Final Report

AIRR-039-08

"Preventing the Spread of Pioneer Populations of Reed Canarygrass (*Phalaris arundinacea*) and Water Cress (*Nasturtium officinale*) Along the Williams-Barneveld Creek, Iowa County, Wisconsin"

(Project Duration: 2008 – 2010)

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Description of Project Area:

The 276-acre A to Z Farm property (Iowa County, Brigham Township, T6N R8E Sections 26 (SE ¼) and 35 (N ½ of NE ¼ and NE ¼ of NW ¼) is located within the exceptionally diverse 500-acre Mounds View Grassland Complex and the 50,000-acre Military Ridge Prairie Heritage Area (MRPHA), both of which are areas of regional importance to Wisconsin's natural heritage. The A to Z Farm property is the headwaters of a cold-water trout stream that has high biological and water quality significance to the MRPHA landscape. The A to Z property is bisected by a shallow valley with the permanent Williams-Barneveld Creek running from NE to SW at the bottom of the valley (Figure 1). There is additional hydrological input from several free flowing springs and groundwater seeps dispersed throughout the valley bottom. Approximately 10 acres of the valley bottom supports a diverse community of native sedge meadow and wet meadow vegetation that is relatively free of invasive non-native plant species (Figure 2). The A to Z wet meadow community is highly significant for the MRPHA and supports at least 19 (and possibly as many as 22) species of greatest conservation need (SGCN). An additional five T & E plant species occur within 1,000 feet of the wet meadow. The wet meadow also serves as moist habitat refugia for the SGCN regal fritillary butterfly (*Speyeria idalia*) during drought years. The A to Z property is open to the general public for fishing, but access is limited to foot travel only and uses are limited to low-impact activities.

Figure 1: The Williams-Barneveld Creek at the A to Z property.

Figure 2: The remnant wet meadow at the A to Z property.

Problem Addressed by this Project:

From 2004 onward, small pioneer populations of reed canarygrass (*Phalaris arundinacea*) and watercress (*Nasturtium officinale*) were observed along the Williams-Barneveld Creek and surrounding area by Richard Henderson, Pat Trochell, and other members of *The Prairie Enthusiasts*. By 2008, the combined total coverage of both species was approximately one acre of the total wet meadow acreage. Much of the reed canarygrass at the A to Z property occurred in small clones less than five meters in diameter interspersed throughout the eastern boundary of the property. There was an additional large clone (approximately ½-acre in area) on the adjacent Schurch-Thompson Property (also owned by *The Prairie Enthusiasts*) along the site access trail that leads to the creek from Riley Road. Watercress was distributed throughout the eastern sections of the William-Barneveld Creek. Early detection and rapid response to these satellite populations in the early stages of colonization and establishment presented an opportunity for inexpensive intervention with a very high probability for successful long-term suppression and control. In 2007, Richard Henderson asked Craig Annen of Integrated Restorations, LLC, to write an AIS grant to address encroachment of these two species at A to Z and help TPE protect the biological integrity of this unique habitat for the benefit of both the public and the SGCN that this site supports. Management of these species complemented other management efforts being conducted by TPE volunteers and contractors within the Mounds View Grassland Complex.

Overall Project Goal:

The overall goal for this project was to prevent pioneer populations of reed canarygrass and watercress from reproducing and/or expanding on the property.

Specific Project Objectives:

1. To reduce the abundance of, or eradicate, pioneer populations of reed canarygrass on the property.
2. To reduce the abundance of, or eradicate pioneer populations of watercress on the property.
3. To recover, maintain, and enhance as much of the property's original vegetation community as possible.

Methodology:

