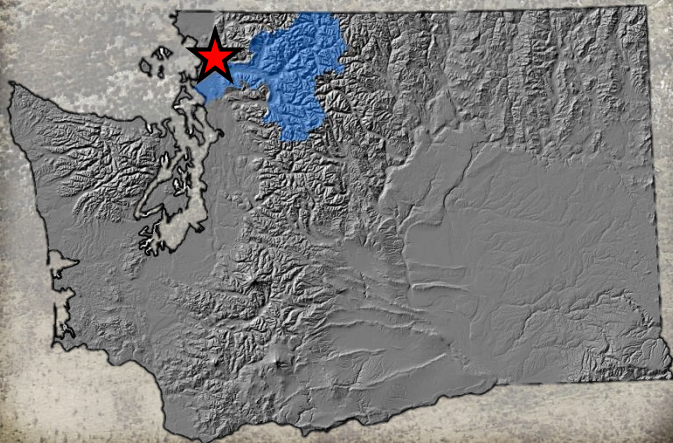
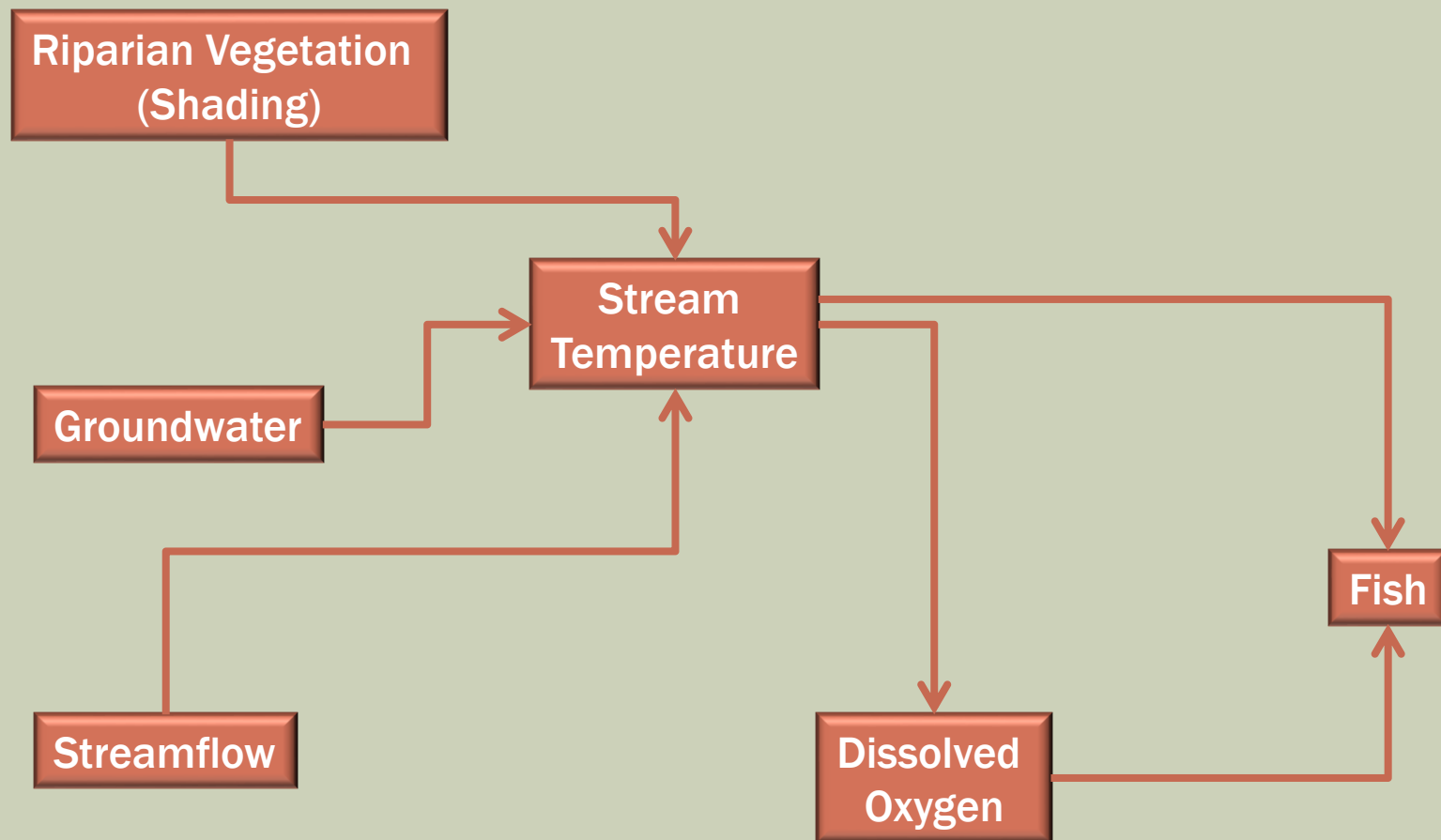


