Newark Road Prairie Management Plan

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In 1835 Lt. D. Ruggles was in central WI and he described the area as, “stretching for miles around, without a single tree or shrub” (Kline 1997). He was describing a savannah ecosystem that had previously covered 5.5 million acres of Southwestern WI but is now less than 500 acres due to anthropogenic disturbances (Cochrane and Iltis 2000). This means that not only do we have an ethical responsibility to restore it for future generations but since we caused its destruction we should be held accountable (The Nature Conservancy 1997). Newark Road Prairie must be preserved by protecting the site, maintaining it, and constant monitoring because of its ecological value and rarity.

The Importance of the Newark Road Prairie:

The Newark Road Prairie is defined as a preserve area located on a 33 acre plot in Rock County that contains a wet mesic prairie savanna with sedge meadows (Newsome 1977) (Wisconsin Department of Natural Resources). John T. Curtis, a UW ecologist who did extensive prairie field surveys, defined prairies as an, “open community, dominated by grass, and having less than one tree per acre” (Kline 1997). The Newark Road Prairie is further classified as wet because gentle elevation and surface materials’ permeability leaves water is standing from spring to July (Newsome 1977). Since several oak lots occur on the site it can further be defined as a savannah occurring on mesic soil (Kline 1997). A savannah is defined as a continuation
between prairies to forest (Kline 1997). The chief tree of a savannah is the bur oak because it tolerates fire the best but shrubs and prairie grasses continue to make up the majority of the vegetation (Kline 1997). Newark Road Prairie was further described by previous site manager, Dick Newsome, as containing sedge meadows but the area does not have the required sedge peat soil (Cochrane and Iltis 2000; Newsome 2003).

The Newark Road Prairie’s worth includes both nonconsumptive and nonuse values. Nonconsumptive values are values that are beneficial because of the natural status of the site (Williams and Diebel 1996). They include such specific benefits as recreation, education, and ecological value (Williams and Diebel 1996). Nonuse values are values that are advantageous independent of their use (Williams and Diebel 1996). These include such specific assets as the aesthetic value, ecological value, existence and future existence of the prairie, cultural/historical value, and the value of biodiversity (Williams and Diebel 1996).

The specific benefits that the Newark Road Prairie imparts are aesthetic, educational, ecological, existence, and cultural values. The site is beneficial aesthetically because it is inspiring (The Nature Conservancy 1997). The educational value from the site is that it can teach us many things about the natural world through research and observation. The ecological value of the prairie includes such benefits as habitat provision, pollination, biodiversity, pollution filtration, and soil production. (Williams and Diebel 1996). Newark Road Prairie's existence value is relevant because the savannah ecosystem was once prominent but now due to anthropogenic forces such as agriculture, development, exotic species introduction, and cessation of fire it is endangered and contains many rare species (Kline 1997). The site has a cultural/historical value because of the past significance the ecosystem held by being a majority and a major life factor (Kline 1997).
The Newark Road Prairie can be further defined as a preserve because it has endangered and rare elements that are threatened (The Nature Conservancy 1997). Prairies have been threatened by destruction for years, creating very rare ecosystems and many endangered species. Overall, there have been few disturbances to the Newark Road Prairie's soil, hydrology, and flora allowing for the existence of rare native savannah species and increasing the urgency to protect the area (Newsome 1977). These uncommon and endangered species include the Eastern Prairie White Fringed Orchid, Meads Sedge, Purple Milkweed, and Prairie Indian Plantain (Newsome 2003). The site also contains an endangered ecosystem, oak openings on mesic sites (Newsome 1977). The continuation of this rare presence makes preservation a mandatory issue and provides a basis for the site’s continued protection.

Goals and management:

To continue to preserve the Newark Road Prairie goals must be defined. By applying these to different issues a specific management plan can arise. They will provide for all the needs of the prairie ecosystem and be adjustable to fluid issues as they arise. The proposed goals for the Newark Road Prairie are continued protection, maintenance of the natural ecosystem, ongoing research on the site’s condition and future needs, and constant monitoring of the efficiency of the plan.