1. Reed Canarygrass

To protect water quality integrity, herbicides were not applied to reed canarygrass plants that were rooted within the stream bank. These individuals were dug out of the sediment, bagged, and removed from the site for destruction. Reed canarygrass clones occurring within 10 (ten) meters of the streambank, but not within the channel itself, were spot treated with a 0.25% (a.i.) mixture of imazapyr (Habitat®, a broad-spectrum herbicide registered for use in aquatic systems) and 0.375% (v/v) Induce pH® (Helena Chemical Company), a non-ionic surfactant/sticking agent/pH stabilizer (also approved for use in aquatic systems). Reed canarygrass clones occurring more than ten meters from the Williams-Barneveld Creek were treated with the grass-selective herbicide sethoxydim (Sethoxydim E Pro®) to prevent collateral damage to non-target species and secondary weed outbreaks that can accompany broad-spectrum herbicide application. The empirically determined minimum effective concentration of this herbicide (0.5% active ingredient by volume) was used when spot-treating reed canarygrass clones more than ten meters from the Williams-Barneveld Creek. A water-conditioning additive and spreading agent are required for sethoxydim to perform effectively. Water conditioner (ReQuest®, Helena Chemical Company) was added to tank mixtures at a rate of 0.25% (v/v) and Induce pH was added to herbicide mixtures at a rate of 0.375% (v/v). Induce pH® was chosen over MSO/NIS additives because the sticking agent it contains minimizes herbicide drift and leaf wash off/rewetting that could have potentially transported sethoxydim into the Williams-Barneveld Creek. Treatments were administered for three growing seasons to dampen reed canarygrass reestablishment and resurgence. GPS waypoints were taken of treated clones each year to relocate clones during subsequent treatment seasons and assess treatment success. Seeds of native species were collected on-site and frost-interseeded to encourage revegetation of treated areas. In accordance with WDATCP and APM permit requirements, all entrances and access points to areas treated with herbicide were posted during the restricted entry interval (REI) period.

2. **Watercress**

To protect water quality integrity, herbicides were not used to control the watercress population at the A to Z property. Watercress was harvested with a rake, bagged, and removed from the site for destruction. Rooted stems were dug out of the channel sediment and bagged. Due to the ability of this species to regenerate from non-rooted fragments, fine mesh cheesecloth netting was anchored across the stream profile immediately downstream from raking points to trap fragments and prevent their downstream spread.

2008 Management Activities:

APM Permit Number: 2008 PERMIT #7 (issued 13 March 2008)
(APM Herbicide Treatment Record Submitted 17 June 2008)

2008 management activities consisted of 1) treatment of existing populations, 2) monitoring and scouting for additional seedlings and immature clones along the length of the Williams-Barneveld Creek at the A to Z property, and 3) seed collecting and interseeding.

Summary of Reed Canarygrass Suppression Activities in 2008:

Snowmelt from the record snowfall during the winter of 2007-08 and surface runoff from record rainfall in the spring of 2008 resulted in extensive flooding throughout the watershed. High water levels in the Williams-Barneveld Creek were evidenced by the presence of numerous debris dams and matted vegetation covered by silt. Flooding delayed the initiation of reed canarygrass treatments by about two weeks, but was not detrimental to achieving the overall management objectives in 2008. In fact, flooding actually facilitated control by loosening soil within and along the streambank, which made hand pulling easier and more effective (i.e., it was easier to uproot and remove up the entire clone, rhizomes and all; reed canarygrass can resprout from rhizome fragments broken off during digging). Reed canarygrass plants that were rooted within the stream and along recently flooded portions of the streambank were dug out of the sediment, bagged, and removed from the site for destruction. This, in turn, lessened the amount of plants that had to be treated with aquatic herbicide (imazapyr).

Reed canarygrass clones occurring within ten meters of the stream bank were treated with imazapyr. Reed canarygrass clones occurring more than ten meters from the Williams-Barneveld Creek were treated with sethoxydim. GPS coordinates were recorded to mark the locations of treated clones. (These data were used to relocate clones in 2009.) Imazapyr was applied on 10 and 16 June 2008. Sethoxydim was applied on 17 June with follow up treatments on 22 September and 9 October 2008. Additional scouting for the presence of reed canarygrass clones took place on 19 June and again on 22 September 2008. Two small clones (diameter less than 1 meter) were detected near upland fence lines.

The locations of these clones were recorded with a GPS receiver for treatment in 2009. Contractors treated a total of 17 reed canarygrass clones in 2008.

Studies in the peer-reviewed literature suggest that reed canarygrass populations are particularly vulnerable to treatment strategies when occurring in mixed vegetation stands because reed canarygrass is sensitive to spectral quality, especially during establishment and regrowth. To provide competition for reed canarygrass during future growing seasons, seeds of 12 graminoids and 7 forbs were collected on-site in 2008, cleaned (dehusked and dehulled then passed through cleaning screens), weighed to the nearest 0.1 g with a portable digital analytical scale, and frost-interseeded at heavy rates into areas denuded by herbicide applications (Table 1). *Carex* achenes were interseeded immediately after collection, as they have limited storage life. Additionally, seeds of mudflat annuals and short-lived perennials (*Glyceria grandis*, *Bidens cernua*, *B. frondosa*, and *Sagittaria latifolia*) were collected and frost- interseeded into mudflats along the Williams-Barneveld Creek.

