

Final Report

AIRR-066-09

**“Checking the Spread of Pioneer Populations of Reed Canarygrass and Water
Cress in a Sedge Meadow Remnant along a Tributary of the Black Earth Creek,
Dane County, Wisconsin”**

(Project Duration: 2009 – 2011)

Funded through the DNR Aquatic Invasive Species Grants Program

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Description of the Project Area

The 460-acre Swamplovers Foundation Nature Preserve includes a 26-acre sedge meadow remnant resting upon an Orion series hydric silt loam (Fig. 1). The Otto-Kerl Creek, a tributary of the Black Earth Creek, flows along the eastern border of the sedge meadow remnant. The remnant supports populations of eight species of conservation concern, including Cream Gentian (WI-THR), Tuberous Indian Plantain (WI-SC), a transplanted population of Eastern Prairie Fringed Orchid (WI-END),

Figure 1: The Sedge Meadow Remnant at the Swamplovers Foundation Nature Preserve (In 2011, Post-Restoration).



Pickereel Frog (WI-SC), Sedge Wren (WI-SC), Willow Flycatcher (WI-SC), Pink Streak Moth (WI-SC), and Silphium Borer Moth (WI-SC).

When the property was acquired in 1987, this sedge meadow remnant was on a trajectory toward reed canarygrass invasion and dominance. Twenty-five acres immediately to the north of the sedge meadow had been planted to row crops for several decades prior to the site acquiring permanent protection as a nature preserve. To make the area more suitable for agricultural production, a drainage ditch and drain tiling system had been installed, which disconnected the sedge meadow from its hydrology. Long-term absence of wildfire (the remnant had not experienced fire since the area was originally settled in the early 1800s) encouraged successional progression to shrub-carr/lowland forest dominated by fire-intolerant shrub and tree species such as box elder, black willow, cottonwood, buckthorn, and honeysuckle. This change in vegetation composition altered vegetation height-structure and exacerbated hydrological losses, as these species have high evapotranspiration rates. By 2007, 3.5 acres of the sedge meadow remnant was dominated by reed canarygrass (Fig. 2a), with additional outliers of reed canarygrass expanding into canopy gaps in relic populations of native sedge meadow species (Fig 2b). An additional seven acres existed in the wet meadow condition and was dominated by a matrix of reed canarygrass intermixed with aggressive perennial forbs such as Canada goldenrod and saw-toothed sunflower. Although the wet meadow vegetation association is often recognized as a distinct natural community type, this vegetation assemblage may be a transitional plant community that develops in altered landscapes and represents an intermediate stage between remnant sedge meadow and reed canarygrass dominance. This assertion was supported by the observation that tussocks of *Carex stricta* could still be found under the wet meadow vegetation canopy following the reintroduction of controlled burns (Fig 3). Nitrogen levels were low (10.7 ppm NH₄-N and 9.2 ppm NO₃-N) but available phosphorus levels were high (57 ppm) when measured in 2007.

Figure 2a: The Initial Condition of the Sedge Meadow Remnant (2007).



Figure 2b: Reed Canarygrass Expanding into Relic Sedge Meadow Vegetation (2007).



Figure 3: Tussocks of *Carex stricta* under Wet Meadow Vegetation following a Controlled Burn (2009).



Restoration Approach (Mitigation of Disturbances Prior to Invasive Species Suppression)

