

Technical response to science panel comments

Bio-integrity in developed landscapes

Recap of work so far

- We identified the problem:
 - Some streams may not be able to attain high scores, even if key stressors are reduced.
- We decided on an approach:
 - Model ranges of likely scores associated with different levels of development
 - Classify based on ranges: Likely high-scoring and likely constrained.
- We identified three key factors requiring input:
 - Types of variables to include in model
 - Index score threshold to define “high-” and “low-scoring”
 - Probability associated with “likely” or “unlikely”

Science panel feedback in two areas

1. What are the policy objectives? Without clarity, technical feedback is limited.
2. Natural factors: Some stream-types may be naturally more sensitive to (and constrained by) development than others.

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Tech Team response to #1:

- We will work with RG and WB staff to clarify policy objectives (today!)

Science panel feedback in two areas

1. What are the policy objectives? Without clarity, technical feedback is limited.
2. Natural factors: Some stream-types may be naturally more sensitive to (and constrained by) development than others.

Tech Team response to #2:

- Explore role of natural factors as resources allow
- In the absence of contradictory evidence, assume consistent response across stream-types

Policy objectives need some clarity to guide technical objectives

There are many potential policy objectives, and they may modify technical objectives

- Identify management options for different types of streams
 - Tech objective: Create classifications appropriate to these options
- Assess biological “potential” or restorability
 - Tech objective: Identify max attainable score, and factors that explain deviations from this maximum
- Set lower targets for developed streams based on observed ranges
 - Tech objective: Identify range of scores at increasing levels of development
- Assess condition of unsampled areas
 - Tech objective: Create models with strong predictive capacity
- Predict locations of modified channels
 - Tech objective: Model modified channels (and not CSCI scores!)

Technical progress since our last meeting

- New models with a refined list of predictors (no natural factors yet)
- Classifications applied with some preliminary rules
- Limited validation with independent data

Variables to include in models:

Based on RG and SG feedback, two models were created:

“Core” model based on these candidate predictors:

- NHD+ Canal density
- NLCD land-cover (aggregated to urban and ag)
- Density of roads and road crossings

“MDAV” model, based on “core” plus...

- Mine density
- Dam storage
- Atmospheric deposition (Nitrogen, Sulfur)
- Non-native Vegetation

Winnowing down all the candidate predictors

- Recursive feature elimination:
- Evaluate all possible models with 5 to 15 candidate predictors
- Pick the “best” (i.e., lowest RMSE) model for each model size, and the overall best
- Pick the simplest model with RMSE within 1% of the overall best.