EFFECTS OF BEAVER ON STREAM TEMPERATURE IN A YOUNG RESTORATION SITE

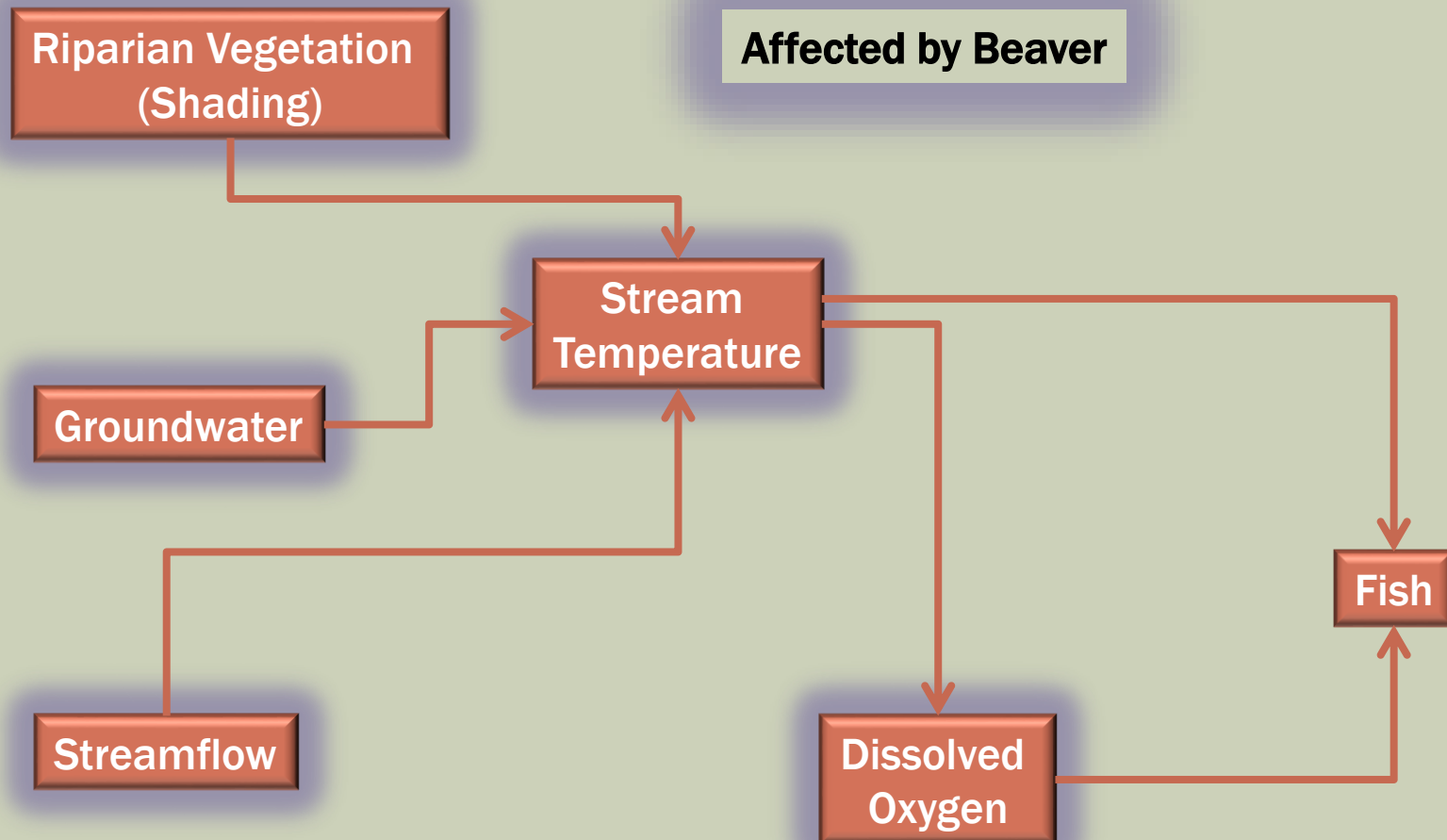


Lisa Hainey
Upper Skagit Indian Tribe
319-106 Tribal WQ Workshop
April 24, 2018

STREAM TEMPERATURE FACTORS

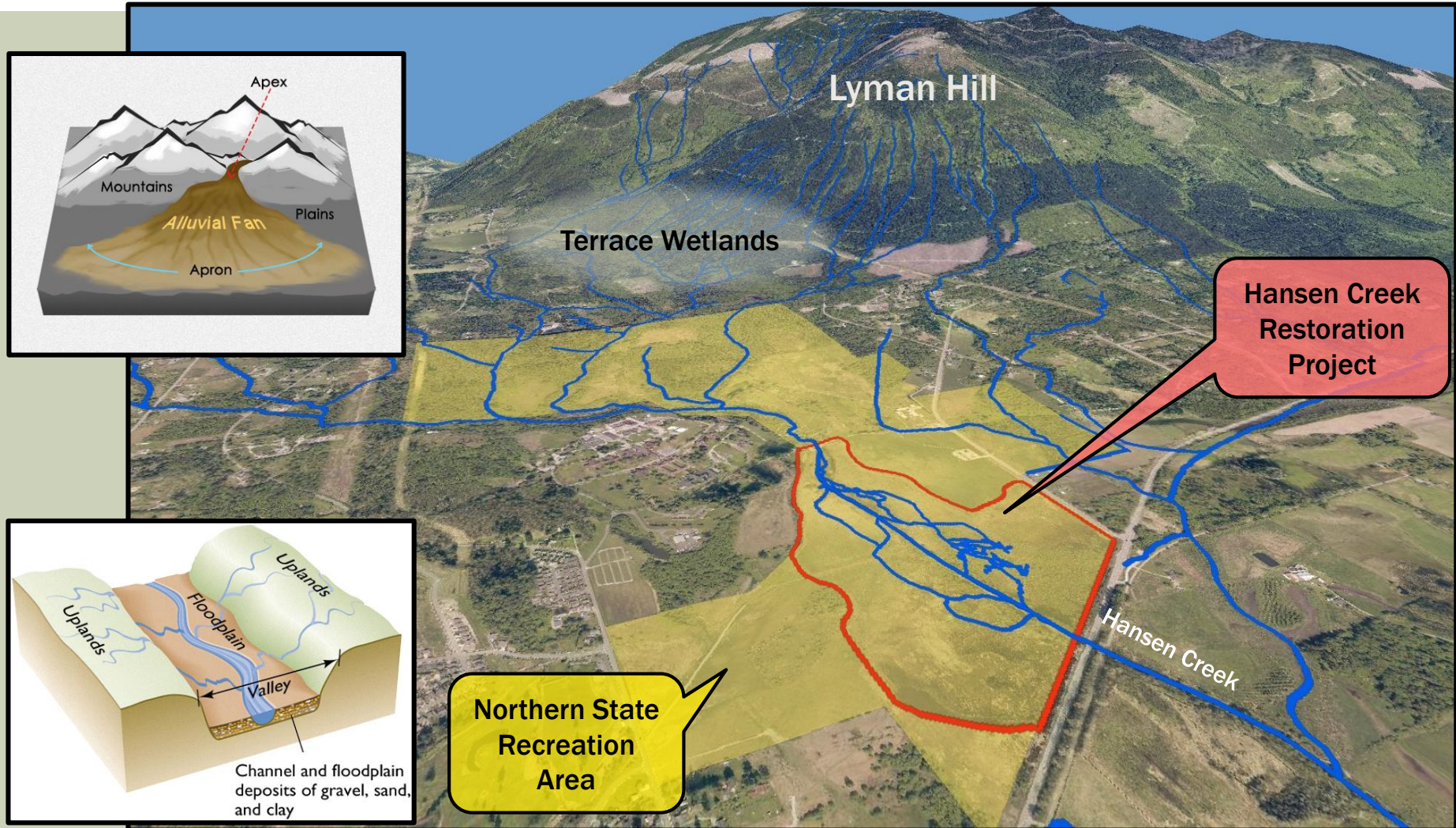


STREAM TEMPERATURE FACTORS

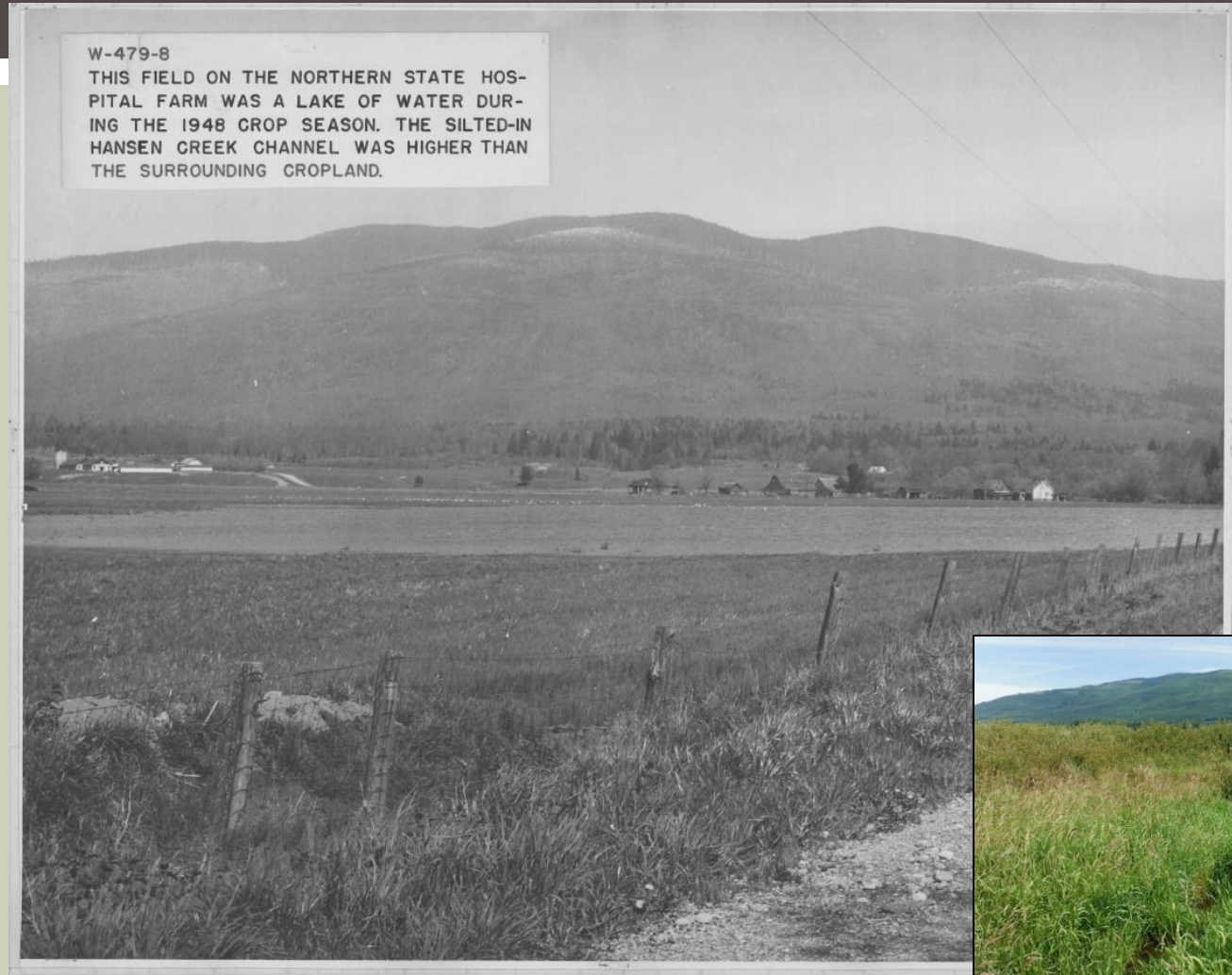


RESTORATION PROJECT BACKGROUND

HANSEN CREEK RESTORATION PROJECT



HUMAN IMPACTS



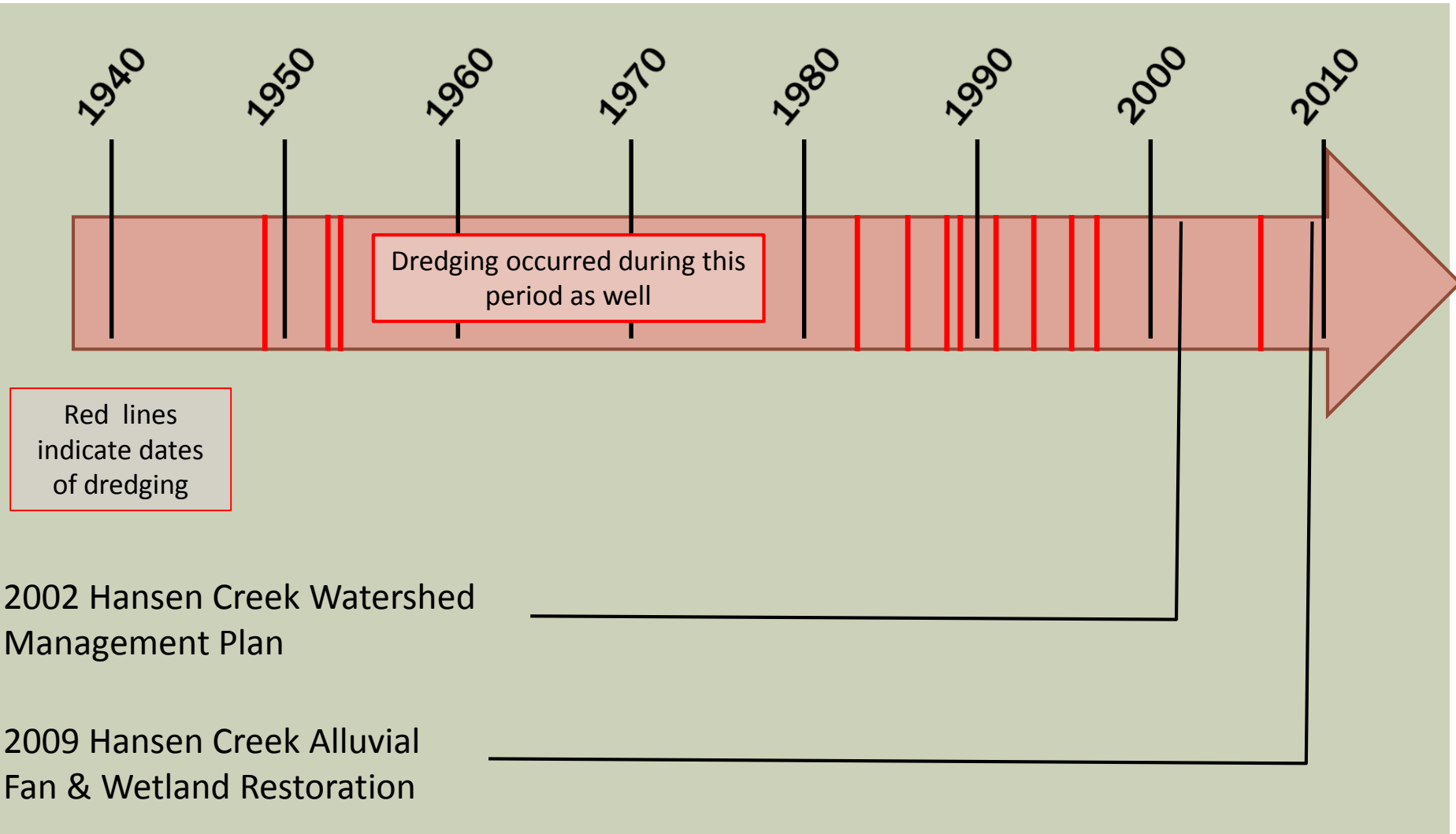
Northern State Hospital agricultural fields
1948 photo of low land flooding on Hansen Creek

HUMAN IMPACTS



1948 – First Recorded Dredging of Hansen Creek

HISTORY OF DREDGING



CONSTRUCTION



PROJECT ACTIVATION



ARRIVAL OF BEAVERS











2014. 2. 10 10:45



05:12PM 05/06/2015

BEAVER DAM CONSTRUCTION



9/16/2013

2013. 9.16 9:50



9/17/2013

2013. 9.17 15:09



9/19/2013

2013. 9.19 11:30



9/25/2013

2013. 9.25 15:22



9/30/2013

2013. 9.30 11:09



11/4/2013






11/20/2013

2013.11.20 15:12





**BEAVER:
EFFECTS ON INUNDATION
& STREAM CHANNELS**

Legend

-  Restoration Project
-  Inundated Area
-  Beaver Dams

Stream Channels

-  Main
-  Side




0 250 500 1,000
Feet

N



Aerial Imagery Copyright Pictometry International Corp. 2013 & 2015
The Upper Skagit Indian Tribe makes no claim as to the completeness, accuracy or content of any data contained herein.
Note: stream channels mapped at ~10 cfs each year

Pre-project (historic)

Legend

-  Restoration Project
-  Inundated Area
-  Beaver Dams

Stream Channels

-  Main
-  Side

0 250 500 1,000
Feet




N

0 acres
5.0 cfs



Aerial Imagery Copyright Pictometry International Corp. 2013 & 2015
The Upper Skagit Indian Tribe makes no claim as to the completeness, accuracy or content of any data contained herein.
Note: stream channels mapped at ~10 cfs each year

August 2012

Legend

-  Restoration Project
-  Inundated Area
-  Beaver Dams

Stream Channels

-  Main
-  Side

0 250 500 1,000
Feet




N

1.9 acres
4.6 cfs



Aerial Imagery Copyright Pictometry International Corp. 2013 & 2015
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Note: stream channels mapped at ~10 cfs each year

October 2013

Legend

-  Restoration Project
-  Inundated Area
-  Beaver Dams

Stream Channels

-  Main
-  Side

0 250 500 1,000
Feet


N


12.0 acres
1.8 cfs


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Note: stream channels mapped at ~10 cfs each year

July 2015

Legend

 Restoration Project

 Inundated Area

 Beaver Dams

Stream Channels

 Main

 Side

0 250 500 1,000
 Feet

N

19.4 acres
2.6 cfs

Aerial Imagery Copyright Pictometry International
Corp. 2013 & 2015

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to the completeness, accuracy or content of any data
contained herein.

Note: stream channels mapped at ~10 cfs each year

July 2017

BEAVER: EFFECTS ON VEGETATION



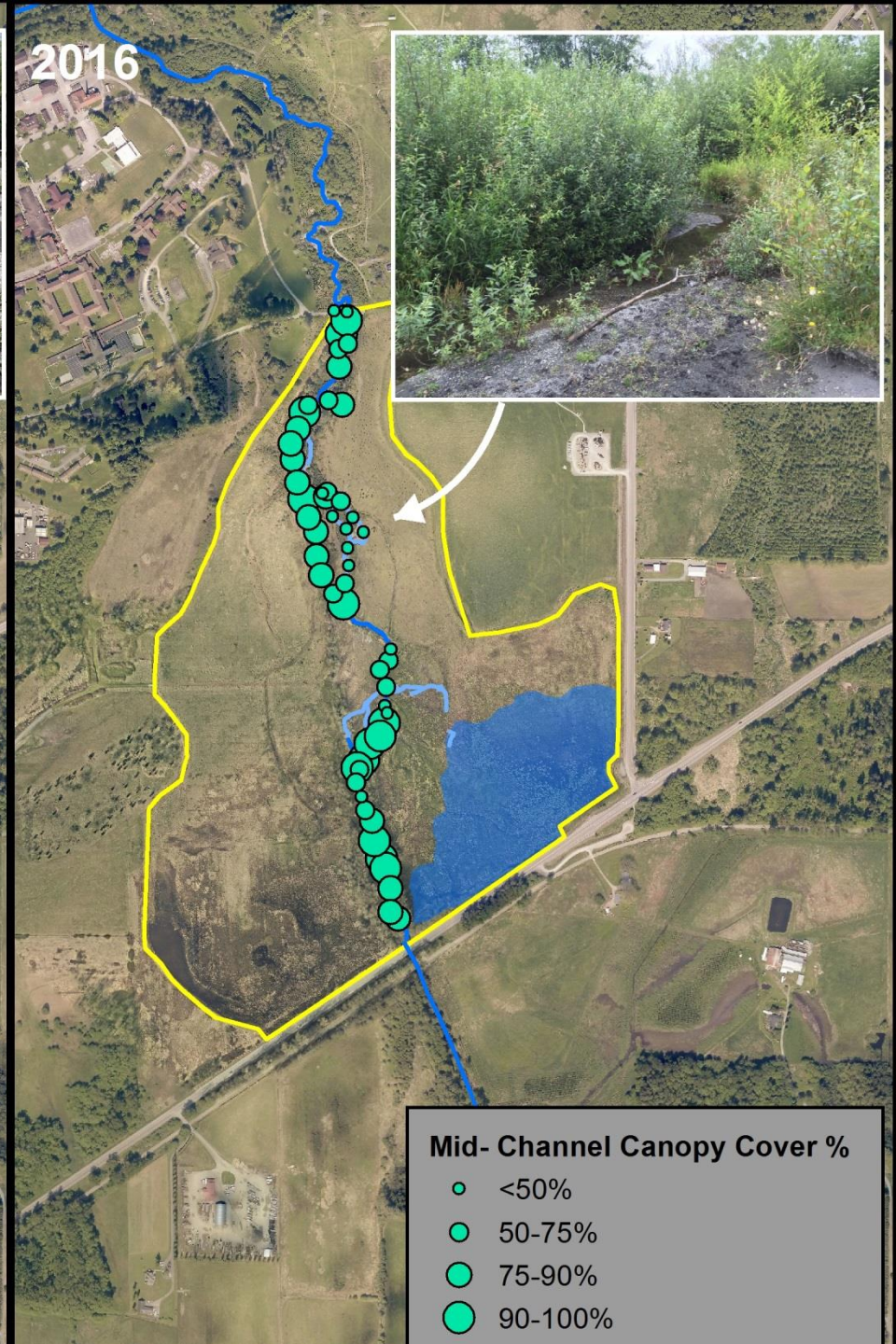
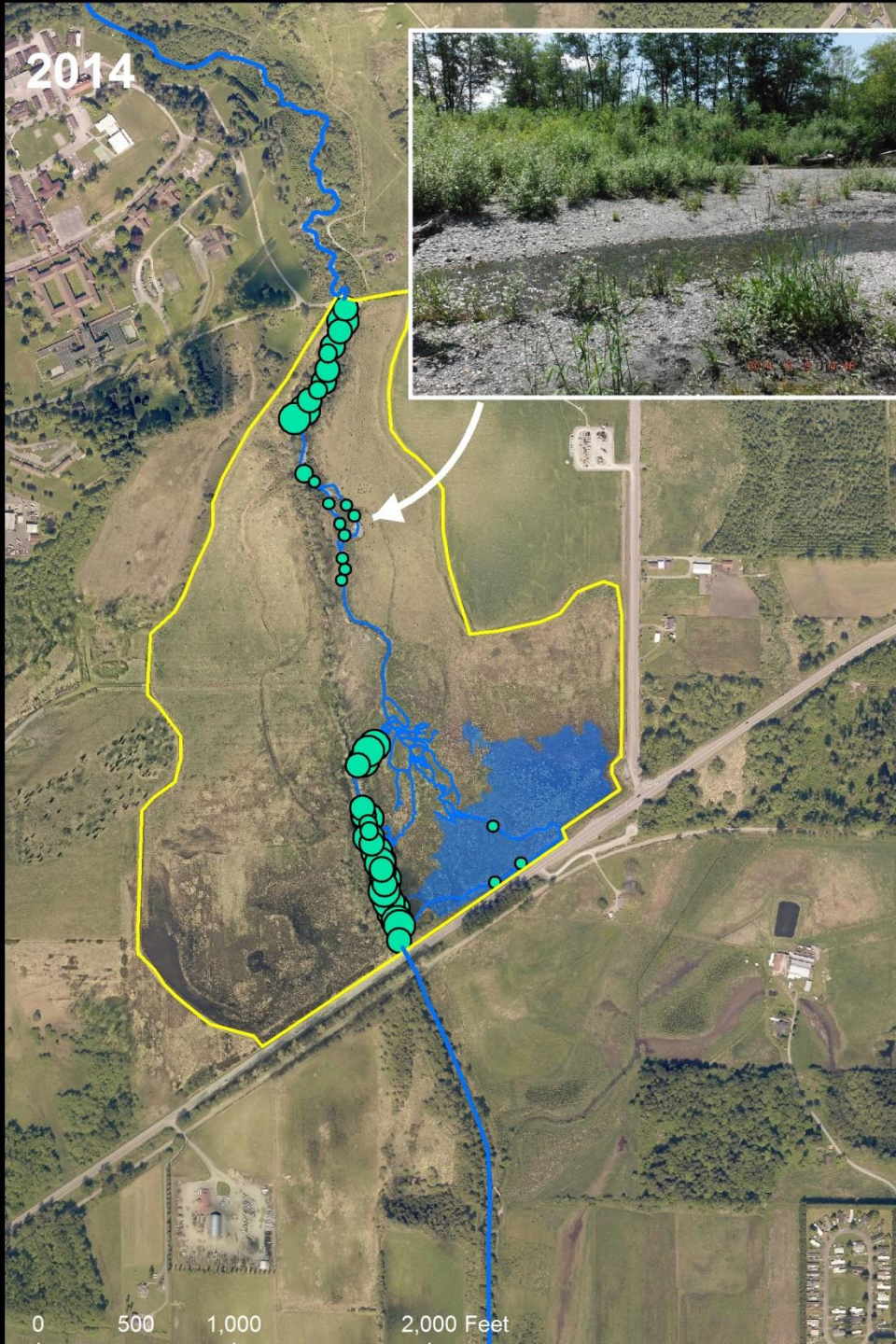


