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Climate Change at Congaree National Park: Realities and Communication Paradigms

Climate Variability and Impacts to South Carolina's Natural Resources Conference
Wednesday, October 24, 2012

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CONGAREE
National Park

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Outline

1. **Overview**
2. **“CongaRee”alities and concerns**
3. **Communication Challenges**

Congaree Climate Change Overview

"**Begin with the End in Mind.**" - Stephen Covey *(and Habit # 2 of The 7 Habits of Highly Effective People!)*

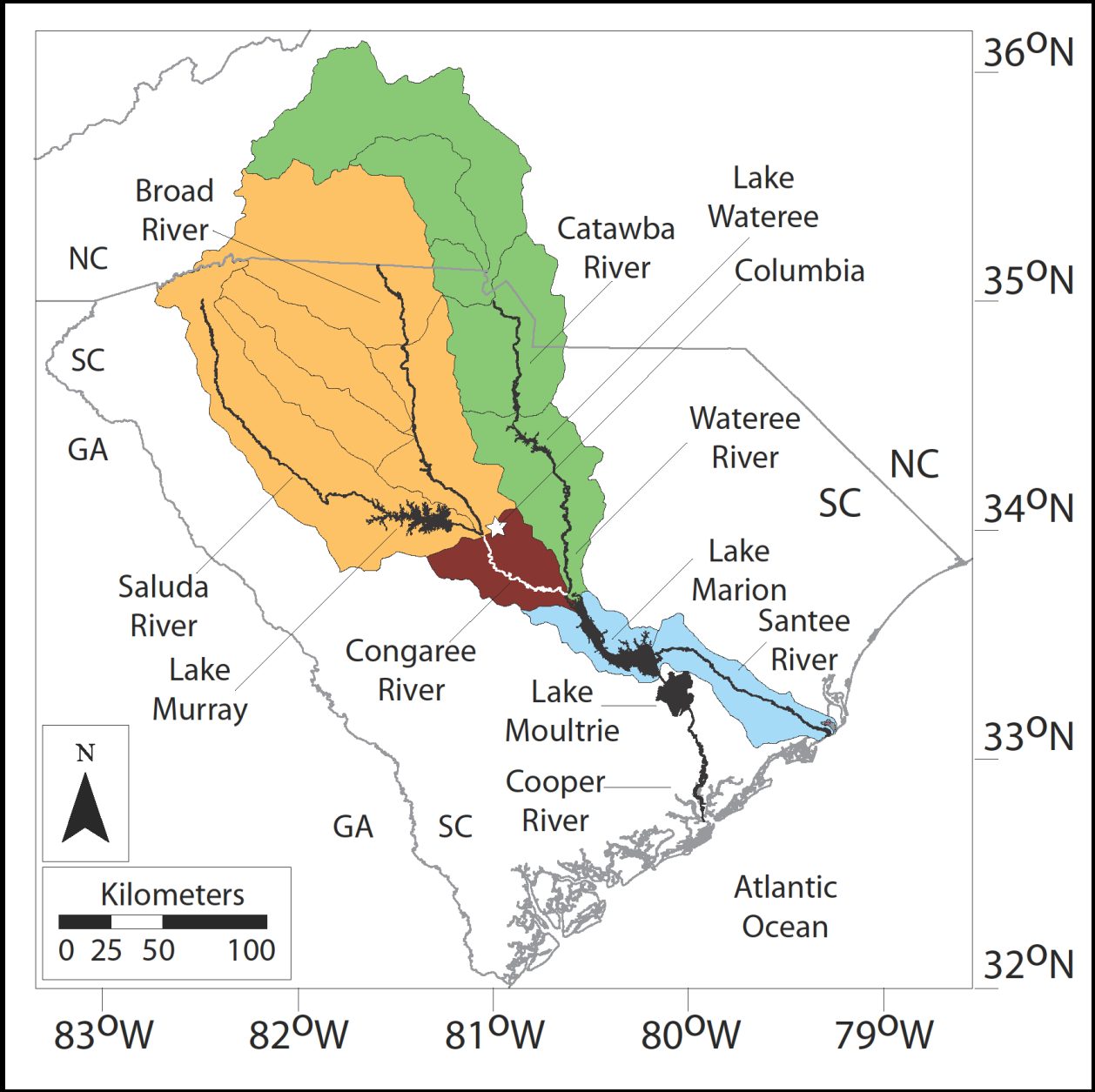
1. **Climate change is already impacting** seasonal weather, greenup onset, liana growth, amphibian breeding cycles, and species ranges – and there are concerns about additional impacts.

2. **Good communication and engagement** with various audiences is fundamental, but requires more than technical *competence* – it requires monumental *resources* and *capacity* as well. There are many paradigms to consider.

