

NorWeST Stream Temperature Datasets for the Lower Columbia River Area

Dan Isaak, Seth Wenger¹, Erin Peterson², Jay Ver Hoef³ Charlie Luce, Steve Hostetler⁴, Jason Dunham⁴, Jeff Kershner⁴, Brett Roper, Dave Nagel, Dona Horan, Gwynne Chandler, Sharon Parkes, Sherry Wollrab, Colete Bresheares, Neal Bernklau

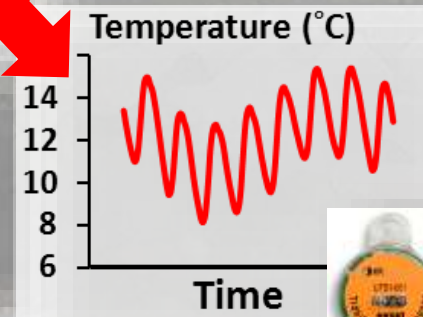
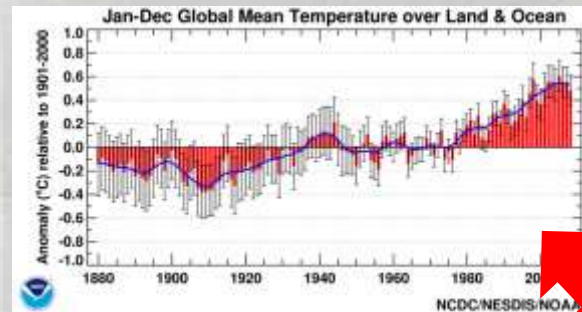
U.S. Forest Service

¹Trout Unlimited

²CSIRO

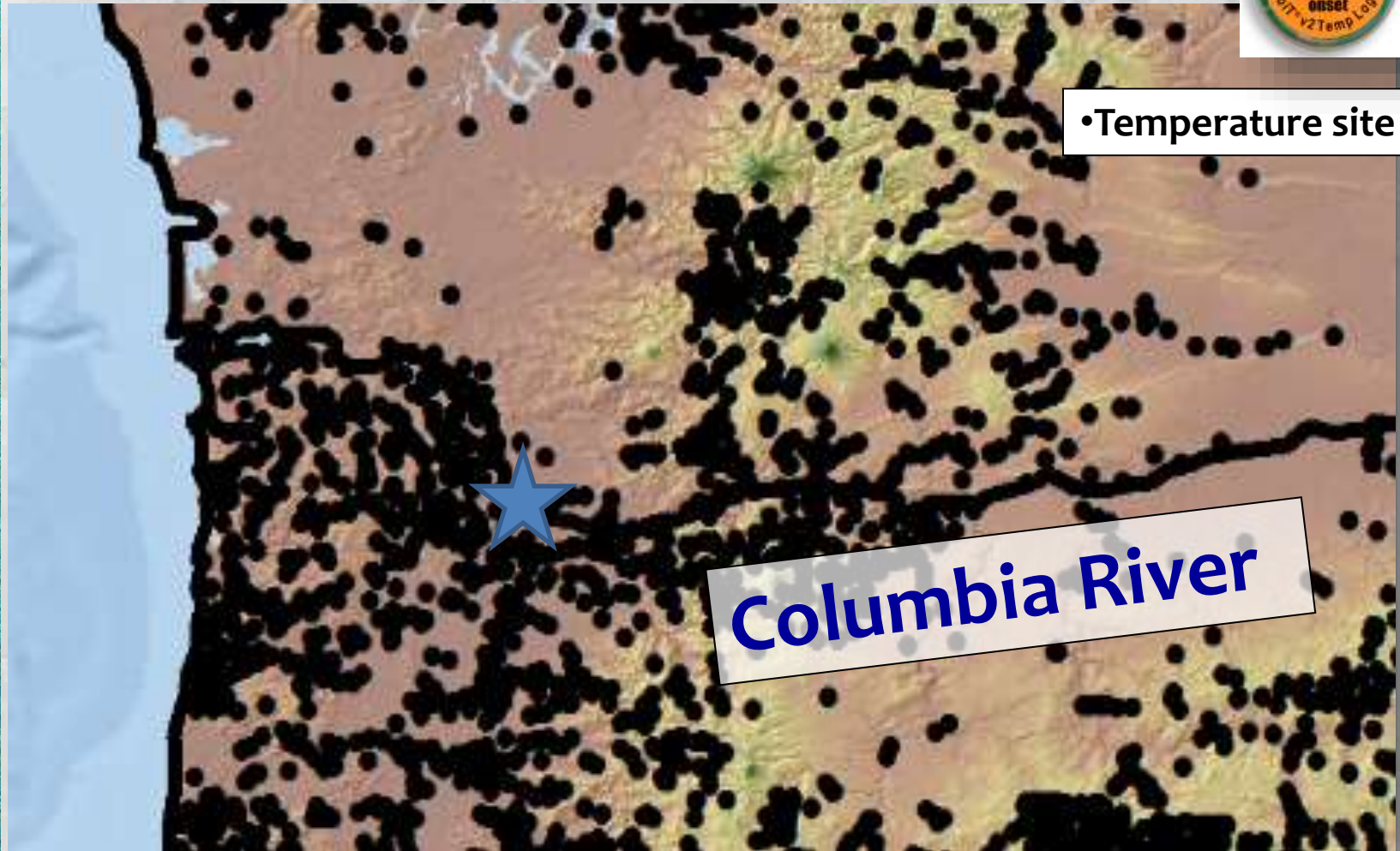
³NOAA

⁴USGS



Funding agencies:

