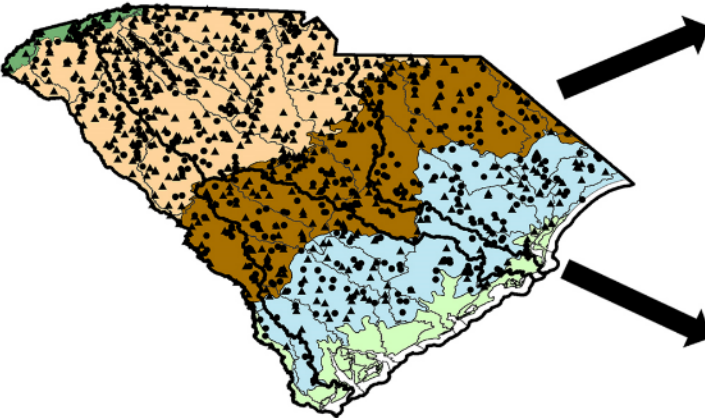


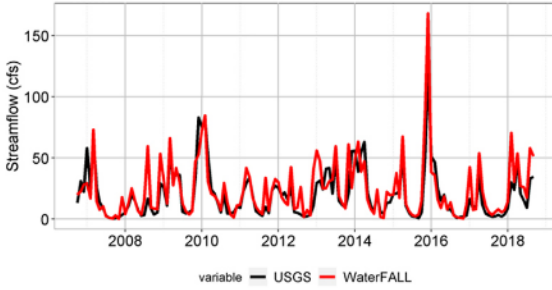
Flow-Stream Health Relationships Study Review and Discussion

Eric Krueger and Dr. Luke Bower

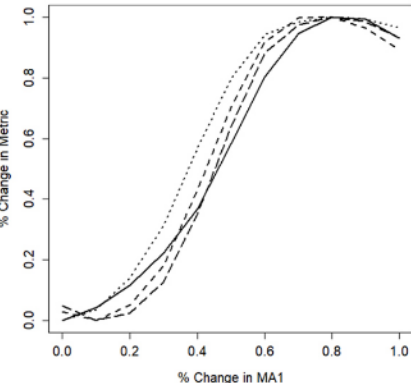
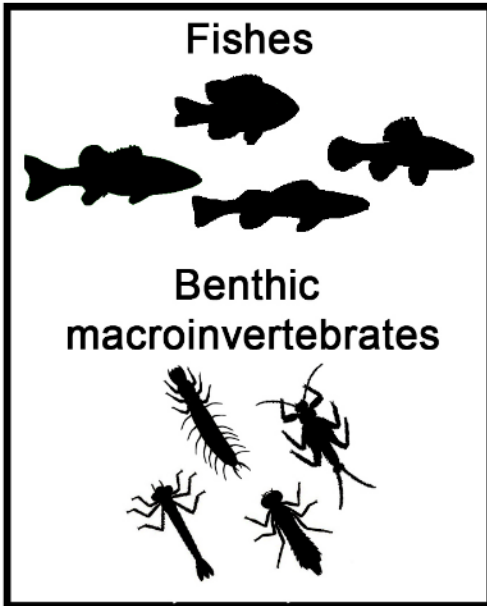




Hydrologic data



Biological data



1) All flow regime components affect aquatic organism

2) Relationships differ across stream classes

3) Provides a flexible framework for flow standard development



Proposal

- ▶ Incorporate 4 flow-ecology metrics as performance measures of Edisto River water use scenarios. They are:
 - ▶ Mean Daily Flow (MA1)
 - ▶ Base Flow Index (ML17)
 - ▶ Duration of Low Flow (DL16)
 - ▶ Timing of Low Flow (TL1)
- ▶ These were chosen based on:
 - ▶ Relevance to water withdrawal and drought management
 - ▶ Strength of relationship
 - ▶ Distribution: All stream classes and basin area represented
 - ▶ Readily calculable in SWAM