Congaree National Park

- Old-Growth floodplain forest ecosystem in the heart of SC
- Defined by periodic floods from the Congaree and Wateree Rivers, which drain a 14,000 km^2 watershed.
- Est. 1976 as Congaree Swamp National Monument
- Today over 27,000 total acres, including:
  - 15,010 acres of Federally designated Wilderness
  - 11,000 acres of old-growth
  - Arguably the last, largest, and best preserved remnant in the Atlantic Coastal Plain – if not the continent

Long human history of the area


36°N
35°N
34°N
33°N
32°N
83°W
82°W
81°W
80°W
79°W
Broad River
NC
SC
GA
Catawba River
Lake Wateree
Columbia
Wateree River
NC
SC
Lake Marion
Santee River
Saluda River
Lake Murray
Congaree River
Lake Moultrie
Cooper River
GA
SC
Atlantic Ocean
N
Kilometers
0 25 50 100

General Ecological Impacts

Biological Changes

* Distribution * Life Cycle * Phenology

Physical Changes

* Hydrology * Geomorphology

Complications and Filters

* Growing population, Invasive Species, Habitat Fragmentation, Altered Hydrology

Threats

* food chains, biodiversity, ecosystem services, human health and safety, and cultural legacies

Part II: "CongaRee"alities and Concerns

Conga“Ree”alities

A Few Data Points

- Increased liana growth, size, and abundance
- Changes in amphibian breeding cycles
- Distribution of Golden Silk Orb Weavers
- Complicated delay of “greenup onset”

Concerns

- Crayfish lifecycles
- Long-term changes in the river discharge

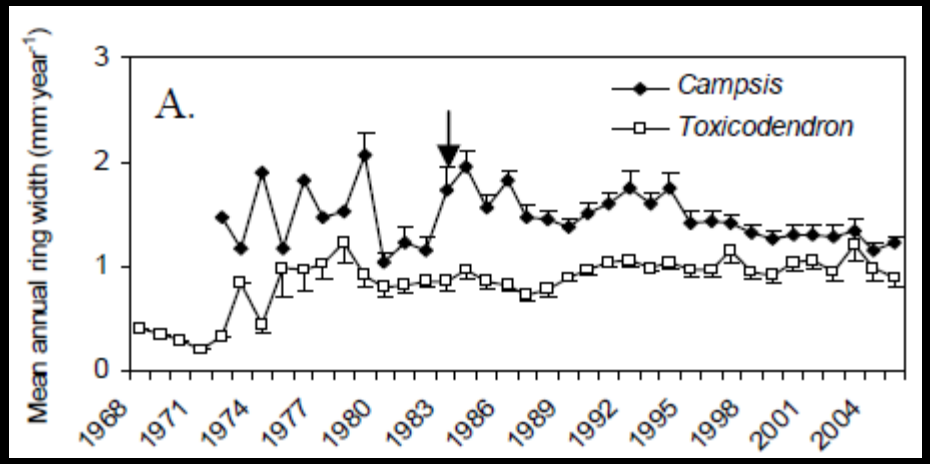
Ongoing Research

- climate modeling, sedimentation rate studies, moth inventories, Hurricane Hugo impacts

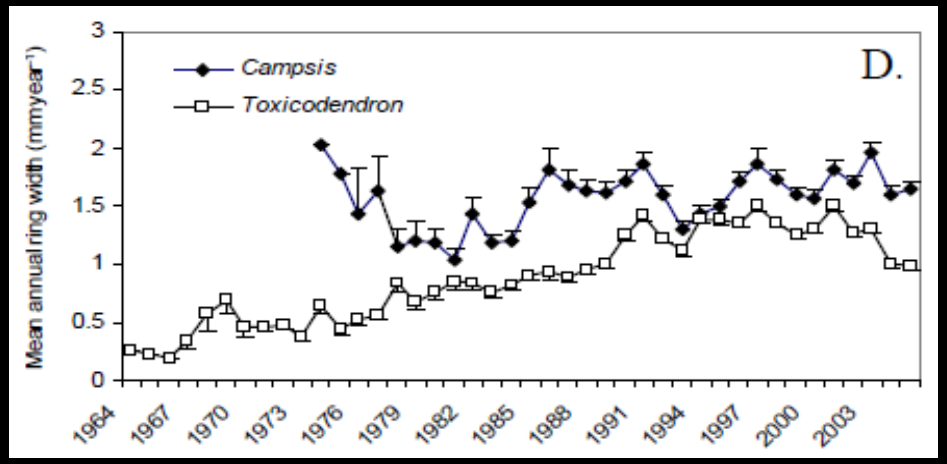
Everything is just "Vine?"

