Catherine Creek RM 44 Southern Cross

The project is located along Catherine Creek with the Atlas Biological Significant Reach (BSR) CCC3b1 which is identified as a high priority BSR with Tier 1 (highest priority) actions. The Phase 3 reach is located on the Southern Cross Ranch, recently conserved by fee acquisition through the CTUIR's Accord agreement with BPA. The purpose of the acquisition is to protect the property in perpetuity for the conservation and restoration of salmon and steelhead habitat. The property includes about ¾ of a mile of Catherine Creek and 68 acres of historic floodplain which was channelized and confined valley left in the early 1940's.

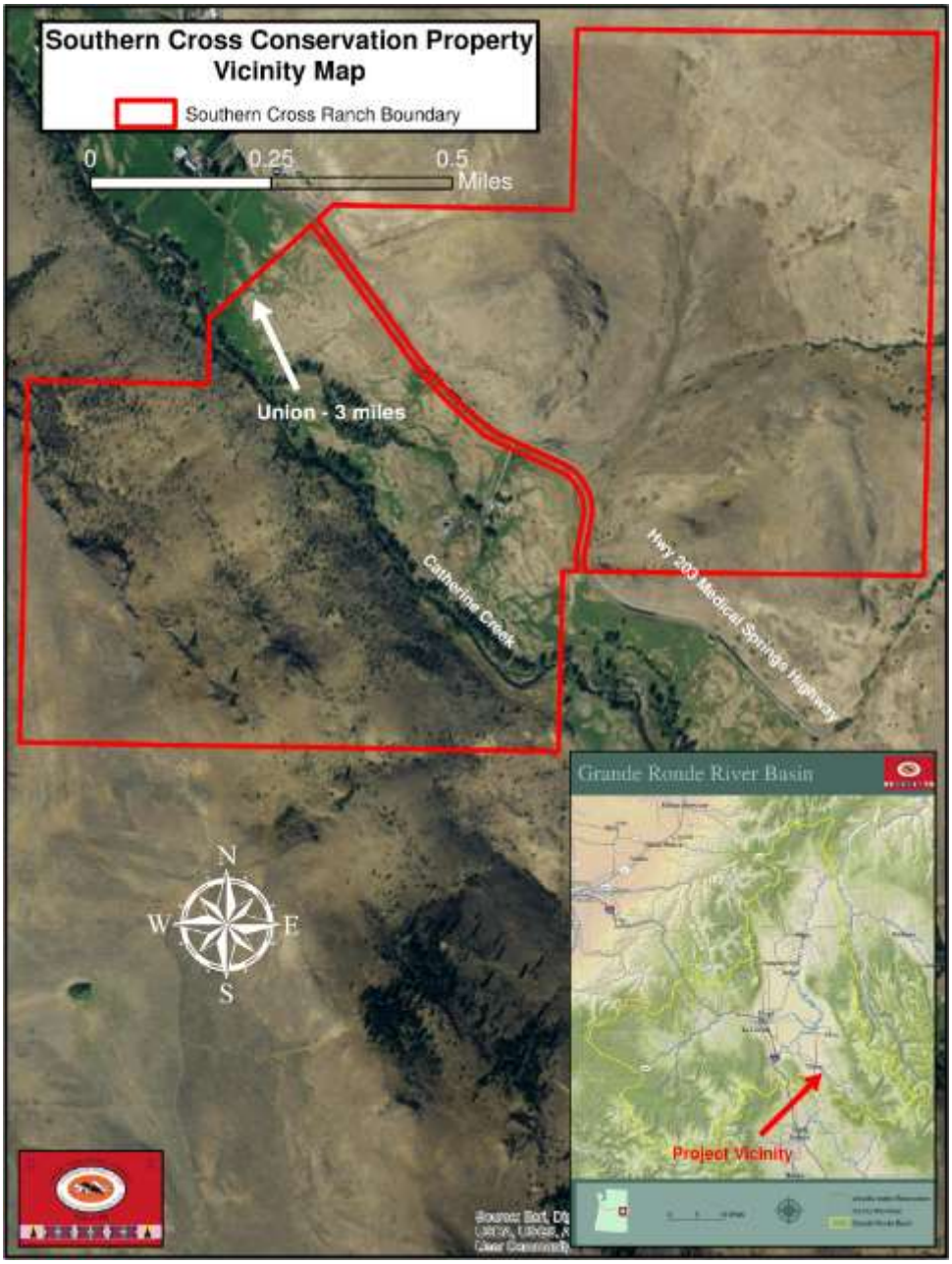
The project is located approximately 3 miles southeast of the City of Union, Oregon along Highway 203 (Medical Springs Highway) (T5SR40E, Sections 28 and 33) at RM44, 59716 Highway 203, Union, OR 97883.

The project included construction of approximately 4,200 linear feet of new main channel (including four confluences with the existing channel); construction/excavation of approximately 955 linear feet of perennial side channel; construction of approximately 425 linear feet of new ephemeral side channel; construction of approximately 1,425 linear feet of alcoves and spring channels; construction of approximately 9,200 linear feet of floodplain swale complexes; construction of 15 riffles in the main channel; construction of 142 main channel wood structure components; construction of approximately 570 linear feet of edge roughness; construction of approximately 1,075 feet of brush mattress; construction/placement of 336 floodplain roughness features (primarily large and small wood structures and whole trees); and the excavation of over 50,000 cubic yards of material (design quantity) over a two year construction period.

