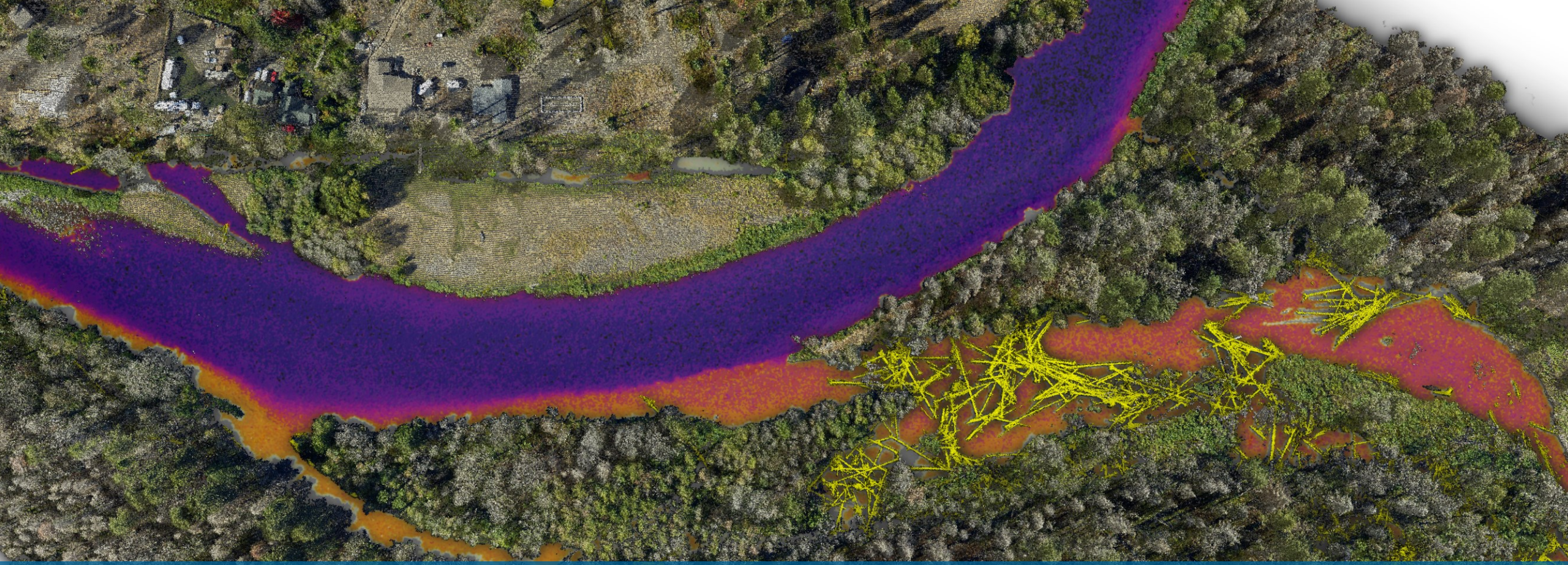


THERMAL INFRARED IMAGERY IN RIVERS

Scott Venables

NV5 GEOSPATIAL

WHY DO I CARE ABOUT TIR IMAGERY IN RIVERS?

NV5 GEOSPATIAL

- Keystone Species
- Cultural & Economical importance
- Spawning/Rearing Habitat
- Facing increasing threats

CONVENTIONAL TEMPERATURE MONITORING

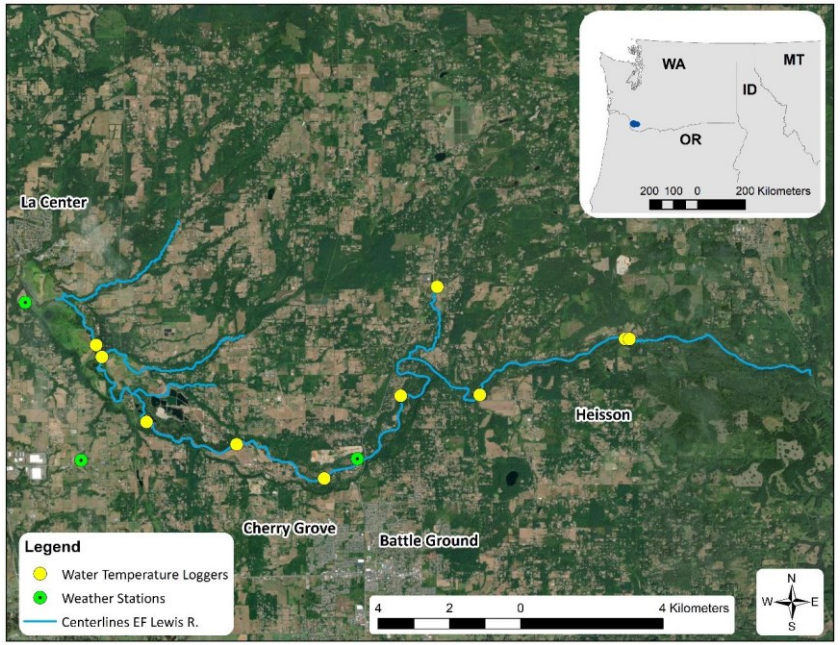
NV5 GEOSPATIAL

In Situ Measurements

- Temporal/diurnal trends
- Long term monitoring
- Discrete/lack resolution
- Deployment/Retrieval

