AS BUILT REPORT

Frazier Creek Wetland Mitigation Bank

Benton County, Oregon

Prepared for:

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INTRODUCTION

Hidden Spring Consulting, Inc. (Consultant) was asked to conduct monitoring inspections for the Frazier Creek Wetland Mitigation Bank (Sponsor), owned by Ken Reynolds, located in Corvallis, Oregon. The site is located in Township 11 South, Range 4 West, northwest quarter of Section 18, Tax Lot 400 Benton County, Oregon (Figure 1). The wetland mitigation bank is contiguous with the Jackson-Frazier Wetland.

The purpose of this report is to review as-built conditions including site preparation, hydrology monitoring, and plant installation. Data from reference sites will also be included. The review is based on the *Instrument for Frazier Creek Wetland Mitigation Bank, Benton County, Oregon* (Instrument) prepared by Jay R. Lorenz.

SITE PREPARATION AND PLANT INSTALLATION

The site, prior to conversion to a wetland mitigation bank, was used for (annual) ryegrass production (*Lolium* sp.). Ryegrass was last harvested in the summer of 2002. Site preparation began in the late summer of 2002 and included plowing and grading. Grading was done in accordance with Figure 3A in the Instrument, including the construction of two water distribution swales.

Outlet structures were constructed at the north end of the two new distribution swales (see attached photographs). The structures were built to restrict (slow down) water exiting the wetland mitigation area. The outlet structures have a four-inch gap to permit fish passage.

Berms in the vicinity of the outlet structures were monitored during the winter of 2002 and 2003. Some bank erosion occurred in the winter due to the severity of the storms and soils that were not stabilized (compacted) enough to withstand high water. Breaches in berms were repaired and compacted in the summer of 2003. Repair work included additional armoring of the sides of the outlet structures with rip-rap.

In the late spring and summer of 2003, soils were prepared for planting by re-application of herbicides to eliminate ryegrass and by additional disking. There was a re-sprouting of annual ryegrass and another application of herbicide (one quart per acre) was applied prior to plant installation.

Plant installation began in October 2003 after multiple efforts (grading, plowing and application of herbicide) had been conducted to remove annual ryegrass. The grass seed mix (tufted hairgrass, *Deschampsia cespitosa*; meadow barley, *Hordeum brachyantherum*; spike bentgrass, *Agrostis exarata*; and slough grass, *Beckmannia syzigachne*) was installed in the area proposed for wet prairie by drilling. The seed mix did not include sedges, rushes, or forbs. Rain fell the day after seeding, suggesting conditions would be good for germination.

Trees and shrubs were planted according to the plan (Tables 2, 5, and 6 of the Instrument). No substitutions or changes were made to the species list or size of the installed material. All trees

and shrubs were planted in the approximate areas proposed on the planting plan. Willow slips were installed in February 2004.

A re-sprout of annual ryegrass was noted in November 2003. Additional herbicides were not applied because the Sponsor did not want to harm the native grass seed mix that was seeded one month earlier.

WETLAND HYDROLOGY

Monitoring wetland hydrology began in December 2002. Ten monitoring tubes (two-inch diameter pvc pipe) were installed to a depth of 18 inches. Slits were cut in the bottom 12 inches of each pipe. Cork dust was sprinkled into each tube prior to measuring water depth. A tape measure was used to measure water levels with the cork dust marking the water level. Direct measurements of water depth were made in areas of inundation. Wetland hydrology data is listed in Table 1. The location of monitoring tubes is illustrated in Figure 3.

TABLE 2. WETLAND HYDROLOGY DATA FRAZIER CREEK WETLAND MITIGATION BANK

TUBE NUMBER	DEPTH OF WATER FROM SURFACE (INCHES, MINUS OR PLUS DENOTES BELOW OR ABOVE SURFACE)						
	DATE						
	12/18/02	2/25/03	4/4/03	4/30/03	3/17/04	3/29/04	4/23/04
1	1.50	-6.00	0	-6.00	-10.25	-7.00	-7.50
2	1.50	-4.50	-2.50	-7.25	-10.25	-14.00	5.00
3	-1.00	-4.00	0	-6.00	-10.00	-9.00	-6.00
4	-1.25	-6.50	0	-2.00	-10.75	-8.50	-8.50
5	-4.50	3.50	0	-2.50	1.50	0.25	2.00
6	1.75	1.75	4.00	3.00	5.25	5.00	1.00
7	1.75	1.00	2.00	0	0	0	2.00
8	-1.10	-2.00	0.50	-2.50	-5.75	-14.00	-7.75
9	-3.25	-6.75	0	-8.50	-11.75	-8.00	0
10	1.00	1.50	0	0	-2.25	-14.00	-4.00

Wetland hydrology was examined at several reference sites in the spring of 2004. The location of reference sites is illustrated in Figures 1 and 2. Reference sites were located in the wetland forest on the Dunning Property, adjacent to the mitigation area; two areas of wet prairie at the entrance of the Jackson-Frazier Wetland; two sites within forested areas of the Jackson-Frazier Wetland; and at two plots in wet prairie areas of the William J. Finley National Wildlife Refuge. Wetland hydrology was examined by digging test pits to a depth of 12 to 16 inches and then measuring the depth of the water seeping into the holes. Test pits were generally left open for 30 to 60 minutes before measuring the depth to soil saturation. Test pits were less than 16 inches deep where soils were saturated close to the surface.

