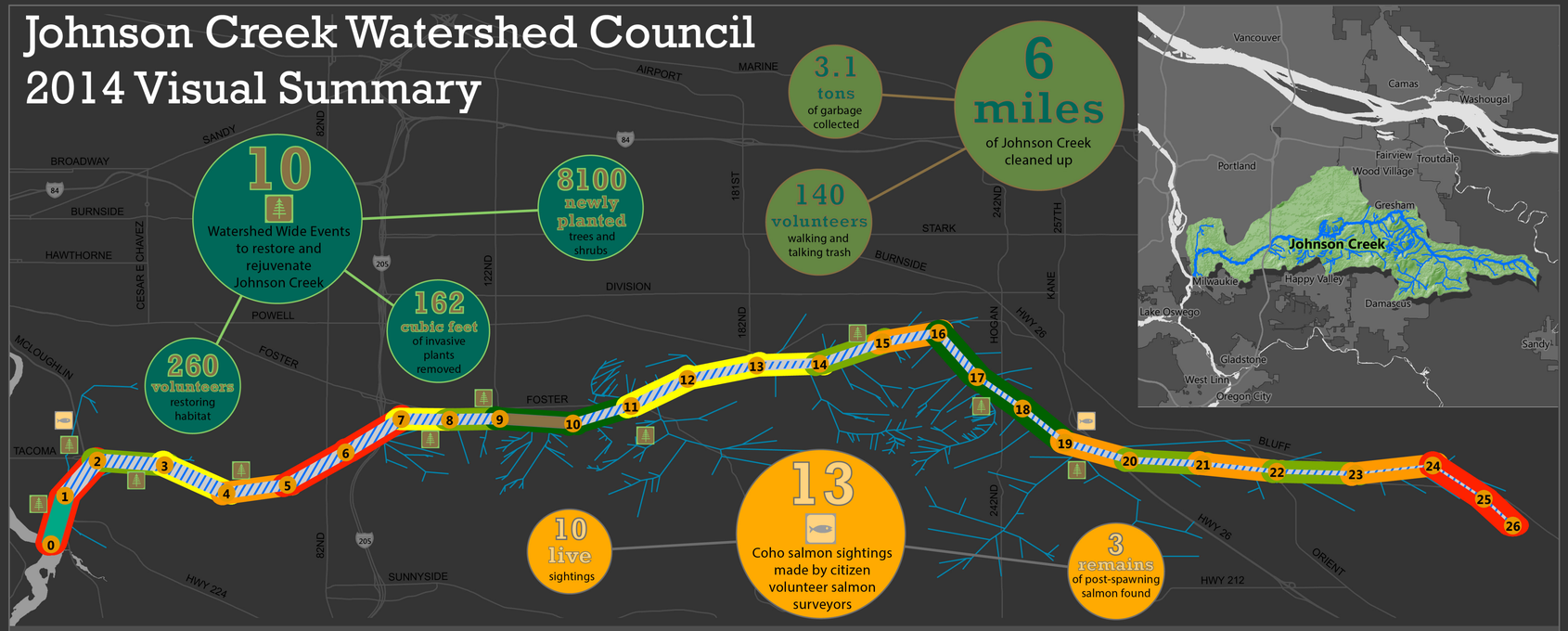
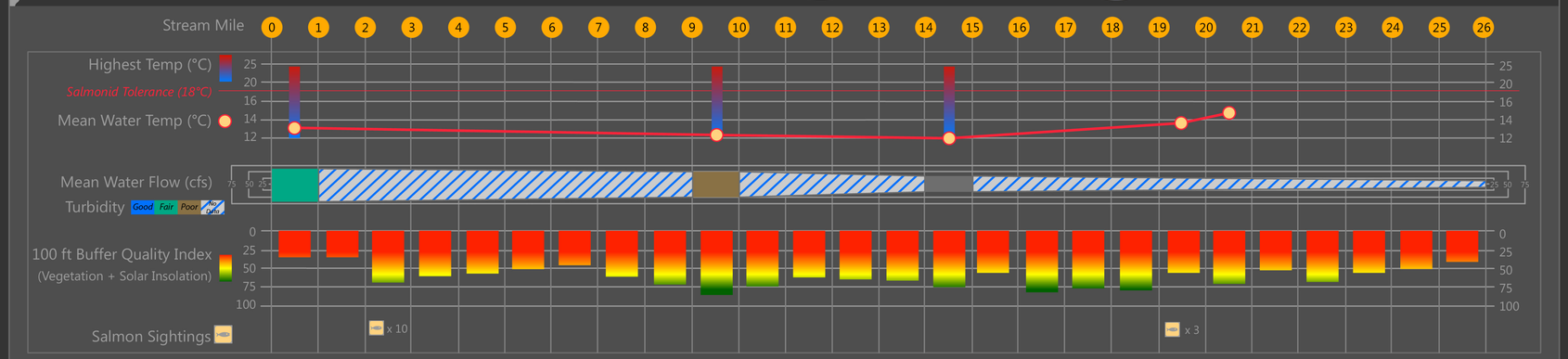
Johnson Creek Watershed Council
2014 Visual Summary