Boat Surveys

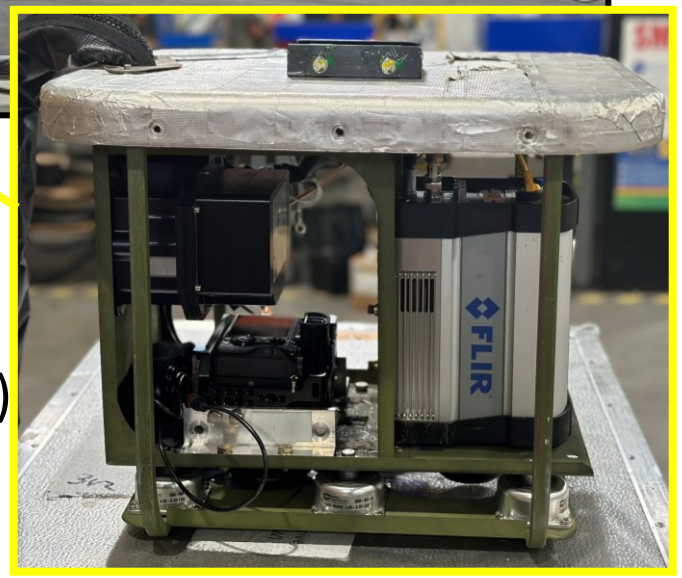
- Longitudinal profile
- Misses Significant features
- Limited to boatable rivers
- Time consuming