TABLE 2. WETLAND HYDROLOGY REFERENCE SITES

SITE NUMBER	SITE LOCATION	LATITUDE (N)* LONGITUDE (W)	DEPTH OF WATER FROM SURFACE (INCHES) DATE		
			3/29/04	3/31/04	4/27/04
D1	Forest, Dunning Property	44.61321 123.23109	0	**	**
JF1	Jackson-Frazier Wet Prairie	44.60401 123.24034	**	-12.0	-12.0
JF2	Jackson-Frazier Wet Prairie	44.60381 123.23906	**	-4.0	-6.0
JF3	Jackson-Frazier Forest	44.60610 123.23796	**	2.0	2.0
JF4	Jackson-Frazier Forest	44.60538 123.23715	**	0	0
Fin1	Finley Wet Prairie	44.42327 123.30392	**	**	-12.0
Fin2	Finley Wet Prairie	44.42293 123.30394	**	**	>16.0 below

* Recorded with hand-held GPS ** No Data

Precipitation data as recorded at the Hyslop Field Station is listed in Table 3.

TABLE 3. PRECIPITATION -- HYSLOP FIELD STATION

DATE	PRECIPITATION (inches)	DEPARTURE FROM NORMAL
November 2002	5.42	-1.41
December 2002	12.51	4.79
January 2003	7.22	0.40
February 2003	3.59	-1.45
March 2003	7.52	2.97
April 2003	6.48	3.92
January 2004	8.00	1.18
February 2004	4.59	-0.09
March 2004	1.92	-2.63
April 2003	2.33	-0.23

The standard of success stated that wetland hydrology (inundation or saturation within the top 12 inches of the soil) should be present through May 15. In 2003, the wetland hydrology criteria were satisfied on April 30. Wetland hydrology data was not recorded in mid-May 2003. However, the data suggests that the wetland hydrology criteria were satisfied through May 15, 2003, based on the depth to saturation on April 30, 2003.

The wetland hydrology criteria were not satisfied at several plots in late March 2004. Precipitation during March 2004 was 1.92 inches or 2.63 inches below normal. Depth to soil saturation was 12 inches from the surface at reference plot JF1 in March and April 2004. Similarly, depth to saturation was 12 inches or more from the surface in the wet prairie in the Finley National Wildlife Refuge in late April 2004. In early April 2004, the bank sponsor blocked the outlet structures in the two constructed swales. Some water was still allowed to escape. Blocking or slowing the release of water from the mitigation area increased the area of inundation behind the outlet structures and increased wetland hydrology in the site (compare March to April data in Table 2). Poor wetland hydrology in March 2004 appeared to be a function of the below normal precipitation during the month of March and was consistent with below normal wetland hydrology at comparable reference sites.

AS-BUILT PLANTING AND MONITORING

Initial planting of trees and shrubs was conducted October 6, 2003 (see attached photographs). The grass seed mix was installed about the first of October 2003. This section will provide the results of as-built monitoring, conducted March 29, 2004.

As-built monitoring was generally conducted in accordance with protocol outlined in the Instrument. However, there was some variation in the number of sample plots. Sampling rather than a complete count was used in the hedgerow as well as the shrub edge of the Oregon ash forest.

Hedgerow Along Northern Boundary

The shrub hedgerow was evaluated at 15 sample plots, one sample plot every 100 feet, along an east to west transect of the northern boundary. The number of trees and shrubs were counted within a 10-foot strip (or five feet either side of the center point). Species of shrubs and trees, approximate size, and estimate of areal cover were noted. Two of the sample plots fell at the outlet structures that were re-enforced with rip-rap and not planted. Data is summarized for the 13 and 15 sample plots in Table 4.

The planting plan proposed that the shrub hedgerow would be three to five feet wide. Measurements taken at several random points indicated the planting strip width was 5 to 8 feet. For the purpose of estimating stem density, a width of 5 feet was used (i.e., 50 square feet per sample plot).

TABLE 4. SUMMARY OF HEDGEROW PLANTINGS—NORTHERN BOUNDARY

	April 27, 2004	Proposed on Plan
Average Number of Shrubs (13 plots)	6	
Average Number of Shrubs (15 plots)	5.2	
Average Number of Trees (13 plots)	0.54	
Average Number of Trees (15 plots)	0.47	
Density per Plot (13 plots, 50 sq. ft.)	1 stem every 2.5 to 3 feet	1 stem every 2.5 to 3 feet

The planting plan called for one tree every 100 feet along the hedgerow. Sampling data suggested that there was less than one tree every 100 feet. However, trees were frequently noted on the edge of each sample plot. The tree density of less than one tree every 100 feet was an artifact of sampling rather than a reduction in the number of trees called for on the plan.

All species of trees and shrubs called for on the planting plan were present in the hedgerow along the northern property boundary. Himalayan blackberry was noted at two sample plots. They were brought to the attention of the Sponsor who was advised to institute control measures. About six dead plants were noted along the entire hedgerow. The planting density indicates that the numbers of plants called for on the plan (885 total) were installed and that survivorship was well above 95 percent.

Willow Planting Southwest Portion of Site

An area of shrubs dominated by willows was proposed in the southwest portion of the site. The planting plan called for an area of about 0.2 acres, in a triangular shape. Assuming a perfect triangular shape, measurements of the willow area indicated that about 0.15 acres was planted to willow. The area planted to willows has rounded angles and curved sides. Thus, the area planted was possibly slightly larger than the measurements that assumed a perfect triangular shape. The area planted to willows is in conformance with the plan.

Willows were planted in February 2004, prior to the onset of the growing season and prior to budding.