Data sources: USGS; Metro RLIS; Johnson Creek Watershed Council; Cartography and information design: Kyung Lee, 2016

Project Description

Project Background:

The Johnson Creek Watershed, located in the state of Oregon, is an urban watershed success story. Seventy-two percent of its 54 square miles is located within the Portland-Metro Urban Growth Boundary. Its 26 miles of stream crosses the jurisdictions of two counties and three cities. Unfortunately, urban development and well-intentioned but misguided Works Progress Administration flood-mitigation projects reduced its once-plentiful salmon populations almost out of existence.

Formed in 1995, the Johnson Creek Watershed Council has led the charge in restoring the creek to a more natural state to bring the salmon back. In 2014, citizen researchers spotted 13 mature Coho salmon in the stream during spawning season. In order to foster even more success restoring salmon populations, this geo-analysis has been undertaken to identify sections that are least hospitable to migrating salmon and most in need of stream buffer rehabilitation.

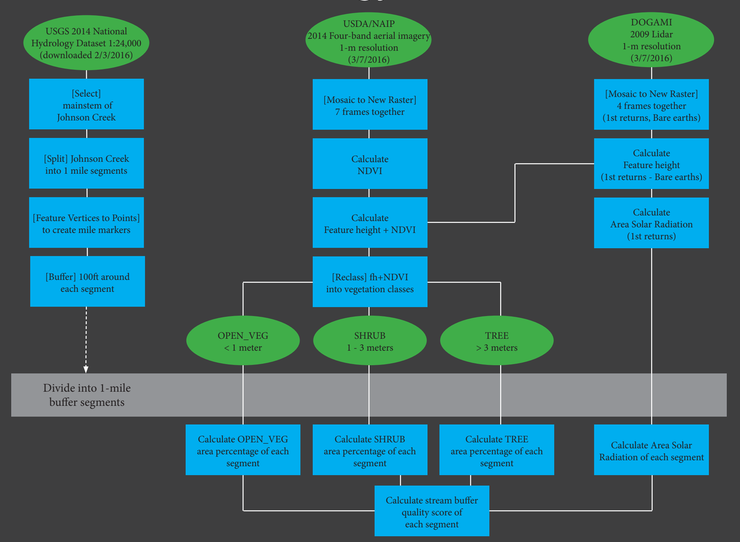
Research Question:

In consideration of the following conclusions about salmon health and habitat:

1. High water temperatures have been shown to have deleterious physiological and behavioral impacts of salmonids, such as Chinook, coho and steelhead (Myrick and Cech, 2004).
2. Riparian vegetation, especially trees, provide the benefits of shading, canopy cover, woody debris, and stream bank erosion prevention, that can greatly increase the health and long term viability of salmonid populations.
3. Flint and Flint (2008) have shown that solar radiation is statistically correlated with maximum stream temperature.

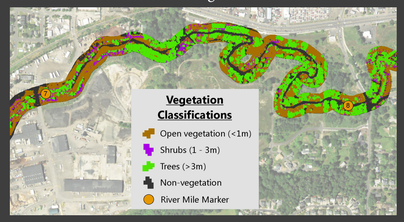
Given that shading has been suggested as the dominant control on stream warming, and that solar radiation correlates with maximum stream temperature, is it possible to identify which segments of Johnson Creek have the least suitable stream buffers for harboring salmonids, so they can be prioritized by Johnson Creek Watershed Council for rehabilitation projects?