Sites with Temperature Data in the Lower Columbia Area (1993-2013)



•Temperature site

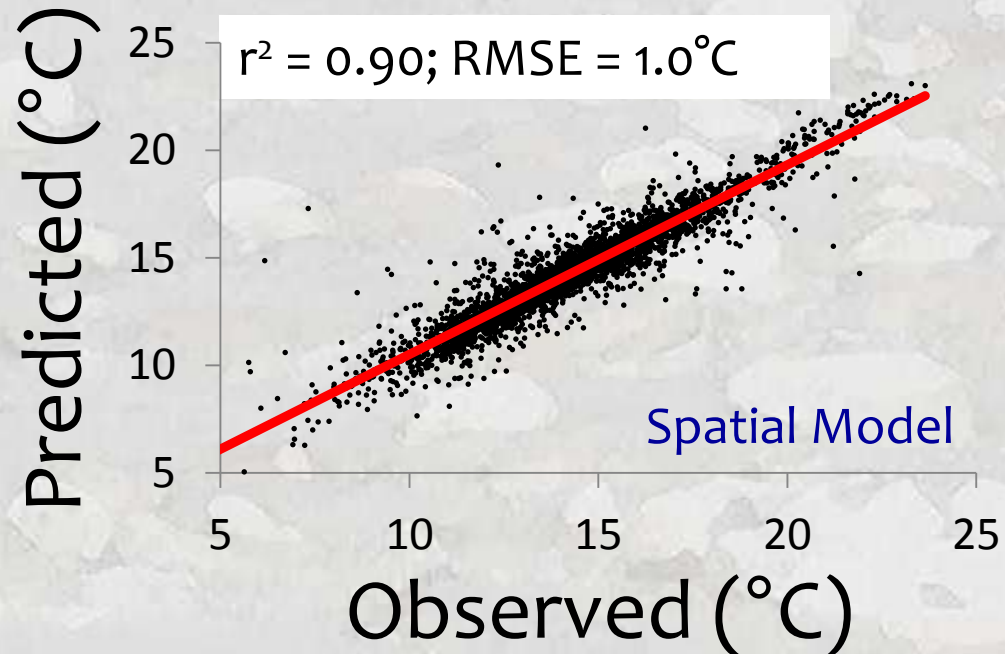
Columbia River

Stream Temperature Model

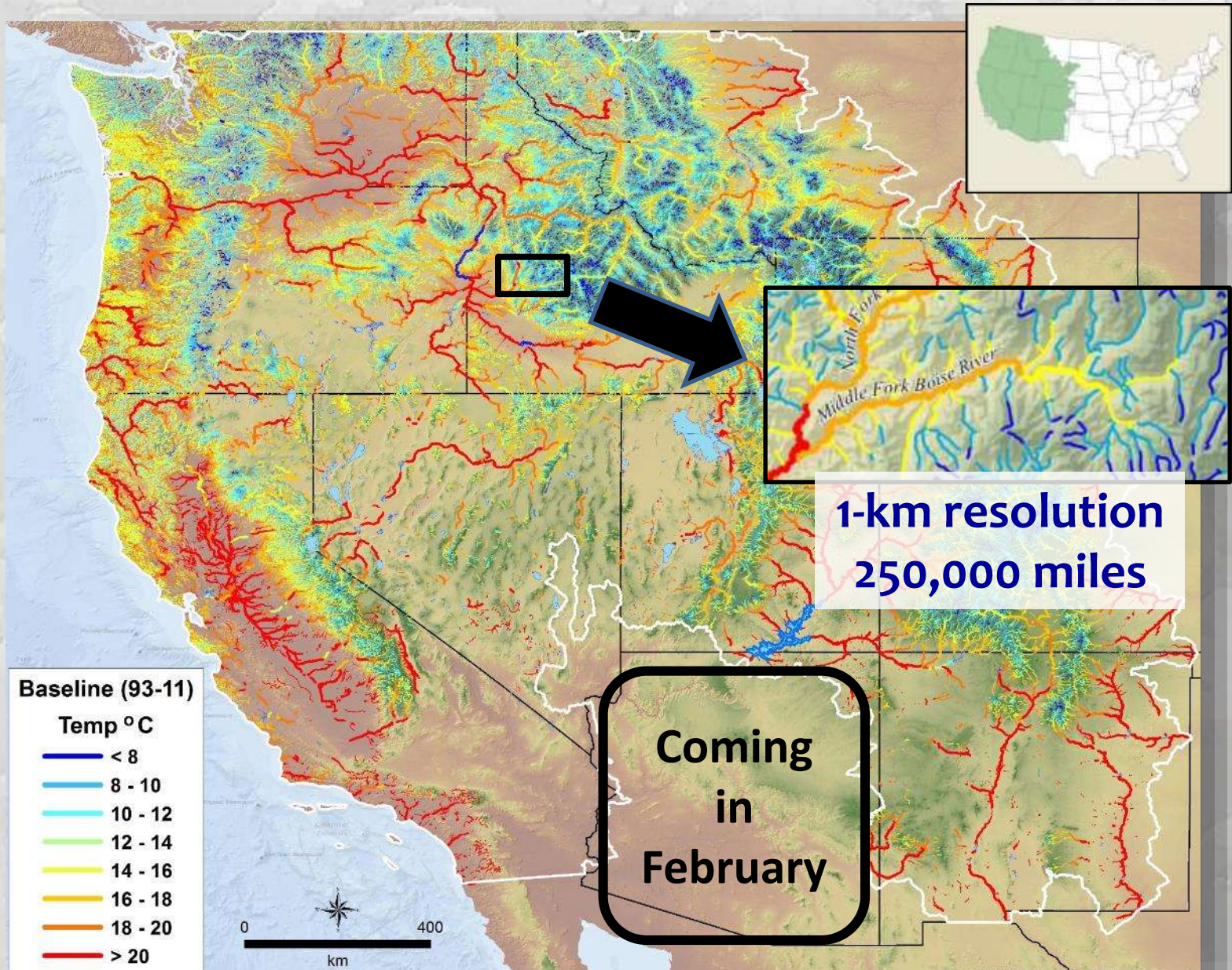
Covariate Predictors

1. Elevation (m)
2. Canopy (%)
3. Stream slope (%)
4. Ave Precipitation (mm)
5. Latitude (km)
6. Lakes upstream (%)
