UCCE Rangeland Stream Temperature Project

Applied Research:

Factors controlling temp

Temp x Habitat x Use

Remote Sensing

Monitoring:

Design Assistance

Training

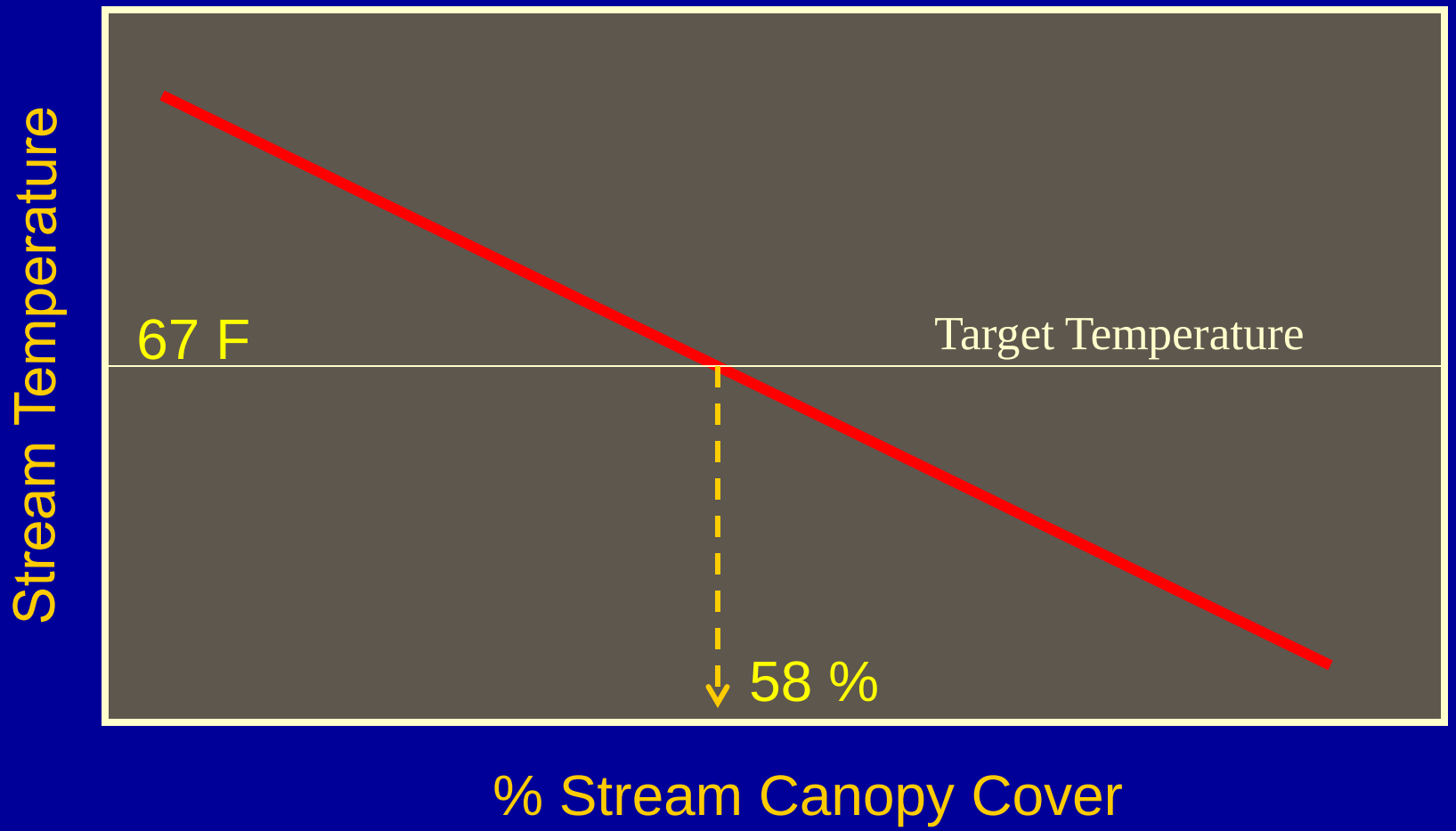
Data Interpretation

Support: CFBF, AFBF, UC-WRC, NASA

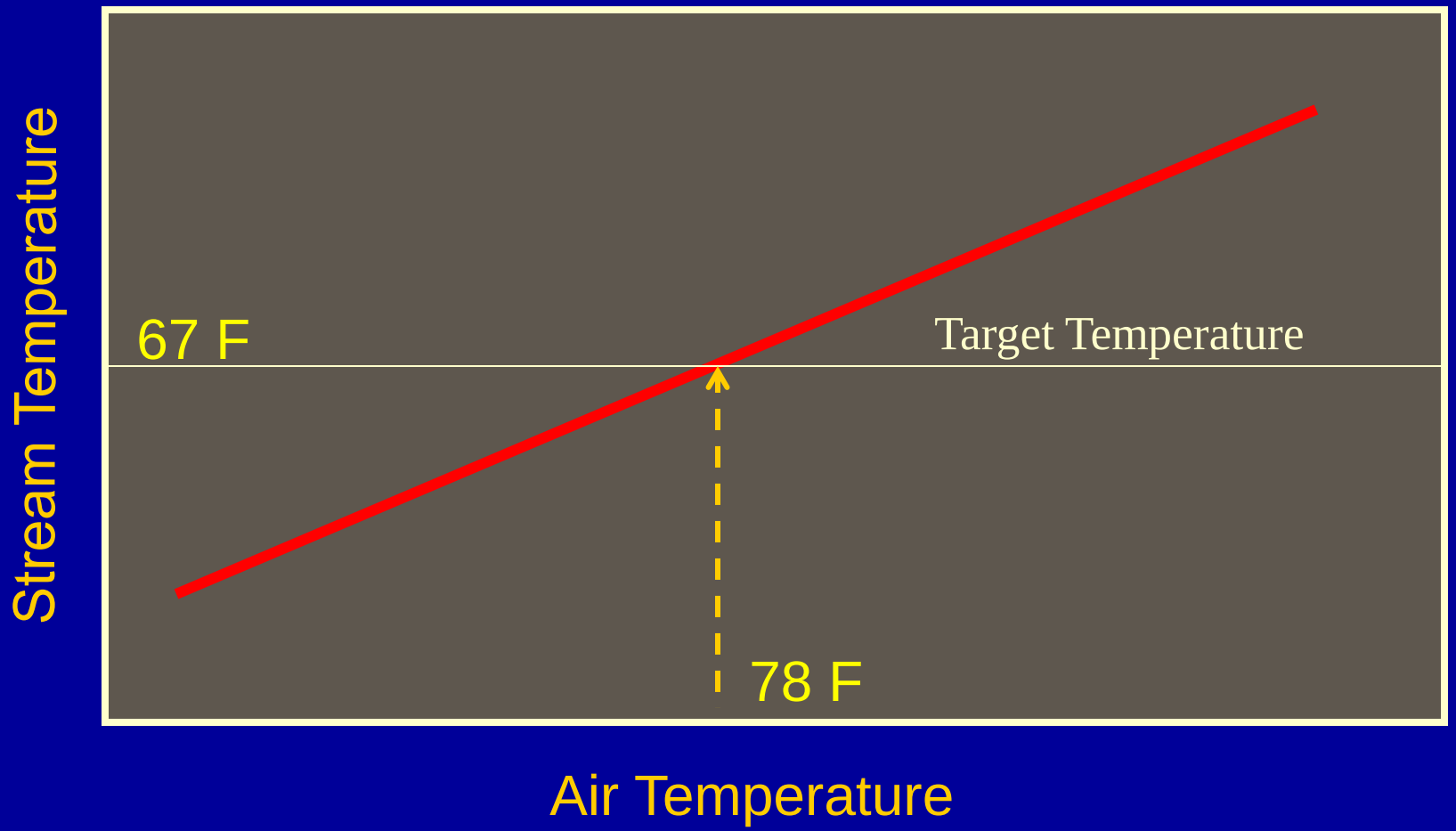
Stream Temperature TMDLs

- Cold water fisheries habitat.
- North Coast 1997 TMDL consent decree.
- All of Sierra Nevada & Central Coast.

