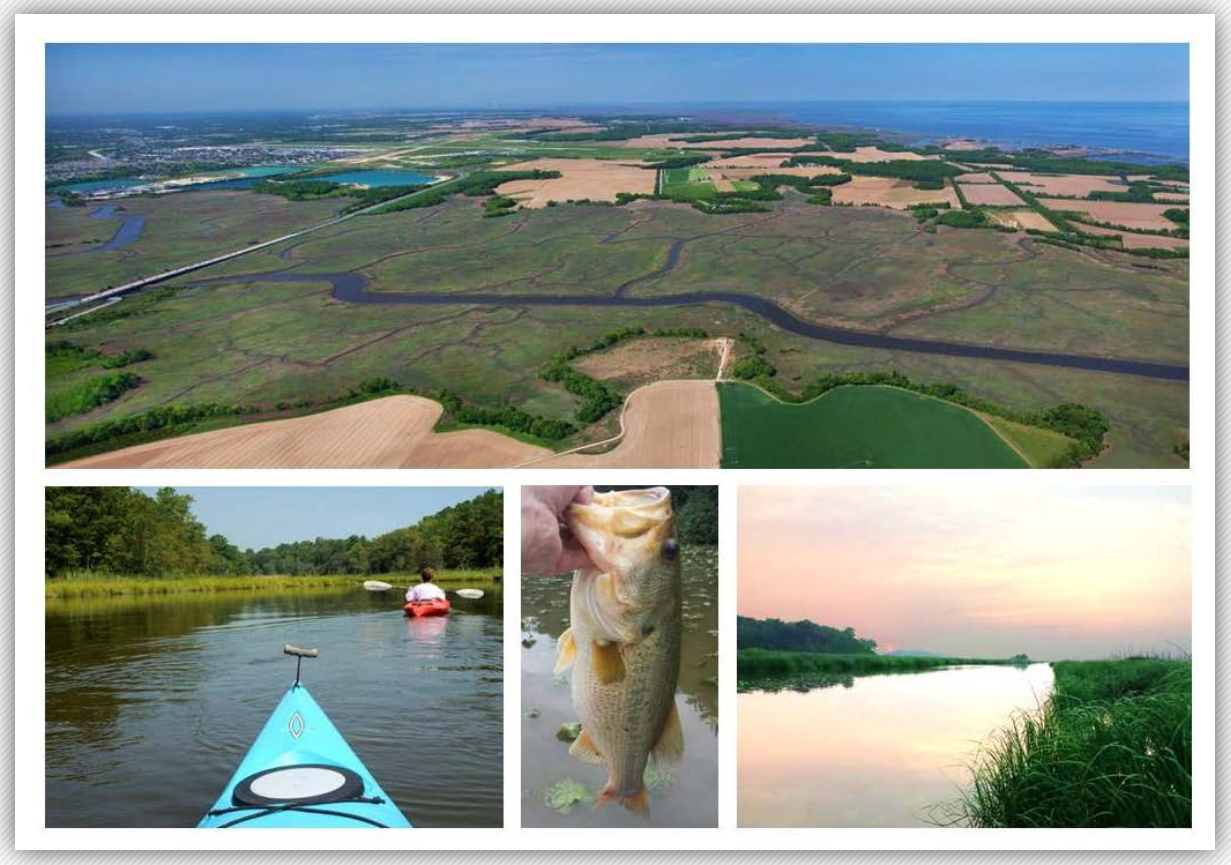
Quantifying the value of tidal wetland ecosystem services in Delaware



Amanda Santoni
NOAA Coastal Management Fellow
Delaware Coastal Programs

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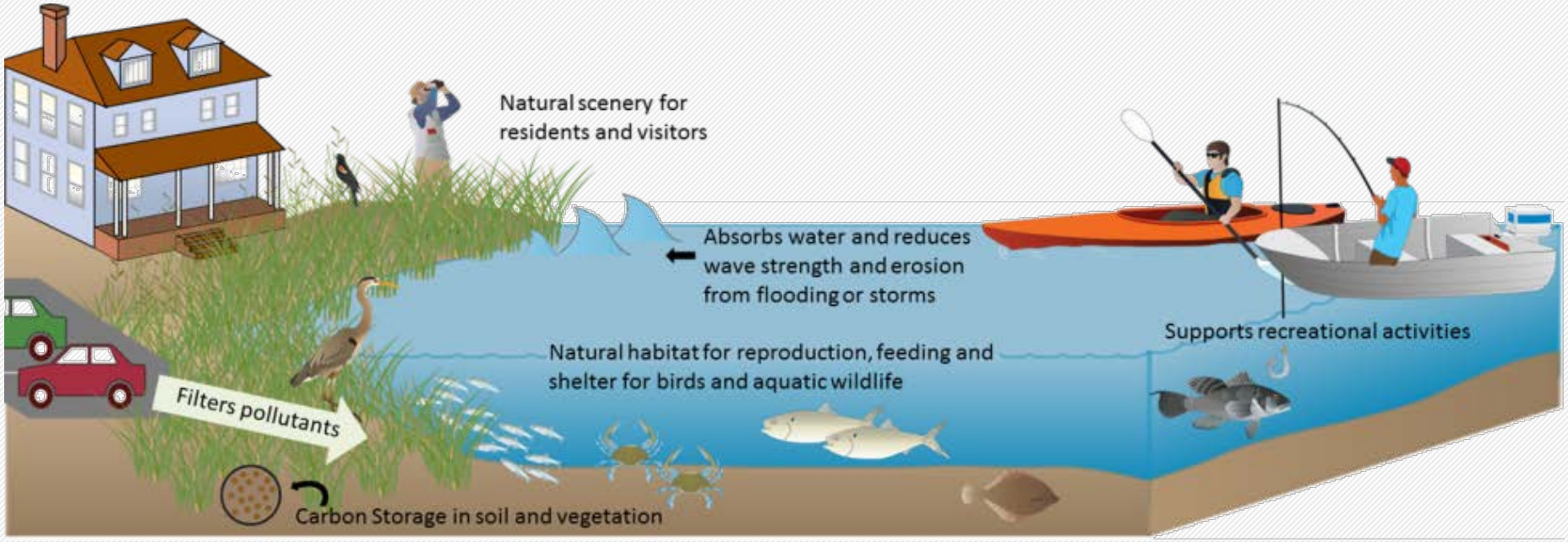
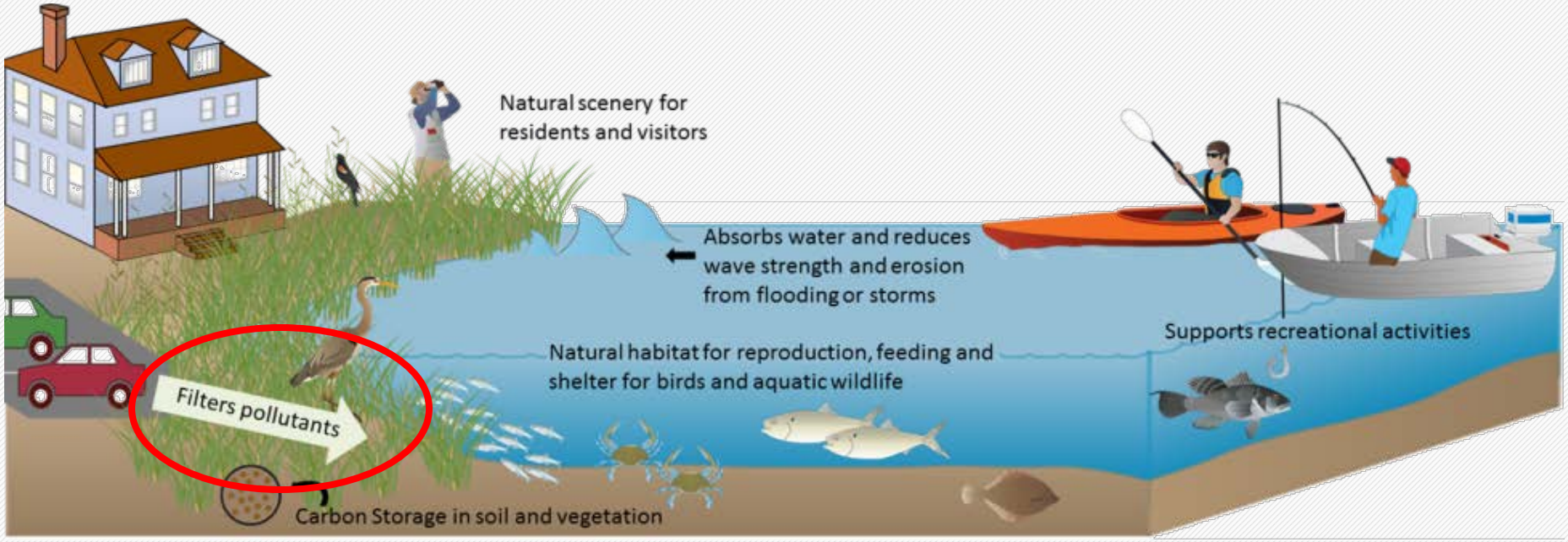
Wetland Ecosystem Services