7. Glaciers upstream (%)
8. Baseflow Index
9. Watershed size (km²)
10. Discharge (m³/s)
USGS gage data
11. Air Temperature (°C)
RegCM3 NCEP reanalysis
Hostetler et al. 2011

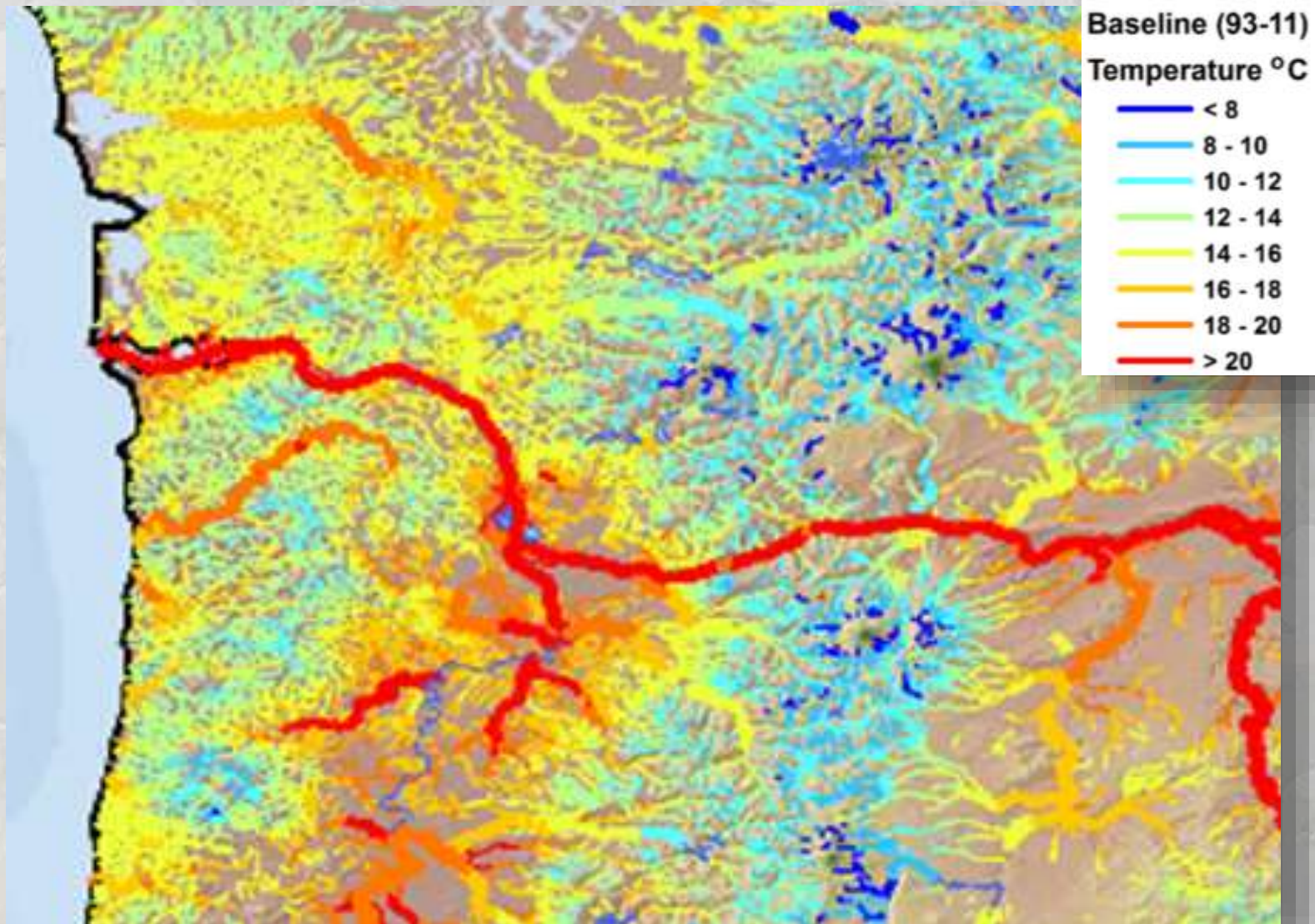
Mean August Temperature



High-Resolution Stream Climate Scenarios



Mean August Stream Temperature Scenario for Lower Columbia Area (1993-2011)