Willows were sampled by counting all stems in a circle within a radius of 20 feet, located in the center of the community. The area sampled was 1,256 square feet and 45 willows were counted. The plan called for one stem every 5 to 6 feet. Stem density of willows is one stem every 5 to 6 feet and is conformance with the plan.

The planting plan called for un-branched slips or stakes to be planted. The Sponsor planted willow stakes that were branched. Willows were in good condition in late April 2004 and the branching on stakes is not likely to be a problem. A photograph illustrating a typical willow is attached.

Ash Forest and Shrub Edge

An area of about 3.5 acres plus a shrub edge were proposed as forested wetland. Forested habitat was designed along the western boundary of the mitigation area and intended to be contiguous with existing forested wetland on adjacent property.

Trees and shrubs were counted at 15 sample plots, each within a 10-foot radius. Two of the plots over-lapped the shrub edge. Stakes were placed in the center of each plot to identify locations for future sampling. Each plot was 314 square feet and had an average of 2.4 stems of Oregon ash per plot. The planting plan called for one tree every 12 feet and sampling indicated that trees were planted at a density of one stem every 11 feet. Trees were approximately three to five feet tall (see typical photograph, attached).

Most of the Oregon ash was still dormant on the date of sampling. Buds were beginning to open on some stems. Overall, Oregon ash were in good condition and dead plants were not apparent. Shrubs called for in the planting plan, rose (*Rosa* sp.), crabapple (*Pyrus fusca*), dogwood (*Cornus stolonifera*), spirea (*Spiraea douglasii*), and black hawthorn (*Crataegus douglasii*), were all present in the edge habitat.

The planting plan called for slough sedge, water parsley, skunk cabbage, and camas lily to be planted in the understory of the forest habitat. These species have yet to be installed. The Sponsor is working to remove ryegrass in the understory before planting emergent plants in the understory.

Wet Prairie

The largest habitat type, wet prairie was proposed over an area of about 17.8 acres. Dominant plants proposed for the wet prairie include grasses, sedges, and rushes. Vegetation was sampled at 39 plots, one yard by one yard, in the wet prairie. The Instrument recommended sampling at 60 to 65 sample plots. Currently, ground cover is homogenous in the area proposed for wet prairie. The reduced number of sample plots had virtually no effect in characterizing current conditions on the wetland prairie.

Annual ryegrass continues to dominate the area proposed for wet prairie and constitutes a cover of 75 percent or more. Newly sprouted grasses of unidentified species, chickweed (*Cerastium arvense*), willow-herb (*Epilobium ciliatum*), manna grass (*Glyceria* sp.), dagger-leaf rush (*Juncus ensifolius*), and water plantain (*Alisma plantago-aquatica*) were noted at several sample plots. Ryegrass is absent in areas that were under prolonged inundation during the winter and early spring, especially along the constructed swales. Presence of ryegrass indicates a latent seed bed in the soils, despite one full growing season of the field being fallow, and chemical and mechanical efforts to remove the ryegrass. Native grasses have yet to express themselves in any identifiable quantity.

VEGETATION AT REFERENCE SITES

Vegetation was sampled at five forest plots in the Jackson-Frazier Wetland (Site Numbers D1, JF3, and JF4), at two wet prairie sites at the entrance to the Jackson-Frazier Wetland (Site Numbers JF1 and JF2), and at two plots in the William L. Finley National Wildlife Refuge (Site Numbers Fin1 and Fin2).

Density of trees at the forested sites was estimated by sampling a total of five plots at site numbers D1, JF3, and JF4. As in the mitigation bank site, each plot was a circle with a 10-foot radius. The number of tree stems per plot varied from 1 to 15 or a density of about one stem every 16 feet to one stem every 5 feet. Canopy cover was greater than 75 percent at all sample plots.

Ground cover was variable across the five forested sample plots. Water parsley comprised about 50 to 75 percent of the ground cover at sites JF3 and JF4. Ground was mostly bare in the vicinity of D1, although patches of slough sedge were scattered in the vicinity.

The planting density in the mitigation bank of one stem every 11 feet was within the range of stem densities recorded at forested reference sites. Higher densities of one stem every five feet appeared to be crowded and were not considered to represent conditions desired in the mitigation bank.

Ground cover at JF1 was about 85 percent and dominated by one-sided sedge (*Carex unilateralis*) and slender rush (*Juncus tenuis*). These two species comprised over 50 percent of the cover. Other species included meadow foxtail (*Alopecurus pratensis*), creeping buttercup (*Ranunculus repens*), fecue (*Festuca* sp.), two other species of sedges (*Carex* spp.), and tufted hairgrass (*Deschampsia cespitosa*). Each of the sub-dominant species covered about 5 percent or less of the ground cover. Roses were also noted in the vicinity of the JF1, although not recorded in the Sample Plot. Prairie habitat is maintained by mowing.

At JF2, tufted hairgrass and one-sided sedge were the dominant plants that accounted for about 60 percent of the ground cover. Other species included camas lily (*Camassia quamash*), dense sedge (*C. densa*), fescue, buttercup, popcorn flower (*Plagiobothrys figuratus*), speedwell (*Veronica* sp.), and curly dock (*Rumex crispus*). Observations of wetland hydrology indicated JF2 was wetter than JF 1. Accordingly, more Facultative Wetland and Obligate plants were noted at JF2 than at JF1.

