

Stressor Modeling for Management Alternative #4

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Why are we using Alternative #4?

- What is alternative 4?: biological expectation based on a single-variable, continuous stressor gradient as opposed to defining 'bins'
- We took your advice to:
'keep it simple and see if it can be communicated'

Modeling Techniques and Steps

Initial exploratory modeling techniques

Used MLR, CART, Random Forest

Modeling Steps for Pilot Study

- 1) Random Forest for identifying “best” variables
 - NOT developing a predictive model
- 2) *Keeping it simple*: Linear regression
 - Determined top 5 single variable (stressor) models based on adj. R² and AIC
- 3) Quantile regression for defining upper bound of biological expectation for final selected stressor

Data Inventory:

- All sites within SMC region

 - (*206-Dev/107-Val=313*)

- Within Xeric Biome

 - (*118-Dev/70-Val=178*)

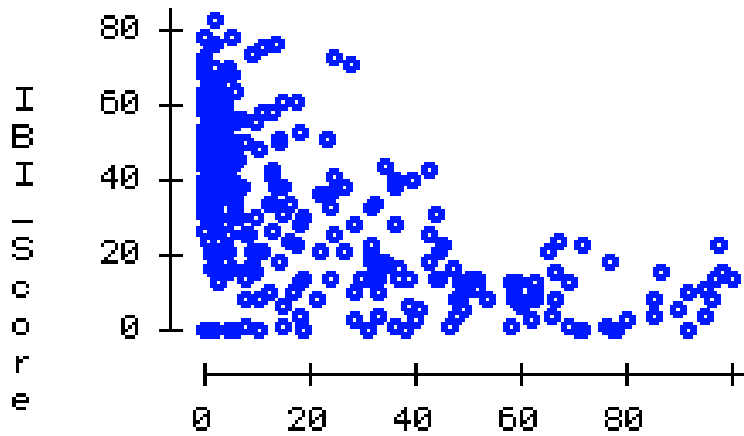
- Within Mountain Biome

 - (*89-Dev/46-Val=135*)

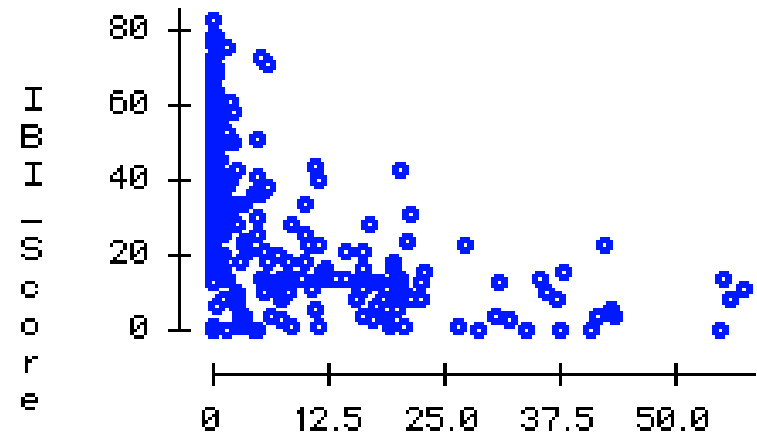
- Pilot watershed:

Ventura River n= 16 sites were excluded from our model development and validation

