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Updated longitudinal water-temperature profiles and zones of cold-water influence in the Lower Yakima River

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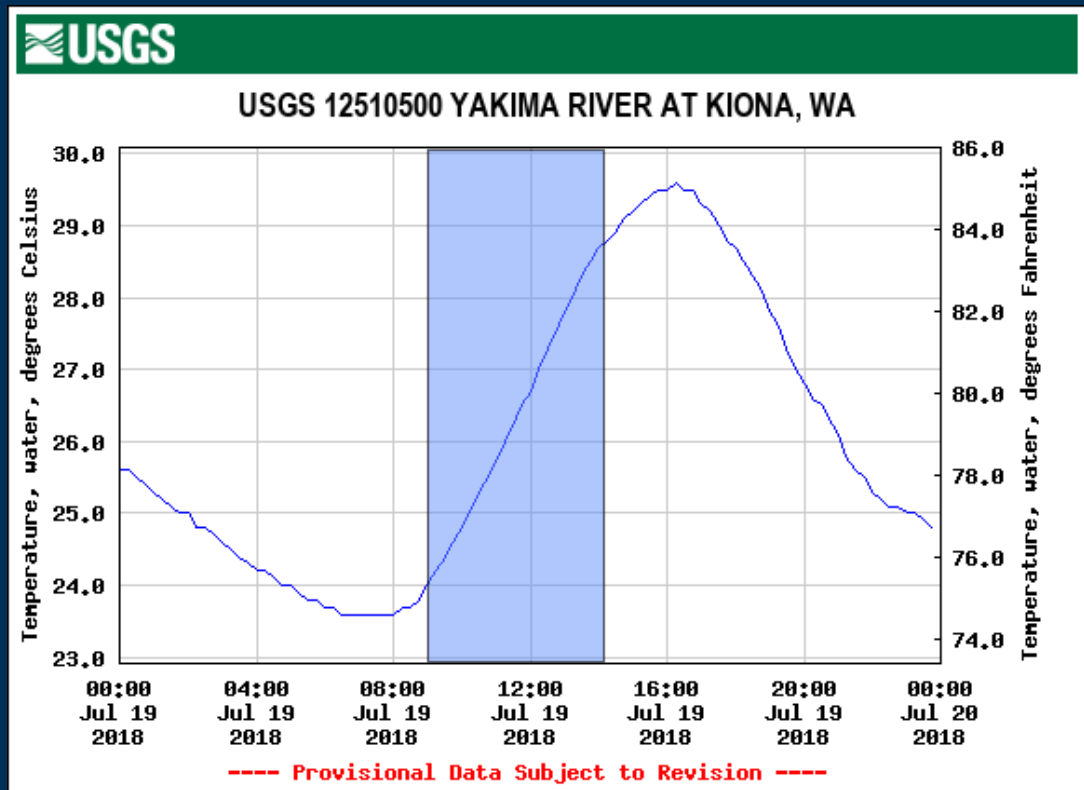
U.S. Department of the Interior
U.S. Geological Survey

Purpose and Scope

- Identify potential thermal refuges
- Update previously collected thermal profiles (e.g., Vaccaro, 2011) and document temporal stability of thermal refugia
- Inform resource managers in prioritization and development of thermal refuge habitat enhancement projects
  - Address thermal barriers to migration
  - Increase freshwater survival of migrating fish

Method: Longitudinal Thermal Profiles

- Vaccaro and Malloy (2006)
- Near-streambed water temperature measured while drifting at ambient river velocity
- Temperature of parcel of water tracked downstream
- Departure of water parcel from diurnal heating may be:
  - Ground-water discharge
  - Surface-water inflows
  - Riparian shading



Method: Longitudinal Thermal Profiles

- Nine reaches profiled from June to September 2018
- Three thermal profiles were collected (3-second measurement rate)
  - River Right
  - Center
  - River Left
- Spatial Extent: Wapato Dam to Columbia Confluence

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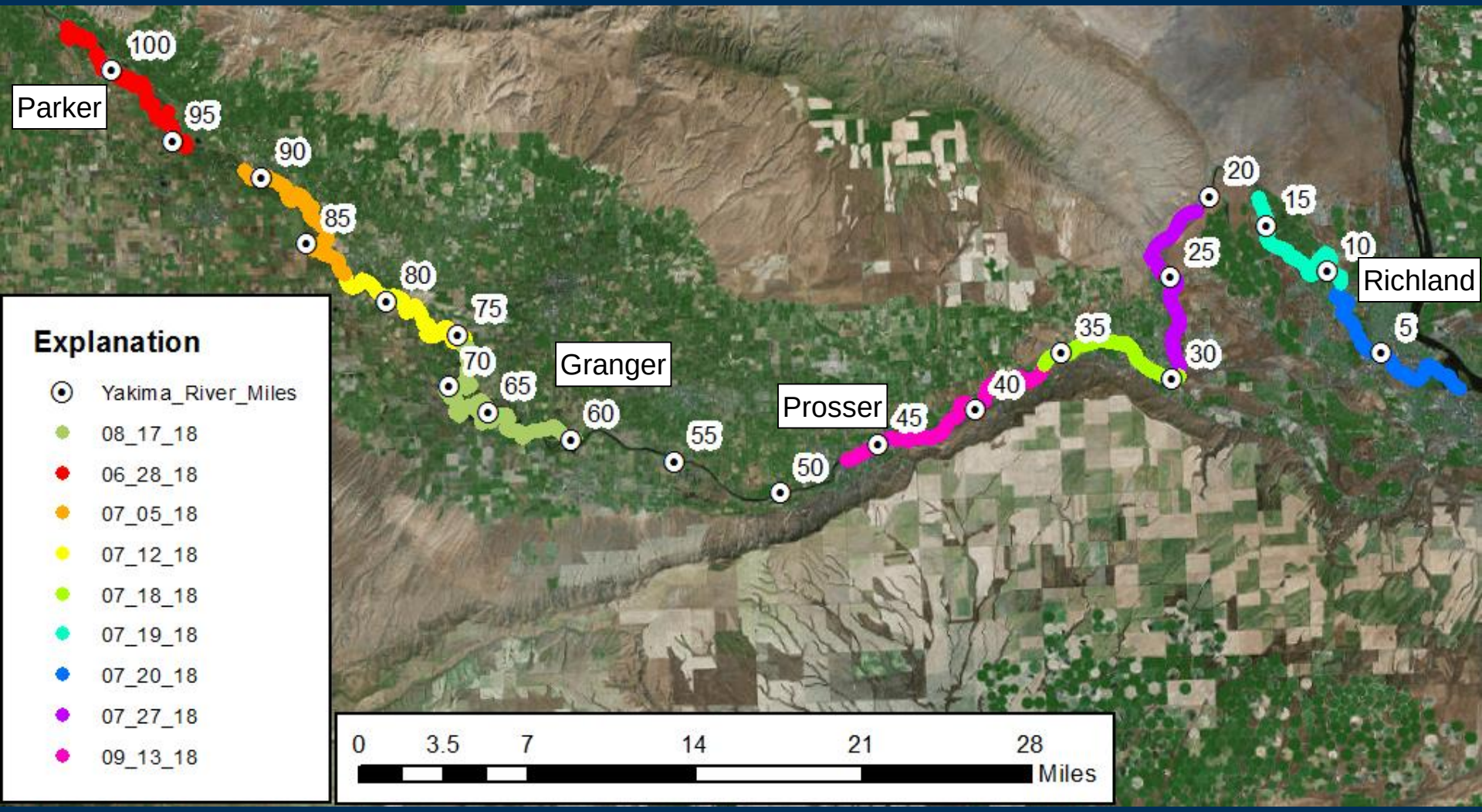
Thermal Profiles – Overview



