



# **Valuing Ecosystem Services Trade-Offs in Sandy-Related Restoration Work:**

## **Salt Marsh Restoration at Forsythe NWR**

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# Overview of presentation

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- Overview of the overall project
- Forsythe NWR
- Method for valuing trade-offs
- Results
- Implications

# Project scope

- Estimate values of ecosystem services that can be used in guiding post-Sandy restoration decisions
  - Look at trade-offs between ecosystem services in restoration decisions
  - But, funds need to go into restoration ASAP
- Focus on New York and New Jersey area
- Take into account transferability
- Result: 4 project components that focused on methods/results that could be applied to future restoration decisions

# Study questions

- What's the value of salt marsh ecosystem services?
- What are the trade-offs between the different ecosystem services in terms of value?
- How is this useful for policy?

# Forsythe National Wildlife Refuge

- Managed by US FWS
- 50 miles along the NJ coast
- Major stop-over for migratory birds
- More than 37K acres
  - 78% is a salt marsh
- Significant damage from Sandy



# Forsythe Restoration

- Forsythe NWR restoring 3,000 acres of salt marsh
  - Thin layer placement
  - Tidal flow restoration
  - More than just repairing damage from Sandy
- Looking at four ecosystem services
  - Protection from surge
  - Protection from non-surge flooding
  - Habitat
  - Recreation

# Method: Stated Preference

- Contingent valuation
  - Describe a project/scenario and ask people whether they are willing to pay a certain amount or not
  - Vary the cost, but not the project/scenario parameters
- Choice experiment
  - Let's make this more complicated!
  - Vary the cost AND vary the project parameters
  - Assess trade-offs

# Choice experiment survey

- Respondents are asked to choose between two options and a status quo (choice set)
  - Each option has attributes (ecosystem services + number of acres being restored)
  - Each option has a “level” for each attribute and a cost
- Combinations of levels are selected using fractional factorial design
  - Used 27 total choice sets
- Each respondent was asked three valuation questions

# Sample of choice table

Category	Status quo	Option A	Option B
Amount of the marsh that is restored	None	[1K, 3K, 5K] acres	[1K, 3K, 5K] acres
Storm protection	Homes in the coastal area are under increased risk from storm damage.	Protects [1K, 3K, 6K] homes and businesses from a 5-foot storm surge (a rise of water generated by a storm that is 5 ft over and above the predicted tide level)	Protects [1K, 3K, 6K] homes and businesses from a 5-foot storm surge (a rise of water generated by a storm that is 5 ft over and above the predicted tide level)
Flood protection	Homes in the coastal areas are under increased risk of suffering flood damage.	Protects [3K, 7K, 10K] homes and businesses from a 20-year flood (a flood that would occur only once every 20 years)	Protects [3K, 7K, 10K] homes and businesses from a 20-year flood (a flood that would occur only once every 20 years)
Habitat	Habitats for migratory birds continue to deteriorate with the marsh; over time fewer birds would visit the marsh.	["NONE", "MINIMAL", "SIGNIFICANT"]	["NONE", "MINIMAL", "SIGNIFICANT"]
Recreation	Recreational opportunities decline as the marsh deteriorates; over time there would be fewer places to fish, hunt, and hike trails.	["NONE", "MINIMAL", "SIGNIFICANT"]	["NONE", "MINIMAL", "SIGNIFICANT"]
Cost - Increase in your annual income tax	\$0	[\$20, \$65, \$130]	[\$20, \$65, \$130]
Vote	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

