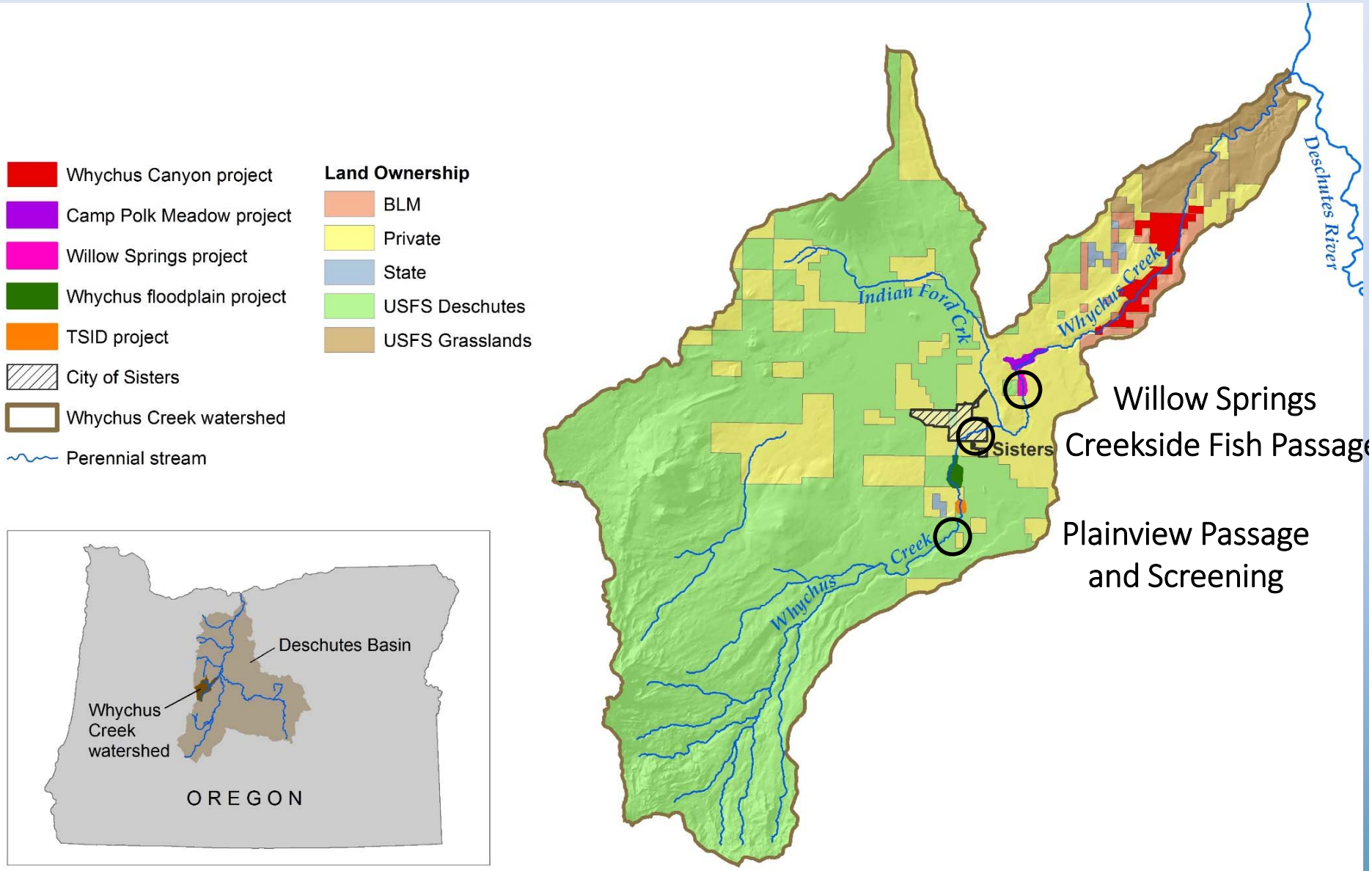
Whychus Creek Project Updates

Photo: J. Mather

Mathias Perle, Upper Deschutes Watershed Council
Lauren Mork, Upper Deschutes Watershed Council

In Partnership with

- PGE
- CTWSRO
- ODFW
- USFS
- USFWS
- PSU
- City of Sisters
- DLT
- DRC
- U of N
- USU
- W2R


Whychus Canyon project
Camp Polk Meadow project
Willow Springs project
Whychus floodplain project
TSID project
City of Sisters
Whychus Creek watershed
Perennial stream
Land Ownership
BLM
Private
State
USFS Deschutes
USFS Grasslands
Deschutes Basin
Whychus Creek watershed
OREGON
Indian Ford Crk
Whychus Creek
Deschutes River
Sisters
Whychus Creek
Willow Springs Creekside Fish Passage
Plainview Passage and Screening

Plainview Diversion

Creekside Park & Campground

CREEKSIDE PARK RESTORATION PROJECT

SISTERS, OREGON

VICINITY MAP

LOCATION MAP

PROJECT DESCRIPTION

LOCATED NEAR DOWNTOWN SISTERS AND FLOWING THROUGH CREEKSIDE PARK, THE PROJECT REACH OF WHYCHUS CREEK EXPERIENCES HIGH USER TRAFFIC WITH OBSERVED SIGNS OF UNINTENDED ACCESS PATHWAYS AND ASSOCIATED STREAMBANK FAILURE. CONSTRUCTED BETWEEN 1939 AND 1941 BY THE CIVILIAN CONSERVATION CORPS (CCC) AND WORKS PROGRESS ADMINISTRATION (WPA), WHEN CREEKSIDE PARK WAS DEVELOPED BY THE STATE, THE EXISTING FOOTBRIDGE BRIDGE ABUTEMENTS HAS SINCE BEEN DESIGNATED AS HISTORICALLY SIGNIFICANT STRUCTURES BY THE STATE HISTORIC PRESERVATION OFFICE (SHPO). WITH ITS HISTORIC AESTHETIC, DAY-USE/CAMPING OPTIONS AND PUBLICLY ACCESSIBLE LOCATION, CREEKSIDE PARK CONTINUES TO BE HIGHLY UTILIZED. ACKNOWLEDGING THIS CONTINUED USE AS WELL AS ITS UNINTENDED IMPACTS, THE CITY AND UDWC HOPE TO DEVELOP A CREATIVE, COMMUNITY INCLUSIVE RESTORATION DESIGN THAT FUTURE PROJECTS CAN USE AS A MODEL.

PRIMARY PROJECT COMPONENTS INCLUDE CHANNEL AND STREAMBANK ENHANCEMENTS ALONG WHYCHUS CREEK; AMERICANS WITH DISABILITIES ACT (ADA) AND STRUCTURAL UPGRADES TO THE EXISTING FOOTBRIDGE AND ACCESS RAMPS; UTILITY LINE PROTECTION AND REALIGNMENT, CREEK ACCESS AND RECREATION MANAGEMENT; AND NATIVE VEGETATION ENRICHMENT.

CITY OF SISTERS AND HENDERSON ENVIRONMENTAL DESIGN-BUILD PROFESSIONALS WOULD LIKE TO EXTEND THEIR GRATITUDE TO UDWC, OWEB, SISTERS CITY COUNCIL AND PARKS ADVISORY BOARD, OPRD, AND THE OTHER CITY STAFF AND ENGINEERS.

