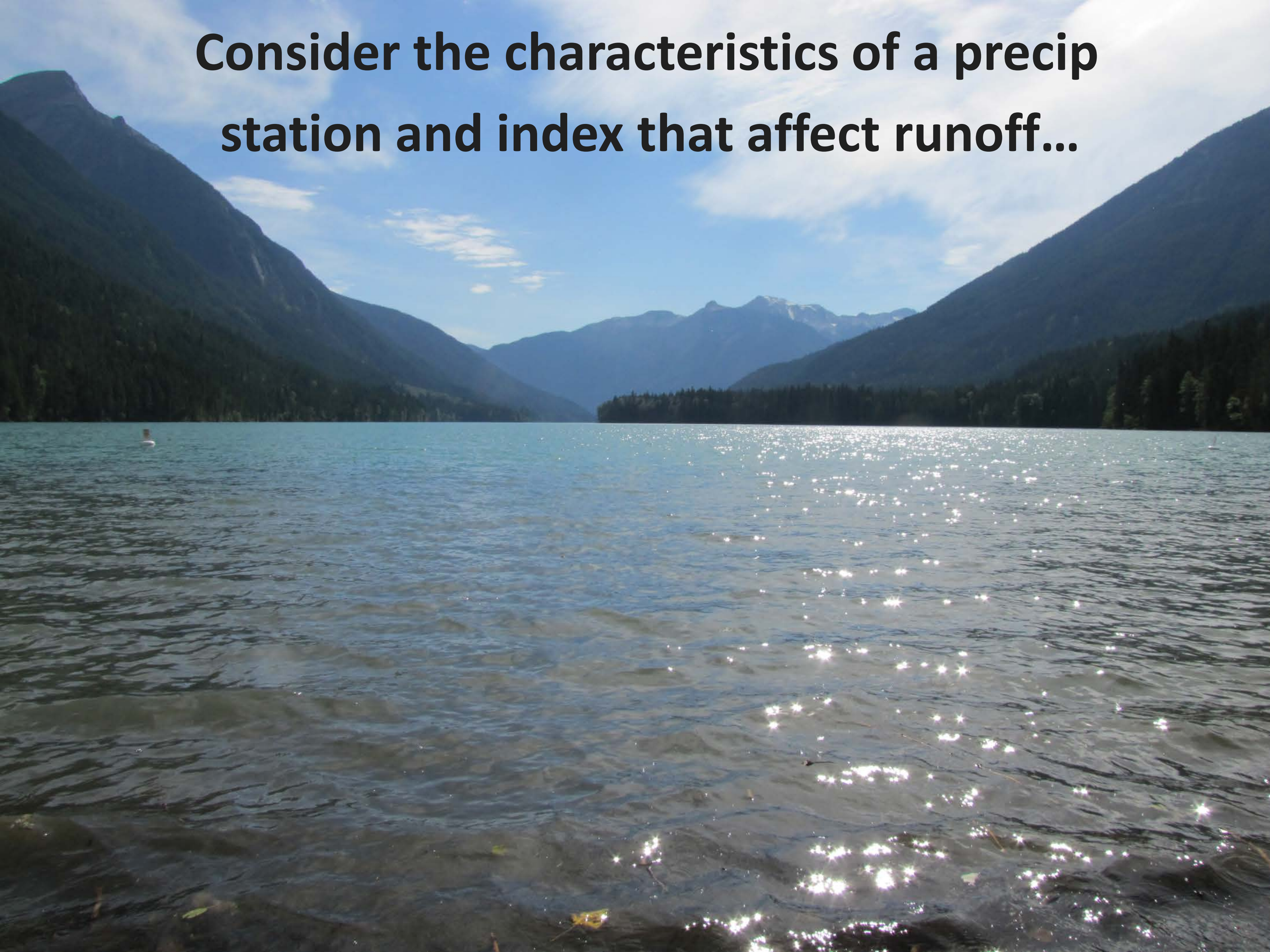
CCSS Conference
Oakhurst, CA
November 2, 2016
Stephen Nemeth

Ideas for choosing precip stations to predict April-July FNF

Question: How could you choose precip stations to represent a basin?