Design changes from 75% to 100% on the CC44, Southern Cross phase III were incorporated to maximize adult spawning and juvenile rearing habitat uplift along an approximate 0.78 mile reach of mainstem Catherine Creek. The property presents the largest and most significant opportunity to expand, create, and enhance core spawning and rearing habitat for ESA spring-summer Chinook salmon and summer steelhead within the Catherine Creek Atlas Tier 1 Biological Significant Reach, CCC3b1.

The Construction Design Drawings and Technical Specifications can be accessed at Web Address: http://data.ctuir.org/fisheries/.

PROJECT VICINITY MAP



Project Vision

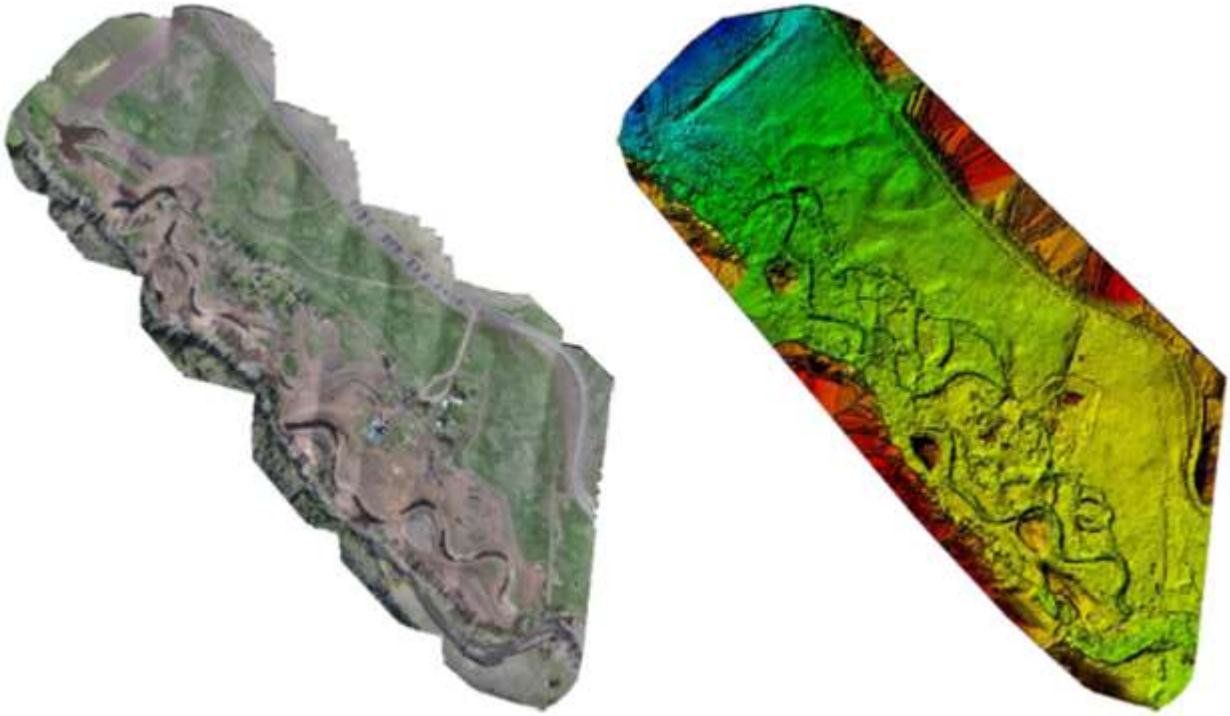
The vision of the project is to restore degraded riparian and floodplain habitat, improve instream habitat diversity, and improve water quality for adult and juvenile summer steelhead and juvenile Chinook salmon. This vision follows the Tribes "First Foods" concept, which manages the ecosystem based on protection of water, fish, deer and elk, roots, and berries. The First Foods provide clear linkages to treaty rights and natural resources and defines direction and goals that relate to the community culture. In conjunction with the First Food principle, the CTUIR DNR

developed the River Vision (Jones et. al., 2008) that describes and organizes ecological processes and functions that provide the First Foods.

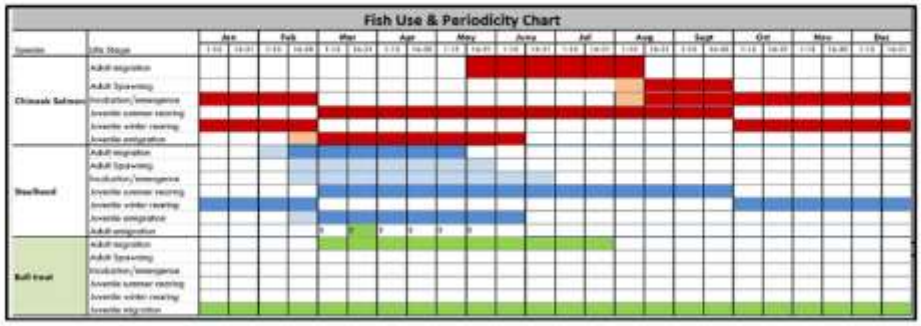
Project Goals and Objectives

- Restore and conserve salmonid spawning and rearing habitat
- Improve passage for all life stages and season's
- Increase flow and groundwater
- Improve water quality
- Restore natural channel and floodplain processes
- Increase habitat and hydraulic complexity and diversity
- Restore riparian and wetland habitat
- Control noxious weeds

ORTHOMOSAIC AND THE CORRESPONDING SPARSE DIGITAL SURFACE MODEL (DSM).