AIRBORNE TIR IMAGERY

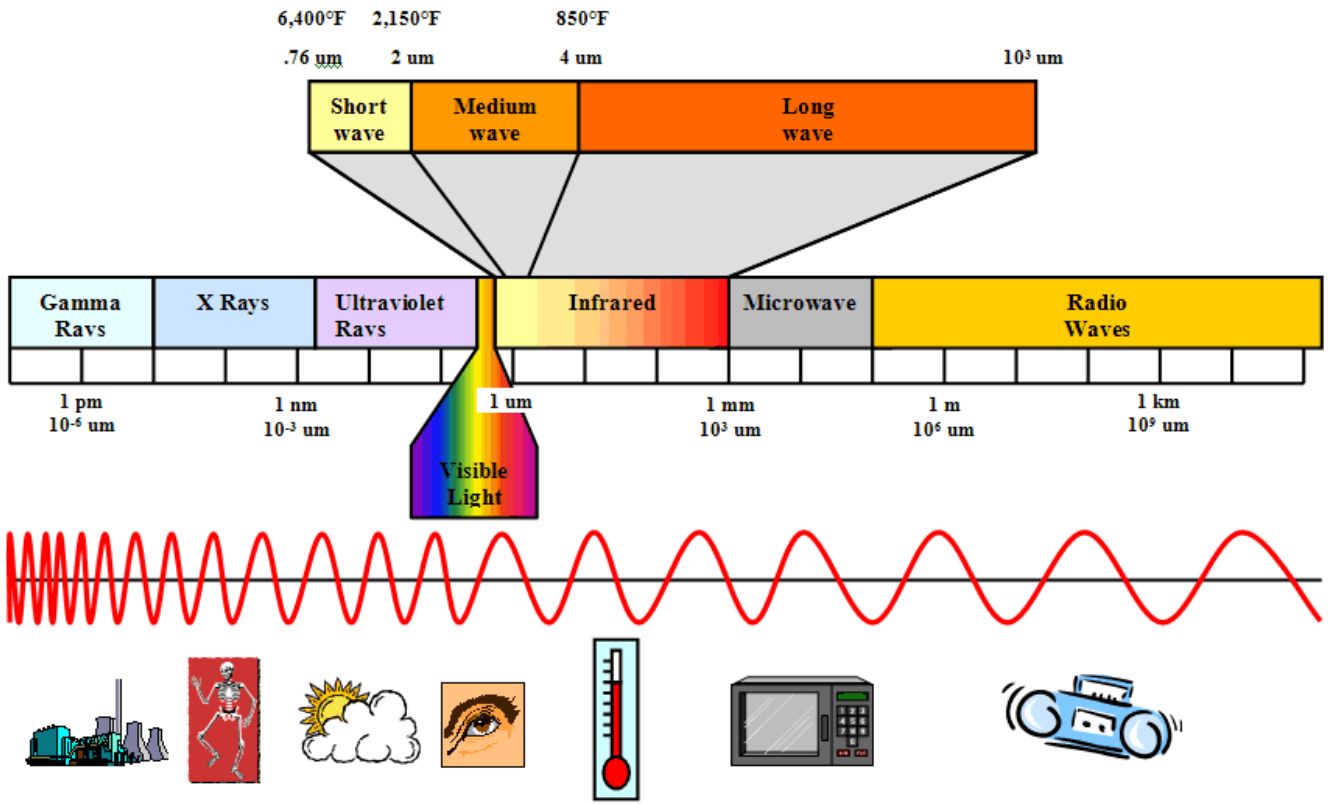
NV5 GEOSPATIAL

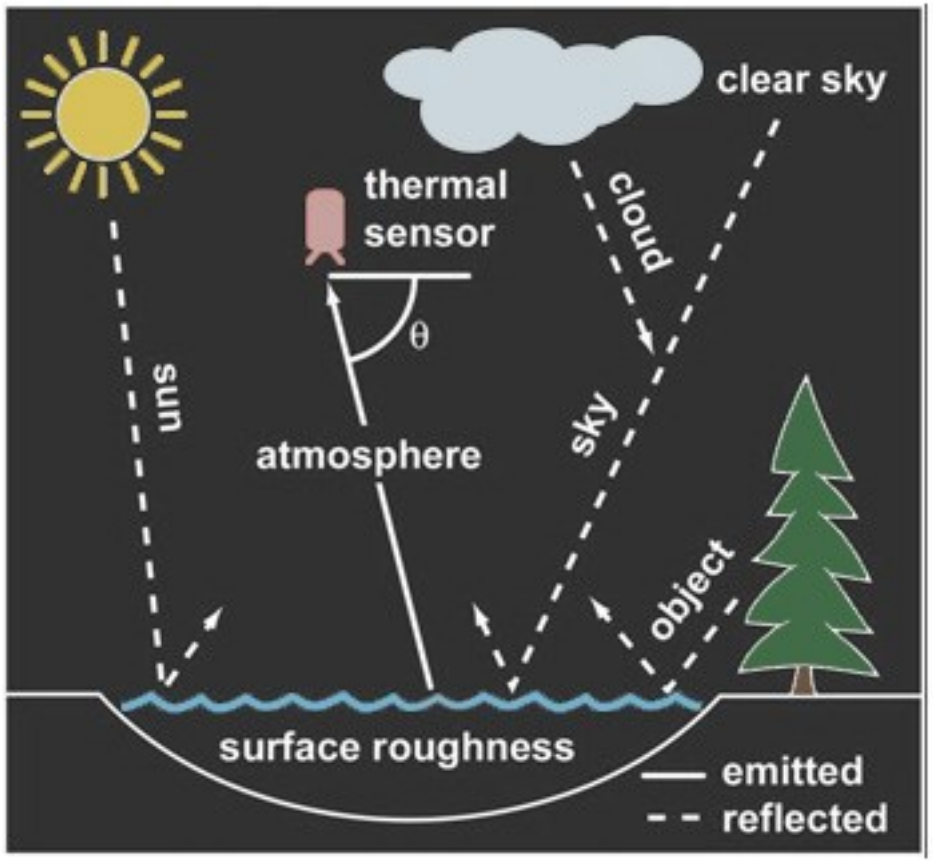
Wavelength:	8-9.2µm
Measured:	Emitted surface Radiation
Spatial Resolution:	0.3 to 1.0 meters
Thermal Sensitivity:	<0.1°C
Thermal Accuracy:	±0.5°C



- FLIR LWIR (cooled) Camera
- Co-Acquired RGB Imagery
- Inertial Measurement Unit (IMU)

THERMAL INFRARED TECHNOLOGY





TIR FEATURES

