Remote Sensing Mapping of Turbidity and Chlorophyll-a in the Upper San Francisco Estuary

Francine Mejia

Geography 342

Study Objectives

Develop a method to map spatial & temporal distribution of turbidity, total suspended solids, colored dissolved organic matter, & chlorophyll-a.

This class project will focus on turbidity

Introduction

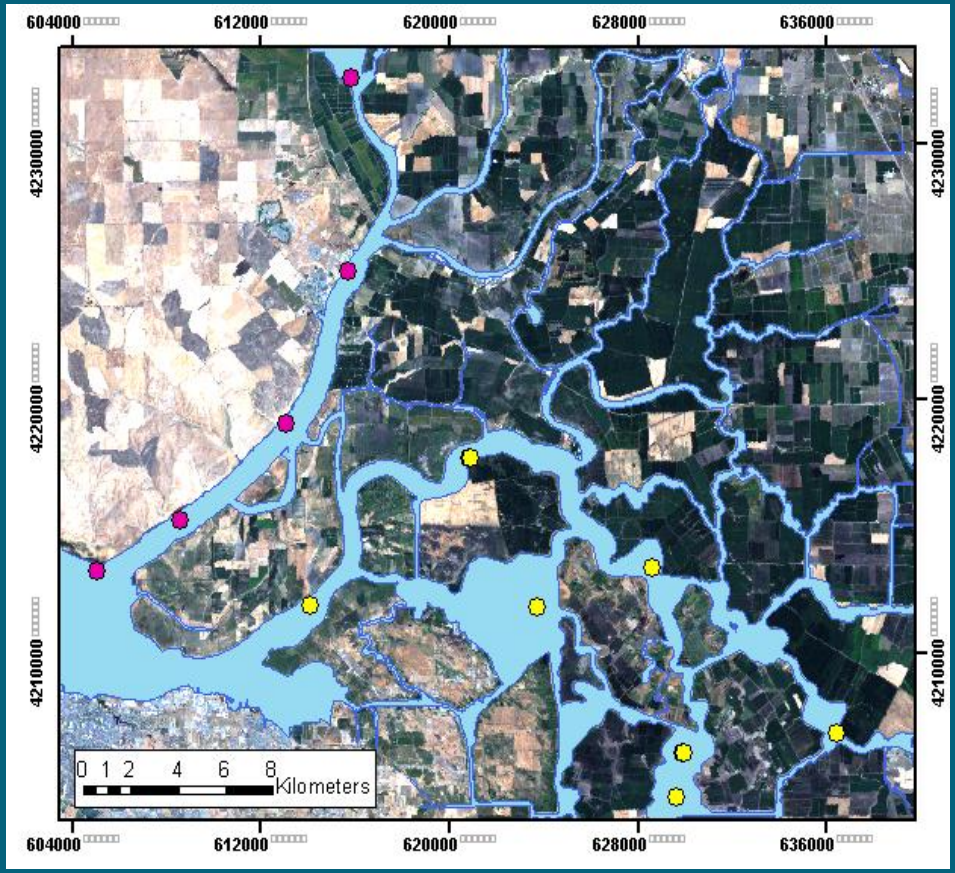
The sensitivity of reflectance to sediment, chlorophyll, and colored DOM in the visible and near-infrared wavelengths have made remote sensing a great tool to measure turbidity & chl- a.

Methodology

Data from DWR (Suspended sediment concentrations, turbidity) will be compared to Landsat imagery obtained from the Earthexplorer USGS websites.

Methodology

Water quality, surface remote sensing reflectance & water column radiance data were collected in July & August 2010



Sacramento River sites

San Joaquin River sites

Methodology

Regression Analysis will link satellite imagery to ground samples.

