Refining Terminology

April 6, 2011

At Our Last Meeting

- Large number of terms with definitions
  - Provided some excellent feedback
- Controllable *versus* Uncontrollable was the primary term of confusion
  - Different stakeholders had different perceptions of what was “uncontrollable”
- Important to the Science Team
  - Different technical directions depending on definition

Goal For Today

- Agree on our common understanding
- Identify where we have some confusion
- Stakeholders provide some directed feedback
  - Assist the Science Team in defining optimal approaches
  - For consideration by the Science Advisory Group

Common Understanding

- Reference condition is a good thing
  - Conceptual agreement on how reference is defined
- Some sites are never going to reach reference condition
  - Even restoration is infeasible
- Likely a different biological expectation for these modified streams

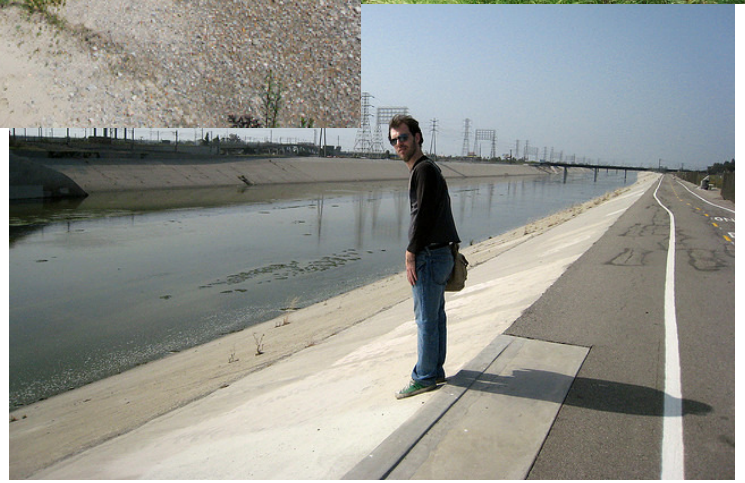
Areas of Uncertainty

- What metrics are used to classify streams as modified?
- What should our biological expectation be for these modified streams?
- How to assign these expectations to actual streams?









Interplay Between Expectations and Classifications

- Biological expectation
  - Minimally disturbed assemblage at reference sites
  - Best attainable assemblage at modified sites
- Stream class
  - Categorization of expectations
- Classification
  - Extrapolation of expectation to unmonitored reaches

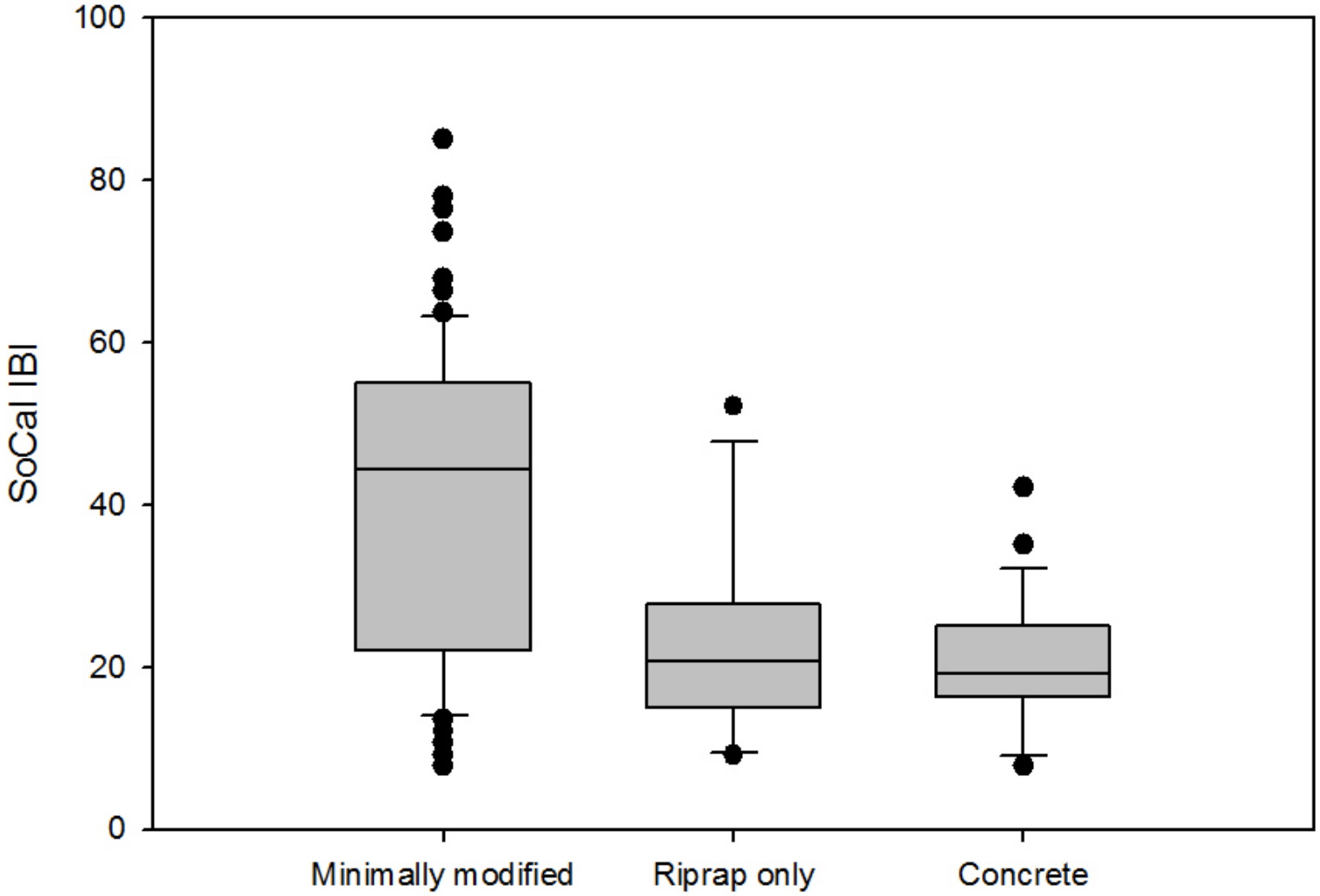
How Do You Move From Expectation To Classification?

