (NA)	0.33 (0.49)	NA (NA)
	AMRO	1 (0.67)	NA (NA)	1 (1)	NA (NA)	0.67 (0.78)	NA (NA)
	BAWW	0.36 (0.48)	NA (NA)	0.6 (0.55)	NA (NA)	0.25 (0.62)	NA (NA)
	BBWA	0.7 (0.65)	NA (NA)	0.8 (0.84)	NA (NA)	0 (0)	NA (NA)
	BCCH	0.68 (0.84)	NA (NA)	0 (0)	NA (NA)	0.58 (0.67)	NA (NA)
	BHVI	0.6 (0.67)	NA (NA)	1 (0)	NA (NA)	0.25 (0.45)	NA (NA)
	BLBW	0.24 (0.48)	NA (NA)	0.4 (0.55)	NA (NA)	0.83 (0.72)	NA (NA)
	BLJA	0.26 (0.44)	NA (NA)	0.6 (0.89)	NA (NA)	0 (0)	NA (NA)
	BLPW	0.06 (0.24)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)
	BOCH	1.4 (0.9)	NA (NA)	0.6 (0.89)	NA (NA)	0.25 (0.62)	NA (NA)
	BRCR	0 (0)	NA (NA)	0 (0)	NA (NA)	0.33 (0.49)	NA (NA)
	BTBW	0.18 (0.39)	NA (NA)	0 (0)	NA (NA)	1.17 (0.58)	NA (NA)
	BTNW	0.78 (0.68)	NA (NA)	0.8 (0.45)	NA (NA)	0.92 (0.67)	NA (NA)
	CAWA	0.36 (0.66)	NA (NA)	0 (0)	NA (NA)	0.08 (0.29)	NA (NA)
	CEDW	0.26 (0.53)	NA (NA)	0.6 (0.55)	NA (NA)	0.33 (0.49)	NA (NA)
	CHSP	0 (0)	NA (NA)	0.4 (0.89)	NA (NA)	0 (0)	NA (NA)
	CMWA	0.02 (0.14)	NA (NA)	0.2 (0.45)	NA (NA)	0 (0)	NA (NA)
	COGR	0 (0)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)
	COYE	0.3 (0.58)	NA (NA)	0.6 (1.34)	NA (NA)	0.25 (0.45)	NA (NA)
	CSWA	0.06 (0.24)	NA (NA)	0.2 (0.45)	NA (NA)	0.08 (0.29)	NA (NA)
	EAPH	0 (0)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)
	EAWP	0.02 (0.14)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)
	FOSP	0.52 (0.68)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)
	GCKI	1.38 (0.9)	NA (NA)	1.2 (0.45)	NA (NA)	0.58 (0.67)	NA (NA)
	GRAJ	0.04 (0.2)	NA (NA)	0 (0)	NA (NA)	0.08 (0.29)	NA (NA)
	GRCA	0 (0)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)
	HETH	1.22 (0.71)	NA (NA)	1.6 (0.55)	NA (NA)	1.67 (0.78)	NA (NA)
	LEFL	0.36 (0.48)	NA (NA)	0 (0)	NA (NA)	0.58 (0.67)	NA (NA)
	MAWA	1.72 (0.7)	NA (NA)	1.8 (0.45)	NA (NA)	0.25 (0.45)	NA (NA)
	MOWA	0.02 (0.14)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)
	MYWA	1.12 (0.69)	NA (NA)	1 (0.71)	NA (NA)	0.08 (0.29)	NA (NA)

	NAWA	1.02 (0.8)	NA (NA)	0.8 (0.84)	NA (NA)	0.5 (0.8)	NA (NA)
	NOPA	0.28 (0.45)	NA (NA)	0.4 (0.55)	NA (NA)	1.17 (0.72)	NA (NA)
	NOWA	0.26 (0.49)	NA (NA)	0.4 (0.89)	NA (NA)	0 (0)	NA (NA)
	OSFL	0 (0)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)
	OVEN	0.22 (0.46)	NA (NA)	0.6 (0.89)	NA (NA)	1.58 (1.08)	NA (NA)
	PIWA	0.08 (0.27)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)
	PUFI	0.62 (0.53)	NA (NA)	0.4 (0.55)	NA (NA)	0 (0)	NA (NA)
	RBGR	0.18 (0.48)	NA (NA)	0 (0)	NA (NA)	0.33 (0.49)	NA (NA)
	RBNU	0.3 (0.51)	NA (NA)	0.6 (0.89)	NA (NA)	0.5 (0.67)	NA (NA)
	RCKI	0.86 (0.73)	NA (NA)	0 (0)	NA (NA)	0.08 (0.29)	NA (NA)
	REVI	0.74 (0.66)	NA (NA)	1 (1)	NA (NA)	2.08 (0.67)	NA (NA)
	SCJU	0.08 (0.27)	NA (NA)	0 (0)	NA (NA)	0.08 (0.29)	NA (NA)
	SOSP	0.06 (0.24)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)
	SWSP	0 (0)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)
	SWTH	1.8 (0.7)	NA (NA)	1 (0.71)	NA (NA)	0.92 (1.24)	NA (NA)
	TEWA	0 (0)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)
	VEER	0.08 (0.27)	NA (NA)	0 (0)	NA (NA)	0.25 (0.45)	NA (NA)
	WIWA	0.14 (0.45)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)
	WIWR	0.82 (0.63)	NA (NA)	0.6 (0.55)	NA (NA)	0.25 (0.62)	NA (NA)
	WTSP	1.02 (0.77)	NA (NA)	0.8 (1.1)	NA (NA)	0.33 (0.65)	NA (NA)
	YBFL	0.86 (0.7)	NA (NA)	0 (0)	NA (NA)	0.08 (0.29)	NA (NA)
	YEWA	0.04 (0.2)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)
	YPWA	0.04 (0.2)	NA (NA)	0 (0)	NA (NA)	0 (0)	NA (NA)