CATHERINE CREEK CC44 FISH HABITAT RESTORATION COMPLEX
Biological Significant Reach CCC3b1 (Atlas Strategic Implementation Plan)



Fish Use & Life Stage Utilization

Fish Utilization	Score	Comments
Adult Migration	H	No complete barriers, flow likely not affecting migration. However, there are three partial barriers (push up dams) that will be addressed in 2014. Revisit ranking once addressed. Holding habitat is limited.
Juvenile Outmigration	H	No complete barriers, but juvenile outmigration being affected due to unknown causes. Potential flow, hydrology, fitness affects.
Holding/Spawning /	M	Spawning occurring, but not the critical need due to density dependence needing to be addressed 1st
Summer Rearing	H	Critical summer rearing to help address density dependance
Winter Rearing	M	Winter/Summer rearing overlap.

Limiting Factors

LF Weight		Description	Score	Comments
2%	1.1	Human Quantity, Anthropogenic Barriers	H	Limited barriers, however addressing would increase summer rearing habitat capacity.
7%	4.1	Riparian Conditions: Riparian Condition	H	Beneficial to address, but ecosystem benefit will be realized two fold, combine with other LF to be most effective
7%	4.2	Riparian Conditions: LWD Recruitment	H	Beneficial to address, but ecosystem benefit will be realized two fold, combine with other LF to be most effective
10%	5.1	Peripheral and Transitional Habitats: Side Channel and Wetland Complexes	H	Important for summer rearing during spring run offpeak
10%	5.2	Peripheral and Transitional Habitats: Floodplain Connection	H	Important for rearing during spring run offpeak. Erosion reduction, healthy floodplain contributes to ground water recharge, delayed release of cool water.
10%	6.1	Channel Structure and Form: Bed and Channel Form	H	Important channel form needed to benefit summer rearing and density dependance
10%	6.2	Channel Structure and Form: Instream Structure Complexity	H	Important complexity needed to benefit summer rearing and density dependance
3%	7.2	Sediment Conditions: Increased Sediment Quantity	L	Limited pathways exist
10%	8.1	Water Quality: Temperature	H	High temps affect summer rearing
10%	9.2	Water Quantity: Decreased Water Quantity	H	Flow affecting summer rearing habitat
Source (above data): Export Panel (X) Sub-Basin [ ] Recovery Plan [ ]				

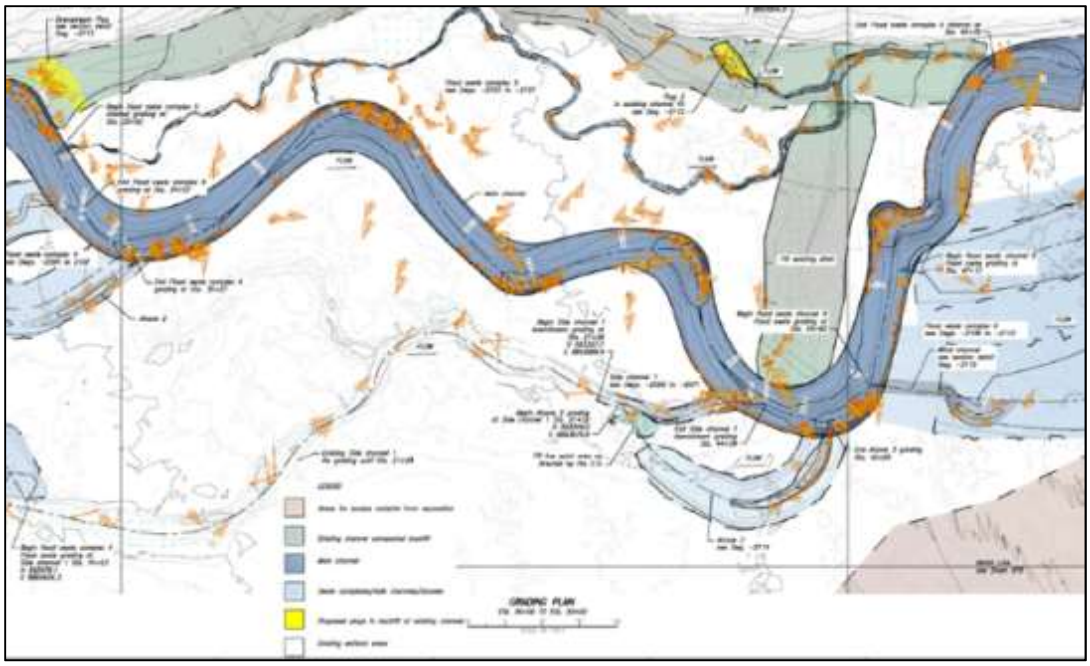
Key Habitat Elements

- Incorporation of channel design criteria to facilitate stable channel form with decreased width to depth ratios, riffle cross sectional area, increased sinuosity with right radius pools and profile conducive to improving floodplain connectivity with activation of peripheral juvenile rearing habitat
- An increase in large wood complexes related to incorporation of different structures types along outside meander pools (Original BO and 75% counted meander wood as single units where 100% counts them as multiple units on each bend)
- Incorporation of floodplain roughness to encourage sediment deposition and riparian vegetation response
- Incorporation of edge roughness and brush mattress to maintain channel dimension and decrease streambank erosion and sediment delivery and provide rapid vegetation regrowth and bank cover
- Incorporation of peripheral habitat (floodplain complexes and side channels) to increase juvenile rearing habitat, wetland development and hyporheic connectivity

CC-44 Parcel 3 Southern Cross Habitat Feature Comparison			
	30% Design	75% Design	100% Design
Main Channel (LF)	4900	5000	5000
Perennial Side Channel (LF)	2562	2575	2317
Ephemeral Side Channel (LF)	1228	0	425
Floodplain Swale Complexes (LF)	0	9219	9200
Alcoves and Spring Channels (LF)	1551	264	1425
Large Wood Complexes (EA)	50	25	142
Floodplain and Side Channel Wood Complexes (EA)	42	44	336
Channel Margin Roughness (LF)	Undecided	Undecided	570
Channel Bank Live Brush Bank (LF)	Undecided	Undecided	1075
Constructed Riffles (EA)	13	13	16
Boulder Complexes (EA)	4	4	4

Habitat uplift associated with the 100% design compared to the 30% design is expected to be significant. A combination of an increase in the planned Catherine Creek channel length, incorporation of additional large wood complexes in into meander pools, point bars, channel transitions, side channels and floodplain swales, increased peripheral habitat, and an increase in channel margin complexity are expected to more fully address habitat limiting factors and increase the overall capacity for spawning and summer-winter rearing habitat within the project area.

