A Regional Holistic Approach to Watershed Management – so as to Protect and Enhance Ecosystem Services for Future Generations

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Let's Step Back & Review

- Where are we today versus 100 years ago?
- What is changing?
  - Population Growth
  - Resources
  - Technology & Application
  - Life Styles
  - Transportation
  - Communication
  - Regional Impacts
  - Stewardship
  - Connection to Landscape & Nature

Population Growth & Pressures

Destin Harbor, Dr Strangelove
1964

Destin Harbor & Holiday Isle
2004

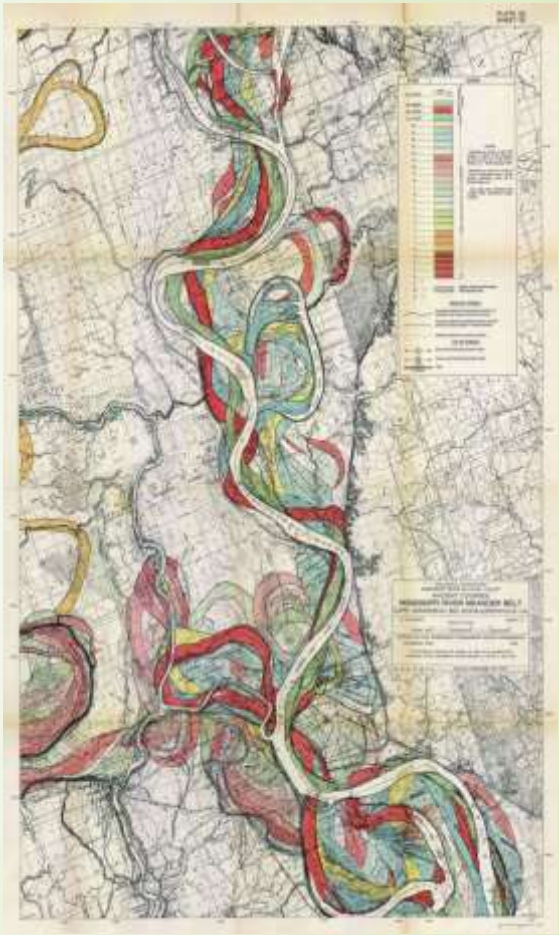
Source: 2004 Mindlace Media & Photography

Time to Visit our current Definition of Healthy Communities & Assign a Value to Healthy Environments

- Recognize that nothing is static;
- When the environment suffers, the surrounding community suffers (both physically and mentally);
- Sustainable Communities promote Sustainable Living;
- Sustainable Communities focus on Environmental and Economic Sustainability;
- Environmental & Economic Sustainability focuses on well planned development (not urban sprawl), urban infrastructure, social equity, and municipal government; and
- Community Resiliency – is directly tied to good schools, safe neighborhoods, quality jobs, quality foods, good air and water quality, and green spaces - vegetated buffers to abate noise – which also serve to sequester carbon and support local food-webs.

Next Big Lesson is that our Environment is not Static

- Our Landscape is not Static but we are slow to apply new technology when working in various environmental fields;
- Communities must be able to adapt to environmental changes;
- It is important to view the entire ecosystem as a whole;
- Science & Data should drive decisions;
- Politics & bureaucracy must not slow down these changes & adaptations; and
- It is always better and cheaper to protect a resource, than have to restore it later.



Mississippi River Meander Belt, 1944

Rethinking Ecosystem Boundaries

- One of the biggest challenges facing us is accurately looking at the complexity of the ecosystem;
- Watersheds do not recognize city, county, or state boundaries – and yet we fragment them and their protection into tiny bits & pieces;
- Random acts of restoration are implemented without oversite or coordination with communities upstream or downstream;
  - In Escambia County, FL, Carpenter Creek was rural & suburban, now suburban and urban – is ten miles from headwater to where Bayou Texar enters Pensacola Bay. The creek has been fragmented more than 10 times by interstates, highways, and dozens of subdivisions.
  - At each fragmentation, during each rain event, the road crossing becomes a stormwater conveyance; and
  - The riparian zone has been removed and most of the system is lined with invasive species – whose seeds were carried into the system by the stormwater runoff.
- Carpenter Creek/Bayou Texar is just an example of one small system, now let's consider the issues surrounding a Interstate River flowing through 10 counties.

