

JCWC Coldwater Restoration Strategy



Daniel Newberry, Executive Director
Johnson Creek Watershed Council
October 22, 2019



A Thermal Map for all Oregon Streams

Data providers:

Funded by:

The aquatic community within Oregon has amassed significant amounts of stream temperature data through their collective monitoring efforts in previous decades. As part of a West-wide effort, the NorWEST project has developed a comprehensive interagency stream temperature database for Oregon that consists of 18,774 summers of monitoring effort at 6,461 unique sites (map inset). Those data were used with spatial-statistical network models (details at the SSN/STARS website: www.fs.fed.us/rm/boise/AAVAE/projects/SpatialStreamNetworks.shtml) to develop an accurate stream temperature model ($R^2 = 90\%$; $RMSE = 1.0^\circ C$), which was then used to predict 30 high-resolution (1 kilometer) historical and future climate scenarios for streams and rivers in Oregon. This poster depicts a historical scenario of the mean August temperature from 1993-2011 for 60,000 kilometers of stream mapped to the 1:100,000-scale NHDPlus hydrography layer trimmed to exclude intermittent reaches and those $>15\%$ slope. NorWEST stream temperature scenarios and state temperature maps are available in user-friendly digital formats (e.g., ArcGIS shapefiles and .pdf files) from the project website (www.fs.fed.us/rm/boise/AAVAE/projects/NorWEST.html) and can also be viewed dynamically online using this webtool (www.sciencebase.gov/gisviewer/NorWEST/). Daily summaries (min/max/mean) of the temperature data used to develop the temperature model are also available through the website if permission was given for their distribution. All data are attributed to the original source agency and contributing biologists or hydrologists in metadata files. By providing open access to stream temperature information in user friendly formats, the NorWEST project is facilitating coordination of monitoring activities among organizations, better conservation planning, and new research on temperature dynamics and thermal ecology.

The analytical infrastructure used to develop the Oregon stream temperature model consists of a new class of spatial-statistical model for data on stream networks that could also be used with water chemistry attributes (e.g., pH, alkalinity, conductivity, etc.), biological datasets (species occurrence, abundance, genetic attributes), or habitat surveys to provide a wealth of new information about streams. More details regarding those applications are provided in the references below and at the National Stream Internet Project website (www.fs.fed.us/rm/boise/AAVAE/projects/)

KEY REFERENCES

NorWEST Website: www.fs.fed.us/rm/boise/AAVAE/projects/NorWEST.html

Spatial Statistical Network Models

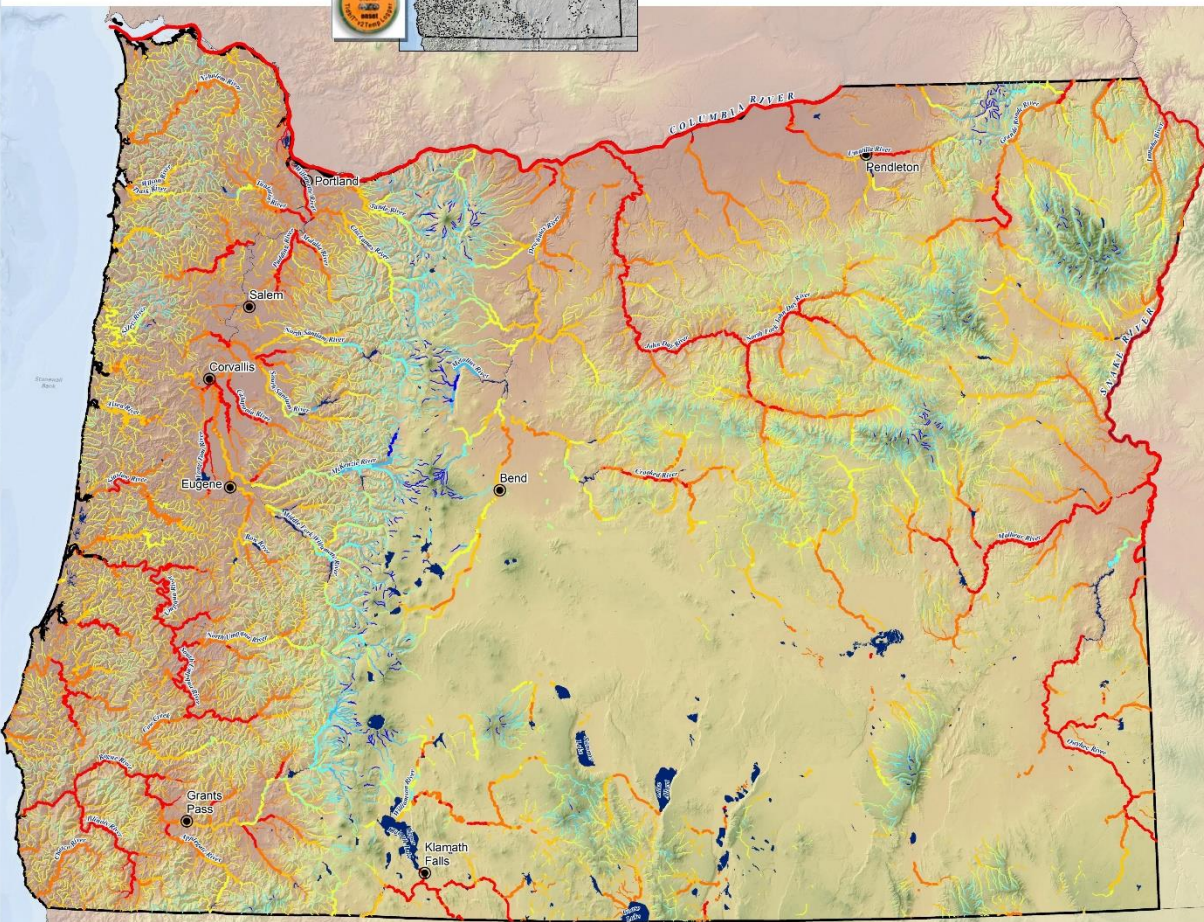
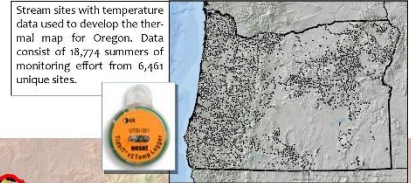
Isaak, D., C. Luce, B. Riemann, D. Nagel, E. Peterson, D. Horan, S. Parkes, G. Chandler. 2010. Effects of climate change and wildfire on stream temperatures and salmonid thermal habitat in a mountain river network. *Ecological Applications* 20: 1359-1371.