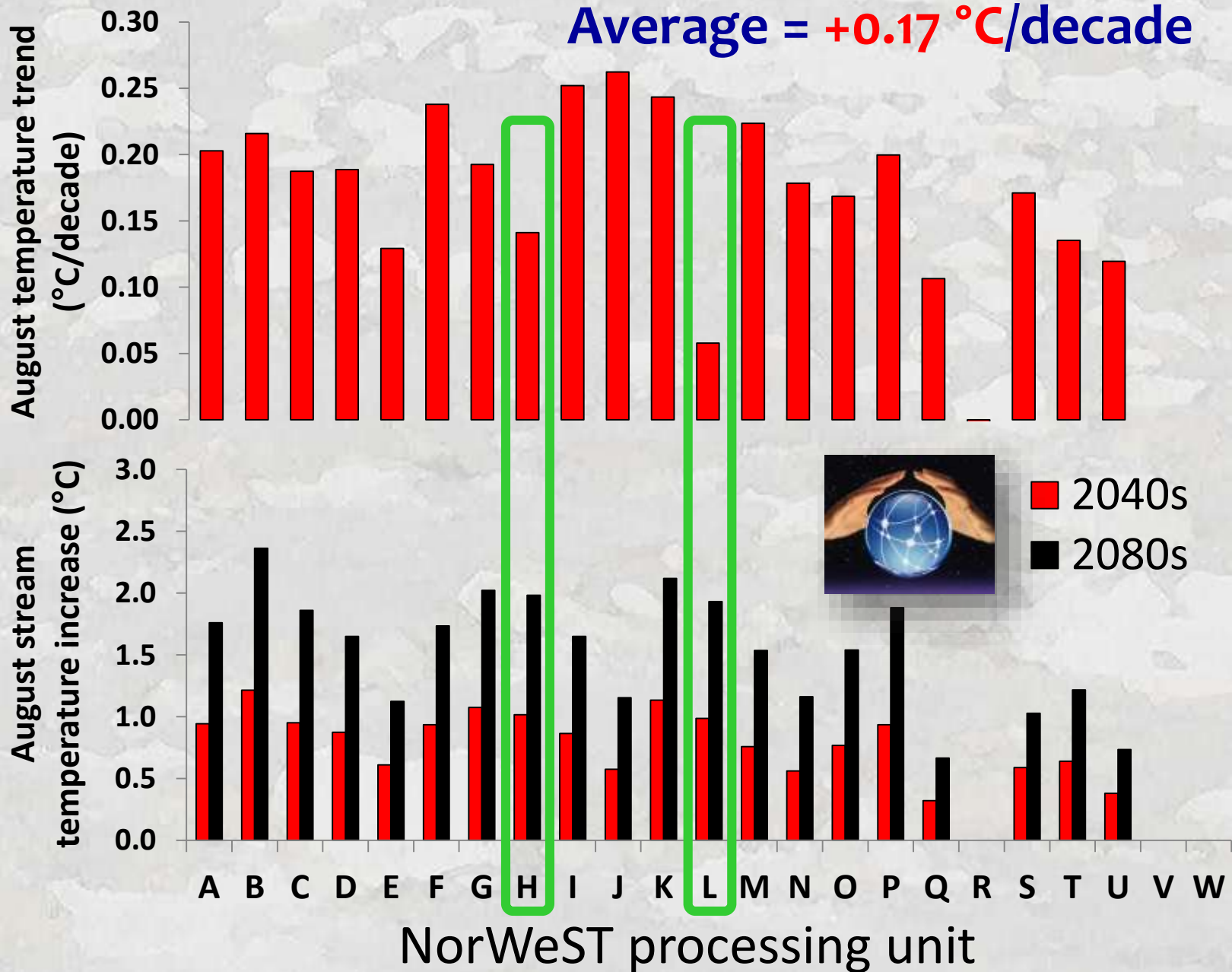


36 NorWeST Climate Scenarios

Scenario	Description
S1_93_11	Historical scenario representing 19 year average August mean stream temperatures for 1993-2011
S2_02_11	Historical scenario representing 10 year average August mean stream temperatures for 2002-2011
S3_1993	Historical scenario representing August mean stream temperatures for 1993
S4_1994	Historical scenario representing August mean stream temperatures for 1994
Etc...	
S23-33	10 Future scenarios...