- **Lianas are increasing in abundance, size, and growth rate** (Allen et al., 2007; Schnitzer and Bongers, 2011).
- **Lianas have adaptations** that help them adjust to Climate Change better than trees
  - **High leaf / stem area ratio** = efficient use of CO2
  - **Increased minimum T** = reduced stem freezing
  - **Deep root systems** = less drought stress
  - **Vegetative propagation** = good disturbance recovery
- **Also aided** by habitat fragmentation and invasive species
- **Supported by Experimental Data** (Mohan et al., 2006)
- ***Implications*** *for forest structure and carbon storage!*

Increased growth rates of poison ivy (*Toxicodendron radicans*) at Congaree National Park (Allen et al., 2010)



Historically logged areas



Minimally disturbed areas

Meanwhile, one valley over…

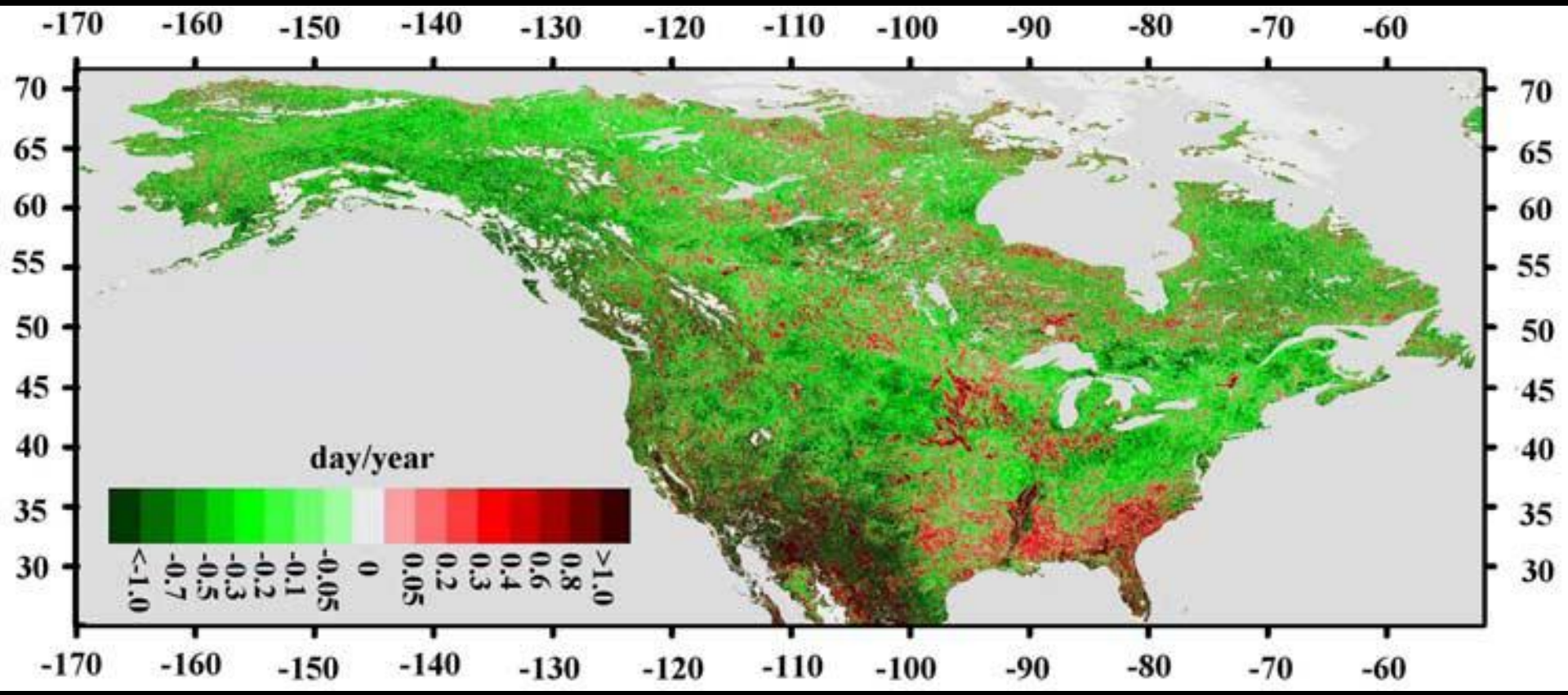
"Climate change correlates with rapid delays and advancements in reproductive timing in an amphibian community" (Todd et al., 2010)

- 30 year dataset at Savannah River Site
- Autumn breeders starting later
- Winter breeders starting earlier
- Four out of ten species (40%) are now breeding an average of15 and 76 days earlier over the course of 30 years
- This will change predator / prey / competition relationships related to amphibian larvae