Protection:

Protection of the Newark Road Prairie is important because of all the previously stated values the area provides and can be achieved by two forms of societal management; education and regulation. Education about the value of the prairie, how to coexist with it, and sustainable practices will create multiple benefits (Baydack et al. 1996). Education will create an informed public that will not harm or disturb the site (Baydack et al. 1996). The public may also take
action to improve the quality of land surrounding the preserve (Baydack et al. 1996). This increased sustainable region can increase the supportable biodiversity of the Beloit ecosystem (Baydack et al. 1996). Education can also create a base of volunteers to work on prairie management (Kline 1997). The second social management tool is regulation which includes fencing, controlling surrounding land developments, prohibiting activities on the prairie, creating a buffer zone if necessary, and posting of boundaries (Newsome 1977). Most of these actions prevent action from being taken against the site and serve to isolate it. The creation of barriers and rules when on the site controls the activities that are allowed to proceed within it (Newsome 1977). The control of surrounding land controls the larger ecosystem that may affect the site. The creation of a buffer zone is another possible way of controlling the effects that society has on the site (Baydack et al. 1996).

Maintenance:

Maintenance of a natural prairie ecosystem involves encouraging native species growth and removing nonnative species (Kline 1997). This practice keeps the natural biodiversity of the ecosystem intact. Maintenance is accomplished by upholding original conditions and practicing active interventions against non native species.

What the problem is:

The survival of rare and native plants has been increasingly complicated by the existence of invasive species. These species are persistent and, if not controlled, will compete with rare plants and reduce the prairie’s diversity. They are able to invade because Newark Road Prairie’s soil type is suitable for some invasive plants and may encourage their growth (Kline 1997). An example is wet soils encouraging reed canary grass and mesic soils encouraging pasture weeds (Kline 1997). An increase in invasive species can also be due to some factor of the natural area
being disturbed (Solecki 1997). Disturbances reduce sensitive native plants and then allow opportunities for exotic plants to invade (Risser 1996). Some examples of these disturbances are increased agriculture, or water pumping changing the natural water table (Risser 1996). Disturbances are further exacerbated by small restored areas being vulnerable from disturbances on the surrounding edges (Risser 1996).

What to do:

In order to maintain the natural prairie ecosystem native conditions such as natural hydrological cycles, a limited human disturbance, and fire should be continued. Native species are adapted to these natural processes but nonnative species are not. Hydrological cycles are important because they determine what sort of vegetation can be sustained and if disturbed they can provide hydration and thus encourage growth of non native species (Solecki 1997). Therefore, if natural cycles are kept native plants will prosper and non native plants will not. Maintenance of hydrological cycles can be accomplished by educating the public about not changing water table levels or polluting the water (Baydack et al. 1996). Limiting human disturbance is important because disturbances can introduce invasive species and can lead to destruction of the site (Risser 1996). Limited human disturbances can be accomplished by societal management through the above mentioned techniques of regulation and education. Finally, fire is needed because it stimulates the growth of native plants and prevents the growth of nonnative species (Cochrane and Iltis 2000). Controlled burns encourage native growth because they lengthen the growing season by burning off litter and exposing the soil to the sun (Pauly 1997). Conversely, burns shorten the growing season for certain Eurasian cool season weeds because the soil warms, water stress is induced, and in the late season they are capable of burning off 3 to 8 inches of growth (Pauly 1997). Specific burn safety recommendations are
found on Table 1.

There is some debate as to the most effective time of year burns should be conducted but generally alternating late and early spring burns is the best. Spring is the easiest season because a burn is slower and has less height due to vegetation being more compacted (Pauly 1997). However, burning too late in the spring does not eliminate cool season natives entirely (Pauly 1997). Conversely, burning too early in the spring may stimulate growth because it heats the soil or not completely eliminate invasive species. It is also not favorable because if burns are in the early spring season year after year there can be a long term loss of vegetation diversity, especially among late flowering forbs (Kline 1997). Therefore, it is proposed that burns be alternated between late and early season so that all of the vegetation can experience the benefits. Also, summer should be considered because it has been shown to help control woody species, some invasive species, and increase diversity (Anderson 1997). In a recent burn at the UW Madison Arboretum a summer burn was able to control their population of quaking aspen (Anderson 1997). Further research should be done into summer burning but it has been shown that it does not seriously hurt vegetation (Anderson 1997).