Isaak, D., E. Peterson, J. Ver Hoef, S. Wenger, J. Falke, C. Torgersen, C. Sowder, A. Steel, M. Fortin, C. Jordan, A. Rauch, N. Sam, P. Monestiez. 2011. Applications of spatial statistical network models to stream data. *Wiley Interdisciplinary Reviews - Water* 1:377-394.

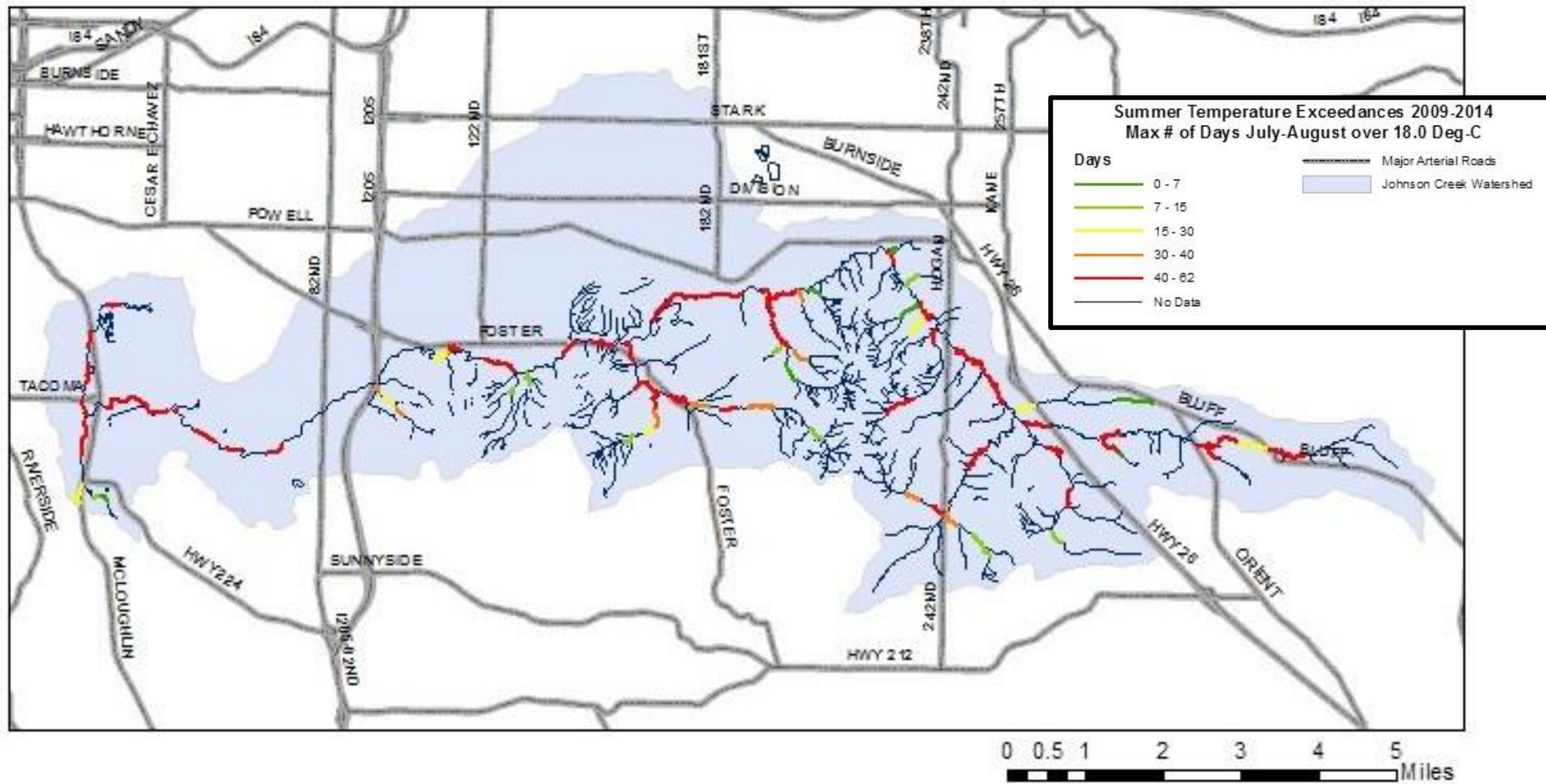
Peterson, E., J. Ver Hoef, D. Isaak, J. Falke, M. Fortin, C. Jordan, K. Mchyska, P. Monestiez, A. Rauch, A. Sengupta, N. Sam, E. Steel, D. Theobald, C. Torgersen, and S. Wenger. 2013. Modeling dendritic ecological networks in space: an integrated network perspective. *Ecology Letters* 16:707-719.