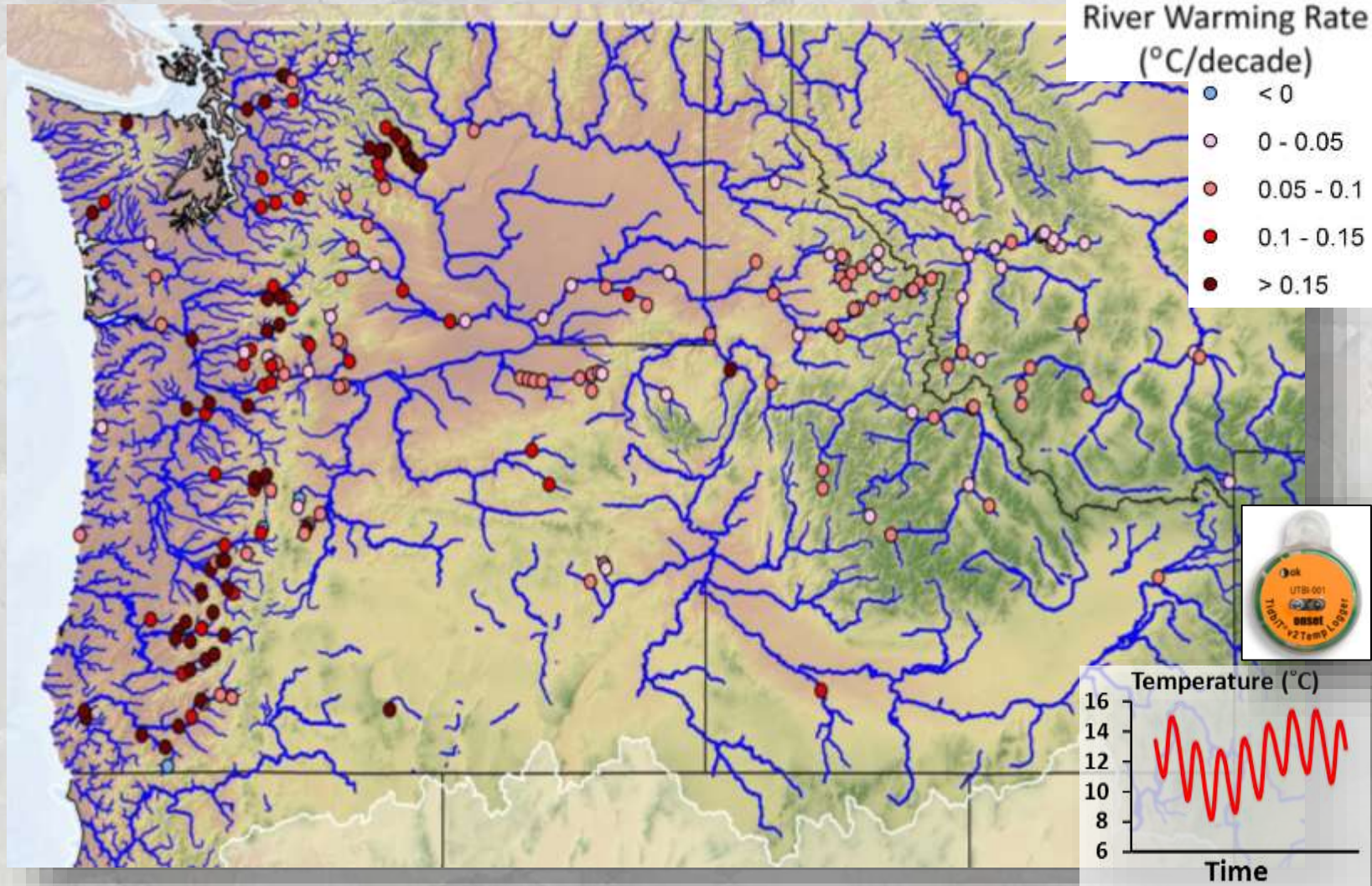
***Extensive metadata on website**

Scenario Trend Reconstructions (1976-2015)



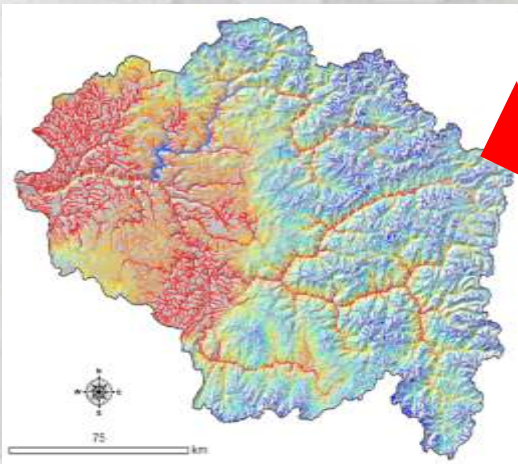
Variation in River Temp Trends (1968-2011)

245 sites with >10 year monitoring records

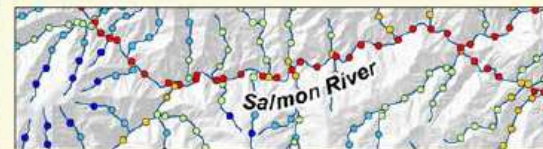


Website Distributes Temperature Data & Scenarios for Convenient Use

1) GIS shapefiles of stream temperature scenarios

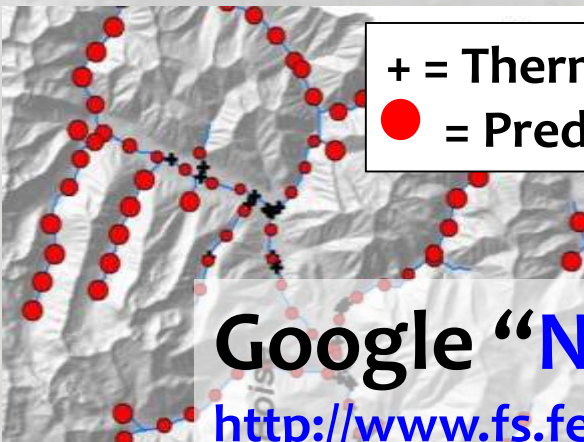


NorWeST
Stream Temp



Regional Database and Modeled Stream Temperatures

2) GIS shapefiles of stream temperature model prediction precision



+ = Thermograph
● = Prediction SE

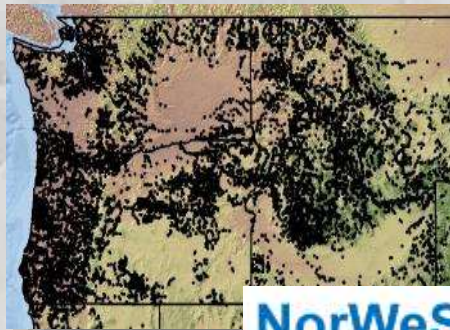
3) Temperature data summaries



Google “**NorWeST**” or go here...