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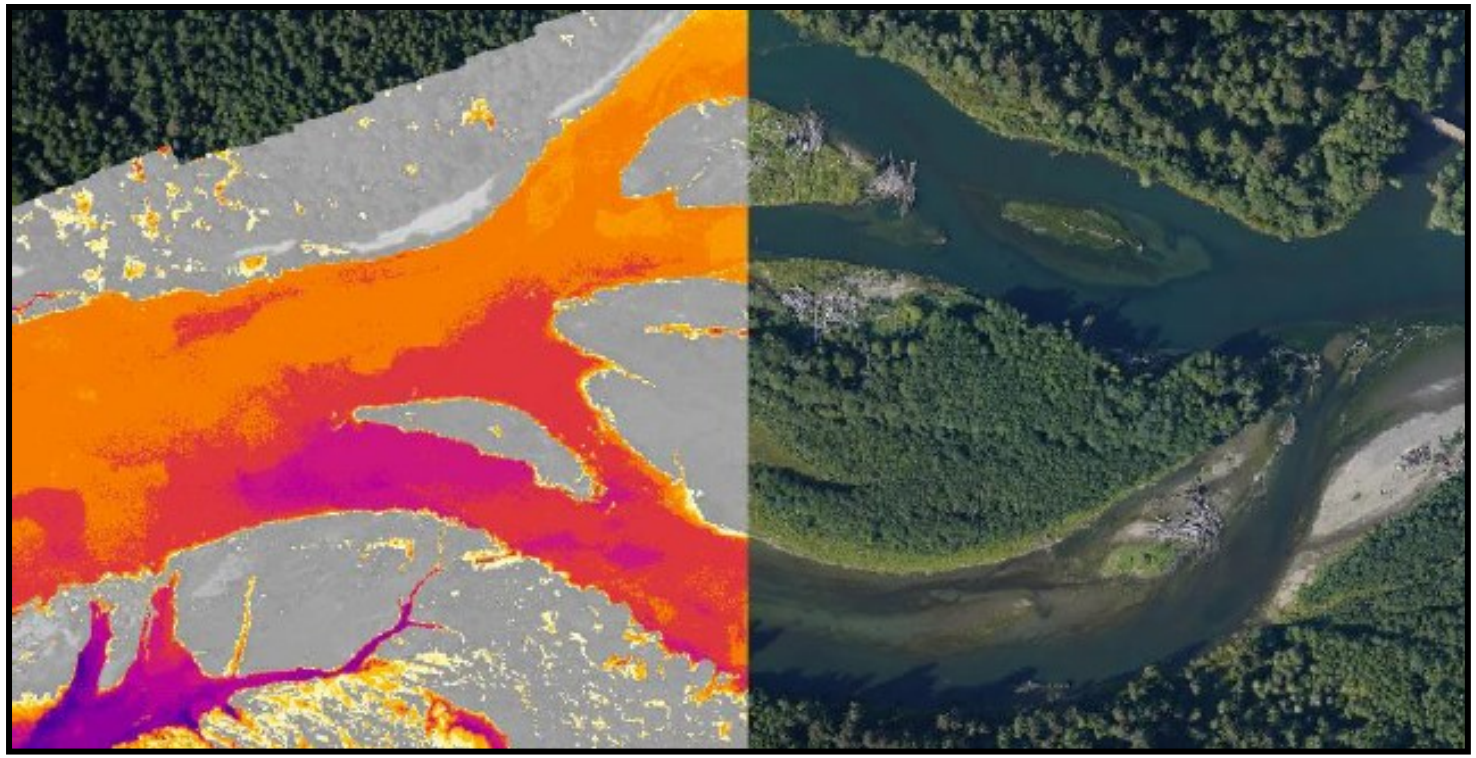
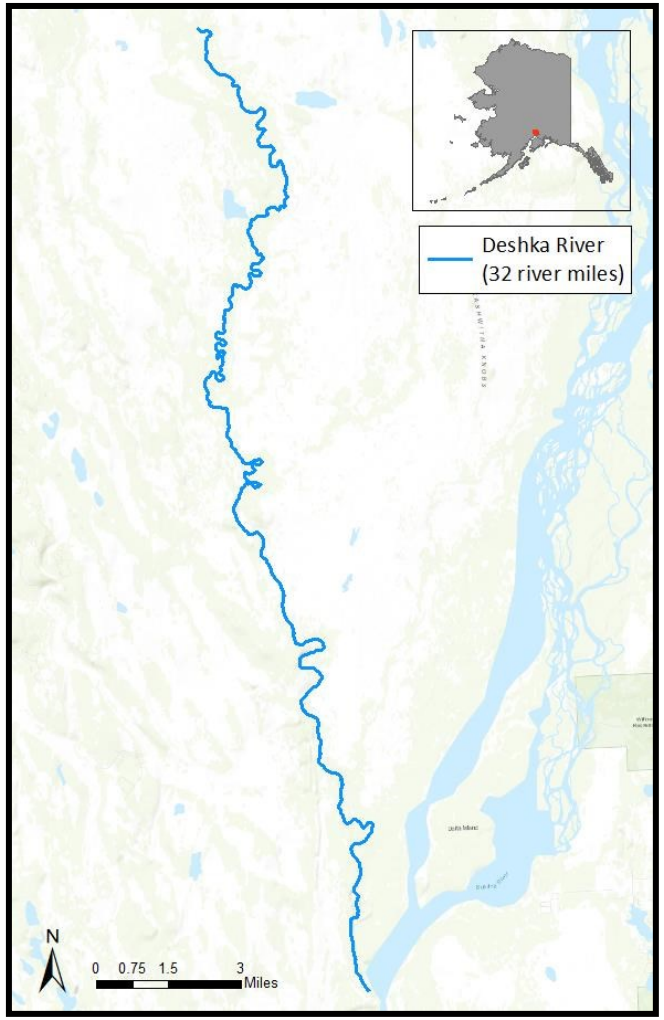
- Measure Surface Water Temperatures over large extent
- Longitudinal profile
- Stream Temperature Gradient
- Significant Features
  - Seeps/springs
  - Hyporheic flow
  - Groundwater infiltration
- Cold-water refugia
- Point source pollution
- Tributaries
- TMDL



