Lessons Learned from Valuing Ecosystem Service Benefits of Invasive Plant Control

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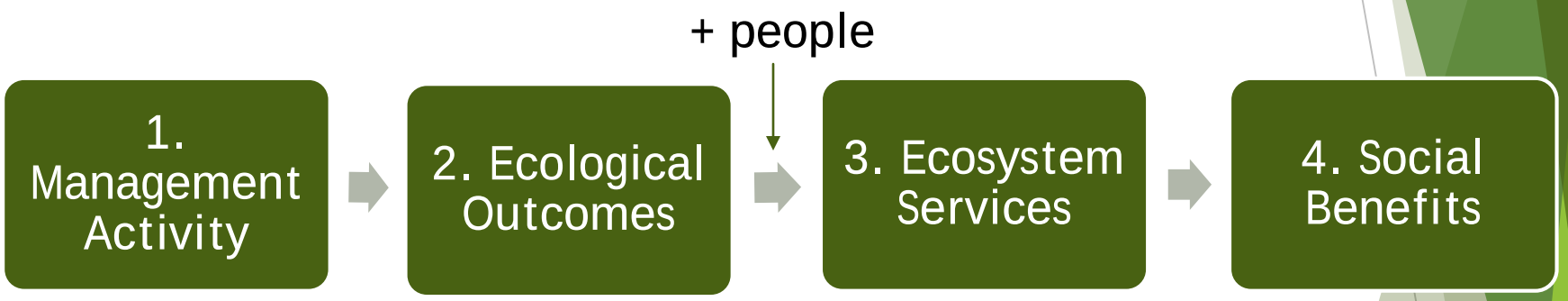
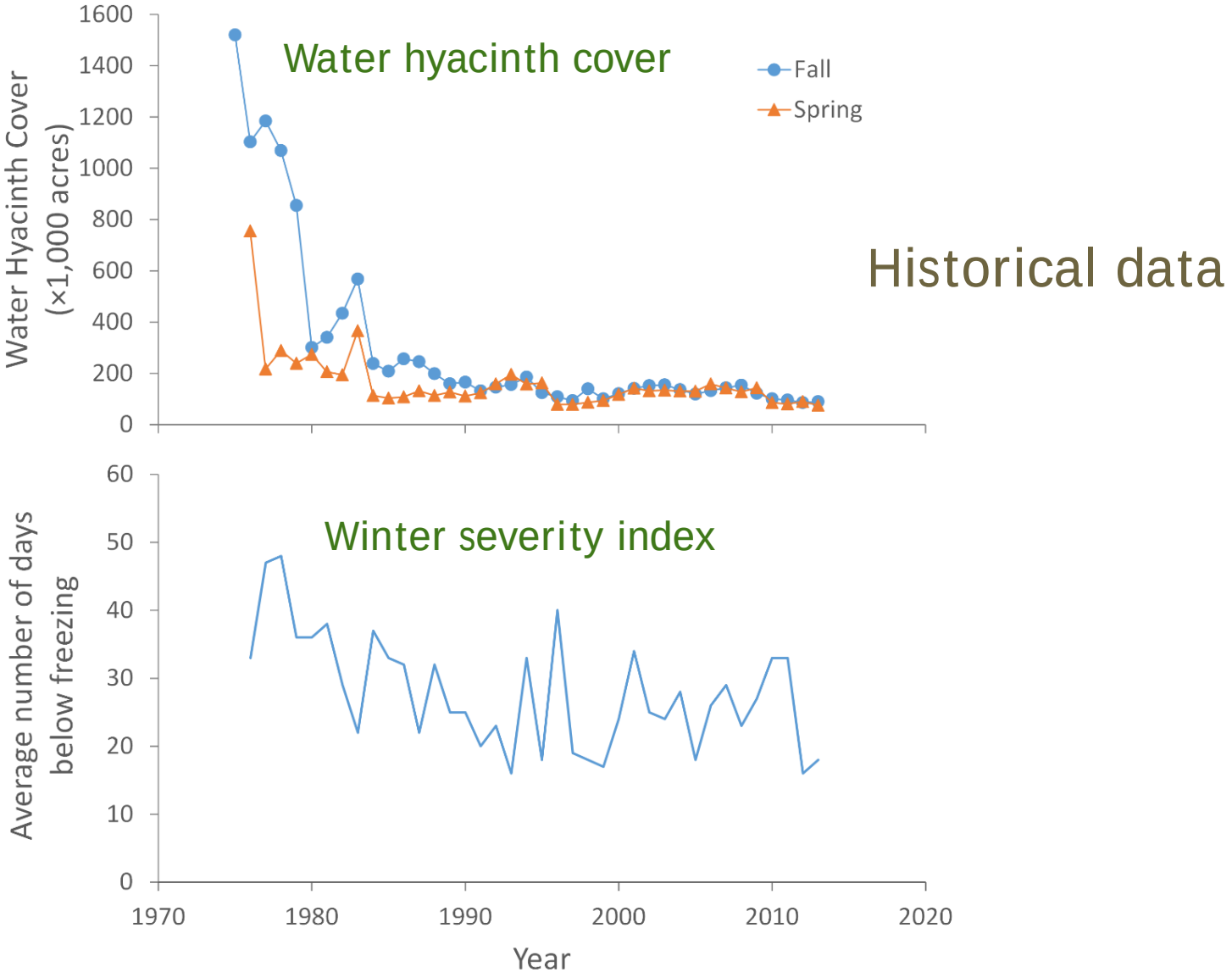
Linking Ecology & Economics to Value Management Actions Involves Many Steps