07.28.2011 10:29

July 2011



July 2016





2013. 9. 26 15:19



January 2014

2014. 1.20 16:58



January 2014

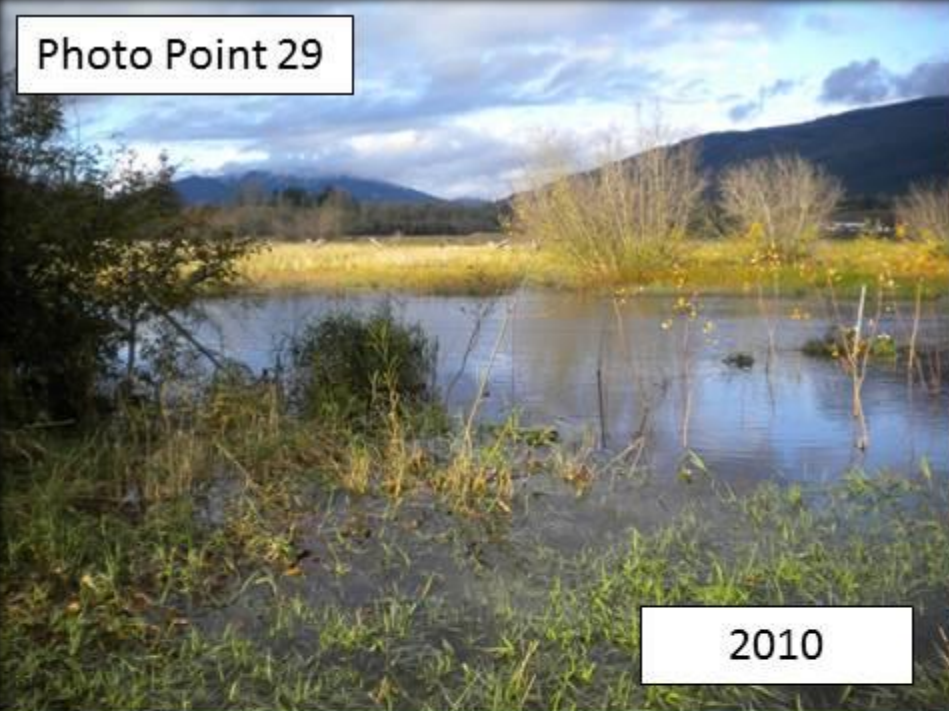
2014. 1.20 16:58



January 2015

2015. 1.20 14:04

Photo Point 29



2010




2014



2015



2017



June 2013

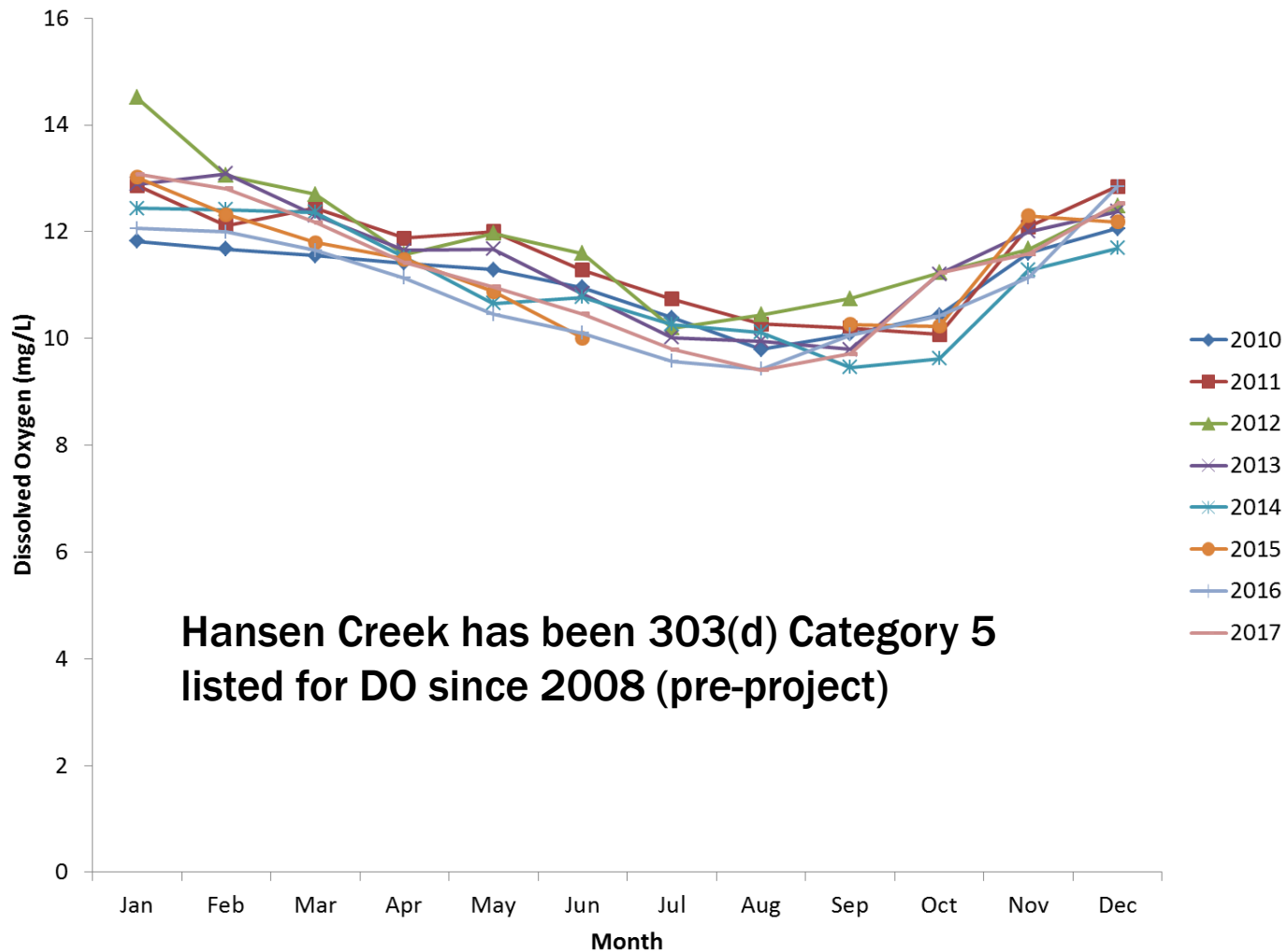
2013. 6. 4. 13:30



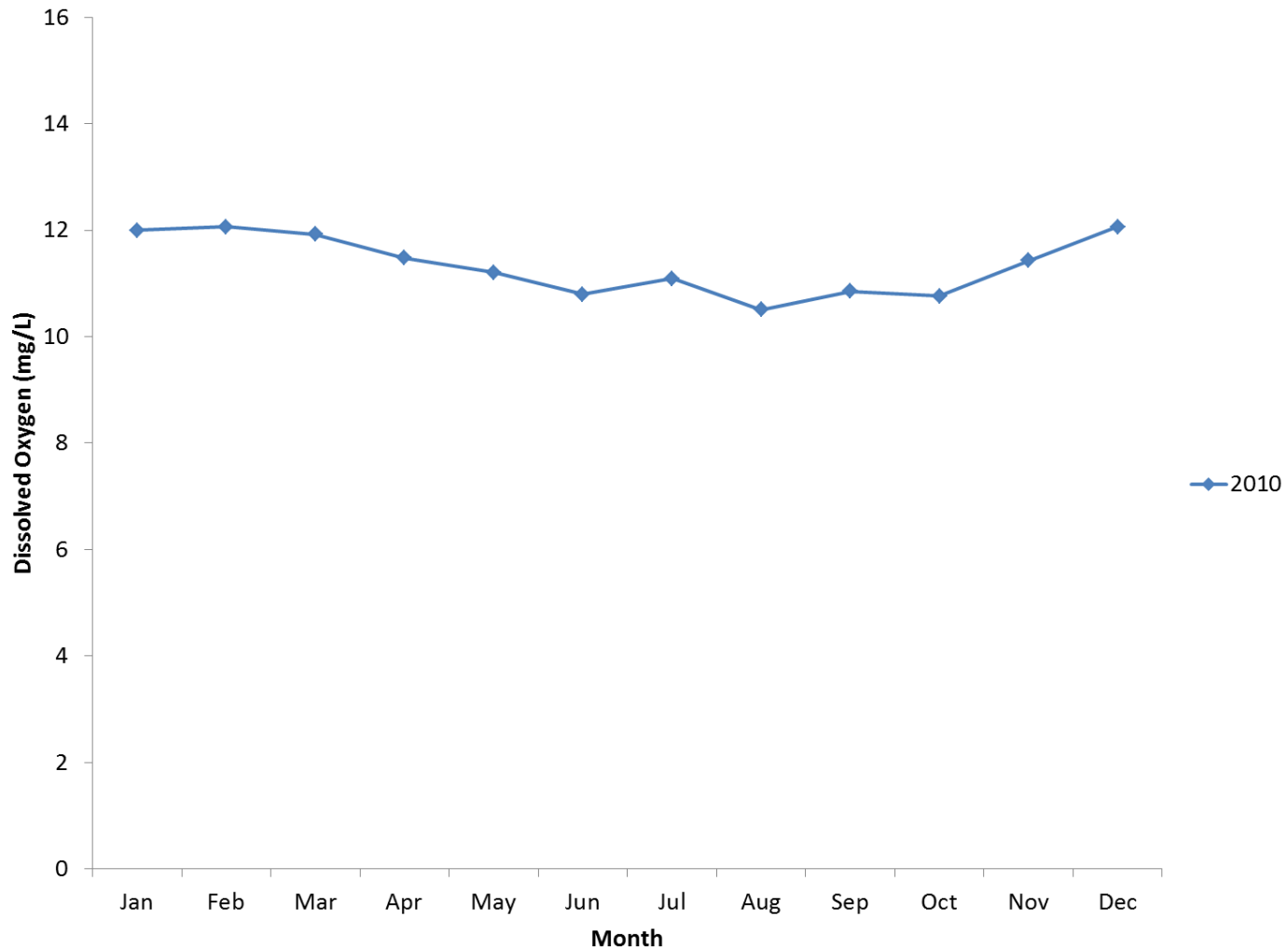
August 2017

BEAVER: EFFECTS ON DISSOLVED OXYGEN

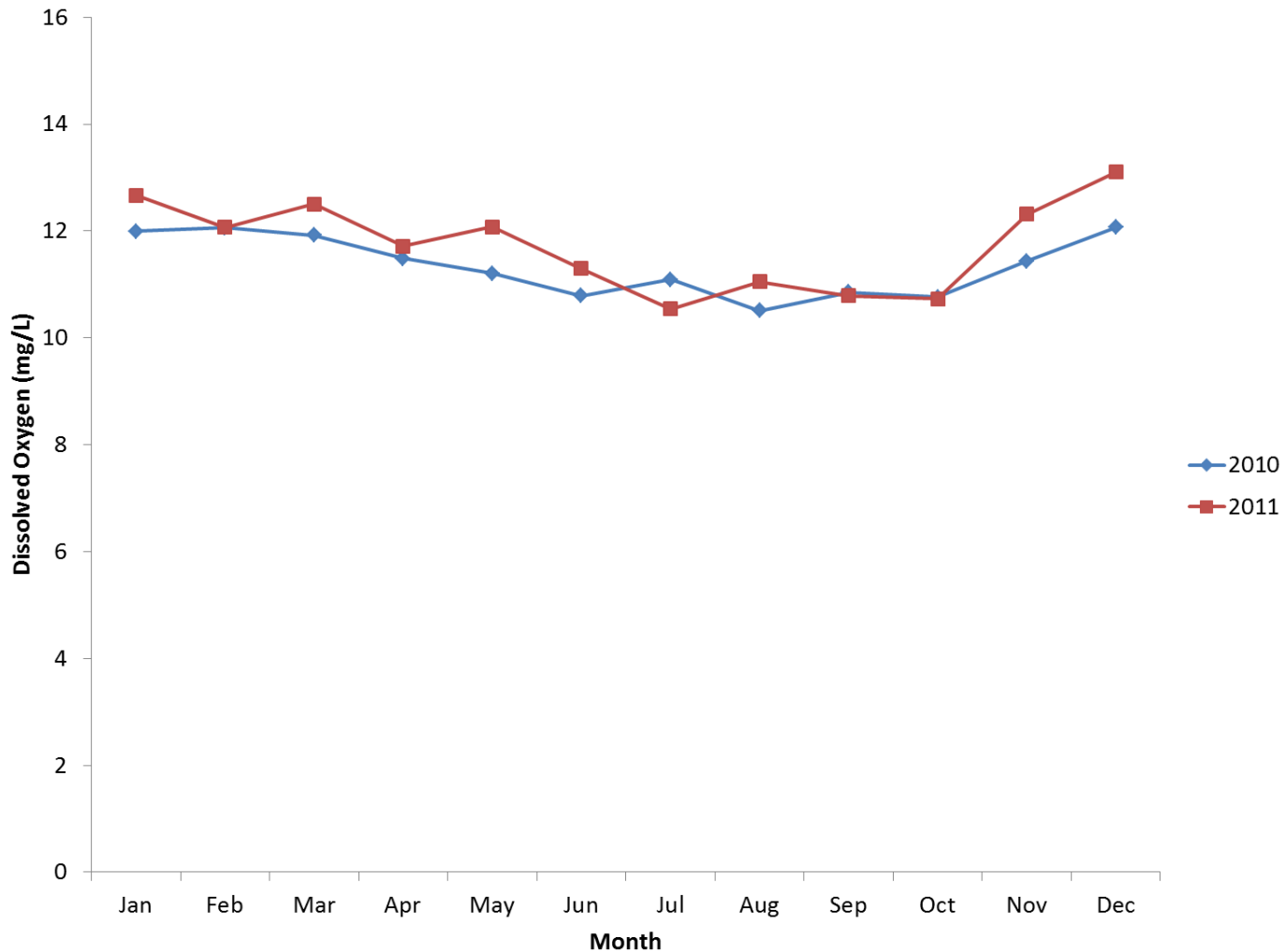
DISSOLVED OXYGEN: US



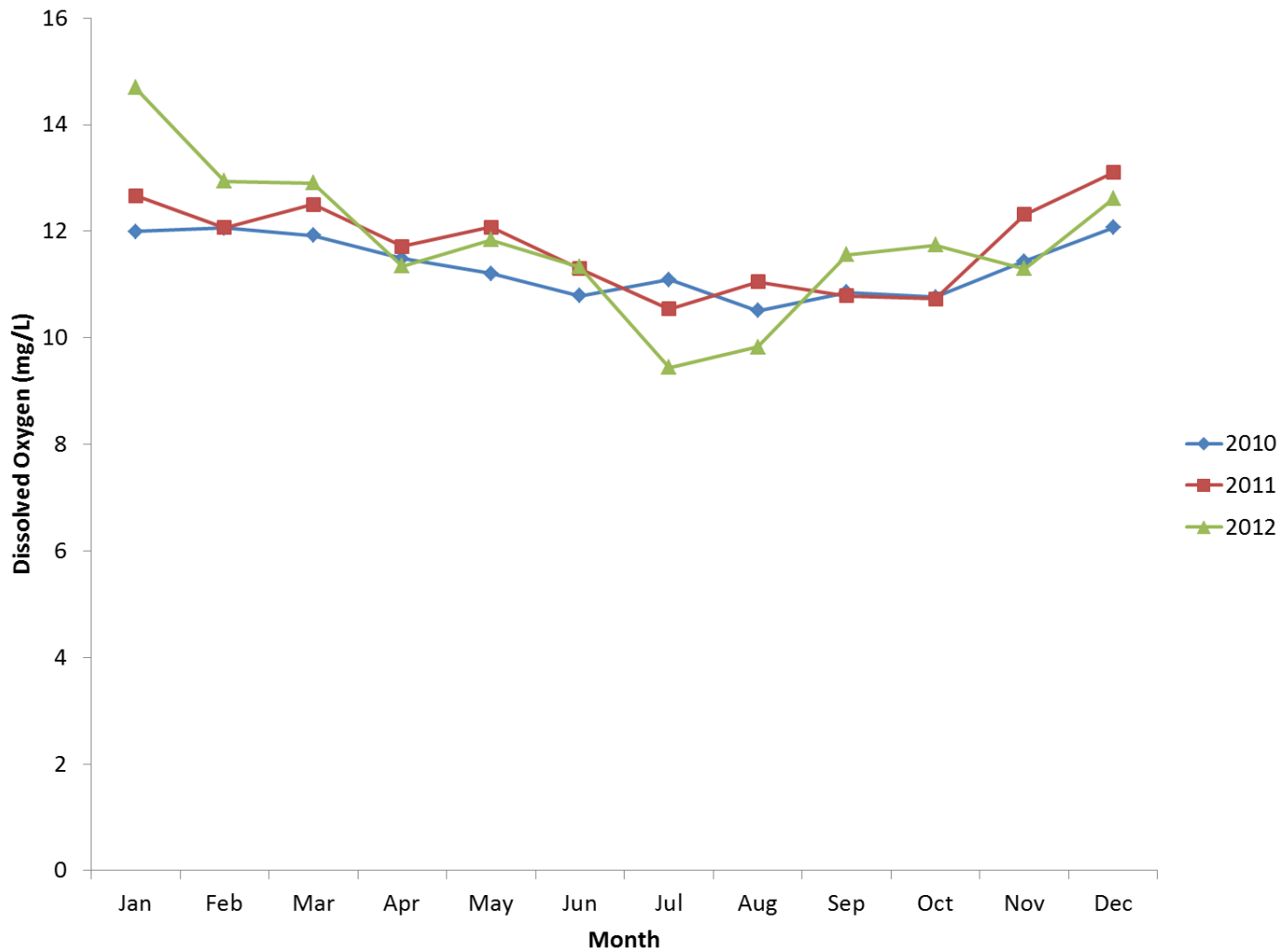
DISSOLVED OXYGEN: DS



