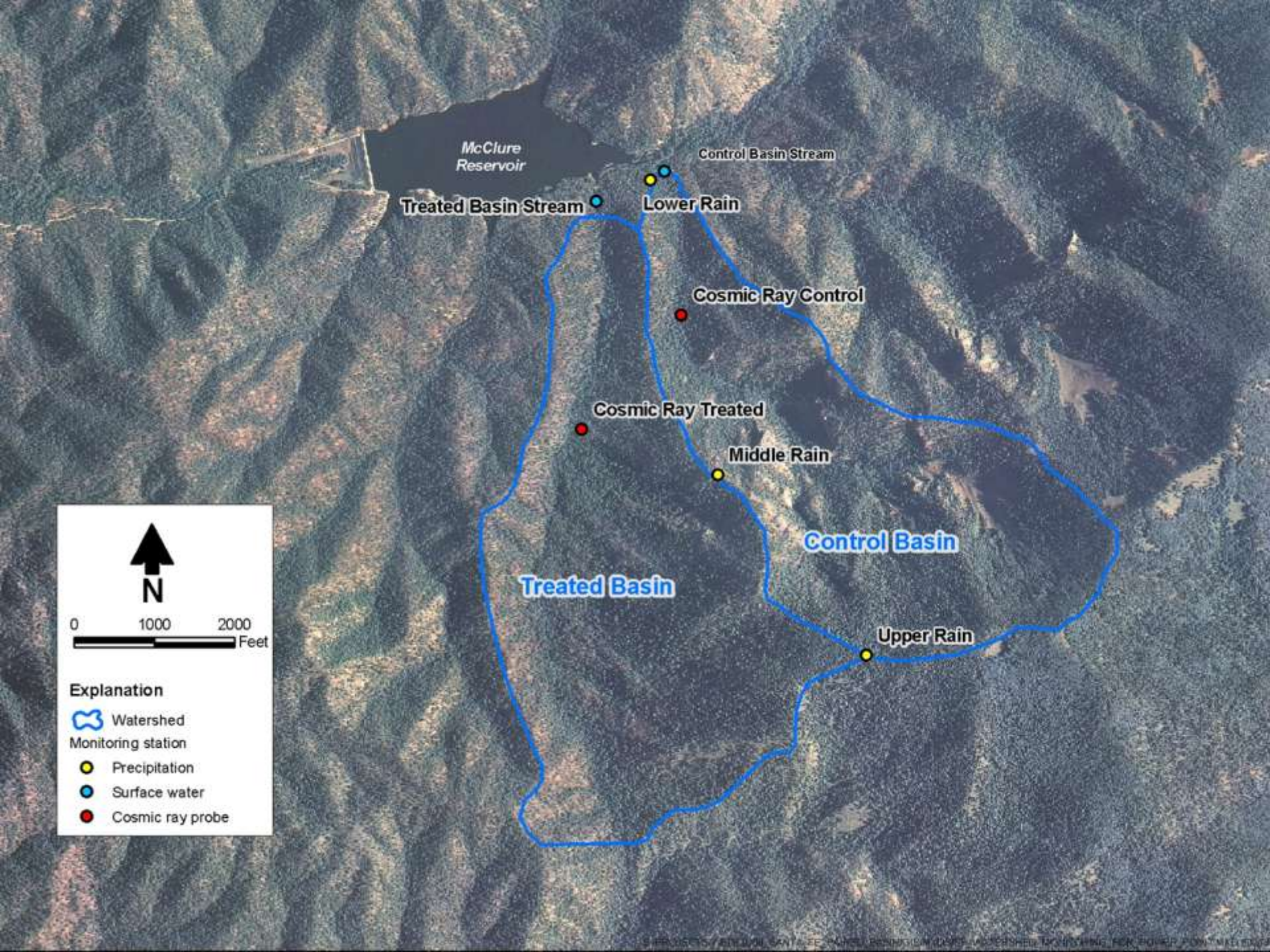


# *Santa Fe Paired Basin Study*



*Southwest Fire  
Consortium  
2011*

*Amy C. Lewis  
Consultant to the  
New Mexico  
Interstate Stream  
Commission*



McClure Reservoir

Control Basin Stream

Treated Basin Stream

Lower Rain

Cosmic Ray Control

Cosmic Ray Treated

Middle Rain

Control Basin

Treated Basin

Upper Rain

**North Arrow**  
N

0 1000 2000 Feet

