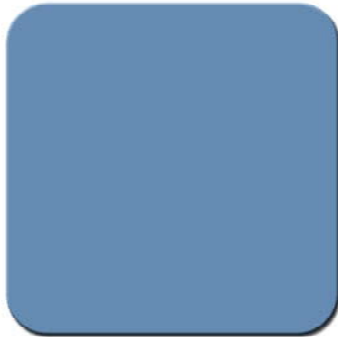


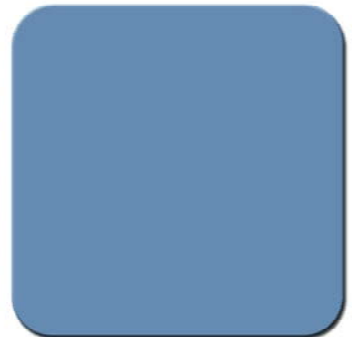
Big Lost River Trenches Revegetation Demonstration Project Progress Report and Formal Revegetation Assessment 2009



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February 2010**



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**Prepared for:
U.S. Department of Energy-Idaho
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Background

Eight trenches were excavated in close proximity to the Big Lost River during 2002 to support a geomorphic study of historical flood patterns and potential flood hazards on the Idaho National Laboratory (INL) Site (Figure 1). Trenches were excavated to a depth of approximately 1.5m, and ranged in length from about 20m to about 380m. Average trench width was 10-12m. Soil was stockpiled along the long axis of each trench and topsoil was separated from lower soil horizons.

The trenches were backfilled and revegetated during fall of 2007. Care was taken during backfill activities to minimize soil compaction and replace topsoil on the surface. A mix of native shrub, grass, and forb seed, specific to the vegetation occurring in the adjacent plant communities, was planted using a rangeland drill. Species used in the seed mix and application rates are shown in Table 1. Granular fertilizer was broadcast using an ATV-mounted spreader at a rate of 75 nitrogen, 35 phosphorous, 50 potassium, 50 elemental sulfur, 30 sulfur, and 5 zinc (# lbs/acre). Straw was hand broadcasted over the site at a rate of 2,000 lbs/acre and was crimped in using the rangeland drill. About 1,000 container-stock sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) seedlings were also planted on the trenches in 2007. Two trenches located within a BLM-administered grazing allotment were fenced with electric wire to exclude cattle. Silt fences were installed on all of the trenches. Supplemental irrigation was applied on four occasions using a water truck in June of 2008. Informal site inspections began in 2007 and formal revegetation assessments began in 2009. Activities from the 2009 growing season are reported here.

General Maintenance and Informal Site Inspections

Informal site inspections were conducted once every two to three weeks during the spring and summer (April through August) and once every month in the fall (September through November). Activities completed during informal site inspections included: photo documentation, survey for noxious weeds, pulling crested wheatgrass (*Agropyron desertorum*), repairing electric fences, and assessing water stress, mortality, and seed production for native, perennial species. Because livestock have not been using the portion of the allotment in which the trenches are located and because many of the seedlings resulting from the initial planting have matured and set seed, we removed the remaining electric fences in October.

Although standing dead plant material from the previous growing season was sparse prior to spring green-up (Figure 2), native, perennial grasses were abundant and thriving by June, especially on the Saddle and BLR-8 trenches (Figure 3). By early July and through the rest of the growing season, annual forbs and grasses grew rapidly, making native grasses less visible within the context of the surrounding vegetation (Figure 4). Most native grasses and native, perennial forbs did, however, survive and produce mature seed. Native grasses were much less abundant on the Big Loop trenches than the trenches at other locations, but native grasses are much less abundant in the native plant community surrounding the Big Loop trenches as well. Most of the container-stock sagebrush

seedlings survived the 2009 growing season and the majority of those produced seed. Some mortality of planted sagebrush seedlings was observed, but it was limited to isolated individuals on a few of the trenches. Hundreds of volunteer sagebrush seedlings, originating from seed dispersed onto the revegetation site from adjacent, mature individuals, germinated on the Big Loop trenches in June and many of them survived the summer.

