

Stream & River Temperature Monitoring & Climate Assessments for the U.S.

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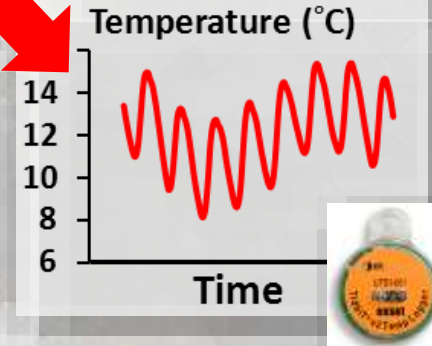
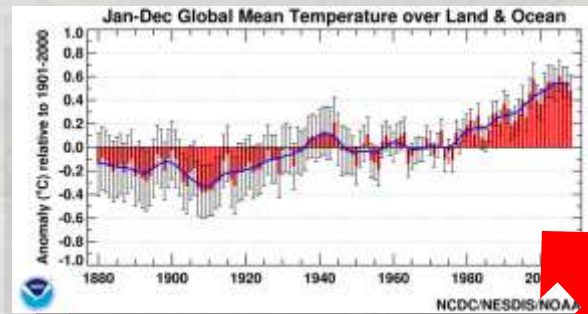
U.S. Forest Service

¹Trout Unlimited

²CSIRO

³NOAA

⁴USGS



Funding agencies:



Miniature Temperature Sensors & National Monitoring Efforts

A)



B)



C)

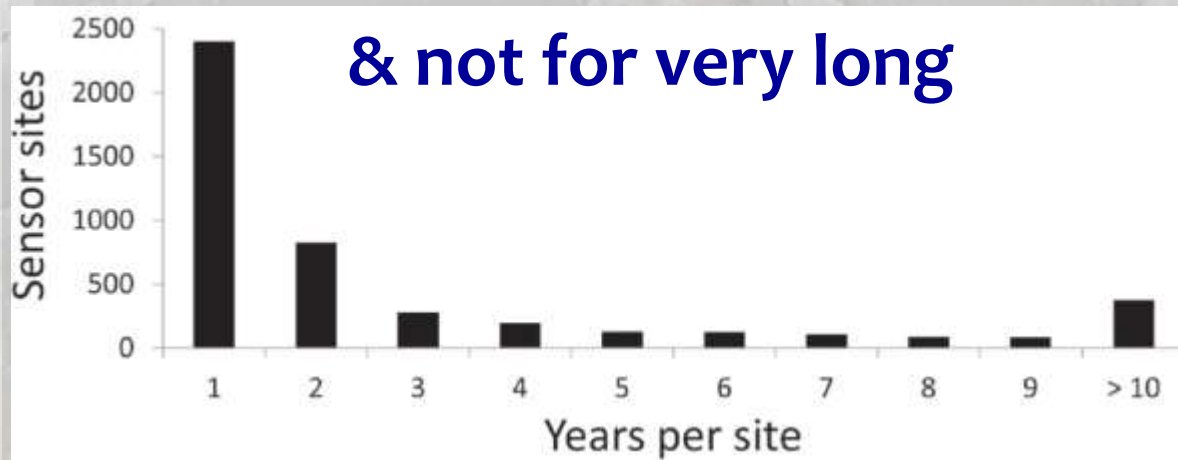
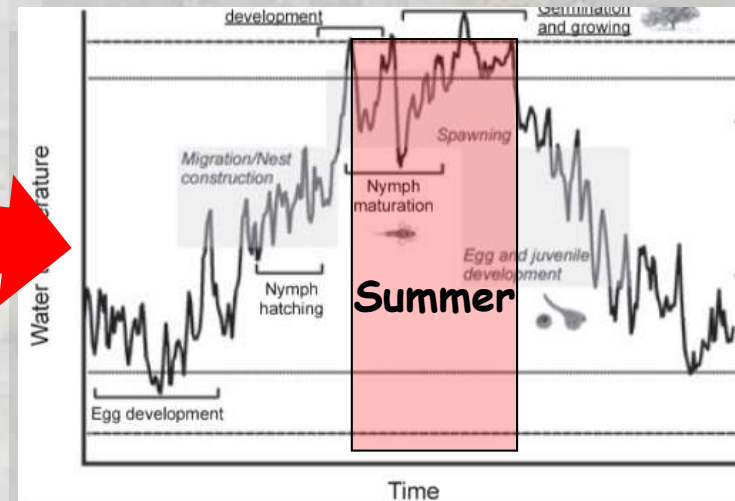


GAPS in existing Monitoring

Many Sites, but...