**Explanation**

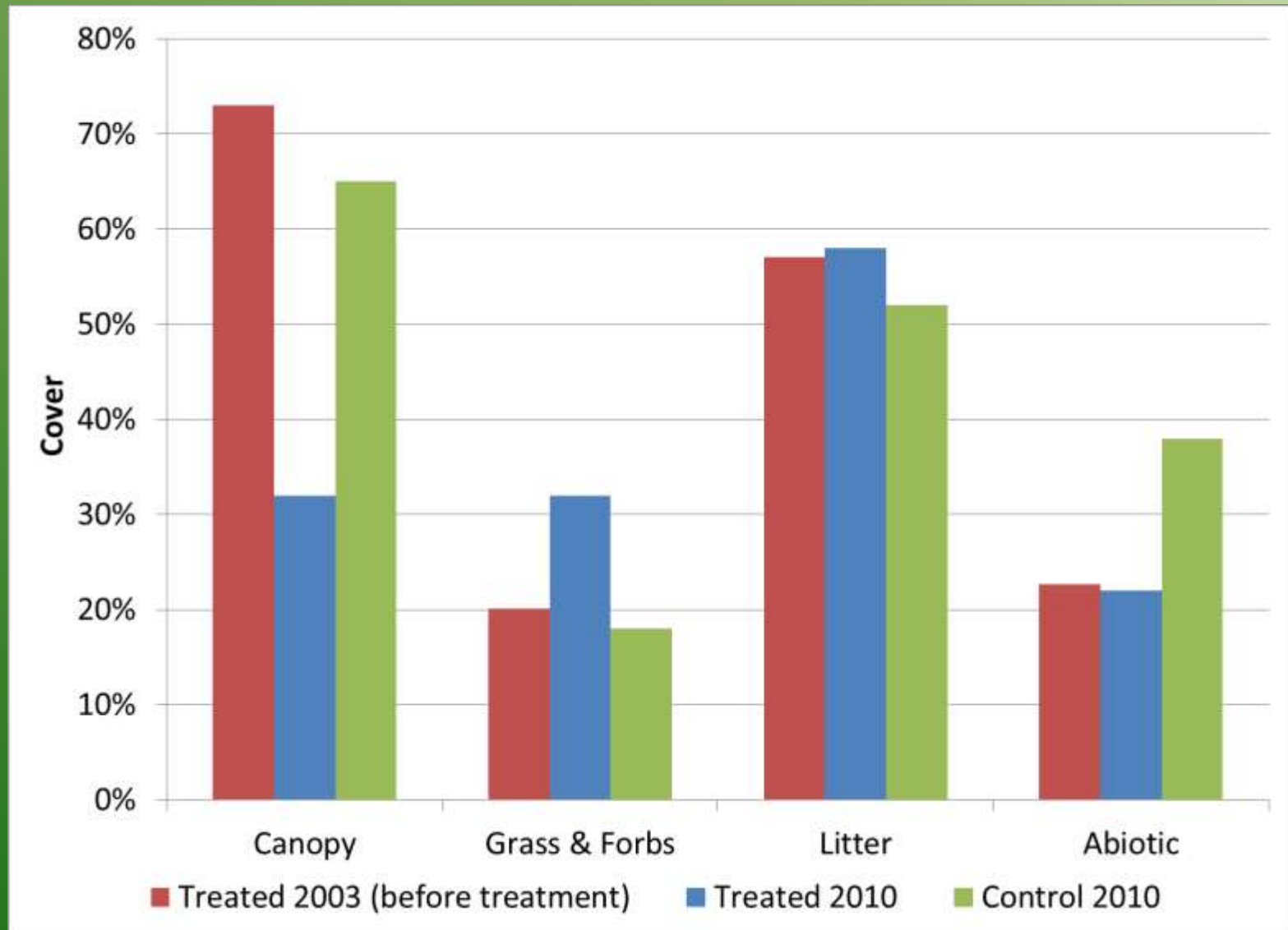
- Watershed
- Monitoring station
  - Precipitation
  - Surface water
  - Cosmic ray probe

# *Specific Questions*

- *Will the total surface runoff volume change following thinning?*
- *Will the rate and timing of surface runoff change?*
- *Will the total amount of groundwater recharge change following thinning?*
- *Will the amount of moisture available to vegetation change following thinning?*