Formal Revegetation Assessment

Vegetative cover data for formal revegetation assessments were collected in mid-July. A baseline transect was established at the edge of, and parallel to the long axis of each trench. Sample transects were placed perpendicular to the baseline transect at systematically chosen locations (every 5 to 10m depending on the size of the trench). Point interception frames (Floyd and Anderson 1982) were placed as sets of five contiguous frames beginning at random locations along each of the sample transects. We chose point interception because it is recognized as being “standard and efficient” in applications where the ability to accurately characterize and assess revegetation progress is critical for maintaining project performance standards, such as alternative landfill capping (ITRC 2003). Point interception frames have also been specifically recommended for evaluating revegetation progress at the INL (Anderson and Shumar 1989). Samples sizes ranged from 15 to 300 frames per trench and a total of 13,500 points were sampled. A relational database was designed for assessment data from this and future years; data from the 2009 revegetation assessments were imported into the database.

General estimates for background vegetation cover were obtained from point interception frame data collected as a component of the INL Plant Community Classification and Vegetation Mapping project in 2008. Four plots located within 5 km of the trenches and within the Tin Cup Fire scar were used to estimate background cover values for the trenches located at BLR-8 and at the Saddle area since those five trenches are also located within the Tin Cup Fire scar. Three plots located within 5 km of the trenches, and outside of the Tin Cup Fire scar were used to estimate background cover values for the Big Loop trenches. All three plots were located in areas where there has been no known recent disturbance, and where there is no history of disturbance apparent in aerial imagery. To assess progress toward meeting 70% standards, we compared absolute aerial cover of native, perennial shrubs, grasses, and forbs, summed across these functional groups, with the same cover estimate in the appropriate set of background plots.

We used data from the Plant Community Classification and Vegetation Mapping Project to estimate general cover ranges for the target group of species because it is generally most efficient to postpone collecting site-specific background data and completing statistical comparisons until a revegetation site begins to approach expected background cover values. Even under favorable conditions, species composition and cover values for revegetation sites in sagebrush steppe ecosystems typically take more than five years to approach those in comparable undisturbed sites (McLendon and Redente 1997) and at the time the data for the formal revegetation assessments were collected, less than two years had passed since planting. As the cover of native perennial species on the trenches

begins to approach at least 70% of cover in the general background estimates, appropriate site-specific control data will be collected and statistical analyses will be completed.

Absolute cover of native, perennial species in the background plots located within the Tin Cup Fire scar ranged from approximately 11% to 45% (Table 2). Native and introduced annual species were also present and often abundant in the background plots, likely a consequence of current and historical land uses of the area coupled with the relatively recent fire. Absolute cover of native, perennial species on the BLR-8 trenches was 26% and 30%. Much of the native, perennial cover was from grasses, both seeded and volunteer. Indian ricegrass (*Achnatherum hymenoides*) was the most abundant native species on both of the BLR-8 trenches (Table 3). On the trenches at the Saddle area, native, perennial cover ranged from 6% to 14% and was from a combination of combination of grasses and forbs (Table 4). The most abundant annual species on the BLR-8 and Saddle area trenches were Russian thistle (*Salsola kali*) and tall tumbled mustard (*Sisymbrium altissimum*).

Absolute cover of native, perennial species in the unburned background plots ranged from 36% to 57%. Shrubs and herbaceous species generally co-dominated those plots; cover from annual species was low (Table 5). Absolute cover of native, perennial species on the Big Loop trenches ranged from about 2% to 7%, about half from shrubs and half from grasses and forbs. Cheatgrass was the most abundant annual species on the Big Loop trenches (Table 6).

Native, perennial species cover was primarily from herbaceous species on the BLR-8 and Saddle trenches and was from a combination of shrubs and herbaceous species on the Big Loop trenches. Thus, the composition of native, perennial species on the trenches was similar to that of the background areas. However, the cover of native, perennial species on the trenches ranged from much lower than the control at Big Loop to well within the range of variability of the control at BLR-8. Much of this result likely relates to the life history characteristics of the dominant species in the background vegetation at the respective locations. For example, grasses can reach maturity within a growing season or two, so it is possible for a revegetated area dominated by grasses to reach approximate cover values of a grass-dominated background area in a relatively short time. Conversely, even under favorable conditions, it can take sagebrush individuals over a decade to reach mature sizes. Mortality of sagebrush at the Big Loop trenches has been low and natural recruitment has resulted in the establishment of dozens of new seedlings, so we expect to see continued annual increases in shrub cover, and consequently in the cover of native, perennial species as sagebrush individuals grow and mature.