To Achieve Sustainability and Healthy Communities including Aquatic Systems will Require a Paradigm Shift

- Resource Management Decisions must be made across several departments (effective and continual communication);
- Resource Management Goals must be decided and agreed upon by all entities within and across jurisdictional boundaries;
  - Flood Protection;
  - Healthy Water Quality;
  - Healthy Water Quantity;
  - Wildlife Corridors;
  - Carbon Sequestration;
  - Sediment Management; and
  - Nutrient Uptake.
- Strong Ordinances must be developed and agreed to by all permitting and oversight Agencies…and then they must be enforced!

Population Growth & Community Needs are always costly…

- The Environment has always been taken for granted;
- We balk at the cost of restoring the environment such as retrofitting culverts to smarter bridges (begin bridge ascent at the riparian zone and not the river/creek bank)to avoid fragmentation of waterways while we continue to pave the surrounding area. Then we wonder why these systems flood.
- 1" of rain on a one-acre parking lot creates 27,000 gallons of runoff;
- The Environment is treated like an 'island of poverty' in a 'sea of abundance'.
- There is never enough funding for environmental projects, until a system becomes so impaired that it makes it on the 303d list – so what is the incentive to keep the system healthy in the first place?

Restoring the Ecosystem can revitalize Community Health, Socio-economic Well-being, and Allow Communities to become more Resilient.

- Understand the area and landscape;
- Identify areas which should not be developed and incentivize owners to leave them in natural states (i.e., Conservation Easements, tax deductions, etc.)
- Sustainable treat our landscape through the management of trees (Ecosystem services they provide include carbon sequestration, clean air, and clean water);
- Environmental Stewardship implies responsibility for sustainable development shared by all those whose actions affect environmental performance.

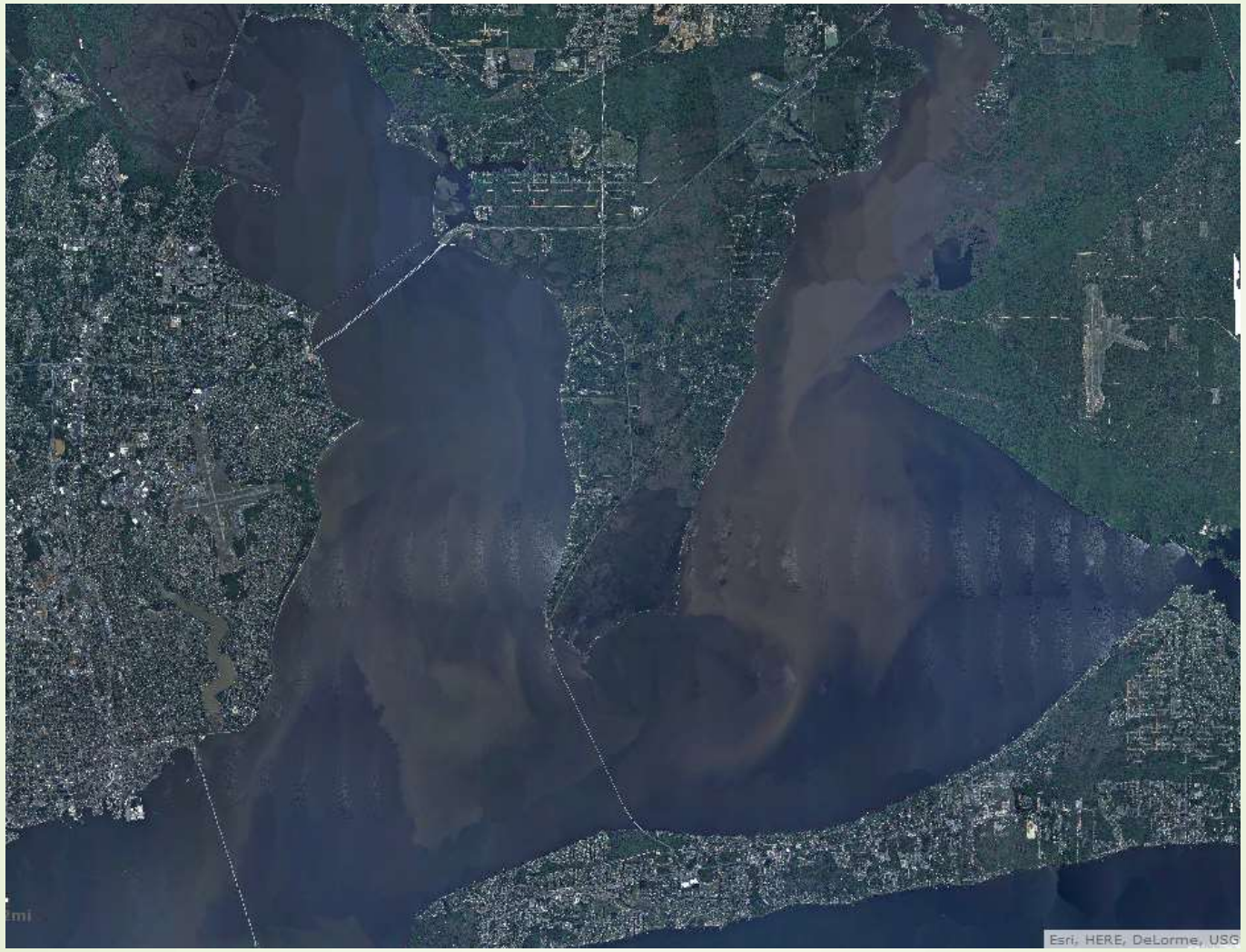
Environmental Stewardship *"This includes economic activity, and social progress, reflected as both a value and a practice by individuals, organizations, communities, and competent authorities."*

