

# Boardman Conservation Area Five-Year Restoration Implementation Plan

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October 2008

## I. Background

The 23,000 acre Boardman Conservation Area contains some of the best remaining grassland and shrub-steppe in the Columbia Plateau ecoregion. However, portions of the Conservation Area are dominated by non-native plant species and pose a risk to the remaining high quality habitats. The Boardman Conservation Area Restoration Plan (Elseroad 2007) outlined restoration objectives and methods; this document identifies sites where restoration efforts will be initiated over the next five years, and the schedule for seed collection, site preparation, planting, and monitoring for each site.

## II. Location of restoration sites

Restoration efforts in the next five years will occur in McIntyre Holding and The Field (Figure 1). Portions of these former pastures were identified as Type 1 restoration sites (i.e. dominated by non-native annual plant species) and were rated as “very high” priority for restoration because they are highly degraded and located adjacent to high quality native grassland (Elseroad 2007). Vegetation at these sites is currently dominated by cheatgrass, which has the potential to spread to the adjacent high quality grassland, and if burned, may experience hot and fast moving fires that could also spread. Noxious weeds, including yellow starthistle (*Centaurea solstitialis*) and diffuse knapweed (*Centaurea diffusa*), are present in some areas as well. Therefore, restoring these sites is an important strategy for protecting the adjacent high quality native grassland from both non-native species and uncharacteristically hot fires.

Degraded portions within McIntyre Holding and The Field were divided into six 50 to ~100 acre restoration sites, one of which will be seeded with native grasses each year (Figure 1). Restoration of McIntyre-1 has already been initiated (Carlson 2007, Elseroad 2008), therefore native grass seeding will occur in McIntyre-2 this fall.

## III. Plant material needs

Large quantities of plant materials will be needed for the restoration plantings. The grass seed mix that will be used at each site is shown in Table 1, and the total amount of grass seed and forb plugs needed are shown in Table 2.

### Grass seed

Native grass seed (*Pseudoroegneria spicata*, *Poa secunda*, *Hesperostipa comata*, and *Elymus elymoides*) collected on the Conservation Area is currently being increased by L&H Seeds, Inc. in Connell, WA. Sufficient seed for all species is available for the 2008 planting, and enough *Pseudoroegneria spicata* seed is available for the 2009 planting. Although sufficient seed is not currently available, it is likely that the *Poa secunda*, *Hesperostipa comata*, and

*Elymus elymoides* plants that are currently in production will produce enough seed for the 2009 and 2010 plantings.

Within the next few years, additional on-site seed collections will be needed to maintain the genetic diversity of the seeds that are being increased. Guidelines for maintaining genetic diversity of plant materials recommend that seed used in restoration plantings be harvested only from the original seed collection (the first generation) planted by the commercial grower (Rogers and Montalvo 2004). Although the increased cost associated with first generation seed may limit its use in all restoration plantings, it should be used whenever possible.

The only *Pseudoroegneria spicata* seed that is currently available is from the second generation, therefore additional on-site seed collections should be made in late spring 2009 and sent to the grower for increasing. The first-generation *Poa secunda*, *Hesperostipa comata*, and *Elymus elymoides* seed currently in production will probably produce seed for a few more years, but additional on-site seed collections may be needed by 2010. On-site seed collections should be made at least two years before the increased seed is needed, since it can take several years for the plants to produce sufficient seed for large restoration plantings.

### **Forbs**

Forb seed collected on-site are currently being grown into plugs by The Plantworks, in LaGrande, OR. All plugs currently in production will be planted in McIntyre Holding-1 this fall, therefore additional seed will need to be collected for future plantings. Large quantities of seed will need to be collected every spring and fall (depending on the species) so that sufficient forb plugs will be available for planting.

## **IV. Site preparation**

Site preparation at all restoration sites should focus on reducing annual plant species competition (primarily cheatgrass) prior to and during native grass establishment. Described below are the herbicide-only options, since these are the easiest to implement, but the other site preparation options outlined in the restoration plan (Elseroad 2007) can also be considered.

Herbicide options for reducing cheatgrass competition include glyphosate, a non-specific herbicide, or imazapic (tradename Plateau), which only targets annual species. The optimal time for applying glyphosate is in the spring prior to planting, before seeds are formed. This can be repeated for 2-3 years to reduce the cheatgrass seedbank. The advantage of spraying in the spring is that the herbicide will also reduce some of the other non-native annuals, such as *Erodium cicutarium* and *Sisymbrium altissimum*, in addition to cheatgrass. Another option is to spray glyphosate in the winter after planting the native grass seed, but this should be done before late January to avoid spraying early emerging native grasses seedlings. The disadvantage of spraying glyphosate in the winter is that the reduction in cheatgrass can cause increases in other non-native annuals, since they emerge later in the season and are thus not affected by the herbicide. This occurred in the McIntyre-1 restoration site, which was sprayed with 16 oz/acre of glyphosate in early February 2007. Although the glyphosate did substantially reduce cheatgrass (Elseroad 2008), in spring 2008 there was a large increase in *Erodium cicutarium* in sprayed areas.

