

Initial results of leather-leaf (*Chamaedaphne calyculata*) and speckled alder (*Alnus rugosa*) cutting regime on plant biodiversity on Cranberry Bog

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INTRODUCTION

Cranberry Bog spans 70 acres of wetland and is a part of the 1200-acre Greenwoods Conservancy in Burlington, NY. Cranberry Bog is a particularly important wetland because it displays characteristics of both a bog and a fen (Saba, 2001). It has a *Sphagnum* moss mat that makes it chiefly a bog but also has an inflow of water from streams that qualify it as a fen. Elements of two different communities allow the support of a wide range of plant species.

Leather-leaf (*Chamaedaphne calyculata*) and speckled alder (*Alnus rugosa*) are plants native to Cranberry Bog that have formed dense thickets on the *Sphagnum* mat as a natural step in ecological succession (Saba, 2000). Leather-leaf and speckled alder shade small plants living on the mat, which is believed by the original researcher (Saba, 2001) to challenge diversity of the delicate plant community on Cranberry Bog. Rose pogonia (*Pogonia ophioglossoides*) is an example of a plant that was growing on the bog mat but is currently absent (O'Dea, 2001)

To test the hypothesis that leather-leaf and speckled alder inhibit diversity, all vascular plant species were identified and their percent coverage was determined on nine, 2X2 m square plots in the summer of 2000 (Saba, 2000). An experimental leather-leaf and speckled alder cutting regime was initiated on the plots following the survey. In the summer of 2001, plants were identified again and their coverage was determined to compare with data from the plots prior to the cutting regime.

METHODS

In 2000, nine 2x2 m square plots in triplicate were measured, labeled, and roped off. These plots ultimately underwent three cutting regimes in triplicate. The plots were chosen so that leather-leaf occupied about the same percentage in the plots of a given cutting regime (Saba, 2000). Leather-leaf covered a mid-point of 62.5 percent in trial 1, 85 percent in trial 2, and 97.5 percent in trial 3. After the plots were marked, vascular plant species were identified on the nine plots following Gleason and Cronquist, (1991) and Tiner, (1998). The percent coverage of the plants was recorded using the protocol outlined by Mueller-Dombois (1974).

The first three plots (labeled "A") were the controls, where no leather-leaf or speckled alder were cut. In the second set ("B"), fifty percent of the coverage of leather-

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leaf and speckled alder plants were cut. One hundred percent was removed from the third set ("C"). About a one-foot border of leather-leaf and speckled alder was cut around all plots to reduce the edge effect and shading that could alter results (Saba, 2000). All cutting was accomplished with pruning shears at the base of the stems. Cuttings were removed from the area.

This year the borders were recut to maintain the established study areas, though the plots were not modified. Plant species were identified again and percent coverage was redetermined. Data collected this year was compared to initial pre-cutting data to determine the effects of the cutting regime.

RESULTS

The type and amount of species found in the plots in 2000 and 2001 are listed in Table 1. Conclusions about the effect of the cutting regime on plant biodiversity can be made from the comparison of data from last year's report.

Comparing the differences between the data from last and that from this year indicates that overall diversity of plant species has declined. Three species identified last year were not found this year in any of the plots; white pine, meadowsweet, and marsh St. John's wort. These plants were rarely found in any abundance greater than a coverage midpoint of 2.5 % the first year. Black chokeberry and sundew were found in half as many plots as the previous year.

Generally, if there were any changes in coverage of plant species it usually reflected a reduction of aerial coverage. The small cranberry displayed the most significant reduction in amount of coverage in each of its plots. The most drastic reductions occurred in trial number one, both plots A and B, where cranberry coverage reduced from 37.5 to 2.5. Within trial number one, similar amounts of coverage decreased in a managed plot and a plot that was left as a control.

Though changes reflected in each cutting regime were quite variable among trials, some generalizations can be made. The plants that showed an increase in coverage in the studied plots were the rush, speckled alder, northern pitcher plant, black chokeberry, and the bog rosemary. Speckled alder increased in coverage in two of the control plots. In those same control plots, leather leaf decreased without applied management. The bog rosemary increased in all three plots of trial two. The northern pitcher plant and the black chokeberry increased in 50% managed B plots. The rush increased in two of the plots that were managed as 100% leather leaf/speckled alder removal. Although the rush and bog rosemary increased in the 100% management plot of C2, six species of plants previously identified in small amounts were not found this year.