# Habitat descriptions

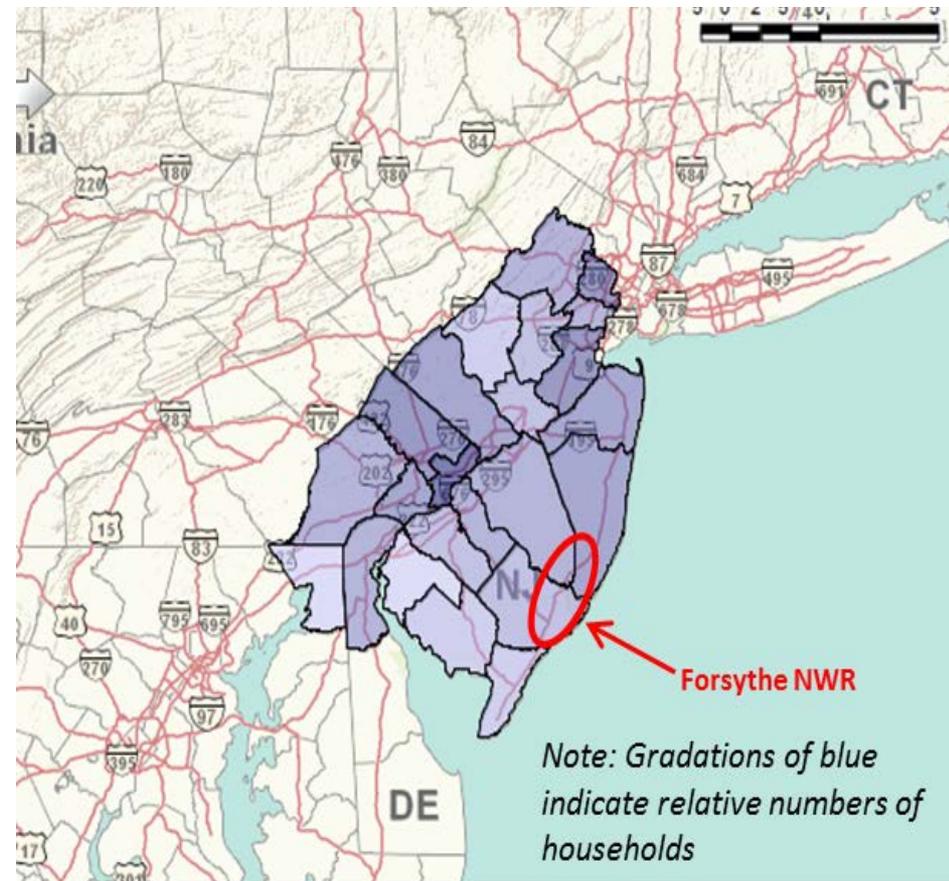
- **None:** “Provides no improvement - Habitats for migratory birds continue to deteriorate with the marsh; over time fewer birds would visit the marsh.”
- **Minimal:** “Provides minimal improvements in habitat for migratory birds – marsh restoration leads to a small increase in the number of birds that visit the marsh each year.”
- **Significant:** “Provides significant improvements in habitat for migratory birds – marsh restoration leads to a large and noticeable increase in the number and variety of birds that visit the marsh each year.”

# Survey content

- Background/education
- Familiarity/visits to FNWR
- Concern about FNWR
- Impact of Sandy
- Instructions for valuation
- Valuation matrix (3x)
- “Debrief” questions
- Altitudinal questions (CC, future storms, restoration)
- Outdoor activities
- Demographics provided by GfK