Ver Hoef, J., E. Peterson, and D. Theobald. 2006. Spatial statistical models that use flow and stream distance. *Environmental and Ecological Statistics* 13:449-464.

Ver Hoef, J., E. Peterson, D. Clifford, and R. Shah. 2014. SSN: An R package for spatial statistical modeling on stream networks. *Journal of Statistical Software* 56(3):1-47.



NorWEST Team: Dan Isaak, David Nagel, Seth Wenger, Matt Groce, Erin Peterson, Jay Ver Hoef, Charlie Luce, Steve Hostetler, Jason Dunham, Jeff Kershner, Brett Roper, Dona Horan, Gwynne Chandler, Sherry Wollrab, Sharon Parkes, Colette Breshears, Neal Bernklau, Sam Chandler

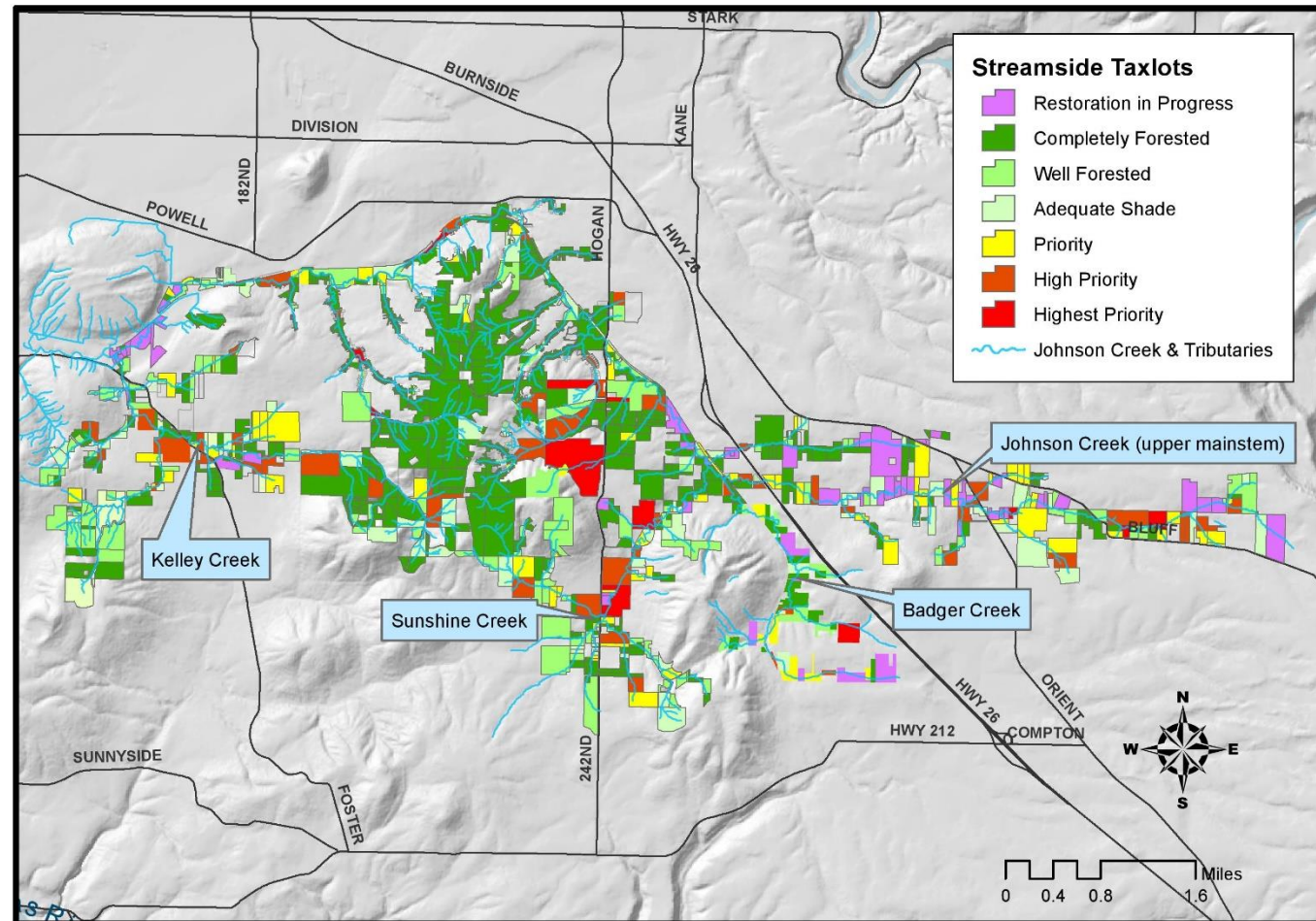




Riparian Reforestation Strategy (2012)

