Lewis River Aquatic Fund Projects (SA 7.5.3.2)
Project Closeout Report

Project Title:	**Lewis River Hydroelectric Project**
Project Approved By:	Aquatic Coordination Committee March 24, 2014
Original Project Sponsor:	Lower Columbia Fish Enhancement Group
Project Funding	$292,460: $40,000 ACC and $252,460 SRFB
Project Description (work completed):	• Main channel margin wood placement: 1,100' of margin habitat created along the NF Lewis River including 11 structures comprised of 55 piling and 41 pieces of LWD. • Floodplain roughness: 4.0 acres of floodplain roughness structures installed using 31 structures comprised of 73 piling and 59 pieces of LWD. • Riparian enhancement: 9.5 acres were treated including scotch broom removal, spraying knotweed, spraying and manually removing blackberry, and revegetating with native plants.
Workforce: o **Personnel (by craft)** o **Contractors:**	• Project Manager: Brice Crayne • Project Coordinator: Maurice Frank • Engineering Firm: Inter-Fluve, Inc. • Contractor for LWD Install: Kysar-Koistinen • Contractor for knotweed treatment: RK Reforestation • Manual Labor provided by Larch Correctional Facility CWC Crews
Schedule Summary:	Planned Completion Date: 3/15/2018 Actual Completion Date: 3/15/2019
Problems Encountered:	• Access permitting on WDFW land set back construction one year. • Plant desiccation in two planting zones increased mortality and required us to bring in equipment to assist with planting to increase hole depth and import compost to increase organic matter in the soil. • Crew access in the winter was sometimes difficult because of the high flow channel that flows through our access route. • LCFEGs stacked up construction schedule made watering the plants regularly nearly impossible.

Things that went well:

- Lots of wood was donated by PacifiCorps to the project from Swift Reservoir wood collections.
- Wood installation went smooth with no equipment issues.
- Plant survival under the established cottonwood canopy is high (>80%) with good growth already on the western red cedar.

Work Not Completed:

- None. All objectives were met.

Lessons Learned:

- Areas dominated by scotch broom likely have underlying soil content issues. At this project, we discovered that areas that were originally dominated by scotch broom had a substrate composition of about 60% cobble, 20% gravel, and 20% sand. To try and get plants established in these areas we dug holes with a 12" diameter x 48" long bit mounted on a skidsteer on about 6-8' centers. These holes had to be manually excavated by hand before they could be planted. Each hole received 5 gallons of compost as it was backfilled during plant installation. This was completed in spring 2019 and results will not be available for a few years.
- Slash should be a primary component of any LWD structure being installed, not a secondary thought. Slash increases the roughness associated with the structure, increases places for fish to hide, and mimics natural woody structures. This is especially important in systems like the NF Lewis which has three major reservoirs and therefore has limited woody debris supply.

*** Attachments (Photo Documentation):**

- See attached document: "Haapa Phase 1 Photo Documentation"

*(Per National Marine Fisheries Service's Biological Opinion for Relicensing of the Lewis River Hydroelectric Projects):

Identify process or methodology the project will include and provide photo documentation of habitat conditions at the project site **before, during, and after** project completion.

a. Include general views and close-ups showing details of the project and project area, including pre- and post-construction.
b. Label each photo with date, time, project name, photographer's name, and documentation of the subject activity.

Lower Columbia RFEG

Inter-Fluve, Inc.

