A NEW KIND OF WILD

Thinking About the Future of Restoration in the Gulf of Mexico

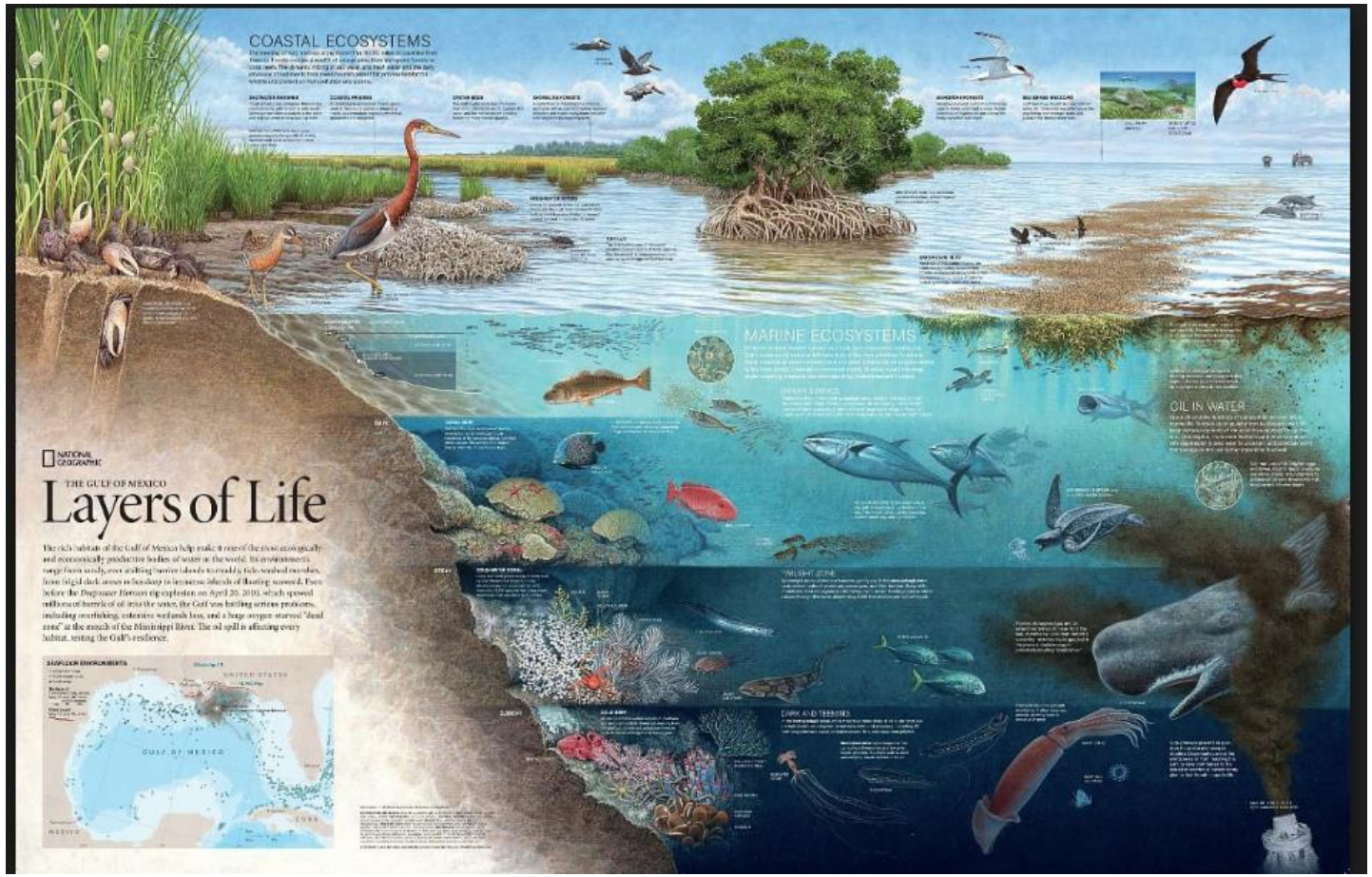
February 6, 2019

VOLKERT

* Slides represent my personal views.

