Valuation of Fishery Ecosystem Services of the Everglades Water Management

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Introduction and Background

The recreational fishing industry in the Everglades and Florida Bay is a direct beneficiary of improved and sustained fishery habitat; freshwater flow through the Everglades serves to maintain low salinity conditions essential to maintaining good habitat for certain fish and wildlife populations. With $1.2 billion in annual economic activity from recreational fishing in the Everglades, the recreational experience is one of the key ecosystem services (ES) of the hydro-ecological system of the Everglades.

These ES are not directly market-valued, so this research develops a conceptual methodology to determine the economic value to stakeholders of recreational fishery ES in response to changes in various fishery attributes, which could occur as a result of changes in freshwater management flows.

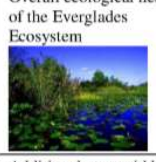
Estimating Willingness to Pay

The discrete choice experiment used to estimate willingness to pay (WTP) is based on the utility-theoretic framework, in which an agent maximizes utility subject to their income constraint. Thus, when presented with a set of scenarios the agent will choose the one from which they derive the greatest utility. Because utility cannot be fully observed, there is a stochastic element in the utility function, yielding a probabilistic model for WTP.

The equation below is a multinomial logit model, where P_i is the probability an individual will choose scenario *i*, J is the total number of scenarios, and V_i is the deterministic element of utility for scenario *i*.

$$P_i = \frac{e^{V_i}}{\sum_{j=1}^{J} e^{V_j}}$$

Sample Choice Card and Attributes

Effects of Future Scenarios on Recreational Fishing Experience	Do Nothing (Scenario I)	Protect Current Status against the threat of Sea Level Rise (Scenario II)	Return to Pre-1970's Historical Status (Scenario III)
Catch rate 	30% Lower than your current catch rate	NO change	50% higher than the current level
Size of the largest keeper 	20% Lower than the size of the largest fish you normally get now	5% Lower than the size of the largest fish you normally get now	30% Larger than the size of the largest fish you normally get now
Size of the fishing area 	100% Increase in the distance that you currently travel in the boat in the fishing area	5% Increase in the distance that you currently travel in boat in the fishing area	40% Decrease in the distance that you currently travel in the boat in the fishing area
Fish-dependent wildlife 	50% Less number of fish-dependent species native to the Everglades/Florida Bay	5% More number of fish-dependent species native to the Everglades/Florida Bay	45% More number of fish-dependent species native to the Everglades/Florida Bay
Overall ecological health of the Everglades Ecosystem 	50% Worse natural health than the current level	NO change In the natural health (stays the same as the current level)	80% Better natural health than the current level
Additional cost paid by you on each trip ($) in terms of either higher boat launching fee, boat registration fee or tour guide fee.	No additional cost	$20/trip	$50/trip
I choose (pick your most preferred scenario)	O	O	O

These clearly defined ecological scenarios and attendant attributes will allow anglers to objectively evaluate the economic trade-off inherent in each scenario.

Recreational Attributes of Anglers	
CR	Catch rate
LK	Size of the largest fish caught
CC	Catch composition
FA	Size of the fishing area
FW	Fish-dependent wildlife
EH	Overall ecological health of the Everglades Ecosystem
OA	Density of other anglers encountered during the trip
TC	Overall travel and fishing costs

