

Incorporating economic and social values into invasive species risk assessments

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Columbia River Basin

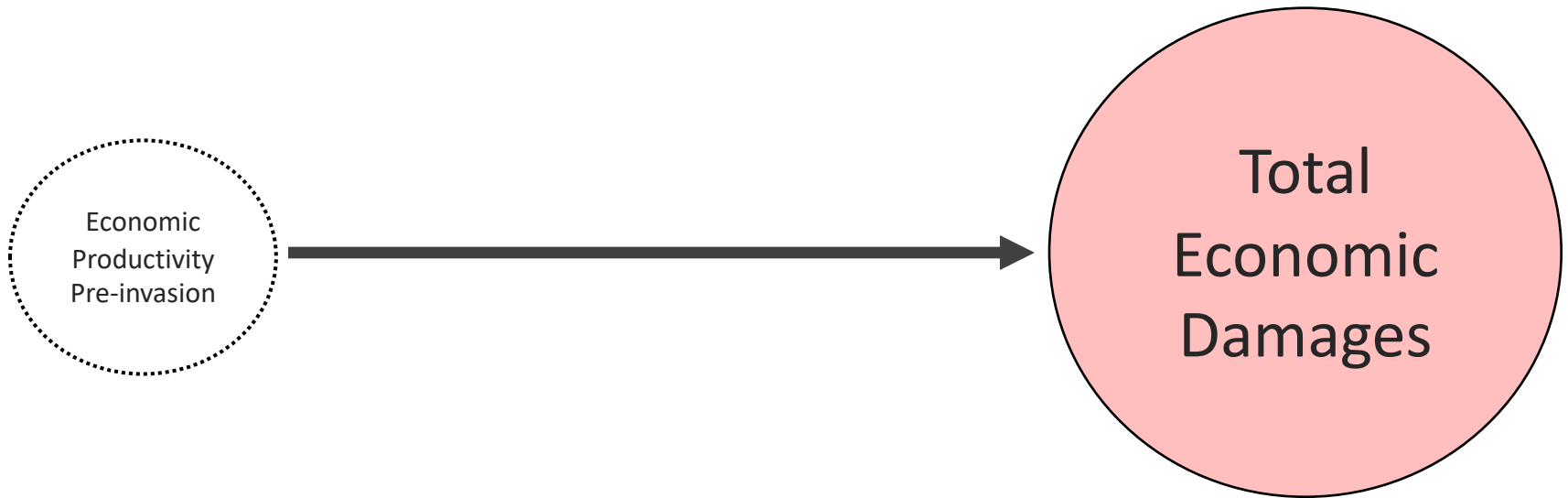
- Overall goal is to prevent the introduction and spread of aquatic invasive species
- Provide managers information that will help them decide how to allocate financial resources to prevention and control strategies.



https://en.wikipedia.org/wiki/Columbia_River_drainage_basin#/media/File:Columbiarivermap.png