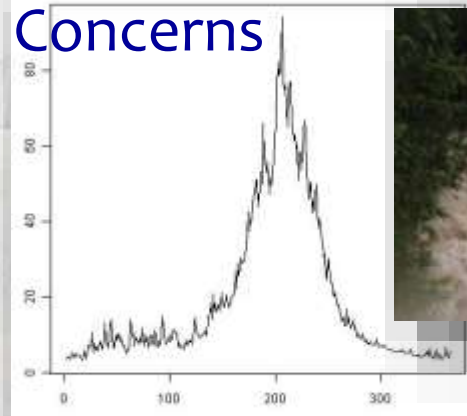
usually summer data



& not for very long

More Longterm, Annual Monitoring Needed

Annual Flooding



Underwater epoxy cement



\$130 = 5 years of data

Data retrieved
from underwater



Sensors glued to large
boulders & bridges

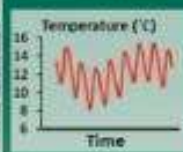
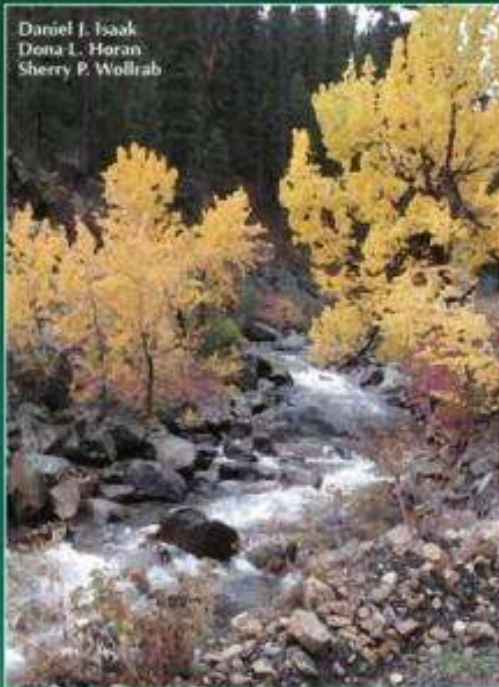


Isaak et al. 2013. USFS Report;
Isaak & Horan 2011. *NAJFM* 31:134-137

Standard Protocols & Miniature Sensors Make Data Collection Easy & Inexpensive

A Simple Protocol Using Underwater Epoxy to Install Annual Temperature Monitoring Sites in Rivers and Streams

Daniel J. Isaak
Dona L. Horan
Sherry P. Wollrab



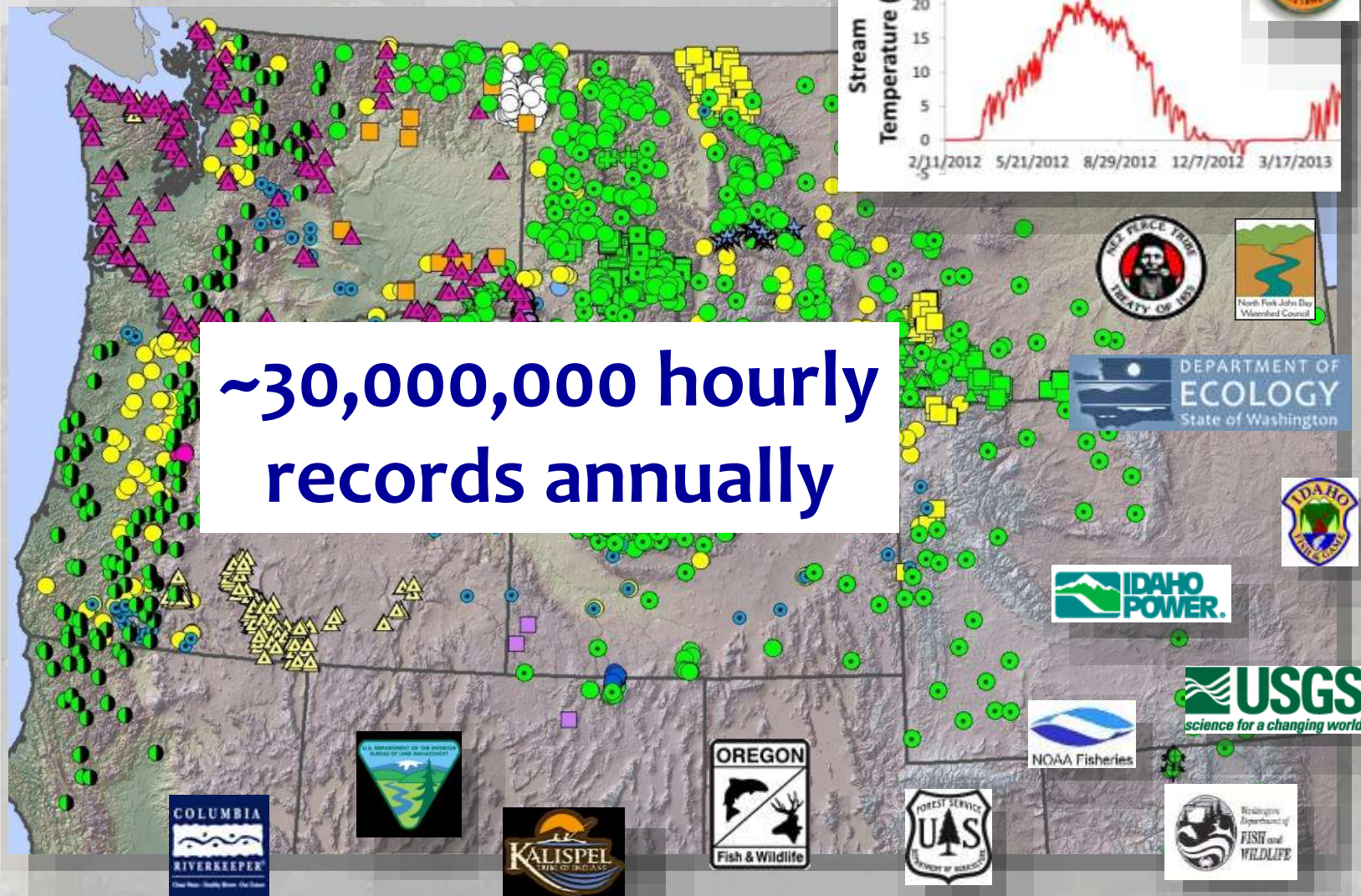
United States Department of Agriculture / Forest Service
Rocky Mountain Research Station
General Technical Report GTR-478, 21 p.
September 2012