School of Thought 1: You just need more canopy!



School of Thought 2: Air temperature drives stream temperature!



Reality: A lot of factors determine stream temp.

- Canopy
- Air Temperature
- Aspect
- Flow dynamics
- Watershed position
- Substrate color
- Land use

We need a better understanding of how these factors interact

Monitoring Stream Temperature

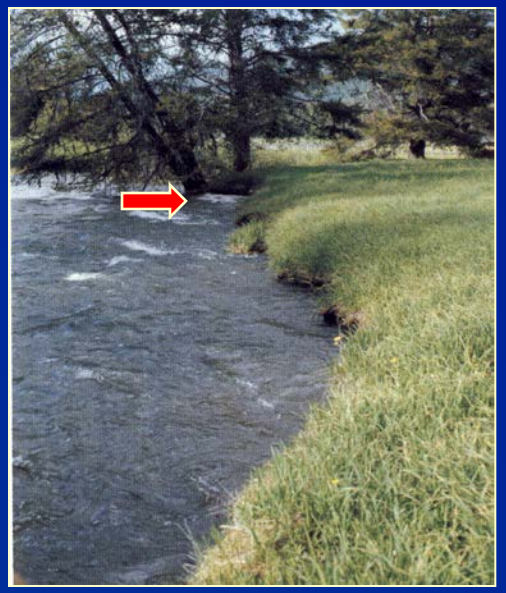
- Objectives
- What do you want to know?
- How confident do you need to be in the data?
- How much time and $$ does this merit?

Gadgets!

- Stow-Away
- Hobo-Temp
- Keep a thermometer and notebook in the pickup!

Monitoring at a site….

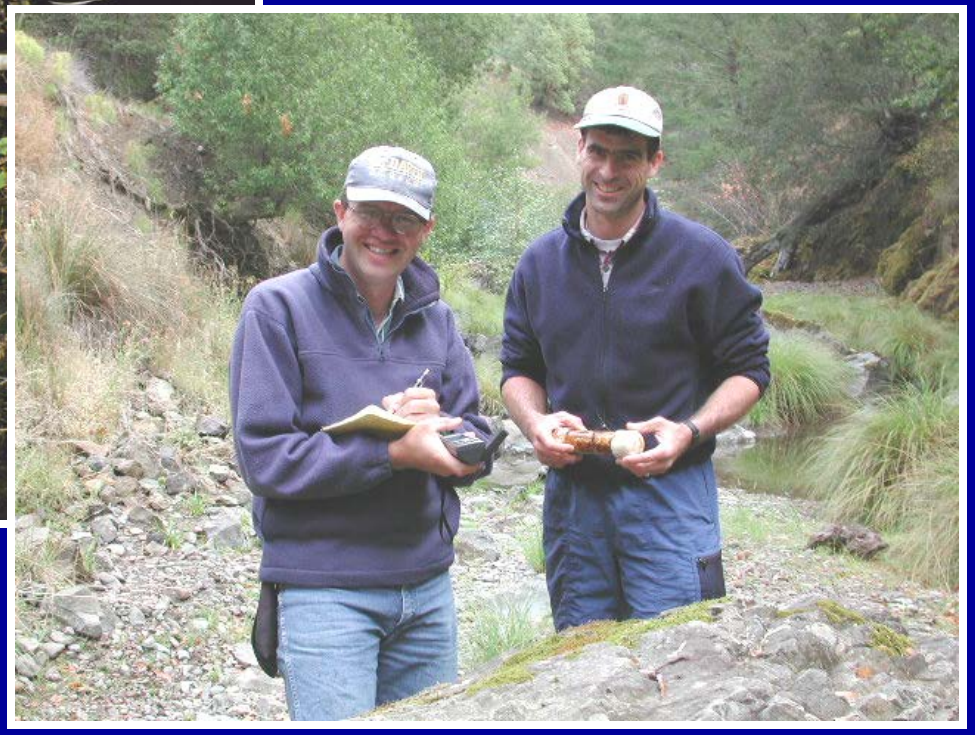
- Why this site?
- Problems
  - flow & theft
  - sunlight
  - poor mixing
  - water level drop
  - silts over
  - time of day (max/min)
- 30 min. samples for peak
- May - Oct
- Photo-Document



Approach 1: Flaunt it and tempt fate…..

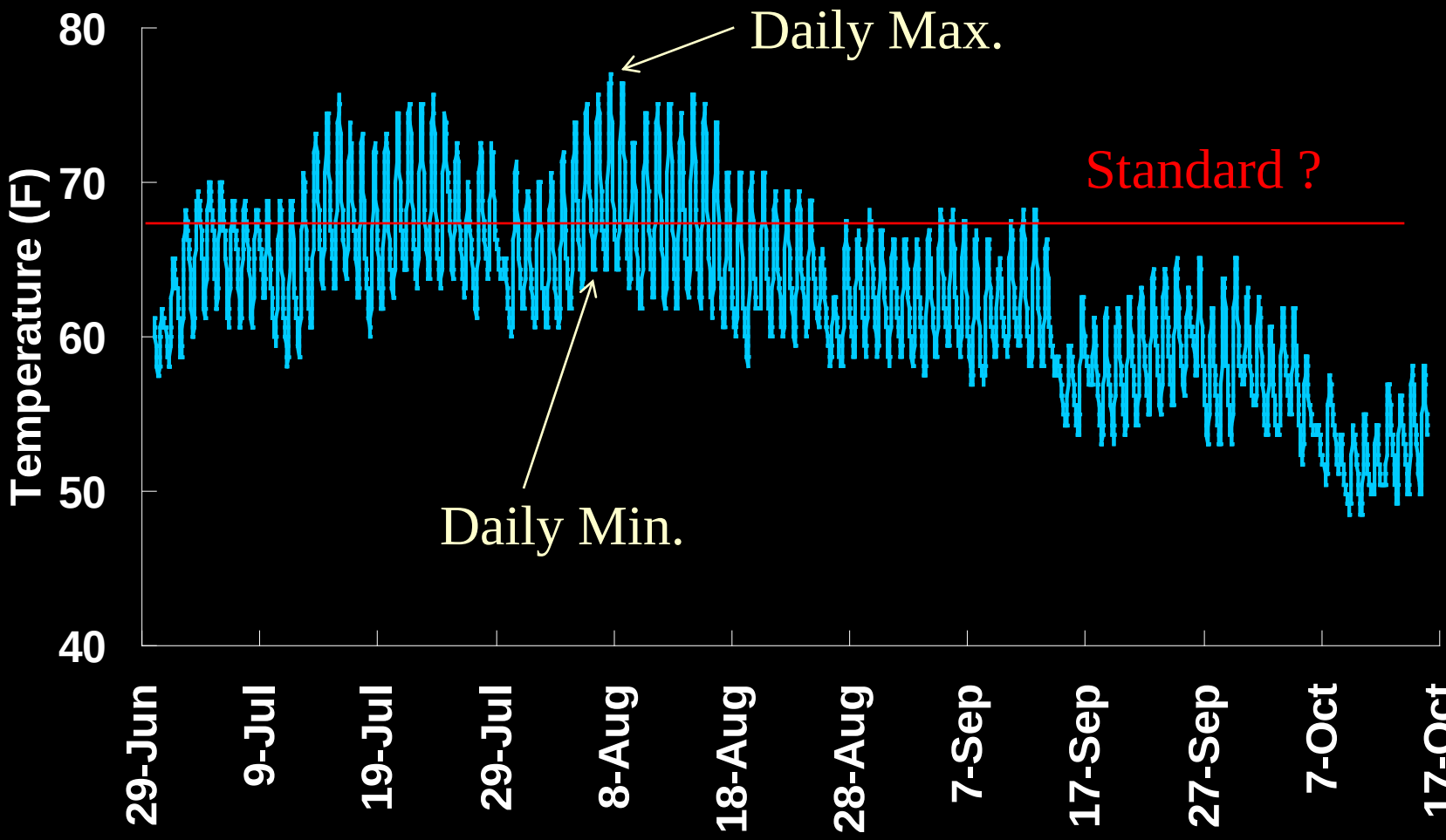
Approach 2: Hide it, but not too well …..

