

Case History Library of Shrub Steppe and Grassland Restoration Projects in the Columbia River Basin 10/18/2011

This case history library is a companion document to the Shrub Steppe and [Grassland Restoration Manual For the Columbia River Basin](http://wdfw.wa.gov/publications/01330) (<http://wdfw.wa.gov/publications/01330>). Interviews with pioneering restoration specialists during the creation of the manual indicated that many lessons were independently learned via the slow, expensive, frustrating process of trial and error. Interviews also indicated that documenting and sharing project information would be a powerful means of accelerating the science and art of restoration. The manual includes a Restoration Project Documentation Form that was created so managers can conveniently and uniformly record planning and implementation activities as they occur and then share details about projects. The template provides for narratives, summary tables, monitoring data, photographs, and attaching of ancillary documents to create a comprehensive case history that can be shared with others who might be assigned in mid-project, colleagues, funding institutions, and other interested parties. While the template asks for standard information to allow for meaningful comparisons of projects, there is no limit on what information goes into the case histories.

It is important to note that case histories need not be fully completed to be of value. Partially completed case histories can also serve as the basis for initial funding requests, progress reports and applications for continuing financial support. In fact, case histories are never really done. The evaluation of current conditions section can be repeatedly completed at different post-project time intervals to track the trajectory of a site.

This case history library currently contains ten case histories for projects of different ages representing a variety of restoration project scenarios. The case history examples herein were created after-the-fact based on notes or memory of the project staff. Accordingly, the case histories are not necessarily the best examples of project documentation. Naturally, the case histories would be more detailed if the template existed before the projects started and managers had foreknowledge that details about their projects would one day be openly shared. Nevertheless, these case histories provide details about a variety of challenging projects that have never been recorded for distribution. It should be noted that the case histories were not selected to only represent the most successful projects. Rather, the case histories were selected to provide a description of a variety of situations, outcomes and lessons learned. In some case histories, project managers point out mistakes, unexplained failures, or unanticipated successes to help others learn from their experiences. The project managers deserve respect for their candor.

Going forward project managers should be able to produce more detailed case histories with little extra effort. Two versions of Restoration Project Documentation Form can be downloaded [with](#) and [without](#) embedded instructions.

All of the intermediate work products that the manual suggests that people create throughout a project like the seed mix, or monitoring report forms can be directly inserted into the Restoration Project Documentation Form to gradually create a complete case history.

The form should be used as the project progresses, starting with the earliest phases of planning. Instructions within the form should be deleted after they are no longer needed. When documentation proceeds as the project progresses, it is easy to include details that are otherwise soon forgotten or later require more effort to retrieve.

Going forward, WDFW, BLM, and others can add to this case history library by submitting case histories to Richard Tveten at Richard.Tveten@dfw.wa.gov . If all future projects contributed to a shared case history library, project proponents could quickly gain insights learned from recent, similar projects and apply them to their projects. Likewise, the information could be used to prioritize research and update the manual.

Case History Index

Page	Name	County	Planted/evaluation year	Interesting points
3	Happy Hill	Okanogan	2007/3	Mix of native grasses established, some forbs, dealing with intermediate wheatgrass and Russian knapweed
9	Silver Hill	Okanogan	2000/10	Sherman big bluegrass largely took over and desired structural diversity not obtained. Good control of intermediate wheatgrass and Russian knapweed.
14	Coulee Creek	Okanogan	2000/10	Nice stand of mixed bunch gasses, Russian knapweed controlled. Did not plant forbs due to broadleaf weeds issues.
20	Anderson 1	Lincoln	1997/13	Replaced cheat grass, with a mix of native grasses, shrubs invading.
25	Anderson 2	Lincoln	2008/2	Overcame crested wheatgrass, planted too much Sherman big bluegrass, forbs did well
30	Horace Smith Field	Douglas	2009/1	Very fast stabilization of erodible, sandy soils with Indian ricegrass. Working to control cereal rye and annual bursage. Forbs added in second year.
39	Rattlesnake Slope	Benton	2003/5	Post –fire restoration, aerial seeding, overcame cheat grass. Experienced herbicide problems.
46	Sunnyside Alkaline	Yakima	2007/3	Alkaline soils. Site with naturally high productivity and low diversity. Overcame Kochia and Russian knapweed with Great basin wildrye and tall wheatgrass (non-native). Inland saltgrass is re-invading but greasewood is not.
52	Central Ferry Field	Douglas	1987/24	Long post-restoration history. Successful bitterbrush establishment.
57	Sheridan Field	Kittitas	2004/7	Mid-elevation, higher moisture site. Dense stand of weed-free native bunchgrasses. Managed as elk food plot. Initial problems occurred with aerial seeding and spraying

Happy Hill Restoration Site Documentation

Recorded By: Jim Olson

Contact information: 509-826-4430, James.Olson@dfw.wa.gov

Date Recorded: 02/16/2011

Location and Site Attributes:

Project name	Happy Hill, LLC		
County	Okanogan		
Location	T35 R25 S34 NE ¼	Lat. 48.491923	Long . -119.674158
Wildlife area and Unit	Scotch Creek, Boyce acquisition		
Restored area size	25 acres		
Ownership	WDFW		
Elevation	2,620 ft		
Aspect	N		
Slope	1-10%		
Annual Precipitation*	14"		

*<http://prismmap.nacse.org/nn/index.phtml>

Soils: Conconully gravelly ashy loam, 0 to 25 percent slopes, extremely stony

Adjacent land use and condition: Native Shrub-steppe to West and North, previously restored shrub-steppe to the east, and private rangeland to the south.

Site History: This site was converted to non-native grasses (Intermediate Wheatgrass) by the previous owner, and managed as a Percheron horse ranch since the early 1970's. Native species had been completely replaced with non-native grasses and invasive weeds including mostly diffuse knapweed. Historically the site functioned as sharp-tail grouse habitat but sharp-tail grouse no longer use the site.

Project Goals:

Ecological goals

- The site will attain the species and structural composition necessary to provide sharp tail grouse nesting and brood rearing habitat
- The historically dominant functional group (structurally diverse native bunchgrasses) will be restored.
- Forbs will provide diversity and food for young sharp-tailed grouse.
- The restored ecosystem will consist of indigenous species to the greatest practicable extent.

Cultural goals

- Eliminate weed sources that could impact neighboring land owners

Note: The historically low level of shrubs will not be restored. It is presumed that shrubs will spontaneously invade from surrounding seed sources

Site Preparation: See table 2

Seed Mix: See table 3

Planting: See table 4

Post-planting weed control and other management actions: See table 5
Evaluation of Current Conditions

Date of status assessment: 9-29-2010 (3 years post planting)

Current Status: No data collected after three years but the restoration site is primarily dominated by native bunchgrass species. Forbs: Yarrow is abundant. Small, scattered buckwheat and lupine plants are present. Intermediate wheatgrass and Russian knapweed are present but at low levels.

Goals realization: After three years a native grass/forbs mix has been achieved to the degree possible with the seed mix composition. Aside from yarrow, forb establishment is slow. Weed sources that could impact neighboring land owners have been successfully suppressed but further work is needed.

Special circumstances affecting outcomes: None

Keys to present level of success: Good seedbed preparation, No disturbances allowed.

Project site future: Continue development of a mixed stand of native grasses. Slow invasion of shrubs expected. Non-native intermediate wheatgrass may regain prominence.

Table 1: Soils, ecological sites, and presumed dominant species

Soils (see map in soils reports)	% of site	Ecological site name or reference site description	Presumed species composition climatic climax dominants
Conconully gravelly ashy loam, 0 to 25 percent slopes, extremely stony	100	R006XY012WA	Idaho fescue (900 lbs/acre) Bluebunch wheatgrass (435/lbs/acre) Sandberg Bluegrass (90/lbs/acre) Cusick's bluegrass (75/lbs/acre) Bottlebrush squirrel tail (60/lbs/acre) All shrubs (105/lbs/acre) Forbs and half shrubs (415/lbs/acre)

Table 2: Site preparation:

	Action	Objective(s)	Observations/Notes (chemicals, equipment used, and special issues).
April	Spray	Kill pre-existing plants	Per weather conditions, early April
April	Moldboard Plow	Remove residue, and bury weed seed bank	If deep soil conditions exist
May thru September	Disk and harrow	Keep weed free seedbed	Continued as needed for each "green-up"
May thru September	Inspect	Assess conditions	Used chemical control if seedbed is powder dry
Early October	Remove rocks	To make mowing available as a mgmt tool	Helps to get jail crews, saves your staff
Late October	Culti-pack	Firm seedbed	Also helps to wait until fall rains firm the seedbed
First of November	Seed	Establish shallow seeding	Always calibrate seed drill

Table 3: Seed Mix:

Species	Pounds/acre PLS
Wheatgrass, Whitmar	2
Bluebunch Wheatgrass, Goldar	2
Snake River Wheatgrass, Secar	2
Idaho 'Fescue	1
Sandbergs Bluegrass	.5
Western Yarrow	.05
Blue Flax	.5
Snow Buckwheat	1
Lupine	1
Arrowleaf Balsamroot	3
Antelope Bitterbrush	1

Table 4: Planting:

Date	First week of November, 2007
Methods(s) and planting equipment	Tye native grass seed drill
Planting depths	Less than ½ inch preferred
Seeding Rate (lbs/acre, or seeds s.f)	13.05 lbs per acre
Special actions taken	None, good seedbed prep
Fertilizers/soil amendments	None

Table 5: Post Planting Actions and Observations.

Date	Action	Observations/Notes (Weed control chemicals and equipment used, effectiveness, inspection observations, any special issues).
Early March	Inspect	Watch for cheatgrass, and bulbous bluegrass, spray out if dominate
Late March	Broadcast Spray	Before perennial species emerge
April	Inspect	Note perennial species emerging
April	Spot spray	As needed with Buctril, before weeds are > 1" wide.
First of June, thru July	Mow	As needed for mustards, other annual weeds
Aug thru October	Inspect	May need to spot spray nasty perennial weeds.
Next 2 years	Inspect	Mow and spot spray as needed. After year 3, you should have successful establishment of native species.

Attachments

Site map

Post-project images

Site Map: For more details see attached site-specific soil survey



Post-project images:

Area 3 years after planting (recently mowed to control Russian knapweed.) 9/29/2010



Non-mowed area 3 years after planting 9/29/2010.



Silver Hill Restoration Site Documentation

Recorded By: Jim Olson

Contact information: 509-826-4430, James.Olson@dfw.wa.gov

Date Recorded: 9/29/2010

Location and Site Attributes:

Project name	Silver Hill Road, Lek field		
County	Okanogan		
Location	T35 R25 S15 NW ¼	Lat. 48.537181	Long. - 119.682055
Wildlife area and Unit	Unit: Scotch Creek, Headquarters		
Restored area size	157 acres		
Ownership	WDFW		
Elevation	2,360ft		
Aspect	Southeast		
Slope	2-5%		
Annual Precipitation*	14"		

Soils: See Table 1

Adjacent land use and condition: Degraded grassland per description in site history

Site History: This site was converted to agriculture from native shrub steppe by the previous owners for the purpose of cattle production over the past 100 years. Native vegetation had been completely replaced with Intermediate wheatgrass (non-native grass) and invasive weeds including Russian Knapweed, Diffuse Knapweed, Common Mullein, and Cheatgrass. Historically the site functioned as sharptail grouse habitat, but sharp-tailed grouse populations in this area have declined and no longer use the site.