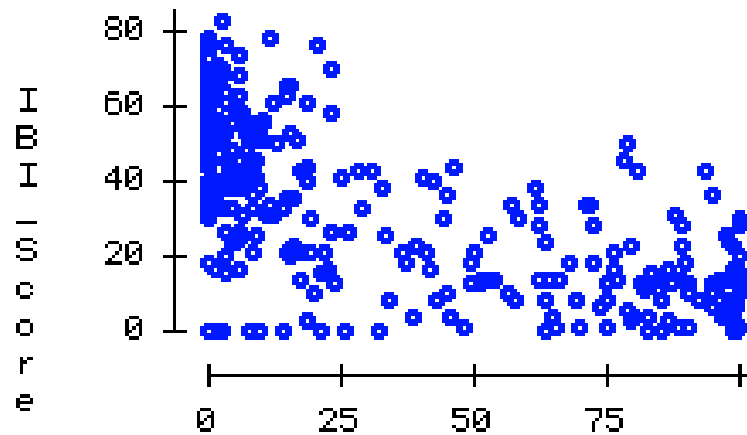
Examples of Important Stressors for SMC



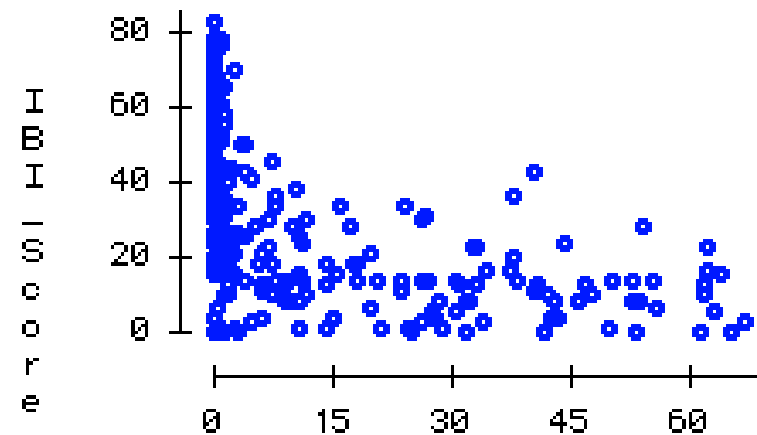
AgUrb21_WS



IMPERVMEAN_LWS



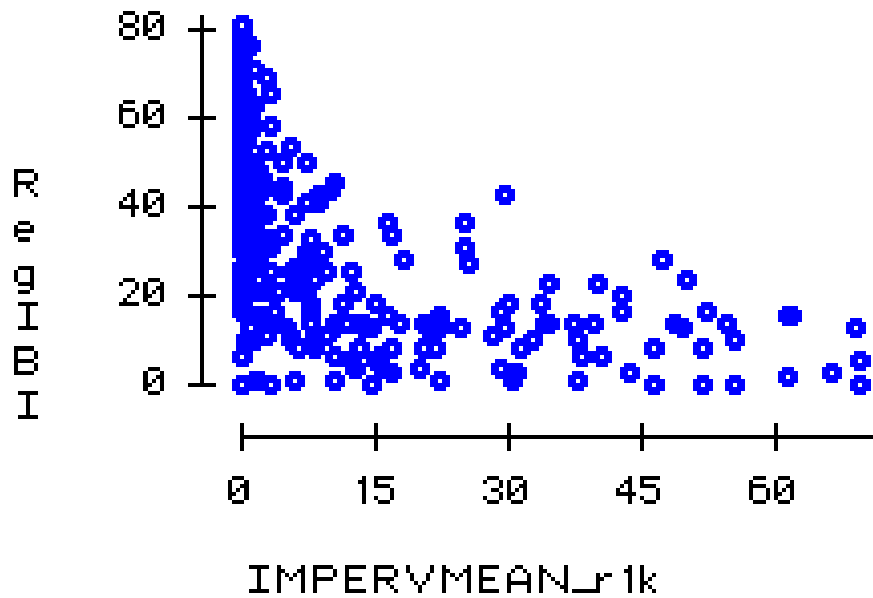
AgUrb21_1k



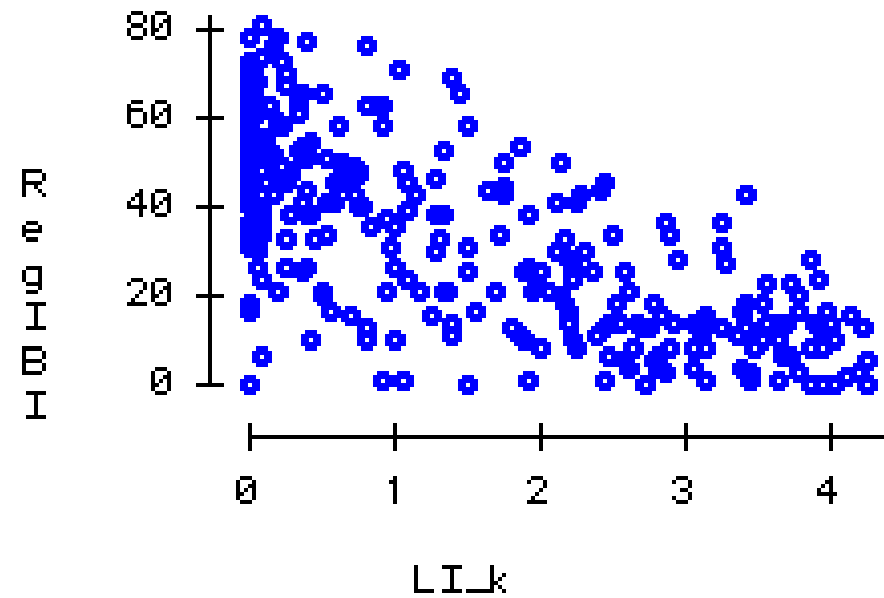
IMPERVMEAN_1k

Example of Transformation of data-% Impervious Area r1k

- Untransformed



- LN(x+1) Transformed



Helps with the fitting of linear models

All sites top 1-variable models

Variable	Adjusted R2	AIC
URBAN_r5k_In(x+1)	0.5429	1675.3
URBAN_1k_In(x+1)	0.5325	1682.3
AgUrb21_r1k	0.5261	1682.1
IMPERVMEAN_r5k_In(x+1)	0.5241	1687.9
IMPERVMEAN_r1k_In(x+1)	0.5167	1692.75

AgUrb21_r1k_In(x+1)	0.4534	1731.28

CODE_21_r1k_In(x+1)	0.1461	1870.9

Ag_WS_LN1	0.1024	1886.5

CanalPipeDist100k	0.06902	1897.9

DamDensL_WS	0.06531	1899.2

GRAZING_WS_LN1	0.02892	1911.1

GravelMinesDensL_r5k	0.006512	1918.3

Urbanization Signal

General disturbance

New Vegetation

AG Land use

Hydro-infrastructure

Grazing

Gravel mining

Comparison of top models across regions within SMC

All data		
Variable	Adjusted R2	AIC
URBAN_r5k_ln(x+1)	0.5429	1675.3
IMPERVMEAN_r1k_ln(x+1)	0.5167	1692.75
Xeric data		
URBAN_r5k_ln(x+1)	0.5362	893.99
IMPERVMEAN_r1k_ln(x+1)	0.4363	928.7
Mountain data		
IMPERVMEAN_r1k_ln(x+1)	0.1676	747.18
URBAN_r5k_ln(x+1)	0.0663	762.68

Xeric biome signal
dominants the All
model

Mountain biome has poor
models

% Impervious was the top
1 variable model

Slide 8

LRB9

There is a space between the ls in "All"

Larry Brown, 10/6/2011

Quantile regression Modeling

- Ran models of SOCAL IBI vs % urban land use and % impervious area at various scales(ie. r1k, r5k etc)
- Confidence intervals determined by bootstrapping 1000 times
- Modeled the 50th, 75th, 80th, 90th, 95th and 99th quantiles
- For pilot project purposes we only present 90th quantile models for IBI Score versus % Urban Land & % Impervious area in the Riparian 1,5k
- 90th quantile selected because:
 - Allows for uncertainty in fitting the upper bound of the distribution of the data but doesn't set the threshold too low
 - The 90th quantile has been used in other studies but it is a subjective decision and you could select other quantiles

