Balancing Freshwater Inflows in a Changing Environment

Collaborating for Water Conservation on the Texas Coast

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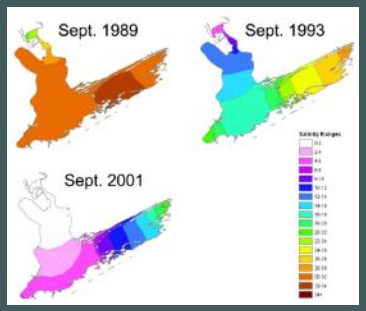
Freshwater Inflows: Determining flow regimes in the face of land use, climate change, and other unknowns

OBJECTIVE 1

Examine the **effects of land use and climate change on freshwater inflows** to the Guadalupe-San Antonio and Mission-Aransas.

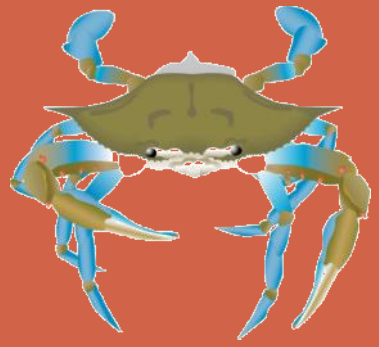
OBJECTIVE 2

Improve inputs to the TxBLEND salinity model of the Texas Water Development Board.



OBJECTIVE 3

Collaborate with intended users to **identify and conduct a priority research project related to a focal species** mentioned in the BBEST report.



OBJECTIVE 4

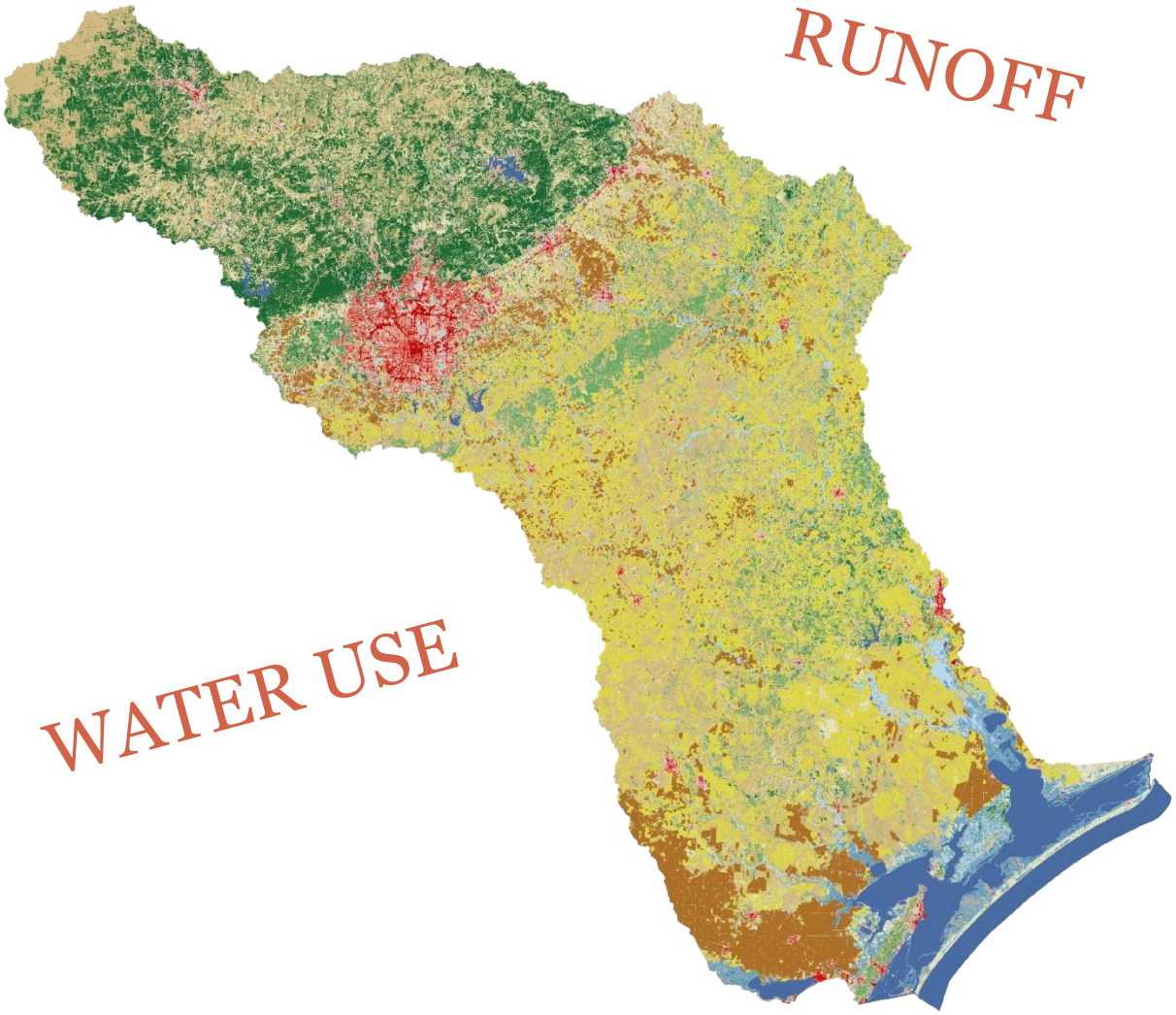
Develop shared systems learning among the local stakeholders and scientists for construction of a system dynamics model.

Objective 1

Examine the effects of land use and climate change on freshwater inflows to the Guadalupe-San Antonio and Mission-Aransas.

Land Use/Land Cover

- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Hay/Pasture
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands



Objective 1

Examine the effects of land use and climate change on freshwater inflows to the Guadalupe-San Antonio and Mission-Aransas.

What time horizon(s) would you like to see included in the land use and climate change modeling?

1. **2020 (32%)**
2. 2040 (23%)
3. **2060 (34%)**
4. 2080 (6%)
5. 2100 (5%)

Which of the following approaches would you prefer to see used for the land use and climate modeling?

1. Monthly (3%)
2. Seasonal (9%)
3. Annual (0%)
4. Monthly & Seasonal (16%)
5. Monthly & Annual (3%)
6. **Seasonal & Annual (50%)**
7. **Monthly, Seasonal, & Annual (19%)**

Which climate change scenarios would you prefer to see used for the climate change and land use modeling?

1. A2 (High) (6%)
2. A1B (Medium) (18%)
3. B1 (Low) (3%)
4. **A2 & B1 (High & Low) (21%)**
5. **All three (53%)**

Objective 1

Examine the effects of land use and climate change on freshwater inflows to the Guadalupe-San Antonio and Mission-Aransas.

Timeframe:
2020, 2060

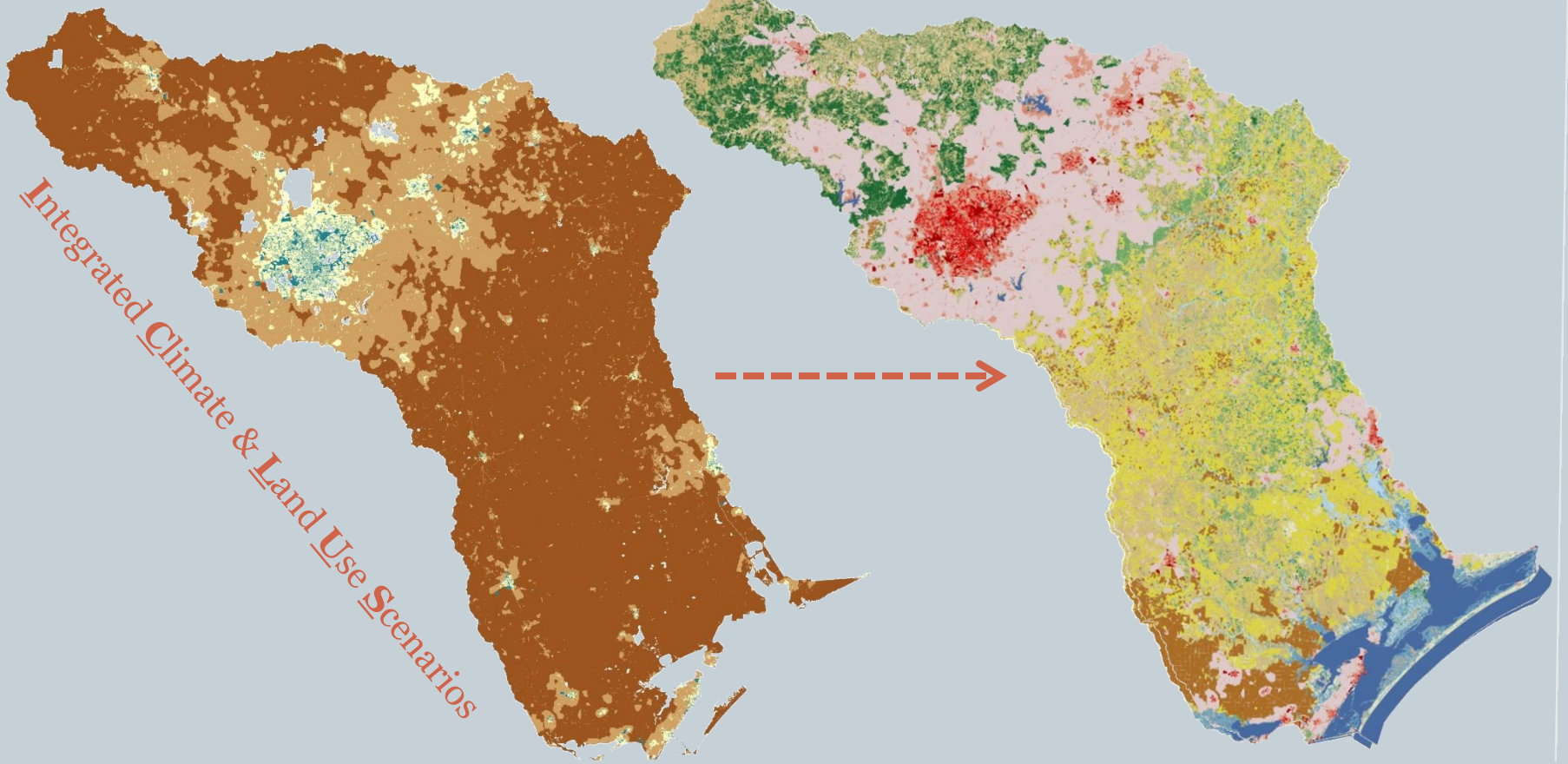
Emissions:
A2 (High), B1 (Low)

Approach:
Annual, Seasonal

SCENARIOS

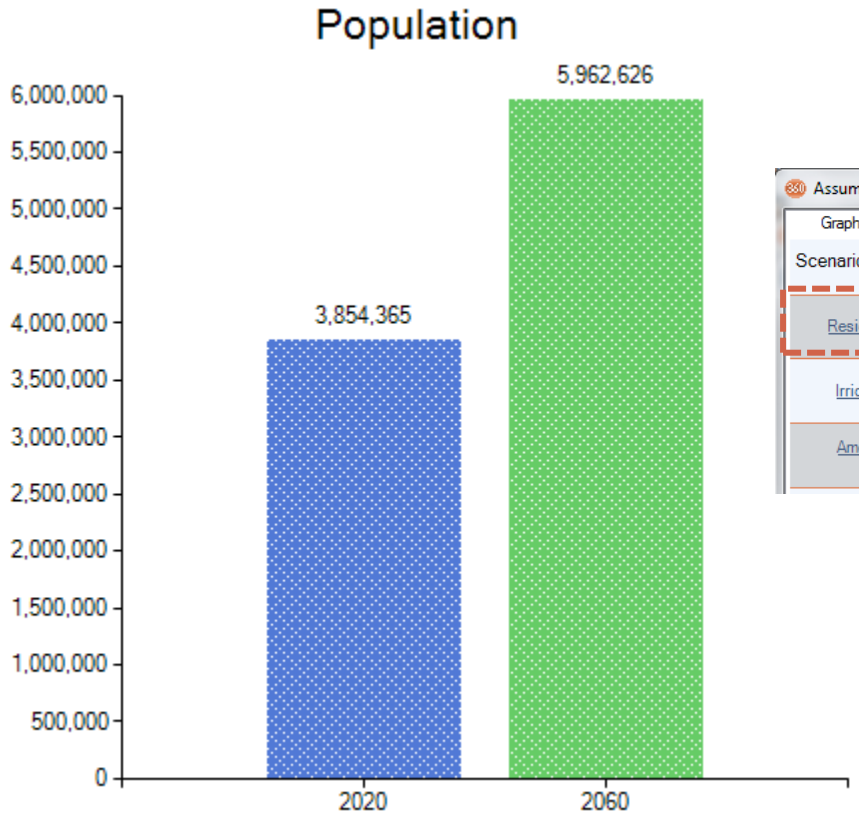
Scenario 1 A2 (High) 2020 Annual	**Scenario 2** A2 (High) 2020 Fall	**Scenario 3** A2 (High) 2020 Winter	**Scenario 4** A2 (High) 2020 Spring	**Scenario 5** A2 (High) 2020 Summer
Scenario 6 A2 (High) 2060 Annual	**Scenario 7** A2 (High) 2060 Fall	**Scenario 8** A2 (High) 2060 Winter	**Scenario 9** A2 (High) 2060 Spring	**Scenario 10** A2 (High) 2060 Spring
Scenario 11 B1 (Low) 2020 Annual	**Scenario 12** B1 (Low) 2020 Fall	**Scenario 13** B1 (Low) 2020 Winter	**Scenario 14** B1 (Low) 2020 Spring	**Scenario 15** B1 (Low) 2020 Summer
Scenario 16 B1 (Low) 2060 Annual	**Scenario 17** B1 (Low) 2060 Fall	**Scenario 18** B1 (Low) 2060 Winter	**Scenario 19** B1 (Low) 2060 Spring	**Scenario 20** B1 (Low) 2060 Spring