Establish the reference ecosystem or “reference.”: Columbia plateau steppe and Grassland - Extensive grasslands, dominated by perennial bunch grasses and forbs (>25% cover) sometimes with a sparse (<10% cover) shrub layer. Presumed dominants include Blue bunch wheatgrass, Idaho fescue, bottlebrush squirrel tail and Sandberg’s g bluegrass. See Table 1 for presumed historic vegetation composition

Project goals.

1. The site will attain the species and structural composition necessary to provide sharp tail grouse nesting and brood rearing habitat
 - a. The historically dominant functional group (native bunchgrasses) will be restored.
 - b. Forbs will provide diversity and food for young Sharp-tailed grouse.
 - c. The restored ecosystem will consist of native species to the greatest practicable extent.
 2. Eliminate weed sources that could impact seeding success and neighboring land owners
- Note: The historically low level of shrubs will was not actively restored. It was presumed that shrubs will spontaneously invades from surrounding seed sources

Site Preparation: See Table 2

Seed Mix: See Table 3

Planting: See Table 4

Post-planting weed control and other management actions: See Table 5

Evaluation of Current Conditions

Date of status assessment: _____ 9/29/2010 _____

Current Status: Near-monoculture of Sherman’s big bluegrass. Very few weeds present. Native forbs largely absent after 10years.

Goals realization: I have observed many Sharp-tails using these Sherman dominated fields.

No performance measures were originally specified for this site but after 10 years the following observations were made in relation to the ex post facto objectives and success criteria were set for vegetation to try and describe how project outcomes compared to original desires. *The following represents best professional judgment and are not based on qualitative monitoring data.*

Success criteria (10 year)	2010 Year Observation	Conclusion	Adaptive management recommendation
Combined native grasses cover to exceed 50%	Greater than 50%	Success	NA
No single species to exceed 80% of the total plant cover.	Near monoculture of Sherman’s big bluegrass	Not successful, (portions of larger field)	Monitor for thinning of stand and invasion of native plants.
Non-natives species not to exceed 20%	Non-native plants exceed 20% in portions of field.	Not successful, (in portions of field only)	Mow and spot spray to remove non-native plants. Fall application to avoid nesting Sharp-tailed grouse.
Noxious weeds not to exceed 5%	Russian knapweed present but <1%	Success	NA

Special circumstances affecting outcomes: None noted.

Keys to present level of success: Good seedbed preparation. No disturbances allowed.

Lessons learned note: Keep good notes, and weekly or bi-weekly observations. Take more pictures. Reduce Sherman big bluegrass seeding rate.

Project site future: Continued near-monoculture of Sherman’s big bluegrass in the short term.

Eventually I expect thinning of the Sherman Big Bluegrass stand and invasion of other native species. Also slow invasion of shrubs and Russian Knapweed expected to return. Continue to monitor at this time.

Reintroduce forbs at some point. Use research in progress to determine best approach to introduce native forbs. I would not suggest starting over on this field.

Table 1: Presumed pre-degradation species

Soils (see map in soils reports)	% of site	Ecological site* name or reference site description	Presumed species composition climatic climax dominants
Conconully gravelly ashy loam, extremely stony	100	R006XY102WA	Grasses 65% <ul style="list-style-type: none"> • Idaho fescue • Bluebunch wheatgrass • Sandberg’s bluegrass • Cusick’s bluegrass • Bottlebrush squirrel tail Forbs and half shrubs 28% <ul style="list-style-type: none"> • lupines predominant Shrubs 7%

*Ecological site descriptions are attached as appendix B

Table 2: Site preparation: Note - Reconstructed from memory 10 years later.

Date	Action	Objective(s)	Observations/Notes (chemicals, equipment used, and special issues).
April 1	Initial spraying	Kill pre-existing plants	Glyphosphate, Per weather conditions.
May 1	Initial plowing	Kill pre-existing plants	Moldboard plow if soil conditions allow, otherwise rolling disk plow with sheet harrows. Continue as needed for each “green-up”.
Weekly, (June through September)	Inspect	Assess conditions, and weed control. Keep seedbed clean and free of all vegetation.	Mechanical or chemical control as needed. Use glyphosphate (after summer rains if available). Disk, or Rod weed if site is too dry and conditions allow.
First two weeks of October	Pick Rocks	Prevent damage to equipment. Remove all rocks that will interfere with mower.	Helps to enlist jail trustees, if available, for this job.
Last two weeks of October	Harrow and pack	Level and firm seedbed. Should be able to see only depth of boot prints in soil.	In combination with disking, or alone to level and firm seedbed. Use tine harrows (to avoid pulling up more rocks) and culti-packer.

Table 3:

Seed mix:	Species	Lbs/acre
	Secar (Snake River) Bluebunch Wheatgrass	3
	Goldar Bluebunch Wheatgrass	1
	Whitmar Bluebunch Wheatgrass	1
	Scwindamar Thickspike Wheatgrass	1
	Idaho Fescue	.5

Covar Sheep Fescue	.5
Sherman Big Bluegrass	.4
Lupine	.5
Yarrow	.3
Ladak Alfalfa	1.0
Magnar Basin Wildrye	.5

Table 4: Planting: Note - Reconstructed from memory 10 years later.

Date	11/1/2000
Methods(s) and planting equipment	Tye seed drill with depth bands and packer wheels
Planting depths	<½ inch
Seeding Rate (lbs per acre, or seeds per foot)	8.8 lbs/acre
Special actions taken	Helps to wait until the first few fall rains to further firm the seedbed.
Fertilizers/soil amendments	No

Table 5: Post Planting Actions and Observations. Note - Reconstructed from memory 10 years later.

Date	Action	Observations/Notes (Weed control chemicals and equipment used, effectiveness, inspection observations, any special issues).
March 15-30	Inspect	Watch for cheatgrass, and bulbous bluegrass and spray (light rate of glyphosphate) if they dominate, before perennial species emerge.
April 1 – 30	Inspect	Watch for carpets of small annual broadleaf weeds. Spot spray with Buctril while weeds are small.
June 1-July 30	Mow	Before annual weeds set seed. May take two or more passes.

Attachments

Map: For more details see attached site-specific soil survey



Post-project photographs: Photograph taken 10 years after planting on 9/29/2010.

Coulee Creek Restoration Site Documentation

Recorded By: Jim Olson

Contact information: 509-826-4430, James.Olson@dfw.wa.gov

Date Recorded: 9/29/2010

Location and Site Attributes:

Project name	Coulee Creek Field west of Alfalfa	
County	Okanogan	
Location	T35 R25 S23 NW ¼	Lat. 48.52047 Long. -119.660168
Wildlife area and Unit	Unit: Scotch Creek, Coulee Creek Drainage	
Restored area size	62 acres	
Ownership	WDFW	
Elevation	1,700ft	
Aspect	East	
Slope	2-5%	
Annual Precipitation	14"	

Soils: See Table 1.

Adjacent land use and condition: Alfalfa field adjacent to east possible weed source.

Site History: This site was converted to agriculture by the previous owners for the purpose of cattle production over the past 100 years. Native species had been completely replaced with non-native grasses and invasive weeds including Russian knapweed. Historically the site functioned as sharptail grouse habitat but sharptail grouse no longer use the site.

Presumed historic condition is Columbia plateau steppe and Grassland: Extensive grasslands, dominated by perennial bunch grasses and forbs (>25% cover) sometimes with a sparse (<10% cover) shrub layer. Presumed dominants include Blue bunch wheatgrass, Idaho fescue, bottlebrush squirrel tail and Sandberg's bluegrass.

Project Goals:

3. The site will attain the species and structural composition necessary to provide sharp tail grouse nesting and brood rearing habitat
 - a. The historically dominant functional group (native bunchgrasses) will be restored.
 - b. Forbs will provide diversity and food for young Sharp-tailed grouse.
 - c. The restored ecosystem will consist of indigenous species to the greatest practicable extent.
4. Eliminate weed sources that could impact seeding success and neighboring land owners

Note: The historically low level of shrubs will was not actively restored. It was presumed that shrubs will spontaneously invades from surrounding seed sources

Ex post facto 10-year performance standards

- Combined native grass cover to exceed 80%
- No single species to exceed 80% of the total plant cover
- Non-natives species cover not to exceed 20% cover
- Noxious weeds not to exceed 5% cover

Site Preparation: See Table 2

Seed Mix: See Table 3

Planting: See Table 4

Post-planting weed control and other management actions: See Table 5

Evaluation of Current Conditions

Date of status assessment: _____9/29/2010__ (10 years post planting_____)

Current Status: No data collected but the restoration site is dominated by the planted native bunchgrass species. Non-native plants are a minor component and noxious weed cover is very low. Native forbs are largely not present.

Goals realization: No performance measures were originally specified for this site but after 10 years the following observations were made in relation to the ex post facto success criteria. **The following represents best professional judgment and are not based on qualitative monitoring data.** See photographs. The site has some qualities of good sharptail grouse habitat.

Success criteria (10 year)	10 Year Observation	Conclusion	Adaptive management recommendation
Combined native grasses cover to exceed 50%	Far greater than 50%	Success	NA
No single species to exceed 80% of the total plant cover.	There is a relatively even mix of the three native grasses	Success	NA
Non-natives species not to exceed 20%	Non-native plants present but well under 20%	Success	NA
Noxious weeds not to exceed 5%	Russian knapweed present but <1%	Success	Spot spray in November

Note: No specific criteria for forbs in light of broadleaf weed control concerns.

Special circumstances affecting outcomes: None noted.

Keys to present level of success: Good seedbed preparation. No disturbances allowed.

Project site future: Continue of mixed stand of native grasses. Slow invasion of shrubs expected. Slow invasion of Russian Knapweed to return unless controlled. Native forbs not returning after 10 years. Reintroduce forbs at some point. Use research in progress to determine best approach to introduce native forbs.

Table 1: Soils, ecological sites, and presumed dominant species

Soils (see map in soils reports)	% of site	Ecological site* name or reference site description	Presumed species composition climatic climax dominants
Conconully gravelly ashy loam, 0 to 25 percent slopes, extremely stony	100	R006XY201WA	Bluebunch wheatgrass 25% Idaho fescue 24% Sandberg Bluegrass 16% Bottlebrush squirrel tail 11% Forbs and half shrubs 35%

See Site Specific Soil Report and Ecological Site Description as Appendices.

Table 2: Site preparation: Note - Reconstructed from memory 10 years later.

Date	Action	Objective(s)	Observations/Notes (chemicals, equipment used, and special issues).
4/2000	Spray	Kill pre-existing plants	Per weather conditions
5/2000	Plow	Kill pre-existing plants	Continued as needed for each "green-up"
Weekly	Inspect	Assess conditions	Used chemical control if seedbed is powder dry
Season	Harrow	Reduce seedbed	If needed

Table 3: Seed Mix:

<u>Species</u>	<u>Lbs/acre</u>
Secar Bluebunch Wheatgrass	3
Goldar Bluebunch Wheatgrass	1
Whitmar Bluebunch Wheatgrass	1
Scwindamar Thickspike Wheatgrass	1
Idaho Fescue	.5
Covar Sheep Fescue	.5
Sherman Big Bluegrass	.4
Lupine	.5
Yarrow	.3
Ladak Alfalfa	1
Magnar Basin Wildrye	.5

Table 4: Planting: Note - Reconstructed from memory 10 years later.

Date	11/1/2000
Methods(s) and planting equipment	Tye seed drill
Planting depths	½ inch
Seeding Rate (lbs per acre, or seeds per foot)	8.8 lbs/acre
Special actions taken	No
Fertilizers/soil amendments	No

Table 5: Post Planting Actions and Observations. Note - Reconstructed from memory 10 years later.