Summary of Watercress Suppression Activities in 2008:

Extensive spring flooding initially flushed watercress from the entire Williams-Barneveld Creek (A to Z section). However, watercress rebounded in abundance by late summer/early autumn. Watercress was harvested with a rake, bagged, and removed from the site for destruction. To curtail resprouting during the 2008 growing season, rooted stems were dug out of the sediment and bagged. Only first year (non-flowering) watercress plants were observed in 2008. Whenever native emergent species (e.g., *Sagittaria latifolia*) were collaterally uprooted during watercress removal, they were replanted in exposed mudflats along the Williams-Barneveld Creek. Watercress removal took place on 24 September and 3 October 2008. Due to the ability of this species to regenerate from non-rooted fragments, a fine mesh net made of cheesecloth was anchored across the stream profile immediately downstream from raking points to trap fragments and prevent their downstream spread. This precaution was effective overall but also somewhat time consuming to implement—it was difficult to remove captured fragments from the netting material because the partially-smashed plant material adhered to it when the mesh was wet. A total of five 30-gallon trash bags of watercress were removed from this portion of the Williams-Barneveld Creek in 2008.

Scouting and Treatment Monitoring:

The overall management goals of the first year of this project were achieved in 2008. Watercress in this portion of the system was completely removed (at least temporarily), and reed canarygrass clones were prevented from producing viable seed. Furthermore, qualitative treatment monitoring revealed that reed canarygrass resurgence (defined as the ability of a rhizomatous perennial species to recover from herbicide treatments) was minimal into October, with recovery of aboveground foliage less than 5% of pre-treatment cover in clones treated with sethoxydim and 0% in clones treated with imazapyr (Figure 3). The young age of the infestation and timing of herbicide applications may have contributed to this encouraging result: Etiolated regrowth of reed canarygrass (an assay where RCG is defoliated and

placed into a dark environmental chamber to measure recovery from storage reserves in the absence of photosynthetic input) has been estimated at only 0.04 g per plant immediately prior to anthesis (mid-June at this latitude). In other words, herbicides were applied to reed canarygrass at a growth stage when its recovery potential (resurgence capacity) was minimal, resulting in diminished regrowth.

Figure 3. Spring 2009 resurgence of a reed canarygrass clone treated with sethoxydim in 2008.

2009 Management Activities:

APM Permit Number: 2009 PERMIT #2 (issued 23 January 2009)
(APM Herbicide Treatment Record Submitted 23 June 2009)

2009 management activities consisted of 1) treatment of existing populations, 2) scouting for additional seedlings and immature plants along the length of the Williams-Barneveld Creek at the A to Z property, and 3) seed collecting and interseeding.

Summary of Reed Canarygrass Suppression Activities in 2009

Four debris dams were distributed along the western stretch of the Williams-Barneveld Creek in 2009 (Figure 4), likely the result of unusually high volumes of snowmelt and early spring precipitation in 2008 and 2009 which temporarily flooded the banks of the creek. By reducing water flow velocity, debris dams can increase water temperatures (to the detriment of fish) and cause scour pools along meanders (which are also utilized by fish) to fill with sediment. They can also trap reed canarygrass seeds and provide niche space for their growth. Indeed, scattered immature (first-year, non-flowering) reed

canarygrass culms were observed near the upstream pools created by two of the four debris dams (see Figure 4). For these reasons, contractors removed all four debris dams on 20 July 2009 after obtaining permission from Amy Staffen (a TPE staff member at the time) for this activity.

Figure 4. Debris dam within the Williams-Barneveld Creek with scattered juvenile culms of reed canarygrass in the foreground.

As in 2008, reed canarygrass plants that were rooted within the stream and along the streambank were dug out of the sediment, bagged, and removed from the site for destruction. Reed canarygrass clones occurring within ten meters of the stream bank were treated with imazapyr. Reed canarygrass clones occurring more than ten meters from the Williams-Barneveld Creek were treated with sethoxydim. GPS coordinates were recorded to mark the locations of treated clones. (These data were used to relocate clones in 2010.) Imazapyr was applied on 18 May 2009. Sethoxydim was applied on 4 June with follow up treatments on 17 June and 30 September 2009. Additional scouting for the presence of reed canarygrass clones took place on 5 June 2009. Contractors treated a total of 22 clones in 2009.