Regressions obtained from literature:

$$\text{Log TSS} = A + B \text{ Log } X_s$$

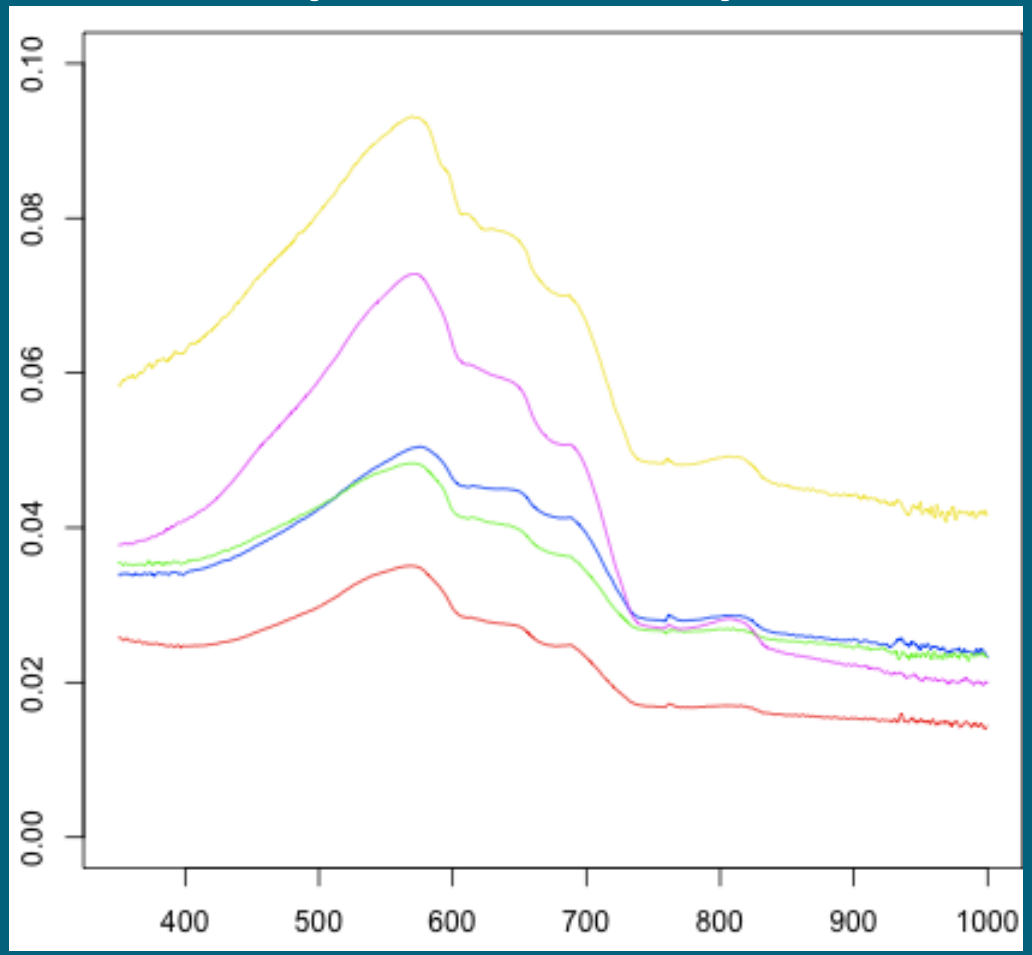
A & B determined by best fit to in situ measurements of reflectance & sediment concentration.

$$Xs = [R(550) - R(670)^a \, [R(520)/R(550)]^b.$$

San Joaquin River (7/26/10)