Kysar-Koistinen

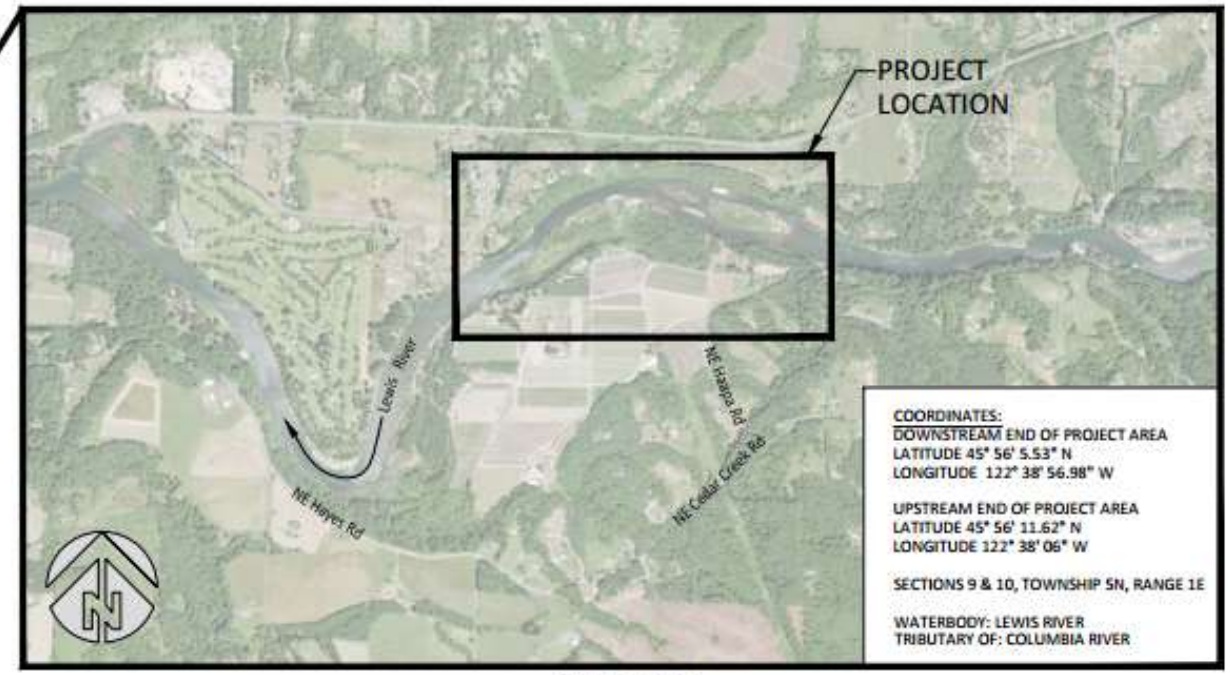
NF Lewis River Restoration

Haapa Phase I Project

SRFB# 14-1339

NORTH FORK LEWIS RIVER - HAAPA FISH HABITAT RESTORATION PROJECT
CLARK COUNTY, WASHINGTON
FINAL DESIGN - JUNE 17, 2014

VICINITY MAP
NOT TO SCALE



SITE MAP
NOT TO SCALE

SHEET LIST

NO.	BY	DATE	REVISION DESCRIPTION