Site	Species	Clearcut	Mature	Overstory Removal	PCT	Selection	Shelterwood
Moosehorn NWR	ALFL	NA (NA)	0.17 (0.44)	NA (NA)	NA (NA)	NA (NA)	0.33 (0.52)
	AMGO	NA (NA)	0.04 (0.21)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	AMRE	NA (NA)	0.15 (0.42)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	AMRO	NA (NA)	0.78 (0.73)	NA (NA)	NA (NA)	NA (NA)	0.67 (0.82)
	BAWW	NA (NA)	1.37 (0.64)	NA (NA)	NA (NA)	NA (NA)	2 (0.89)
	BBWA	NA (NA)	0.11 (0.31)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	BCCH	NA (NA)	0.87 (0.72)	NA (NA)	NA (NA)	NA (NA)	1.5 (0.55)
	BHVI	NA (NA)	0.93 (0.57)	NA (NA)	NA (NA)	NA (NA)	0.5 (0.84)
	BLBW	NA (NA)	0.85 (0.76)	NA (NA)	NA (NA)	NA (NA)	0.5 (0.55)
	BLJA	NA (NA)	0.61 (0.65)	NA (NA)	NA (NA)	NA (NA)	1.17 (0.75)
	BLPW	NA (NA)	0.04 (0.21)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	BOCH	NA (NA)	0.04 (0.29)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	BRCR	NA (NA)	0.33 (0.56)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	BTBW	NA (NA)	0.78 (0.66)	NA (NA)	NA (NA)	NA (NA)	0.67 (0.82)
	BTNW	NA (NA)	2.09 (0.76)	NA (NA)	NA (NA)	NA (NA)	1.67 (0.82)
	CAWA	NA (NA)	0.3 (0.51)	NA (NA)	NA (NA)	NA (NA)	0.67 (0.52)
	CEDW	NA (NA)	0.98 (1.39)	NA (NA)	NA (NA)	NA (NA)	0.67 (0.52)
	CHSP	NA (NA)	0.24 (0.43)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	CMWA	NA (NA)	0.02 (0.15)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	COGR	NA (NA)	0.07 (0.33)	NA (NA)	NA (NA)	NA (NA)	0.17 (0.41)
	COYE	NA (NA)	0.43 (0.83)	NA (NA)	NA (NA)	NA (NA)	0.67 (0.52)
	CSWA	NA (NA)	0.43 (0.62)	NA (NA)	NA (NA)	NA (NA)	0.5 (0.84)
	EAPH	NA (NA)	0.04 (0.21)	NA (NA)	NA (NA)	NA (NA)	0.33 (0.52)
	EAWP	NA (NA)	0.09 (0.28)	NA (NA)	NA (NA)	NA (NA)	0.17 (0.41)
	FOSP	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	GCKI	NA (NA)	1.33 (0.6)	NA (NA)	NA (NA)	NA (NA)	0.33 (0.52)
	GRAJ	NA (NA)	0.17 (0.49)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	GRCA	NA (NA)	0.09 (0.28)	NA (NA)	NA (NA)	NA (NA)	0.33 (0.52)
	HETH	NA (NA)	1.7 (0.94)	NA (NA)	NA (NA)	NA (NA)	1.67 (0.52)
	LEFL	NA (NA)	0.52 (0.72)	NA (NA)	NA (NA)	NA (NA)	0.17 (0.41)
	MAWA	NA (NA)	1.46 (0.81)	NA (NA)	NA (NA)	NA (NA)	1.83 (0.75)
	MOWA	NA (NA)	0.02 (0.15)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	MYWA	NA (NA)	0.63 (0.64)	NA (NA)	NA (NA)	NA (NA)	0.5 (0.55)

	NAWA	NA (NA)	0.74 (0.61)	NA (NA)	NA (NA)	NA (NA)	1.5 (0.84)
	NOPA	NA (NA)	0.85 (0.7)	NA (NA)	NA (NA)	NA (NA)	0.83 (0.98)
	NOWA	NA (NA)	0.17 (0.38)	NA (NA)	NA (NA)	NA (NA)	0.5 (0.55)
	OSFL	NA (NA)	0.02 (0.15)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	OVEN	NA (NA)	1.54 (1.15)	NA (NA)	NA (NA)	NA (NA)	2 (0.63)
	PIWA	NA (NA)	0.78 (0.66)	NA (NA)	NA (NA)	NA (NA)	0.17 (0.41)
	PUFI	NA (NA)	0.11 (0.31)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	RBGR	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	RBNU	NA (NA)	1.13 (0.69)	NA (NA)	NA (NA)	NA (NA)	0.5 (0.55)
	RCKI	NA (NA)	0.04 (0.29)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	REVI	NA (NA)	0.52 (0.59)	NA (NA)	NA (NA)	NA (NA)	0.83 (0.98)
	SCJU	NA (NA)	0.41 (0.54)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	SOSP	NA (NA)	0.07 (0.33)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	SWSP	NA (NA)	0.02 (0.15)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	SWTH	NA (NA)	0.67 (0.82)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	TEWA	NA (NA)	0.04 (0.21)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	VEER	NA (NA)	0.04 (0.21)	NA (NA)	NA (NA)	NA (NA)	0.83 (0.75)
	WIWA	NA (NA)	0 (0)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	WIWR	NA (NA)	1.04 (0.7)	NA (NA)	NA (NA)	NA (NA)	1.17 (0.75)
	WTSP	NA (NA)	0.33 (0.6)	NA (NA)	NA (NA)	NA (NA)	1.5 (0.55)
	YBFL	NA (NA)	0.5 (0.59)	NA (NA)	NA (NA)	NA (NA)	0.33 (0.52)
	YEWA	NA (NA)	0.02 (0.15)	NA (NA)	NA (NA)	NA (NA)	0 (0)
	YPWA	NA (NA)	0.04 (0.21)	NA (NA)	NA (NA)	NA (NA)	0.17 (0.41)