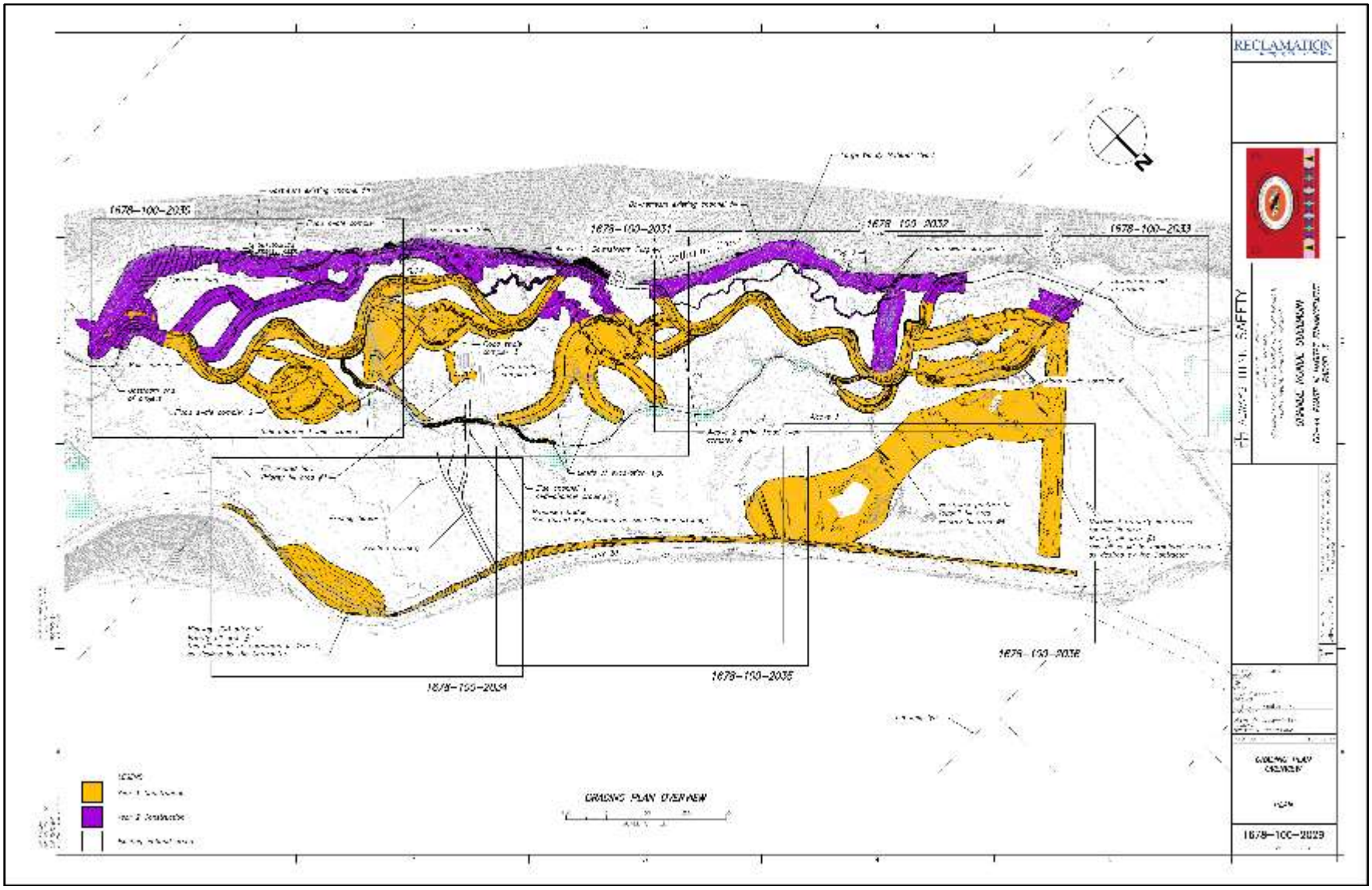
SOUTHERN CROSS GRADING PLAN AT STATION 33+00 TO 50+00.