Answer: pay snow surveys and we'll do it (time and a half on weekends)

Consider the characteristics of a precip station and index that affect runoff…



Those characteristics are:

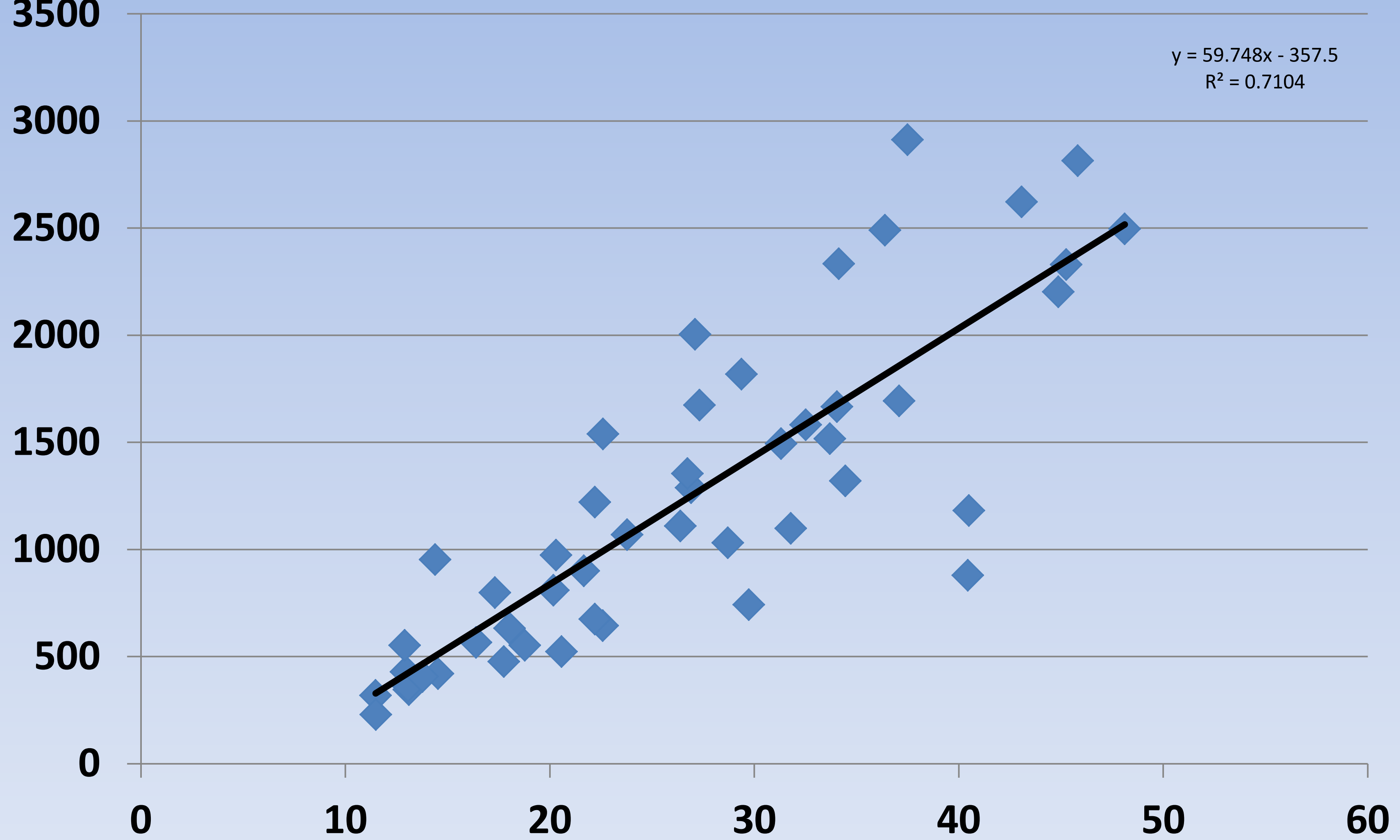
How wet is it? (Nov-May precip)