Biggest Challenges for Invasive Species Benefit Assessment

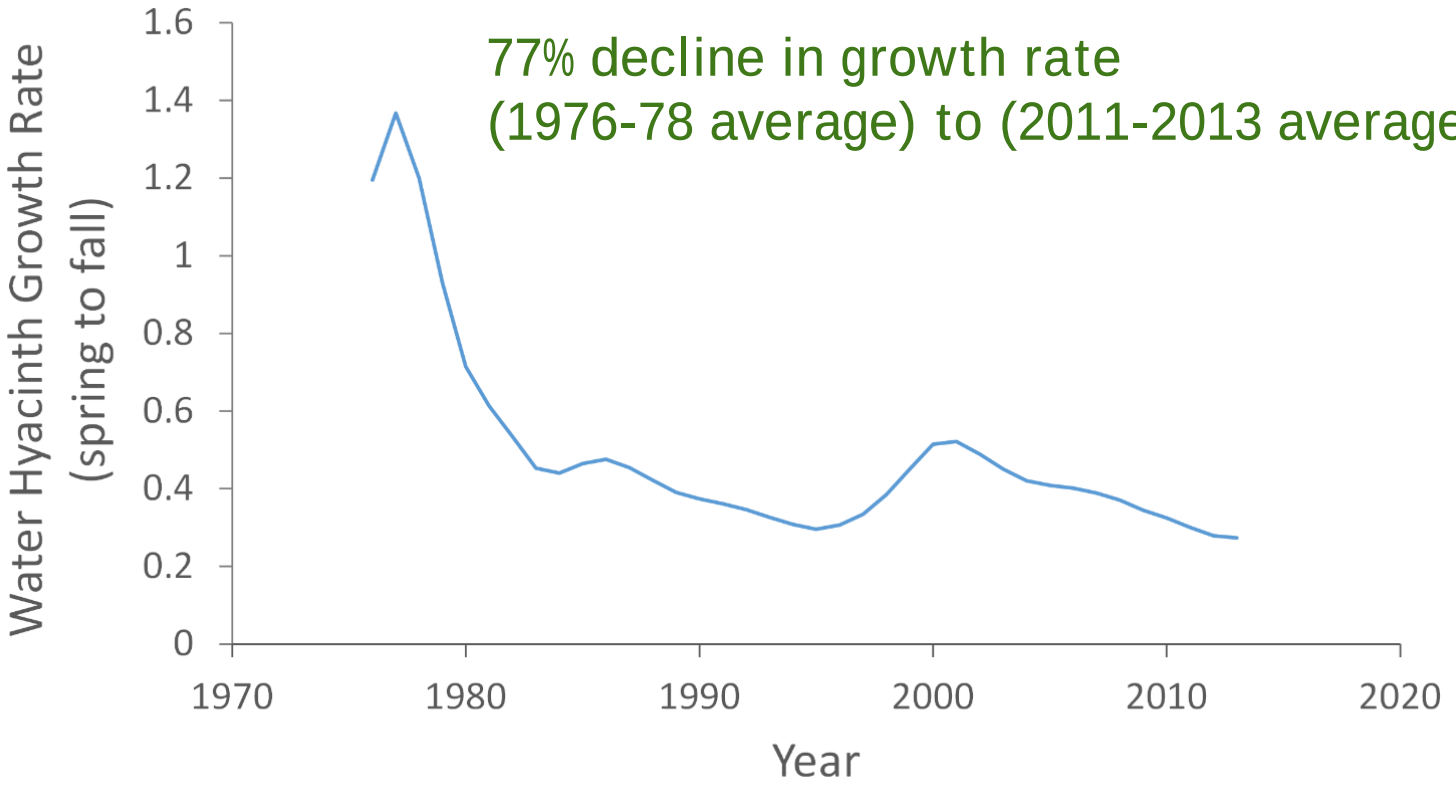
1. Counterfactual baselines
2. Damage functions
3. Substitutability
4. Including the most important stuff

