

Final Report
Bear Paw Timberlands Project 2010
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Introduction

Timber harvesting changes the vegetation composition of stands in a forest, and resulting changes in vegetation affect forest wildlife habitat. In many instances, removing trees causes the “necessary perturbation” to prompt successional changes in stands and will have a positive influence on many wildlife species; however, if the stand is significantly altered, the wildlife species that were abundant before the cut may not find the new conditions and vegetation changes suitable for nesting and overall survival. A series of selection harvests may provide forest habitat for many different species of wildlife over a long period of time while not losing the original inhabitants of the stand.

Specifically for birds, canopy openings are important for species diversity (LeDoux). This process of removing trees can be done through timber harvesting, but can be observed naturally through natural disturbances like forest fires or strong wind storms that kill small sections of trees from a stand (Lorimer). By modeling our harvesting after nature we can provide native forest systems that would occur naturally in this geographical region. A series of cuts are to be performed on the Bear Paw lands in Conway, New Hampshire with these ideals in mind.

The land was divided into three stands which all received different treatments. One stand was harvested by single-tree selection, one stand will be cut in the future and one section will remain uncut as a control. A vegetation survey and a wildlife inventory survey (bird survey) were performed on the three treatments to determine the differences we see in wildlife habitat from the cut stand and the original forest stand. By determining any species we are losing and/or gaining by harvesting the lands, we are able to gain a greater understanding of how the pre-cut stand should be harvested to retain and gain the most wildlife habitat.

Materials/ Methods

The bird survey was conducted on all three stand treatments. Each bird plot was spaced out on a 500’ by 500’ grid on the different stands with six different transects and 43 plots. These plots are not fixed permanent plots. The bird plots were visited once throughout the late spring/early summer. At each plot, the time, temperature, wind, plot/transect number were noted. Five minutes was spent at each plot listening and looking for signs of birds. All sightings and vocalizations were recorded with species of bird, distance from center of the plot and general direction from which the voice was heard or bird was seen (this is depicted on data sheets as the plot divided into four quadrants). All raw data sheets are located in the Bear Paw Bird Survey folder; however, the bird data is also entered in a excel data sheet and can be found on GIS.

The vegetation survey was conducted on all three stand treatments. The vegetation plots are not fixed or permanent and were spaced out on a 200’ by 200’ grid along the different stands. There

are seven transects and 52 plots. Each plot was visited once throughout the summer and date, transect, and plot number were noted for each. At each plot there was a tree plot, sapling plot, groundcover plot, tree seedling plot, and a notation of CWD. The tree plot was conducted using a 10 factor prism to determine the trees needed to be measured. The species and DBH of each tree within the plot was recorded. A tree is considered anything with a 4'' diameter and greater, while anything with a diameter less than 4'' and greater than 2 feet in height is considered a sapling. The sapling sampling was conducted on 1/100th of an acre circular plot. The plot had a radius of 11.7 feet, which was measured out using a 100foot tape measure from the center of the original plot. Any sapling that fell within this plot had species, DBH and height recorded. Both the groundcover and tree seedling plot are 1 sq meter circular plots that reside 15 feet to the east of plot center. The plots had a radius of 1.83 feet and were measured out using a tape measure. Any herbaceous plant that fell within the plot had species and percent cover recorded. The number and species of each tree seedling within the plot was also recorded. CDW was recorded on a 100foot transect along the original transect line. For each piece of CWD that fell on the transect line, species (if able to tell), length (in inches), diameter (in inches), and decay class was recorded. There are 5 levels of decay, one being newly downed and five being almost completely soil. CWD must be greater than 8'' in diameter and can be considered either snags or downed trees. All raw data sheets are located in the Bear Paw Veg. plot/CWD folder. The tree plot data is also entered in NED SIP data program on Mike's computer. Cover type/stand type map was created on GIS which was overlaid with the bird data.

Results

A vegetation survey was conducted to determine the vegetation differences in the recently harvested area and the uncut area on the Bear Paw Timberlands. The harvested stand on the timberlands had approximately 40-50 sq. ft. removed, this is about 1/3 of the basal area and volume of the original stand. For both the cut and uncut sections more than 3/2 of the stand consisted of American Beech, Eastern Hemlock and Red Maple (see Figure 1, 2, 3). The average diameter was large and similar across all the stands (both cut and uncut). The basal area and volume was larger in all three of the uncut stands than in the cut area. A cover type map was created for the entire surveyed portion of the timberlands and it was found that the Bear Paw lands consists of three major stand types. An Eastern Hemlock/ American Beech/ Northern Hardwoods (mixedwood) stand was found to cover most of the lands and is depicted on Figure 14. The other two stands are a Hemlock stand and a Beech forest stand and are also depicted on the map in Figure 14.