- National Academy of Sciences, 2009

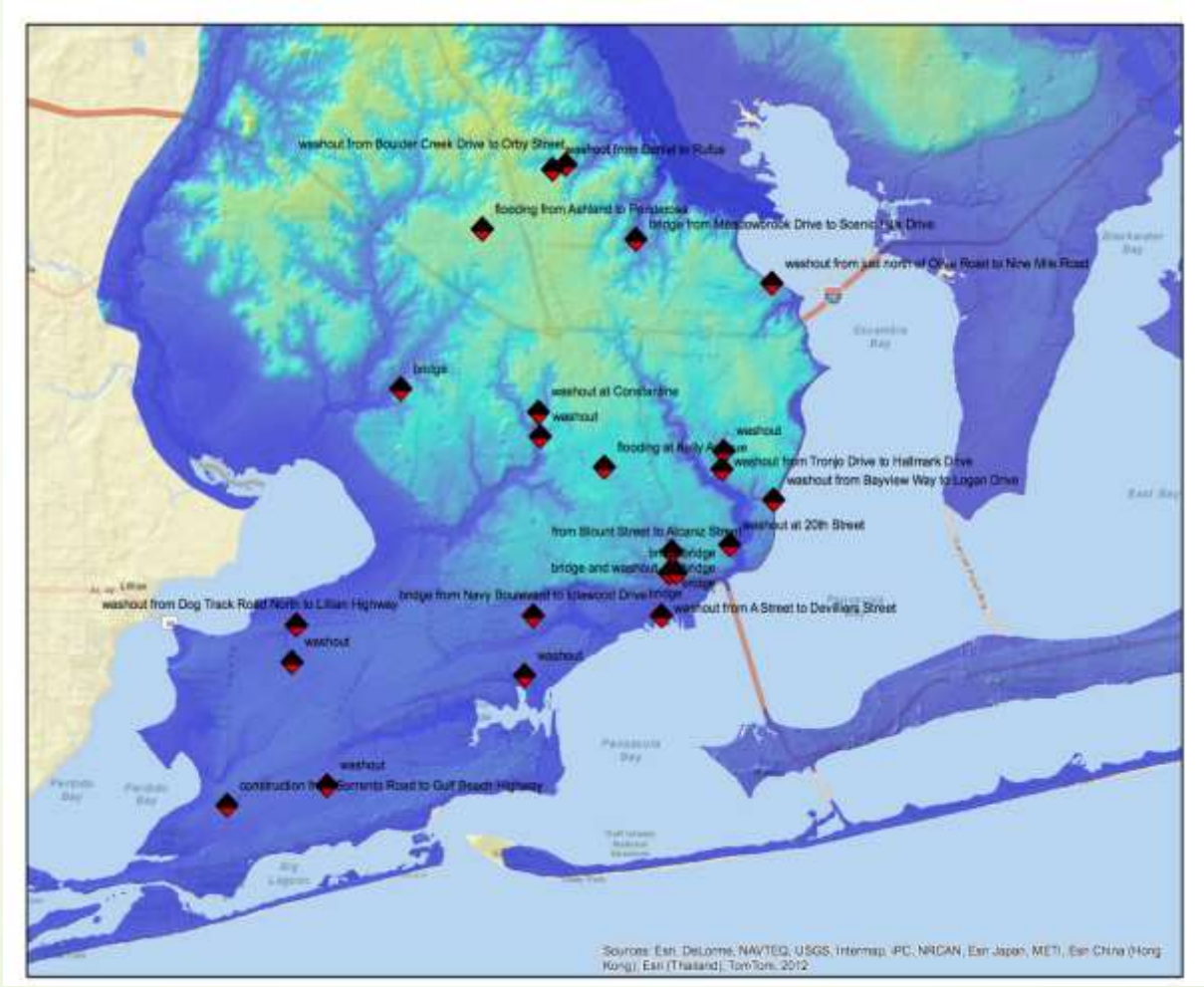
How do we Learn? Usually from our Mistakes….