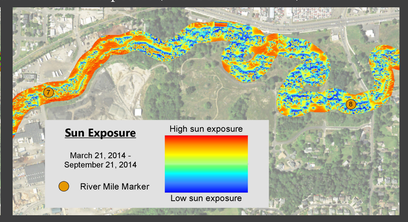
Methodology Overview

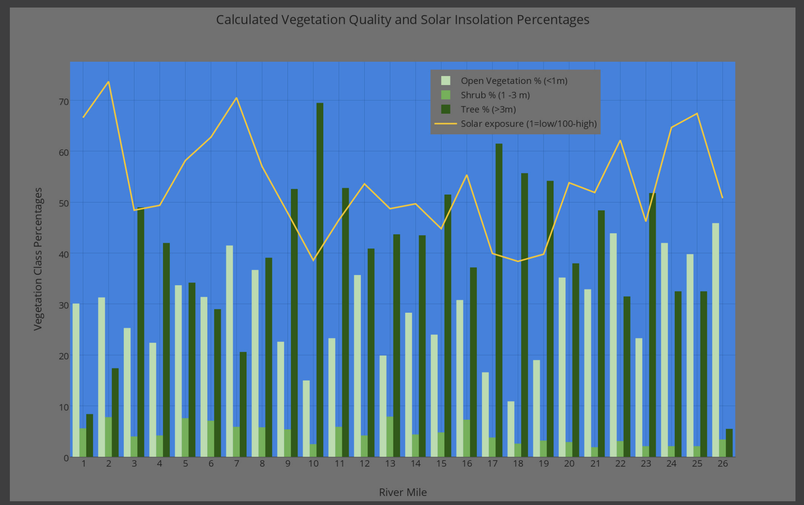


Analysis & Results

Four-band imagery was used to calculate a vegetation index of the 100-foot stream buffer area. Highest hit and bare earth lidar data sets were incorporated to calculate feature heights, allowing for classification of vegetation into open, shrub and tree classes. The highest hit data set was also used to derive sun exposure (Area Solar Radiation) index values.



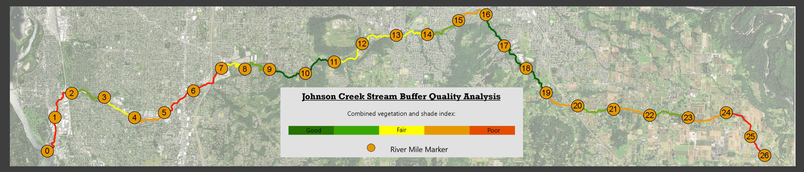




Each river mile buffer was assessed a vegetation score:
(Open vegetation percentage x 1) + (Shrub area percentage x 2) + (Tree area percentage x 3) = Vegetation sum / 3 = vegetation score (1 - 100)

And a solar radiation score:
100 - Area solar radiation value = solar score (1 - 100)

The vegetation and solar radiation scores were combined for equal weighting, with the resulting rankings below.
(Vegetation score + Solar score) / 2 = Total score (1 - 100)



According to the rankings, sections 10, 11, 17, 18, and 19 are most hospitable to salmon populations. Sections 2, 6, 7, 25 and 26 need the most rehabilitation to become salmon-friendly. Section 1 was rated the lowest, but its ranking may have been unduly influenced by its starting point being placed in the middle of the Willamette River, creating bias of its vegetation and solar radiation scores (see image below).

This bias should be removed from the next iteration of buffer-quality assessment by clipping the segment closer to the Willamette River shoreline. An updated lidar data set is due to be released by Metro later in 2016, offering more timely vegetation information. Incorporation of second and third lidar returns could add a vegetation density factor to the overall stream buffer quality index.

Processing notes: Geodata analysis was performed in ArcMap 10.3 with Spatial Analyst extensions activated. Layers were individually exported and reassembled in Adobe Illustrator CC 2015 for final cartographic touchups. Statistical analysis performed using Microsoft Excel. Graphs and infographic elements were also created using Illustrator.

Downloaded data sets arrived in WGS84 or NAD83 geographic projections and were projected into NAD_1983_HARN_StatePlane_Oregon_North_FIPS_3601_Feet_Intl to best suit local geography.

Special thanks to PCC GIS instructors Christina Friedle, Joe Gordon and Randy Morris.

Buffer Quality Rank	River Mile	Veg Score Ranking	Solar Score Ranking
1	10	1	2
2	17	2	4
3	19	6	3
4	18	7	1
5	11	3	7
6	15	5	5
7	9	4	8
8	23	8	6
9	3	10	9
10	21	9	14
11	13	12	10
12	14	11	12
13	12	13	15
14	4	15	11
15	8	14	18
16	20	17	16
17	16	16	17
18	5	18	19
19	22	19	20
20	24	20	22
21	6	22	21
22	25	21	24
23	7	23	25
24	26	25	13
25	2	24	26
26	1	26	23