

West Fork Cow Creek Watershed Action Plan

December 30, 2016



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1 Introduction

The Partnership for the Umpqua Rivers (Partnership) has developed this watershed action plan (Plan) for the West Fork Cow Creek watershed in southwestern Oregon (**Figure 1**). The focus of the Plan is to direct restoration project funding to recover or restore native fish populations in the watershed. The first step in developing the plan was to hold a workshop in June 2016 to construct a framework for scoring and ranking potential restoration projects. The framework includes metrics for native fish species potentially enhanced, amount and type of habitat restored or enhanced, relative difficulty of site access, and estimated cost. The second step in developing the Plan was to collect information on current habitat and fish presence throughout the watershed to inform the scoring of metrics included in the framework. Habitat and fish surveys throughout the watershed were conducted in summer 2016, and a report was completed that summarized the information collected (**Appendix A**). Workshops were held in November and December 2016 to develop a list of potential projects and to score each project.

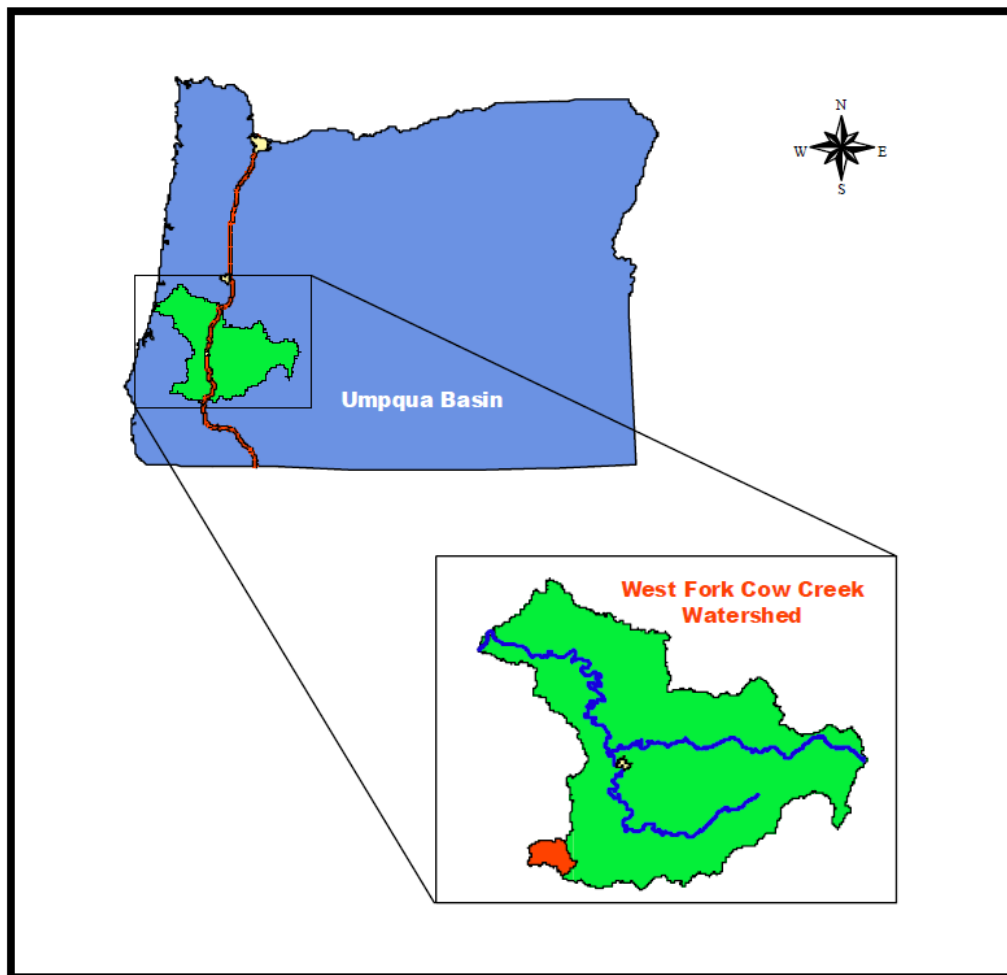


Figure 1. Location of the West Fork Cow Creek Watershed.

The Partnership originally planned to use the same process to score habitat restoration projects and passage improvement projects (primarily culvert replacements); however, it was eventually decided to treat these two basic categories of projects separately. Habitat restoration projects were scored by workshop participants using the metrics described above and in more detail in **sections 2.1.1 through 2.1.3**. Passage improvement projects were scored through a separate modeling process described in **Section 3.1**.

2 Habitat Restoration Projects

The Partnership held a workshop in June 2016 to develop metrics pertinent to ranking potential restoration projects and to develop scoring criteria for each metric. Participants in the work shop included representatives from the Partnership, the Cow Creek Tribe, the Oregon Department of Fish and Wildlife, and the U.S. Bureau of Land Management. Workshop participants agreed that metrics should be developed that relate to both fish and to habitat. Participants also agreed that consideration should be given to relative ease of access to project sites and to project cost.

Workshop participants drafted a preliminary list of potential projects types and the unit of measurement associated with each project type. Potential project types were similar in nature to those frequently used to improve conditions for native species:

Project Type	Unit
Road decommissioning	Miles
Off/side channel enhancement	Miles
Large woody debris enhancement	
Road-based	Miles
Helicopter required	Miles
Boulder/rock enhancement	Miles
Engineered log jams	Miles
Riparian underplanting	Acres
Riparian rehabilitation	Acres
Bank stabilization/protection	Miles

2.1 Project Metrics and Scoring

Workshop participants agreed that all native fish species should be considered when scoring potential restoration projects. Participants agreed that all native fish are important, but also realized that because Coho Salmon (*Oncorhynchus kisutch*) are listed as threatened under the Endangered Species Act they would be a focus for future project funding. Participants therefore determined that metrics should include (1) an index of native species diversity, and (2) an index of the number of anadromous fish species life history stages that could potentially benefit.

Workshop participants also agreed that habitat metrics should include indices of both instream and riparian habitat restored or enhanced. Participants therefore determined that metrics should include indices of (1) restoration of instream habitat, and (2) restoration of riparian or upland habitat.