Date	Action	Observations/Notes (Weed control chemicals and equipment used, effectiveness, inspection observations, any special issues).
3/15-30/2001	Inspect	Assess conditions
3/15-30/2001	Broadcast spray	Kill bulbous and cheat grass before perennial species emerge.
4/15-30/2001	Inspect	Assess conditions
5/2001	Spot spray	Kill “carpets” of competing veg.
Weekly remainder of season	Inspect	Assess conditions
July/July/01	Mow	Reduce competition, stop seed set As needed for mustards, and other annual weeds

Attachments

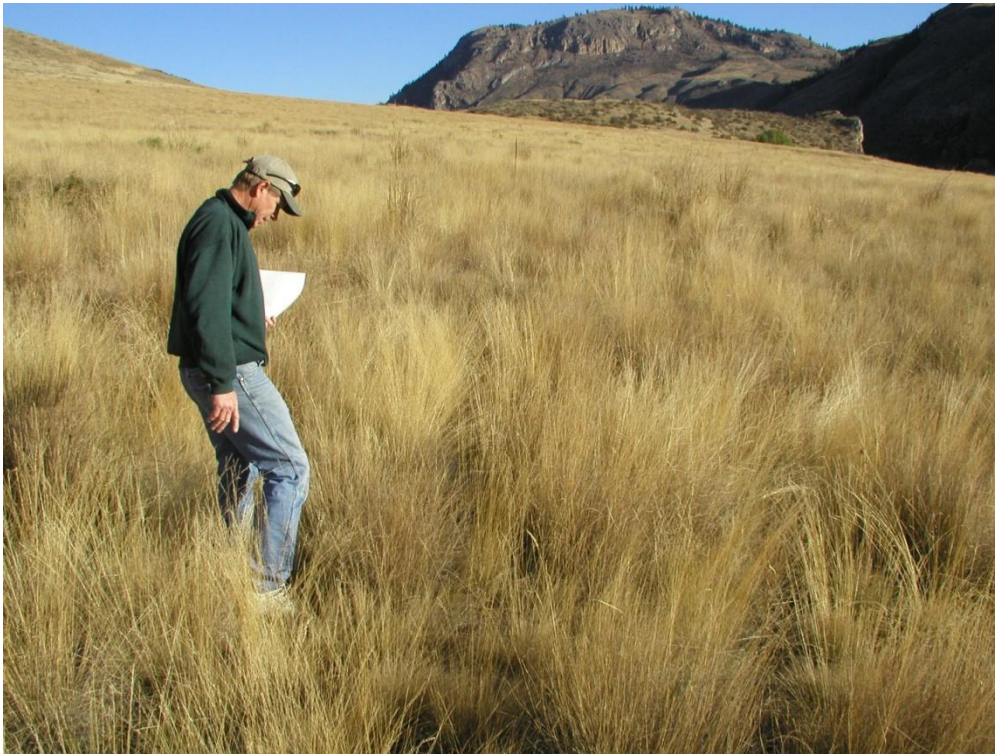
Site map

Post-project photographs

Site map



Post-project images: Photographs taken 10 years after planting on 9/29/2010.



Post-project photographs (10 years after planting)

Anderson 1 Restoration Site Documentation

Recorded By: Mike C Finch

Contact information: 509-636-2344 Mike.Finch@dfw.wa.gov

Date Recorded: 01/27/2011

Location and Site Attributes:

Project name	Anderson 1	
County	Lincoln	
Location	T24 R35 S23 N ½ S14 S ½	Lat. 47.556 Long. -118.366
Wildlife area and Unit	Swanson Lakes Wildlife Area	
Restored area size	110 acres	
Ownership	WDFW	
Elevation	2,280 ft	
Aspect	S	
Slope	2-5%	
Annual Precipitation*	14"	

*<http://prismmap.nacse.org/nn/index.phtml>

Soils: Bagdad Silt loam and Endicott Silt loam

Adjacent land use and condition: Agriculture cereal grain fields that border to the north and east side. Shrub- steppe and range land to the west and alfalfa pasture to the south.

Site History: Prior to 1997 this field was used for cereal grain production only. We converted this field the last year after the crop was harvested into a native grass/forbs mix. This was a problem site for cheat grass due to the crop rotation history.

Project Goals: Establish a predominantly native grass/forbs mix to aid with grouse recovery and to compete with weeds or other non-native plant species. Eliminate weed sources that could impact seeding success and adjacent landowners that raise cereal grains.

Note: The 1997 seed mix included non-native species because of budget reason. We were able to get more bang for our buck by including some non-natives

Site Preparation: See table 2

Seed Mix: See table 3

Planting: See table 4

Post-planting weed control and other management actions: See table 5

Evaluation of Current Conditions

Date of status assessment: 6-2005

Current Status: No data collected but the native grassland restoration site is primarily dominated by bunchgrass species. Also with this field being adjacent to shrub-steep habitat to the west and agriculture to the east, the sage brush has moved in on its own without being a part of the native grass mix.

Goals realization: Seeded bunchgrasses are the dominant component of the plant community. All seeded forbs are present but as minor subordinates. The most noted outcome of this restoration project has been the natural invasion of Wyoming Big Sagebrush as shown in attached photo. Weeds are largely suppressed. - We had field bindweed (morning glory) in this field that is now being held in check with the well established native mix. Cheat grass is largely absent.

Special circumstances affecting outcomes: Nearby seed source for sagebrush.

Keys to present level of success: We have worked with similar soil types with similar results of success (Previous restoration site a mile to the west). We invested in proper seedbed preparation. We spent extra time on post-planting weed control due to the neighboring agriculture field being along the east and north boundary. We learned from this project to really pay close attention to the seed count of each individual species when putting together a native grass mix.

Project site future: We will continue to monitor this field for noxious weeds and species such of sheep fescue for their competitiveness toward other native grasses and forbs in that mix. We will also monitor the rate and percent of the big sagebrush invasion to this site.

Table 1: Soils, ecological sites, and presumed historic dominant species

Soils	% of site	Ecological site name or reference site description	Presumed dominant species composition in healthy condition
Bagdad silt loam	92	R008XY102WA	Bluebunch wheatgrass 72% Idaho fescue 8% Sandberg bluegrass 7% Lupines and vetches (N-fixers) 4% Sagebrush/serviceberry 3%
Endicott silt loam	4	R008XY103WA	Idaho Fescue 72% Sherman big bluegrass 36% Balsamroot 2% Sagebrush and other shrubs 3%
Anders silt loam	4	R008XY102WA	Same as above

Table 2: Site preparation:

Date	Action	Objective(s)	Observations/Notes (chemicals, equipment used, and special issues).
4-1997	Harrow winter wheat stubble	Breakup and thin stubble residue	75 ft tine harrow; waited for stubble to be nice and dry
5-1997	Cultivate	First main tillage operation to reduce residue	15 ft cultivator sweep
6-1997	Cultiweeder/harrow	Used cultiweeder machine, 1 machine, both cultivator and rod weeder/harrow- clean field from all weeds	30 ft machine used to clean field from all weeds and help reduce residue
7-1997	Cultiweeder/harrow	Clean field from all weeds	30 ft machine used to clean field from all weeds and help reduce residue
8-1997	Cultiweeder/harrow	Clean field from all weeds	30 ft machine used to clean field from all weeds and help reduce residue

Table 3: Seed Mix:

Species	Percent	Seeds/s.f.	Pure live seeds lbs/acre
Big bluegrass, Sherman	17.0%	41.3	1.82 lbs/ac
Sheep fescue, Covar	17.0%	31.8	1.56 lbs/ac
Thick-spike wheatgrass	17.0%	7.2	1.86 lbs/ac
Idaho Fescue	6.3%	7.43	.62 lbs/ac
Burnet, Delar	12.7%	1.79	1.52 lbs/ac
Alfalfa, Ladak	8.5%	5.20	1.00 lbs/ac
Lupine, silky	4.2%	.143	.40 lbs/ac
Sainfoin, Remont	17.0%	1.40	1.00lbs/ac
Rice hulls	15.0%	N/A	N/A

Table 4: Planting:

Date	11-6-1997
Methods(s) and planting equipment	24 ft double disc Tye drill/ press wheels
Planting depths	1/8"
Seeding Rate (lbs/acre, or seeds/s.f.)	12 lbs/ac of grasses and forbs/ rice hulls as filler in addition
Special actions taken	We made sure that we had a nice firm seedbed for planting
Fertilizers/soil amendments	None

Table 5: Post Planting Actions and Observations.

Date	Action	Observations/Notes (Weed control chemicals and equipment used, effectiveness, inspection observations, any special issues).
4-1998	Inspect field	New grasses forbs and weeds for new emergence
5-1998	Post spray	1 ½ pt/acre of Buctril (Bromoxynil)with no surfactant; weak on purple mustard and only effects broadleaf weeds. Grasses must be in 2-3 leaf stage with mustards no larger than 2-3" diameter.
7-1998	Mow	Mowed second flush and re-growth of weeds. Mowing will help stimulates new and established grasses for a healthier plant
8-1998	Mow	Mowed just areas of weed infestation
9-1998	Inspect field	Important to inspect the field on a regular schedule
5-1999	Inspect field	Noticed a high plant population of Sherman big bluegrass
6-2000	Inspect field	After looking at the native grass establishment it was noted that the high plant count of Sherman was due to not considering the high number of seeds/lb (882,000) of that particular species and what percent of the mix we had of Sherman (.17%). The exact same conclusion came from the Sheep fescue in the mix (680,000) seeds/lb with it being .17% of the total mix and not knowing the high competitiveness of that particular species. Since then we no longer use Sheep fescue and we greatly reduced the percent of Sherman used on any restoration field due to the high number of seeds/lb of that particular grass species.

Attachments

Site map:



Post-project image: Photo illustrates the invasion of Wyoming Big Sagebrush to Anderson field (Photo taken 1-31-2011)



Anderson 2 Restoration Site Documentation

Recorded By: Mike C Finch

Contact Information: 509-636-2344, Mike.Finch@dfw.wa.gov

Date Recorded: 02/01/2011

Location and Site Attributes:

Project name	Anderson	
County	Lincoln	
Location	T24 R35 S15 NE1/4 S14 NW ¼	Lat. 45.577 Long. -118.381
Wildlife area and Unit	Swanson Lakes Wildlife Area	
Restored area size	62 acres	
Ownership	WDFW	
Elevation	2,240 ft	
Aspect	S	
Slope	2-5%	
Annual Precipitation*	14"	

*<http://prismmap.nacse.org/nn/index.phtml>

Soils: Chard silt loam and Benco cobbly silt loam

Adjacent land use and condition: Shrub-steppe to west, east and north, crested wheatgrass to south from 1986 CRP program.

Site History: Prior to 1986 this field was used for cereal grain production and owned by Dan Anderson. Anderson then placed it in the 1986 CRP program and planted it to crested wheatgrass. In 1997 WDFW purchased the land and kept it in the current condition until converting it to a native grass/forbs mix in 2006.

Project Goals: Establish a primarily native grass/forbs mix to aid with grouse recovery and to compete with weeds or other non-native plant species. Eliminate weed sources that could impact seeding success and neighboring land owners.

Site Preparation: See table 2

Seed Mix: See table 3

Planting: See table 4

Post-planting weed control and other management actions: See table 5

Attachments

Site map: Attached NRCS Custom soil resource report document

NRCS Site specific soils report:

Evaluation of Current Conditions

Date of status assessment: 6-2008

Current Status: No data collected after two years but the native grassland restoration site is primarily dominated by bunchgrass species. We did get an excellent establishment of forbs as well which was surprising due to the high rate of Sherman big bluegrass that was planted.

Goals realization: At this point a native grass/forbs mix has been achieved to the degree possible with the seed mix composition but sustainability of diversity is a concern. Weed sources that could impact neighboring land owners have been successfully suppressed.

