

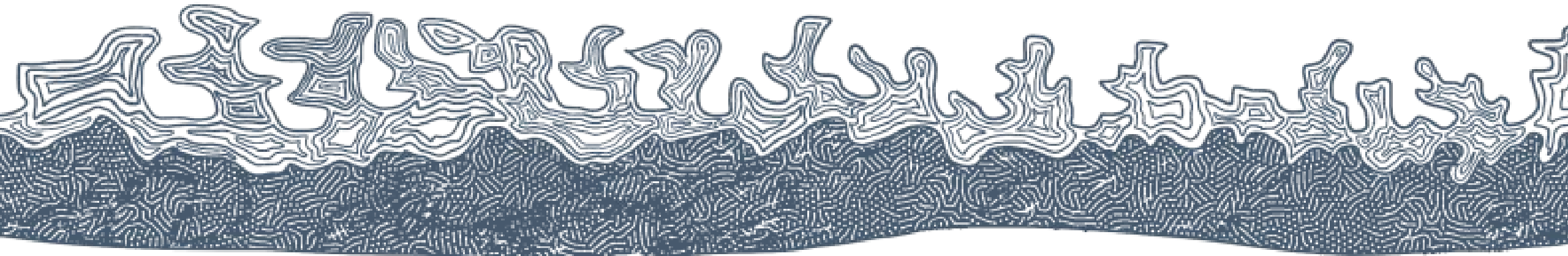


UNIVERSITY OF  
**GEORGIA**

*Institute for Resilient  
Infrastructure Systems*

# *The Planet and People Need a Better Way: New Frontiers for Beneficial Use*

Dr. Todd S. Bridges  
College of Engineering  
University of Georgia

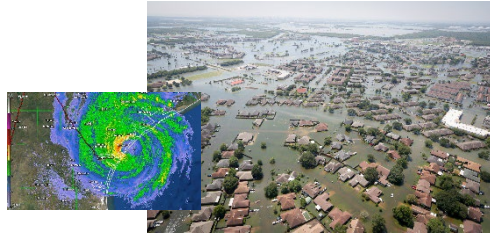


# A Planetary Crisis of Our Own Engineering

## Climate Change



Hurricane Katrina, 2005



Hurricane Harvey; landfall and Houston, 2017



Pollinator Declines

## Biodiversity Loss

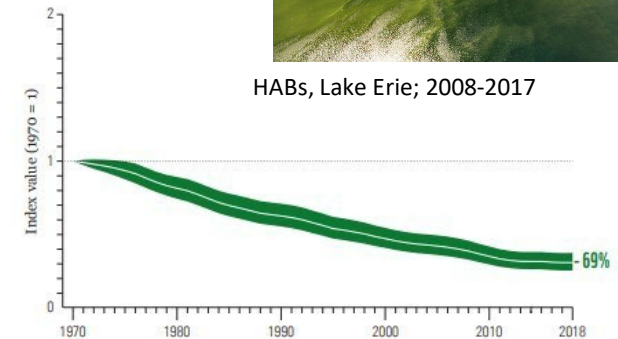


Red Knot

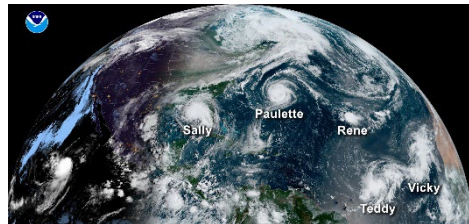


HABs, Lake Erie, 2008-2017

**Figure 3: The global Living Planet Index (1970 to 2018)**  
The average change in relative abundance of 31,821 populations, representing 5,230 species monitored across the globe, was a decline of 69%. The white line shows the index values and the shaded areas represent the statistical certainty surrounding the trend (95% statistical certainty, range 63% to 75%). Source: WWF/ZSL (2022)<sup>184</sup>.



