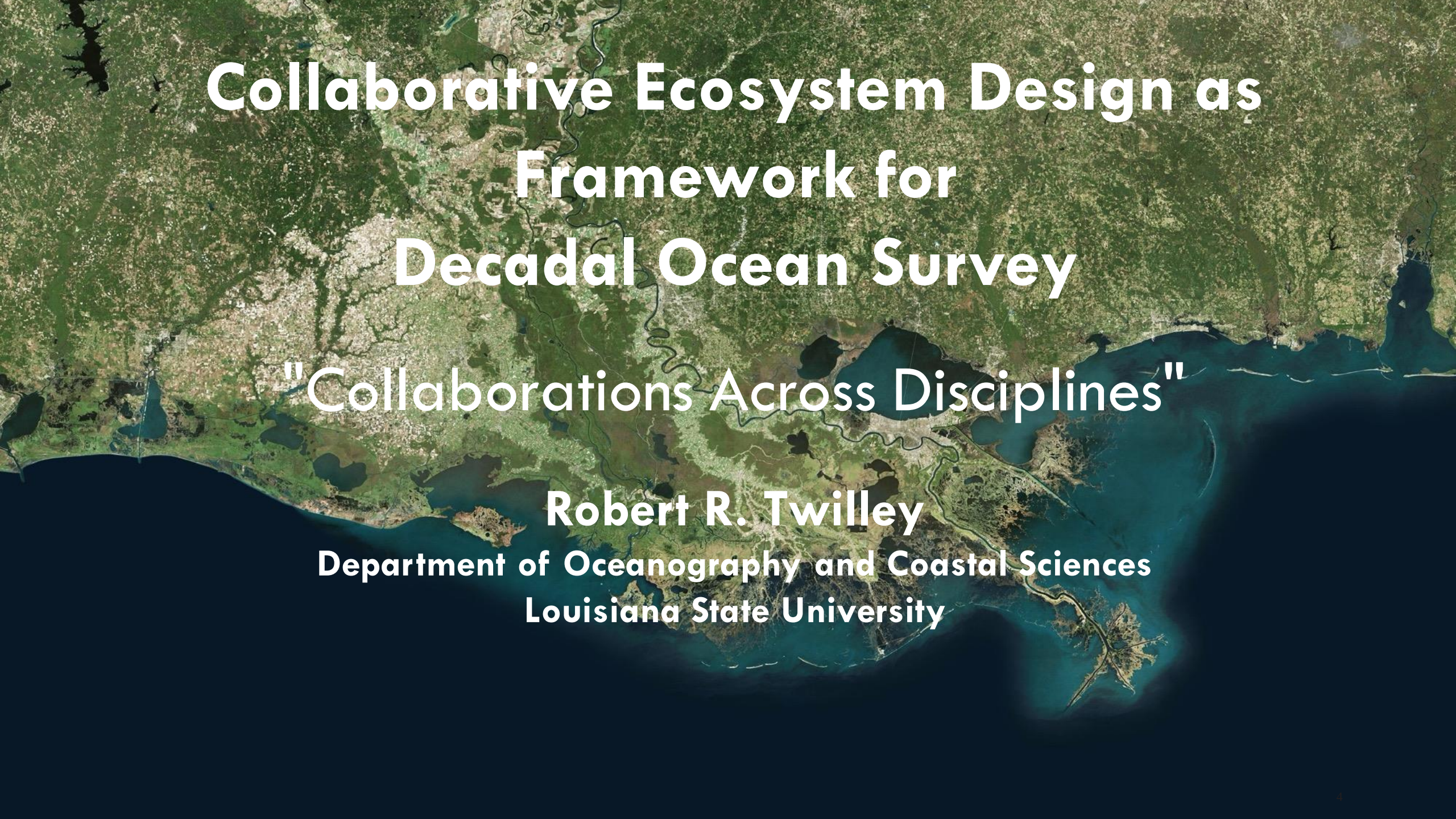


Collaborative Ecosystem Design as Framework for Decadal Ocean Survey

"Collaborations Across Disciplines"

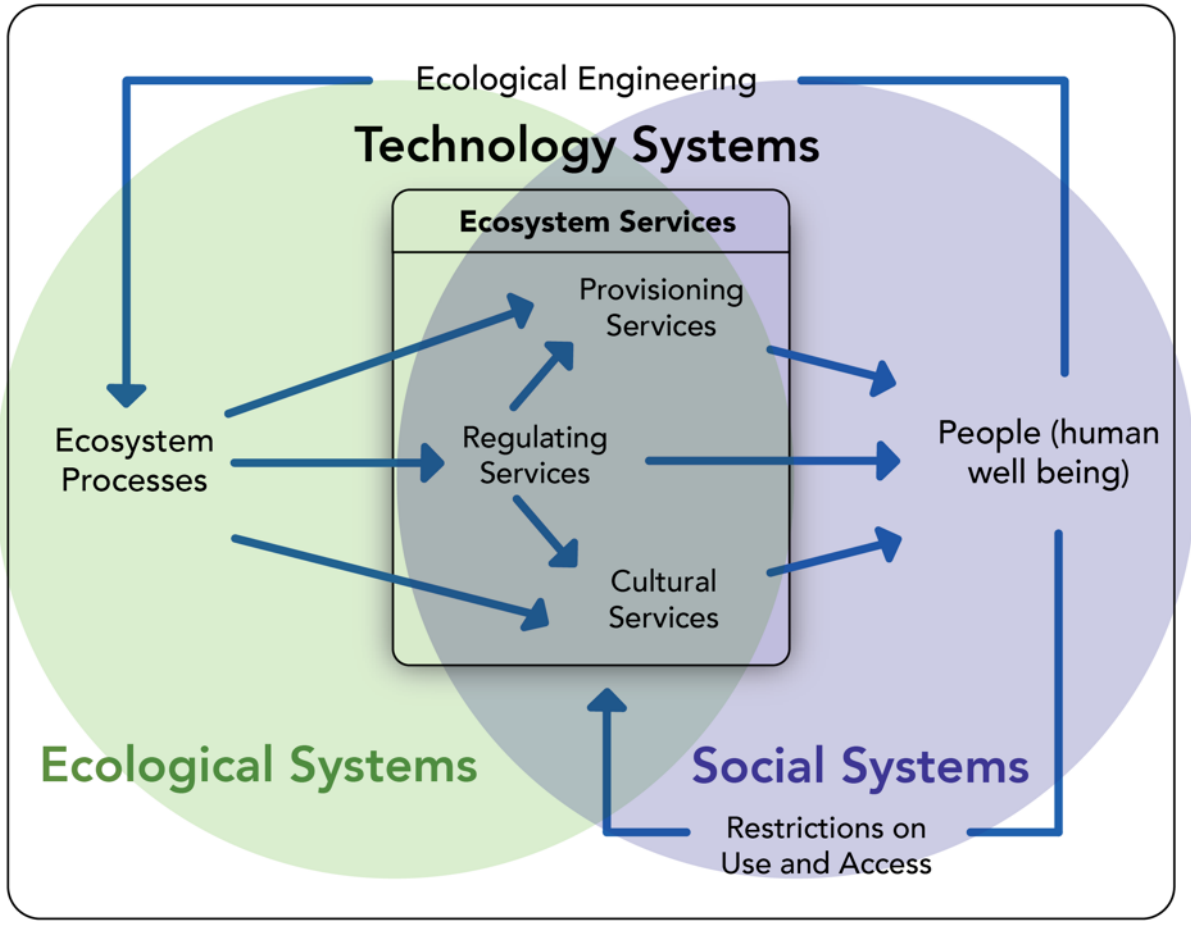
Robert R. Twilley
Department of Oceanography and Coastal Sciences
Louisiana State University