# *Changes in Vegetation in Paired Basins*



# *Project Approach*

*Monitor/estimate water budget components in treated and untreated basins*

*Water in: Precipitation (P)*

*Water out: Runoff (RO) + Evaporation (E) +  
Transpiration (T) + Recharge (R)*

*Change in Storage:  $\Delta S = P - RO - E - T - R$*

# *Water Budget Components*

- *Precipitation (P) (including snow) - measurement at 3 stations*



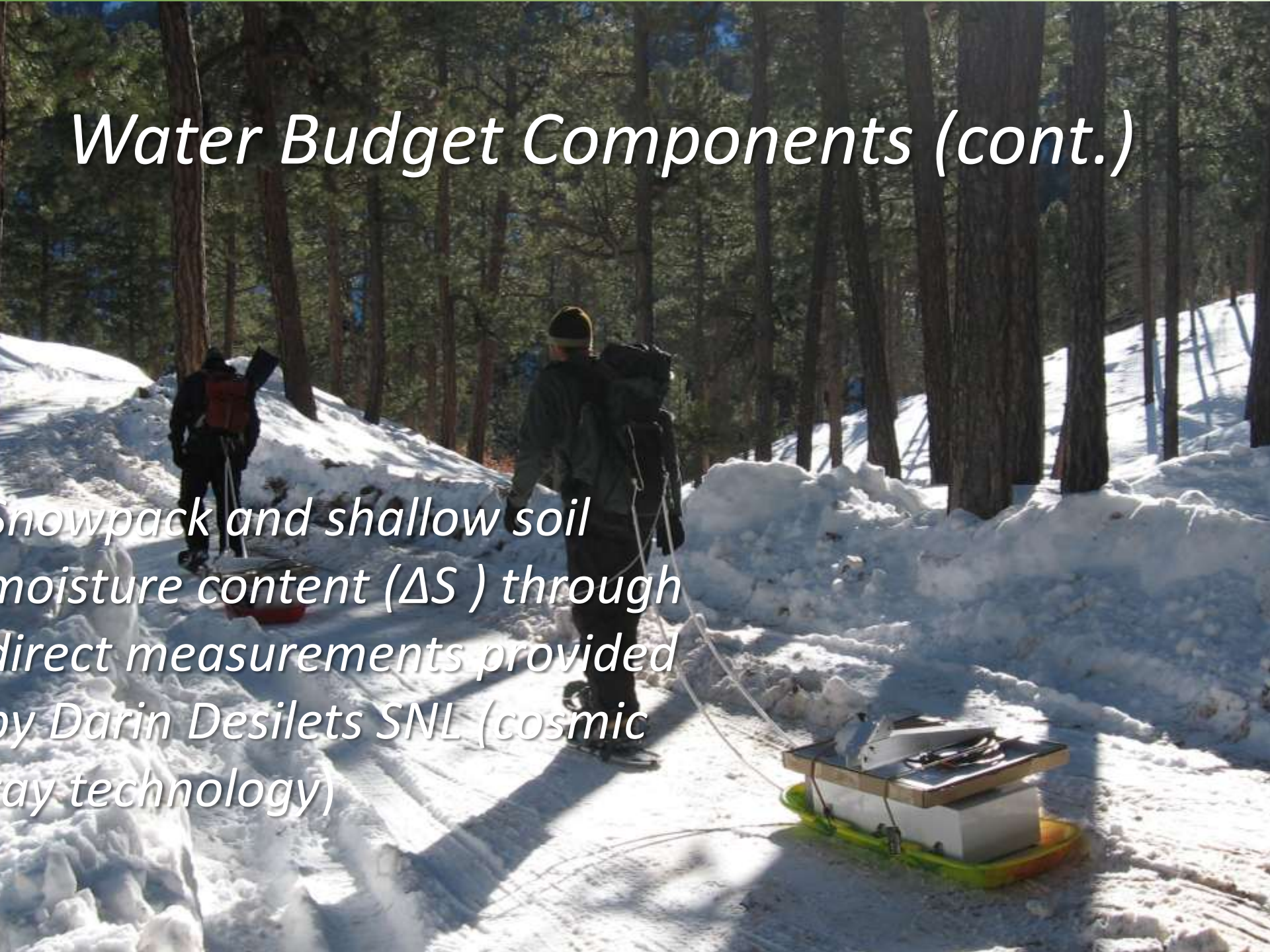
# Water Budget Components (cont)

- *Stream flow (RO) - measurement-Parshall flumes equipped with pressure transducers*



# *Water Budget Components (cont.)*

*Snowpack and shallow soil  
moisture content ( $\Delta S$ ) through  
direct measurements provided  
by Darin Desilets SNL (cosmic  
ray technology)*