- Long-term goal of 80% riparian canopy coverage
- Prioritizes riparian taxlots for planting/reforestation
- Uses the Heat Source model

Riparian Restoration Priorities by Taxlot in Target Johnson Creek Subwatersheds



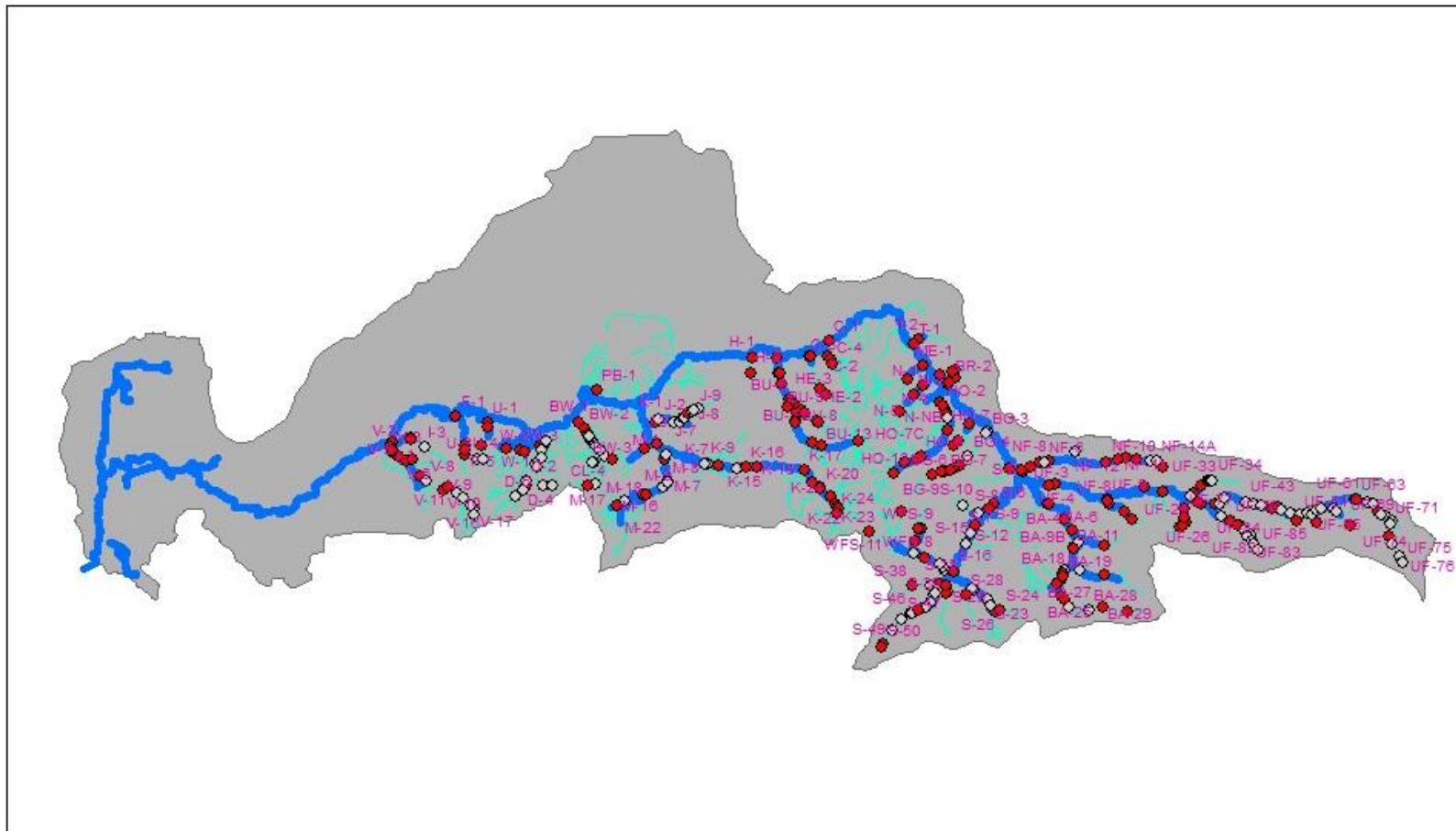


Fish passage: access to cold water

- >300 potential barriers to salmonids in JCW, mostly culverts
- 274 road/stream crossings assessed by JCWC in 2013-14
- 75% were barriers to salmonid migration
- Several tributaries are currently cold water refugia—but blocked
- Many cold springs and hyporheic flow