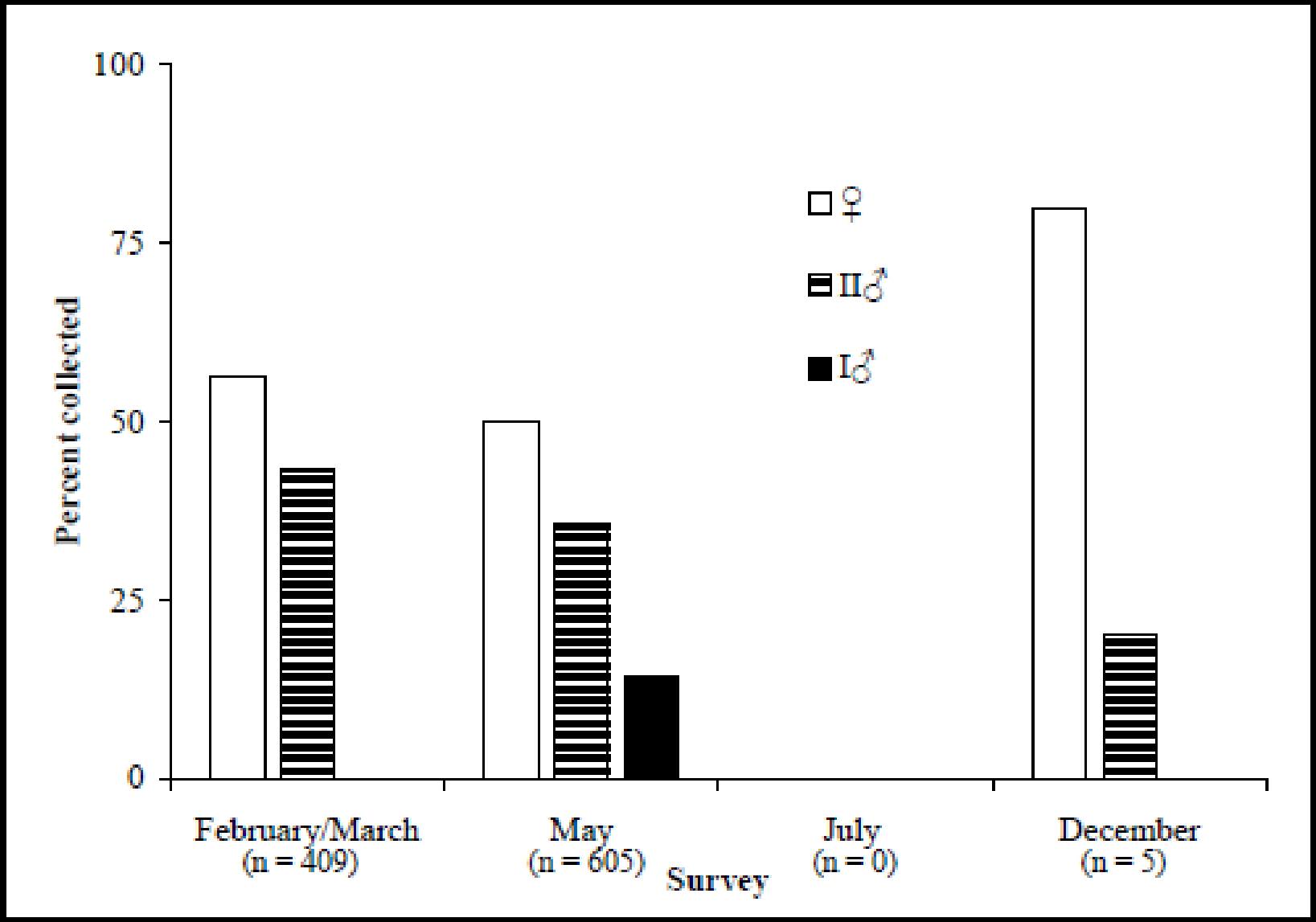
Climate Change as a "Golden" Opportunity…

for Range Expansion of Golden Silk Orb Weavers (*Nephila clavipes*; Bakkegard and Davenport, 2012)