Special circumstances affecting outcomes: A larger proportion of Sherman big bluegrass seed than wanted was inadvertently planted.

Keys to present level of success: We have worked with similar soil types with similar results of success (We were within a mile of our last restoration project). High investment in seed bed preparation: We were successful at obtaining a very clean and firm seed bed prior to planting.

Project site future: Continue to monitor the field and note if forbs decrease due to the high rate of Sherman.

Table 1: Soils, ecological sites, and presumed dominant species

Soils	% of site	Ecological site name or reference site description	Presumed dominant species composition in healthy condition
Chard silt loam	95	R008XY102WA	Bluebunch wheatgrass 72% Idaho fescue 8% Sandberg bluegrass 7% Lupines and vetches (N-fixers) 4% Sagebrush/serviceberry 3%
Benco cobbly silt loam	5	R008XY402WA	Great basin wildrye 41% Bluebunch wheatgrass 23% Idaho fescue 7% Sedges/rushes 7% Sandberg bluegrass 4% Tufted hairgrass 3% Lupines and vetches (N-fixers) 3% Sagebrush and other shrubs 10%

Table 2: Site preparation:

	Action	Objective(s)	Observations/Notes (chemicals, equipment used, and special issues).
5-2006	Sprayed roundup	Kill all actively growing plants (including crested wheatgrass and noxious weeds)	50' - 500 gallon sprayer 48 oz. of roundup per acre.
7-2006	Plow field	First main tillage operation to turn over and bury all dead plants	5 bottom moldboard plow
7-2006	Disk field	Disk field to level the plowing	15' tandem disk
7-2006	Disk field	Disk field in different direction to help level out plowing	15' tandem disk
8-2006	Cultiweeder/ Harrow	Clean field from all weeds	30' machine used to clean field from all weeds and help reduce residue
9-2006	Cultiweeder/ Harrow	Clean field from all weeds	30' machine used to clean field from all weeds and help reduce residue

Table 3: Seed Mix:

Species	Percent	Seeds/s.f.	Pure live seeds lbs/acre
Big bluegrass, Sherman	59.0%	143.0	4.72 lbs/ac (66.8 % PLS)
Sandberg bluegrass	2.8%	7.13	.29 lbs/ac
Canby bluegrass wheatgrass	2.9%	7.39	.29 lbs/ac
Secar Bluebunch wheatgrass	5.4%	2.08	.60 lbs/ac
Whitmar Bluebunch wheatgrass	5.5%	2.27	.63 lbs/ac
Thickspike wheatgrass	4.1%	1.74	.45 lbs/ac
Idaho Fescue	6.1%	7.56	.60 lbs/ac
Flax, Lewis blue	1.9%	1.53	.20 lbs/ac
Delar, Burnet (intro)	2.6%	.36	.21 lbs/ac
Sainfoin, Remont (intro)	3.0%	.24	.29 lbs/ac
Alfalfa, Ladak (intro)	1.8%	1.04	.20 lbs/ac
Vetch, Hairy	3.8%	8.37	.42 lbs/ac
Wildrye, Basin, Magnar	1.1%	.39	.11 lbs/ac
Rice Hulls	5.0%	N/A	N/A

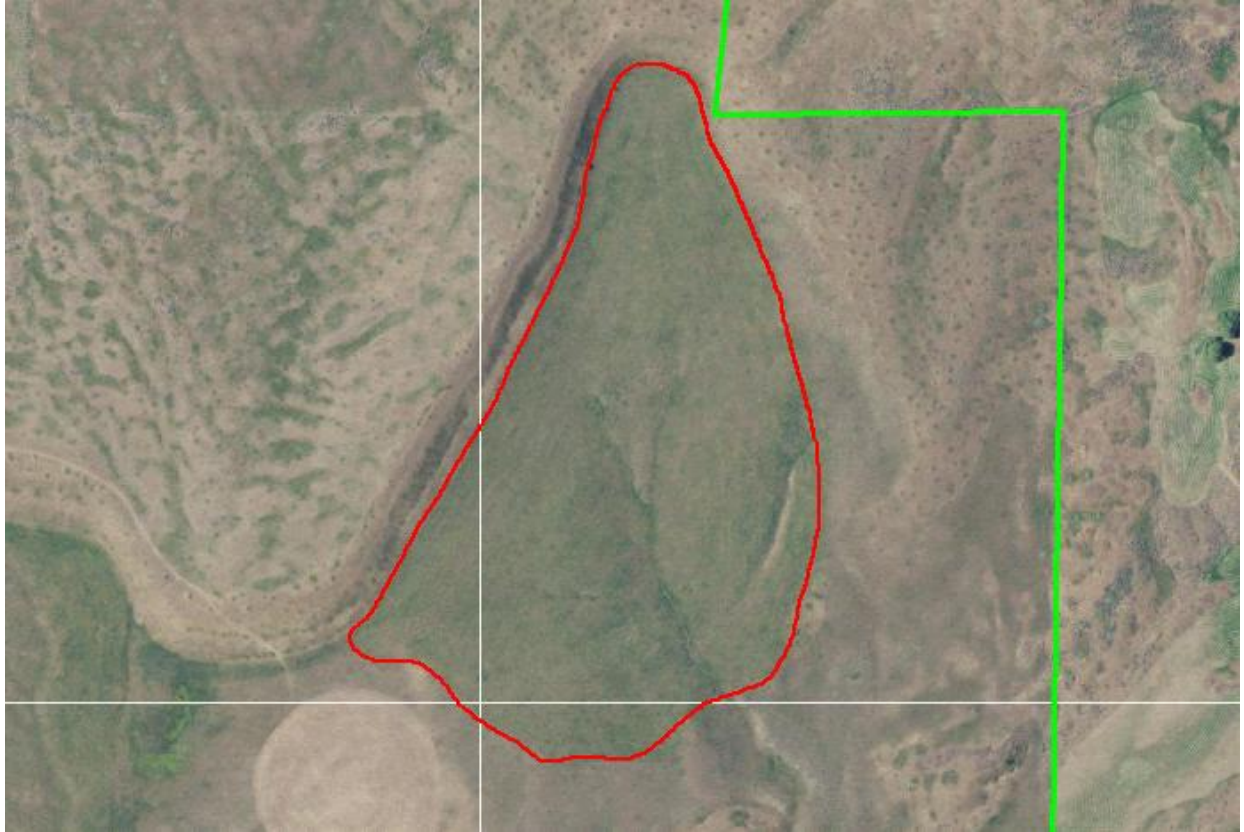
Table 4: Planting:

Date	09-28-06
Methods(s) and planting equipment	50 ft Bee-line air drill/coil packer
Planting depths	1/8"-broadcast seeding-depth from coil packing
Seeding Rate (lbs/acre, or seeds s.f)	12 lbs/ac of grasses and forbs/ rice hulls as filler in addition
Special actions taken	Made sure that we had a nice clean/ firm seedbed for planting
Fertilizers/soil amendments	None

Table 5: Post Planting Actions and Observations.

Date	Action	Observations/Notes (<u>Weed control</u> chemicals and equipment used, effectiveness, inspection observations, any special issues).
4-2007	Inspect field	New grasses forbs and weeds for new emergence
5-2007	Post spray	1 ½ pt of Buctril(Bromoxynil)with no surfactant; weak on purple mustard and only effects broadleaf weeds. Grasses must be in 2-3 leaf stage with mustards no larger than 2-3" diameter.
6-2007	Inspect field	Important to inspect the field on a regular schedule
6-2007	Inspect field	Noticed a high plant population of Sherman big bluegrass. Double checked records and discovered that ratio was way too high in the mix. No explanation why. Take note that the PLS for the particular lot of Sherman we received was extremely low at 66.8%.
6-2008	Inspect field	After looking at the native grass establishment it was noted that the high plant count of Sherman was due to not considering the high number of seeds/lbs (882,000) of that particular species and what percent of the mix we had of Sherman (59%). Although we did get an excellent grass stand I believe that Sherman will be too competitive for some of our other species especially the forbs.

Site map:



Post-project images: No images available.

Horace Smith Field Restoration Site Documentation

Recorded By: Dan Peterson

Contact information: 509-686-4305 Dan.Peterson@dfw.wa.gov

Date Recorded: 1 March 2011

Location and Site Attributes:

Project name	Horace Smith Field	
County	Douglas	
Legal	T28N, R25E, Sec 2	Lat47.9552, Long. -119.6454
Wildlife area and Unit	Bridgeport Wildlife Area Unit	
Restored area size	50 acres +/-	
Ownership	WDFW	
Elevation	1,280 – 1,340 ft	
Aspect	Level to East/Northeast	
Slope	0-3%	
Annual Precipitation*	10.72 (1895 – 2010 average)	

*<http://prismmap.nacse.org/nn/index.phtml>

Soils: Cashmere fine sandy loam, Ellisforde fine sandy loam, Torriorthents. See Table 1.

Adjacent land use and condition: Agriculture, primarily wheat border the north side. Shrub-steppe borders the west, south and east sides.

Site History: This site was used for growing wheat for most of the 20th Century. Conversion to agriculture likely occurred in the early 1900's. The field had been maintained as fallow following the harvest in 2008 by the sharecropper, Lee Hanford. Lee had planned to plant wheat in 2009 and so had applied 40lbs of nitrogen to the site in August. Primary weeds in need of control included Russian thistle, annual bursage and annual rye. Seeding occurred in mid-November of 2009.

Project Goals: To establish native shrub-steppe/meadow-steppe vegetation within a former agricultural field. The desired result is a diverse mix of native grass, forb and shrub species representative of the indigenous/native ecosystem of the area prior to European settlement. Positive outcomes of the project are to benefit the recovery efforts for the Columbian sharp-tailed grouse and greater sage grouse.

Site Preparation: see Table 2, attached

Seed Mix: see Table 3, attached

Planting: see Table 4, attached

Post planting weed control and other management actions: see Table 5, attached

Evaluation of Current Conditions

Date of status assessment: 2 March 2011

Current Status: Indian rice grass is the dominant grass at this time (see figures 1 and 2). Our past experience with this species suggests that over a period of several years its dominance will decline and will be replaced by bluebunch wheatgrass and the other species. In November 2010 we interseeded forbs on this site. It's entirely possible that the present dense grass will inhibit the establishment of these forbs.

Due to the extremely sandy soil, this site is strongly susceptible to wind erosion as can be seen in Figure 3. We included Indian rice grass in this seed mixture because we've found that it becomes established more quickly and robustly and thus reduces erosion of the site. More detailed information on this species can found in the USDA plant guide at <http://plants.usda.gov/java/profile?symbol=ACHY>

Goals realization: It's far too early in this process to assess goals realized.

Special circumstances affecting outcomes: Fertilizer application, above normal precipitation (15.5 inches in 2010) and forb interseeding in 2010.

Keys to present level of success: Again, it's far too soon to give any rational assessment of success or failure at this site.

Project site future: Continue monitoring to assess grass and forb response. We anticipate that weed species such as annual rye, annual bursage and Russian thistle will require periodic treatments for next few years. Now t hat forbs have been seeded treatments likely will be limited to mowing and perhaps harrowing. We will retain the option to do additional interseeding work if needed to improve species diversity.