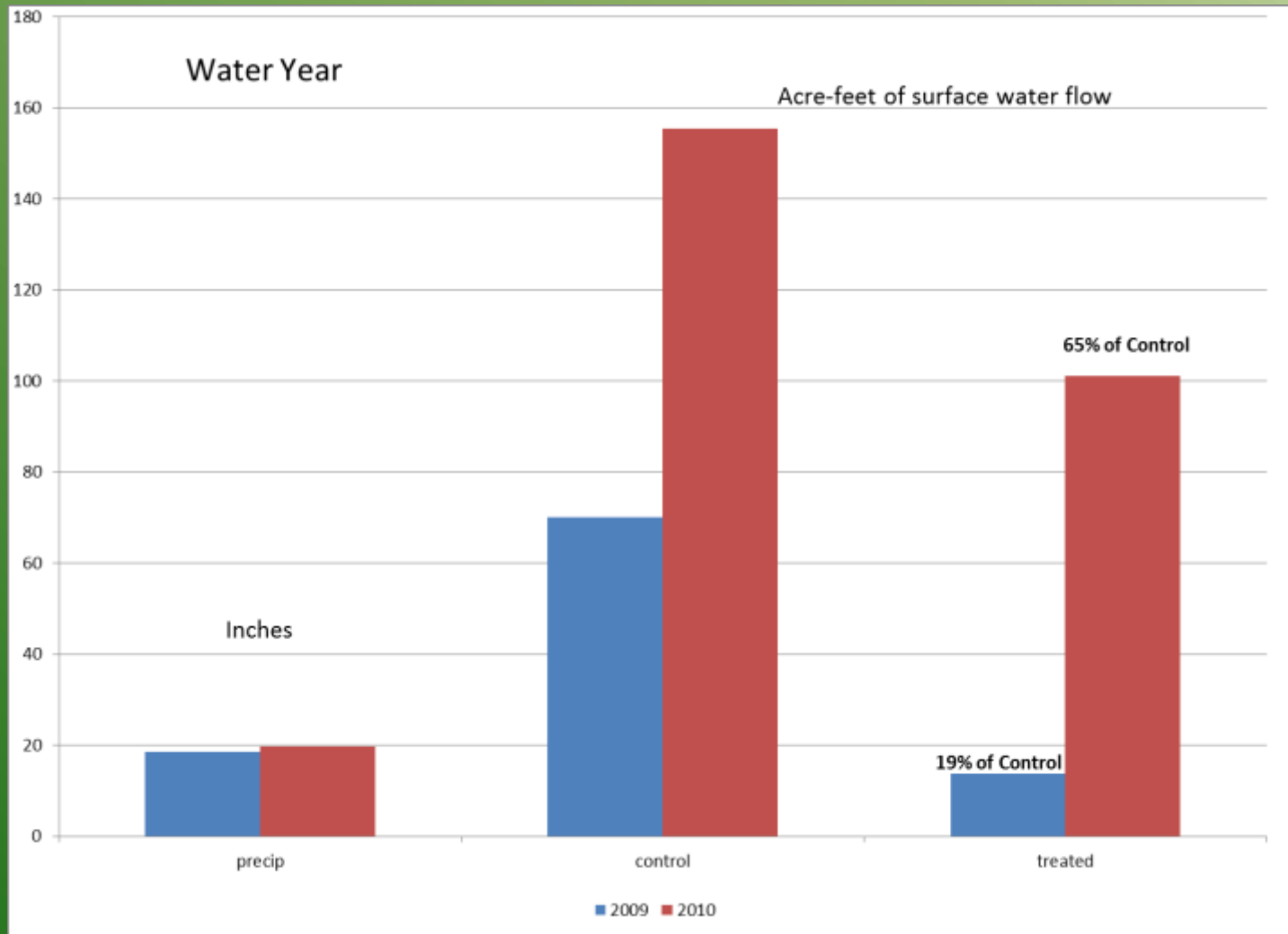
# *Water Budget Components*

*(cont.)*

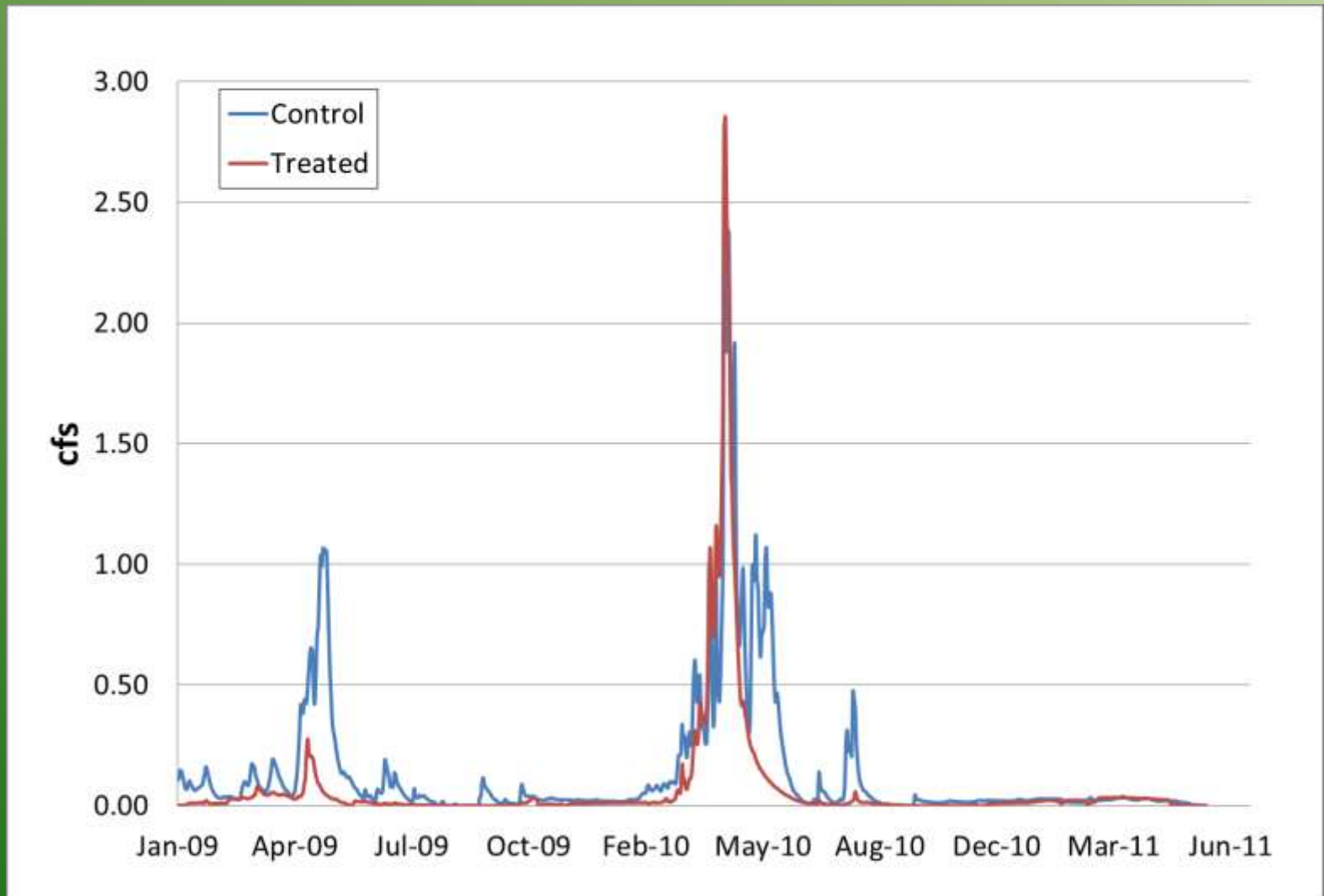
- *Evapotranspiration (ET) estimated by comparison of chloride in precipitation and stream flow (assuming no loss of chloride to recharge)*