Species diversity appeared to be greater at the Finley National Wildlife Refuge. Shrubs, including roses, spirea, and black hawthorn were invading the wetland prairie. At Fin1, dominant plants included an unidentified sedge (*Carex* sp.), bluegrass (*Poa* sp.), rose, and northwestern cinquefoil (*Potentilla gracilis*). Other plants around the sample plot included popcorn flower, tufted hairgrass, creeping buttercup, camas lily, water foxtail (*Alopecurus geniculatus*), and wood rush (*Luzula campestris*).

Tufted-hairgrass, rose, slender rush, and an unidentified sedge were the dominant plants at Fin2. Tufted hairgrass amounted to about 50 percent of the cover while rose and sedges accounted for

about 30 percent. Sub-dominants included creeping buttercup and popcorn flower. Habitat is maintained in the prairie seral stage with periodic controlled fires in the Finley National Wildlife Refuge.

WILDLIFE

Wildlife habitat is sparse, given the current status of the plant communities. The Instrument calls for formal bird census. Sparse habitat does not warrant intensive sampling at this time. Table 5 lists birds and mammals observed in the vicinity of the Frazier Creek Wetland Mitigation Bank.

TABLE 5. BIRD AND MAMMAL OBSERVATIONS

SPECIES	SIGN	OBSERVATION	INTERIOR OF SITE	PERIMETER OF SITE
Mallard duck		X	X	
Common snipe		X	X	
Savannah Sparrow		X		
Killdeer		X	X	X
Canada goose	X		X	
Northern harrier		X	X	
Great-blue heron		X		X
Beaver	X			X
Coyote	X		X	X
Raccoon	X		X	X

SUMMARY

Site preparation, installation of native grasses, shrubs, and trees is complete. Plant material was installed at densities stated in the planting plan. All tree and shrub species called for on the planting plan are present. They were installed in areas specified in the Instrument.

Ground cover plants including sedges, rushes, and native forbs have yet to be planted. The Sponsor conducted management activities to remove annual ryegrass before planting native material. Annual ryegrass continues to re-sprout and is dominant in the wet prairie. Management plans are in place to remove ryegrass. Sedges, rushes, and native forbs will be installed after further actions are taken to eliminate the annual ryegrass. Natural invasion of native plants such as *Juncus ensifolius* and *Alisima plantago-aquatica* were noted in areas where ryegrass was drowned out by prolonged inundation.

Plant survivorship between the time of installation in October 2003 and April 2004 is nearly 100 percent. Less than 10 dead shrubs and trees were seen during the as-built sampling in late March 2004.

Wetland hydrology was monitored in the winter of 2002/2003 and in the spring of 2004. Wetland hydrology is present and persists for a significant portion of the growing season. Depth

to soil saturation was lower in the spring of 2004 than in the spring of 2003. Precipitation was significantly below normal in March 2004. In April 2004, depth to soil saturation was 12 inches or more at several reference sites, indicating that the mitigation site was on a par with other wetlands in the region. However, retaining water in swales by slowing the discharge of water, increased wetland hydrology in April 2004, despite the relatively low precipitation. Regulating water discharge is a useful strategy for managing wetland hydrology, especially to insure prolonged soil saturation in years with below normal precipitation.

Noxious plants such Himalayan blackberry (*Rubus discolor*) and reed canary grass (*Phalaris arundinacea*) cover less than one percent of the site.

MANAGEMENT AND RECOMMENDATIONS

Management and planning for additional plant installation have been a topic of frequent discussion between the Consultant and Sponsor. Priorities are to continue efforts to remove annual ryegrass, make adjustments to outlet structures, and to plant additional emergents in both the forest and wet prairie habitats.

The following list summarizes management plans over the next year:

- **Summer 2004**—Mow ryegrass after it flowers and before it sets seed. Ryegrass will be baled and removed from the field, reducing the likelihood of any re-seeding.
- **Spring/Summer 2004**—Apply chemical control to eliminate ryegrass in shrub and forest habitats. Conduct periodic qualitative inspections.
- **Summer 2004**—Place large woody debris (root wads or logs) in swales that are inundated to increase structural diversity for wildlife habitat.
- **Fall 2004**—Install sedges, rushes, and forbs in forest habitat and wet prairie habitat, according to the Instrument.
- **Fall 2004**—Evaluate germination and growth of native grasses. Evaluate whether additional seeding is needed.
- **Fall 2004**—Sample tree and shrub survivorship and evaluate whether remedial planting is needed. Install additional shrubs on the berm located on the south side of Swale 1.
- **Winter/Spring 2005**—Monitor wetland hydrology at fixed monitoring tubes.
- **Spring 2005**—Conduct qualitative monitoring to assess conditions.
- **Spring 2005**—Increase the number of sample plots at the Finley National Wildlife Refuge from two to five.