SETS: Social – Environmental – Technology Systems

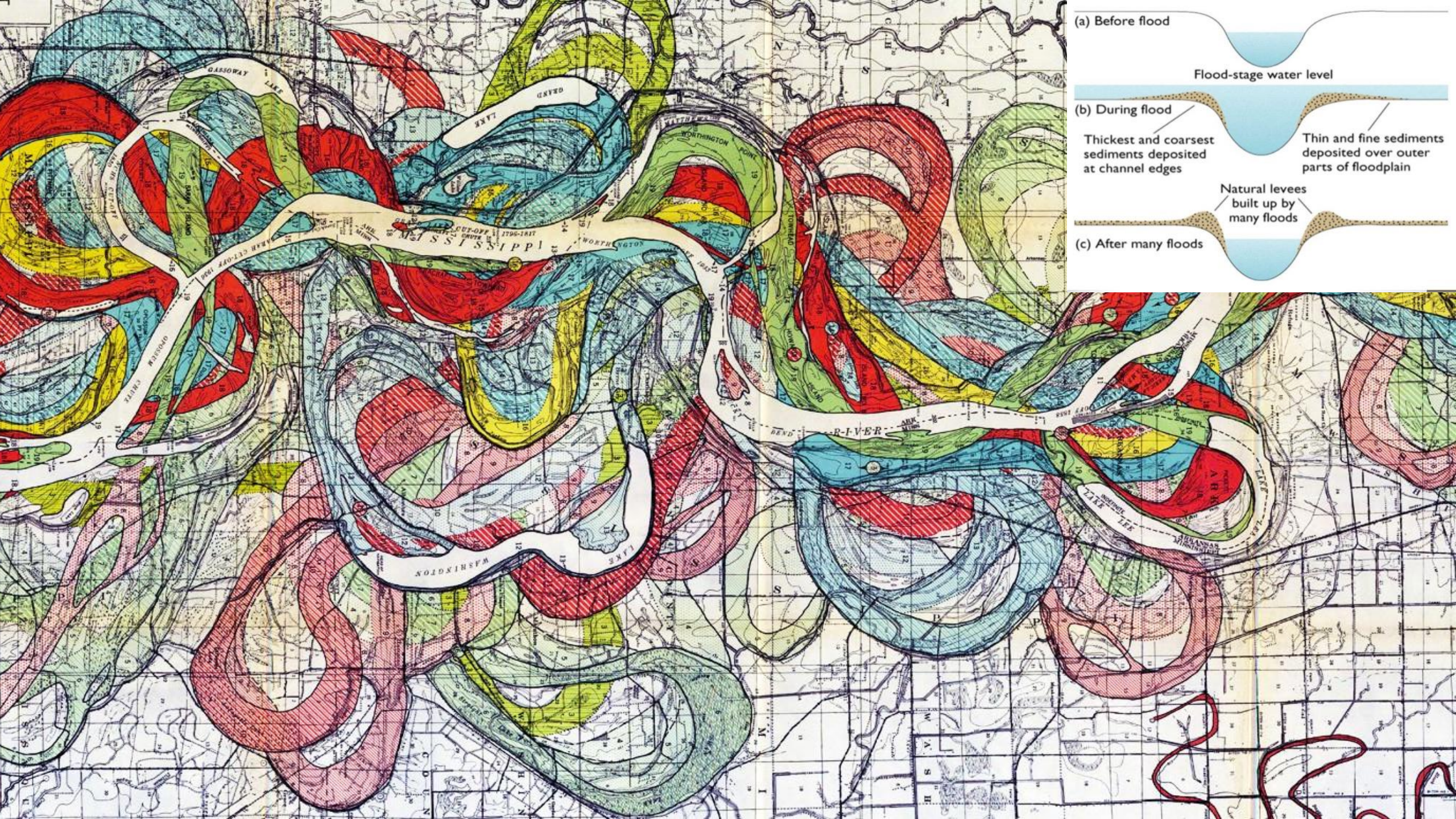
1. ***"As society's energy flow increases, it has become more and more influential on the <u>design of ecosystems</u>, and it becomes more and more necessary that society provide a reasonable system coupling nature with it's culture." (HT Odum, 1974 –'The Network Nightmare').***

(2) To design is to devise courses of action aimed at changing existing situations into <u>preferred</u> ones. (Herbert Simon)

Ecosystem Services
Link Social and Ecological Systems



Modified from: Bennett Peterson, Gordon 2009 Ecological Letters


(a) Before flood
Flood-stage water level
(b) During flood
Thickest and coarsest sediments deposited at channel edges
Thin and fine sediments deposited over outer parts of floodplain
Natural levees built up by many floods
(c) After many floods