**Key**  
█ Global Living Planet Index  
  Confidence limits



2020 record-setting storm season



Offutt AFB, 2019



NYC Skyline, June 7, 2023; Photo B. Bajuelos Castillo



Tulare Lake, CA, 2023

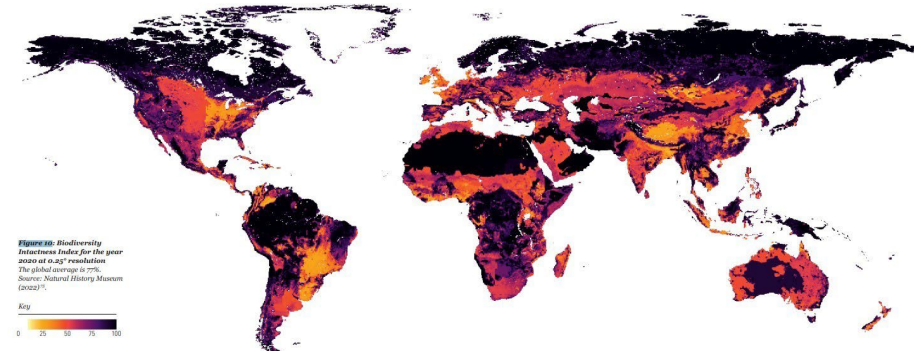
CRAIG KOHLRUSS



Lake Mead, 2022



Fort Nelson, British Columbia, June 3, 2023

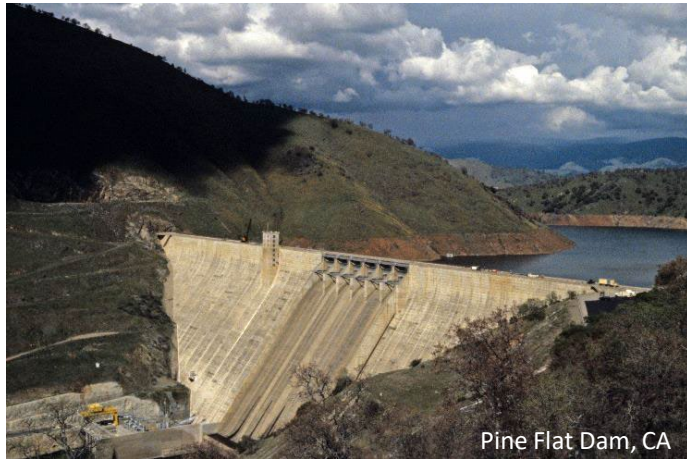


**Figure 10: Biodiversity Intactness Index for the year 2020 at 6.43° resolution**  
The global average is 77%. Source: Natural History Museum (2023)<sup>185</sup>.

**Key**  
█ 100  
█ 75  
█ 50  
█ 25  
█ 0

Biodiversity Intactness Index; WWF Living Planet Report 2022

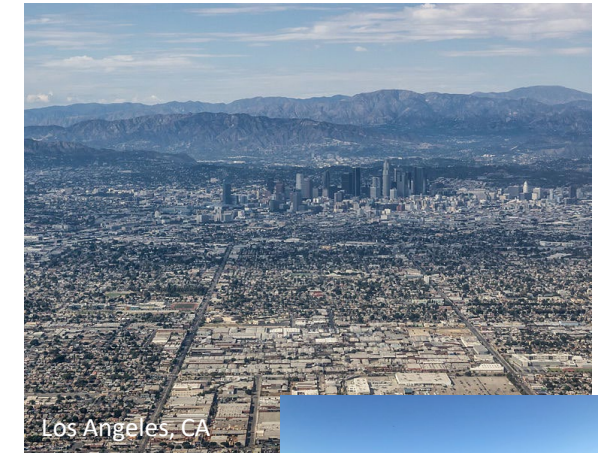
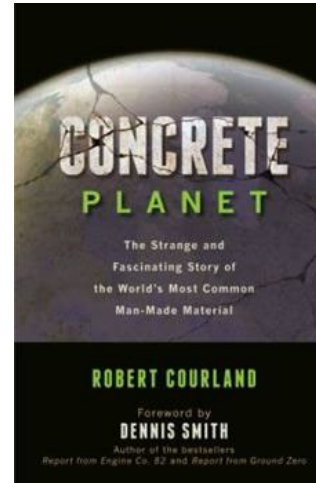
# Landscape Transformation