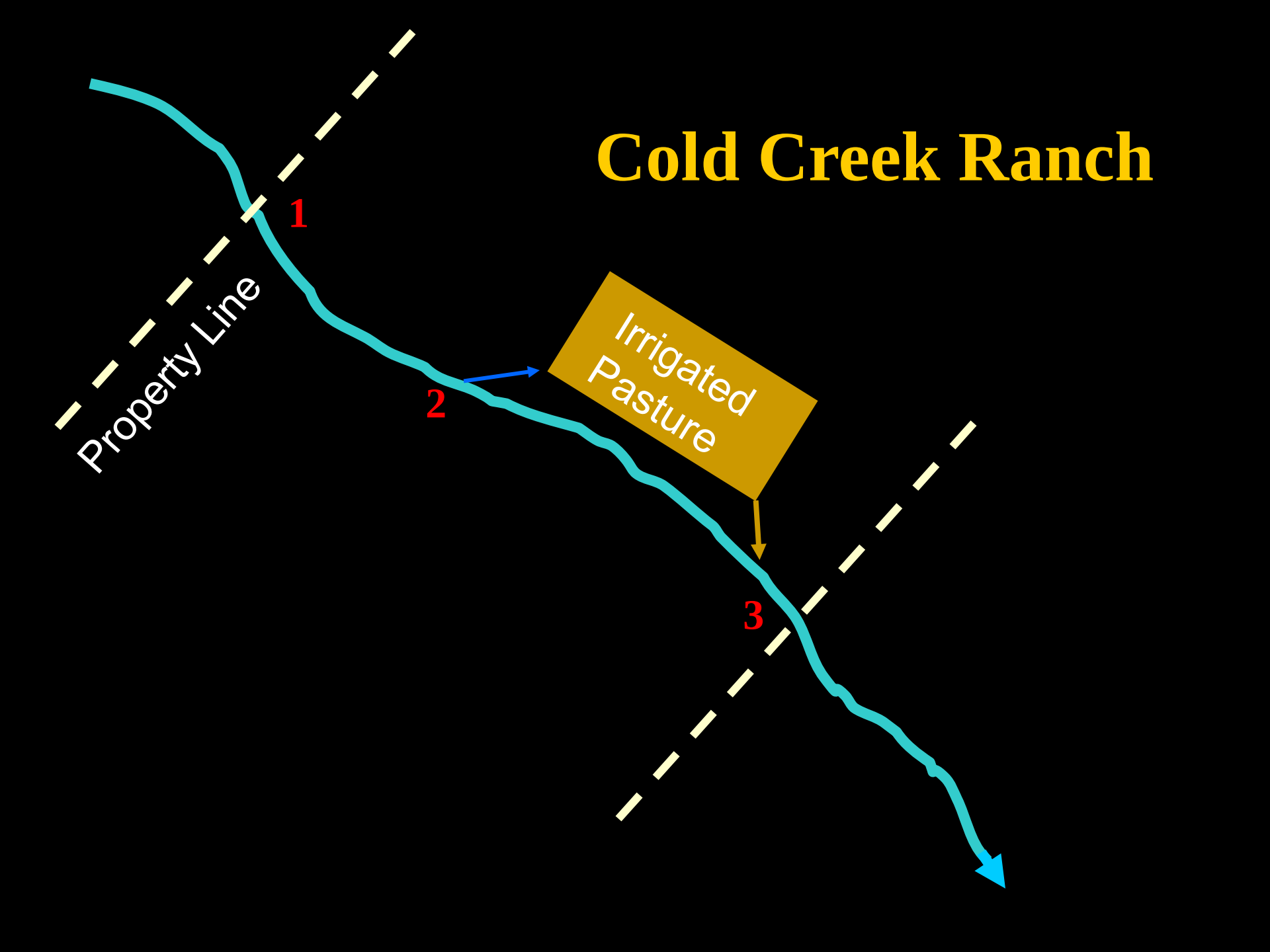
Approach 3: You ain’t takin’ my gadget!