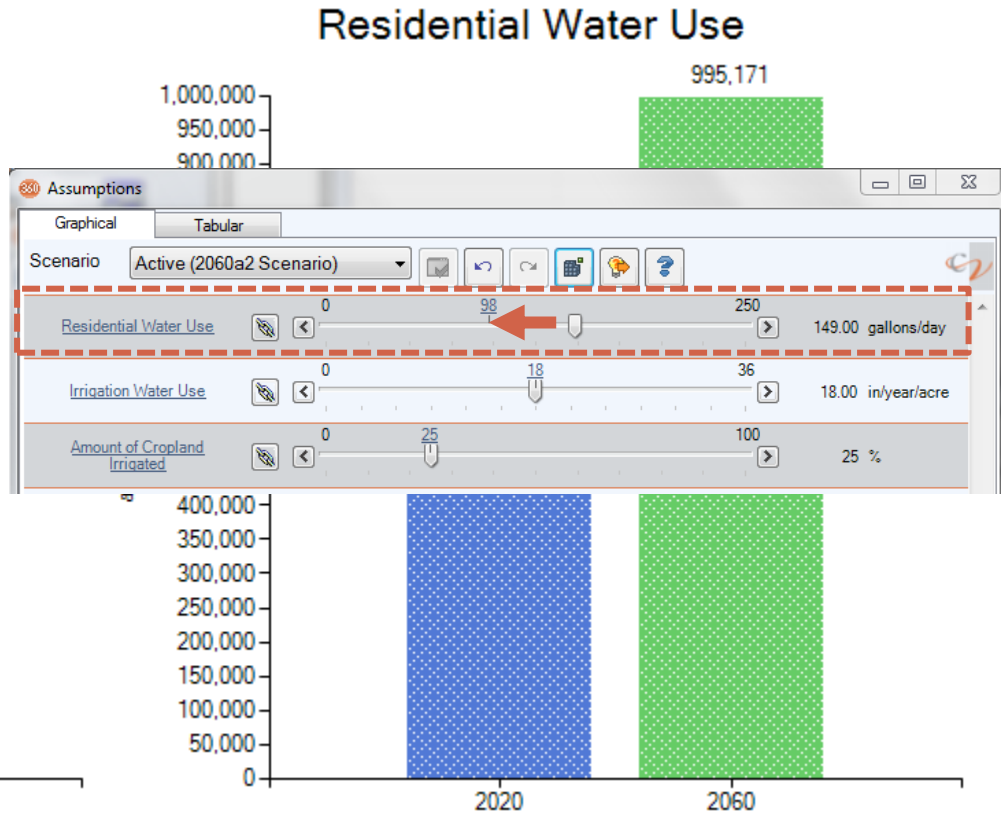
Changing Landscape . . .



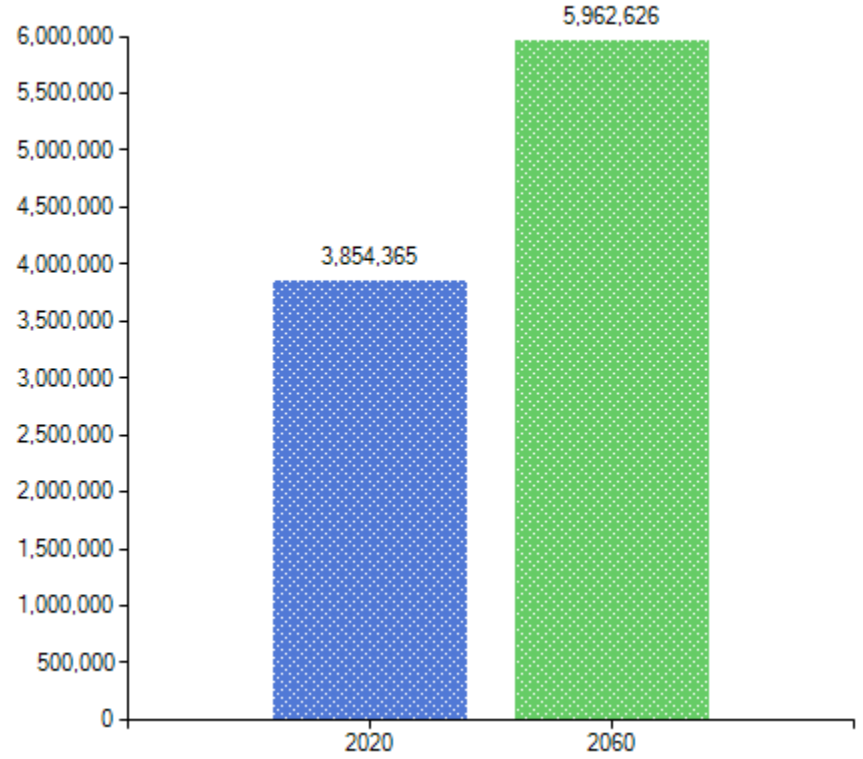
Indicator: Population & Residential Water Use