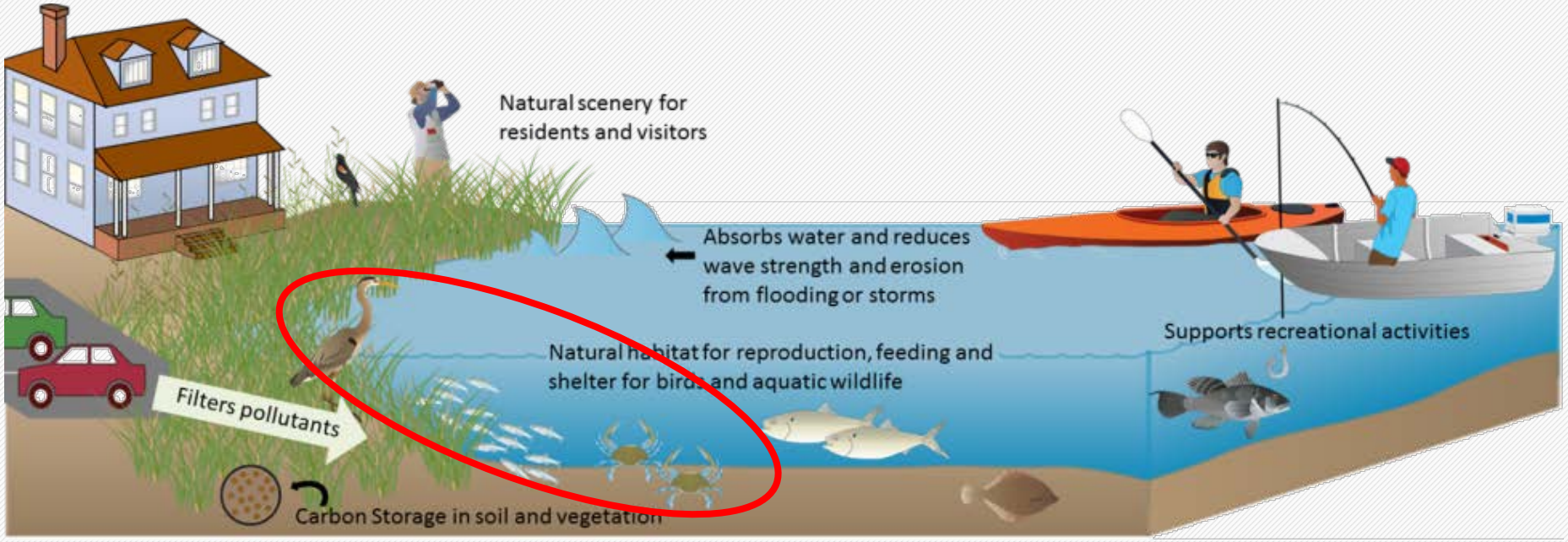


Wetland Ecosystem Services



Water Quality Improvement

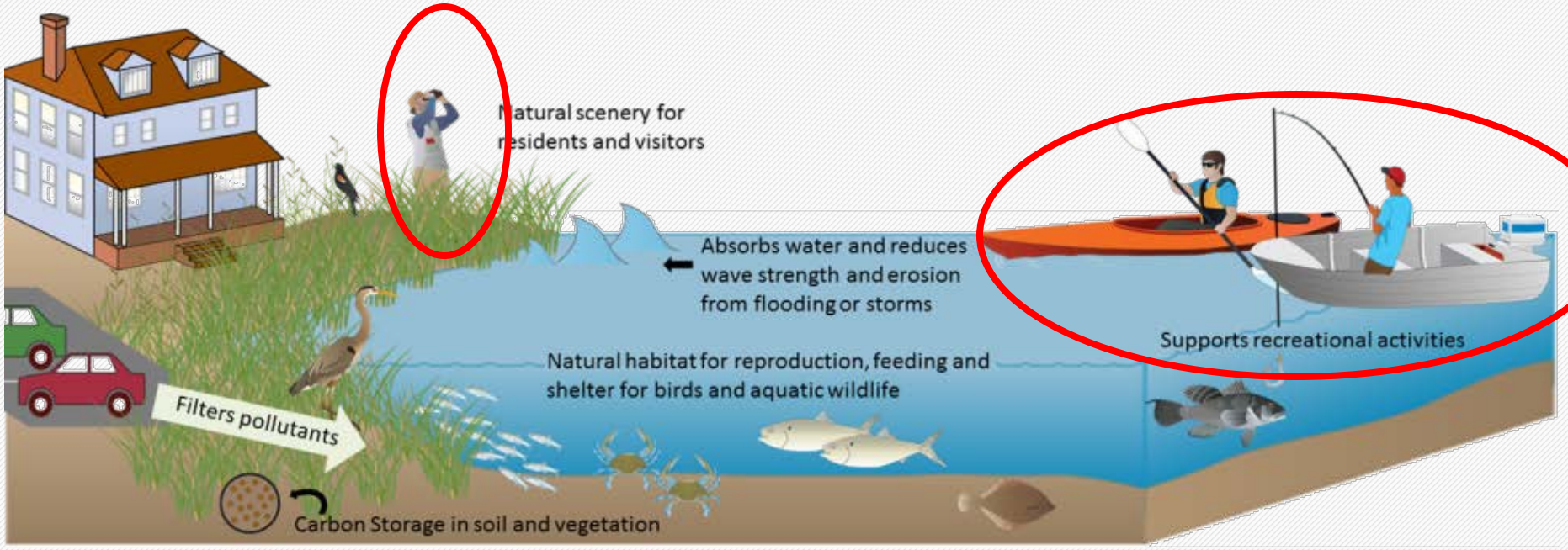
Wetland Ecosystem Services

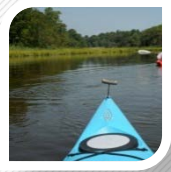


Extractive Resources

Ecologic

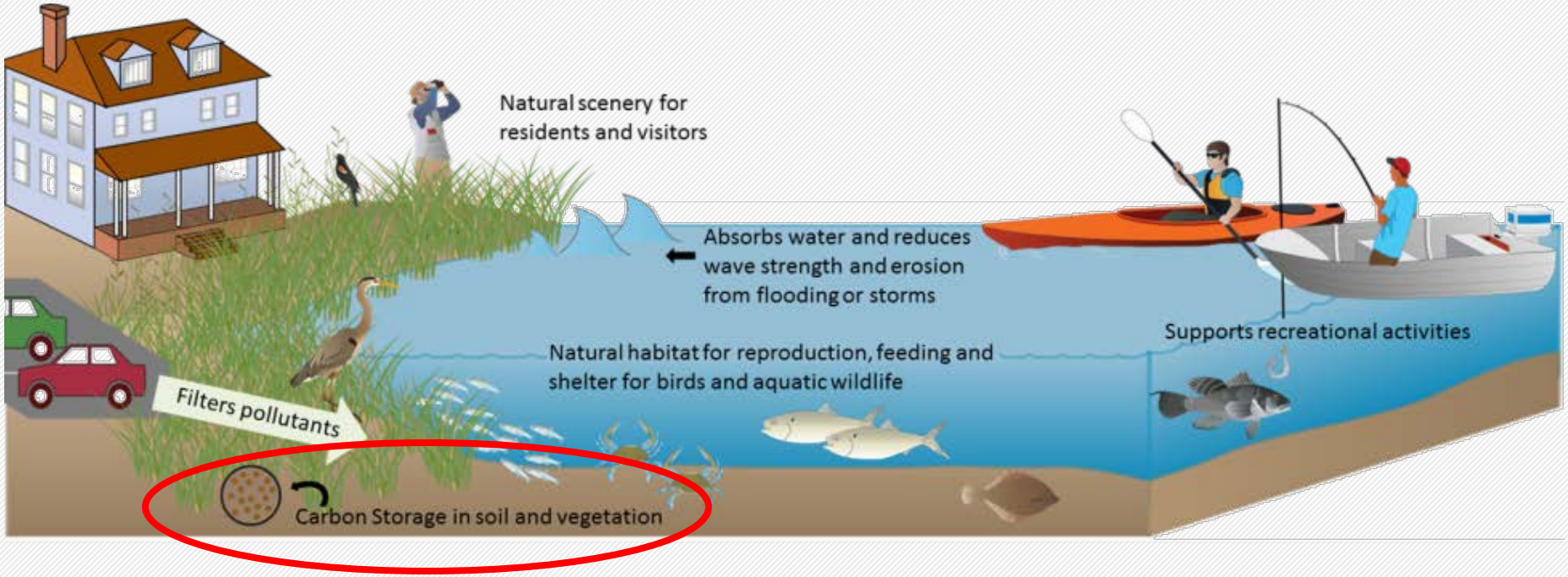