Co-evolution of natural and social systems around conflict

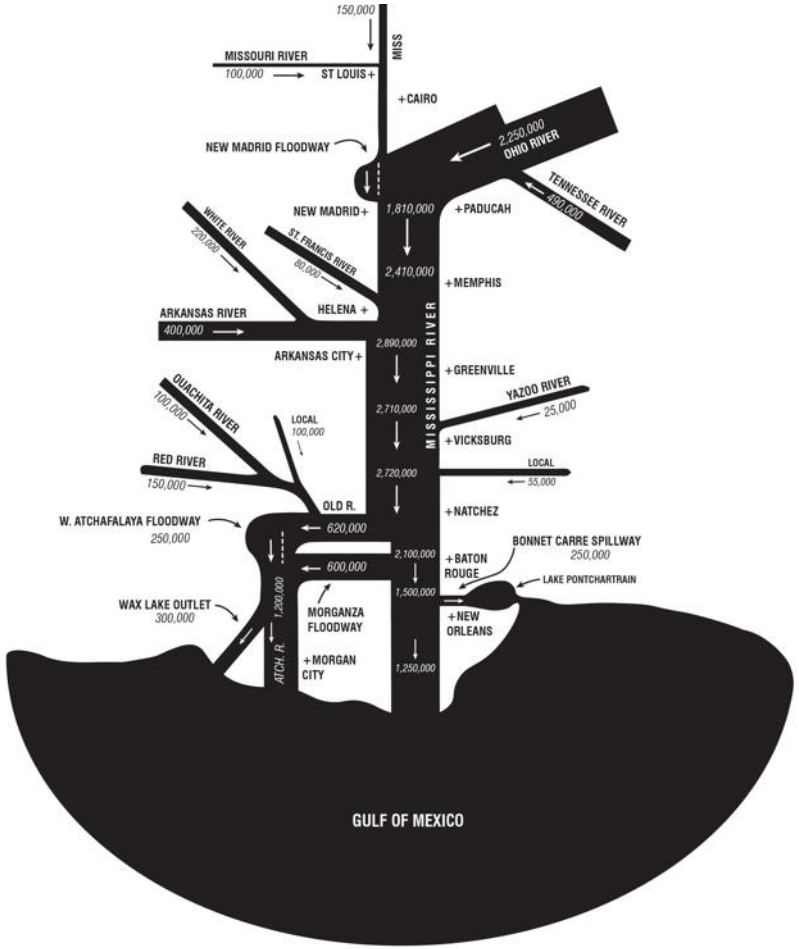
Persac, 1858, "Norman's Chart of the Lower Mississippi River"