Pine Flat Dam, CA



Dardanelle Lock and Dam, Arkansas River



Los Angeles, CA



Los Angeles River

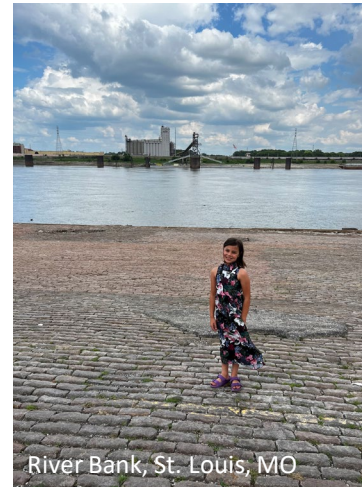
>90,000 dams in the US, impounding  
>600,000 miles of river



MS River levee near Cairo, IL

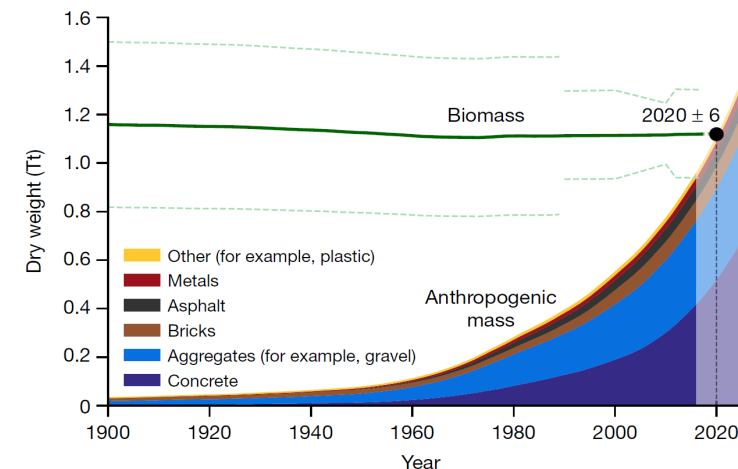


Levee at Dogtooth Bend



River Bank, St. Louis, MO

250,000 sq. miles of paved  
surface on the planet



Elhacham et al. 2020. Global human-made mass exceeds all living biomass. Nature 588:442-444

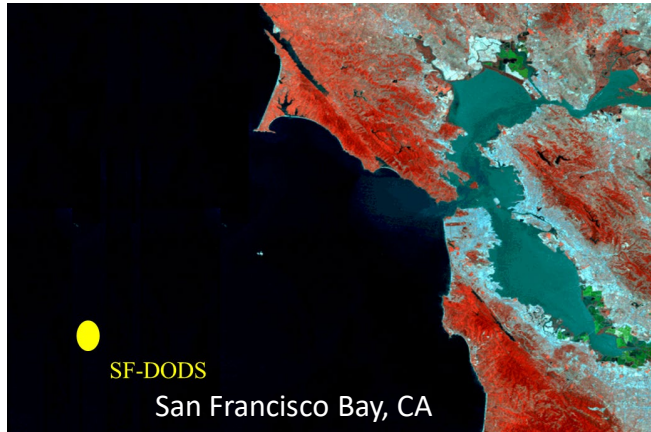
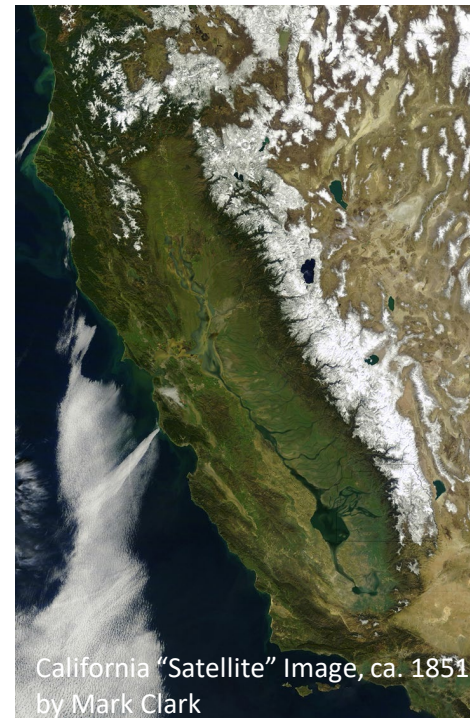
24,500 miles of levee in National Levee Database;