Wetland Ecosystem Services





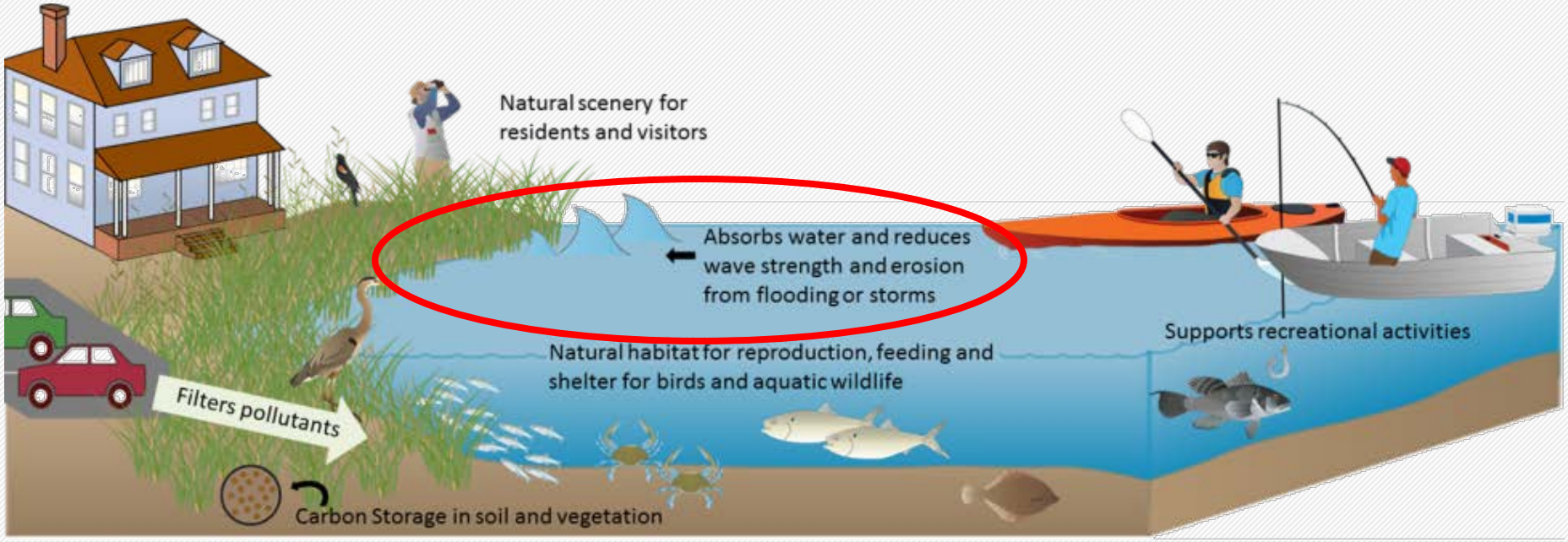
Recreation

Wetland Ecosystem Services



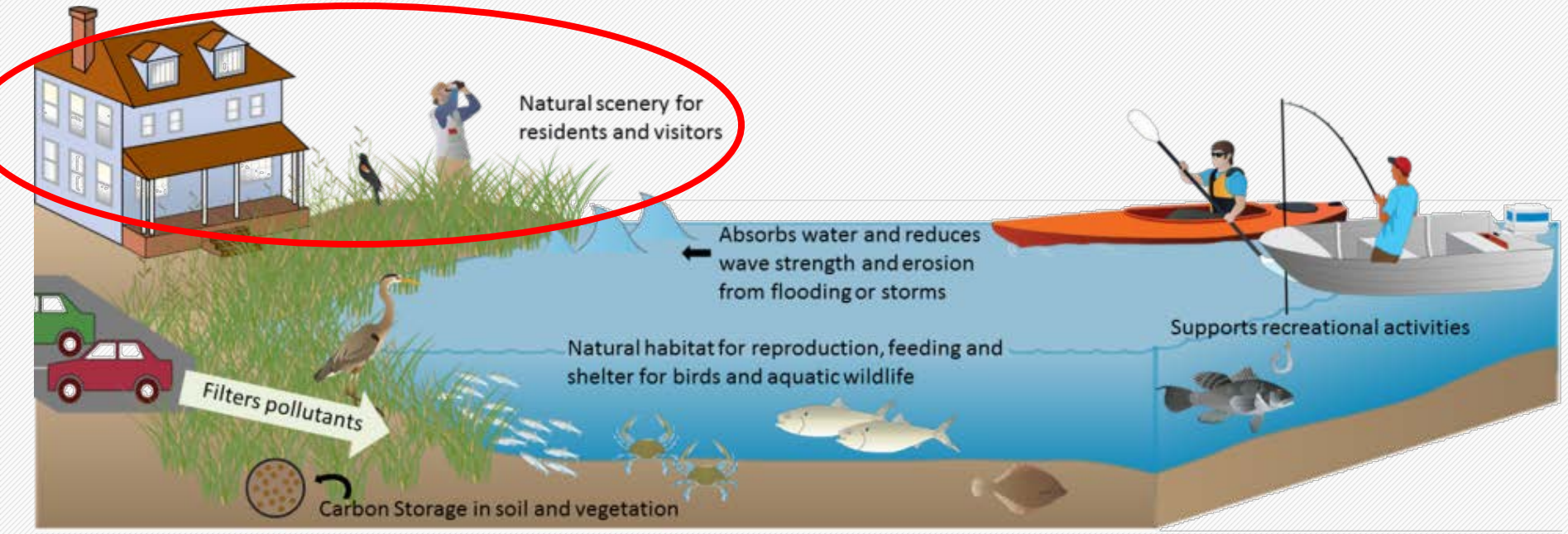
Carbon Storage

Wetland Ecosystem Services



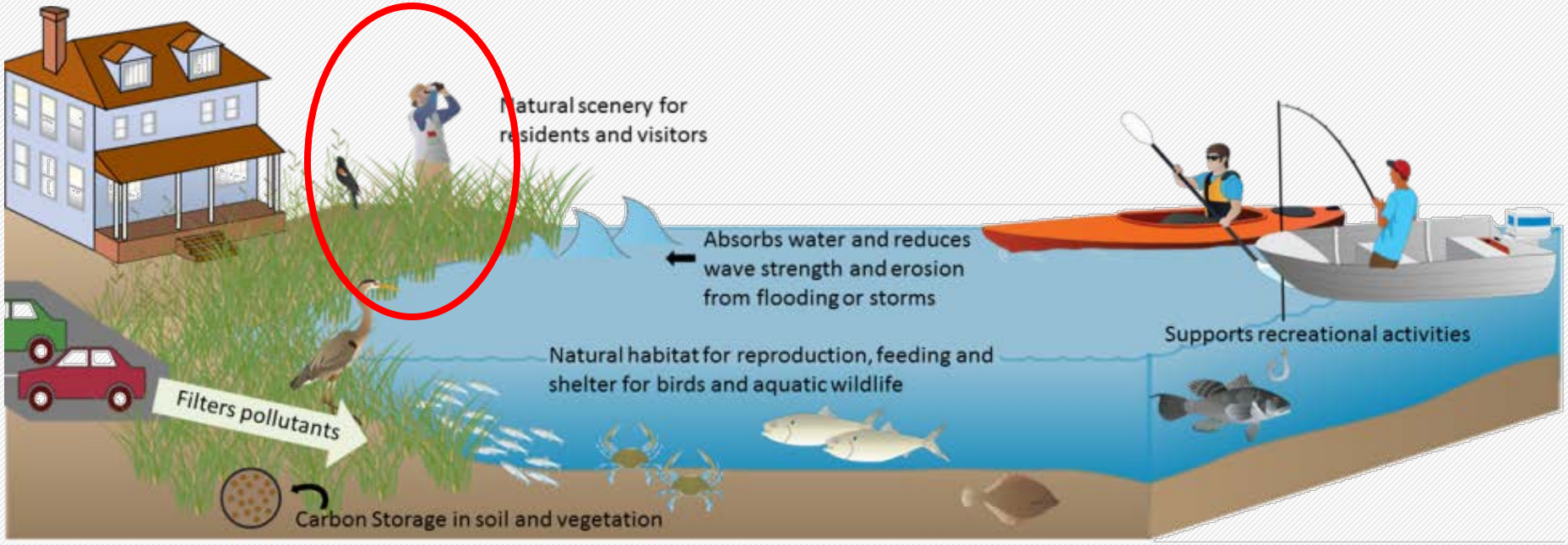
Coastal Protection

Wetland Ecosystem Services