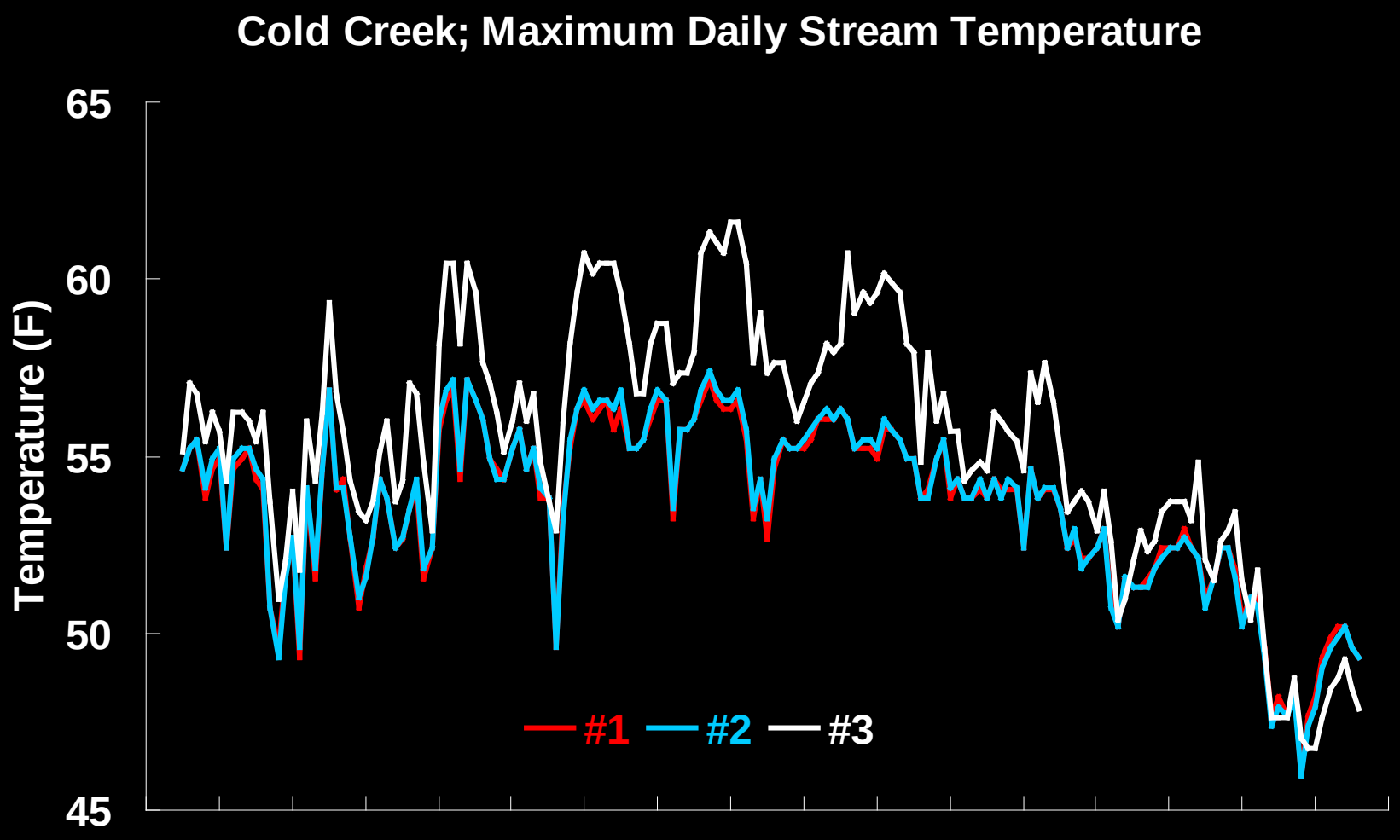


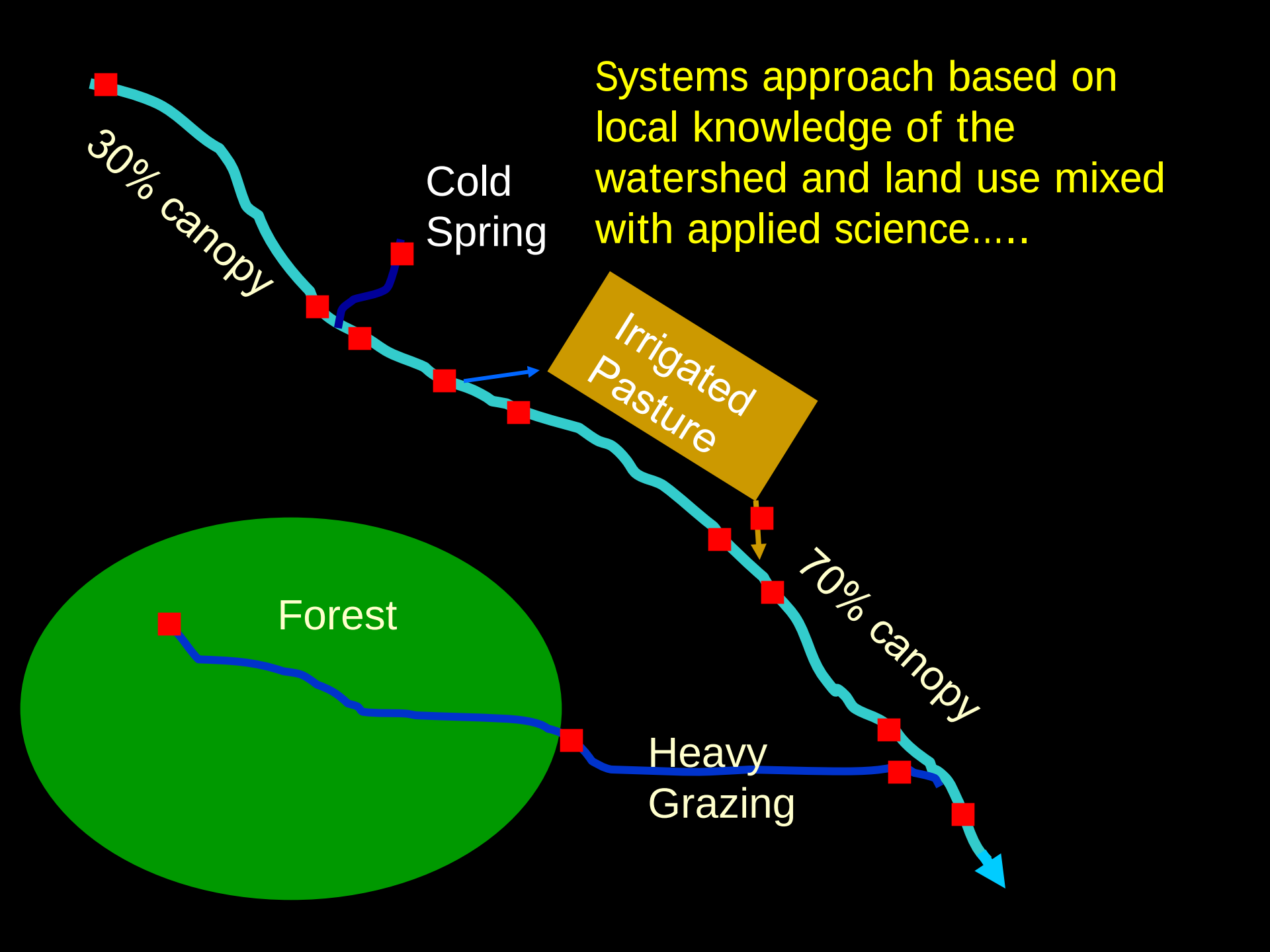

onset
computer corporation
Range
Optic
StowAway
Temp

Data collected every 30 minutes from one site via a Stowaway, 48 readings per day



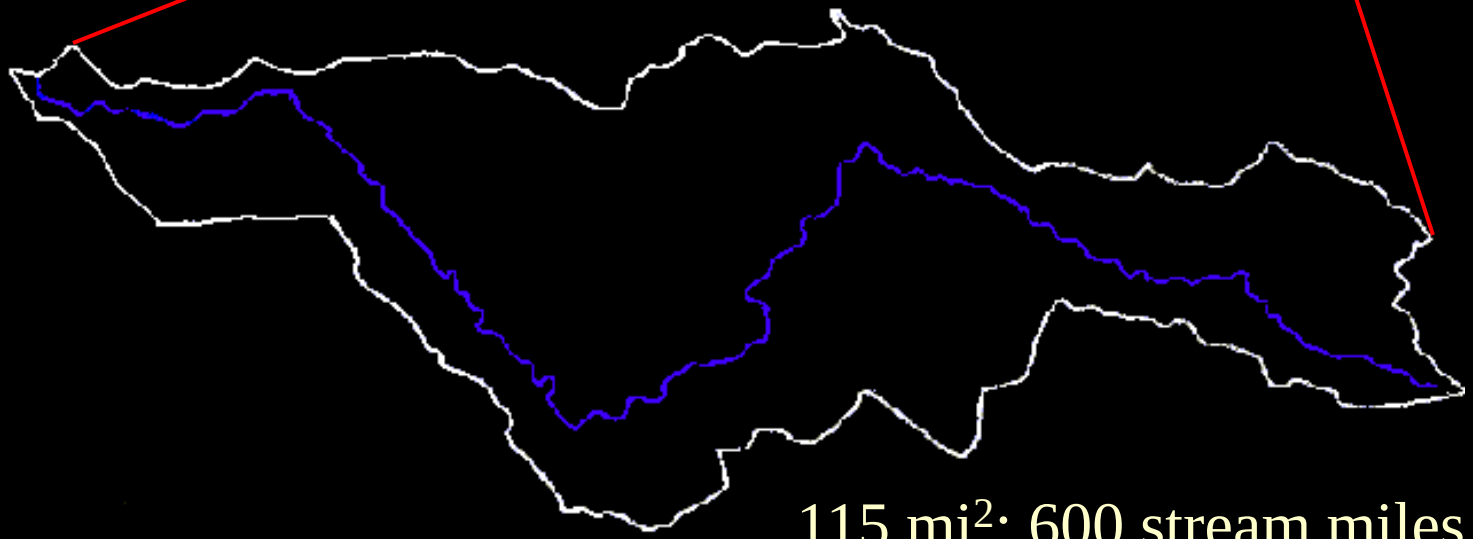

Cold Creek Ranch
1
2
3
Property Line
Irrigated Pasture


Cold Creek; Maximum Daily Stream Temperature
Temperature (F)
65
60
55
50
45
#1
#2
#3


Systems approach based on local knowledge of the watershed and land use mixed with applied science.....
30% canopy
Cold Spring
Irrigated Pasture
70% canopy
Forest
Heavy Grazing

