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Rose Lake Plant Materials Center

Establishment of Native Plants/Habitat on Lake Huron

Final Report

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Introduction

In response to the ever-increasing pressure on native habitats, the Great Lakes National Program Office's Ecological Protection and Restoration Team awarded a grant to the City of Rogers City and to the Natural Resources Conservation Service to install a dune revegetation project along the shore of Lake Huron. The grant was awarded in June 1995 and work on the project began in October 1995.

The objective of the Rogers City dune revegetation project was to reproduce native beach vegetation in an area which had lost its original plant cover. The focus was to be habitat restoration, with the intent of demonstrating techniques required to restore native habitat. Native plant communities were to be identified, samples collected and native plants propagated and planted. The ultimate goal of the project was the creation of a healthy and sustainable ecosystem on the site, which could be used as a prototype by private landowners and other groups wishing to install a similar project.

The groundwork for the project was laid in 1994 by city manager Rob Fairbanks, who was interested in re-establishing native vegetation along the lakefront, and by Carla Gregory, who was the District Conservationist working with the Presque Isle Conservation District. By the time the grant was awarded, Perry Smeltzer, Resource Conservationist, was working with the Presque Isle Conservation District in this capacity.

A partnership was created involving the Presque Isle Natural Resources Conservation District, the City of Rogers City, and the Rose Lake Plant Materials Center in East Lansing. The City of Rogers City volunteered city maintenance crews to assist with the work. Rob Fairbanks, City Manager/Engineer, was the city contact person for the project. Perry Smeltzer, Resource Conservationist, supervised planting and the gathering of seed and cuttings; and David Burgdorf and Phil Koch of the Plant Materials Center agreed to propagate the plant materials and transport them to the project site.

Methods

The project was installed on a strip of beach on Lake Huron about 50 feet wide and 200-300 yards long which was known as North Shore Park and which had been disturbed by industrial use and human traffic. The site was essentially devoid of vegetation, with the exception of balsam poplar *Populus balsamifera*. This tree had encroached on the site following construction activities to establish traditional park-like conditions. Originally the project was to have encompassed several sites and to have involved the creation of some small wetland areas, but funding considerations reduced the scope of the project. The location selected was part of the city park and was also adjacent to the Rogers City municipal water treatment facility. The creation of a transition zone from beach to park using native species was envisioned. Seed and cuttings from areas of native vegetation, which were either adjacent to the site or close by, were gathered, propagated at the Rose Lake Plant Materials Center, and transplanted to the site.Although modest in size, this comparatively small area effectively demonstrates typical beach dynamics and comprises several micro-ecosystems. The area of primary wave action, beginning at the water's edge, is continually swept by waves and has virtually no vegetation. The area of secondary wave action, called the fore dune, is waveswept only during major storms, most typically in winter. Plants in this zone are subject to both erosion and deposition during times of strong wave activity and must tolerate being

buried by deposition. Grasses, along with a few hardy shrubs, are the dominant species in this environment. A third area, called the "back dune", is almost entirely protected from wave action, and supports a much greater variety of vegetation. Ground-hugging shrubs such as trailing juniper and bearberry are often common in this zone, as well as a variety of grasses, forbes, and other shrubs and trees.

Site before planting

Although the project area was nearly barren of vegetation, areas nearby had abundant native vegetation. Seeds and cuttings for the initial stage of the project were obtained from two nearby beach sites. The first site was immediately south of the project area, where several species of grasses grew in abundance and sand cherry was well established. The other site was at Seagull Point, several miles north of the project area. This site had extremely well established back dune vegetation and was the source of the juniper and bearberry cuttings used in the project.

Grass seed from several species; prairie sandreed, Canada wildrye and American beachgrass, was collected from the site adjacent to the project. Seed and cuttings from bearberry and creeping juniper were collected at Seagull Point. Two years after the beginning of the project, when revegetation of the site had progressed considerably, beach pea seeds were collected from the project site itself; sand cherry seeds were collected at the same time, directly north of the site.