Assumes 149 gall/person/day



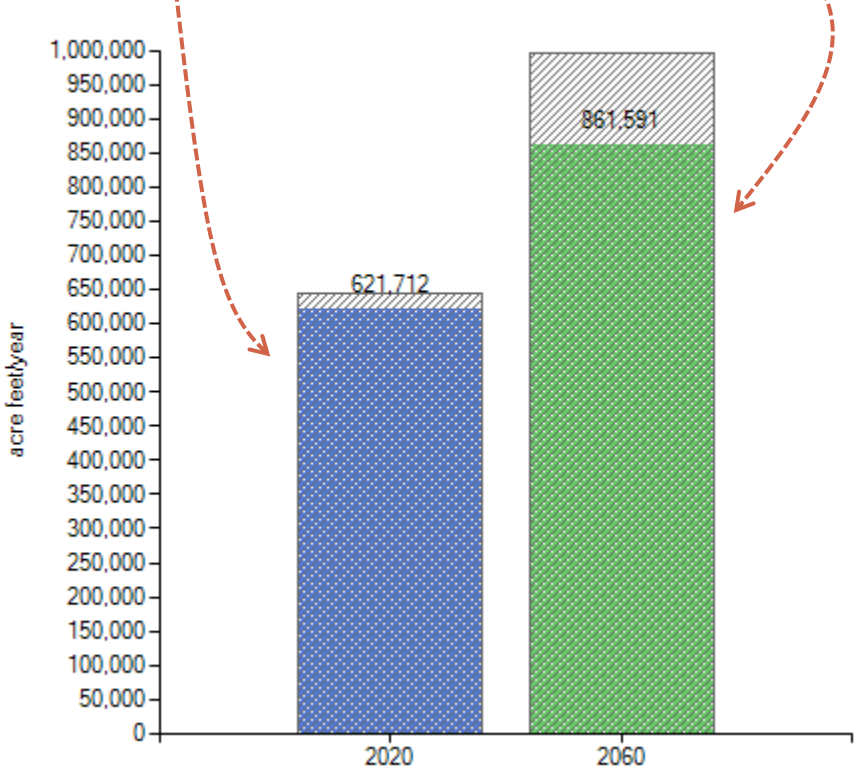


Indicator: Population & Residential Water Use

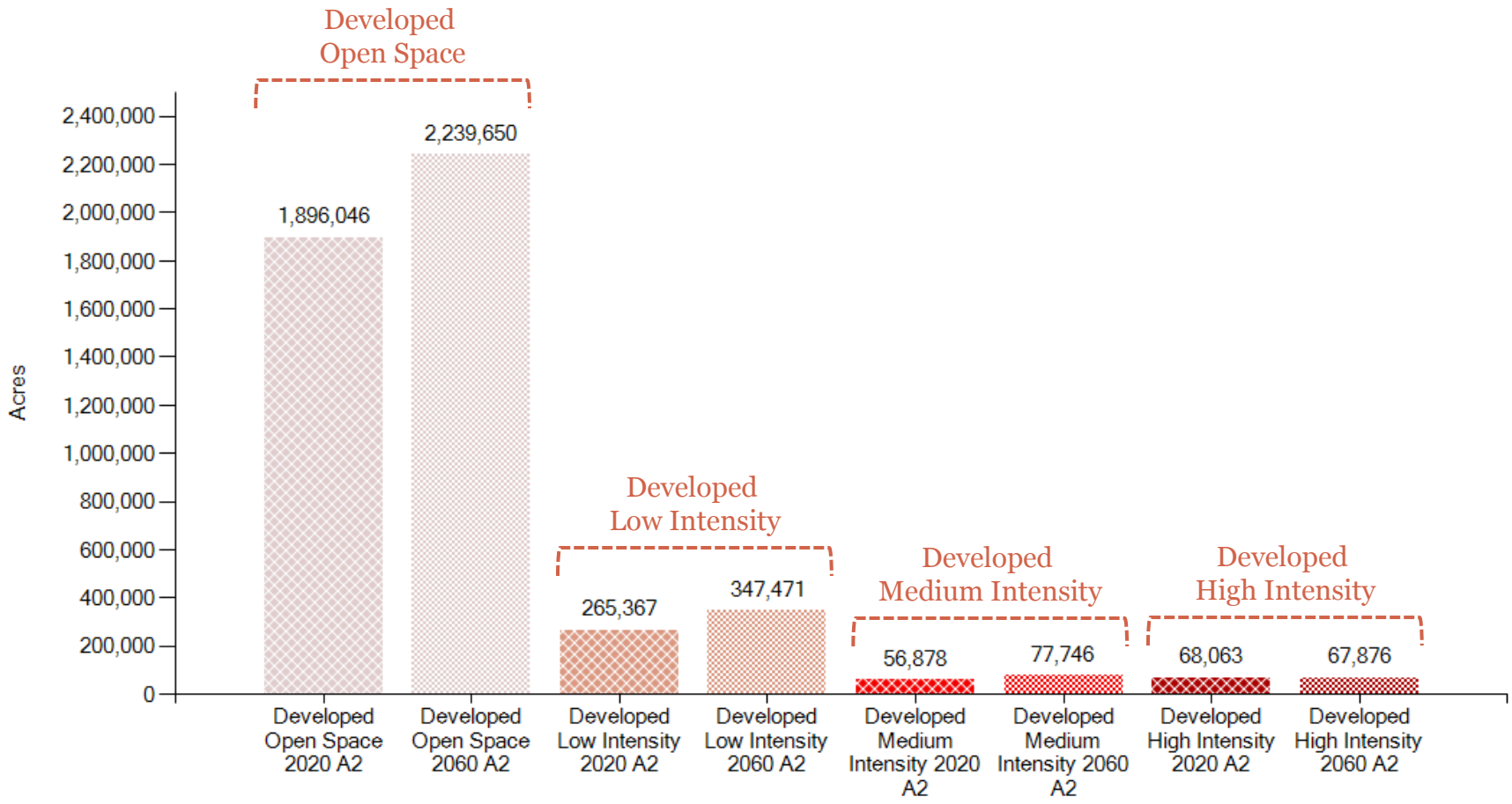


Assumes 143 gall/person/day

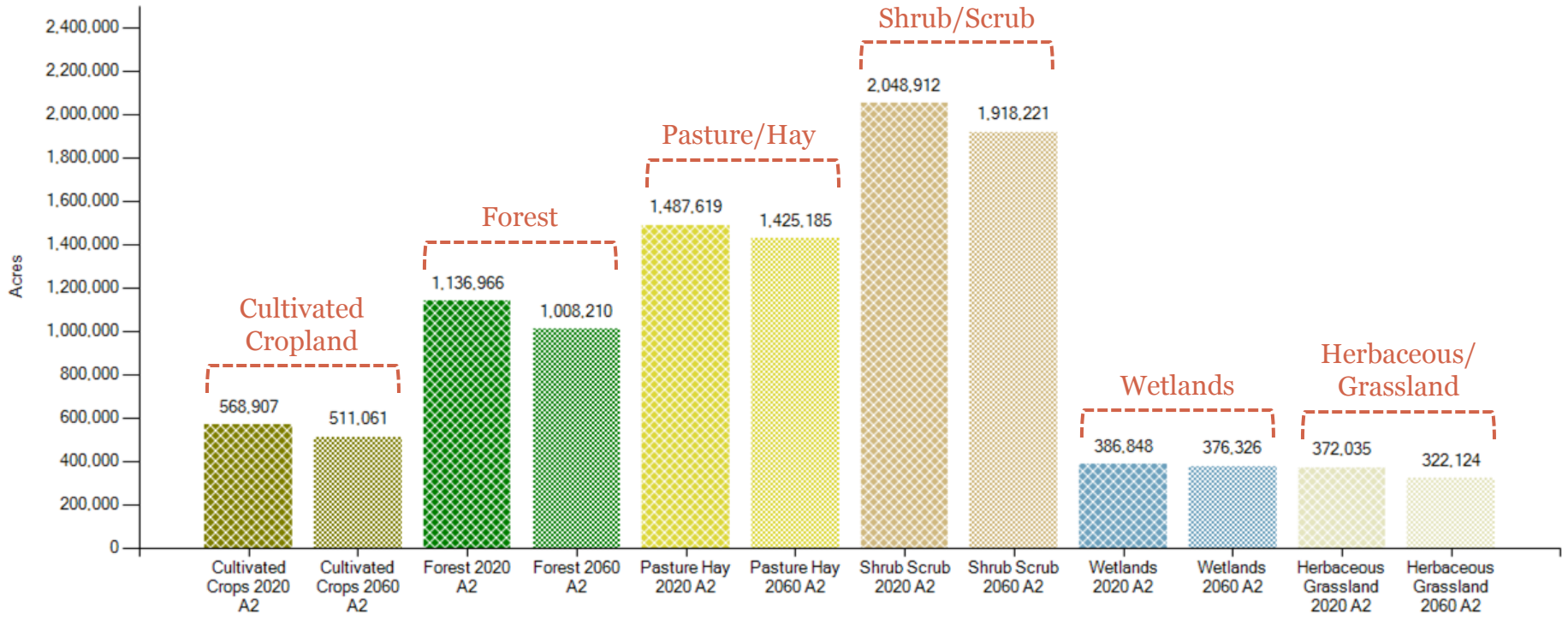
Assumes 129 gall/person/day



Indicator: Land Use



Indicator: Land Cover



Indicator: Irrigation Water Use

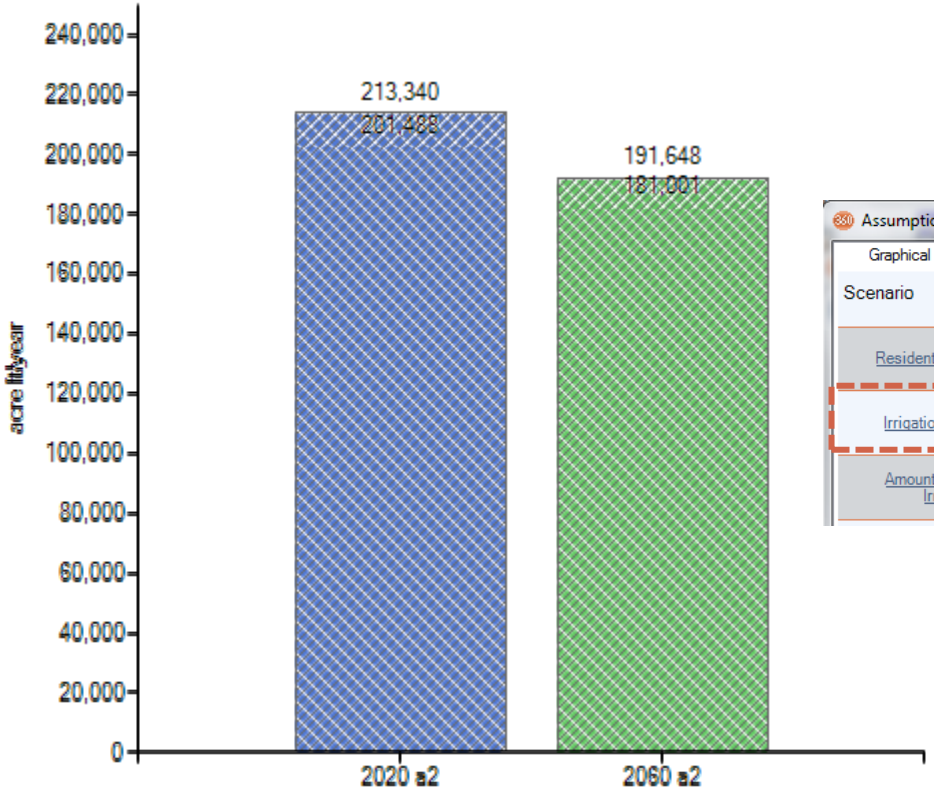
Irrigation Water Use =

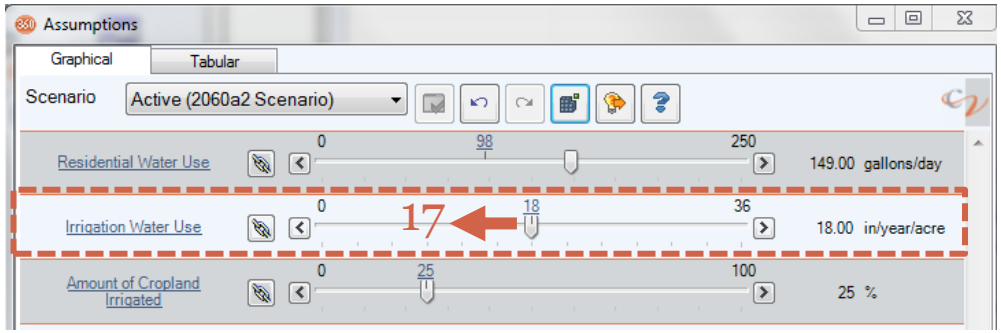
Acres of Cropland * Water Use Assumption (inches/acre/year) * % of Acres Irrigated Assumption

Source: "Status and Trends of Irrigated Agriculture in Texas" (TWRI, 2012)