The Gulf of Mexico is Really Cool, (too)

- Ninth largest body of water in the world (NOAA 2011)
- Drains 20 major river systems: 3.8 million km^2
- Over 15,000 marine species
- Gulf States: GDP $3 Trillion in 2016 (BEA 2017)



National Geographic Society

Stressors & Challenges

- Chronic & acute loss of critical habitats, including wetlands & barriers
- Water quality degradation, including the annual appearance of a hypoxic dead zone (size of New Jersey in 2017)
- Invasive species
- Alteration of hydrology
- Hurricanes and storms
- Climate Change
- Impacts from DWH

= Compounded vulnerability, Billions of $ of infrastructure, habitats and human communities at risk

Old Shell Road in Mobile, AL (USA Archives)

RISE OF 'SHORELINE HARDENING' THREATENS COASTAL ECOSYSTEMS

(Gulf Coast Ecosystem Restoration Task Force 2011).

Impacts from the *Deepwater Horizon* Spill

Resulted in "an injury to the entire ecosystem of the northern Gulf of Mexico"

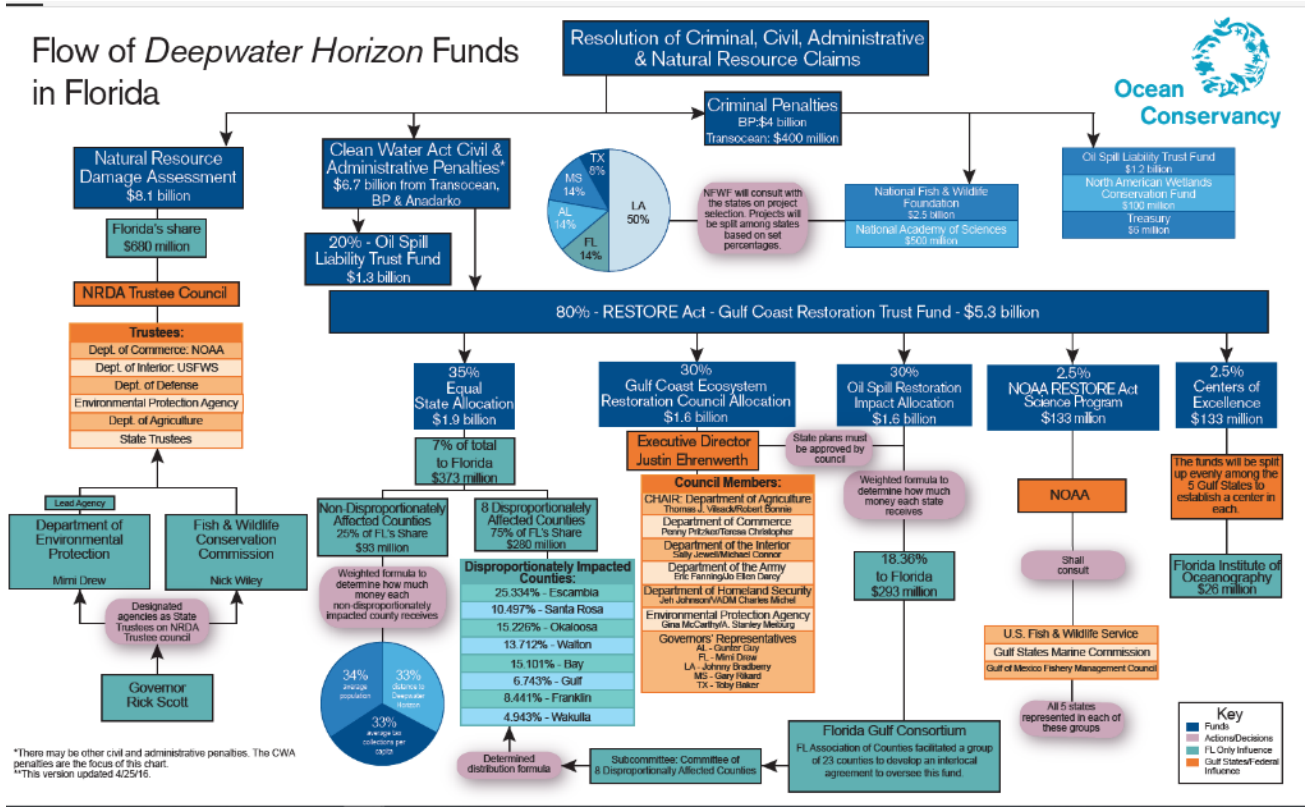
-- *Deepwater Horizon* Natural Resource Damage Assessment (NRDA) Trustees