Figure 1: Stand Table for Cut Area on Bear Paw Timberlands in Conway, NH.

Species	DBH	BA	% BA	TPA	Vol.
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					(CDS/AC)
EH	13.6	49.1	54	76	10.5
AB	11.5	11.6	13	26	2.6
RM	11.3	10.9	12	23	2.9
WB	11.2	8.1	9	18	2.0
YB	9.2	3.4	4	10	0.7
NRO	16.1	3.4	4	3	1.1
WA	12.4	2.5	3	3	0.7
RS	11.4	1.6	2	2	0.5
Total	12.7	90.6	100	161	21.0

Figure 2: Stand Table for Eastern Hemlock Stand in the uncut area of Bear Paw Timberlands in Conway, NH.

Species	DBH	BA	%BA	TPA	Vol. (CDS/AC)
EH	14.1	95.7	63	130	21.6
RM	12.3	37.1	24	55	10.9
YB	11.4	10.0	7.0	25	2.2
RS	12.0	2.9	2.0	4	0.8
AB	10.5	2.9	2.0	6	0.7
WA	6.5	2.9	2.0	13	0.5
NRO	20.0	1.4	1.0	1	0.5
Total	13.3	152.9	100	234	37.2

Figure 3: Stand Table for Easter Hemlock/American Beech/ Northern Hardwoods Stand in uncut area on Bear Paw Timberlands in Conway, NH.

Species	DBH	BA	%BA	TPA	Vol. (CDS/AC)
EH	13.6	47.5	35	68	10.3
RM	12.8	32.5	24	51	9.4
AB	10.2	30.0	22	67	6.6
YB	10.9	10.8	8.0	27	2.6
WA	13.0	6.7	5.0	7.0	2.1
NRO	12.0	3.3	2.0	5.0	1.0
PB	9.3	2.5	2.0	6.0	0.6
RS	11.0	1.7	1.0	3.0	0.5
EPW	34	0.8	1.0	0	0.3
Total	12.3	135.8	100	236	33.4

A notation of Coarse Woody Debris (CWD) was made for each of the stand types in both the cut and uncut areas to compare the amount of CWD present in each treatment type. Generally, there was more CWD observed in the cut area than in the uncut area. Not only were there more

occurrences, but the woody debris found had larger diameters (see Figure 4 and 5), while the uncut area appeared to possess CWD with longer lengths and smaller diameters. About half as many CDW occurrences were observed in the Mixedwood cut and uncut than in the Hemlock stand (see Figure 4 and 5). The Beech stand cut area had very similar CDW to that of the mixedwood cut area (see Figure 6).

Figure 4: Comparison of CWD composition on uncut and cut Eastern Hemlock Stand on Tin Mountain's Bear Paw Timberlands in Conway, NH

Parameter	Cut stand	Uncut stand
Average Diameter	13.25''	9.5''
Average length	12.38'	29.5'
Average Class	3.25	2.75
% Plots w/ CWD	100%	57%

Figure 5: Comparison of CWD composition on the cut and uncut Eastern Hemlock/American Beech/Northern Hardwoods Stand on Tin Mountain's Bear Paw Timberlands in Conway, NH.

Parameter	Cut Stand	Uncut Stand
Average Diameter	17''	11.5''
Average Length	19.06'	28'
Average Class	3.0	3.67
% Plots w/ CWD	50%	25%

Figure 6: CWD composition on cut American Beech Stand (only found in the cut area) on Tin Mountain's Bear Paw Timberlands in Conway, NH.

Average Diameter	9''
Average Length	18.5'
Average Class	2.5
% Plots w/ CWD	50%

As part of the vegetation survey, the sapling layer was observed to determine if there are any differences in regeneration between the stands in the harvested and un-harvested areas. As a general trend, the saplings appeared taller in the uncut area. The uncut area also appeared to have much more species richness, as Hobble Bush, Witch Hazel and many other species were only found in the uncut areas (see Figure 7 and 8). There also appeared to be a large amount of American Beech saplings in the Hemlock cut area, and a large decrease in Eastern Hemlock saplings on the cut Hemlock stand. In the Beech cut stand, the saplings tend to have larger a DBH and be taller than in all the other stand conditions (see Figure 9).

Figure 7: Sapling Composition of Eastern Hemlock Stand (cut and uncut) On Bear Paw Timberlands in Conway NH.