- *Recharge (R) – estimate by chloride mass balance and quantified as the balance of the water budget components Recharge*

$$R = P - RO - E - T - \Delta S$$

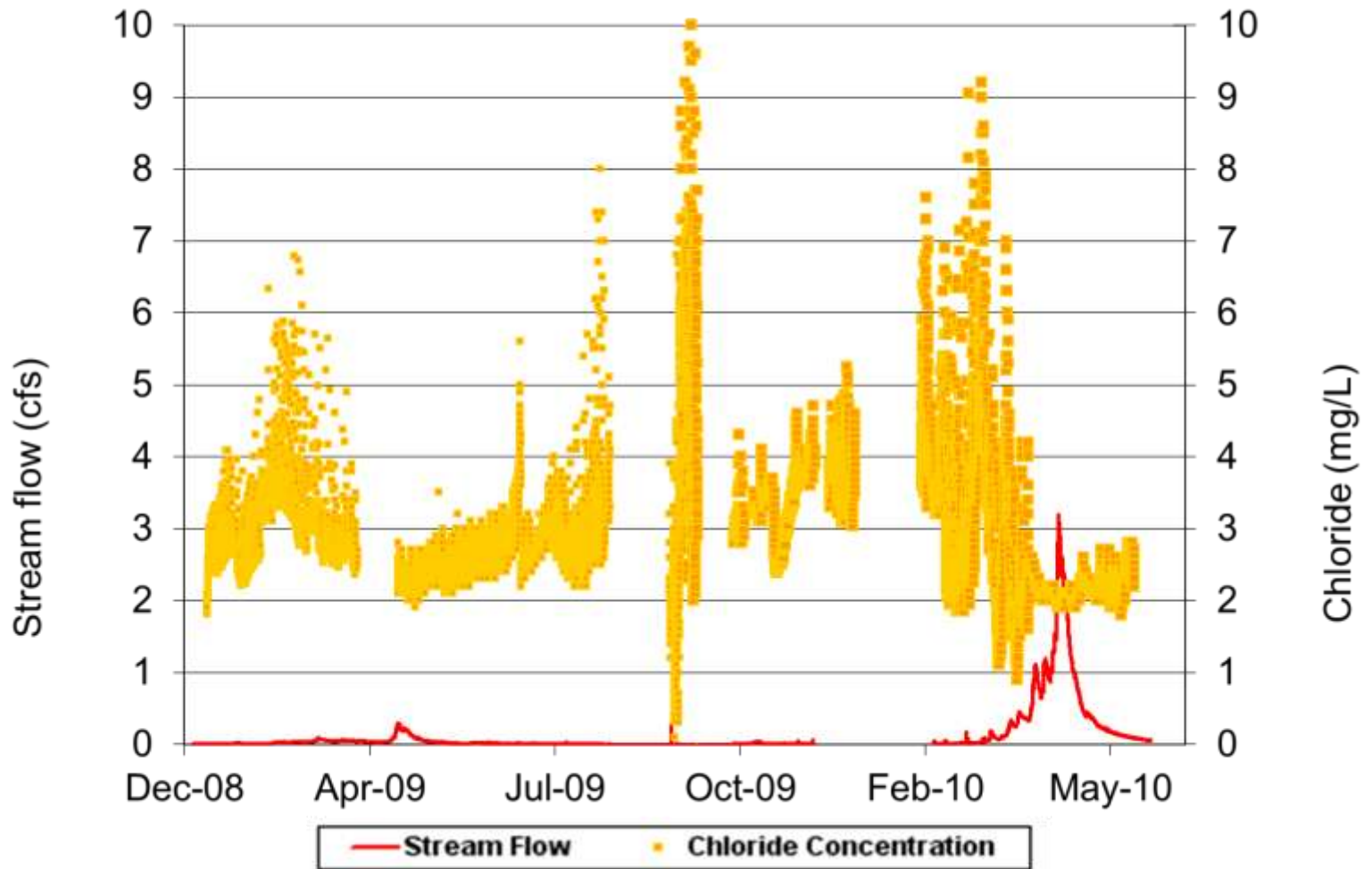
# Summary of Annual Yield (ac-ft) and Precipitation (inches)