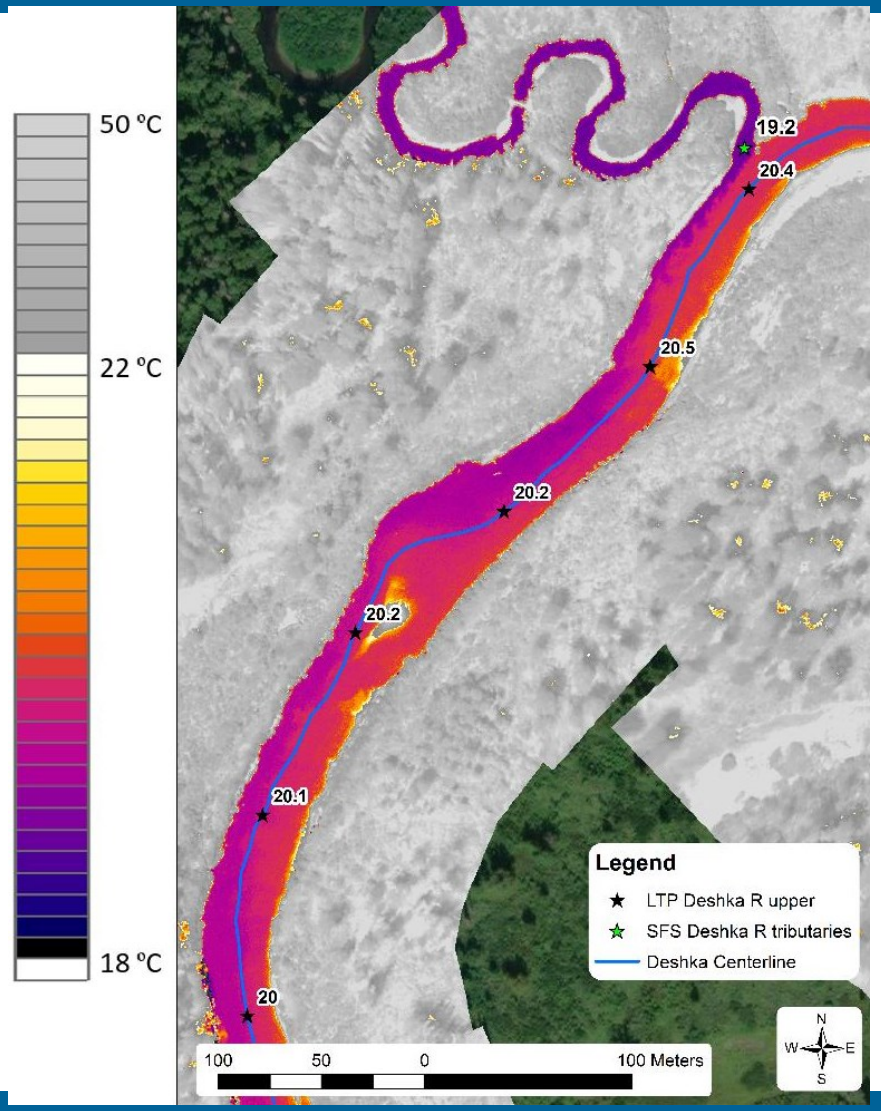
DESHKA RIVER TIR

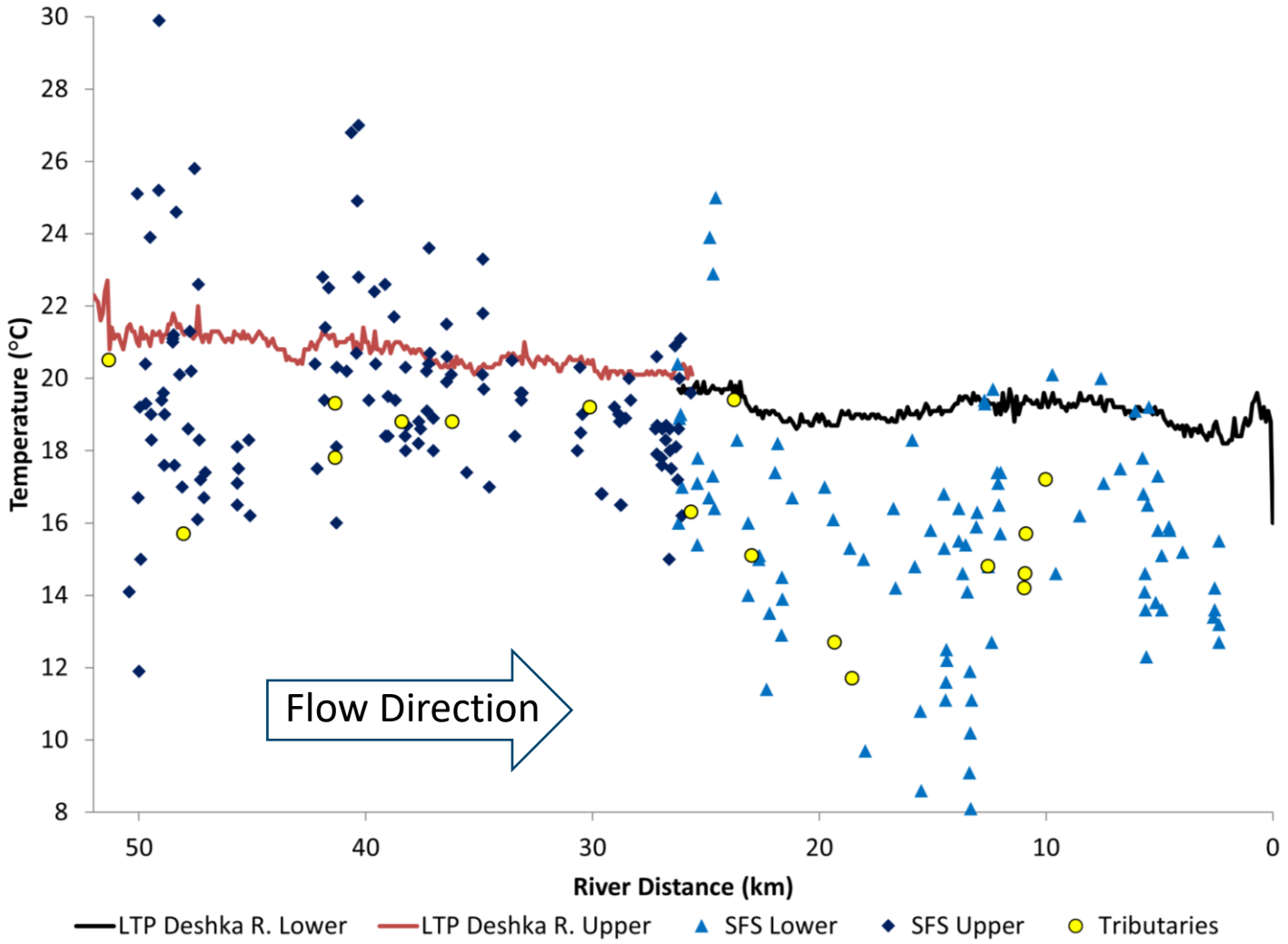
NV5 GEOSPATIAL

- ~32 River Miles
- Acquired July 4, 2020
- Susitna upstream to Moose Creek
- Premier Sport fishing River in AK
- Difficult to access (roadless)