Best Practices for Continuous Monitoring of Temperature and Flow in Wadeable Streams

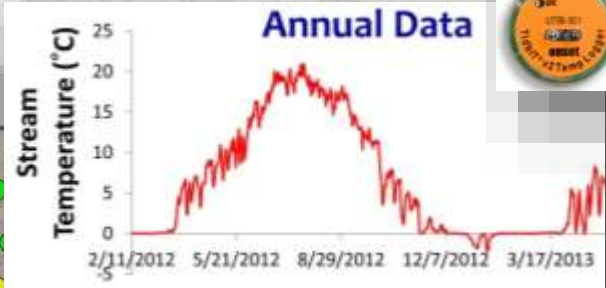


Annual Temperature Monitoring Sites

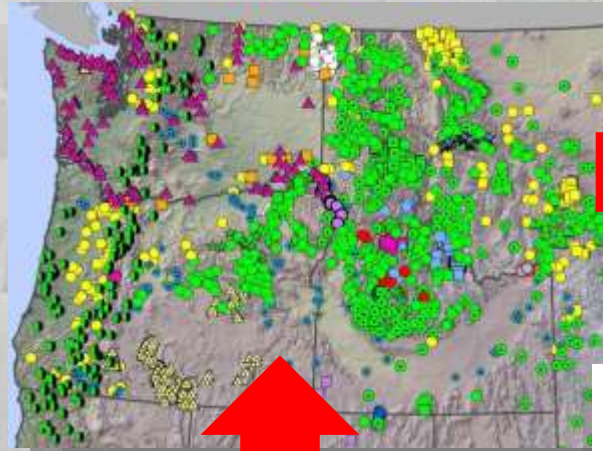
>4,000 sites in Pacific Northwest



~30,000,000 hourly records annually



Data



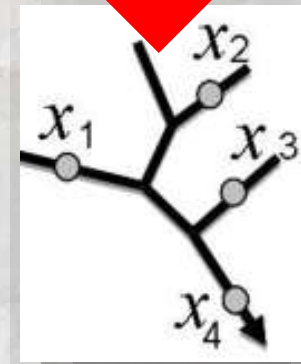
Functional