Proposal

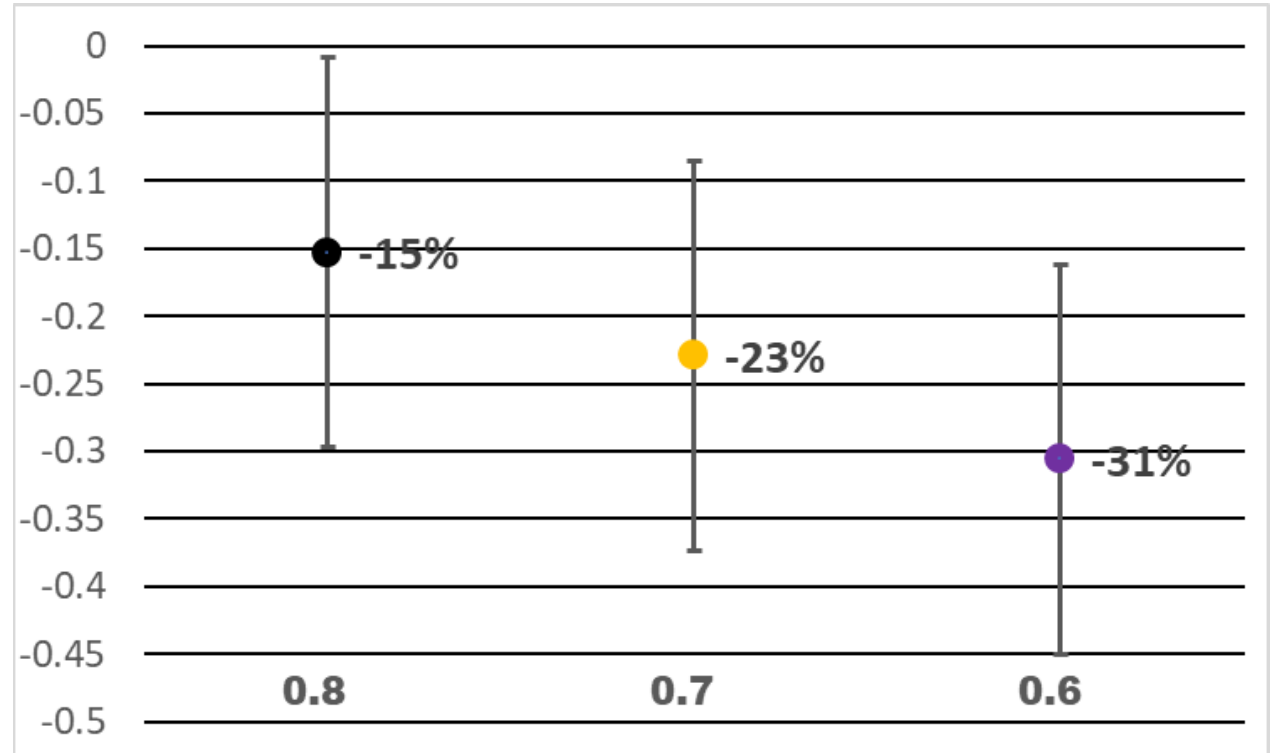
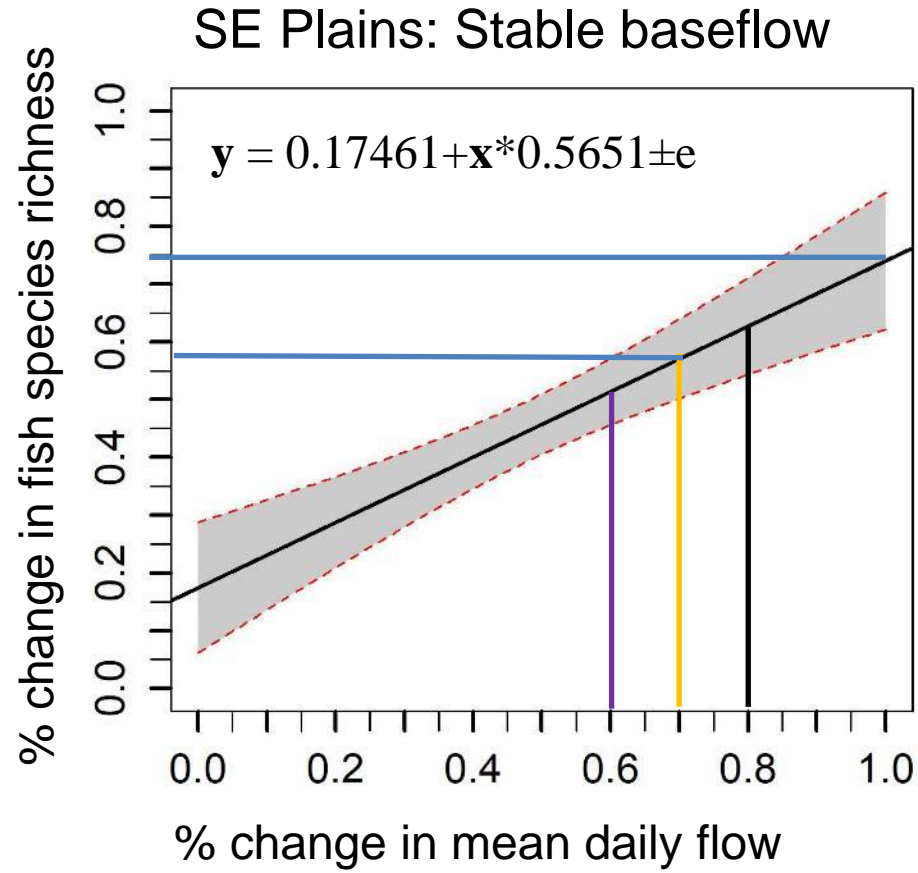