Indicator: Irrigation

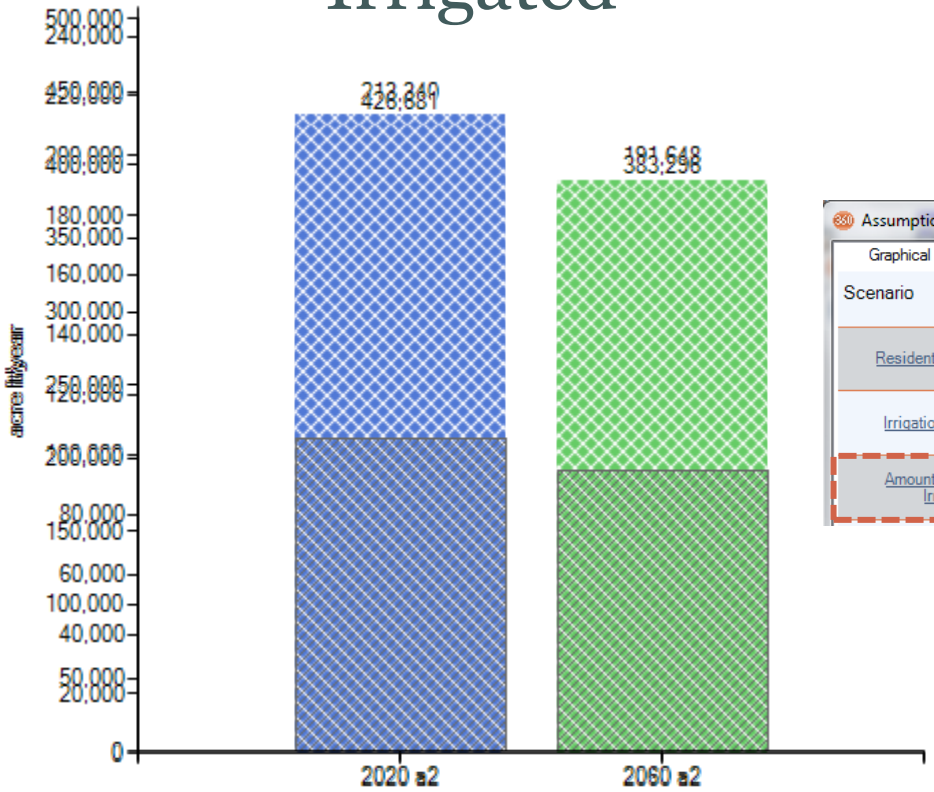
17 in/acre/year

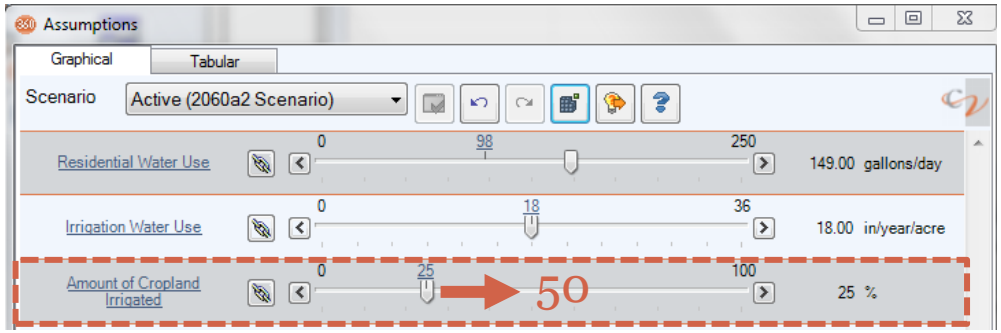




Indicator: Irrigation

50% of Cropland Irrigated

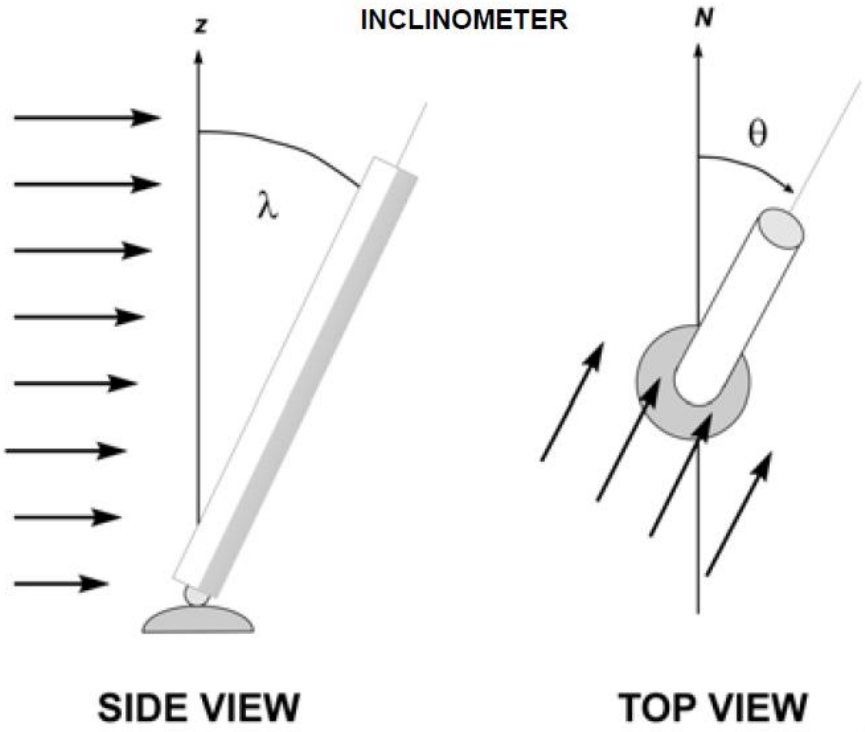


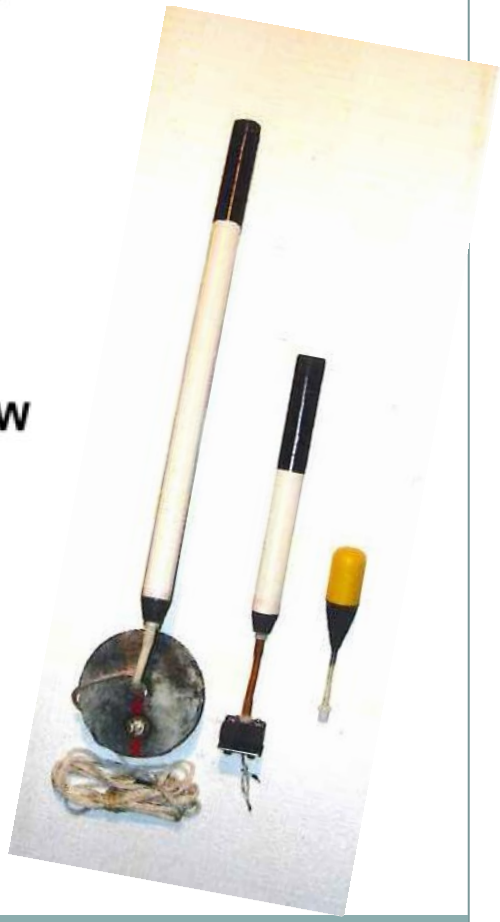


Objective 2

Improve inputs to the TxBLEND salinity model of the Texas Water Development Board.

Tiltmeter





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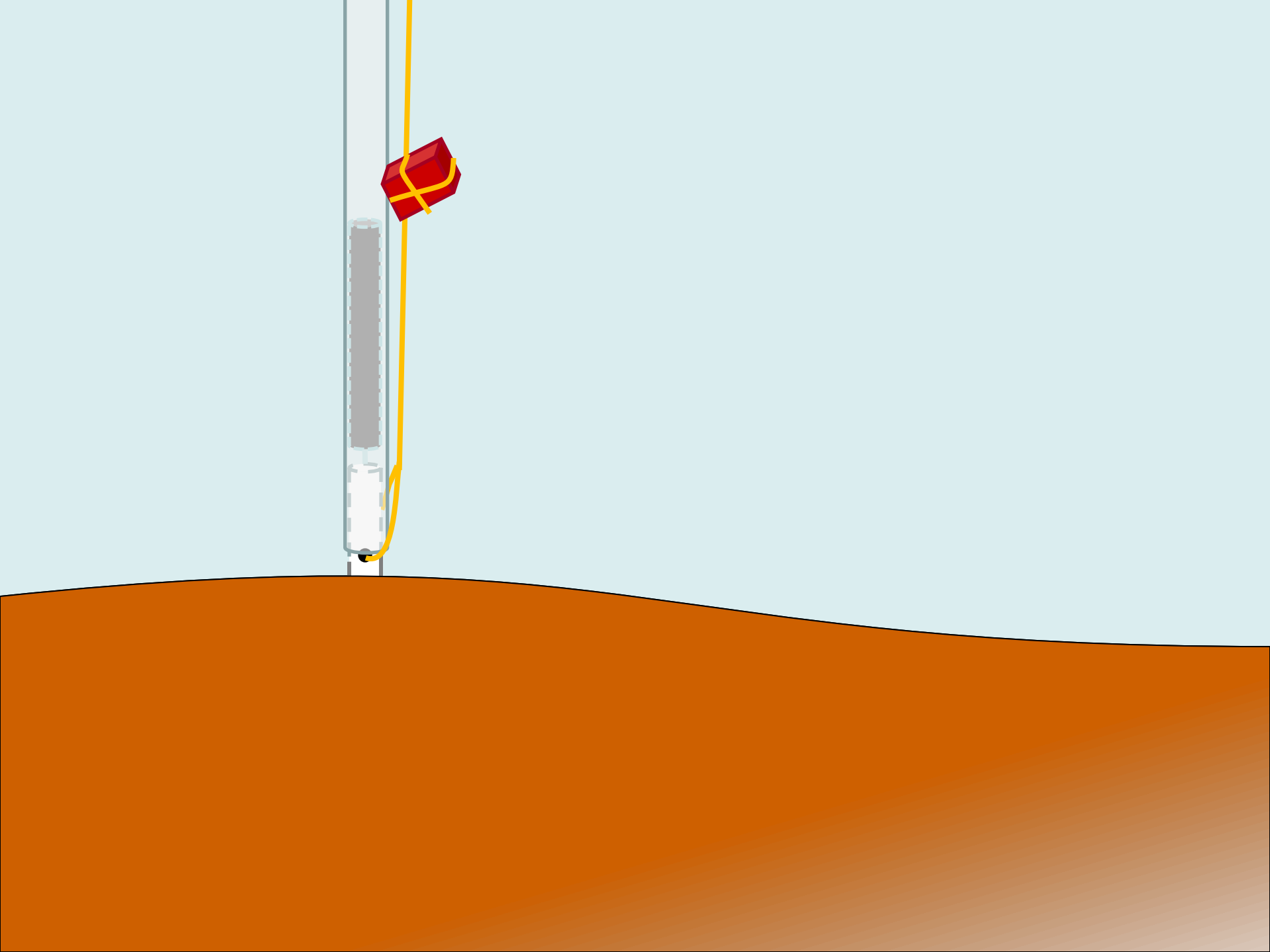