Databases



STOP



Management Decisions

Analysis & Information

Databases Require Database Teams



NorWeST
Stream Temp

Forging Disparate Data Into a Functional Database

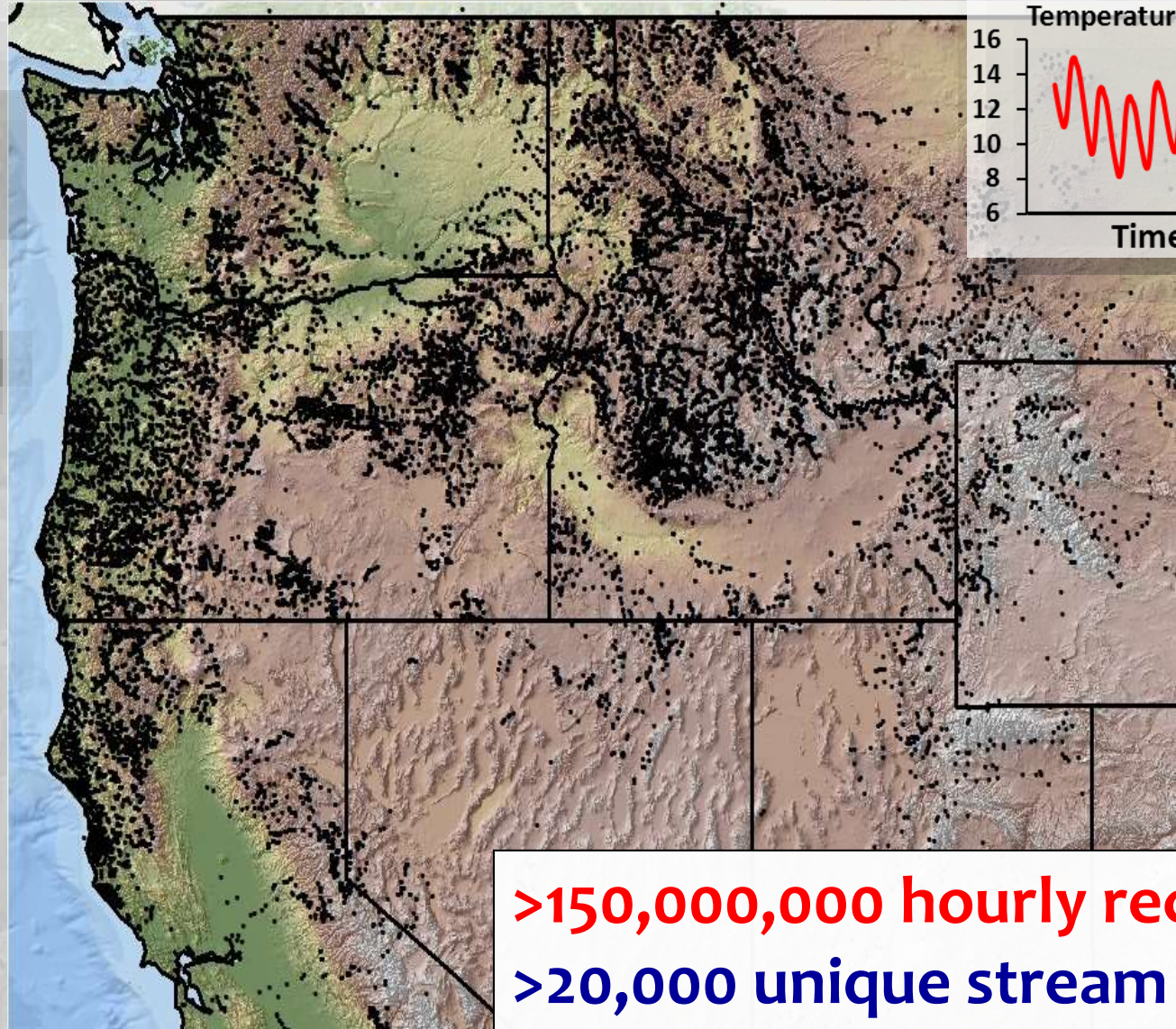
Funded by:



NorWeST
Stream Temp

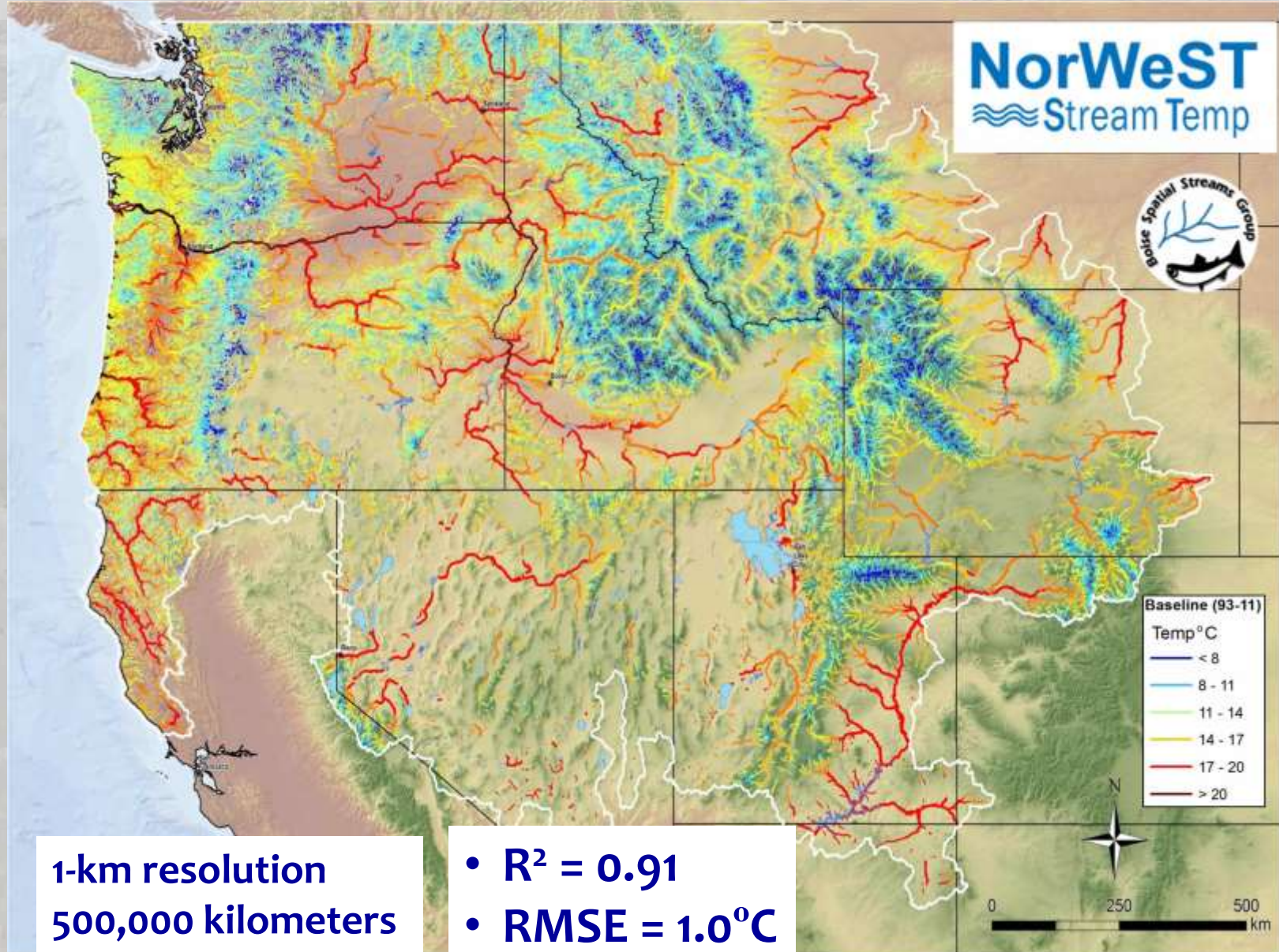
Forging Disparate Data Into a Functional Database