SHEET INDEX

HISTORIC FOOTBRIDGE AND ABUTMENTS

STREAMBANK EROSION

EXISTING SEWER LINE

50% DESIGN – NOT FOR CONSTRUCTION

HENDERSON
Environmental Design-Build Professionals
200 N STATE STREET, SUITE 103
LAKE OSWEGO, OR 97034
PH: (503) 889-8990
OR CCB# 142914
WA CCB# HENDEL995QH
www.HENDERSONDESIGN-BUILD.com

CITY OF SISTERS

UPPER DESCHUTES WATERSHED COUNCIL

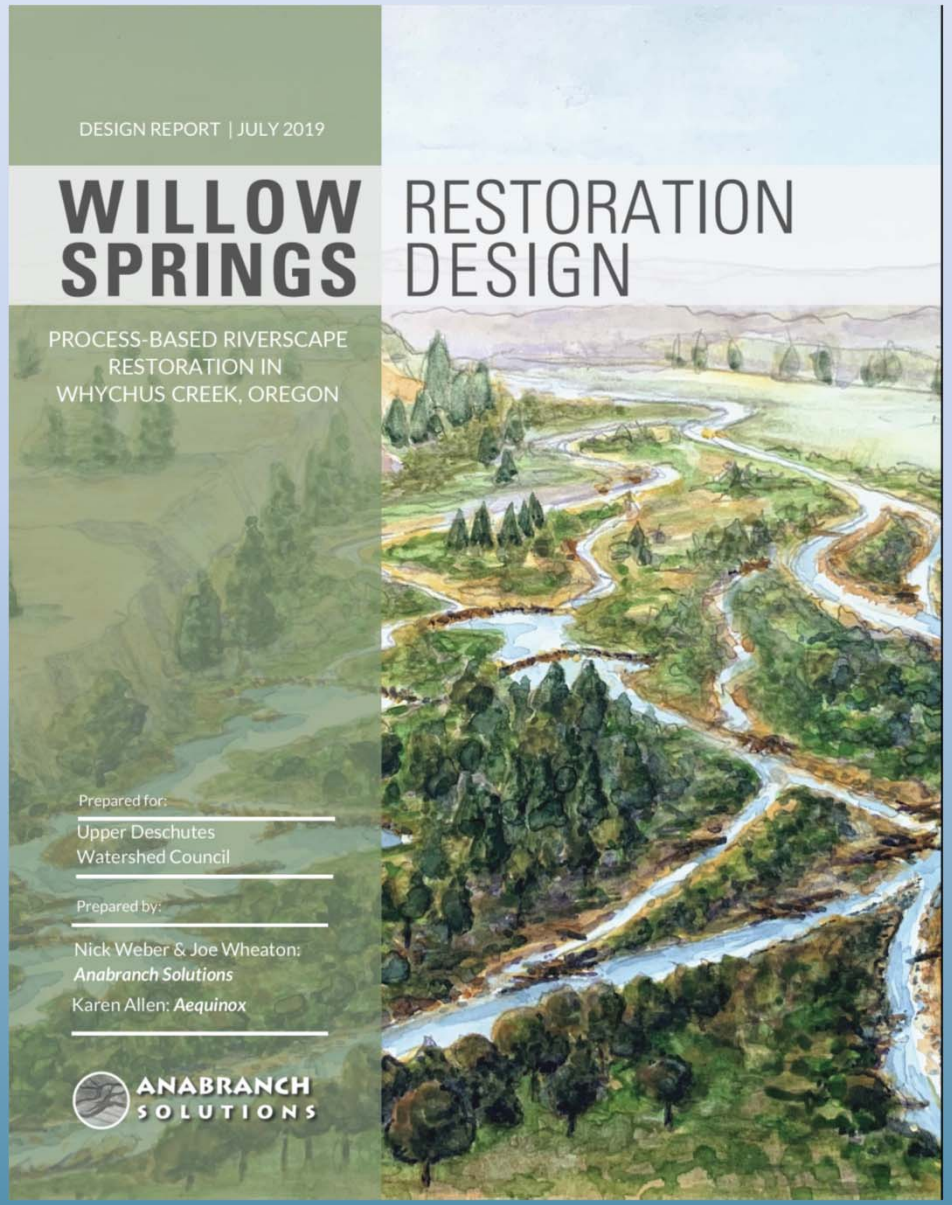
PRELIMINARY
EXPIRES 6/30/2019

CREEKSIDE PARK RESTORATION PROJECT
CITY OF SISTERS AND UDWC
SISTERS, OR

COVER SHEET

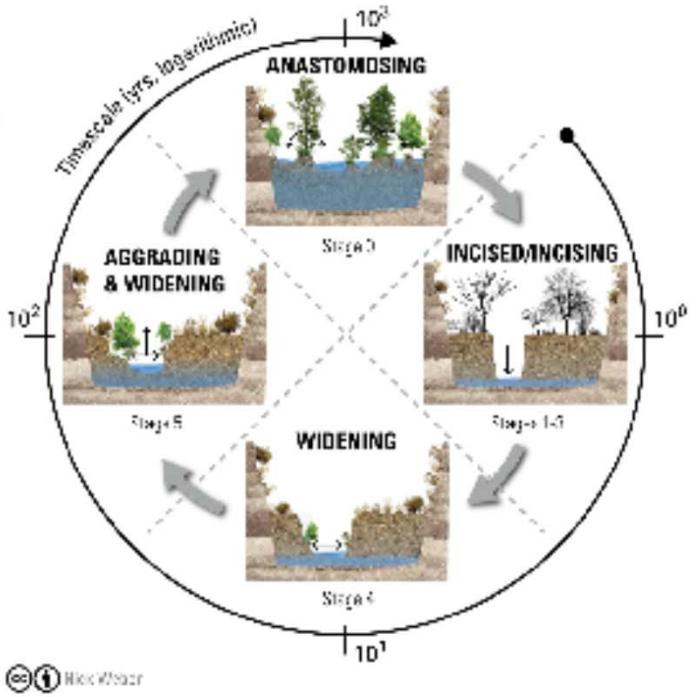
FIELDWORK:	–
DATE:	–/–/–
DESIGN:	RS, AM
DRAWN:	AM
CHECKED:	BH
PROJECT NUMBER	COSCP 18-1
REVISION	DATE
–	–
SHEET NUMBER	G01
SHT 1 OF 26	