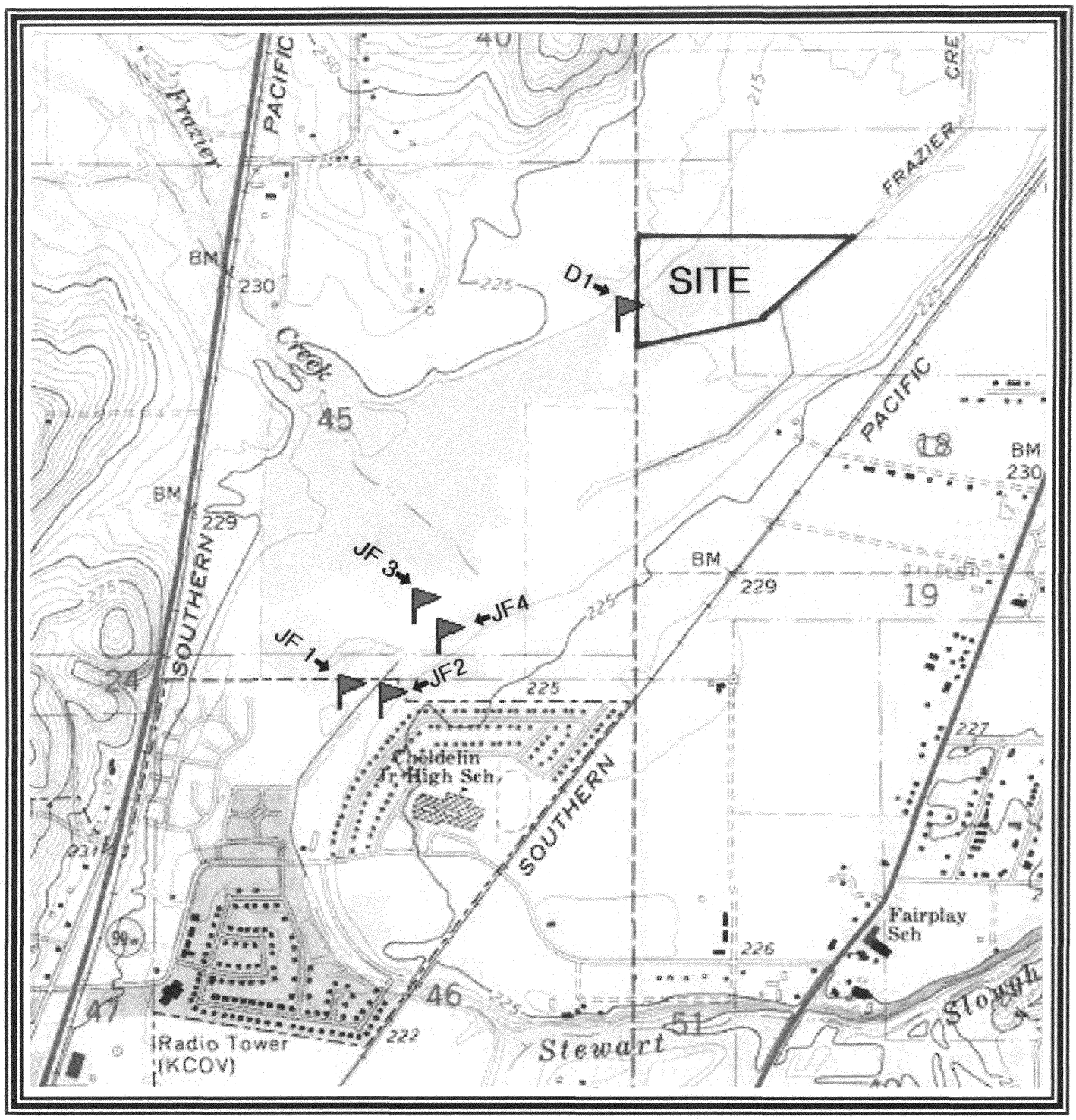

Figure 1. VICINITY MAP – Frazier Creek Wetland Mitigation Bank and Reference Points

A portion of the topographic map (7.5 minute series printed from **TOPO!**)