Successful restoration of a reed canarygrass-dominated wetland requires not only properly implementing effective control techniques, but also mitigating the underlying disturbances that contribute to and maintain the invaded condition. Restoration initially began in autumn 1998, when a wet-mesic prairie buffer was planted into 22 acres of former cropland bordering the sedge meadow remnant (50 species were planted). This planting was expanded by an additional 3 acres in 2003 (45 species were planted). By 2007, the 25-acre wet-mesic prairie buffer was well-established, with a diverse mixture of self-regenerating native species forming a closed canopy. To partially restore hydrological function to the site, the drain tile system was probed and destroyed with a backhoe in 1999. Hydrological restoration was completed in 2007, when a project to fill the agricultural drainage ditch, recontour the soil surface, and create four small scrape ponds was carried out (Figs. 4a & 4b). Sod-bound reed canarygrass was excavated and buried in the bottom of the ditch, while small sedge-dominated remnant sods were stockpiled for later placement within the newly restored wetland area. Recontouring and scrape pond construction created one acre of bareground space, a condition that often facilitates subsequent reed canarygrass invasion unless a closed vegetation canopy is quickly established. Bareground space was planted on 20 November 2007 with seeds of 60 native species at a rate of 11.9 kg/ha (10.5 lbs/acre) following recommendations being prepared at the time by Wisconsin's Reed Canarygrass Working Group (which were published in 2009). Species were planted according to a log-series abundance curve model, a distribution thought to mimic abundance patterns in undisturbed natural areas and use up all available niche space to discourage reinvasion by reed canarygrass. Seed was obtained from the existing sedge meadow remnant, from local sources near the preserve, and from local nurseries. Exposed bareground surfaces were culimulched to a depth of five cm, and seed was hand-broadcast onto the soil surface. The bareground area was also seeded with perennial rye at a rate

of 4.5 kg/ha (4 pounds per acre) as a cover crop to stabilize the exposed soil from erosion while planted species became established and root bound. Plugs or bare root tubers of an additional 15 sedge meadow and aquatic vascular plant species were planted on 11 June 2008. To encourage transplant success, plugs were dipped in a 4% (a.i.) solution of cytokinin rooting hormone (X-Cyte[®]) immediately prior to planting. During the summer of 2008, basking logs of rot-resistant black locust were placed in two of the ponds for wildlife use.

As expected, reed canarygrass quickly reestablished in the bareground space created by wetland recontouring and scrape construction, likely from multi-nodal rhizome fragments that were spread around by heavy equipment. The initial response to this was to apply a 4% glyphosate (Credit Extra[®]) solution on 7 October 2007 to re-emerging reed canarygrass. Thereafter, spring applications of grass-selective herbicides were employed to enable planted and plugged species to survive and establish. A 2.25% (a.i.) solution of sethoxydim (Sethoxydim G Pro[®]) was applied to reed canarygrass on 28 May 2008. A 0.5% (a.i.) solution of clethodim (Intensity[®]) was applied to reed canarygrass on 29 April 2009, and again on 21 April 2010.

The next phase of the restoration was to remove fire-intolerant trees and shrubs and reintroduce wildfire to the site. Tree and shrub removal took place during the winter of 2008-09, and fire was reintroduced to the site on 20 March 2009 and again on 31 March 2010. To provide burn refugia for a population of *Silphium* borer moth (*Papaipema silphii*, listed as endangered in Wisconsin) regularly sampled within this site, one third of the sedge meadow/wet-mesic prairie buffers were not burned each year. The unburned area varied between burn years so that the entire area experienced fire during the restoration. To provide habitat for Willow Flycatcher, Bebb's Willow was not removed from the remnant.

Figure 4a: Aerial Photograph of the Sedge Meadow Remnant in 2005, Prior to Hydrological Restoration. Management Unit 9 is the Sedge Meadow Remnant, Unit 15 the Wet-Mesic Prairie Buffer, and Unit 13 the Future Ditch Fill/Scrape Pond Area.



Figure 4b: Aerial Photograph of the Sedge Meadow Remnant in 2010, After Hydrological Restoration.



Overall Project Goal

This project was unique in that control efforts for aquatic invasive species are rarely applied in conjunction with removal of disturbances and manipulation of the feedbacks indirectly responsible for maintaining a system in a degraded condition. In 2009, with the major disturbances addressed, reed canarygrass and watercress suppression efforts were initiated with Aquatic Invasive Species Rapid Response Grant AIRR-066-09. The overall goal for this project was to prevent pioneer populations of

reed canarygrass and watercress from reproducing and/or expanding in order to protect the biological and ecological integrity of the remnant sedge meadow vegetation and at-risk species it supports.