Funded by:



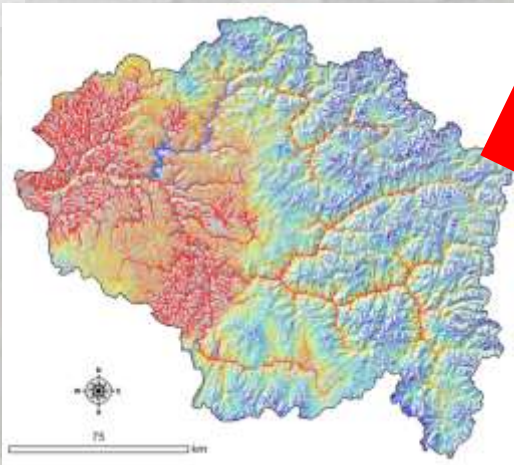
>150,000,000 hourly records
>20,000 unique stream sites

High-Resolution Stream Scenarios

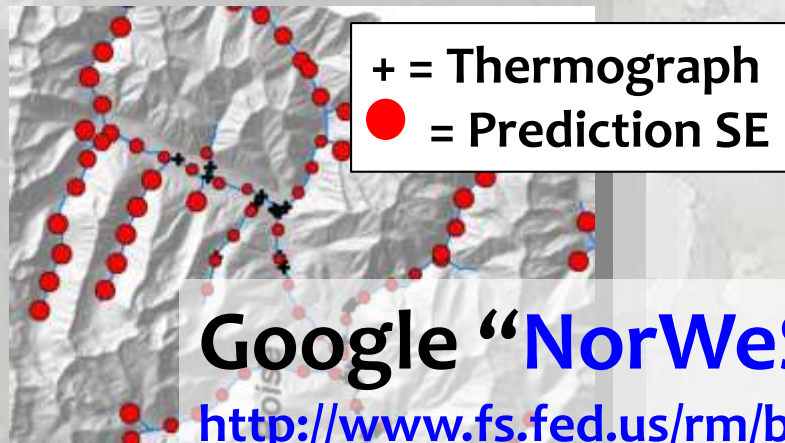


Website: Distributes Information in Useful Digital Formats (ArcGIS & .pdfs & Excel)

1) GIS shapefiles of stream temperature scenarios



2) GIS shapefiles of stream temperature model prediction precision



3) Temperature data summaries



Google “**NorWeST**” or go here...

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

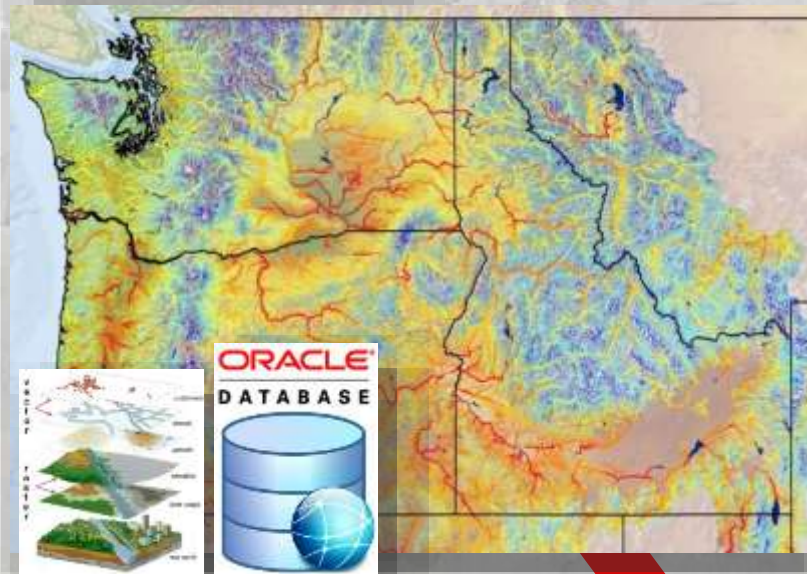
NorWeST User Community...