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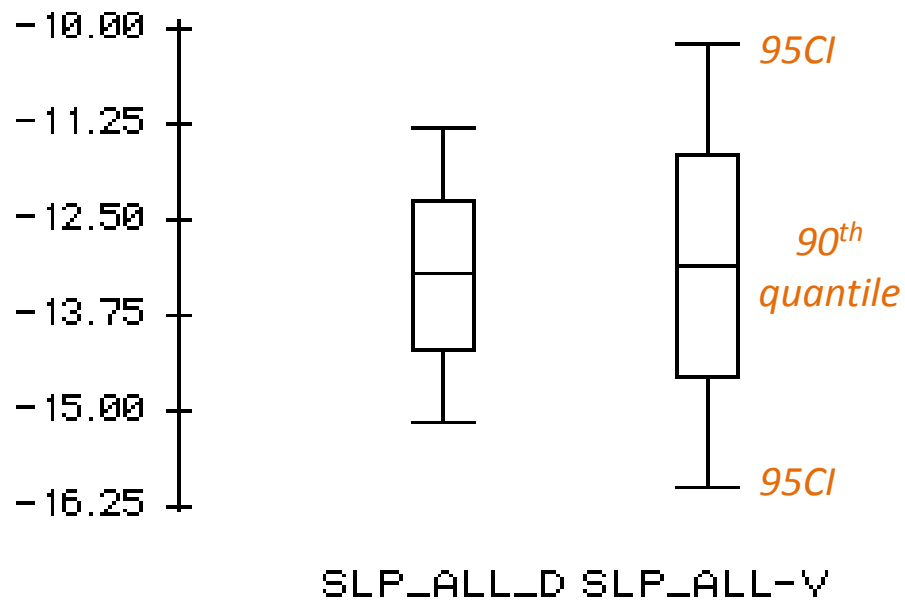
LRB10

Maybe it goes without saying that you have to justify your choice of quantile. I did not add text to that effect but maybe there should be? Up to Ken.

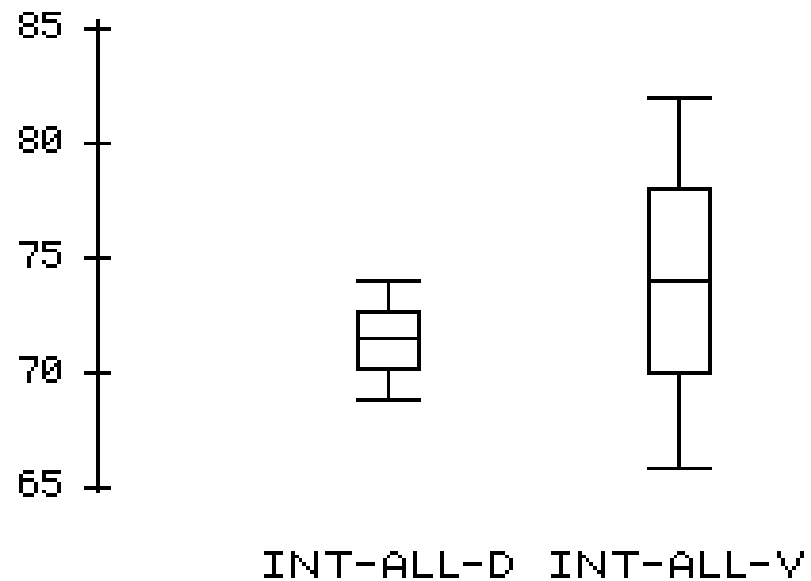
Larry Brown, 10/6/2011

Validation of 90th Quantile Model for % Impervious area_r1k based on bootstrapping with 1000 iterations