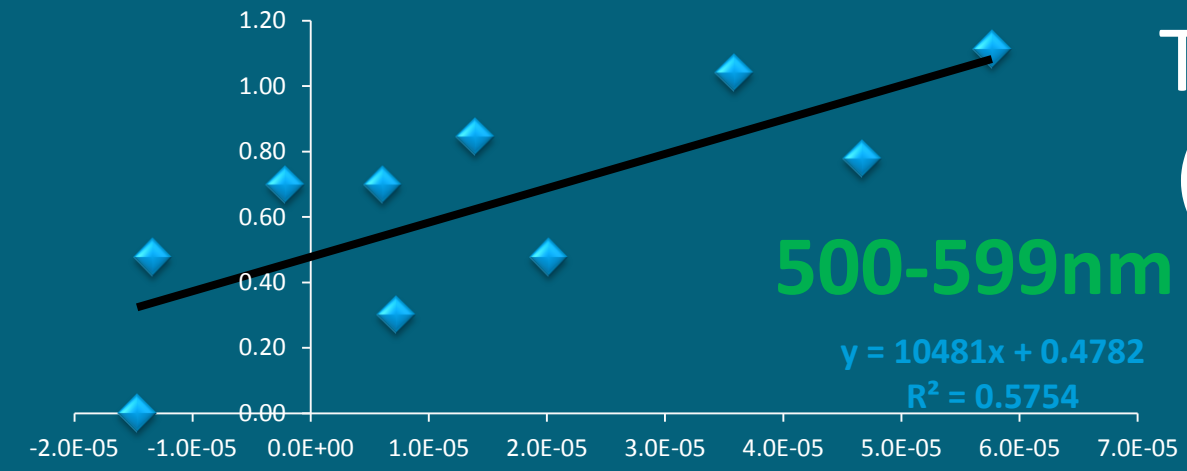
Field remote sensing measurements were calibrated from radiance to reflectance using RS# field spectrometry software (350-100nm).

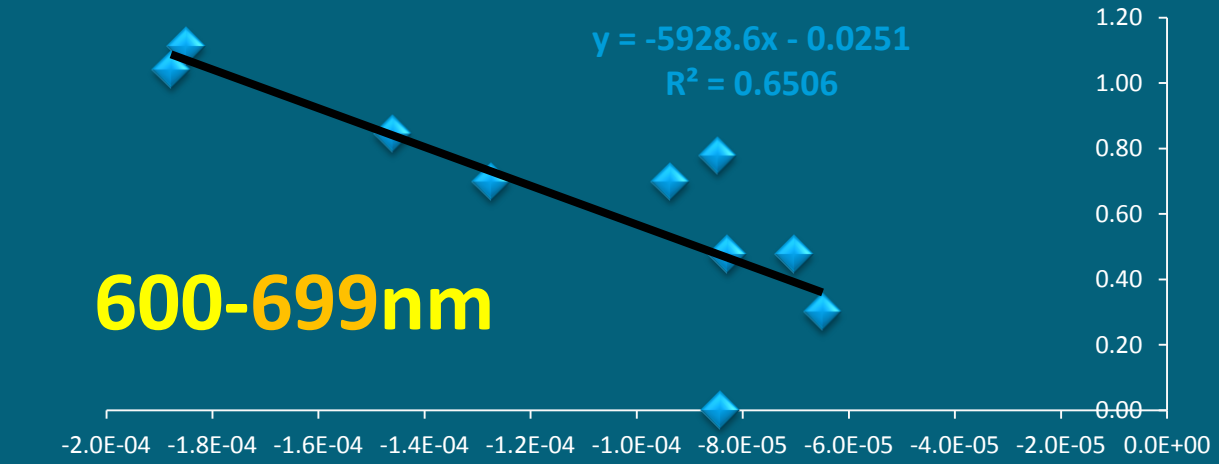
Mean reflectance for each sampling location was calculated using SAMS spectral analyst software