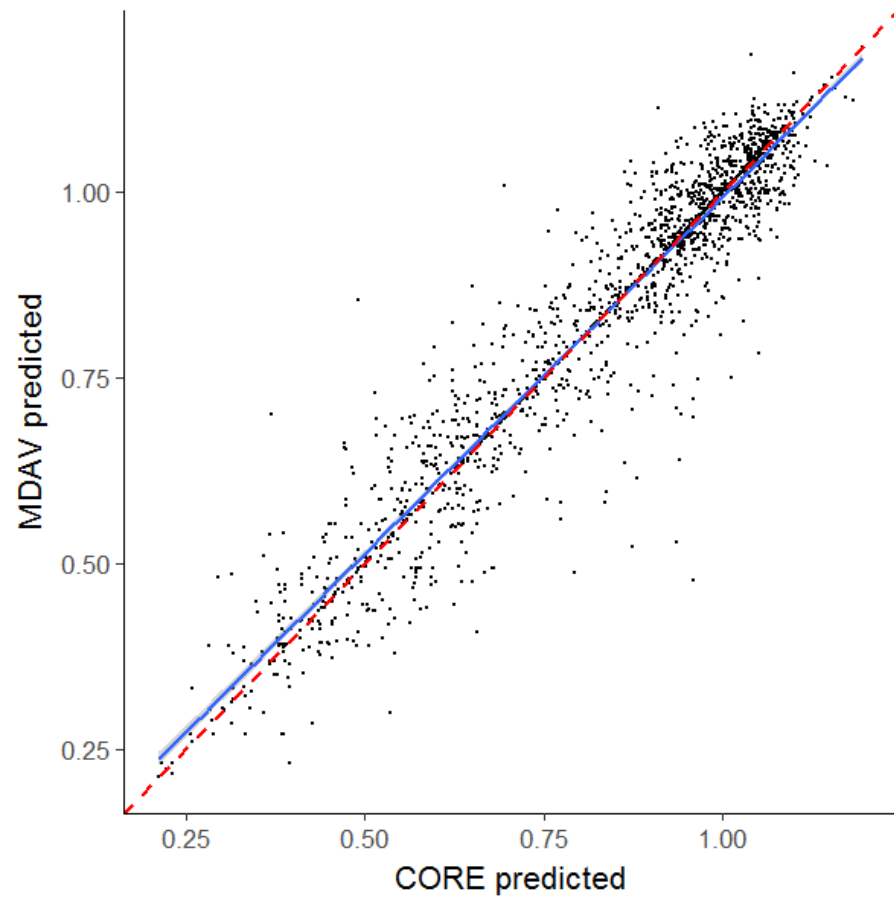
Example

Variables	RMSE	% of best	Selected
5	0.1769	2.1	
6	0.1763	1.8	
7	0.1751	1.1	
8	0.1756	1.4	
9	0.1745	0.8	Selected
10	0.1740	0.5	
11	0.1732	0	Best
12	0.1737	0.3	
13	0.1740	0.5	
14	0.1740	0.5	
15	0.1741	0.5	

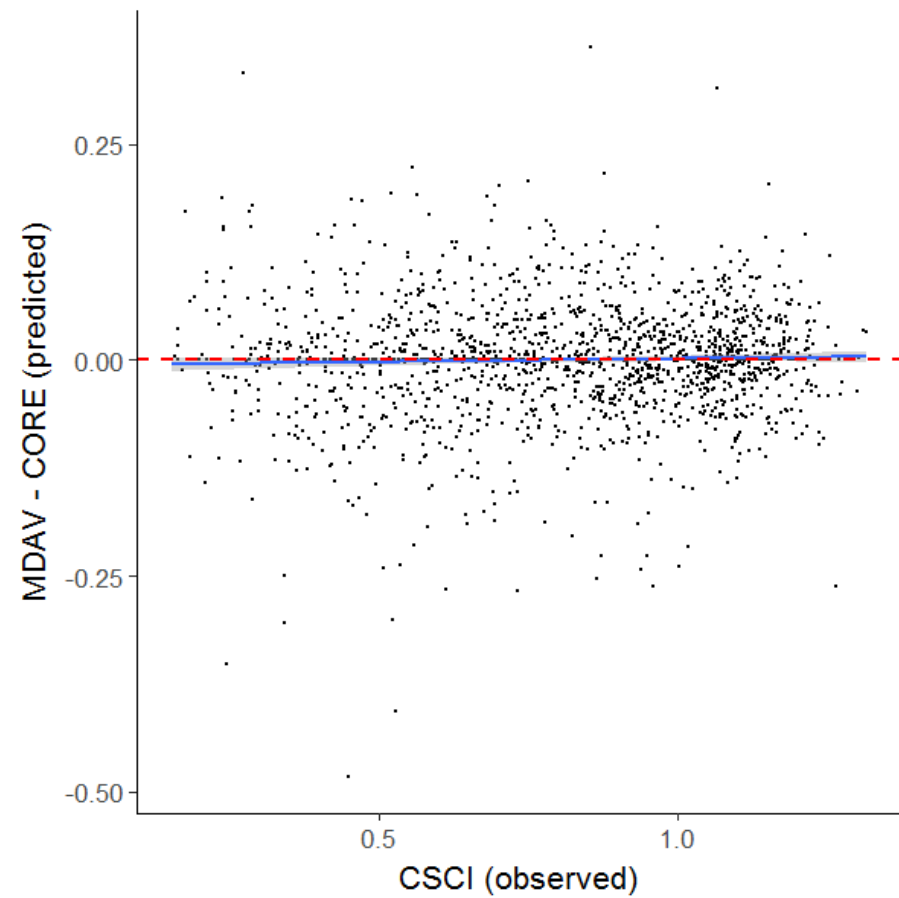
Variable	Core	MDAV	Variable	Core	MDAV
Land use			Roads		
PctImp2006Cat	Sel	Sel	RdDensCat	Rej	Rej
PctImp2006Ws	Rej	Rej	RdDensWs	Sel	Sel
PctImp2006CatRp100	Rej	Rej	RdDensCatRp100	Rej	Rej
PctImp2006WsRp100	Sel	Rej	RdDensWsRp100	Rej	Rej
TotUrb2011Ws	Sel	Rej	RdCrsCat	Rej	Rej
TotUrb2011Cat	Rej	Rej	RdCrsSlpWtdCat	Rej	Rej
TotUrb2011WsRp100	Sel	Rej	RdCrsWs	Sel	Rej
TotUrb2011CatRp100	Rej	Rej	RdCrsSlpWtdWs	Sel	Sel
TotAg2011Ws	Sel	Sel	Atmospheric deposition		
TotAg2011Cat	Rej	Rej	NH4_2008Ws	NC	Sel
TotAg2011WsRp100	Sel	Sel	NO3_2008Ws	NC	Sel
TotAg2011CatRp100	Rej	Rej	InorgNWetDep_2008Ws	NC	Sel
Non-native veg cover			SN_2008Ws	NC	Sel
PctNonAgIntrodManagVegCat	NC	Sel	Hydrology		
PctNonAgIntrodManagVegWs	NC	Sel	CanalDensCat	Rej	Rej
PctNonAgIntrodManagVegCatRp100	NC	Sel	CanalDensWs	Sel	Rej
PctNonAgIntrodManagVegWsRp100	NC	Sel	DamDensCat	NC	Rej
Mines			DamDensWs	NC	Rej
MineDensCat	NC	Rej	DamNrmStorM3Cat	NC	Rej
MineDensWs	NC	Rej	DamNrmStorM3Ws	NC	Rej
MineDensCatRp100	NC	Rej			
MineDensWsRp100	NC	Rej			