Willow Springs Preserve Restoration Design



RESTORATION VISION

From Now



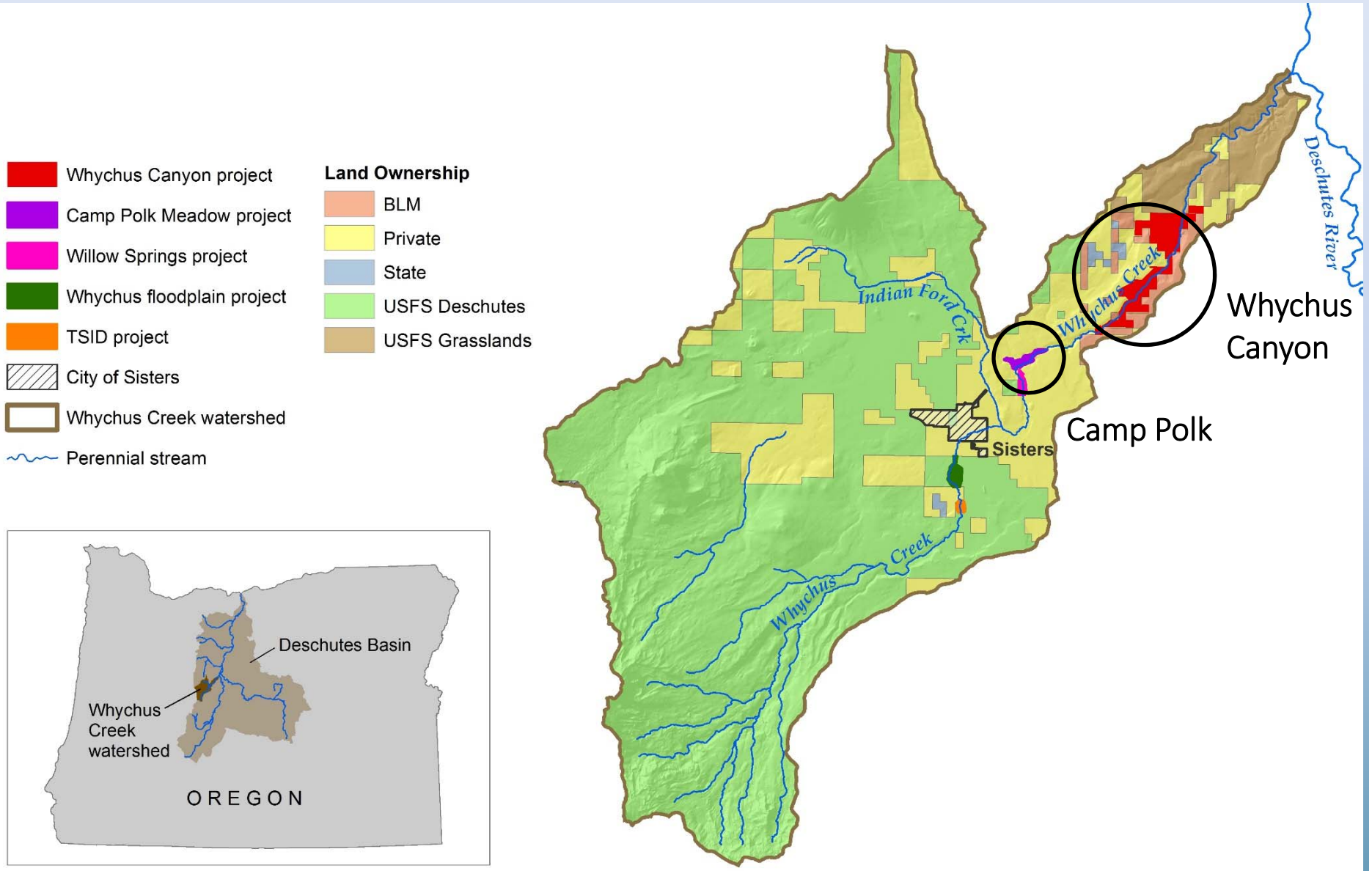
To Phase 1

Medium-Term

Long-Term

Masie Richards

Whychus Canyon
Stage 0 Restoration Project
Future Restoration & Monitoring Results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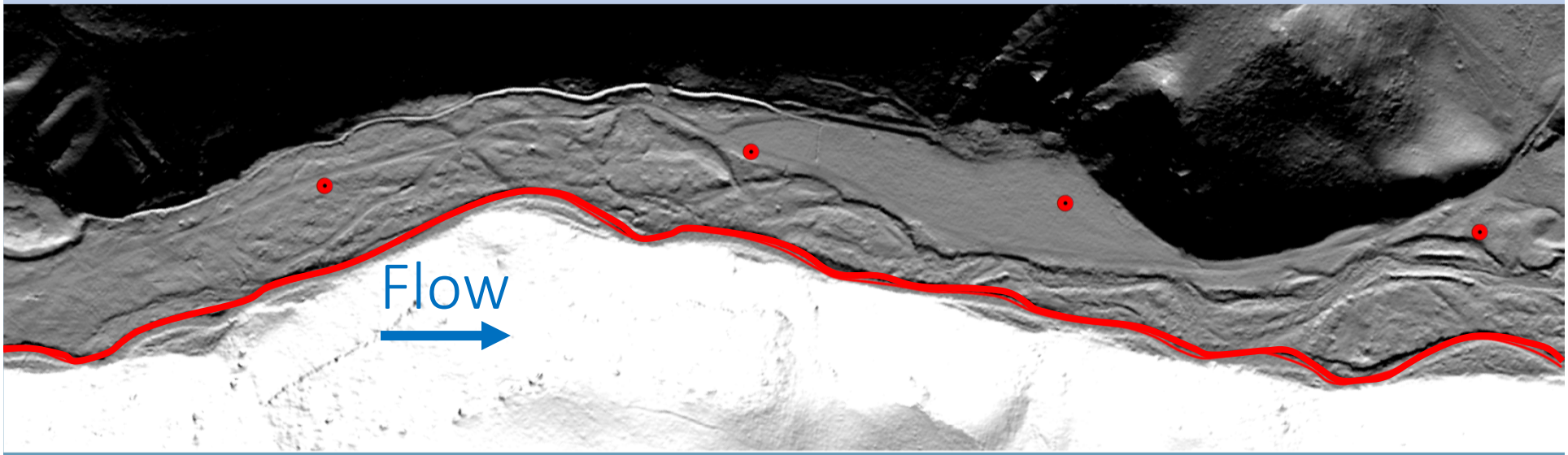
Sisters
Whychus Canyon
Camp Polk

Whychus Canyon - 2015




July 2015


October 2016


Flow
July 2018

What are the metrics? (at baseflow)

PHYSICAL

Groundwater

- Depth

Channel morphology

- Number of channels
- Channel elevation
- Total channel length
- Ratio of primary : secondary
- Total wetted area

Stream temperature

- July rate of change

Geomorphic units / habitat

- Total number of units
- Number of types of units
- Percent riffle
- Percent pool
- Pool number, types, area, dimensions
- Pieces of wood
- Substrate sizes, proportions

BIOLOGICAL

Riparian and wetland vegetation

- Area
- Species richness and type

Algae and diatoms

- Species richness and abundance

Macroinvertebrates

- Taxa richness and abundance

Fish

- Juvenile density
- Juvenile growth rate and condition

Groundwater Depth

HYPOTHESIS	OBJECTIVE
Average depth to groundwater will decrease	Average depth of ≤2 ft below floodplain surface July 15-Aug 31

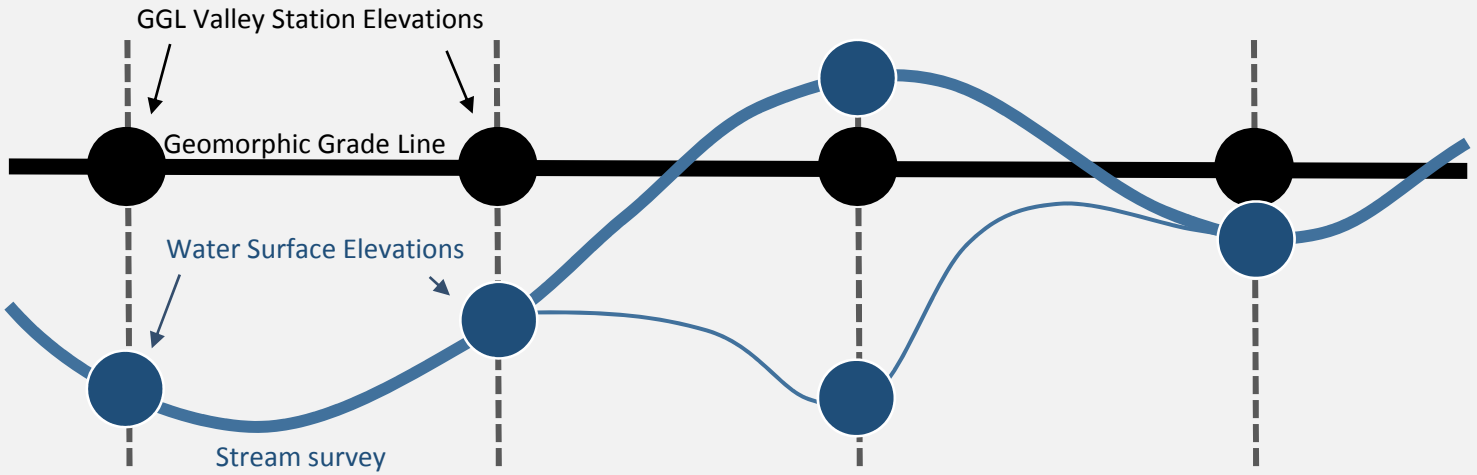
METRIC	BEFORE	1 YEAR AFTER	2 YEARS AFTER
Average depth July 15 – Aug 31	-7.2 ft	-1.0 ft	-1.5 ft