# Implementation: GfK Knowledge Network Panel

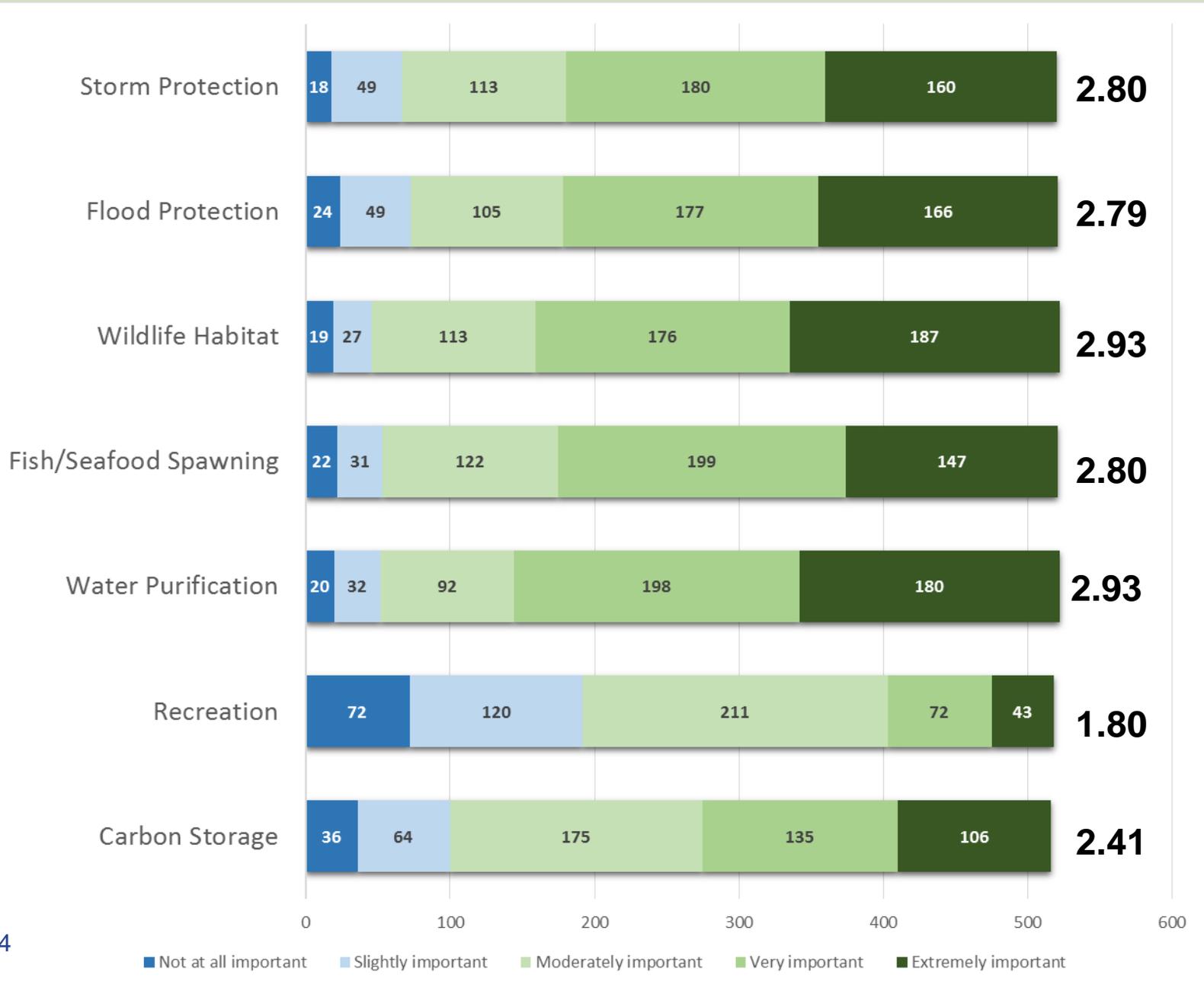
- GfK recruits people to take online surveys
  - Recruited from non-online sources
- Representative set of households for the US population
  - Based on demographics