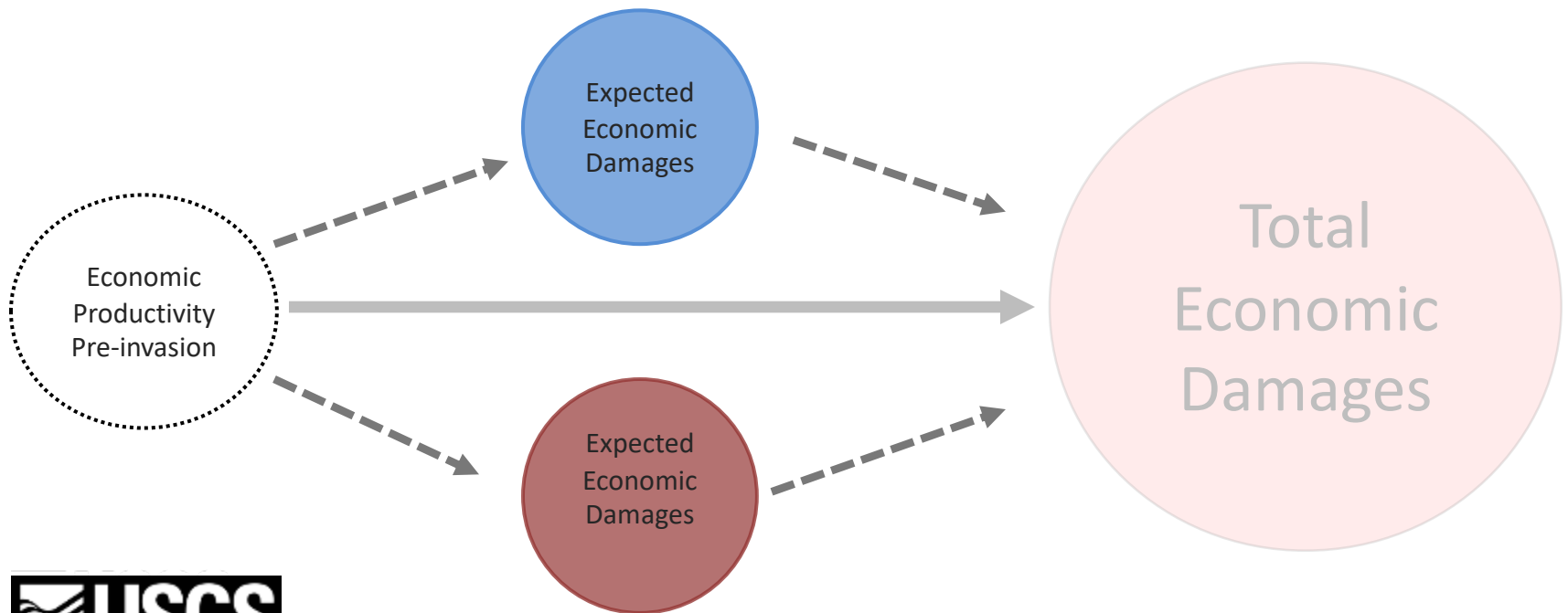
Overarching Objective

- Provide information for decision making concerning detection, prevention, and control that incorporates economic and social factors.



Formal Objective Statement

- Minimize the expected economic and social damages over time subject to a constrained budget for detection, prevention, and control.



Bioeconomic Model

- Develop a model of the biological and social dynamics of the system
- Document the budget available to prevent the introduction and spread of aquatic invasive species
- Outline the multiple decision points for making decision about resource allocation (*to attempt to avoid damages to economic productivity*)
- Identify other criteria such as the planning horizon and the value of avoiding damages now verses in the future (i.e., discount rate)

Economic Benefits

- Economic benefit is the economic value in production for the firm or household – also known as producer and consumer surplus
- Economic benefits do not include changes in regional economic impact (i.e., taxes, spending)



Economic Sectors

Total Average Daily Surface Water Withdrawals

Category	Withdrawal (Mgal/d)	
	Columbia River Basin	Missouri River Basin
Irrigation	1,233	8,160
Thermoelectric	--	74.9
Public Supply	13	58
Livestock	2.2	27.7
Mining	9	11.5
Aquaculture	4.9	8.7
Industrial	0.5	4