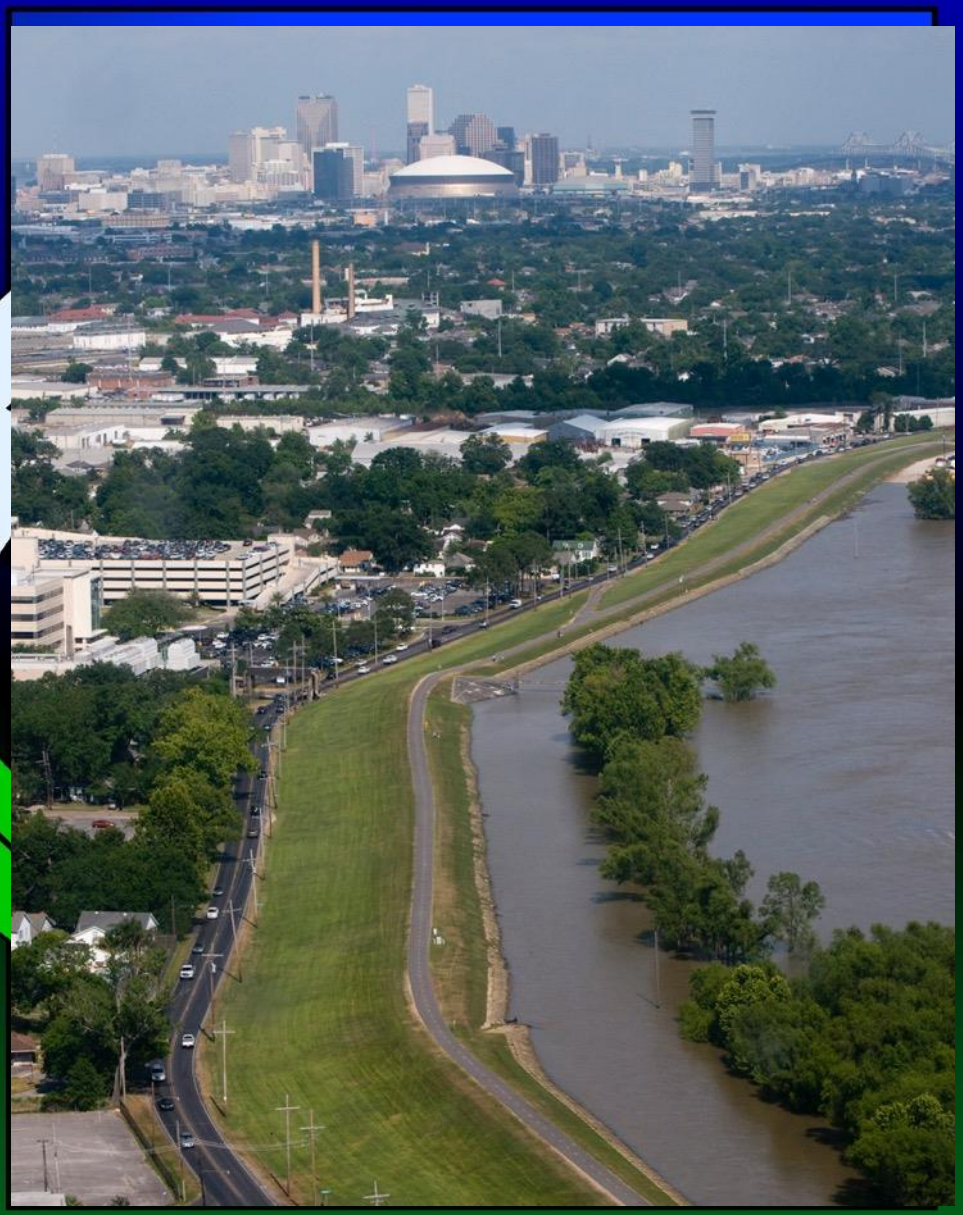
potential →

connectedness →

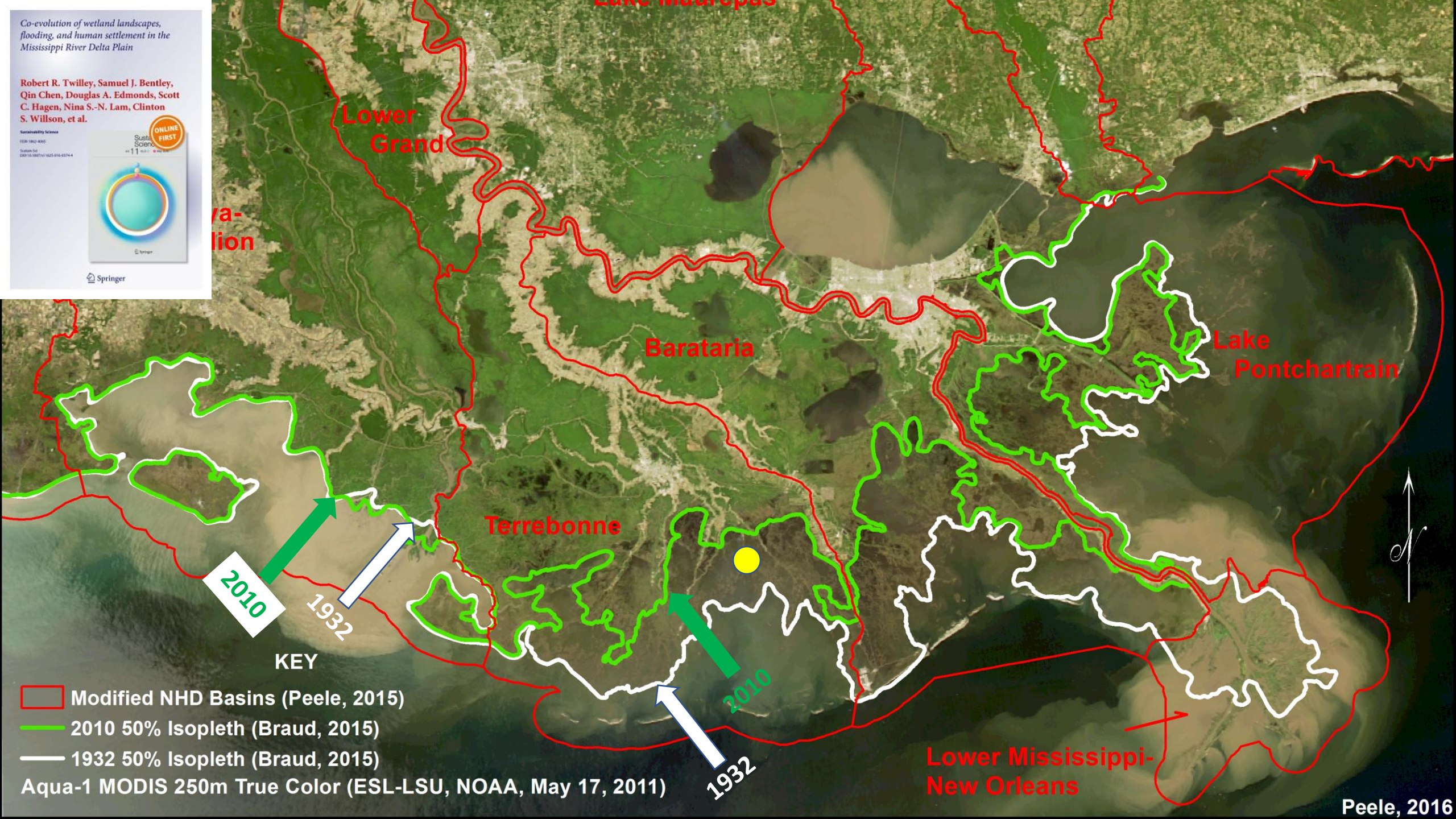
potential →

Project Design Flood





connectedness →


Co-evolution of wetland landscapes, flooding, and human settlement in the Mississippi River Delta Plain
Robert R. Twilley, Samuel J. Bentley, Qin Chen, Douglas A. Edmonds, Scott C. Hagen, Nina S.-N. Lam, Clinton S. Willson, et al.
ONLINE FIRST
Springer
Lower Grand
Barataria
Terrebonne
Lake Pontchartrain
Lower Mississippi-New Orleans
2010
1932
2010
1932
KEY
Modified NHD Basins (Peele, 2015)
2010 50% Isopleth (Braud, 2015)
1932 50% Isopleth (Braud, 2015)
Aqua-1 MODIS 250m True Color (ESL-LSU, NOAA, May 17, 2011)
Peele, 2016

A Louisiana Tribe Is Now Officially A Community Of Climate Refugees

Since the 1950s, the Native American tribe has lost 98 percent of the land it calls home.

02/12/2016 08:19 am ET | **Updated** Feb 15, 2016

7.6 K

SCREENSHOT/GOOG

A map showing
50 years.