Elevation of the station

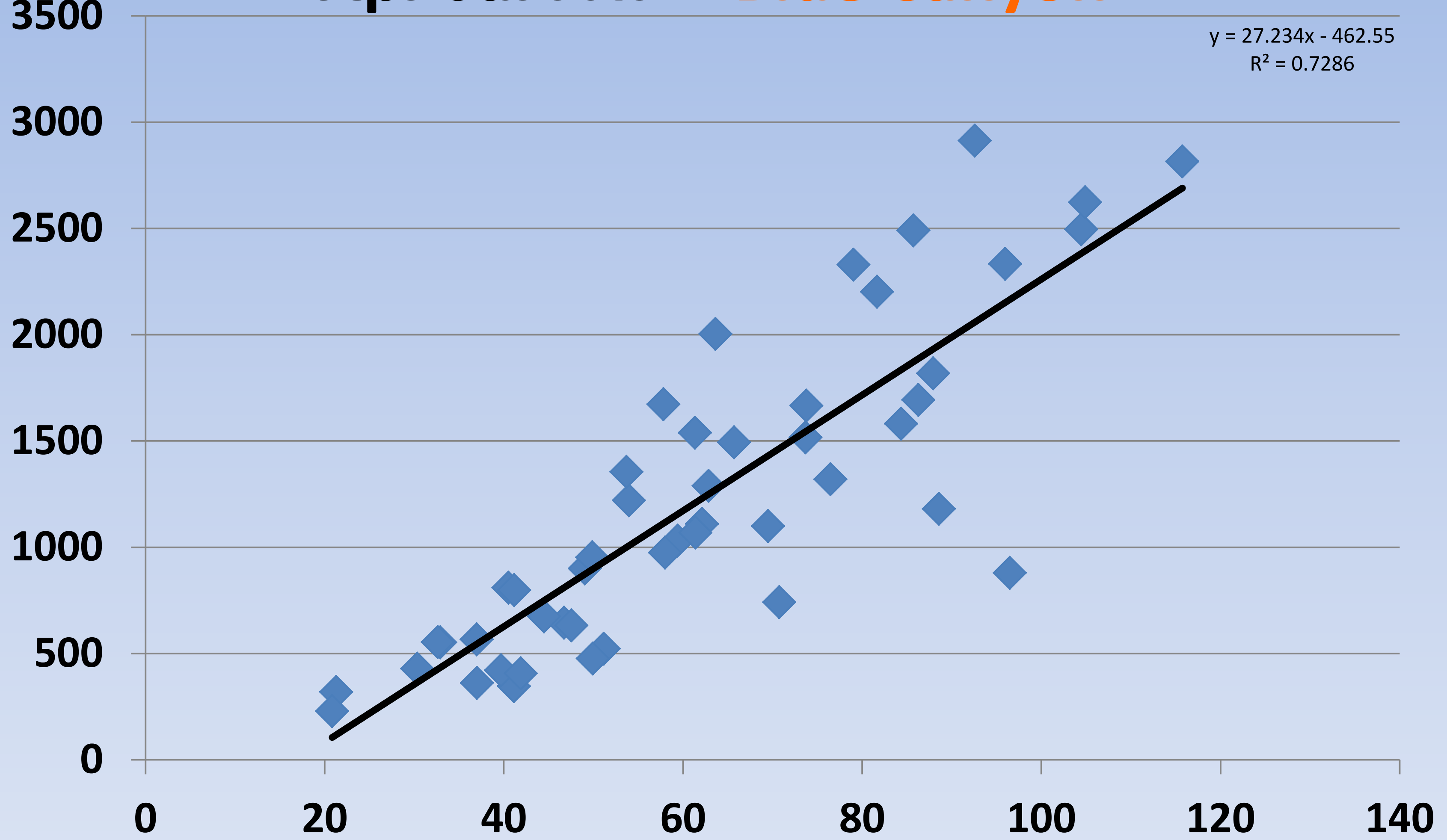
Location in or out of the basin?

Number of stations used in the index

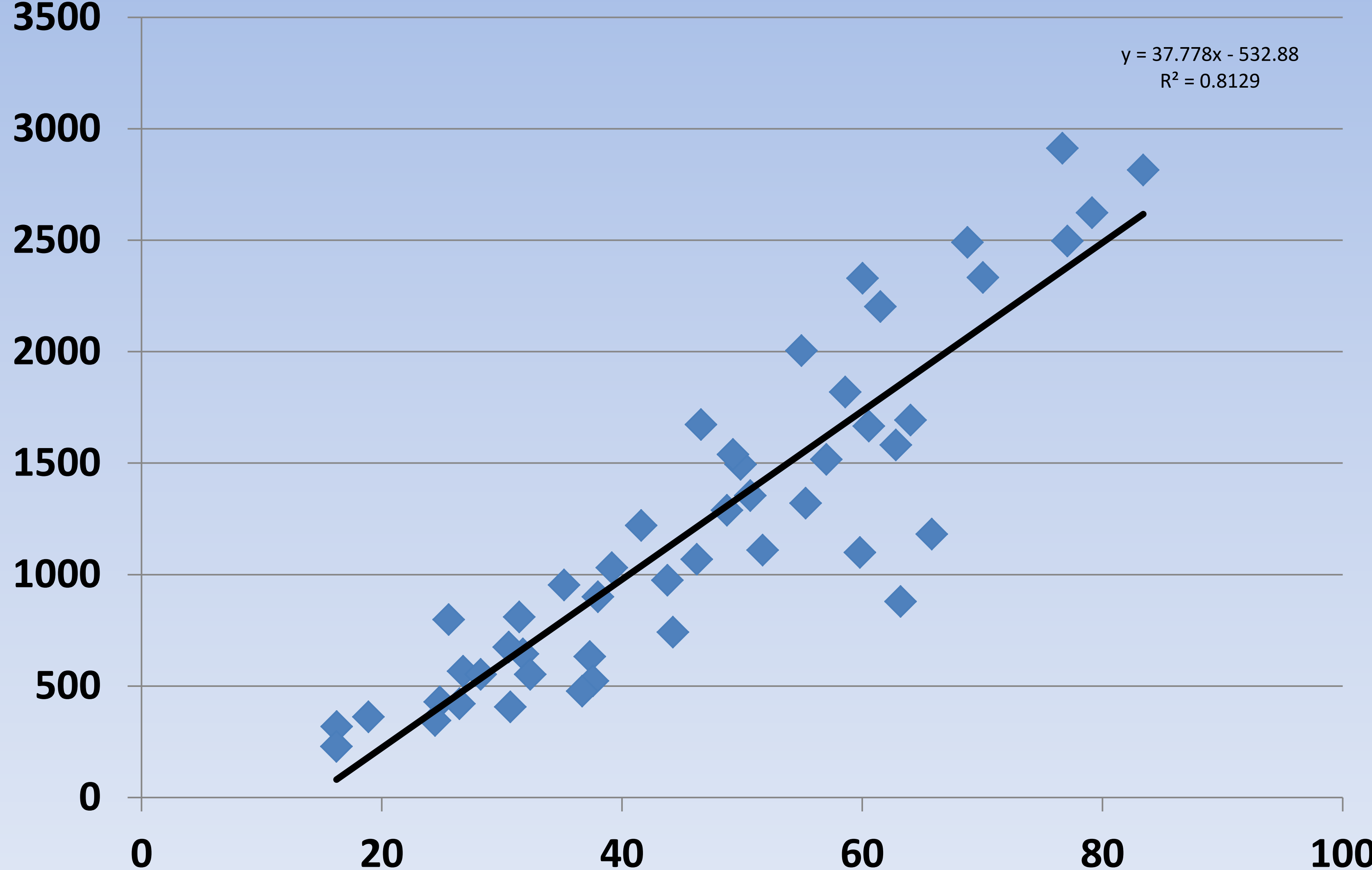
Nov-May precip vs American R Apr-July FNF – Truckee Ranger Station