- Slopes



- Intercepts



Slide 10

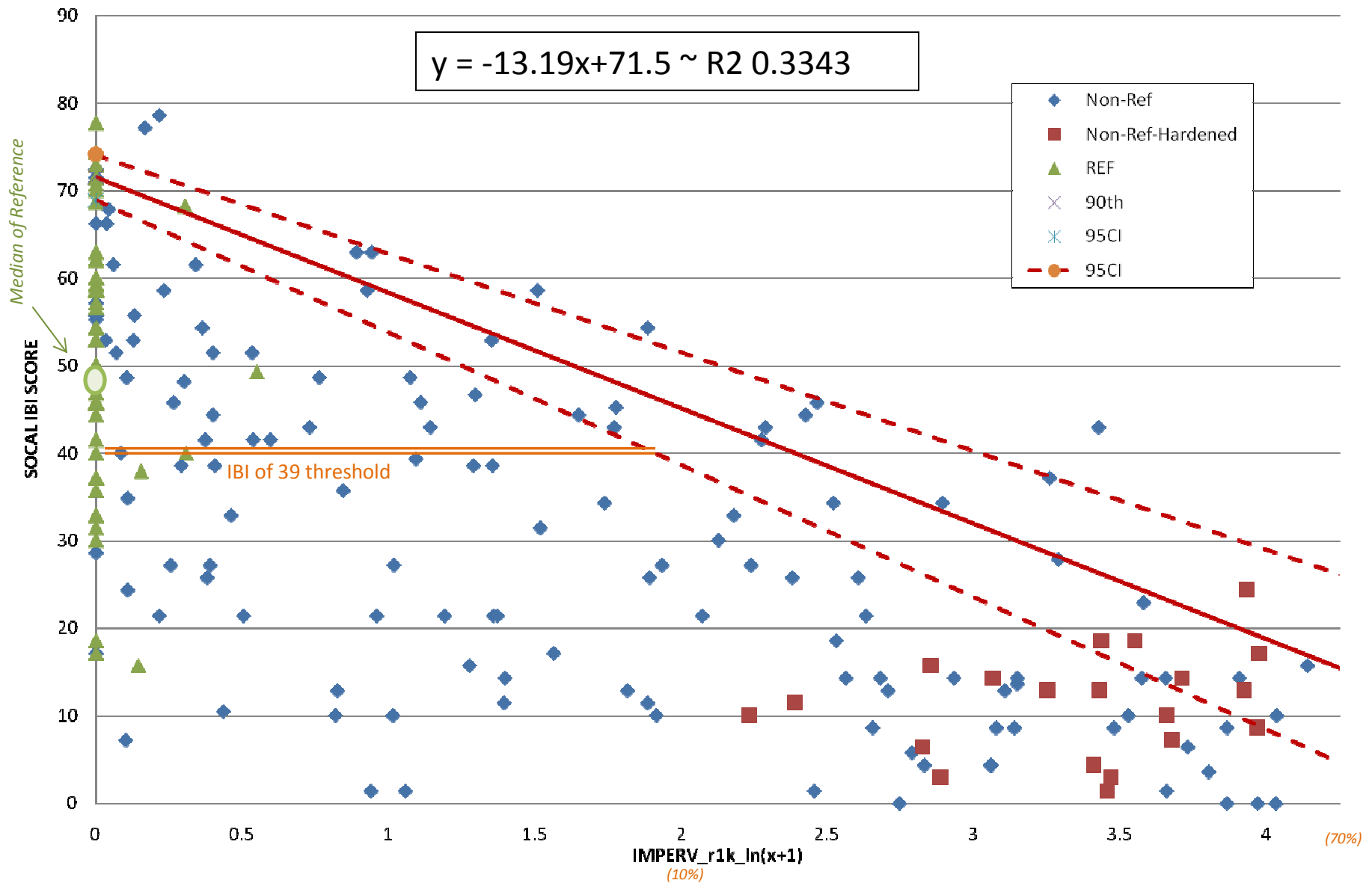
LRB11

I just cleaned this up a bit

Larry Brown, 10/6/2011

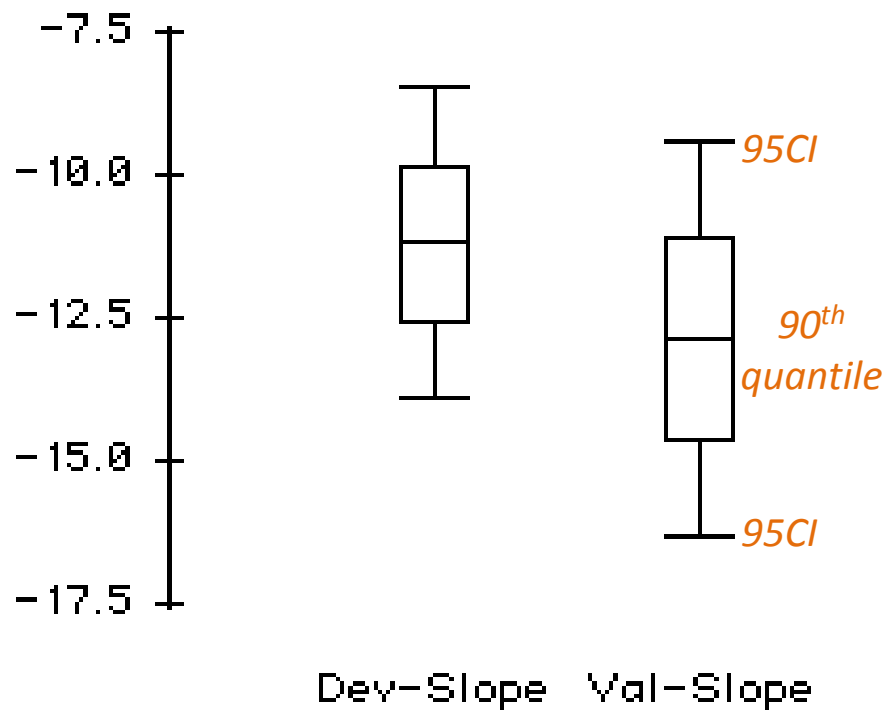