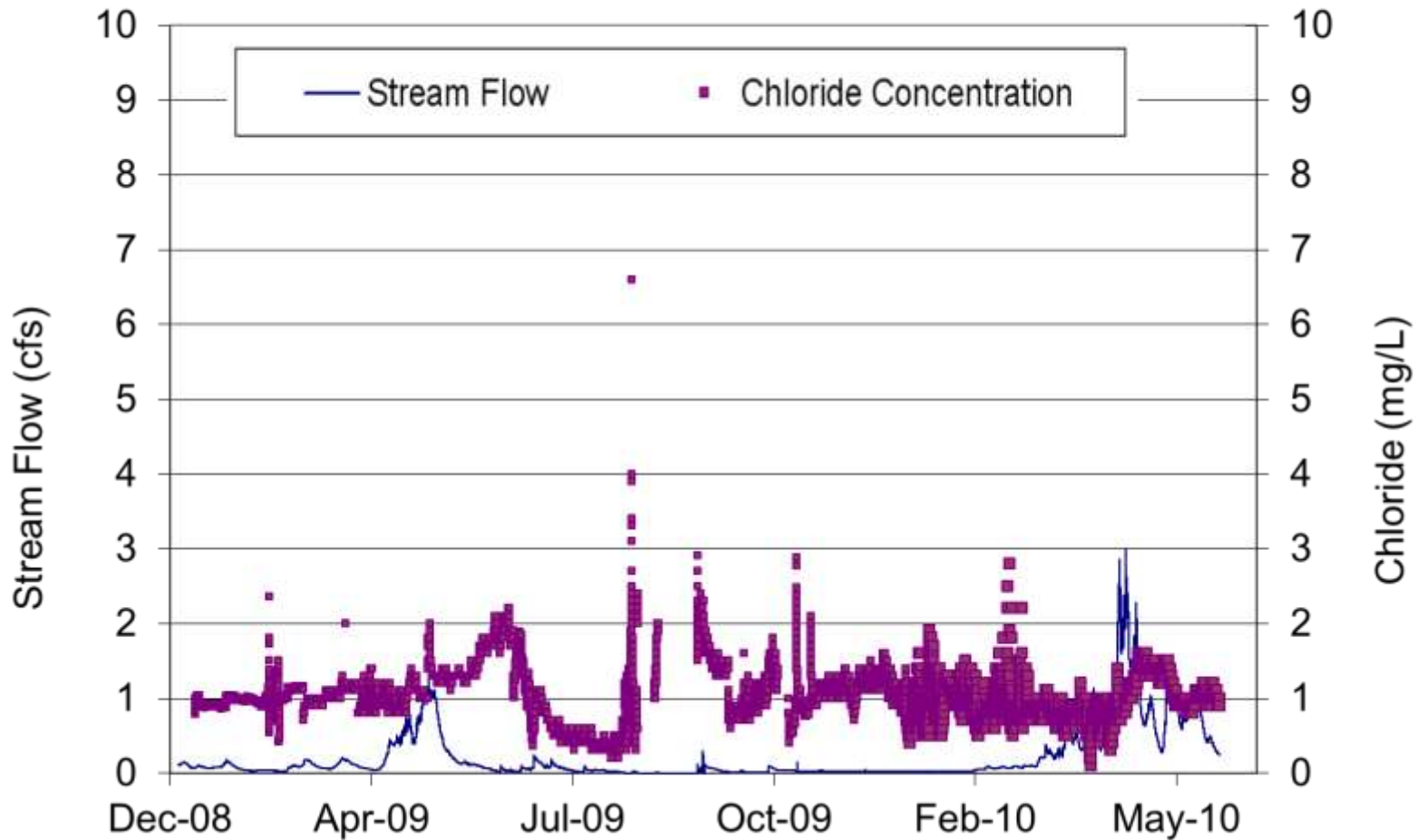
# *Average Daily Stream Flow in Treated and Control Basins update*