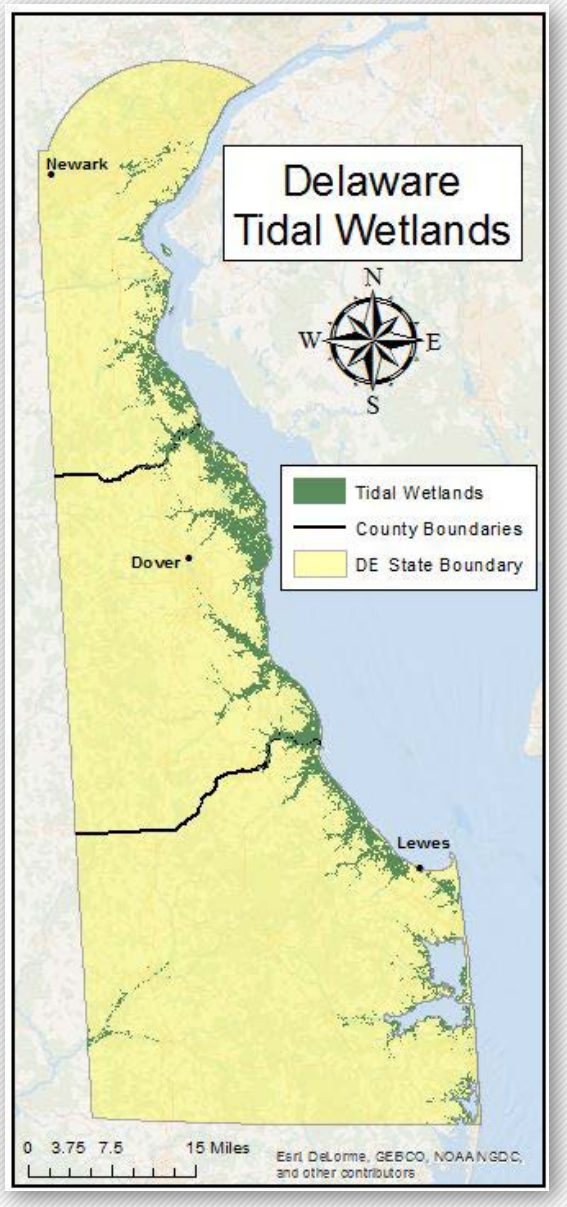
Aesthetic

Wetland Ecosystem Services



Education & Research

Tidal Wetlands in Delaware



- 25% of Delaware is wetland
- ~87,000 acres tidal (~320,000 total)

Tidal Wetlands in Delaware

- Loss of 580 acres estuarine vegetated wetlands 1992-2007 (Tiner et al, 2011).