All seeds and cuttings gathered at these sites were sent to the Rose Lake Plant Materials Center, which played a central role in the project. In addition to being involved in the initial planning of the project with the Rogers City field personnel, the task of raising viable plants from seed and cuttings gathered by on-site personnel was the sole responsibility of PMC. The successful production of plant materials from the seed and cuttings provided involved research and experimentation. Initial information on propagation methods for shrub species was obtained from The Reference Manual of Woody Plant Propagation (Dirr and Heuser, 1987) and then modified to suit the needs of the project.

The first phase of the project focussed on six selected plant species. The Rose Lake PMC had a target of providing 400 woody and 2000 grass plants as follows:

Bearberry, *Arctostaphylos uva-ursi* - 200 plants
Creeping juniper, *Juniperus horizontalis* - 200 plants
Prairie sandreed, *Calamovilfa longifolia* - 1000 plants
Canada wildrye, *Elymus canadensis* - 1000 plants

In addition to the four targeted species, another grass species, American beachgrass, *Amophila breviligulata,* and an additional shrub species, common juniper, *Juniperus communis,* were also collected at Rogers City. In addition, seed heads from thickspike wheatgrass, *Agropyron*

dasystachyum, were collected; however, when the wheatgrass seedheads were processed at PMC, they were found to contain no viable seed.

Seed Propagation: field personnel collected Seed from all six species in early October 1995.

Grass: Grass seed collected at Rogers City was cleaned in December with the aid of a brush huller which had been purchased for the project. After removing hulls, poor viability of thickspike wheatgrass and American beachgrass was confirmed, although a small amount of viable seed was obtained from beachgrass. The cleaned seed was then stored in a refrigerator, to be planted in March. On March 7-11, after being planted, it was placed on bottom heat in the greenhouse and watered for six minutes a day. The three grass species varied as to the quantity and quality of the seed collected. Wildrye was very prolific. A total of 1078 "conetainers" of wildrye were planted and 98% germinated. Growth of seedlings for this species was also very rapid, they were 1-2 inches tall 10 days after planting! American beachgrass, on the other hand, produced very little seed. Ninety-eight cones were planted and of these only 22 had germinated after three weeks. (However, since beachgrass is not normally propagated from seed, this was an extremely satisfactory germination rate.) Prairie sandreed produced as much seed as the wildrye and 1078 cones were planted, with 85% germination. Germination was noted a week after planting.

On May 8-10, approximately 1800 grass plants were transported to Rogers City.

Bearberry and juniper. Although bearberry and juniper plants are normally started from cuttings, seeds of both species were collected and germination attempted for purposes of observation and experimentation. In mid-October, bearberry seeds were cleaned in a blender, acid scarified and double stratified. Seeds which germinated during warm stratification were planted in the greenhouse. The ungerminated seed was planted in flat trays in late March. Approximately 40 seeds germinated during warm stratification and the tray planting resulted in over 100 germinants. Although about 70 plants were produced, these plants were much smaller than those produced with cuttings. The juniper seeds, which were planted in "conetainers" after three months cold stratification, did not germinate. It was determined that starting these two species from seed was not the most efficient method.

Cutting Propagation: Perry Smeltzer and Conservation District personnel collected Bearberry and juniper cuttings on November 4 at Seagull Point. More juniper cuttings were collected in January. The juniper cuttings collected in November were common juniper; those collected in January were creeping juniper.

Bearberry. Bearberry cuttings were divided into three groups of 92 each (276 total) and were planted in three different types of potting media: sand; Metro-mix; and a 2 sand/3 Metro-mix blend. Bottom leaves were removed and they were treated with IBA, a rooting hormone (Hormex No. 1), and placed on bottom heat with mist, and fertilized regularly (approximately once a week). The planting was done on November 14, and extra lighting was added in December. On December 19, HID lighting was added, from 5pm to 9pm; on December 26, fluorescent lighting was added, from 6-8am and 5-8pm. By early January 3, some of the cuttings had burst bud and others were in flower. None had rotted. From February 26 to March 7, cuttings which had rooted were transferred to D-pots. ("D-pots" are cone-shaped containers which are wider and deeper that the smaller "conetainers" used for smaller plants, such as grasses.) Transplanted cuttings were transferred to a flood bench irrigation system and watered for five minutes a day. This system, which was purchased for the project, allows plants to be uniformly watered and to dry out at regular intervals.