Site	Species	Clearcut	Mature	Overstory Removal	PCT	Selection	Shelterwood
Nulhegan NWR	ALFL	0.07 (0.33)	0 (0)	NA (NA)	0.09 (0.29)	0.03 (0.18)	0 (0)
	AMGO	0.04 (0.19)	0.09 (0.3)	NA (NA)	0.03 (0.17)	0 (0)	0 (0)
	AMRE	0.65 (0.8)	0 (0)	NA (NA)	0.21 (0.42)	0.48 (0.63)	0.33 (0.58)
	AMRO	0.17 (0.38)	0.18 (0.4)	NA (NA)	0.15 (0.36)	0.16 (0.37)	0 (0)
	BAWW	0.74 (0.52)	0.27 (0.47)	NA (NA)	0.21 (0.42)	0.35 (0.49)	1 (0)
	BBWA	0.13 (0.34)	0.09 (0.3)	NA (NA)	0.21 (0.42)	0.1 (0.3)	0.33 (0.58)
	BCCH	1.26 (0.78)	1.36 (0.81)	NA (NA)	1.48 (0.83)	1.1 (0.75)	1.67 (0.58)
	BHVI	0.43 (0.5)	0.73 (0.47)	NA (NA)	0.45 (0.51)	0.84 (0.69)	0.67 (0.58)
	BLBW	0.37 (0.59)	1.09 (0.7)	NA (NA)	0.3 (0.53)	0.87 (0.96)	0.67 (0.58)
	BLJA	0.63 (0.68)	1.27 (1.19)	NA (NA)	0.48 (0.67)	0.58 (0.67)	0.67 (0.58)
	BLPW	0.85 (0.98)	0 (0)	NA (NA)	0.12 (0.33)	0.13 (0.34)	0 (0)
	BOCH	0.57 (0.66)	0.27 (0.65)	NA (NA)	0.73 (0.76)	0.29 (0.53)	0 (0)
	BRCR	0.15 (0.36)	0.82 (0.6)	NA (NA)	0.18 (0.39)	0.42 (0.5)	0 (0)
	BTBW	0.35 (0.55)	0.45 (0.52)	NA (NA)	0.33 (0.48)	0.74 (0.68)	1.33 (0.58)
	BTNW	0.44 (0.54)	0.18 (0.4)	NA (NA)	0.85 (0.67)	0.84 (0.73)	0 (0)
	CAWA	1.56 (0.69)	1.27 (0.65)	NA (NA)	0.94 (0.66)	1.16 (0.64)	1.67 (0.58)
	CEDW	0.48 (0.64)	0.27 (0.47)	NA (NA)	0.36 (0.55)	0.13 (0.34)	0 (0)
	CHSP	0.11 (0.42)	0.09 (0.3)	NA (NA)	0.21 (0.6)	0.1 (0.3)	0 (0)
	CMWA	0.09 (0.29)	0 (0)	NA (NA)	0.09 (0.38)	0.03 (0.18)	0 (0)
	COGR	0 (0)	0 (0)	NA (NA)	0.03 (0.17)	0.03 (0.18)	0 (0)
	COYE	0.85 (0.76)	0.64 (0.5)	NA (NA)	1.15 (0.67)	0.58 (0.62)	0.33 (0.58)
	CSWA	0.06 (0.23)	0.09 (0.3)	NA (NA)	0.21 (0.48)	0 (0)	0.67 (0.58)
	EAPH	0 (0)	0 (0)	NA (NA)	0 (0)	0.06 (0.25)	0 (0)
	EAWP	0 (0)	0 (0)	NA (NA)	0 (0)	0 (0)	0 (0)
	FOSP	0 (0)	0 (0)	NA (NA)	0 (0)	0 (0)	0 (0)
	GCKI	0.98 (0.46)	1.18 (0.4)	NA (NA)	1.39 (0.56)	1.06 (0.57)	1 (0)
	GRAJ	0.17 (0.42)	0.36 (0.67)	NA (NA)	0.48 (0.8)	0.13 (0.34)	0 (0)
	GRCA	0 (0)	0 (0)	NA (NA)	0 (0)	0 (0)	0 (0)
	HETH	1.04 (0.73)	1 (0.63)	NA (NA)	1.09 (0.58)	1.19 (0.83)	2 (0)
	LEFL	0.24 (0.47)	0.27 (0.47)	NA (NA)	0.09 (0.38)	0.1 (0.3)	0 (0)
	MAWA	2 (0.82)	1.64 (0.92)	NA (NA)	1.94 (0.61)	1.81 (0.87)	1.67 (0.58)
	MOWA	0 (0)	0 (0)	NA (NA)	0 (0)	0 (0)	0 (0)
	MYWA	1.17 (0.61)	1.09 (0.7)	NA (NA)	1.7 (0.98)	0.94 (0.57)	1 (1)

	NAWA	1.57 (0.66)	1.55 (0.69)	NA (NA)	1.7 (0.77)	1.45 (0.68)	1.33 (0.58)
	NOPA	0.44 (0.57)	0.73 (0.47)	NA (NA)	0.45 (0.62)	0.94 (0.57)	0.67 (0.58)
	NOWA	0.33 (0.55)	0.27 (0.47)	NA (NA)	0.3 (0.59)	0.35 (0.61)	0.33 (0.58)
	OSFL	0.07 (0.38)	0.09 (0.3)	NA (NA)	0.09 (0.29)	0.16 (0.37)	0 (0)
	OVEN	0.46 (0.64)	0.36 (0.5)	NA (NA)	0.33 (0.69)	0.68 (0.83)	2 (1)
	PIWA	0.22 (0.46)	0.09 (0.3)	NA (NA)	0.58 (0.87)	0.13 (0.34)	0.33 (0.58)
	PUFI	0.2 (0.41)	0.18 (0.4)	NA (NA)	0.45 (0.56)	0.16 (0.37)	0 (0)
	RBGR	0 (0)	0 (0)	NA (NA)	0.03 (0.17)	0 (0)	0 (0)
	RBNU	0.44 (0.57)	0.64 (0.81)	NA (NA)	0.67 (0.54)	0.77 (0.62)	1 (0)
	RCKI	0.57 (0.66)	0.18 (0.4)	NA (NA)	0.76 (0.61)	0.29 (0.46)	0 (0)
	REVI	0.81 (0.65)	0.36 (0.5)	NA (NA)	0.48 (0.57)	0.68 (0.7)	0.33 (0.58)
	SCJU	0.28 (0.45)	0.45 (0.52)	NA (NA)	0.85 (0.67)	0.29 (0.46)	0.33 (0.58)
	SOSP	0.02 (0.14)	0.09 (0.3)	NA (NA)	0.06 (0.24)	0 (0)	0 (0)
	SWSP	0.19 (0.52)	0.09 (0.3)	NA (NA)	0.09 (0.38)	0.03 (0.18)	0 (0)
	SWTH	1.24 (0.73)	1 (0.89)	NA (NA)	1.15 (0.62)	1.1 (0.7)	0.33 (0.58)
	TEWA	0 (0)	0 (0)	NA (NA)	0 (0)	0.06 (0.25)	0 (0)
	VEER	0.09 (0.29)	0 (0)	NA (NA)	0.03 (0.17)	0.06 (0.25)	0 (0)
	WIWA	0.09 (0.29)	0.18 (0.4)	NA (NA)	0.24 (0.56)	0.13 (0.43)	0.33 (0.58)
	WIWR	0.96 (0.7)	1.36 (0.67)	NA (NA)	0.67 (0.65)	1.19 (0.6)	0.67 (0.58)
	WTSP	1.22 (0.84)	1.09 (0.7)	NA (NA)	0.88 (0.7)	0.74 (0.63)	1.33 (0.58)
	YBFL	1.39 (0.66)	1.18 (1.25)	NA (NA)	1.03 (0.81)	1.13 (0.72)	1 (0)
	YEWA	0 (0)	0.09 (0.3)	NA (NA)	0 (0)	0 (0)	0 (0)
	YPWA	0.67 (0.85)	0 (0)	NA (NA)	0.42 (0.79)	0.23 (0.43)	0 (0)