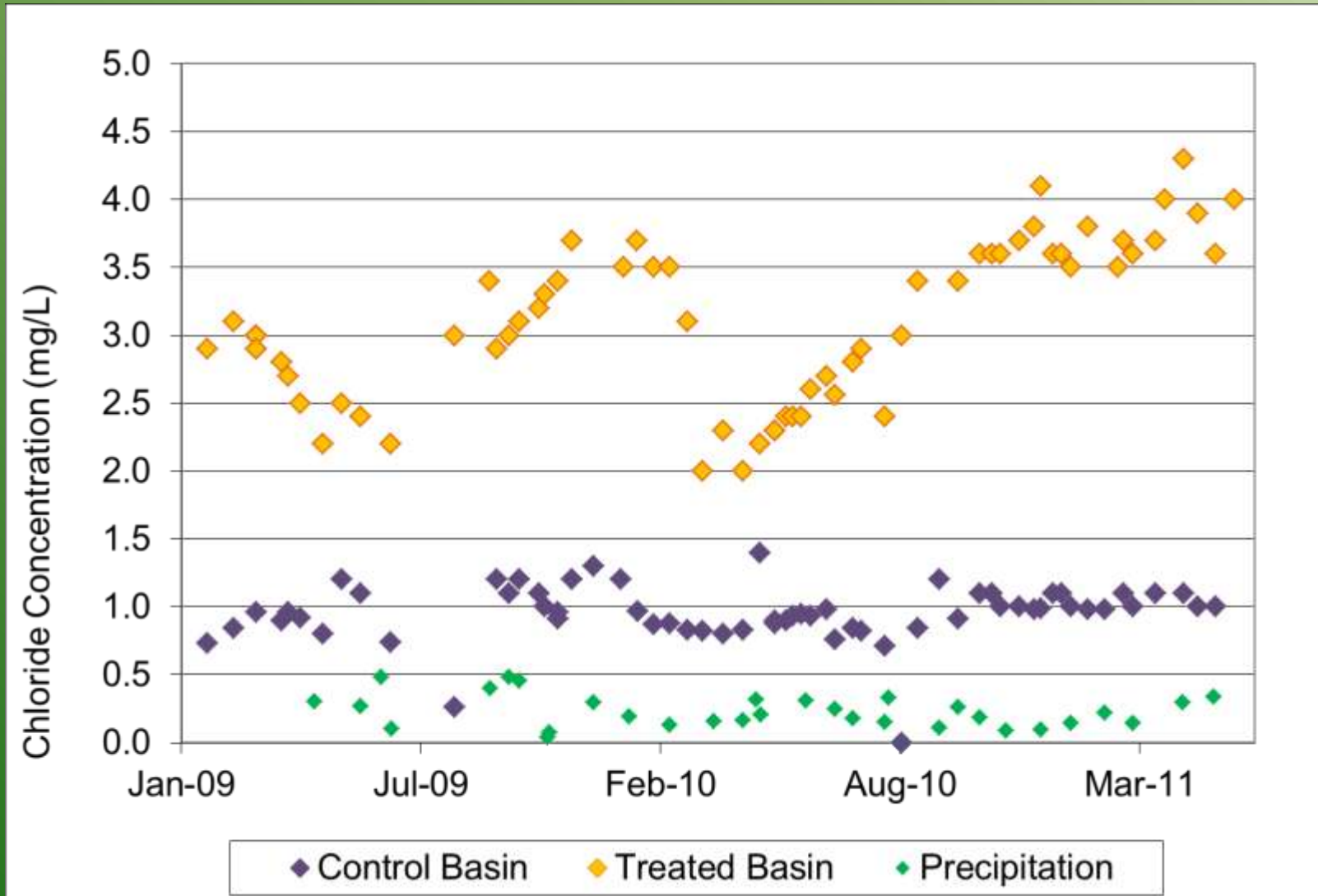
# *Stream flow and Chloride in Treated Basin*



