Middle Snake Watershed (WRIA 35)

Tucannon River Temperature Investigation

April 13, 2006

Presentation Outline

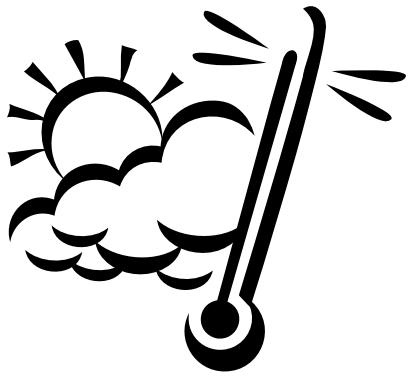
- **Part 1** - Study Purpose – Why are we doing this project?
- **Part 2** - Temperature Analysis – What we did
- **Part 3** - Model Scenario – Full shade
- **Part 4** - Update of Temperature Standards
- **Part 5** - Next Steps

Part 1

Why are we doing this project?

Purpose of Tucannon River Temperature Study

- River temperatures exceed standards
- Is this a natural condition?
- What are the sources of heat to the river?
- What is the “worst case” condition during low-flow
- What temperatures can be attained, and where, under full shade conditions?



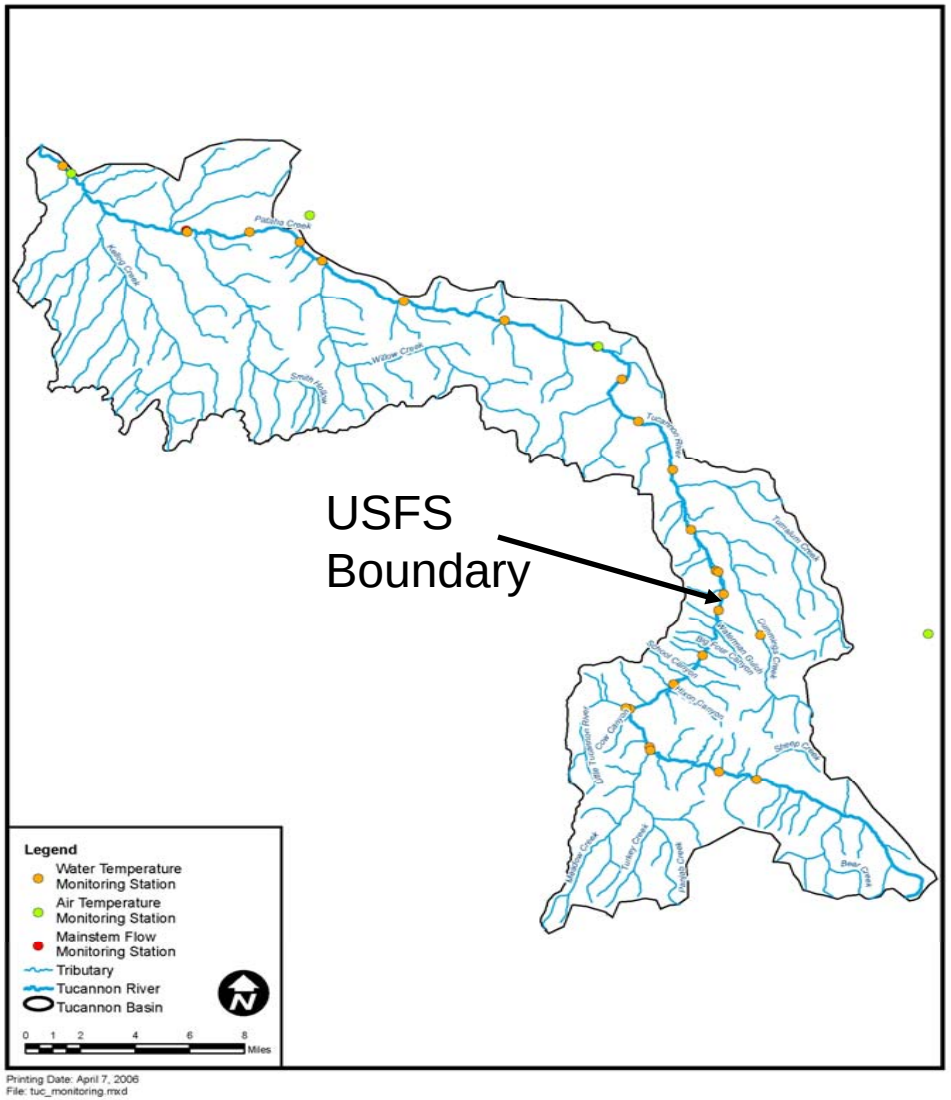
Long-term Monitoring Stations

Study Area = Above Sheep Creek to mouth

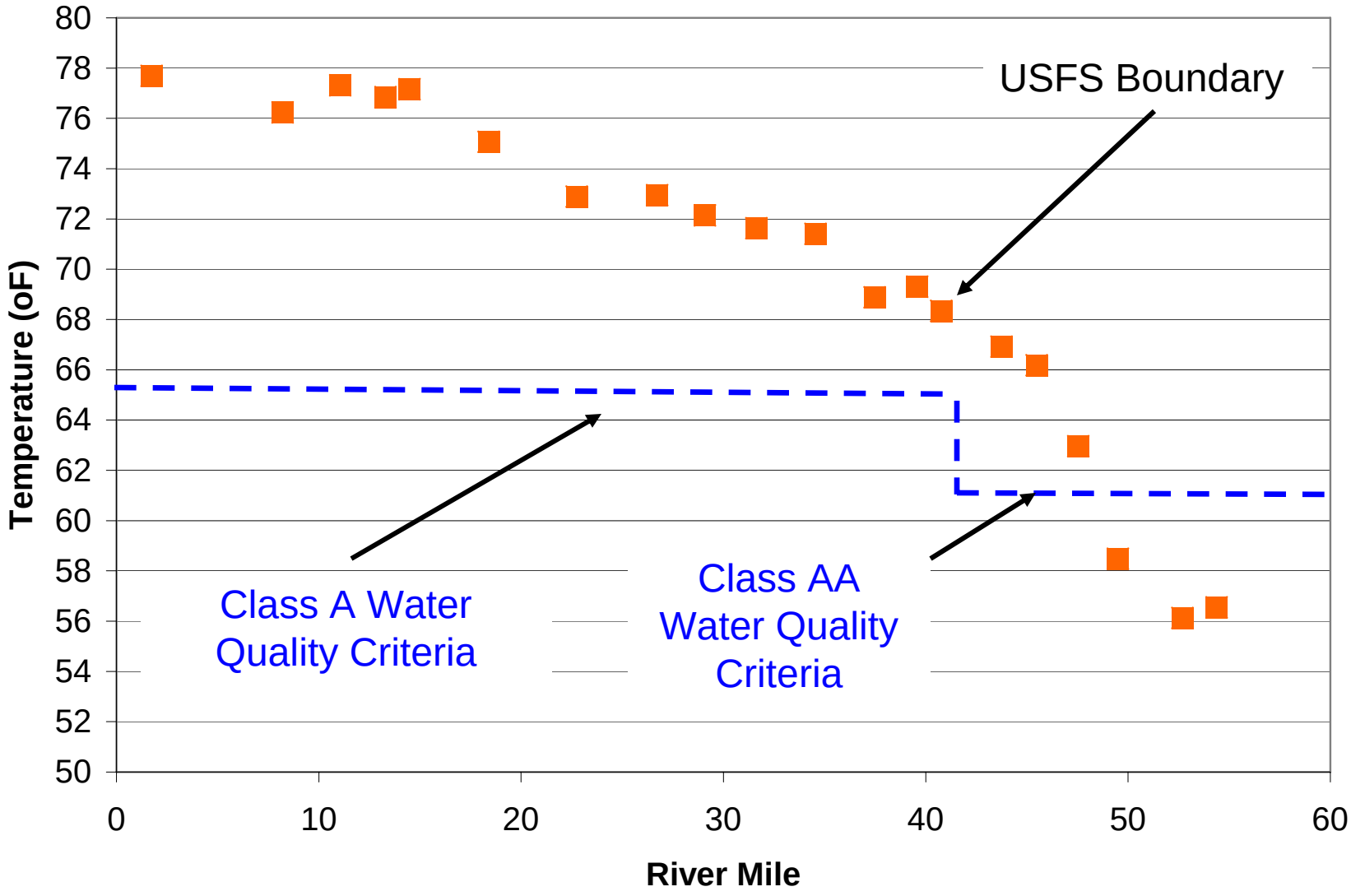
26 WDFW temperature stations

3 Ecology stations

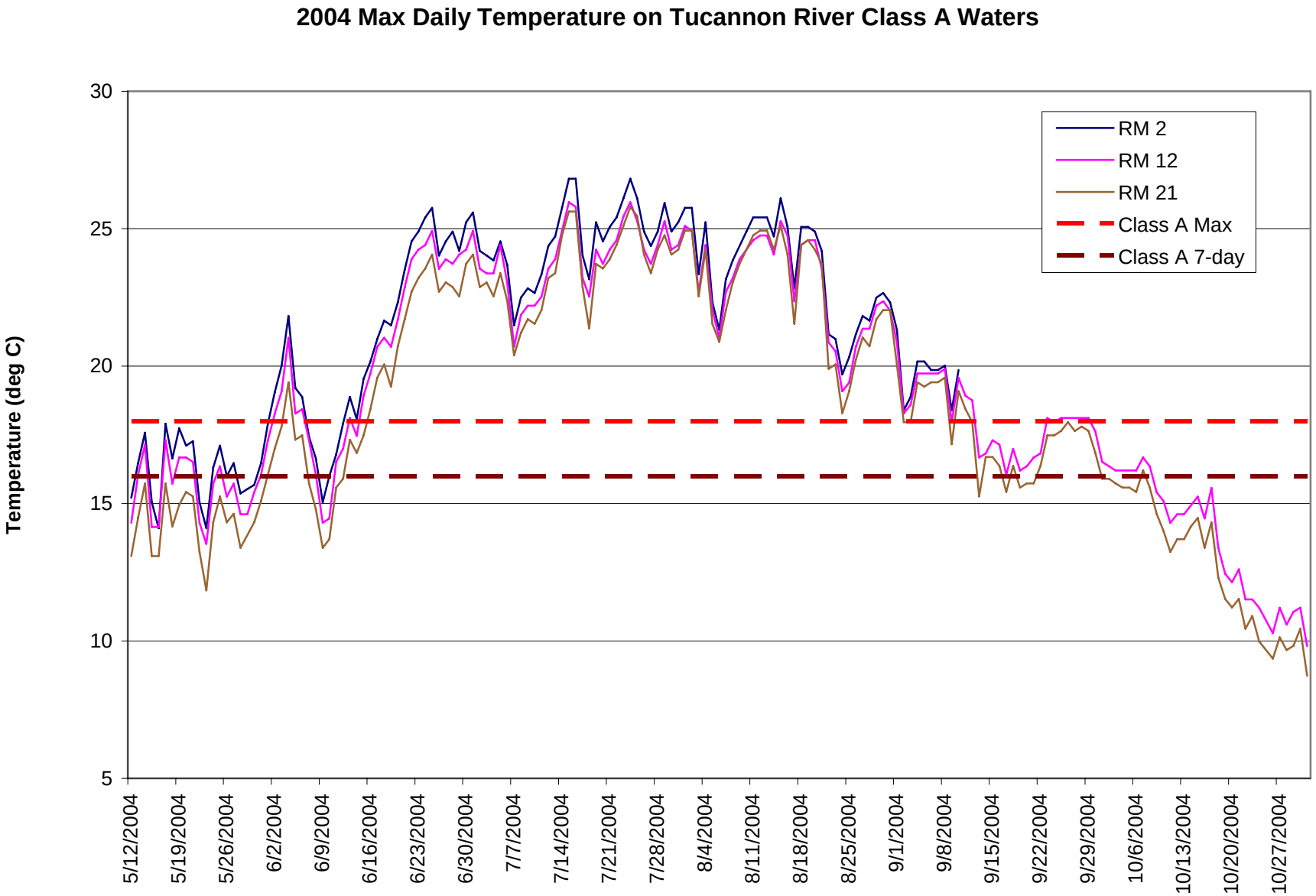
4 USFS temperature stations



Daily maximum temperature criteria exceeded for most of river



Lower Tucannon River Water Temperatures



Why are river temperatures cooler upstream and warmer downstream?