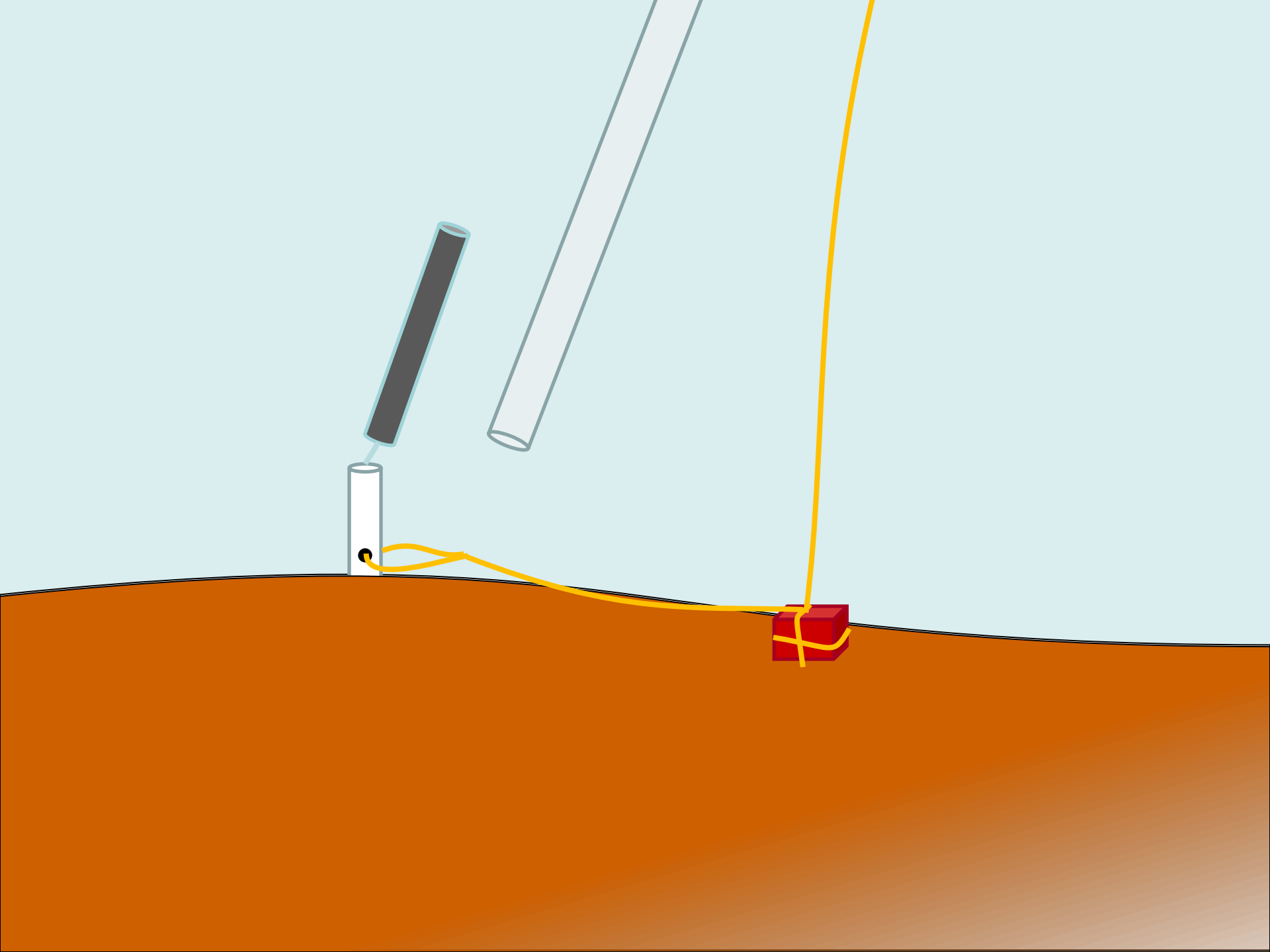

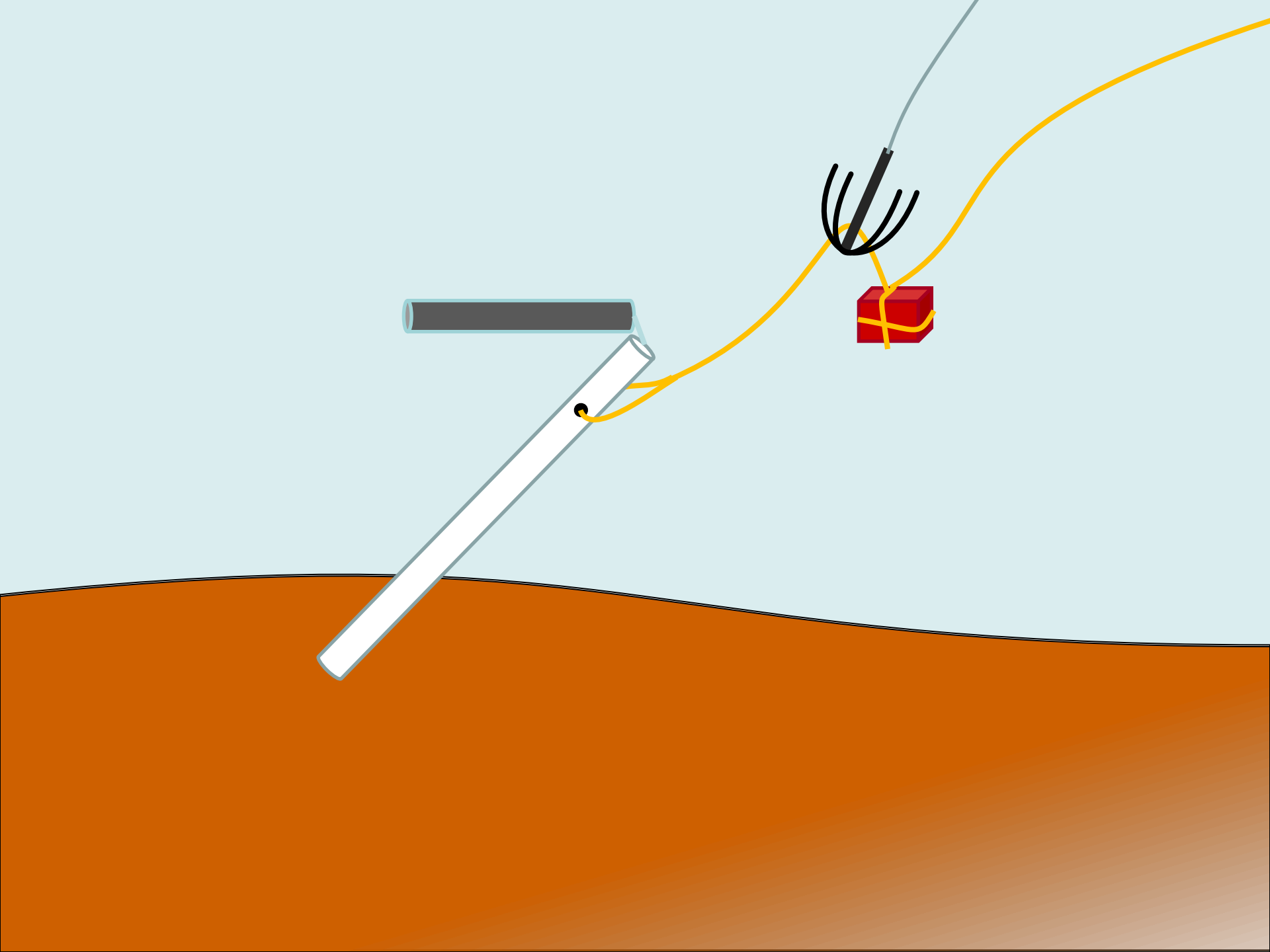

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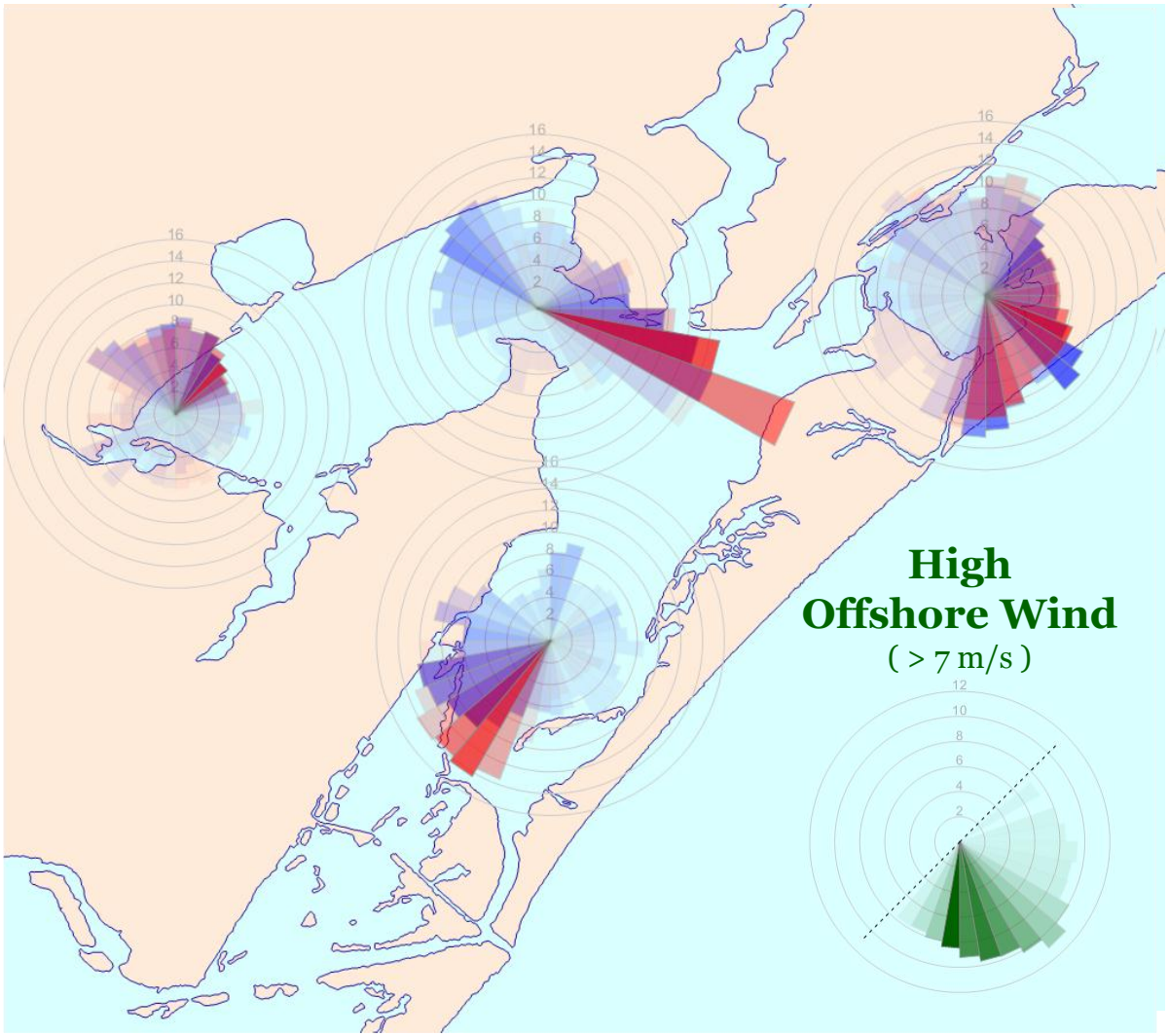
Wind:
Meters/second

Current:
Centimeters/second

Line length:
Speed in a direction

Line Color:
% time in a direction



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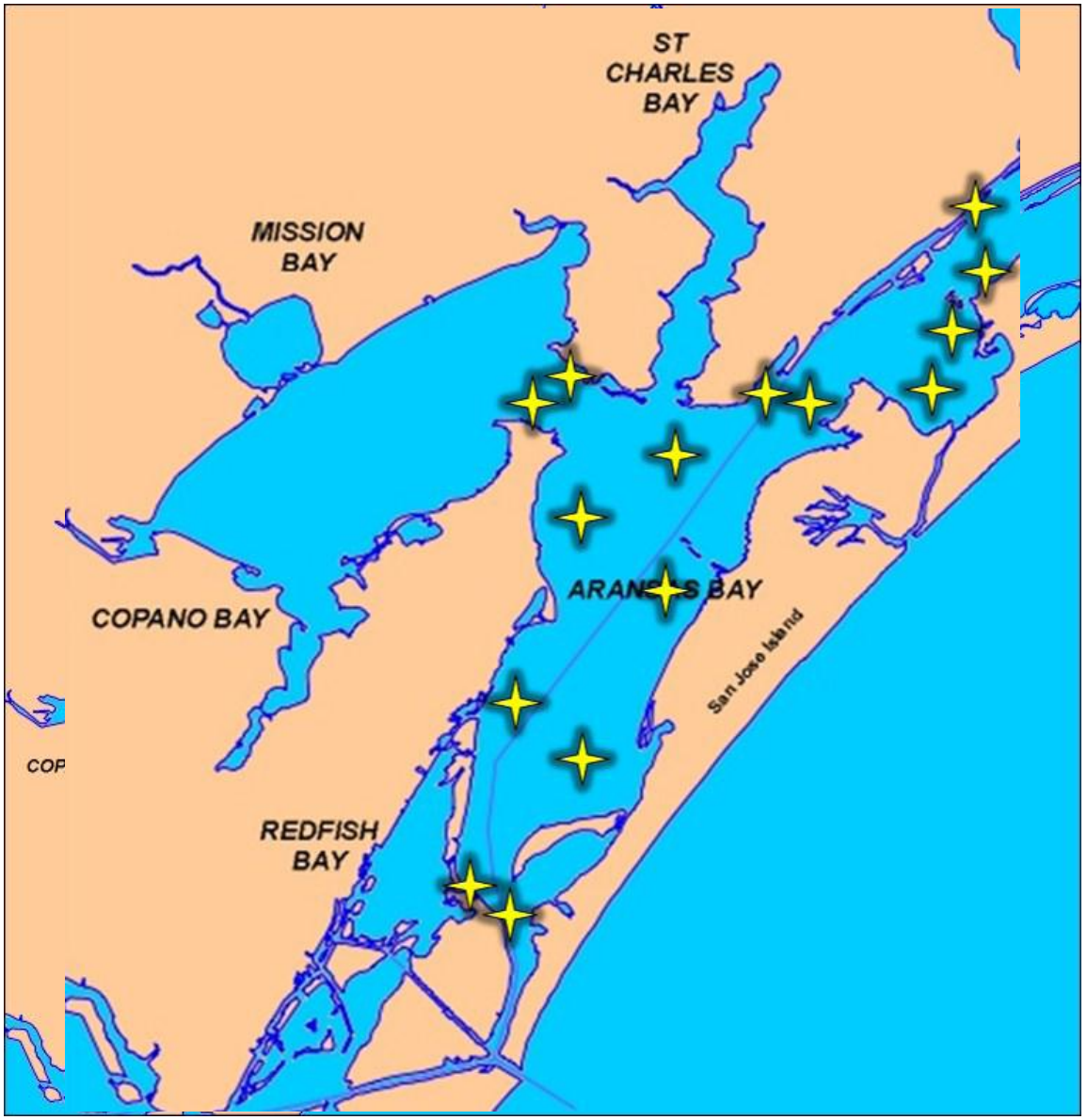
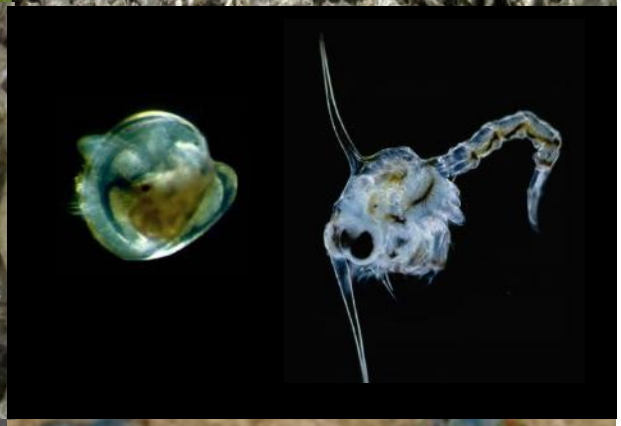


Objective 3

Collaborate with intended users to identify and conduct a priority research project related to a focal species mentioned in the BBEST report.