CC44 SUMMARY TABLE

Project Name	Streams	Year	Assessment Unit steelhead	Assessment Unit Chinook	River Vision Touchstones	BiOP Limiting Factor ID	Snake River Basin Draft Recovery Plan/BiOP Identified Limiting Factors	Eco Concern Sub-Cat ID	Ecological Concern-Sub Category	Project Goals	Project Objectives	Implementation Actions/Metrics	Monitoring Metrics
Catherine Creek RM44 Fish Habitat Enhancement Project (Project in planning stage)	Catherine Creek	2014 2017	UGS10B	CCC3B	Biota-Connectivity	1	Habitat Quantity	1.1	Anthropogenic Barriers	Improve diversion structures. Subbasin Plan Reference: Channel Conditions. (page 260)	**Protect Habitat:** Develop riparian easement with 8 landowners (CTUIR/BPA/ODFW easement and/or CREP). **Enhance riparian habitat conditions:** Increase riparian plant communities through planting and seeding and natural recruitment. **Enhance Floodplain Connectivity:** Remove channel confinement structures. **Enhance in-stream structural diversity and complexity:** Re-activate historic channel meanders to increase sinuosity and place large wood within active channel. **Reduce excessive sediment:** Manage riparian grazing with exclusion fences, stabilize existing erosion sites with wood structures and re-establishment of vegetation. **Decrease summer peak temperatures:** Improve/increase vegetative cover/shade to decrease summer stream temperatures and increase winter temperatures. **Decreased Water Quantity;** Consolidate points of diversion. Purchase water rights.	Conceptually includes: 2 miles restoration channel, 3-4 miles of side channel habitat, 5.5 miles habitat complexity. Removal of irrigation push up dams (4) Planting within riparian area. Seeding disturbed ground. Construct riparian fence. Off-channel water to be developed	**Enhance Floodplain Connectivity:** Topographical GPS points collected pre project using Trimble R8 GPS. **Enhance in-stream structural diversity and complexity:** Longitudinal profile and cross-sections pre project surveyed using Trimble R8 GPS. **Reduce excessive sediment:** Pebble counts at permanent cross-sections pre project. **Decrease summer peak temperatures:** Water temperature - hourly data - Hobo Pendant loggers - April to November starting 2012.
					Riparian Vegetation	4	Riparian Condition	4.1	Riparian Condition	Protect Habitat. Subbasin Plan Reference: Habitat Protection (page 258).			
										Enhance riparian habitat conditions. Subbasin Plan Reference: Riparian Conditions (page 262).			
								4.2	LWD Recruitment				
					Connectivity	5	Peripheral and Transitional Habitats	5.1	Side Channel and Wetland Conditions	Enhance Floodplain Connectivity. Subbasin Plan Reference: Channel Conditions (page 260).			
								5.2	Floodplain Condition				
					Geomorphology	6	Channel Structure and Form	6.1	Bed and Channel Form	Enhance in-stream structural diversity and complexity. Subbasin Plan Reference: Channel Conditions (page 260).			
								6.2	Instream Structural Complexity				
						7	Sediment Conditions	7.2	Increased Sediment Quantity	Reduce excessive sediment. Subbasin Plan Reference: Sediment Conditions (page 261).			
					Hydrology	8	Water Quality	8.1	Temperature	Decrease summer peak temperatures. Subbasin Plan Reference: Riparian Conditions (page 262).			
						9	Water Quantity	9.2	Decreased Water Quantity	Increase summer water quantity. Subbasin Plan Reference: Low Flow Conditions (page 263).			

SOUTHERN CROSS GRADING PLAN OVERVIEW


RECLAMATION
1678-100-2030
1678-100-2031
1678-100-2032
1678-100-2033
1678-100-2034
1678-100-2035
1678-100-2036
GRADING PLAN OVERVIEW
1678-100-2029

TWO PHOTOGRAPHS OF SOUTHERN CROSS CONSTRUCTION AT THE UPPER AND MID PROJECT AREAS JUNE 2016 AND SEPTEMBER 2016.

CONSTRUCTION OF LARGE WOOD STRUCTURE AT LOWER PROJECT AREA.

CONSTRUCTION OF LARGE WOOD STRUCTURE AT UPPER PROJECT AREA.

TWO AERIAL PHOTOPOINTS OF THE SOUTHERN CROSS PROPERTY MID-PROJECT AREA. THE UPPER PHOTO WAS TAKEN IN APRIL, 2009 AND THE LOWER PHOTO WAS TAKEN IN MARCH 2016.

Southern Cross Planting Plan

The long-term goal of the Southern Cross planting plan is to restore natural riparian and wetland plant communities. Black cottonwood, Alder, and River birch dominated riparian forests and native sedge communities currently exist on the property, but have been suppressed or modified from historical conditions. Tree and shrub species planted within the project area include: Mountain alder, Serviceberry, Water birch, Red osier dogwood, Black hawthorn, Cascara, Mock orange, Ninebark, Black cottonwood, Chokecherry, Golden currant, Woods and Nutka rose, Booth willow, Coyote willow, Blue elderberry, Snowberry, and Ponderosa pine. Upland areas, access roads, and disturbed areas were planted with locally-adapted grass species which include Idaho fescue, Bluebunch wheatgrass, Basin wildrye, and Tufted hairgrass. Swale complexes and side channels were planted with sedges which include Nebraska sedge and Beaked sedge. The planting plan is divided into 6 zones, with each zone having different species composition, planting methods, and locations.