Nov-May prec vs American R Apr-Jul FNF – Blue Canyon



Nov-May prec vs American R Apr-July FNF – Pacific House



American R Precip Index stations sorted by Nov-May precip amounts

Station	Nov-May avg (inches)	R-squared of Nov-May precip vs Amer R AJ FNF (Amer R)	elev (feet)
Truckee RS	26.6	0.71	6020
Fiddletown	33.3	0.86	2160
Placerville	34.1	0.70	1850
Salt Springs	37.2	0.84	3700
Caples Lake	39.0	0.74	8000
Pacific House	46.1	0.81	3400
Georgetown	49.3	0.71	3000
Blue Canyon	61.3	0.73	5280
Lake Spaulding	65.7	0.73	5160

Definition of R-Squared

$$R^2 = 1 - \frac{SS_E}{SS_T}.$$

$$R^2 = \frac{SS_R}{SS_T}.$$

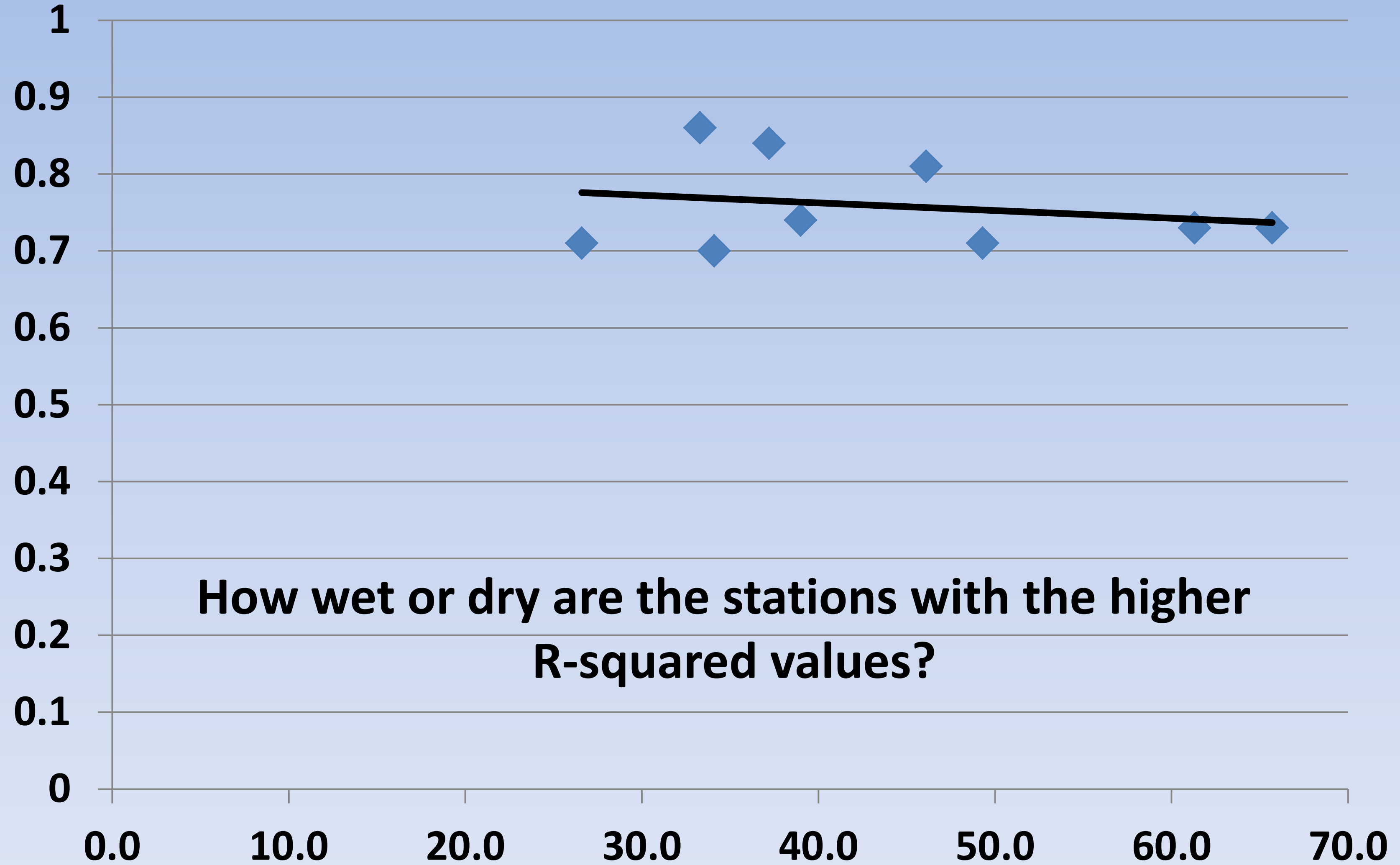
$$SS_T = \sum_i (y_i - \bar{y})^2, SS_R = \sum_i (\hat{y}_i - \bar{y})^2, SS_E = \sum_i (y_i - \hat{y}_i)^2,$$