- 1300 miles of shoreline oiled
- Plant cover and vegetation mass reduced along 350 to 720 miles of shoreline
- Amphipods, periwinkles, shrimp, forage fish, red drum, fiddler crabs, insects mortality
- 4 – 8.3 billion harvestable oysters lost
- Mortality of between 51,000 to 84,000 birds
- Mortality of between 56,000 to 166,000 small juvenile sea turtles
- Up to 51% decrease in Barataria Bay dolphin population
- An estimated 2 – 5 trillion newly hatched fish were killed

(DWH Oil Spill Trustees 2016)

What Would You Do With $20 Billion?

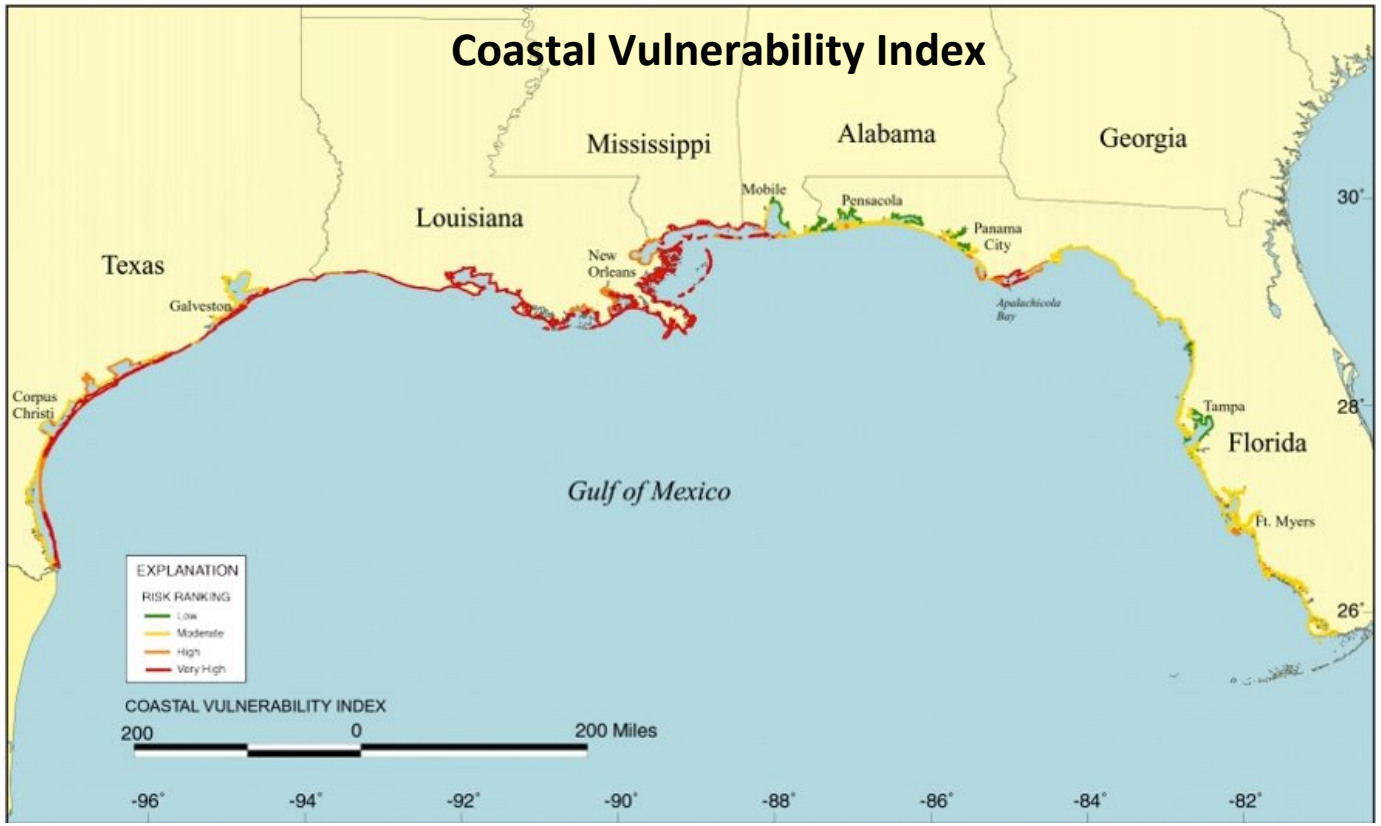
- Natural Resource Damage Assessment: $8.1 Billion
- RESTORE Act: $5.3 Billion
- National Fish and Wildlife Foundation GEBF: $2.5 Billion
- National Academy of Sciences: $500 Million
- North American Wetlands Conservation Fund: $100 million