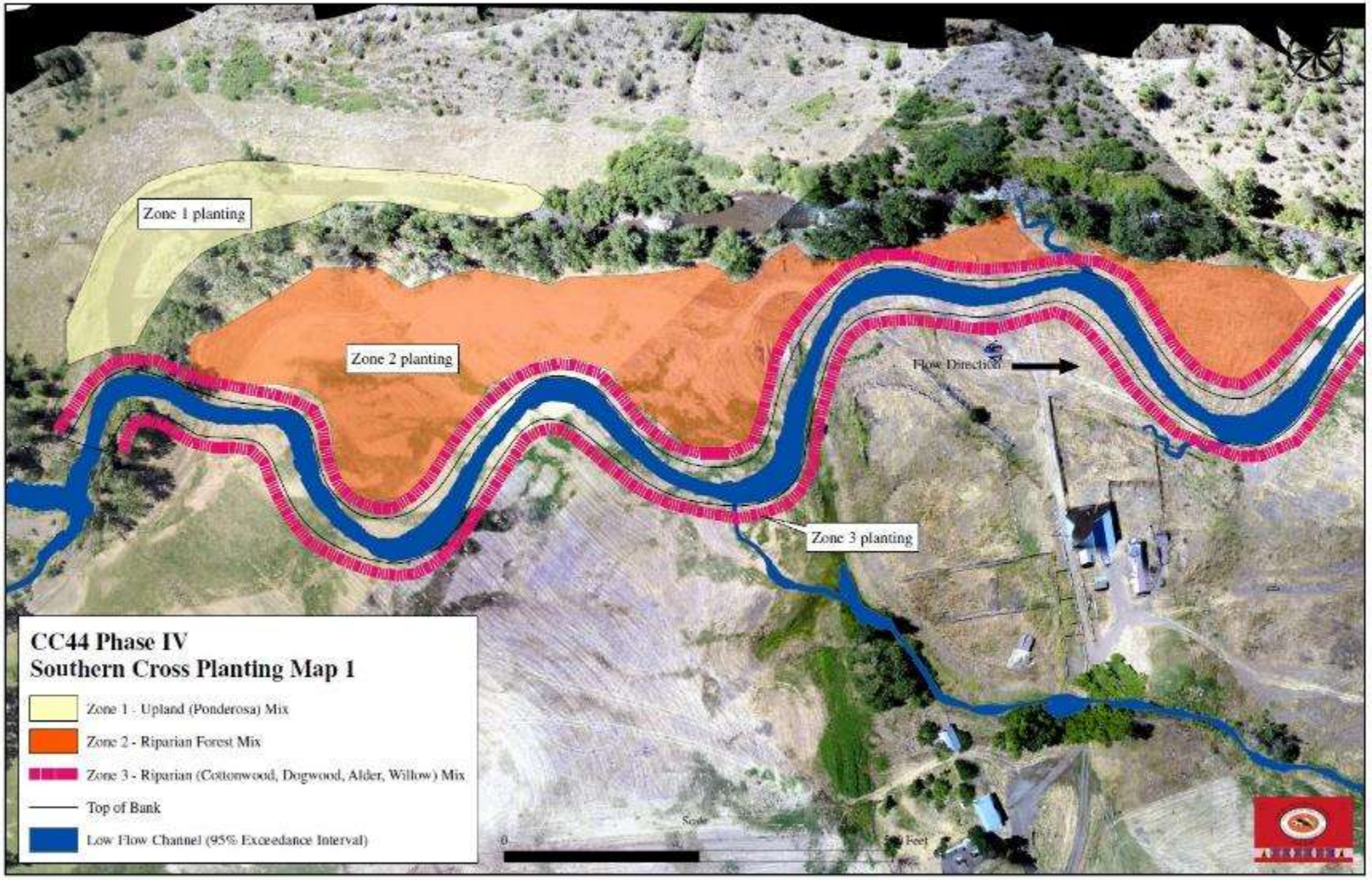
- Zone 1 is composed of live willow cuttings and willow clumps, with 4' variable width spacing, located on point bars within inside meander bends.
- Zone 2 is composed of 1-gallon containerized trees and shrubs, with 8' variable width spacing, located above bank full elevation on outside meander bends and within areas of the 1.25 year flood inundation level.
- Zone 3 is composed of 1-gallon containerized trees and shrubs, with 8' variable width spacing, primarily Mountain alder, Red osier dogwood, Black cottonwood, and Water Birch located above the bank full elevation along riffles.
- Zone 4 is composed of 1-gallon upland containerized trees and shrubs, primarily Ponderosa Pine, Ninebark, and Snowberry located on filled upland areas.
- Zone 5 is composed of 1-gallon containerized trees and shrubs and live willow cuttings, located above bank full elevation within the 1.25 year flood inundation level. Trees were planted on the north and west sides of installed floodplain trees to provide shade.
- Zone 6 is composed of live willow cuttings, with 2' to 4' variable width spacing, located within large wood structures, side channels, and swale channels.

Planting on the Southern Cross Property began in March, 2016, with approximately 8,000 trees and shrubs planted March-May, and over 10,000 planted in fall 2016 using CTUIR staff, Union SWCD staff, and the Powder River Correctional Facility inmate work crew. Trees and shrubs were planted using hand augers, a mini-excavator (trenching), and a 9" diameter hydraulic auger attached to a skid steer. Grass seeding was conducted by hand seeding or by an ATV mounted spreader, and was harrowed post-seeding. An irrigation system was installed after spring planting and plants will be irrigated throughout the summer. Plants will likely be hand watered 2017 and beyond due the instream transfer of the water right in 2018.