Site	Species	Clearcut	Mature	Overstory Removal	PCT	Selection	Shelterwood
Telos	ALFL	0.09 (0.29)	0 (0)	NA (NA)	0.11 (0.37)	0 (0)	NA (NA)
	AMGO	0 (0)	0 (0)	NA (NA)	0.06 (0.32)	0 (0)	NA (NA)
	AMRE	0.45 (0.6)	0.19 (0.4)	NA (NA)	0.6 (0.61)	0.43 (0.59)	NA (NA)
	AMRO	0.58 (0.57)	0.3 (0.54)	NA (NA)	0.32 (0.52)	0.39 (0.5)	NA (NA)
	BAWW	0.55 (0.63)	0.19 (0.4)	NA (NA)	0.3 (0.51)	0.57 (0.59)	NA (NA)
	BBWA	0.75 (0.7)	0.04 (0.19)	NA (NA)	0.96 (0.66)	0.09 (0.29)	NA (NA)
	BCCH	0.78 (0.74)	1.04 (0.94)	NA (NA)	1.02 (1.31)	0.83 (0.78)	NA (NA)
	BHVI	0.53 (0.6)	0.89 (0.7)	NA (NA)	0.62 (0.53)	0.61 (0.78)	NA (NA)
	BLBW	0.16 (0.37)	0.41 (0.57)	NA (NA)	0.15 (0.42)	1 (0.8)	NA (NA)
	BLJA	0.47 (0.57)	0.15 (0.46)	NA (NA)	0.32 (0.52)	0.57 (0.79)	NA (NA)
	BLPW	0.09 (0.29)	0 (0)	NA (NA)	0 (0)	0 (0)	NA (NA)
	BOCH	1.02 (0.87)	0.56 (0.8)	NA (NA)	1.17 (1.19)	0.13 (0.34)	NA (NA)
	BRCR	0.07 (0.26)	0.3 (0.47)	NA (NA)	0.06 (0.25)	0.13 (0.34)	NA (NA)
	BTBW	0 (0)	0.48 (0.7)	NA (NA)	0.15 (0.42)	1 (0.6)	NA (NA)
	BTNW	0.87 (0.77)	0.33 (0.48)	NA (NA)	0.96 (0.81)	1.35 (0.83)	NA (NA)
	CAWA	0.22 (0.6)	0.26 (0.71)	NA (NA)	0.13 (0.4)	0.04 (0.21)	NA (NA)
	CEDW	0.42 (0.76)	0.41 (0.64)	NA (NA)	0.32 (0.52)	0.52 (0.67)	NA (NA)
	CHSP	0.13 (0.39)	0 (0)	NA (NA)	0.11 (0.31)	0 (0)	NA (NA)
	CMWA	0.02 (0.13)	0 (0)	NA (NA)	0.15 (0.42)	0 (0)	NA (NA)
	COGR	0.02 (0.13)	0.04 (0.19)	NA (NA)	0 (0)	0 (0)	NA (NA)
	COYE	0.62 (0.85)	0.52 (0.89)	NA (NA)	0.38 (0.61)	0.39 (0.78)	NA (NA)
	CSWA	0.2 (0.45)	0.15 (0.36)	NA (NA)	0.15 (0.36)	0.35 (0.65)	NA (NA)
	EAPH	0 (0)	0.04 (0.19)	NA (NA)	0 (0)	0 (0)	NA (NA)
	EAWP	0.02 (0.13)	0 (0)	NA (NA)	0.02 (0.15)	0.09 (0.29)	NA (NA)
	FOSP	0.42 (0.63)	0.04 (0.19)	NA (NA)	0.09 (0.28)	0 (0)	NA (NA)
	GCKI	1.02 (0.65)	1.15 (0.91)	NA (NA)	1.38 (0.68)	0.7 (0.63)	NA (NA)
	GRAJ	0.18 (0.55)	0.11 (0.32)	NA (NA)	0.06 (0.25)	0.09 (0.29)	NA (NA)
	GRCA	0.02 (0.13)	0 (0)	NA (NA)	0.04 (0.29)	0.04 (0.21)	NA (NA)
	HETH	1.53 (0.66)	1 (0.62)	NA (NA)	1.51 (0.86)	1.35 (0.71)	NA (NA)
	LEFL	0.58 (0.63)	0.19 (0.4)	NA (NA)	0.34 (0.56)	0.22 (0.52)	NA (NA)
	MAWA	1.91 (0.97)	1 (0.83)	NA (NA)	1.4 (0.83)	0.52 (0.73)	NA (NA)
	MOWA	0 (0)	0 (0)	NA (NA)	0 (0)	0.04 (0.21)	NA (NA)
	MYWA	1.16 (0.69)	0.67 (0.48)	NA (NA)	1.36 (1.03)	0.35 (0.49)	NA (NA)

	NAWA	1.11 (0.85)	0.3 (0.54)	NA (NA)	1.02 (0.79)	0.22 (0.42)	NA (NA)
	NOPA	0.18 (0.39)	0.67 (0.73)	NA (NA)	0.15 (0.47)	1 (0.6)	NA (NA)
	NOWA	0.18 (0.43)	0.04 (0.19)	NA (NA)	0.21 (0.55)	0.09 (0.29)	NA (NA)
	OSFL	0.04 (0.19)	0.11 (0.32)	NA (NA)	0.04 (0.2)	0 (0)	NA (NA)
	OVEN	0.4 (0.6)	0.48 (0.8)	NA (NA)	0.62 (0.64)	1.52 (0.73)	NA (NA)
	PIWA	0.25 (0.48)	0.3 (0.54)	NA (NA)	0.28 (0.5)	0 (0)	NA (NA)
	PUFI	0.42 (0.53)	0.15 (0.36)	NA (NA)	0.3 (0.51)	0.35 (0.57)	NA (NA)
	RBGR	0.05 (0.23)	0.04 (0.19)	NA (NA)	0.04 (0.2)	0.26 (0.45)	NA (NA)
	RBNU	0.8 (0.68)	1.26 (0.81)	NA (NA)	0.87 (0.71)	0.7 (0.56)	NA (NA)
	RCKI	0.69 (0.74)	0.33 (0.55)	NA (NA)	0.34 (0.48)	0.09 (0.29)	NA (NA)
	REVI	0.71 (0.69)	0.78 (0.75)	NA (NA)	0.91 (0.8)	1.7 (0.56)	NA (NA)
	SCJU	0.67 (0.84)	0.67 (0.78)	NA (NA)	0.55 (0.65)	0.09 (0.29)	NA (NA)
	SOSP	0 (0)	0 (0)	NA (NA)	0 (0)	0.04 (0.21)	NA (NA)
	SWSP	0 (0)	0.07 (0.38)	NA (NA)	0 (0)	0 (0)	NA (NA)
	SWTH	1.93 (0.81)	1.37 (0.69)	NA (NA)	1.57 (0.71)	1.26 (0.92)	NA (NA)
	TEWA	0.04 (0.19)	0.04 (0.19)	NA (NA)	0.06 (0.25)	0 (0)	NA (NA)
	VEER	0.07 (0.26)	0.04 (0.19)	NA (NA)	0 (0)	0.43 (0.59)	NA (NA)
	WIWA	0.11 (0.31)	0 (0)	NA (NA)	0.02 (0.15)	0 (0)	NA (NA)
	WIWR	0.45 (0.66)	1.26 (0.66)	NA (NA)	0.49 (0.51)	0.52 (0.51)	NA (NA)
	WTSP	1.53 (1.3)	1.11 (1.22)	NA (NA)	0.74 (0.67)	0.7 (0.82)	NA (NA)
	YBFL	0.71 (0.66)	0.26 (0.53)	NA (NA)	0.6 (0.61)	0.09 (0.29)	NA (NA)
	YEWA	0.02 (0.13)	0 (0)	NA (NA)	0 (0)	0 (0)	NA (NA)
	YPWA	0.24 (0.51)	0.11 (0.32)	NA (NA)	0.11 (0.37)	0 (0)	NA (NA)