The effectiveness of burn frequency is also an issue of debate. It is known that areas such as the Newark Road Prairie with mesic prairies and invasive species require more frequent burnings (Kline 1997). It is recommended that plot burning be rotated so that a species is not accidentally eliminated and so that fauna will still have some of their habitat maintained (Newsome 1977). It is also recommended that burns be in irregular intervals of 3 years because than weeds and grasses are not able to dominate (Newsome 1977). The frequency of the burns may need to be increased if invaders are not controlled.
The two types of invasive species, woody and herbaceous, should initially be managed by observation so that early identification can be made and effects can be studied. Patrols for invasions should be made constantly because the earlier an invader is identified the easier it can be monitored to determine the correct action (Solecki 1997). This monitoring is important because it shows how the native vegetation is utilizing the bothersome species (Solecki 1997). Some native species can become dependent on invasive species and then it may not be advisable to remove the invader (Solecki 1997). However, if invasive species are spreading rapidly or competing with the native species than active management becomes an option (Solecki 1997).

Active management techniques against invasive species include selective removal such as cutting or pulling, girdling, and herbicide use. Selective removal should be used when invasive populations are small (Solecki 1997). The two methods, pulling and cutting, differ in that hand pulling completely removes all of the problem vegetation and cutting does not (Solecki 1997). Another method, girdling, involves making two parallel cuts 3 inches apart in the phloem (Solecki 1997). This should be done in the early summer and usually kills the plant (Solecki 1997). The final active management method is herbicide use which can be utilized by frilling, by being applied to cut stumps, or by foliar treatment. In all cases the minimum effective concentration should be used and care should be taken to not damaging non-target species (Solecki 1997). Frilling involves killing standing trees by depositing herbicide in cut pockets in the bark (Solecki 1997). Another option, foliar treatment, inhibits bud expansion when Krenate is sprayed during the dormant season to any invasive species that remain green (Solecki 1997). Herbicide can and should also be wiped on immediately cut stumps with a sponge to kill the root system (Solecki 1997). This should be done late in the growing season or dormant season to
reduce any unintentional damage (Solecki 1997). Specific active management recommendations for Newark Prairie invasive species are given in Table 2

**Monitoring:**

Prairie management involves determining the needs of the ecosystem, providing for these needs with specific management practices, (The Nature Conservancy 1997) monitoring the success of the management by looking at the ecosystem's response, and then adjusting the management plan based upon the results. The needs of the ecosystem are determined by constant monitoring and in depth research into specific areas. This observational process is undertaken so that management can constantly improve.

General monitoring of the site’s ecosystem involves periodic inventory accompanied with periodic specific sampling in areas of particular interest. The first step in monitoring is taking a complete inventory to see what is there (Masters 1997). This will be aided by a grid system that was put in 1986-87 (Newsome 2003). For plant species inventory should be taken during the fall floras’ growing season and during the springs’ so no species is overlooked (Masters 1997). Next, specific questions can be used to track management progress using specified indicators (Masters 1997). Examples of some proposed questions include if specific invasive species are being eradicated, if specific endangered species are increasing, or how burning is effecting specific vegetation growing rates. Next, samples in the form of plots, quadrants, or transects should be taken. Plots are usually one quarter acre, quadrants are 1/4m², transects are lines of quadrants that can be fixed or random (Masters 1997). The number of samples needed to get an accurate species representation can be determined using \( n = (200 \text{ CV}/r)^2 \) (Myers 2003). Finally measurements should be taken of species in each sample area and the estimated ground cover (Masters 1997). From these measurements the information given in Table 3 can be determined.
All of this information can then be used to determine if management goals are progressing and if they are not, then they can be adjusted to the ecosystem’s needs.

Research is the other element needed in order to monitor an ecosystem's needs accurately. Research is based on a specific area that not enough information is known about and that holds importance for the ecosystem as a whole. Some specific areas that should be researched because they have been neglected in reports and are an important part of the ecosystem are the soil, climate, hydrology, and the fauna of the Newark Road Prairie.