Imazapic should be used as a pre-emergent herbicide, and applied in the fall before cheatgrass emerges, and just prior to planting grass seed. In research plots on the Conservation Area, imazapic applied in the fall at 4 oz/acre successfully reduced cheatgrass and other annuals for at least two years. The advantage of imazapic compared to glyphosate is that it only has to be applied once for two years of control, and it is easier to ensure that it is applied at the proper time, since it is used before cheatgrass emerges. The disadvantage of imazapic is it can lead to large increases in Russian thistle (*Salsola kali*), as seen in the research plots, and there is some evidence that it may reduce establishment of seeded native species (Bekedam 2004, Sheley et al. 2007).

In Table 3, four herbicide-only site preparation options are listed. Only Option 2 has been tested on the Conservation Area so far, therefore it is difficult to predict which option will be most effective. The optimal site preparation option will be the one that results in the greatest non-native annual weed reduction, the greatest establishment of planted species, and uses the least amount of herbicide. The best way to compare the effectiveness of the herbicide-only site preparation options is to develop a small-scaled research project. Treatments could include those listed in Table 3, and be implemented starting in spring 2009.

#### **IV. Planting**

Planting will consist of seeding native grasses in the fall with a rangeland drill and hand-transplanting native forb plugs the following fall. Timing of planting and plant materials needed for each restoration site are shown in Table 2, and assumes that all forb plugs are planted in one season. Depending on plug availability, however, forb transplanting may need to be split over two years.

Recommended seeding and transplanting rates are provided in Tables 1 and 2, but these should only be considered guidelines. The rates and/or species used should be modified if monitoring results indicate that the methods used were not successful. For example, initial seeding efforts on the Conservation Area using the rates in Table 2 resulted in low grass establishment in McIntyre-1 (Elsroad 2008), but because results were partially attributed to problems with the seed drill, the same mix will be used again this year. However, if establishment rates are still low when the new Truax range drill is used, seeding rates should be increased, or transplanting with grass plugs should be considered. Similarly, if some of the forb species consistently experience high mortality rates, species with higher survival rates should be used instead.

#### **IV. Post-planting weed control**

Options for controlling weeds once the native species are established are limited to spot-spraying, hand-pulling, or broadcast spraying herbicides that will not damage the native species. For controlling cheatgrass, imazapic can be sprayed in the fall or a low concentration of glyphosate can be sprayed in the winter when the native plants are dormant.

Since the need for post-planting weed control cannot be predicted, and will probably vary by restoration site, the specific methods used and the timing of weed control are not included in this plan. However, monitoring results should be used to evaluate whether additional weed control is needed.

## V. Monitoring

For the first three sites that are planted (McIntyre Holding-1, McIntyre Holding-2, and McIntyre Holding-3), grass and forb monitoring will occur at the following time periods: 1 year post-planting, 2-years post-planting, 3-years post-planting, 5-years post-planting, and 10-years post-planting. For the remaining sites (McIntyre Holding-4, McIntyre Holding-5, The Field-1, The Field-2), monitoring will be scaled back and will occur at the following time periods: 1 year post-planting, 5-years post-planting, and 10-years post-planting. The first three sites will be monitored more frequently to provide information about initial seedling germination and survival, which can be used to adjust seeding rates. The monitoring schedule for each site is shown in Table 3.

Monitoring grass plantings will consist of measuring the density of all seeded grass species, and the cover of all species in 1m<sup>2</sup> plots. A detailed description of monitoring methods is available in Elseroad (2008). Forb monitoring will consist of tracking the survival of 50 individuals of each species in each restoration site.

After the 5 years post-planting monitoring for grasses is completed for each site, monitoring results should be evaluated to determine whether restoration objectives set in the restoration plan have been met. Restoration objectives for Type 1 restoration sites (which include all the sites identified in this plan) are to: 1) increase native perennial herbaceous cover to at least 50% of total plant cover and 2) decrease non-native species cover to less than 50% of total plant cover. If objectives have not been met, decisions should be made about whether further restoration activities are needed, such as additional planting or weed control.

## VI. Scheduling

Table 5 lists the schedule for all restoration activities associated with the McIntyre Holding and The Field restoration sites from 2008-2024. This table combines the schedules for planting, site preparation, monitoring listed in Tables 2, 3, and 4, and also includes dates for additional seed collection, monitoring reports and evaluations, and the amount of time need to complete each task.