DF	MM,JE	GJ
DRAWN	DESIGNED	CHECKED
MM	6/17/14	13-02-01
APPROVED	DATE	PROJECT

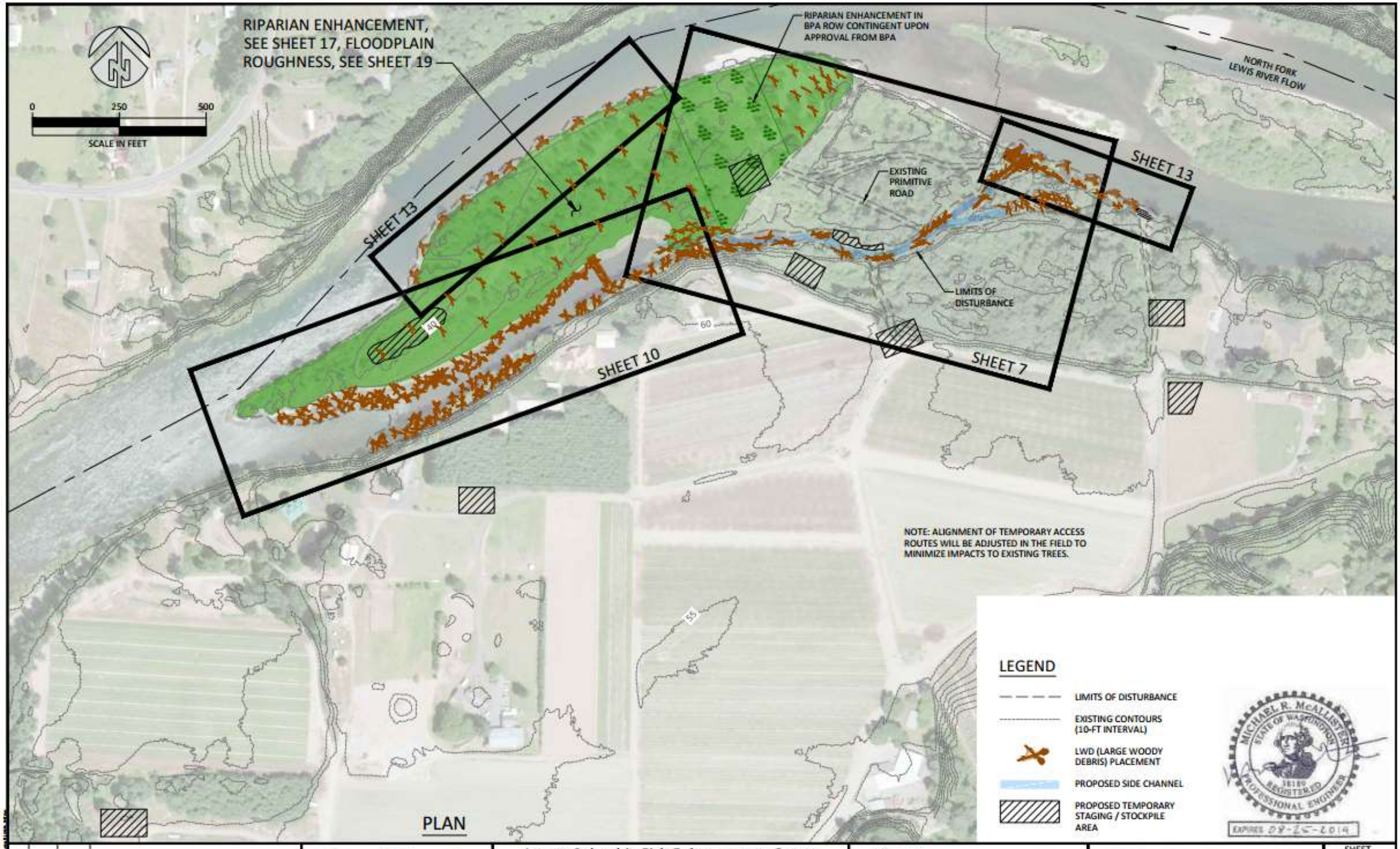
Lower Columbia Fish Enhancement Group
North Fork Lewis River - Haapa
Fish Habitat Restoration Project

Interfluve
501 Portway Ave, Suite 101
Hood River, OR 97031
541.386.9003
www.interfluve.com