<https://levees.sec.usace.army.mil/#/>

>100,000 miles of levee total estimate for US;

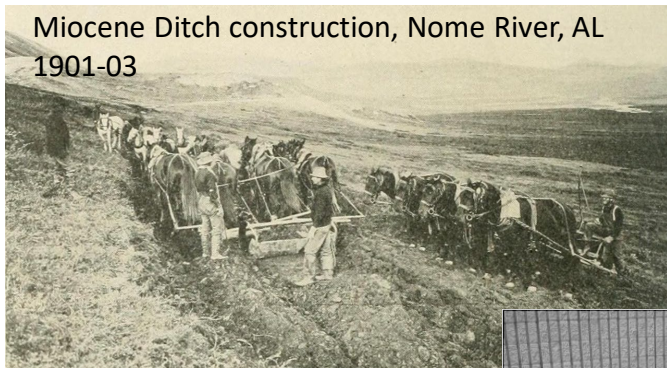
<https://eos.org/research-spotlights/algorithm-detects-thousands-of-missing-levees-from-u-s-database>

# The Story of US Wetlands



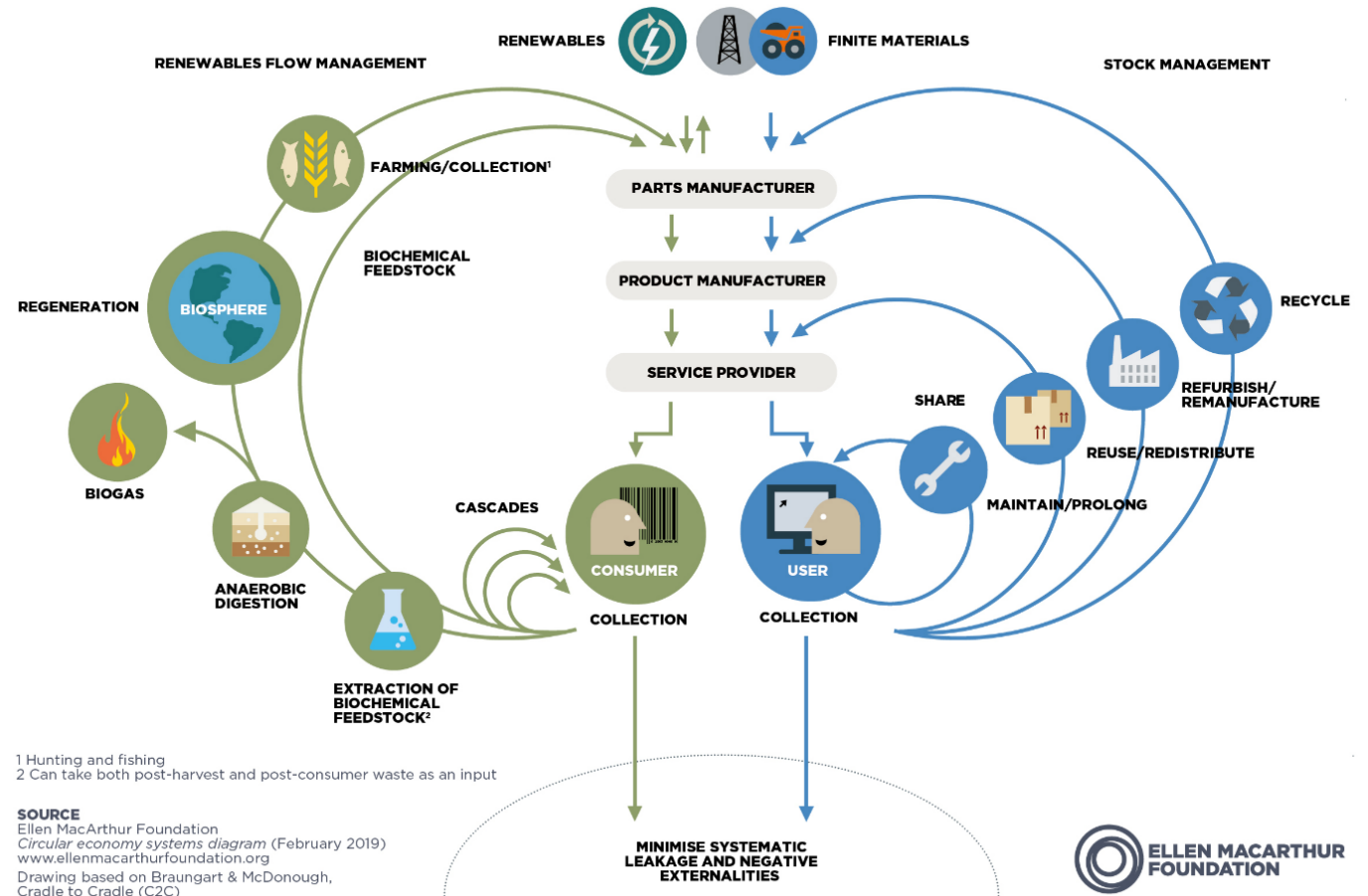
**Wetland Acreage in Conterminous US**  
**ca. 220,000,000 acres in 1700s**  
**ca. 110,000,000 acres today**