## VII. Literature cited

Bekedam, S. 2004. Establishment tolerance of six native sagebrush steppe species to imazapic (Plateau) herbicide: Implications for restoration and recovery. M.S. Thesis, Oregon State University, Corvallis, OR.

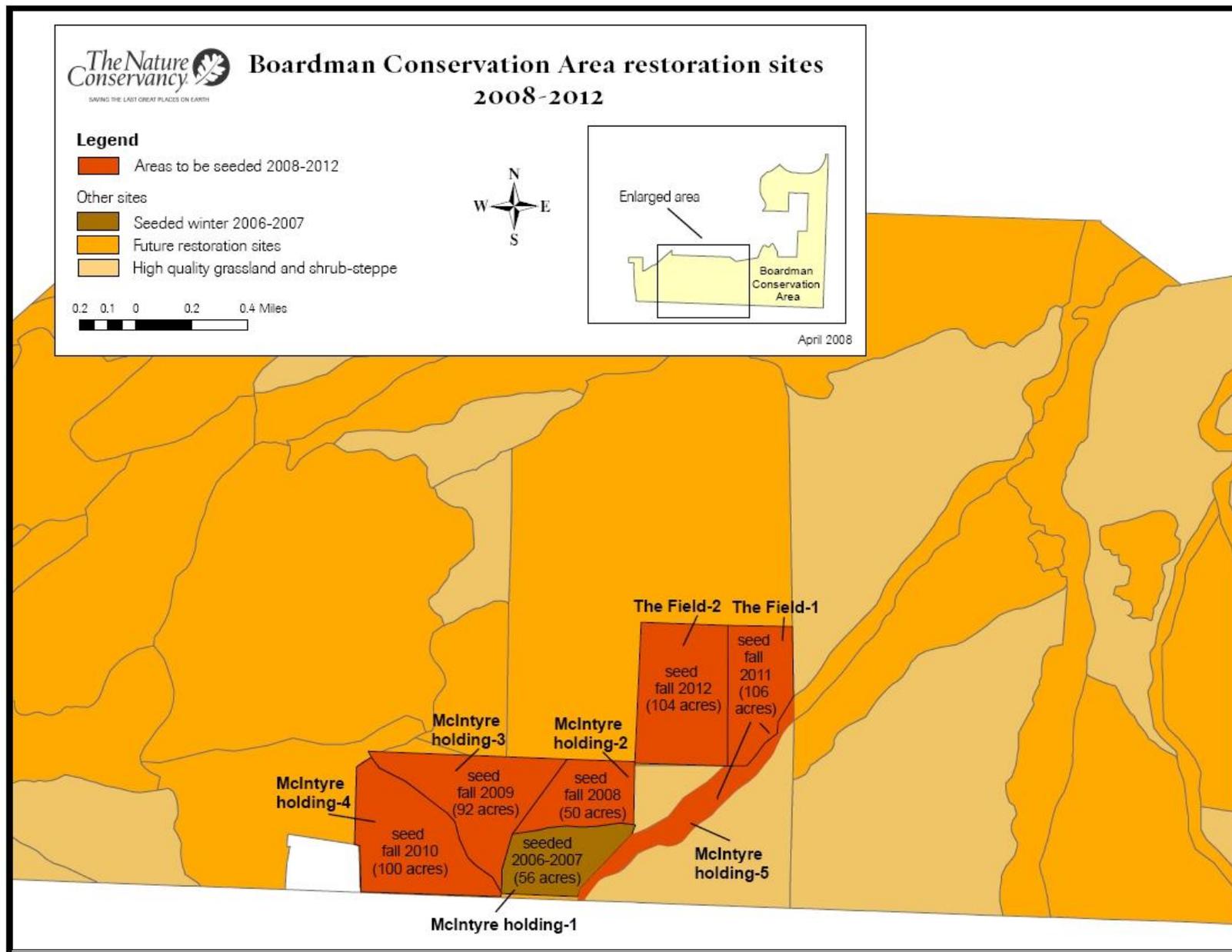
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<http://www.fs.fed.us/r2/publications/botany/plantgenetics.pdf>

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**Figure 1. Priority restoration sites on the Boardman Conservation Area**

**Table 1. Grass seed mix for 2008-2012 Boardman Conservation Area restoration plantings.**

Species	% of mix	lbs. PLS/ acre
Pseudoroegneria spicata	55	6.6
Hesperostipa comata	15	1.8
Poa secunda	20	2.4
Elymus elymoides	10	1.2
	<b>100</b>	<b>12</b>

**Table 2. Plant material needs for Boardman Conservation Area restoration projects initiated in 2008-2012.** Lbs. of grass seed needed are based on the seeding rates provided in Table 1, and the number of forb plugs needed is based on a planting density of 100 plugs/acre.