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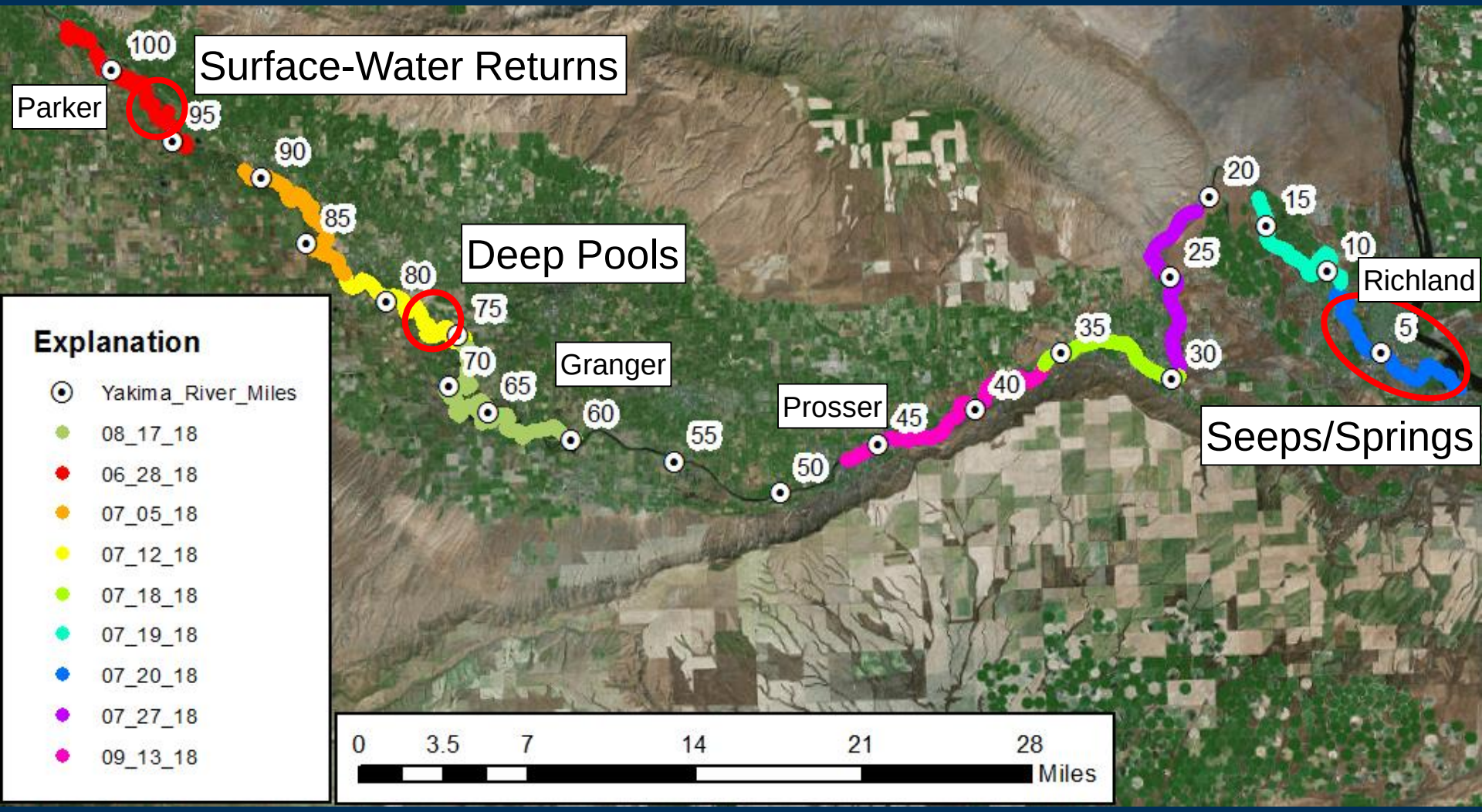
Preliminary Data – Subject to Revision