<http://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.shtml>

Database & Scenarios Create Synergies



NorWeST
Stream Temp

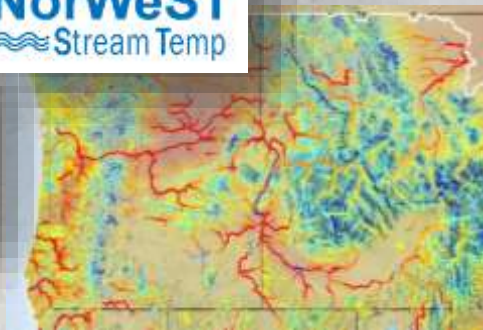
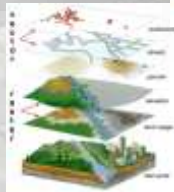
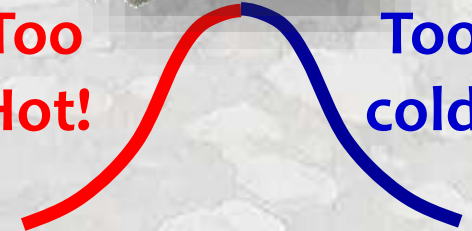


Regulatory temperature standards

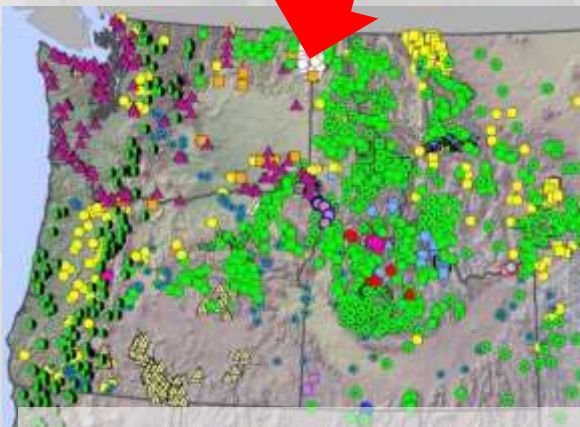


Too Hot!

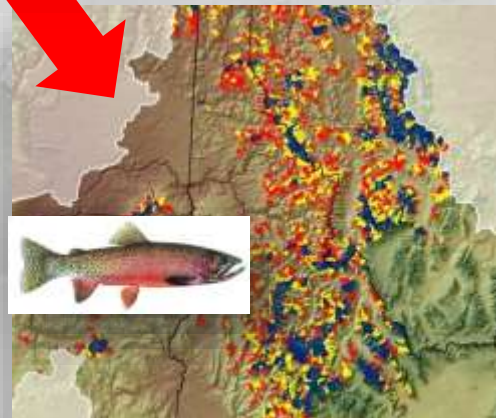
Too cold!



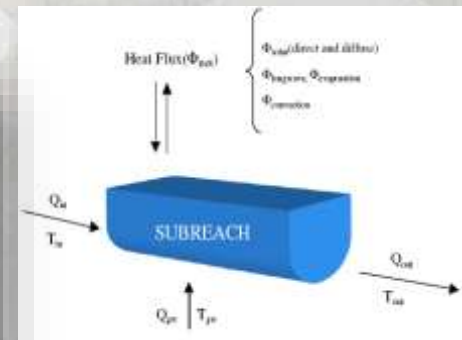
Data access accelerates temperature research



Coordinated Interagency monitoring

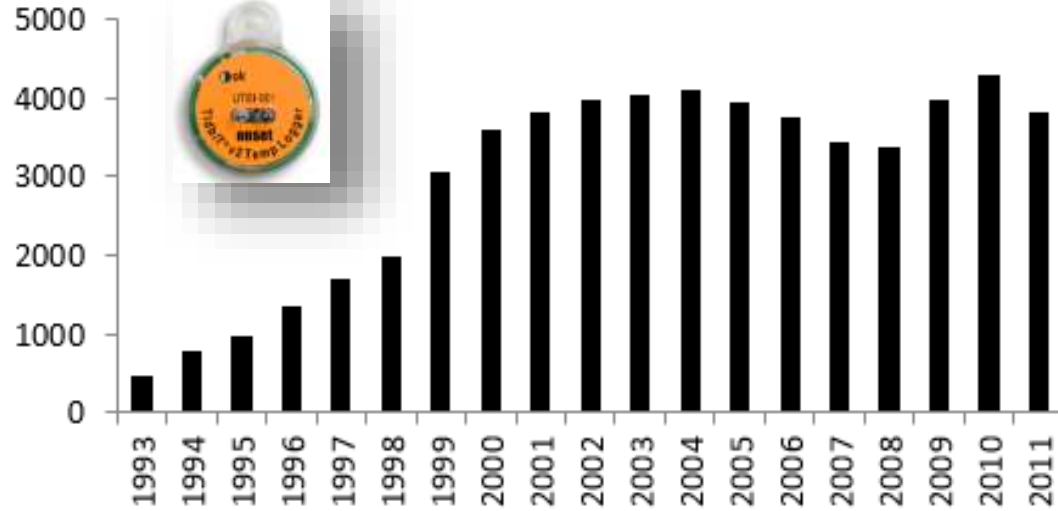


Species distribution models & climate assessments

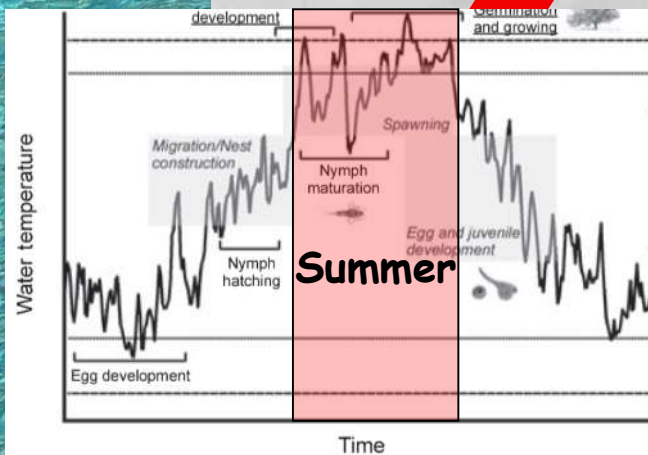


Database Identifies Data Gaps, Many Sites...

