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Bikey ID 98473

PROGRESS REPORT

on the research project entitled

LONG TERM POST-FIRE
VEGETATION MONITORING
OF THE RECENT
STANLEY RIDGE BURN
IN ISLE ROYALE NATIONAL PARK

by

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March, 1993

INTRODUCTION

This report describes the progress made on a research project dealing with the monitoring of vegetation within a recently burned area in Isle Royale National Park. The primary objective is to determine what vegetation invades the area following a fire and how this vegetation changes with time after the fire.

The fire occurred during the summer of 1988 on Stanley Ridge on the northeast end of Isle Royale. Before it was extinguished by natural causes, the area burned spread over approximately 75 acres. Part of this was on the ridge top which had been occupied by a forest of jack pine (*Pinus banksiana*). The remainder was on the open south slope of the ridge.

The initial vegetation sampling of this burn occurred during the summer of 1991. The results of this were summarized in a report to the National Park Service in March, 1992. The area was again sampled during the summer of 1992. This report will discuss the results of the latter sampling and will compare these with the results from the 1991 sampling.

Sampling during the summer of 1992 was performed by myself with the assistance of two National Park Service employees Pat Valencia and Cory Counard. Funding (\$1800) was provided by the National Park Service.

METHODS

Following the ridge top, 10 plot reference points separated by random distances had been established with the assistance of National Park Service personnel during the summer of 1990 in the jack pine forested portion of the burn. These had been marked by permanent metal reference stakes. During the summer of 1991 we established 10 more plot reference points within the open rocky meadow on the south-east facing slope of the ridge. Each of these points were established at a random distance down-slope of the ridge (in a direction of 160°) from one of the original 10 reference points and marked with a permanent metal stake. Thus 10 vegetation plots were established in each of 2 distinctly different ecosystems.

Stems of tree and tall shrub species equal to or greater than 1 meter in height (saplings) were counted in circular plots of 6 meters radius centered about each reference point. All stems were checked for moose browsing. Low ground cover plants and seedlings (stems less than 1 meter in height) of tree and tall shrub species were sampled in 2x2 meter square plots oriented so that one side of the square aligned with the line connecting one of the upper plot reference points with the corresponding lower one and so that the reference point was at the center of this side. For ground cover plants, % cover was estimated for each species. For seedlings, both % cover estimates and stem counts were made. Also browsing was noted. The percentage of the plot covered by exposed rocks was also estimated. To facilitate this sampling, a 1x1 meter wooden quadrat frame was used and laid down on the ground 4 times to cover the 2x2 meter quadrat.

RESULTS

No woody plants in the tree stage of development (d.b.h. > 5 cm.) were found in the sampling areas. This is not surprising since our sampling in 1991 indicated that no trees survived the fire and the four years since the fire is hardly sufficient time for seedlings to become trees. Our 1991 sampling of dead trees indicated that, before the fire, the ridge top was a forest dominated by jack pine. The south slope of the ridge however, was relatively open with widely scattered trees.

Woody plants in the sapling stage are also low in abundance but their density has increased considerably since 1991 (Table 1). Quaking aspen (*Populus tremuloides*) has, by far, the greatest sapling density although it is found only on the ridge top.

Seedlings of tree and tall shrub species have also increased considerably between 1991 and 1992 (Table 2). Total seedling density is considerably greater on the ridge top than on the south slope ecosystem. On the ridge top the seedling layer is dominated by quaking aspen, jack pine (*Pinus banksiana*), and white birch (*Betula papyrifera*). The density of the aspen seedlings is about twice that of the pine or birch, yet the forest preceding the burn was dominated by jack pine. This suggests that the jack pine forest will be replaced by an aspen forest as a result of the burn. However, the nature of the future forest also depends on how well these seedlings survive to become trees. Our previous studies have indicated that of these 3 species, jack pine fares best on dry rocky habitats. Aspen, however, fares better on more moist and less rocky soil. The ridge top in this burn may be considered a dry rocky habitat. It is therefore possible that jack pine will eventually prevail here. Future vegetation monitoring at this area will answer this question.

While seedlings of various species on the ridge top generally tended to increase between 1991 and 1992, those of jack pine remained almost constant. This may be related to the nature of jack pine cones which normally are reluctant to open unless exposed to high temperatures during a fire. Therefore unless other fires occur in the surrounding area, a continual source of seed is not generally available. Seeds from aspen and birch, on the other hand, are usually released each year and are easily transported from surrounding areas by wind. It will be noted that jack pine seedling densities also failed to increase on the south slope. Furthermore, the density there is considerably less than on the ridge top for both years sampled. This is probably due to the fact that the seeds are not easily transported by wind and thus most of the seeds remained on the ridge top under the trees that bore them.

