



Succession-based Restoration of Oak Savanna

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INTRODUCTION

In 1995 the Capital Improvement Program approved the allocation of \$57,000 from the Landfill Trust Fund for the enhancement of Lake Itasca Park which is located in south western Anoka County, due north of Minneapolis, Minnesota. At this two acre location, the City of Ramsey has proposed construction on the Lake Itasca Park Trail Head, which will connect the northern trail to the proposed culdesac south and west of Lake Itasca, and the trail corridor entering the northern end of the existing Lake Itasca Park. This trail head was proposed with the intention of providing an area for recreational users to park, and become familiar with a unique vegetation type. Within this parkhead it is proposed to include a parking lot, walking path, and drive which will be off Okapi Street (Boos, 1996).

The City of Ramsey has proposed to create a municipal landscape using native and non-native species at this site. This municipal landscape will be similar to the oak savanna in structure and function, but other non-typical species to oak savanna will be used. City planners anticipate that trees such as bur oak (*Quercus macrocarpa*), typical of oak savannas, will then dominant the other species through succession. Through succession, the prairie component of oak savanna will remain stable. The City of Ramsey planned the project this way because of cost and public's perception of park land. It is generally assumed that the public desires visual attraction and an indication that there is a deliberate landscape feature. For instance, on the site hackberry trees (*Celtis occidentalis*) will grow more quickly creating a more instant landscape effect until the oaks reach the point where their impact in the landscape is more apparent. The non-random planting form that the hackberry trees take along the lot drive provides a deliberate landscape treatment that many residents expect.

This future oak savanna community historically "appeared as parklike openings on the landscape" with intermixed oaks (Delaney et. al. 1995). This type of community was mainly influenced by soil type, drainage, fire frequency, and presence of oaks (Delaney et. al, 1995). Fire frequency is especially important to this type of natural community. Fires assisted in reducing the litter layer which resulted in increased temperature of the soil and increased microbial activity (Tester, 1995). The fires also resulted in an increase moisture in the soil rather than the above ground litter. In addition, the fires were responsible for preventing the spread of the deciduous forest (Tester, 1995). The only woody species to survive in these hostile conditions were the fire resistant oaks. In the Lake Itasca site, small restricted prescribed burns are planned to be administered to maintain the prairie but not to kill the fire intolerant trees.

Currently this site is a rather undeveloped area. The soils include organic soils in the lower areas and Duelm loamy coarse sand, Hubbard coarse sand (2+

slopes), and Hubbard coarse sand (6-12% slopes) loam in the higher areas. The vegetation consists of wetland grasses, forbs, and willows in the lower areas, aspen, various shrubs, native grasses, weed species, and isolated oaks in the higher elevations. This area also harbors a diversity of wildlife, of particular interest is the abundant red bellied snakes (*Seminatrix pygaea*). The area was also once an early settlement/trading post which could have development implications for the rest of the park in trying to bring back Anoka County's historical roots (Boos, 1996).

GOALS AND MOTIVATIONS

In this restoration there are three main intended goals or motivations in creating this municipal landscape on the Lake Itasca Trailhead. They include:

- introducing this municipal landscape to the public
- minimizing operational costs
- creating a natural vegetation and wildlife corridor

One of the most important goals of this municipal landscape is introducing this municipal landscape to the surrounding public. Once the public has become accustomed to the site, this municipal landscape can be expanded to other parts of Anoka County. In addition, it's hoped that the homeowners might use native grasses in their own yards. This type of restoration is advantageous to the City of Ramsey because of the soil and water conservation attributes of native grasses. The more soil in Anoka County that will be covered in this vegetation, the more soil that will be more resistant to wind and water erosion because of its soil stabilization qualities. In addition, this type of community needs little if no added water to sustain itself. The water conserving quality of a prairie community is very important because of the predicted water shortage in Anoka County. It is hoped by the City of Ramsey that more public and private landscapes will use the water conserving prairie landscape.

Minimizing operational cost includes reducing product inputs, decreasing maintenance costs, decreasing the time and labor spent on maintenance, and using materials and trees that are locally abundant. Only product inputs will occur initially, and after that they will be reduced dramatically. Inputs will include the herbicides Roundup and Ranger, prairie forb and grass seed mix, and mixed organic compost which will substitute for inorganic fertilizers. Maintenance of this area initially will be substantial, but after the vegetation community establishes itself the maintenance will again decrease. Only long term maintenance will include some pruning of trees, burning, and mowing of the native grasses. In addition, some of the trees that will be used in this landscape will be transplanted from city owned property because they are available and abundant. The City of Ramsey will incur significant savings by using the trees already on city owned land.