Examples of Thermal Refugia and Processes



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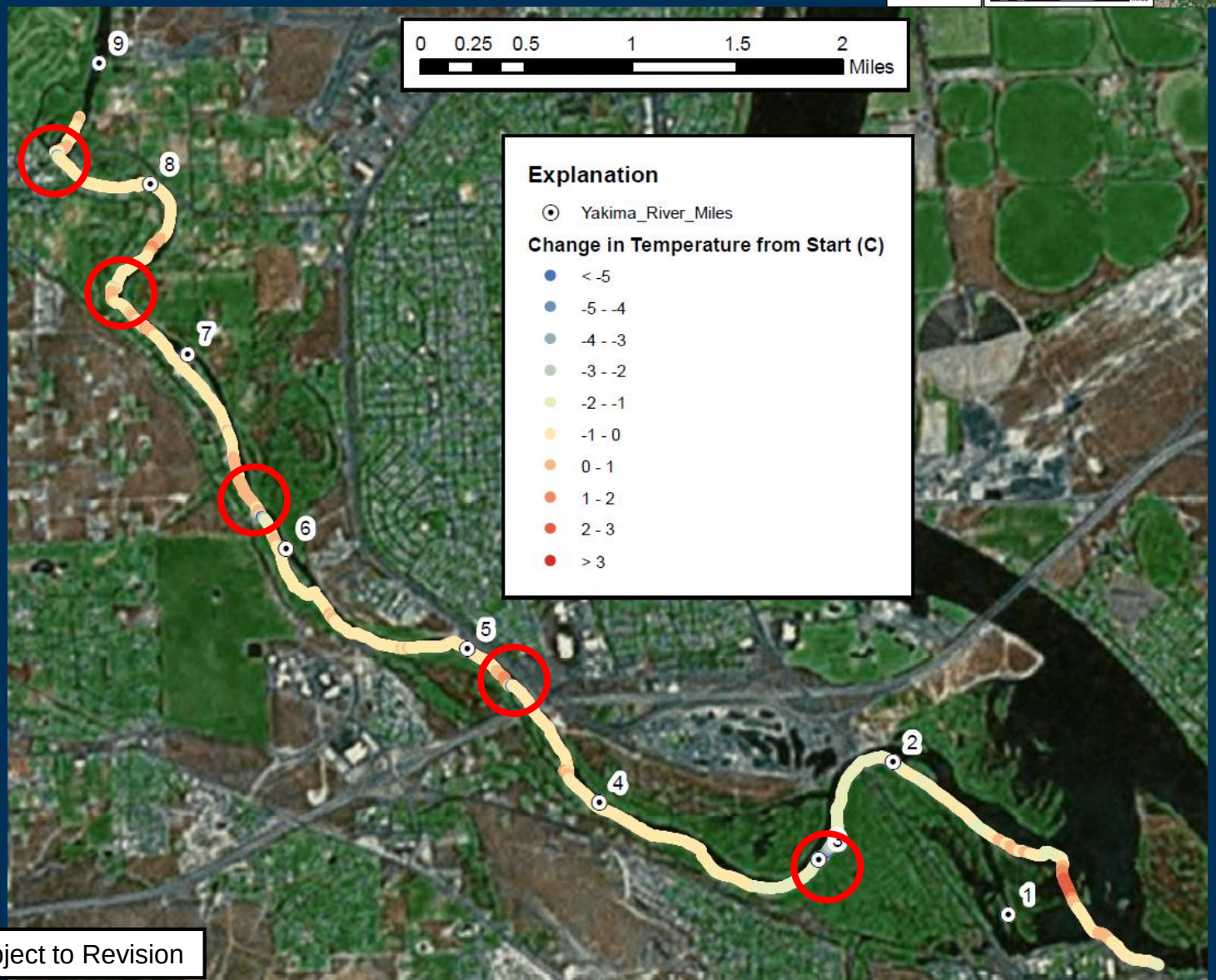
Springs/Seeps/Surface-Water Returns: Confluence Reach



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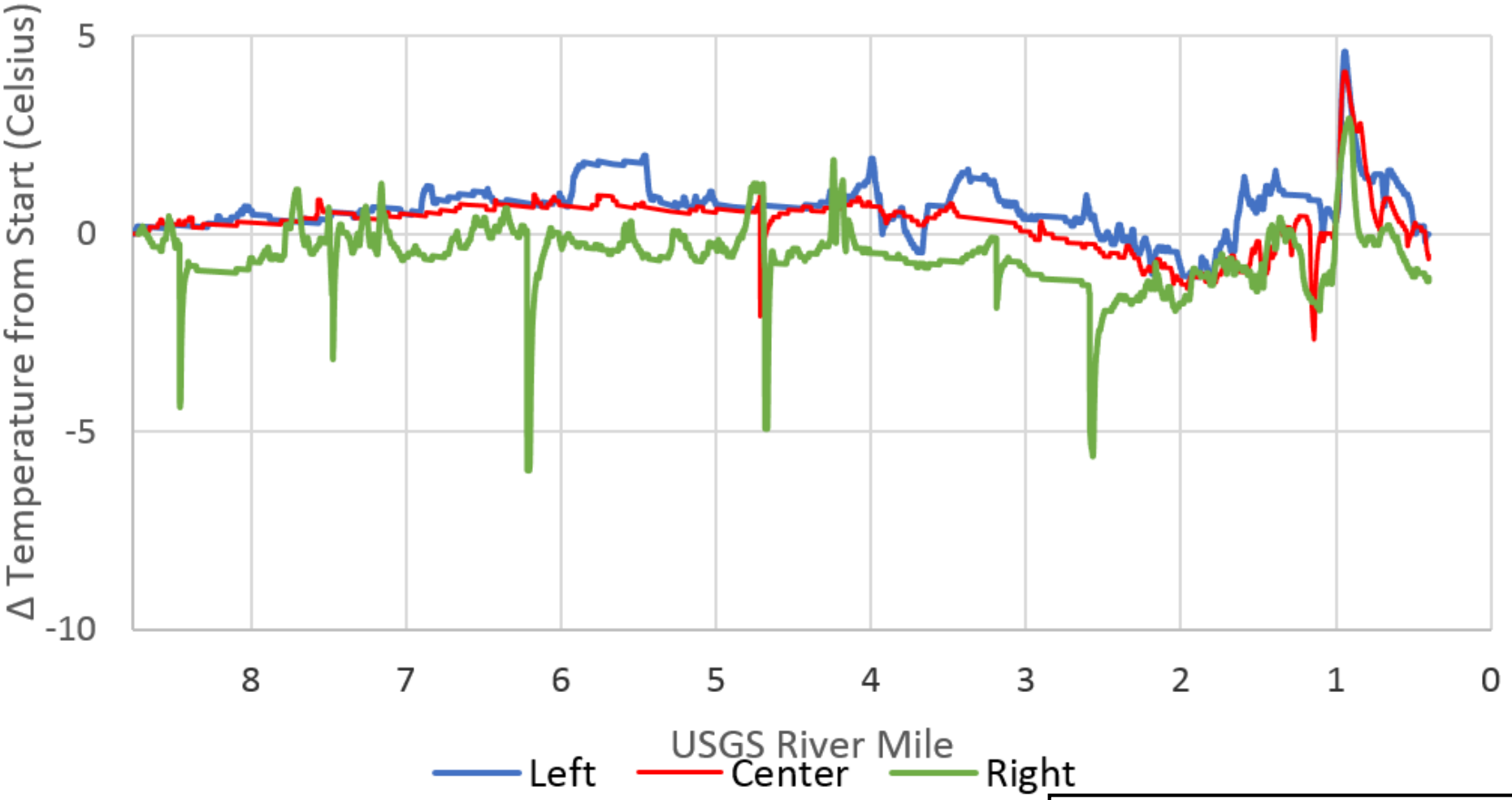
Confluence Reach: 7/20/18