Workshop participants agreed that each of the four metrics (two fish and two habitat) would be scored on a 3-point scale, so that a total of 12 points would be available for fish and habitat scores. An additional metric to be scored on a 3-point scale would be relative ease of access, bringing the total number of points possible to 15. Point total for each project would then be divided by an estimate of project cost to provide a final raw score for each project. To put scores on a familiar scale, each raw score would be converted to a final score on a 0-100 point scale. After all raw scores were computed, the project with the highest score raw score would be given a final score of 100. All other project scores would be scaled to the highest score on a percentage basis (see **Appendix B**).

In addition to scoring each metric, workshop participants agreed that projects would be considered only if they completely meet three additional criteria. A potential project would be considered only if (1) it meets restoration objectives as described in various pertinent restoration and recovery plans, (2) it addresses recognized limiting factors for fish, and (3) the affected land owner is a willing participant.

Participants also realized that scoring of potential restoration projects would not be refined enough to accurately quantify differences among similar projects. Distribution of scores would therefore be used to place projects into one of three tiers rather than to rank all projects from top to bottom. Projects within a tier would be considered similar in terms of potential benefit per cost.

2.1.1 Fish Scores

2.1.1.1 Native Fish Species Diversity

A maximum of three points were awarded for projects located in stream reaches in which native fish species were found during surveys. Additional native fish species that workshop participants determined would likely be present if restoration actions are completed (and therefore would potentially benefit) were also included. This assessment of potential species was based on past surveys (Geyer 2003; Streamnet 2016) and professional of participants. Species of primary concern include Coho Salmon, Chinook Salmon (*O. tshawytscha*), steelhead (*O. mykiss*), Cutthroat Trout (*O. clarkii*), Pacific Lamprey (*Entosphenus tridentatus*), Western Brook Lamprey (*Lampetra richardsoni*), Umpqua Dace (*Rhinichthys evermanni*), and Umpqua chub (*Oregonichthys kalawatseti*). Native fresh water mussels are also included. The final score was based on the number of native species found or determined to potentially benefit from a restoration project:

No. of Species	Score
>6	3
4-6	2
1-3	1
0	0

2.1.1.2 Anadromous Fish Life History

A maximum of three points were awarded for projects based on potential benefits to various life history stages of anadromous fish. Species included in this metric included Coho Salmon, Chinook Salmon, Steelhead, and Pacific Lamprey. Life history stages considered included spawning, rearing, and migrating. With four species and three life history stages to consider, a potential benefit to twelve species/life history combinations was possible for any project. The final score was based on the number of combinations determined to potentially benefit from a restoration project:

No. of Species/Life History Combinations	Score
>8	3
5-8	2
1-4	1
0	0

2.1.2 Habitat Scores

2.1.2.1 Instream Habitat Restoration

A maximum of three points were awarded for projects based on the amount of instream habitat improved. Instream is defined to include anything within the active channel width, as well as side channel and off channel areas. The final score was based on the amount of habitat improved, measured in miles:

Miles of Instream Habitat Improved	Score
>1.0	3
0.5-1.0	2
<0.5	1
0	0

2.1.2.2 Riparian Restoration

A maximum of three points were awarded for projects based on the amount of riparian habitat improved. Riparian is defined to include areas affecting stream quality that is outside the areas considered instream. The final score was based on the amount of habitat improved, measured in acres:

Acres of Riparian Habitat Improved	Score
>2	3
1-2	2
<1	1
0	0

2.1.3 Project Access Scores

A maximum of three points were awarded for projects based on distance of the project from the nearest point of road access. For simplification, distances and terrain were classified as easy, moderate or difficult based on expert opinion of workshop participants:

Project Access	Score
Easy	3
Moderate	2
Difficult	1

2.2 Project Ranking

In November 2016, workshop participants partitioned the West Fork Cow Creek watershed into 49 reaches based on accessibility, geomorphology, fish distribution, and location in the watershed (**Figure 2 through Figure 5**). Based on existing knowledge of the watershed, information from summer 2016 habitat and fish surveys (**Appendix A**), and professional judgment regarding relative effectiveness of project types, participants then identified 50 potential restoration projects for these reaches (**Table 1**). In December 2016, workshop participants confirmed the list of projects, estimated the potential cost of each project and assigned each project a score for each of the fish, habitat, and accessibility metrics described in **sections 2.1.1 through 2.1.3**. Because so few fish species were observed during surveys (see **Appendix A**), scoring for native fish species diversity (see **Section 2.1.1.1**) was based only on those species actually observed (see **Appendix B**).

2.2.1 Tier 1 Projects

Eleven of the 49 potential habitat restoration projects were placed into Tier 1 based on adjusted scores (**Table 2**). Eight of the 11 Tier 1 reaches are in the West Fork of Cow Creek. Two of the remaining three reaches are in the West Fork Elk Valley Creek subwatershed. Eight of the projects involve large woody debris enhancement, two involve enhancement of boulder/rock habitat, and only one project involves riparian rehabilitation. Total points assigned to each Tier 1 project ranged from 6 to 10 of the possible 15 (mean = 8.1); however estimated costs of the projects were generally low, ranging from about \$2,000 to about \$31,000 (mean = \$15,500).

2.2.2 Tier 2 Projects

Twenty two of the 49 potential habitat restoration projects were placed into Tier 2 based on adjusted scores (**Table 3**). Nine of the 22 Tier 2 reaches are in the West Fork of Cow Creek. Most projects involve large woody debris enhancement; one project involves boulder rock enhancement and one project involves riparian rehabilitation. Total points assigned to each Tier 2 project ranged from 5 to 10 of the possible 15 (mean = 7.9); however estimated costs of the projects were higher than those for Tier 1, ranging from about \$25,000 to about \$121,000 (mean = \$73,800).

2.2.3 Tier 3 Projects

Sixteen of the 49 potential habitat restoration projects were placed into Tier 2 based on adjusted scores (**Table 4**). Only two of the 16 Tier 3 reaches are in the West Fork of Cow Creek. Other reaches are in tributaries distributed throughout the watershed. All projects involve enhancement of large woody debris, and would require the use of a helicopter. Total points assigned to each Tier 3 project ranged from 5 to 8 of the possible 15 (mean = 6.4), and estimated costs of the projects were high, ranging from about \$100,000 to about \$320,000 (mean = \$223,000).