- 92% decrease brackish marsh, 14% increase estuarine open water under 69 cm SLR (NWF, 2008).

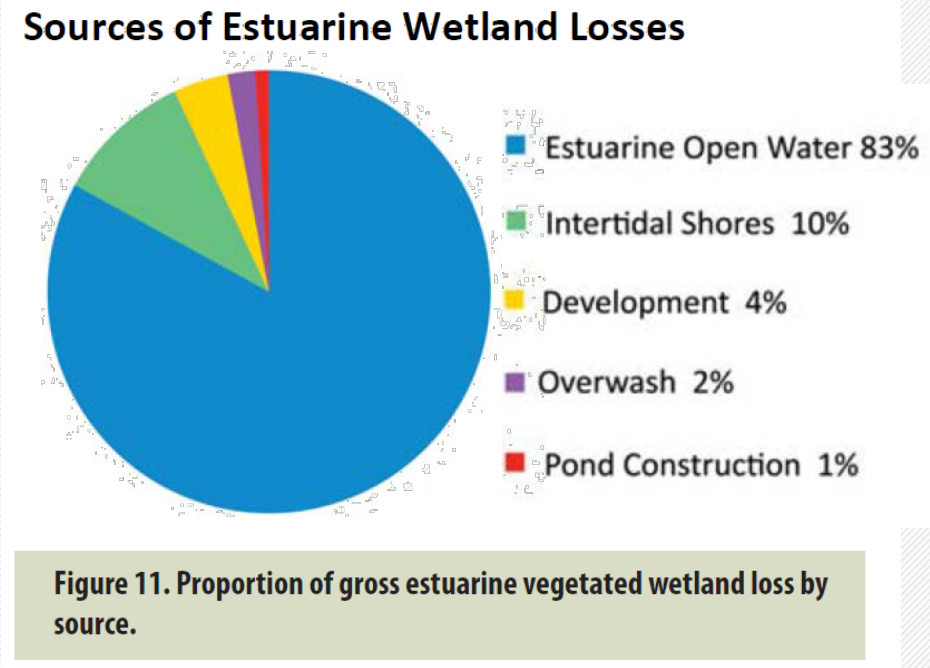


Figure 11. Proportion of gross estuarine vegetated wetland loss by source.

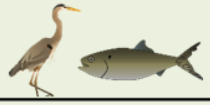
Ecosystem Service Project Goals

- Do DE residents want to preserve tidal wetlands, and how much are they WTP?
- Which ecosystem services are priorities and what is the WTP for each?
- Obtain statistics on recreational use.
- Use these values to leverage funding for wetlands protection and management
- Use priorities to help inform better management of existing wetlands

Contingent Choice Valuation

- Multiple ecosystem services
- Use & non-use values
- Great for policy implications
- Allows for DE residents to voice how much they would actually pay

Effect of management/ preservation	**No Action:** In 25 years (2040) under current situation	**Scenario A** In 25 years (2040) under scenario A	**Scenario B** In 25 years (2040) under scenario B
Tidal Wetland acres	Lose 400 acres	Gain 200 Acres	Gain 400 acres
Ecological / Wildlife Condition	55% 55 out of 100 ecologic condition	60% 60 out of 100 ecologic condition	70% 70 out of 100 ecologic condition
Water Quality	50% 50 out of 100 water quality condition	60% 60 out of 100 water quality condition	50% 50 out of 100 water quality condition
Coastal Protection	Lose protection for an estimated 40 structures	Lose protection for an estimated 40 structures	Gain protection for an estimated 40 structures
Management & Ownership	No Change	Non-profit obtains easement	Government buys land
Public Access	No New Access	New Access	New Access
Cost to your household per year	$0 annual increase in taxes and fees	$5 annual increase in taxes and fees	$50 annual increase in taxes and fees
How would you vote? Choose only one	☐ I vote for NO ACTION	☐ I vote for Scenario A	☐ I vote for Scenario B

Effect of management/ preservation	No Action: In 25 years (2040) under current situation	Scenario A In 25 years (2040) under scenario A	Scenario B In 25 years (2040) under scenario B
Tidal Wetland acres 	Lose 400 acres	Gain 200 Acres	Gain 400 acres
Ecological / Wildlife Condition 	55% 55 out of 100 ecologic condition	60% 60 out of 100 ecologic condition	70% 70 out of 100 ecologic condition
Water Quality 	50% 50 out of 100 water quality condition	60% 60 out of 100 water quality condition	50% 50 out of 100 water quality condition
Coastal Protection 	Lose protection for an estimated 40 structures	Lose protection for an estimated 40 structures	Gain protection for an estimated 40 structures
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Cost to your household per year 	$0 annual increase in taxes and fees	$5 annual increase in taxes and fees	$50 annual increase in taxes and fees
How would you vote? Choose only one	☐ I vote for NO ACTION	☐ I vote for Scenario A	☐ I vote for Scenario B

Effect of management/ preservation	**No Action:** In 25 years (2040) under current situation	Scenario A ...years (2040) under scenario A	Scenario B In 25 years (2040) under scenario B
Tidal Wetland acres 	Lose 400 acres	...Gain 200 Acres	Gain 400 acres
Ecological / Wildlife Condition 	55% 55 out of 100 ecologic condition	60% ...t of 100 ecologic condition	70% 70 out of 100 ecologic condition
Water Quality 	50% 50 out of 100 water quality condition	60% ...out of 100 water quality condition	50% 50 out of 100 water quality condition
Coastal Protection 	Lose protection for an estimated 40 structures	...ose protection ...n estimated 40 structures	Gain protection for an estimated 40 structures
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Cost to your household per year 	$0 annual increase in taxes and fees	$5 ...ual increase in taxes and fees	$50 annual increase in taxes and fees
How would you vote? Choose only one	☐ **I vote for NO ACTION**	☐ **I vote for Scenario A**	☐ **I vote for Scenario B**

Effect of management/ preservation	**No Action:** In 25 years (2040) under current situation	**Scenario A** In 25 years (2040) under scenario A	**Scenario B** In 25 years (2040) under scenario B
Tidal Wetland acres 	Lose 400 acres	Gain 200 Acres	Gain 400 acres
Ecological / Wildlife Condition 	55% 55 out of 100 ecologic condition	60% 60 out of 100 ecologic condition	70% 70 out of 100 ecologic condition
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How would you vote? Choose only one	☐ **I vote for NO ACTION**	☐ **I vote for Scenario A**	☐ **I vote for Scenario B**