Freshwater Indicator Species



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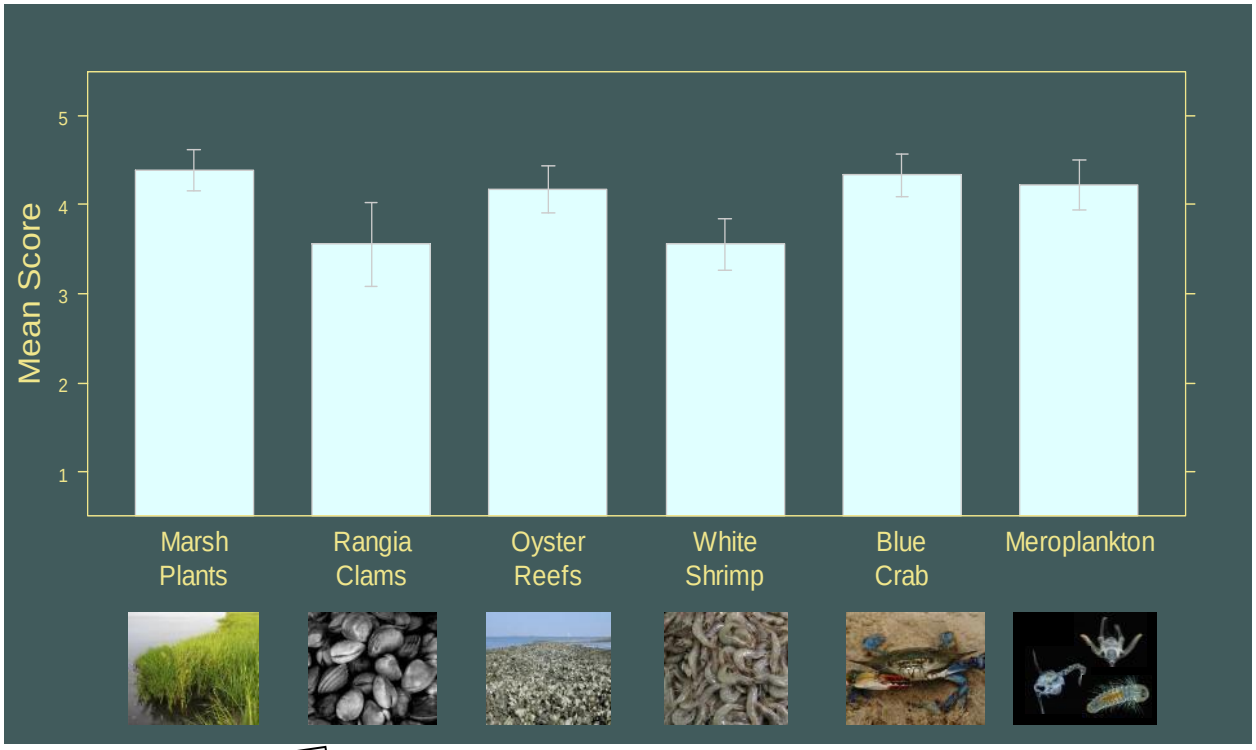
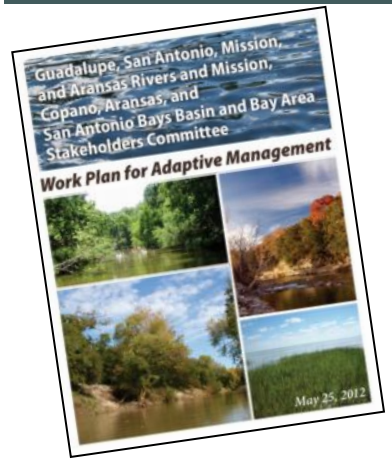
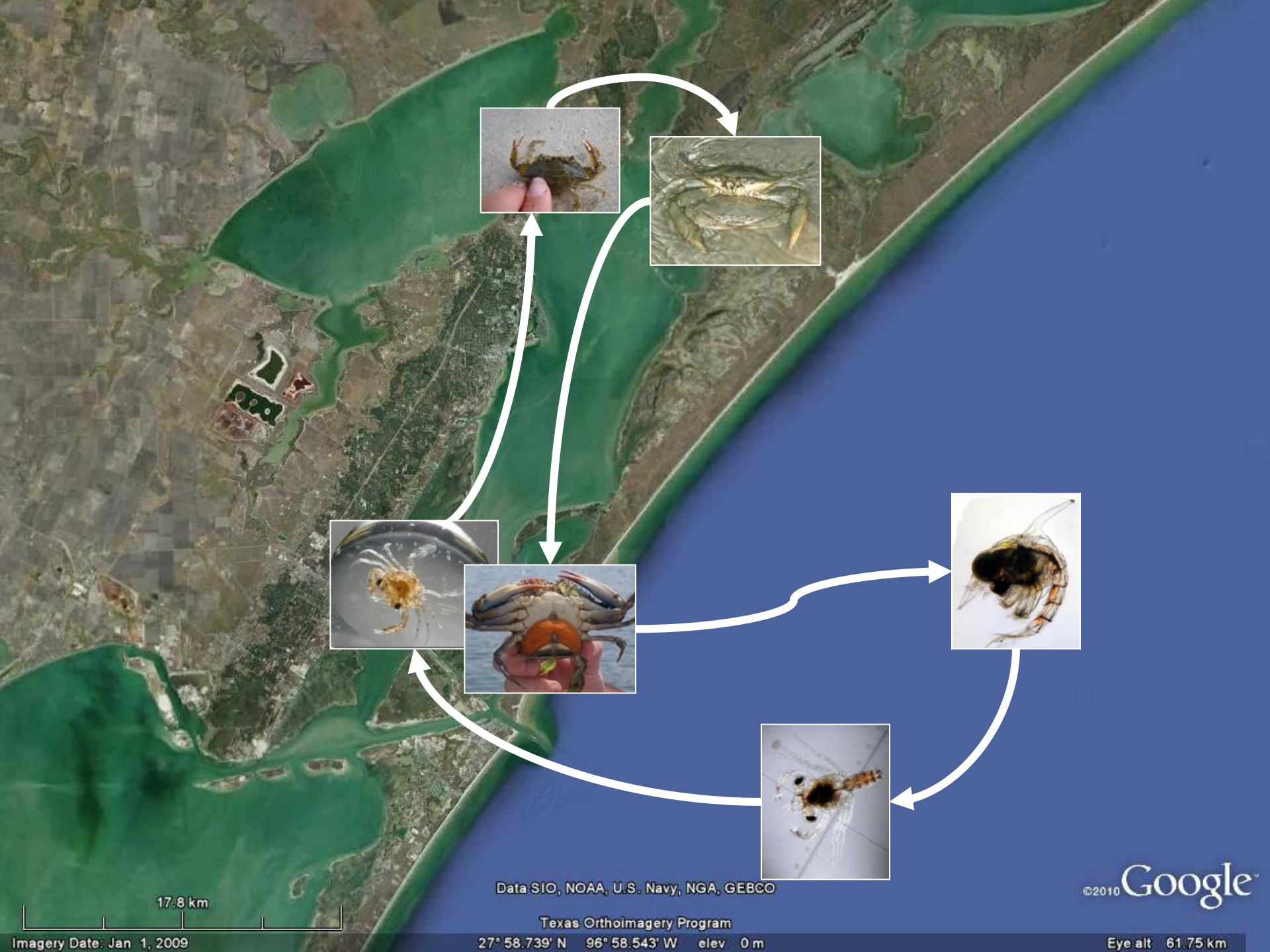
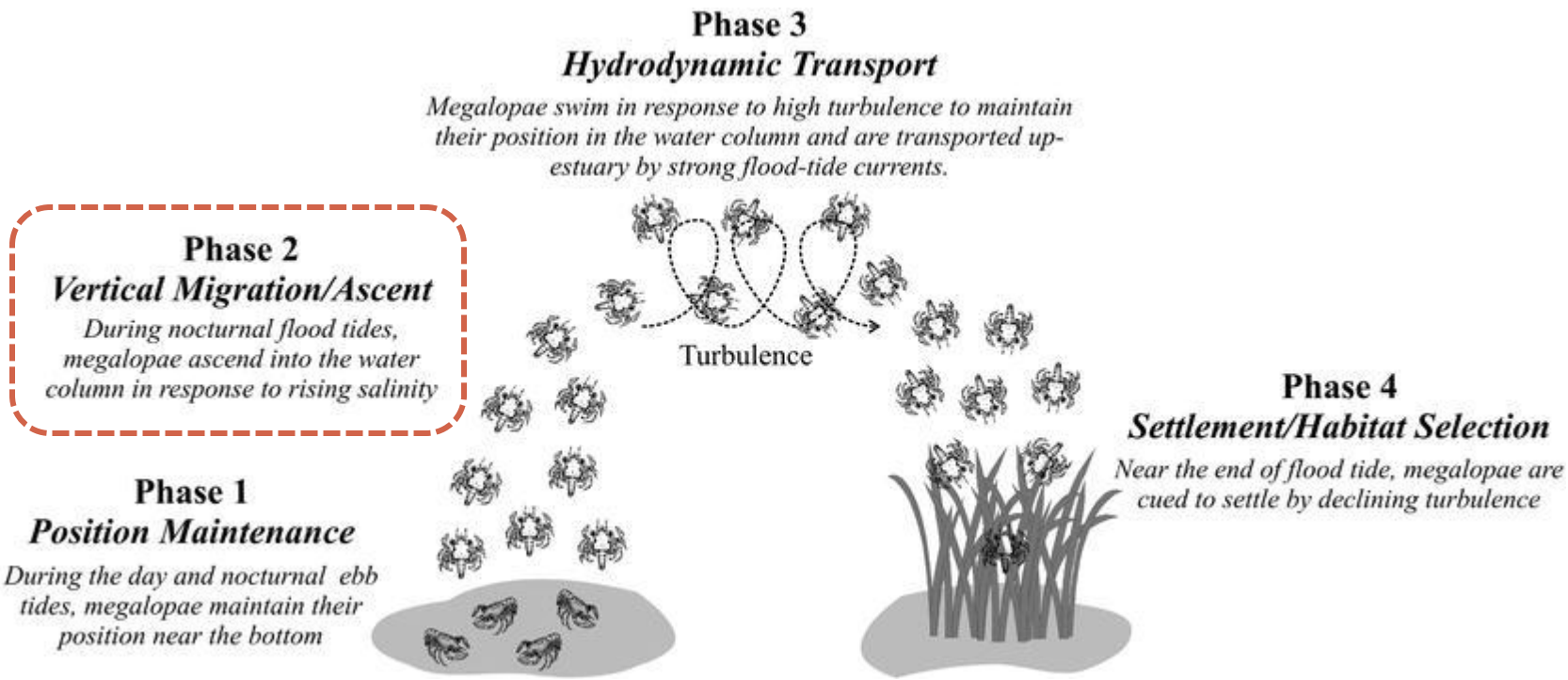





17.8 km
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Texas Orthoimagery Program
©2010 Google
Imagery Date: Jan 1, 2009
27° 58.739' N 96° 58.543' W elev 0 m
Eye alt 61.75 km

Selective Tidal Stream Transport



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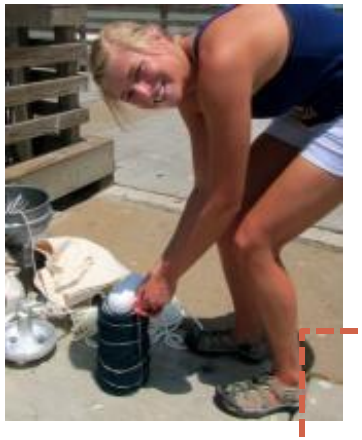
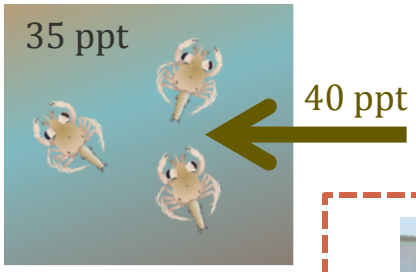
Blue Crab Research



LARGE-SCALE CITIZEN SCIENCE SURVEY OF DAILY MEGALOPAL SETTLEMENT

DROUGHT

Add **hypersaline** water



SMALL-SCALE LAB EXPERIMENTS ASSESSING TRANSPORT BEHAVIOR AS A FUNCTION OF SALINITY

MONTHLY SURVEYS OF JUVENILE ABUNDANCE IN MESQUITE BAY

Objective 3

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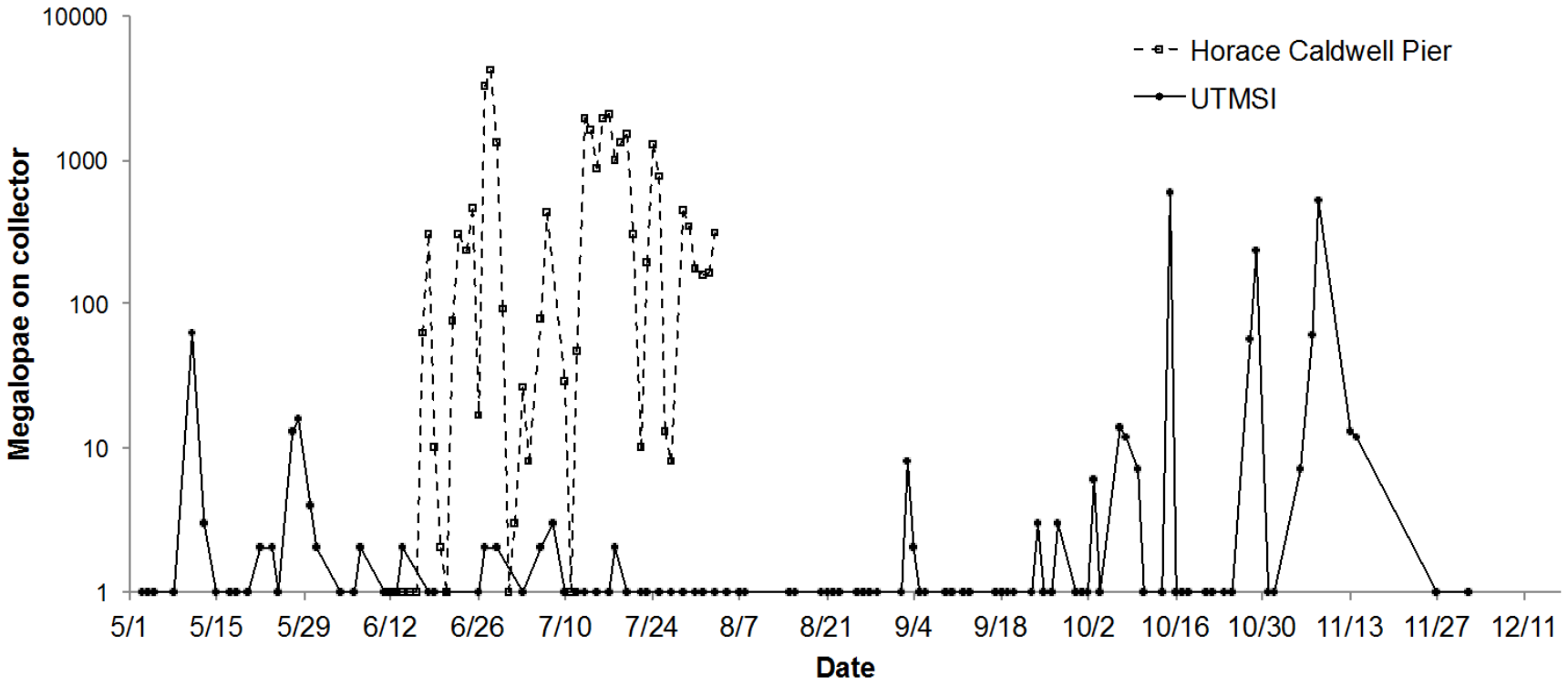
Blue Crab Research