3 Passage Improvement Projects

As described in **Section 1**, passage improvement projects were considered separately from habitat improvement projects. Scores were generated using methods developed by for the Umpqua Basin Fish Barrier Inventory Assessment and Scoring Project (UBFAT 2003).

3.1 Project Scoring Model

The Umpqua Basin Fish Access Team (UBFAT 2003) developed a matrix to score potential fish barriers according to estimated value of repair or replacement. Values are assigned for the amount of habitat opened for salmonid species, the quality of habitat upstream of the site, the number of barriers downstream of the site, and how the watershed scored according to general regional prioritization scheme. Additional are awarded to those sites that have historical data confirming fish presence above the potential barrier. Scores are modified by three magnitude factors: seasonality, structure construction, and culvert severity. Details on all metrics and scoring are summarized by UBFAT (2003).

3.2 Project Ranking

In December 2016, the Partnership identified 26 potential fish barriers (**Figure 6; Table 5**) used the UBFAT (2003) scoring method to rank the potential barriers according to relative value of repair or replacement. Rankings are based solely on metrics used by the scoring model; cost is not considered.

3.2.1 Tier 1 Projects

Nine of the 26 potential fish barriers received scores higher than the minimum value possible of 5, and were therefore placed into Tier 1 (**Table 6**). Repair or replacement of these potential barriers has the highest likelihood of benefitting fish in the watershed. Four of the potential barriers are in the Elk Valley Creek subwatershed. Two are in the Walker-Wallace Creek subwatershed, and the remaining three are in tributaries distributed throughout the watershed. All Tier 1 structures are culverts.

3.2.2 Tier 2 Projects

Seventeen of the 26 potential fish barriers received the minimal possible score of 5, and were therefore placed into Tier 2 (**Table 7**). Repair or replacement of these structures would likely have minimal benefit to fish in the watershed. These structures are distributed throughout the watershed. Three of the structures are culverts, the remaining 14 are bridges.

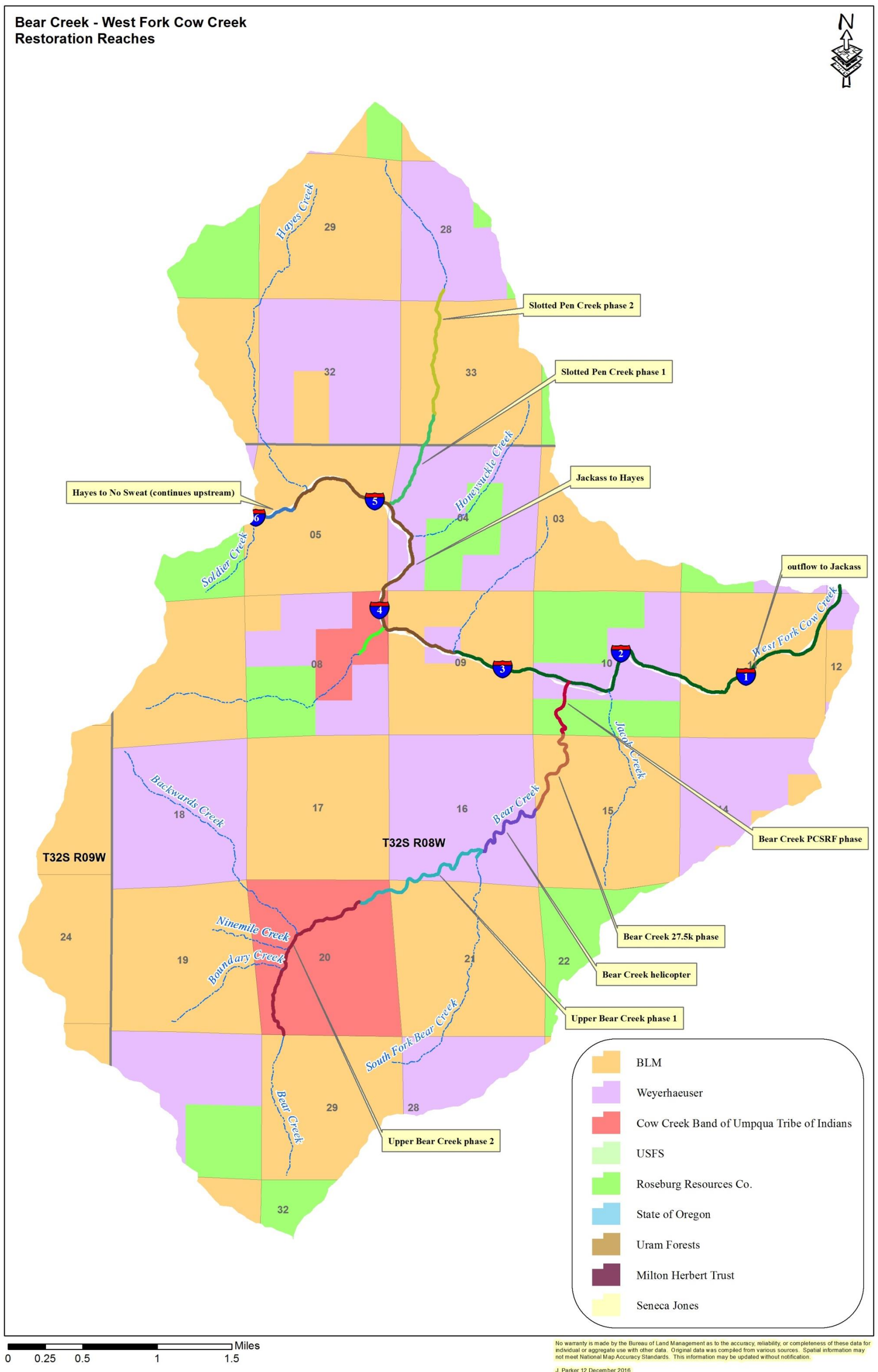


Figure 2. Project reaches 1-10 (potential projects 1-12) identified in the West Fork Cow Creek watershed.