	McIntyre holding-2	McIntyre holding-3	McIntyre holding-4	McIntyre holding-5 + The Field-1	The Field-2	5 year total
<b>Total acres</b>	50	92	100	106	104	<b>452</b>
Grass seeding date	Fall 2008	Fall 2009	Fall 2010	Fall 2011	Fall 2012	
Forb planting date	Fall 2009	Fall 2010	Fall 2011	Fall 2012	Fall 2013	
<b>Grass species</b>	<b>lbs. PLS needed</b>					
Pseudoroegneria spicata	330	607	660	693	686	<b>2977</b>
Hesperostipa comata	90	166	180	189	187	<b>812</b>
Poa secunda	120	221	240	252	250	<b>1082</b>
Elymus elymoides	60	110	120	126	125	<b>541</b>
<b>Forb species</b>	<b>number of plugs needed</b>					
Achillea millefolium	333	613	666	699	693	<b>3004</b>
Antennaria dimorpha	333	613	666	699	693	<b>3004</b>
Astragalus filipes	333	613	666	699	693	<b>3004</b>
Astragalus purshii	333	613	666	699	693	<b>3004</b>
Astragalus sclerocarpus	333	613	666	699	693	<b>3004</b>
Balsamorhiza careyana	333	613	666	699	693	<b>3004</b>
Calochortus macrocarpus	333	613	666	699	693	<b>3004</b>
Chrysopsis villosa	333	613	666	699	693	<b>3004</b>
Erigeron filifolius	333	613	666	699	693	<b>3004</b>
Eriogonum niveum	333	613	666	699	693	<b>3004</b>
Erigeron pumilis	333	613	666	699	693	<b>3004</b>
Linum lewisii var. lewisii	333	613	666	699	693	<b>3004</b>
Lomatium macrocarpum	333	613	666	699	693	<b>3004</b>
Oenothera pallida ssp. pallida	333	613	666	699	693	<b>3004</b>
Phlox longifolia	333	613	666	699	693	<b>3004</b>
<b>Total plugs per site</b>	<b>4,995</b>	<b>9,191</b>	<b>9,990</b>	<b>10,490</b>	<b>10,390</b>	<b>45,055</b>

**Table 3. Herbicide-only site preparation options for Boardman Conservation Area restoration sites. Option 1 and Option 4 are likely to result in the greatest annual weed reductions.**

<b>Herbicide option</b>	<b>McIntyre Holding-2</b>	<b>McIntyre Holding-3</b>	<b>McIntyre Holding-4</b>	<b>McIntyre Holding-5 + The Field-1</b>	<b>The Field-2</b>
<b>OPTION 1:</b> Imazapic- applied October, same year as grass seeding	October 2008	October 2009	October 2010	October 2011	October 2012
<b>OR</b>					
<b>OPTION 2:</b> Glyphosate- applied 1st January post-grass seeding	January 2009	January 2010	January 2011	January 2012	January 2013
<b>OR</b>					
<b>OPTION 3:</b> Glyphosate- applied April, same year as grass seeding AND Glyphosate- applied 1st January post-grass seeding	-	April 2009, January 2010	April 2010, January 2011	April 2011, January 2012	April 2012, January 2013
<b>OR</b>					
<b>OPTION 4:</b> Glyphosate- applied April, year prior to grass seeding AND Glyphosate- applied April, same year as grass seeding	-	-	April 2009, April 2010	April 2010, April 2011	April 2011, April 2012

**Table 4. Monitoring schedule for Boardman Conservation Area restoration sites.**

	<b>McIntyre Holding-1</b>	<b>McIntyre Holding-2</b>	<b>McIntyre Holding-3</b>	<b>McIntyre Holding-4</b>	<b>McIntyre Holding-5 + The Field-1</b>	<b>The Field-2</b>
<b>Pre-treatment monitoring</b>	completed May 2006	completed May 2007	May 2009	May 2010	May 2011	May 2012
<b>Grass seed</b>						
one year post-seeding	May 2007	May 2009	May 2010	May 2011	May 2012	May 2013
2 years post-seeding	May 2008	May 2010	May 2011	-	-	-
3 years post-seeding	May 2009	May 2011	May 2012	-	-	-
5 years post-seeding	May 2011	May 2013	May 2014	May 2015	May 2016	May 2017
10 years post-seeding	May 2016	May 2018	May 2019	May 2020	May 2021	May 2022
<b>Forb plugs</b>						
1 year post-planting	May 2008	May 2010	May 2011	May 2012	May 2013	May 2014
2 years post-planting	May 2009	May 2011	May 2012	-	-	-
3 years post-planting	May 2010	May 2012	May 2013	-	-	-
5 years post-planting	May 2012	May 2014	May 2015	May 2016	May 2017	May 2018
10 years post-planting	May 2017	May 2019	May 2020	May 2021	May 2022	May 2023

**Table 5. Schedule for all restoration activities in McIntyre Holding and The Field on the Boardman Conservation Area, 2008-2024.** Site preparation options refer to Table 3. Although only one option should be used at each site, the schedule for each potential option is listed.