Consider this instead…

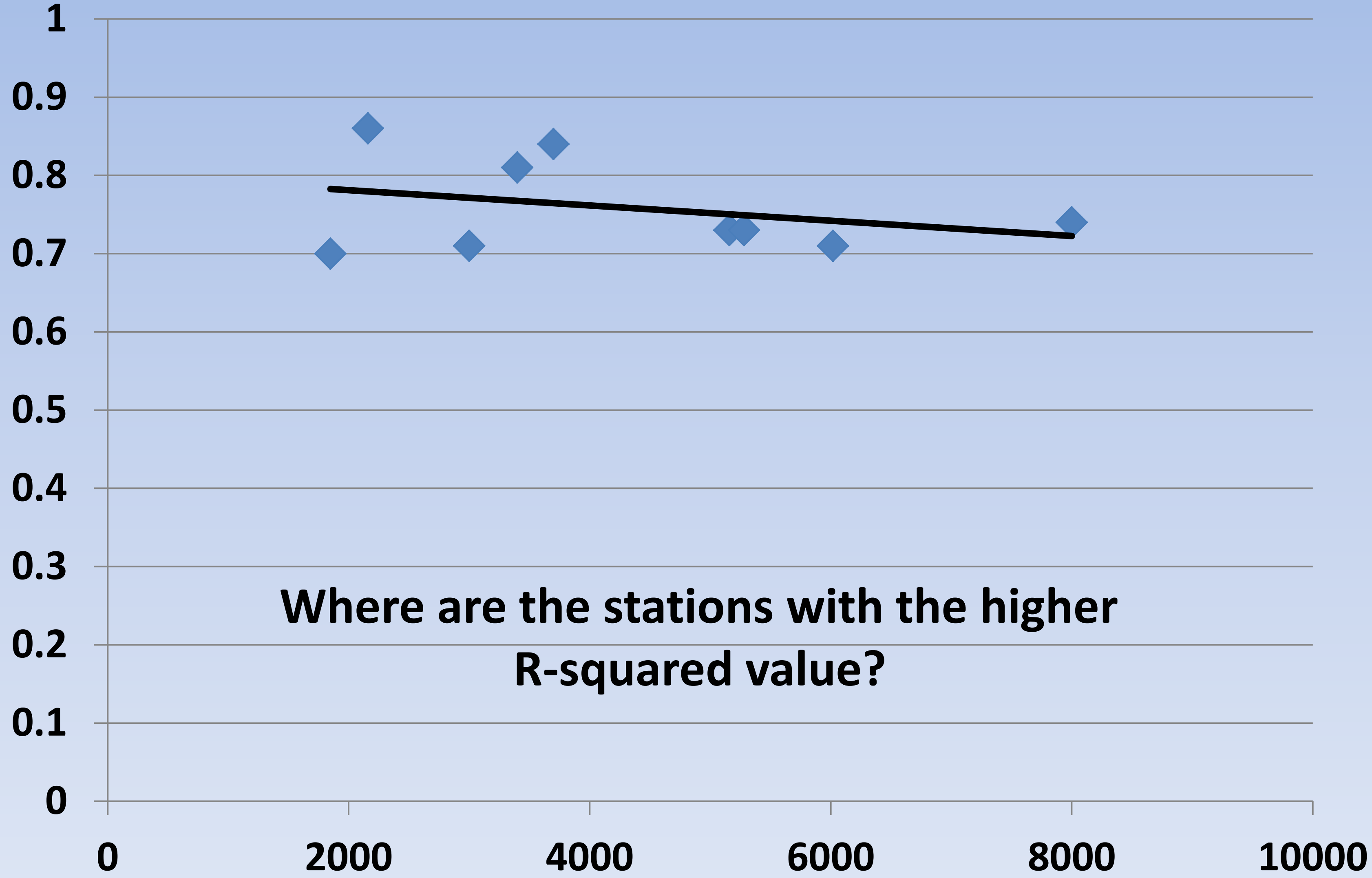
An R-Squared of 0.89 means 89% of the variation in Y is accounted for by the variation in X.