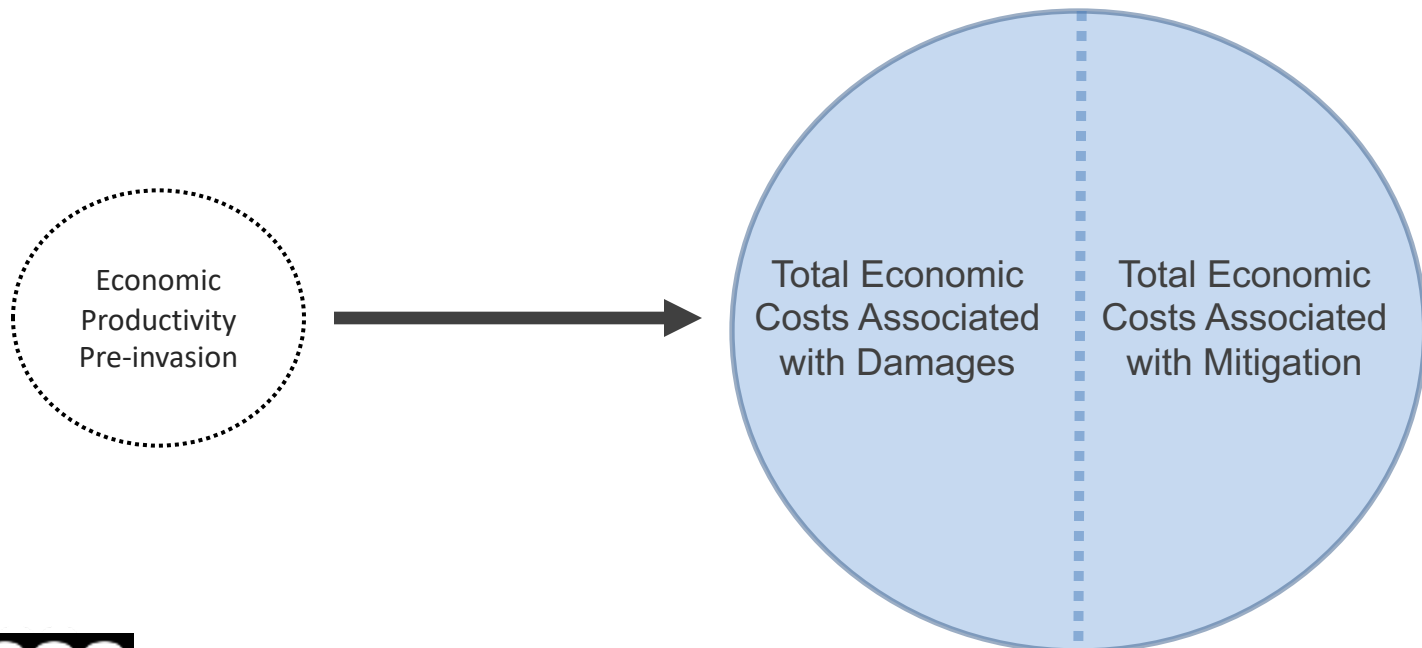
Note: Mgal/d, million gallons per day

Social and Ecological Value

- Non-market environmental goods and services also have significant economic, social, and cultural value.
- Recreation is an example of a direct use non-market good or service that has important value in the Columbia River Basin.
- Passive use of non-market goods and services can have significant value (e.g., endangered species, historic or cultural properties).

Economic and Social Costs

- Costs are losses in economic productivity or the loss of important social or cultural aspects of ecosystem goods and services.