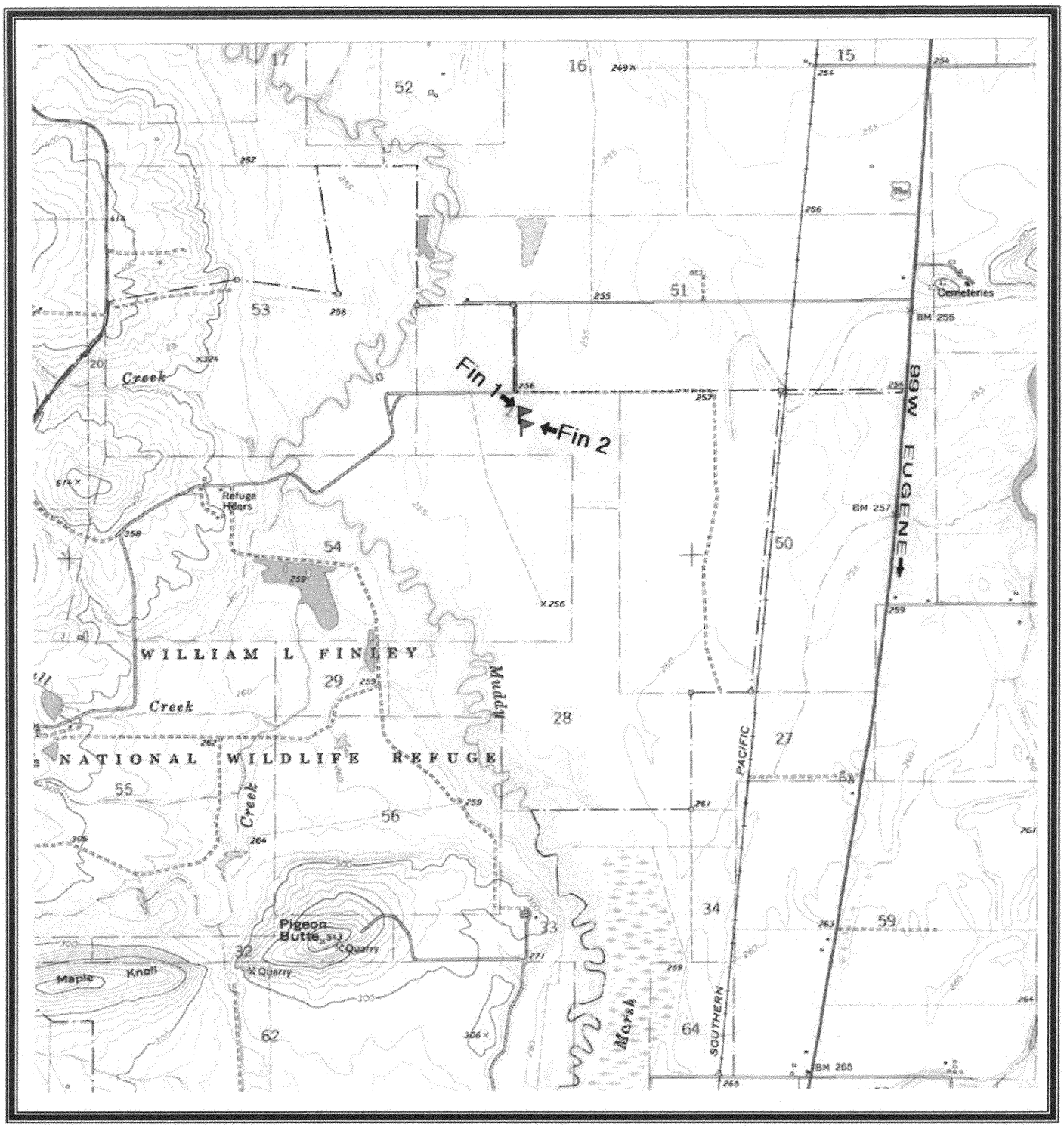

Figure 2. VICINITY MAP – William L. Finley National Wildlife Refuge and Reference Points.

A portion of the topographic map (7.5 minute series printed from **TOPO!**)

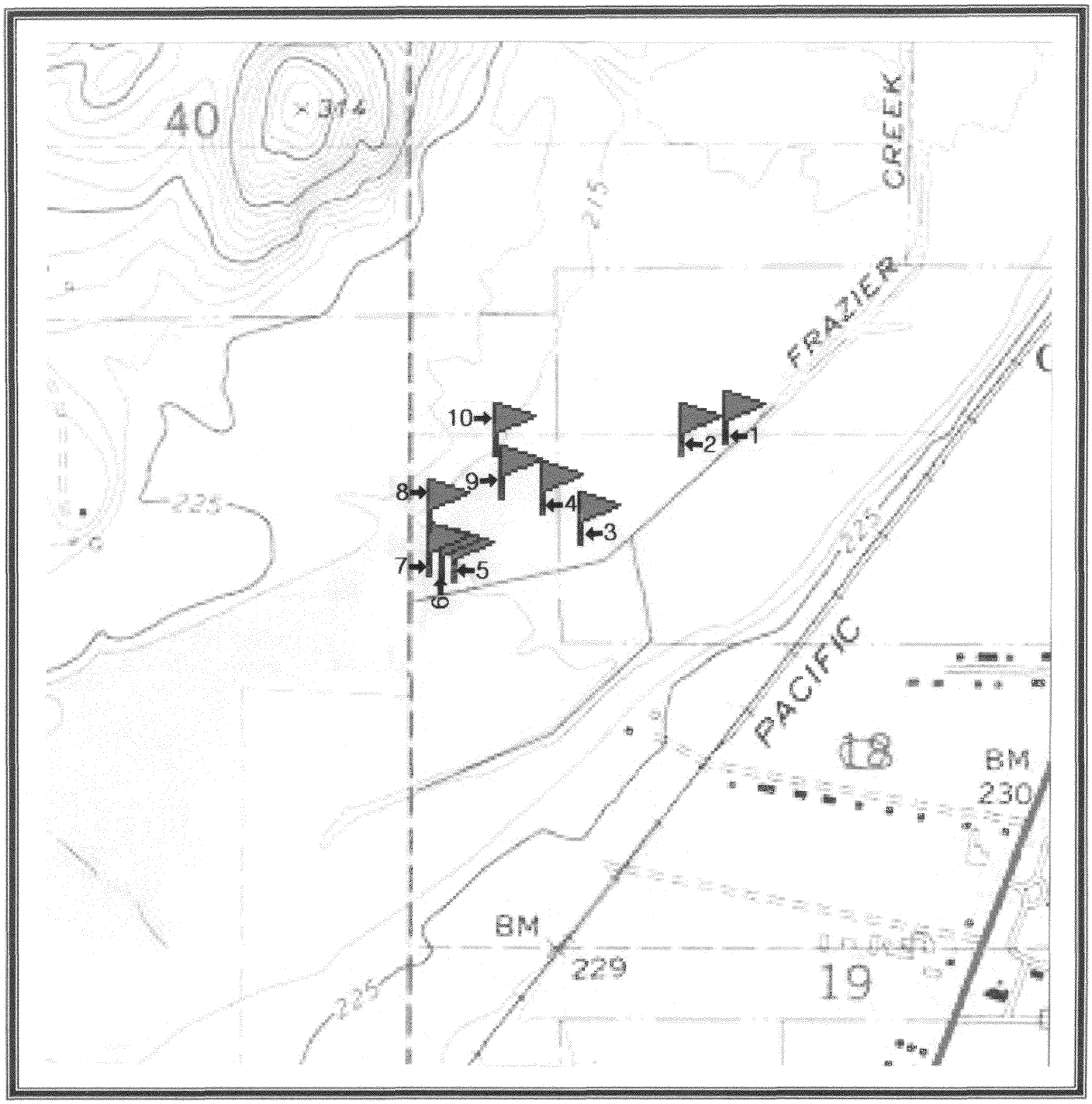

Figure 3. LOCATION OF HYDROLOGY MONITORING TUBES

Frazier Creek Wetland Mitigation Bank. (Printed from **TOPO!**)