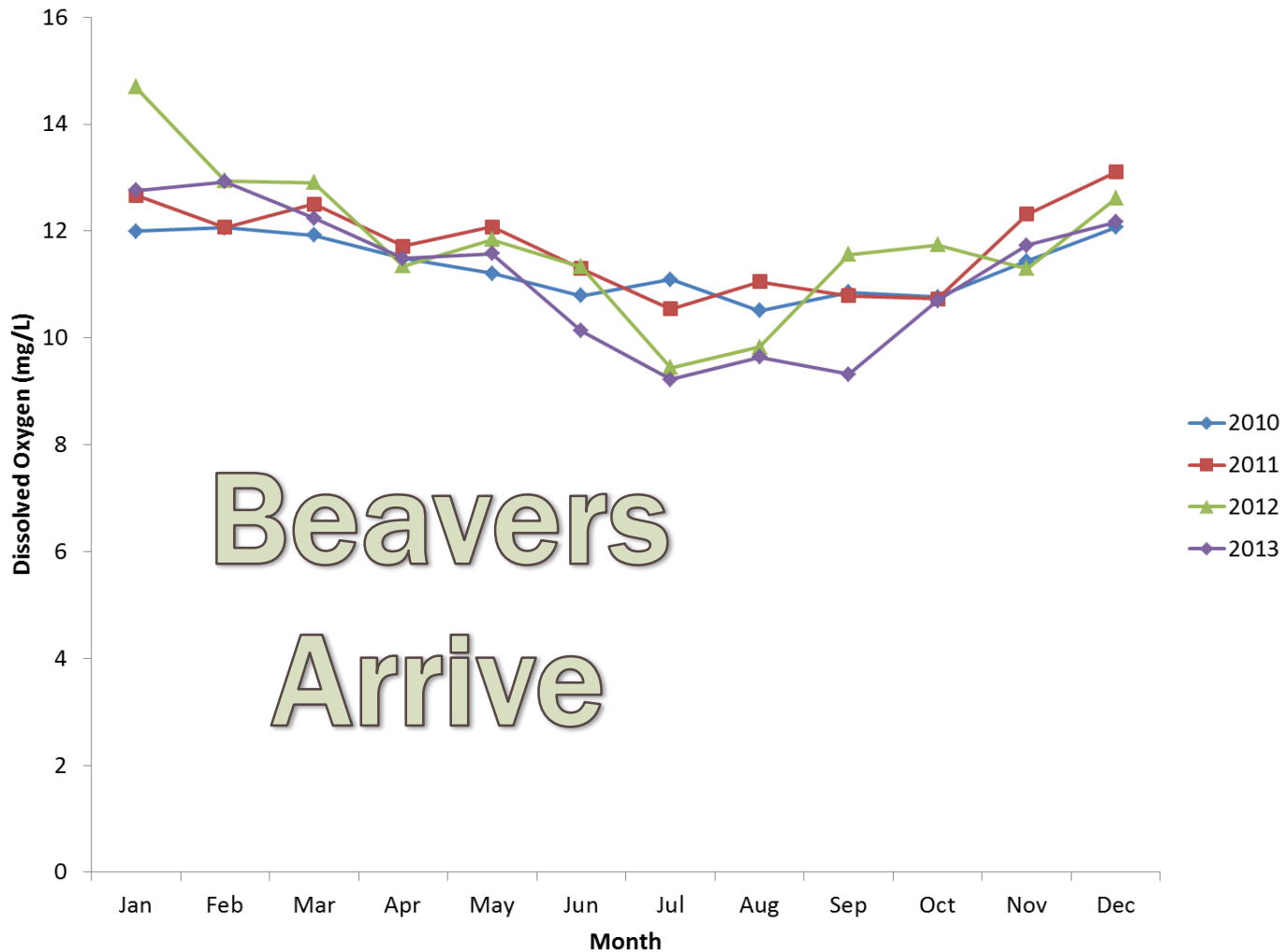
DISSOLVED OXYGEN: DS



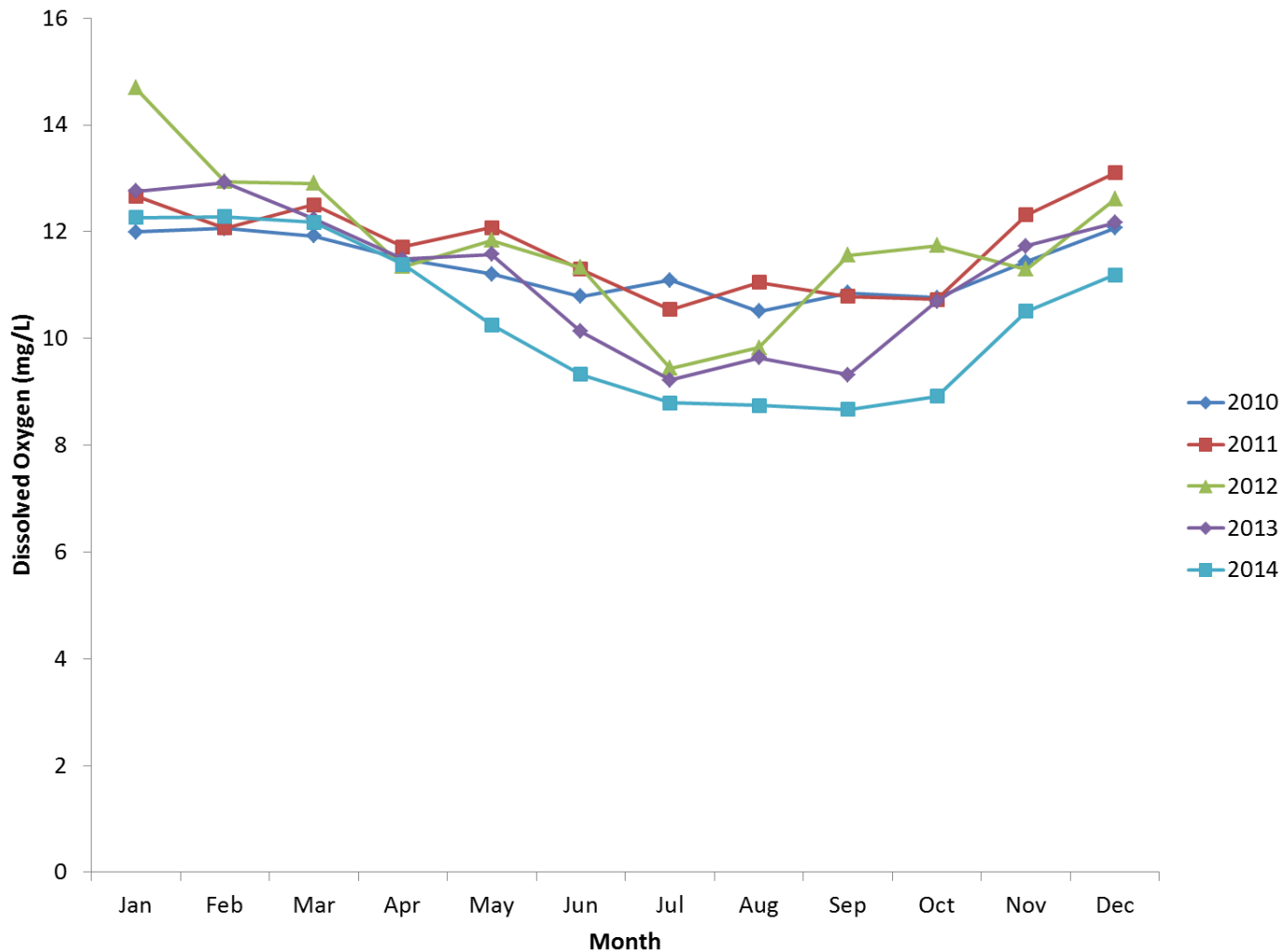
DISSOLVED OXYGEN: DS



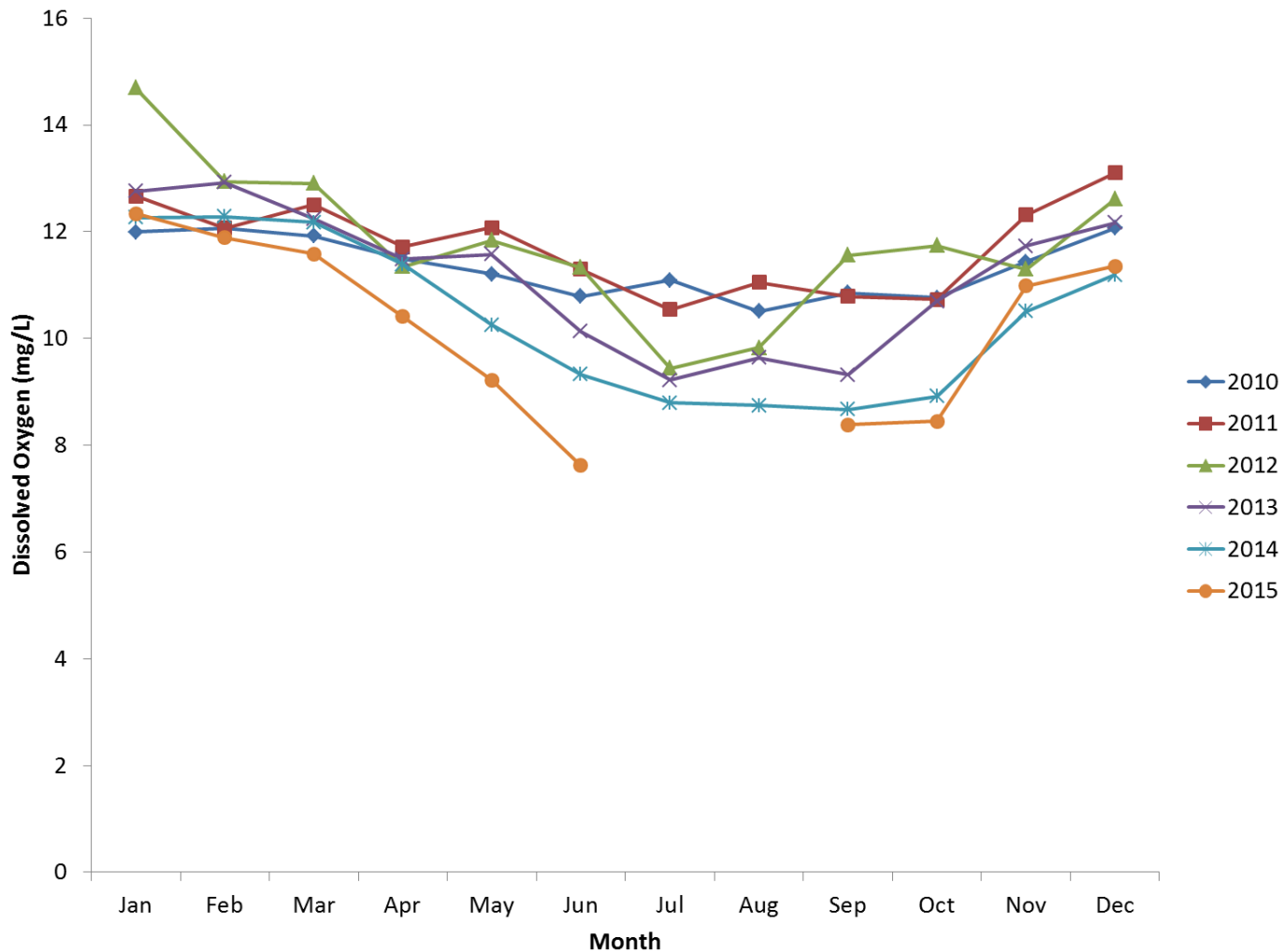
DISSOLVED OXYGEN: DS



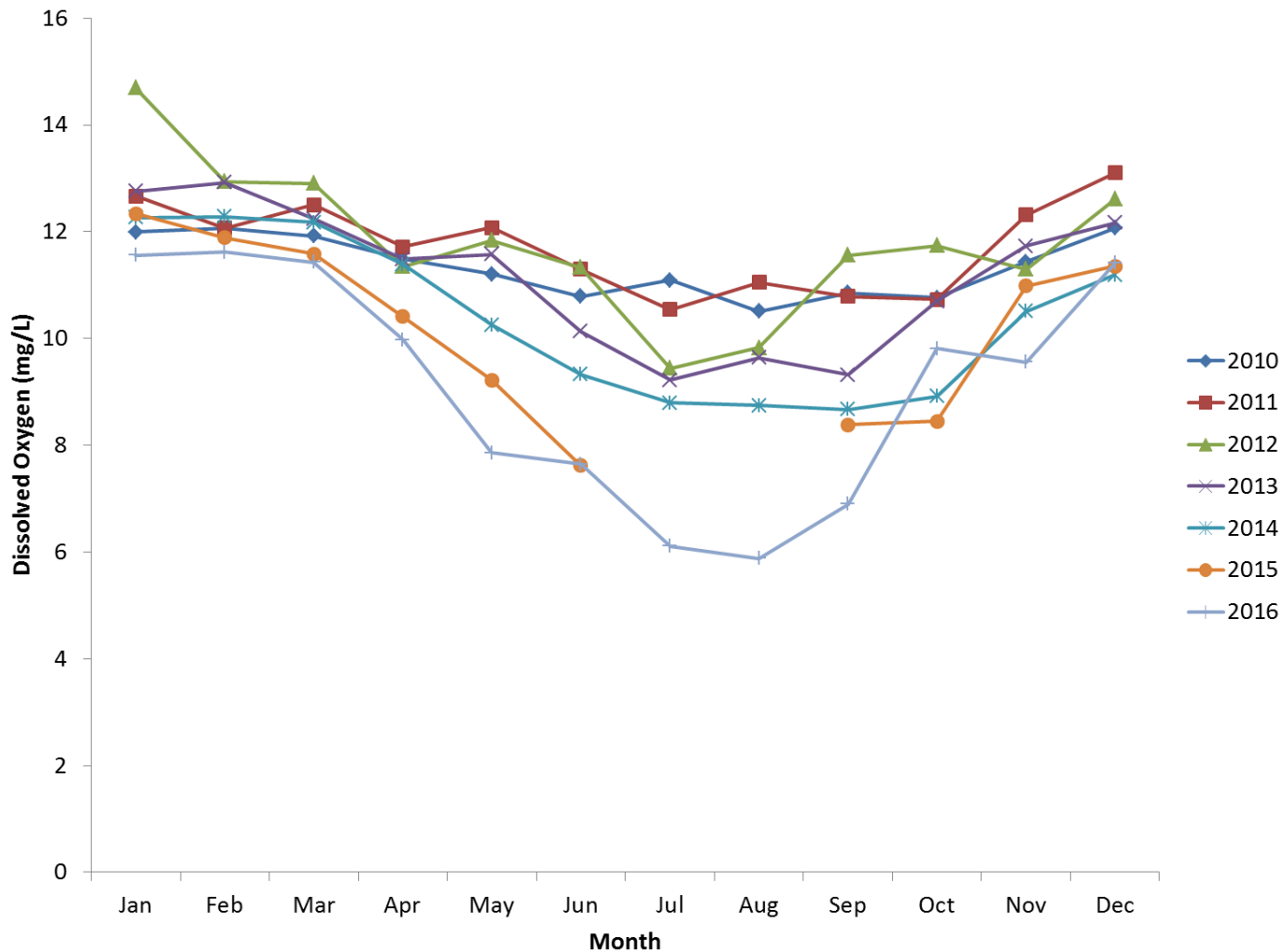
DISSOLVED OXYGEN: DS



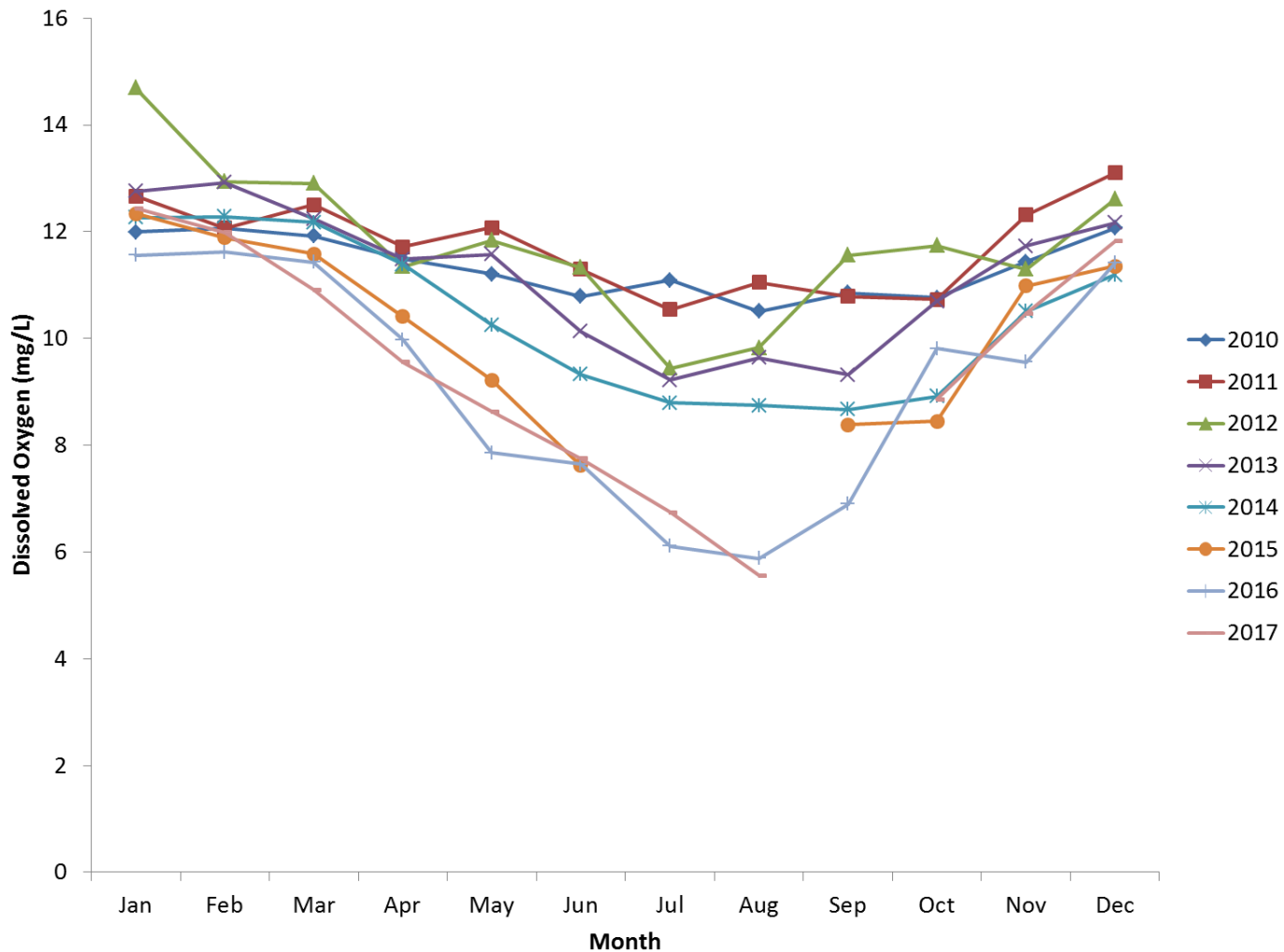
DISSOLVED OXYGEN: DS



DISSOLVED OXYGEN: DS






DISSOLVED OXYGEN: DS





BEAVER: EFFECTS ON GROUNDWATER & STREAMFLOW

Legend

-  GW Monitoring Well
-  Beaver Inundation (July 2017)
-  Restoration Project Outline

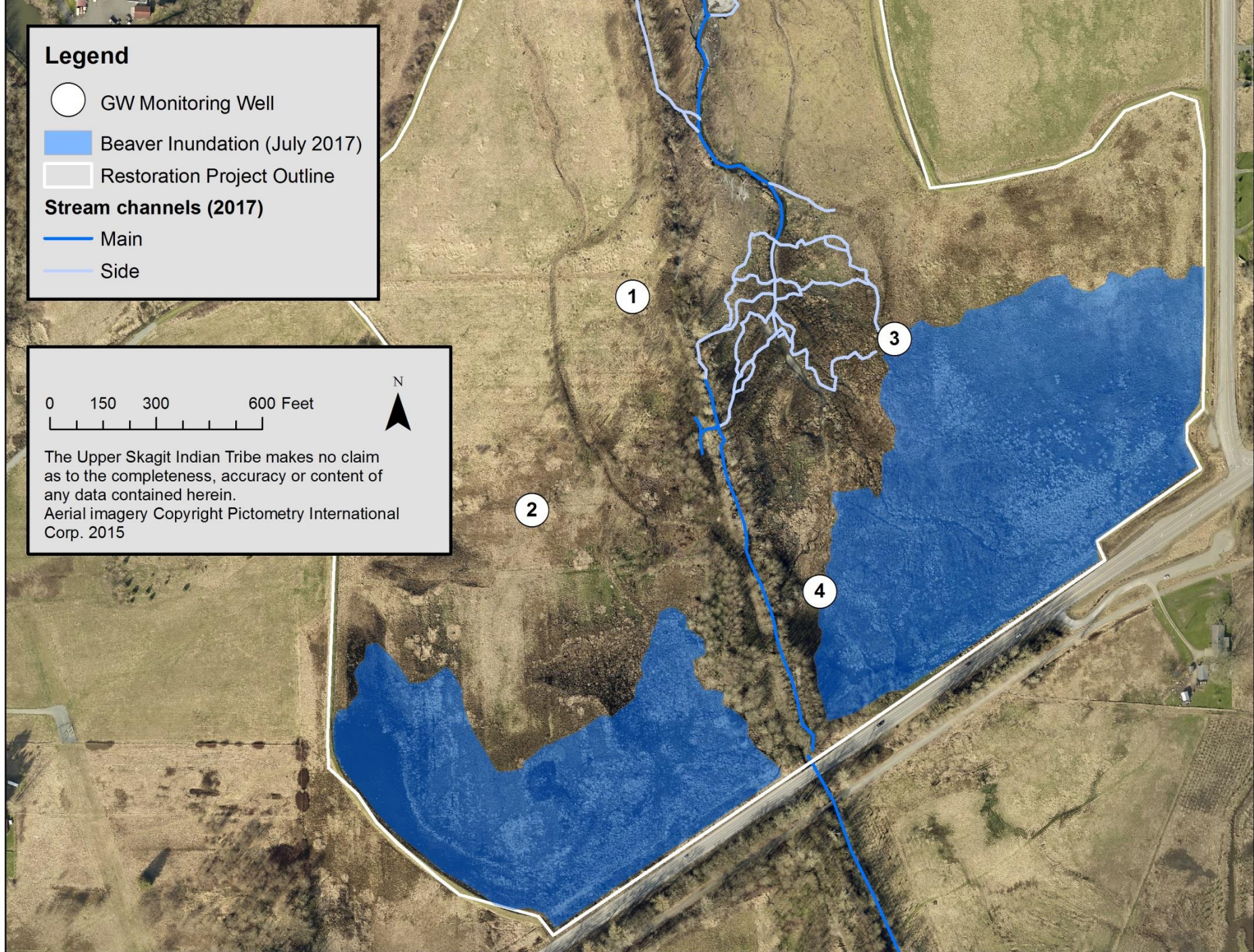
Stream channels (2017)