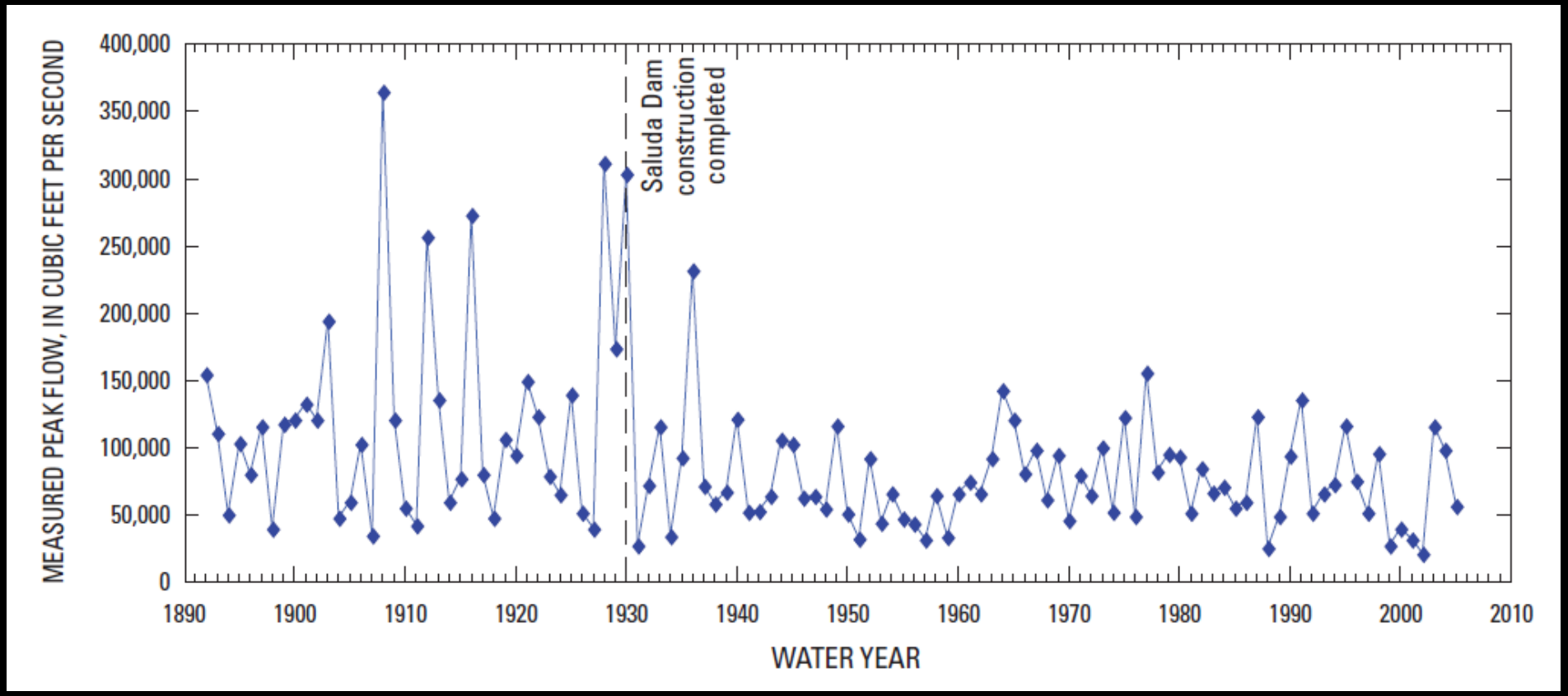
Satellite-derrived change in greenup onset, 1982-2005 (Chang et al., 2007)



Eastern Red Swamp Crayfish Lifecycle at Congaree National Park (Welch and Eversole, 2007)



Maximum water-year peak flows for the period of record at the Congaree River (Conrads et al., 2008)



- Recent analysis shows that this change is mostly NOT driven by the dam, but by regional climate and land use

So What?

Why should people really care?

What do people really need to know or do?

Why? How?

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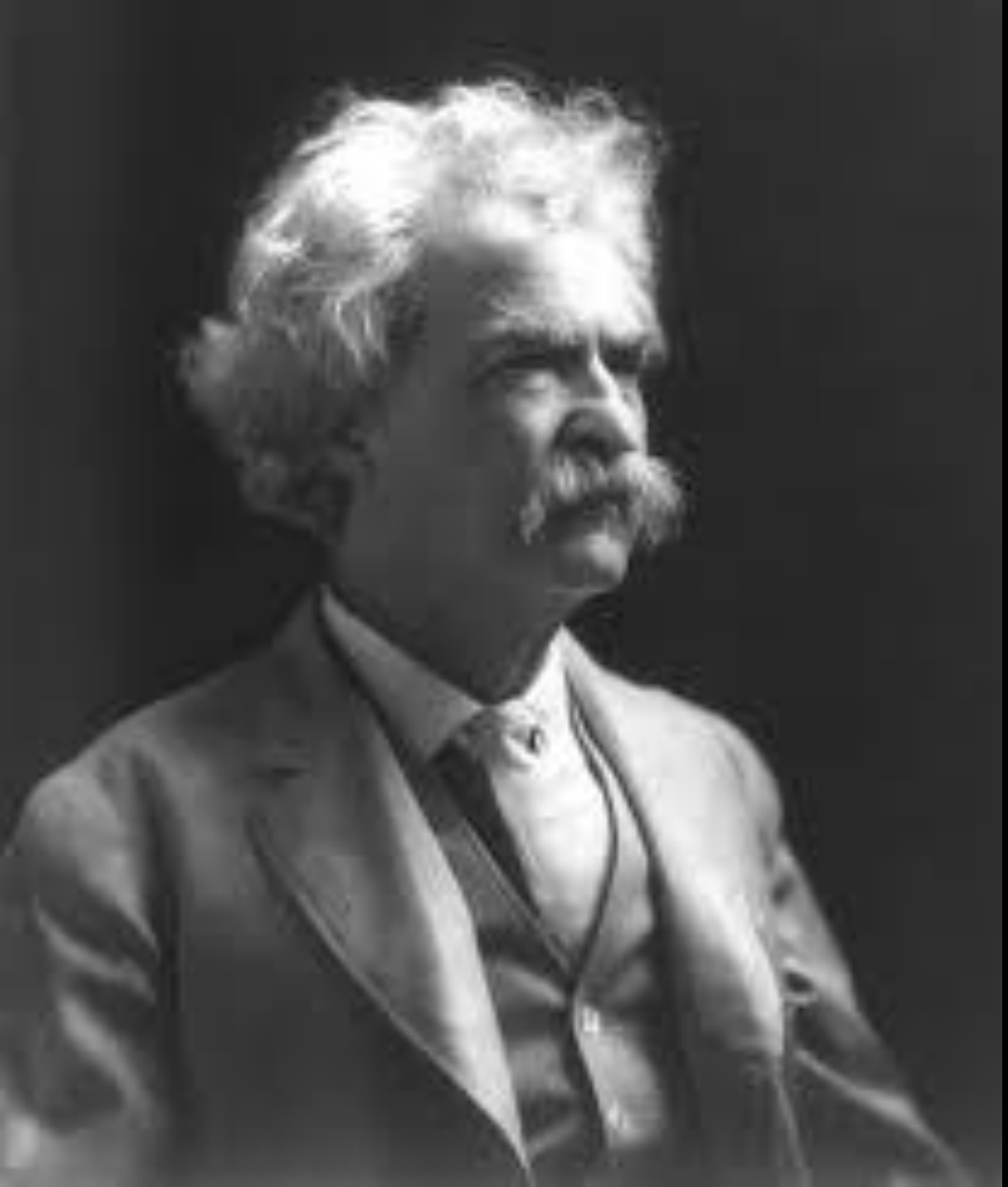
Paradigms for Communication (Part III)