# The Tools of Transformation



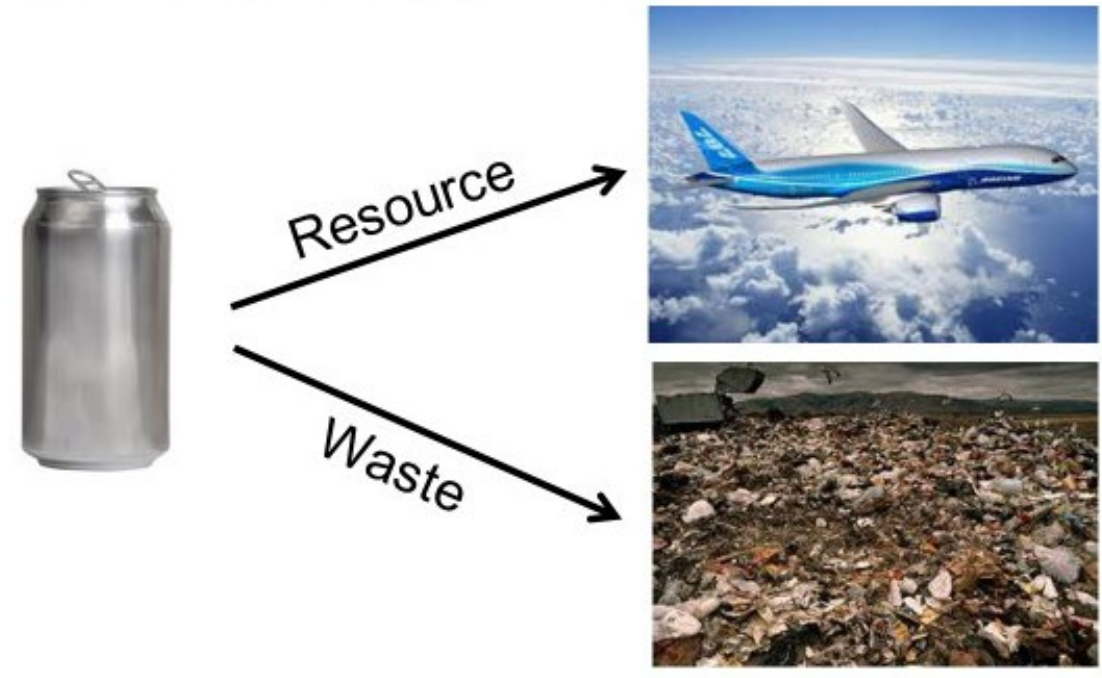
# Regenerative, Nature-Positive Outcomes and the Circular Economy