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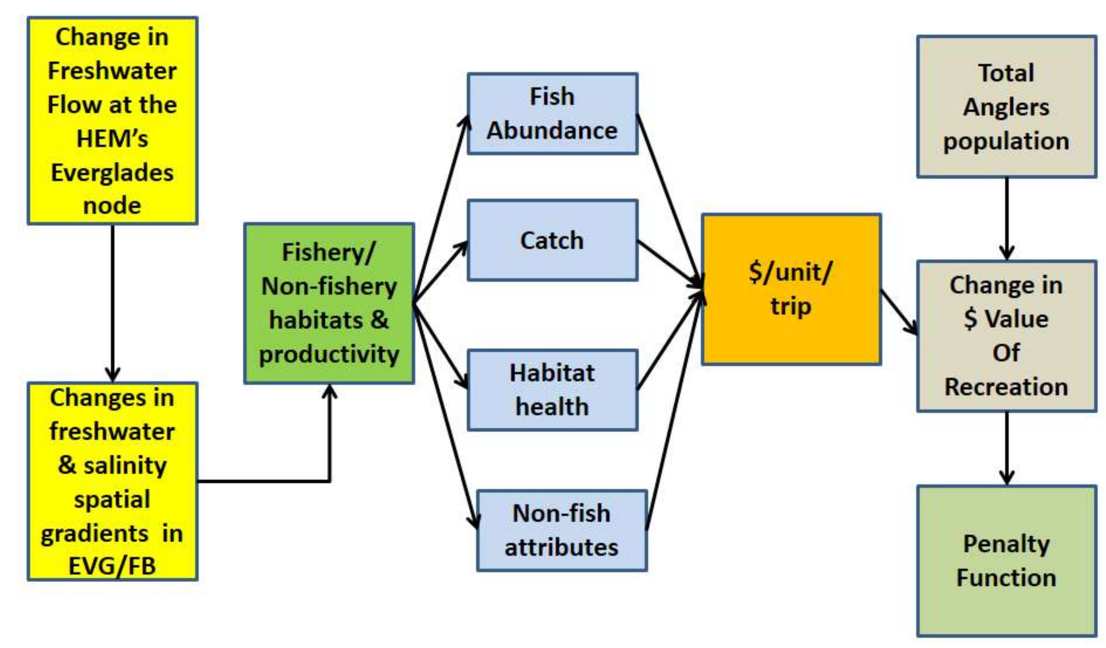
Expected Results and Application

Surveyed anglers' preferences for changes in recreational attributes will be used to estimate their WTP for incremental changes in attributes which are dependent on changes in the freshwater flow (W). WTP values will be estimated for the baseline scenario with no changes in future economic conditions, as well as for various economic scenarios and risk perceptions.

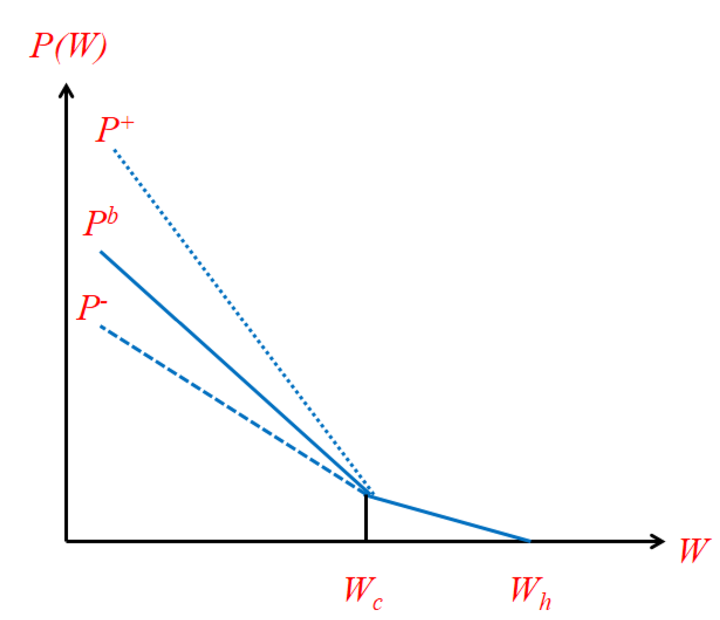


Penalty Function

$$P(W) = F * \begin{bmatrix} WTP_{CR} * \overline{CR}(W) + WTP_{LK} * \overline{LK}(W) + WTP_{CC} * \overline{CC}(W) + \\ WTP_{FA} * \overline{FA}(W) + WTP_{FW} * \overline{FW}(W) \end{bmatrix}$$

Where F is the total annual number of fishing trips by anglers, P is the penalty or lost monetary value of a certain reduction in freshwater flow W.

The penalty function will be simulated for different values of W, generating a range of values for P.



The figure above shows hypothetical penalty functions under three different economic scenarios: baseline (P^b); if increase in fishing trips does not compensate for the reductions in per trip value of attributes (P^+); and if the increase in fishing trips does offset the reductions in per trip values of attributes (P^-).

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