Effect of management/ preservation	**No Action:** In 25 years (2040) under current situation	**Scenario A** In 25 years (2040) under scenario A	**Scenario B** In 25 years (2040) under scenario B
Tidal Wetland acres 	Lose 400 acres	Gain 200 Acres	Gain 400 acres
Ecological / Wildlife Condition 	55% 55 out of 100 ecologic condition	60% 60 out of 100 ecologic condition	70% 70 out of 100 ecologic condition
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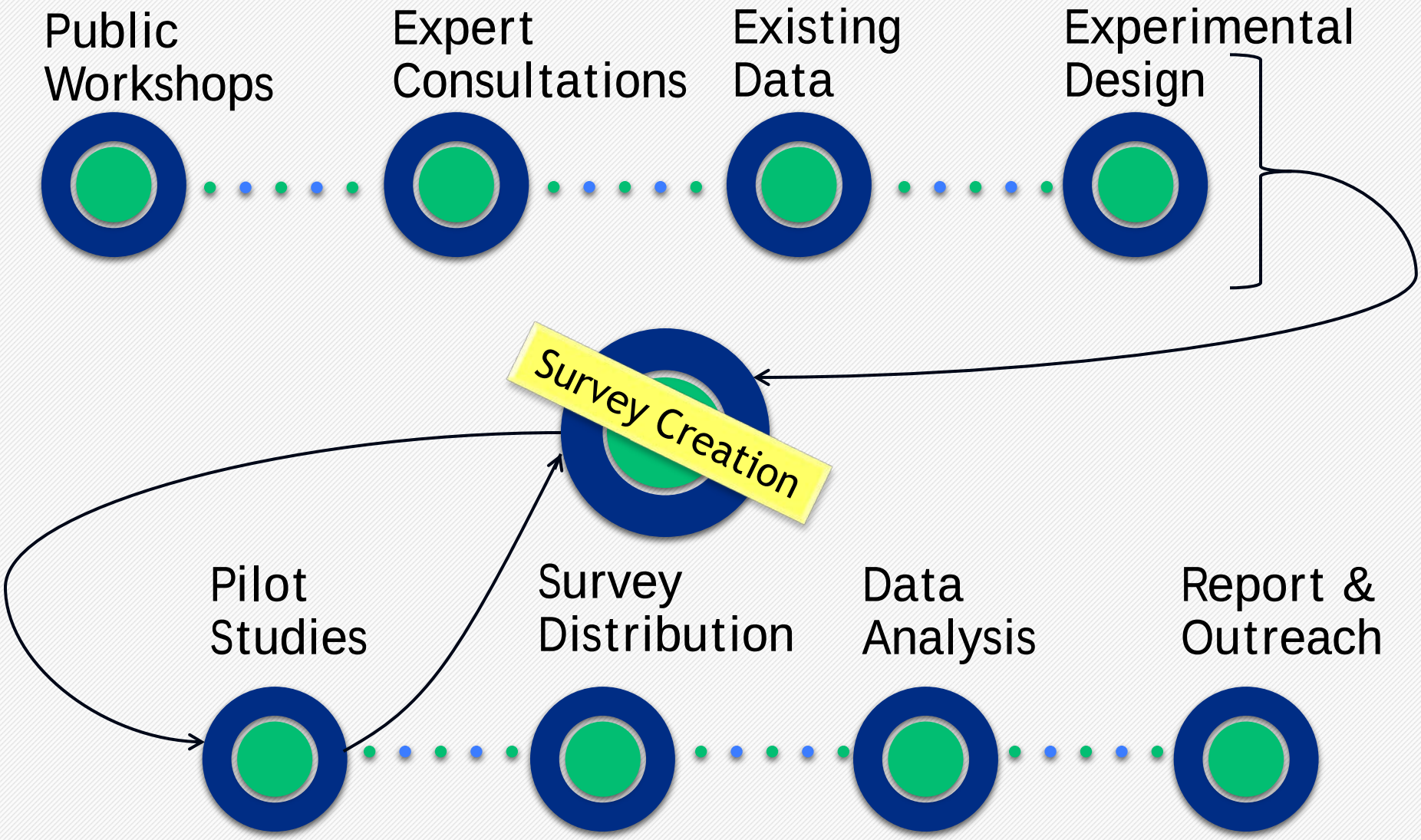
How would you vote? Choose only one	☐ **I vote for NO ACTION**	☐ **I vote for Scenario A**	☐ **I vote for Scenario B**

Process


Public Workshops
Expert Consultations
Existing Data
Experimental Design
Survey Creation
Pilot Studies
Survey Distribution
Data Analysis
Report & Outreach

Delaware Tidal Wetland Values Survey

A survey of experiences and opinions of Delaware Residents

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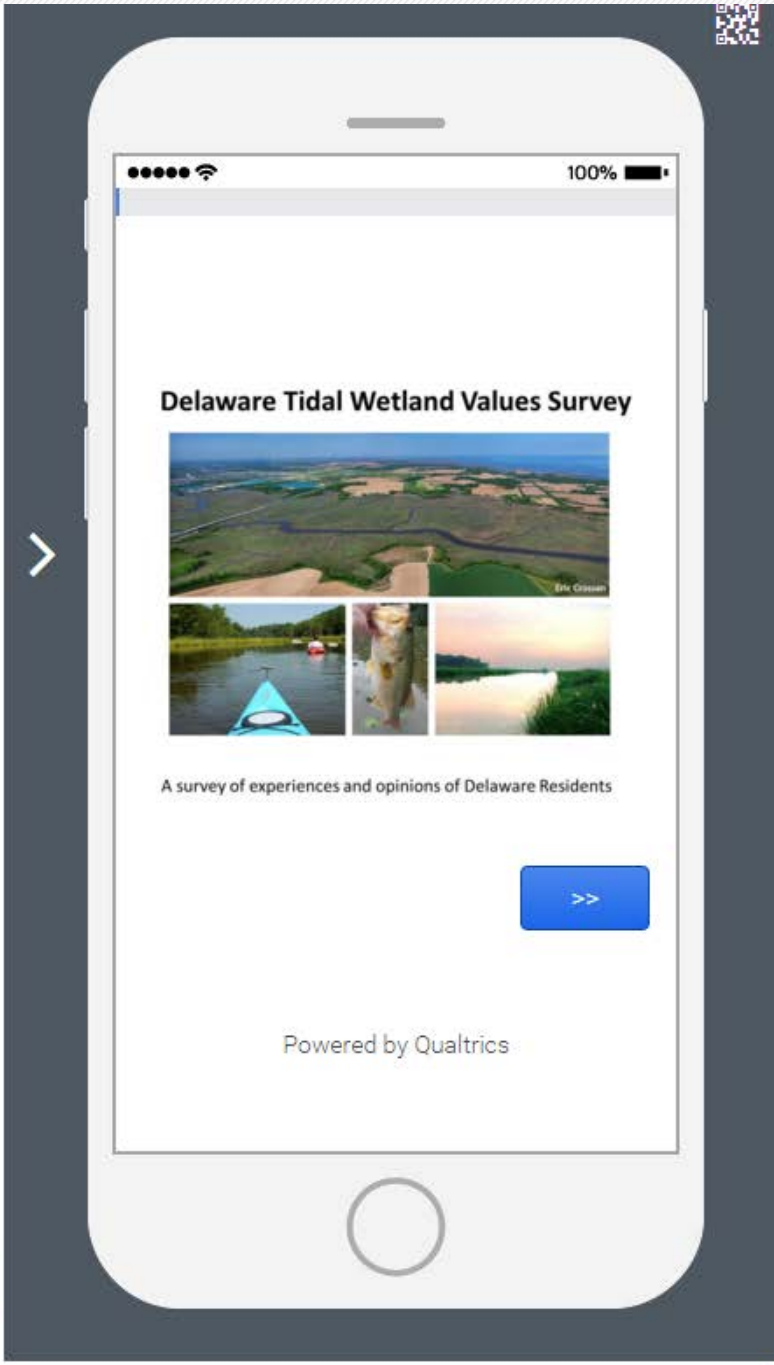