Known Fish Passage Barrier Stream Crossings in the Johnson Creek Watershed



● Publicly-owned Barrier

▲ Privately-owned Barrier

— Streams with year-round flow and habitat suitable for salmon and trout

— Streams with intermittent flow or lacking habitat for salmon and trout

— Major Arterial Roads



Prioritizing culverts according to cost-benefit

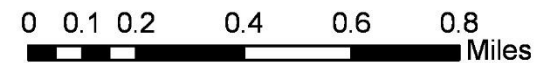
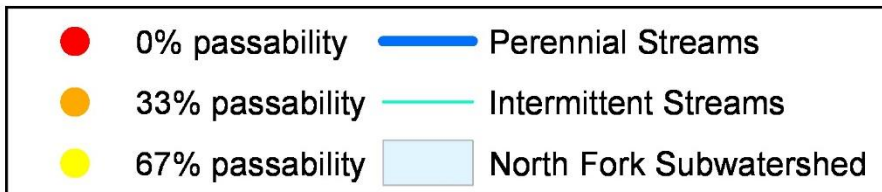
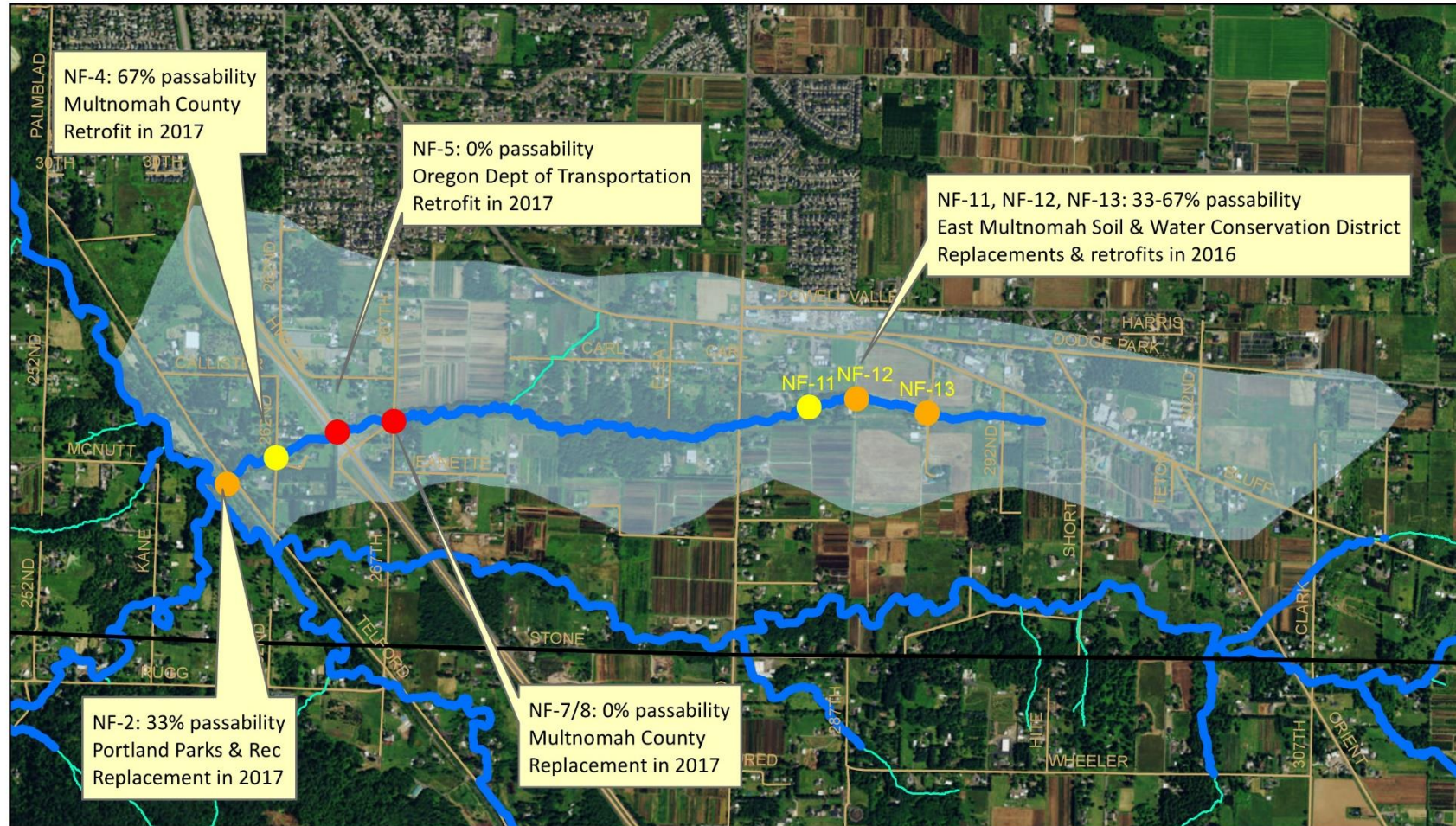
- APASS (**A**nadromous Fish **P**assage Optimization Tool)--a decision support tool for optimizing barrier mitigation (2014).
- Considers project cost, spatial network location, habitat above barriers, passability
- Produced a list of 18 highest priority cost-benefit culvert replacement/removal projects