The moose browse data for seedlings and saplings indicate that moose browsed on all of the species listed with the exception of jack pine. The list does not include species of low density since for these, the number of stems sampled was very small and hence computation of percent of stems browsed would be very inaccurate. Generally the browsing percentages listed are relatively small. Possibly this may be because most of the seedlings may be still quite low and so in winter may be covered by snow. In our study of two other recent burns on Isle Royale (Card Point and McGinty's Cove) we found that average browse percentages varied from 65% to 95% during the period from 6 to 15 years following the burn.

The percent cover for each species of the vascular ground cover plants are given for the ridge top and open south slope ecosystems in Tables 4 and 5. Ground cover plants are here defined as all plants less than 1 meter in height, including seedlings of tree and tall shrub species.

For the ridge top, most species experienced a sizable increase in percent cover from 1991 to 1992. The total cover for all species combined increased from 33.0 to 44.1%. The total number of species present increased from 42 to 51. *Vaccinium angustifolium* is still by far the most dominant species even though its percent cover did not increase between 1991 and 1992. We noted that the production of blueberries by this species was phenomenal within the burned area during the past 2 summers whereas just outside the burn boundary, on the same ridge top and in the same environment, fruit production was very meager. Apparently fire acted as a stimulant to the vigor of this species.

Most ground cover species on the open south slope also experienced a noticeable increase in percent cover and the total cover for all species combined increased from 11.0 to 16.8% from 1991 to 1992. The total number of species present increased from 37 to 42. Both total % cover and number of species were considerably less for this ecosystem than for the ridge top. The species composition of the open south slope also differed considerably from that of the ridge top. It is, however, similar to two other recent burns (one near Daisy Farm; the other near Mt.

Ojibway) which we have sampled in the past and both of which were open and rocky prior to the burn. Abundant species which the open south slope had in common with these other two burns were: *Ameladchier* spp., *Danthonia spicata*, *Agropyron trachycaulon*, *Deschampsia flexuosa*, *Polygonum douglassii*, and *Convolvulus spithemaeus*.

RECOMMENDATIONS

Since one of the primary objectives of this project is to determine how vegetation changes following a burn, we recommend that similar sampling procedures be repeated in future years. Specifically we propose that sampling should take place during the summers of 1993, 1995, and 1997. After 1997 sampling should occur at 5 year intervals.

TABLE 1. Sapling densities (stems/hectare) of tree and tall shrub species for 1991 and 1992.

FORESTED RIDGE TOP

<u>species</u>	<u>density</u>	
	<u>1991</u>	<u>1992</u>
quaking aspen	8.8	141.5
white birch	0.0	61.9
sugar plum (serviceberry)	0.0	26.5
pin cherry	0.0	17.7
total all species	8.8	247.6

OPEN SOUTH SLOPE

<u>species</u>	<u>density</u>	
	<u>1991</u>	<u>1992</u>
sugar plum (serviceberry)	0.0	35.4
jack pine	0.0	26.5
willow	8.8	8.8
quaking aspen	17.7	0.0
total all species	26.5	70.7

TABLE 2. Seedling densities (stems/hectare) of tree and tall shrub species for 1991 and 1992.

FORESTED RIDGE TOP

<u>species</u>	<u>density</u>	
	<u>1991</u>	<u>1992</u>
quaking aspen	26,500	51,750
jack pine	23,000	25,000
white birch	9,750	24,250
sugar plum (serviceberry)	18,250	18,250
white spruce	500	1,000
pin cherry	750	750
mountain ash	250	500
red elderberry	250	250
choke cherry	500	0
total all species	79,750	121,750

OPEN SOUTH SLOPE

<u>species</u>	<u>density</u>	
	<u>1991</u>	<u>1992</u>
sugar plum (serviceberry)	22,000	27,250
choke cherry	1,750	9,750
mountain ash	500	1,500
jack pine	1,000	0
pin cherry	1,000	0
total all species	26,250	38,500

TABLE 3. Percent sapling and seedlings browsed by moose for tree and tall shrub species.

FORESTED RIDGE TOP

<u>species</u>	<u>% browsed</u>
quaking aspen	32.2
white birch	39.4
sugar plum (serviceberry)	42.0
jack pine	0.0
all species combined	28.0

OPEN SOUTH SLOPE

<u>species</u>	<u>% browsed</u>
sugar plum (serviceberry)	68.1
choke cherry	20.5
all species combined	54.6

TABLE 4. Percent cover of vascular ground cover species for forested ridge top. "P" indicates cover less than 0.1%.