"A classic is something that everybody wants to have read and nobody wants to read."

~ Mark Twain

DON'T BE *SUCH* A SCIENTIST

TALKING SUBSTANCE IN AN AGE OF STYLE

RANDY OLSON

WRITER/DIRECTOR OF *FLOCK OF DODOS: THE EVOLUTION-INTELLIGENT DESIGN CIRCUS*
AND *SIZZLE: A GLOBAL WARMING COMEDY*

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National Park Service Response

- **Science –** Collaborate, Discover, and Apply Scientific Knowledge
- **Adaptation –** Plan on rapid, flexible, fluid responses to various climate scenarios
- **Mitigation –** Lead by example in climate friendly practices
- **Communication –** Sharing both knowledge and decision-making processes with staff, partners, and the public to engage, inform, and inspire resource stewardship.

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Interpretation

The art of making ***INTELLECTUAL*** *and* ***EMMOTIONAL CONNECTIONS*** *between visitors and a resource*

Eppley Institute for Parks and Public Lands (Eppley.org)

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The Interpretive Equation

(KR + KA) x AT = IO

- **KR = Knowledge of Resource**

  Knowledge of climate change at your site
- **KA = Knowledge of Audience**

  *YOUR experience + social science + **standards***
- **AT = Appropriate Techniques**

  ***Standards** + unique opportunities from you and your site*
- **IO = Interpretive Opportunity** *to make connections*
- ***To inform and inspire resource stewardship***

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T angibles – Objects, Places, or Events. Tree, Rock, Water, Air, Feather, Fin, Scale, Bridge

I ntangibles – Systems, Processes, Values, or Relationships. Wilderness, Phenology, Boundary, Freezing, Self-Reliance, Average

U niversal Concepts – Intangibles in the *BROADEST* possible sense. Life, Death, Love, Hope, Change, Fear, Legacy

American Journal of Botany 96(10): 1767–1778. 2009.

SPECIAL INVITED PAPER—YEAR OF SCIENCE

What's next for science communication? Promising directions and lingering distractions[1]

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In this essay, we review research from the social sciences on how the public makes sense of and participates in societal decisions about science and technology. We specifically highlight the role of the media and public communication in this process, challenging the still dominant assumption that science literacy is both the problem and the solution to societal conflicts. After reviewing the cases of evolution, climate change, food biotechnology, and nanotechnology, we offer a set of detailed recommendations for improved public engagement efforts on the part of scientists and their organizations. We emphasize the need for science communication initiatives that are guided by careful formative research; that span a diversity of media platforms and audiences; and that facilitate conversations with the public that recognize, respect, and incorporate differences in knowledge, values, perspectives, and goals.

Key words: informal learning; popular science; public engagement; science and society; science communication; science literacy; science policy.

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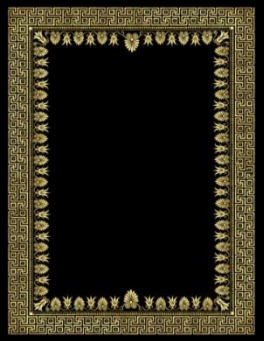
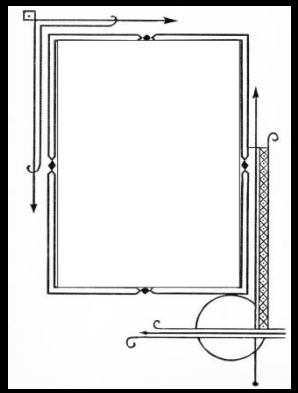
Common Frames (Nisbet and Scheufele, 2009)





- Social Progress
- Economic Development
- Moral / Ethical
- Scientific Uncertainty
- Public Accountability

- Pandora's Box / Frankenstein's Monster
- Middle Way
- Conflict / Strategy
- *Historical / Aesthetic / TIU*