Soil:

Soil should be studied because it contains 65% of the biomass of the prairie and it is influential in determining what plant species can be sustained (Miller 1997). There are many microbes within this soil and the rhizosphere that have a critical role to the success of the prairie. For example, mycorrhizal fungi are required in several prairie plant species, especially little blue stem, because they provide the roots with nutrients (Miller 1997). Thus, the rhizosphere should be studied to ensure that the necessary microbes are there.

Climate:

Climate for the Newark Road Prairie is not directly known but it affects the hydrology and vegetation type that can be supported. The current climate is a composite of the Beloit area. In 1977 Dick Newsome, the steward, proposed a climate station so that there would not need to be speculate about what the prairie's specific climate was (Newsome 1977). This idea should be put in place now so that studies on climate change can be performed. This issue is even more pertinent with the advent of global climate change because it is necessary to monitor climate to determine the effect that climate change will have on the site.

Hydrology:
Hydrology should be more thoroughly examined because it determines the soil and vegetation type of the site. Also, if it is disturbed it can cause the prevalence of invasive species (Masters 1997). Since in recent years invasive species have been increasing this is a prudent study. Currently, groundwater is able to supply Newark Road Prairie through seepage and artesian wells because of the permeability of the surface material (Newsome 1977). The groundwater is then recharged by precipitation. The permeability of the soil and the methods by which water reaches the surface should be further studied because these conditions may change. It was also proposed by Dick Newsome, the previous site manager, that a ridge northwest of the prairie with bedrock close to the surface may facilitate percolation (Newsome 1977). This area should be further studied to see if this is true or if any disturbances are occurring.

*Insects:*

Research should be conducted on prairie insects because they maintain the soil composition by aeration, and pollinate the plants (Taron 1997). Research should focus on the roles of insects within the ecosystem, the species type occurring in Newark Road Prairie, and the possibility of introduction of more species. Prairie insects do not specifically need to be prairie natives and in many cases non natives may replace the natives’ role (Taron 1997). Several advantages of introducing prairie natives are that many are threatened due to habitat loss and the Newark Road Prairie is one of the few places that could save them (Taron 1997). Another advantage is that it would maintain the natural characteristic of the prairie (Taron 1997). Also, since both plant and insect natives adapted with each other reintroducing the native insects is definitely an advantage for both and could lead to a higher quality prairie (Taron 1997).

*Amphibians:*
Amphibians should be investigated because they are important to biodiversity, some are endangered, they have a role in the ecosystem, and they are an earlier indicator of environmental problems (Corn et al. 1996). Newark Road Prairie currently supports the Painted turtle and the endangered Blanding’s turtle (Newsome 2003). This endangered status increases the urgency of protection and studies to determine protection methods. Research should focus on the roles of the amphibians within the ecosystem, the species types within Newark Road Prairie, and if they are indicating any ecological distress. If a census is done it must be multi seasonal because the surface activity of amphibians varies (Mierzwa 1997). Again the issue of Newark Road Prairie being a potential reservoir to save remaining threatened prairie natives is a question to consider (Taron 1997).

*Birds:*

Birds should be studied because they are also important to biodiversity, have roles within the ecosystem, and are indicators of prairie quality. Monitoring of bird density and diversity can be accomplished by spot mapping, or simple point counts. Spot mapping maps each bird territory and point counts are observed birds from one location over a set period of time (Byre 1997). No introduction of new species should be undertaken because on such a small site it might interfere with the few birds that are there (Byre 1997). The efforts that should be undertaken are continuing to keep the area maintained for these species (Byre 1997).

Newark Road Prairie’s natural ecosystem should be protected, maintained, and constantly monitored because it is a rare and threatened area. Anthropogenic disturbances have caused a significant reduction in the savannah habitat creating an ethical responsibility for society to protect sites such as the Newark Road Prairie that hold valuable remnants. The site can be protected by societal management. The site’s natural ecosystem can be maintained by sustaining
native practices and practicing active management of invasive species. The success of the site’s management should be constantly monitored by research so that future management is able to adjust and continue to provide for this unique ecosystem’s needs.

Table 1: Burn Safety Recommendations for the Newark Road Prairie.