	Average DBH	Average Height	% Composition
Cut area	1.22''	8.09'	70% AB

			13% RM
			17% EH
Uncut Area	0.97''	9.02'	49% AB
			34% EH
			5% Witch Hazel
			3% Hobble Bush
			2% YB
			2% Moose Maple
			2% Red Spruce
			1% WA
			1% RM

Figure 8: Sapling composition of Eastern Hemlock/ American Beech/ Northern Hardwoods Stand (uncut and cut) on Bear Paw Timberlands in Conway, NH.

	Average DBH	Average Height	% Composition
Cut Area	0.99''	11.76'	54% AB
			37% EH
			4% RM
			3% Moose Maple
			1% YB
Uncut Area	1.2''	14.13'	52% AB
			21% EH
			10% YB
			8% Moose Maple
			2% Witch Hazel
			1% RS
			1% WA
			1% BF
			1% RM
			1% Hobble Bush

Figure 9: Sapling composition of American Beech Stand (only found in cut area) on Bear Paw Timberlands in Conway, NH.

	Average DBH	Average Height	% Composition
Cut Area	1.71''	15.06'	71% AB
			29% EH

A groundcover survey was performed as a part of the vegetation survey to determine the differences in herbaceous groundcover between the harvested and un-harvested areas of the Bear Paw Timberlands. Generally, the uncut area had more species richness, while the cut area had few species. Although few species, the plots in the cut area tended to have more percentage of the plot covered with plants than in the uncut area.

A bird survey was conducted to determine if there is a difference in bird populations from the harvested area and un-harvested area on the Bear Paw Timberlands. Although many species of birds were observed on the timberlands during the bird survey, six species were heard/seen commonly. These included the Eastern Wood Pewee (EAWP), the Black-Throated Blue Warbler (BTBW), the Black-Throated Green Warbler (BTNW), the Hermit Thrush (HETH), the Red-Eyed Vireo (REVI), and the Ovenbird (OVEN). The birds responded to the harvest in one of three ways. A group of birds consisting of Ovenbirds, Hermit Thrushes and Red-Eyed Vireos appeared to have no response to the harvest. The percent of plots with occurrences for these birds were similar for the cut and uncut area (see Figure 10). Not only did these birds have no response to the timber harvest, they also appeared to have no particular preference for forest/stand type. They were observed in every stand type consistently (see appendix). Another group of birds consisting of the Black-Throated Blue Warbler and the Black-Throated Green Warbler responded negatively to the timber harvest. The percent of plots with Black-throated Green and Black-Throated Blue Warblers were significantly higher in the uncut area, while the percent was very low on the cut area (see Figure 10). There were only three occurrences on each of these species in the harvested area. For the Black-Throated Blue Warbler, the only birds found in the cut area were along the southern border of the cut. Both the Warbler species were found in the Hemlock or Mixedwood stand, but not in the Beech stand at all (see Figure 11 and 12). The third group of birds consisted of only one species: the Eastern Wood Pewee. The Pewee responded positively to the timber harvesting. The percent of plots with Pewee occurrences was significantly higher in the cut area than in the uncut portion (see Figure 10), and was also found in all three stand types (see figure 13).

Figure 10: Frequency of Occurrence of Common Bird Species in Cut and Uncut Areas of Bear Paw Timberlands in Conway, NH.

	Species	% Plots w/ Bird Occurrences
Uncut Area	EAWP	3%
	BTBW	35%
	BTNW	65%
	HETH	65%
	REVI	106%*
	OVEN	133%*
Cut Area	EAWP	67%
	BTBW	25%
	BTNW	25%
	HETH	67%
	REVI	117%*
	OVEN	103%*

*Species occurrence with > 100% had more than one individual found at a plot.

Conclusion/Discussion/Recommendations

The vegetation survey and bird survey were conducted on the Bear Paw Timberlands in Conway, NH to determine the differences in wildlife habitat between the harvested and un-harvested

section of the timberlands. By determining how the landscape and vegetation was changed after harvesting and how the bird populations differ in cut and uncut areas, we are able to use this information to help manage the rest of the timberlands in a way that will alter the forest enough to create habitat for new species, while still maintaining habitat for the species that were originally there.