The next goal includes creating a natural wildlife and vegetation corridor. Succession-based restoration will play an important role in recreating a native

ecosystem. The parkhead will assist in interconnecting natural habitats of Anoka County. Interconnecting the parks will facilitate plant pollination and dispersal since species in pollination, since populations will not be isolated. The corridor will also assist animal species in migrating from place to place in a natural setting. The City of Ramsey's interconnected parks will be an example of how an ecosystem can be reintroduced into an area which is considered a residential landscape. These interconnected parks could be a template for other residential landscapes that want natural interconnectiveness within their geopolitical area for the purpose of making it aesthetically pleasing and environmentally sustainable.

INTERVENTIONS

Within this restoration project there will be four main interventions. They include; preparing site including grading, establishing drainage ways, plantings and seedings, and maintaining the site. The first three interventions are to occur in the short term, and the last to occur in the long term. It's proposed that the first three interventions will be completed by the end of summer, 1996.

The first step in preparing the site will be the grading of the area which will be done by a contractor. Next, in areas with actively growing vegetation, Roundup or Ranger herbicide will be applied. One application should eliminate all weed species, but if not, another application of Roundup or Ranger will be applied. Once weed species are destroyed, the area will be disked up to a depth of four inches to roughen up the soil surface. The site will then be harrowed to smooth and break up the soil. Harrowing will create favorable microsites to promote soil-seed contact, for germination.

The second intervention will include manipulating the terrain to slow down the drainage water from the parking lot. A small depression east of the proposed parking lot will be excavated for this purpose. Spillways will be constructed on the north and south ends of the parking lot leading into this depression. The depression isn't likely to hold any water because of the rapid infiltration rate for this soil. For this reason, project planners are not choosing to plant any vegetation. The City of Ramsey will leave it unplanted and see what types of plants will take advantage of this open invasion window.

Seeding and planting this site will entail seeding both prairie grass seed and forbs, and the planting of red pine (*Pinus resinosa*), smooth and staghorn sumac (*Rhus typhina* and *R. glabra*), bur oak, and hackberry. Previously eastern red cedar (*Juniperus virginiana*) were specified in the plan for instant screening, but due to their invasive nature, they will not be used (Chmielewski, 1996). The hackberry, as stated before, will act as instant vegetation before the bur oaks establish themselves. Once these hackberry trees succeed, bur oaks will emerge through the canopy. Throughout this succession process it is also planned that bur oak seedlings will be spaded in areas that receive more sun because they are shade intolerant. Some other trees already existing on the site include jack pines (*Pinus banksiana*) and bur oaks. These trees will be left because of the cost of taking them out and replacing them is too great.

Prairie seed on the site will include:

Short Dry Grass Mix: Side oats grama (*Bouteloua curtipendula*), Blue grama (*Bouteloua gracilis*), Little bluestem (*Schizachyrium scoparium*), June grass (*Koeleria macrantha*), Kalm's brome (*Bromus kalmii*)

Mixed Height/Mesic Grass Mix: Big bluestem (*Andropogon gerardii*), Side oats grama, Canada wild rye (*Elymus canadensis*), Switch grass (*Panicum virgatum*), Little bluestem, Indian grass (*Sorghastrum nutans*), Kalm's grass, Prairie dropseed (*Sporobolus heterolepis*)

Tallgrass Wet Grass Mix: Big bluestem, Canada wild rye, Switch grass, Indian grass, Bluejoint grass (*Calamagrostis canadensis*), Wild rye (*Elymus virginicus*), Green bulrush (*Scirpus atrovirens*), Wool grass (*Scirpus cyperinus*), Cord grass (*Spartina pectinata*)

Short Dry Wildflower Mix: Yarrow (*Achillea millefolium*), Leadplant (*Amorpha canescens*), Butterfly weed (*Asclepias tuberosa*), Azure aster (*Aster oolentangiensis*), Stiff tickseed (*Coreopsis palmata*), Alum root (*Heuchera richardsonii*), Golden aster (*Heterotheca villosa*), Bush clover (*Lespedeza capitata*), White and purple prairie clover (*Penstemon grandiflorus* and *P. candidum*), Prairie rose (*Rosa arkansana*), Black-eyed susans (*Rudbeckia hirta*), Goldenrods (*Solidago sp.*), Hoary vervain (*Verbena stricta*)

Mixed Height Mesic Wildflower Mix: Same as short dry wildflower mix, in addition to Stiff sunflower, Blazingstars (*Liatris sp.*), Wild bergamot (*Monarda fistulosa*), and Golden alexanders (*Zig aurea*).