Annual species were abundant on all of the trenches. Cover of annual species is not typically included as a component of the target cover criteria used to determine whether a revegetated site has reached the goal of 70% of background native, perennial cover in order to be considered for release from regulatory oversight. However, the presence and dominance of annual species on native revegetation sites on the INL Site within the first few years of planting is documented (Anderson and Shumar 1989) and should be anticipated. Because the nature of the annual species occupying a revegetation site may

affect the ability of that site to reach target cover levels of native, perennial species; annual species should receive consideration during revegetation assessments.

The most abundant annual species on the BLR-8 and Saddle trenches are Russian thistle and tall tumbled mustard. Both of these species are poor competitors against native perennials and should “give up” easily as the cover of native, perennial species continues to increase (McLendon and Redente 1997). Consequently, we will not proceed with any action to control these species at this time. Cheatgrass is the most abundant annual species on the Big Loop trenches and is more likely to persist than other annuals. It is however, moderately sensitive to shading and is likely to decrease in abundance as sagebrush increase in size and the canopy begins to close (McLendon and Redente 1997). Cheatgrass will continued to be monitored over the next growing season, and if the 2010 revegetation assessment results indicate that native, perennial cover is not increasing as a result of abundant cheatgrass cover, further maintenance action will be considered. Possible maintenance action may include planting additional container-stock seedlings or transplanting salvaged wildings of appropriate grass and shrub species onto the affected trenches.

Schedule

Informal site inspections will resume in the spring of 2010 and the trenches will continue to be monitored for crested wheatgrass, noxious weeds, and excessive mortality of native perennials. Data for formal revegetation assessments will be collected during the 2010 growing season, and will include site-specific control data for the BLR-8 trenches as native, perennial cover estimates for those trenches are within the range of variability of the general background estimates for the surrounding area. Formal statistical analyses will be completed for the BLR-8 trenches to determine, with some degree of certainty, whether they meet the 70% of background requirement for native, perennial species.

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Tables

Table 1. Species mix and application rates of seed planted on the Big Lost River trenches in October 2007.

Species	Seeding Rate (PLS lb/acre)
Green Rabbitbrush (<i>Chrysothamnus viscidiflorus</i>)	0.5
Wyoming Big Sagebrush (<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>)	0.5
Needle-and-Thread Grass (<i>Hesperostipa comata</i>)	3
Indian Ricegrass "Rimrock" (<i>Achnatherum hymenoides</i>)	3
Thickspike wheatgrass "Bannock" (<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>)	3
Bottlebrush Squirreltail (<i>Elymus elymoides</i>)	2
Silverleaf Lupine (<i>Lupinus argenteus</i>)	2

Table 2. Absolute cover by species for four plots sampled during 2008 to support the Plant Community Classification and Mapping project. Data are used to estimate the general range of cover values in the plant community surrounding the trenches at BLR-8 and the Saddle area.