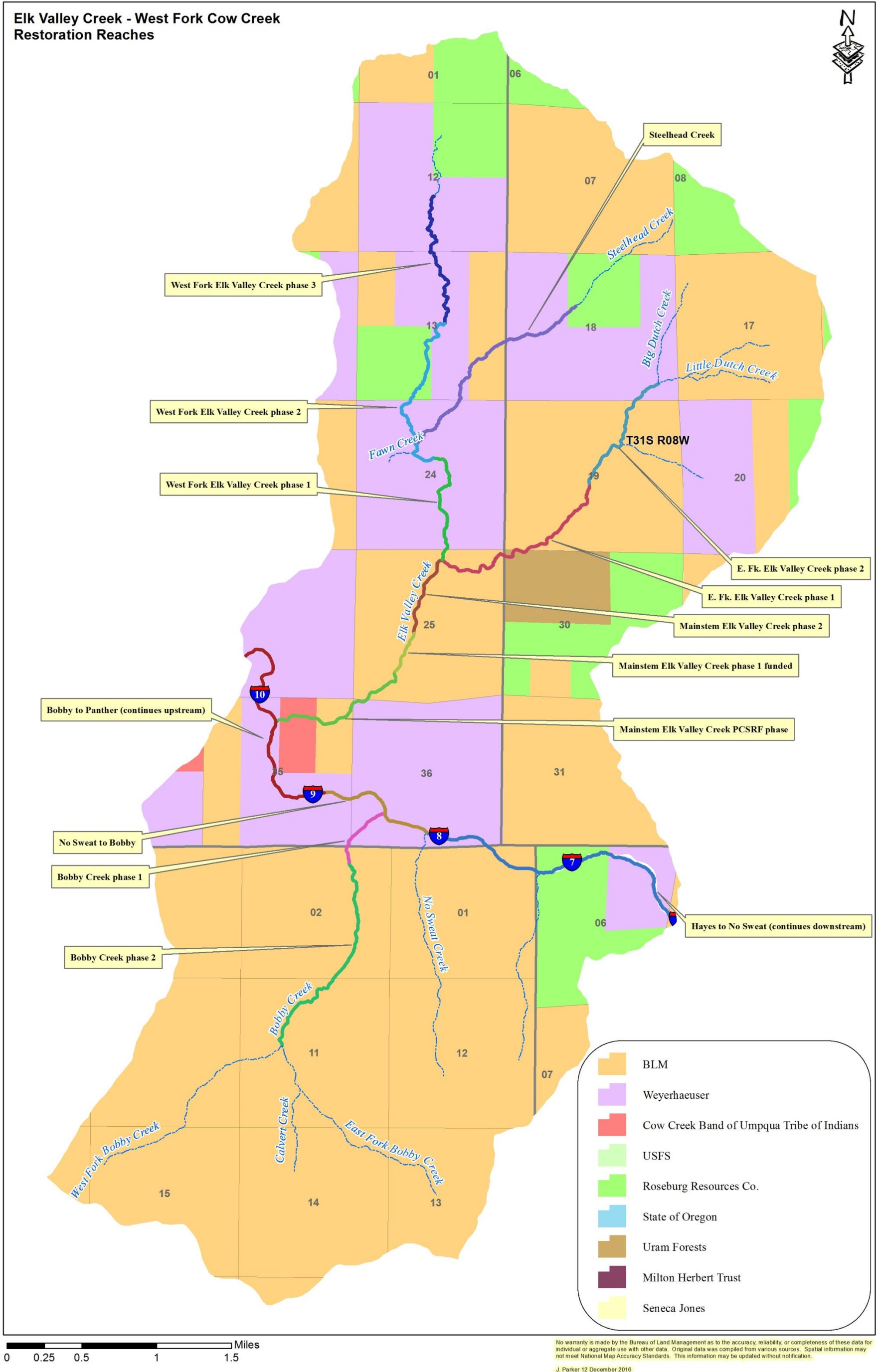


Figure 3. Project reaches 10-23 (potential projects 12-27) identified in the West Fork Cow Creek watershed.