- ▶ **Why?** This enables you to evaluate the actual impact on the basin's health *and* compare multiple scenarios quickly
- ▶ **How** to use them? There are multiple possibilities. We recommend:
 - ▶ Evaluate the performance of water use scenarios on stream and river health
 - ▶ Strategic nodes, stream reaches of interest, and selected tributaries.
 - ▶ Use them in a risk management context: high, medium, low risk (we have an example)

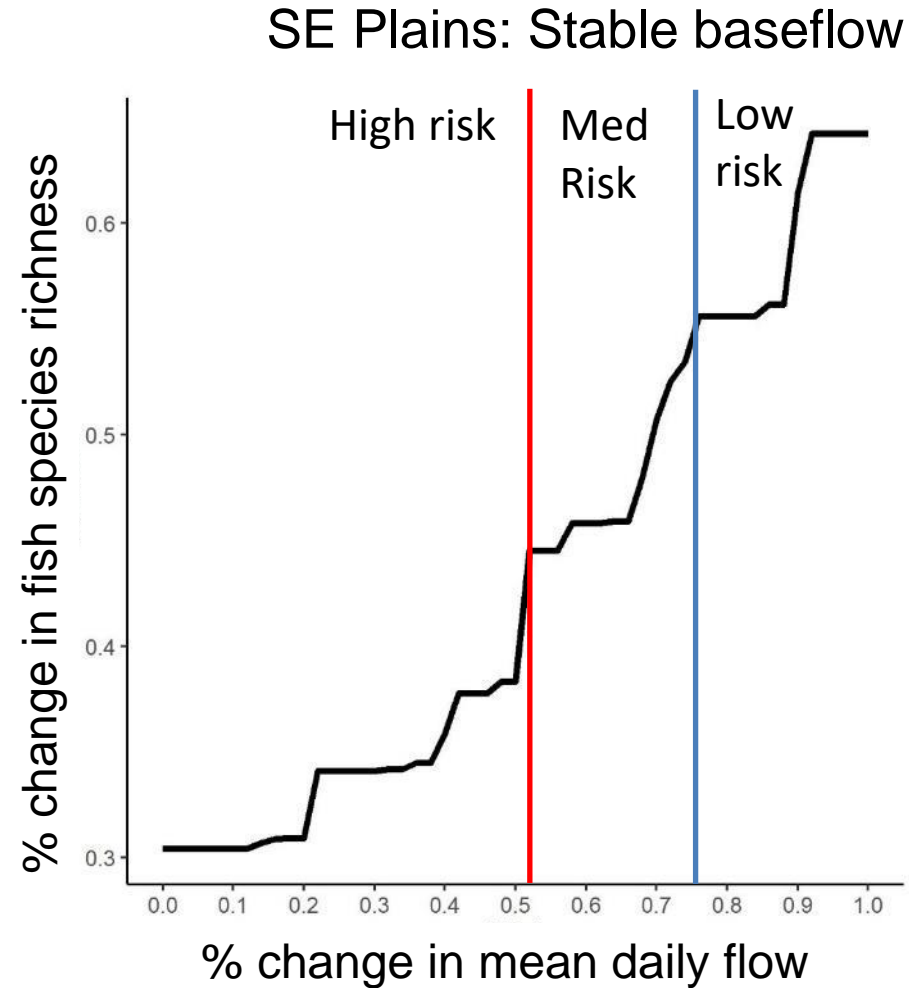
Proposal: Low-Med-High Risk Ranges

	Instream Flow Performance Recommendations and Risk Ranges								
Stream Type:	Southeastern Plains 1 (SE1)			Southeastern Plains 3 (SE3)			Mid-Atlantic 1 (M-A-1)		
	<i>Risk Ranges</i>								
	Low	Med	High	Low	Med	High	Low	Med	High
Flow Metric									
Mean Daily Flow (FR)	>0.66	0.42-0.66	<0.42	>0.75	0.52-0.75	<0.52			
Base Flow (MR)							>0.68	0.25-0.68	<0.25
Base Flow (MT)							>0.60	0.36-0.60	<0.36
Low Flow Duration (FR)				<0.13	0.13-0.40	>0.40			
Low Flow Duration (FT)							<0.20	0.20-0.60	>0.60
Calendar Day of Lowest Flow (MO)				>280	262-280	<262			
Calendar Day of Lowest Flow (FT)							>250	232-250	<232