COVER SHEET, INDEX AND VICINITY MAP

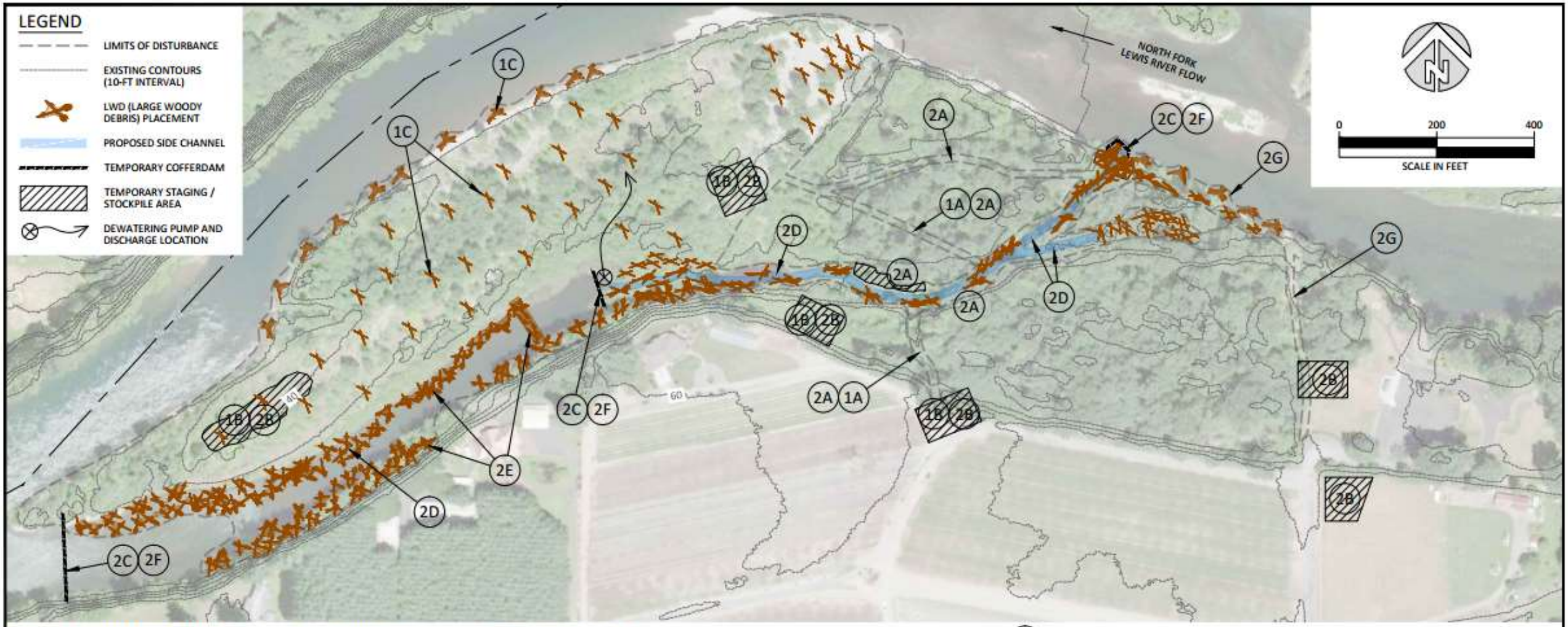
SHEET 1 OF 19

SRFB-FUNDED DESIGN SRFB#12-1165



SRFB-Funded Design SRFB#12-1165

Phase I included riparian enhancement and floodplain roughness (Sheet 17 and 19)



PHASE 1 CONSTRUCTION SEQUENCE

PRIOR TO ANY EARTHWORK, CONSTRUCTION LIMITS SHALL BE DELINEATED BY PAINTED LATH AND FLAGGING.

EQUIPMENT TRAFFIC SHALL OCCUR WITHIN THE NEW CONSTRUCTION LIMITS FOR NEW CHANNELS, AND ALONG EXISTING GRAVEL ROADS.

FINISHED AREAS SHALL BE STABILIZED WITH SEED AND MULCH.

1A ESTABLISH ACCESS AND CLEAR AND GRUB VEGETATION.

1B STAGE WOOD ALONG THE PHASE 1 WORK SITES AT DESIGNATED AREAS.

1C CONSTRUCT LOWER BANK ENHANCMENT, FLOODPLAIN ROUGHNESS

PHASE 2 CONSTRUCTION SEQUENCE

PRIOR TO ANY EARTHWORK, CONSTRUCTION LIMITS SHALL BE DELINEATED BY PAINTED LATH AND FLAGGING.

EQUIPMENT TRAFFIC SHALL OCCUR WITHIN THE NEW CONSTRUCTION LIMITS FOR NEW CHANNELS, AND ALONG EXISTING GRAVEL ROADS.

AS CHANNEL IS CONSTRUCTED, FINISHED AREAS SHALL BE STABILIZED WITH SEED AND MULCH.

UPSTREAM END OF SIDE CHANNEL CONSTRUCTION SHALL OCCUR DURING THE IN-WATER WORK WINDOW AND DURING A PERIOD OF EXPECTED ZERO PRECIPITATION AND LOW FLOW IN THE RIVER.

2A ESTABLISH ACCESS AND CLEAR AND GRUB VEGETATION. CLEAR AND GRUB EQUIPMENT ACCESS AND SIDE CHANNEL ALIGNMENT. REMOVE (AND DISPOSE OF OFF-SITE) SOILS CONTAMINATED BY INVASIVE, NON-NATIVE VEGETATION IN THE SIDE CHANNEL ALIGNMENT TO AVOID SPREADING SEEDS AND OTHER MATERIALS ON CONSTRUCTION EQUIPMENT (REMOVAL AREAS WILL BE FLAGGED). NATIVE VEGETATION IN SIDE CHANNEL ALIGNMENT TO BE SALVAGED AND TRANSPLANTED IN WETLAND ENHANCEMENT ZONES.