Specific Project Objectives

1. To reduce the abundance of, or eradicate, pioneer populations of reed canarygrass expanding into remnant plant communities.
2. To reduce the abundance of, or eradicate pioneer populations of watercress in the tributary creek and internal drainage channels to prevent their downstream migration throughout the Black Earth Creek Priority Watershed.
3. To recover, maintain, and enhance as much of the property's original vegetation community as possible to conserve and protect the sedge meadow's long-term ecological stability.
4. To prevent replacement of listed plant species by reed canarygrass and submersed aquatic vegetation by watercress.
5. To provide for improved water quality and water supply to the Black Earth Creek Priority Watershed and preserve this cold water stream's ecological stability.
6. To provide grassland/wetland resources for the general public to experience, enjoy, and learn from, as well as provide high-quality habitat for indigenous species.

Invasive Species Suppression Methodology

1. Reed Canarygrass

Reed canarygrass clones occurring within 10 (ten) meters of the streambank, but not within the channel itself, were spot treated with a 2% (a.i.) mixture of imazapyr (Habitat[®], a broad-spectrum herbicide registered for use in aquatic systems) and 0.375% (v/v) Induce pH[®], 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 Otto Kerl Creek were treated with the grass-selective herbicide clethodim (Intensity[®]) 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 Otto Kerl Creek. A water-conditioning additive and spreading agent are required for clethodim to perform effectively. Water conditioner (ReQuest®) 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 methylated seed oil/nonionic surfactant additives because the sticking agent it contains minimizes herbicide drift and leaf wash off/rewetting that could have potentially transported clethodim into the Otto Kerl Creek. Treatments were administered for three growing seasons to dampen reed canarygrass reestablishment and resurgence. 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 Swamplovers Nature Preserve. 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.

2009 Management Activities:

APM Permit Number: 2008 PERMIT #1 (issued 23 January 2009)

2009 management activities consisted of 1) conducting a prescribed burn at the site, 2) locating, flagging, and collecting GPS coordinates of at-risk plant species, 3) placing protective exclosures around at-risk plants to protect them from contact with herbicide, 4) scouting and spot treating reed

canarygrass clones, 5) collecting and bagging watercress from the tributary stream, 6) transplanting plugs and multi-nodal rhizome fragments of *Carex trichocarpa*, and 7) seed collecting.

Summary of Reed Canarygrass Suppression Activities in 2009

The entire site was burned on 20 March 2009. Burn permits were secured from the regional DNR office (in Poynette) and from the Village of Cross Plains. Wildfire regimes are both a historical-ecological component of sedge meadow communities and also a way to remove reed canarygrass litter (which has been shown to have a mulching effect on native species) to facilitate native species recruitment from the seed bank. Burning the sedge meadow remnant has the additional advantages of improving site access for more efficient herbicide treatments, and promoting springtime sun-drying for legal use of clethodim herbicide (which cannot be applied to areas where standing water is present). As vegetation reemerged following the burn, contractors scouted, flagged, and took GPS coordinates of at-risk plant species. Records of these species were submitted to Craig Anderson at the WDNR Natural Heritage Inventory (NHI). Immediately prior to herbicide application, at-risk species were covered with plastic ½-gallon exclosures to prevent collateral damage or leaf spotting from contact with herbicides and herbicide additives (Fig. 5). Exclosures were removed approximately 15 minutes after herbicide application.

Figure 5: Protective Exclosures were used to Protect At-Risk Plants from Herbicides.



Large stands of Canada Bluejoint Grass (*Calamagrostis canadensis*) emerged from *Carex stricta* tussocks in some areas of the remnant sedge meadow. In some places, this species was comingled with reed canarygrass. Since Bluejoint Grass was a major historical component of sedge meadow vegetation, and since this species is susceptible to clethodim, areas where reed canarygrass and bluejoint grass were mixed were left untreated in order to avoid collateral damage to bluejoint grass. 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. Imazapyr was applied between 18 and 28 May 2009. Clethodim was applied between 5 May and 12 June 2009. Additional scouting for the presence of reed canarygrass clones took place concurrently with herbicide applications.