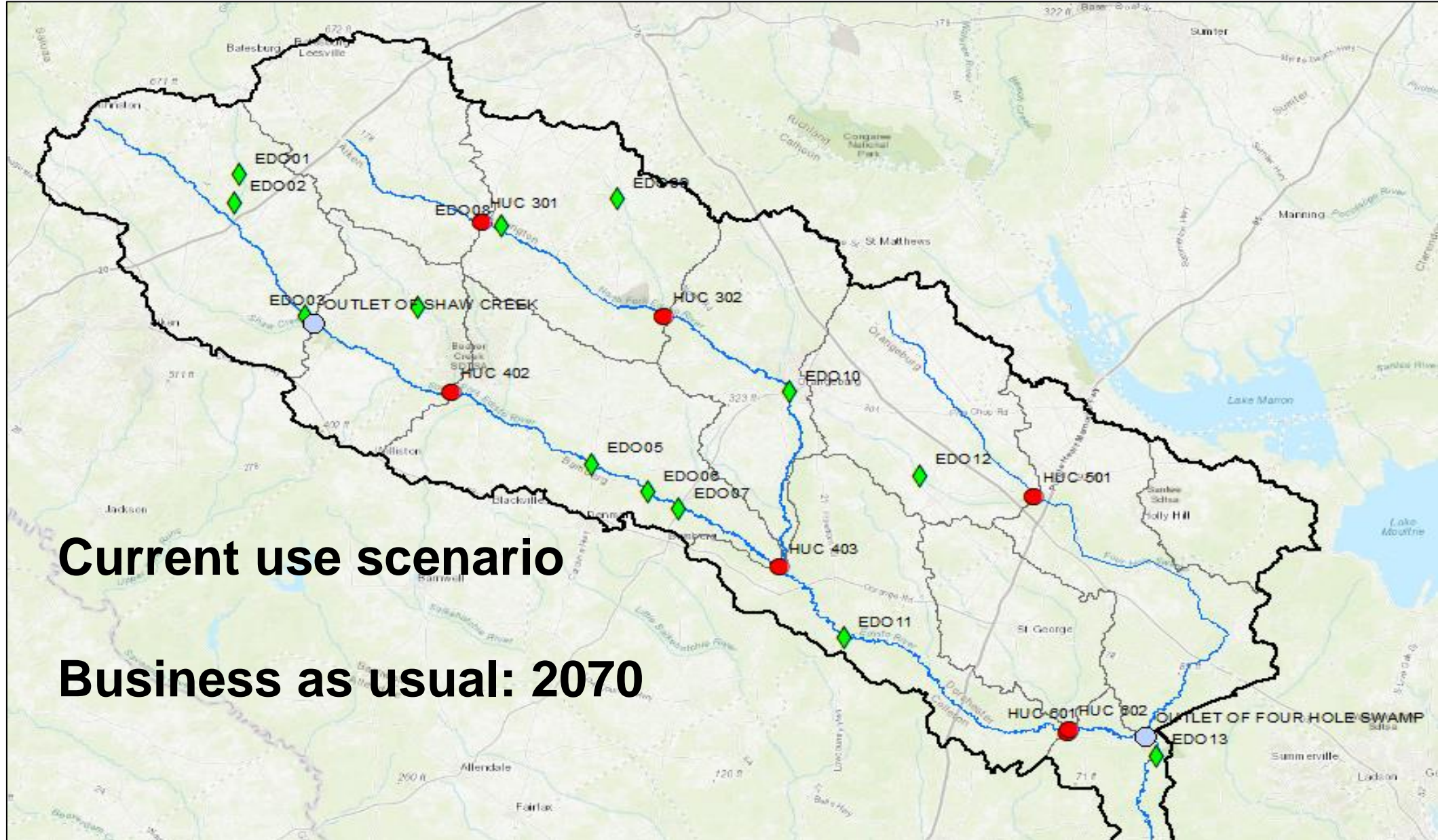
Mean daily flow (MA1): predictions



Mean daily flow (MA1): biological response limits



RBC-Identified Strategic Nodes



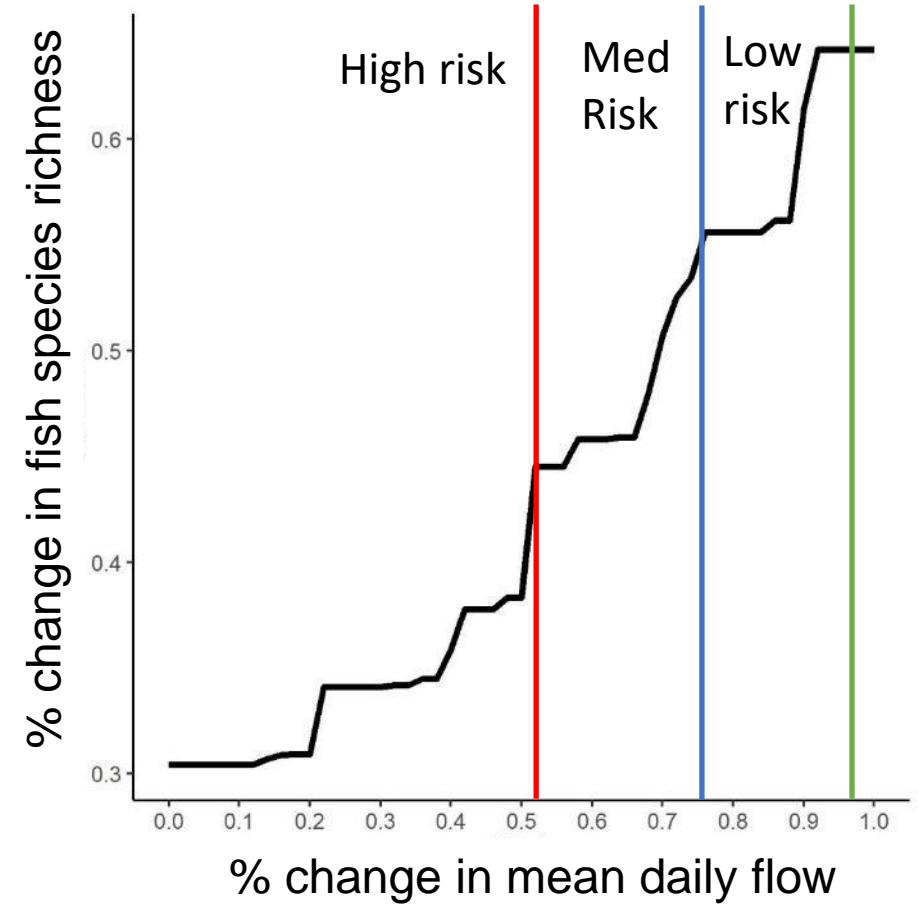
Application to SWAM: approaches



Class	Flow Metric
SE3 (HUC402)	MA1
SE3 (HUC402)	DL16
SE3 (HUC402)	TL1
MID1 (4 Hole)	ML17

MA1: mean daily flow
DL16: duration of low flow
TL1: timing of low flow
ML17: base flow