Website launched 3 Years Ago

- 12,000 visits/year
- 1,146 downloads last 6 months



Temperature Applications

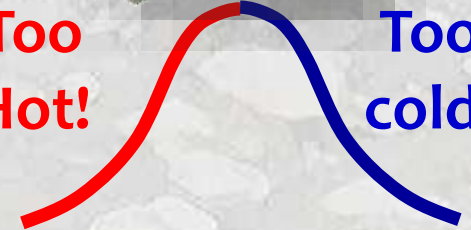


Regulatory temperature standards

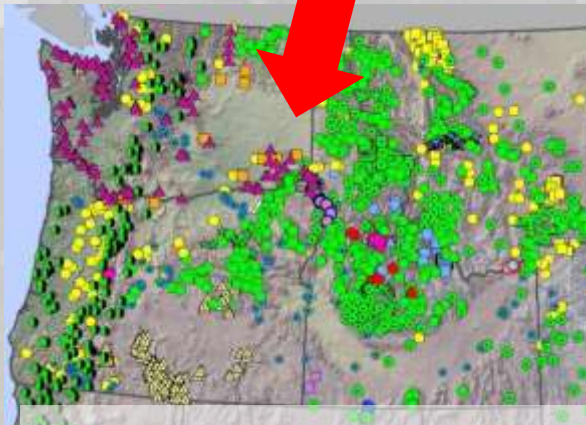


Too Hot!

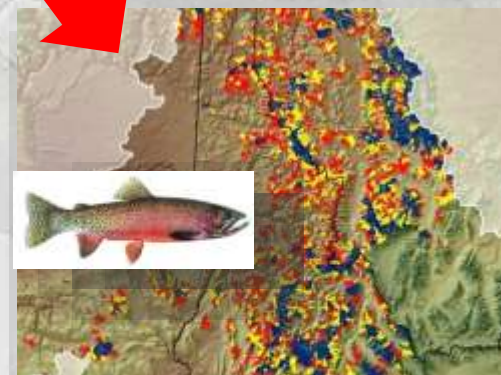
Too cold!



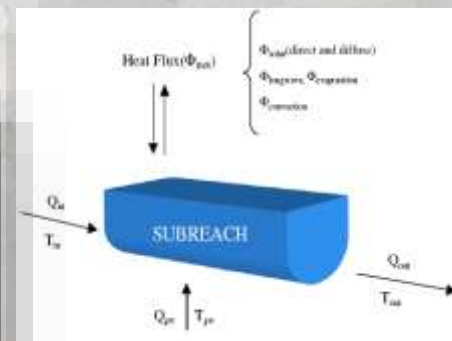
Data access accelerates temperature research