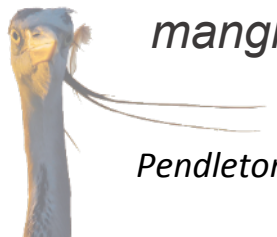
Ocean Conservancy

Where Are We Headed? Climate Change in the GOM

- Relative Sea Level Rise
- Habitat Loss/Erosion *(e.g. marsh conversion to open water)*
- Changes in Water Availability and Flow
- Coastal Storms
- Changes in Biodiversity, Ecosystem Composition, and Species Invasion/Shifts in Composition *(e.g. marsh to mangrove)*



USGS via GCOOS



Pendleton et al., 2010

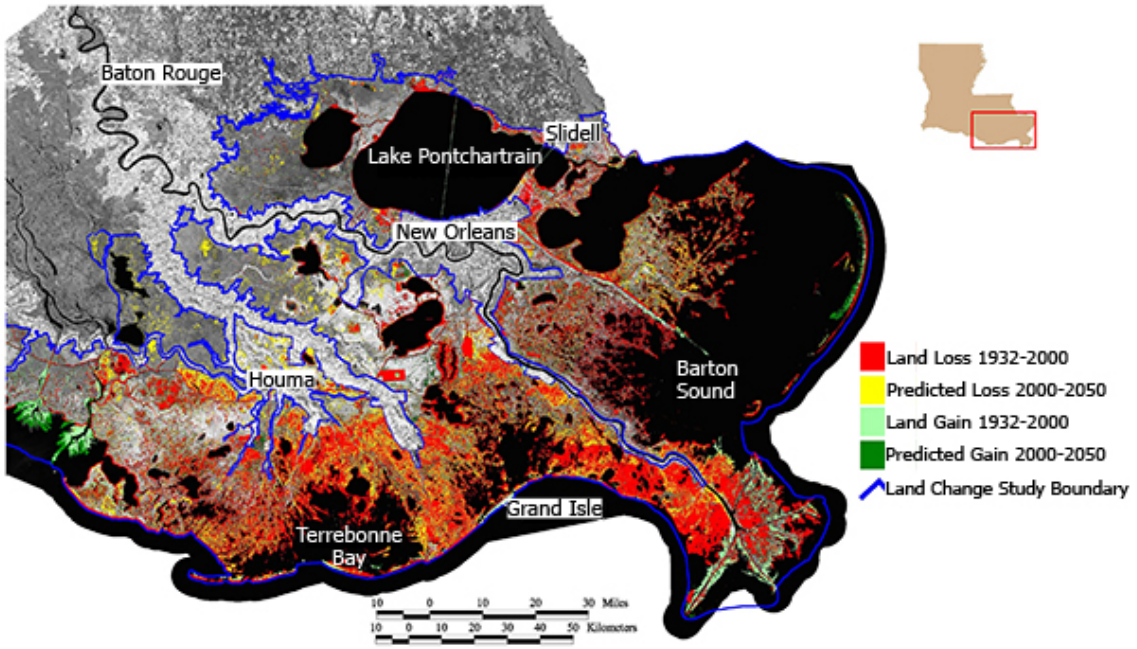
Advancing Restoration Under Complex Conditions

Creating favorable conditions for restoration to succeed:

- The past is no longer prologue.
- Sound governance structures are critical and should consider new, integrated approaches to planning, implementation and monitoring.
- High-impact investments are key.
- We need adequate data and information on which to base the case for investments, while recognizing that uncertainty is a reality.