Herbicide treatments substantially reduced aboveground abundance of reed canarygrass during the 2009 growing season (Fig. 6). Qualitative treatment monitoring revealed that reed canarygrass resurgence (defined as the ability of a rhizomatous perennial species to recover from herbicide treatments) was minimal to moderate two months following herbicide applications. In August 2009, approximately 20% of clones treated with sethoxydim exhibited resurgence of topgrowth while none of the clones treated with imazapyr resurged. Resurgence was more common in larger reed canarygrass clones, probably because larger clones were older and had developed more extensive networks of dormant rhizome buds from which to recover from herbicide applications to topgrowth. Native at-risk plant species appeared to be unaffected by herbicide treatments (Fig. 7).

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, a total of 33.7 pounds of seeds from 10 graminoids and 13 forbs (Table 1) were collected on-site in October 2009, cleaned (dehusked and dehulled then

passed through cleaning screens), and were interseeded into treated areas following the spring 2010 burn. Focus areas for reseeding were referenced and delineated with markers constructed from ¾-inch stainless steel electrical conduit. Contractors were instructed to collect large amounts of *Silphium* spp. in accordance with management for the Wisconsin-Special Concern *Silphium* Borer Moth (*Papaipema silphii*) which has been documented at the site since 2008. Plugs and rhizome fragments from large clones of the aggressive native sedge *Carex trichocarpa* were harvested and transplanted into larger reed canarygrass clones in July 2009, particularly along the tributary creek to curtail erosion following imazapyr applications. To encourage transplant success, plugs and rhizome fragments were dipped in a 4% solution of cytokinin rooting hormone immediately prior to planting. Most of these transplants survived transplanting and were well established and even expanding in area by the conclusion of the project.

Summary of Watercress Suppression Activities in 2009

Watercress was harvested with a rake, bagged, and removed from the site for destruction. Watercress removal took place on 24 July 2009. Both first-year (non-flowering) and second-year (flowering) plants were observed and collected. A total of five 30-gallon trash bags of watercress were removed from this portion of the Otto Kerl Creek in 2009.

Figure 6: Foliage necrosis (dieback) in a large clone of RCG that was treated with clethodim in spring 2009. The dead thatch was burned and the area was reseeded with native species in spring 2010.



Figure 7: Cream gentian (*Gentiana alba*) and Tuberous Indian Plantain (*Cacalia tuberosa*) emerging from a reed canarygrass clone treated with clethodim in spring 2009.



2010 Management Activities:

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

2010 management activities consisted of 1) conducting a prescribed burn at the site, 2) interseeding species that were collected in 2009, 3) relocating and flagging at-risk plant species, 4) placing protective enclosures around at-risk plants to protect them from contact with herbicide, 5) scouting and spot treating reed canarygrass clones, 6) collecting and bagging watercress from the tributary stream, 7) seed collecting, and 8) hosting two tours of the site for members of *The Prairie Enthusiasts* (June) and *Town of Berry Garden Group* (October). The WDNR AIS program was acknowledged for providing funding assistance with this project during both tours.

Summary of Reed Canarygrass Suppression Activities in 2010

Two-thirds of the site was burned on 31 March 2010. The remaining one-third served as burn refugia for at-risk and fire-sensitive birds, herptiles, and insects known to inhabit the site. Burn permits were secured from the regional DNR office (in Poynette) and from the Village of Cross Plains. Post-burn

sowing of seed collected in autumn 2009 occurred on 1 April 2010. As vegetation reemerged following the burn, contractors used GPS coordinates to relocate and flag at-risk plant species. Immediately prior to herbicide application, at-risk species were covered with plastic ½-gallon exclosures to prevent collateral damage or leaf spotting from contact with herbicides and herbicide additives. Exclosures were removed approximately 15 minutes after herbicide application. 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. Imazapyr was applied on 22 April 2010. Clethodim was applied between 24 April and 28 May 2010. Additional scouting for the presence of reed canarygrass clones took place concurrently with herbicide applications. In October 2010, a total of 13 pounds of seeds from 9 graminoids and 14 forbs (Table 2) were collected on-site and cleaned (dehusked and dehulled then passed through cleaning screens) for interseeding into treated areas.