Coordinated Interagency monitoring

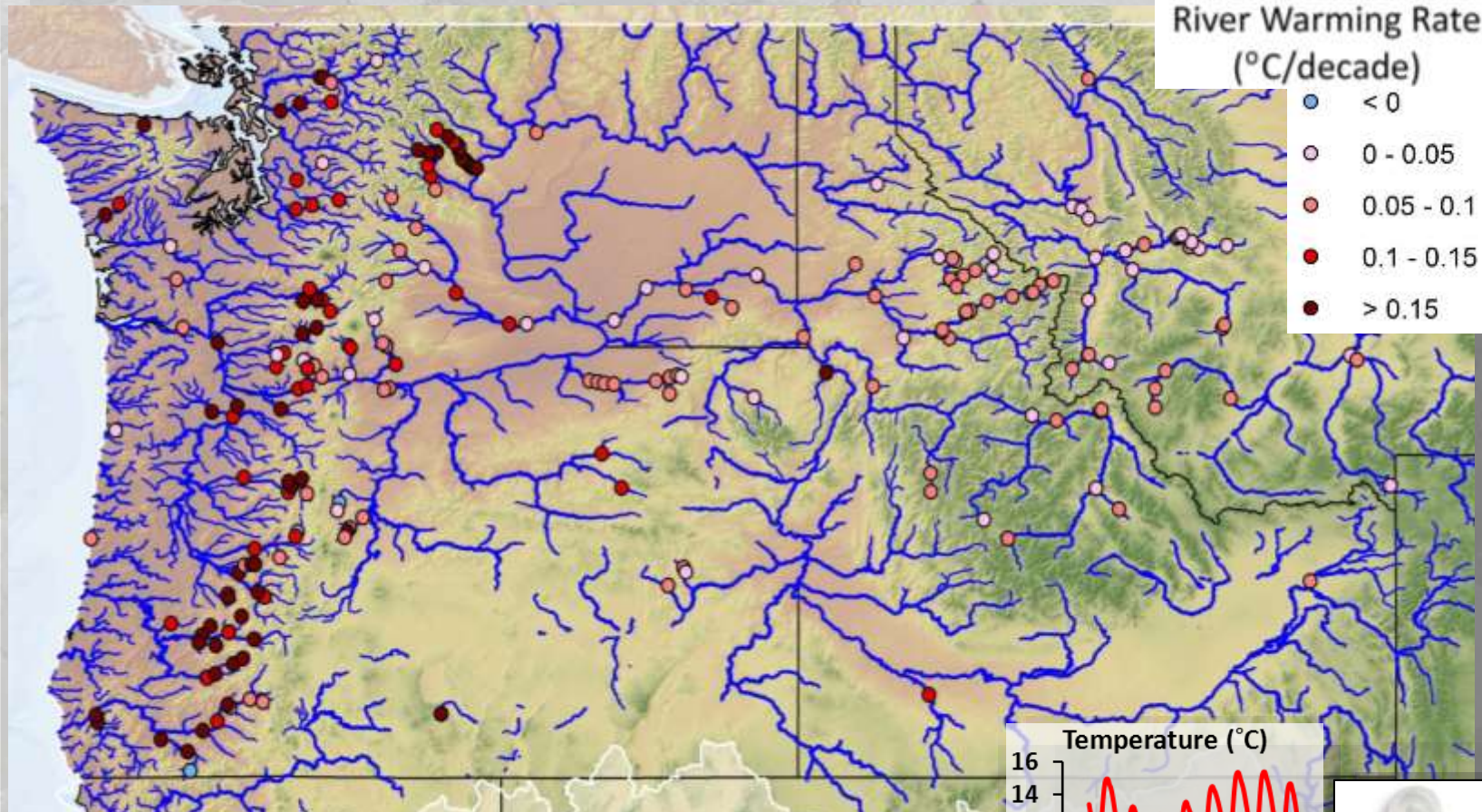


Species distribution models & climate assessments



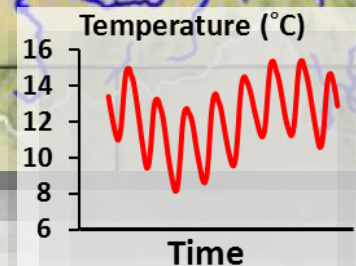
Historical River Temp Trends (1968-2011)