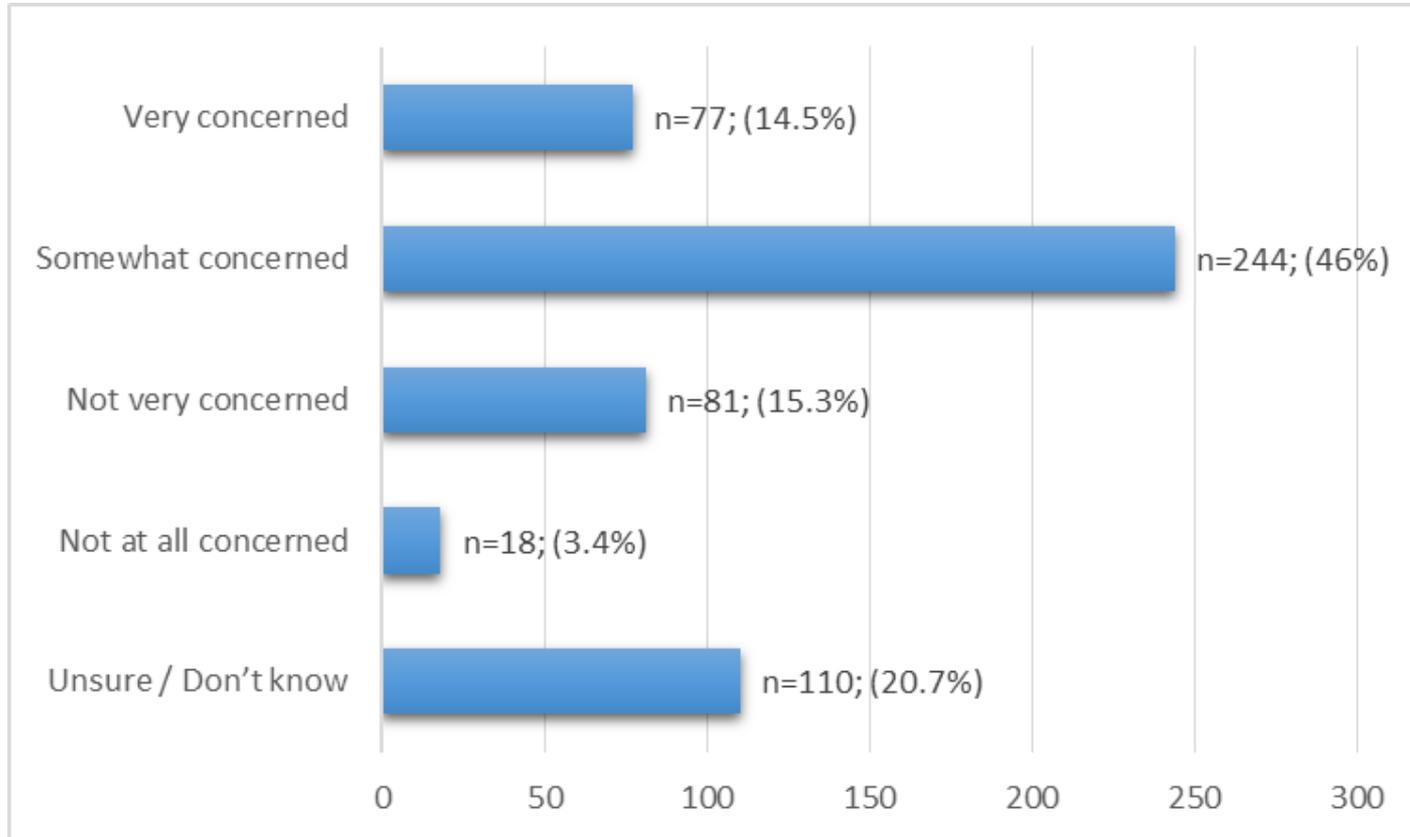
# Forsythe survey implementation

- Pre-tested in late winter/early Spring by ERG and then again by GfK
- Full implementation: mid-August 2015
  - 541 total responses
- Sample was
  - Older, better educated, and less representative of minority populations
  - Matched well on gender, income, and employment