Species	1991	1992
<i>Vaccinium angustifolium</i>	14.3	14.5
<i>Epilobium angustifolium</i>	1.7	3.6
<i>Betula papyrifera</i>	1.6	2.7
<i>Amelanchier</i> spp.	2.1	2.5
<i>Populus tremuloides</i>	1.9	2.5
<i>Deschampsia flexuosa</i>	0.1	2.0
<i>Maianthemum canadense</i>	0.5	1.9
<i>Pinus banksiana</i>	1.0	1.8
<i>Potentilla tridentata</i>	1.3	1.3
<i>Potentilla arguta</i>	P	1.0
<i>Carex aenea</i>	2.9	1.0
<i>Hieracium florentinum</i>	0.1	1.0
<i>Diervilla lonicera</i>	1.0	0.9
<i>Rubus strigosus</i>	0.5	0.9
<i>Vaccinium myrtilloides</i>	0.6	0.8
<i>Solidago nemoralis</i>	P	0.8
<i>Arctostaphylos uva-ursi</i>	0.4	0.7
<i>Lonicera dioica</i>	0.4	0.5
<i>Danthonia spicata</i>	0	0.5
<i>Linnaea borealis</i>	0.2	0.4
<i>Carex houghtoniana</i>	0.2	0.4
<i>Symphoricarpos alba</i>	0.1	0.2
<i>Argrostis hyemalis</i>	0.3	0.2
<i>Calamagrostis canadensis</i>	0.3	0.2
<i>Aster macrophyllus</i>	0	0.2
<i>Oryzopsis pungens</i>	P	0.1
<i>Fragaria virginiana</i>	0.1	0.1
<i>Arabis drummondii</i>	P	0.1
<i>Prunus pensylvanica</i>	P	0.1
<i>Anaphalis margaritacea</i>	P	0.1
<i>Erigeron canadensis</i>	0	0.1
<i>Poa glauca</i>	0	P
<i>Geranium bicknellii</i>	P	P
<i>Corydalis sempervirens</i>	0.1	P
<i>Polygonum douglasii</i>	P	P
<i>Convolvulus spithameus</i>	P	P
<i>Picea glauca</i>	0	P
<i>Rubus parviflorus</i>	P	P
<i>Campanula rotundifolia</i>	P	P
<i>Sambucus pubens</i>	0.1	P
<i>Arabis divaricarpa</i>	0	P
<i>Agropyron trachycaulon</i>	0.3	P
<i>Prunus virginiana</i>	P	P
<i>Polygonum cilinode</i>	P	P
<i>Antennaria plataginifolia</i>	0	P
<i>Silene antirrhina</i>	P	P
<i>Dracocephalum parviflorum</i>	0	P
<i>Viburnum edula</i>	0	P
<i>Taraxacum officinale</i>	0	P
<i>Sorbus decora</i>	0.1	P
<i>Viola conspersa</i>	P	P
<i>Ribes glandulosum</i>	P	0
total of all species	33.0	44.1

TABLE 5. Percent cover of vascular ground cover species for open south slope.
 "P" indicates cover less than 0.1%.

Species	1991	1992
<i>Amelanchier</i> spp.	1.9	2.5
<i>Polygonum douglassii</i>	0.3	1.2
<i>Convolvulus spithameus</i>	1.6	1.2
<i>Geranium bicknellii</i>	0.1	1.0
<i>Saxifraga virginiana</i>	0.2	0.9
<i>Solidago nemoralis</i>	0.4	0.8
<i>Danthonia spicata</i>	1.3	0.8
<i>Argrostis hyemalis</i>	0.4	0.8
<i>Symphoricarpos albus</i>	0.3	0.8
<i>Potentilla arguta</i>	0.5	0.7
<i>Prunus virginiana</i>	0.3	0.6
<i>Fragaria virginiana</i>	0.5	0.5
<i>Argopyron trachycaulum</i>	0.3	0.5
<i>Deschampsia flexuosa</i>	0.1	0.4
<i>Hieracium florentinum</i>	0.1	0.4
<i>Antennaria plantaginifolia</i>	0.1	0.4
<i>Diervilla lonicera</i>	0.5	0.4
<i>Arabis drummondii</i>	0.2	0.3
<i>Vaccinium angustifolium</i>	0.3	0.3
<i>Carex houghtoniana</i>	0	0.3
<i>Woodsia ilvensis</i>	0.2	0.2
<i>Satureja vulgaris</i>	P	0.2
<i>Artemisia canadensis</i>	0.1	0.2
<i>Rosa acicularis</i>	0.2	0.2
<i>Sorbus decora</i>	0.2	0.1
<i>Aquilegia canadensis</i>	0	0.1
<i>Arctostaphylos uva-ursi</i>	0.1	0.1
<i>Rubus strigosus</i>	0.1	0.1
<i>Viola conspersa</i>	P	0.1
<i>Prunus pensylvanica</i>	0.1	0.1
<i>Mianthemum canadense</i>	P	P
<i>Pinus banksiana</i>	P	P
<i>Carex aenea</i>	P	P
<i>Lilium philadelphicum</i>	0	P
<i>Dracocephalum parviflorum</i>	P	P
<i>Campanula rotundifolia</i>	P	P
<i>Oryzopsis pungens</i>	P	P
<i>Corydalis sempervirens</i>	0.1	P
<i>Polygonum cilinode</i>	P	P
<i>Arabis divaricarpa</i>	0	P
<i>Erigeron canadensis</i>	0	P
<i>Taraxacum officinalis</i>	0	P
<i>Poa compressa</i>	P	0
total of all species	11.0	16.8