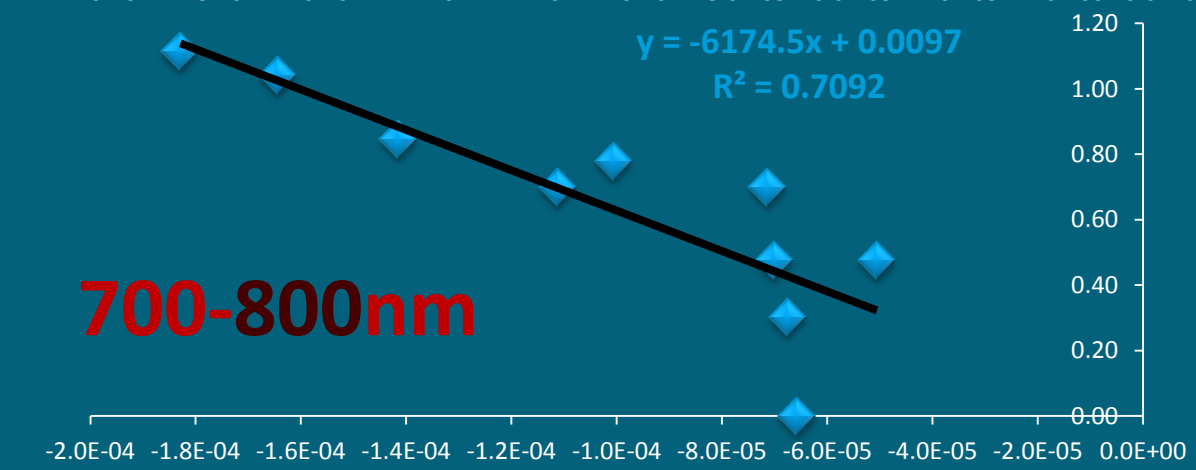


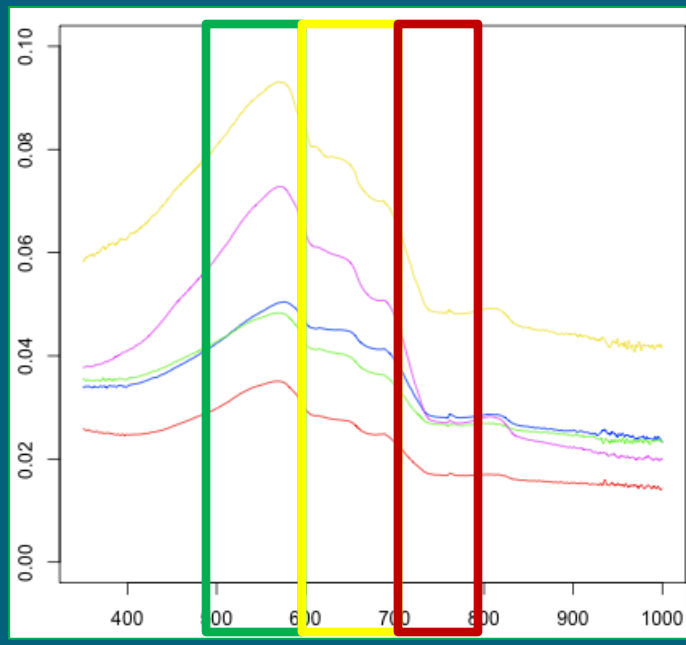
Each line represents mean reflectance for each sampling location along transect

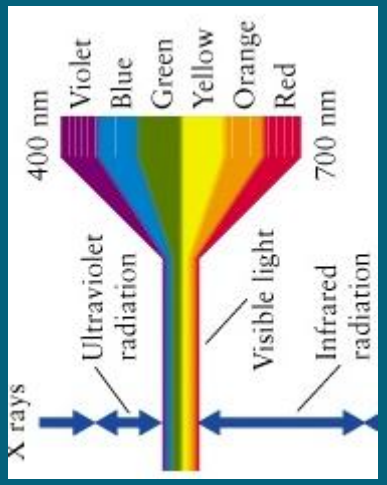
TSS vs. Reflectance (derivative values)