Summary of Watercress Suppression Activities in 2010

Watercress was harvested with a rake, bagged, and removed from the site for destruction. Watercress removal took place on 9 September 2010. Only first-year (non-flowering) plants were observed and collected. A total of seven 30-gallon trash bags of watercress were removed from this portion of the Otto Kerl Creek in 2010.

2011 Management Activities:

**APM Permit Number: 2011 PERMIT #9-11 (issued 6 April 2011)
(APM Herbicide Treatment Record Submitted 15 June 2011)**

2011 management activities consisted of 1) interseeding species that were collected in 2010, 2) relocating and flagging at-risk plant species, 3) placing protective exclosures around at-risk plants to protect them from contact with herbicide, 4) scouting and spot treating reed canarygrass clones, 5)

collecting and bagging watercress from the tributary stream, and 6) hosting a tour of the remnant for attendees of Invasive Species Awareness Month (ISAM), which was organized by the Invasive Plant Association of Wisconsin (IPAW) and hosted by the Swamplovers Foundation at their nature preserve. The tour was conducted in June 2011, and the WDNR AIS program was acknowledged for providing funding assistance with this project during the tour.

Summary of Reed Canarygrass Suppression Activities in 2011

Site conditions during the spring of 2011 prohibited conducting a prescribed burn within the sedge meadow remnant. In the absence of seed bed preparation provided by a burn, seeds collected during autumn 2010 were sown into litter gaps within treated areas. Once again, at-risk species were relocated using GPS coordinates, covered with plastic ½-gallon enclosures to prevent collateral damage or leaf spotting from contact with herbicides and herbicide additives immediately prior to herbicide application. Enclosures were removed approximately 15 minutes after herbicide application. 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. Imazapyr was applied on 24 May 2011. Clethodim was applied between 1 May and 1 June 2011. Additional scouting for the presence of reed canarygrass clones took place concurrently with herbicide applications.

Summary of Watercress Suppression Activities in 2011

Watercress was harvested with a rake, bagged, and removed from the site for destruction. Watercress removal was performed by Fresh Start Crews and took place in August of 2011. A total of six 30-gallon trash bags of watercress were removed from this portion of the Otto Kerl Creek in 2011.

Project Outcomes and Overall Assessment

Funding from the WDNR Aquatic Invasive Species (AIS) program enabled the Swamplovers Foundation to conduct invasive species treatment efforts to help preserve and protect this unique habitat for the benefit of both the public and the at-risk species that this site supports. Sedge meadow restoration and enhancement at this site is being tied into additional rehabilitation and enhancement projects being conducted in adjacent sections of the Swamplovers' Foundation Nature Preserve to provide Wisconsin's indigenous flora and fauna with a continuum of habitats along the wetland to upland continuum. This project illustrates an integrated, concerted effort to restore and rehabilitate remnant sedge meadow community within a landscape-scale context through the interaction of a non-profit foundation and its funding collaborators, including the U.S. Fish and Wildlife Service Partners for Wildlife Program, Farm Service Agency, and Ducks Unlimited (who provided funding for hydrological restoration), the USDA-NRCS Wildlife Habitat Improvement Program (WHIP) (who provided funding for tree and shrub removal and reintroduction of wildfire to the site), and the Wisconsin DNR Aquatic Invasive Species Program (who provided funding for invasive species suppression and habitat enhancement).

