

# Upland Restoration Monitoring at the Williamson River Delta Preserve – 2012 Results



Basin Wildrye,  
Riverbend Field



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On the Tulana portion of the Williamson River Delta Preserve (the Delta), approximately 775 acres were not flooded in 2007 when sections of levee were removed to hydrologically reconnect the Delta to Upper Klamath and Agency lakes. Five hundred of these acres are leased to a local farmer for agriculture production. The remaining 275 acres of upland habitat in Tulana have been the focus of an upland restoration project, initiated in 2005. In the fall of 2009 roughly 180 acres were planted with varying combinations of basin wildrye (*Leymus cinereus*), Idaho fescue (*Festuca idahoensis*), bottlebrush squirreltail (*Elymus elymoides*) and Nuttall’s/Lemmon’s alkaligrass (*Puccinellia nuttalliana*; Figure 1). The wildrye and Idaho fescue were collected locally and then propagated for seed by Jerry Benson of BFI Native Seeds in Moses Lake, Washington while the bottlebrush squirreltail and alkaligrass were purchased from a commercial seed grower in Utah. Riverbend (64 acres) and Searchlight (26 acres) fields were planted with basin wildrye and Idaho fescue and Camp field (37 acres) and Strip field (54 acres) were planted with wildrye, squirreltail, and alkaligrass. The objective of the upland restoration is to establish native vegetation—native grass, forb, and shrub species—that was historically present at the site or exists at sites with similar characteristics (soil and precipitation).

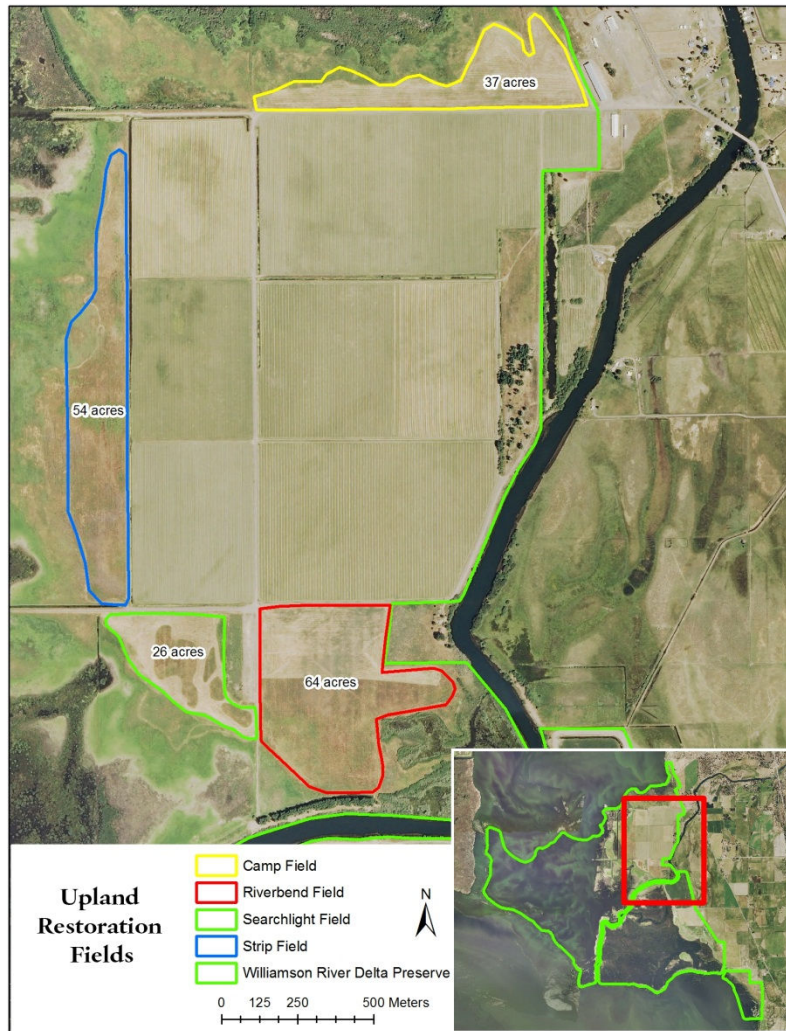


Figure 1. Location of four upland restoration fields, Williamson River Delta Preserve, Upper Klamath Lake, Oregon.