Quantile regression example for 90th quantile

IBI Score vs. % Impervious r1k

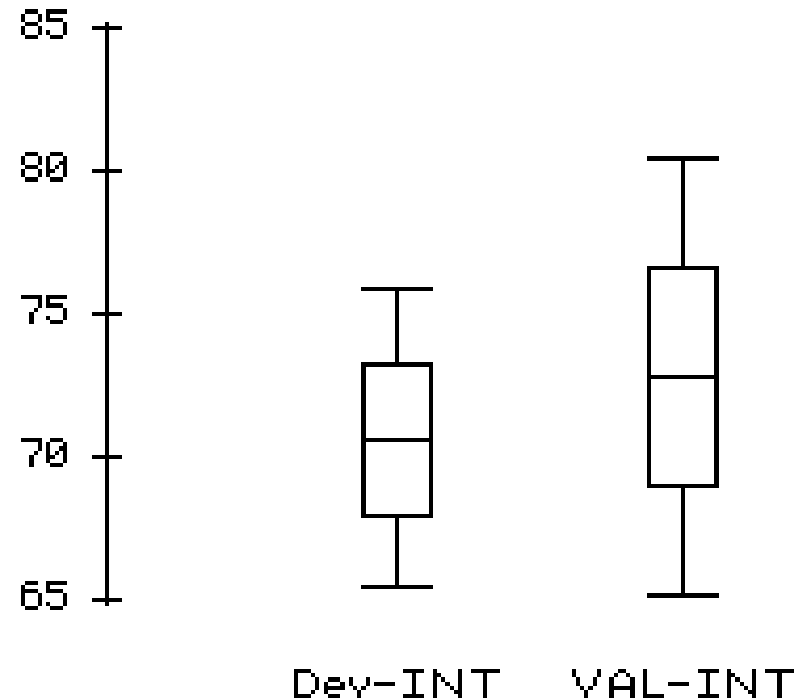


Validation of 90th Quantile Model for % URBAN_r5k based on bootstrapping with 1000 iterations