- Two basic options
- Empirical
  - Relies on local data
- Modeled
  - Utilizes remotely sensed data

Empirical Methodology

- Gather as much data as possible
- *A priori* selection of stream classes
- Put data into classes and examine distribution
- Use existing data distribution to select thresholds within a class
- Apply thresholds to all streams of that type

Example Empirical Approach using *a priori* Stream Classification From the Southern Cal (SMC) Region (N=116)



Pros and Cons of Empirical Approach

- Relatively straightforward approach
- *A priori* selection completely a policy decision
  - Independent of biological information
- Can use independent local information for assigning stream class metrics
  - observable, unconfounded information
- Data may be unavailable
  - For creating stream classes of existing data
  - for extrapolation to unmonitored reaches
- Expectations [Thresholds] within a class will be arbitrary
  - Automatically assumes xx% noncompliance

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Modeling Approach

- Gather as much data as possible
- Determine which metrics biology responds to most
  - A variety of models to explore
- Establish thresholds based on optimized relationships between stressors and biological responses
  - Can account for uncertainty
- Use predictions to assign stream classes

Types of Models We're Exploring

- Regression models
  - Correlation, General Linear Regression
  - Multiple Linear Regression
  - Quantile Regression
- Multivariate models
  - Principle components analysis (PCA)
  - Nonmetric multidimensional scaling (NMS)
- Regression trees
  - Classification and regression trees (CART)
  - Boosted regression trees (BRT)

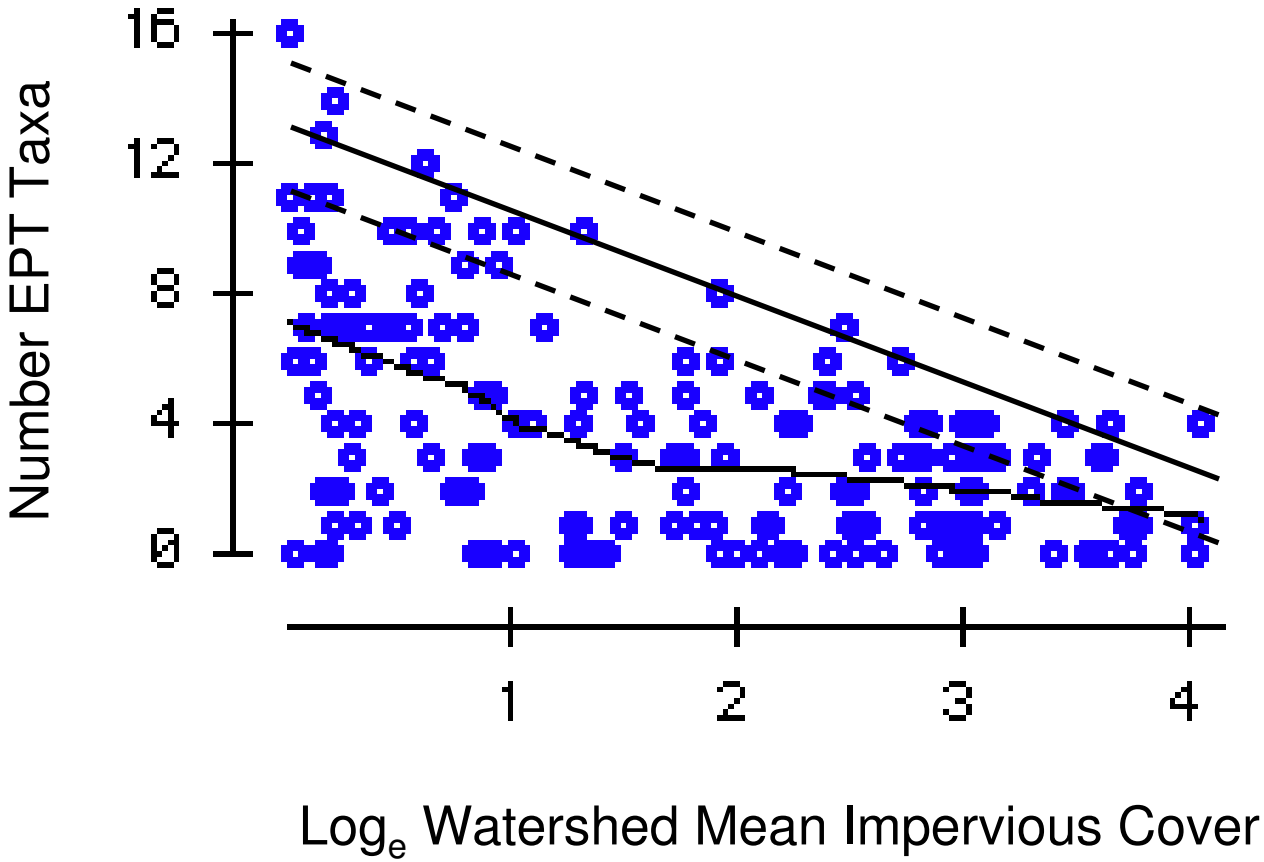
Southern Cal (SMC)-Xeric: Correlation of Biotic Indicators (Spearman's)