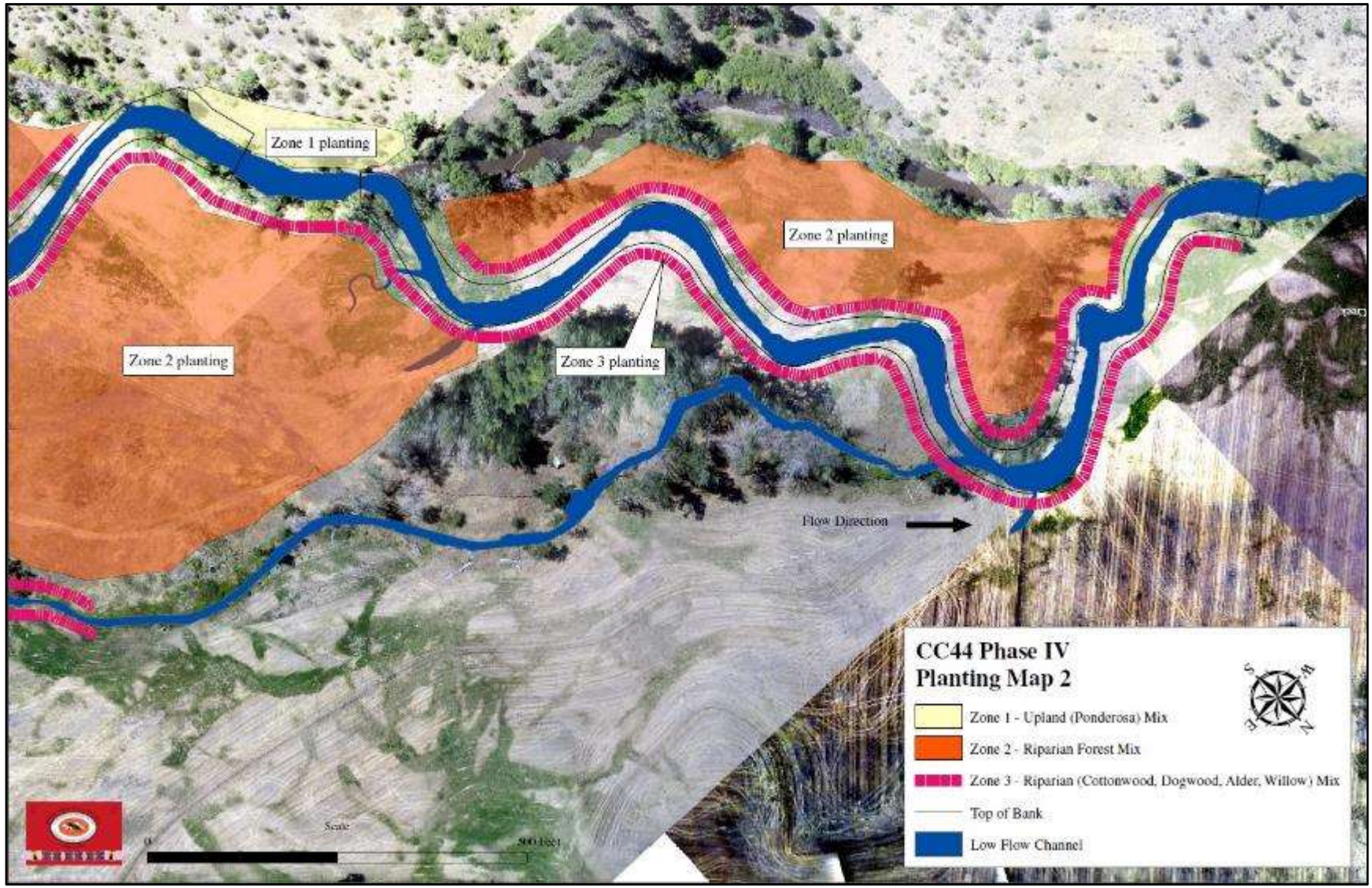
CTUIR UMATILLA FISH HABITAT CREW ASSISTING WITH PLANTING EFFORTS, JUNE 2016.

CTUIR GRANDE RONDE FISH HABITAT CREW SPREADING STRAW MULCH, APRIL 2016.

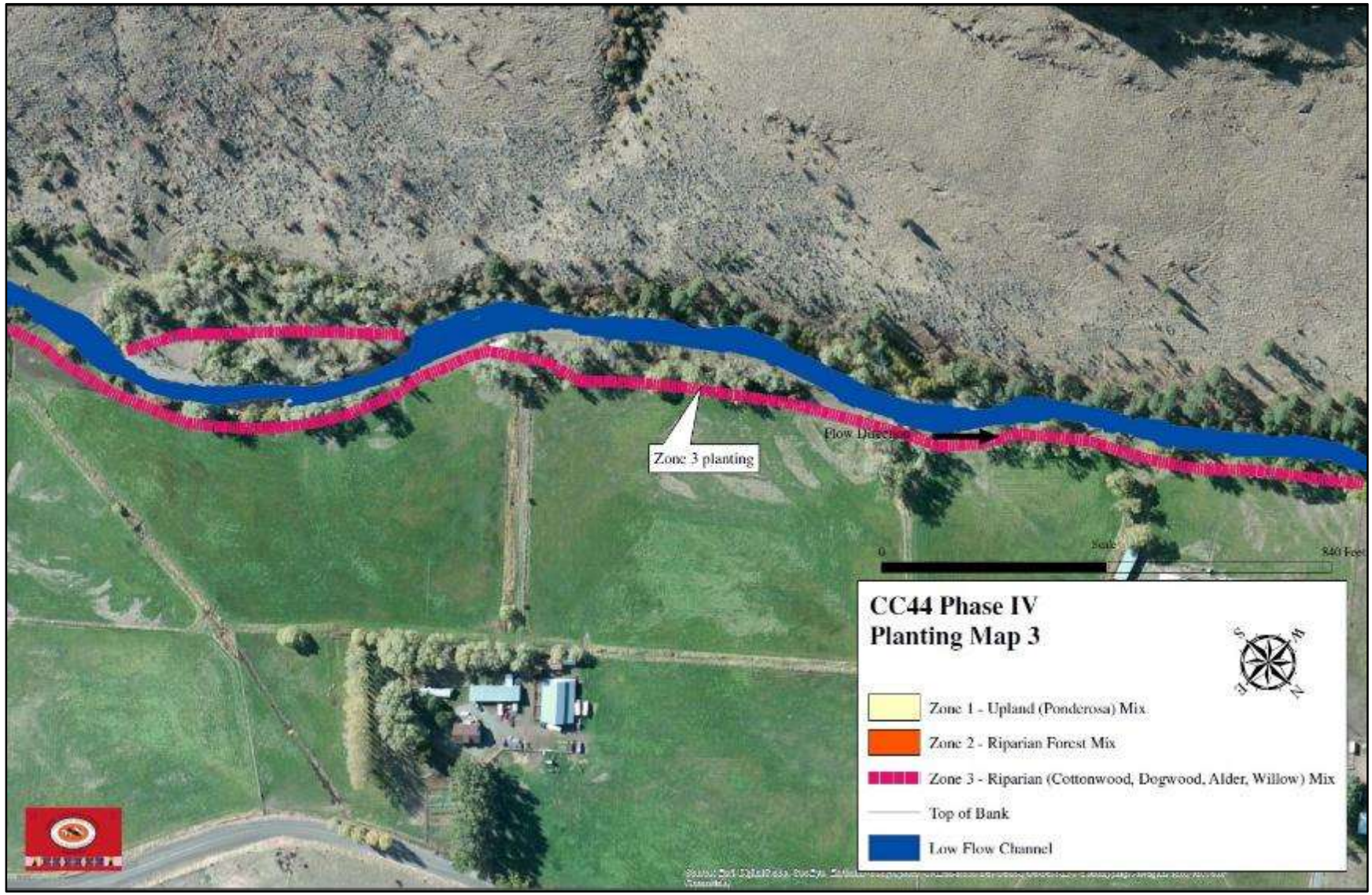
SOUTHERN CROSS YEAR TWO PLANTING PLAN MAP 1