Key Question - How well did control work?



Historical data

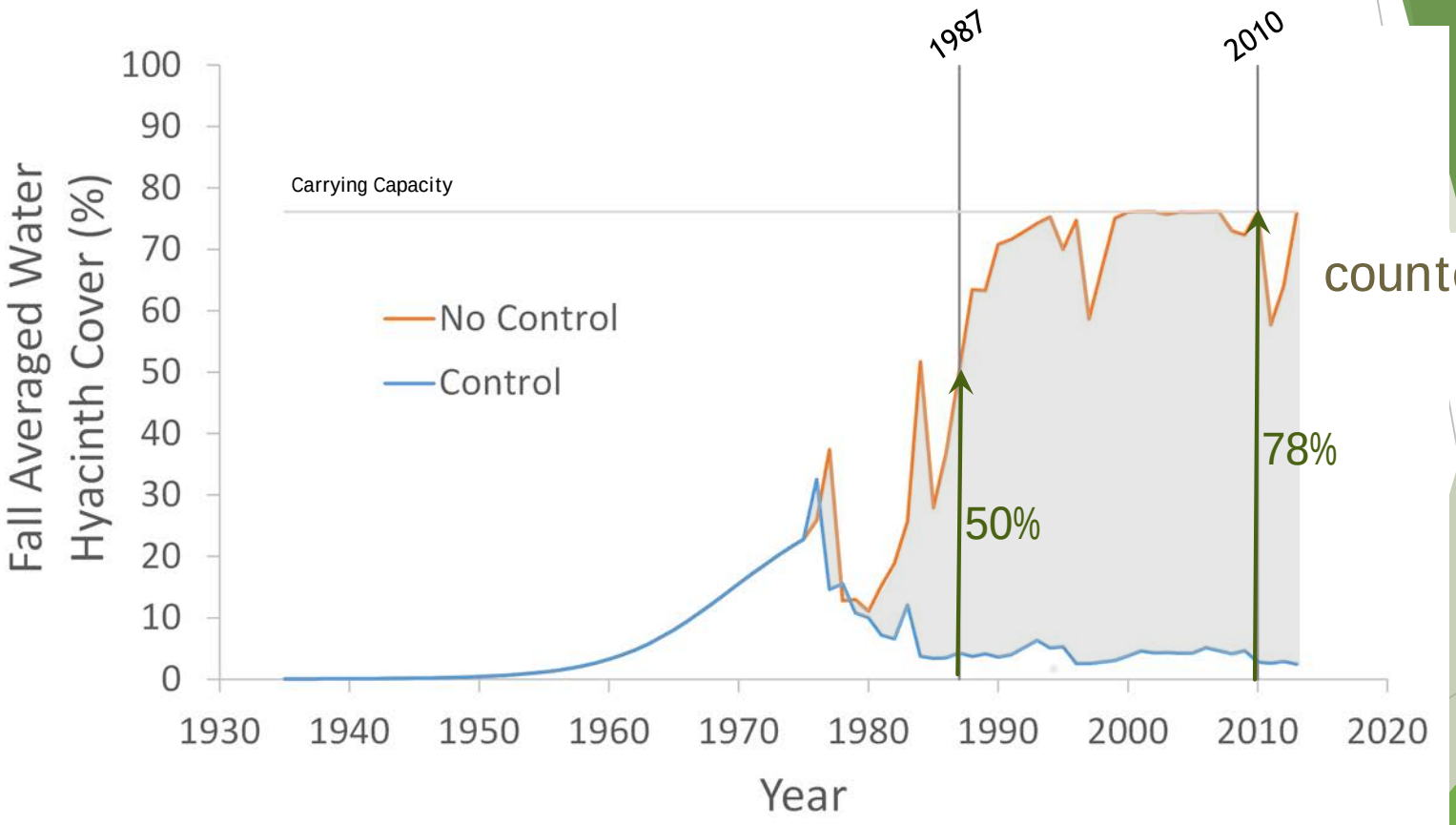
Statistical Model Results - Annual water hyacinth growth rate declined dramatically with biocontrol