- What tools are needed to make better decisions?
- What value do we place on a healthy ecosystem?
- What benefits do communities receive from healthy ecosystems?
- Who wants to live in an impaired community?
- Retooling communities after a disaster is ALWAYS costly.
- Current & updated technology must be made available to community planners (i.e., LiDAR, land use changes, etc.)
- When natural resources are lost due to neglect, we can often observe a trickle down effect to the nearby communities.
- Ecosystem services afford an increased stability of the environment which in turn allows communities (flora & fauna) to be more resilient to flooding, disease, etc.

Escambia & East Bay – April 2014 Flood

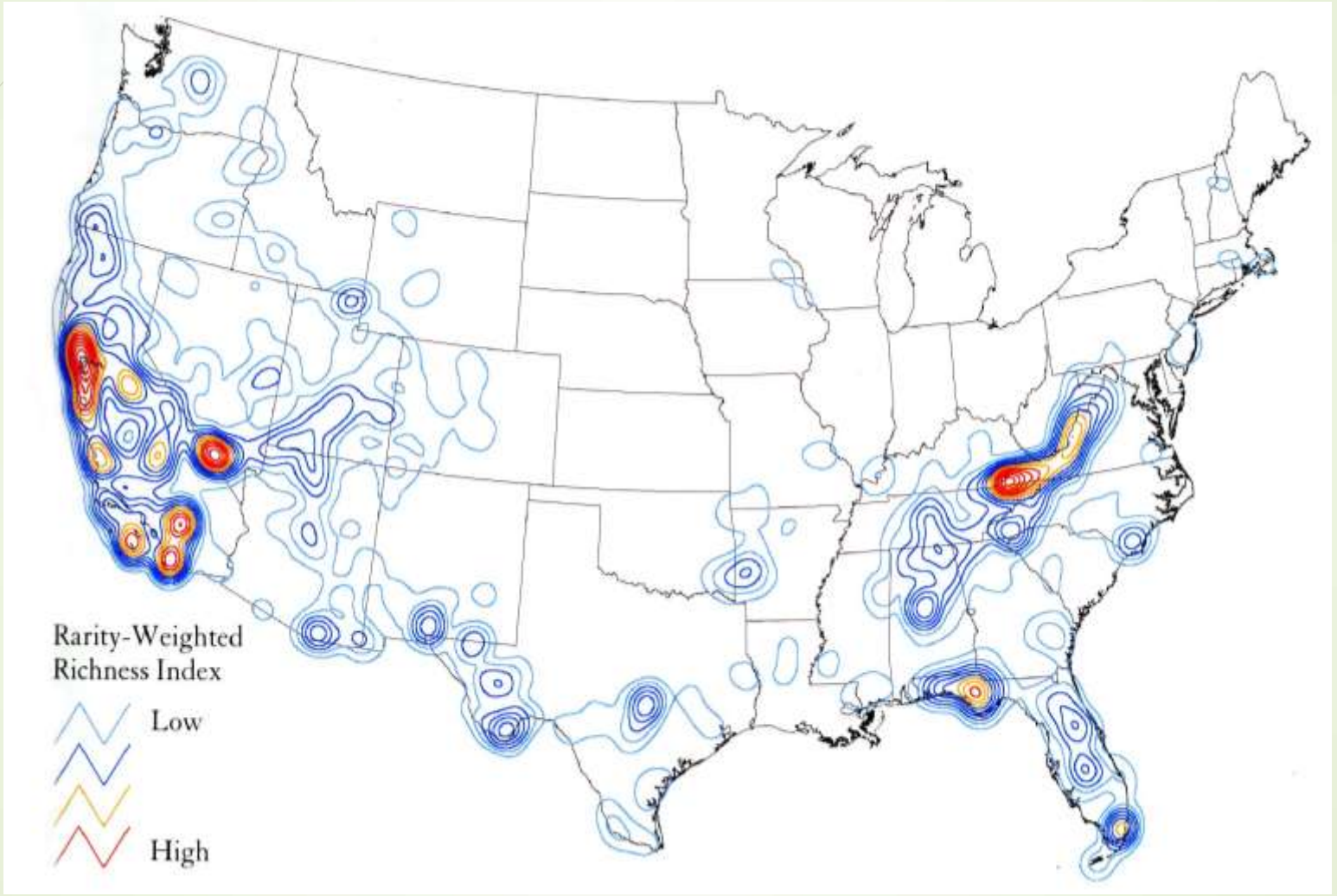


The Intersection of LiDAR & the 2014 Flood in Escambia County, FL



NATHAN MCKINNEY UNIVERSITY OF WEST FLORIDA GEOGRAPHIC INFORMATION SYSTEMS

Biological Hot Spots



Here's our Goal

Monetizing Ecosystem Services

- Healthy Seagrass Beds:
  - 1 Acre of seagrass produces 10 tons of leaves annually;
  - 1 Acre of seagrass can support 40,000 fish annually;
  - 1 Acre of seagrass can support 500,000 small invertebrates;
  - Seagrass beds are an important indicator species of a healthy and vibrant diverse ecosystem;
  - Seagrass beds require excellent water quality;
  - FDEP has placed a value of $20,500/acre of seagrass;
  - FL currently has ~2.7 million acres of seagrass beds which has a 'relative value' of $55.4 billion to FL's economy.