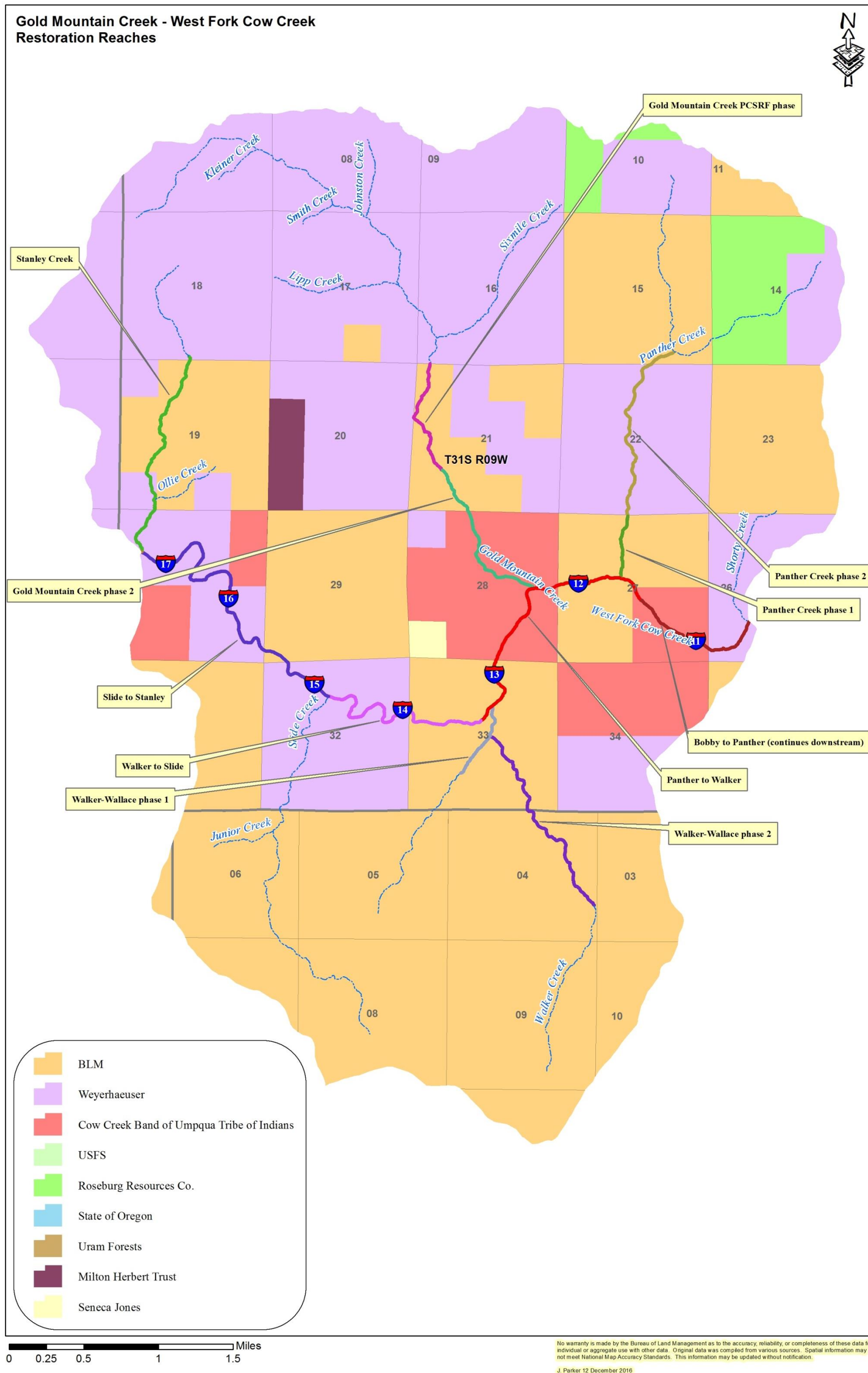


Figure 4. Project reaches 23-34 (potential projects 18; 28-39) identified in the West Fork Cow Creek watershed.

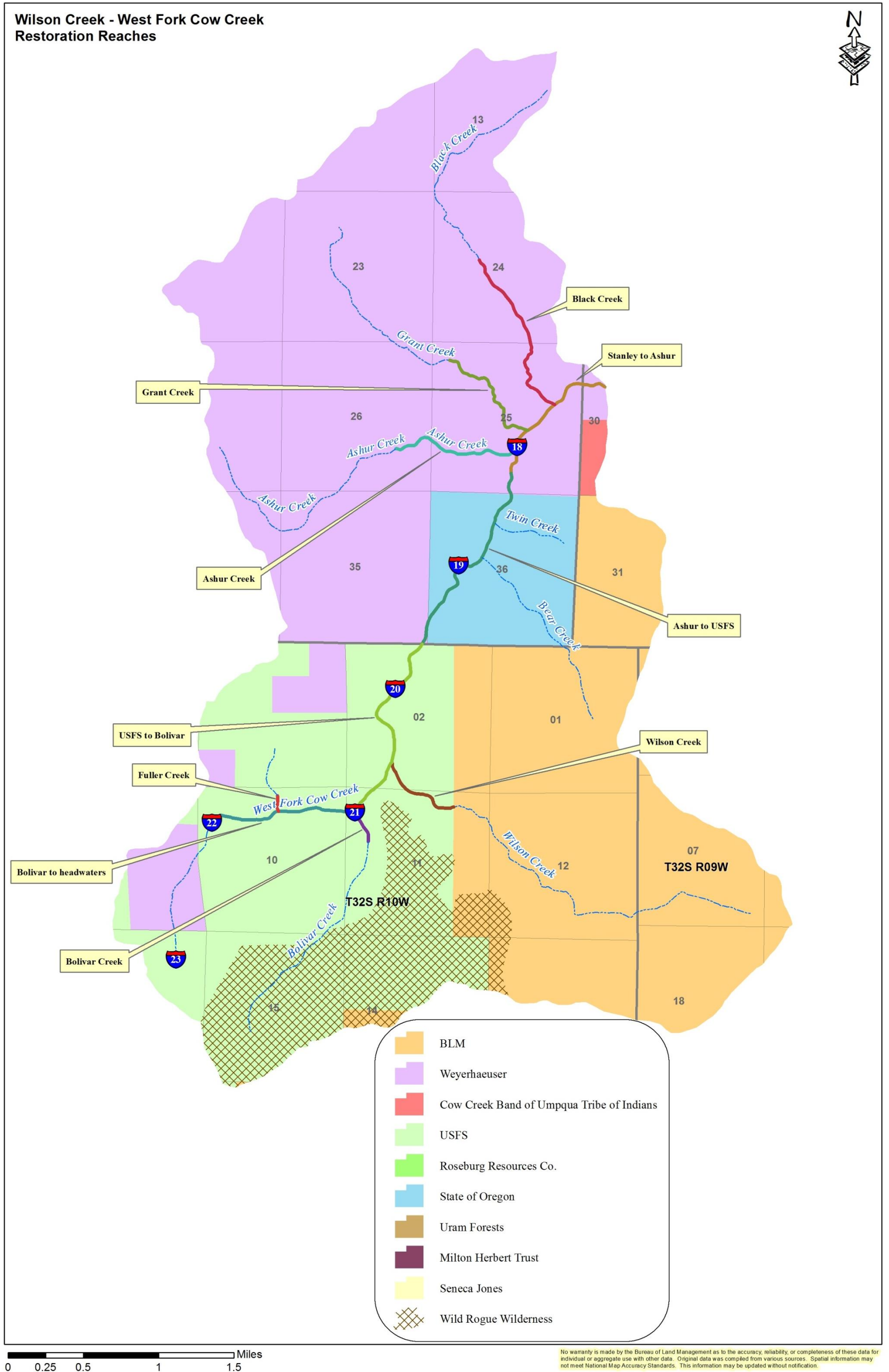


Figure 5. Project reaches 35-44 (potential projects 40-49) identified in the West Fork Cow Creek watershed.

Table 1. Potential habitat restoration projects in the West Fork Cow Creek Watershed. Project locations are shown on Figure 2 (projects 1-12), Figure 3 (projects 12-27), Figure 4 (projects 18 and 28-39), and Figure 5 (projects 40-49)