DONE…next slide

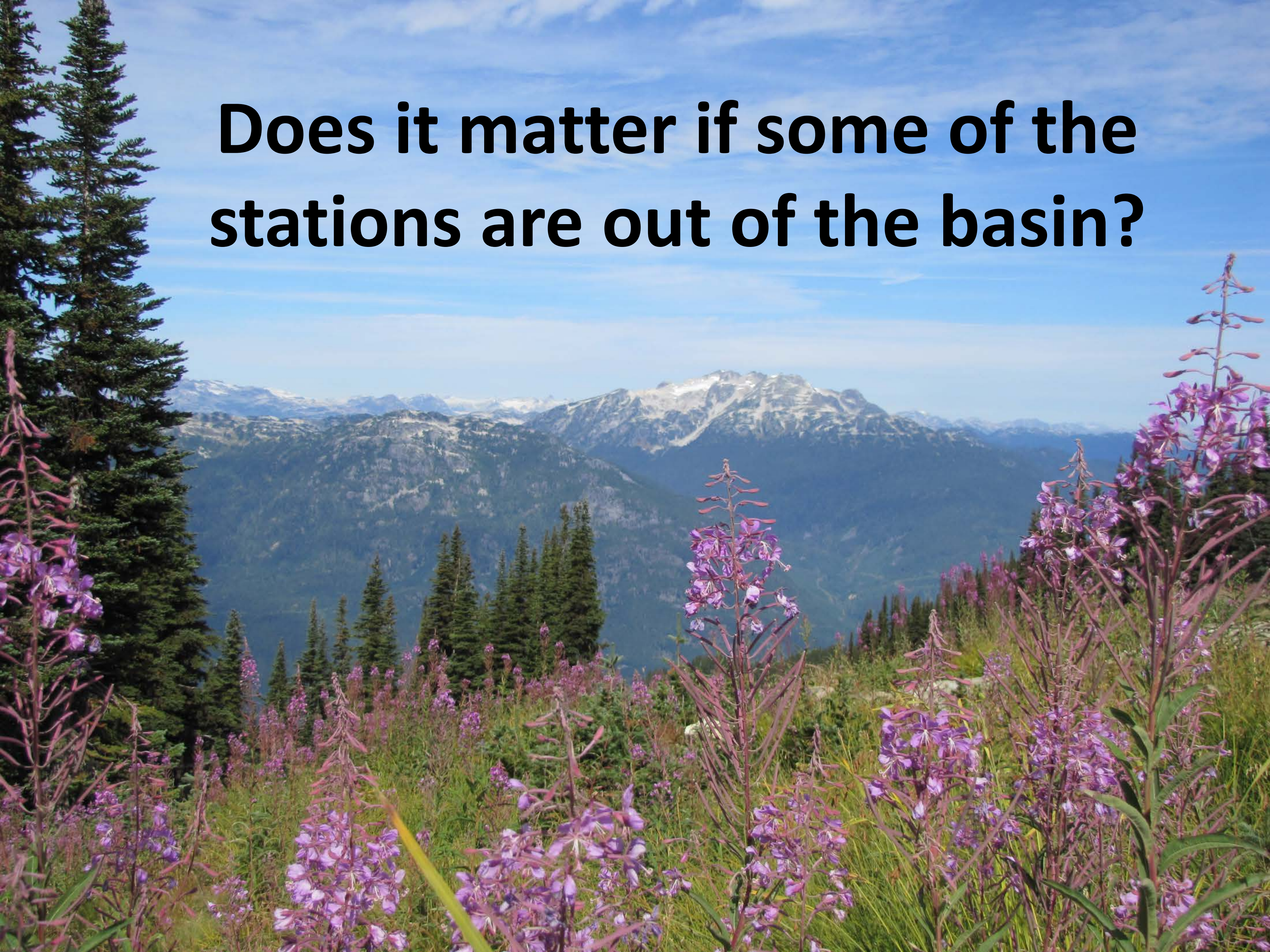
Nov-May precip vs R-Squared correlating precip and Amer R AJ FNF