Garcia River Watershed

Garcia River Agricultural Landowners Group



115 mi^2; 600 stream miles

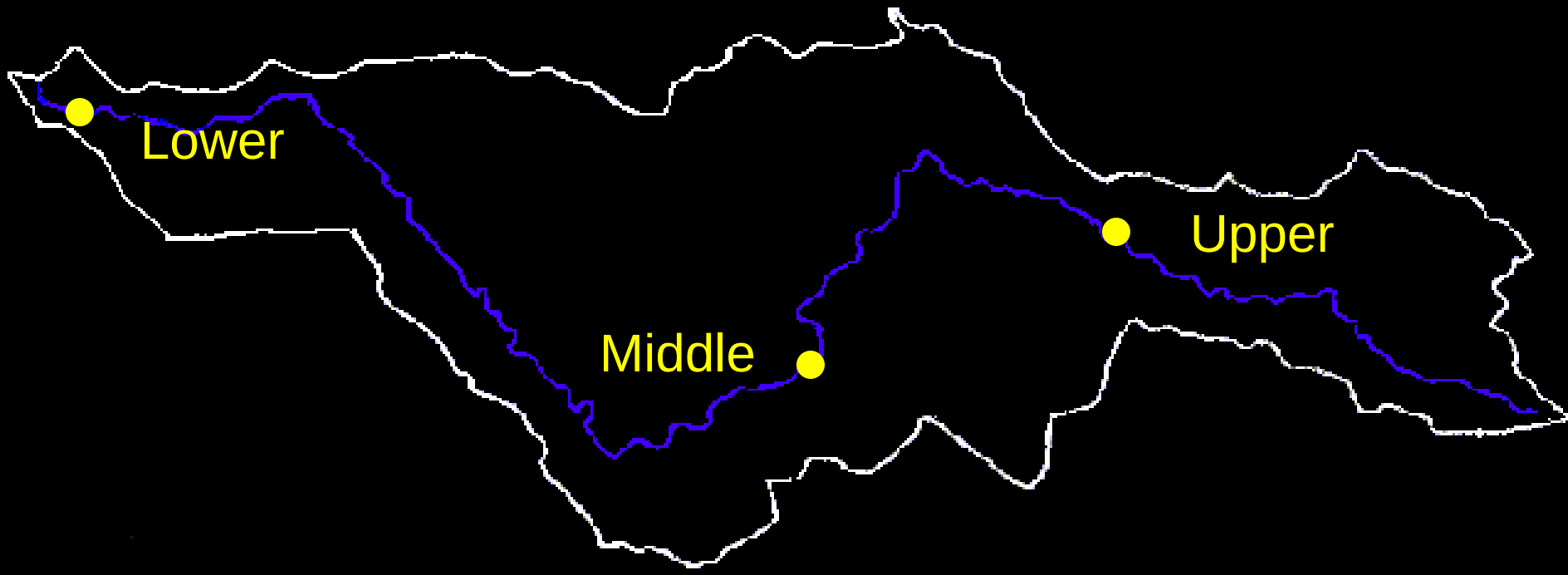
Objectives

- Quantify relationships between stream temperature and watershed and reach factors.
- Interpret for regulation and BMP development & implementation.

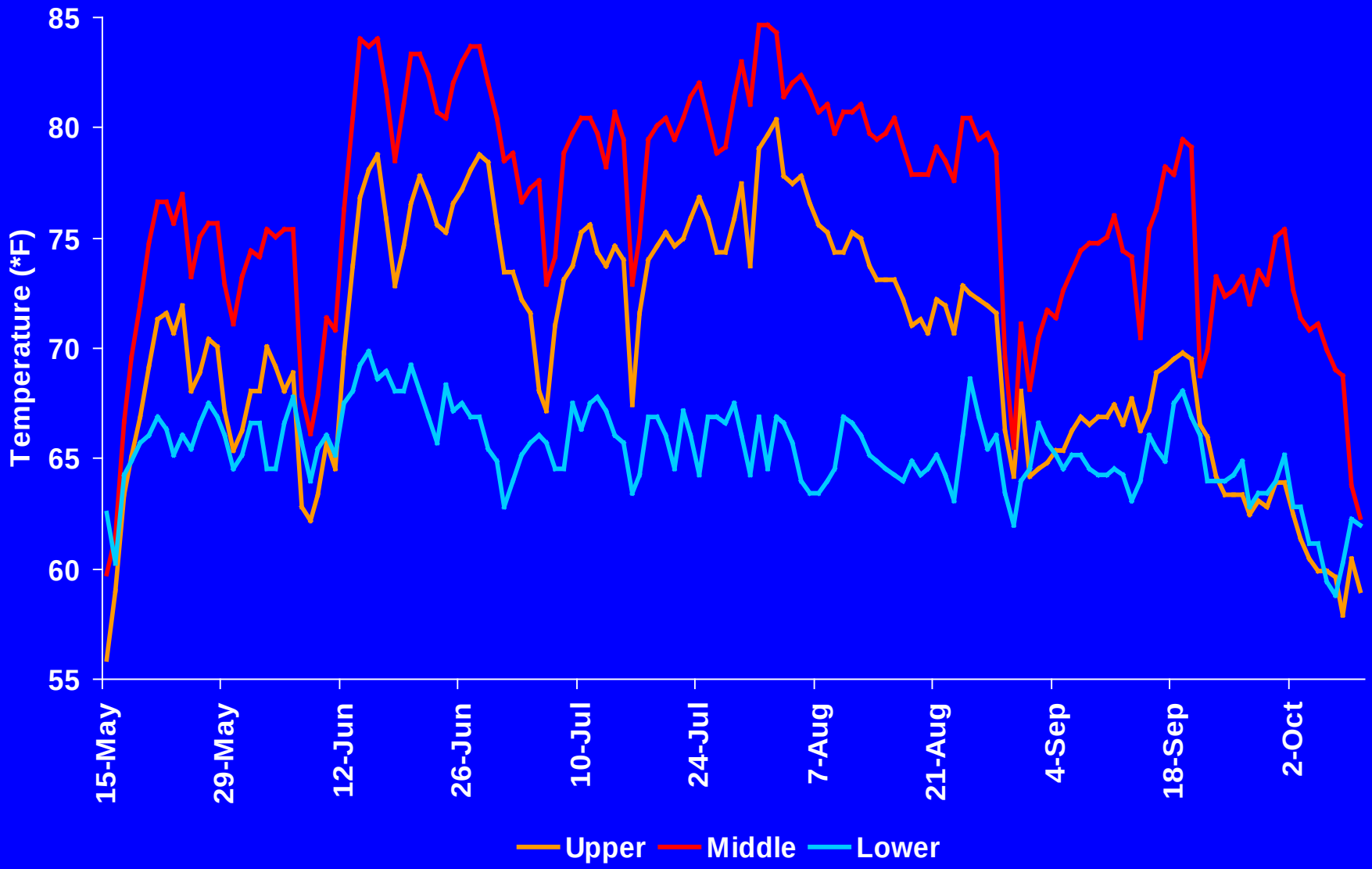
Approach

- Summer 1999 and 2000
- 44 stream locations
- 6 air locations
- Canopy, stream flow, aspect, etc.