2B STAGE WOOD ALONG THE PHASE 2 WORK SITES AT DESIGNATED AREAS.

2C COFFER DAMS AND FISH RESCUE
INSTALL COFFER DAMS AT THE INLET AND MOUTH OF THE SIDE CHANNEL, AND THE DOWNSTREAM END OF THE BACKWATER CHANNEL IN COORDINATION WITH FISH RESCUE.

2D SIDE CHANNEL EXCAVATION
EXCAVATE SIDE CHANNEL AND GROUNDWATER CHANNEL FROM DOWNSTREAM TO UPSTREAM. TRANSPLANT NATIVE VEGETATION MATS TO WETLAND ENHANCEMENT ZONES ALONG THE SIDE CHANNEL. TRANSPORT EXCAVATED MATERIAL TO BACKWATER FILL LOCATIONS. DEWATER CONSTRUCTION AREA AS NEEDED BY PUMPING TO ADJACENT UPLAND VEGETATED INFILTRATION AREAS. INSTALL STRAWBALES, SILT FENCE, AND/OR SANDBAG DAMS AS NEEDED TO REMOVE TURBIDITY BEFORE DISCHARGED WATER ENTERS BACKWATERED AREAS OF THE RIVER.

2E CONSTRUCT BACKWATER & BEAVER DAM
PLACE FILL AND CONSTRUCT BACKWATER ENHANCEMENT LWD, CONSTRUCT SIMULATED BEAVER DAM.

2F FLOW RAMPING
AFTER SIDE CHANNEL CONSTRUCTION IS COMPLETE AND ALL SURFACES HAVE BEEN SEEDED AND MULCHED, GRADUALLY INCREASE FLOW TO SIDE CHANNEL BY PARTIALLY REMOVING THE UPSTREAM COFFERDAM. CONTINUE PUMPING UNTIL SIDE CHANNEL FLOW BECOMES CLEAR. NEXT, REMOVE DOWNSTREAM COFFERDAM AND THEN REMOVE REMAINDER OF UPSTREAM COFFERDAM.ALLOW TIME FOR TURBIDITY TO SETTLE IN BACKWATER, AND REMOVE COFFER DAM FROM THE DOWNSTREAM END OF THE BACKWATER.

2G UPPER BANK ENHANCEMENT AND EGRESS
CONSTRUCT UPPER MAINSTEM BANK ENHANCEMENT, BANK REGRADING AND EGRESS THROUGH WDFW/CLARK COUNTY LAND.

MICHAEL R. McALLISTER — STATE OF WASHINGTON — 38189 — REGISTERED PROFESSIONAL ENGINEER
EXPIRES 09-25-2014

NO.	BY	DATE	REVISION DESCRIPTION

DF	MM,JE	GJ
DRAWN	DESIGNED	CHECKED
MM	6/17/14	13-02-01
APPROVED	DATE	PROJECT

Lower Columbia Fish Enhancement Group
North Fork Lewis River - Haapa
Fish Habitat Restoration Project

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501 Portway Ave, Suite 101
Hood River, OR 97031
541.386.9003
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SIDE CHANNEL AND BACKWATER SEQUENCING AND EROSION CONTROL

SHEET 6 OF 19

SRFB-Funded Design SRFB#12-1165

Phase I included 1A-C: Access, Staging, and Lower Bank Enhancement and Floodplain Roughness