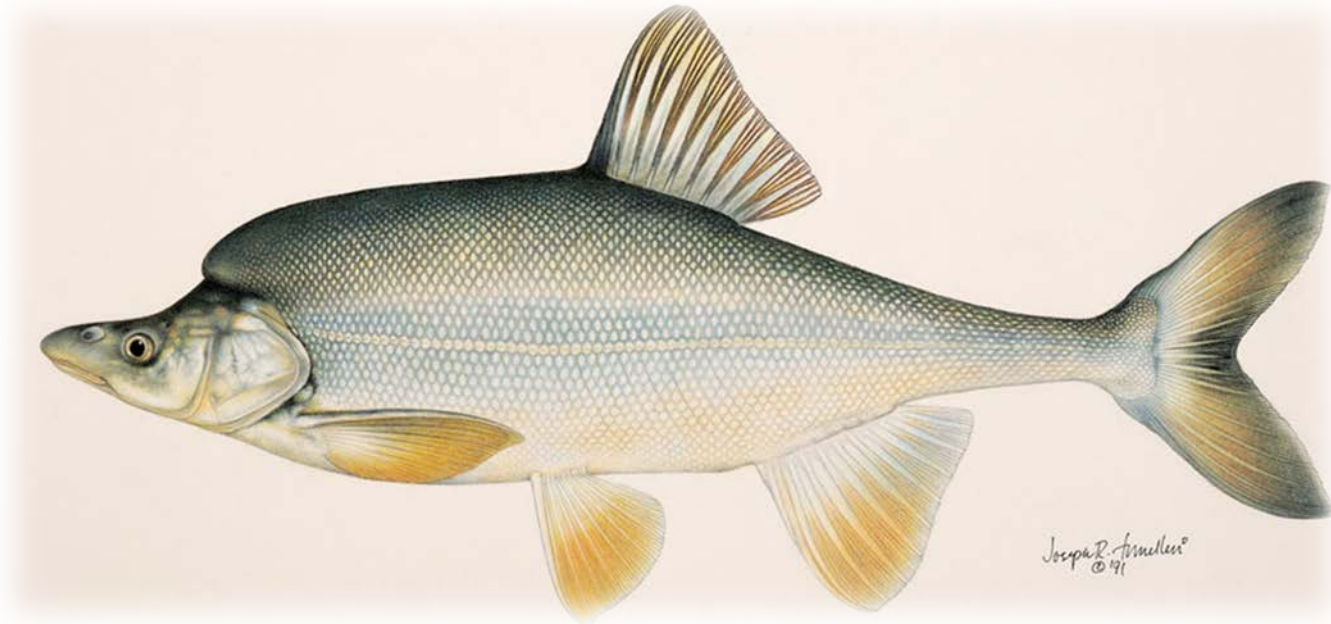
Conclusion

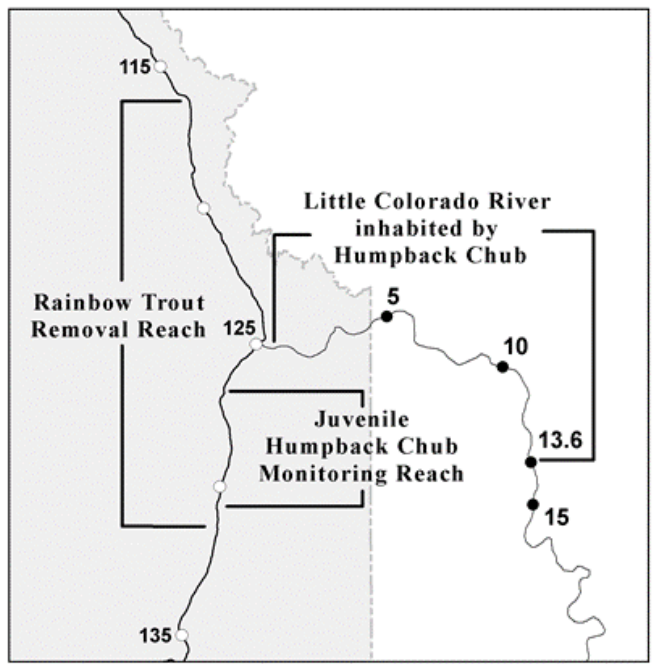
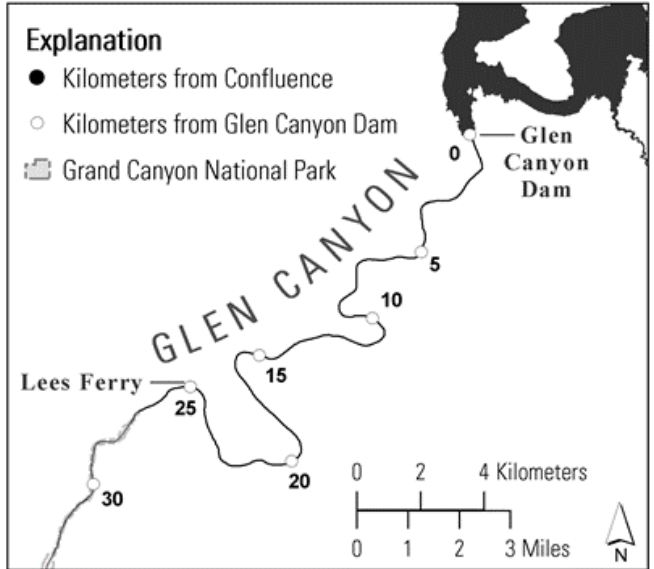
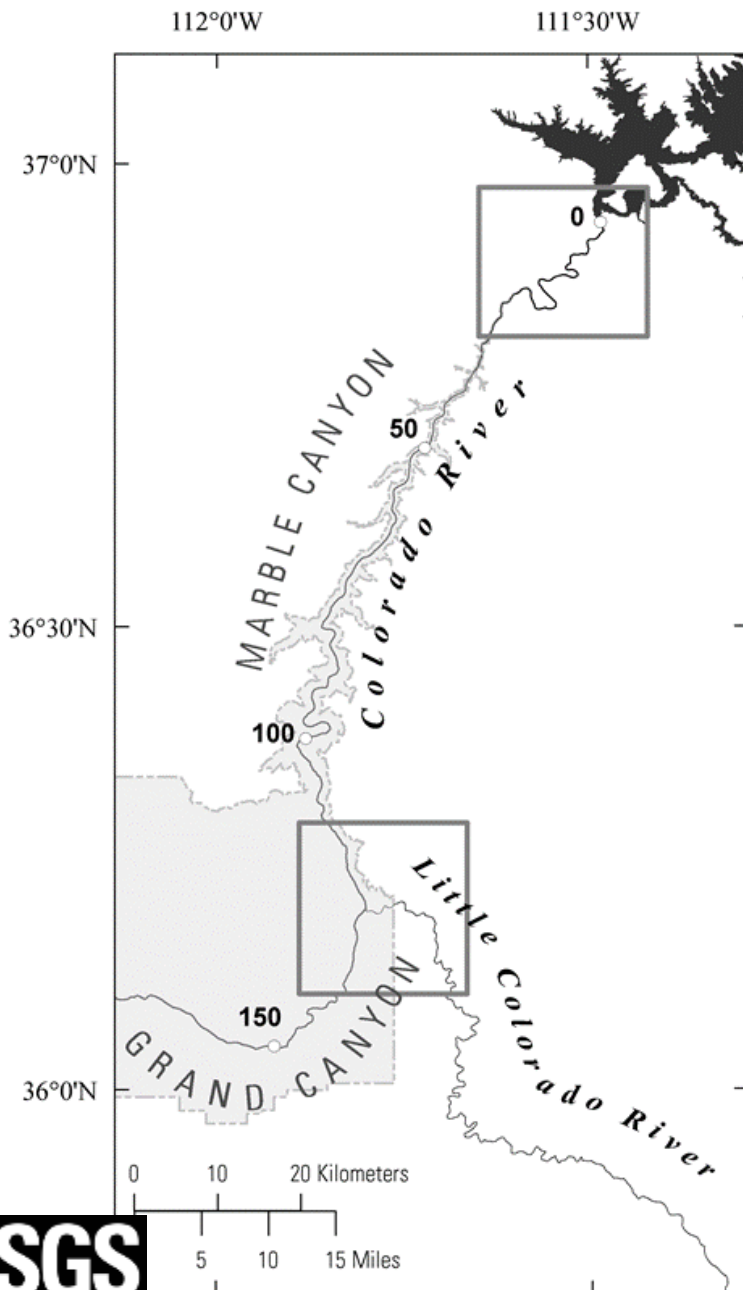
- Developing a decision framework that fits the management context is as important as running predictive models (i.e., make sure our models are asking the right questions).
- Predictive decision models will provide a framework for evaluating alternative management actions and communicating uncertainty.