To provide competition for reed canarygrass during future growing seasons, seeds of 11 graminoids and 8 forbs were collected on-site in 2009, cleaned (dehusked and dehulled then passed through cleaning screens) and frost-interseeded at heavy rates (the approximate equivalent of 10 lbs per acre) into clones denuded by herbicide applications (Table 2). Additionally, seeds of mudflat annuals and short-lived perennials (*Glyceria grandis*, *Bidens cernua*, *B. frondosa*) were collected and frost- interseeded into mudflats along the Williams-Barneveld Creek, just as in 2008.

Summary of Watercress Suppression Activities in 2009

Watercress was harvested with a rake, bagged, and removed from the site for destruction. To curtail resprouting during the 2009 growing season, all rooted stems were dug out of the sediment and bagged. Similar to 2008, only first year (non-flowering) watercress plants were observed in 2009. Whenever native emergent species were collaterally uprooted during watercress removal, they were immediately replanted in exposed mudflats along the Williams-Barneveld Creek. Watercress removal took place on 5 June and again on 1 October 2009. In total, contractors bagged and removed a total of three 30-gallon trash bags from this portion of the Williams-Barneveld Creek in 2009, less than in 2008. Contractors also observed Pickerel Frogs (*Rana palustris*) along the Williams-Barneveld Creed during watercress removal activities. Contractors took GPS coordinates of the sighting and submitted a record to Richard Staffen of the DNR Natural Heritage Inventory (NHI) in 2009.

Scouting and Treatment Monitoring

The overall management goals of the second year of this project were achieved in 2009. Watercress in this portion of the system was completely removed (at least temporarily), and reed canarygrass clones were prevented from producing viable seed and from expanding clonally at the A to Z site. In the spring of 2009, second-year resurgence of reed canarygrass clones was restricted to only two of the 17 clones treated in 2008 and was minimal in each instance. This result was consistent with a total nonstructural carbohydrate (TNC) depletion model of reed canarygrass control, which predicts diminished carbohydrate reserves within perennial rhizomes over subsequent growing seasons. However, while most of the clones treated in 2008 had disappeared and been replaced by native species in 2009 (see Figures 5a & 5b), 20 new clones had appeared in 2009 (including the two clones discovered during 2008 scouting). Most of these clones were small (less than 1 meter in diameter), were composed of immature (non-flowering) plants, and consisted of only 5 – 20 culms apiece. Reed canarygrass seeds may have been introduced to the site by spring flooding in 2009, or by foraging cows which were able to access and graze the site in 2009 through a gap in the barbed wire fence along the east-central property boundary.

Figure 5a: A reed canarygrass clone that was treated with sethoxydim (brown foliage) being replaced by the native rhizomatous sedge *Carex trichocarpa* in 2008.

Figure 5b: By 2009, the *C. trichocarpa* and other native sedges (interseeded in 2008) had replaced the reed canarygrass.

2010 Management Activities:

APM Permit Number: 2010 PERMIT #6 (issued 7 April 2010)
(APM Herbicide Treatment Record Submitted 10 May 2010)

2010 management activities consisted of 1) treatment of existing populations, and 2) scouting for additional seedlings and established plants along the length of the Williams-Barneveld Creek at the A to Z property.

Summary of Reed Canarygrass Suppression Activities in 2010

As in 2008-09, reed canarygrass plants that were rooted within the stream and along the streambank were dug out of the sediment, bagged, and removed from the site for destruction. Reed canarygrass clones occurring within ten meters of the stream bank were treated with imazapyr. Reed canarygrass clones occurring more than ten meters from the Williams-Barneveld Creek were treated with sethoxydim. Imazapyr was applied on 8 May 2010. Sethoxydim was also applied on 8 May 2010. In 2010, additional scouting for the presence of reed canarygrass clones took place on 8 May 2009, concomitant with herbicide treatments. Contractors treated a total of 15 small reed canarygrass clones in 2010.

Summary of Watercress Suppression Activities in 2010

As in 2008-09, watercress was harvested with a rake, bagged, and removed from the site for destruction. Similar to 2008-09, only first year (non-flowering) watercress plants were observed in 2010. However, watercress was much more abundant and more widely distributed along the length of the Williams-Barneveld Creek in 2010; contractors bagged and removed a total of eleven 30-gallon trash bags in 2010. Whenever native emergent species were collaterally uprooted during watercress removal, they were immediately replanted in exposed mudflats along the Williams-Barneveld Creek. Watercress removal took place on 1 September 2010.