No.	Stream	Project Description	Project Type	Unit Type	No. Units
1	West Fork Cow Creek	Mouth to Jackass Creek	boulder/rock enhancement	miles	3.4
2	West Fork Cow Creek	Mouth to Jackass Creek	riparian rehabilitation	acres	82.0
3	West Fork Cow Creek	Mouth to Jackass Creek	LWD enhancement - road based	miles	3.4
4	Bear Creek	Bear Creek PCSRF phase	LWD enhancement - road based	miles	0.4
5	Bear Creek	Bear Creek 27.5k project	LWD enhancement - road based	miles	0.7
6	Bear Creek	Bear Creek helicopter	LWD enhancement - helicopter required	miles	0.7
7	Bear Creek	Upper Bear Creek phase 1	LWD enhancement - helicopter required	miles	1.2
8	Bear Creek	Upper Bear Creek phase 2	LWD enhancement - helicopter required	miles	1.3
9	West Fork Cow Creek	Jackass Creek to Hayes Creek	LWD enhancement - road based	miles	2.4
10	Slotted Pen Creek	Slotted Pen Creek phase 1	LWD enhancement - road based	miles	0.7
11	Slotted Pen Creek	Slotted Pen Creek phase 2	LWD enhancement - road based	miles	0.9
12	West Fork Cow Creek	Hayes Creek to No Sweat Creek	LWD enhancement - road based	miles	2.4
13	Bobby Creek	Bobby Creek phase 1	LWD enhancement - helicopter required	miles	0.5
14	Bobby Creek	Bobby Creek phase 2	LWD enhancement - helicopter required	miles	1.6
15	Goat Trail Creek	Goat Trail Creek	LWD enhancement - road based	miles	0.3
16	West Fork Cow Creek	No Sweat Creek to Bobby Creek	LWD enhancement - road based	miles	0.9
17	West Fork Cow Creek	No Sweat Creek to Bobby Creek	riparian rehabilitation	acres	22.0
18	West Fork Cow Creek	No Sweat Creek to Bobby Creek	LWD enhancement - road based	miles	0.9
19	West Fork Cow Creek	Bobby Creek to Panther Creek	LWD enhancement - helicopter required	miles	2.6
20	Elk Valley Creek	Mainstem Elk Valley Creek PCSRF phase	LWD enhancement - helicopter required	miles	1.0
21	Elk Valley Creek	Mainstem Elk Valley Creek phase 1 funded	LWD enhancement - helicopter required	miles	0.3
22	Elk Valley Creek	Mainstem Elk Valley Creek phase 2	LWD enhancement - road based	miles	0.6
23	East Fork Cow Creek	East Fork Elk Valley Creek phase 1	LWD enhancement - road based	miles	1.4
24	East Fork Cow Creek	East Fork Elk Valley Creek phase 2	LWD enhancement - road based	miles	1.0
25	West Fork Cow Creek	West Fork Elk Valley Creek phase 1	LWD enhancement - helicopter required	miles	0.9
26	Steelhead Creek	Steelhead Creek	LWD enhancement - road based	miles	1.6
27	West Fork Cow Creek	West Fork Elk Valley Creek phase 2	LWD enhancement - road based	miles	1.3
28	West Fork Cow Creek	West Fork Elk Valley Creek phase 3	LWD enhancement - road based	miles	1.1
29	Panther Creek	Panther Creek phase 1	LWD enhancement - road based	miles	0.4

No.	Stream	Project Description	Project Type	Unit Type	No. Units
30	Panther Creek	Panther Creek phase 2	LWD enhancement - helicopter required	miles	1.4
31	West Fork Cow Creek	Panther Creek to Walker Creek	LWD enhancement - road based	miles	2.0
32	Gold Mountain Creek	Gold Mountain Creek PCSRF phase	LWD enhancement - road based	miles	0.9
33	Gold Mountain Creek	Gold Mountain Creek phase 2	LWD enhancement - helicopter required	miles	1.1
34	Walker-Wallace Creeks	Walker-Wallace creeks phase 1	LWD enhancement - road based	miles	0.6
35	Walker Creek	Walker-Wallace creeks phase 2	LWD enhancement - helicopter required	miles	1.6
36	West Fork Cow Creek	Walker Creek to Slide Creek	LWD enhancement - road based	miles	1.5
37	West Fork Cow Creek	Walker Creek to Slide Creek	boulder/rock enhancement	miles	1.5
38	West Fork Cow Creek	Slide Creek to Stanley Creek	LWD enhancement - road based	miles	2.4
39	West Fork Cow Creek	Slide Creek to Stanley Creek	boulder/rock enhancement	miles	2.4
40	Stanley Creek	Stanley Creek	LWD enhancement - helicopter required	miles	1.6
41	West Fork Cow Creek	Stanley Creek to Ashur Creek	LWD enhancement - road based	miles	1.0
42	Black Creek	Black Creek	LWD enhancement - road based	miles	1.2
43	Grant Creek	Grant Creek	LWD enhancement - helicopter required	miles	0.8
44	Ashur Creek	Ashur Creek	LWD enhancement - road based	miles	0.9
45	West Fork Cow Creek	Ashur Creek to USFS boundary	LWD enhancement - helicopter required	miles	1.4
46	West Fork Cow Creek	USFS Boundary to Bolivar Creek	LWD enhancement - helicopter required	miles	1.4
47	West Fork Cow Creek	Wilson Creek	LWD enhancement - helicopter required	miles	0.6
48	Fuller Creek	Fuller Creek	LWD enhancement - road based	miles	0.1
49	West Fork Cow Creek	Bolivar Creek to headwaters	LWD enhancement - road based	miles	0.9

Table 2. Habitat restoration projects placed into Tier 1 based on adjusted scores.

Stream	Project Description	Project Type	Fish Species Score	Life History Score	Instream Restoration Score	Riparian Restoration Score	Project Access Score	Total Points	Estimated Cost	Raw Score	Adjusted Score
West Fork Cow Creek	Hayes to No Sweat	LWD enhancement - road based	2	2	3	0	1	8	\$2,000	40.00	100.00
West Fork Cow Creek	Bobby to Panther	LWD enhancement - helicopter required	2	2	3	0	1	8	\$3,000	26.67	66.67
Steelhead Creek	Steelhead Creek	LWD enhancement - road based	1	1	3	0	2	7	\$6,000	11.67	29.17
West Fork Cow Creek	No Sweat to Bobby	LWD enhancement - road based	2	2	2	0	3	9	\$8,000	11.25	28.13
West Fork Cow Creek	No Sweat to Bobby	Riparian rehabilitation	2	2	0	3	3	10	\$14,000	7.14	17.86
Fuller Creek	Fuller Creek	LWD enhancement - road based	1	1	1	0	3	6	\$8,500	7.06	17.65
West Fork Cow Creek	Walker to Slide	Boulder/rock enhancement	1	1	3	0	3	8	\$16,400	4.88	12.20
West Fork Cow Creek	No Sweat to Bobby	LWD enhancement - road based	2	2	2	0	3	9	\$23,400	3.85	9.62
West Fork Cow Creek	Slide to Stanley	Boulder/rock enhancement	1	2	3	0	3	9	\$31,300	2.88	7.19
West Fork Elk Valley Creek	West Fork Elk Valley Creek phase 2	LWD enhancement - road based	1	2	3	0	2	8	\$30,000	2.67	6.67
Bear Creek	Bear Creek 27.5k project	LWD enhancement - road based	1	2	2	0	2	7	\$27,500	2.55	6.36

Table 3. Habitat restoration projects placed into Tier 2 based on adjusted scores.