<b>Date</b>	<b>Project type</b>	<b>Restoration site</b>	<b>Tasks</b>	<b>Staff/volunteer hours needed</b>	<b>Person responsible</b>
<b>2008</b>					
October 2008	Planting	McIntyre Holding-1	Plant 1,250 remaining forbs	63 hrs.	All staff/volunteers
October 2008	Planting	McIntyre Holding-2	Mark planting and spray area	5 hrs.	Land steward/Preserve Assistant
October 2008	Site preparation-Option 1	McIntyre Holding-2	Spray imazapic	-	Contractor
November 2008	Planting	McIntyre Holding-2	Plant grass seed	40 hrs.	Land steward/Preserve Assistant
<b>2009</b>					
January 2009	Site preparation-Option 2	McIntyre Holding-2	Spray glyphosate	-	Contractor
February 2009	Monitoring	All sites monitored to date	Complete 2006-2008 restoration monitoring report	35 hrs.	Plant ecologist
April 2009	Site preparation-Option 3	McIntyre Holding-3	Spray 1st glyphosate application	-	Contractor
April 2009	Site preparation-Option 4	McIntyre Holding-4	Spray 1st glyphosate application	-	Contractor
May 2009	Monitoring	McIntyre Holding-1	Monitor 1st forb planting (yr. 2 post-planting)	3 hrs.	Plant/Field ecologist
May 2009	Monitoring	McIntyre Holding-1	Monitor 2nd forb planting (year 1 post-planting)	3 hrs.	Plant/Field ecologist
May 2009	Monitoring	McIntyre Holding-1	Monitor grass planting (year 3 post-seeding)	3 hrs.	Plant/Field ecologist
May 2009	Monitoring	McIntyre Holding-2	Monitor grass planting (year 1 post-seeding)	3 hrs.	Plant/Field ecologist
May 2009	Monitoring	McIntyre Holding-3	Collect pre-treatment monitoring data	3 hrs.	Plant/Field ecologist
Late spring 2009	Seed collection	McIntyre Holding-2	Collect forb seed for plug grow-out	60 hrs.	Seasonal staff/volunteers
Late spring 2009	Seed collection	All sites planted after 2010	Collect Pseudoregneria spicata seed for grow-out	40 hrs.	Seasonal staff/volunteers
Summer/Fall 2009	Seed collection	McIntyre Holding-2	Collect forb seed for plug grow-out	30 hrs.	Staff/volunteers
October 2009	Planting	McIntyre Holding-2	Plant 5,000 forbs	250 hrs.	All staff/volunteers
October 2009	Planting	McIntyre Holding-3	Mark planting and spray area	5 hrs.	Land steward/Preserve Assistant
October 2009	Site preparation-Option 1	McIntyre Holding-3	Spray imazapic	-	Contractor
October 2009	Planting	McIntyre Holding-3	Plant grass seed	160 hrs.	Land steward/Preserve Assistant

Date	Project type	Restoration site	Tasks	Staff/volunteer hours needed	Person responsible
<b>2010</b>					
January 2010	Site preparation-Option 2	McIntyre Holding-3	Spray glyphosate	-	Contractor
January 2010	Site preparation-Option 3	McIntyre Holding-3	Spray 2nd glyphosate application	-	Contractor
February 2010	Monitoring	All sites monitored to date	Complete 2006-2009 monitoring report	35 hrs.	Plant ecologist
April 2010	Site preparation-Option 3	McIntyre Holding-4	Spray 1st glyphosate application	-	Contractor
April 2010	Site preparation-Option 4	McIntyre Holding-4	Spray 2nd glyphosate application	-	Contractor
April 2010	Site preparation-Option 4	McIntyre Holding-5 + The Field-1	Spray 1st glyphosate application	-	Contractor
May 2010	Monitoring	McIntyre Holding-1	Monitor 1st forb planting (year 3 post-planting)	3 hrs.	Plant/Field ecologist
May 2010	Monitoring	McIntyre Holding-1	Monitor 2nd forb planting (year 2 post-planting)	3 hrs.	Plant/Field ecologist
May 2010	Monitoring	McIntyre Holding-2	Monitor forb planting (year 1 post-planting)	3 hrs.	Plant/Field ecologist
May 2010	Monitoring	McIntyre Holding-2	Monitor grass planting (year 2 post-seeding)	3 hrs.	Plant/Field ecologist
May 2010	Monitoring	McIntyre Holding-3	Monitor grass planting (year 1 post-seeding)	3 hrs.	Plant/Field ecologist
May 2010	Monitoring	McIntyre Holding-4	Collect pre-treatment monitoring data	3 hrs.	Plant/Field ecologist
Late spring 2010	Seed collection	McIntyre Holding-3	Collect forb seed for plug grow-out	60 hrs.	Seasonal staff/volunteers
Late spring 2010	Seed collection	All sites planted after 2011	Collect Elymus elymoides, Hesperostipa comata, and Poa secunda seed for grown-out (as needed)	120 hrs.	Seasonal staff/volunteers
Summer/Fall 2010	Seed collection	McIntyre Holding-3	Collect forb seed for plug grow-out	30 hrs.	Staff/volunteers
October 2010	Planting	McIntyre Holding-3	Plant 10,000 forbs	500 hrs.	All staff/volunteers
October 2010	Planting	McIntyre Holding-4	Mark planting and spray area	5 hrs.	Land steward/Preserve Assistant
October 2010	Site preparation-Option 1	McIntyre Holding-4	Spray imazapic	-	Contractor
October 2010	Planting	McIntyre Holding-4	Plant grass seed	160 hrs.	Land steward/Preserve Assistant
<b>2011</b>					
January 2011	Site preparation-Option 2	McIntyre Holding-4	Spray glyphosate	-	Contractor
January 2011	Site preparation-Option 3	McIntyre Holding-4	Spray 2nd glyphosate application	-	Contractor