Observations were made on the effects of different potting media and different moisture conditions. As of February 26, of the cuttings planted in sand, 59% had rooted; of those planted in Metro-mix, 63% had rooted; and of cuttings planted in the 2 sand/3 Metro-mix blend, 81.5% had rooted. It was noted that the wettest Metro-mix pots had not rooted as well as those which had been kept drier. By mid-April, eight of the transplanted cuttings which had been rooted in the sand mixture had died. Of the untransplanted cuttings, 18 in Metro-mix, 7 in sand, and 4 in the sand/Metro-mix blend had rooted. A final tally showed that of cuttings planted in sand, 55% had rooted; of cuttings planted in Metro-mix, 83% had rooted; and of cuttings planted in the sand/Metro-mix blend, 86% had rooted.

Juniper. The creeping juniper cuttings, collected in January, were of very good size, 8" long. Two hundred were terminal cuttings and 52, collected for comparison, were from further down the branch. Only 47 cuttings of common juniper were potted, since most of those collected were too small. The available samples had very little new growth, The maximum was 4inches and cuttings of less than 2inches were discarded.

Juniper cuttings, which were planted in Metro-mix 510, were treated very similarly to the bearberry cuttings. Bottom needles were removed and No. 3 Hormex rooting powder was used. Common juniper was planted at the same time as the bearberry cuttings (11/14/95). HID and fluorescent lighting were added at the same time as for the bearberry cuttings. Creeping juniper was planted on January 19 and given supplementary HID and fluorescent lighting.

On February 14, both groups of juniper cuttings were moved from mist to bench irrigation (5 minutes per day) and were removed from bottom heat. A week later, on February 21, the January cuttings were moved back to heat and mist. By February 24, ten days after being put on flood bench irrigation, 43 cuttings of common juniper had rooted and were transferred to D-pots. The four which had not rooted were placed back on heat and mist.

By March 19, about half the creeping juniper cuttings had rooted, 51% of the tip cuttings and 52% of "lower down the branch". By April 19, 3 of the remaining 4 November cuttings had rooted, giving an overall success rate of 98% for this group. The final tally for the January cuttings was 51.2%. Juniper and bearberry cuttings were prepared for shipping on September 19 and sprayed with Offanol insecticide.

Volunteers Planting Native Grasses

In spring 1996, the focus of the project shifted from the PMC greenhouse to the Rogers City site. Planting plans had been made the previous December at a meeting between the City Manager and the Resource Conservationist. Planting was done in May 1996 by local volunteers (Girl Scouts and Boy Scouts), and again in October. Grass plants from the PMC greenhouse were shipped to the project site and were planted by local volunteers on May 11 and May 15. In May, in addition to the grass planting, balsam poplar was removed by mechanical means from the project site by City personnel. Woody plants and more grass plants were delivered to field personnel at Rogers City by the PMC on September 19-20. They were planted on October 21.

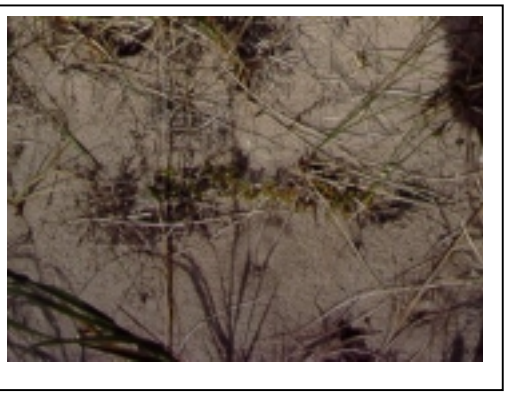
September 19-20 was also the occasion of a site visit and project evaluation by David Burgdorf, Phil Koch and Perry Smeltzer. They made observations regarding the establishment of grass plants and noted contributing environmental factors. On the basis of this evaluation, goals for the second phase of the project were set. These involved collecting additional plant species, reviewing the literature on propagation techniques on these species and implementing them in the Rose Lake PMC greenhouse. It was determined that this stage of the project would focus on producing additional different species, establishing these additional plant species on site, and making additional efforts to control balsam poplar, either by mechanical means and/or herbicides. Another site visit was planned for continued evaluation and to gather data for the formation of future plans and was scheduled for late summer, 1997; seed collection was also planned for this visit.