Lower Watershed

Middle Watershed

Upper Watershed

Warmer Water Temperature:

Wider channel (more surface area)

Low elevation (500 ft msl)

Slower flow (more heating time)

Less riparian veg. (less shading)

Cooler Water Temperature:

Narrower channel (less surface area)

Higher elevation (3,000 ft)

Faster flow (less heating time)

Denser riparian veg. (more shading)

Part 2

Temperature Analysis-
Field Work and Modeling

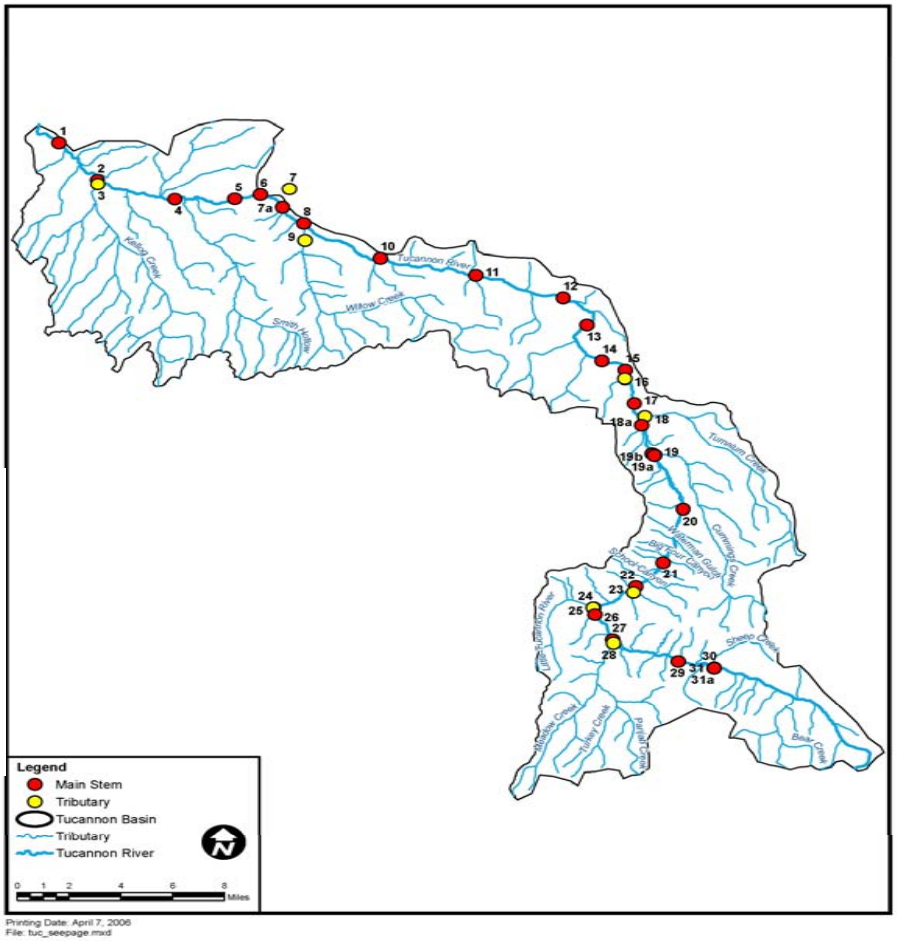
Field Work

Field work during summer 2005

- Install flow, temp. & humidity meters and collect data
- Stream geometry data (width, depth)
- Calculate ground water inflow/outflow
- Tree shading measurements

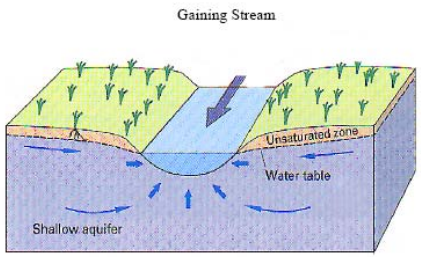
Seepage Study

Flow and Temperature Measurement Stations



Measure:

- flows
- temperatures
- channel geometry



Estimate withdrawals

Calculate ground water inflow/outflow

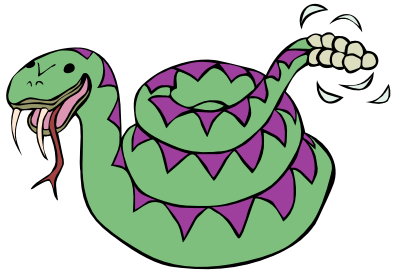
Measure Tree Shading

Measured each stream edge to 150 feet out

- Tree height
- Classify general tree type
- Canopy density
- Overhang at 170 locations (transects)
- Effective shade from trees