Site	Species	Clearcut	Mature	Overstory Removal	PCT	Selection	Shelterwood
Umbagog NWR	ALFL	0.96 (0.88)	0.08 (0.27)	NA (NA)	0.15 (0.49)	0.13 (0.44)	0.5 (0.53)
	AMGO	0 (0)	0 (0)	NA (NA)	0.05 (0.22)	0.02 (0.14)	0.12 (0.35)
	AMRE	0.26 (0.45)	0.25 (0.52)	NA (NA)	0.4 (0.6)	0.3 (0.5)	0.38 (0.74)
	AMRO	0.74 (0.62)	0.22 (0.42)	NA (NA)	0.4 (0.6)	0.65 (0.7)	1.12 (1.36)
	BAWW	0.96 (0.71)	0.2 (0.45)	NA (NA)	0.35 (0.59)	0.26 (0.44)	0.88 (0.64)
	BBWA	0 (0)	0.04 (0.2)	NA (NA)	0.25 (0.44)	0.02 (0.14)	0 (0)
	BCCH	1.57 (1.38)	1.71 (1.38)	NA (NA)	1.6 (0.82)	1.69 (1.24)	1.12 (1.13)
	BHVI	0.39 (0.58)	0.73 (0.67)	NA (NA)	0.25 (0.44)	0.7 (0.66)	0.12 (0.35)
	BLBW	0.22 (0.42)	1.02 (0.71)	NA (NA)	0.55 (0.6)	0.89 (0.72)	0.5 (0.53)
	BLJA	0.83 (0.72)	0.63 (0.75)	NA (NA)	0.8 (1.15)	0.76 (0.8)	0.5 (0.53)
	BLPW	0.13 (0.34)	0 (0)	NA (NA)	0 (0)	0.04 (0.19)	0 (0)
	BOCH	0.09 (0.42)	0.88 (1.14)	NA (NA)	0.9 (0.97)	0.28 (0.53)	0.5 (1.07)
	BRCR	0.13 (0.34)	0.69 (0.71)	NA (NA)	0.15 (0.37)	0.67 (0.61)	0.38 (0.52)
	BTBW	0.13 (0.34)	0.33 (0.52)	NA (NA)	0.2 (0.41)	0.91 (0.73)	0.25 (0.46)
	BTNW	0.35 (0.57)	0.65 (0.77)	NA (NA)	1.1 (0.97)	0.7 (0.72)	0.38 (0.52)
	CAWA	0.7 (0.47)	0.57 (0.64)	NA (NA)	0.3 (0.47)	0.59 (0.77)	0.75 (0.71)
	CEDW	1.65 (1.4)	0.49 (0.81)	NA (NA)	0.5 (1)	0.33 (0.8)	2.25 (0.71)
	CHSP	0 (0)	0 (0)	NA (NA)	0 (0)	0.02 (0.14)	0 (0)
	CMWA	0 (0)	0.04 (0.2)	NA (NA)	0.1 (0.31)	0 (0)	0 (0)
	COGR	0.09 (0.29)	0 (0)	NA (NA)	0.1 (0.45)	0.02 (0.14)	0 (0)
	COYE	1.91 (0.67)	0.27 (0.49)	NA (NA)	0.4 (0.68)	0.43 (0.57)	1.12 (0.83)
	CSWA	0.43 (0.59)	0 (0)	NA (NA)	0.05 (0.22)	0.09 (0.29)	0.38 (0.52)
	EAPH	0.04 (0.21)	0 (0)	NA (NA)	0 (0)	0.06 (0.3)	0 (0)
	EAWP	0 (0)	0.14 (0.45)	NA (NA)	0 (0)	0.04 (0.19)	0 (0)
	FOSP	0 (0)	0 (0)	NA (NA)	0 (0)	0 (0)	0 (0)
	GCKI	0.83 (0.58)	1.53 (0.61)	NA (NA)	1.8 (0.83)	1.46 (0.79)	1 (0.53)
	GRAJ	0.13 (0.34)	0.96 (1.51)	NA (NA)	0.2 (0.52)	0.28 (0.63)	0 (0)
	GRCA	0 (0)	0 (0)	NA (NA)	0.1 (0.31)	0.07 (0.26)	0.12 (0.35)
	HETH	1.09 (1)	1.22 (1.14)	NA (NA)	1.6 (0.82)	1.11 (0.9)	1.62 (1.41)
	LEFL	0.17 (0.39)	0.08 (0.27)	NA (NA)	0.25 (0.44)	0.2 (0.66)	0.12 (0.35)
	MAWA	2.48 (0.67)	1.76 (0.86)	NA (NA)	2.4 (0.82)	2.07 (0.8)	2.88 (0.99)
	MOWA	0.09 (0.29)	0 (0)	NA (NA)	0.1 (0.31)	0.04 (0.19)	0.25 (0.46)
	MYWA	0.7 (0.56)	1.18 (0.77)	NA (NA)	1.35 (0.81)	1.11 (0.79)	0.88 (0.83)