Rejected
Selected
Not considered

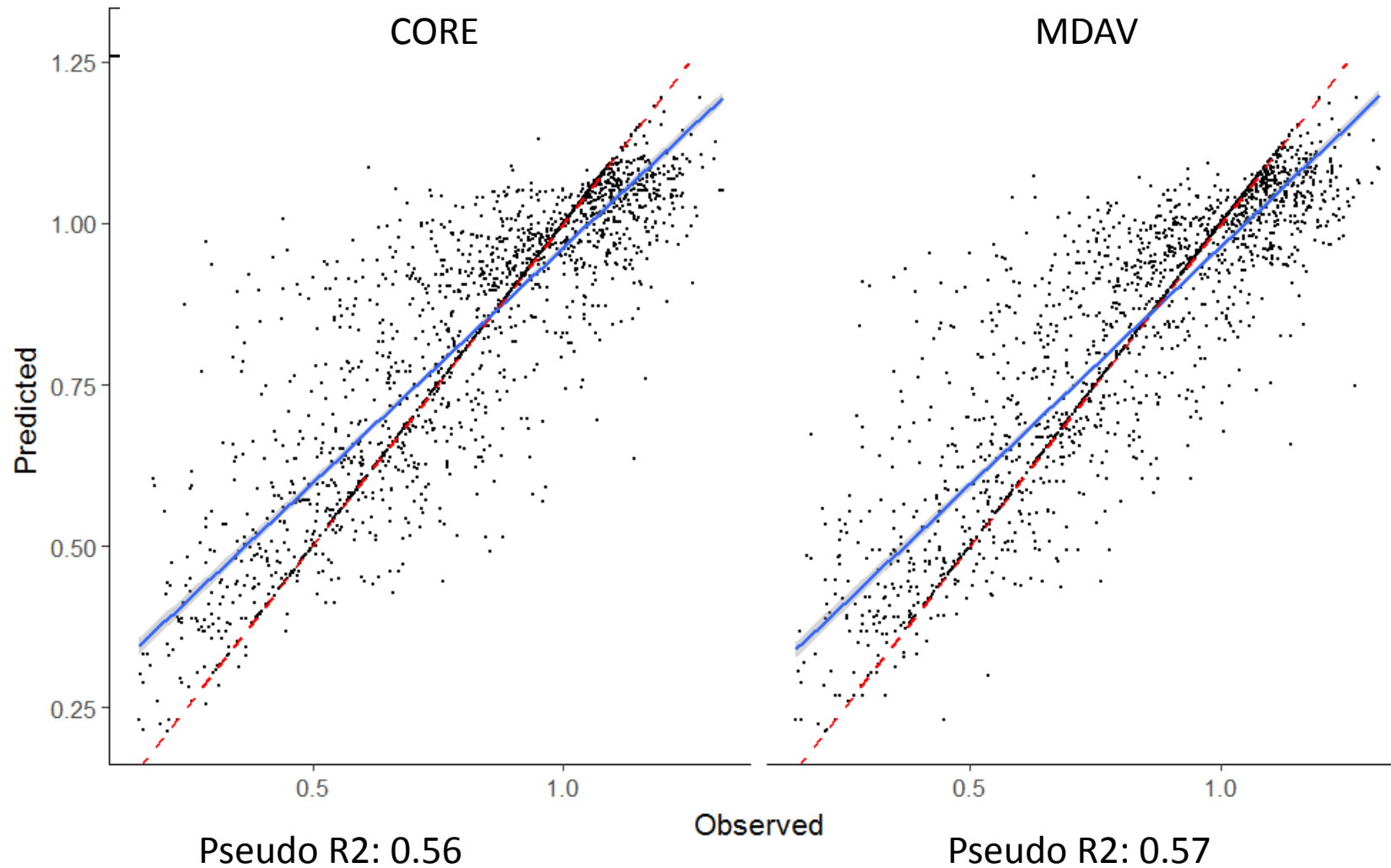
The two models are pretty similar to each other