1. Wood should be burned at 30% relative humidity because it is extremely resilient (Pauly 1997).

2. Trunks of large woody species need to be removed prior to the burn so that it does not heat the ground to an inadvisable temperature (Newsome 1977).

3. Caution should be taken when burning brush because it can carry embers far and anything under brush can be damaged from heat exposure (Pauly 1997). These conditions can be managed by burning brush when there is still snow (Pauly 1997).

4. Reed canary grass can pose a fire hazard because it forms a hard to put out mat but it can be managed by sweeping a fire broom under the mat or applying water under the mat (Pauly 1997).

5. Poison ivy’s irritating oils can be carried through the air during burns. (Pauly 1997).
Table 2: Management options for invasive species.

<table>
<thead>
<tr>
<th>Species</th>
<th>Management Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wild Parsnip</td>
<td>Allow natives to outcompete, hand pull after drought/rain when the roots are shrunk, cut second year plants during spring before flowering, dig out rosettes after a spring burn, or spot apply 2% Roundup to rosettes (Solecki 1997).</td>
</tr>
<tr>
<td>Wild Sweet Clover</td>
<td>Hand pull first year plants, cut stems before flowering, or burn completely in April and then again the following May (Solecki 1997).</td>
</tr>
<tr>
<td>Reed Canary Grass</td>
<td>Conduct annual burns in late spring, hand chop culms at flowering, and restore water levels (Cochrane and Itis 2000).</td>
</tr>
<tr>
<td>Poison Ivy</td>
<td>Burning (Pauly 1997).</td>
</tr>
<tr>
<td>Multiflora Rose</td>
<td>Conduct controlled burns, mow three times a year, cut stems in the dormant season, apply Roundup to the stump, or hand pull if it is a light infestation (Solecki 1997).</td>
</tr>
<tr>
<td>Garlic Mustard</td>
<td>Use a combination of intense fires, removal of unburned plants before flowering, cutting flowering plants to ground level and then removing the cut stem or spray with 2% Roundup during the dormant season when the plant is still green (Solecki 1997).</td>
</tr>
<tr>
<td>Crown Vetch</td>
<td>Conduct late spring burnings and mow to manage seedlings. This species invades from roadside plantings so research into the effects of the nearby road may be needed (Solecki 1997).</td>
</tr>
<tr>
<td>Buckthorn</td>
<td>Conduct repeated hot fires every year, restore natural water levels, girdling, or apply Roundup to stumps (Solecki 1997).</td>
</tr>
<tr>
<td>Quaking Aspen</td>
<td>Girdling, conduct late spring burns after flowering, or cut. It is very important that any cut stumps are treated with herbicide so that they do not resprout (Solecki 1997).</td>
</tr>
</tbody>
</table>

Table 3: Formulas for density, frequency, dominance, and importance.

<table>
<thead>
<tr>
<th>Formula</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (Myers 2003)</td>
<td>Number of individuals/ Area sampled</td>
</tr>
<tr>
<td>Relative Density</td>
<td>Density of a species/Total density of all species (100)</td>
</tr>
<tr>
<td>Frequency (Myers 2003)</td>
<td>Number of quadrants in which a species occurs/Total number of quadrants sampled</td>
</tr>
<tr>
<td>Relative frequency (Myers 2003)</td>
<td>Frequency value for a species/Total frequency value for all species (100)</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Dominance (Myers 2003)</td>
<td>Total area coverage values/Area sampled</td>
</tr>
<tr>
<td>Relative dominance (Myers 2003)</td>
<td>Dominance for a species/Total dominance for all species (100)</td>
</tr>
<tr>
<td>Importance value of a species (Myers 2003)</td>
<td>Relative dominance + Relative density + Relative frequency</td>
</tr>
<tr>
<td>Conservatism (Masters 1997)</td>
<td>Ecologist gives a rank of 0 to 10 based upon the restrictedness of the vegetation</td>
</tr>
<tr>
<td>Floristic quality index (what a change in quality means) (Masters 1997)</td>
<td>Total area’s mean conservatism x $\sqrt{\text{total#of\species}}$</td>
</tr>
</tbody>
</table>

**Works Cited**


Newsome, R.  July 2003. A sketch of Newark Road Prairie.