245 sites with >10 year monitoring records



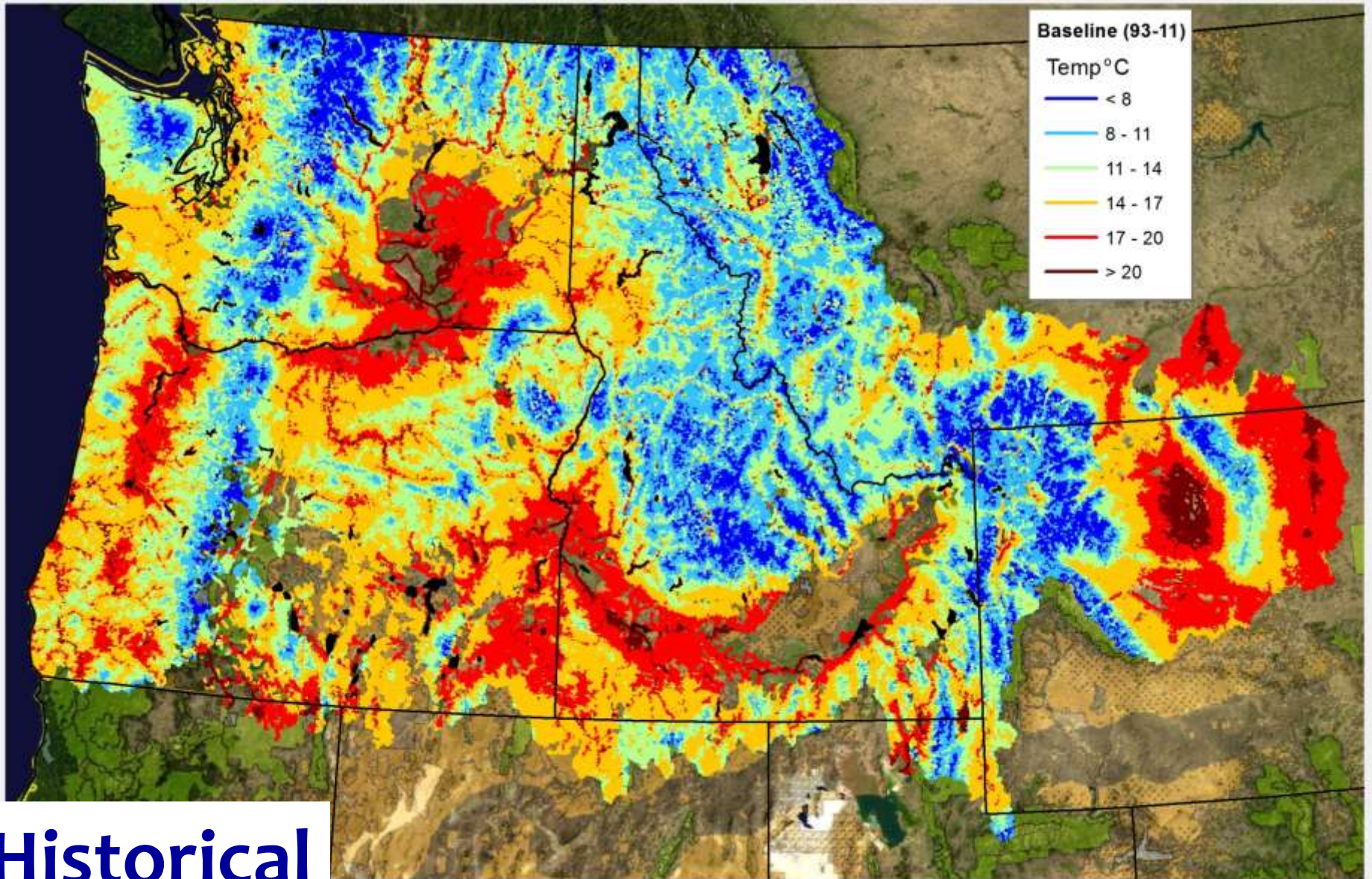
+0.11°C/decade

98.5% sites are warming

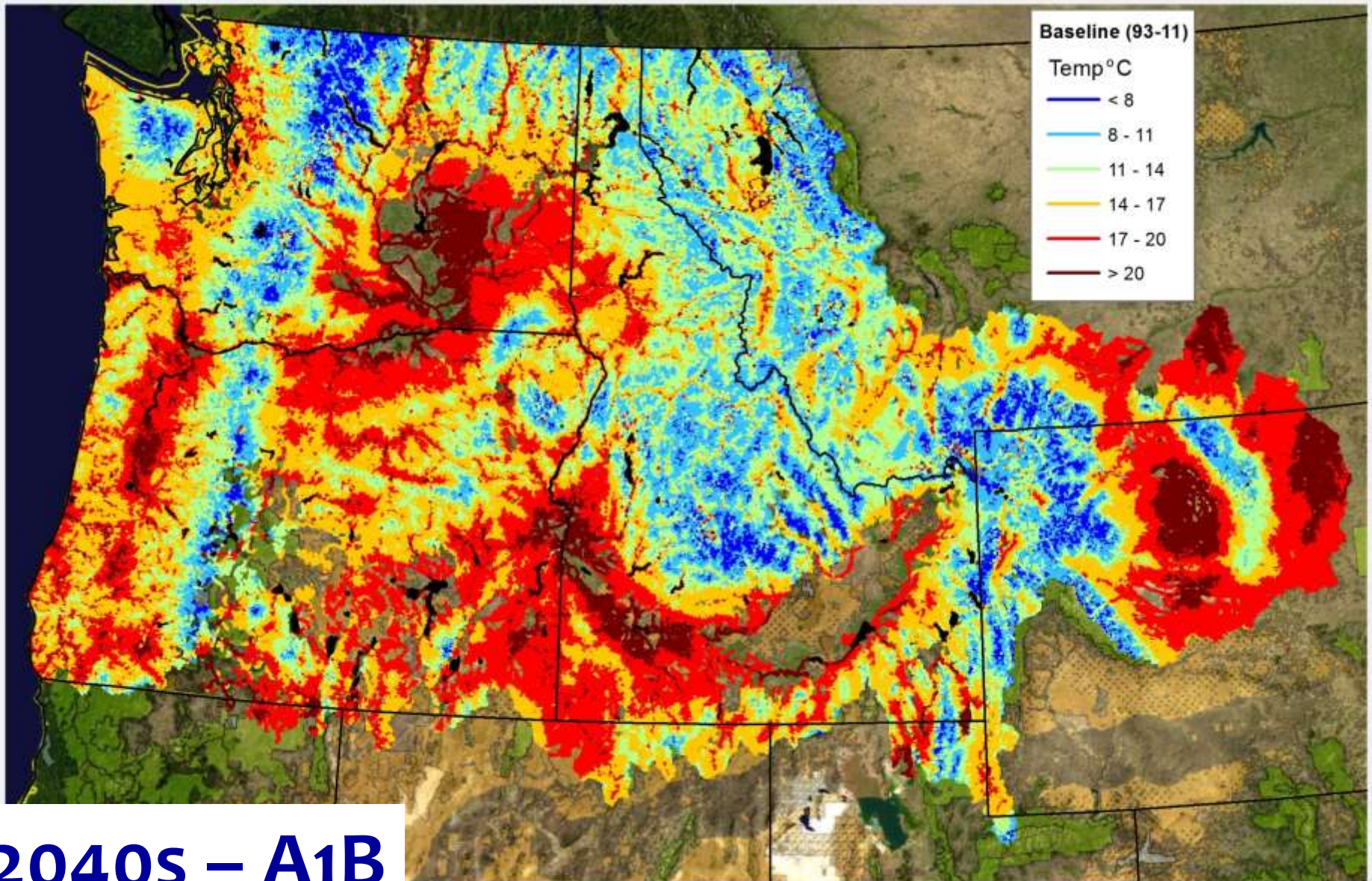


Isaak et al. In Prep.

& Future Climate Projections...



& Future Climate Projections...



& Future Climate Projections...