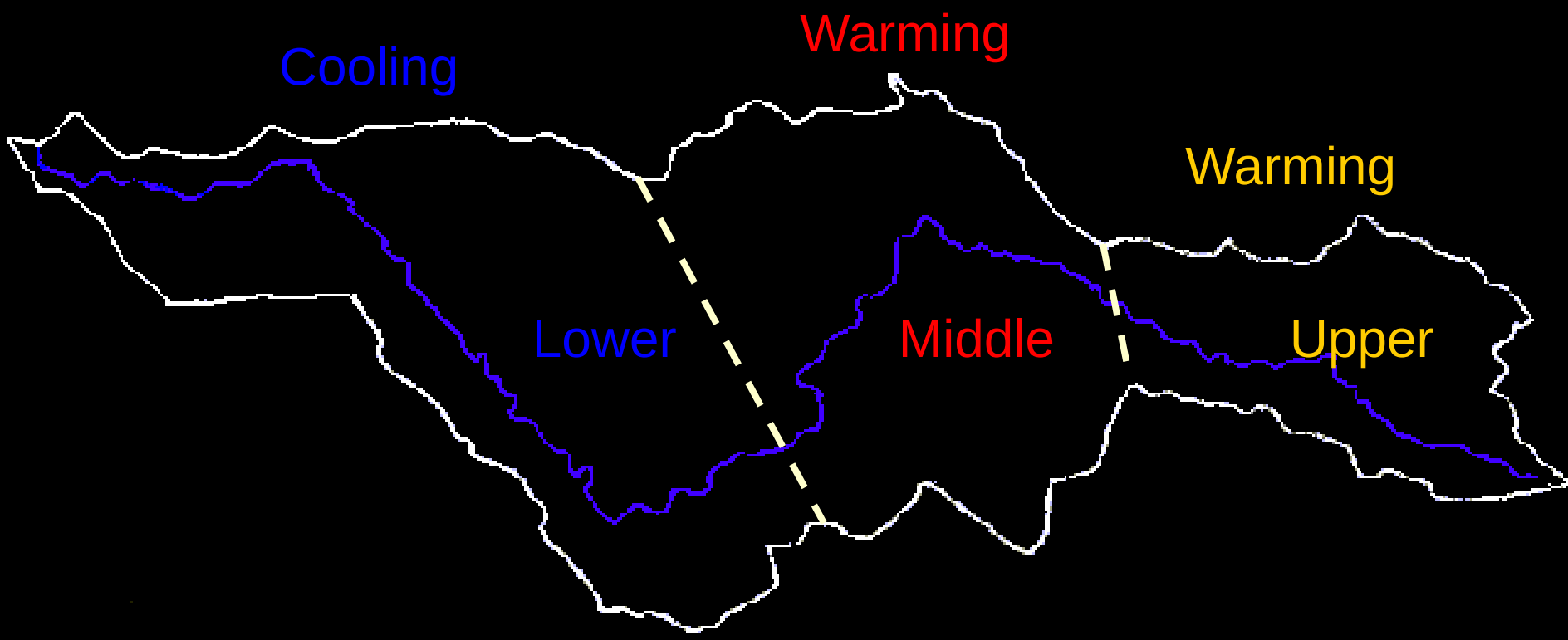
Watershed Scale Factors



2000 Daily Maximum Stream Temperature



Watershed position affects Garcia River temperatures, but not as expected.




10 13'00

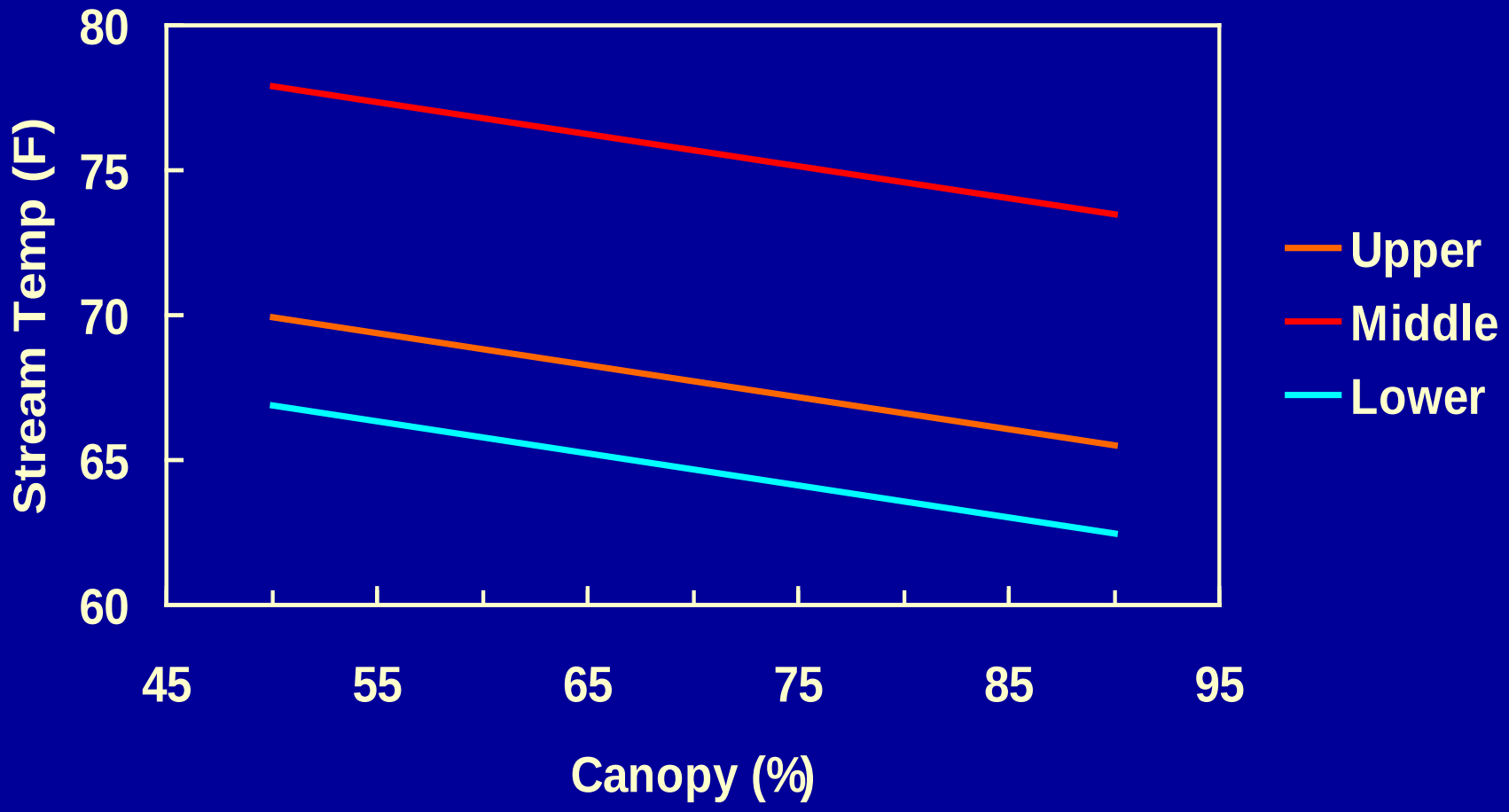
Factors determining Aug-1 max daily stream temperatures (r^2 = 0.99)

Factor	Effect	P value
Max Daily Air Temp	+ 0.9	<0.001
Watershed Position		0.004
Lower	- 3.0	
Middle	+ 8.0	
Upper	0.0	
Stream Canopy	- 0.1	0.07
Stream Order	+ 3.1	0.08
Stream Flow	- 0.9	0.09