Promising Directions

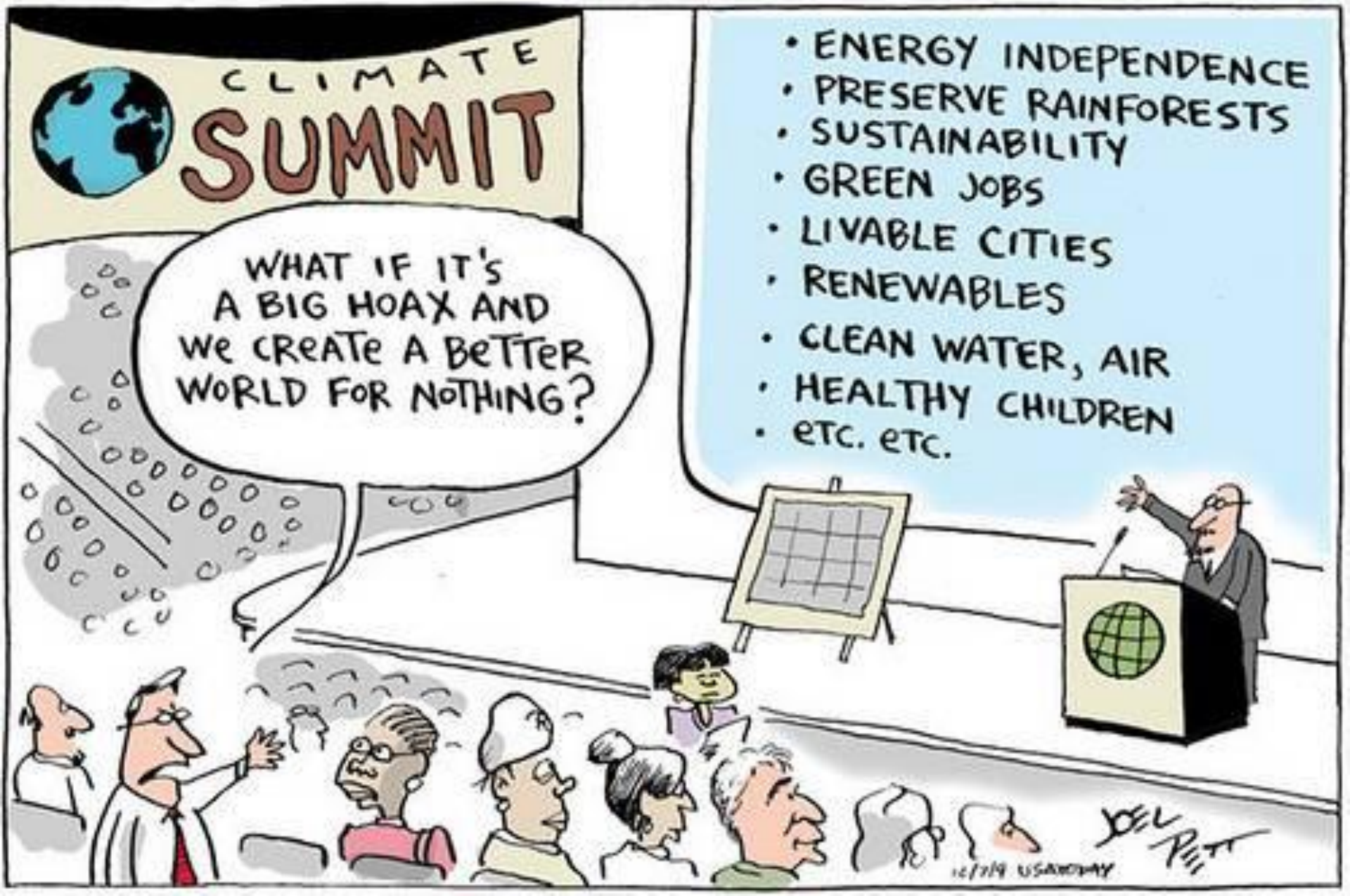
(Nisbet and Scheufele, 2009)

- Communications training for scientists
- Significant, early, and genuine public involvement
- Use social science data
- Focus beyond "elite," predictable audiences
- Participation in local media
- Multi-faceted communications campaigns
- Training in science media literacy
- "Opinion Leaders" to bridge audience gaps

Competence
• Scientific Literacy
• Scientific Data and Analysis
• Relevant Policy
* Audience
* Objectives
* Techniques
Resources
• Time
• Money
• Partnerships
• Training
• Support
• Planning
Capacity
• Charisma, Trust, Practice, Presence, Creativity, Vision
• Candid and deliberate self-reflection on values, hope, and fear