j10

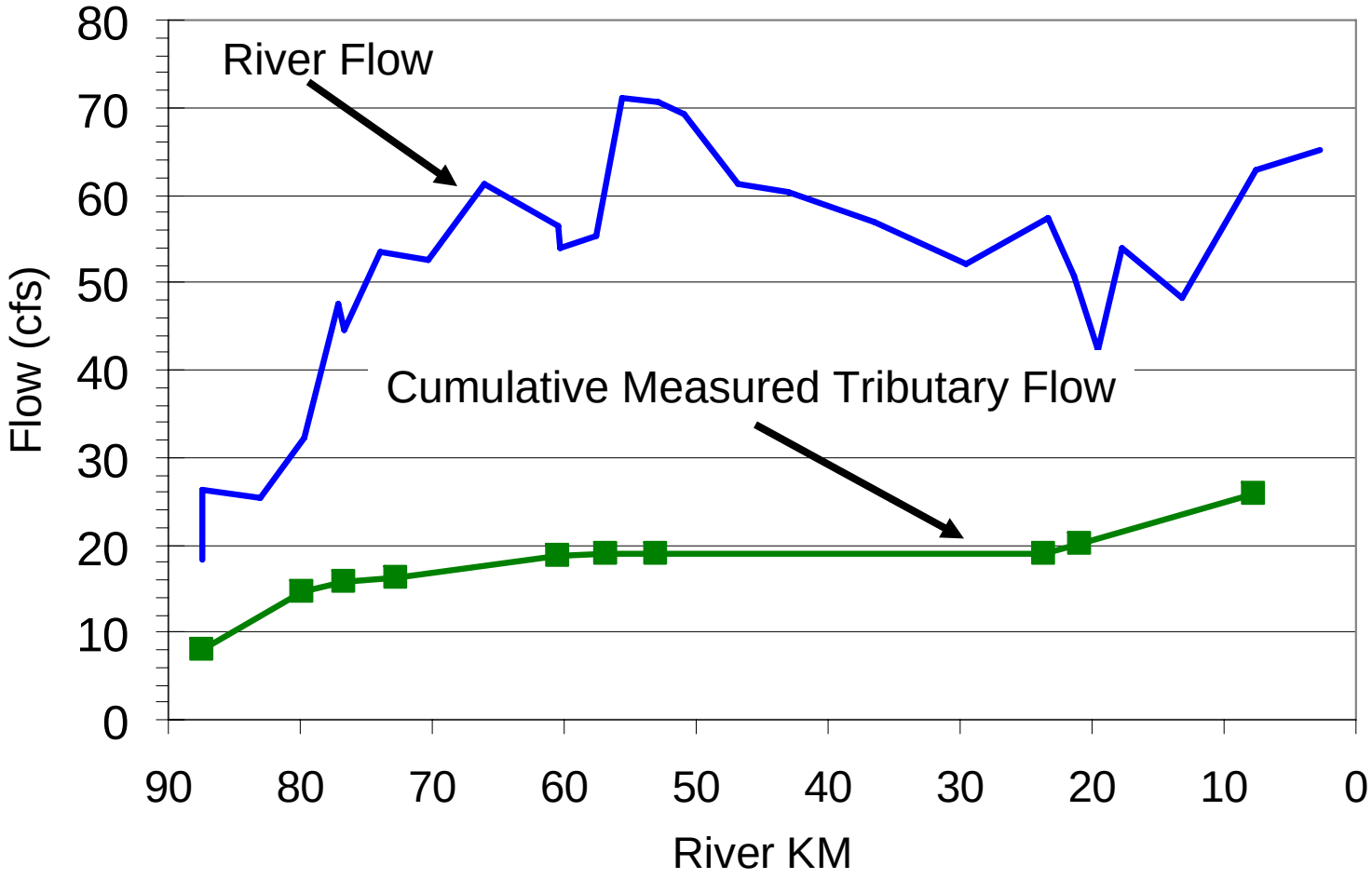
We also found snakes!



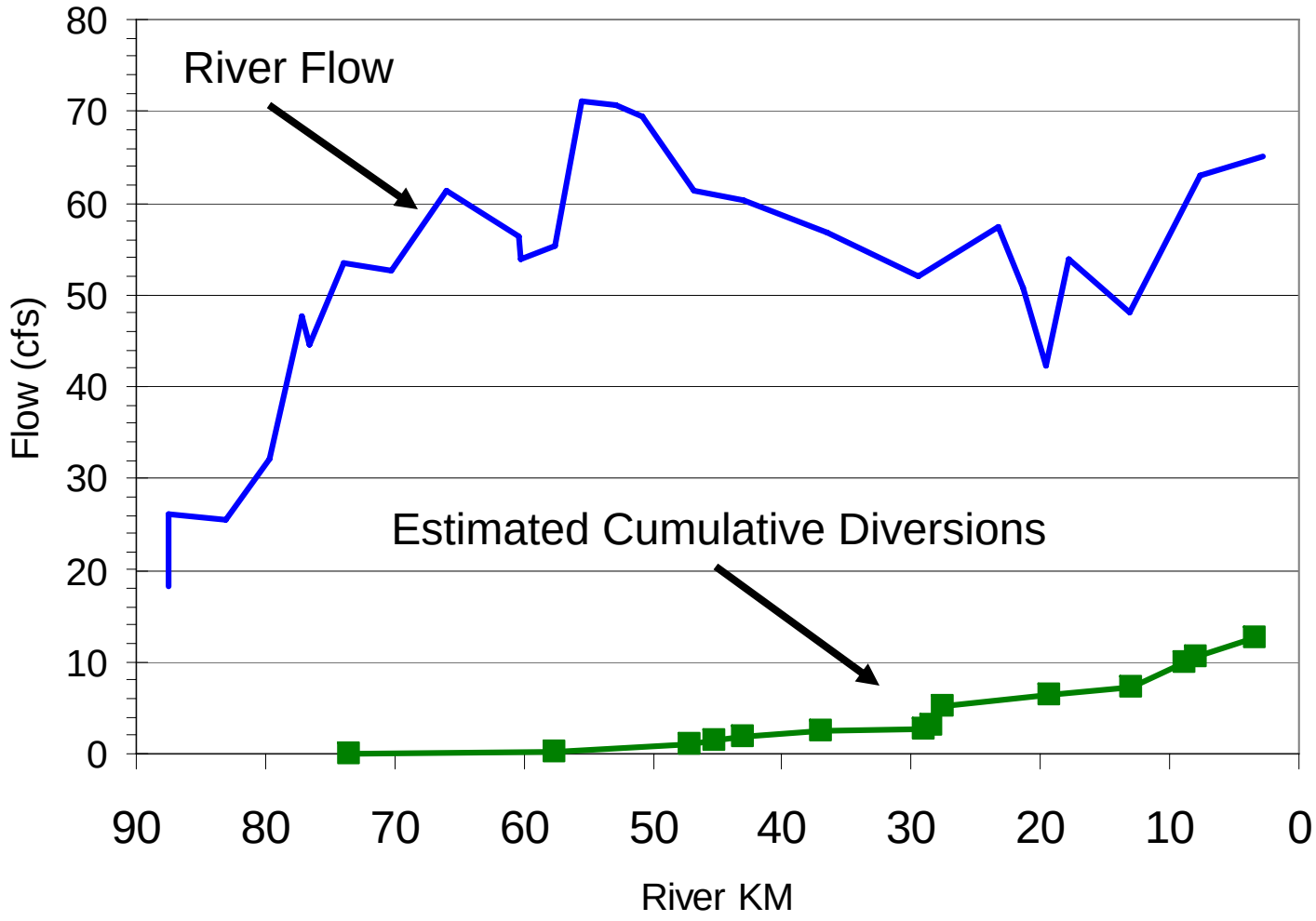
Modeling steps . . .

- GIS analysis for shading and stream geometry
- Input weather and temperature data
- Flow budget
- Model development and calibration
  - Based on July 13 field data
  - Flow is constant
  - Weather and temperature data are diurnal