Channel morphology

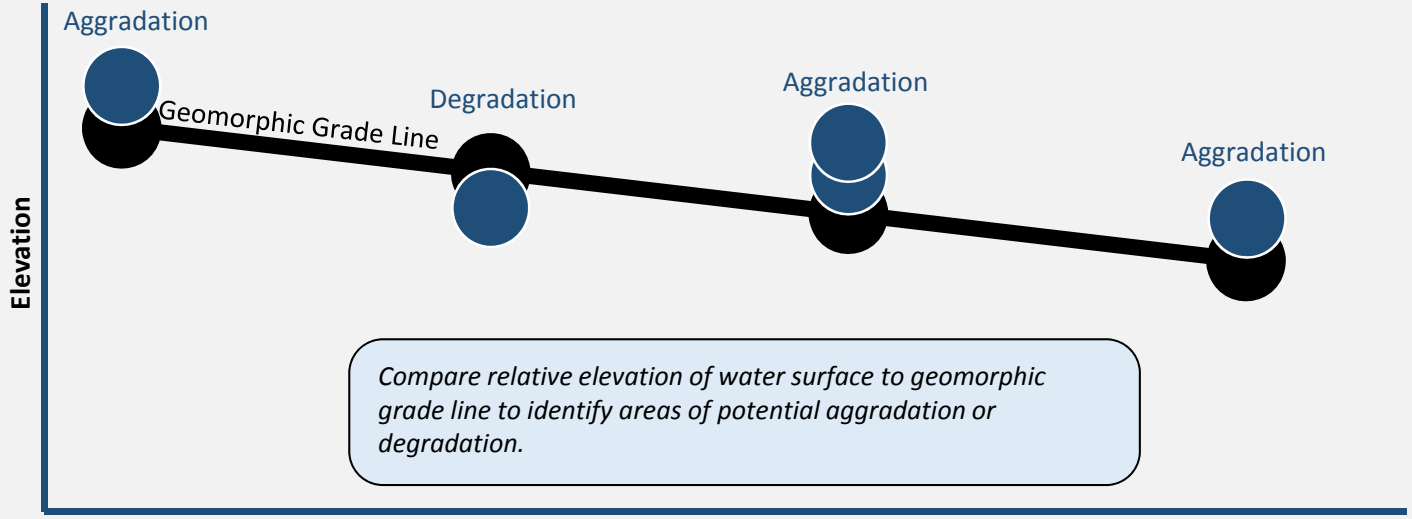
HYPOTHESIS	OBJECTIVE
Channels will remain within 1 ft below the target GGL elevation	Flow is dispersed among multiple channels and elevations remain not more than 1 ft below target GGL elevation
Number of channels wetted at base flow will increase	Increase average number of channels at each cross-section by > 1

Powers PD, Helstab M, Niezgoda SL.
A process-based approach to restoring depositional river valleys to Stage 0, an anastomosing channel network.
River Res Applic. 2018;1–11. https://doi.org/10.1002/rra.3378