Stream	Project Description	Project Type	Fish Species Score	Life History Score	Instream Restoration Score	Riparian Restoration Score	Project Access Score	Total Points	Estimated Cost	Raw Score	Adjusted Score
Panther Creek	Panther Creek phase 1	LWD enhancement - road based	1	2	1	0	3	7	\$34,000	2.06	5.15
Goat Trail Creek	Goat Trail Creek	LWD enhancement - road based	1	2	1	0	1	5	\$25,500	1.96	4.90
West Fork Cow Creek	Outflow to Jackass	riparian rehabilitation	2	2	0	3	3	10	\$57,000	1.75	4.39
Elk Valley Creek	Mainstem Elk Valley Creek phase 2	LWD enhancement - road based	2	2	2	0	2	8	\$51,000	1.57	3.92
Walker and Wallace Creeks	Walker-Wallace phase 1	LWD enhancement - road based	1	2	2	0	3	8	\$51,000	1.57	3.92
West Fork Cow Creek	Outflow to Jackass	boulder/rock enhancement	2	2	3	0	3	10	\$66,300	1.51	3.77
Bear Creek	Bear Creek PCSRF phase	LWD enhancement - road based	1	2	1	0	3	7	\$46,929	1.49	3.73
West Fork Cow Creek	Walker to Slide	LWD enhancement - road based	1	1	3	0	3	8	\$56,250	1.42	3.56
West Fork Cow Creek	Outflow to Jackass	LWD enhancement - road based	2	2	3	0	3	10	\$75,000	1.33	3.33
Slotted Pen Creek	Slotted Pen Creek phase 1	LWD enhancement - road based	1	2	2	0	2	7	\$59,500	1.18	2.94
Gold Mountain Creek	Gold Mountain Creek PCSRF phase	LWD enhancement - road based	1	2	2	0	2	7	\$61,369	1.14	2.85
West Fork Cow Creek	Bolivar to headwaters	LWD enhancement - road based	1	2	2	0	3	8	\$76,500	1.05	2.61
West Fork Cow Creek	Stanley to Ashur	LWD enhancement - road based	1	2	3	0	2	8	\$85,000	0.94	2.35
Ashur Creek	Ashur Creek	LWD enhancement - road based	1	1	2	0	3	7	\$76,500	0.92	2.29
West Fork Elk Valley Creek	West Fork Elk Valley Creek phase 3	LWD enhancement - road based	1	1	3	0	3	8	\$93,500	0.86	2.14
West Fork Cow Creek	Slide to Stanley	LWD enhancement - road based	1	2	3	0	3	9	\$108,300	0.83	2.08
West Fork Cow	Panther to	LWD enhancement -	2	2	3	0	1	8	\$96,750	0.83	2.07

Stream	Project Description	Project Type	Fish Species Score	Life History Score	Instream Restoration Score	Riparian Restoration Score	Project Access Score	Total Points	Estimated Cost	Raw Score	Adjusted Score
Creek	Walker	road based									
East Fork Elk Valley Creek	East Fork Elk Valley Creek phase 2	LWD enhancement - road based	1	2	2	0	2	7	\$85,000	0.82	2.06
Slotted Pen Creek	Slotted Pen Creek phase 2	LWD enhancement - road based	1	0	2	0	3	6	\$76,500	0.78	1.96
East Fork Elk Valley Creek	East Fork Elk Valley Creek phase 1	LWD enhancement - road based	1	2	3	0	3	9	\$119,000	0.76	1.89
West Fork Cow Creek	Jackass to Hayes	LWD enhancement - road based	2	2	3	0	2	9	\$120,750	0.75	1.86
Black Creek	Black Creek	LWD enhancement - road based	1	1	3	0	2	7	\$102,000	0.69	1.72

Table 4. Habitat restoration projects placed into Tier 3 based on adjusted scores.

Stream	Project Description	Project Type	Fish Species Score	Life History Score	Instream Restoration Score	Riparian Restoration Score	Project Access Score	Total Points	Estimated Cost	Raw Score	Adjusted Score
Bear Creek	Bear Creek helicopter	LWD enhancement - helicopter required	1	2	2	0	2	7	\$140,000	0.50	1.25
Bobby Creek	Bobby Creek phase 1	LWD enhancement - helicopter required	1	2	1	0	1	5	\$100,000	0.50	1.25
Wilson Creek	Wilson Creek	LWD enhancement - helicopter required	1	1	2	0	1	5	\$120,000	0.42	1.04
Elk Valley Creek	Mainstem Elk Valley Creek PCSRF phase	LWD enhancement - helicopter required	2	2	3	0	1	8	\$200,000	0.40	1.00
Elk Valley Creek	Mainstem Elk Valley Creek phase 1 funded	LWD enhancement - helicopter required	2	2	1	0	1	6	\$150,000	0.40	1.00
West Fork Elk Valley Creek	West Fork Elk Valley Creek phase 1	LWD enhancement - helicopter required	1	2	2	0	1	6	\$180,000	0.33	0.83
Gold Mountain Creek	Gold Mountain Creek phase 2	LWD enhancement - helicopter required	1	2	3	0	1	7	\$220,000	0.32	0.80
Grant Creek	Grant Creek	LWD enhancement - helicopter required	1	1	2	0	1	5	\$160,000	0.31	0.78
Bear Creek	Upper Bear Creek phase 1	LWD enhancement - helicopter required	1	2	3	0	1	7	\$240,000	0.29	0.73
West Fork Cow Creek	Ashur to USFS	LWD enhancement - helicopter required	1	2	3	0	1	7	\$280,000	0.25	0.63
Panther Creek	Panther Creek phase 2	LWD enhancement - helicopter required	1	2	3	0	1	7	\$280,000	0.25	0.63
West Fork Cow Creek	USFS to Bolivar	LWD enhancement - helicopter required	1	2	3	0	1	7	\$280,000	0.25	0.63
Bear Creek	Upper Bear Creek phase 2	LWD enhancement - helicopter required	1	1	3	0	1	6	\$260,000	0.23	0.58
Stanley Creek	Stanley Creek	LWD enhancement - helicopter required	1	2	3	0	1	7	\$320,000	0.22	0.55
Walker Creek	Walker-Wallace phase 2	LWD enhancement - helicopter required	1	2	3	0	1	7	\$320,000	0.22	0.55
Bobby Creek	Bobby Creek phase 2	LWD enhancement - helicopter required	1	1	3	0	1	6	\$320,000	0.19	0.47

Figure 6. Locations of 26 potential fish barriers identified in the West Fork Cow Creek Watershed.

