

*even
to gear*

BIBKEY ID 98472

PROGRESS REPORT

on the Research Project Entitled

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

by

Robert A. Janke
Michigan Technological University
March, 1992

INTRODUCTION

This report summarizes the progress made during the past year in the monitoring of post-fire vegetation changes in recent burns on Isle Royale National Park. Specifically, it deals with the first sampling of vegetation in the Stanley Ridge Burn since the fire occurred. By repeating this procedure many times in the future we ultimately hope to describe how vegetation changes with time after fire in this particular type of ecosystem.

This burn is one of three recent burns that we have been monitoring. The other two occurred at Card Point and at an area near McGinty's Cove. The latter 2 burns have been monitored since 1977. The results of those were summarized in our annual progress report of March, 1991.

The Stanley Ridge Burn occurred during the summer of 1988 on that portion of the ridge nearest to Belle Harbor. It included the ridge top which was mostly forested with jack pine and the southeast facing slope which was mostly unforested and rocky. The area burned was approximately 75 acres.

The vegetation sampling was performed during late June and early July of 1991 by myself and two students, John Vucetich and Andrew Chinavare. Funding was provided by the Conservation and Research Foundation, Inc. (\$2,000) and by the National Park Service (\$1,063). Efforts in identification of unknown plant specimens and in the preparation of this report during the winter months were my own contribution to the project.

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 southeast-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 but less than 5 cm. in d.b.h. (saplings) were counted in circular plots of 6 meters radius centered about each reference point. In those same plots, counts and d.b.h. measurements were made of all woody stems with d.b.h. greater than or equal to 5 c.m. (trees). 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. 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 layed down on the ground 4 times to cover the 2x2 meter quadrat.

RESULTS AND DISCUSSION

The results of the tree strata sampling indicate that no tree survived the fire in either of the 2 ecosystems. An approximation of what existed before the fire was obtained from the dead tree sample. The level areas of the ridge top supported a dense, almost pure stand of jack pine (*Pinus banksiana*) (Table 1), while the south facing slope had only a few very widely scattered quaking aspen (*Populus tremuloides*) and jack pine trees.

The percentage of the ground area covered by exposed rock were as follows:

	<u>%</u>
forested ridge top	41.7
open south slope	52.1

As would be expected, the forest was growing in the terrain with less exposed rock. However, even the value 41.7% is relatively high for a forest. Jack pine is probably the only tree species on Isle Royale that can produce a forest with such rocky soil condition.

The survival of saplings after the fire is scarcely greater than that of trees (Table 2). Only quaking aspen and willow (*Salix spp.*) were found in the sample but their densities were extremely low.

Seedlings of jack pine were relatively dense on the forested ridge top as we expected (Table 3). The serotinous cones of this species normally do not release their seeds under normal conditions so that through the years a large stock of seeds builds up in the forest. A fire, however, causes these cones to open and thus large quantities of seeds are released all at once. Also the increased amount of light following fire facilitates the germination of these seeds. In marked contrast to this, our studies of jack pine stands which had been undisturbed by fire for at least 100 years revealed that seedling reproduction was zero (Janke, 1978).

The relatively high quaking aspen seedling density on the ridge top was not expected. Most of the aspen reproduction on Isle Royale seems to be from succur shoots. In this study, however, most of the plots where reproduction of aspen was present showed no sign of aspen trees or saplings in the vicinity. It is unlikely, then,

that the reproduction was from succur shoots. Since aspen seeds are easily born by wind, seeds from aspen trees in the surrounding area probably blew into the burned area after the burn. Although aspen seem to be thriving here in the seedling stage, it is highly possible that they will not survive to the sapling or tree stage on this very rocky ridge top as jack pine seem to be capable of. White birch (*Betula papyrifera*) seedlings are also moderately dense on the ridge top but they too are unlikely to survive in any significant numbers.

On the open south slope, jack pine seedlings are quite sparse even though a plentiful seed source existed at the ridge top. This possibly is due to the fact that jack pine seeds are not readily wind-borne and hence would not spread very far from the parent tree.

Among ground cover species, *Vaccinium angustifolium* (blueberry) is by far the most dominant species on the ridge top. In fact its % cover exceeds the combined % cover of all the other species. This species was also found to be the most dominant ground cover species in the hundred year old jack pine stands that we studied. Evidently its status does not change much with time.

Among the more abundant ground cover species of the Card Point and the McGinty's Cove burns, which we have studied in the past, 4 species are common to both. These are *Rubus strigosus* (red raspberry), *Epilobium angustifolium* (fireweed), *Rubus parviflorus* (thimbleberry), and *Sambucus racemosa* (red elderberry). Of these, only *Epilobium angustifolium* and *Rubus strigosus* are abundant in the Stanley Ridge Burn and, in the latter, only in the ridge top ecosystem. The other 2 species are either rare or absent from both of the Stanley Ridge ecosystems. *Vaccinium angustifolium*, on the other hand, is extremely abundant on the ridge top of the Stanley Ridge burn, moderately abundant on the south slope of the latter burn, but completely absent in the Card Point and McGinty's Cove burns. These differences are probably related to the abundance of rocks in the substrate of Stanley Ridge as compared with that of Card Point and McGinty's Cove.