Daily Megalopal Abundance



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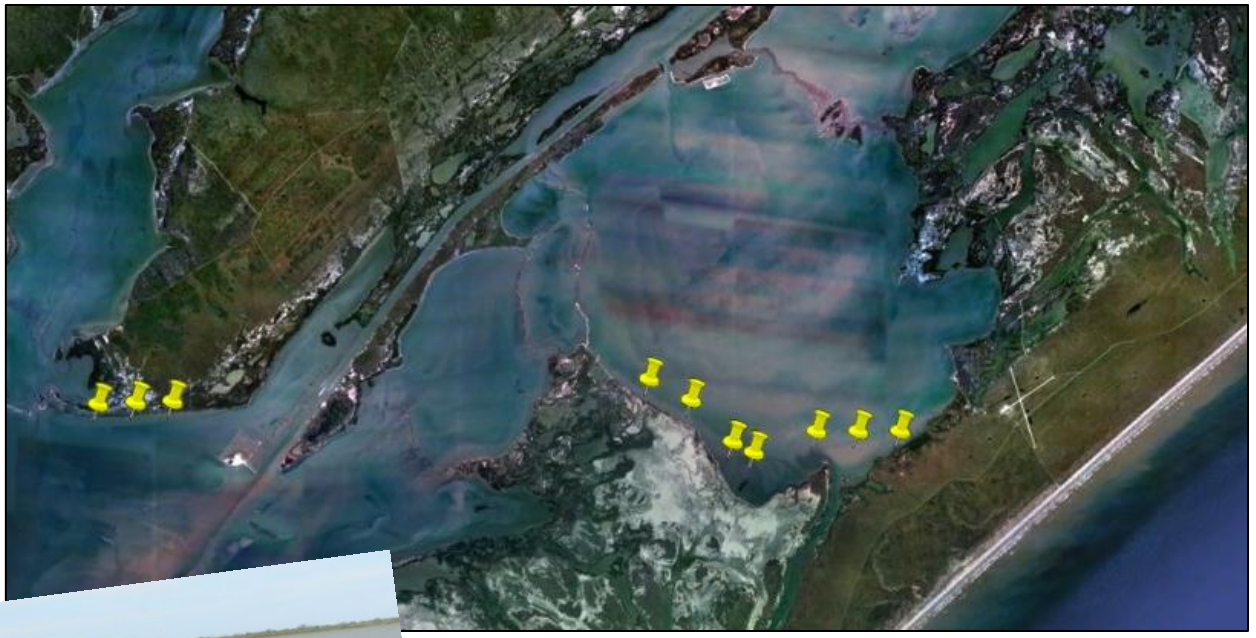

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Rangia Clam Research

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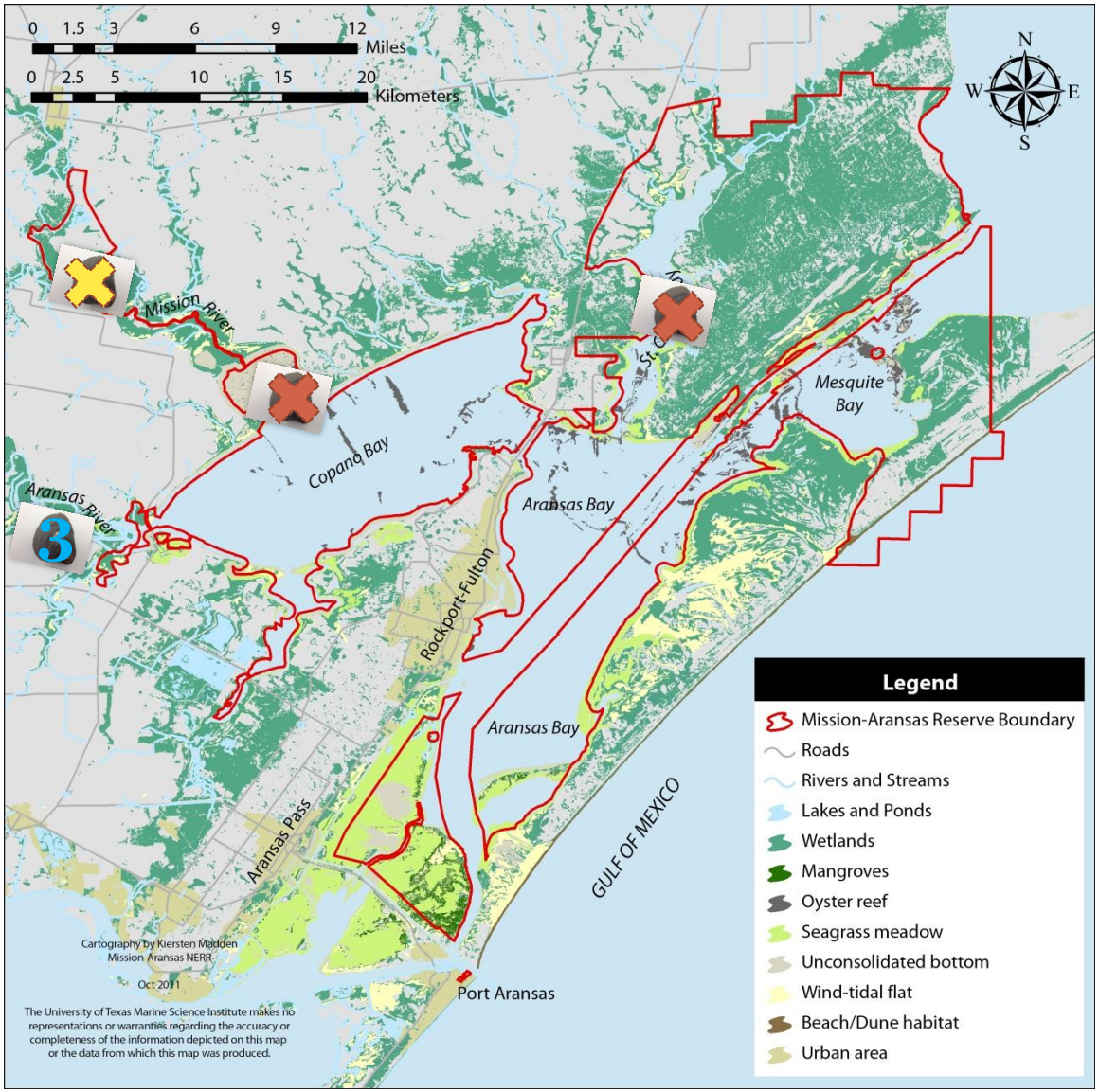
Rangia Clam Research



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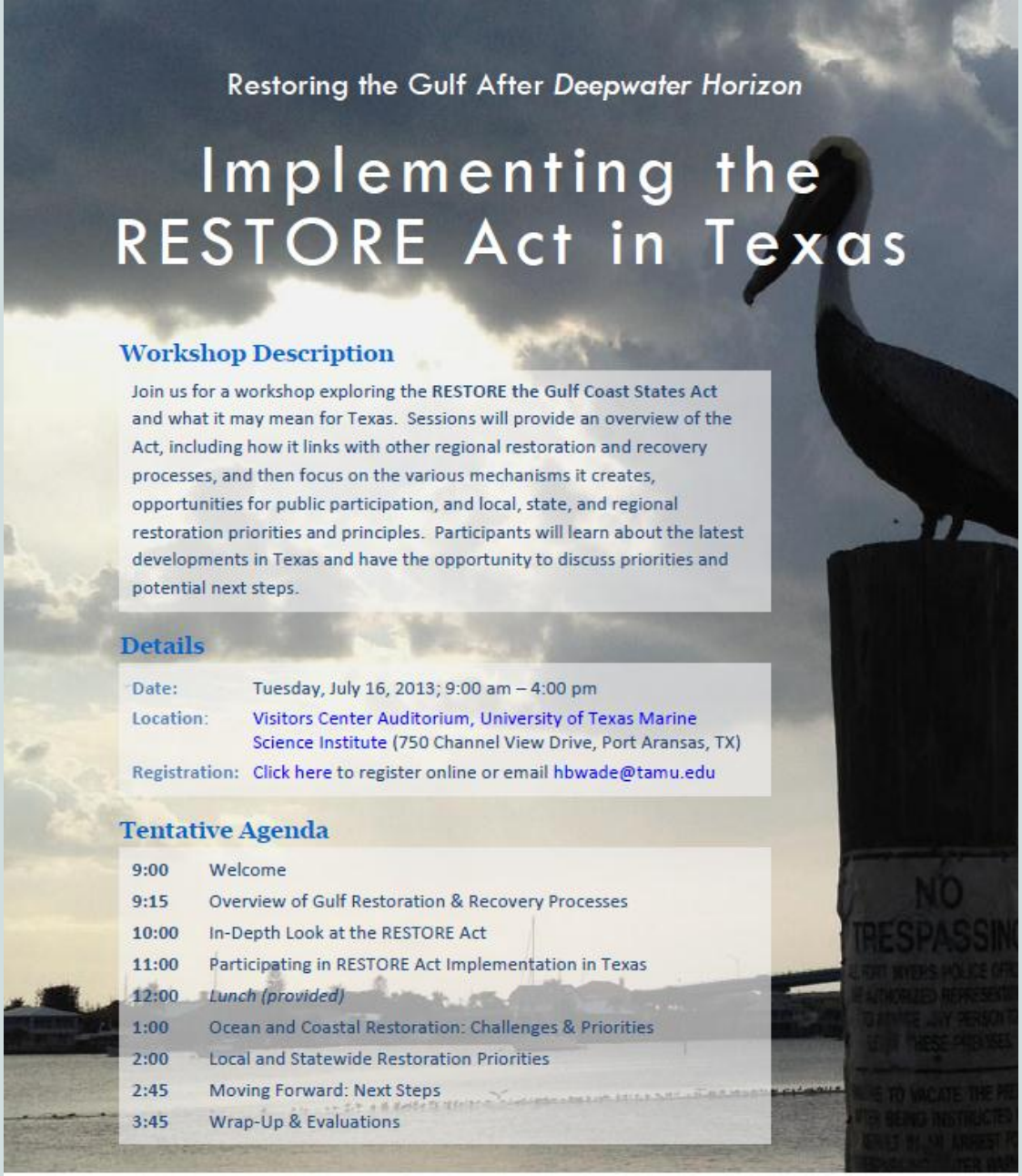
Develop shared systems learning among the local stakeholders and scientists for construction of a system dynamics model.

Mediated Modeling



Tuesday, JULY 16

9:00am - 4:00pm

UTMSI Auditorium

750 Channel View Dr.
Port Aransas, TX 78373

Questions?