Table 1: Soils, ecological sites, and presumed dominant species

Soils	% of site	Ecological site name or reference site description	Presumed dominant species composition in healthy condition
Predominant soils: Cashmere fine sandy loam, 0 to 3 and 8 to 15 percent slopes	92.7	R008XY101WA	Bluebunch wheatgrass 60% Sandberg Bluegrass 10% Big Sagebrush 5% Muttongrass 5% Thurber needlegrass 3% Fleabane 2% Longleaf phlox 2% Arrowleaf balsamroot 2% Lupine 2% Milkvetch 2% Gray rabbitbrush 2% Buckwheat 2%
Slopes, Torriorthents, very steep	6.9	R008WY501WA	Needle and thread 25% Bluebunch wheatgrass 20% Sandberg Bluegrass 10% Sagebrush 5% Antelope bitterbrush 5% Buckwheat 5% Arrowleaf balsamroot 5% Pricklypear 2% Gray rabbitbrush 2% Lupine 1%

Table 2: Site preparation:

Date	Action	Objective(s)	Observations/Notes (chemicals, equipment used, and special issues).
Aug 2008	Harvest wheat crop	To remove standing wheat crop, transport to elevator	Done by Lee Hanford, sharecropper.
Sept 2008 - Fall, 2009	Cultivate	Incorporate wheat stubble into ground. Multiple operations occurred during this period.	Done by Lee Hanford,
Fall, 2009	Fertilize	Applied nitrogen at 40lbs/ac	Done by Lee Hanford to prep field for next wheat crop
11/2009	Harrow	Remove fall annuals and smooth seed bed.	15 foot spike-tooth harrow
11/2009	Pack	Create firm seed bed.	12 foot culti-packer

Table 3: Seed Mix 1:

Species	Percent	Seeds/s.f.	Pure live seeds lbs/acre
Duffy Creek Sandberg Bluegrass		12.74	0.6
Wahluke Bluebunch Wheatgrass		13.09	4.0
Winchester Idaho Fescue		7.74	0.75
Schwindimar Thickspike Wheatgrass		3.58	1.0

Table 3b: Seed Mix 2:

Species	Percent	Seeds/s.f.	Pure live seeds lbs/acre
Nezpar Indian Rice Grass		17.53	3.25
Antelope Bitterbrush		1.05	3.0

Table 3c: Forb Mix:

Species	Percent	Seeds/s.f.	Pure live seeds lbs/acre
Blue Mountain Prairie Clover		1.09	0.15
Venus Penstemon		3.03	0.15
Small Burnett		1.14	1.0
Lewis Flax		1.92	0.2
White Native Yarrow		5.57	0.09
Arrowleaf Balsamroot		0.44	0.35
Threadleaf Fleabane		0.55	0.08
Long-leaved Phlox		0.19	0.03
Snow Buckwheat		2.89	0.4
Shaggy Fleabane		4.13	0.1

Table 4a: Planting, Seed Mix 1:

Date	3-4 November, 2009
Methods(s) and planting equipment	12 foot Truax Flex II drill
Planting depths	½ to ¾ inches, approximately, using 12 inch diameter depth bands mounted on drill
Seeding Rate (lbs per acre, or seeds per foot)	6.35lbs per acre. 37.16 seeds per square foot.
Special actions taken	Used middle box, aka fluffy box, on Truax. Rice hulls added to mix at rate of 3lbs per acre. Total rate = 9.35lbs per acre
Fertilizers/soil amendments	None

Table 4b: Planting, Seed Mix 2:

Date	3-4 November, 2009
Methods(s) and planting equipment	12 foot Truax Flex II drill
Planting depths	1.75 to 2 inches, approximately, using 9.5 inch diameter depth bands mounted on drill
Seeding Rate (lbs per acre, or seeds per foot)	6.25lbs per acre. 18.59 seeds per square foot.
Special actions taken	Used rear box on Truax. White rice added to mix at rate of 4lbs per acre. Total rate = 10.25lbs per acre
Fertilizers/soil amendments	None

Table 4b: Planting, Seed Mix 2:

Date	3-4 November, 2009
Methods(s) and planting equipment	12 foot Truax Flex II drill
Planting depths	½ to ¾ inches, approximately, using 12 inch diameter depth bands mounted on drill
Seeding Rate (lbs per acre, or seeds per foot)	3.485lbs per acre. 20.98 seeds per square foot.
Special actions taken	Used rear box on Truax. Rice hulls added to mix at rate of 9.5lbs per acre. Total rate = 12.98lbs per acre
Fertilizers/soil amendments	None

Table 5: Post Planting Actions and Observations.

Date	Action	Observations/Notes (Weed control chemicals and equipment used, effectiveness, inspection observations, any special issues).
3/2010	Inspect field	Monitor grass and annual weed growth
4/2010	Inspect field	Monitor grass and annual weed growth
4/19/2010	Spray	Treat annual bursage and Russian thistle. Used BroClean (a generic Buctril (Bromoxynil) at 12oz/ac, 2,4-D at 8oz/ac, dicamba at 3oz/ac plus Choice at 4oz and Spreader 90 at 4oz. Used Kubota and 30 foot pull-behind sprayer rented from CPS in Coulee City.
5/3/2010	Inspect field	Assess herbicide application. Excellent kill on annuals. Some skips, primarily where Kubota traveled traveled.
5/6/2010	Spray	Treat Dalmatian toadflax in adjacent 20 acre field. Used Tordon 22K at 2qt/ac and 2,4-D at 2 pt/ac. Spot sprayed with ATV
6/8/2010	Spray	Treat annual bursage and Russian thistle in skips left from April treatment. Used same herbicides and rates. Sprayed with Ford truck and slip-in sprayer.
6/2010	Mow (2X)	Mowed annual rye to reduce seed production.
6/29/2010	Spray	Treat Russian thistle. Used same herbicides and rates as April treatment. Sprayed with Kubota and 3-point sprayer
7/2010	Mow	Mowed annual rye to reduce seed production.
7-11/2010	Inspect field	Inspected multiple times during this period. The response of the Indian rice grass has been remarkable, it clearly dominates the stand. Thickspike appears to be the second most common species follow by bluebunch and Sandberg's. At this time we feel that three factors have influenced the rice grass: seeding depth, above normal precipitation and the fertilizer treatment that Lee applied.
11/18-19/2010	Interseed forbs	Used Truax Flex II with 12 inch depth bands attached to achieve planting depth of ½ - ¾ inches.

Attachments

Site map: For more details see attached site-specific soil survey



Site map

Post-project images:

Figure 1. Taken 20 June 2010 showing rows of rice grass, clumps of annual rye grass and dead annual bursage.



Figure 2. Taken at end of first growing season.



Pre-project images

Figure 3. Showing wind erosion at field site, April 2008



Rattlesnake Slope Post-Fire Restoration Site Documentation

Recorded By: Rocky Ross

Contact information: 509-539-1136

Date Recorded: January 18, 2011

Location and Site Attributes:

Project name	Rattlesnake Slope post-fire restoration	
County	Benton	
Location	T10N R26E gen. area S8,17,18 &19	Lat. 46.359 Long. -119.453
Wildlife area and Unit	Rattlesnake Slope, Sunnyside	
Restored area size	160	
Ownership	WDFW	
Elevation	500 feet	
Aspect	SE	
Slope	Variable	
Annual Precipitation	7-8 inches	

Soils: Not mapped by NRCS. Sandy, well drained

Adjacent land use and condition: Public land with similar weed control issues. Shooting range-fire hazard.

Site History: Grazed in the past. Wildfires occurred in the summer of 2000 and on July 16, 2003. Restoration areas were nearly devoid of any evidence that native bunchgrass (other than Sandburg bluegrass) existed prior to the fire. Fires killed most shrubs.

Presumed historic condition is Columbia plateau steppe and Grassland: Extensive grasslands, dominated by perennial bunch grasses and forbs (>25% cover) sometimes with a sparse (<10% cover) shrub layer.

Presumed dominants include: Sandberg bluegrass, bluebunch wheatgrass, big sagebrush, yarrow.

Project Goals:

Get as much native cover as possible to compete with weeds

Establish forbs and sagebrush to aid in sage grouse recovery

Establish forage to attract elk for hunting (a driver for including winterfat)

Site Preparation: Harrowed only. See Table 2

Seed Mix: See Table 3

Planting: See Table 4

Post-planting weed control and other management actions: See Table 5

Evaluation of Current Conditions

Date of status assessment: ____2008____

Current Status: Data analysis not available. Performance measures were not originally specified for this site but after 6 years the following observations were made: Visually, the seeding operation appears to be successful based on the representative photo shown below. A comparison of the 3 treatments probably can't be made without analyzing the collected data. All data collected remains on the original data sheets and was never analyzed. Mike Keller, the new Wildlife Area Manager, or Robby Sak, Assistant Manager, should have the data sheets.

Goals realization: This was a very harsh site and I'm very satisfied with the results we got. It's very hard to get a good stand of any native vegetation in a desert environment, especially when you seed both grass and broadleaves and have to deal with weeds.

Special circumstances affecting outcomes: We were blessed with the right amount of moisture when we seeded and again after seeding was complete. The soil remained unfrozen during the process so our tillage was very effective and we got good soil to seed contact.

Keys to present level of success:

I monitored the sites weekly as the weather started to warm up so we could get our herbicide on at precisely the right time. We sprayed early enough so that late germinating winterfat and sage were unaffected. We unintentionally seeded heavier than anticipated and this added to our plant density.

Results too mixed to make many definitive conclusions about the different fields based on casual observation. Aerial herbicide applicator error was a confounding factor. Conclusions regarding herbicides.

- Plateau
 - A single 3 oz/acre application was very damaging to desirable species on WDFW test plots.
 - Two 4 oz/acre applications severe damage to desirable species on adjacent USFWS planting areas.
- Buctril
 - Controlled some of the broadleaves
 - 90% of the winterfat that had emerged (2 to 3 leaf stage) was killed.
 - Did not have an apparent effect on many broadleaf plants including *Draba verna* and fiddleneck tarweed.

Project site future: No comment.

Table 1: Soils, ecological sites, and presumed dominant species

NRCS has not mapped site yet. Associated ecological sites and presumed dominant species information not available. Soil sandy and well drained.

Table 2: Site preparation:

Date	Action	Objective(s)	Observations/Notes (chemicals, equipment used, and special issues).
Dec 2003 (First week)	Harrow	Prepare seed bed	Harrowed twice after first good hard rain of season. Moisture helped. Second pass perpendicular to first. Surface irregular. Treated soil varied from loose to only scratched.