Treatment Monitoring

The overall management goals of the third year of this project were achieved in 2010. Watercress in this portion of the system was completely removed (at least temporarily), and reed canarygrass clones were prevented from producing viable seed and from expanding clonally at the A to Z site. As previously observed at the A to Z site, most of the reed canarygrass clones treated in 2009 had disappeared and been replaced by native species by 2010. However, new clones had appeared in different locations once again in 2010. As in 2009, most of these clones were small (less than 1 meter in diameter), with the majority of clones consisting of less than five non-flowering culms, indicative of immature reed canarygrass plants arising from recent seed germination. Despite thorough scouting and mechanical removal during two consecutive growing seasons, watercress had increased dramatically in abundance

in 2010 compared to previous years, and it is likely that this species will continue to impact water quality at the A to Z site unless additional future measures are taken to hamper its spread.

Overall Project Assessment

In terms of suppression and eradication of pioneer populations of reed canarygrass and watercress at the A to Z property, two trends are evident: 1) Treatment of existing pioneer populations of these species was highly successful **in the short term**, yet 2) These species are continually attempting to establish themselves at the A to Z property via propagule influx from the adjacent surrounding landscape, from existing on-site propagule banks, and from propagules brought to the site lodged in fur and feathers of wildlife and waterfowl. Nevertheless, annual interventions from 2008 through 2010 have accomplished the overall project goal of preventing pioneer populations of reed canarygrass and watercress from reproducing and/or expanding on the property. Had no intervention been undertaken, these species would likely have already become well established and would be expanding with detrimental impacts to the ecological integrity of this site and the at-risk species it supports. Moreover, the present abundance and distribution of these species at the A to Z property are at a minimal level that can be easily (albeit regularly) handled by volunteer and intern labor provided by TPE.

Table 1: Species collected for interseeding into reed canarygrass treatment zones in 2008. (Nomenclature follows *Flora of North America* (1999 et seq.))

Species	Cleaned Weight (oz.)
Graminoids (12 species)	
Carex hystericina (Porcupine Sedge)	16.500
Carex scoparia (Nodding Sedge)	4.100
Carex stricta (Tussock Sedge)	0.750
Carex stipita (Northern Brown Sedge)	0.900
Carex trichocarpa (Brown Fruited Sedge)	0.150
Carex vulpinoidea (Fox Sedge)	23.750
Eleocharis acicularis (Spike Rush)	0.100
Elymus riparia (Riverbank Wild Rye)	0.500
Glyceria grandis (Tall Managrass) Mudflat Annual	1.225
Scirpus tabernaemontani (Soft Stem Bulrush)	0.100
Scirpus atrovirens (Green Bulrush)	32.600
Scirpus cyperinus (Woolgrass)	4.100
Forbs (7 species)	
Aster novae-anglae (New England Aster)	11.150
Bidens cernua (Bur Marigold) Mudflat Annual	17.900
Bidens frondosa (Common Beggar's Ticks) Mudflat Annual	20.000
Eupatorium maculatum (Spotted Joe Pye Weed)	2.750
Eupatorium perfoliatum (Perfoliate Boneset)	17.200
Helenium autumnale (Sneezeweed)	10.250
Verbena hastata (Tall Vervain)	3.950

Table 2: Species collected for interseeding into reed canarygrass treatment zones in 2009. (Nomenclature follows *Flora of North America* (1999 et seq.))

Species	Cleaned Weight (oz.)
Graminoids (11 species)	
Carex hystericina (Porcupine Sedge)	2.500
Carex pellita (Broad-Leaved Woolly Sedge)	0.125
Carex scoparia (Nodding Sedge)	7.300
Carex stricta (Tussock Sedge)	0.100
Carex stipita (Northern Brown Sedge)	0.250
Carex vulpinoidea (Fox Sedge)	3.750
Eleocharis acicularis (Spike Rush)	0.200
Juncus tenuis (Path Rush)	0.050
Scirpus tabernaemontani (Soft Stem Bulrush)	0.050
Scirpus atrovirens (Green Bulrush)	19.300
Scirpus cyperinus (Woolgrass)	0.750
Forbs (8 species)	
Asclepias incarnata (Swamp Milkweed)	0.100
Aster novae-anglae (New England Aster)	13.200
Bidens cernua (Bur Marigold) Mudflat Annual	4.700
Bidens frondosa (Common Beggar's Ticks) Mudflat Annual	4.000
Eupatorium maculatum (Spotted Joe Pye Weed)	1.100
Eupatorium perfoliatum (Perfoliate Boneset)	17.200
Helenium autumnale (Sneezeweed)	20.500
Verbena hastata (Tall Vervain)	1.150