Whole stream fish passage

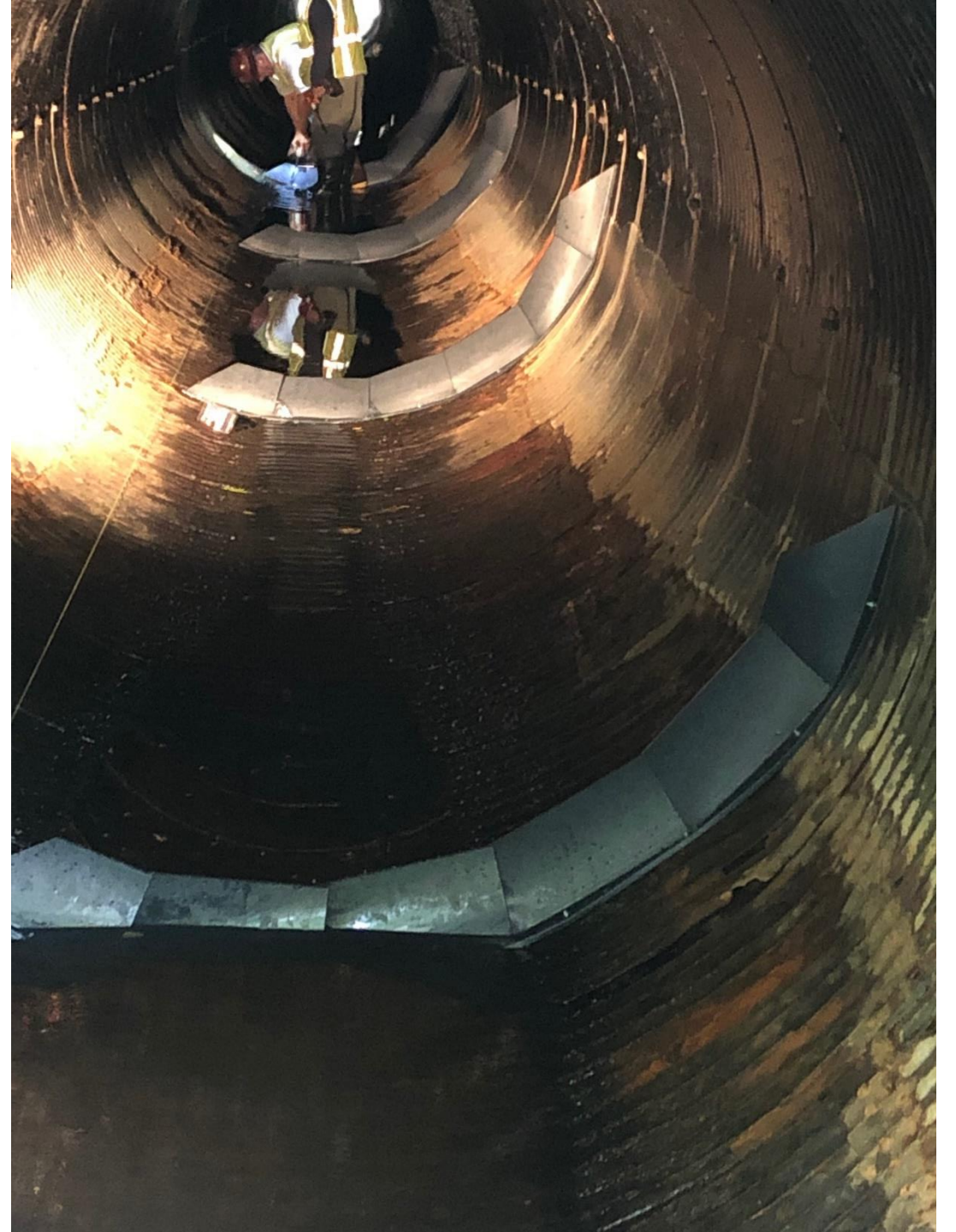
- Further refine culvert prioritization by incorporating climate change concerns
- Several barriers in the “top 18” list are in natural cold water tributaries
- We are focusing on opening up those entire tributaries