Table 3: Seed Mix:

<u>Species</u>	<u>Mix A</u>	<u>Mix B</u>	<u>Rate</u>
Sandburg bluegrass (Hanford collection)	550 lb	33 lb	2.5 lb/acre
Bluebunch wheatgrass (Wahluke collection)	880 lb	52 lb	4.0 lb/acre
Thickspike wheatgrass (Schwindimar)	770 lb	46 lb	3.5 lb/acre
Big Sagebrush (var. wyomingensis)	33 lb	3 lb	0.15 lb/acre
Winterfat	110 lb	7 lb	0.5 lb/acre
White yarrow (millefolium)	66 lb	5 lb	0.3 lb/acre

Table 4: Planting:

Date	First week of December 2003
Methods(s) and planting equipment	Tye drill in fire line and along highway, aircraft everywhere else. Rice hulls used to suspend seed in Tye drill.
Planting depths	Not recorded. Indian ricegrass "very deep"
Seeding Rate (lbs per acre, or seeds per foot)	Estimated 15 lbs/acre
Special actions taken	Follow-up tillage on aerially seeded areas on December 6-19 th to improve seed/soil contact. Three different treatment were tried Field A: Harrowed once and then packed with 14 foot Schmeiser packer. Field B: Only harrowed Field C: Only packed
Fertilizers/soil amendments	None

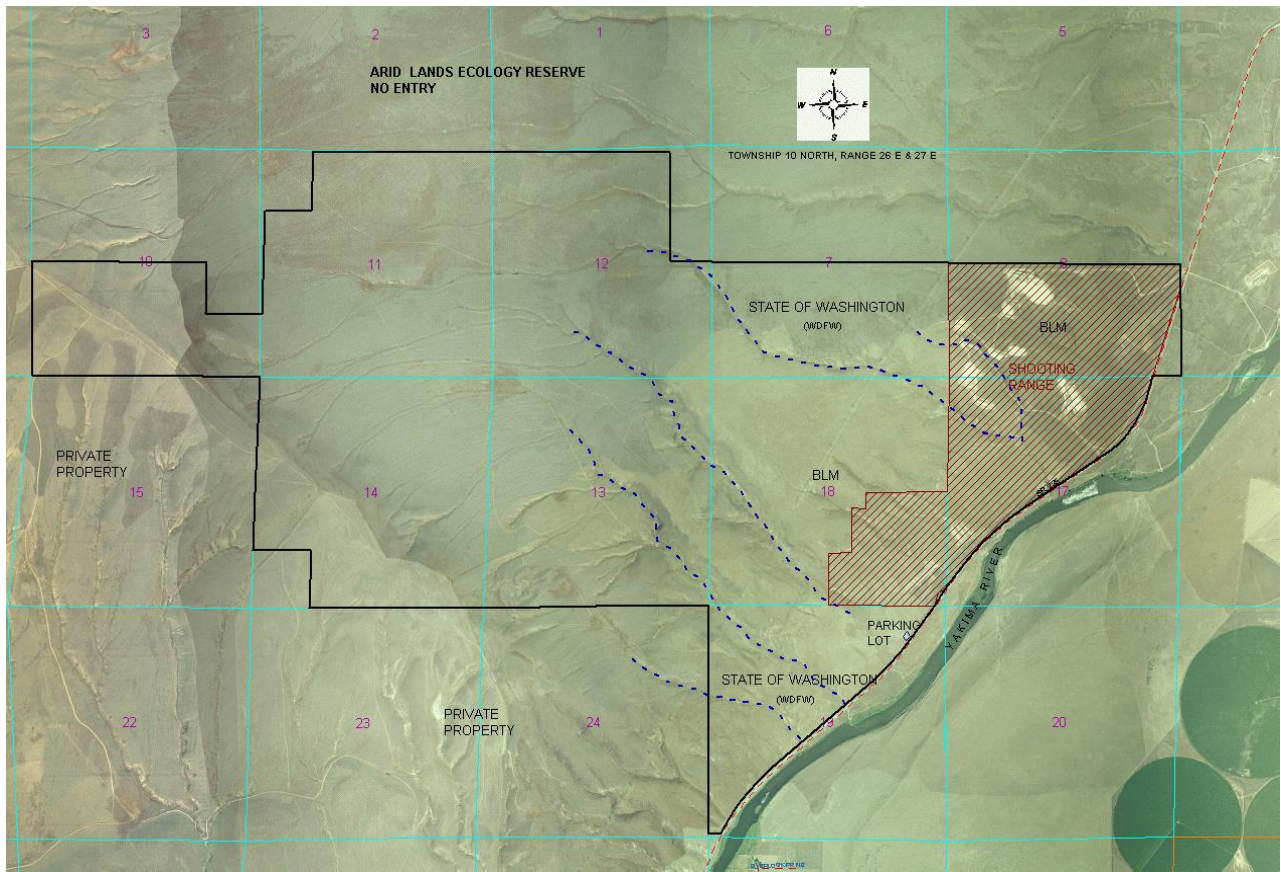
Table 5: Post Planting Actions and Observations.

Date	Action	Observations/Notes (Weed control chemicals and equipment used, effectiveness, inspection observations, any special issues).
3/2004 (first week)	Spray	USFWS applied 3oz/acre of Plateau on two DFW test plots in field A and B. USFWS applied 4oz/acre on all of their adjacent planted areas (and then a second time a month or two later).
3/9-10/2004	Spray	Intended to Kill weeds including cheatgrass. Mirage (glyphosate) used at 3.5 oz per acre on the entire burned area on except for fields A and C. Field B was loaded with cheatgrass.
3/10/2004	Spray	Buctril at 18 oz/acre with Spreader 90 at 10oz/100 gal. water on all seeded fields.
12/19/03- 4/24/04	Multiple inspections	Check weeds /results of spraying. Weather wise, we've had two brief rain showers since the snow went off. See detailed notes about herbicide effects*
<p>*On 3/24/04, The entire Plateau –treated area looks like it was sprayed with a non selective herbicide from a distance. Up close, there is surviving Sandburg and some small restoration grass seedlings but little else. No cheat or annual broadleaves present.</p> <p>On March 24, Fields A and B were checked and results were mixed. Some of the Sandburg bluegrass is extremely red with just a hint of green color remaining. Other Sandburg appears to be unaffected or nearly so. A lot of cheatgrass is dying but a new flush (or missed seedlings) appears unaffected. In addition, on field B, the pilot completely missed a wide band that runs parallel to the Plateau strip. That strip easily exceeds 100 feet in width. The results overall are so mixed at this time, it's hard to know if it was operator error or some other element of the operation.</p> <p>The Buctril appears to have controlled some of the broadleaves but a lot of <i>Draba verna</i> has flowered and there is a lot of fiddleneck tarweed that was either partially affected or missed altogether. The sad part is that 90% of the winterfat that had emerged has apparently been killed. A few live plants were found in today's survey but the majority appear to be lost. They were mostly in the 2 to 3 leaf stage when the Buctril was applied. The seed fuzz clings to the cotyledon leaves, even after they are fully emerged and could possibly act like a sponge for the herbicide, holding it against the plant for a longer period and doing more damage. Field A was not sprayed with Roundup and there is a lot of cheatgrass emerging in that field. The entire field has a green hue from the unaffected cheat and small broadleaves. All of the <i>Lomatium</i> appears healthy, along with a few scattered balsamroots, lots of filaree, and other broadleaf plants. The Buctril did not have an apparent effect on very many of the broadleaf plants.</p> <p>I found no emerged sagebrush plants on 3/24.</p> <p>From a distance, the USFWS land across the fence to the north looks totally devoid of vegetation. The total application of 8 oz per acre could have damaged the perennial plants but we'll know more this</p>		

<p>summer.</p> <p>I did not check field C for results (shooting range open) of the spray operation.</p> <p>Plateau plots devoid of vegetation except for established Sandburg bluegrass and it has been suppressed to the point of not producing seed heads.</p>		
4/14/2004	Inspection	Accompanied by Jerry Benson. Weather has been unseasonably dry and warm. See detailed notes about herbicide effects**
<p>**4/14/04</p> <p>Plot A: (harrowed and packed post seeding, sprayed with Buctril only) Lots of restoration grasses and yarrow evident (and almost too thick). Found one or two winterfat and no sage. Cheat is scattered and 2-3 inches tall, some just pushing a head. Much of the fiddleneck is gone and the only broadleaf of substance is filaree. Perennial broadleaves are thriving.</p> <p>Plot B: (only harrowed after seeding, sprayed with 3.5 oz of Roundup and 18 oz of Buctril 36 hours later) Established Sandburg was hit hard in places and those same areas show very little restoration grass coming. It's possible that the Sandburg bunches were so dense, the harrow could not mix up much soil. A lot of the Sandburg looks like it could actually die, where a lot in other areas appears to just be set back. It's red in color but has a little green at the base and has put up seed heads. Where the Sandburg is still hanging on, the restoration grass is also coming. Much less evidence of yarrow/winterfat and no sage yet. Only an occasional Russian thistle showing. Plot C: (only packed after seeding, only Buctril at 18 oz) Good survival of Sandburg and bluebunch. Good presence of restoration grasses. Not much yarrow, no winterfat or sage.</p> <p>Jerry's assessment was that most of the area looks as good as it could be under the conditions we have had. The cheatgrass is so small, it's likely that it won't provide much competition. Broadleaf weeds appear to be minimal. A rain + warm temps could bring on a flush of R. thistle which we can't do anything about at this point in time.</p>		
6/8/04	Observation	Heavy rain - 0.77in. recorded in Hanford. Even heavier rain observed a few weeks earlier but not recorded.
6/9/04 - 6/14/04	Monitoring	Gather vegetation data. Sampled plot C: Quantitative data collected. Casual observations: Grass seedlings were almost too dense. Winterfat was occasional. Sage was present but uncommon. Russian thistle is present in substantial numbers and will likely cause a mess due to all the moisture. The spring has been unseasonably cool and wet.
Summer 2005	Monitoring	Gather vegetation data. We completed transects on all 3 treatment areas in 2004 and repeated those transects again one year later.
Fall 2006	Reseeding	Establish native vegetation in areas sprayed with Plateau. No details available.

Attachments

Site map: Map of exact planting areas not available. Replanted areas in the southeastern portion of the site.



Pre-project images: Not available.

Post-project images: Taken in 2008, four years after the area was seeded. The target area was between the foreground fence and the toe of the hill at the top of the picture. The diagonal road was the north boundary so the target area was to the left of the road. The sagebrush and winterfat on the right side of the road is from drifting seed due to a south wind during application. The shrubs in front of the fence are also from drifting seed. The latter is the highway right of way, which, interestingly, was full of weeds at the time of seeding and had no soil disturbance.



Sunnyside Alkaline Restoration Site Documentation

Recorded By: Robby Sak

Contact Information: 509-840-2877 Robert.Sak@dfw.wa.gov

Date Recorded: February 10, 2011

Location and Site Attributes:

Project name	Sunnyside Restoration Field (Alkaline) Restoration	
County	Yakima	
Location	T19N R22E S23 SE1/4	Lat. 46.246 Long. -120.027
Wildlife area and Unit	Sunnyside, Headquarters	
Restored area size	18	
Ownership	WDFW	
Elevation	630 feet	
Aspect	Level	
Slope	Level	
Annual Precipitation*	7-8 inches	

Soils:

84% of site Esquatzel silt loam, 0-2% slopes. Max. calcium carbonate 5%. Depth to water >80 inches
116% Umapine silt loam, drained, 0-2% slopes. Max. calcium carbonate 30%. Depth to water 24-48 inches.

Adjacent land use and condition: Agriculture to the north Greasewood flats to East, South and West.

Site History: Ag field for small grain/ Alfalfa rotation. Before 1997 field was flood irrigated. In 1997 Pump and mainline was installed and a wheel line was used to irrigate. In 2000 Ag Leaser stopped farming site and WDFW staff continued with small grain food plot for next 4 yrs. The site was then idle for 3yrs prior to restoration with a high density of Kochia, Russian Knapweed and Russian thistle.

Presumed historic condition: INTER-MOUNTAIN BASINS GREASEWOOD FLAT. A mosaic of open to moderately dense greasewood (*Sarcobatus vermiculatus*) shrublands with grasses. Dominant grass in low areas is inland saltgrass. Great Basin Wildrye (*Leymus cinereus*) was prominent in high spots. Note: NRCS has not developed ecological site description for the site. See table 1

Project Goals:

Get as much native cover as possible to compete with weeds (Russian knapweed and Kochia)
Establish forage and nesting cover for mallard ducks, pheasant, and quail.

Note regarding goals: A decision was made against trying to plant greasewood as past attempts to grow it on the wildlife area and via contract nursery grower were unsuccessful. The reason we wanted to use the tall wheatgrass was to help get more cover on the saltier areas. Tall wheatgrass has been used around here for pastures since the 50's on the more alkali soils. We knew that the saltgrass would eventually fill in but it doesn't provide good nesting/hiding cover. Since we haven't been very successful in planting greasewood we wanted to have taller cover in this area and using tall wheatgrass in our mix would give us that. The basin wildrye will not grow very well in the more alkali areas, tending to grow alongside those areas leaving big voids out in the landscape. When we added the tall wheatgrass we

were able to fill in some of those voids and provide better nesting/hiding cover. It is hoped that greasewood will eventually re-invade the site.