Since the initial native grass seeding in 2009, a variety of management actions, including herbicide spraying and mowing, have been used to reduce the populations of introduced species such as cheatgrass (*Bromus tectorum*) and tall tumbled mustard (*Sisymbrium altissimum*) and to help establish the native grass species. In 2011, roughly 350 pounds of common yarrow (*Achillea millefolium*), Lewis flax (*Linum lewisii*), threadleaf fleabane (*Erigeron filifolius*), and Wyeth's buckwheat (*Eriogonum heracleoides*) seed were purchased from BFI Native Seeds and hand broadcasted in October on all four fields. These forb species were identified as species that occur at similar sites. After seeding, the fields were mowed to ensure proper soil to seed contact and that a mulch layer was present.

A monitoring program has been in place since 2010 to assess the success or failure of the restoration project (Elseroad and others, 2011). Twenty five 1m<sup>2</sup> plots in each field were surveyed each year, beginning in 2010. Plot locations were randomly selected prior to sampling using Hawth's tools in ArcMap and are intended to be re-randomized each year that monitoring occurs, which will allow a larger percentage of the area to be sampled over time. In each plot, data collected included the density of each seeded species (grasses and forbs) and the aerial cover of all plant species and ground surface type (bare ground or litter). Results from the 2012 monitoring, completed in June and July, are presented here.

Mean densities of native grasses, 3-4 plants per m<sup>2</sup>, remained similar to densities observed in 2011 (mean density 3-6 per m<sup>2</sup>). Slight increases in seeded native grass density were observed in Searchlight and Strip fields compared to 2011, while slight decreases were observed in the other two fields, Riverbend and Camp. Strip field had the lowest density of native grasses,  $2.6 \pm 0.49$  plants per m<sup>2</sup>, and Camp field had the highest,  $4.04 \pm 0.61$  plants per m<sup>2</sup>. Wildrye, Idaho fescue, and squirreltail continue to be the most abundant native grasses, with no alkaligrass observed in 2012. Only one alkaligrass plant was observed in 2011. Seeded native grass cover increased from 21% in 2011 to 33% in 2012. Cover of wildrye and squirreltail increased from 2011 in all fields where the species were planted. Idaho fescue cover increased in Riverbend field but decreased in Searchlight field.

No forbs seeded in 2011 were found in Searchlight and Riverbend fields. This could be a result of the timing of the survey. These two fields were sampled in early June, possibly prior to the emergence of the species. Stripfield and Camp field were sampled in late July, roughly a month and a half after Searchlight and Riverbend fields were sampled, and both common yarrow and Lewis flax were recorded in these fields. Density of yarrow was  $0.64 \pm 0.4$  plants per m<sup>2</sup> in Camp field and no plants were found in Strip field. Density of Lewis flax in Camp field was  $0.76 \pm 0.64$  plants per m<sup>2</sup> and  $1.4 \pm 1.2$  plants per m<sup>2</sup> in Strip field. It is likely that densities of both species will increase in subsequent years. However, if densities remain similarly low in 2013 and if no fleabane and Wyeth's buckwheat are found, it might be necessary to replant forb species using a different method.

Cheatgrass is an introduced annual grass that has become widely distributed throughout the West and poses a serious threat, both economically and ecologically. Cheatgrass and tall tumbled mustard, another introduced species, are present in all four upland restoration fields and threatened the ability of native grasses and forbs to become permanently established. Cheatgrass cover in 2012, 32%, was similar to cheatgrass cover in 2011 and seeded native grass cover in 2012. Cheatgrass cover increased in Camp and Strip fields, but decreased and remains lower in Riverbend and Searchlight fields. Cheatgrass cover in Camp and Strip fields was  $49.32\% \pm 5.12\%$  and  $43.24\% \pm 5.46\%$ , respectively. Cheatgrass cover was below 20% in both Riverbend and Searchlight fields. Tall tumbled mustard cover remained relatively low in all four fields, but increased in cover from 2011 in Camp and Riverbend fields. Tumbled mustard cover was highest in Riverbend field at  $3.04\% \pm 1.82\%$ .

In July and August 2011, Camp and Strip field were mowed entirely while only certain portions of Riverbend and Searchlight field were mowed (Figure 2). Mowing is a management strategy intended to limit the abundance of introduced species and stimulate the growth of the native grasses. However, it is unknown if this is effective strategy for accomplishing these objectives. Portions of Riverbend and Searchlight field were left un-mowed as an attempt to more rigorously gauge the response in plant density and cover to mowing. After fields were seeded with forbs in October 2011, Camp and Strip fields were mowed in their entirety while only portions that were mowed in July in Searchlight and Riverbend fields were mowed again.