North Fork Johnson Creek Culvert Projects

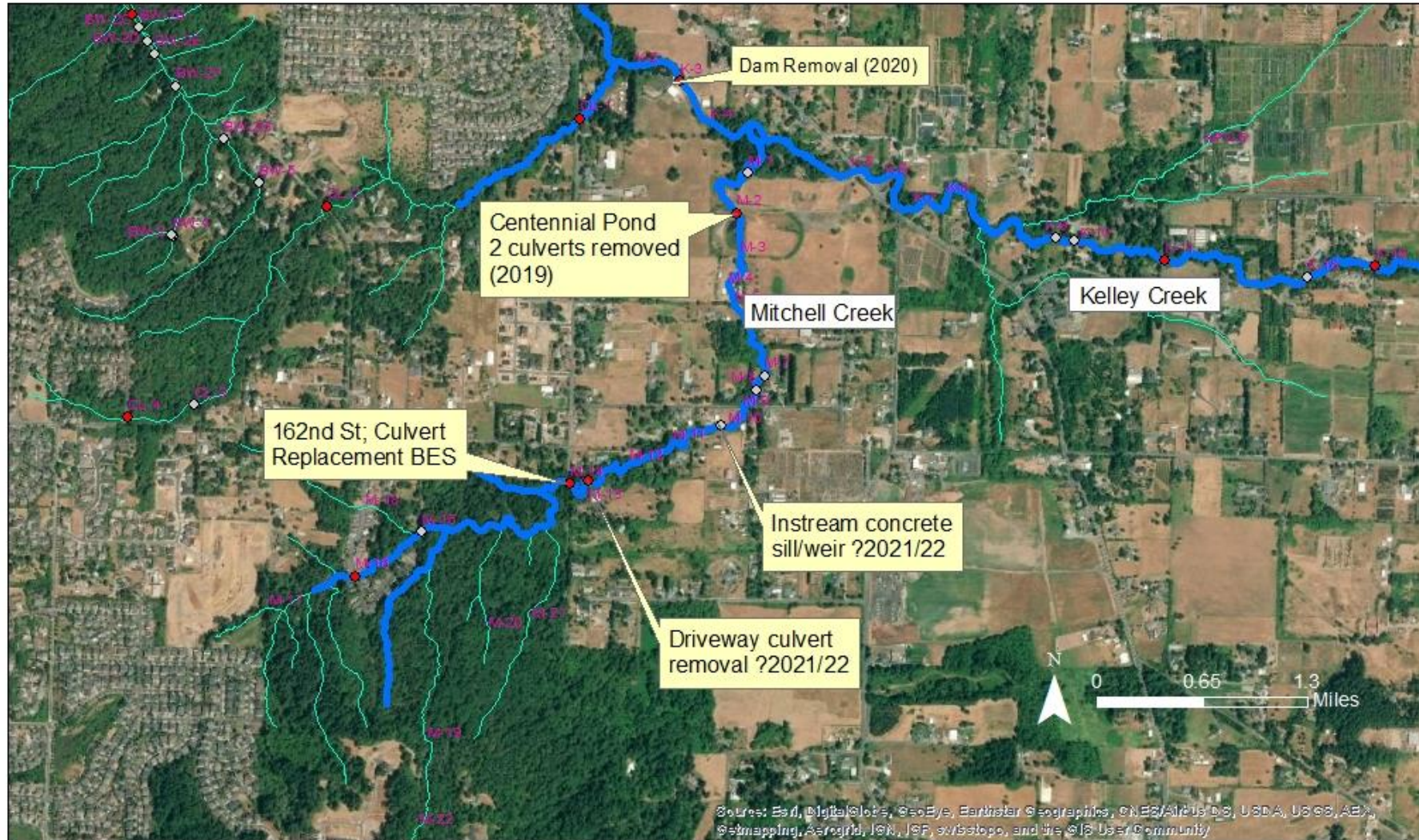








Planned fish passage projects in the Kelley/Mitchell watersheds.





- Publicly-owned Barrier
- ▲ Privately-owned Barrier

- Streams with year-round flow and habitat suitable for salmon and trout
- Streams with intermittent flow or lacking habitat for salmon and trout
- Major Arterial Roads