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Humpback Chub (*Gila chypha*)





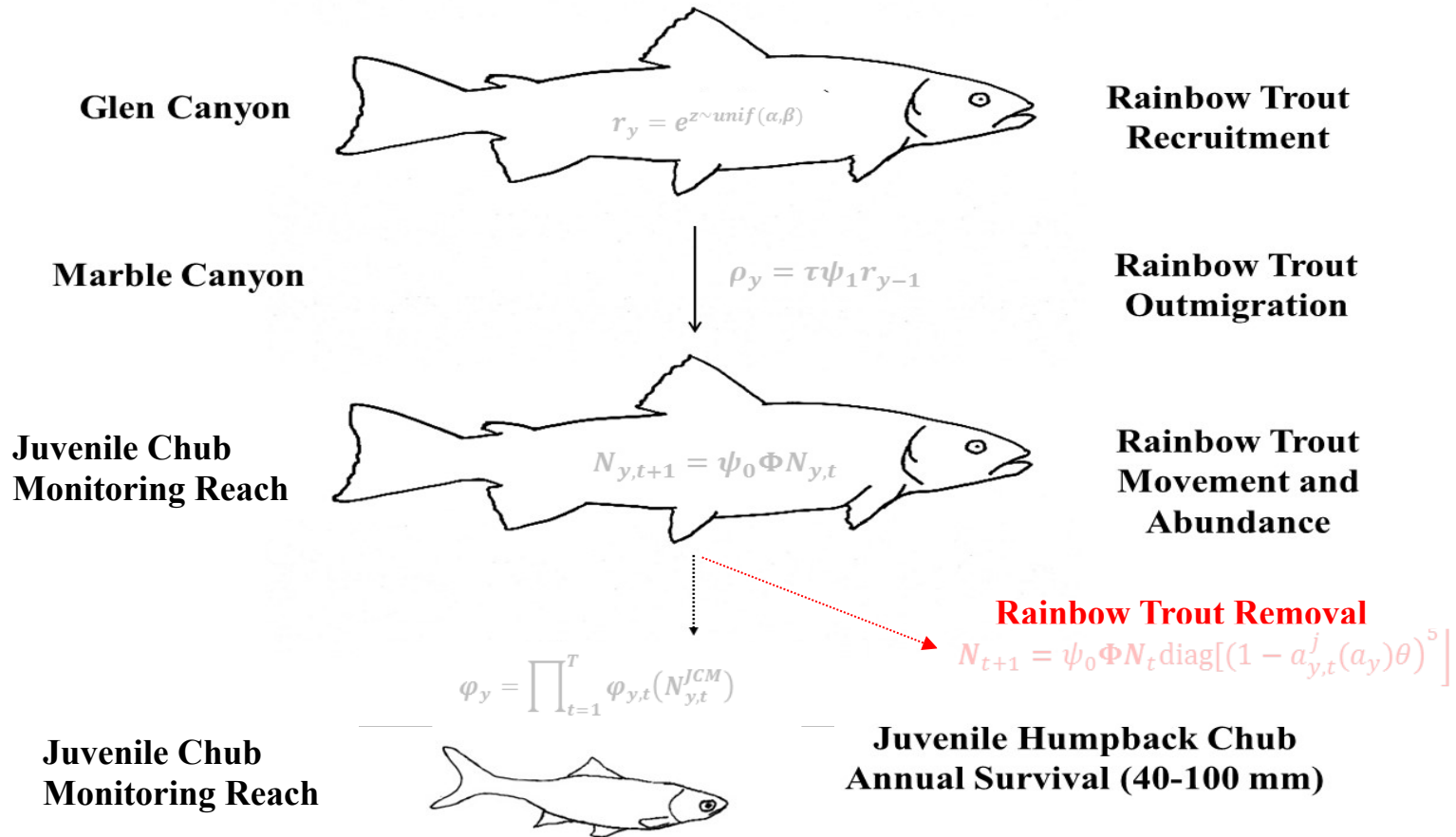
Cost-effectiveness Analysis

- Comparing the costs of alternative means to achieve goals set through a political or public process (Mark Sagoff)
- Cost-effectiveness analysis shifts the focus from the ends to the means and this is important where stakeholders have various world views.

Population Viability Analysis (PVA)

- Develop a bioeconomic model to identify cost-effective management strategies for rainbow trout that achieve conservation objectives for the humpback chub.
- PVA problems are hard to solve because they often involve achieving a population goal over many periods with a given level of confidence.

Simulation Based Population Viability Analysis



Results of Dynamic Programming Based Population Viability Analysis