On August 28-29 1997 David Burgdorf, Phil Koch and Perry Smeltzer again visited the site. In evaluating the 1996 plantings, it was found that some species had successfully established themselves and others had not.

Site After Planting

The most successful plantings in the fore dune area were wildrye and beach grass. Wild rye was established and doing well. It had grown to a height of 3 feet, seed heads had formed, and it was beginning to spread on site from the roots. Beach grass was established and doing okay, with some spreading noted from the roots. Not surprisingly, grasses closest to the lakeshore were destroyed by wave and ice action. Prairie sandreed planted in the fore dune area was not doing as well as plantings of the same species in the back dune area.

Bearberry did not do as well as expected. Site location and planting technique were considered important. The plants placed on the forefront of the dune did poorly, the plants on the back dune did much better. The same pattern was evident in the natural location of the plants on the existing dune area adjacent to the site.



Juniper did better in establishment. Site location seems to be less of an issue for this species. Planting techniques are still considered important to assure larger survival rates.

Mechanical removal of balsam poplar was not successful, since the species resprouted from roots remaining in the soil. The application of a chemical treatment may be indicated. Concerns about water quality and

environmental issues has not allowed this alternative to date.

Juniper Transplant

In addition to conducting a site evaluation, seed was also collected, both on the site itself and adjacent to it. Sand cherry seeds were collected immediately north of the site, and seeds from beach pea were collected on the site.

Goals for the following year involved continued evaluation of already-installed plant species, identification of additional species for seed collection and for propagation at PMC, and outplanting of propagated plant materials as soon as possible in Spring 1998. In addition to a year end report to GLNPO, it was recognized that it would also be time to draw conclusions for an overall summary as part of the final report on the project.

Fall and winter at the Rose Lake PMC saw the propagation of beach pea and sand cherry seeds.

Sand cherry. Seeds were cleaned in a blender and cold stratified for three months, then planted in December. After germination, they were transplanted to D-pots. Germination of sand cherry exceeded expectations. 300 sand cherry plants were produced for planting in spring 1998.

Beach pea. In fall 1997, beach pea seed was inoculated with a standard garden pea innoculant, then planted. In April, germinants were transplanted into two different growth media, Metro-mix and sand. Seventy-five beach pea plants were produced.

In mid-June, sand cherry and beach pea plants were delivered to the project site.

In July 1998, a final evaluation and site visit was made by Perry Smeltzer and by Patricia Lewis from the Rose Lake PMC.

Of the several species planted, Canada wildrye and American beachgrass had become vigorously established. Although American beachgrass is the species most commonly installed in dune revegetation projects, Canada wildrye had not only taken hold but also had increased 25% and had proved to be a very effective co-colonizer with beachgrass. As previously observed, although prairie sandreed was also planted in the fore dune area, it did much better on the back dune. A few bearberry plants were still surviving, although they did not appear to have established themselves. The transplanted junipers were much more in evidence; however, volunteer juniper plants appeared to be outstripping the transplanted individuals in establishment.

The planting of grasses on the fore dune had made a noticeable change in the geomorphology of the site. A well-defined “mini-bluff” of about 12-18 inches had formed between the zones of primary and secondary wave action, and had sharply delineated the boundary of the vegetated area. Vegetation grew on top of this but not below. Although a few uprooted grass plants lay along the perimeter, showing the progress of erosion by primary wave action, it was evident that erosion would have continued unabated into the fore dune area had plant roots not been present to stabilize the soil.

It was too early to evaluate the progress of the sand cherry planting, since this was done only a few months previously. The new sand cherry cuttings were planted along the interface of the primary and secondary wave action zones and would have to survive the winter storm period before their success could be determined.