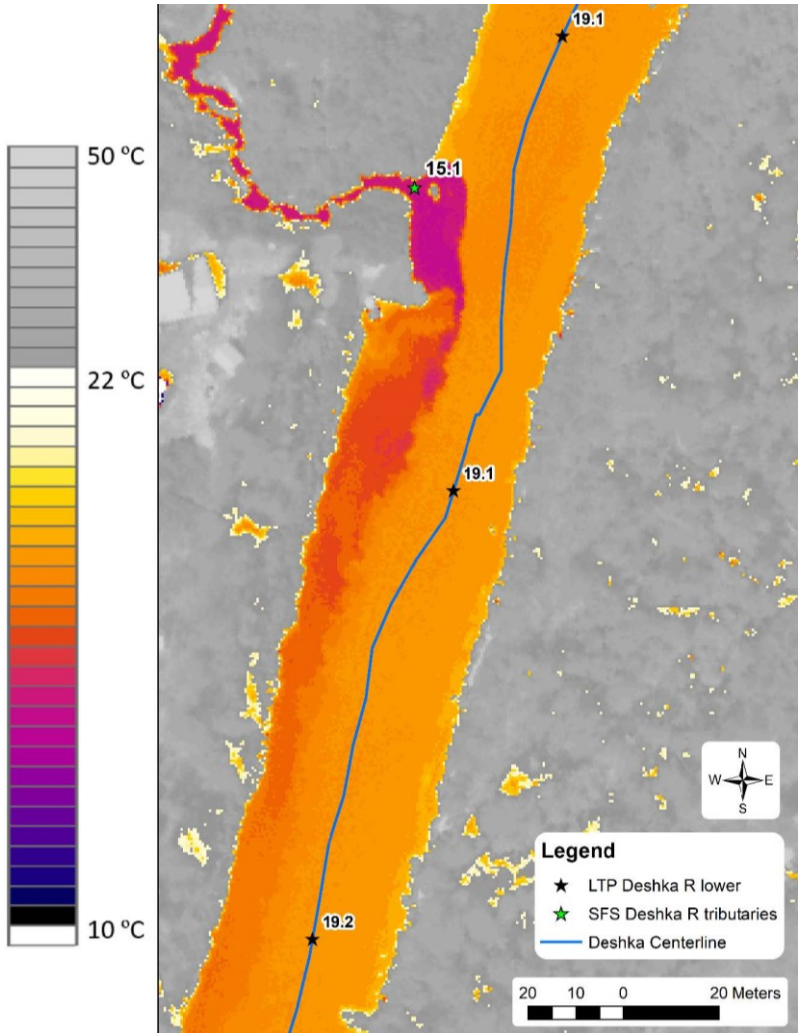
DESHKA RIVER RESULTS

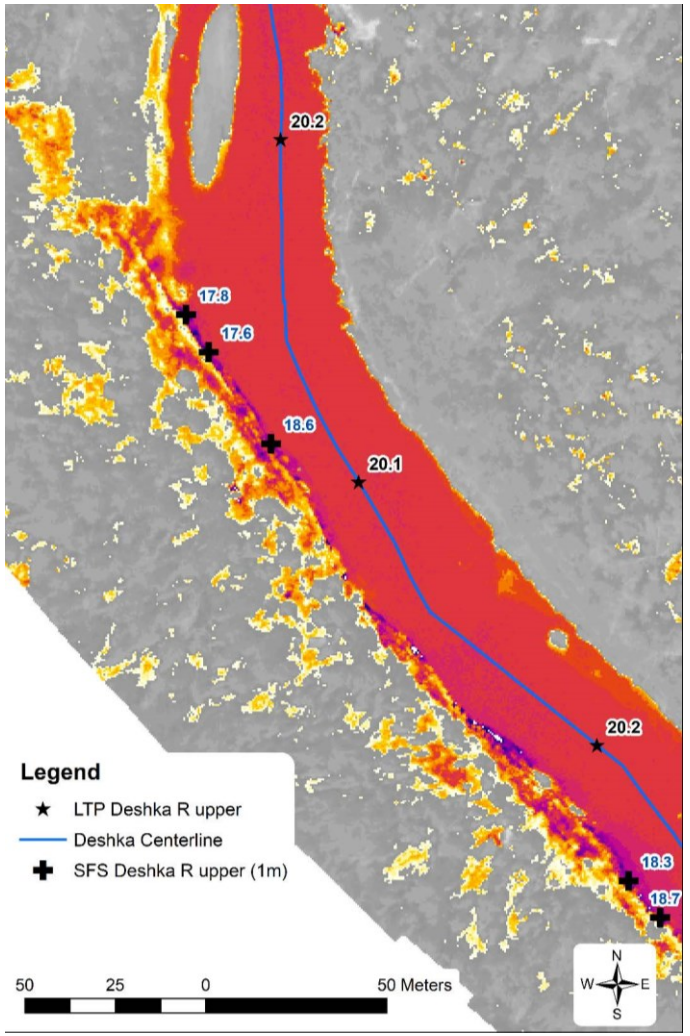


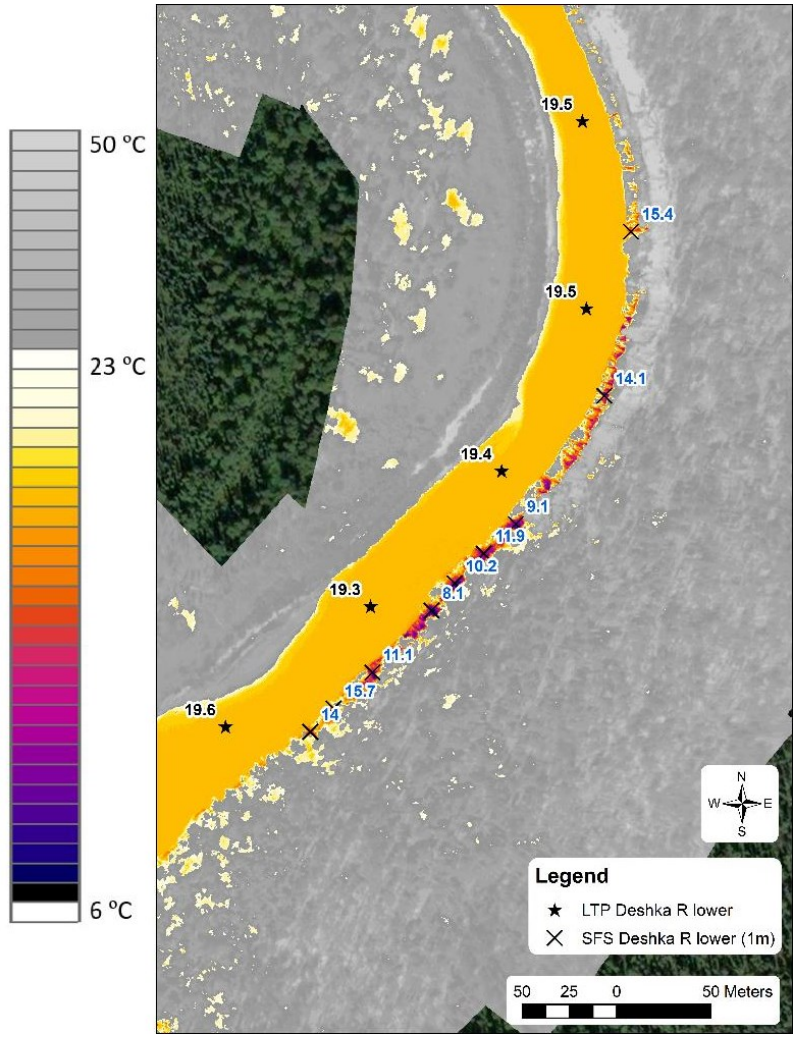


DESHKA RIVER

NV5 GEOSPATIAL

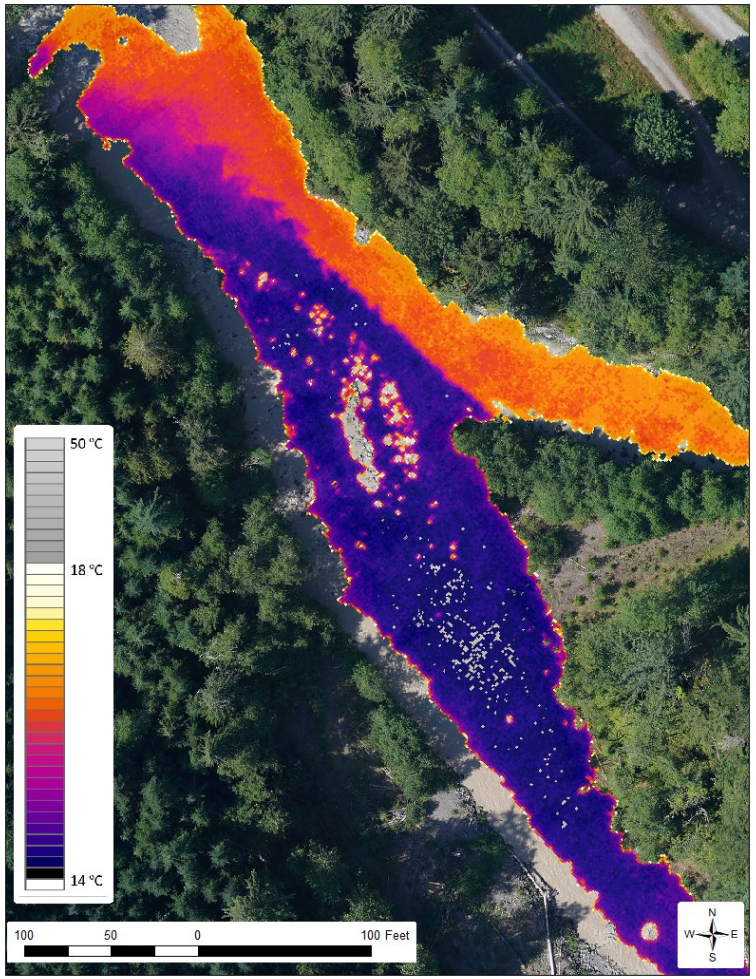






INFORM DECISION MAKING/RESTORATION

NV5 GEOSPATIAL



- Target cold water inputs for enhancement
  - Log jams to slow and pool cold water
  - Prioritize reconnection of cold-water wetlands and tributaries where disconnection has occurred
- Riparian plantings to increase shading
- Enhance spawning and/or rearing habitat
- Floodplain reconnection and enhancement of groundwater/surface-water exchange
- Increased protections to prevent future degradation