Tall Wet Wildflower Mix: Swamp milkweed (*Asclepias incarnata*), Canada tick trefoil (*Desmodium canadense*), Joe-pye weed (*Eupatorium maculatum*), Boneset (*Eupatorium perfoliatum*), Sneezeweed (*Helenium autumnale*), Common ox-eye (*Heliopsis helianthoides*), Greater St. John's wort (*Hypericum pyramidatum*), Mountain mint (*Pycnanthemum virginianum*), Culver's root (*Veronicastrum virginianum*)

All grass seed will be planted with a Traux seed drill. Wildflower mixes will be applied by broadcasting, which is done so the seeds are spread in the most opportune area for which they grow. After all seeding is complete, a harrow or rake will be used on the entire planted site. Straw mulch will be spread where grades are greater than a three to one ratio, with the intention of assisting in erosion control and soil moisture retention.

The last intervention includes maintaining the vegetation on the site. The prairie in the first growing season will be maintained by mowing three times at approximately 30 day intervals to assist in controlling weed species and eliminating cool season grass growth. In the years following the first growing season, maintenance will mainly occur by burning and mowing. In addition, newly planted prairie is very susceptible to weed invasions, so weeds will be

identified and treated as soon as they appear. In this site, trees will periodically be pruned or removed which will speed up succession.

ASSESSING SUCCESS

The success of this project will be shown by:

- examining the performance of the vegetation
 - Performance of vegetation includes the plants vigor, which in turn will be a good indicator of plant health (Chmielewski, 1996). If this non-typical vegetation looks healthy with respect to a natural landscape, then the public is more likely to accept it.
- degree to which it could stimulate other projects of its kind
 - The City of Ramsey also believes this project will be a success if other cities and landowners start to implement some of these planting techniques on their own land.
- maintenance savings
 - Another indication of success will be on how much money will be saved with this landscape as compared to the traditional park landscapes.
- wildlife attraction
 - How many new animal species move into the area will also be an indicator of success.
- sustainability
 - The last indicator is if this changing ecosystem will be sustainable. Will the structure and function of this changing ecosystem remain resilient or will the entire ecosystem go toward some other vegetation type? Will this restoration require many human interventions in the future to maintain its integrity, or will it naturally succeed into oak savanna and maintain itself.

CRITIQUE

This proposed project has many well thought, innovative ideas, but in addition it also has some areas that are unclear. For instance, I like the idea of a low maintenance system, instead of the usual lawn landscape. Using these low maintenance systems will also decrease the probability of ground water pollution. In addition, the water availability of this area fits well with the project. After establishment, this area will not have to be watered because the prairie species are well adapted to dry conditions. Another positive aspect of this plan is the use of species that are on-site and near the site. It's an excellent way to curb the costs of

a project.

A problem I do see is oak succession into the area. Establishing oak savanna has historically been somewhat of a problem. Studies have shown that there are two ways in which to attempt to create oak savanna. They include opening up a oak woodland to allow the prairie species to come through and planting oaks in an already established prairie. The City of Ramsey has chosen to plant prairie first and then let the oaks succeed into the area. This could possibly work, but the prescribed burns are surely to kill the young oaks as they emerge. Another possibility because of the small site, would be to mow around the oak until they are able to withstand fire. Proceeding with the mowing option then would defeat the purpose of being a low maintenance site.

This notion of letting succession take place to arrive at a new vegetation community is a valid one, but this whole process could take hundreds of years to get to an oak savanna. Is it really feasible to manage that far ahead into the future? The succession process could be accelerated by possibly cutting down a few other species of trees slowly through time. This would allow the oaks to come through the canopy quicker.

In assessing if this project will be a success, the City of Ramsey has brought forth some ways to access the success. These are somewhat general and will be hard to monitor. I would suggest to the City of Ramsey of creating a succession-based time line. It would include such tasks as when to take out screening trees, when to add oaks and overall, what to expect through the years. This would assist city planners in deciding on how long they would like the whole succession process to occur. In the future, planners would be able to look back at the time line and analyze the project. An easy and cost effective way to monitor the project would be to involve the public provided it would be interesting work. Many groups such as schools, residents, and clubs are very interested in getting involved and would be eager to help. This would give the City of Ramsey a way of monitoring the progress on the site, in addition to getting the public interested and involved. Another way of accessing success would be to examine the spatial distribution of plant species. The spatial distribution would give an indication if this site was moving toward an oak savanna.

Another problem I foresee is the acceptance by the public to this new non-typical landscape. The prairie portion of this project will not be mature for the whole growing season. To some park users this prairie might just look like weeds. I would suggest putting some interpretive signs up, letting the users know what is there and how it works. In summation, this type of succession-based restoration of oak savanna is somewhat of a new idea, so of course there will be some unanswered questions. By in large though, this project looks to be promising and it will be interesting to see how it proceeds.

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