GOOGLE EARTH IMAGERY
PRE-CONSTRUCTION
APRIL 2015

March 2016

HAAPA HABITAT RESTORATION PHASE I

PHOTOGRAPHER: MAURICE FRANK

PRE-TREATMENT OF SCOTCH BROOM

March 2016

HAAPA HABITAT RESTORATION PHASE I

PHOTOGRAPHER: MAURICE FRANK

POST TREATMENT OF SCOTCH BROOM

December 2016

HAAPA HABITAT RESTORATION PHASE I

PHOTOGRAPHER: BRICE CRAYNE

FLOODPLAIN ROUGHNESS INSTALLATION ON PRIVATE LAND

February 2017

HAAPA HABITAT RESTORATION PHASE I

PHOTOGRAPHER: BRICE CRAYNE

SPRING 2017 PLANTING

February 2017

HAAPA HABITAT RESTORATION PHASE I

PHOTOGRAPHER: BRICE CRAYNE

GREEN MOUNTAIN SCHOOL VOLUNTEER PLANTING DAY

April 2017

HAAPA HABITAT RESTORATION PHASE I

PHOTOGRAPHER: BRICE CRAYNE

SPRING SURVIVAL ASSESSMENT

GOOGLE EARTH IMAGERY
MID-CONSTRUCTION
MAY 2017

April 2016

HAAPA HABITAT RESTORATION PHASE I

PHOTOGRAPHER: BRICE CRAYNE

WOOD DONATED BY PACIFICORPS

April 2017

Haapa Habitat Restoration Phase I

Photographer: Brice Crayne

Before - Image of Instream LWD Construction Site (looking downstream)

September 2017

HAAPA HABITAT RESTORATION PHASE I

PHOTOGRAPHER: BRICE CRAYNE

DURING - CONSTRUCTION IMAGE OF INSTREAM LWD CONSTRUCTION SITE (LOOKING UPSTREAM)

September 2017

HAAPA HABITAT RESTORATION PHASE I

PHOTOGRAPHER: BRICE CRAYNE

AFTER - CONSTRUCTION IMAGE OF INSTREAM LWD CONSTRUCTION SITE (LOOKING SLIGHTLY UPSTREAM)

October 2017
HAAPA HABITAT RESTORATION PHASE I
PHOTOGRAPHER: BRICE CRAYNE
AFTER - CONSTRUCTION IMAGE OF INSTREAM LWD CONSTRUCTION SITE AT HIGH FLOWS (LOOKING UPSTREAM)

March 2018

HAAPA HABITAT RESTORATION PHASE I

PHOTOGRAPHER: BRICE CRAYNE

AFTER - CONSTRUCTION IMAGE OF INSTREAM LWD CONSTRUCTION SITE (PANORAMIC)

March 2018

HAAPA HABITAT RESTORATION PHASE I

PHOTOGRAPHER: BRICE CRAYNE

AFTER - CONSTRUCTION IMAGE OF INSTREAM LWD CONSTRUCTION SITE (UPSTREAM STRUCTURES)

GOOGLE EARTH IMAGERY
POST-CONSTRUCTION (2018/19 RIPARIAN REVEGETATION STILL REMAINING)
JULY 2018

January 2019

HAAPA HABITAT RESTORATION PHASE I

VIDEOGRAPHER: BRICE CRAYNE

PHOTO SERIES FROM VIDEO OF SKIDSTEER-AUGER HOLE DIGGING; EACH HOLE TOOK 30-60 SECONDS TO DIG.