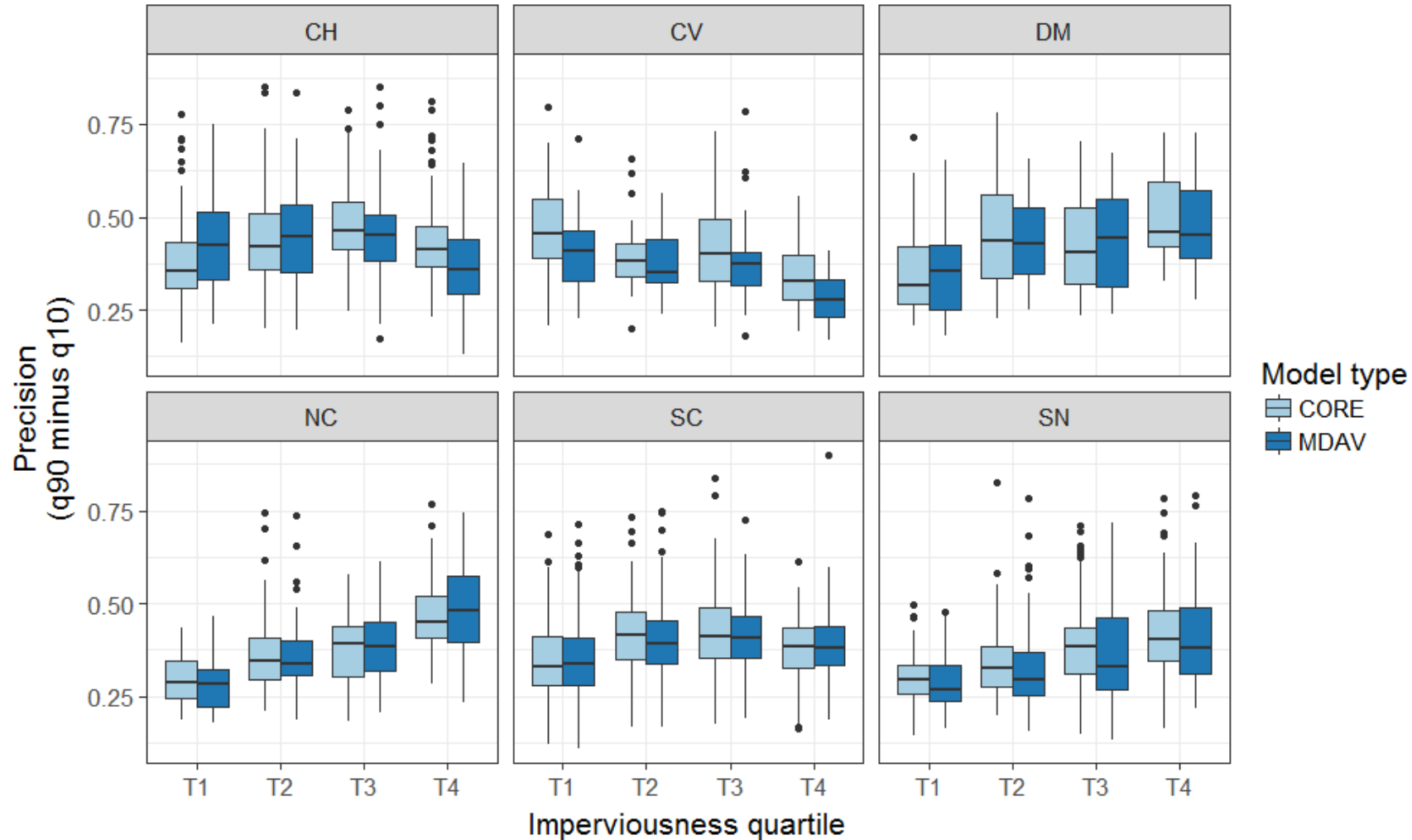
Pseudo R2: 0.56



Both over-predict low scores and under-predict high scores



Models work better in some areas than others



If q90 and q10 are close, model can precisely estimate score.

Imprecise estimations happen all over, but more common:

- The most developed parts of several regions
- The least developed parts of the Central Valley

Outcomes of these models

Explore in Google Earth files

Preliminary classification decisions:

- **DARK BLUE**: Likely high-scoring. <10% chance of scoring below 0.79
- **RED**: Likely constrained. <10% chance of scoring above 0.79
- **LIGHT BLUE**: Other. Prediction interval includes 0.79.
- **YELLOW**: Not determined. Predictor data missing in STREAMCAT

No model is perfect—but is this useful?

- Model is a screening tool
- Classification scheme is objective
- You will sometimes disagree—and you're probably right.
- New data (especially personal site knowledge) could over-ride model classifications
- Models best for areas where data are lacking