Tributary Inflows

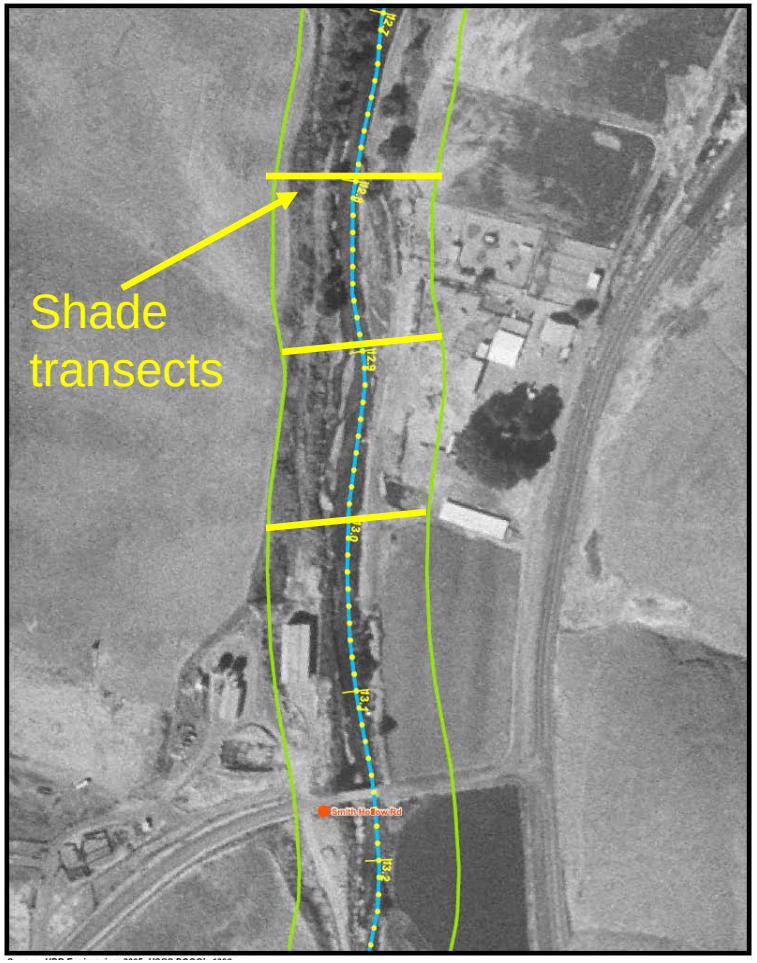


River Diversions

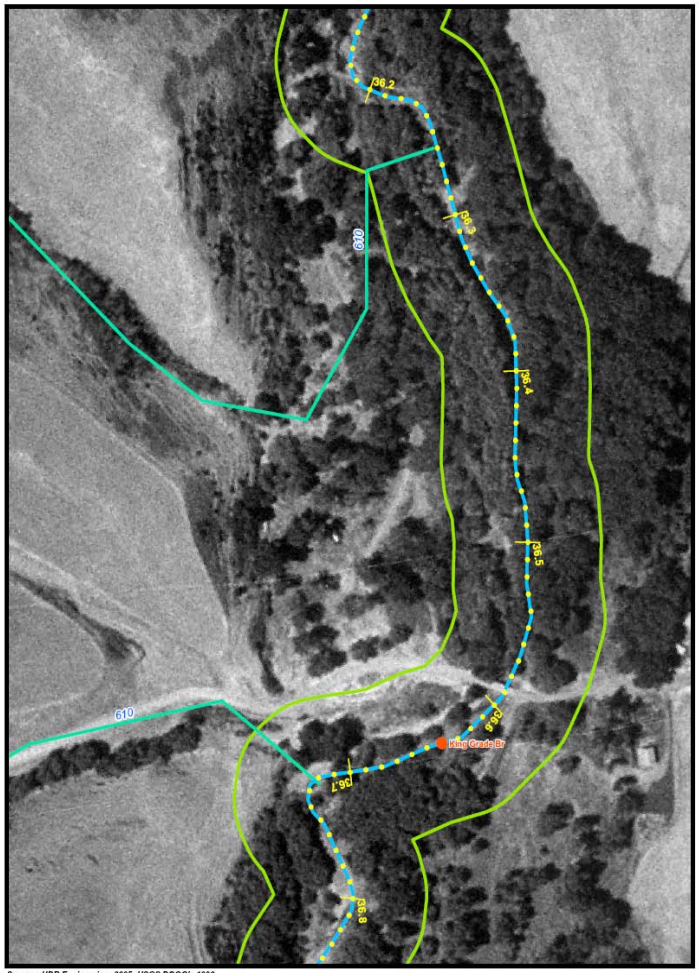


Riparian GIS Analysis

Lower Watershed - Low Shade

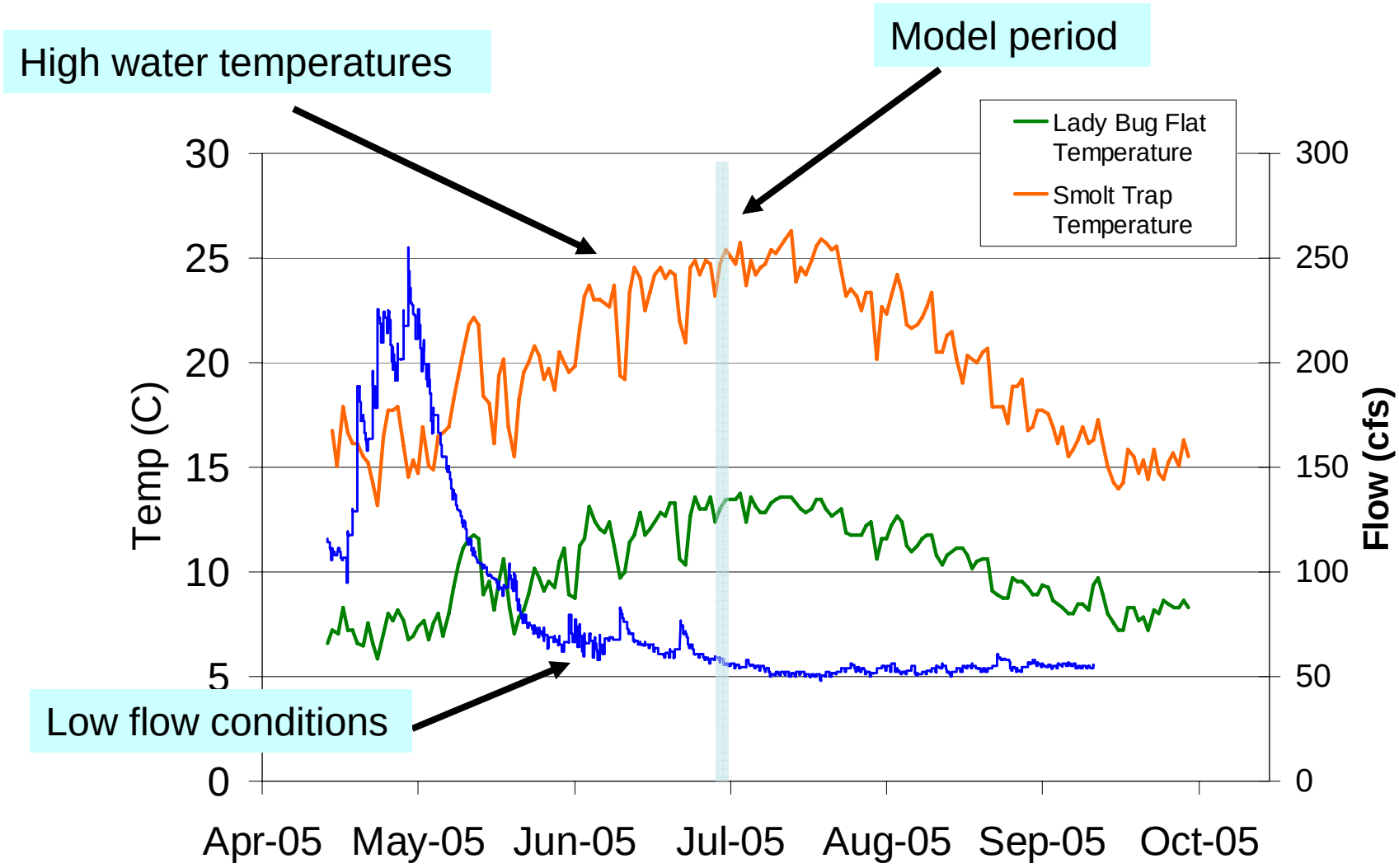


Upper Watershed - More Shade

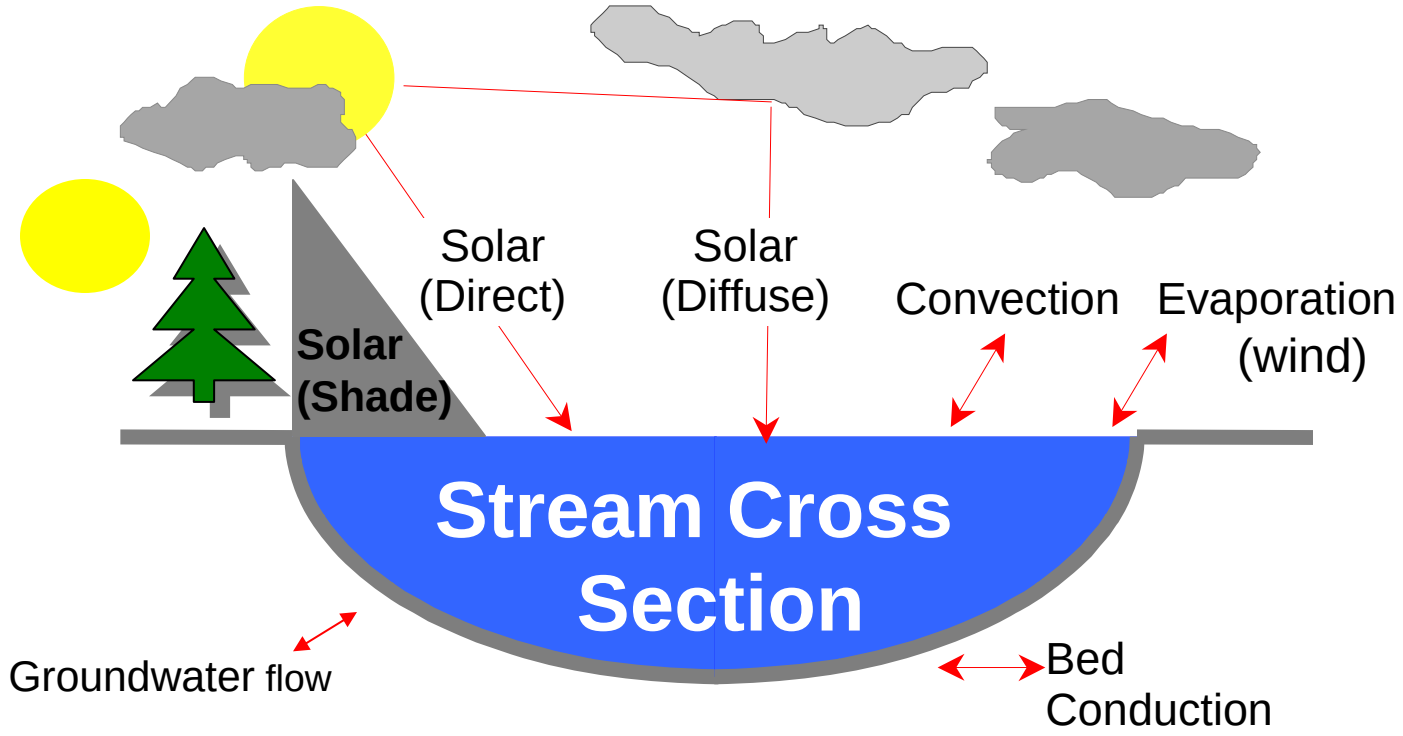


Shading data every 100 meters within 150 feet of the river- ~900 data points

Model represents near worst-case conditions . . .