**Sustainability:** “create and maintain conditions under which humans and nature can exist in **productive harmony**, that permit fulfilling the social, economic and other requirements of present and future generations.”  
NEPA (1969)

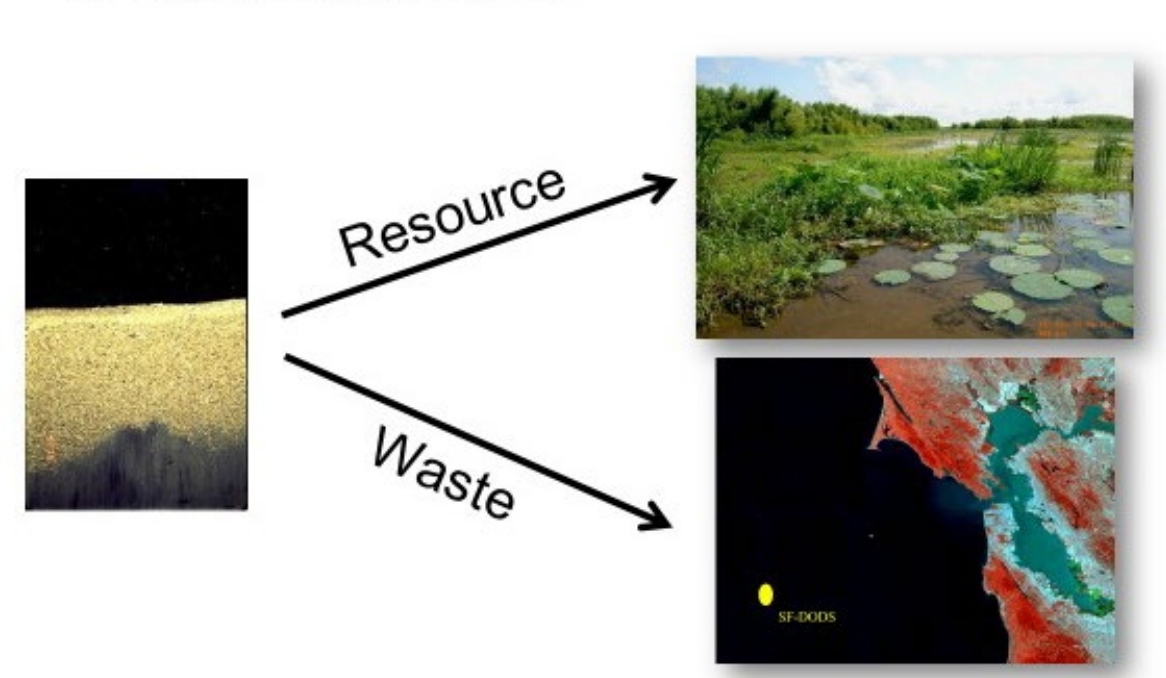


# Application to Dredging

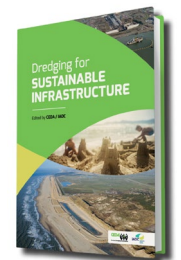
What is an empty aluminum can?



What is sediment?




\*From a presentation I gave at the National Dredging Meeting in May 2012



# Beneficial Use Benefits: *The USACE '70 x 30' Goal*

*“Beneficial use” is using dredged sediment to achieve additional benefits beyond its removal from a channel/waterway, including other economic, environmental or social benefits.*

 DEPARTMENT OF THE ARMY  
HEADQUARTERS, US ARMY CORPS OF ENGINEERS  
441 G STREET NORTHWEST  
WASHINGTON DC 20314-1000

CECG 25 January 2023

Beneficial Use of Dredged Material Command Philosophy Notice

Teammates,

Today I am formally issuing a Beneficial Use of Dredged Material Command Philosophy Notice which outlines my vision for expanding the U.S. Army Corps of Engineers beneficial use of dredged material (BUDM) program. This philosophy notice aligns with two of my four key priorities for the organization, Partnerships and Innovate.