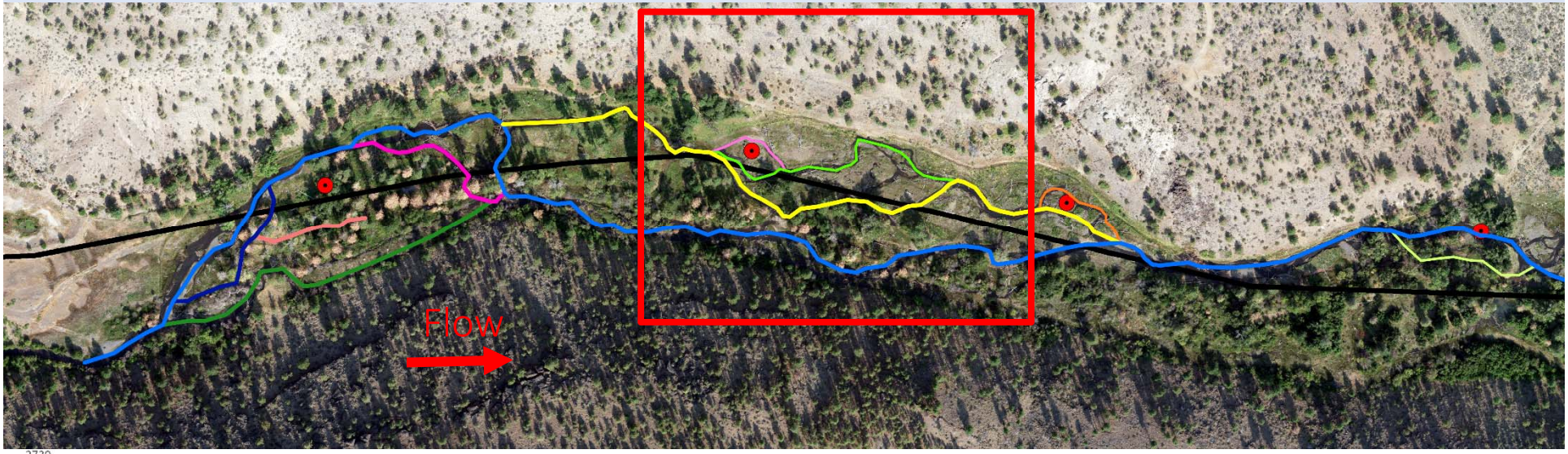
Plan View of Valley

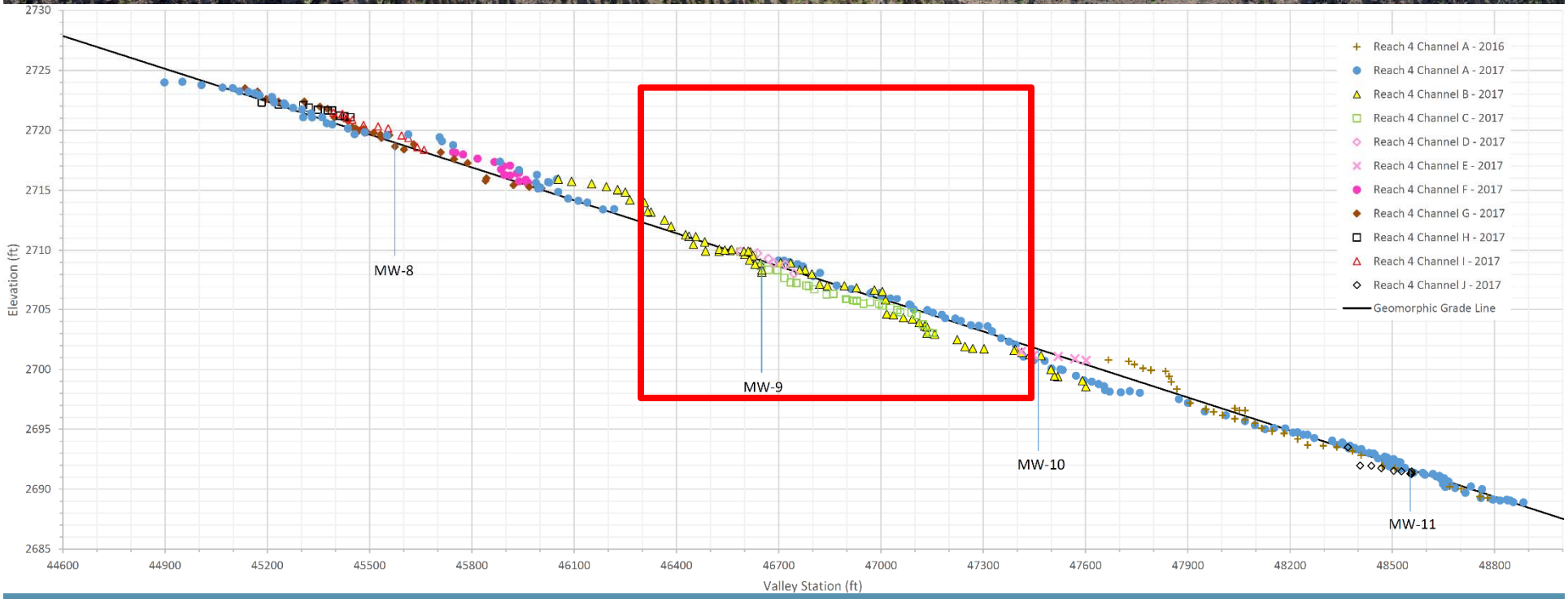


Elevation Data Plot



Compare relative elevation of water surface to geomorphic grade line to identify areas of potential aggradation or degradation.


Flow


Elevation (ft)
2730
2725
2720
2715
2710
2705
2700
2695
2690
2685
44600
44900
45200
45500
45800
46100
46400
46700
47000
47300
47600
47900
48200
48500
48800
Valley Station (ft)
MW-8
MW-9
MW-10
MW-11
Reach 4 Channel A - 2016
Reach 4 Channel A - 2017
Reach 4 Channel B - 2017
Reach 4 Channel C - 2017
Reach 4 Channel D - 2017
Reach 4 Channel E - 2017
Reach 4 Channel F - 2017
Reach 4 Channel G - 2017
Reach 4 Channel H - 2017
Reach 4 Channel I - 2017
Reach 4 Channel J - 2017
Geomorphic Grade Line

Channel morphology

HYPOTHESIS	OBJECTIVE
Total channel length will increase	Total channel length > 3 mi
Total wetted area at base flow will increase	Increase total wetted area
Ratio of lengths of secondary : primary channels will increase	Ratio > 2:1

METRIC	BEFORE	1 YEAR AFTER	DIFFERENCE
Total channel length	1.2 mi	3.8 mi	+ 3.2 x
Total wetted area at base flow	923 m^2/ 100m	2647 m^2/ 100m	+ 2.9 x
Ratio of lengths secondary: primary	0.1	2.4	+ 24 x

Geomorphic Units / Habitat

HYPOTHESIS	OBJECTIVE
Total number and richness (types) of habitat units will increase	Increase number and richness of habitat units
Percent riffle will decrease and percent pool will increase	Decrease % riffle and increase % pool

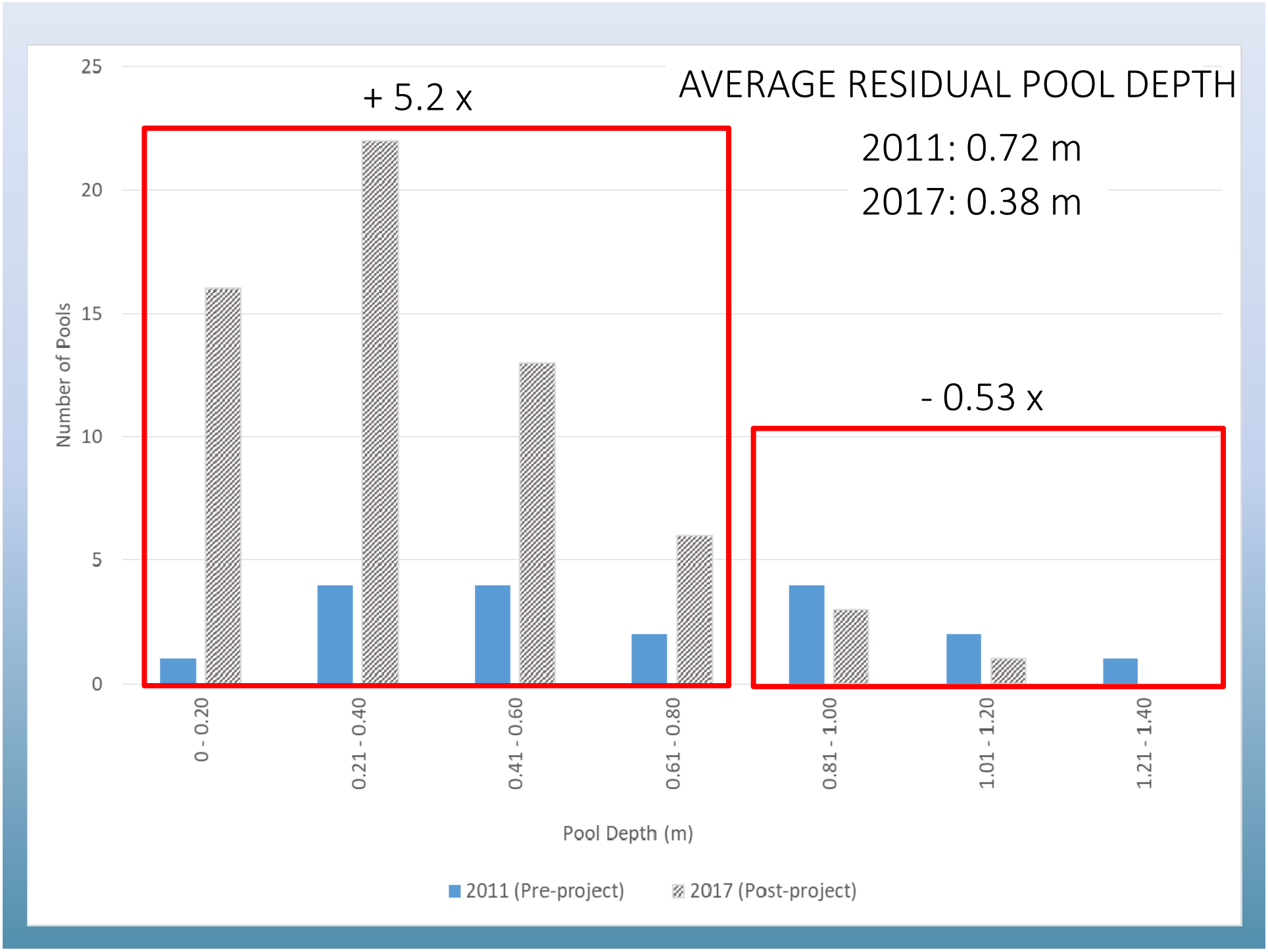
METRIC	BEFORE	1 YEAR AFTER	DIFFERENCE
Number of habitat units	56	304	+ 5.4 x
Habitat unit richness	11	16	+ 1.5 x
Percent riffle	63%	58%	- 0.9 x
Percent pool	27%	34%	+ 1.3 x

Wood and Pools

HYPOTHESIS	OBJECTIVE
Amount of large wood will increase	Increase amount of large wood
Type and character of pools will reflect low energy depositional	Increase number and total area of pools