	PCCS130	PCCS136	PCC26	PCC36
Native Perennial Shrubs				
<i>Chrysothamnus viscidiflorus</i>	0.00	17.22	0.42	4.86
<i>Linanthus pungens</i>	0.00	0.00	0.28	0.00
<i>Opuntia polyacantha</i>	0.00	0.00	0.69	0.00
<i>Tetradymia canescens</i>	0.00	0.14	1.39	0.00
Native Perennial Shrub Cover	0.00	17.36	2.78	4.86
Native Perennial Grasses				
<i>Achnatherum hymenoides</i>	0.00	3.06	3.61	1.11
<i>Elymus elymoides</i>	0.00	0.00	0.28	0.00
<i>Elymus lanceolatus</i>	4.44	9.03	3.75	8.19
<i>Hesperostipa comata</i>	0.00	6.39	7.08	2.92
<i>Pascopyrum smithii</i>	0.00	0.00	2.92	0.28
<i>Poa secunda</i>	6.53	1.67	19.86	0.14
<i>Pseudoroegneria spicata</i>	0.00	0.00	2.08	0.14
Native Perennial Grass Cover	10.97	20.14	39.58	12.78
Native Perennial Forbs				
<i>Astragalus lentiginosus</i>	0.00	0.00	1.94	0.69
<i>Crepis acuminata</i>	0.00	0.00	0.14	1.39
<i>Lomatium dissectum</i>	0.00	0.00	0.00	0.69
<i>Lomatium foeniculaceum</i>	0.00	0.00	0.00	0.14
<i>Lupinus argenteus</i>	0.00	0.14	0.00	0.00
<i>Machaeranthera canescens</i>	0.00	0.69	0.00	0.00
<i>Phacelia hastata</i>	0.00	0.00	0.56	0.00
<i>Phlox hoodii</i>	0.00	0.00	0.00	0.28
Native Perennial Forb Cover	0.00	0.83	2.64	3.19
TOTAL NATIVE PERENNIAL COVER	10.97	38.33	45.00	20.83
Native and Annual and Biennial Forbs				
<i>Chaenactis douglasii</i>	0.00	0.14	0.14	0.00
<i>Chenopodium leptophyllum</i>	0.00	0.28	0.00	0.00
<i>Descurainia pinnata</i>	0.00	0.69	0.00	0.42
<i>Mentzelia albicaulis</i>	5.69	0.00	0.14	0.00
Native Annual an Biennial Forb Cover	5.69	1.11	0.28	0.42
Introduced Perennial Grasses				
<i>Agropyron cristatum</i>	0.00	17.08	0.00	0.00
Introduced Perennial Grass Cover	0.00	17.08	0.00	0.00
Introduced Annual Grasses				
<i>Bromus tectorum</i>	63.47	0.28	0.14	1.94
Introduced Annual Grass Cover	63.47	0.28	0.14	1.94
Introduced Annual and Biennial Forbs				
<i>Alyssum desertorum</i>	0.00	10.69	4.58	30.69
<i>Descurainia sophia</i>	0.00	0.00	2.50	0.00
<i>Salsola kali</i>	0.14	0.00	0.00	0.00
<i>Sisymbrium altissimum</i>	0.97	0.00	0.42	0.00
<i>Tragopogon dubius</i>	0.00	0.14	0.28	0.00
Introduced Annual and Biennial Forb Cover	1.11	10.83	7.78	30.69
TOTAL VEGETATIVE COVER	81.25	67.64	53.19	53.89

Table 3. Absolute cover by species for the trenches located at BLR-8. Trenches were sampled in July 2009 to support formal revegetation assessments. Trench 7 is the western-most trench and trench 8 is the eastern-most trench.

	Trench 7	Trench 8
Native Perennial Shrubs		
<i>Artemisia tridentata</i>	0.56	0.46
<i>Chrysothamnus viscidiflorus</i>	0.42	0.00
Native Perennial Shrub Cover	0.97	0.46
Native Perennial Grasses		
<i>Achnatherum hymenoides</i>	14.24	14.81
<i>Elymus elymoides</i>	0.14	0.00
<i>Elymus lanceolatus</i>	5.90	3.89
<i>Hesperostipa comata</i>	3.33	2.04
<i>Leymus cinereus</i>	0.14	0.00
<i>Pascopyrum smithii</i>	2.36	3.52
Native Perennial Grass Cover	26.11	24.26
Native Perennial Forbs		
<i>Astragalus lentiginosus</i>	1.88	0.00
<i>Crepis acuminata</i>	0.00	0.93
<i>Machaeranthera canescens</i>	0.83	0.74
Native Perennial Forb Cover	2.71	1.67
TOTAL NATIVE PERENNIAL COVER	29.79	26.39
Native and Annual and Biennial Forbs		
<i>Chenopodium leptophyllum</i>	0.07	0.00
<i>Cryptantha scoparia</i>	0.00	3.80
<i>Descurainia pinnata</i>	1.11	0.46
<i>Eriogonum cernuum</i>	0.07	0.00
<i>Lappula occidentalis</i>	0.49	0.28
<i>Mentzelia albicaulis</i>	2.92	1.57
Native Annual an Biennial Forb Cover	4.65	6.11
Introduced Annual Grasses		
<i>Bromus tectorum</i>	3.19	3.89
<i>Triticum aestivum</i>	0.49	1.11
Introduced Annual Grass Cover	3.68	5.00
Introduced Annual and Biennial Forbs		
<i>Alyssum desertorum</i>	0.14	0.09
<i>Bassia scoparia</i>	0.07	0.00
<i>Descurainia sophia</i>	4.86	0.00
<i>Salsola kali</i>	31.25	33.52
<i>Sisymbrium altissimum</i>	7.64	0.93
Introduced Annual and Biennial Forb Cover	43.96	34.54
TOTAL VEGETATIVE COVER	82.08	72.04

Table 4. Absolute cover by species for the trenches located at the Saddle area. Trenches were sampled in July 2009 to support formal revegetation assessments. Trench 4 is located east of the river, trench 5 is the small trench located west of the river, and trench 6 is the long trench located west of the river.