January 2019

HAAPA HABITAT RESTORATION PHASE I

PHOTOGRAPHER: BRICE CRAYNE

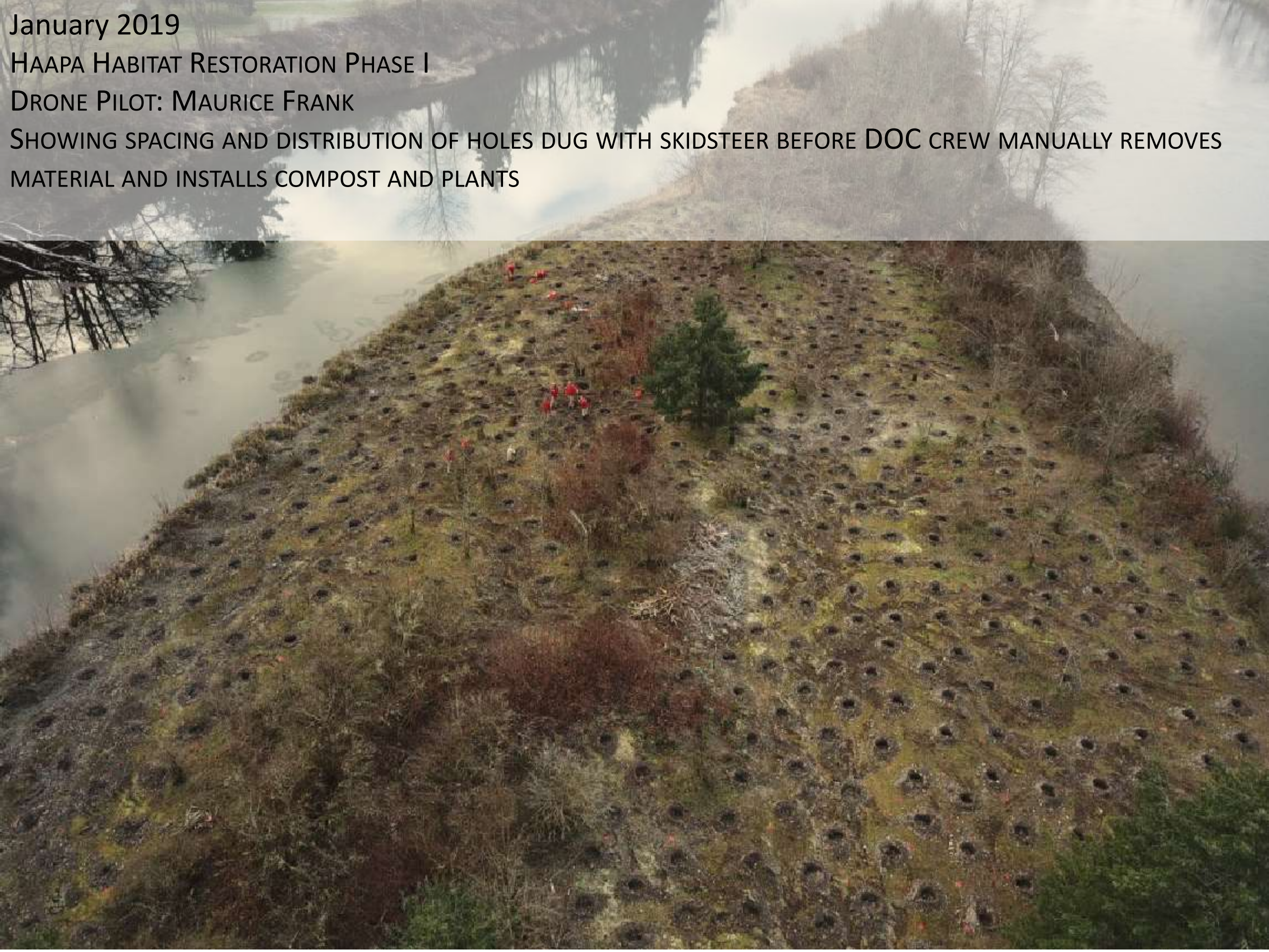
SHOWING HOLE COMPOSITION, DEPTH AND SUBSTRATE SIZE AFTER SKIDSTEER AUGER FINISHES

January 2019

HAAPA HABITAT RESTORATION PHASE I

DRONE PILOT: MAURICE FRANK

SHOWING SPACING AND DISTRIBUTION OF HOLES DUG WITH SKIDSTEER BEFORE DOC CREW MANUALLY REMOVES MATERIAL AND INSTALLS COMPOST AND PLANTS



January 2019

HAAPA HABITAT RESTORATION PHASE I

DRONE PILOT: MAURICE FRANK

HOLES WERE DUG OUT MANUALLY BY DOC CREWS

January 2019

HAAPA HABITAT RESTORATION PHASE I

PHOTOGRAPHER: MAURICE FRANK

EACH HOLE WAS DUG OUT DEEP AND WIDE ENOUGH TO FIT A 5-GALLON BUCKET. 5 GALLONS OF COMPOST WAS ADDED TO EACH HOLE.

January 2019

HAAPA HABITAT RESTORATION PHASE I

PHOTOGRAPHER: BRICE CRAYNE

50 YARDS OF COMPOST IMPORTED TO AMEND SOIL AND MULCH PLANTS

March 2019

HAAPA HABITAT RESTORATION

PHASE I

PHOTOGRAPHER: BRICE CRAYNE

WESTERN RED CEDAR WERE SHADED AND PROTECTED FROM DEER BROWSE

March 2019

HAAPA HABITAT RESTORATION PHASE I

PHOTOGRAPHER: BRICE CRAYNE

FINAL PRODUCT OF RIPARIAN ENHANCEMENT