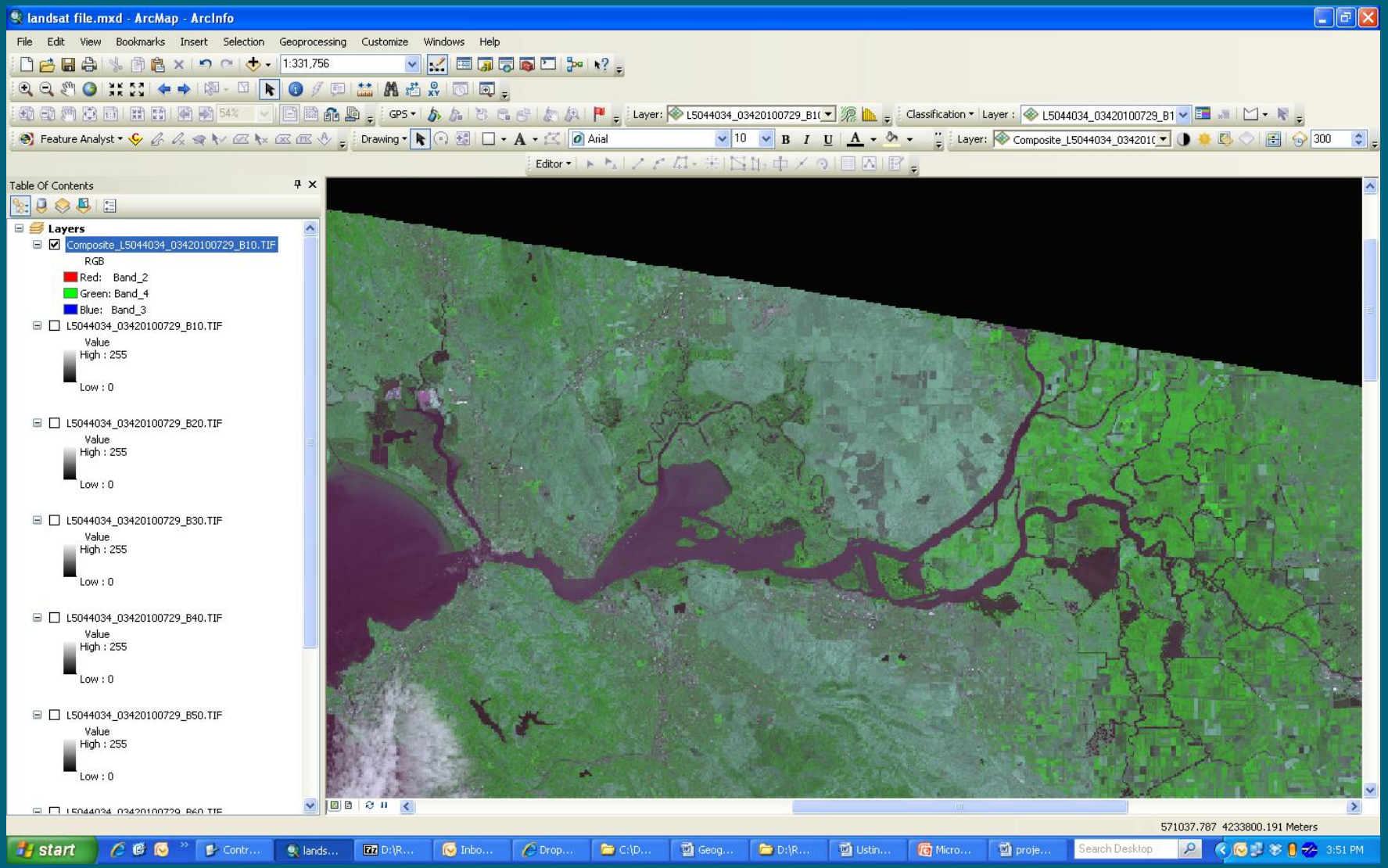




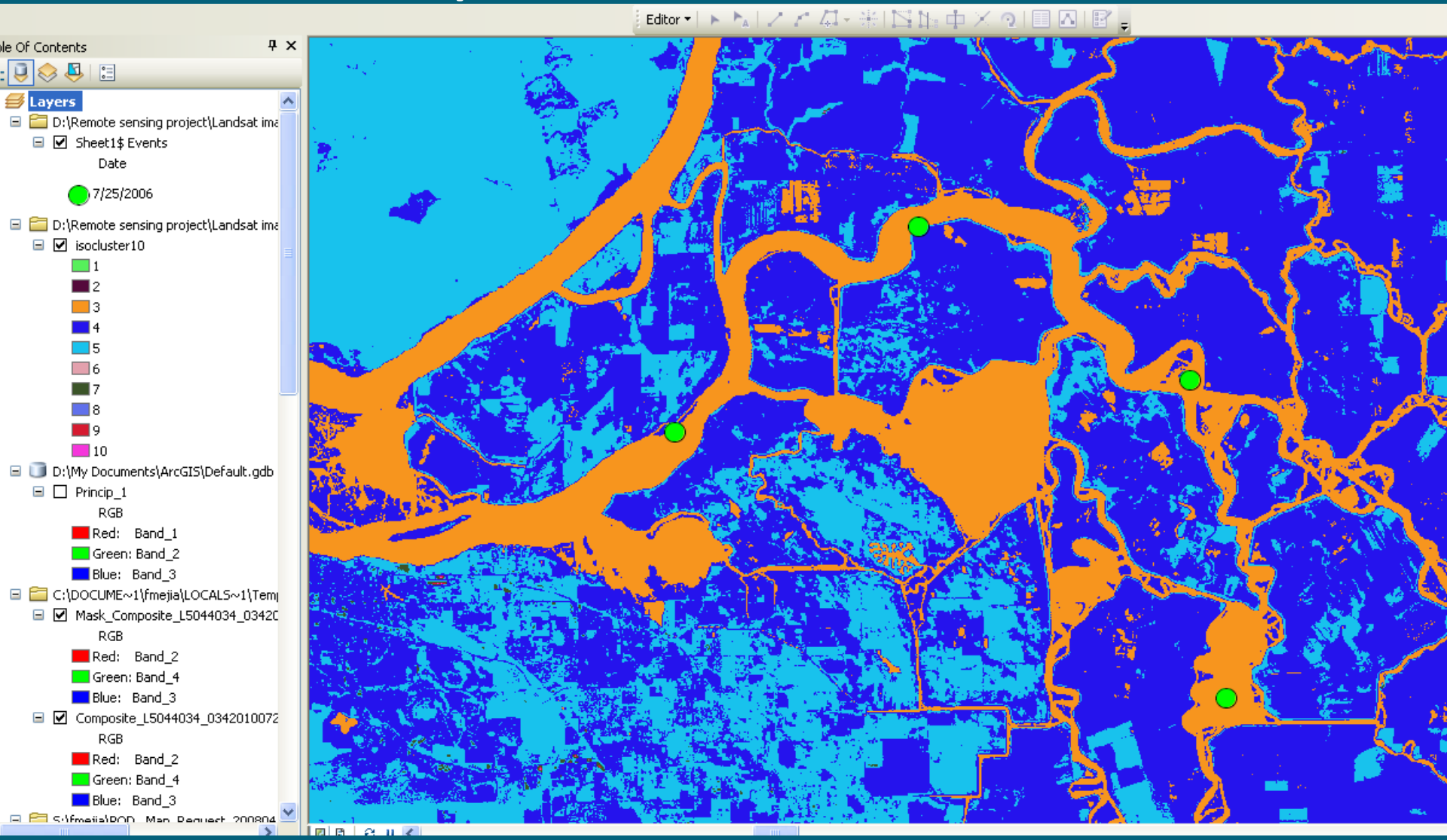
The Thematic Mapper (TM)

Band Number	µm	Resolution
1	0.45-0.52	30 m
2	0.52-0.60	30 m
3	0.63-0.69	30 m
4	0.76-0.90	30 m
5	1.55-1.75	30 m
6	10.4-12.5	120 m
7	2.08-2.35	30 m