	Trench 4	Trench 5	Trench 6
Native Perennial Shrubs			
<i>Artemisia tridentata</i>	0.00	4.26	0.74
<i>Ericameria nauseosa</i>	0.00	0.00	0.09
Native Perennial Shrub Cover	0.00	4.26	0.83
Native Perennial Grasses			
<i>Achnatherum hymenoides</i>	9.63	1.11	3.63
<i>Elymus elymoides</i>	0.00	0.00	0.13
<i>Elymus lanceolatus</i>	3.33	0.37	1.67
<i>Hesperostipa comata</i>	0.37	0.00	0.13
<i>Pascopyrum smithii</i>	0.00	0.00	0.07
<i>Poa secunda</i>	0.00	0.00	0.33
Native Perennial Grass Cover	13.33	1.48	5.96
Native Perennial Forbs			
<i>Iva axillaris</i>	0.00	0.00	0.07
<i>Lupinus argenteus</i>	0.56	0.19	0.00
<i>Machaeranthera canescens</i>	0.00	0.19	0.00
<i>Psoralidium lanceolatum</i>	0.00	0.00	3.02
Native Perennial Forb Cover	0.56	0.37	3.09
TOTAL NATIVE PERENNIAL COVER	13.89	6.11	9.89
Native and Annual and Biennial Forbs			
<i>Aliciella leptomeria</i>	0.00	0.00	0.02
<i>Chaenactis douglasii</i>	0.19	0.00	0.00
<i>Chenopodium leptophyllum</i>	0.00	0.00	0.11
<i>Cryptantha circumscissa</i>	0.00	0.00	0.02
<i>Cryptantha scoparia</i>	0.00	0.00	0.06
<i>Descurainia pinnata</i>	0.74	0.00	0.06
<i>Eriogonum cernuum</i>	0.74	0.00	0.00
<i>Gayophytum diffusum</i>	0.00	0.00	0.07
<i>Lappula occidentalis</i>	0.19	0.00	0.04
<i>Mentzelia albicaulis</i>	1.67	1.67	1.44
Native Annual an Biennial Forb Cover	3.52	1.67	1.81
Introduced Annual Grasses			
<i>Bromus tectorum</i>	14.81	6.85	11.22
<i>Triticum aestivum</i>	1.30	0.00	0.46
Introduced Annual Grass Cover	16.11	6.85	11.69
Introduced Annual and Biennial Forbs			
<i>Alyssum desertorum</i>	0.00	0.00	4.44
<i>Bassia scoparia</i>	0.00	0.37	0.02
<i>Chenopodium album</i>	0.00	0.00	0.02
<i>Descurainia sophia</i>	3.89	2.59	4.85
<i>Salsola kali</i>	55.74	70.00	30.93
<i>Sisymbrium altissimum</i>	0.00	14.81	34.31
Introduced Annual and Biennial Forb Cover	59.63	87.78	74.57
TOTAL VEGETATIVE COVER	93.15	102.41	97.96

Table 5. Absolute cover by species for three plots sampled during 2008 to support the Plant Community Classification and Mapping project. Data are used to estimate the general range of cover values in the plant community surrounding the trenches at Big Loop.