SUMMARY

The Stanley Ridge fire of 1988 burned vegetation in 2 distinct ecosystems: (1) a dense jack pine forest on the ridge top and (2) an open rocky meadow with a few widely scattered aspen and jack pine trees on the south facing slope of the ridge. All trees were killed by the fire. Both ecosystems were on very rocky terrain but exposed rock in the jack pine forest was somewhat less than that of the open meadow. Since the fire, large numbers of seedlings of jack pine and quaking aspen have invaded the jack pine forest but in the open meadow seedlings are scarce. The ground cover vegetation invading the burn is very different from that of other burns we have studied. The ridge top is highly dominated by *Vaccinium angustifolium* (blueberry) whose % cover exceeds that of all other species combined.

RECOMMENDATIONS

The main objective of this project is to monitor changes which occur in recently burned areas after the fire occurs. To accomplish this it will be necessary to repeat the vegetation sampling process that we accomplished last summer many times in the future. We suggest that for the next few years sampling should be done at 1 or 2 year intervals. After that, perhaps 5 year intervals would be sufficient, depending upon how rapidly things change.

REFERENCE CITED

Janke, Robert A. 1983. The flora and vegetation ecology of Isle Royale National Park. A five year research report to the National Park Service. 95 pp.

TABLE 1. Pre-fire tree densities (stems/hectare) and basal areas (meters²/hectare).

FORESTED RIDGE TOP		
<u>Species</u>	<u>density</u>	<u>basal area</u>
Jack pine	1317	23.3
Quaking aspen	9	0.0

OPEN SOUTH SLOPE		
<u>Species</u>	<u>density</u>	<u>basal area</u>
Quaking aspen	53	0.3
Jack pine	44	1.5

TABLE 2. Sapling densities (stems/hectare) for tree and tall shrub species.

FORESTED RIDGE TOP

<u>Species</u>	<u>density</u>
Quaking aspen	8.8

OPEN SOUTH SLOPE

<u>Species</u>	<u>density</u>
Quaking aspen	17.7
Willow	8.8

TABLE 3. Density (stems/hectare) and percent cover of seedlings of tree and tall shrub species. "p" indicates cover less than 0.1%.

FORESTED RIDGE TOP

<u>Species</u>	<u>density</u>	<u>% cover</u>
Quaking aspen	26,500	1.9
Jack pine	23,000	1.0
Serviceberry	18,250	2.0
White birch	9,750	1.6
Pin cherry	750	p
White spruce	500	p
Choke cherry	500	p
Mountain ash	250	0.1
Red elderberry	250	0.1

OPEN SOUTH SLOPE

<u>Species</u>	<u>density</u>	<u>% cover</u>
Serviceberry	22,000	1.9
Choke cherry	1,750	0.3
Jack pine	1,000	p
Pin cherry	1,000	0.1
Mountain ash	500	0.2

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

<u>Species</u>	<u>% cover</u>
Vaccinium angustifolium	14.3
Carex aenea	2.9
Epilobium angustifolium	1.7
Potentilla tridentata	1.3
Diervilla lonicera	1.0
Vaccinium myrtilloides	0.6
Maianthemum canadense	0.5
Rubus strigosus	0.5
Lonicera dioica	0.4
Arctostaphylos uva-ursi	0.4
Agropyron trachycaulum	0.3
Calamagrostis canadensis	0.3
Agrostis hyemalis	0.3
Linnaea borealis	0.2
Carex houghtoniana	0.2
Fragaria virginiana	0.1
Hieracium florentinum	0.1
Corydalis sempervirens	0.1
Deschampsia flexuosa	0.1
Symphoricarpus alba	0.1
Sambucus racemosa	0.1
Solidago nemoralis	p
Solidago hispida	p
Campanula rotundifolia	p
Prunus virginiana	p
Polygonum cilinode	p
Anaphalis margaritacea	p
Rubus parviflorus	p
Geranium bicknellii	p
Cynosurus cristata	p
Silene antirrhina	p
Convolvulus spithameus	p
Potentilla arguta	p
Ribes glandulosum	p
Viola conspersa	p
Polygonum douglassii	p
Arabis drummondii	p
Oryzopsis pungens	p

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

<u>Species</u>	<u>% cover</u>
Convolvulus spithameus	1.6
Danthonia spicata	1.3
Potentilla arguta	0.5
Fragaria virginiana	0.5
Diervilla lonicera	0.5
Solidago nemoralis	0.4
Agrostis hyemalis	0.4
Polygonum douglasii	0.3
Agropyron trachycaulum	0.3
Vaccinium angustifolium	0.3
Prunus virginiana	0.3
Symphoricarpus alba	0.3
Saxifraga virginensis	0.2
Rosa acicularis	0.2
Woodsia ilvensis	0.2
Arabis drummondii	0.2
Artemisia canadensis	0.1
Deschampsia flexuosa	0.1
Hieracium florentinum	0.1
Antennaria plataginifolia	0.1
Corydalis sempervirens	0.1
Geranium bicknellii	0.1
Rubus strigosus	0.1
Arctostaphylos uva-ursi	0.1
Viola conspersa	p
Carex aenea	p
Campanula rotundifolia	p
Dracocephalum parviflorum	p
Poa compressa	p
Oryzopsis pungens	p
Polygonum cilinode	p
Satureja vulgaris	p
Maianthemum canadense	p