- Slopes



- Intercepts



Slide 12

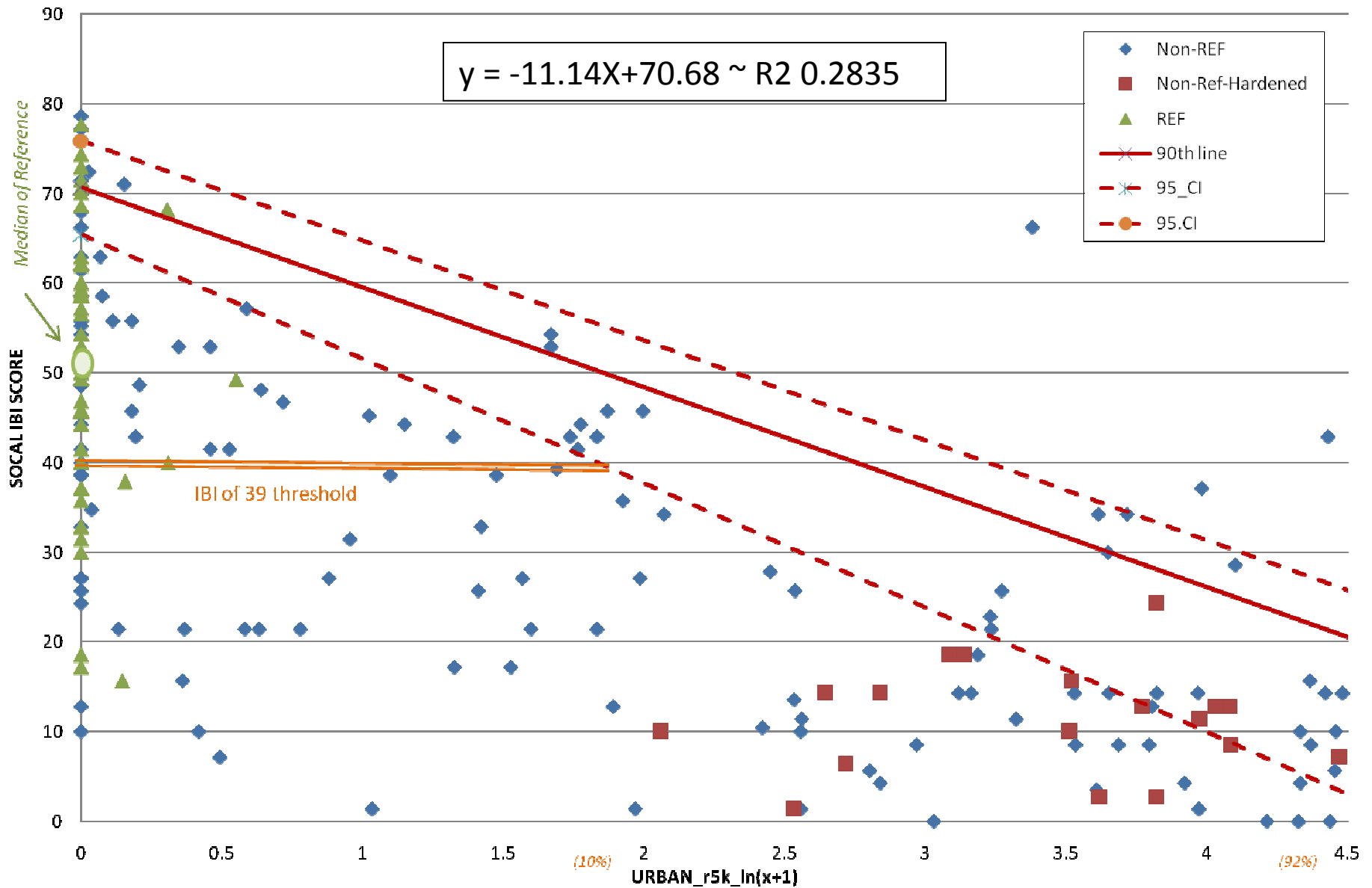
LRB12

Just cleaned this up a bit

Larry Brown, 10/6/2011

Quantile regression example for 90th quantile

All Development Data Set (n= 206) IBI vs. URBAN_r5k_In(x+1)



Concluding thoughts on modeling I

- We were able to establish effective models of a continuous stressor gradient to inform management option #4
- Future efforts will likely include non-linear models
- The simple linear models may well be sufficient for the task

Closing Modeling considerations

- One single stressor may not be appropriate for the whole study area?
- May need to break up management/regulatory strategy by biomes (xeric/mountain)
 - The poor models in the mountains suggest that the landscape-scale variables available do not capture the important stressors
 - Mountain biome sites may require more detailed investigations for management/regulation