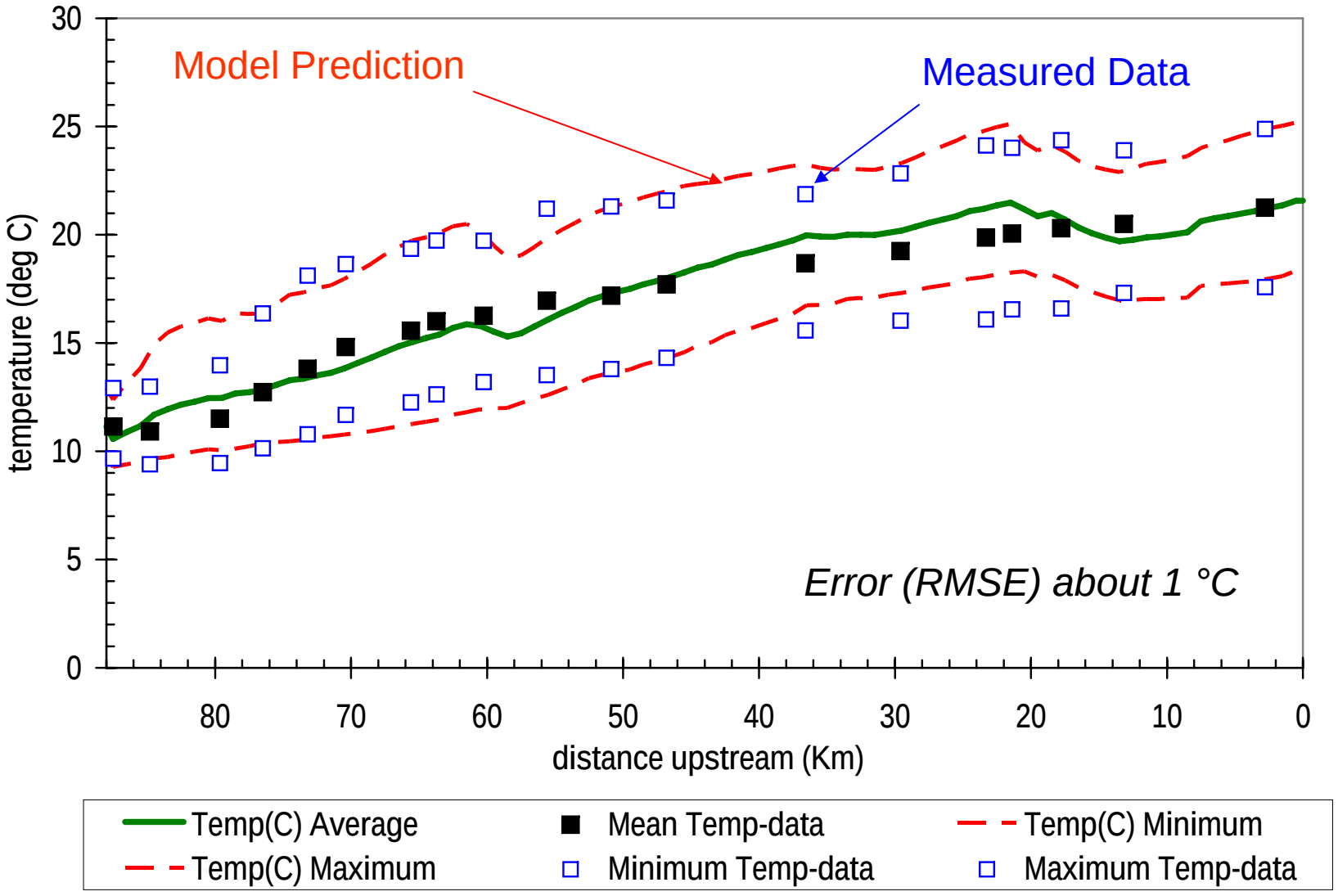
Model solves heat budget to calculate temperature . . .



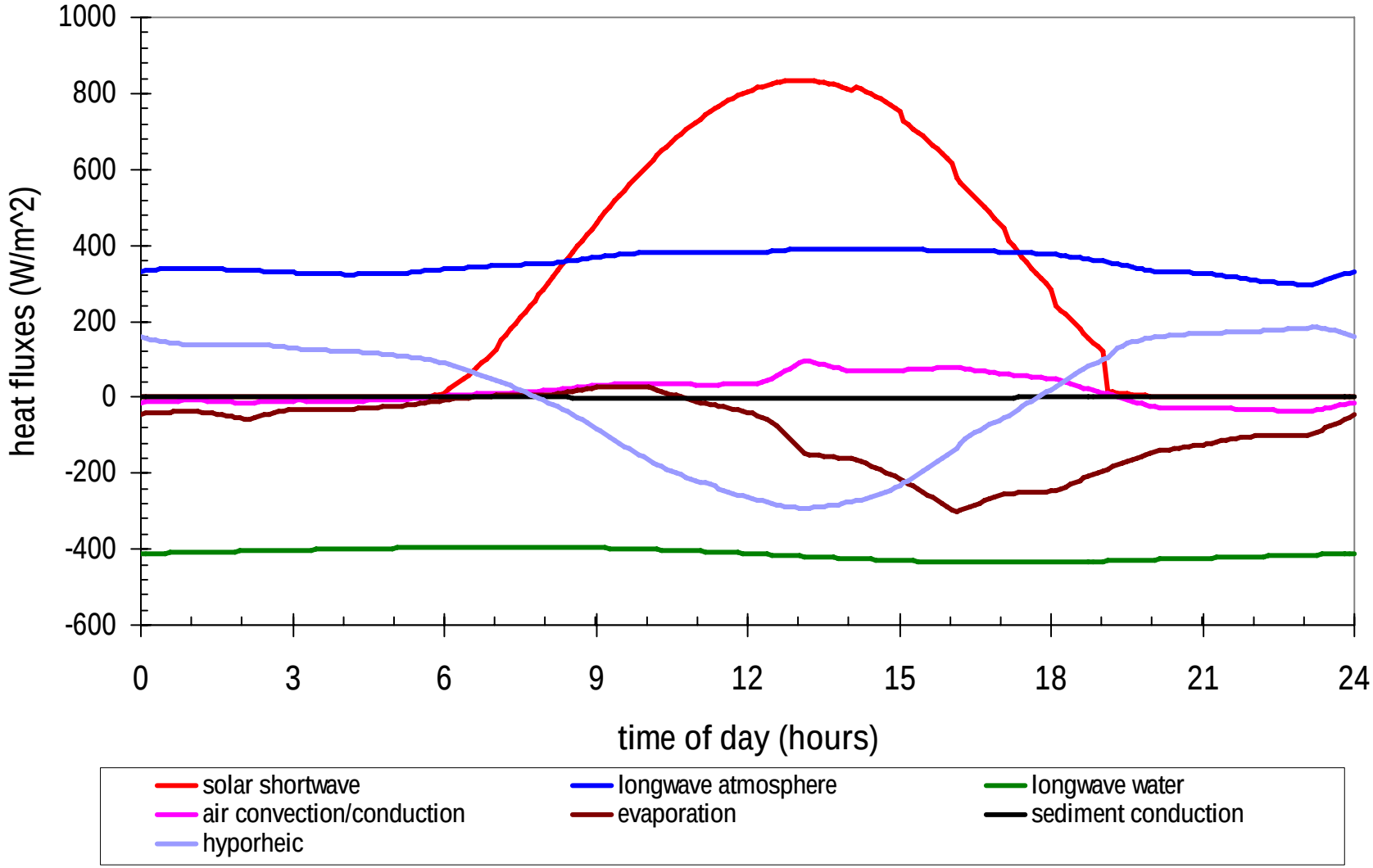
Heat Budget Eq.

Total heat = solar + longwave + convection + evaporation + streambed + groundwater