Date	Project type	Restoration site	Tasks	Staff/volunteer hours needed	Person responsible
April 2011	Site preparation-Option 3	McIntyre Holding-5 + The Field-1	Spray 1st glyphosate application	-	Contractor
April 2011	Site preparation-Option 4	McIntyre Holding-5 + The Field-1	Spray 2nd glyphosate application	-	Contractor
April 2011	Site preparation-Option 4	The Field-2	Spray 1st glyphosate application	-	Contractor
May 2011	Monitoring	McIntyre Holding-1	Monitor 2nd forb planting (year 3 post-planting)	3 hrs.	Plant/Field ecologist
May 2011	Monitoring	McIntyre Holding-1	Monitor grass planting (year 5 post-seeding)	3 hrs.	Plant/Field ecologist
May 2011	Monitoring	McIntyre Holding-2	Monitor forb planting (year 2 post-planting)	3 hrs.	Plant/Field ecologist
May 2011	Monitoring	McIntyre Holding-2	Monitor grass planting (year 3 post-seeding)	3 hrs.	Plant/Field ecologist
May 2011	Monitoring	McIntyre Holding-3	Monitor forb planting (year 1 post-planting)	3 hrs.	Plant/Field ecologist
May 2011	Monitoring	McIntyre Holding-3	Monitor grass planting (year 2 post-seeding)	3 hrs.	Plant/Field ecologist
May 2011	Monitoring	McIntyre Holding-4	Monitor grass planting (year 1 post-seeding)	3 hrs.	Plant/Field ecologist
May 2011	Monitoring	McIntyre Holding-5 + The Field-1	Collect pre-treatment monitoring data	3 hrs.	Plant/Field ecologist
Late spring 2011	Seed collection	McIntyre Holding-4	Collect forb seed for plug grow-out	60 hrs.	Seasonal staff/volunteers
Summer/Fall 2011	Seed collection	McIntyre Holding-4	Collect forb seed for plug grow-out	30 hrs.	Staff/volunteers
October 2011	Planting	McIntyre Holding-4	Plant 10,000 forbs	500 hrs.	All staff/volunteers
October 2011	Planting	McIntyre Holding-5 + The Field-1	Mark planting and spray area	5 hrs.	Land steward/Preserve Assistant
October 2011	Site preparation-Option 1	McIntyre Holding-5 + The Field-1	Spray imazapic	-	Contractor
October 2011	Planting	McIntyre Holding-5 + The Field-1	Plant grass seed	160 hrs.	Land steward/Preserve Assistant
<b>2012</b>					
January 2012	Site preparation-Option 2	McIntyre Holding-5 + The Field-1	Spray glyphosate	-	Contractor
January 2012	Site preparation-Option 3	McIntyre Holding-5 + The Field-1	Spray 2nd glyphosate application	-	Contractor
February 2012	Monitoring	All sites monitored to date	Complete 2006-2011 monitoring report	35 hrs.	Plant ecologist
February 2012	Evaluation	McIntyre Holding-1	Evaluate whether restoration objectives have been met	4 hrs.	Plant ecologist/Project manager
April 2012	Site preparation-Option 3	The Field-2	Spray 1st glyphosate application	-	Contractor
April 2012	Site preparation-Option 4	The Field-2	Spray 2nd glyphosate application	-	Contractor
May 2012	Monitoring	McIntyre Holding-1	Monitor forb planting (year 5 post-planting)	3 hrs.	Plant/Field ecologist
May 2012	Monitoring	McIntyre Holding-2	Monitor forb planting (year 3 post-planting)	3 hrs.	Plant/Field ecologist