Watershed Position and Canopy Effect

Aug-1 Maximum Daily Stream Temp

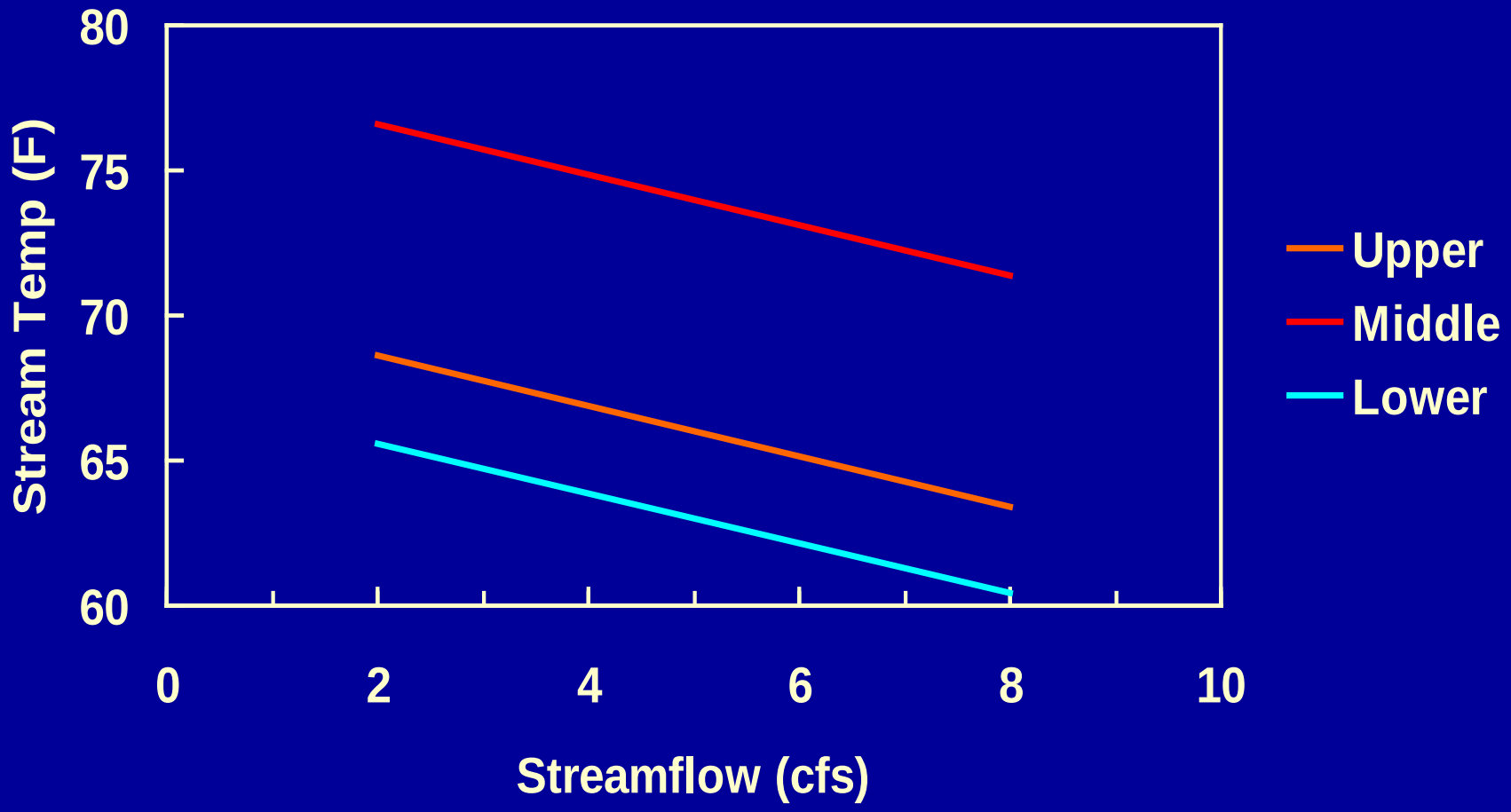
flow = 3cfs, order = 2, air max = 85 F



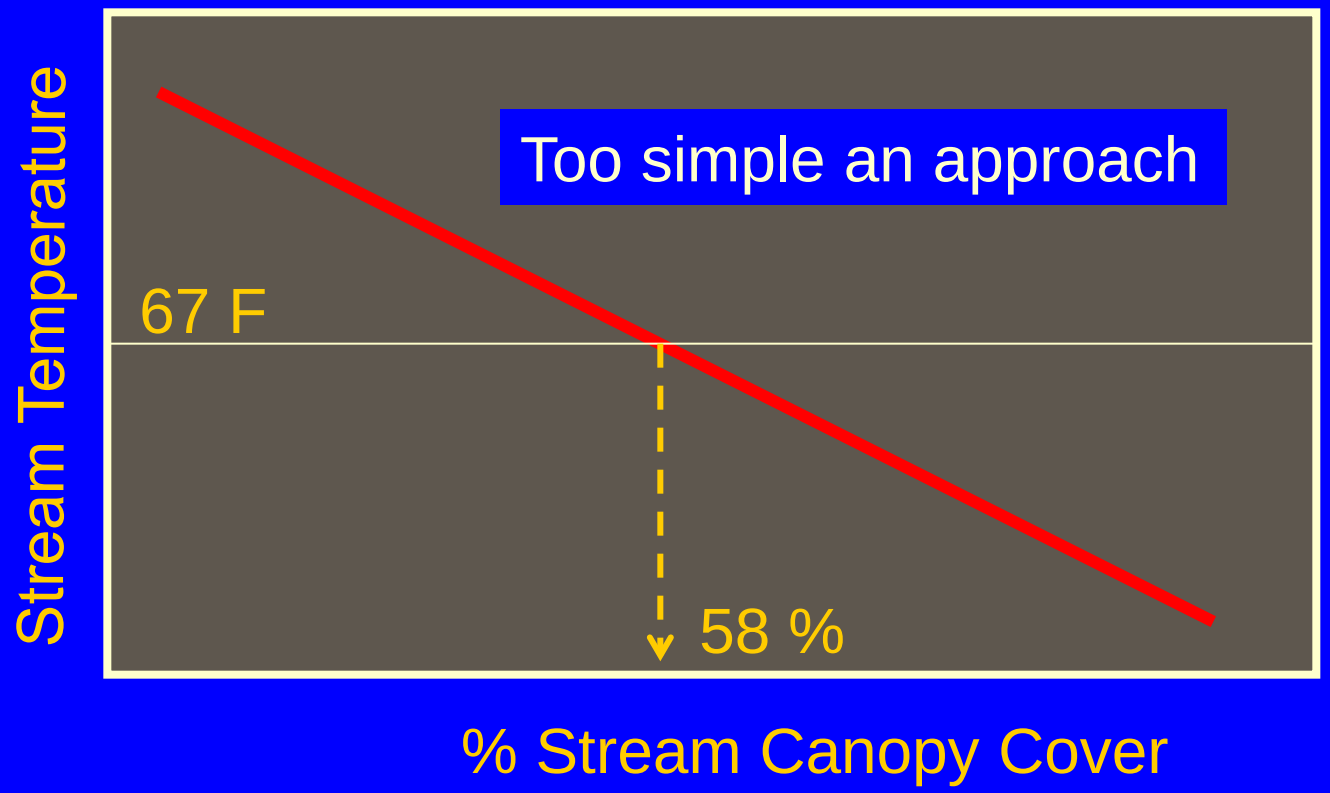
Watershed Position and Streamflow Effect