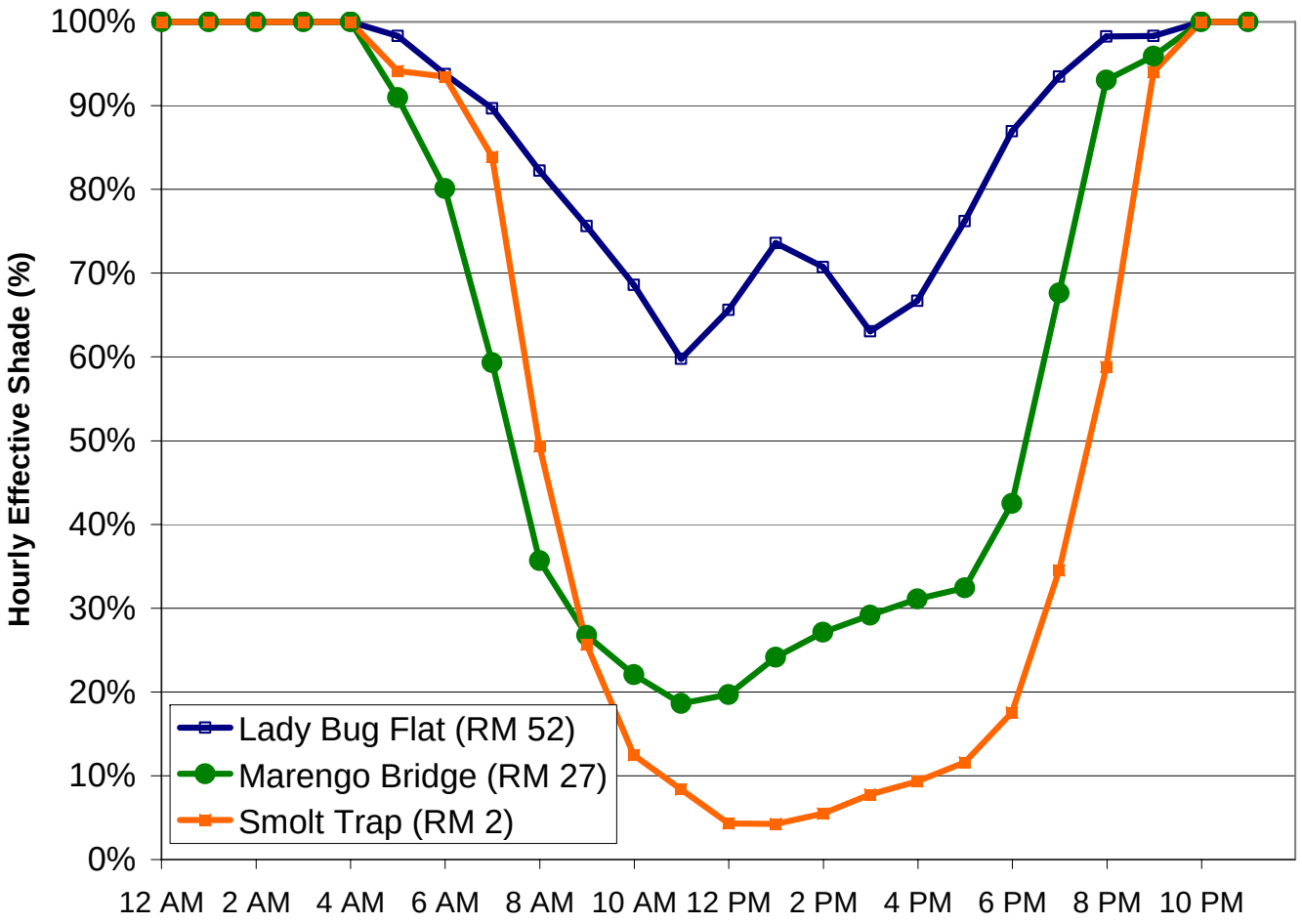
Model Results!!



Tucannon River Heat Budget – Solar heating main factor in heating



Shade is less in lower watershed

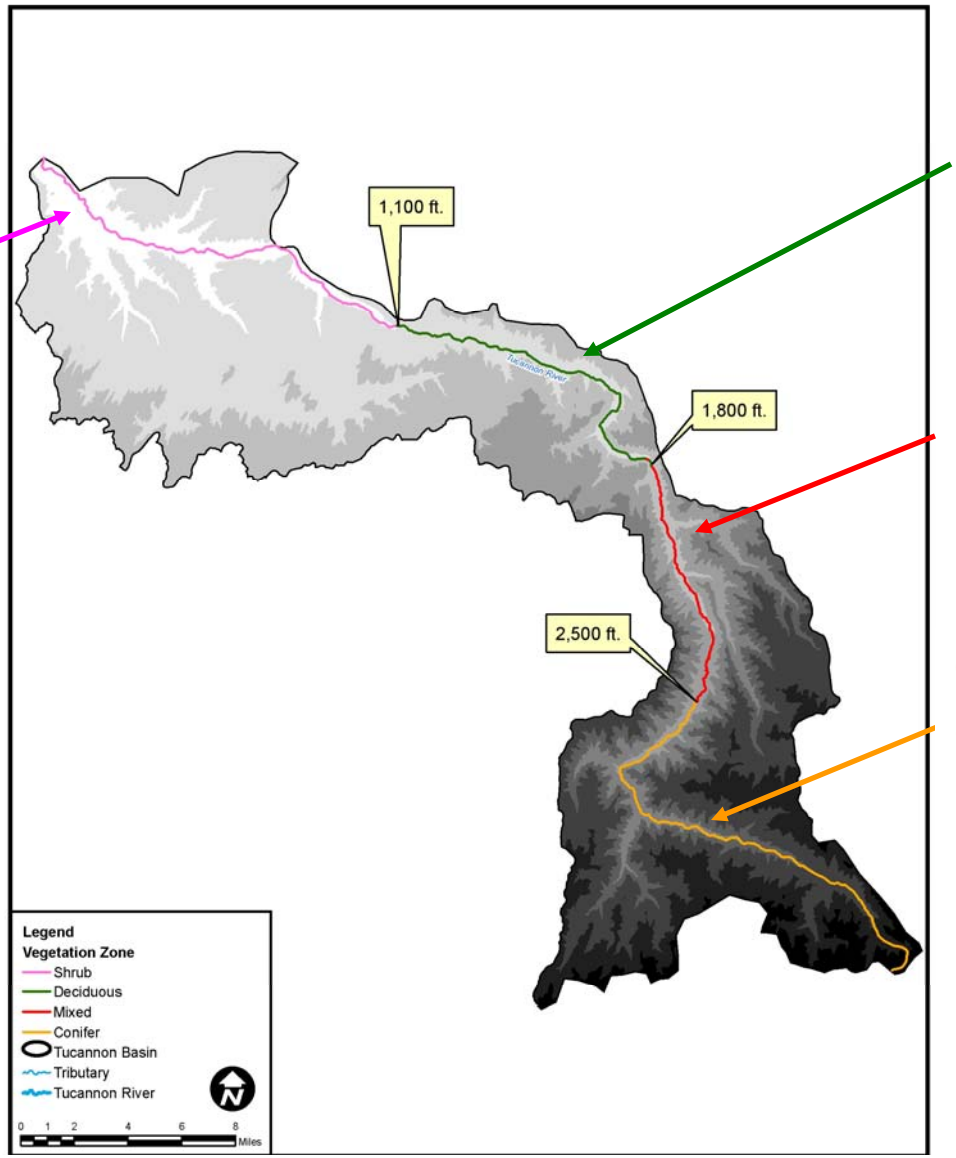


Part 3

Model Scenario - Full Shade

Full shading for watershed vegetation example cover types . . .