<b>Date</b>	<b>Project type</b>	<b>Restoration site</b>	<b>Tasks</b>	<b>Staff/volunteer hours needed</b>	<b>Person responsible</b>
May 2012	Monitoring	McIntyre Holding-3	Monitor forb planting (year 2 post-planting)	3 hrs.	Plant/Field ecologist
May 2012	Monitoring	McIntyre Holding-3	Monitor grass planting (year 3 post-seeding)	3 hrs.	Plant/Field ecologist
May 2012	Monitoring	McIntyre Holding-4	Monitor forb planting (year 1 post-planting)	3 hrs.	Plant/Field ecologist
May 2012	Monitoring	McIntyre Holding-5 + The Field-1	Monitor grass planting (year 1 post-seeding)	3 hrs.	Plant/Field ecologist
May 2012	Monitoring	The Field-2	Collect pre-treatment monitoring data	3 hrs.	Plant/Field ecologist
Late spring 2012	Seed collection	McIntyre Holding-5 + The Field-1	Collect forb seed for plug grow-out	60 hrs.	Seasonal staff/volunteers
Late spring 2012	Seed collection	Seed collection	Collect Pseudoregneria spicata seed for grown-out (as needed)	40 hrs.	Seasonal staff/volunteers
Summer/Fall 2012	Seed collection	McIntyre Holding-5 + The Field-1	Collect forb seed for plug grow-out	30 hrs.	Staff/volunteers
October 2012	Planting	McIntyre Holding-5 + The Field-1	Plant 10,000 forbs	500 hrs.	All staff/volunteers
October 2012	Planting	The Field-2	Mark planting and spray area	5 hrs.	Land steward/Preserve Assistant
October 2012	Site preparation-Option 1	The Field-2	Spray imazapic	-	Contractor
October 2012	Planting	The Field-2	Plant grass seed	160 hrs.	Land steward/Preserve Assistant
<b>2013</b>					
January 2013	Site preparation-Option 2	The Field-2	Spray glyphosate	-	Contractor
January 2013	Site preparation-Option 3	The Field-2	Spray 2nd glyphosate application	-	Contractor
February 2013	Monitoring	All sites monitored to date	Complete 2006-2012 monitoring report	35 hrs.	Plant ecologist
May 2013	Monitoring	McIntyre Holding-1	Monitor 2nd forb planting (year 5 post-planting)	3 hrs.	Plant/Field ecologist
May 2013	Monitoring	McIntyre Holding-2	Monitor grass planting (year 5 post-seeding)	3 hrs.	Plant/Field ecologist
May 2013	Monitoring	McIntyre Holding-3	Monitor forb planting (year 3 post-planting)	3 hrs.	Plant/Field ecologist
May 2013	Monitoring	McIntyre Holding-5 + The Field-1	Monitor forb planting (year 1 post-planting)	3 hrs.	Plant/Field ecologist
May 2013	Monitoring	The Field-2	Monitor grass planting (year 1 post-seeding)	3 hrs.	Plant/Field ecologist
Late spring 2013	Seed collection	The Field-2	Collect forb seed for plug grow-out	60 hrs.	Seasonal staff/volunteers
Summer/Fall 2013	Seed collection	The Field-2	Collect forb seed for plug grow-out	30 hrs.	Staff/volunteers
October 2013	Planting	The Field-2	Plant 10,000 forbs	500 hrs.	All staff/volunteers
<b>2014</b>					
February 2014	Monitoring	All sites	Complete 2006-2013 monitoring report	35 hrs.	Plant ecologist
February 2014	Evaluation	McIntyre Holding-2	Evaluate whether restoration objectives have been met	4 hrs.	Plant ecologist/Project manager
May 2014	Monitoring	McIntyre Holding-2	Monitor forb planting (year 5 post-planting)	3 hrs.	Plant/Field ecologist