	NAWA	1.87 (0.69)	0.94 (0.79)	NA (NA)	1.3 (0.66)	1.04 (0.87)	1.62 (0.92)
	NOPA	0.91 (0.67)	1.37 (0.75)	NA (NA)	0.7 (0.73)	1.3 (0.69)	0.88 (0.64)
	NOWA	1 (0.85)	0.69 (0.88)	NA (NA)	0.55 (0.83)	0.33 (0.58)	0.88 (1.13)
	OSFL	0.61 (0.72)	0.12 (0.48)	NA (NA)	0 (0)	0.04 (0.19)	0.5 (0.76)
	OVEN	0.39 (0.58)	0.25 (0.48)	NA (NA)	0.9 (0.64)	1.13 (0.89)	0.25 (0.46)
	PIWA	0.22 (0.42)	0.47 (0.67)	NA (NA)	0.05 (0.22)	0.5 (0.72)	0.38 (0.52)
	PUFI	0.26 (0.45)	0.18 (0.39)	NA (NA)	0.35 (0.49)	0.17 (0.42)	0.5 (0.53)
	RBGR	0 (0)	0.02 (0.14)	NA (NA)	0 (0)	0.02 (0.14)	0 (0)
	RBNU	1.04 (0.82)	1.49 (0.78)	NA (NA)	0.65 (0.67)	1.39 (0.71)	1 (0.76)
	RCKI	0.22 (0.42)	0.37 (0.6)	NA (NA)	0.95 (0.83)	0.28 (0.66)	0.25 (0.46)
	REVI	0.78 (0.52)	0.71 (0.61)	NA (NA)	0.95 (0.6)	0.89 (0.6)	0.5 (0.53)
	SCJU	0.39 (0.58)	0.98 (0.76)	NA (NA)	0.25 (0.55)	0.61 (0.76)	0.62 (0.92)
	SOSP	0.13 (0.34)	0.02 (0.14)	NA (NA)	0 (0)	0.04 (0.19)	0 (0)
	SWSP	0 (0)	0.06 (0.31)	NA (NA)	0.1 (0.31)	0.02 (0.14)	0.25 (0.46)
	SWTH	1 (0.6)	1.25 (0.82)	NA (NA)	1.35 (0.59)	1.04 (1.06)	1.5 (1.2)
	TEWA	0 (0)	0 (0)	NA (NA)	0 (0)	0 (0)	0 (0)
	VEER	0.04 (0.21)	0 (0)	NA (NA)	0.3 (0.8)	0.2 (0.49)	0.62 (0.92)
	WIWA	0 (0)	0 (0)	NA (NA)	0 (0)	0.06 (0.23)	0 (0)
	WIWR	1.26 (0.45)	1.37 (0.8)	NA (NA)	1.1 (0.85)	1.31 (0.7)	1.62 (0.74)
	WTSP	3.52 (1.31)	0.75 (0.82)	NA (NA)	0.95 (1)	0.94 (0.92)	1.88 (0.83)
	YBFL	0.96 (0.56)	0.84 (0.64)	NA (NA)	1 (0.56)	0.81 (0.7)	0.75 (0.71)
	YEWA	0.04 (0.21)	0.02 (0.14)	NA (NA)	0 (0)	0.04 (0.19)	0 (0)
	YPWA	1.83 (0.94)	0.16 (0.37)	NA (NA)	0.5 (0.76)	0.22 (0.54)	1 (1.2)

Appendix 3. Vegetation variables summarized by study site and treatment. Presented as mean (SD).

Site	Measure	Clearcut	Mature	Overstory Removal	PCT	Selection	Shelterwood
Aroostook NWR	dbh	20.6 (2.69)	25.13 (3.84)	NA	NA	22.88 (3.98)	NA
	qmd	37.66 (35.76)	82.6 (29.46)	NA	NA	79.95 (44.77)	NA
	ba	10 (10)	26.25 (15.14)	NA	NA	27.89 (16.1)	NA
	trees	7.5 (3.54)	13.12 (7.57)	NA	NA	15.69 (6.54)	NA
	elev	227.5 (5.77)	216.25 (15.72)	NA	NA	211.04 (29.69)	NA
	mid	0.28 (0.26)	0.21 (0.27)	NA	NA	0.45 (0.39)	NA
	canopy	0.13 (0.23)	0.46 (0.35)	NA	NA	0.42 (0.32)	NA
	ground	0.85 (0.1)	0.65 (0.25)	NA	NA	0.63 (0.26)	NA
	moss	0.3 (0.31)	0.37 (0.22)	NA	NA	0.32 (0.22)	NA
	shrubs	0.24 (0.18)	0.33 (0.19)	NA	NA	0.36 (0.13)	NA
	dshrubs	0.17 (0.15)	0.25 (0.21)	NA	NA	0.1 (0.09)	NA
	cshrubs	0.16 (0.17)	0.12 (0.1)	NA	NA	0.23 (0.14)	NA
	litter	0.17 (0.14)	0.4 (0.27)	NA	NA	0.43 (0.24)	NA
	dwd	0 (0)	0.29 (0.46)	NA	NA	0 (0)	NA
	tipups	0 (0)	0.25 (0.44)	NA	NA	0.33 (0.5)	NA
	AvgOfheight	12.45 (0.01)	20.19 (2.81)	NA	NA	19.6 (3.33)	NA
	p_gaps	0.62 (0.25)	0.47 (0.23)	NA	NA	0.53 (0.23)	NA
	water_pa	0 (0)	0.11 (0.31)	NA	NA	0.11 (0.33)	NA
	conif	0.93 (0.12)	0.57 (0.35)	NA	NA	0.61 (0.19)	NA
	sp_fir	0.87 (0.22)	0.51 (0.35)	NA	NA	0.55 (0.22)	NA

Site	Measure	Clearcut	Mature	Overstory Removal	PCT	Selection	Shelterwood
Baxter State Park	dbh	NA	34.88 (8.57)	NA	NA	NA	32.24 (7.47)
	qmd	NA	135.96 (43.81)	NA	NA	NA	108.39 (36.62)
	ba	NA	32.64 (10.73)	NA	NA	NA	26.3 (14.7)
	trees	NA	16.32 (5.36)	NA	NA	NA	13.56 (7.07)
	elev	NA	277.5 (29.79)	NA	NA	NA	299.65 (11.11)
	mid	NA	0.46 (0.34)	NA	NA	NA	0.46 (0.37)
	canopy	NA	0.69 (0.27)	NA	NA	NA	0.42 (0.29)
	ground	NA	0.47 (0.25)	NA	NA	NA	0.53 (0.19)
	moss	NA	0.34 (0.26)	NA	NA	NA	0.48 (0.28)
	shrubs	NA	0.36 (0.1)	NA	NA	NA	0.46 (0.16)
	dshrubs	NA	0.12 (0.1)	NA	NA	NA	0.15 (0.15)
	cshrubs	NA	0.24 (0.14)	NA	NA	NA	0.3 (0.17)
	litter	NA	0.62 (0.3)	NA	NA	NA	0.48 (0.29)
	dwd	NA	0.32 (0.48)	NA	NA	NA	0.33 (0.48)
	tipups	NA	0.2 (0.41)	NA	NA	NA	0.21 (0.42)
	AvgOfheight	NA	22.75 (2.17)	NA	NA	NA	22.03 (4.56)
	p_gaps	NA	0.28 (0.23)	NA	NA	NA	0.65 (0.24)
	water_pa	NA	0.28 (0.46)	NA	NA	NA	0.36 (0.49)
	conif	NA	0.77 (0.17)	NA	NA	NA	0.86 (0.14)
	sp_fir	NA	0.42 (0.23)	NA	NA	NA	0.55 (0.22)