Site Preparation: See Table 2

Seed Mix: See Table 3

Planting: See Table 4

Post-planting weed control and other management actions: See Table 5

Evaluation of Current Conditions

Date of status assessment: ____ February 2011 (two years after planting)_____

Current Status: An even mix of tall wheatgrass and basin wildrye dominate the area. Weed cover is below 3%. Some areas that are more alkali than others remain bare or have very short vegetation due to high salt levels. Native salt grass is starting to appear in some of these higher salt areas.

Goals realization: Very satisfied with the results. It's very hard to re-establish Alkali soils after the native vegetation has been missing for so many years. Weeds are under control. Great basin wildrye and tall wheatgrass gave us the desired forage and nesting cover.

Special circumstances affecting outcomes: We did a late fall planting based on the weather. We had a few good rains before we planted and a snow storm the next day after we got done. I think with that amount of moisture we were able to drive the salts down into the soil away from the seed.

Keys to present level of success: I think it was the above normal moisture that fall and the kind of site prep we did before planting.

Project site future: Right now I think the objective would be to keep a close watch on the area for weed infestation. No burning or mowing is needed at this time. We purposely have not tried to plant greasewood on this site. In years past we tried greasewood plugs from seed in different areas without much success. Our hope is that the established greasewood that borders both the west and east side of this site will eventually fill in by natural seed distribution. Native salt grass is starting to appear in some of these higher salt areas and should fill eventually its niche.

Table 1: Soils, ecological sites, and presumed dominant species

Soils	% of site	Reference site description	Presumed dominant species composition in healthy condition
84% Esquatzel silt loam 16% Umapine silt loam	100	Intermountain Basin Greasewood flat	Based on adjacent undisturbed lands Greasewood Saltgrass. Great Basin Wildrye (high spots)

Table 2: Site preparation:

Date	Action	Objective(s)	Observations/Notes (chemicals, equipment used, and special issues).
Spring 2007	Disked	Disk dead vegetation	Site had been was left idle for 3yrs. High density of Kochia, Russian Knapweed, and Russian Thistle.
Summer/ Fall 2007	Chem. Fallow	Bare ground no cover	Treated area twice with Round-up. 3qts/ac rate.
Spring 2008	Ripped/ Disked area	To break up the top hard layer and help with getting the spring moisture into the ground.	We used a 7 shank ripper and ripped the area twice (second pass across at angle from the first) and then disked it closed.
Summer/ Fall 2008	Monitored area	Monitored to make sure area was kept weed free.	Spot sprayed small Russian Knapweed areas.

Table 3: Seed Mix:

Species	Amount	
Alkar Tall Wheatgrass	50.42% 5lbs/ac	Non-native, alkali tolerant
Magnar Basin Wildrye	44.35% 4lbs/ac	Native

Table 4: Planting:

Date	Nov 14 2008
Methods(s) and planting equipment	7ft Tye drill with press wheels
Planting depths	1 to 1.5 inches
Seeding Rate (lbs per acre, or seeds per foot)	10 lbs per acre
Special actions taken	Went over the area with a Roller Harrow before planting to make a firm seedbed. Rice Hulls- 4.00%
Fertilizers/soil amendments	None

Table 5: Post Planting Actions and Observations.

Date	Action	Observations/Notes (Weed control chemicals and equipment used, effectiveness, inspection observations, any special issues).
Spring 09	Sprayed	Sprayed area with low rate of 2,4-D 12oz/ac, Vanquish 6oz/ac. Spraying was done after the 2 leaf stage of the grass seedlings.
Summer 09	Monitored	Continued with site observation for weed control
Fall 09	Mowed	Spot mowed small areas that had a higher density of Kochia.
Spring 10	Sprayed	Sprayed site with Milestone 7oz/ac, 2,4-D 16oz/ac
Summer 10	Monitored	Continued with monitoring for weed control
Fall 10	Monitored	Had good results with Milestone, 2,4-D application in the spring. Less than 3% weed cover.
Spring 2011 and beyond	Monitor	At least twice a year we will need to monitor the site and determine if anything needs to-be done at that time.

Attachments

Site map:



The area inside the line was all planted. Replanted areas in the southeastern portion of the site.

Pre-project images: *None.*

Post project images:



Alkali area with minimal vegetation .



Native salt grass naturally occurring in very high Alkali areas.



Tall Wheatgrass and Basin Wildrye.

Sheridan Field Restoration Site Documentation

Recorded By: Pete Lopushinsky

Contact information: 509-663-6260- Pete.Lopushinsky@dfw.wa.gov

Date Recorded: April 20, 2011

Location and Site Attributes:

Project name	Sheridan Field	
County	Kittitas	
Location	T.20N, R.21E, sec 10, sw1/4	Lat.47.2333 Long. -120.1875
Wildlife area and Unit	Colockum	
Restored area size	38 acres	
Ownership	WDFW	
Elevation	2,700 ft	
Aspect	Level to slightly eastward sloping	
Slope	0-3%	
Annual Precipitation*	19"	

Soils: 98% Meystre loam 0-15%. See table 1.

Adjacent land use and condition: Relatively healthy ponderosa pine forest, grassland and shrub steppe and. No development, agriculture or livestock grazing in the immediate vicinity. Tree cover is probably much higher than the historic condition due to fire suppression,

Site History: Trees were probably cleared prior to agricultures. This was a farmed grain field, with many problem weeds: Russian knapweed, diffuse knapweed, morning glory, jointed goatgrass and cereal rye.

Project Goals and objectives :

- Establish native –species dominated plant community as a grass pasture for elk
- Restore the Bluebunch wheatgrass and Idaho fescue dominants
 - with combined native grass cover to exceed 80% and
 - No single species to exceed 80% of the total plant cover
- Control noxious weeds (Noxious weeds not to exceed 1% cover)
- Stabilize soils

Note: No forbs were planted due to noxious weed control issues.

Site preparation: See table 2a and 2b

Seed Mix: See table 3

Planting: (Table 4a and 4b, attached)

Post-planting weed control and other management actions: (see Table 5, attached)

Evaluation of Current Conditions

Date of status assessment: 04/20/2011. Seven years after planting.

Current Status: This field now looks really good, goatgrass and other weeds are at a very low level. The field will be mowed and fertilized occasionally and managed as a green grass pasture. This is an effort to make it attractive to elk and encourage them to remain on public lands instead of causing crop damage on nearby private lands.

Goals realization: Goal met. Native pasture with desired dominant grasses established. The pasture is heavily used by elk. Weeds and erosion are effectively controlled.

Lessons learned: Seeding with helicopters can be problematic, especially in windy sites. We also were not able to harrow after aerial seeding, which may have improved success. The unplanned application of Roundup was probably due to a misunderstanding with the aerial applicator. Mowing was effective in reducing goatgrass and rye, as was the application of Prowl herbicide.

Special circumstances that may have affected project outcomes (unusual weather, wildfires etc.):
None.

Key's to present level of success:

Planting spring wheat the year before grass seeding seemed to reduce annual grass weeds. Use of the Truax seed drill was obviously very effective in seedling establishment.

Anticipated site trajectory: Use mowing and fertilization to keep grass succulent and competitive. Watch for possible re-invasion of Russian knapweed and other weeds.

Possible steps to further improve conditions: None planned. Diversity should increase via invasion from surrounding in-tact communities.

Table 1: Soils, ecological sites, and presumed dominant species

Soils	% of site	Ecological site name or reference site description	Presumed dominant species composition in healthy condition
Meystre loam 0-15%	98	Interface between ponderosa pine forest and Columbia plateau steppe and Grassland: Dominated by perennial bunch grasses and forbs (>25% cover) sometimes with a sparse (<10% cover) shrub layer.	Guide to Washington's Ecological Systems: Bluebunch wheatgrass, Idaho fescue, bottlebrush squirrel tail and Sandberg's g bluegrass. Additions based on field observations Arrowleaf balsamroot, lupine, buckwheat, bitter brush, Ponderosa pine and Western serviceberry
Tekison Stony loam 0-25%	2	Same	Same

Table 2: Site preparation:

Date	Action	Objective(s)	Observations/Notes (chemicals, equipment used, and special issues).
Preparation for first planting using a helicopter			
Fall 2002	Spot-sprayed weeds,	Control diffuse knapweed, Russian knapweed, morning glory	Tordon 22K (1.5 pts./a.), Roundup (2.8 pts/a).
Spring 2003	Spray	Control broadleaves and grasses	Roundup, Banvel, 2,4-D
Summer 2003	Disked and harrowed	Weed control, seed bed preparation	
Fall 2003	Seeded	Establish grass	Helicopter and spreader bucket
Preparation for second planting using a seed drill.			
Summer 2004	Disked and harrowed	Weed control, seed bed preparation	

Table 3: Seed Mix

Species	Percent: Seed	Pure live seed in lbs/acre or seeds/square foot?
Anatone bluebunch wheatgrass	18%	1.78
Wahluke Bluebunch wheatgrass	22%	2.24
Jim Creek Bluebunch wheatgrass	14%	1.42
Winchester Idaho Fescue	14%	1.27
Duffy Creek Idaho Fescue	9%	.78
Wallowa Sandberg bluegrass	5%	.44
Sherman big bluegrass	5%	.49
Schwindimar Thickspike wheatgrass	13%	1.31

Table 4a: Planting- First Planting With Helicopter

Date	Fall 2003
Methods(s) and planting equipment	Helicopter and spreader bucket
Planting depths	NA
Seeding Rate (lbs per acre, or seeds per foot)	20 lbs./A.
Special actions taken	None
Fertilizers/soil amendments	None

Table 4b: Second Planting With Seed Drill

Date	Fall 2004
Methods(s) and planting equipment	Truax native seed drill
Planting depths	Less than ½"
Seeding Rate (lbs per acre, or seeds per foot)	11 lbs./A.
Special actions taken	No rice hulls
Fertilizers/soil amendments	None

Table 5: Post-Planting Actions and Observations

Date	Action	Observations/Notes (Weed control chemicals and equipment used, effectiveness, inspection observations, any special issues).
After first planting using a helicopter		
April 2004	Inspection	Grass stand looked poor, obvious poor seed placement by helicopter
June 22, 2004	Herbicide app.	Used ATV with weed wiper to apply Roundup (2%) to cereal rye.
Summer 2004	Accidental herbicide app.	Grass stand accidentally sprayed with Roundup by aerial contractor (other fields were being sprayed for a fallow operation and the Sheridan Field was included by mistake).
After second planting using a seed drill.		
March 24, 2005	Inspection	Grass germination looked good. Applied fertilizer (46-0-0, 80 lbs N/a) on entire 40 a. field.
March 25, 2005	Sprayed entire field	For broadleaf weeds by air (Clarity, 2 oz/a), (Harmony, .33 dry oz/a), Curtail (1 pint/a)
May 2, 2005	Sprayed entire field	For broadleaf weeds by ground (Buctril, 16 oz/a.), (Vanquish, 2 oz./a.), (Amine 4, 12 oz/a.).
Summer 2006	Field spot-sprayed	For Russian Knapweed (Tordon 22K, 1 pint/a.)
Summer 2006	Mowed	As short as possible for Jointed goatgrass to prevent seed set.
March 29, 2007	Sprayed entire field	By air for goatgrass, rye and cheatgrass (Prowl, 3 pints/a.).
October 2010	Mowed	To encourage elk use of fall green-up.