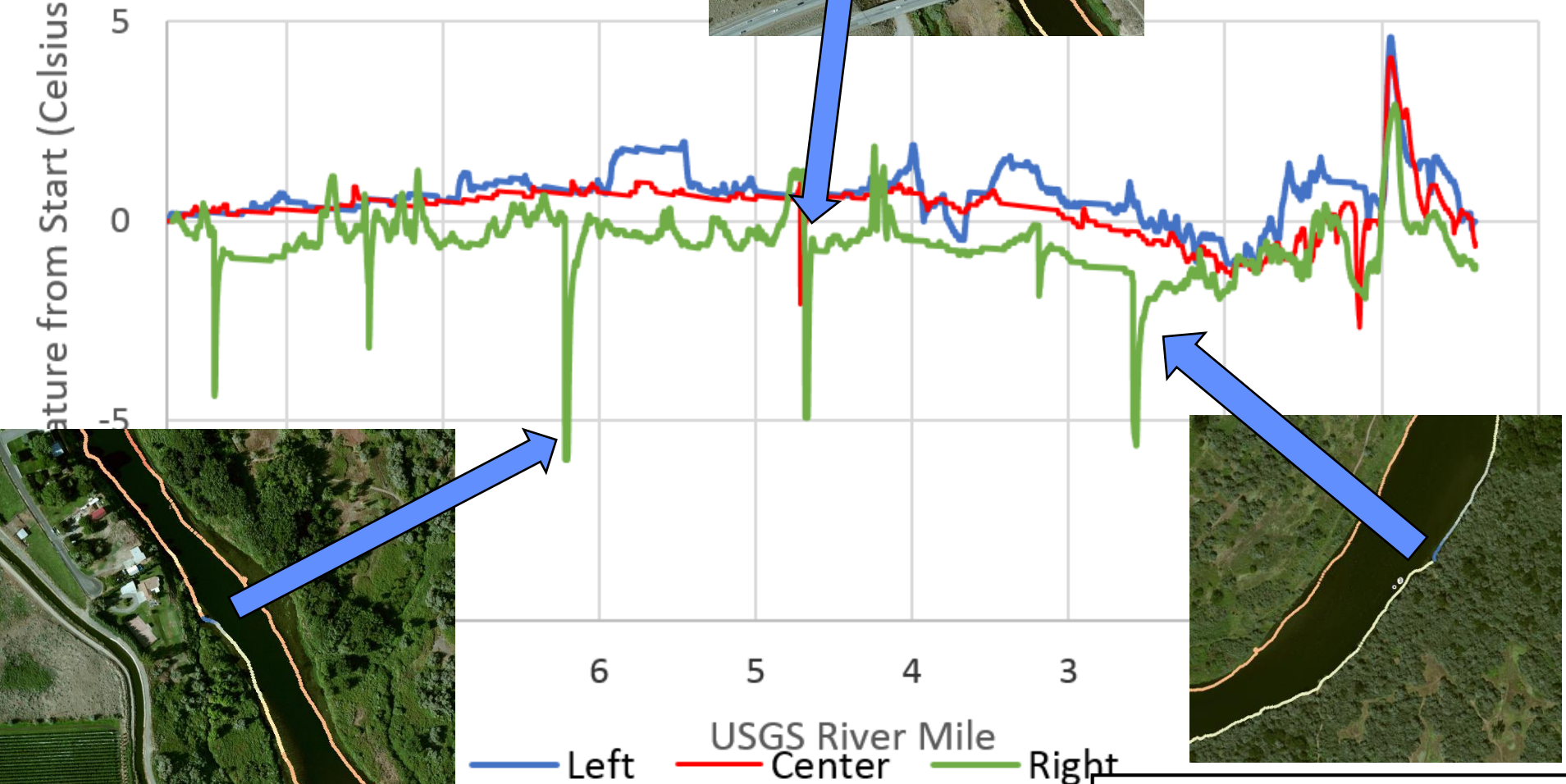
Van Giesen to Bateman Island



Preliminary Data – Subject to Revision

Confluence Rch 7/20/18

Van Giesen t land



Preliminary Data – Subject to Revision

2008 Benton Conservation District Data (Vaccaro, 2011)

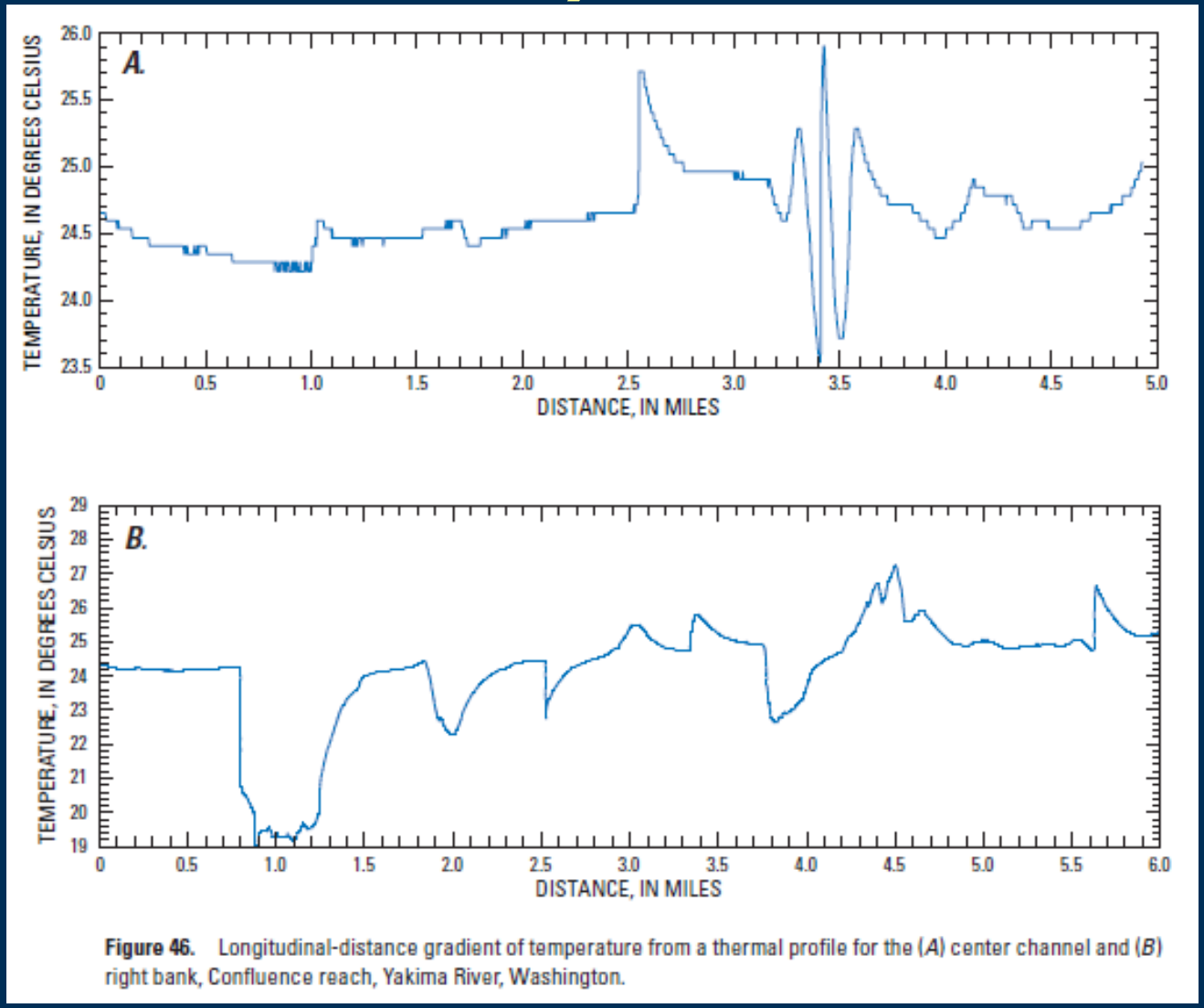