<b>Date</b>	<b>Project type</b>	<b>Restoration site</b>	<b>Tasks</b>	<b>Staff/volunteer hours needed</b>	<b>Person responsible</b>
May 2014	Monitoring	McIntyre Holding-3	Monitor grass planting (year 5 post-seeding)	3 hrs.	Plant/Field ecologist
May 2014	Monitoring	The Field-2	Monitor forb planting (year 1 post-planting)	3 hrs.	Plant/Field ecologist
<b>2015</b>					
February 2015	Monitoring	All sites	Complete 2006-2014 monitoring report	35 hrs.	Plant ecologist
February 2015	Evaluation	McIntyre Holding-3	Evaluate whether restoration objectives have been met	4 hrs.	Plant ecologist/Project manager
May 2015	Monitoring	McIntyre Holding-3	Monitor forb planting (year 5 post-planting)	3 hrs.	Plant/Field ecologist
May 2015	Monitoring	McIntyre Holding-4	Monitor grass planting (year 5 post-seeding)	3 hrs.	Plant/Field ecologist
<b>2016</b>					
February 2016	Monitoring	All sites	Complete 2006-2015 monitoring report	35 hrs.	Plant ecologist
January 2016	Evaluation	McIntyre Holding-4	Evaluate whether restoration objectives have been met	4 hrs.	Plant ecologist/Project manager
May 2016	Monitoring	McIntyre Holding-1	Monitor grass planting (year 10 post-seeding)	3 hrs.	Plant/Field ecologist
May 2016	Monitoring	McIntyre Holding-4	Monitor forb planting (year 5 post-planting)	3 hrs.	Plant/Field ecologist
May 2016	Monitoring	McIntyre Holding-5 + The Field-1	Monitor grass planting (year 5 post-seeding)	3 hrs.	Plant/Field ecologist
<b>2017</b>					
February 2017	Monitoring	All sites	Complete 2006-2016 monitoring report	35 hrs.	Plant ecologist
February 2017	Evaluation	McIntyre Holding-5 + The Field-1	Evaluate whether restoration objectives have been met		Plant ecologist/Project manager
May 2017	Monitoring	McIntyre Holding-5 + The Field-1	Monitor forb planting (year 5 post-planting)	3 hrs.	Plant/Field ecologist
May 2017	Monitoring	The Field-2	Monitor grass planting (year 5 post-seeding)	3 hrs.	Plant/Field ecologist
<b>2018</b>					
February 2018	Monitoring	All sites	Complete 2006-2017 monitoring report	35 hrs.	Plant ecologist
February 2018	Evaluation	The Field-2	Evaluate whether restoration objectives have been met	4 hrs.	Plant ecologist/Project manager
May 2018	Monitoring	McIntyre Holding-1	Monitor 2nd forb planting (year 10 post-planting)	3 hrs.	Plant/Field ecologist
May 2018	Monitoring	McIntyre Holding-2	Monitor grass planting (year 10 post-seeding)	3 hrs.	Plant/Field ecologist
May 2018	Monitoring	The Field-2	Monitor forb planting (year 5 post-planting)	3 hrs.	Plant/Field ecologist
<b>2019</b>					
February 2018	Monitoring	All sites	Complete 2006-2018 monitoring report	35 hrs.	Plant ecologist
May 2019	Monitoring	McIntyre Holding-2	Monitor forb planting (year 10 post-planting)	3 hrs.	Plant/Field ecologist

<b>Date</b>	<b>Project type</b>	<b>Restoration site</b>	<b>Tasks</b>	<b>Staff/volunteer hours needed</b>	<b>Person responsible</b>
May 2019	Monitoring	McIntyre Holding-3	Monitor grass planting (year 10 post-seeding)	3 hrs.	Plant/Field ecologist
<b>2020</b>					
February 2018	Monitoring	All sites	Complete 2006-2019 monitoring report	35 hrs.	Plant ecologist
May 2020	Monitoring	McIntyre Holding-3	Monitor forb planting (year 10 post-planting)	3 hrs.	Plant/Field ecologist
May 2020	Monitoring	McIntyre Holding-4	Monitor grass planting (year 10 post-seeding)	3 hrs.	Plant/Field ecologist
<b>2021</b>					
February 2018	Monitoring	All sites	Complete 2006-2020 monitoring report	35 hrs.	Plant ecologist
May 2021	Monitoring	McIntyre Holding-4	Monitor forb planting (year 10 post-planting)	3 hrs.	Plant/Field ecologist
May 2021	Monitoring	McIntyre Holding-5 + The Field-1	Monitor grass planting (year 10 post-seeding)	3 hrs.	Plant/Field ecologist
<b>2022</b>					
February 2018	Monitoring	All sites	Complete 2006-2021 monitoring report	35 hrs.	Plant ecologist
May 2022	Monitoring	McIntyre Holding-5 + The Field-1	Monitor forb planting (year 10 post-planting)	3 hrs.	Plant/Field ecologist
May 2022	Monitoring	The Field-2	Monitor grass planting (year 10 post-seeding)	3 hrs.	Plant/Field ecologist
<b>2023</b>					
February 2023	Monitoring	All sites	Complete 2006-2022 restoration monitoring report	35 hrs.	Plant ecologist
May 2023	Monitoring	The Field-2	Monitor forb planting (year 10 post-planting)	3 hrs.	Plant/Field ecologist
<b>2024</b>					
February 2024	Monitoring	All sites	Complete 2006-2023 restoration monitoring report	35 hrs.	Plant ecologist