SE Plains: Stable baseflow

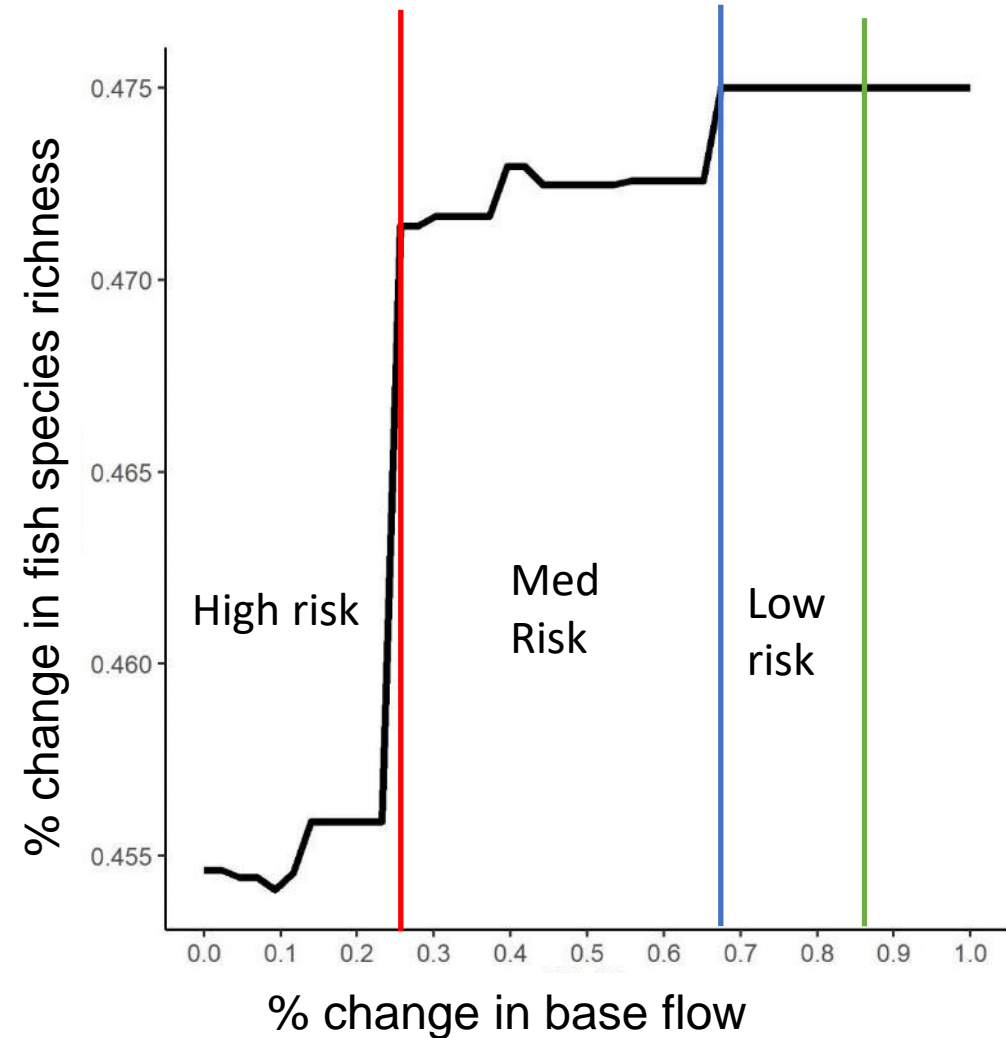


Application to SWAM: approaches

Class	Flow Metric
SE3 (HUC402)	MA1
SE3 (HUC402)	DL16
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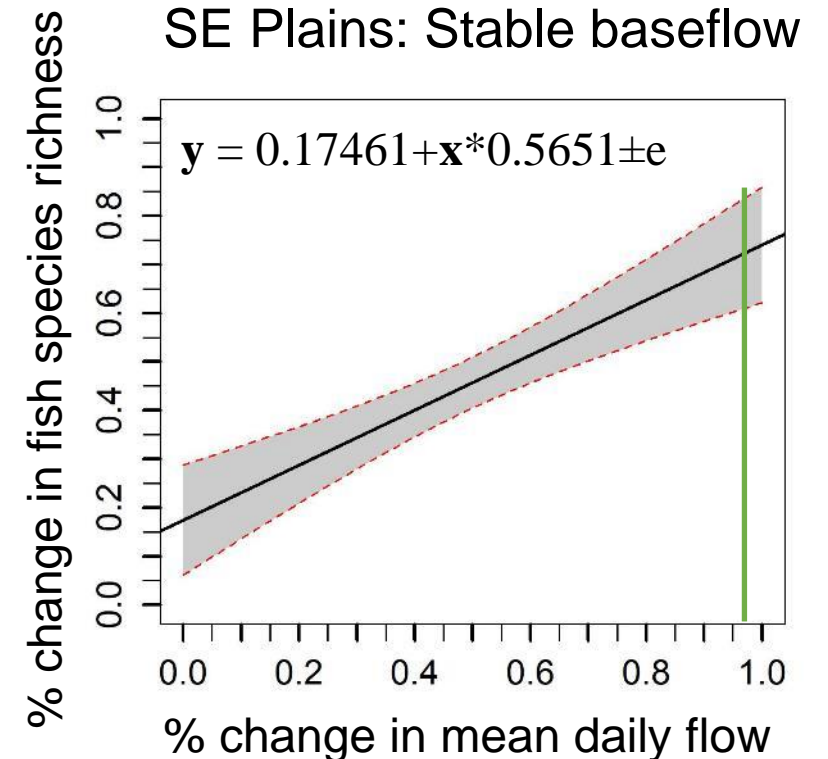
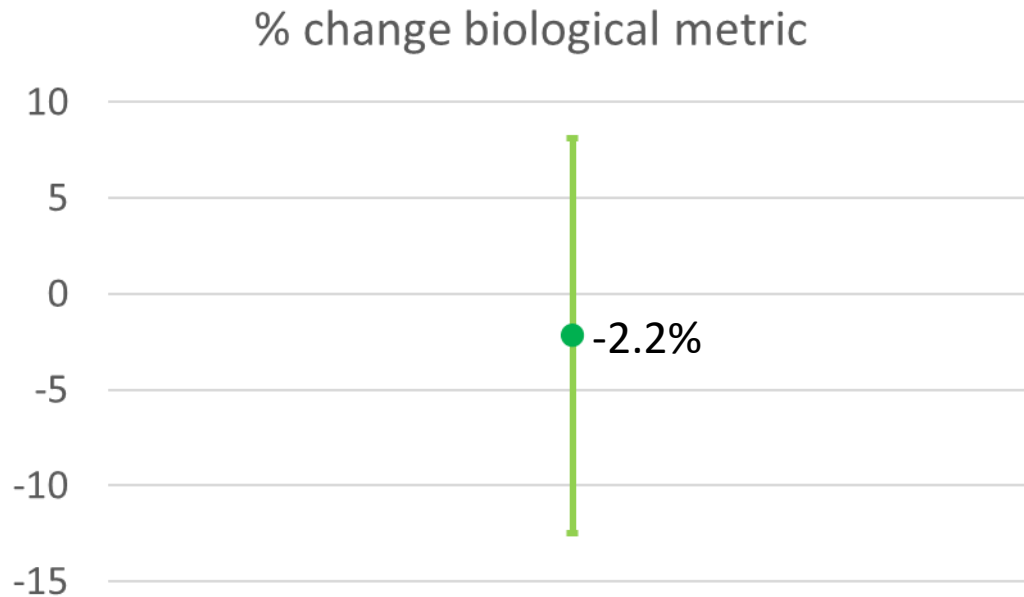
Mid Atlantic Plains: Perennial runoff



Application to SWAM: approaches

Class	Flow Metric	Base	Future	% change	Bio Metric
SE3 (HUC402)	MA1	450	440	-2.2%	Richness
SE3 (HUC402)	DL16	12.4	12.5	1.0%	Richness
SE3 (HUC402)	TL1	212	204	3.8%	M-O index
MID1 (4 Hole)	ML17	0.18	0.15	-14.1%	Richness