Table 5. Descriptions of potential fish barriers identified in the West Fork Cow Creek Watershed. Project locations are shown on Figure 6.

No.	Stream	Location	Description	Material
1	Cow Creek	Mile 26.65	Bridge	Concrete
2	Elk Valley Tributary	Mile 0.03	Box Culvert	Concrete
3	Elk Valley Tributary	Mile 0.57	Arch Culvert	Steel
4	Elk Valley Creek	Mile 1.93	Arch Culvert	Concrete
5	Elk Valley Creek Tributary	Mile 0.83	Round Culvert	Composite
6	Elk Valley Creek	Mile 4.42	Bridge	Steel
7	Elk Valley Creek	Mile 5.11	Round Culvert	Steel
8	Elk Valley Creek	Mile 5.68	Arch Culvert	Composite
9	West Fork Cow Creek	At Bear Creek Rd (Mile 2.41)	Bridge	Concrete
10	Bear Creek	Mile 0.11	Bridge	Concrete
11	West Fork Cow Creek	Mile 3.92	Bridge	Concrete
12	Slotted Pen Creek	Mile 0.04	Round Culvert	Steel
13	Hays Creek	At West Fork Cow Creek (Mile 0.03)	Box Culvert	Concrete
14	West Fork Cow Creek	Mile 8.511	Bridge	Concrete
15	Walker Creek	Mile 1.92	Arch Culvert	Steel
16	Walker Creek	Mile 0.06	Bridge	Concrete
17	Slide Creek	Mile 0.01	Bridge	Steel
18	West Fork Cow Creek	Mile 16.26	Bridge	Steel
19	Stanley Creek	Mile 0.20	Bridge	Steel
20	Black Creek	Mile 0.16	Bridge	Steel
21	Grant Creek	Mile 0.02	Bridge	Steel
22	West Fork Cow Creek Tributary	Mile 0.03	Bridge	Steel
23	Gold Mountain Creek	Mile 1.86	Arch Culvert	Steel
24	Panther Creek	Mile 0.68	Arch Culvert	Steel
25	Panther Creek	Mile 0.01	Bridge	Concrete
26	Wallace Creek	Mile 0.34	Round Culvert	CMP

Table 6. Potential fish barrier repair or replacement projects placed into Tier 1 based on scores from the UBFAT (2003) process.

No.	Stream	Location	Description	Score	Comment
3	Elk Valley Tributary	Mile 0.57	Arch Culvert	48.2	
13	Hays Creek	West Fork Cow Creek (Mile 0.03)	Box Culvert	43.0	
24	Panther Creek	Mile 0.68	Arch Culvert	37.5	
15	Walker Creek	Mile 1.92	Arch Culvert	37.0	Rotten culvert
26	Wallace Creek	Mile 0.34	Round Culvert	37.0	
12	Slotted Pen Creek	Mile 0.04	Round Culvert	36.0	Culvert bottom rusting out.
5	Elk Valley Creek Tributary	Mile 0.83	Round Culvert	33.5	Rotten at last 4-5ft
7	Elk Valley Creek	Mile 5.11	Round Culvert	26.8	Imminent failure expected
8	Elk Valley Creek	Mile 5.68	Arch Culvert	15.1	

Table 7. Potential fish barrier repair or replacement projects placed into Tier 2 based on scores from the UBFAT (2003) process.

No.	Stream	Location	Description	Score	Comment
1	Cow Creek	Mile 26.65	Bridge	5.0	
2	Elk Valley Tributary	Mile 0.03	Box Culvert	5.0	
4	Elk Valley Creek	Mile 1.93	Arch Culvert	5.0	
6	Elk Valley Creek	Mile 4.42	Bridge	5.0	
9	West Fork Cow Creek	At Bear Creek Rd (Mile 2.41)	Bridge	5.0	
10	Bear Creek	Mile 0.11	Bridge	5.0	
11	West Fork Cow Creek	Mile 3.92	Bridge	5.0	
14	West Fork Cow Creek	Mile 8.511	Bridge	5.0	
16	Walker Creek	Mile 0.06	Bridge	5.0	
17	Slide Creek	Mile 0.01	Bridge	5.0	Rail car bridge
18	West Fork Cow Creek	Mile 16.26	Bridge	5.0	
19	Stanley Creek	Mile 0.20	Bridge	5.0	
20	Black Creek	Mile 0.16	Bridge	5.0	Rail car bridge
21	Grant Creek	Mile 0.02	Bridge	5.0	

No.	Stream	Location	Description	Score	Comment
22	West Fork Cow Creek Tributary	Mile 0.03	Bridge	5.0	
23	Gold Mountain Creek	Mile 1.86	Arch Culvert	5.0	
25	Panther Creek	Mile 0.01	Bridge	5.0	

4 References

Geyer, N. A. West Fork Cow Creek Watershed Assessment and Action Plan. Roseburg, Oregon: Prepared for the Umpqua Basin Watershed Council; 2003 November.

StreamNet 2016. StreamNet Mapper. Available at <http://www.streamnet.org/data/interactive-maps-and-gis-data/>.

UBFAT (Umpqua Basin Fish Barrier Inventory Assessment Team). 2003. Umpqua Basin Fish Barrier Inventory Assessment and Scoring Project. August 2003.



Appendix A

West Fork Cow Creek Field Survey Report

(See Separate Document)

Appendix B

Scoring Matrix for Habitat Restoration Projects