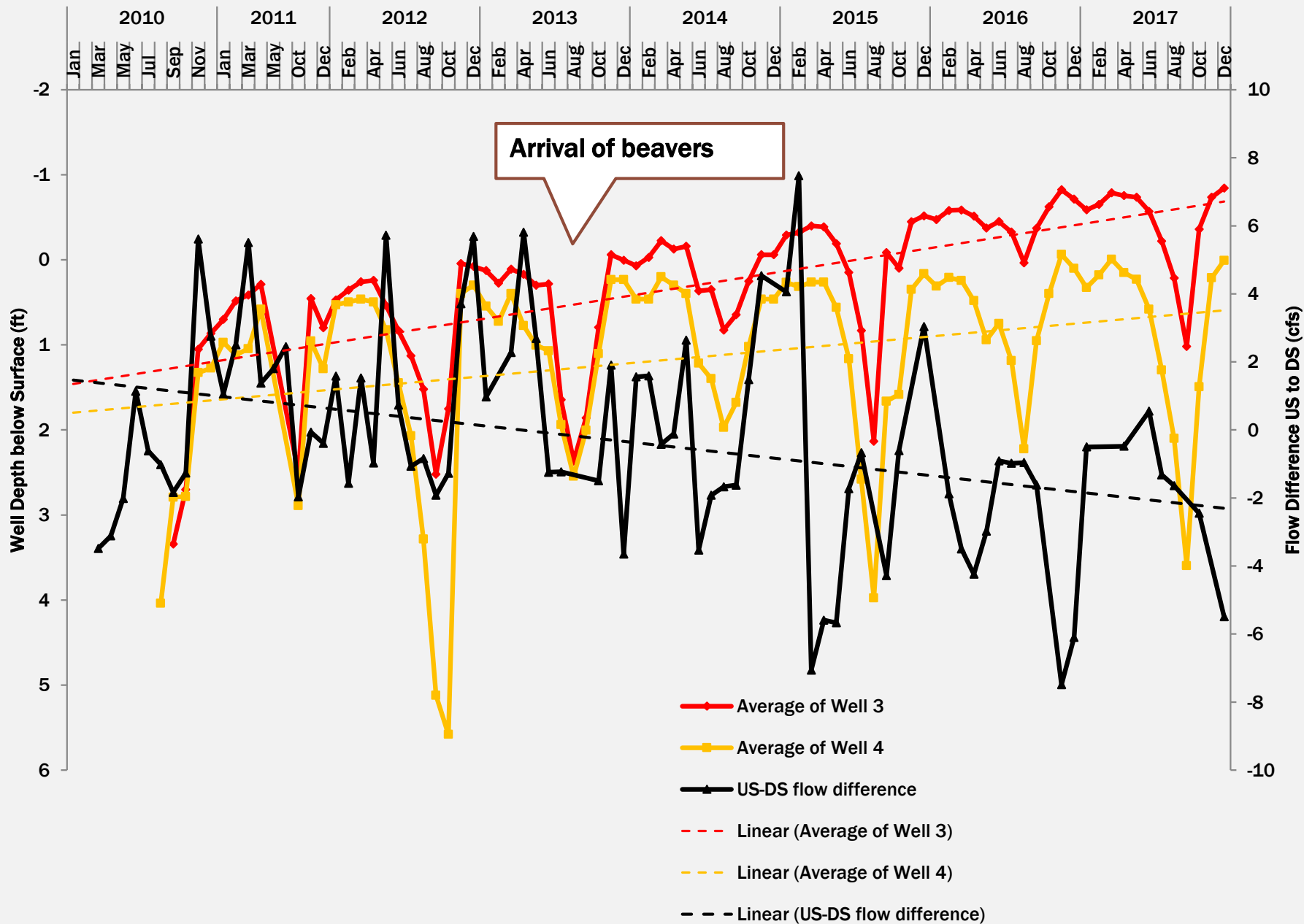
-  Main
-  Side

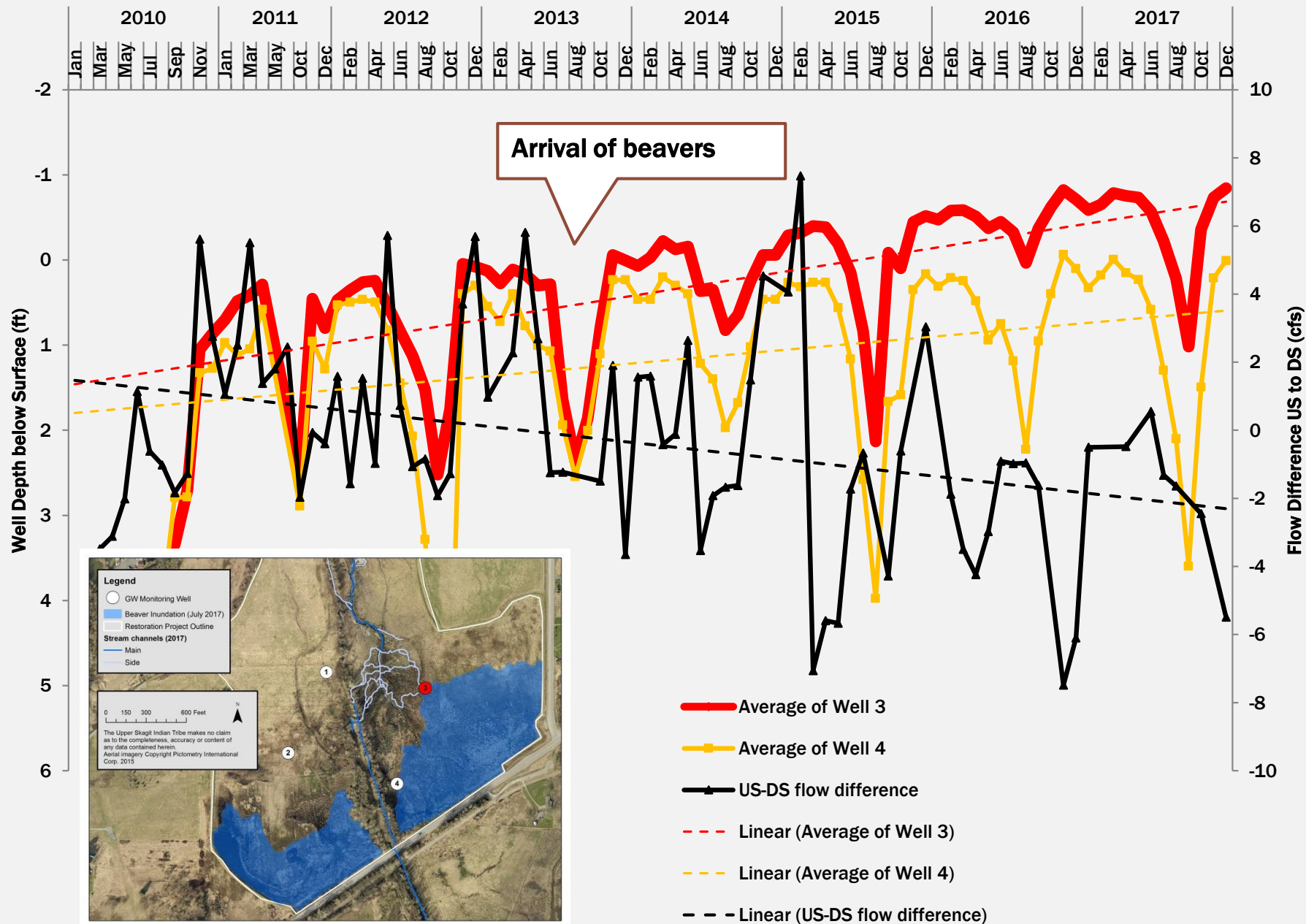
0 150 300 600 Feet

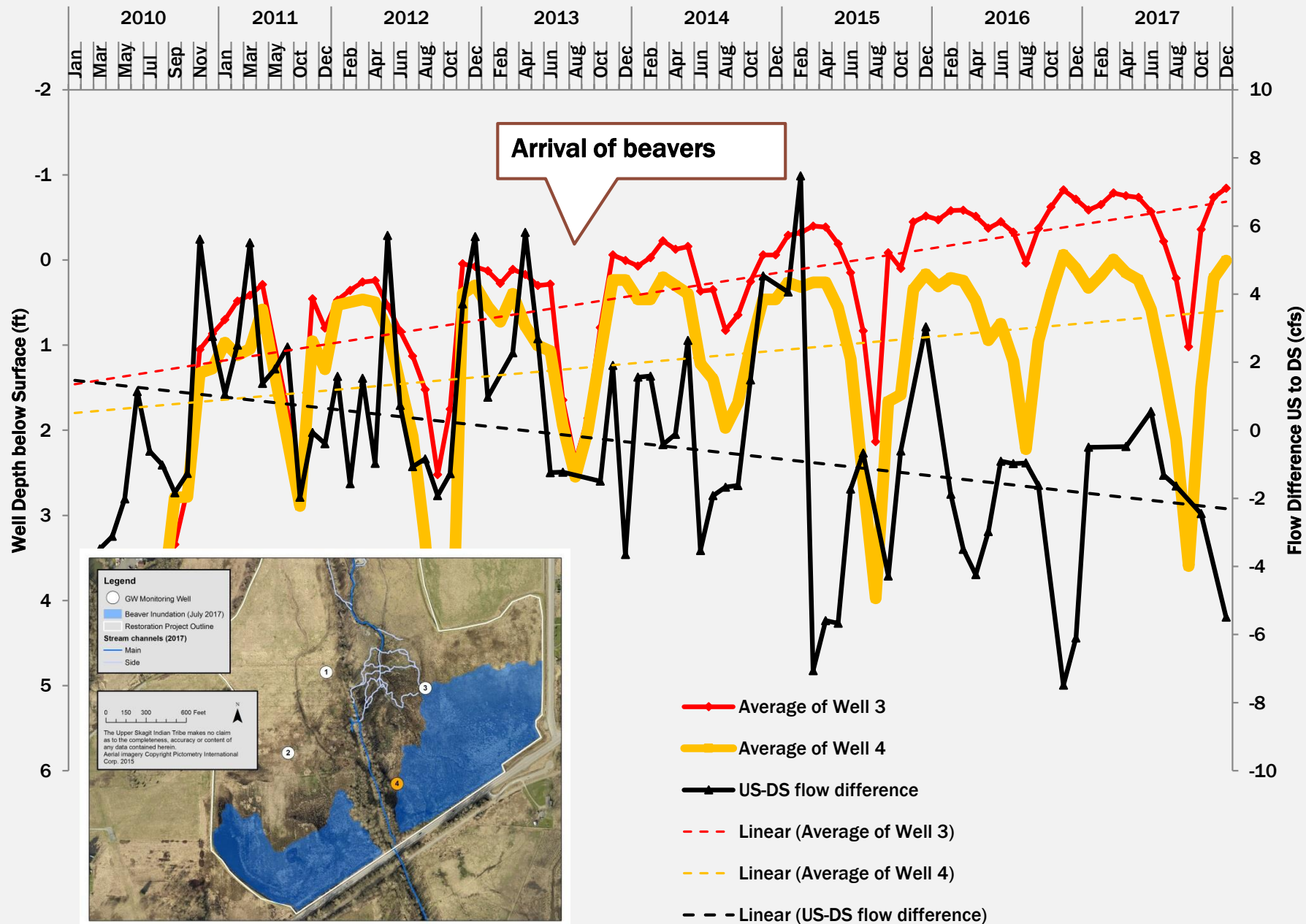


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Aerial imagery Copyright Pictometry International
Corp. 2015