Figure 46. Longitudinal-distance gradient of temperature from a thermal profile for the (*A*) center channel and (*B*) right bank, Confluence reach, Yakima River, Washington.

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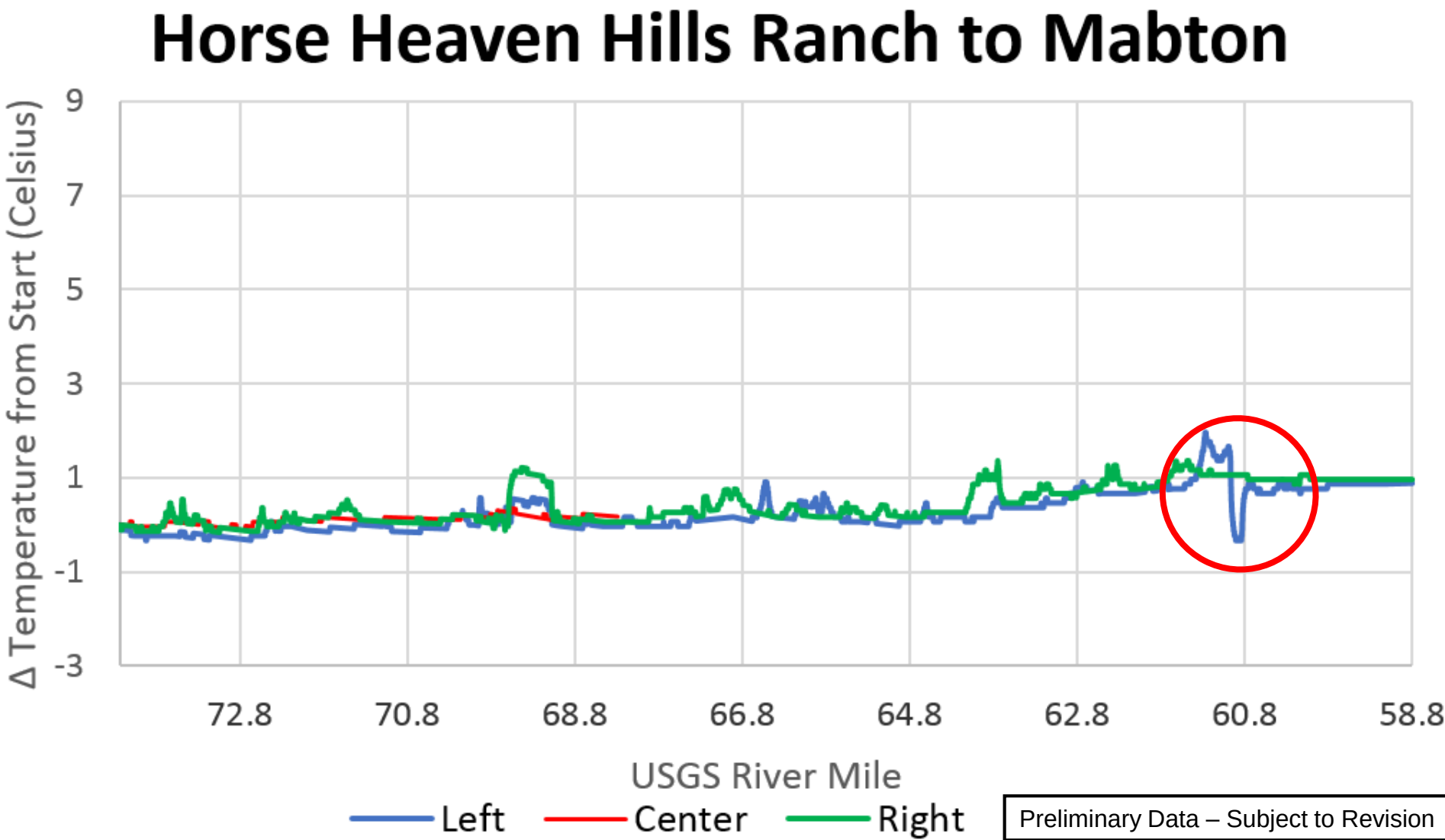
Mabton Reach: 8/17/18