Project Goal:

- ✓ ***To reduce the abundance of, or eradicate, pioneer populations of reed canarygrass expanding into remnant plant communities.***

Following three growing seasons of suppression efforts, reed canarygrass has decreased in abundance by 68%. Moreover, reed canarygrass clones were prevented from producing viable seed and from expanding clonally. It is interesting and noteworthy to compare this rate to the five or six growing seasons typically required to affect a similar change in vegetation composition when grass-selective herbicides are

used in the absence of mitigating underlying disturbances prior to implementing control efforts.

Project Goal:

- ✓ **To recover, maintain, and enhance as much of the property's original vegetation community as possible to conserve and protect the sedge meadow's long-term ecological stability.**

Although reed canarygrass is still present in the sedge meadow remnant, it is intermixed with a diverse variety of native species, and the Swamplovers Foundation has already scheduled additional follow-up suppression efforts for the 2012 growing season and beyond to maintain the gains achieved with AIS funding. Not only did suppression efforts reduce the abundance of reed canarygrass, restoration also decreased vegetation height-structure at this site. Prior to management, herbaceous vegetation height in the degraded condition was up to two meters; reversing the invasion and replacing reed canarygrass and wet meadow vegetation stands with remnant sedge meadow vegetation dominated by sedges and Canada bluejoint grass reduced vegetation height-structure to less than $\frac{3}{4}$ -meter.

Project Goal:

- ✓ **To reduce the abundance of, or eradicate pioneer populations of watercress in the tributary creek and internal drainage channels to prevent their downstream migration throughout the Black Earth Creek Priority Watershed.**

While populations of watercress were not completely eradicated in the course of this project, the species was temporarily removed from the Otto Kerl Creek for a three-year time span. Unfortunately, more watercress is moving into the creek from upstream

infestations, and additional watercress management will be required in future years to sustain this effect.

Project Goal:

- ✓ **To prevent replacement of listed plant species by reed canarygrass and submersed aquatic vegetation by watercress.**

During the course of this project, and indigenous population of Wisconsin-Threatened Tuberous Indian Plantain (*Arnoglossum plantagineum*) more than doubled in abundance, with the majority of new individuals arising in areas that were formerly dominated by reed canarygrass. In 2010, while collecting seed from the remnant, contractors flushed a Woodcock (Wisconsin-Special Concern) from a nest in the project area. In 2011, contractors discovered a small population of Wisconsin-Threatened Marsh Bluegrass (*Poa paludigena*) in an area of the sedge meadow formerly dominated by reed canarygrass (Fig. 8). A record of this finding was submitted to Ryan O'Connor for inclusion in the Natural Heritage Inventory.

Figure 8: Marsh Bluegrass (*Poa paludigena*).



Project Goal:

- ✓ **To provide for improved water quality and water supply to the Black Earth Creek Priority Watershed and preserve this cold water stream's ecological stability.**

Vegetation diversity was preserved and enhanced by reversing the reed canarygrass invasion and temporarily removing watercress from the Otto Kerl Creek, enabling this site to be more effective at capturing and retaining sediments and nutrients that would otherwise have ended up in the Black Earth Creek Priority Watershed.

Project Goal:

- ✓ **To provide grassland/wetland resources for the general public to experience, enjoy, and learn from, as well as provide high-quality habitat for indigenous species.**

Three tours were given of the project area during the course of the AIS-sponsored project, with a combined attendance of more than 70 people from a variety of backgrounds and ages, from college professors and restoration practitioners to elementary school children. Also, a background description and results of this project was published as a case study in the trade journal *Ecological Restoration*, and the Wisconsin DNR's Aquatic Invasive Species Program was acknowledged for its financial contribution:

Annen (2011). Manipulating Internal System Feedbacks to Accelerate Reed Canarygrass (*Phalaris arundinacea*) Control: From Theory to Practice. **Ecological Restoration** 29(3): 222-224.