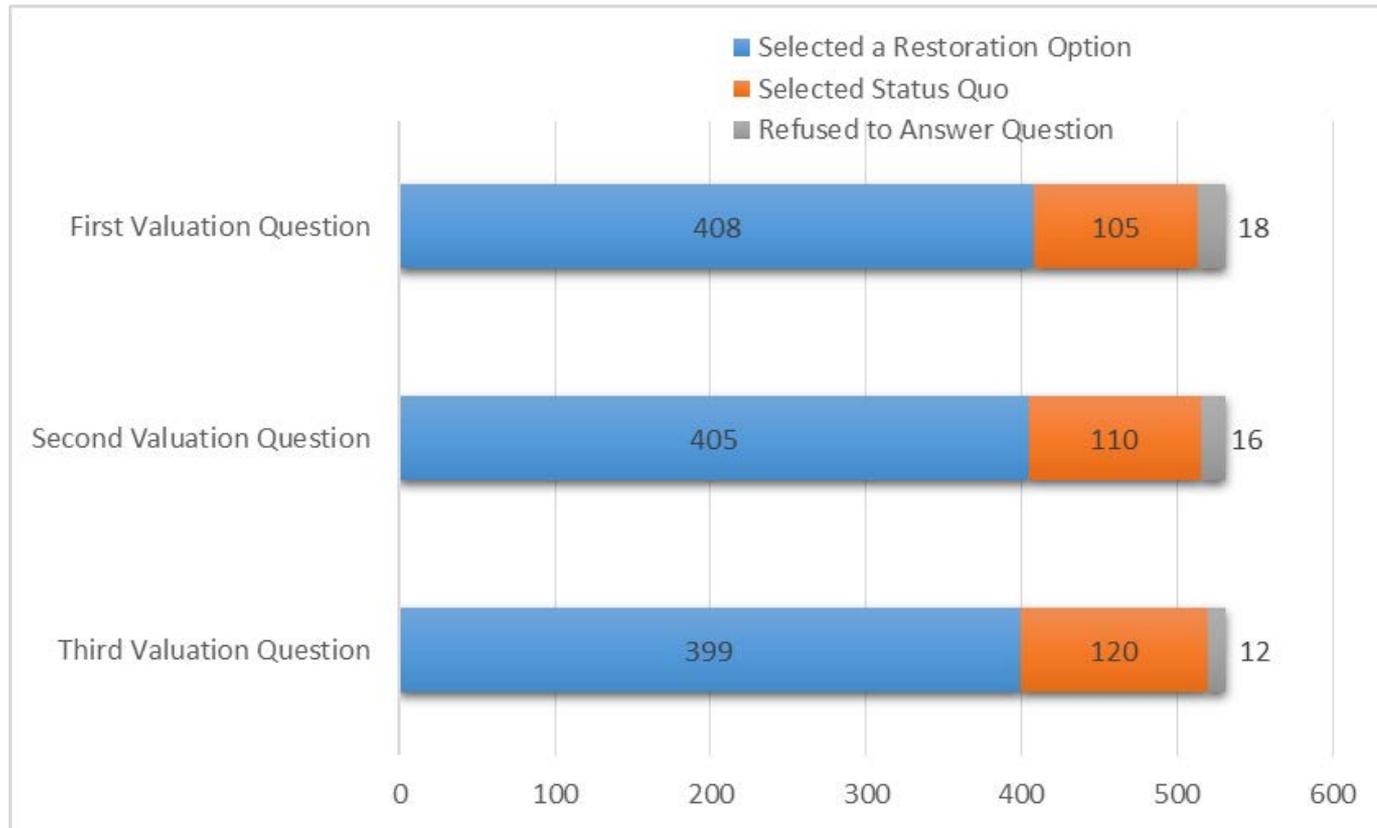
# Importance of Salt Marsh Ecosystem Services to Respondents



# Concern about Forsythe Salt Marshes



# Selection on Valuation Questions



# Willingness to pay (WTP)

Ecosystem service	Incremental change	Estimated WTP
Habitat provision	None to minimal improvements	\$62.23
	None to significant improvements	\$100.20
	Minimal to significant	\$37.98
Recreation	None to minimal improvements	\$38.40
	None to significant improvements	\$52.21
	Minimal to significant	#13.81
Protecting homes from surge	5,000 homes	\$14.30
Protecting homes from flooding	5,000 home	\$14.30

# Trade-offs (examples)

- Households (HHs) value a significant improvement in habitat twice as much as a significant improvement in recreation
  - \$100.20 vs. \$52.21
- Minimal improvements in habitat are more valuable to HHs than significant improvements in recreation
  - \$62.23 vs. \$52.21
- A significant improvement in recreation is the “equivalent” to protecting 18,255 homes
  - $(\$52.21/\$14.03) \times 5,000$
- Protecting a home from surge has equal value to protecting the home from flooding.

# Trade-offs (an example)

For every \$1 in WTP for...	People are WTP these amounts for other changes			
	Habitat (Sig, imp.)	Recreation (Sig. Imp.)	Surge (5K homes)	Flooding (5K homes)
Significant improvement in habitat	-	\$0.52	\$0.14	\$0.14
Significant improvements in recreation	\$1.92	-	\$0.27	\$0.27
Protecting 5,000 homes from surge	\$7.01	\$3.65	-	\$1.00
Protecting 5,000 homes from flooding	\$7.01	\$3.65	\$1.00	-

# Summary

- Choice experiments offers a wealth of information for decision-makers
  - Can be used to assist decision-makers in valuing trade-offs
- No difference between surge and non-surge flooding
  - Respondents value each type of protection the same
- Recreation's low value could be related to the study site/sample

# Contact information

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