Map: For more map details see attached site-specific soil survey



Post project photograph: Seven years after planting



Central Ferry Canyon Field B Restoration Site Documentation

Recorded By: Marc Hallet

Date Recorded: 4/25/2011

Location and Site Attributes:

Project name/Year	Central Ferry Canyon Field B - 1987	
County	Douglas	
Location	T 29N R24E S 03	Lat. 48.0375 Long. -119.8077
Wildlife area and Unit	Wells WLA – Central Ferry Canyon	
Supervising personnel	M. Hallet, John Morris, J. Benson	
Restored area size	42.2 ac.	
Ownership	WDFW	
Elevation	1850-2020	
Aspect	NW	
Slope	~6%	
Annual Precipitation*	1987-2011 Average: 10.38" (6.75"-17.11")	

*<http://prismmap.nacse.org/nn/index.phtml>

Soils: Willock-Conconully complex, Chelan ashy fine sandy loam (See Table 1).

Adjacent land use and condition: Older CRP fields to the east have a serious infestation of Dalmatian toadflax. Dalmatian toadflax is now present on the site.

Site History: Dryland Wheat.

Project Goals: Revegetate wheat fields to shrub steppe habitat. Take advantage of resources provided by the CRP program.

Site Preparation: Wheat stubble. The fields had very few weeds and did not require any spraying, mowing or additional cultivation. (See Table 2, attached)

Seed Mix: We used two seed mixes in the 3-section drill: Part of the area was seeded with the grass/forb mix in two sections of the drill (16ft) and with the shrub/grass mix in the third (8 ft). (See Table 3a and 3b, attached)

Planting: (Table 4, attached)

Post-planting weed control and other management actions: (see Table 5, attached)

Evaluation of Current Conditions

Date of status assessment: 04/25/201 (24 years after planting)

Current Status: Overall, the seeding was relatively successful. The forb component is lacking however. Dalmatian toadflax has encroached on the seeding especially in field E. We have limited our treatment for this weed to biological agents (*Mecinus janthinus*).

Shrub/grass mix: Bitterbrush (Idaho source) did very well in this field and in about 2/3 of the area it was seeded elsewhere on the Central Ferry Canyon Unit. The four-wing saltbrush and seeded big sage had very poor success. This may have contributed to bitterbrush doing well. Too low a pH due to fertilizer use may have caused the failure of the saltbrush. Bitterbrush is slowly expanding into the neighboring grass strips. Over time, big sage spread onto the site from adjacent native stands.

Grass/forb mix: The forb component is extremely sparse.

Goals realization: Generally, the goal of establishing “shrub steppe” was achieved. The diversity of species on most of the site was relatively low due to poor establishment of the sagebrush, saltbrush and forbs. The infestation of Dalmatian toadflax was unexpected. It is still manageable in this field. The bitterbrush stand was especially good in this field.

Primary “lessons learned”: The bitterbrush stand was very successful on this site seeded at ½ seed per square foot along with 13.4 seed/square foot of Sherman big bluegrass.

Special circumstances affecting outcomes: The seedbed was fairly weed-free at the time of seeding. Lower pH due to past farming activity may have caused poor four-wing salt brush establishment. Lack of sagebrush establishment may have been due to seed quality and/or seeding depth problems. Seeding depth with the no-till drill was difficult to regulate. Deeper planting of the shrub/grass mix may have caused poor Sherman big blue and sagebrush establishment giving the bitterbrush a competitive advantage.

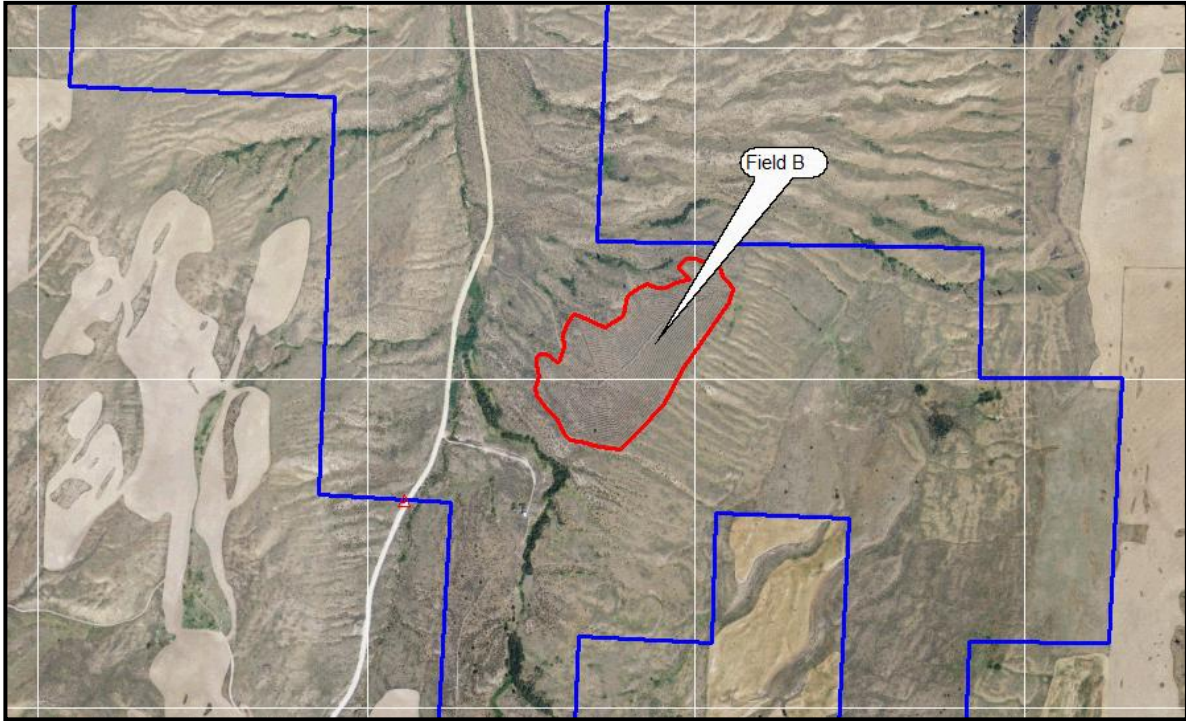
The shrub/grass seed mix was seeded in 8 ft rows adjacent to a grass/forb row 16 ft wide. Knowing that bitterbrush seedlings are poor competitors, the seed count was kept at a low 25 seed/square foot (PLS). Since the sagebrush and saltbrush seeding did not succeed, the effective seed count was around 13.4 seed/square foot. (12.9 for Sherman big bluegrass and 0.5 for bitterbrush).

Keys to present level of success: The initial lack of weeds due to relatively good farming practices lead to successful establishment of many of the species seeded. The firm seedbed in wheat stubble also contributed to positive results. What could have been done differently: Include some bitterbrush in the grass-forb mix, use native species, increase diversity (shrubs/forbs/grass), replace Sherman with Sandberg (lower rate) and deleted tall wheatgrass.

Project site future: No immediate plans. Consider inter-planting forbs and shrubs in the grass/forb strips to increase plant diversity and stand quality. If fire occurs, follow up with an inter-seeding of bitterbrush and forbs. A fire would remove the bitter brush component but would make inter-planting much easier. Inspect the site for noxious weeds and apply biological agents and herbicide as needed.

Attachments

Site maps:



_____ Central Ferry Canyon Unit Boundary

_____ Field boundary.

Soil map:



Central Ferry Canyon CRP Field B. Bitterbrush strips show up as darker lines (see also vicinity map).

Pre-project images: All were taken in the same general direction ~ N to NE



Figure 1: 11/23/1987 Central Ferry Canyon CRP Field B (looking northeast). No-till drill used to seed the site.

Post-project images:



Figure 2: 04/11/2011-(24 years post-planting). Same area as in photo 1. This stand is typical of the entire field.



Figure 3: 05/14/2004 (17 years post-planting)



Figure 4: 05/14/2004 - Encroachment of shrubs in the “grass/forb” strips
Seventeen years post-planting



Figure 5: 10/22/2009 – Field B in the center showing grass-forb and shrub-grass strips.
Twenty-two years post-planting.

Project characterization data:

Table 1: Soils, ecological sites, and presumed dominant species

Soils	% of site	Ecological site name or reference site description	Presumed dominant species composition in healthy condition
Winlock cemented and Conconully bedrock	71%	R008XY101WA	Grasses Bluebunch wheatgrass 72% Sandberg bluegrass 10% Cusick's bluegrass 7% Thurber's Needlegrass 7% Shrubs Sagebrush 10% Rabbitbrush 1% Bitterbrush 1% Forbs diverse but each <1%
Chelan, Cemented	27%	R008XY102WA	Grasses Bluebunch wheatgrass 72% Idaho fescue 8% Sandberg bluegrass 10% Shrubs - Sagebrush 1% Forbs diverse but each <1%

Table 2: Site preparation:

Date	Action	Objective(s)	Observations/Notes (chemicals, equipment used, and special issues).
9/86-9/87	Summer Fallow	Moisture retention and weed control	Disk, cultivator, rod weeder etc
8/87	Harvest	Harvest wheat. Stubble left for seeding	

Table 3a: Seed Mix 1. Grass/Forb mix (approx. 137.5 ac. in 16 ft wide strips alongside seed mix 2 strips)

Species	Percent: Seed/sq ft	Seeds/ sq ft	Pure live seeds lbs/acre
Alkar Tall Wheatgrass	5.3	2.11	1.16
Secar Bluebunch Wheatgrass	15.6	6.25	1.91
Small Burnett (New)	5.3	2.11	1.67
Yellow Blossom Sweet Clover	7.8	3.13	0.52
Appar Lewis Flax	8.6	3.43	0.51
Ladak Alfalfa	6.9	2.75	0.53

Sherman Big Blue Grass	48.2	19.26	0.91
Great Basin Wild Rye	2.3	0.90	0.24
TOTAL SEED		39.95	7.45
Rice hull			3.89
TOTAL			11.34

Table 3b: Seed Mix 2. Shrub/Forb Mix (Approx 46 acres in 8 ft wide strips alongside seed mix 1 strips)

Species	Percent: Seed/sq ft	Seeds/sq. ft.	Pure live seeds lbs/acre
Sherman Big Blue Grass	51.6	12.89	0.61
Bitterbrush	2.1	0.52	1.46
Big Sage (Wyoming)	13.5	3.38	0.06
Four-winged Saltbrush	32.9	8.21	6.46
TOTAL SEED		25.00	8.59
Rice hull			1.42
TOTAL			10.01

Table 4: Planting:

Date	11/20/87 – 11/24/87
Methods(s) and planting equipment	Contract “no-till” drill. 24 ft wide (3 sections).
Planting depths	Uneven – difficult to control with no-till drill
Seeding Rate (lbs per acre, or seeds per foot)	See table 3
Special actions taken	We used three seed mixes in the 3-section drill: Part of the area (252 acres) was seeded with the grass/forb mix in two sections of the drill (16ft) and with the shrub/grass mix in the third (8 ft). The grass only mix was seeded in a 10-acre portion of the southeast field where we had a Russian Knapweed problem. Drill feed tubes plugged up frequently and had to be disconnected from the shanks to allow seed to free-flow. Someone had to ride on the back of the drill through most of the seeding to stir the seed and notify the tractor driver when the feed tubes plugged.
Fertilizers/soil amendments	None

Table 5: Post Planting Actions and Observations.

Date	Action	Observations/Notes (Weed control chemicals and equipment used, effectiveness, inspection observations, any special issues).
Many years	None	No action needed as the site was relatively weed free.
Many years later	Biocontrol	Mecinus janthinus released to control Dalmatian toadflax.