PHOTO DATE 10/29/03

ABOVE: Oregon ash planting (typical)
BELOW: Outlet structure, Swale #1

PHOTO DATE 10/29/03

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PHOTO DATE 3/29/04

ABOVE: Swale #1 - Looking south from northern berm.
BELOW: Swale #2 - After blocking of outlet structure.

PHOTO DATE 4/27/04

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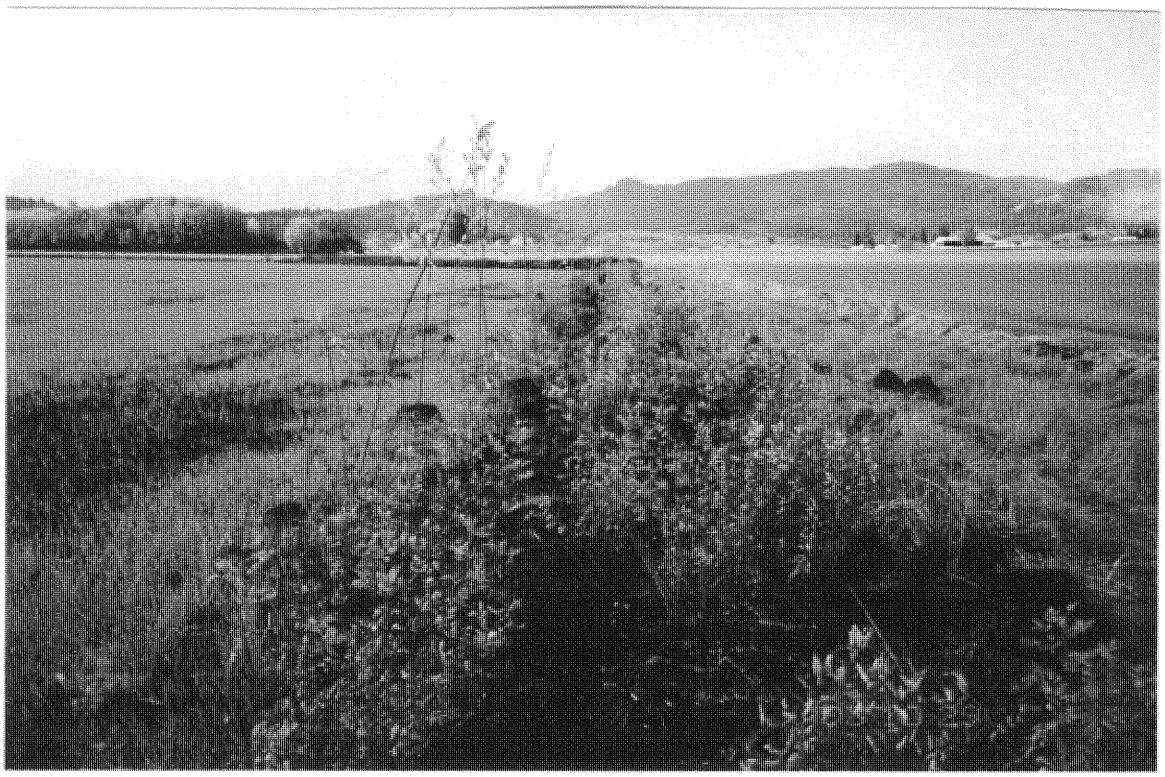
SHRUB HEDGEROW ALONG NORTHERN BOUNDARY

ABOVE: Looking east from west end.

BELOW: Looking west from east end.

PHOTO DATE 10/29/03



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Corvallis, Oregon
HSCI #03-057 May 2004

PHOTO DATE 10/29/03

ABOVE: Looking southwest from northeast corner of forest planting.
BELOW: Transitional shrub on edge of Oregon ash planting (typical).

PHOTO DATE 10/29/03

As Built
Frazier Creek Wetland Mitigation Bank
Corvallis, Oregon
HSCI #03-057 May 2004

PHOTO DATE 3/30/04

ABOVE: Looking north from PZ 03.
BELOW: Looking toward PZ 05 from southwest corner.

PHOTO DATE 3/29/04

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Corvallis, Oregon
HSCI #03-057 May 2004