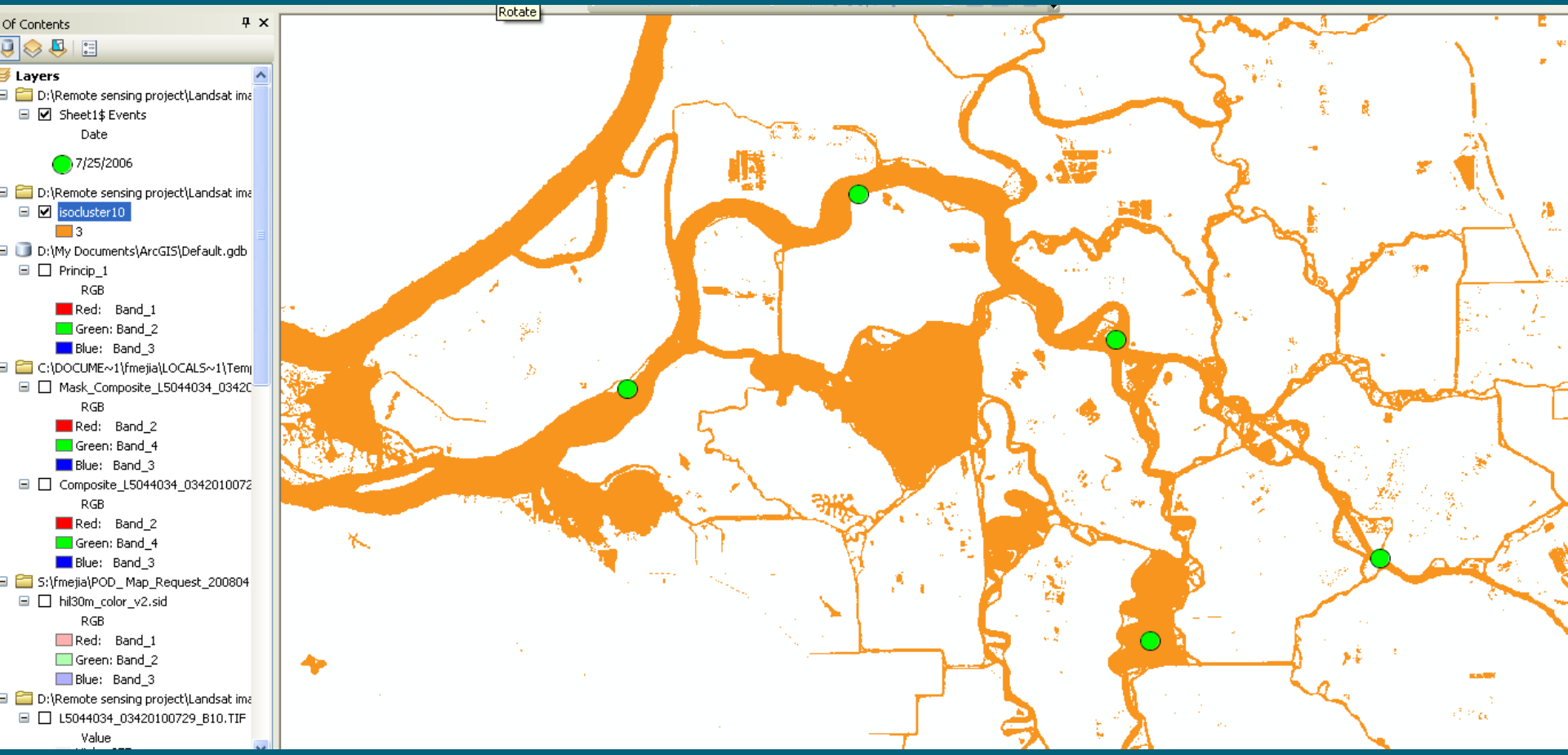
Input Image (July 29, 2010)



Isocluster –10 classes
Unsupervised classification



Isolating the water category



San Joaquin River Training site (example)

Class Name						
Layers	1	2	3	4	5	6
Means						
	74	34.5	29	17	10	13.4
Covariance						
1	2.00E+00	1.00E+00	0.00E+00	2.00E+00	4.00E+00	2.00E+00
2	1.00E+00	5.00E-01	0.00E+00	1.00E+00	2.00E+00	1.00E+00
3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4	2.00E+00	1.00E+00	0.00E+00	2.00E+00	4.00E+00	2.00E+00
5	4.00E+00	2.00E+00	0.00E+00	4.00E+00	8.00E+00	4.00E+00
6	2.00E+00	1.00E+00	0.00E+00	2.00E+00	4.00E+00	2.00E+00

Created 5 training sites total

Delta Equation

- Log TSS= 0.0097+6174.5Xs

- Equation is giving me really low values…

Other concern: Don’t understand link between values I get and landsat…Still have until Dec 15!!