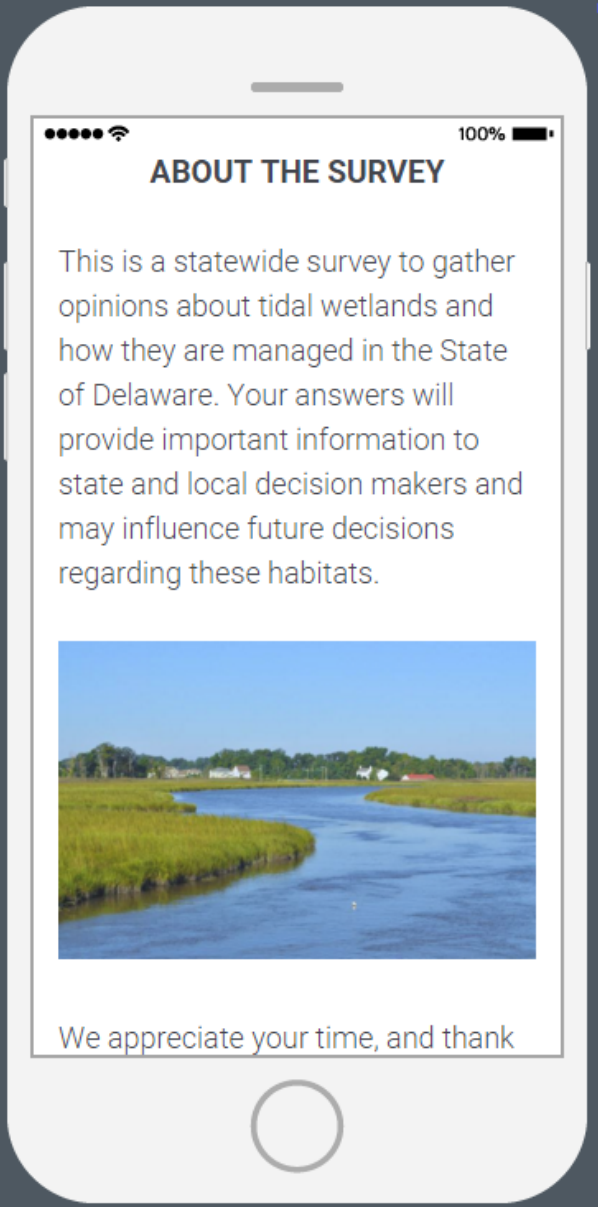
ABOUT THE SURVEY

This is a statewide survey to gather opinions about tidal wetlands and how they are managed in the State of Delaware. Your answers will provide important information to state and local decision makers and may influence future decisions regarding these habitats.

We appreciate your time, and thank you for participating in this survey. Please keep in mind:

- Your answers will be anonymous.
- Your participation is voluntary.
- Your opinion is valuable, even if you do not think you are familiar with the subject.
- Please have only one adult member of your household take this survey.
- Please answer each question truthfully to the best of your abilities.
- The survey includes a brief introduction to tidal wetlands which you should read before answering.

The survey should take about 15 minutes to complete.



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WHAT ARE TIDAL WETLANDS AND WHERE ARE THEY LOCATED?

Tidal wetlands are lands that are flooded regularly by the incoming tides. They can include salt and freshwater marshes, and typically occur along coasts, rivers, and streams. Tidal marshes in Delaware generally consist of grasses, grass-like plants, trees and shrubs that are specifically adapted to survive in wet and/or salty conditions.

There are about 87,000 acres of tidal wetlands in Delaware, shown on the map and in the pictures below. An acre is roughly the size of a football field.

100%

WHAT ARE TIDAL WETLANDS AND WHERE ARE THEY LOCATED?

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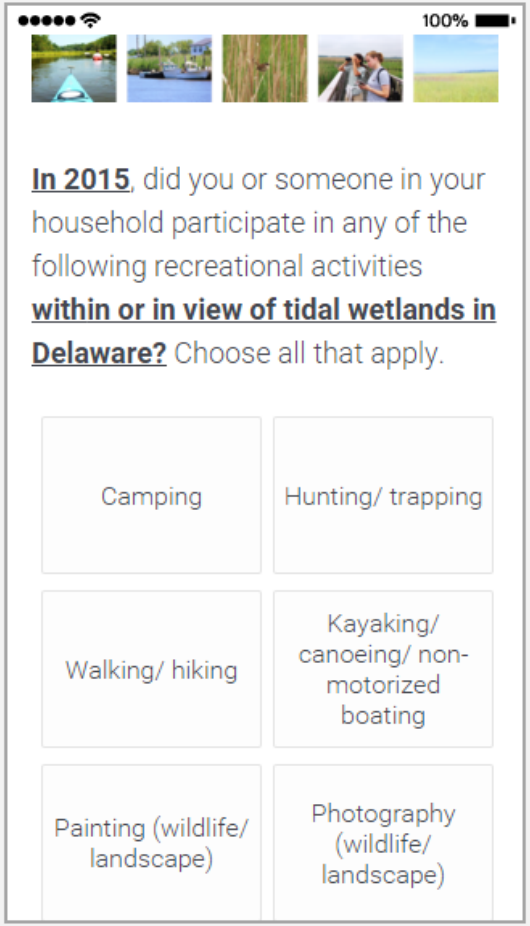
There are about 87,000 acres of tidal wetlands in Delaware, shown on the map and in the pictures below. An acre is roughly the size of a football field.

In 2015, did you or someone in your household participate in any of the following recreational activities **within or in view of tidal wetlands in Delaware?** Choose all that apply.

Camping	Hunting/ trapping
Walking/ hiking	Kayaking/ canoeing/ non-motorized boating
Painting (wildlife/ landscape)	Photography (wildlife/ landscape)
Swimming	Cycling
Birdwatching	Motorized boating
Other wildlife viewing	Fishing/ crabbing/ shellfish harvesting
Other	None



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Prior to this survey, **were you aware** of the following benefits of tidal wetlands?

	Not Aware	Somewhat Aware	Aware
Influence on climate/ heat trapping gas reduction	○	○	○
Commercial Resources	○	○	○
Ecological/ wildlife health and diversity	○	○	○
Educational opportunities	○	○	○
Water quality improvement	○	○	○
Natural scenery/ aesthetics	○	○	○
Coastal protection from flooding and storms	○	○	○
Recreational opportunities	○	○	○

Do you live in Delaware (either full or part time)?