Shrub Shading
23 to 31 feet tall
80% density
25 to 50% trees

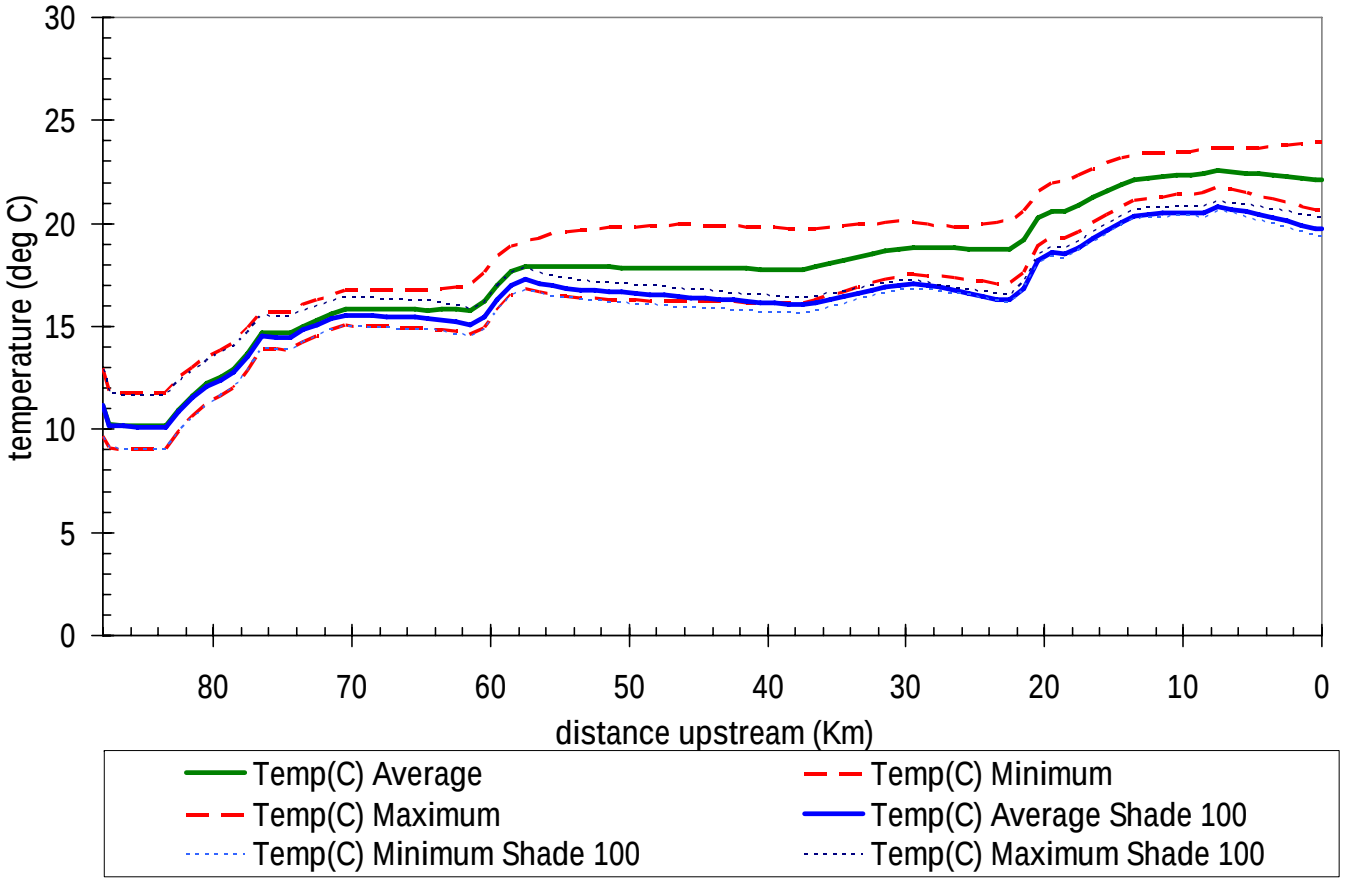


Mixed Shading
72 feet tall
80% density
100% trees

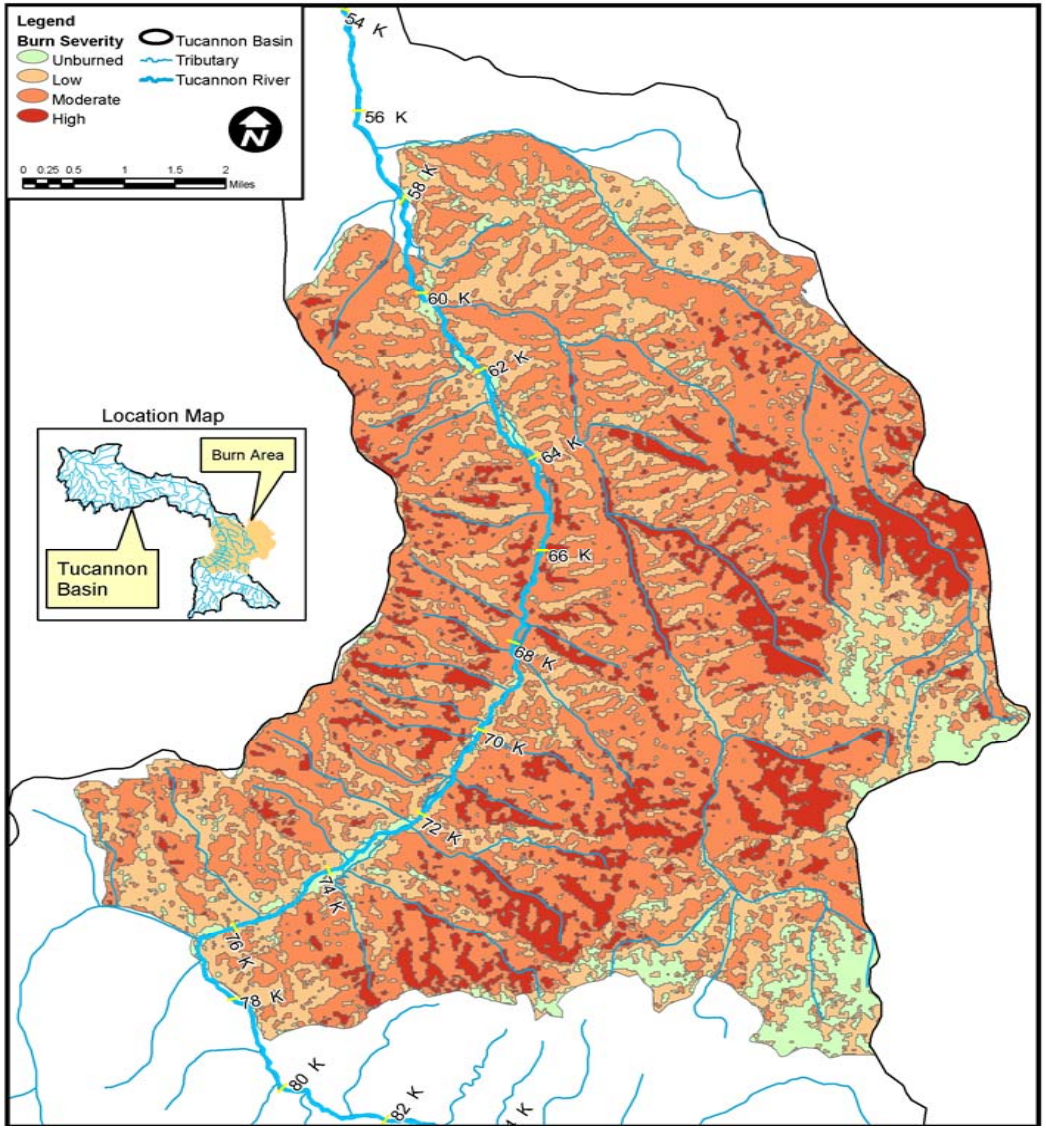
Mixed Shading
82 feet tall
80% density
100% trees

Conifer Shading
80 feet tall
80% density
100% trees

Example model run with system potential vegetation

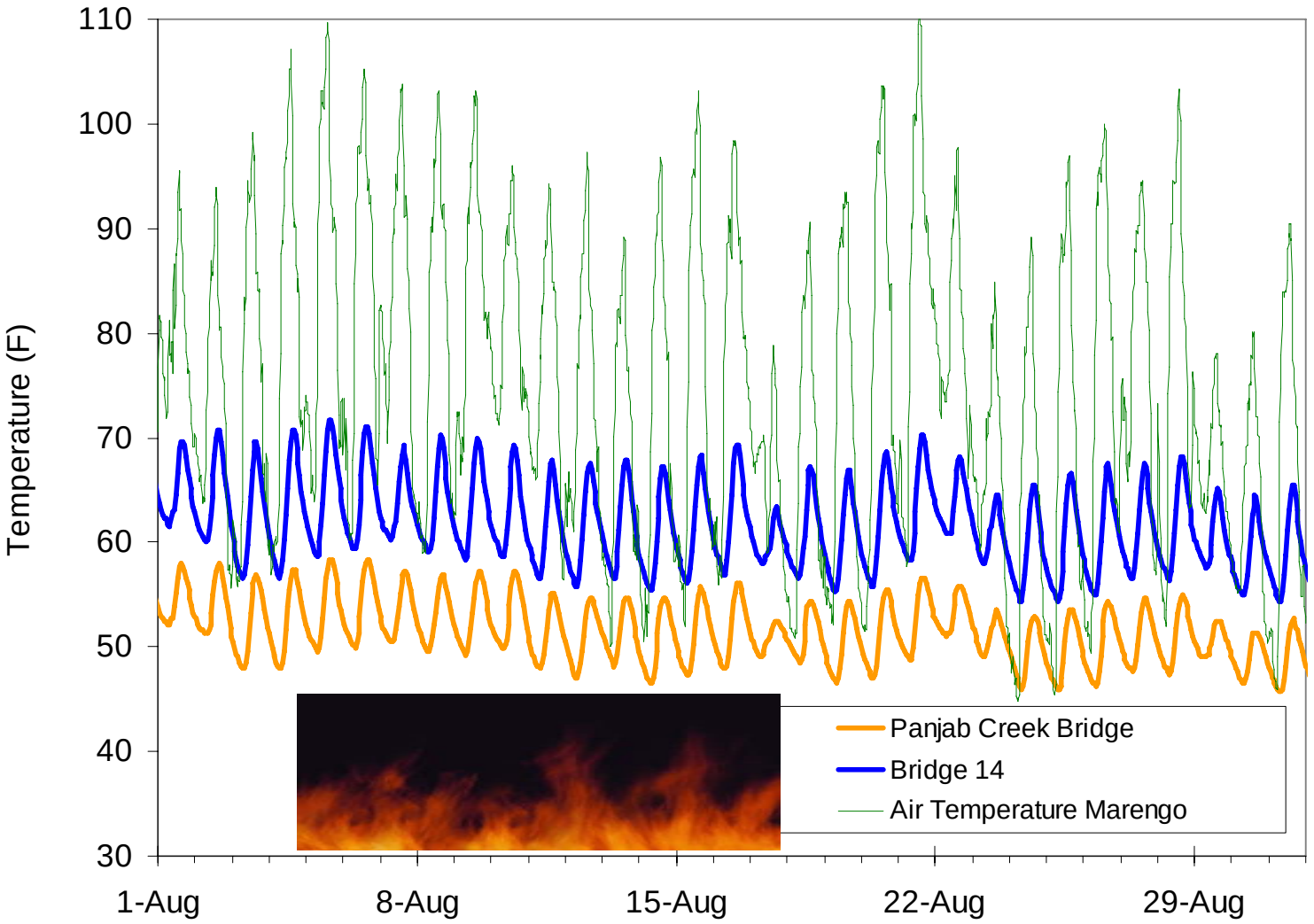


School House Fire (Aug 5-19)



http://www.fs.fed.us/r6/uma/fire/school.shtml

Temperature results after School House Fire



Part 4

Updated on Ecology/EPA Temperatures Standards

Update of Temperature Standards

- Ecology submitted temp. standards for EPA review – July 2003
- March 23, 2006 – EPA denied Ecology standards
- New EPA standards:
  - Fish-specific
  - More stringent in many areas
  - More exceedences for Tucannon River
- Ecology will revise standards
- TMDL scoping for Tucannon/Pataha next year

Ecology's Temperature Standards

Existing (1997)