Leather leaf did not show increase in the control plots. In the 50% managed B plots, it showed a coverage midpoint of 37.5 for all three trials. In all three of the 100%

managed C plots, leather leaf made a comeback to at least a midpoint coverage of 15. The most significant return was in plot C2 with a midpoint of 37.5.

CONCLUSIONS

Within the three 100% management plots, the leather leaf made a significant comeback. The only plant to make use of the clear-cut style plot was the rush.

The three 50% management plots resulted in almost uniform leather leaf coverage. The northern pitcher plant seemed to do well in these plots. While the pitcher plants in the C plots became withered from exposure to the sun, the balance of light and shade in the B plots seemed to be the most beneficial for that species.

Bog rosemary increased in all three plots of trial two independent of any plot management. The increase of rosemary seems to be a result of the adjacent proximity of the plots in trial two.

Leather leaf decreased in the control plots where the speckled alder increased. This relation shows the natural succession of a taller plant that will dominate and reduce the control held by leather leaf. The loss of the small cranberry is occurring regardless of the management regime and probably a sign of the succession of the entire bog.

DISCUSSION

This project addresses the belief that leather leaf and speckled alder presumably reduce biodiversity on the bog mat. The main focus is really on the leather leaf because it is in the greatest abundance and is the dominant plant on the mat. Speckled alder probably reflects the next class of succession.

Succession implies a sequence of something in time or space. Noted observations of vegetation changing through time can be traced back to the works of *Theophrastus* around 300 BC. The awareness as competition being one of the causes of succession is shown by De Candolle's remark in 1820 that: "All the plants of a country, all those of a given place, are in a state of war, the ones relative to the others". A stable equilibrium is rare in plant communities and is usually only for a relatively short time (Miles, 1987).

Leather leaf is considered a true bog species; its a dominant, indicator species for bogs and peatlands (U.S. Department of Agriculture, 2001). This plant is not an exotic species and it is found in practically all boreal bogs. Leather leaf is characteristic of late stages of moss-low ericaceous shrub communities (Dammon et al., 1987). Leather leaf is not shade tolerant and will decline when a taller species, such as speckled alder, invades.

It may seem unconventional to attempt to promote biodiversity by controlling native species. However, this experiment seemed warranted given the unique character of

this wetland, and the fact that wetlands in general have been so reduced in recent history. Representations of each distinct stage of succession are increasingly harder to find, particularly the more intricate and advanced stages as seen on Cranberry Bog. The educational value of a bio-reserve of this type could prove to be invaluable for generations. This project is the beginning to finding a way to maintain a living example of the diversified species that this specialized environment can potentially support.

FUTURE RECOMMENDATIONS

Continued plant identification and percent coverage should be continued annually for at least several more years, especially to observe any reintroduction of species in the 100% removal plots. It will be interesting to observe how the control plots will change in composition by way of succession.

Other methods of invasive plant species control include regulated burns, herbicides and biocontrol. Regulated fire is more forest related and probably too extreme for use on the bog. Herbicides are difficult to apply and their effects are hard to contain to just the target species without disrupting the greater ecological balance of the wetland. Because the plants in question are native, biocontrol is not an option. These methods do not seem suitable to obtaining a diversified, pristine environment.

If the project is to be expanded by creating more plots with different cutting regimes, I have two suggestions. First, do not create clear-cut borders around the plots. It would make for a better study if the same cutting regime used inside the plot was extended just beyond the border of the plot to keep the integrity of the plot size by not increasing the amount of sunshine and growth space available to the plants on the edges of the plot.

Secondly, from this year's results it seems that the 100% removal plots did not benefit from the clear-cut style. Species were lost, the leather leaf is growing back strong, and aesthetically it looks horrible. The *Sphagnum* becomes bleached and the northern pitcher plant deteriorates. The 50% removal plots seems to be better at trying to balance the leather leaf with other plants. Space is created for smaller plants to grow, but it is not nearly as disruptive to the mat.

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