Site	Measure	Clearcut	Mature	Overstory Removal	PCT	Selection	Shelterwood
Clayton Lake	dbh	16.51 (4.61)	NA	14.49 (0.73)	NA	24.5 (4.89)	NA
	qmd	42.59 (15.63)	NA	39.66 (25.56)	NA	78.18 (28.73)	NA
	ba	17.66 (10.26)	NA	21.2 (16.22)	NA	22.42 (9.59)	NA
	trees	8.83 (5.13)	NA	13.25 (6.4)	NA	11.21 (4.79)	NA
	elev	369.47 (44.13)	NA	329.2 (14.73)	NA	322.67 (28.6)	NA
	mid	0.49 (0.28)	NA	0.46 (0.29)	NA	0.57 (0.4)	NA
	canopy	0.39 (0.34)	NA	0.62 (0.42)	NA	0.69 (0.34)	NA
	ground	0.43 (0.27)	NA	0.4 (0.37)	NA	0.4 (0.19)	NA
	moss	0.52 (0.24)	NA	0.35 (0.29)	NA	0.09 (0.07)	NA
	shrubs	0.32 (0.16)	NA	0.16 (0.09)	NA	0.32 (0.13)	NA
	dshrubs	0.07 (0.1)	NA	0.1 (0.09)	NA	0.2 (0.17)	NA
	cshrubs	0.1 (0.11)	NA	0.06 (0.03)	NA	0.08 (0.09)	NA
	litter	0.54 (0.32)	NA	0.62 (0.43)	NA	0.84 (0.22)	NA
	dwd	0.4 (0.49)	NA	0.4 (0.55)	NA	0.33 (0.49)	NA
	tipups	0.16 (0.37)	NA	0.2 (0.45)	NA	0.08 (0.29)	NA
	AvgOfheight	13.08 (3.53)	NA	14.87 (1.88)	NA	17.8 (2.98)	NA
	p_gaps	0.5 (0.37)	NA	0.31 (0.3)	NA	0.22 (0.27)	NA
	water_pa	0.32 (0.47)	NA	0.2 (0.45)	NA	0 (0)	NA
	conif	0.88 (0.24)	NA	0.79 (0.18)	NA	0.14 (0.12)	NA
	sp_fir	0.8 (0.28)	NA	0.72 (0.16)	NA	0.09 (0.1)	NA

Site	Measure	Clearcut	Mature	Overstory Removal	PCT	Selection	Shelterwood
Moosehorn NWR	dbh	NA	26.55 (5.19)	NA	NA	NA	21.83 (2.39)
	qmd	NA	98.49 (29.54)	NA	NA	NA	63.82 (28.81)
	ba	NA	29.46 (11.03)	NA	NA	NA	21.33 (13.59)
	trees	NA	14.73 (5.52)	NA	NA	NA	10.67 (6.79)
	elev	NA	66.17 (29.9)	NA	NA	NA	47.75 (8.74)
	mid	NA	0.48 (0.3)	NA	NA	NA	0.51 (0.32)
	canopy	NA	0.52 (0.28)	NA	NA	NA	0.38 (0.32)
	ground	NA	0.4 (0.21)	NA	NA	NA	0.49 (0.18)
	moss	NA	0.4 (0.24)	NA	NA	NA	0.31 (0.26)
	shrubs	NA	0.3 (0.15)	NA	NA	NA	0.29 (0.09)
	dshrubs	NA	0.08 (0.12)	NA	NA	NA	0.2 (0.13)
	cshrubs	NA	0.32 (0.21)	NA	NA	NA	0.22 (0.14)
	litter	NA	0.52 (0.26)	NA	NA	NA	0.46 (0.17)
	dwd	NA	0.22 (0.42)	NA	NA	NA	0.17 (0.41)
	tipups	NA	0.24 (0.43)	NA	NA	NA	0.17 (0.41)
	AvgOfheight	NA	19.79 (4.09)	NA	NA	NA	14.96 (2.51)
	p_gaps	NA	0.51 (0.19)	NA	NA	NA	0.5 (0.18)
	water_pa	NA	0.37 (0.49)	NA	NA	NA	0.5 (0.55)
	conif	NA	0.83 (0.17)	NA	NA	NA	0.69 (0.36)
	sp_fir	NA	0.54 (0.29)	NA	NA	NA	0.22 (0.3)

Site	Measure	Clearcut	Mature	Overstory Removal	PCT	Selection	Shelterwood
Nulhegan NWR	dbh	18.25 (5.31)	24.66 (4.61)	NA	19.31 (4.19)	22.57 (4.15)	21.71 (2.79)
	qmd	41.06 (27.88)	83.03 (18.3)	NA	61.21 (24.91)	76.6 (22.03)	70.72 (15.77)
	ba	12.39 (10.65)	24.64 (10.87)	NA	21.92 (11.89)	23.87 (8.68)	22.67 (5.03)
	trees	6.69 (5.22)	12.32 (5.44)	NA	10.96 (5.95)	11.94 (4.34)	11.33 (2.52)
	elev	409 (18.91)	369.59 (12.99)	NA	386.68 (11.51)	378.72 (25.93)	362.5 (6.56)
	mid	0.42 (0.33)	0.31 (0.22)	NA	0.52 (0.3)	0.48 (0.26)	0.67 (0.4)
	canopy	0.17 (0.27)	0.47 (0.31)	NA	0.41 (0.34)	0.57 (0.31)	0.45 (0.25)
	ground	0.33 (0.16)	0.29 (0.14)	NA	0.36 (0.16)	0.38 (0.15)	0.47 (0.04)
	moss	0.47 (0.22)	0.5 (0.14)	NA	0.51 (0.22)	0.44 (0.23)	0.36 (0.07)
	shrubs	0.32 (0.12)	0.32 (0.14)	NA	0.26 (0.11)	0.27 (0.11)	0.44 (0.06)
	dshrubs	0.16 (0.12)	0.14 (0.11)	NA	0.19 (0.11)	0.18 (0.14)	0.3 (0.1)
	cshrubs	0.31 (0.18)	0.33 (0.18)	NA	0.17 (0.13)	0.18 (0.12)	0.48 (0.08)
	litter	0.29 (0.2)	0.25 (0.17)	NA	0.23 (0.12)	0.36 (0.23)	0.32 (0.25)
	dwd	0.17 (0.38)	0.55 (0.52)	NA	0.18 (0.39)	0.32 (0.48)	0 (0)
	tipups	0.15 (0.36)	0.27 (0.47)	NA	0.12 (0.33)	0.23 (0.43)	0 (0)
	AvgOfheight	13.43 (4.11)	20.99 (3.42)	NA	15.73 (3.02)	19.01 (2.94)	16.82 (2.31)
	p_gaps	0.63 (0.28)	0.52 (0.25)	NA	0.4 (0.26)	0.4 (0.21)	0.58 (0.12)
	water_pa	0.39 (0.49)	0.27 (0.47)	NA	0.28 (0.46)	0.42 (0.5)	0 (0)
	conif	0.78 (0.24)	0.8 (0.32)	NA	0.77 (0.22)	0.69 (0.22)	0.46 (0.32)
	sp_fir	0.7 (0.29)	0.77 (0.34)	NA	0.75 (0.23)	0.68 (0.22)	0.45 (0.33)