Dredged material is a valued resource that is not to be wasted, but instead used for benefits to the ecosystem, economy, and to deliver the USACE mission more effectively and efficiently across our portfolio of Navigation, Flood Risk Management and Aquatic Ecosystem Restoration projects.


Through a symbiotic relationship with navigation dredging, you are being called to generate productive and positive uses of dredged material. If there is a need for USACE to dredge an authorized channel, the operational strategy should inherently include beneficial use placement options. Equally, if there is a need for sediment, gravel, or rock material to implement a project, beneficial use from dredging operations within authorized channels should be considered as a source in the planning and execution strategy. We must do these things in compliance with applicable laws and regulations, including the Federal Standard for dredged material disposal or placement. A proper analysis of the total lifecycle cost of dredging and placement as well as the full benefits will result in an accurate determination of the Federal Standard.

USACE historically uses 30-40% of the sediments derived from the Navigation mission for beneficial purposes. I have established a goal for USACE to advance the practice of BUDM to 70% by the year 2030 (“70/30 Goal”).

Achieving our vision will require purposeful documentation and an innovative pursuit both internally and externally with our partners and stakeholders. You will need to leverage available solutions, strategies, and tools to the maximum extent practicable while developing and applying new approaches and technologies to address the associated engineering challenges.


Districts and divisions are hereby called upon to participate in supporting this shared vision, provide input into the actions to be undertaken, and ensure ultimate success of the BUDM program.

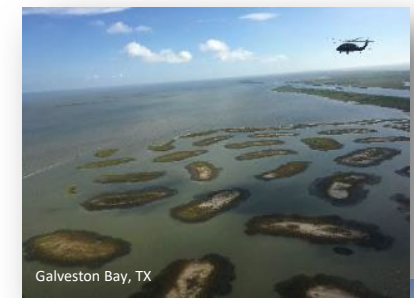
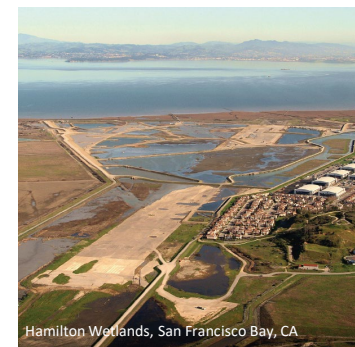
Now is the time to get involved. For more information on how to get involved, contact Tiffany Burroughs, Chief Navigation, HQUSACE by phone at (202) 761-4474 or by email at [tiffany.s.burroughs@usace.army.mil](mailto:tiffany.s.burroughs@usace.army.mil)

**BUILDING STRONG!**  
  
SCOTT A. SPELLMON  
Lieutenant General, US Army  
Commanding

*“Dredged material is a valued resource that is not to be wasted, but instead used for benefits to the ecosystem, economy, and to deliver the USACE mission more effectively and efficiently across our portfolio of Navigation, Flood Risk Management and Aquatic Ecosystem Restoration projects.”*

*“I have established a goal for USACE to advance the practice of BUDM to 70% by the year 2030 (“70/30 Goal”).”*

**BUILDING STRONG!**  
  
SCOTT A. SPELLMON  
Lieutenant General, US Army  
Commanding





# *The Importance of Leadership Intent on Nature-Based Solutions...*

*“My vision for the future is driven by a sense of urgency. I’d like the Army Corps, a capable and talented organization, to be innovative in developing new strategies and to build climate resilience to better protect and prepare communities for some of the challenges they’re facing. We need to take advantage of nature-based infrastructure and figure out how we can bring multiple benefits to our projects so that we’re not just doing flood risk and coastal storm management but are also helping to further environmental restoration and even augment water supply where we can.”*