Yes	No

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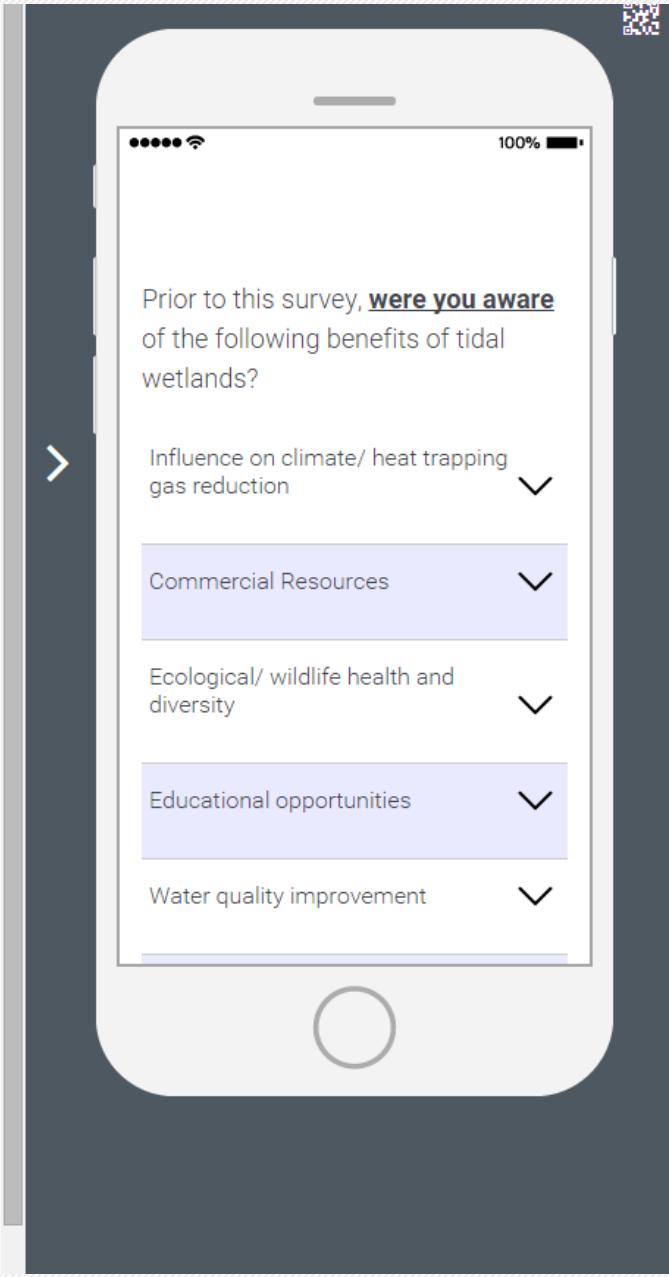

IMPORTANT INFORMATION FOR UPCOMING QUESTIONS

The chart below provides descriptions that give context for the next few questions. You will be asked to compare different management options and vote for your preferred scenario. Each option will be described by the effects defined below, as estimated by scientists:

Effect of Management	What it Means	Current Situation & No Action
Tidal Wetland Acres 	The total number of tidal wetland acres lost, maintained, or gained.	Today: Around 87,000 acres of tidal wetlands in Delaware. No action: Will result in a **loss of 400** acres in 25 years (2040).
Ecologic/ Wildlife Condition 	The average ecologic/ wildlife condition within and adjacent to managed tidal wetland areas. This includes: • percentage of native plants • marsh bird community diversity • fish abundance • fish diversity A score of 100 represents the best ecologic/wildlife condition in Delaware.	Today: In Delaware, the average ecologic condition is **60 out of 100 (60%)** No action: Predicted condition is **55 out of 100 (55%)** in 25 years (2040).
Water Quality 	The average water quality within and adjacent to managed tidal wetland areas. This includes: • water clarity • dissolved oxygen • nitrogen (dissolved inorganic) • phosphorous (dissolved inorganic) • chlorophyll a	Today: In Delaware the average water quality is **60 out of 100 (60%)** No action: Predicted condition is **50 out of 100 (50%)** in 25 years (2040).

Preliminary Results

DE TIDAL WETLAND VALUES - PANEL COPY 411 Total Responses

QUOTAS 1/18

RESPONSES 456 356 — STARTED — COMPLETED — 30

TOTALS 12 DAY TREND TODAY

356 TOTAL RESPONSES
13% DROPOUT RATE
456 SURVEYS STARTED
45 SURVEYS IN PROGRESS

8. In 2015, did you or someone in your household participate in any of the following recreational...

#	Answer	Response	%
9	Painting (wildlife/ landscape)	4	1.02%
4	Hunting/ trapping	14	3.56%
13	Other	17	4.33%
12	Camping	28	7.12%
6	Other wildlife viewing	30	7.63%
2	Kayaking/ canoeing/ non-motorized boating	33	8.40%
3	Motorized boating	34	8.65%
11	Cycling	39	9.92%
5	Birdwatching	44	11.20%
10	Swimming	62	15.78%
8	Photography (wildlife/ landscape)	68	17.30%
1	Fishing/ crabbing/ shellfish harvesting	82	20.87%
14	None	147	37.40%
7	Walking/ hiking	166	42.24%

Preliminary Results

10. How certain are you, that your recreational activities were in or adjacent to a tidal wetland?

#	Answer		Response	%
1	Not Certain		24	10%
2	Somewhat Certain		97	40%
3	Very Certain		122	50%
	Total		243	100%

Preliminary Results

16. Prior to this survey, were you aware of the following benefits of tidal wetlands?

#	Question	Not Aware	Somewhat Aware	Very Aware	Mean
6	Influence on climate/ carbon storage	139	161	82	1.85
3	Commercial resources	132	169	81	1.87
1	Water quality improvement	104	164	114	2.03
5	Coastal protection from flooding and storms	71	129	182	2.29
7	Educational opportunities	54	156	172	2.31
4	Recreational opportunities	50	120	212	2.42
2	Ecological/ wildlife health and diversity	50	117	215	2.43
8	Natural scenery/ aesthetics	34	91	257	2.58

Preliminary Results

22. How strongly do you agree or disagree with the following statements about the survey?

More...

#	Question	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree	Mean
1	I was provided enough information to make informed choices	5	21	53	141	142	4.09
2	I felt comfortable with my answers	4	12	47	160	139	4.15
4	I would vote the same way in a binding public vote	6	12	58	144	142	4.12

Thank You!

- NOAA Office For Coastal Management
- Tridec Technologies
- Bob Scarborough, Bonnie Arvay, Carl Yetter
  Delaware Coastal Programs, DNREC
- **George Parsons**
  University of Delaware
- **Rob Johnston**
  Clark University, Worcester MA
- Pete Wiley
  NOAA
- Ian Yue
  NOAA Coastal Management Fellow, Connecticut
- UMCES IAN Image Library

Symbols Courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science (ian.umces.edu/symbols/)

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Questions?

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