OTHER TIR APPLICATIONS

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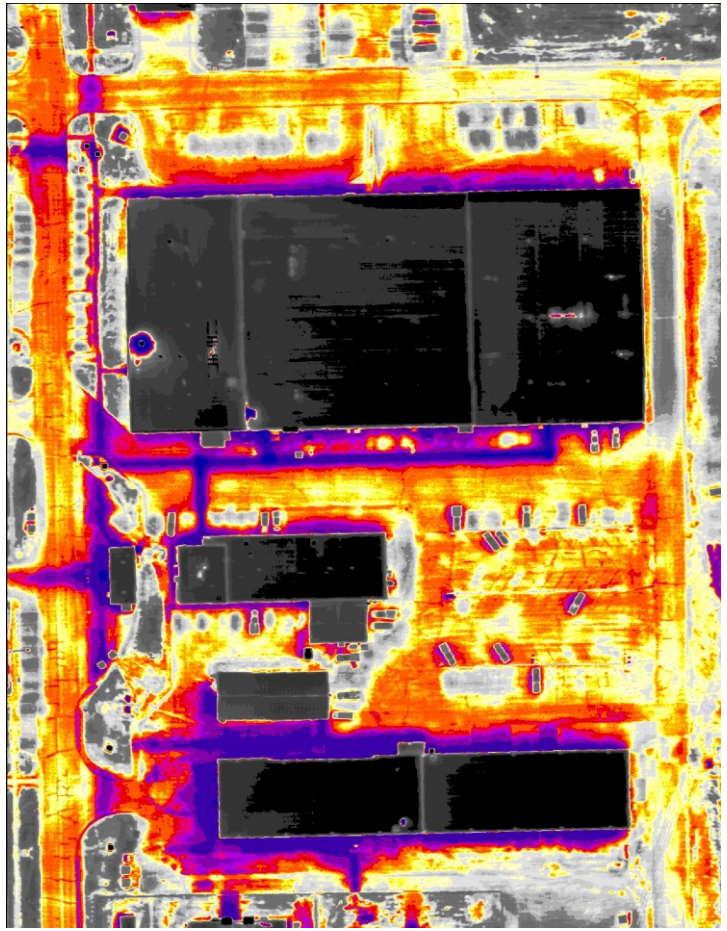
Heat Loss/Energy Efficiency

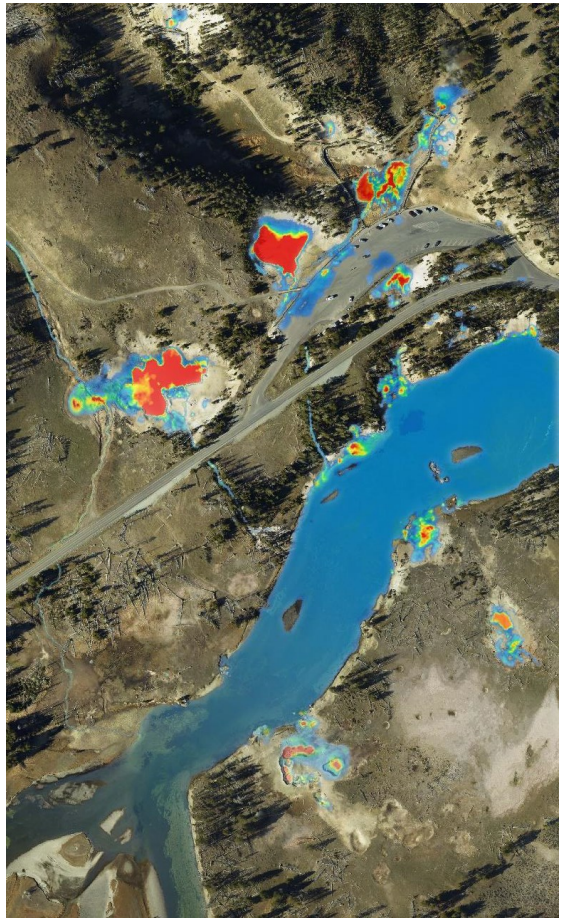
Geothermal Exploration

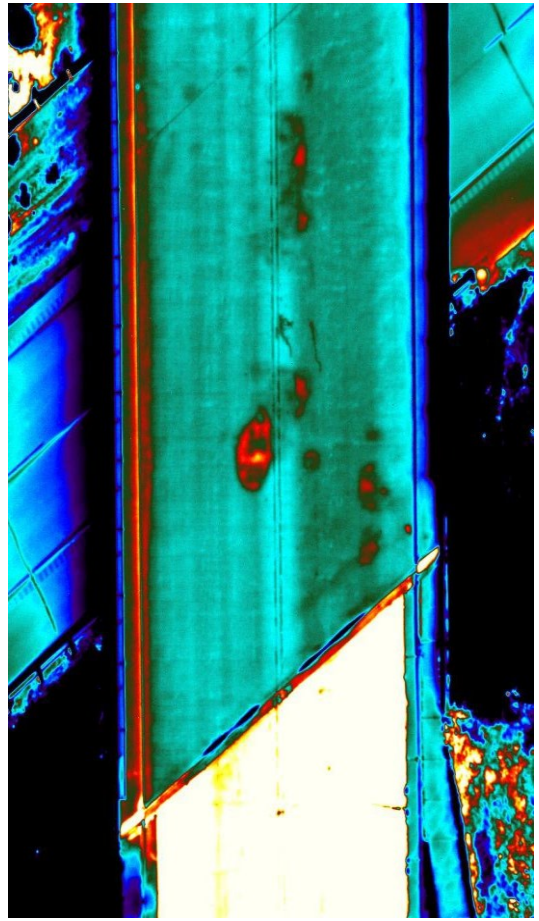
Bridge Inspection

Pipeline Inspection

Fire Mapping








NV5 GEOSPATIAL
Scott.Venables@nv5.com
Species Group | Fir
Height | 36.63 m
Crown Diameter | 11.32 m
DBH | 0.85 m
Condition | Healthy
Depth | 0.32 m
Temperature | 14.7°C
Geomorphic Class | Riffle
Solar Exposure | High
Degrees Celsius
13.5
14.0
14.5
15.0
15.5
16.0
16.5
17.0
17.5
18.0
Orthometric Ht (m)
1109
1108
1107
1106
1105
1104
0
10
20
30
40
50
60
Distance along cross section (m)
Water Column
Ground
Water Surface
Bathymetry