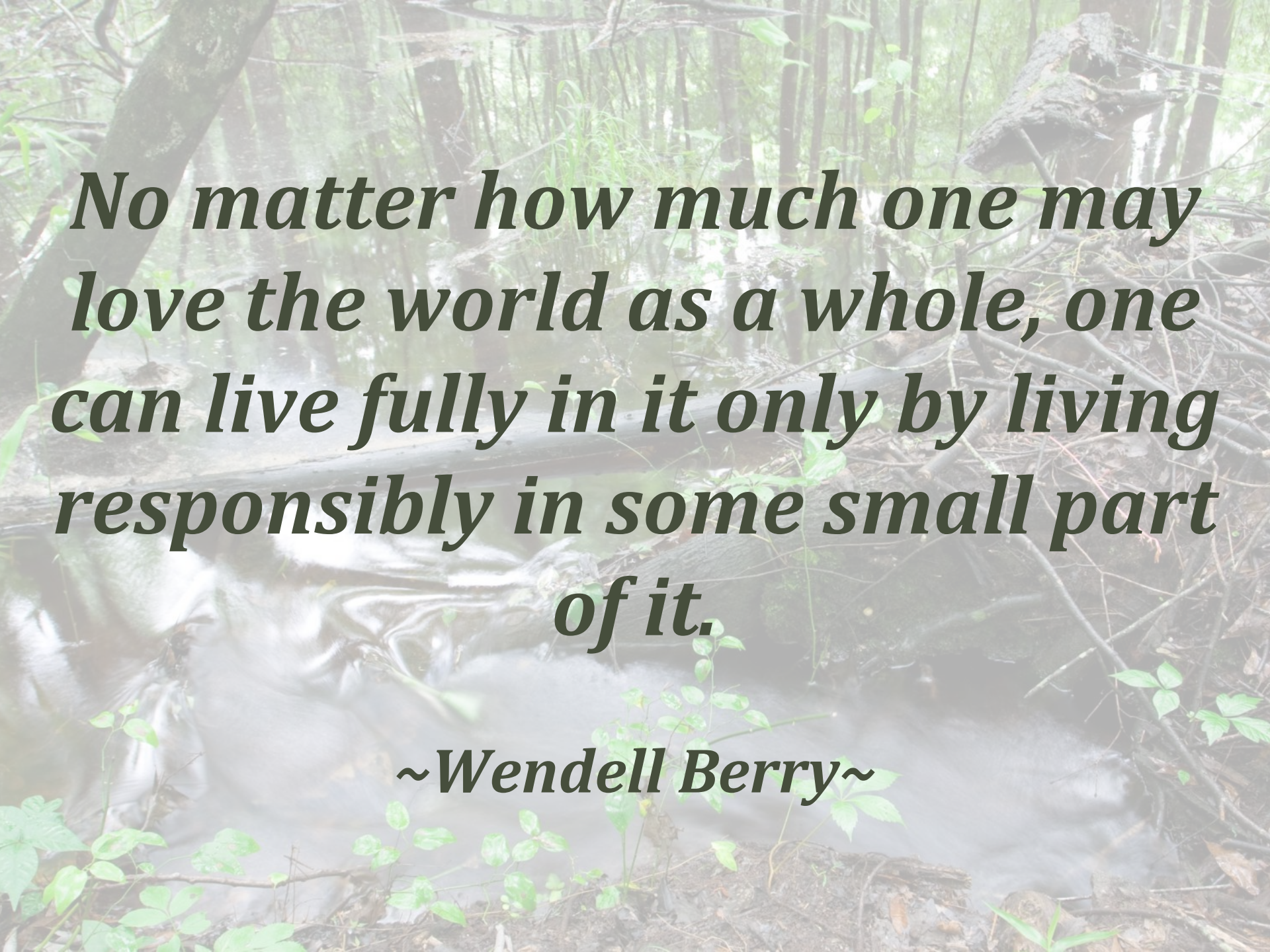
My Take: Messaging

- Three Audiences – Staff, Partners, and the Public
- Concrete, simple, relevant, and recursive
- Think long-term and aim for the middle
- Study, Study, Study
- Maintain trust and credibility
- Understand your "Why," before you get to the "What," or "How"
- "Reverse engineer" from objectives and frames


CLIMATE SUMMIT
WHAT IF IT'S A BIG HOAX AND WE CREATE A BETTER WORLD FOR NOTHING?
• ENERGY INDEPENDENCE
• PRESERVE RAINFORESTS
• SUSTAINABILITY
• GREEN JOBS
• LIVABLE CITIES
• RENEWABLES
• CLEAN WATER, AIR
• HEALTHY CHILDREN
• ETC. ETC.
12/7/19 USA TODAY
JOEL PETT

My Take: Five Positive Messages

- **Consumer Power!** Think carefully about source, processing, transportation, and packaging
- **Home / Car / Equipment Maintenance and Use**
- **Reduce / Reuse / Recycle / Compost**
- **Landscaping!** Consider a Rain Garden or plant non-invasive trees
- **Get Engaged!** Participate in park programs, citizen science programs, and community clean-ups
- **Spread the Word!** Share what you have learned with others


No matter how much one may love the world as a whole, one can live fully in it only by living responsibly in some small part of it.
~Wendell Berry~