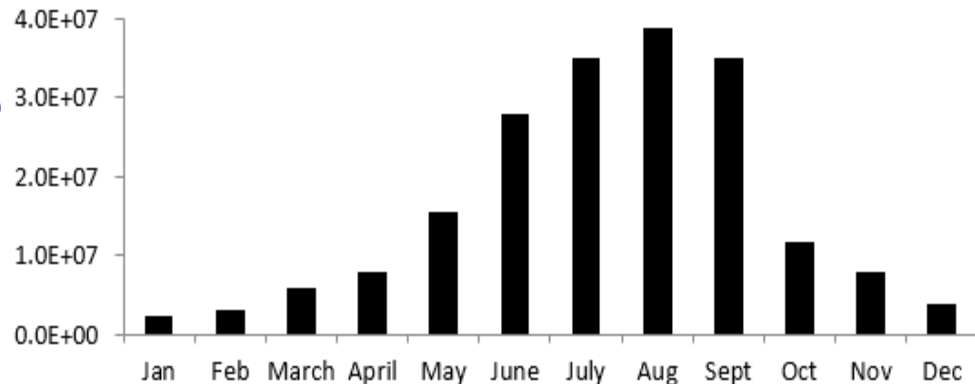
Sensor sites



but mostly summer...



Hourly recordings



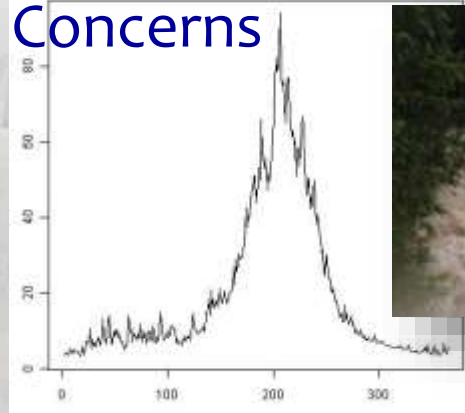
Month

More Annual Monitoring Sites Needed

Inexpensive, reliable “epoxy protocol”