Aug-1 Maximum Daily Stream Temp

canopy = 70%, order = 2, air max = 85 F

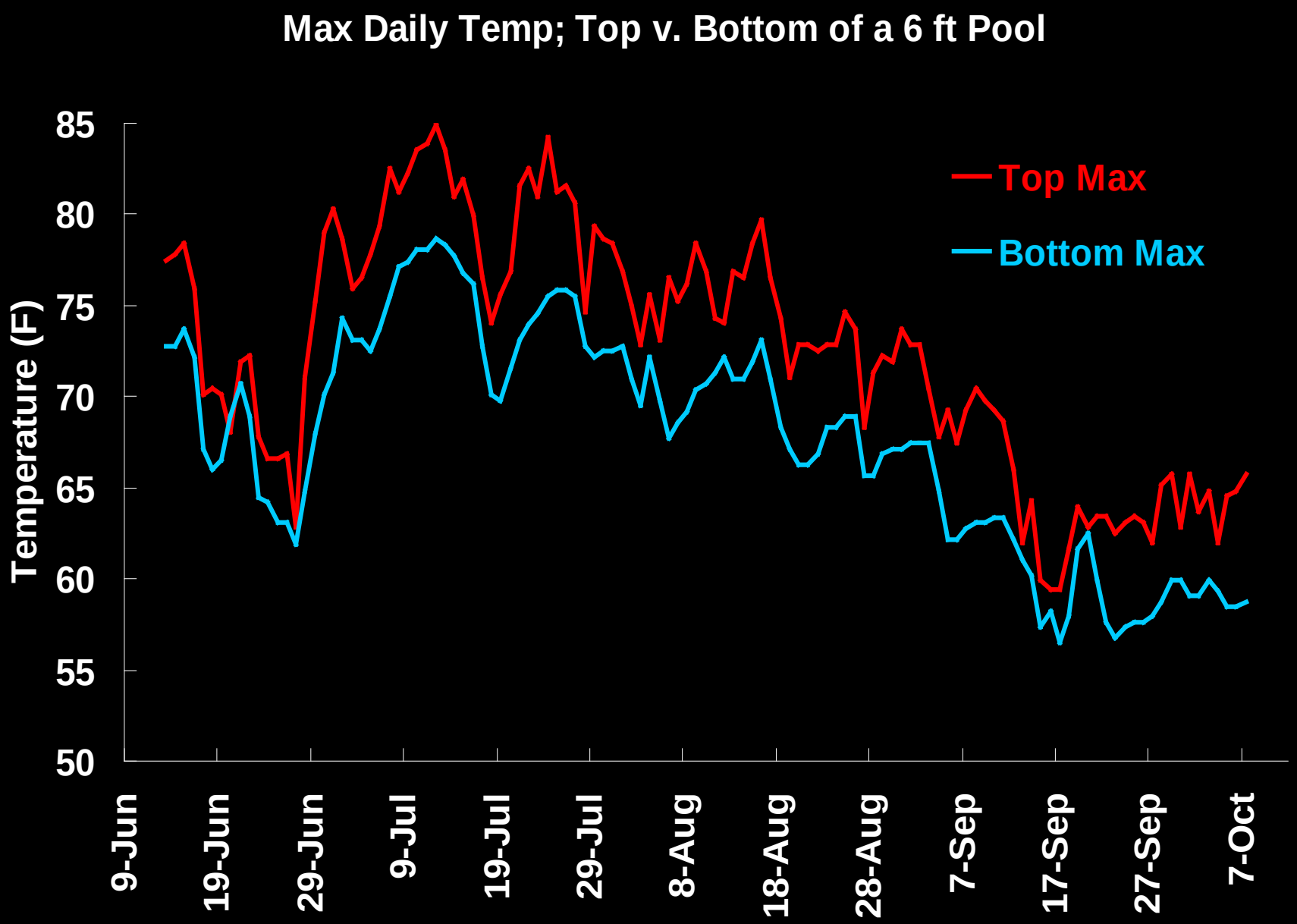


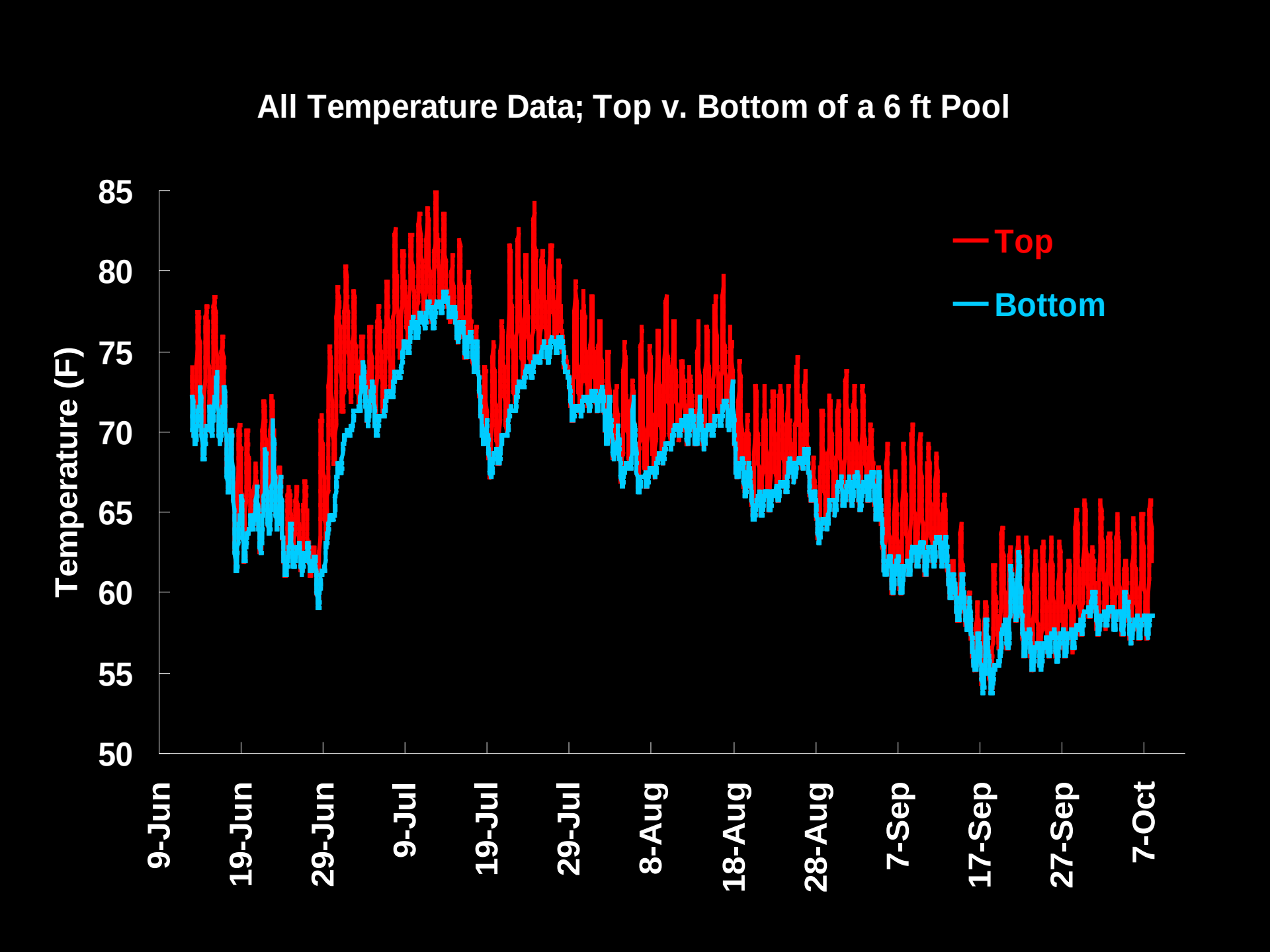
The effect of canopy & flow will vary depending on watershed and stream reach scale factors



Fish are mobile……

- Thermal refuge
  - Deep pools, below springs, etc.
- Do you have it?
- What type and quality?
- Is it there when the fish need it?


Max Daily Temp; Top v. Bottom of a 6 ft Pool
Temperature (F)
85
80
75
70
65
60
55
50
9-Jun
19-Jun
29-Jun
9-Jul
19-Jul
29-Jul
8-Aug
18-Aug
28-Aug
7-Sep
17-Sep
27-Sep
7-Oct
Top Max
Bottom Max


All Temperature Data; Top v. Bottom of a 6 ft Pool
Temperature (F)
85
80
75
70
65
60
55
50
Top
Bottom
9-Jun
19-Jun
29-Jun
9-Jul
19-Jul
29-Jul
8-Aug
18-Aug
28-Aug
7-Sep
17-Sep
27-Sep
7-Oct

Rules of thumb

1. Fix obvious problems *asap*.
2. Monitor when there is uncertainty.
3. Monitoring alone won't save the day.
4. Proactive water quality management includes *critical self assessments, planning, management change, and monitoring*.
5. Monitoring data has its greatest effect when presented via a positive forum.

Take Home

- Keep it simple, set objectives.
- Use your knowledge of the system.
- Where can it warm up or cool off? Why?
- Work with your neighbors.
- Learn from each year's data and plan accordingly.