Elevation vs R-Squared for precip stations in the American River precip index

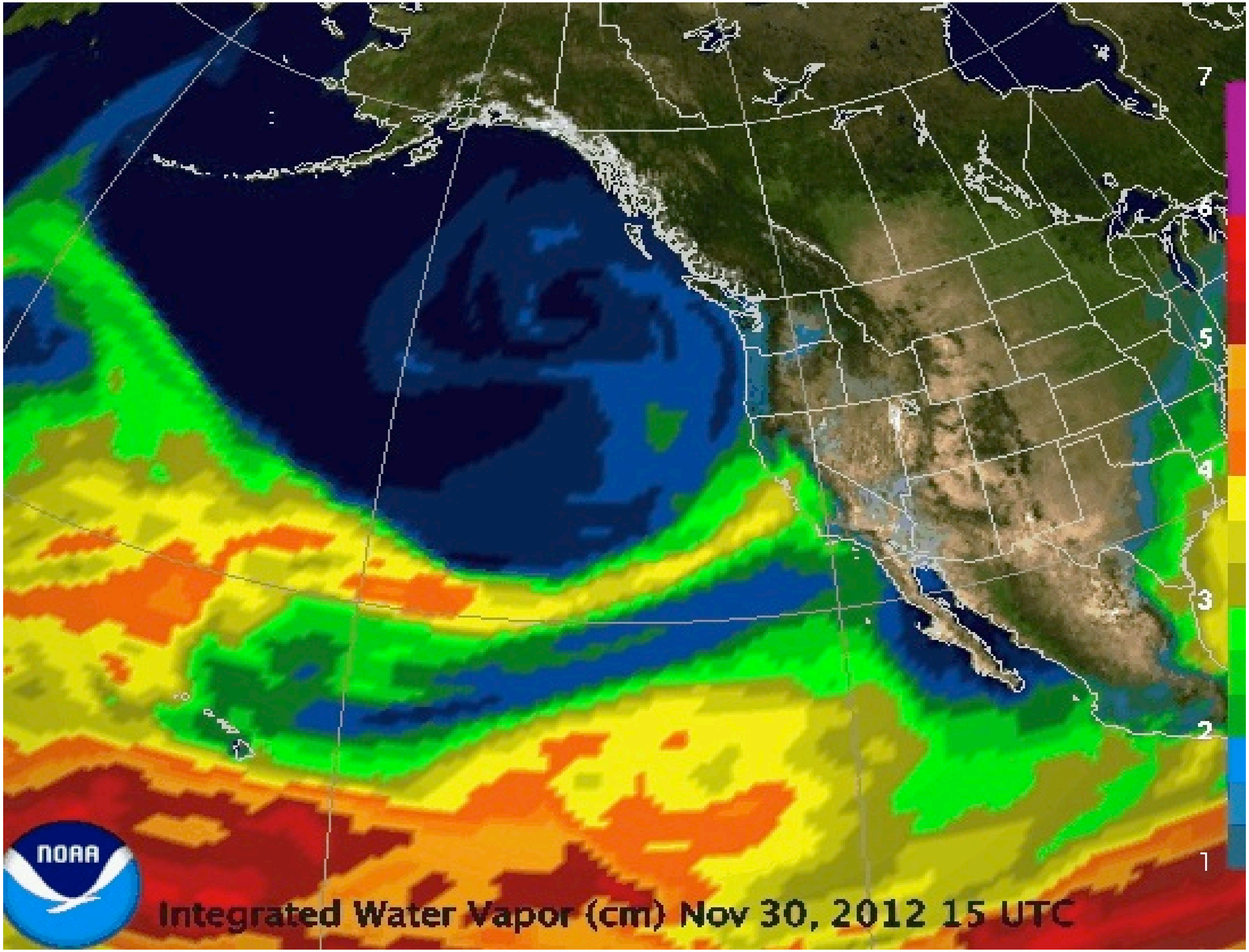


Does it matter if some of the stations are out of the basin?