132 Known in-line ponds



0 0.5 1 2 Miles

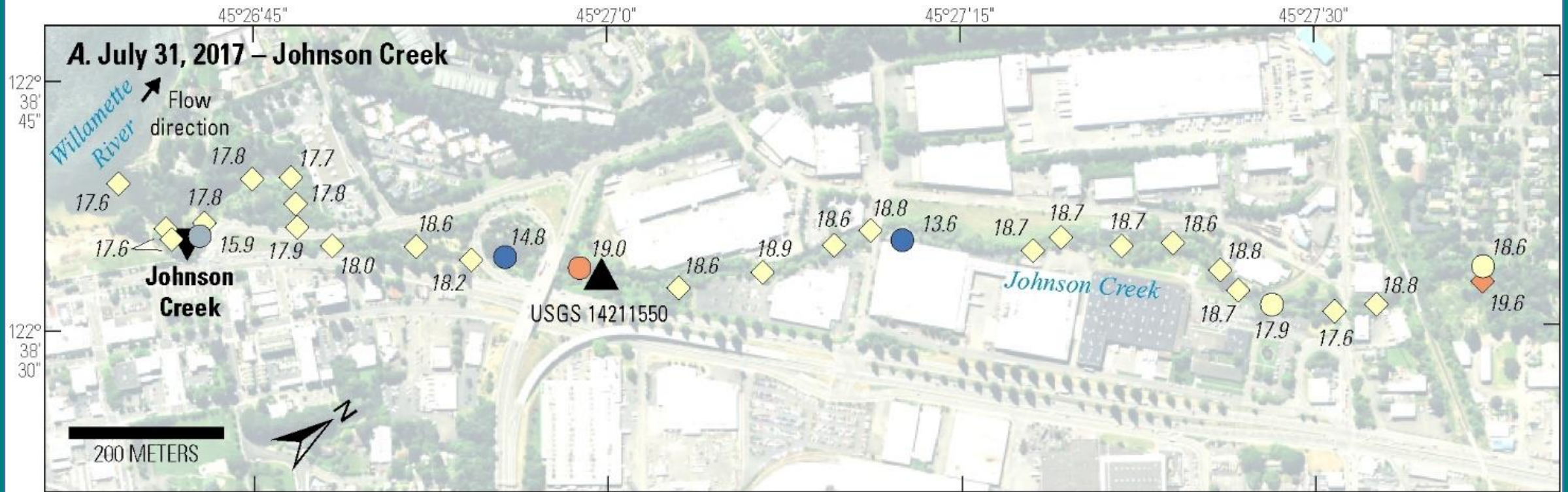
 Ponds
 Perennial Streams



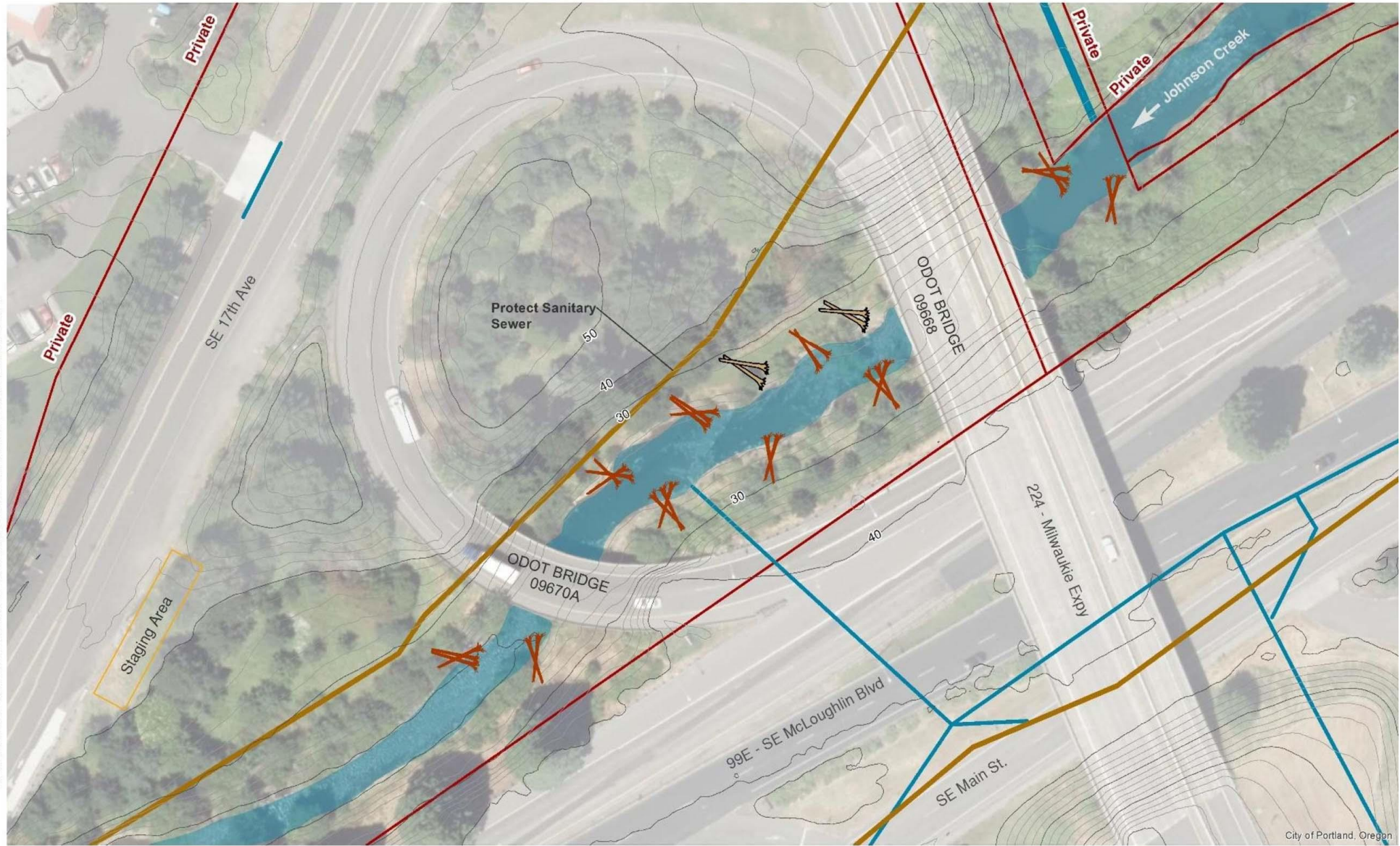
Clackamas Partnership

- Coalition of 4 watershed councils & 12 agencies
- Native fish restoration
- Awarded a \$3.4 million grant from OWEB for FY2019-2021, promised \$8.7 million over 6 years.
- JCWC: 4 fish passage projects, 2 habitat enhancement project, 1 stormwater planning project

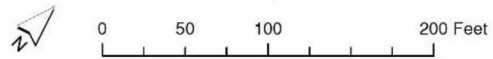
Habitat enhancement in cold water areas



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SOURCES: Clackamas County, City of Milwaukie, City of Portland, Johnson Creek Watershed Council, Wolf Water Resources



- Sanitary Sewer
- Storm Sewer
- Taxlots
- X Instream Wood Habitat Structures (not to scale)
- Y Floodplain Wood Habitat Structures (not to scale)

Notes:
 1. Summer 2017 Aerial
 2. Elevations NAVD88



Concept Design
 Johnson Creek Restoration
 Portland, Oregon

Figure 1 –Johnson Creek River Mile 0.5 Restoration Concept Plan