Volunteer plants had also begun to establish themselves on the project site. A surprise volunteer in the fore dune area was horse tail *Equisetum arvense*. Although this species was not one of the project plantings, it had recently begun to colonize. Wormwood *Artemesia caudata*, had colonized freely in both fore dune and back dune areas, and a few small but dense stands of slender wheatgrass were identified on the fore dune.The back dune area, which typically has a much more diverse plant community, showed a variety of species in addition to those installed as part of the project. Grasses, a variety of forbes, a few shrub species and unfortunately, balsam poplar, were all growing in this area. As mentioned previously, prairie sandreed had become well established. Of the several shrub species planted, juniper appeared healthy and vigorous, while the bearberry planting, while still in evidence and surviving, had not become established. Balsam poplar, which had been mechanically removed from the area, had, as previously noted, grown back vigorously.

Volunteer Wormwood On Site

Discussion

The goal of establishing a healthy and self-sustaining ecosystem was clearly met in this project. The grass plants, particularly wildrye and beachgrass, but also prairie sandreed, were an enormously successful pioneer species. They became vigorously established in a short period of time, slowed erosion dramatically and created a viable habitat which facilitated colonization by other plant species; the original vision of a natural transition zone between beach and park was realized. The project demonstrated that the planting of grasses is an extremely feasible option for private landowners and for municipalities and other groups. Since seed and other plant materials for the project were collected at nearby sites, this project is an excellent example of regional applicability. Probably the question of greatest interest is why some species in the project have done better than others. It can easily be speculated that the two most successful grass species, Canada wildrye and American beachgrass, probably did as well as they did because they are tolerant of being buried by deposition and can tolerate soil poor in

Established Grasses Spreading by Rhizomes

organic matter and the fact that prairie sandreed did better on the back dune may mean that it is less tolerant of these conditions.

It is also interesting to note that since grasses have become established on the fore dune, other plants have begun to colonize in this zone. Whether this is because of the increased stability of the soil and the reduction of wave action, because of an increase in organic matter, shelter from the wind, shading and therefore at least a slight decrease in soil temperature, or a combination of factors, is still to be determined.

It is interesting, although not surprising, that shrubs that were planted in the project area are taking a longer time to become established. Even the transplanted juniper, which did much better than the bearberry, still showed evidence of transplanting shock, as compared to the more vigorous condition of recent volunteer juniper plants on the site. The fact that bearberry did poorly in the back dune zone of the project site, in spite of doing well in a similar zone in the area in which it was collected, may be due to the fact that its place of origin may have a richer soil. Seagull Point, where the bearberry cuttings were collected, had an undisturbed and well-established back dune ecosystem where organic matter would have been able to accumulate. A contributing factor may be that bearberry, along with beach pea, even in areas where it is well established, is a complementary, rather that a dominant, species.

More initial care could make a difference in how quickly shrub species become established. The addition of organic matter when planting, the removal of excessive top growth, and initial watering, could provide better growth conditions and reduce transplanting shock. Grass plants, by contrast, appeared to need no extra care.

Removing intrusive species has been shown to be a challenge. It may be advisable to investigate the use of chemical methods to eradicate balsam poplar, since mechanical removal was not successful. Balsam poplar had colonized this site after native vegetation had been removed. It spreads by underground roots and is difficult to eradicate. The major objection to this species is that it is capable of shading out more desirable indigenous vegetation.

One original goal of the project was to plant three endangered species: Pitcher's thistle, dwarf lake iris and Houghton's goldenrod. None of these species, however, was found at the collection sites which were adjacent to the project site or nearby. This strongly suggested that none of the above species were originally indigenous to the site, and it was therefore decided not to install them.

While some species have unquestionably established themselves, not enough time has passed to rule out any of the experimental species as having been unsuccessful, since questions remain concerning the amount of time it takes for some species to become established. Planting and propagation methods are also, at this time, a matter of experiment and trial and error. Time will answer many of these questions and will undoubtedly pose some new ones.

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