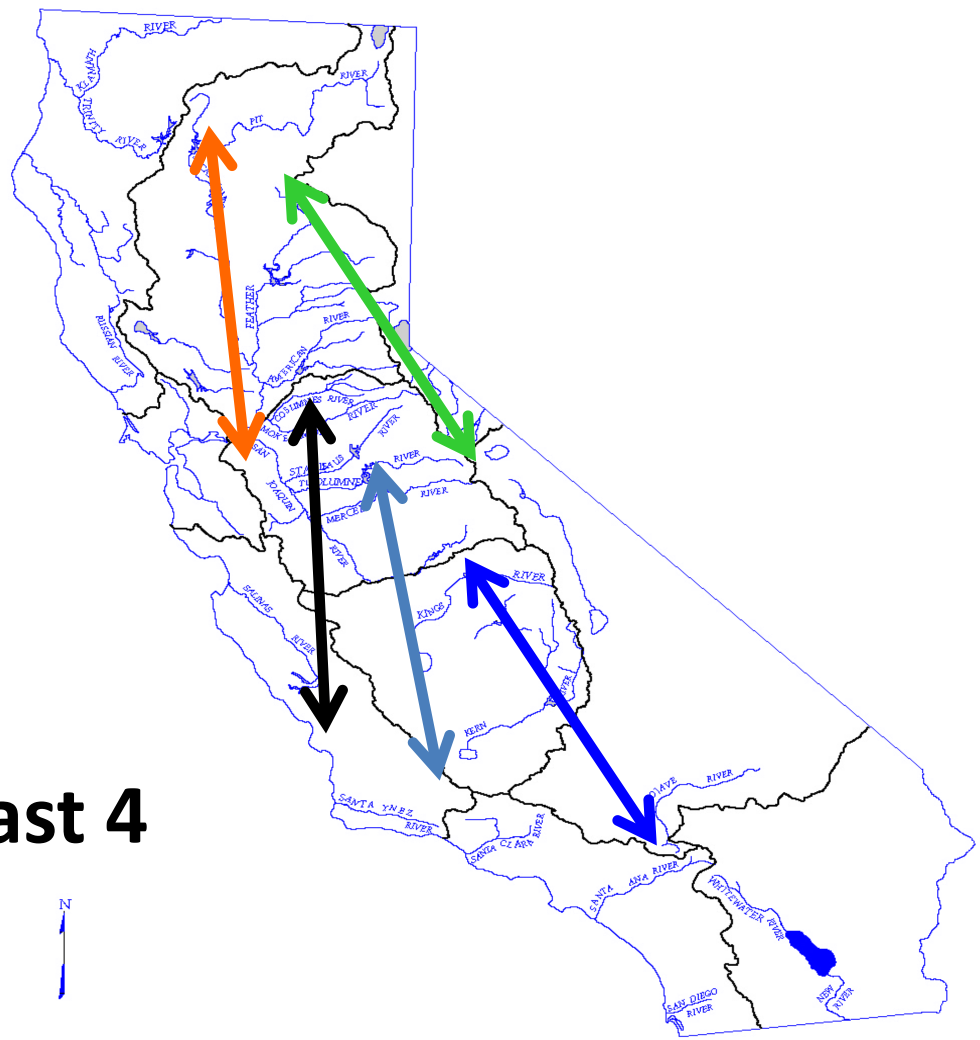


Can an Atmospheric River affect only one basin?

Atmospheric River Plume Approaching California, Nov 30, 2012



How many watersheds would an AR cover if it is 200 miles wide?



Answer: at least 4

Consider 3 equations with various numbers of stations and station locations

	Eqn 1	Eqn 2	Eqn 3
Avg error	59	51	73
St Dev of errors	386	329	345
R-Squared	0.93	0.94	0.95
# Occurences closest to obs	17	19	12
Number of Stations	?	?	?
Location of Stations	?	?	?

The number of stations for each equation…

	Eqn 1	Eqn 2	Eqn 3
Avg error	59	51	73
St Dev of errors	386	329	345
R-Squared	0.93	0.94	0.95
# Occurences closest to obs	17	19	12
Number of Stations	6	2	6
Location of Stations	?	?	?

The location of the stations for each equation…

	Eqn 1	Eqn 2	Eqn 3
Avg error	59	51	73
St Dev of errors	386	329	345
R-Squared	0.93	0.94	0.95
# Occurences closest to obs	17	19	12
Number of Stations	6	2	6
Location of Stations	all out	1 in, 1 out	5 in, 1 out

We started with no ideas

Now we have several…

- Don’t rule out the drier stations
- Consider low elevation stations
- Out-of-basin stations should be considered
  (AR’s may affect at least 4 basins)
- Of the 3 equations, the best one used only 2 stations

- And one more…

Don't forget the squared term

$$SS_T = \sum_i (y_i - \bar{y})^2, SS_R = \sum_i (\hat{y}_i - \bar{y})^2, SS_E = \sum_i (y_i - \hat{y}_i)^2,$$


THE
END

Questions and comments?

Thank you