The goals of the timber harvest on the Bear Paw Lands were to reduce the amount of hemlock in the stands and encourage the growth of higher value hardwoods when present, and the target basal area was around 80-95 square feet. Although there was Beech scale present, cutting didn't actively remove Beech as it is considered a good wildlife tree. The vast majority of the trees removed were Red Maple, Eastern Hemlock, and American Beech. The harvest removed around 40-50 square feet, which was about 1/3 of the total basal area and volume; however, after the cut, the basal area was above target. The species composition also remained almost changed, as American Beech, Eastern Hemlock, and Red Maple make up more than 3/2 of the cut and uncut overstory remained very similar to the un-harvested stand. It is also seen from the cover type map that the forest stand types remained similar to that of the uncut. There were three major stand types throughout the entire timberlands, and the cut did not change those natural forest types.

From the sapling data, it is apparent that the shrub layer was lost in the cut area, and species richness went down considerably. Hobble Bush and Witch Hazel were only found in the uncut area, and the saplings in the cut area consisted of only a few species, while the uncut area had many species making up the sapling layer. This trend was also seen in the herbaceous groundcover layer. There was more species richness in the uncut area; however, more of the plot was covered with plant in the cut area. This was most likely due to plants that thrive in disturbed areas and need more sunlight overtaking the groundcover and sapling layer after the cut. The change in sapling layer could also be due to early succession taking over in areas with much more light and not a lot of competition from other trees. The CWD data illustrated that there is more woody debris in the cut area, and that they are smaller in length. Because the harvest happened only two years ago, the excess CDW was most likely from brush that was left behind from logging. The smaller length is probably due to loggers cutting the trees into smaller sections, while the trees in the uncut area had fallen naturally and remained intact. There were half as many CWD occurrences in the mixedwood cut and uncut stands than in the Hemlock cut and uncut stands. This could be due to the fact that there are a larger number of trees in the Hemlock stand than in the mixedwood; however, could also in part be due to the fact that dead softwoods take longer to decompose and stay around longer than hardwoods.

Of all the birds commonly seen on the Bear Paw Timberlands, it is illustrated that most of the birds did not respond to the harvest. The Ovenbird, Hermit Thrush, and the Red-Eyed Vireo appeared in both the cut and uncut stands on a regular basis and seemed to find both stands suitable for a habitat. This shows that the timberlands retained all three of these species throughout the harvesting process. These birds also appeared to utilize all three stand types and did not appear to favor any of the three. One bird species, the Eastern Wood Pewee, appeared to favor the cut area, while only seen once in the uncut area. This suggests that the timberlands gained this species from the harvesting process. It is known that Eastern Wood Pewees favor more open areas that the lower basal area and loss of shrub layer provided. The Pewee also did not appear to favor one stand type over another, as they were seen in all three stand types. Two

species of Warbler, the Black-Throated Green and the Black-Throated Blue, appeared to favor the uncut area, and was rarely seen in the cut area. On the occurrences that the Black-Throated Blue was seen in the cut area, it was only along the southern border where there is a stream and large buffer in the cut. This buffer more resembles an uncut area than a cut area, which is a reason these birds could have been seen there. This suggests that these two bird species were lost from the harvested area because of the change in habitat the cut made. These two species of Warbler also appeared to inhabit the softwood stands, and did not favor the hardwood stands. Many Warblers, such as the Black-Throated Blue make their nests low to the ground in shrubs-particularly Hobble Bush and Mountain Laurel. The loss of these birds in the cut area could be a direct result from the loss of shrub layer in the cut area. Overall, the bird habitat was not changed completely in the harvested area, as it retained habitat for three commonly found species, gained habitat for one commonly found species, and lost habitat for two commonly found species.

With the harvest, it appears that the natural forest types and vegetation did not change a large amount and that with a few exceptions; the original bird populations remained similar. This suggests that the harvest was close to the goal of modeling the cut after nature. It provided native forest systems that are close to the naturally found forest systems on the Bear Paw Timberlands. With further monitoring in the upcoming years, more data can be accumulated to further understand the effect the harvest had on wildlife habitat and populations.

In further years, I would recommend different kinds of wildlife inventory, such as scat surveys or small mammal trappings to determine the effect on not only the bird's habitat, but other animal's habitat. More vegetation plots on areas that are uncut and plan to remain uncut would also be helpful. More organization and clear objectives should be set for the following years with goals and end products of the projects being discussed at the beginning of the internship. With an overall goal for research and question in mind, it makes data collection easier and allows for more self-reliance for the intern. Also, a set schedule with deadlines could help ensure all needed data collection and work gets done in a timely manner. I found working in the field alone challenging. I also enjoyed working on other intern's projects and appreciated the help from fellow interns, and believe that more constructive work can be done with more than one person because it has the factor of teamwork involved. Overall, I think that the summer work was successful and was a good first year to summer internship projects.

Sources Cited

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