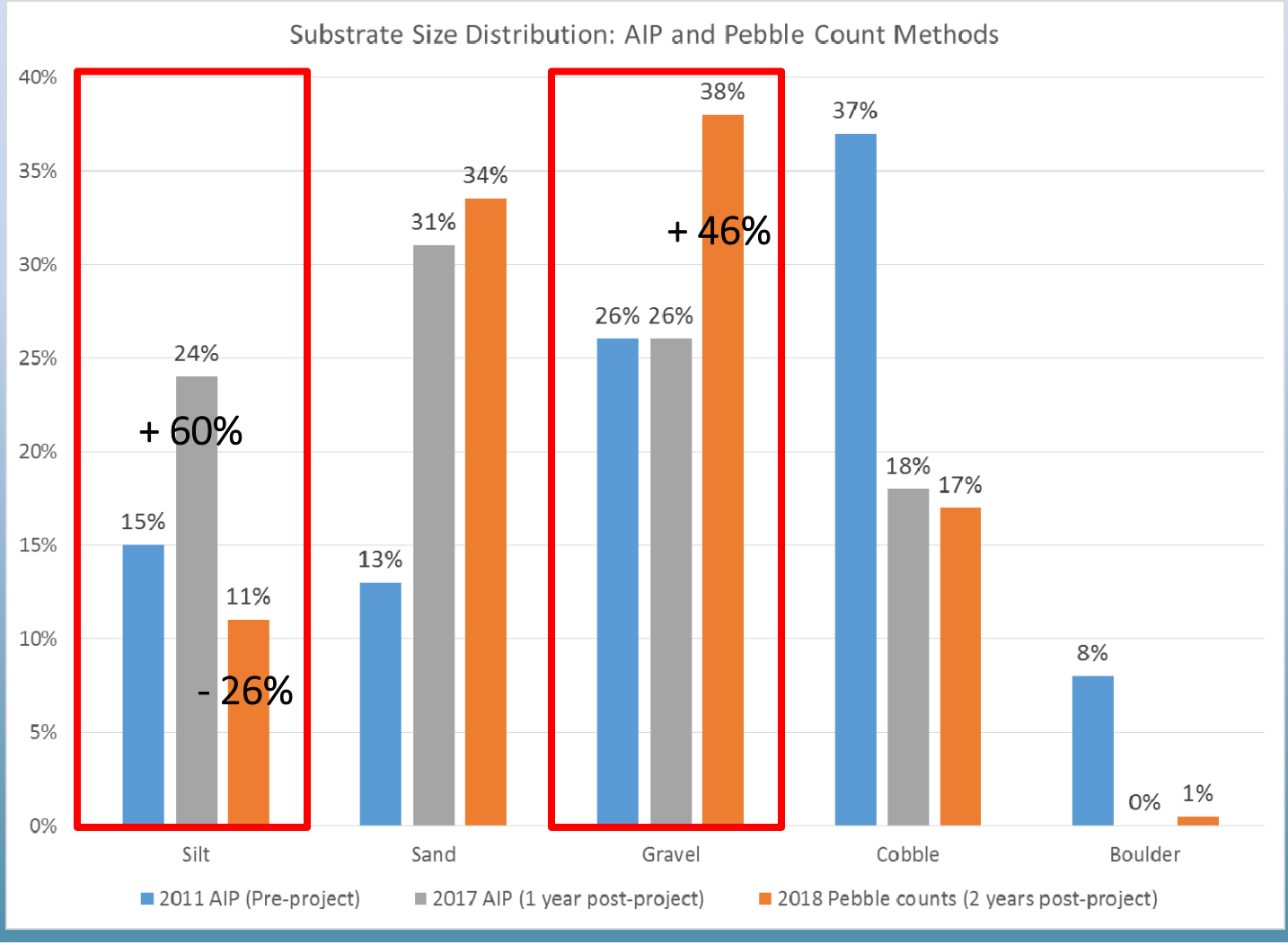
METRIC	BEFORE	1 YEAR AFTER	DIFFERENCE
# Pieces of wood per 100m	4	53	+ 13.2 x
# Pools per 100m	1.4	7.4	+ 5.3 x
Complex pools per 100m	0.3	2.4	+ 8 x
Pool area per 100m (m^2)	249	900	+ 3.6 x
Average size of pools (m^2)	217	118	- 0.54 x
Average residual pool depth (m)	0.72	0.38	- 0.53 x

Photos: P. Powers


AVERAGE RESIDUAL POOL DEPTH
2011: 0.72 m
2017: 0.38 m
+ 5.2 x
- 0.53 x
Number of Pools
25
20
15
10
5
0
0 - 0.20
0.21 - 0.40
0.41 - 0.60
0.61 - 0.80
0.81 - 1.00
1.01 - 1.20
1.21 - 1.40
Pool Depth (m)
2011 (Pre-project)
2017 (Post-project)

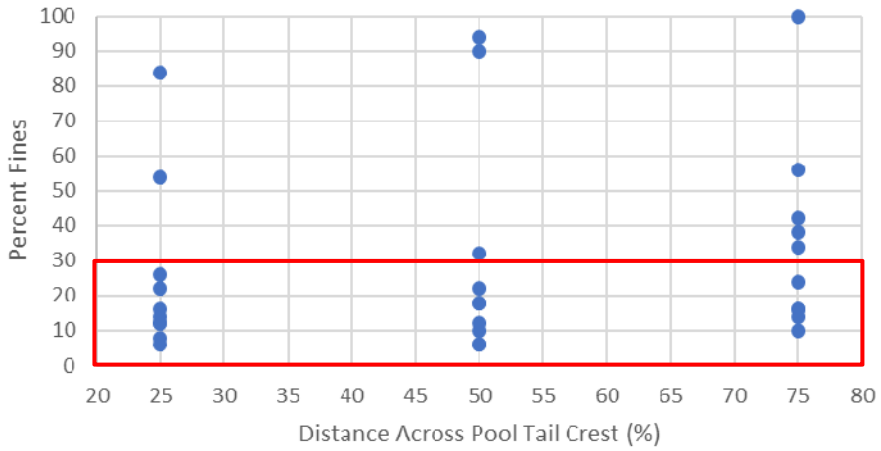
Substrate Size Distribution

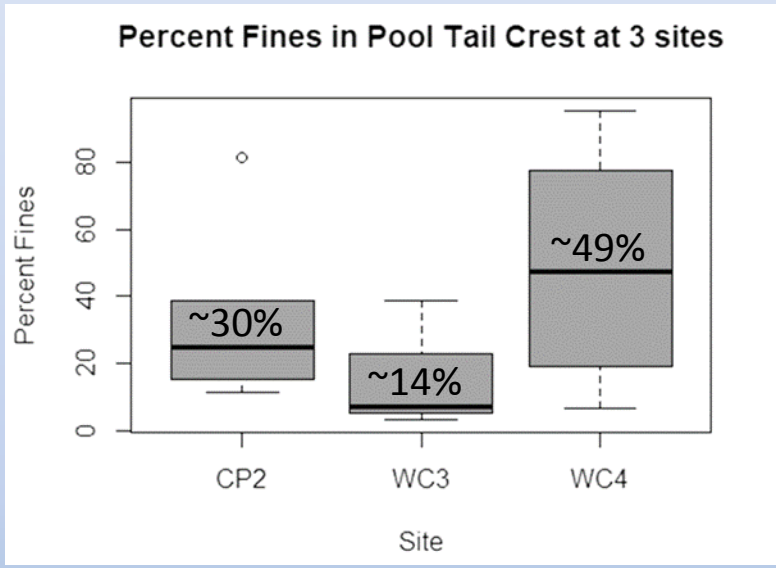
HYPOTHESIS	OBJECTIVE
Substrate size distribution will reflect shift toward low energy depositional	Shift distribution toward smaller size classes