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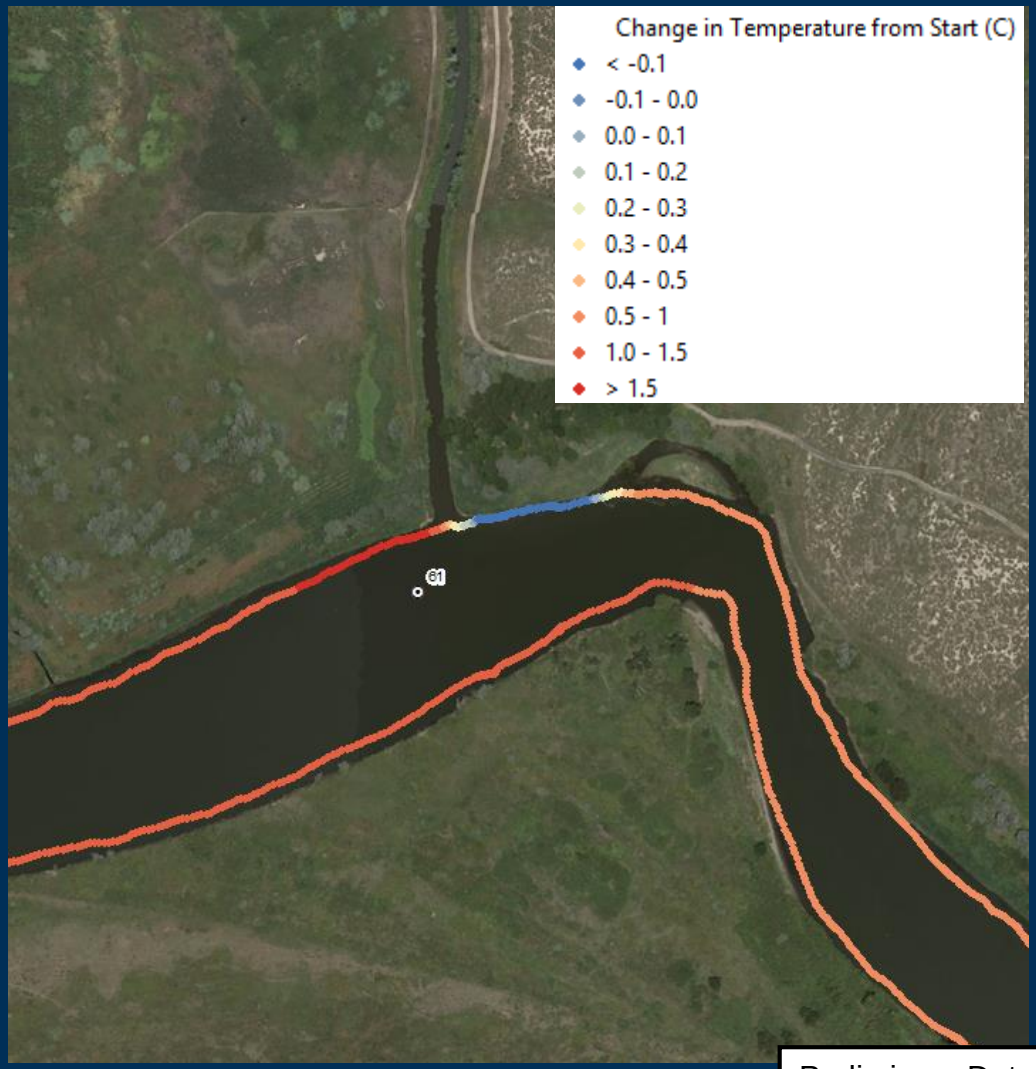
Surface-Water Return: Sulphur Creek Wasteway