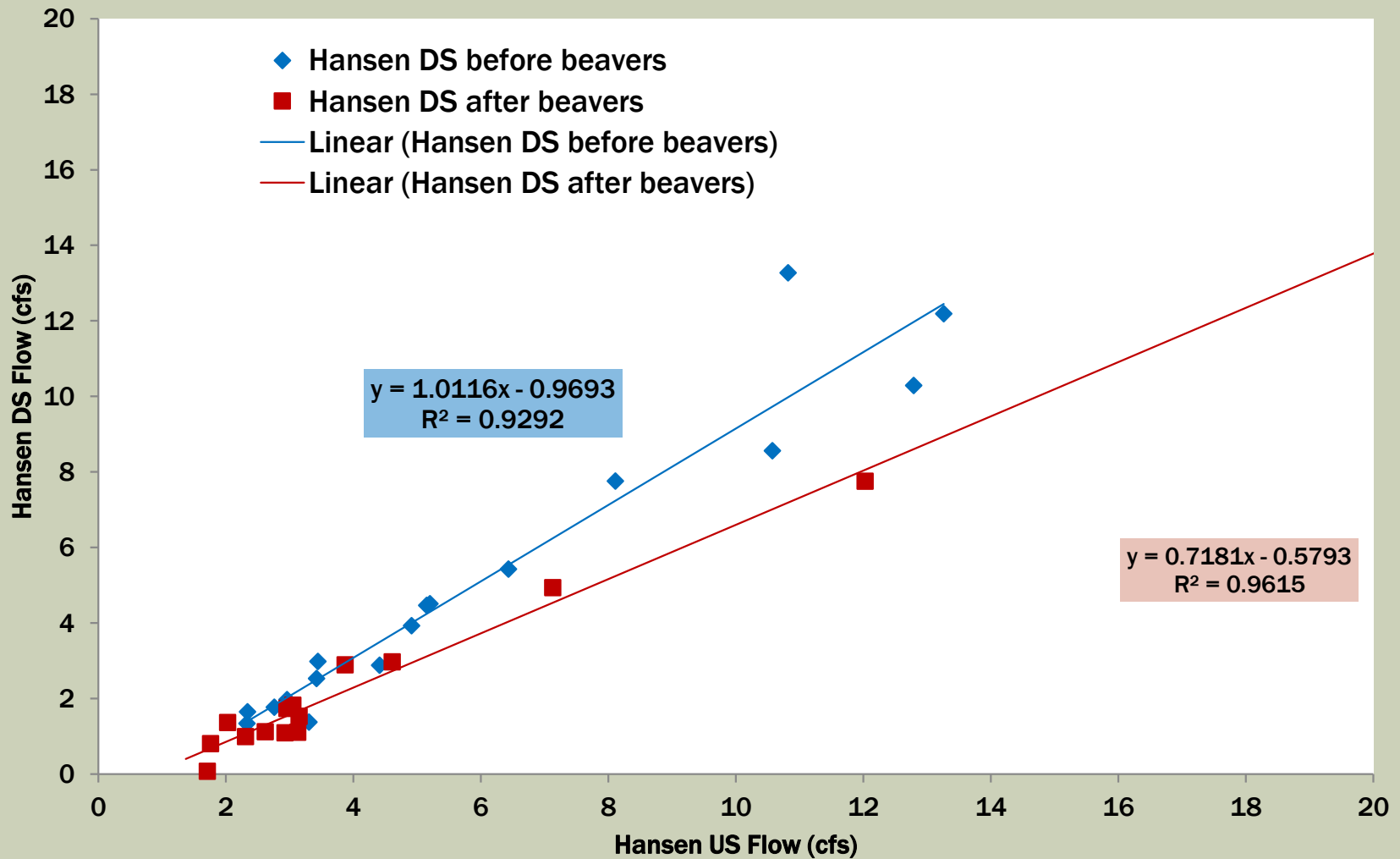






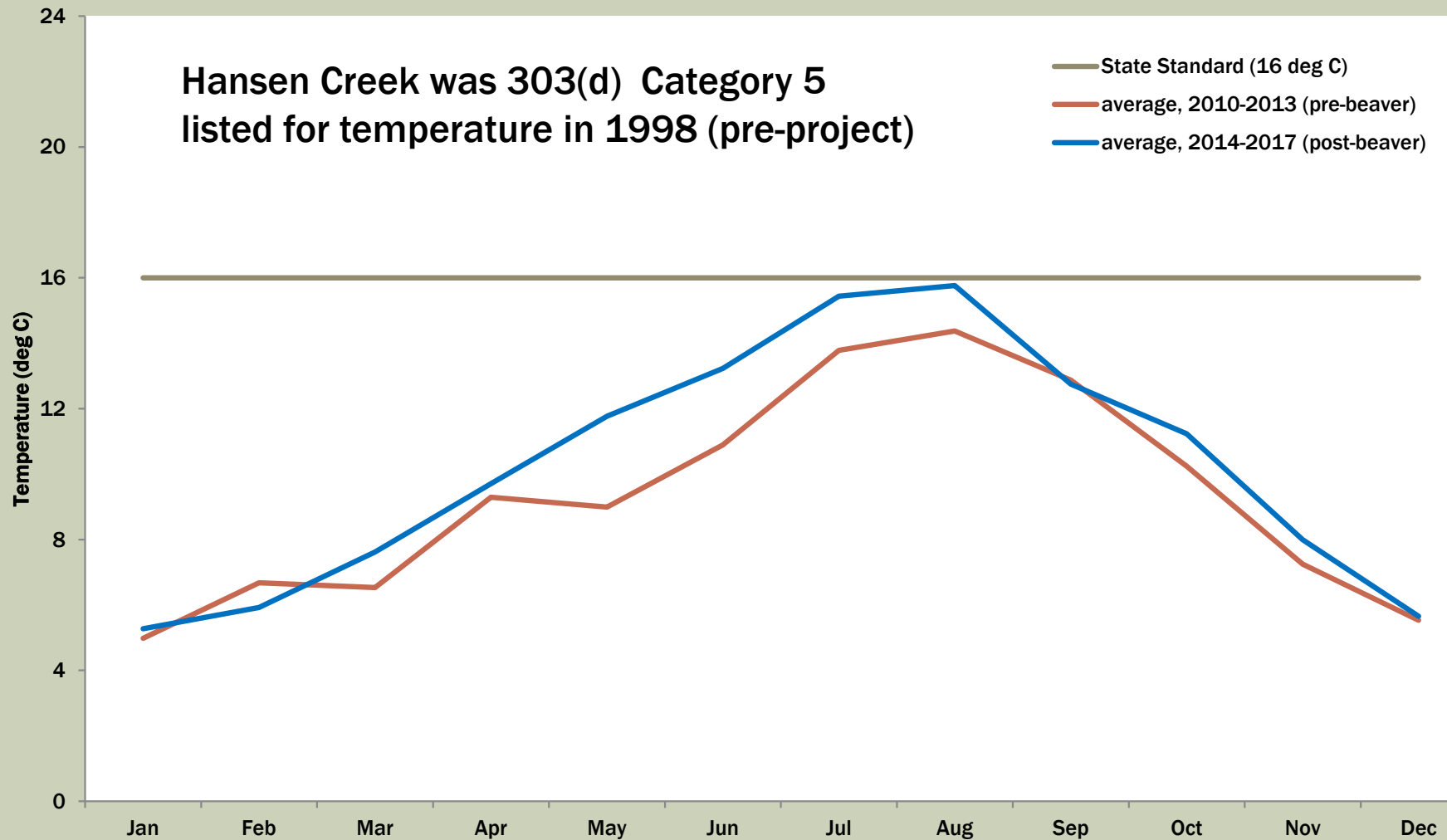


US VS. DS STREAMFLOW

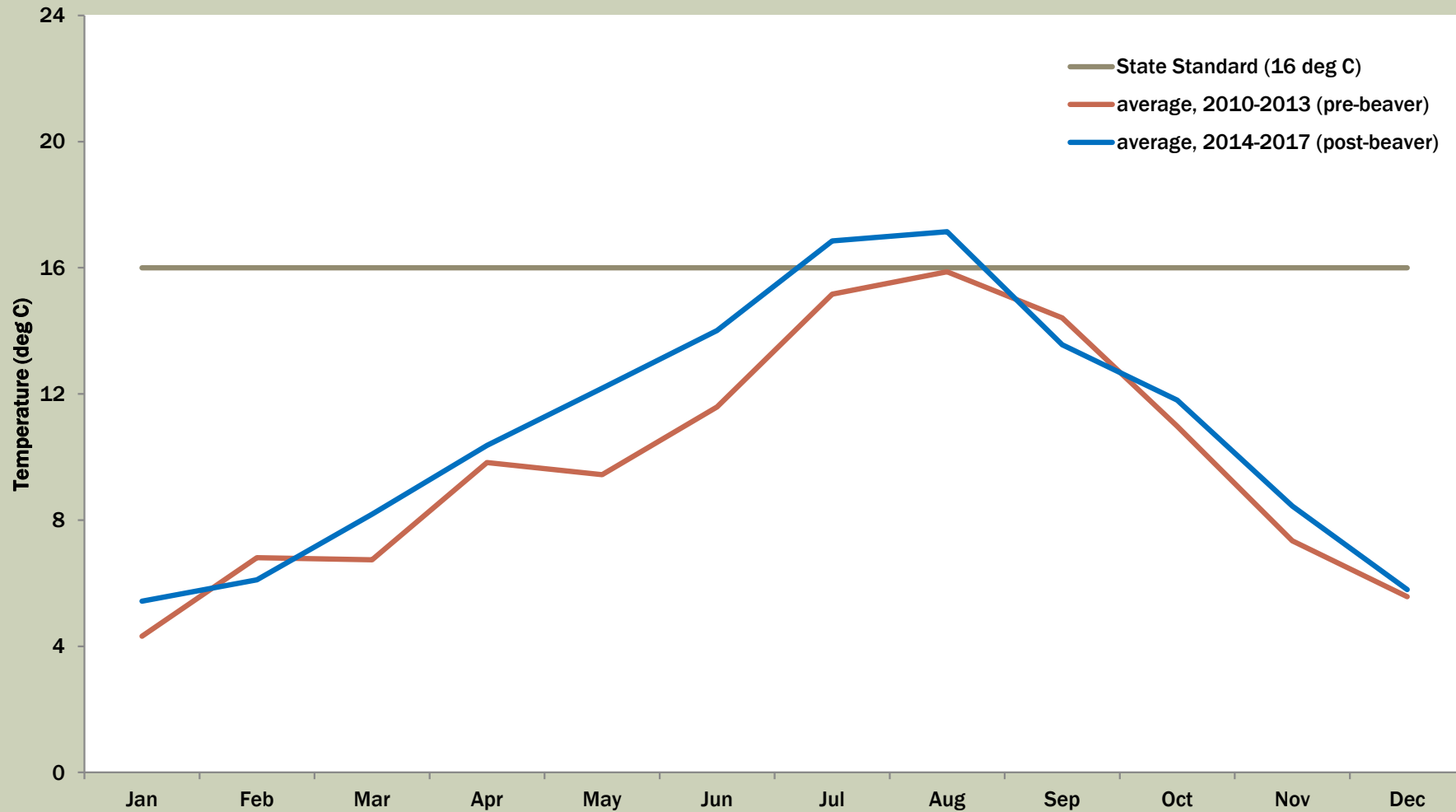


BEAVER: EFFECTS ON TEMPERATURE

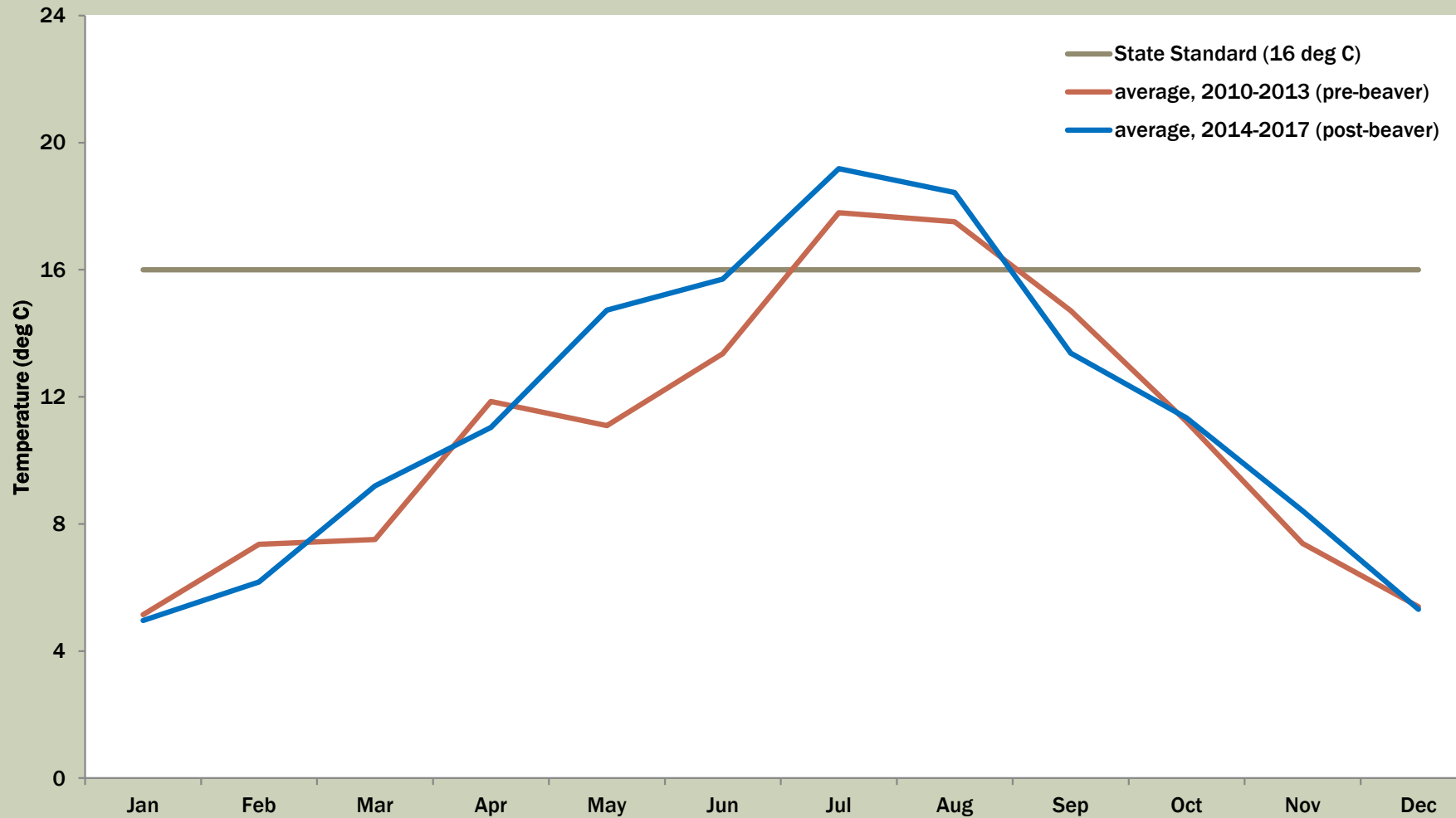
HANSEN US



HANSEN MID