Nesslage et al. (in press)

Benefits are Losses Avoided

Difference between control and no-control scenarios

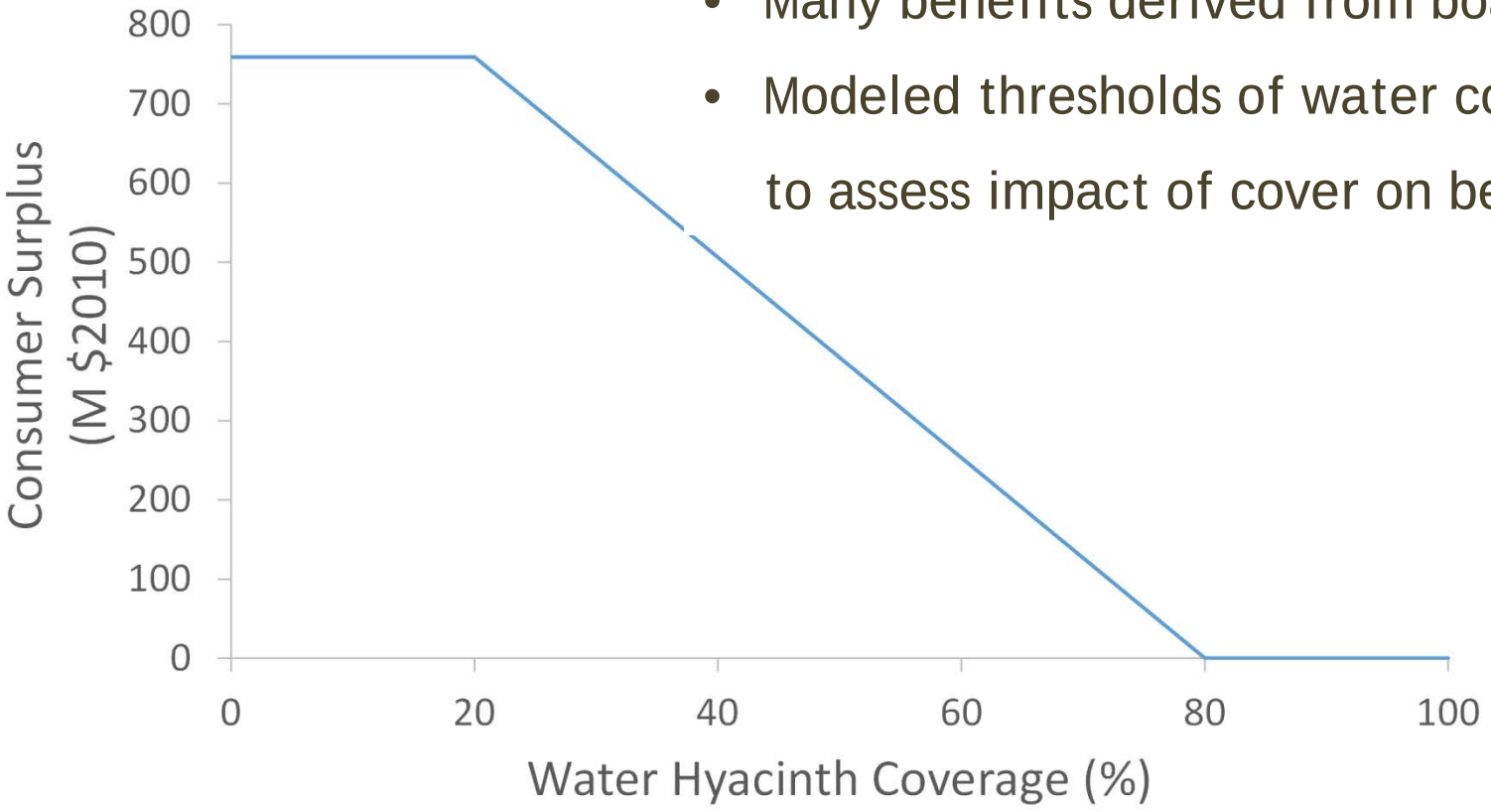


counterfactual

Non-Linear Damage Functions Needed to Mimic Human Behavior

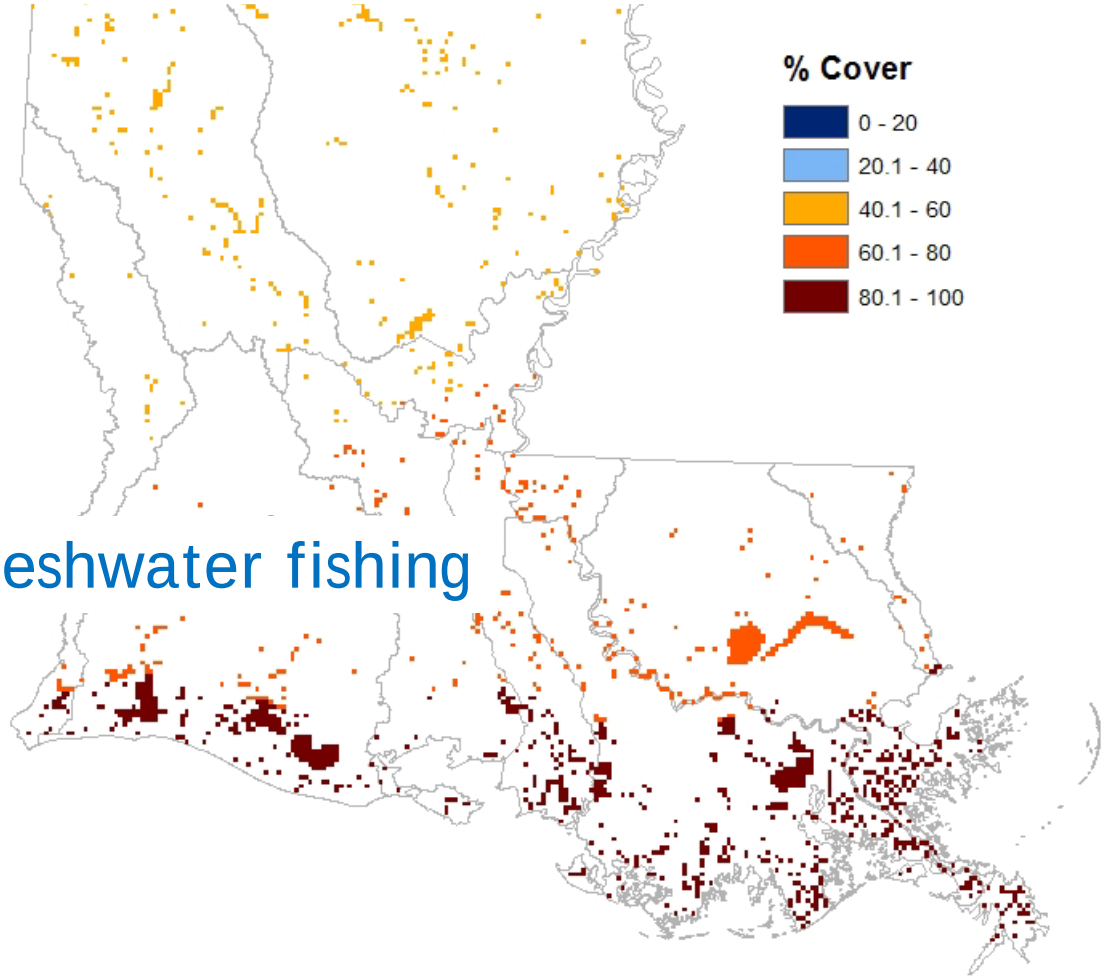
Benefits as a function of %cover

- Many benefits derived from boat access
- Modeled thresholds of water connectivity to assess impact of cover on benefits



No-Action Scenario Generates Large Losses

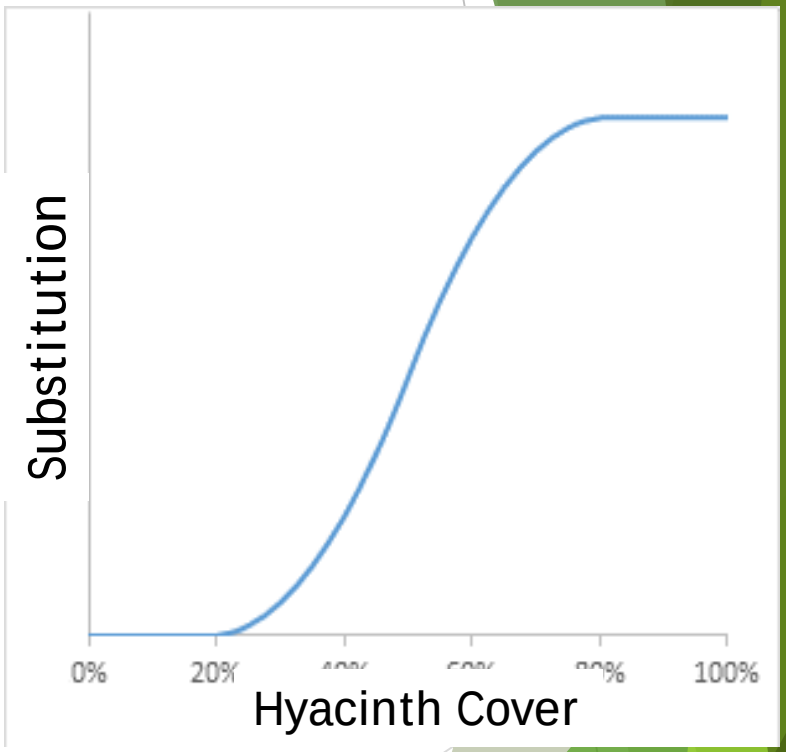
Suggests People Would Adapt



No freshwater fishing

Substitutability of Recreational Fishing

- Up to 59% of anglers would be equally satisfied with another activity - camping, hiking, surfing, or waterskiing. (Sutton & Oh, 2015)
- Function used to represent substitution behavior
  - partially or wholly offset losses



Substitution Reduces Benefits But Increases Realism

	Without Recreation Substitutions (×1,000 $2010/year)	With Recreation Substitutions (x1000 $2010/year)
	2010	2010
Recreational freshwater fishing	$675,512	$236,650
Total	$691,236	$251,555

What Does Not Get Valued?

1. Recreational Fishing
2. Recreational Hunting
3. Boat-dependent tourism & recreation ("swamp tour" companies, marinas)
4. Water Supply
5. Flood risk reduction
6. Commercial navigation
7. Commercial fishing
8. Non-use services (values for species and ecosystems)

Benefit:Cost = 60:1

Lessons Learned

- To inform the no-action (counterfactual) scenario – Need to document invasive species behavior and impacts prior to treatment
- Incorporating system non-linearities improves benefit estimates and informs cost-effective targeting
  - Ecological responses to invasives
  - Human responses to ecosystem
- Incorporating substitution reduces error of benefit estimates for large ecosystem changes
- Missing data and understanding – means that ecosystem services that motivate actions are often not monetized