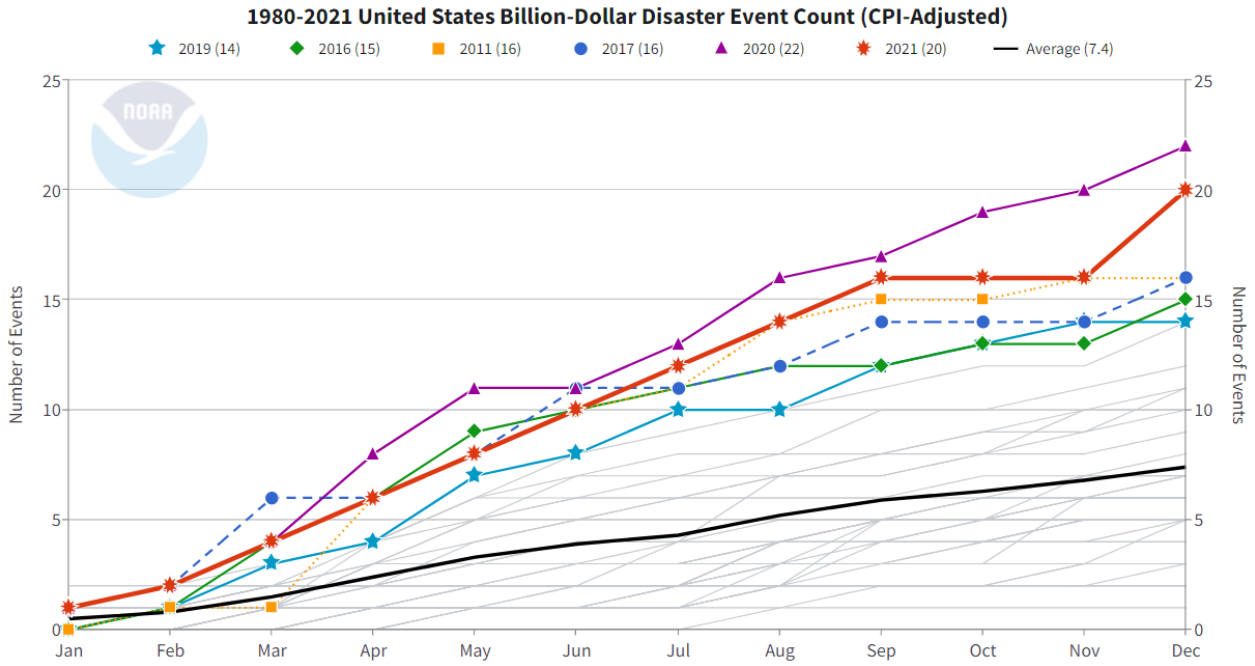
daily advertiser

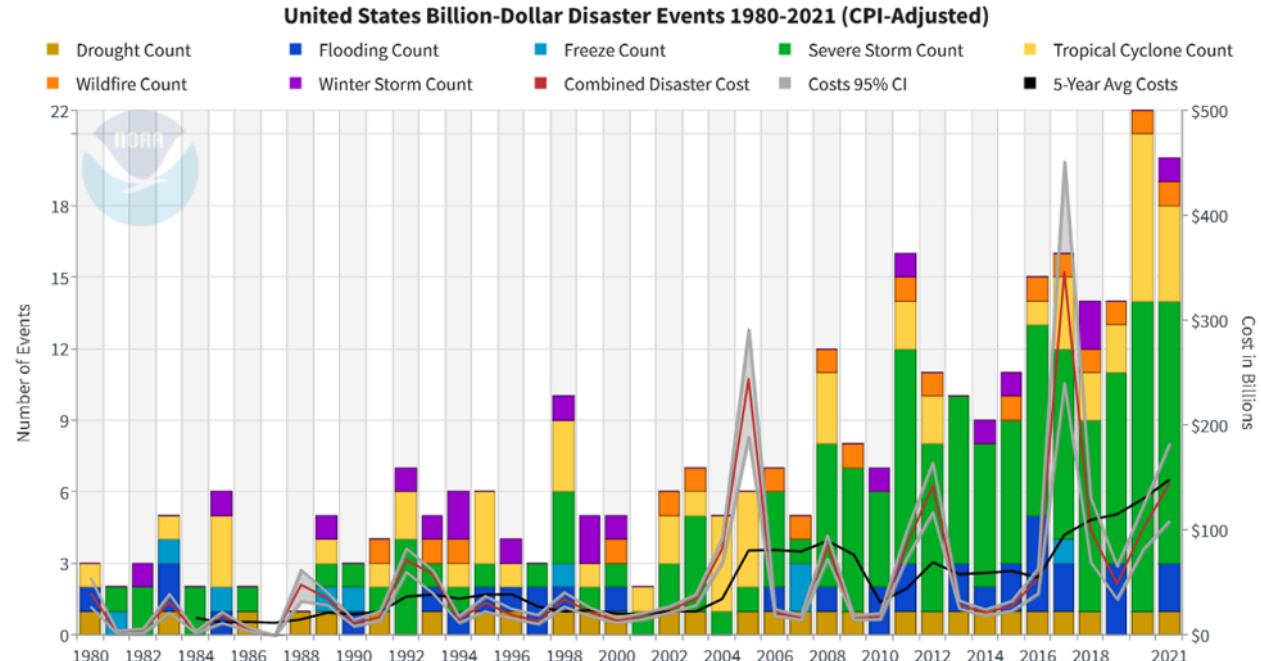
Sign In

CLIMATE COLLISION

As Gulf swallows Louisiana island, displaced tribe fears the future

Andrew J. Yawn, The American South
Updated 9:35 a.m. CST Feb. 27, 2020


1980-2021 United States Billion-Dollar Disaster Event Count (CPI-Adjusted)
2019 (14)
2016 (15)
2011 (16)
2017 (16)
2020 (22)
2021 (20)
Average (7.4)
Number of Events
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


United States Billion-Dollar Disaster Events 1980-2021 (CPI-Adjusted)
Drought Count
Flooding Count
Freeze Count
Severe Storm Count
Tropical Cyclone Count
Wildfire Count
Winter Storm Count
Combined Disaster Cost
Costs 95% CI
5-Year Avg Costs
Number of Events
Cost in Billions

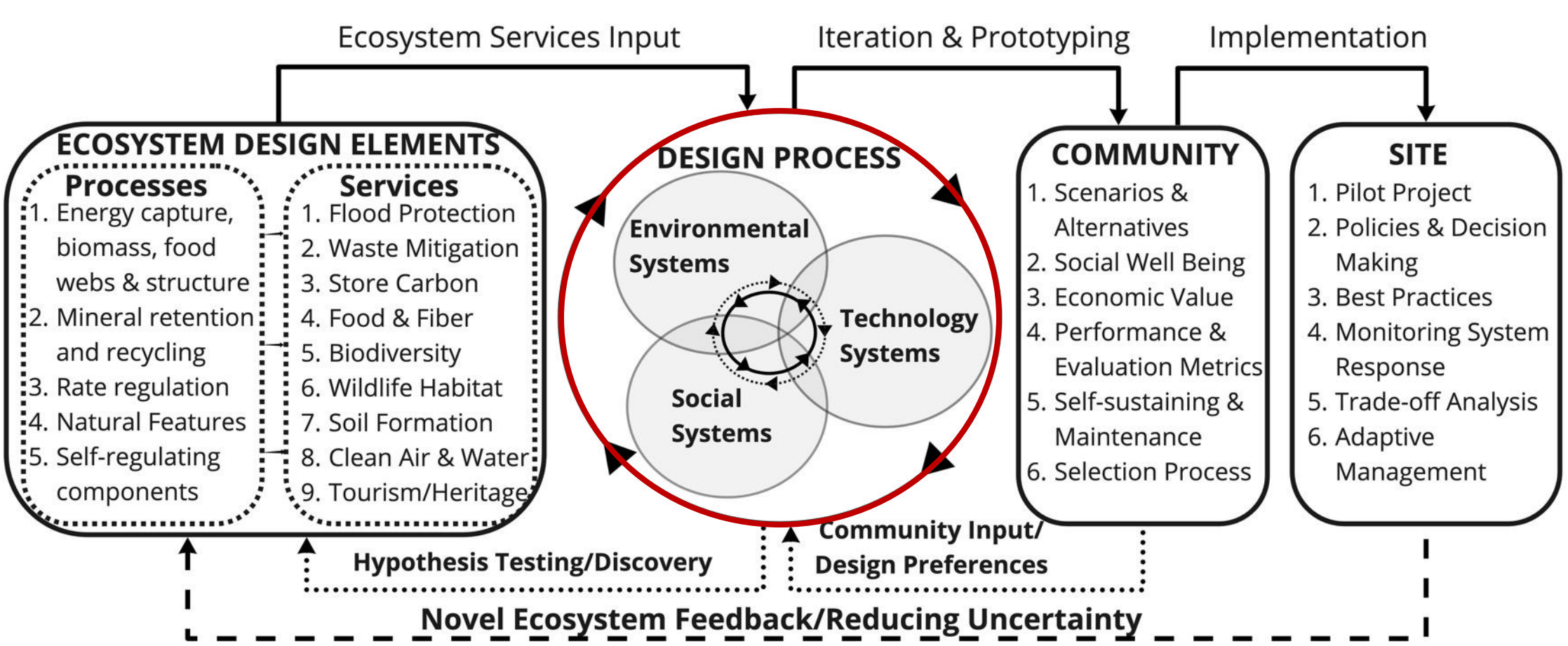
National Centers for Environmental Information
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Billion-Dollar Weather and Climate Disasters
Search Monitoring Products
Home / Climate Monitoring / Billions
2nd Quarter Release: Mon, 11 Jul 2022, 11:00 AM EDT
Overview
Disaster and Risk Mapping
Time Series
Climatology
Summary Stats
Events
FAQ
References
U.S. 2021 Billion-Dollar Weather and Climate Disasters
Drought/Heat Wave
Flooding
Hail
Hurricane
Tornado Outbreak
Severe Weather
Wildfire
Winter Storm/Cold Wave
Western Wildfires 2021
Central Severe Weather July 8–11
Midwest Derecho and Tornado Outbreak December 15
North Central Severe Weather August 10–13
Central Severe Weather June 24–26
Ohio Valley Hail Storms June 17–18
Southeast, Central Tornado Outbreak December 10
Eastern Severe Weather March 27–28
Southeast Tornadoes and Severe Weather March 24–25
Tropical Storm Fred August 16–18
Tropical Storm Elsa July 7–9
California Flooding and Severe Weather January 24–29
Western Drought and Heat Wave 2021
Texas and Oklahoma Severe Weather April 27–28
Texas Hail Storms April 12–15
Southern Tornadoes and Southeast Severe Weather May 2–4
Northwest, Central, Eastern Winter Storm and Cold Wave February 10–19
Hurricane Nicholas September 14–18
Louisiana Flooding May 17–18
Hurricane Ida August 29–September 1
This map denotes the approximate location for each of the 20 separate billion-dollar weather and climate disasters that impacted the United States in 2021
All Disasters
Drought
Flooding
Freeze
Severe Storm
Tropical Cyclone
Wildfire
Winter Storm