SOUTHERN CROSS YEAR 2 PLANTING PLAN MAP 2



SOUTHERN CROSS YEAR 2 PLANTING PLAN MAP 3



CC44 Phase III Fish Salvage 2016

From July 5 to July 27, fish salvage operations were conducted on Phase III of the Catherine Creek 44 (Southern Cross) Fish Habitat Enhancement Project by staff from CTUIR, ODFW, BOR, UCSWCD, and the Grande Ronde Model Watershed using Smith-Root electro-fishers and beach seines. The National Marine Fisheries Service "Guidelines for Electrofishing Waters Containing Salmonids Listed under the Endangered Species Act" document was used as a guideline for salvage.

Reach-scale isolation and salvage was favored over isolating individual sites due to the vast area requiring dewatering prior to constructing the numerous engineered large wood structures and extensive channel grading specified in the project design. Two engineered large wood structures at the bottom end of the project area, however, did require individual isolation prior to construction due to their location downstream of where the new channel returns back to the old alignment. In these cases sites were isolated from the main channel by placing large sand bags and eco-blocks around the perimeter of the site and allowing an opening at the downstream end of the site, which was then blocked by a seine net on the day of the salvage.

The project area was divided into upper and lower reaches, where each contained both the old channel alignment and the newly constructed channel. In addition, one bypass channel was constructed mid-project to divert water around a short vestige of old channel that would be retained as part of the final new channel alignment. Salvage efforts began with isolation of the lower old channel in preparation for dewatering and backfill. Once fish were removed, the main channel of Catherine Creek was forced in to the temporary bypass channel, connecting the active upper old and new channels to the lower new channel.

Upper reach salvage efforts continued similarly with isolation of the upper old channel in preparation for dewatering and backfill. At this point the main channel of Catherine Creek was diverted from its old alignment and turned into the upper new channel, as flows had been split between the two since June to allow for excess sediment flushing and the introduction of macroinvertebrates and organic compounds into the newly constructed channel.

The final salvage activity within the project area occurred as the temporary bypass channel was to be abandoned and filled. Once fish were removed from the bypass, all flow was turned into the short mid-project reach, retained from the old channel alignment, and connected to the lower new channel.

FISH SALVAGE OF BYPASS CHANNEL, JULY 2016.

Salvage work was generally done in the morning when stream temperatures were less than 18º C, and sites were salvaged until depletion was achieved or temperatures reach 18º C. Sites were considered depleted when 2 consecutive passes with the electro-fisher were made with zero salmonid spp. captured on each pass. The number of passes that individual sites or bypassed reaches needed to meet depletion criteria (using both seine nets and/or electro-fisher) ranged from a minimum of 3 passes in one day to a maximum of 7 in one day. Efforts to deplete the larger bypassed reaches occasionally required crew to halt salvage once stream temperature reached 18º C and resume again the next morning when temperatures were cooler.

Table 6 contains records from four consecutive years of fish salvage on CC44 Phase I-III from 2013-2016. Included are number of O.mykiss and Chinook salvaged, and number of mortalities for each species per year. O.mykiss mortalities averaged 2.74% and Chinook 1.68 % for combined phases I-III.

TOTAL NUMBERS OF SALVAGED FISH-CC44 2013-2016

CC44 salvage year	Area (m2)	O.mykiss salvaged	Chinook salvaged	O.mykiss morts	Chinook morts	%O.mykiss morts	%Chinook morts
2013	295.8	298	529	4	3	1.34%	0.57%
2014	3639.9	1275	357	67	4	5.25%	1.12%
2015	7199.8	4204	1476	47	21	1.12%	1.42%
2016	13455	1511	862	49	31	3.24%	3.60%
Total 2013-2016	**24590.5**	**5777**	**2362**	**118**	**28**	**Average=2.74%**	**Average=1.68%**