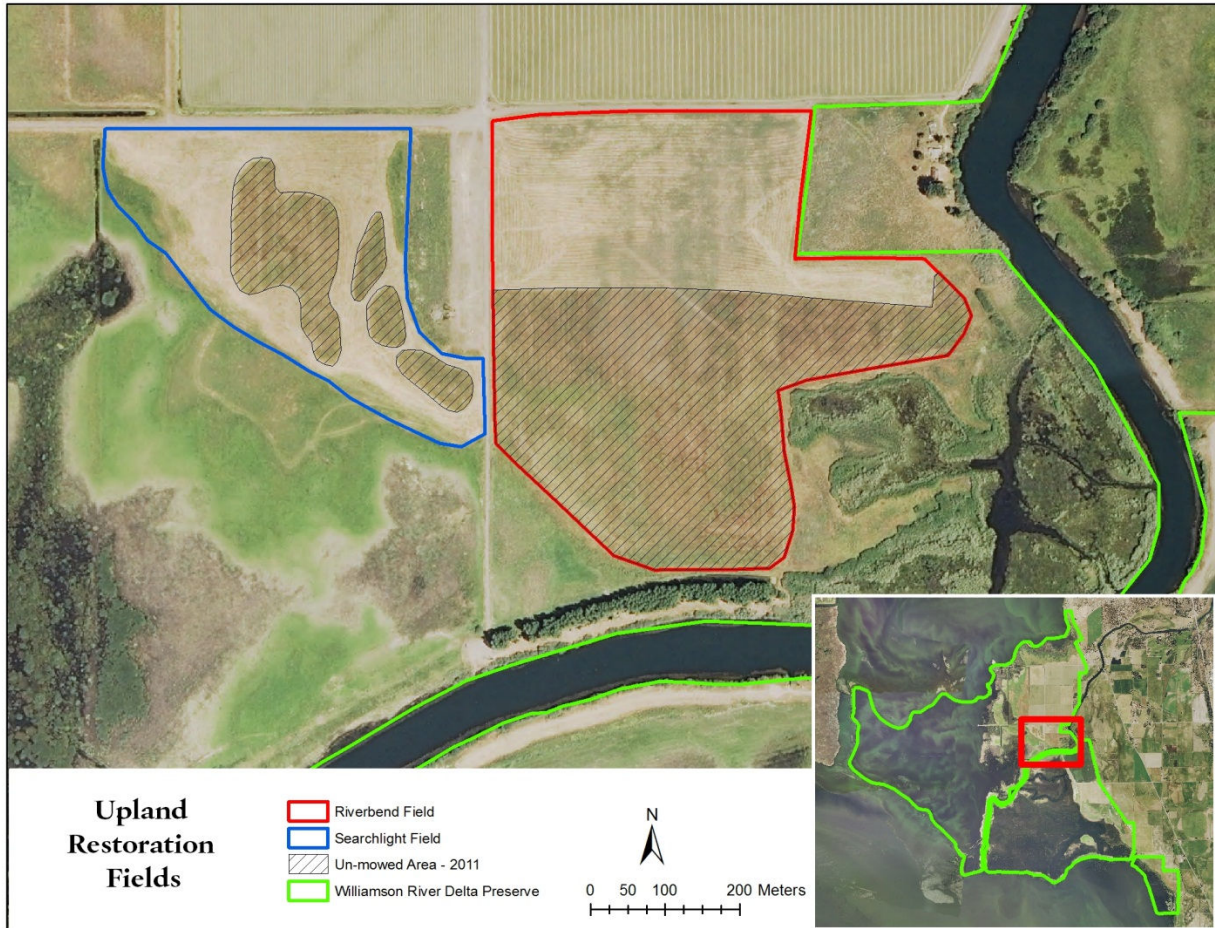


Figure 2. Portions of Riverbend and Searchlight field that were not mowed in 2011.