New Integrated Planning Frameworks - 2007

1. Build Institutional Design Capacity

potential →

connectedness →



Concept of Ecosystem Design

- Integrating ecosystem design elements using a design process that provides value to both natural and social systems using natural, nature-based and built infrastructure that promotes social well being.
- The "design process" carries the connotations of intention, precision, and preference.

Ecosystem Design

2. Participate in Integrated Design Competitions

FARROC
FOR A RESILIENT ROCKAWAY

FUTURE GROUND

LIVING WITH WATER

changing course

navigating the future of the Lower Mississippi River Delta

CERF2021 26TH BIENNIAL CONFERENCE https://cerfcompetition.vaseagrant.org/

CERF 2021 Design Competition:

COASTAL VIRGINIA

The CERF 2021 Design Competition is a forward-facing initiative to inspire students and

Hampton, Virginia

Six neighborhoods in Hampton, which are linked geographically but have different levels of socioeconomic status, different built environments, and different priorities and vulnerabilities.

CERF2021 26TH BIENNIAL CONFERENC

CERF AT 50: CELEBRATING OUR PAST, CHART

1–4 and 8–11 Nove

CERF 2021 Design Competiti d

The CERF 2021 Design Competiti to inspire students and faculty across disciplines to work together and innovative strategies to make our coastal environments more r pacts of climate change. The Design Competition is

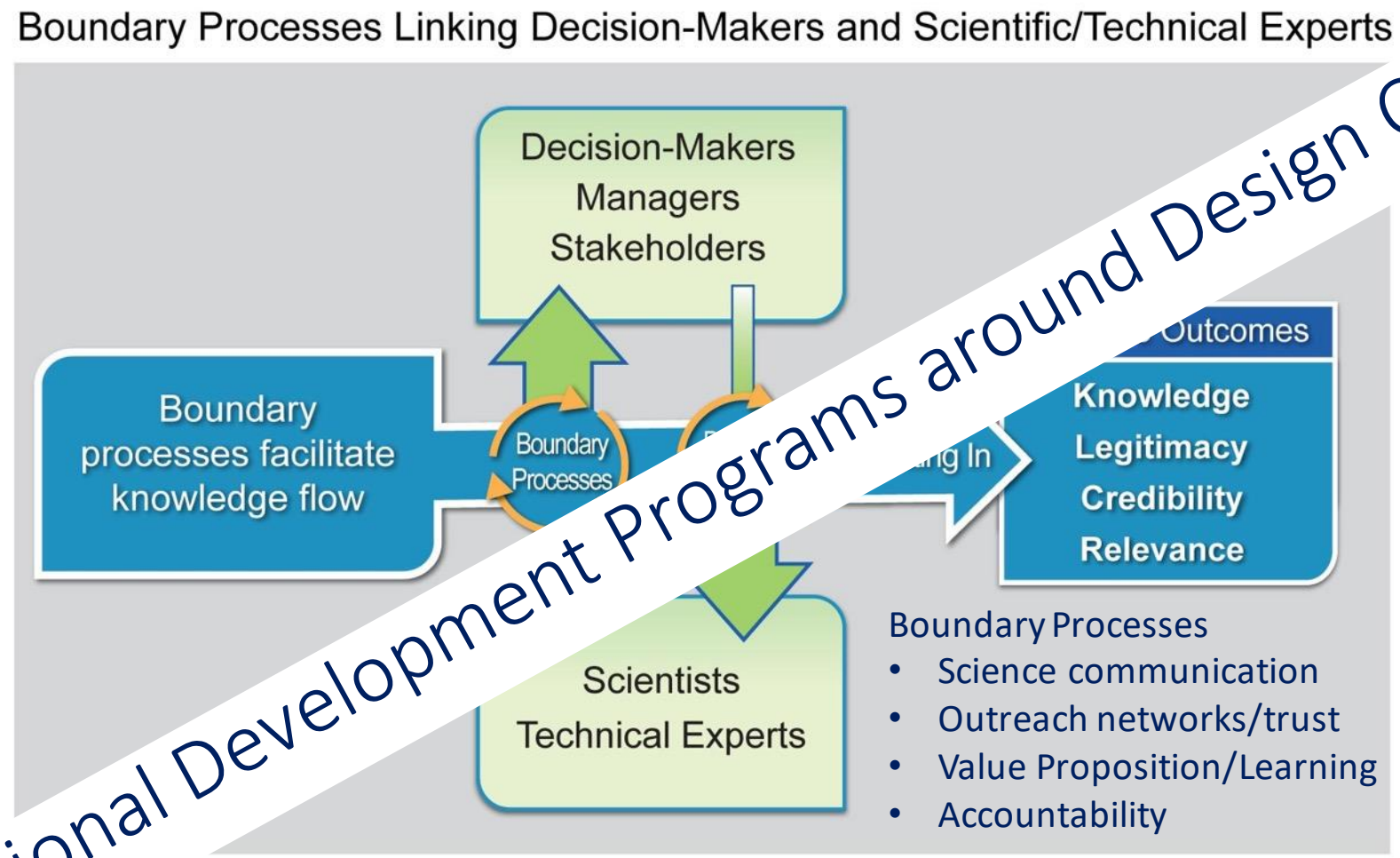
Design comp ed on Monday, 8 November, during the CERF 2021 virtual confere ent of the awards and a reception.