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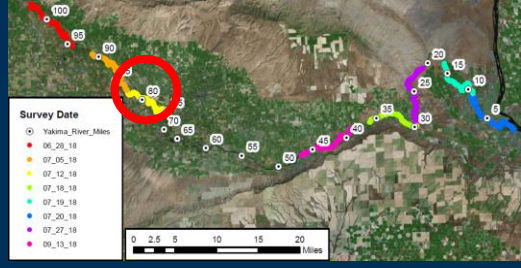
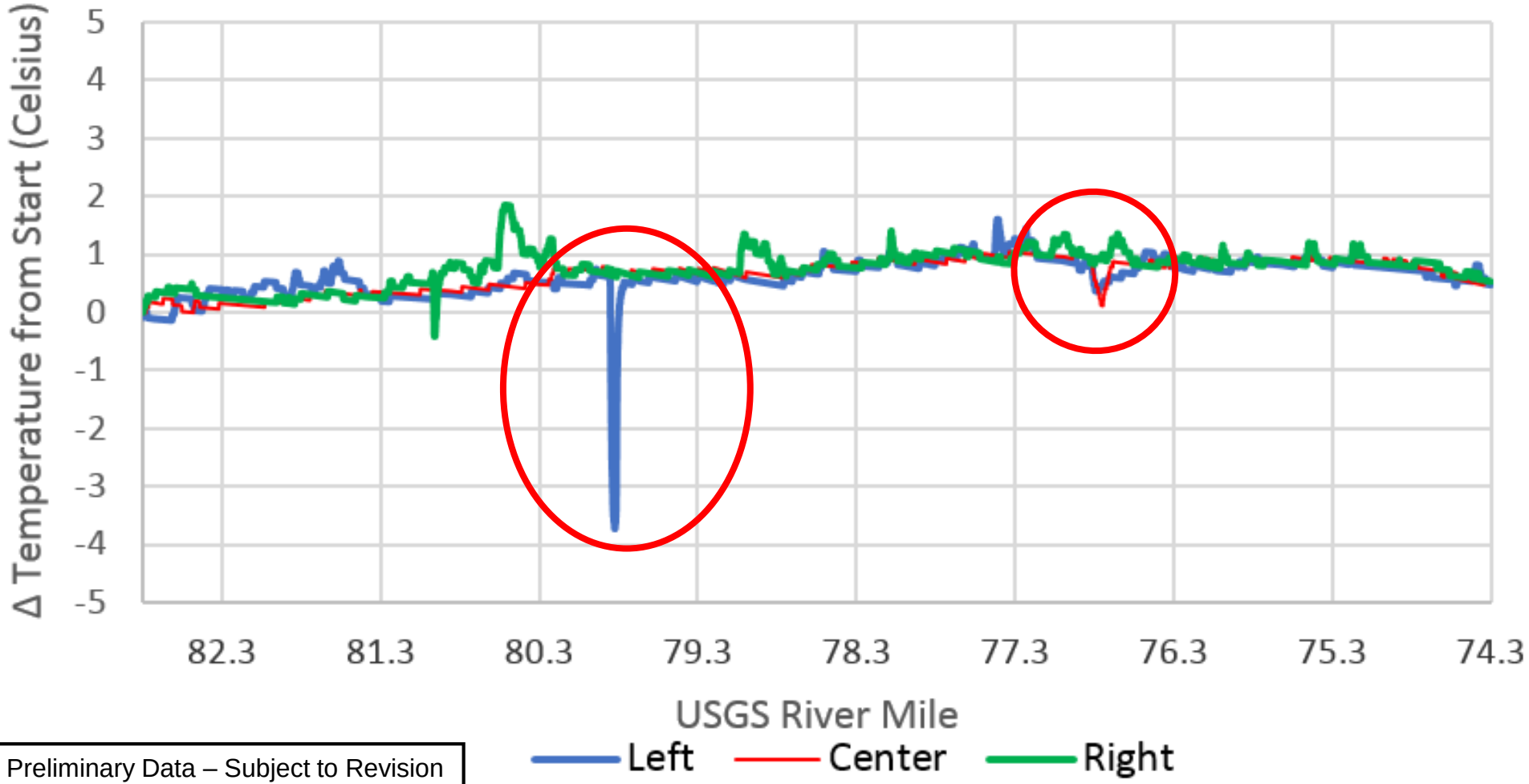
Granger Reach: 7/12/18



Granger to Horse Heaven Hills Ranch



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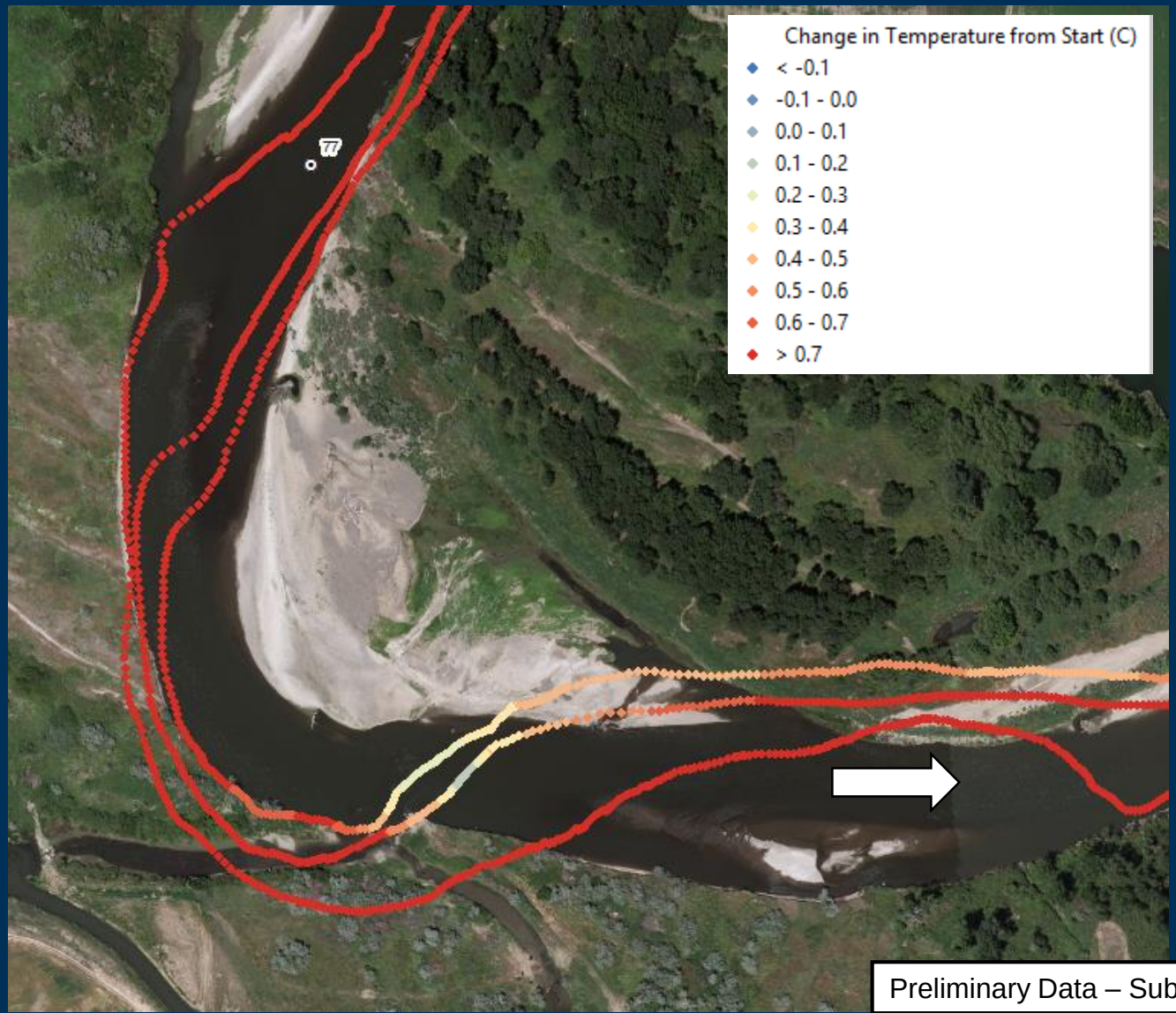
Deep Pool: Granger Reach