Site	Measure	Clearcut	Mature	Overstory Removal	PCT	Selection	Shelterwood
Telos	dbh	18.16 (7.33)	25.39 (6.25)	NA	18.07 (4.11)	25.42 (6.96)	NA
	qmd	46.2 (22.71)	90.9 (34.85)	NA	59.98 (18.54)	72.27 (29.24)	NA
	ba	19.51 (14.42)	30.04 (16.06)	NA	26.53 (11.67)	17.96 (7.91)	NA
	trees	10.32 (7.01)	15.6 (7.59)	NA	13.55 (5.55)	8.98 (3.96)	NA
	elev	392.03 (51.39)	343.37 (69.99)	NA	385.39 (51.05)	396.89 (35.26)	NA
	mid	0.43 (0.31)	0.38 (0.37)	NA	0.54 (0.31)	0.79 (0.33)	NA
	canopy	0.43 (0.36)	0.51 (0.36)	NA	0.49 (0.31)	0.51 (0.31)	NA
	ground	0.47 (0.29)	0.4 (0.23)	NA	0.44 (0.26)	0.37 (0.2)	NA
	moss	0.51 (0.28)	0.51 (0.38)	NA	0.53 (0.28)	0.11 (0.07)	NA
	shrubs	0.3 (0.25)	0.3 (0.19)	NA	0.25 (0.18)	0.38 (0.14)	NA
	dshrubs	0.08 (0.11)	0.13 (0.12)	NA	0.1 (0.13)	0.24 (0.17)	NA
	cshrubs	0.18 (0.27)	0.17 (0.15)	NA	0.1 (0.09)	0.11 (0.13)	NA
	litter	0.51 (0.31)	0.44 (0.34)	NA	0.61 (0.29)	0.81 (0.27)	NA
	dwd	0.24 (0.43)	0.37 (0.49)	NA	0.36 (0.49)	0.3 (0.47)	NA
	tipups	0.15 (0.36)	0.33 (0.48)	NA	0.15 (0.36)	0.35 (0.49)	NA
	AvgOfheight	12.69 (2.82)	20.78 (4.9)	NA	14.69 (2.51)	17.45 (4.24)	NA
	p_gaps	0.51 (0.38)	0.41 (0.37)	NA	0.46 (0.37)	0.31 (0.29)	NA
	water_pa	0.15 (0.36)	0.26 (0.45)	NA	0.11 (0.31)	0.04 (0.21)	NA
	conif	0.82 (0.28)	0.8 (0.27)	NA	0.88 (0.22)	0.33 (0.28)	NA
	sp_fir	0.62 (0.34)	0.57 (0.25)	NA	0.72 (0.27)	0.3 (0.24)	NA

Site	Measure	Clearcut	Mature	Overstory Removal	PCT	Selection	Shelterwood
Umbagog NWR	dbh	24.94 (20.08)	26.04 (3.9)	NA	19.53 (6.81)	26.77 (5.42)	25.61 (4.97)
	qmd	30.52 (29.28)	108.06 (27.52)	NA	63.62 (21.78)	102.47 (34.9)	71.53 (26.02)
	ba	7.39 (10.38)	35.53 (11.31)	NA	22.05 (9.21)	31.5 (13.5)	18.12 (9.91)
	trees	5.31 (5.51)	17.76 (5.66)	NA	11.03 (4.61)	16.05 (6.45)	9.06 (4.95)
	elev	433.13 (22.28)	402.16 (7.39)	NA	406.85 (19.21)	413.82 (25.39)	396.25 (9.37)
	mid	0.13 (0.15)	0.38 (0.3)	NA	0.46 (0.29)	0.41 (0.29)	0.43 (0.32)
	canopy	0.07 (0.17)	0.65 (0.29)	NA	0.49 (0.36)	0.6 (0.27)	0.36 (0.35)
	ground	0.72 (0.19)	0.31 (0.18)	NA	0.32 (0.24)	0.36 (0.2)	0.42 (0.26)
	moss	0.56 (0.31)	0.56 (0.28)	NA	0.36 (0.24)	0.4 (0.3)	0.39 (0.32)
	shrubs	0.49 (0.16)	0.16 (0.13)	NA	0.18 (0.16)	0.25 (0.17)	0.34 (0.28)
	dshrubs	0.21 (0.15)	0.06 (0.07)	NA	0.07 (0.1)	0.11 (0.11)	0.12 (0.13)
	cshrubs	0.23 (0.12)	0.14 (0.14)	NA	0.05 (0.05)	0.16 (0.12)	0.13 (0.1)
	litter	0.35 (0.29)	0.39 (0.24)	NA	0.67 (0.25)	0.55 (0.28)	0.57 (0.32)
	dwd	0.22 (0.42)	0.24 (0.43)	NA	0.15 (0.37)	0.26 (0.44)	0.38 (0.52)
	tipups	0.43 (0.51)	0.37 (0.49)	NA	0.15 (0.37)	0.22 (0.42)	0.38 (0.52)
	AvgOfheight	13.82 (5.79)	21.69 (3.78)	NA	15.42 (3.63)	22.96 (4.22)	20.17 (6.03)
	p_gaps	0.88 (0.17)	0.26 (0.21)	NA	0.4 (0.32)	0.27 (0.22)	0.56 (0.22)
	water_pa	0.61 (0.5)	0.53 (0.5)	NA	0.2 (0.41)	0.3 (0.46)	0.12 (0.35)
	conif	0.83 (0.24)	0.87 (0.16)	NA	0.9 (0.14)	0.74 (0.26)	0.8 (0.31)
	sp_fir	0.66 (0.32)	0.57 (0.21)	NA	0.83 (0.21)	0.53 (0.24)	0.44 (0.38)