	Event
0 AM – 10:00 AM ET 5:00 AM – 7:00 AM PT	Workshops
10:00 AM – 11:30 AM ET 7:00 AM – 8:30 AM PT	Plenary 2
11:30 AM – 1:00 PM ET 8:30 AM – 10:00 AM PT	Break and Mentoring Booth
1:00 PM – 2:30 PM ET 10:00 AM – 11:30 AM PT	Oral Sessions
2:30 PM – 6:30 PM ET 11:30 AM – 3:30 PM PT	**Workshops & Design Competition**
7:00 PM – 8:30 PM ET 4:00 PM – 5:30 PM PT	**Announcement of Design Competition Awards and Reception**

View Complete Schedule-at-a-Glance

3. Develop Design Competitions within Science Societies

COMMUNITY ENGAGEMENT – TECHNICAL EXPERTS - LEADERSH



4. Professional Development Programs around Design Challenges

Decision-Makers, Managers and Stakeholders should be informed by the best scientific knowledge available.

Sea Grant – Connecting University Content to SERVE Coastal Communities

"NEW Gen Ed science class -3 credit hours"

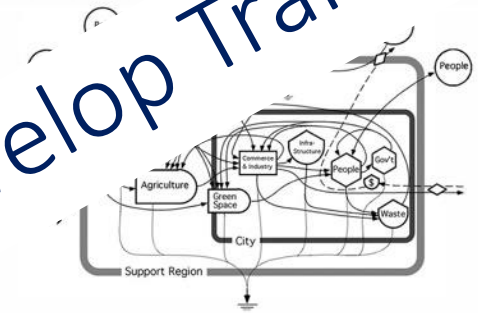
SPRING 2020
Tuesdays & Thursdays 3-4:30pm

Coastal Systems Ecology & Ecosystem Design - OCS 2050

This is the first course in a series of requirements in the proposed Delta Research Minor.

All students are eligible to take this class!

Fundamental principles of systems ecology to instruct "systems thinking" linking natural and built infrastructure, processes, and ecosystem dynamics with focus on deltaic coasts; creating innovative methods to frame th complexity of designing more resilient coastal ec (ecosystem design).



For more information contact Dr. Robert Twilley | rtwilley@lsu.edu | Ph. (225)-578-6445

LSU | Coastal Sustainability Studi

2022 Summer Internship Program

WHO: Graduate students and undergraduate seniors from a range of disciplines (see program description):

HOW: To apply, please email no later than March 15, 2022, the following to **sandyparfait@lsu.edu**:

- 2-page Letter of Interest outlining who you are and why you're interested in this Summer Internship.
- Resume demonstrating perform in your area of study. Desi may include three Engineering may in

ay in-

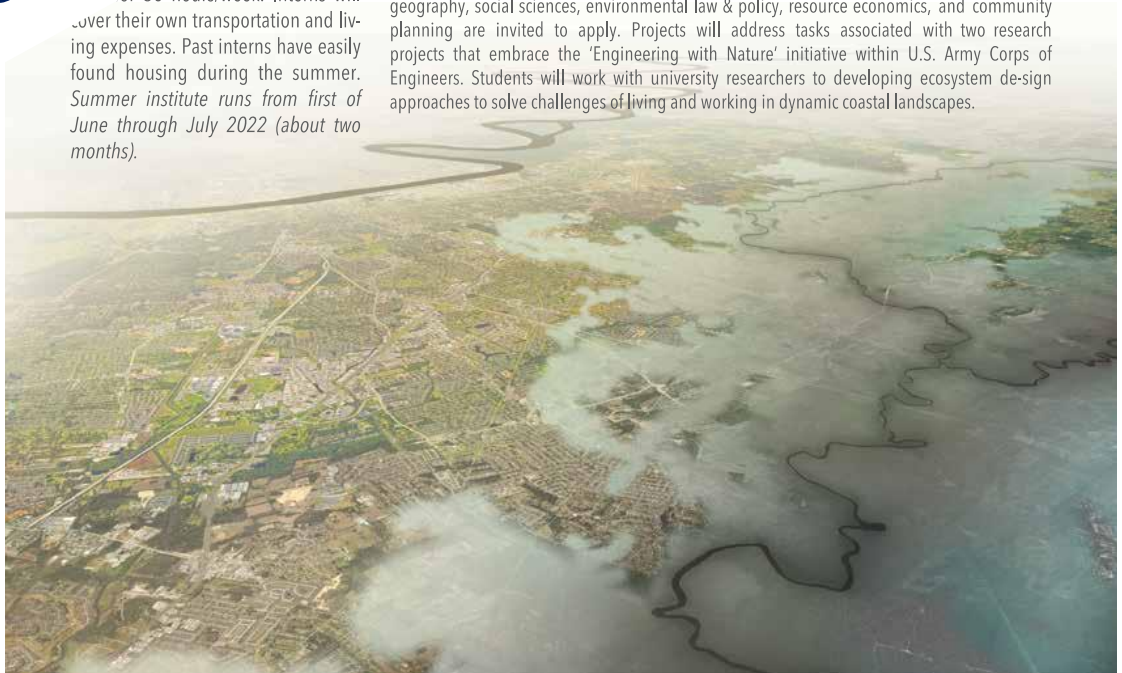
.. Compensation is $20/ r 30 hours/week. Interns will over their own transportation and living expenses. Past interns have easily found housing during the summer. *Summer institute runs from first of June through July 2022 (about two months).*

Situated at the intersection of the Mississippi River and the Gul one of the most complex, and culturally rich environmen most vulnerable. The Mississippi River watershed in es, draining over 40% of the United States. Th oast, which is vulnerable to climate change. I rtal issues. Additionally, The region faces e ges that require multi-disciplinary collabora

The developm economic and social values for the Mississi coastal and riverine communities around th its geology and geography, Louisiana is a living esign, innovative planning, and community collabora-

ans-disciplinary approaches, the LSU Coastal Sustainability Studio (CSS) oastal Resiliency (CCR) engage scientists, engineers, and designers to study is- ttlement, coastal restoration, flood protection, and economic development to develop novative solutions for coastal communities. This focus on ecosystem design provides a sound basis to build adaptation into sustainable land-use planning, coastal protection, and education.