Location	Classification	Criteria
Mouth to Umatilla National Forest boundary (RM 38.1):	Class A	18 C (64.4 F)
Umatilla National Forest boundary (RM 38.1) to Panjab Creek	Class AA	16 C (60.8 F)

Proposed (2003)

Location	Classification	Criteria
Mouth to Umatilla National Forest boundary (RM 38.1):	Noncore Salmon/Trout	17.5 C (63.5 F)
Umatilla National Forest boundary (RM 38.1) to Panjab Creek	Core Salmon/Trout	16 C (60.8 F)
Upstream of Panjab confluence:	Char	12 C (53.6 F)

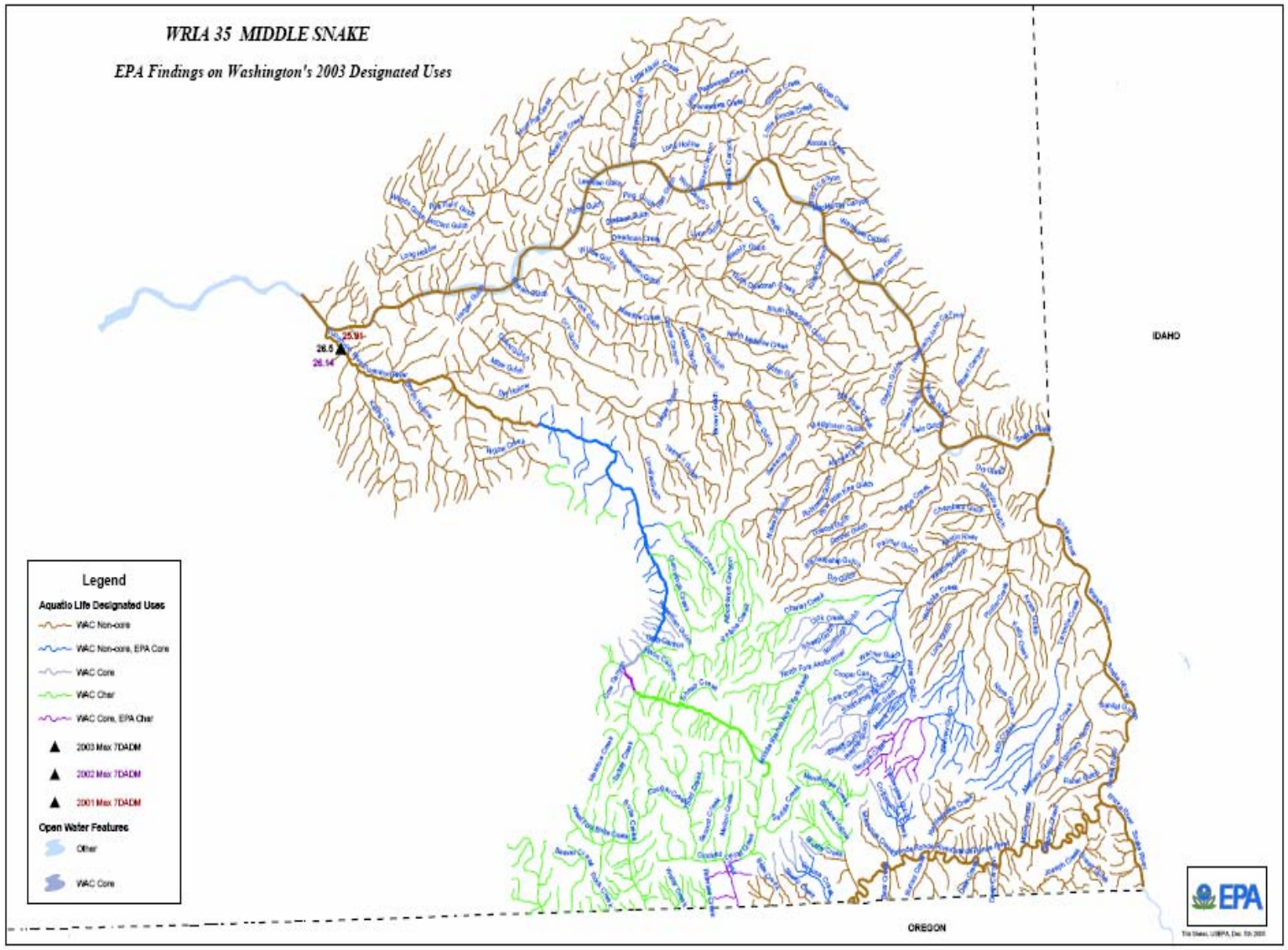
EPA's March 2006 Proposed Temperature Standards

Location	**Classification**	**Criteria**
Mouth to RM 20	Non Core/Salmon	17.5 ^{o}C
RM 20 – 38.1	Core	16 ^{o}C
Above RM 38.1	Char	12 ^{o}C

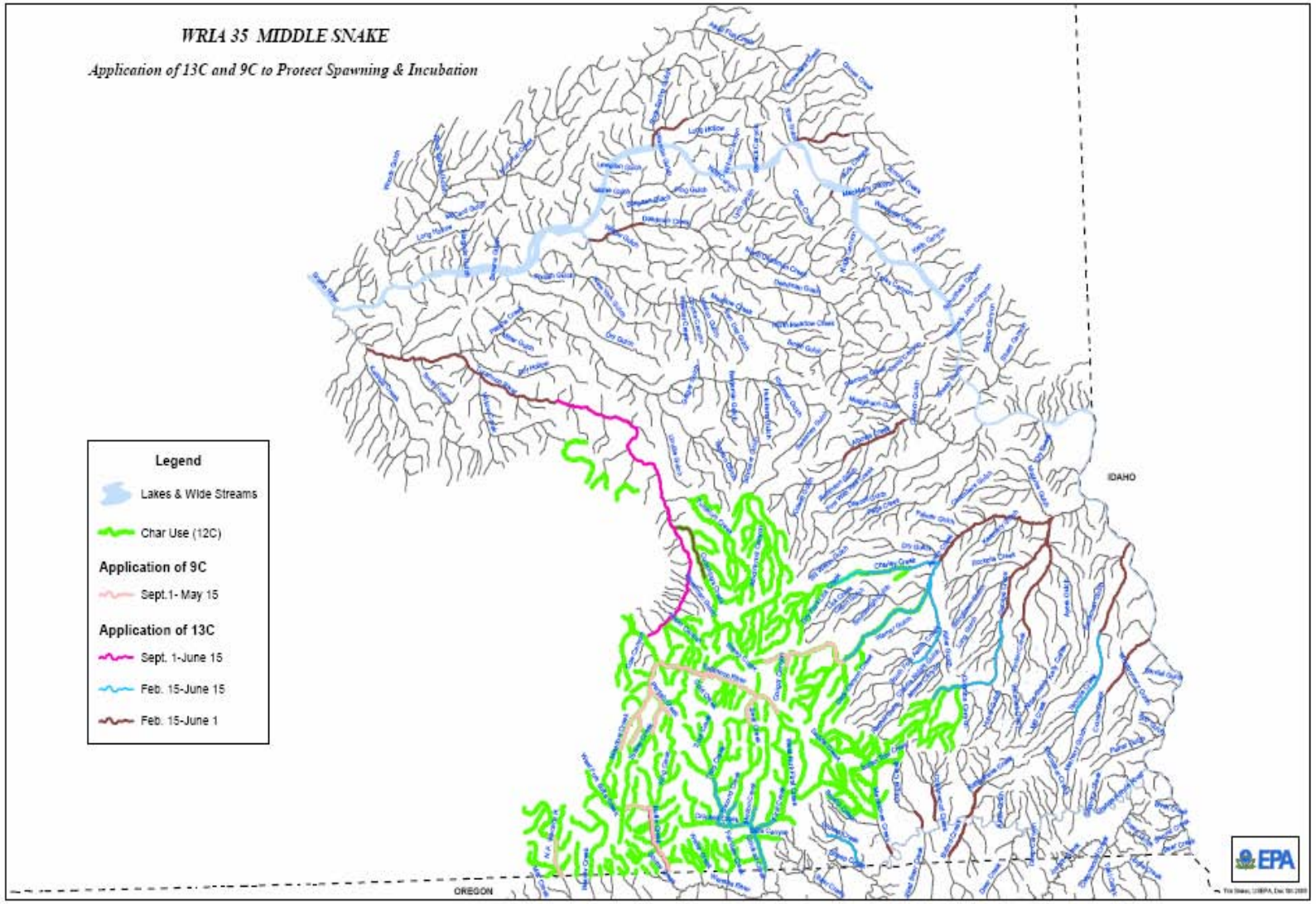
EPA's March 2006 Recommended Seasonal Temperature Standards

Location	Time period	Criteria	
Mouth to RM 20	Feb 15 – Jun 1	13 ^{o}C	To protect spawning and incubation
RM 20 – RM 38.1	Sept 1 – Jun 15	13 ^{o}C	To protect spawning and incubation
Upper Tucannon above Panjab Creek	Sept 1 – May 15	9 ^{o}C	To protect Bull Trout Spawning and Incubation

EPA's Proposed Temp. Standards



EPA's Seasonal Temp Standards for Fish Use



Part 5

Next steps . . .

Next Steps

- HDR - run natural conditions (system potential vegetation) scenario and prepare technical memo on methods and results

- HDR - present results of natural conditions modeling and discuss with Planning Unit the options for future steps