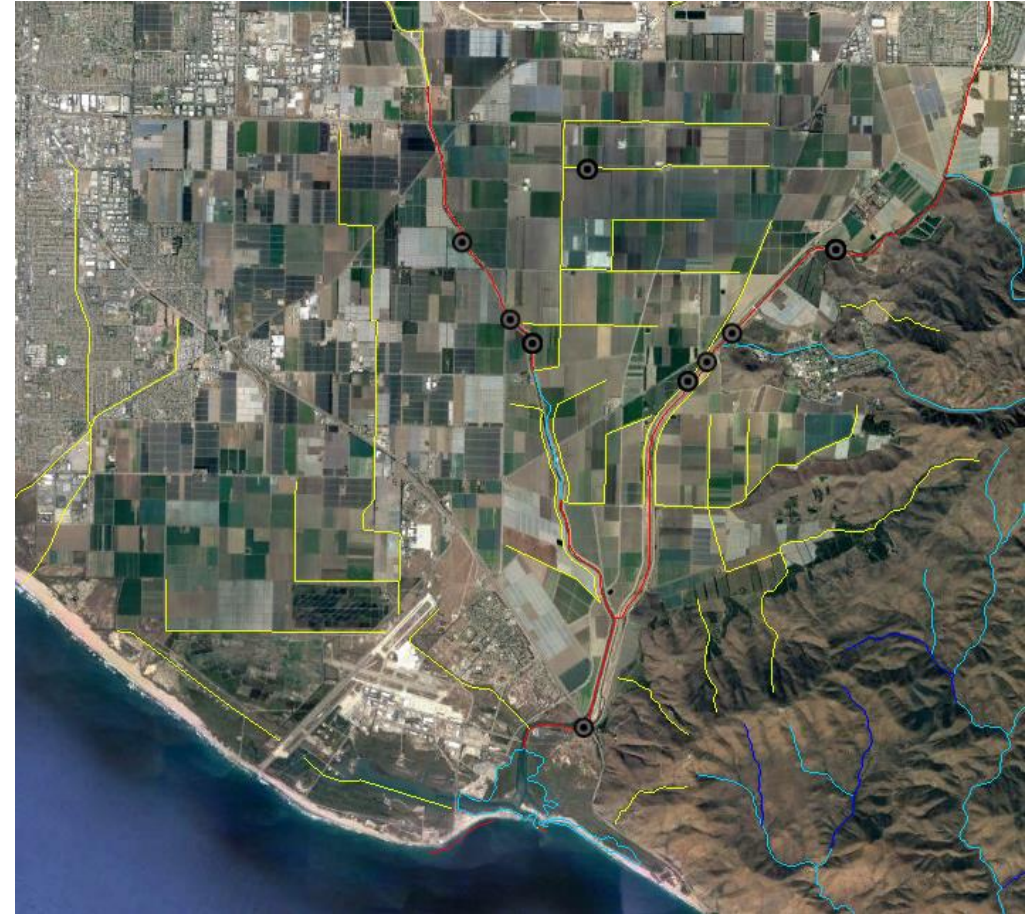
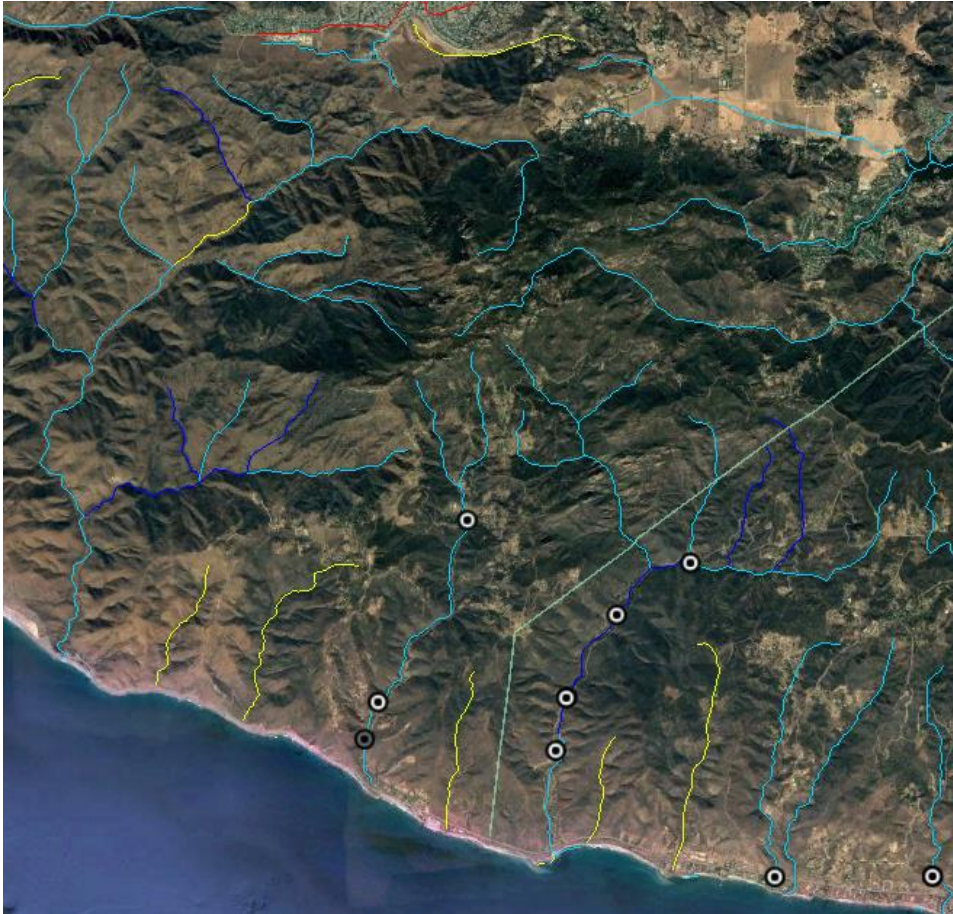


These should probably be red



The whole segment is red, but upper reaches are hardly developed

Is **NOT DETERMINED** a problem?



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