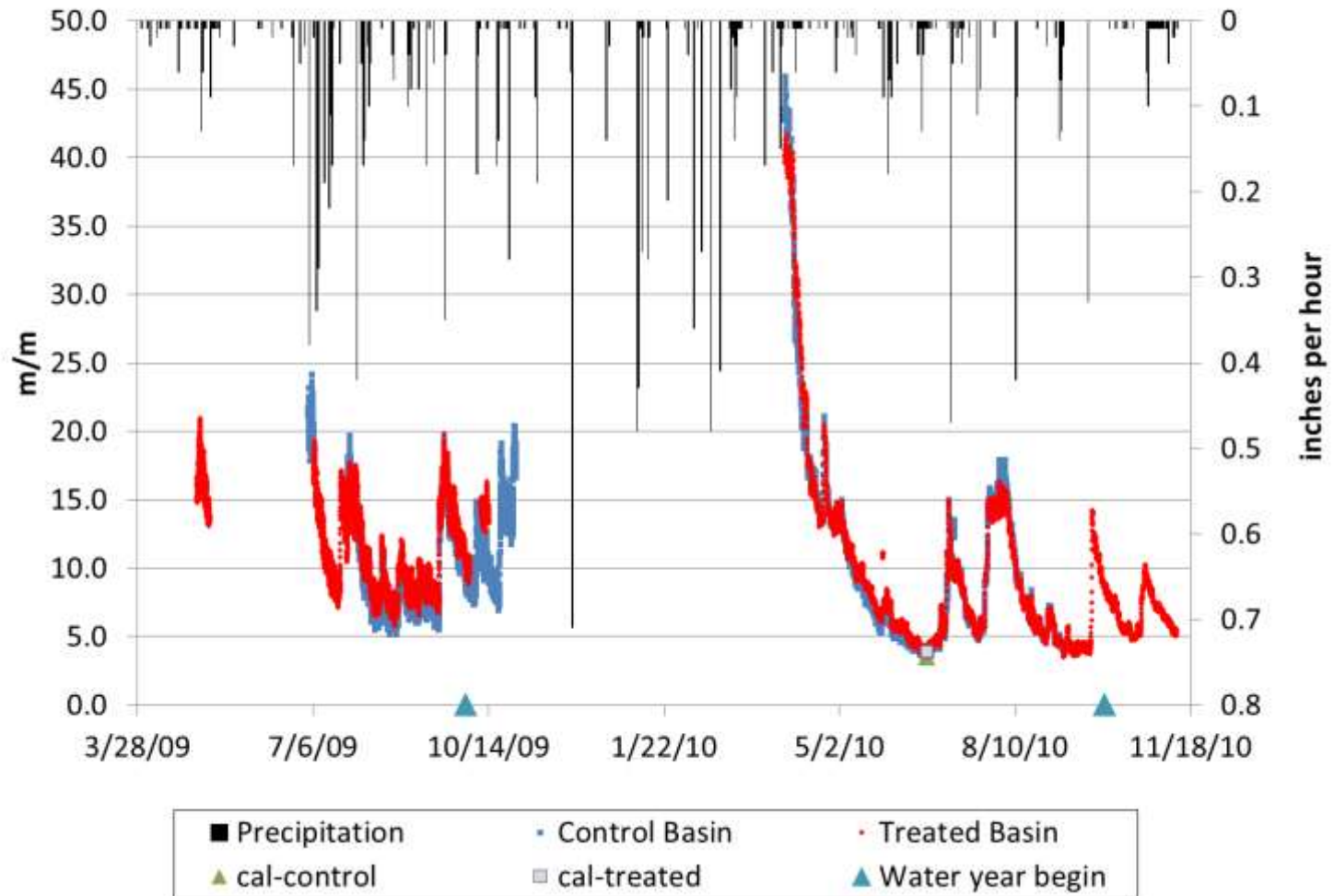
# *Stream flow and Chloride in Control Basin*



# Chloride Concentrations in Streams and Precipitation



# Soil Moisture



Measured by Darin Desilets, Sandia National Lab

# *Evapotranspiration*

	Water Year 2009		Water Year 2010	
	Treated	Control	Treated	Control
Area (acres)	439	394	439	394
Precipitation (in)	18.65	18.65	19.99	19.99
Win (ac-ft)	682	612	731	656
Weighted Cl in precipit (mg/L)	0.28	0.28	0.21	0.21
Weighted Cl in stream flow (mg/L)	2.71	1.09	2.18	0.99
ET = (Cl <sub>s</sub> -Cl <sub>p</sub> )/Cl <sub>s</sub>	90%	75%	91%	79%
ET (ac-ft)	613	457	662	519



# Water Budgets