The Past Isn't Prologue

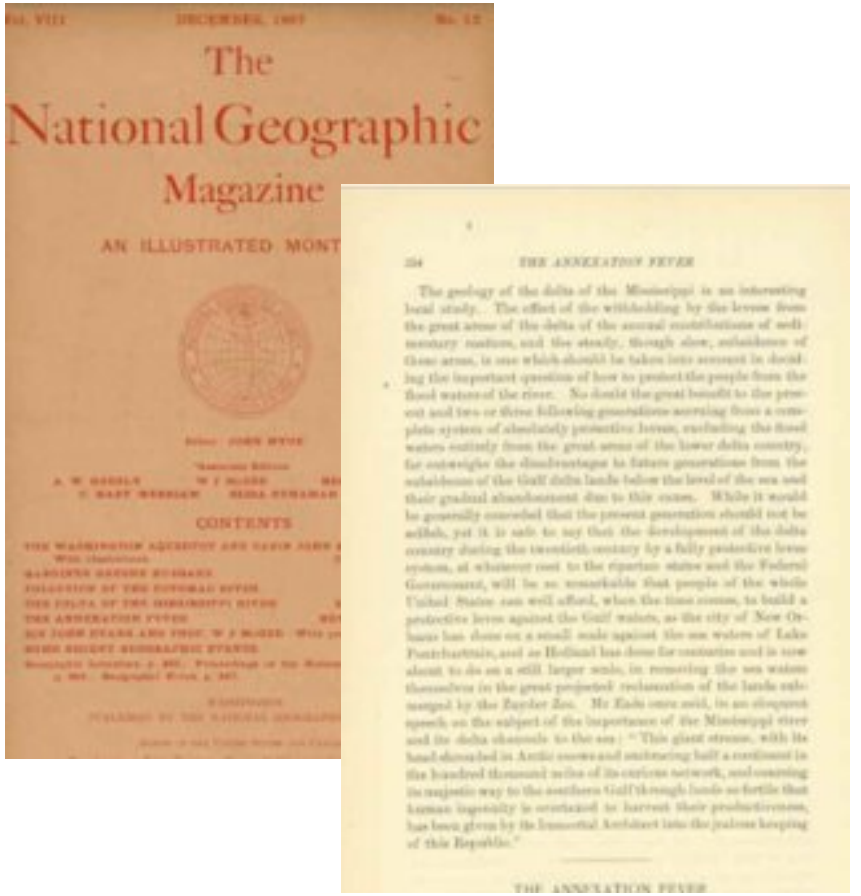
- Traditional approaches will likely be inadequate given the scale and severity of changes to ecosystem form and function in the coming century.
- New approaches will acknowledge that change is inevitable, and recognize that the landscape is fluid. (Manning et al., 2009).
- What is achievable? Focus project planning, prioritization and goal-setting based on a basic understanding of what we know about future conditions: "Achievable Future Conditions" (Golladay et al., 2016)
- *Anticipatory Restoration*: Activities designed to create "certain conditions in anticipation of further changes in the future" (Manning et al., 2009)



LACoast, USGS

Promote Sound, Interdisciplinary Governance Structures, Take Innovative Approaches

- Bring everyone to the same table, then connect theories and concepts to prioritization, implementation and monitoring (translational ecology) (see Enquist et al., 2017).
- Consider future conditions/impacts of activities.
- Take an open-ended approach to goal-setting that focuses on, e.g. enhancing natural processes, increasing habitat connectivity. (See: Reguero et al., 2018, Enwright et al., 2016)
- Design monitoring to focus on change over time as a result of activities rather than a set of numeric benchmarks that may or may not