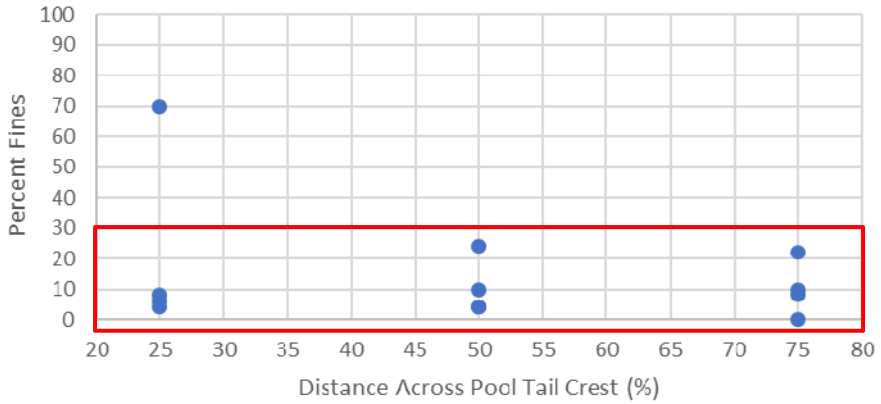
Fines (< 2 mm)

Post-Restoration (6 years)

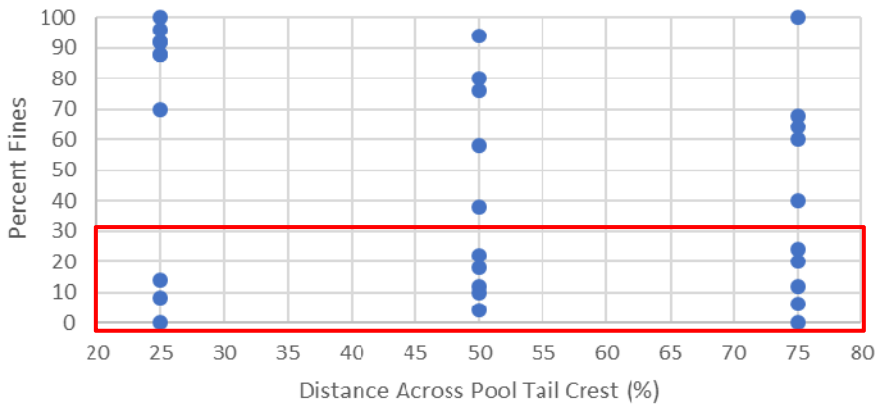




Untreated Reach



Post-Restoration (2 years)

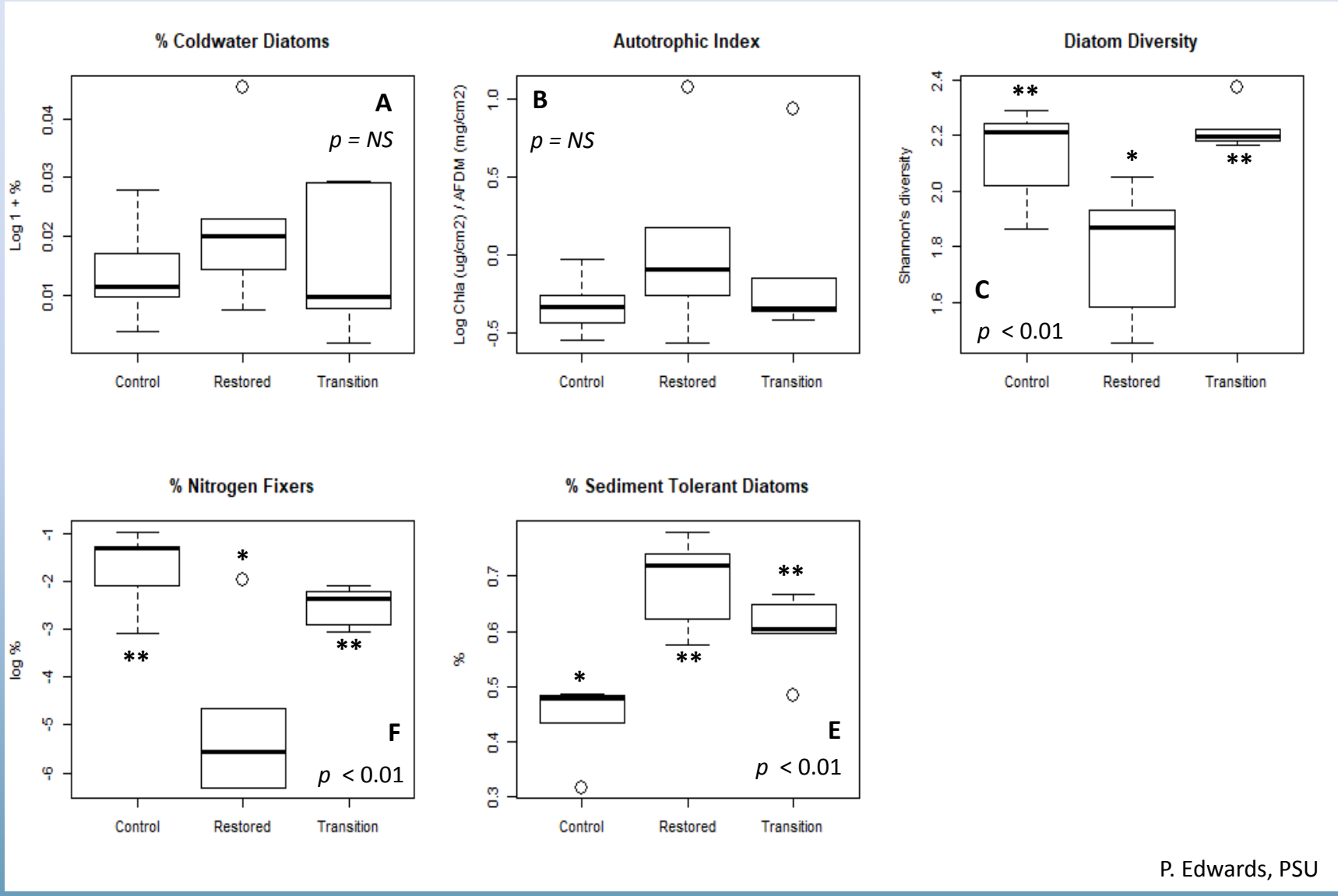


Riparian and Wetland Vegetation

HYPOTHESIS	OBJECTIVE
Total acreage of desired riparian and wetland vegetation will increase	Increase acreage of desired plant communities by > 20 ac

METRIC	BEFORE	AFTER	DIFFERENCE
Acres of riparian vegetation	23.47	28.32	+ 1.2 x
Species richness	27	67	+ 2.5 x
# native species	19	41	+ 2.2 x
# non-native species	8	19	+ 2.4 x
# facw or obl species	10	24	+ 2.4 x