	PCC68	PCC70	PCC77
Native Perennial Shrubs			
<i>Artemisia tridentata</i>	0.00	1.11	15.83
<i>Artemisia tripartita</i>	12.92	4.44	0.00
<i>Chrysothamnus viscidiflorus</i>	20.42	7.22	2.50
<i>Eriogonum microthecum</i>	0.00	0.28	0.00
<i>Linanthus pungens</i>	0.00	1.81	0.14
<i>Opuntia polyacantha</i>	0.00	0.14	0.00
<i>Tetradymia canescens</i>	8.75	3.61	0.00
Native Perennial Shrub Cover	42.08	18.61	18.47
Native Perennial Grasses			
<i>Achnatherum hymenoides</i>	0.00	0.00	0.56
<i>Carex douglasii</i>	0.00	1.11	0.00
<i>Elymus elymoides</i>	0.42	0.00	2.50
<i>Elymus lanceolatus</i>	3.89	6.11	6.11
<i>Poa secunda</i>	0.14	0.00	8.06
<i>Pseudoroegneria spicata</i>	8.47	12.92	0.00
Native Perennial Grass Cover	12.92	20.14	17.22
Native Perennial Forbs			
<i>Arabis lignifera</i>	0.14	0.00	0.00
<i>Astragalus lentiginosus</i>	0.28	0.14	0.00
<i>Erigeron pumilus</i>	0.00	0.14	0.00
<i>Machaeranthera canescens</i>	0.00	0.42	0.00
<i>Phlox hoodii</i>	1.11	0.42	0.14
<i>Schoenocrambe linifolia</i>	0.00	0.14	0.00
Native Perennial Forb Cover	1.53	1.25	0.14
TOTAL NATIVE PERENNIAL COVER	56.53	40.00	35.83
Native and Annual and Biennial Forbs			
<i>Descurainia pinnata</i>	1.25	0.00	0.00
<i>Lappula occidentalis</i>	0.14	0.00	0.00
Native Annual and Biennial Forb Cover	1.39	0.00	0.00
Introduced Annual Grasses			
<i>Bromus tectorum</i>	0.00	0.00	5.28
Introduced Annual Grass Cover	0.00	0.00	5.28
Introduced Annual and Biennial Forbs			
<i>Alyssum desertorum</i>	0.00	0.00	2.92
Introduced Annual and Biennial Forb Cover	0.00	0.00	2.92
TOTAL VEGETATIVE COVER	57.92	40.00	44.03

Table 6. Absolute cover by species for the trenches located at the Big Loop. Trenches were sampled in July 2009 to support formal revegetation assessments. Trench 1 is the southern-most trench, Trench 3 is the northern-most trench and trench 2 is located between trenches 1 and 3.

	Trench 1	Trench 2	Trench 3
Native Perennial Shrubs			
<i>Artemisia tridentata</i>	0.00	1.98	0.99
<i>Chrysothamnus viscidiflorus</i>	0.00	1.36	1.11
<i>Ericameria nauseosa</i>	0.00	0.00	0.37
Native Perennial Shrub Cover	0.00	3.33	2.47
Native Perennial Grasses			
<i>Achnatherum hymenoides</i>	0.48	0.19	1.17
<i>Elymus elymoides</i>	0.00	0.00	0.25
<i>Elymus lanceolatus</i>	0.32	1.23	1.91
<i>Poa secunda</i>	1.43	0.37	0.93
Native Perennial Grass Cover	2.22	1.79	4.26
Native Perennial Forbs			
<i>Lupinus argenteus</i>	0.00	0.49	0.31
<i>Machaeranthera canescens</i>	0.00	0.68	0.06
Native Perennial Forb Cover	0.00	1.17	0.37
TOTAL NATIVE PERENNIAL COVER	2.22	6.30	7.10
Native Annual Forbs			
<i>Chenopodium leptophyllum</i>	0.00	0.06	0.00
<i>Cryptantha scoparia</i>	0.00	0.00	0.12
<i>Descurainia pinnata</i>	0.00	0.06	1.05
<i>Eriastrum wilcoxii</i>	0.00	0.00	0.06
<i>Lappula occidentalis</i>	0.00	0.43	1.60
Native Annual Forb Cover	0.00	0.56	2.84
Introduced Annual Grasses			
<i>Bromus arvensis</i>	0.00	0.00	0.06
<i>Bromus tectorum</i>	67.86	72.59	48.52
<i>Triticum aestivum</i>	0.00	0.12	0.93
Introduced Annual Grass Cover	67.86	72.72	49.51
Introduced Annual and Biennial Forbs			
<i>Alyssum desertorum</i>	0.08	0.00	0.49
<i>Bassia scoparia</i>	0.08	6.79	0.19
<i>Descurainia sophia</i>	0.08	3.58	3.83
<i>Halogeton glomeratus</i>	0.00	0.31	0.00
<i>Lactuca serriola</i>	0.00	0.12	0.12
<i>Salsola kali</i>	0.00	2.10	37.72
<i>Sisymbrium altissimum</i>	60.40	40.19	4.01
Introduced Annual and Biennial Forb Cover	60.63	53.09	46.36
TOTAL VEGETATIVE COVER	130.71	132.65	105.80