**Michael Connor, ASA(CW)**  
*Municipal Water Leader, May 2022*



*“Serious consideration of NNBFs is non-negotiable.”*

**Eric L. Bush, SES**  
*Chief, Planning and Policy (HQUSACE)*  
*July, 2022*



# Mission, Responsibility, and Codes

- ASCE Code of Ethics, Fundamental Canons
  - “Engineers shall hold paramount the safety, health, and welfare of the public and shall strive to comply with the principles of **sustainable development** in the performance of their professional duties.”
- ASCE Policy Statement (418) on “the role of the civil engineer in **sustainable development**”
  - ASCE “defines **sustainability** as a set of economic, environmental, and social conditions (aka "The Triple Bottom Line") in which all of society has the capacity and opportunity to maintain and improve its quality of life indefinitely without degrading the quantity, quality, or the availability of economic, environmental, and social resources. **Sustainable development** is the application of these resources to enhance the safety, welfare, and quality of life for all of society.”
- ASCE supports the following steps to achieve a **sustainable project**:
  - Perform Life Cycle Assessment from Planning to Reuse.
  - Use Resources Wisely.
  - Plan for Resiliency. **Sustainability** requires planning for the impact natural and man-made disasters and changing conditions can have on economic, environmental, and social resources.
  - Validate Application of Principles.

# Applying the Full Range Practices for Sustainable Sediment Management

Sediment "Recharge" via Dredging



Direct Wetland "Nourishment"



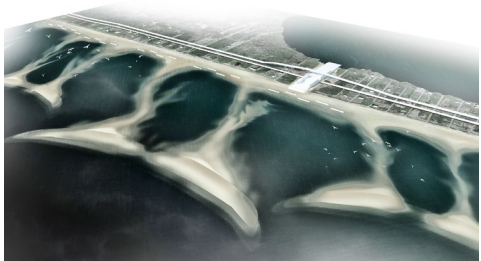
Wetland Creation



Island Enhancement or Restoration



Engineering / Operational Effort



Strategic Placement



Thin-Layer Placement for Bottom Contouring



Beach and Dune Construction



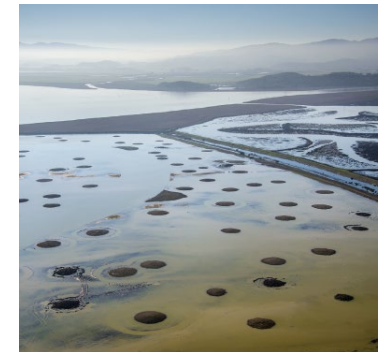
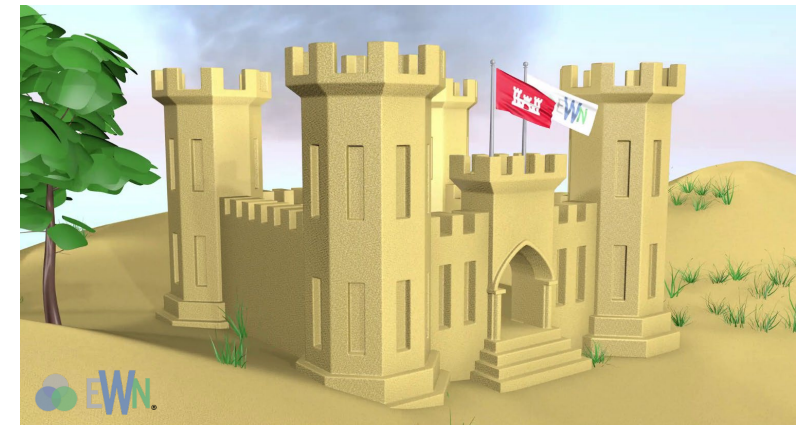
New Island Construction

# ***A Call to Action: A Regenerative, Nature-Positive Navigation System***

## ***An Imperative for the 21<sup>st</sup> Century: 100% Beneficial Use of Dredged Sediment***

Beneficial Use Innovation: *There's something for everyone to do!*

- Government Agencies: Innovate policy, procedure, and business practices
- Ports / Navigation Sector: Pursue multi-purpose projects
- Regulatory Agencies: Efficiently pursue win-wins
- Dredging / Engineering Companies: Innovate engineering and operational practices
- Environmental NGOs: Facilitate P3s



**Think of dredged material volumes in terms of “wetland units”  
How many acres of wetland could 250 mcy of sediment create?**

**50,000-100,000 acres!**