Algae and Diatoms



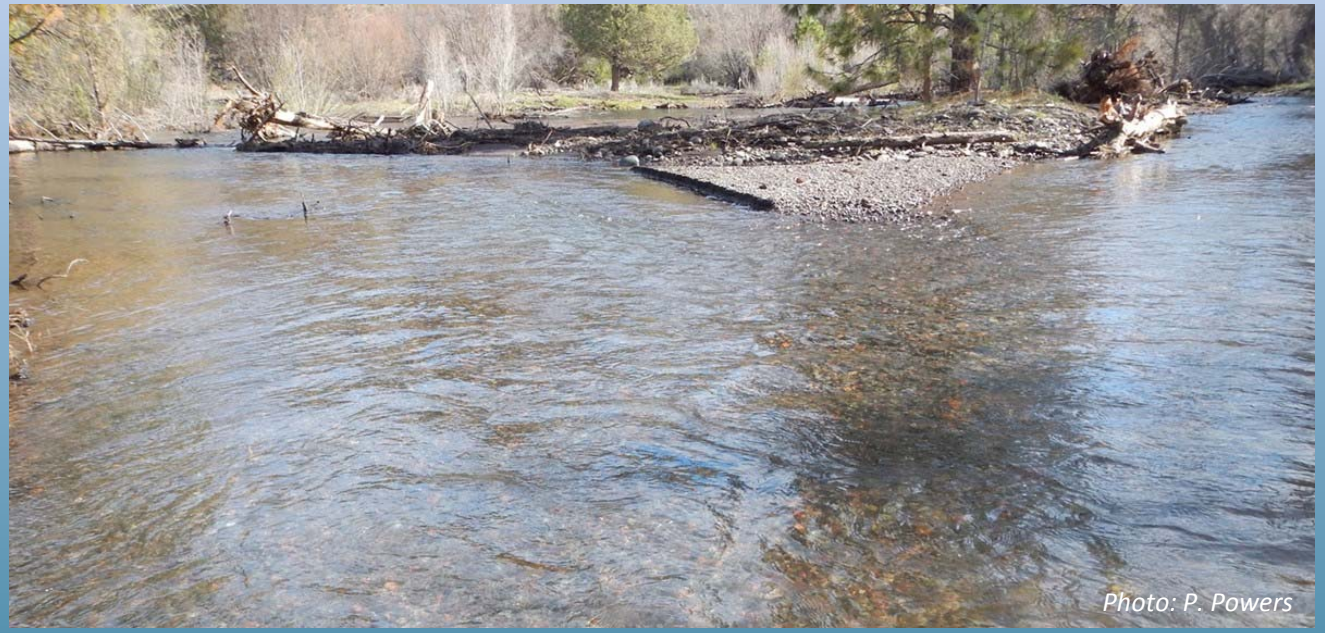
P. Edwards, PSU

Figure 4: Boxplots of primary productivity data and diatom traits. P values were generated with a one-way ANOVA. Asterisks show which sites are significantly different.

Stream Temperature

HYPOTHESIS	OBJECTIVE
Stream temperature rate of warming will remain below 0.3°C / mile	July average rate of warming remains below 0.3°C

PRE-PROJECT 10-YR MAX	1 YEAR AFTER	2 YEARS AFTER
0.3°C	0.2°C	0.1°C



Macroinvertebrates (a.k.a. Fish Food)

HYPOTHESIS
Total number of taxa, number of EPT taxa, and total macroinvertebrate abundance will increase

METRIC	BEFORE	1 YEAR AFTER	2 YEARS AFTER	DIFFERENCE
Richness	30	14	48	x 1.6
# Sensitive (EPT) Taxa	13	5	19	x 1.5

Fish

HYPOTHESES
Juvenile fish density in the project reach will increase

METRIC	UNTREATED	BEFORE	2 YEARS AFTER	DIFFERENCE
O. mykiss per 100m^2	16	11	34.5	+ 2.2 x
O. mykiss per 100m	120	108	455	+ 3.8 x
Channel area (m^2) per km	1019	1352	2397	+ 2.4 x

METRIC	UNTREATED	PROJECT REACH	% DIFFERENCE
Chinook per 100m	3	112	+ 37 x
Chinook per 100m^2	< 1	9	+ 9 x

What are the metrics? (at baseflow)

PHYSICAL

Groundwater

- Depth +

Channel morphology

- Number of channels +
- Channel elevation + / -
- Total channel length +
- Ratio of primary : secondary +
- Total wetted area +

Stream temperature

- July rate of change +

Geomorphic units / habitat

- Total number of units +
- Number of types of units +
- Percent riffle +
- Percent pool +
- Pool number, types, area, dimensions + / -
- Pieces of wood +
- Substrate sizes, proportions + / -

BIOLOGICAL

Riparian and wetland vegetation

- Area + / -
- Species richness and type +

Algae and plankton

- Species richness and abundance +

Macroinvertebrates

- Taxa richness and abundance +

Fish

- Juvenile density +

QUESTIONS?

Thanks To:

Deschutes Land Trust
PGE
CTWSRO
ODFW
USFS
USFWS
University of Nottingham Field Study
Wolf Water Resources
Portland State University
2018 UDWC Interns
Stream Sampling Volunteers

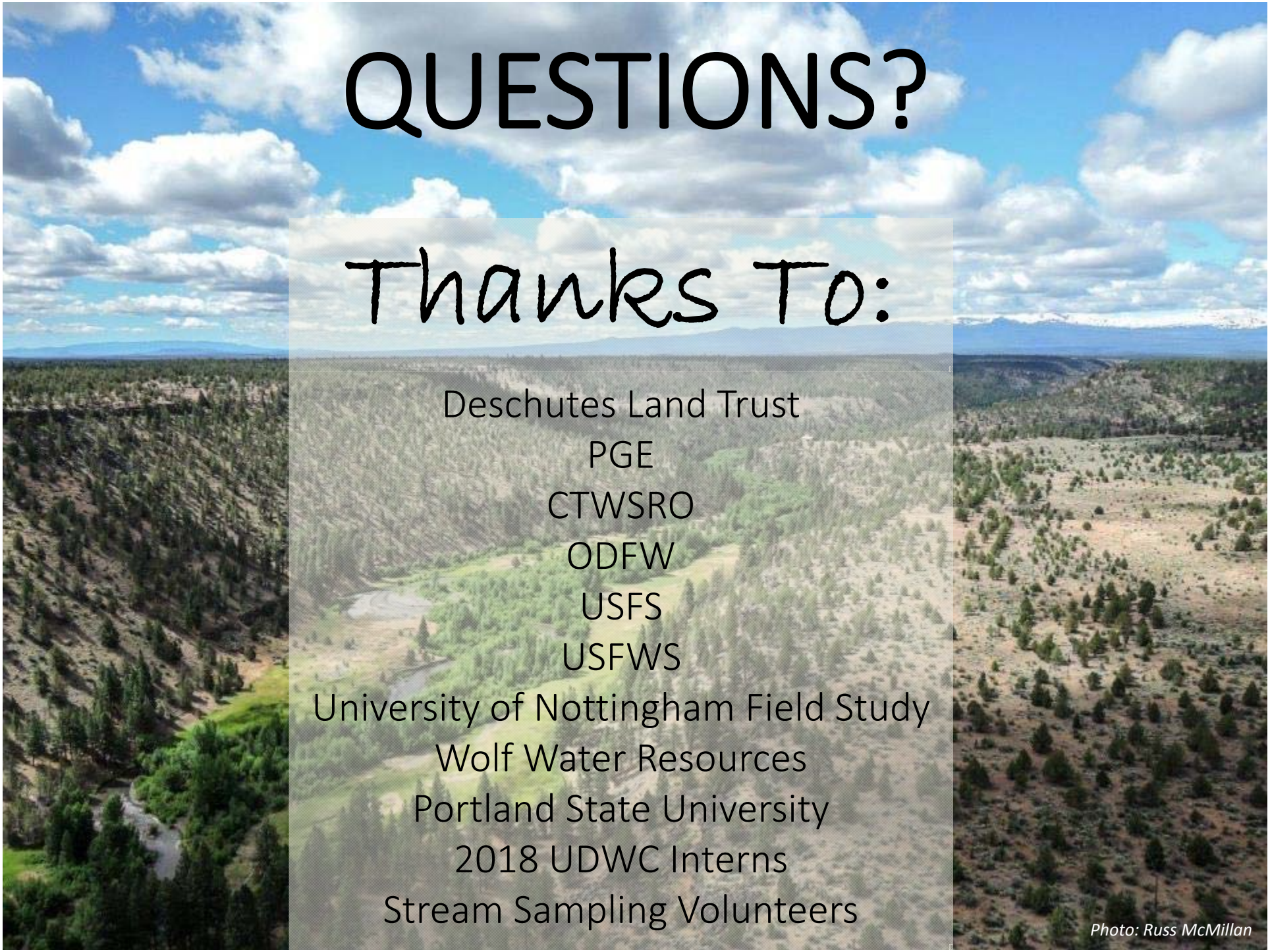


Photo: Russ McMillan