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Spring?: Granger Reach

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Summary and Next Steps

- Nine lower Yakima reaches profiled in 2018
  - Two to three profiles per reach (left, center, right)
  - Complements previous profiles (Vaccaro, 2011)
- 2018 thermal profiles analysis
  - Where are thermal refugia and are they stable over time?
  - Comparison to previous thermal profiles
  - Geomorphic/hydrogeologic conditions
  - Changes in river morphology/basin groundwater/surface-water system between 2018 and 2001-2008 (Vaccaro, 2011)

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Questions?

- Andy Gendaszek (agendasz@usgs.gov)

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References

- Vaccaro, J.J., and Maloy, K.J., 2006, A thermal profile method to identify potential ground-water discharge areas and preferred salmonid habitats for long river reaches: U.S. Geological Survey Scientific Investigations Report 2006-5136, 16 p.
- Vaccaro, J.J., 2011, River-aquifer exchanges in the Yakima River basin, Washington: U.S. Geological Survey Scientific Investigations Report 2011-5026, 98 p.

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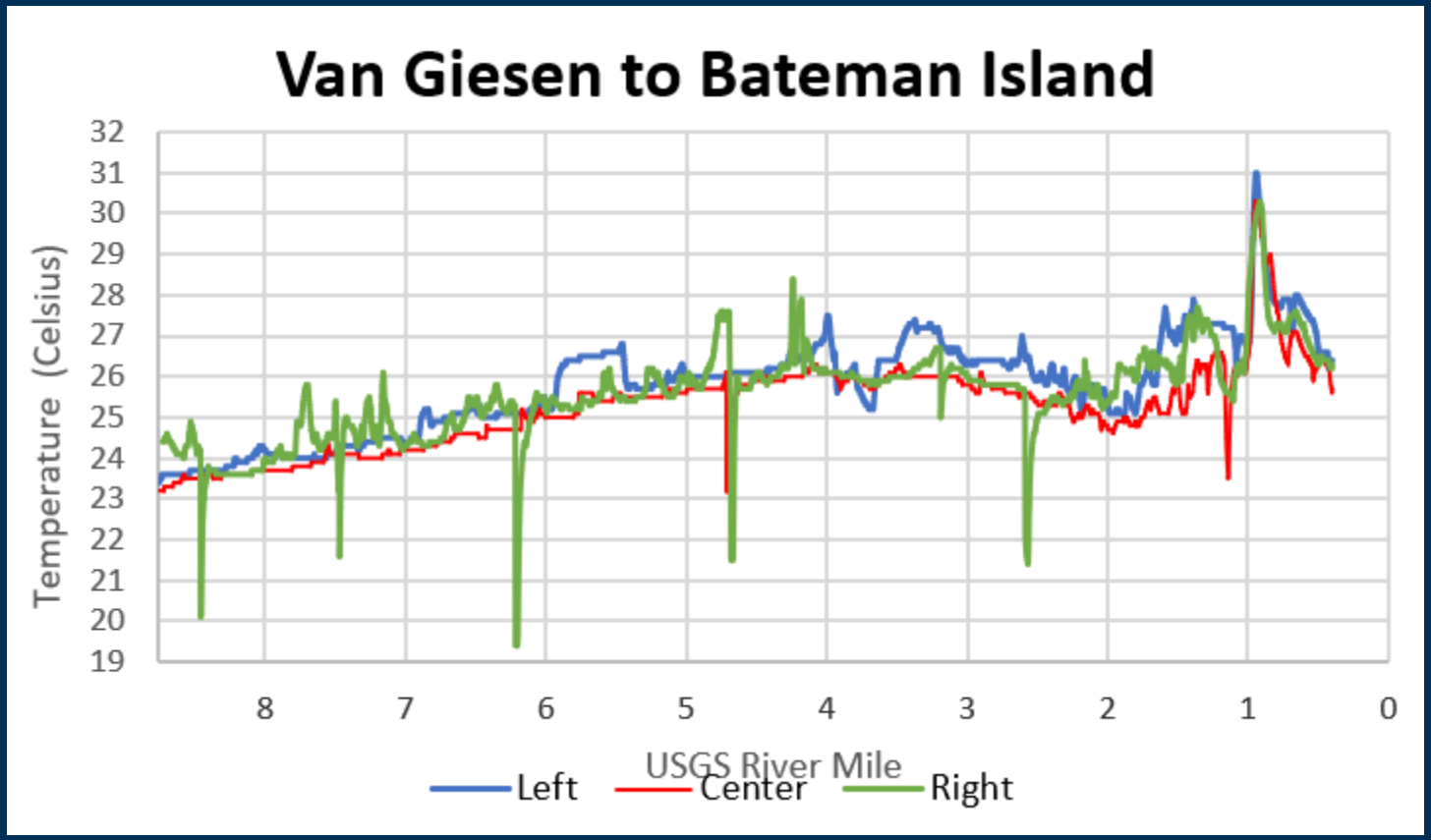
Van Giesen to Bateman Island
Temperature (Celsius)
32
31
30
29
28
27
26
25
24
23
22
21
20
19
8
7
6
5
4
3
2
1
0
USGS River Mile
Left
Center
Right

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