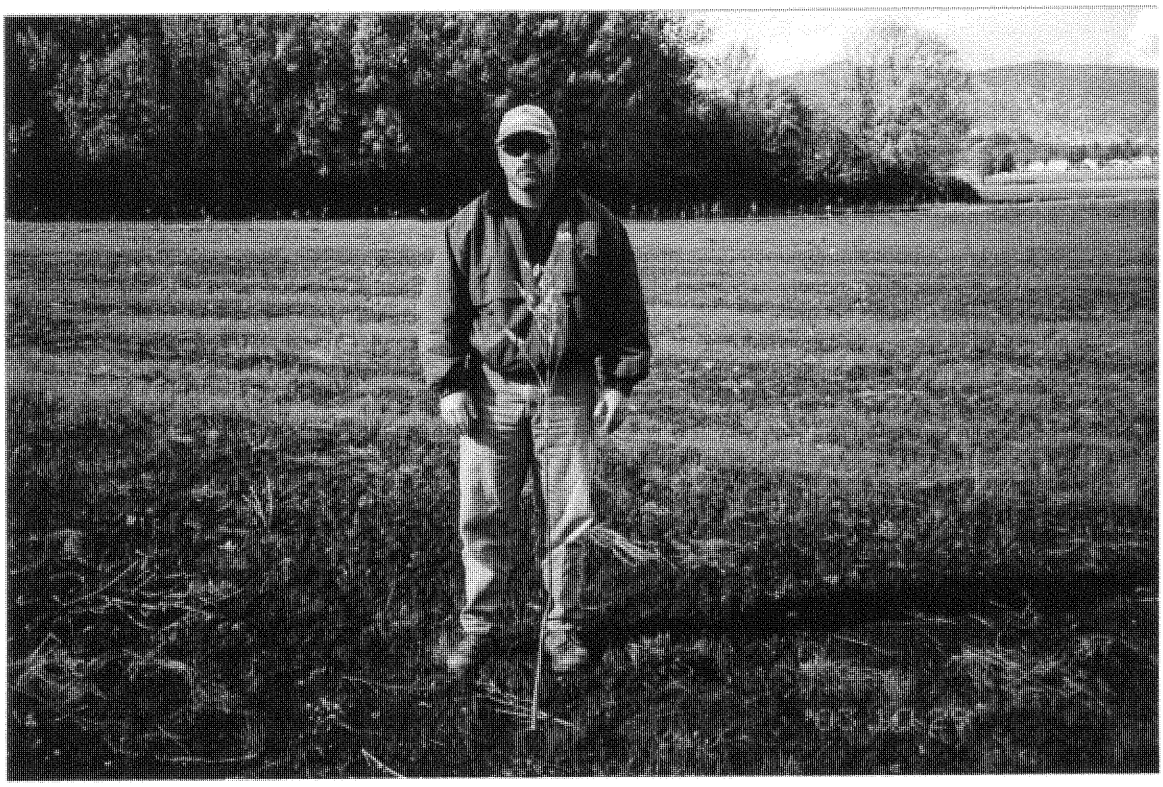

PHOTO DATE 10/29/03

OREGON ASH - TYPICAL

PHOTO DATE 3/30/04

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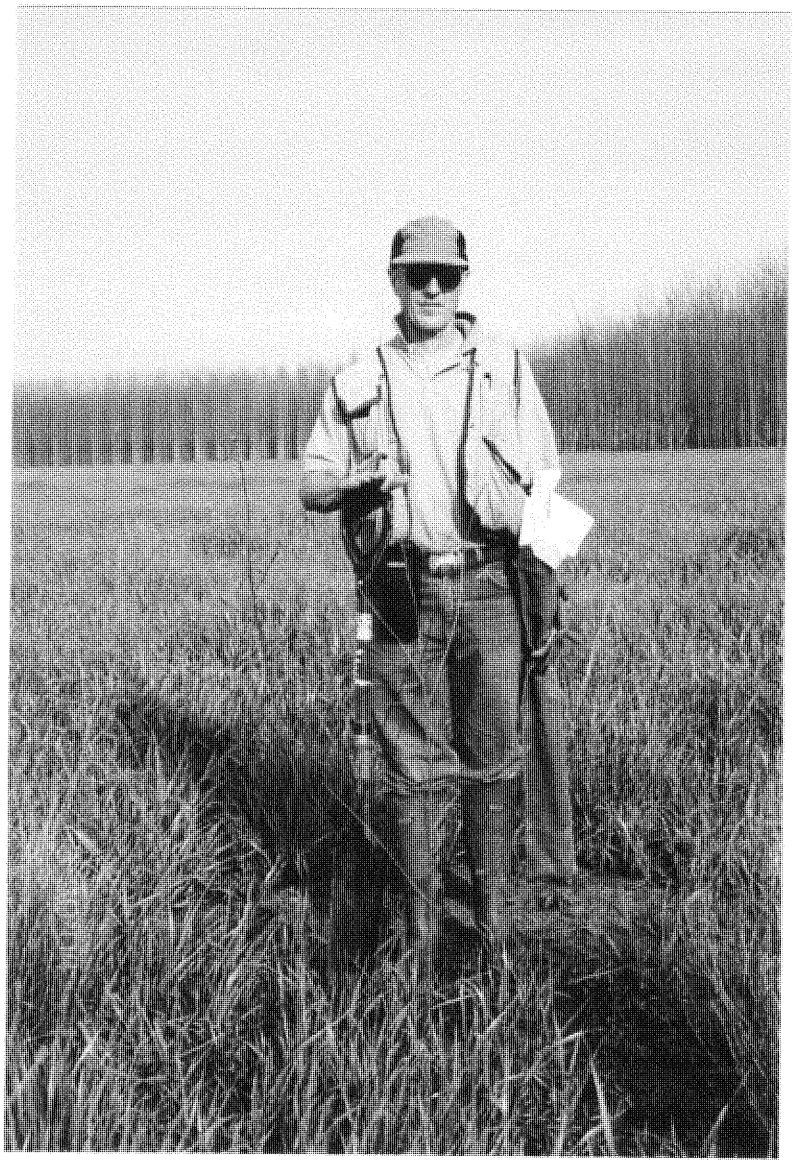

PHOTO DATE 10/29/03

WILLOW – TYPICAL

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