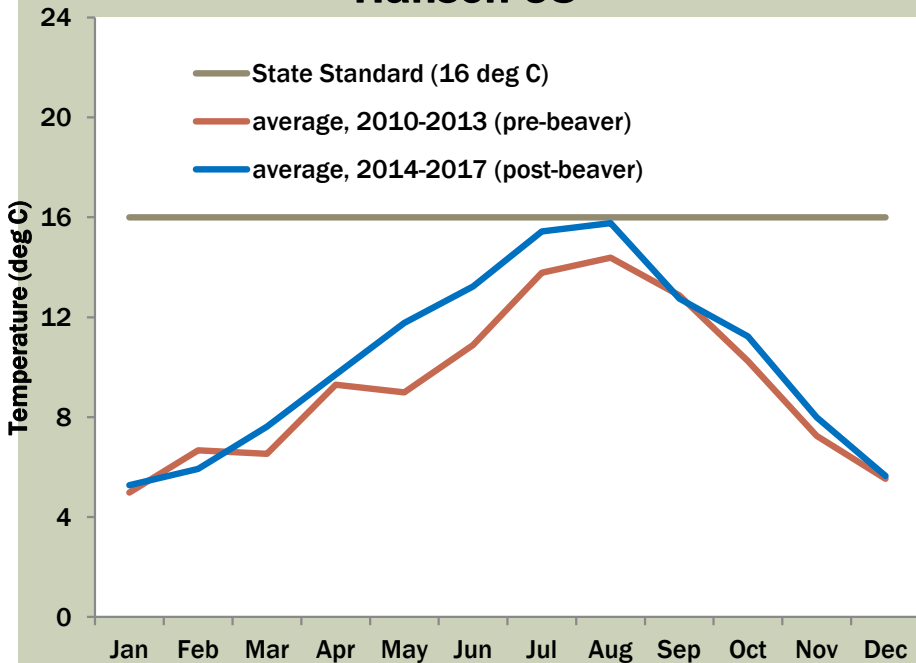


HANSEN DS

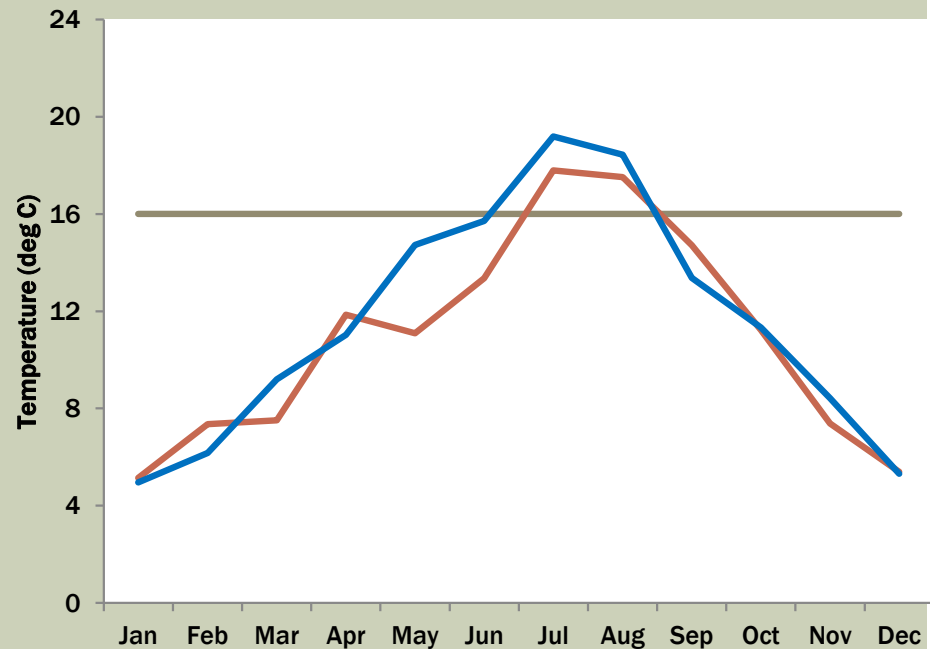


COMPARISON: US VS. DS

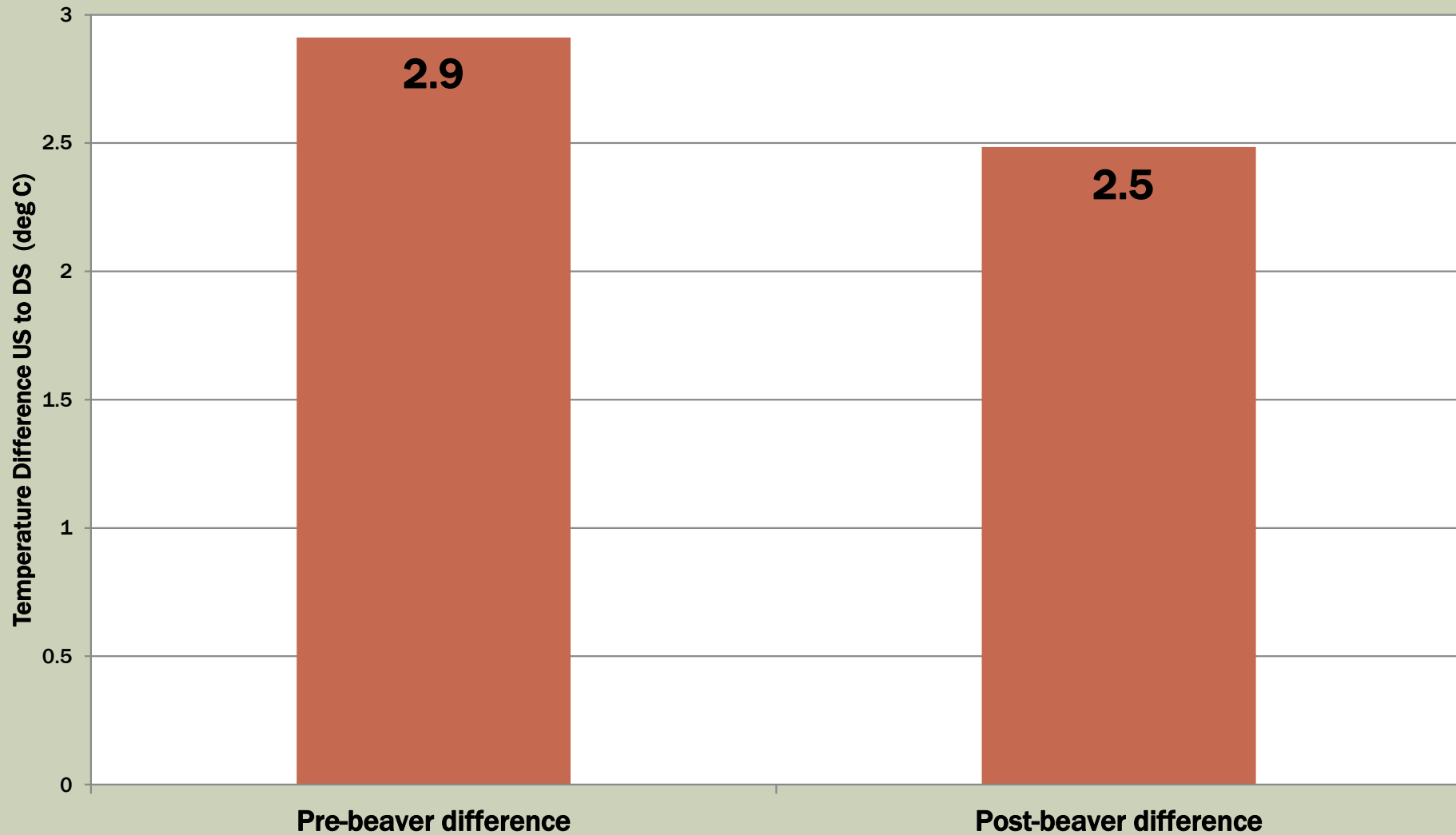
Hansen US



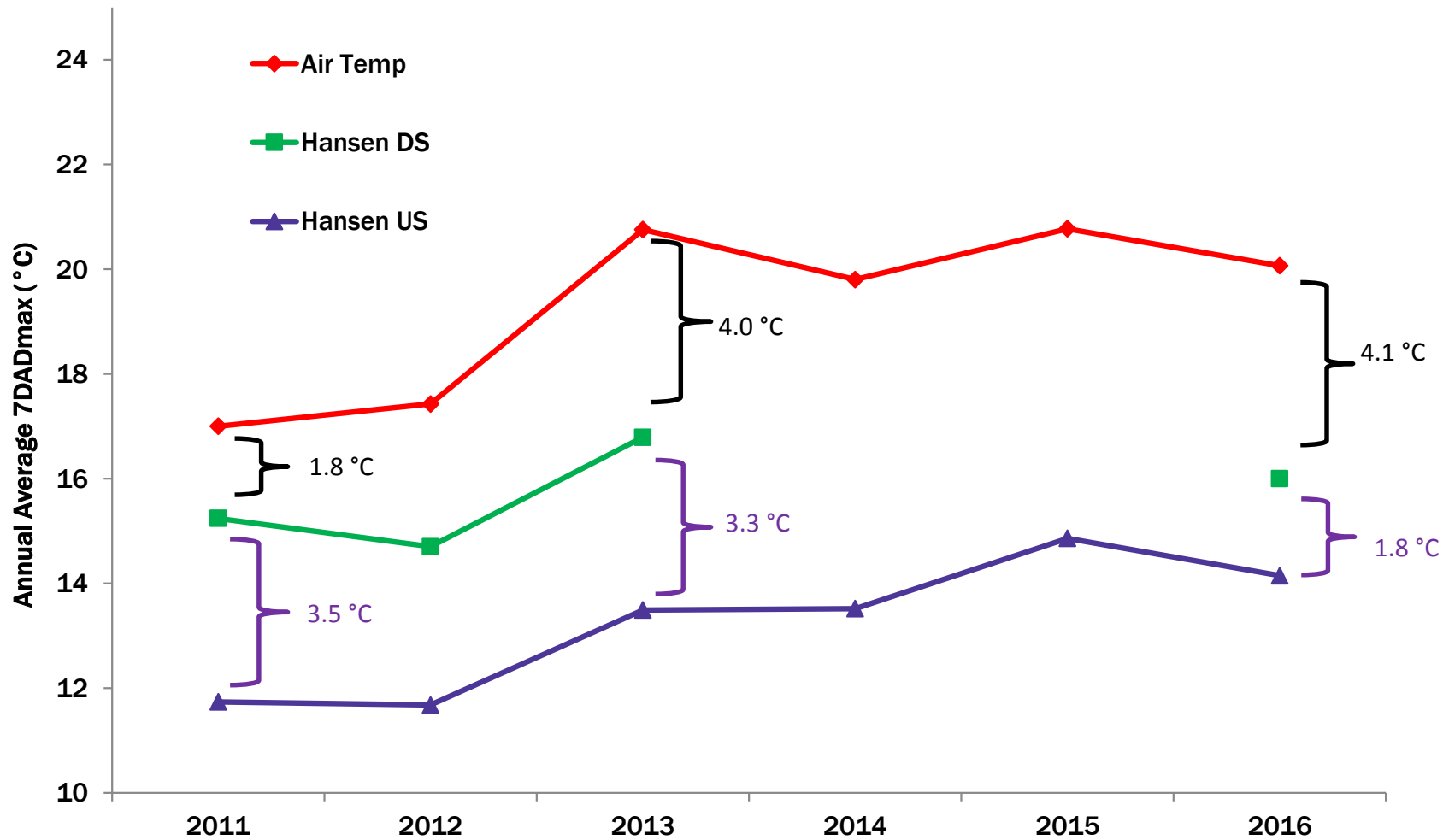
Hansen DS



US VS. DS DIFFERENCE (SUMMER)