The LSU Coastal Sustainability Studio and Center for Coastal Resiliency will host a 2022 summer internship program in their highly collaborative, interdisciplinary studio environment situated at the Water Campus in Baton Rouge. Qualified candidates with interests as varied as geoscience, systems ecology, civil & environmental engineering, architecture, landscape architecture, geography, social sciences, environmental law & policy, resource economics, and community planning are invited to apply. Projects will address tasks associated with two research projects that embrace the 'Engineering with Nature' initiative within U.S. Army Corps of Engineers. Students will work with university researchers to developing ecosystem de-sign approaches to solve challenges of living and working in dynamic coastal landscapes.

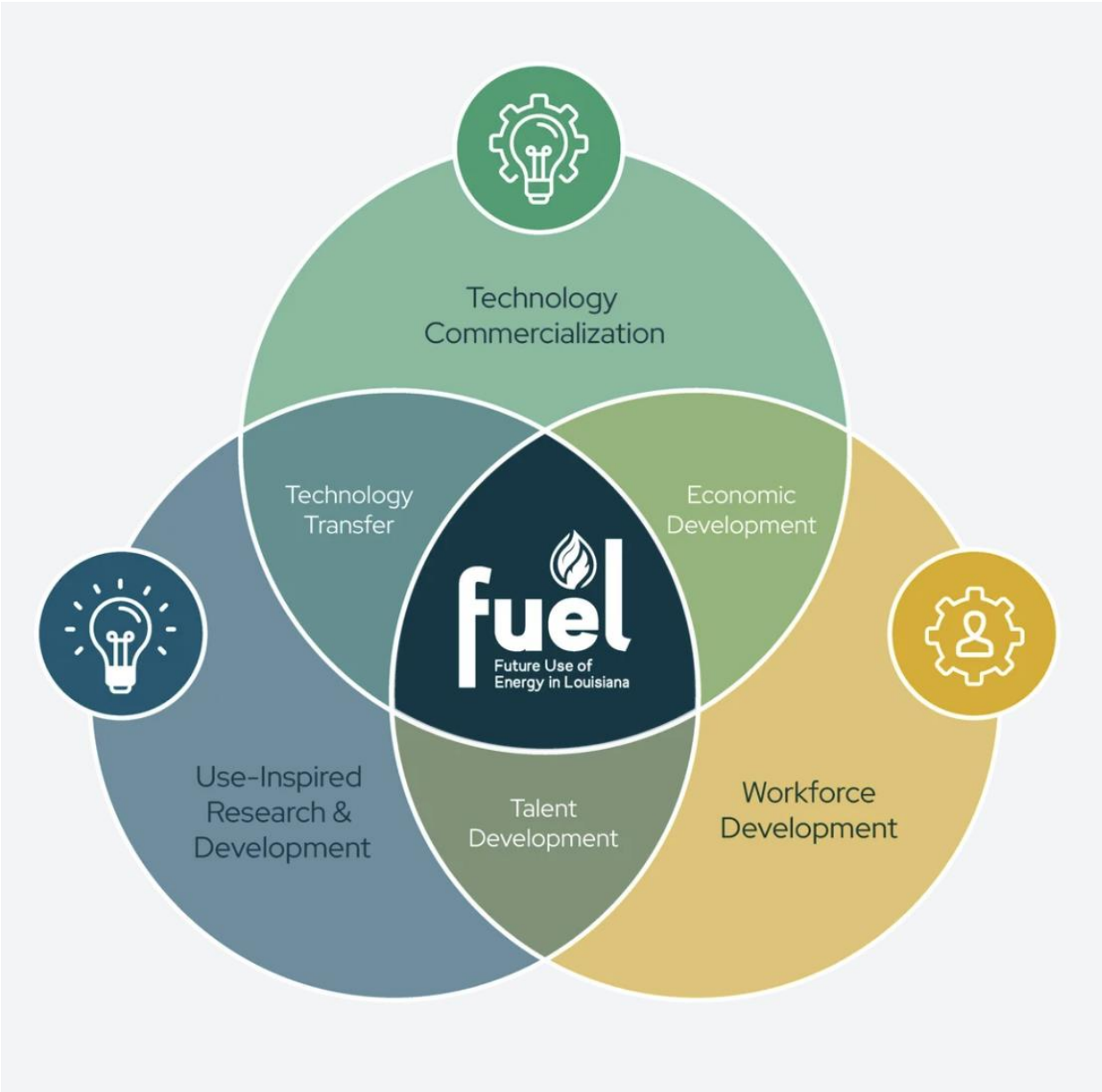


5. Develop Training that Integrates Design Approaches

fuel

Future Use of Energy in Louisiana

NSF | LSU | fuel



USE-INSPIRED RESEARCH AND DEVELOPMENT

Enabling initial discoveries with the needs of industry and Louisiana in mind

FUEL aims to grow collaboration across various industries, fostering faster and more extensive use-inspired research and development for innovative carbon management in Louisiana and across the globe. FUEL will serve as an engine for the generation of new ideas, projects, and knowledge by bringing together experts across disciplines.

WORKFORCE DEVELOPMENT

Developing and attracting talent for entrepreneurship that creates jobs

At all levels, FUEL will support the creation and implementation of workforce development programs that cultivate a diverse, skilled, and adaptable workforce that is prepared to support and share in the benefits of the energy transition.

TECHNOLOGY COMMERCIALIZATION

Converting research into commercial applications and practical solutions

FUEL helps turn research into practical innovation by establishing a strong foundation for continuous collaboration and skill development. FUEL will use diverse strategies, including a comprehensive incubator, to provide extensive training in commercialization and entrepreneurship, fostering broad and impactful outcomes.

EDUCATION

GOVERNMENT AND COMMUNITY

INDUSTRY AND CAPITAL