Mowing did not seem to have a substantial effect on the density of native grasses. In both Riverbend and Searchlight fields, mean densities were slightly less in un-mowed plots compared to mowed plots. When data from all fields are combined, native grass density in mowed plots was  $3.6 \pm 0.33$  plants per  $m^2$  while only  $3.4 \pm 0.5$  plants per  $m^2$  in un-mowed plots (Figure 3). Mowing appeared to decrease the cover of native grasses and increase the cover of cheatgrass. Native grass cover was greater in un-mowed plots compared to mowed plots in Searchlight field. Conversely, in Riverbend field native grass cover was greater in mowed plots. When data from the two fields are combined, seeded native grass cover in mowed plots was  $34.2\% \pm 4.02\%$  compared to  $38.3\% \pm 6.55\%$  in un-mowed plots, suggesting

that mowing actually reduced the aerial cover of the native grass species which could result in increased cheatgrass growth. Cover of cheatgrass was substantially less in un-mowed plots in both fields than in mowed plots (Figure 4), a possible result of the plants being shaded out by the larger and more dominant wildrye plants. No fields were mowed in 2012 and monitoring will continue in 2013. Additional data collection will help clarify the relationship between mowing and density and cover of native and introduced species in these fields. To achieve a higher degree of scientific certainty regarding this relationship, it might be necessary to sample the same plot each year rather than sample random plots.

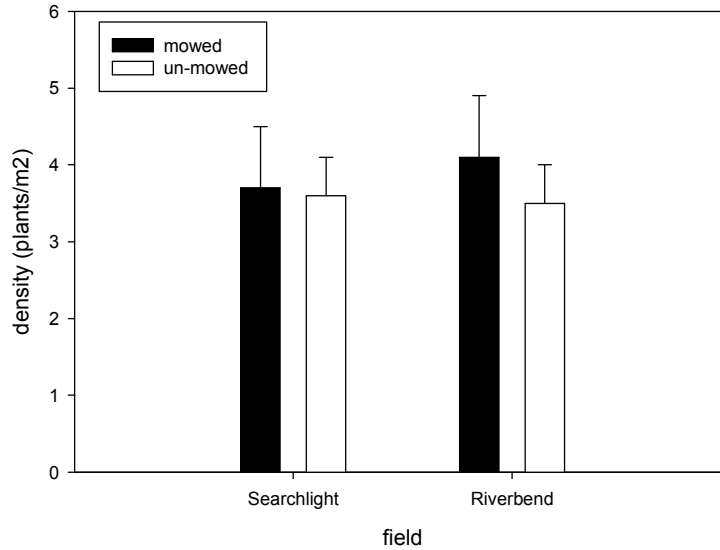


Figure 3. Densities of seeded native grasses in mowed and un-mowed plots in Searchlight and Riverbend Fields.

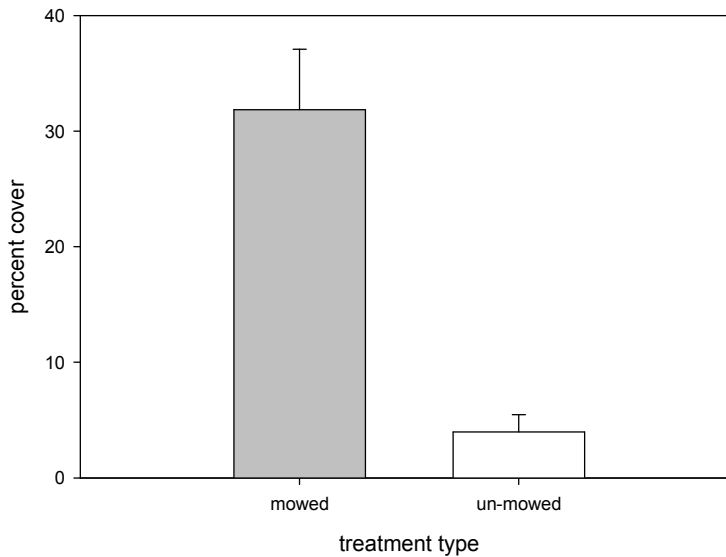


Figure 4. Cheatgrass cover in mowed and un-mowed plots in Searchlight and Riverbend fields.

Upland restoration in the Tulana portion of the Delta has been successful in establishing three native grass species: basin wildrye, squirreltail, and Idaho fescue. Density of the three species seems to have stabilized after a substantial decrease from 2010 to 2011. Cover of the established plants continues to increase and can be expected to increase during the next few years. Cheatgrass cover seems to have stabilized as well and the cover of non-native broadleaf species remained low in 2012. Mowing appears to increase cheatgrass cover and reduce seeded native grass cover; however, more data collection is necessary to increase the certainty of this relationship. Seeded forb establishment was low, with common yarrow and Lewis flax detected only in small numbers in Camp and Strip fields. Densities are expected to increase over the next few years, but replanting could be necessary.

### **Literature Cited**

Elseroad, A, H. Hendrixson, C. Erdman, and N. Rudd. 2011. Upland restoration monitoring at the Williamson River Delta—first year results. The Nature Conservancy, unpublished report.