US VS. DS



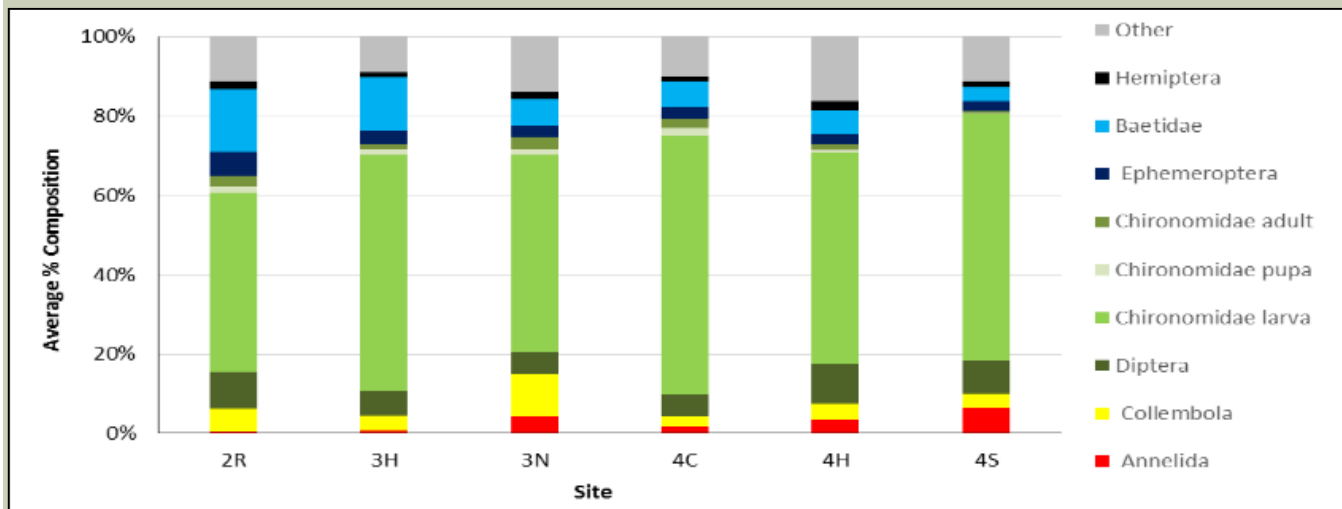
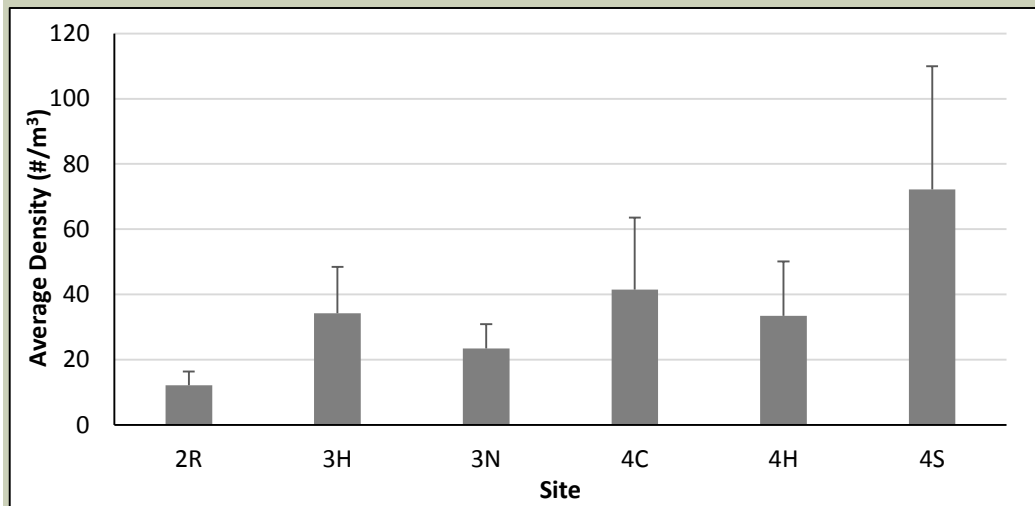
BEAVER: EFFECTS ON FISH

JUVENILE SALMONIDS & MACROINVERTEBRATES (UW)

- Pole seine, netting, electrofishing techniques
- Diet sampling-gastric lavage
- Insect fall-out traps

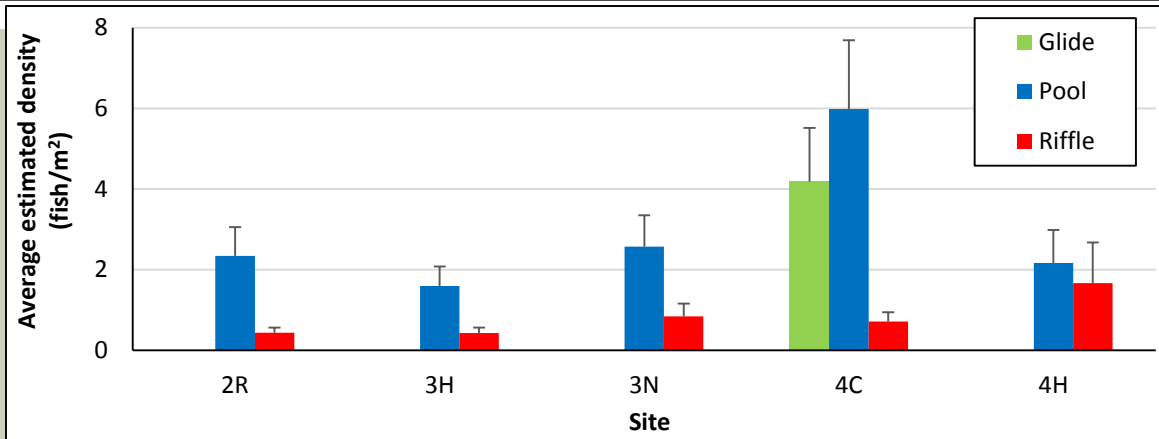


JUVENILE SALMONIDS: PREY RESOURCES

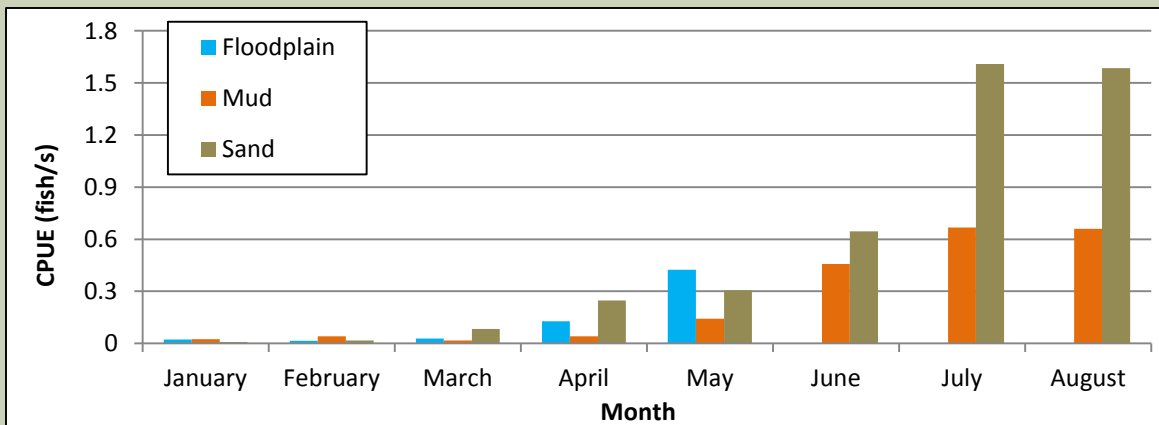


All reaches are similar in prey density and composition.

JUVENILE SALMONIDS: COHO DENSITY/ABUNDANCE



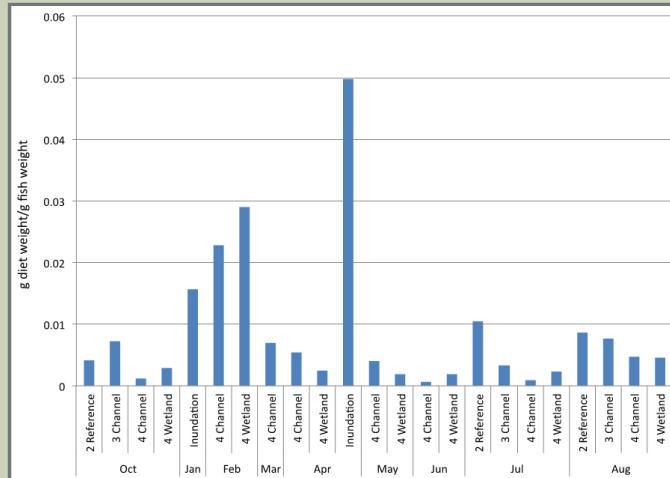
Coho densities follow expected patterns across the project.



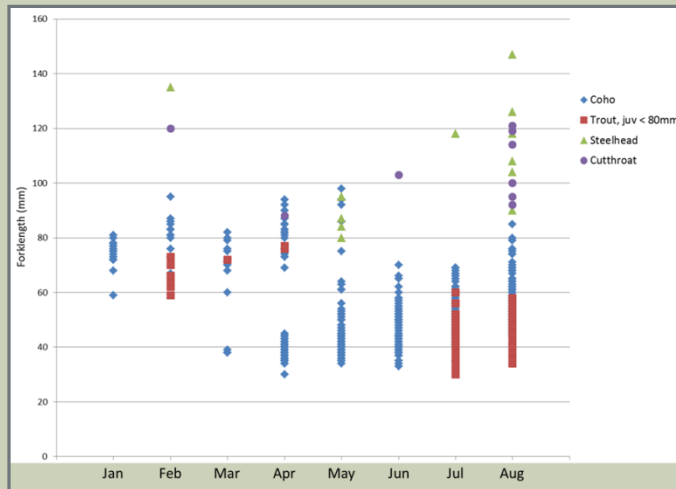
Coho can access floodplain & wetland capacity.

JUVENILE SALMONIDS: DIET COMPOSITION & FITNESS

Instantaneous
ratios for
larger Coho
(55-98mm)



Fork length
of salmonids
captured by
netting



- Coho used inundated areas during high flows and fish caught there had higher instantaneous ratios than all other fish of equal sizing.
- Few trout were caught, though they were observed in snorkel survey
- Diet composition varied by location and date sampled

BEAVER & SALMONIDS

- Coho utilized inundated floodplain habitat & prey resources
- UW-WET work completed 2012-13 (pre-beaver)
- Beaver have greatly expanded inundated floodplain habitat—need for future study

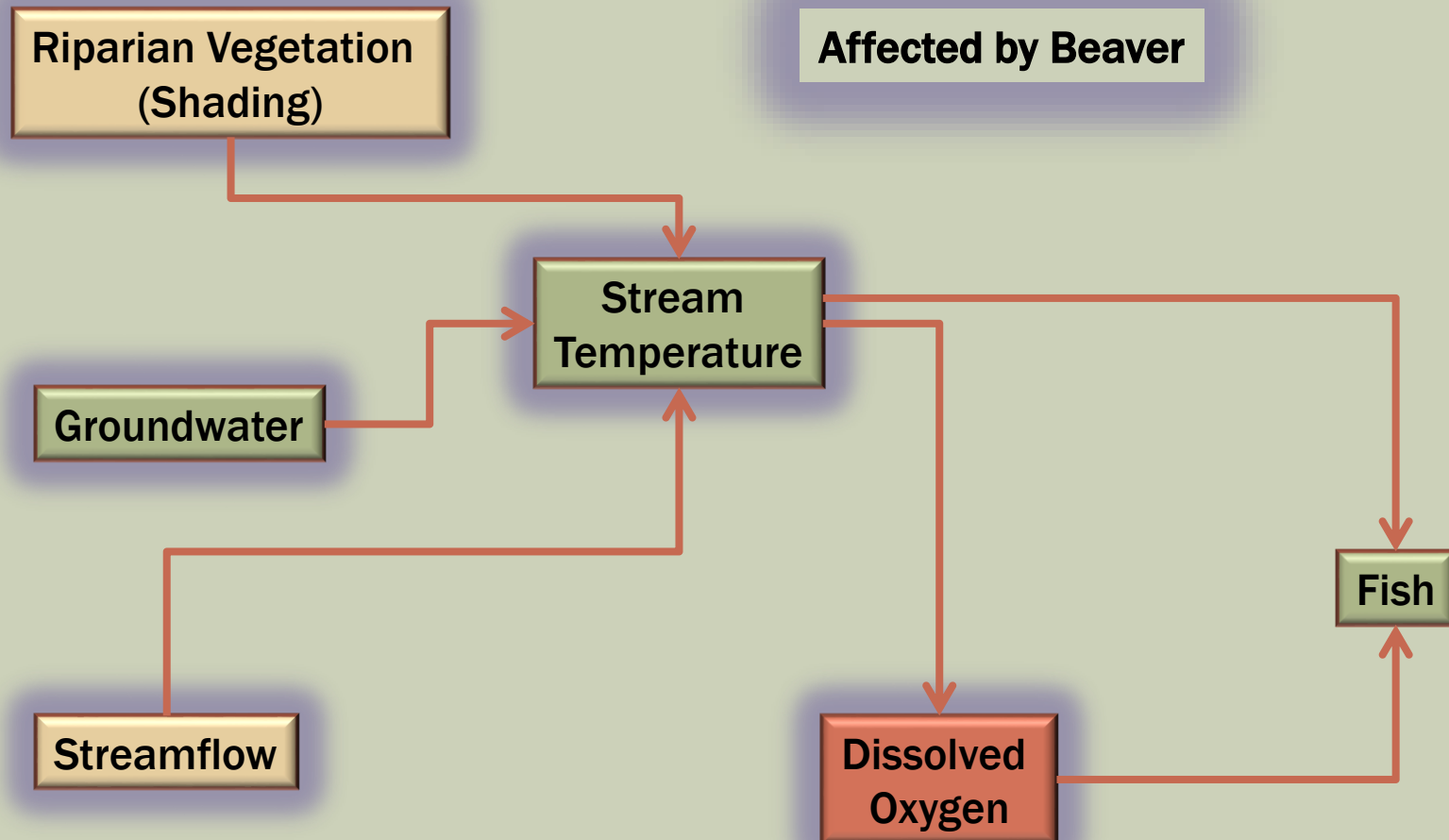


Positive

Mixed

Negative

CONCLUSIONS



ACKNOWLEDGEMENTS

- Herrera Environmental Consultants
- University of Washington Wetland Ecosystem Team
- Upper Skagit Indian Tribe Staff

This project has been funded wholly or in part by the United States Environmental Protection Agency under assistance agreements PA - 00J30801, PA - 01J01601, BG - 00J52901, and BG - 00J52902 to the Upper Skagit Indian Tribe. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Questions?