**Table 1: Species collected in 2009 for interseeding into reed canarygrass treatment zones in 2010.
(Nomenclature follows *Flora of North America* (1999 et seq.))**

Species	Cleaned Weight (oz.)
Graminoids (10 species)	
<i>Calamagrostis canadensis</i> (Canada Blue Joint Grass)	32.750
<i>Carex hystericina</i> (Porcupine Sedge)	19.700
<i>Carex languinosa</i> (Forked Sedge)	1.100
<i>Carex scoparia</i> (Nodding Sedge)	8.975
<i>Carex stipita</i> (Northern Brown Sedge)	16.750
<i>Carex vulpinoidea</i> (Fox Sedge)	55.250
<i>Elymus canadensis</i> (Canada Wild Rye)	16.000
<i>Scirpus tabernaemontani</i> (Soft Stem Bulrush)	2.250
<i>Scirpus atrovirens</i> (Green Bulrush)	64.500
<i>Scirpus cyperinus</i> (Woolgrass)	7.250
Forbs (13 species)	
<i>Asclepias incarnata</i> (Swamp Milkweed)	24.200
<i>Aster ptarmicoides</i> (Swamp Aster)	4.300
<i>Bidens cernua</i> (Bur Marigold) Mudflat Annual	34.950
<i>Bidens frondosa</i> (Common Beggar's Ticks) Mudflat Annual	23.000
<i>Arnoglossum plantagineum</i> (Tuberous Indian Plantain)	4.500
<i>Eupatorium maculatum</i> (Spotted Joe Pye Weed)	35.225
<i>Eupatorium perfoliatum</i> (Perfoliate Boneset)	8.500
<i>Gentiana alba</i> (Cream Gentian)	44.900
<i>Geum allepicum</i> (Yellow Avens)	4.800
<i>Liatris pycnostachya</i> (Prairie Blazing Star)	31.400
<i>Silphium perfoliatum</i> (Cup Plant)	51.000
<i>Silphium terebinthinaceum</i> (Prairie Dock)	34.200
<i>Verbena hastata</i> (Tall Vervain)	3.250
Total	33.7 lbs

**Table 2: Species collected in 2010 for interseeding into reed canarygrass treatment zones in 2011.
(Nomenclature follows *Flora of North America* (1999 et seq.))**

Species	Cleaned Weight (oz.)
Graminoids (9 species)	
<i>Carex hystericina</i> (Porcupine Sedge)	12.000
<i>Carex stipita</i> (Northern Brown Sedge)	1.750
<i>Carex trichocarpa</i> (Brown-Fruited Sedge)	0.500
<i>Carex vulpinoidea</i> (Fox Sedge)	19.250
<i>Juncus tenuis</i> (Path Rush)	0.250
<i>Scirpus tabernaemontani</i> (Soft Stem Bulrush)	2.550
<i>Scirpus atrovirens</i> (Green Bulrush)	15.500
<i>Scirpus cyperinus</i> (Woolgrass)	4.000
<i>Scirpus fluviatilis</i> (River Bulrush)	2.255
Forbs (14 species)	
<i>Asclepias incarnata</i> (Swamp Milkweed)	24.300
<i>Asclepias syriaca</i> (Common Milkweed)	14.800
<i>Aster ptarmicoides</i> (Swamp Aster)	0.990
<i>Bidens cernua</i> (Bur Marigold) Mudflat Annual	10.650
<i>Bidens frondosa</i> (Common Beggar's Ticks) Mudflat Annual	2.950
<i>Arnoglossum plantagineum</i> (Tuberous Indian Plantain)	6.000
<i>Eupatorium maculatum</i> (Spotted Joe Pye Weed)	5.045
<i>Gentiana alba</i> (Cream Gentian)	32.500
<i>Geum allepicum</i> (Yellow Avens)	0.850
<i>Liatris pycnostachya</i> (Prairie Blazing Star)	4.330
<i>Rumex orbiculatus</i> (Great Water Dock)	20.050
<i>Silphium perfoliatum</i> (Cup Plant)	22.000
<i>Silphium terebinthinaceum</i> (Prairie Dock)	3.455
<i>Verbena hastata</i> (Tall Vervain)	2.025
Total	13.0 lbs