Annual Flooding

Concerns



Underwater epoxy cement



\$130 = 5 years of data

Data retrieved
from underwater

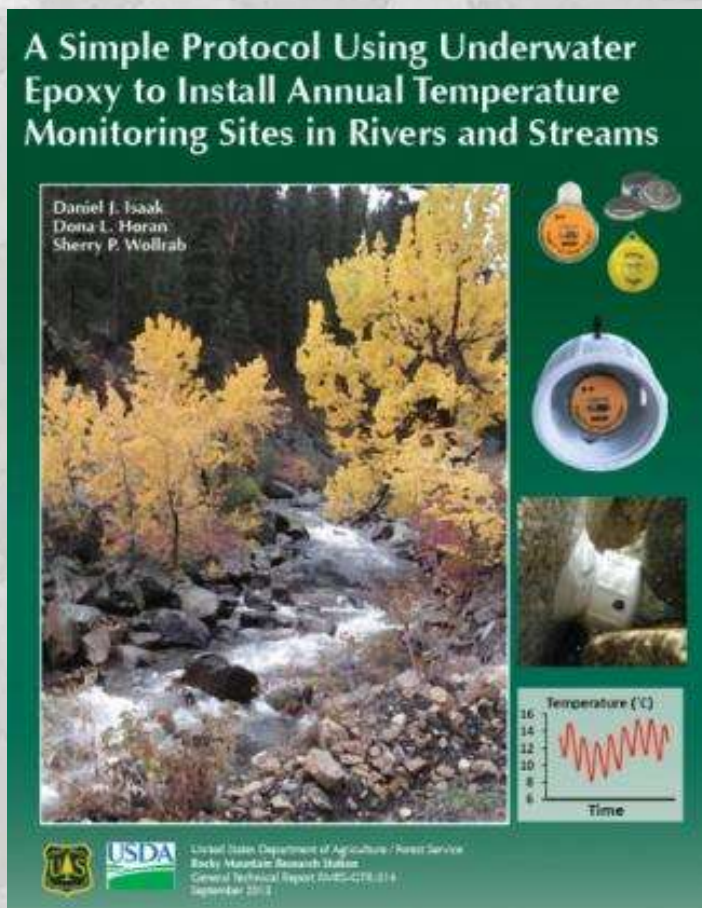


Sensors glued to large
boulders & bridges

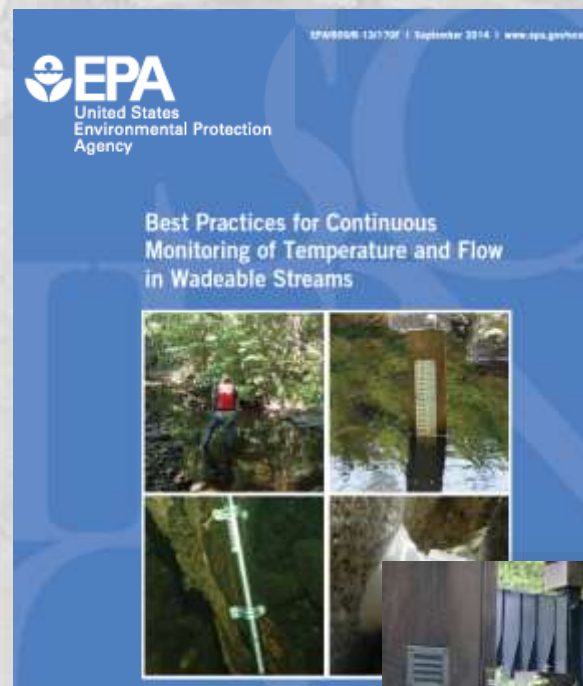


Isaak et al. 2013. USFS Report;
Isaak & Horan 2011. *NAJFM* 31:134-137

Standard Protocols for Data Collection



Isaak et al. 2013. [A simple protocol using underwater epoxy to install annual temperature monitoring sites in rivers and streams](#). USFS General Technical Report, 314.



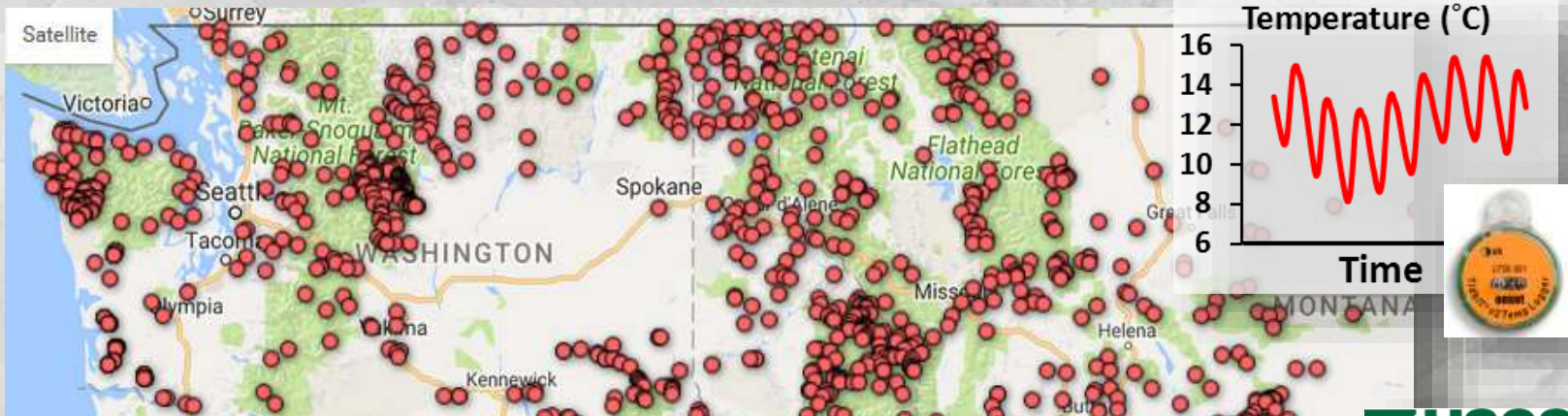
FLOW too!



U.S. EPA. 2014. Guidelines for Continuous Monitoring of Temperature and Flow in Wadeable Streams. National Center for Environmental Assessment. Office of Research and Development. Washington, DC.

Annual Temperature Monitoring is Increasing

~3,000 sites in Pacific Northwest



30,000,000 hourly records annually!



A GoogleMap Tool for InterAgency Coordination of Annual Monitoring Sites Regional Sensor Network



Site Information

- Stream name
- Data steward contact information
- Agency
- Site Initiation Date



Query Individual Sites

Google maps Search Maps Show search options

Get Directions My Maps Save to My Maps

Montana Annual Stream Temperature
Points available
www.fs.fed.us/rm/boise/AWAE/projects/temperature.shtml
Stream Temperature Points available by Agency
2/02/2011
62 views - Public
Created on Feb 2 - Updated 13 hours ago
By
Rate this map - Write a comment

- **Adair Creek**
Thermograph Location: Adair Creek Contact: Clint Muhfeld - cmuhfeld@usgs.gov (406-888-7926)
USGS, NOROCK
- **Agassiz Creek**
Thermograph Location: Agassiz Creek Contact: Clint Muhfeld - cmuhfeld@usgs.gov (406-888-7926)
USGS, NOROCK
- **Akokala Creek**
Thermograph Location: Akokala Creek Contact: Clint Muhfeld - cmuhfeld@usgs.gov (406-888-7926)
USGS, NOROCK

Cottonwood-Clyde Park- Creek
Updated 2 days ago
Thermograph Location: Cottonwood-Clyde Park- Creek
Contact: Robert Al-Chokhachy - ral-chokhachy@usgs.gov (406-994-7842)
USGS, NOROCK
Directions Search nearby more

1 of 2 nearby results Next >

GoogleMap Tool at “Stream Temperature Monitoring and Modeling” website

Site New Monitoring Sensors to Fill Gaps

Current Annual Temperature Sites

05/2016 - Full Year Stream Temperature Monitoring Sites

The Dynamic Mapping Tool provides a spatial index to over 6,000 sites on streams and rivers in the U.S. [more >>](#)

[USDA FS RMRS AWAE - Boise Aquatic Sciences Lab](#) - Edited on 2016 May 13

File Edit Tools Help

Map of monitoring sites

Rows 1

Cards 1

Filter

No filters applied