Paulami Banerjee – Texas A&M University College Station

Kimberly Bittler – University of Texas Marine Science Institute

Catherine Buchalski – University of New Hampshire

Dr. Ed Buskey – Mission-Aransas NERR

Dr. Zack Darnell – Mission-Aransas NERR

Dr. Ken Dunton – University of Texas Marine Science Institute

Dr. Bill Grant – Texas A&M University College Station

Kristin Hicks – Mission-Aransas NERR

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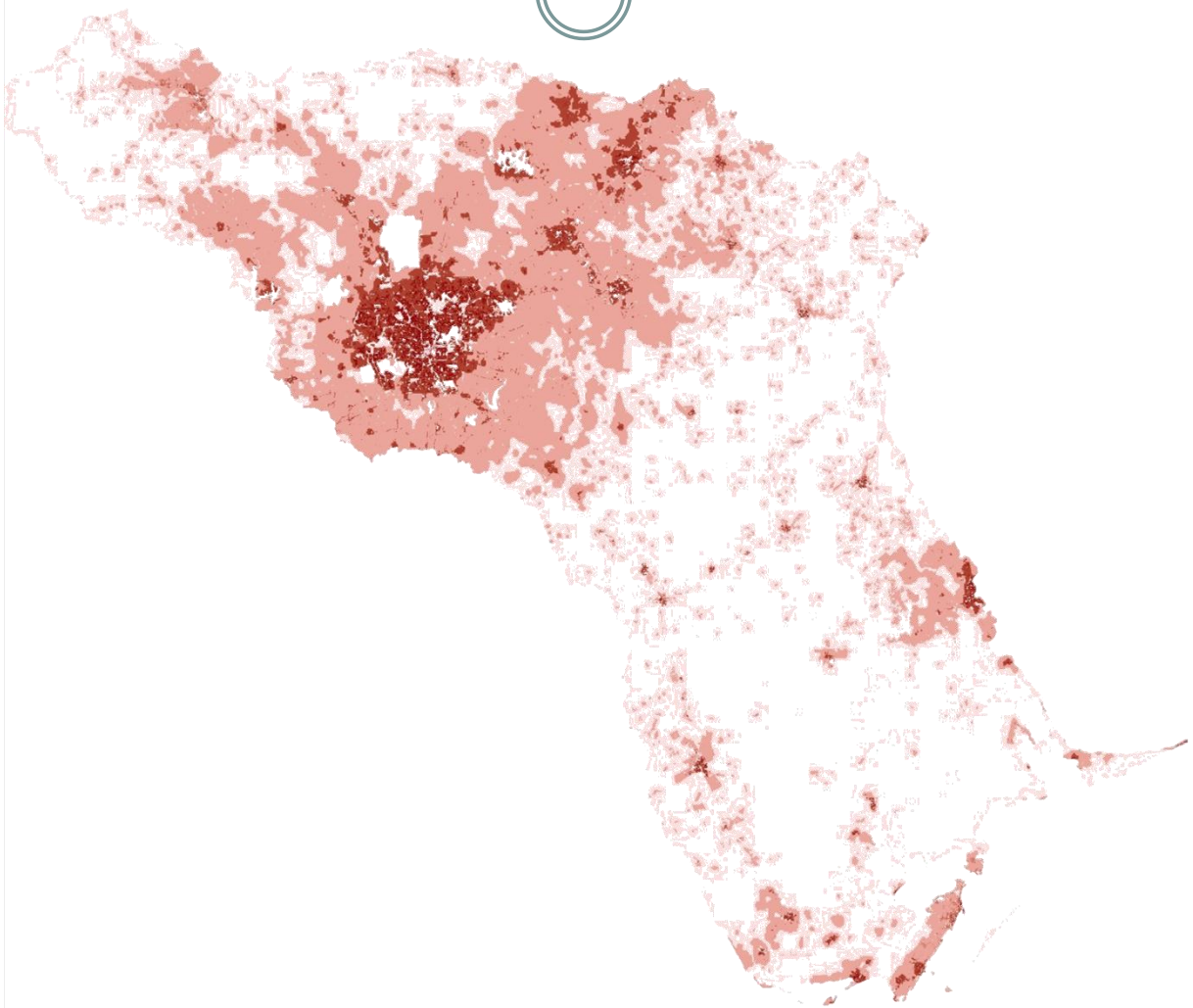
Dr. Lindsay Scheef – Mission-Aransas NERR

NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM SCIENCE COLLABORATIVE

This project is funded by the National Estuarine Research Reserve System Science Collaborative, a partnership of the National Oceanic and Atmospheric Administration and the University of New Hampshire.

NATIONAL ESTUARINE
RESEARCH RESERVE SYSTEM
SCIENCE COLLABORATIVE

People Per Acre



Future Land Use

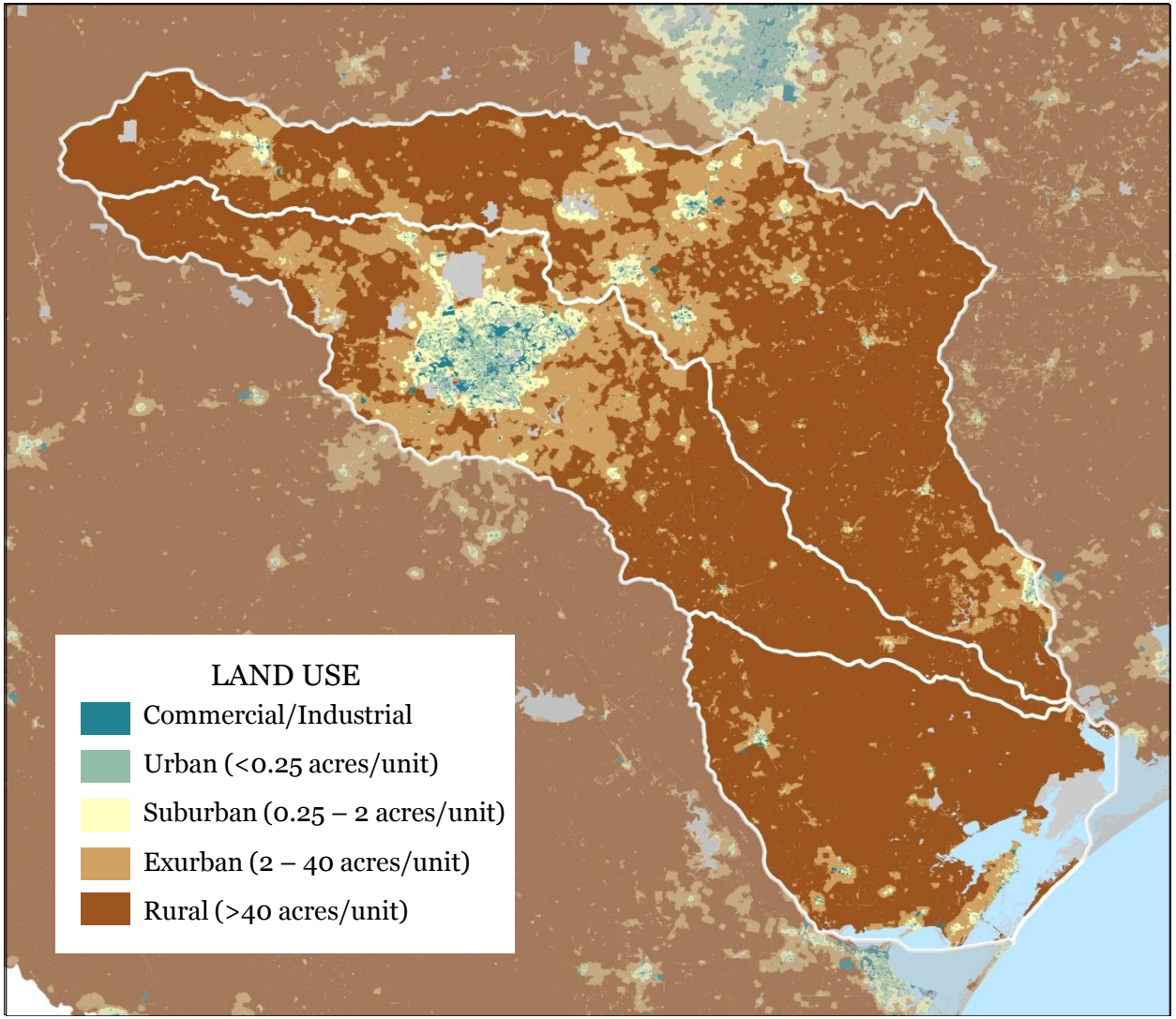
This scenario consists of a low population projection and a slightly compact development pattern, which results in the least altered landscape for most areas of the U.S..

B1: Rapid social development in developing regions.

Population rises rapidly until mid-century, then falls below replacement levels.

Fertility and average U.S. household size decrease.

Domestic migration is low, but net international migration is high.



ICLUS: INTEGRATED CLIMATE AND LAND USE SCENARIOS

Future Land Use

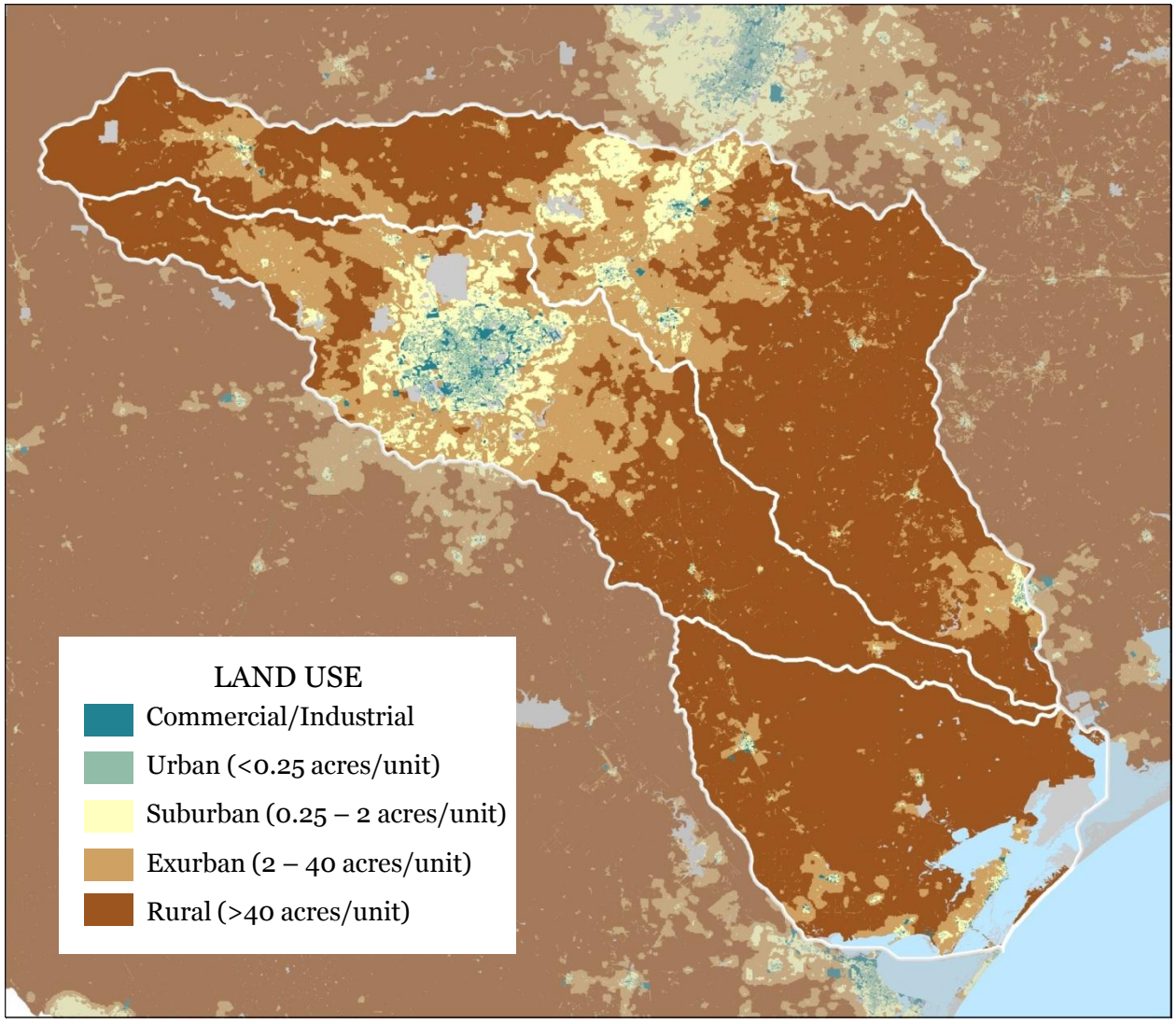
This is the highest ICLUS population projection and for most areas in the U.S. represents a "worst case" pattern of development.

A2: Slower rate of economic growth.

Restricted flow of people and ideas across regions.

Fertility and average U.S. household size increase.

Domestic migration is high, but net international migration is moderate.



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