Figures

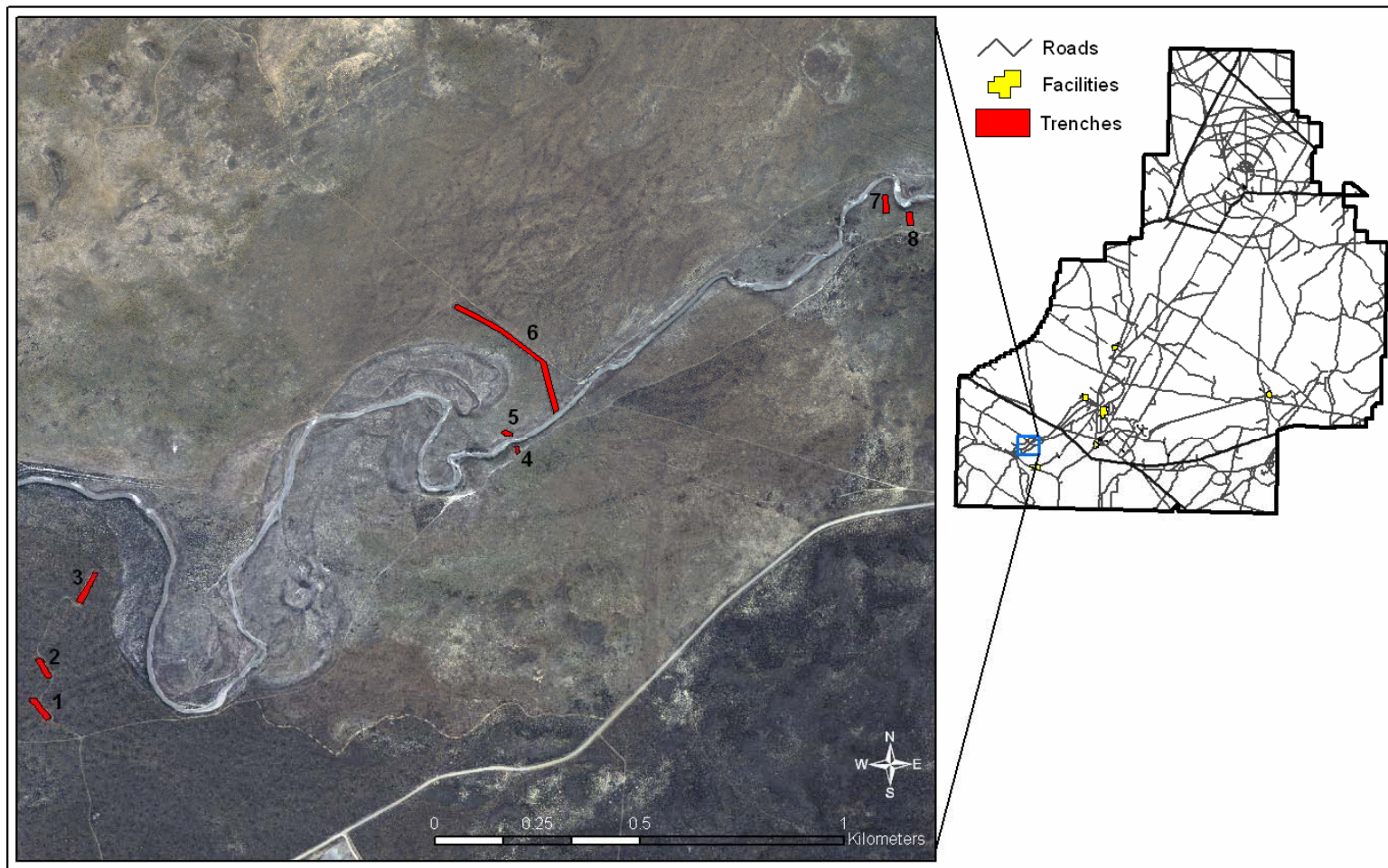


Figure 1. Location of the Big Lost River Trenches on the Idaho National Laboratory Site.



Figure 2. Trench 6 at the Saddle area on April 14, 2009, prior to spring green-up.



Figure 3. Trench 6 at the Saddle area on June 5, 2009; native, perennial species are abundant and annuals have not yet reached peak biomass.



Figure 4. Trench 6 at the Saddle area on November 4, 2009; the electric fence has been removed and plants have senesced for the season.