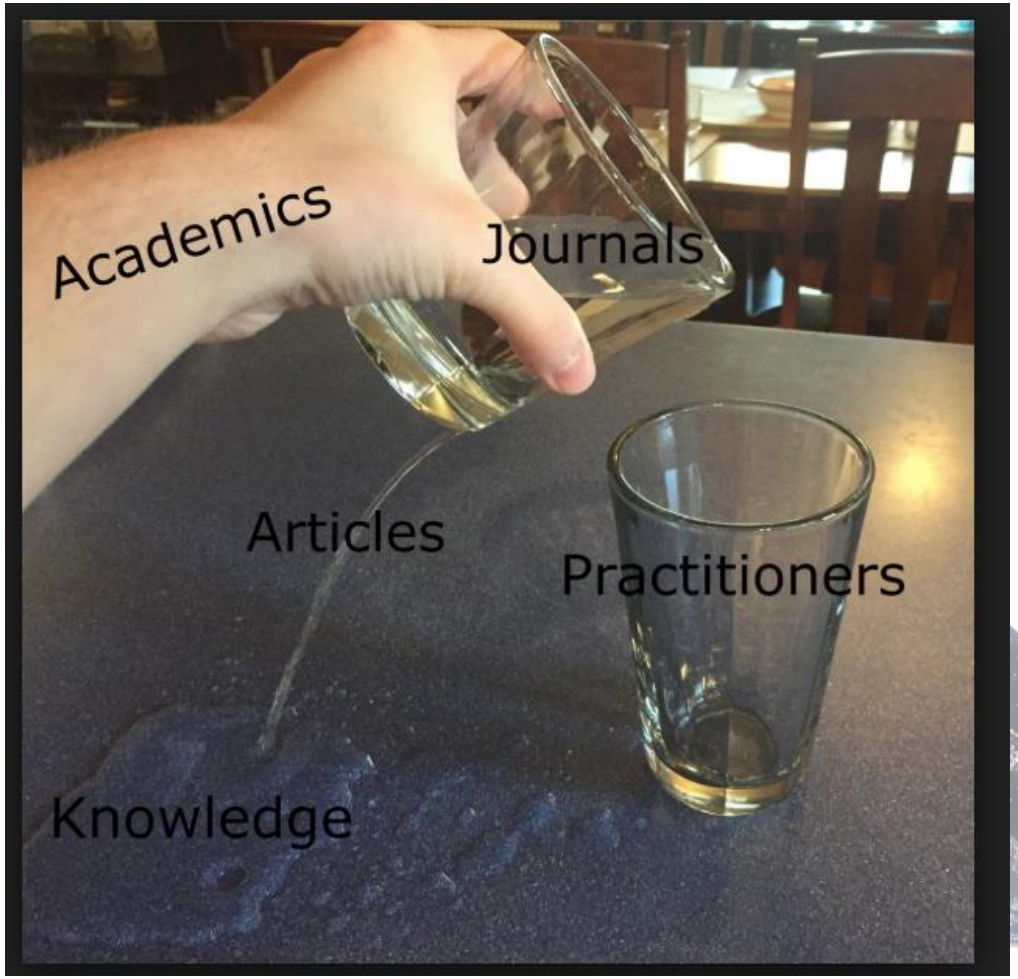
High Impact Investments Are Key

- What constitutes high impact?
  - Large-scale projects?
  - Projects with long design-lives?
  - Projects that result in measurable change to ecosystem form or function, regardless of size?
  - Projects that reduce or mitigate future risk?
  - Projects that address a current critical need (e.g. wetlands in restoration)
- How should we (scientists, community, decision-makers) prioritize?
- Short-term vs long-term goals and objectives…
- Are there some places that shouldn't be "restored"?

- Lessons from the Gulf of Mexico
  - RESTORE Act Priority Criteria
  - Regulatory efficiencies (can we find them?)

Gaining Adequate Information

- What data is most critical to collect?
- What can we do with the information we have, learning and innovating as we go?
- Use Conceptual Models: general and site-specific
- Conduct Adaptive Management at the project and program levels



Lessons from the Gulf of Mexico

- Baseline data is important.
- What data is most important to integrate/ synthesize?
- How to infuse science into inherently complex political constructs?

Putting It All Together…

Mississippi River Meander Belt, Harold Fisk, 1944.

- Change is inevitable, but we can get more comfortable with uncertainty and manage it through use of conceptual models, focused data collection and adaptive management.
- Translational Ecology is a must– develop story lines and approaches from problem definition through to results.
- Decisions will be made and money will be spent…it's up to us to make the case to spend it on projects that provide benefits to both natural and human communities.
- Shift from a focus on replicating/maintaining historic conditions to facilitating ecosystem processes that support a large-scale approach and a recognition of the dynamic nature of the coast and the people/critters

Thank You!
Questions?

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