	O_E_0	O_E_05	IBI_Score	EPT	pINTOL	pNONINS	pTOL	pTOLtaxa
O_E_0	1							
O_E_05	0.846	1						
IBI_Score	0.788	0.628	1					
EPT	0.807	0.685	0.717	1				
pINTOL	0.679	0.55	0.702	0.766	1			
pNONINS	-0.349	-0.275	-0.744	-0.527	-0.396	1		
pTOL	0.089	0.085	-0.202	-0.094	-0.078	0.381	1	
pTOLtaxa	-0.191	-0.198	-0.600	-0.415	-0.383	0.651	0.512	1

SMC-Xeric Example Modeling Metrics

Point (PNT)	1km watershed (1k)	Entire Catchment (WS)
COND	1k_AgUrb21	ws_DamDensArea
NTL	1k_FOREST	ws_GRAZING
Elevation	1k_IMPERVMEAN	ws_MinesDens
P_SAFN	1k_Pipe24k	ws_ROW_CROPS
W1_HALL	1k_ROW_CROPS	ws_WETLANDS
InvasiveInvertDist	1k_WETLANDS	ws_AgUrb21
PPT	1k_CanalPipe24kPer	ws_FOREST
TEMP	1k_GravelMinesDens	ws_IMPERVMEAN
	1k_MinesDens	ws_PopDens2000
	1k_PopDens2000	ws_SHRUB
	1k_SHRUB	ws_CanalPipe24kPe
	1k_DamDensArea	ws_GravelMinesDen
	1k_GRAZING	ws_LAKES
	1k_PASTURE	ws_RDDENSC1234
	1k_RDDENSC1234	

Linear Regression



SMC-Xeric Example
Multiple Linear Regression

Number Of Modeled Variables	SOCAL IBI	
	Variable(s)	**R2-adj**
1	ws_IMPERVMEAN	0.427
1	1k_AgUrb21	0.415
1	ws_AgUrb21	0.262
2	1k_AgUrb21 +ws_IMPERVMEAN	0.513
2	ws_AgUrb21 +1k_IMPERVMEAN	0.493
2	1k_AgUrb21 +1k_IMPERVMEAN	0.45
3	COND+ 1k_AgUrb21 +ws_IMPERVMEAN	0.524
3	W1_HALL+1k_AgUrb21 +ws_IMPERVMEAN 1	0.518
3	P_SAFN+1k_AgUrb21 +ws_IMPERVMEAN	0.516
4	COND+W1_HALL+1k_AgUrb21 +ws_IMPERVMEAN	0.531

N= 186, All variables log transformed

Summary of Pros and Cons

Empirical	Modeled
Needs a lot of data	Needs a lot of data
A priori selection of classes	Uses model to independently select metrics
Can use local unambiguous metrics	Requires landscape metrics possibly confounded by local issues
Uses population based estimators	Uses modeled predictions accounting for uncertainty
Difficult to impossible to extrapolate	Uses GIS to extrapolate

Next Steps

- Analyze issues and options discussed today
- Apply to our Pilot Study Regions to assess viability
- Get feedback from the Science Advisory Group in April for modifications and improvements