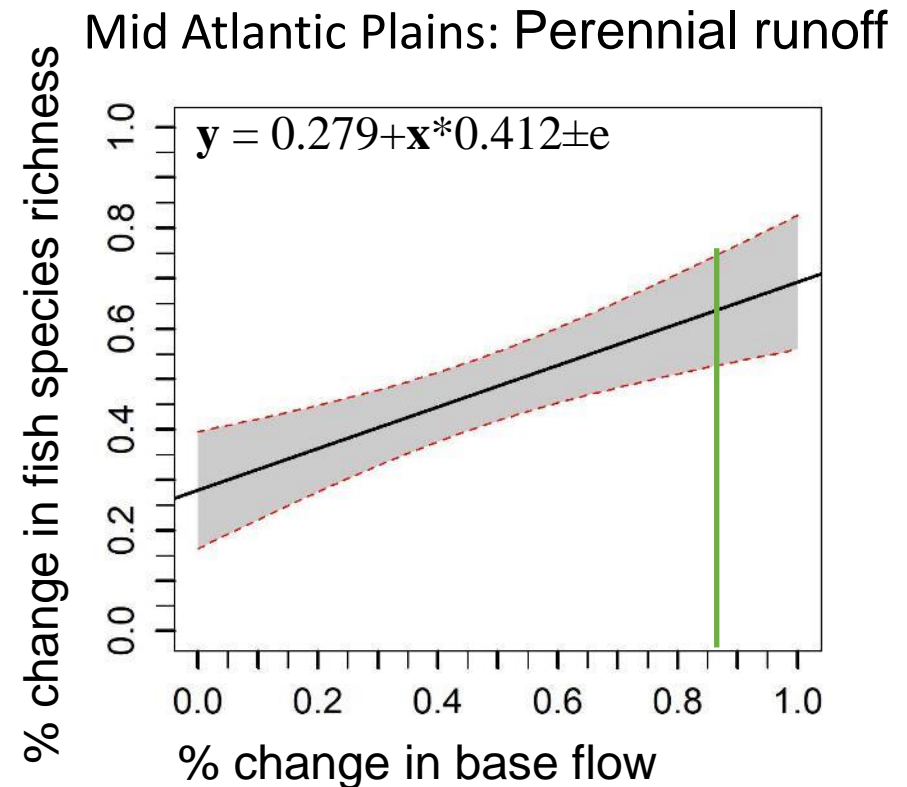
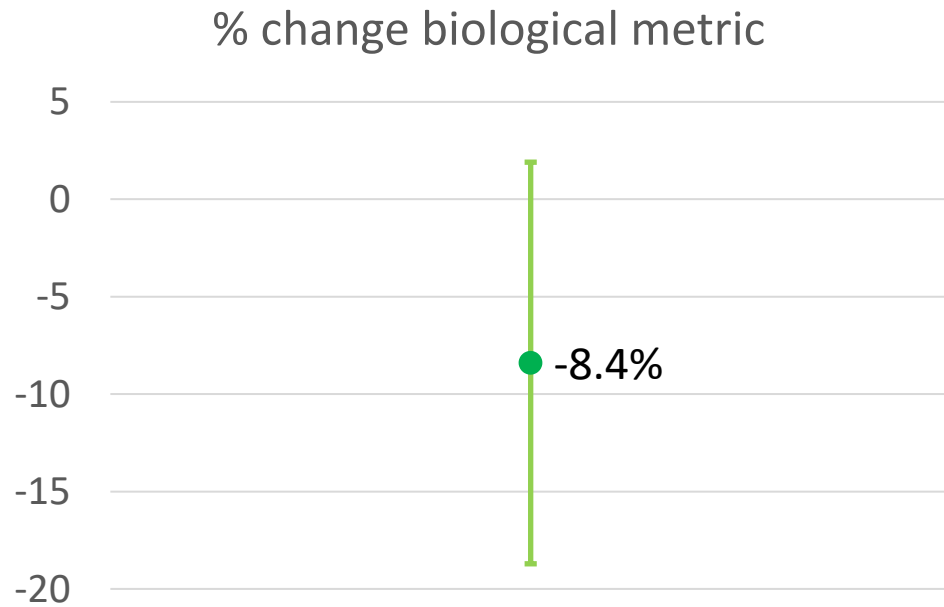
MA1: mean daily flow
DL16: duration of low flow
TL1: timing of low flow
ML17: base flow



Application to SWAM: approaches

Class	Flow Metric	Base	Future	% change	Bio Metric	% bio change
SE3 (HUC402)	MA1	450	440	-2.2%	Richness	-1.7%
SE3 (HUC402)	DL16	12.4	12.5	1.0%	Richness	- <0.1%
SE3 (HUC402)	TL1	212	204	3.8%	M-O index	-3.1%
MID1 (4 Hole)	ML17	0.18	0.15	-14.1%	Richness	-8.4%

MA1: mean daily flow
 DL16: duration of low flow
 TL1: timing of low flow
 ML17: base flow



Application

- Performance measures to look at the differences between SWAM scenarios.
 - Real data and relationships
 - Helps ground these scenarios
- Determine if a scenario could lead to high, medium, or low impact on aquatic organisms at strategic nodes.
- We can also estimate the impact on aquatic organisms (% change in biotic metrics) with associated error of estimate.