Swarm of Mysids

Habitat Protection

- Carbon Sequestration
- Retooling Communities
- Consider Habitat Fragmentation & Mitigate it:
  - Incentivize to minimize impacts
- Ecological Changes create a ripple in the system:
  - Invasive species take hold;
  - Sensitive species are lost;
  - Relaxing protective rules (SCI, wetland buffers, DO, etc.);
  - Weakening ordinances;
  - Rubber stamping permits without considering impacts;
  - Educate the public, elected officials, communities, etc. – what happens upstream (here) impacts and effects what happens downstream (there); and
  - Upland changes have negative implications to low lying areas.

Planning is Essential

- Development in watersheds without a plan has given rise to the stormwater issues we are facing today ($$$);
- Be consistent! One Dept is concerned about water quality, and the other is pushing through development plans in a wetland;
- Today, we are in a hurry – taking the fast track without the benefit of the slow methodical route;
- Plan for the future (more growth, more housing, more roads or RAIL, etc.)
- The cost of roads, bridges, infrastructure today is always cheaper than it will be tomorrow; and
- Plan for the other people and animals in your community – allow green spaces and wildlife corridors.

Importance of Buffers – Riparian & Wetland

- How much of a buffer is required to achieve a healthy functioning Ecosystem?

Benefit Provided:	Buffer Width: 30 ft	50 ft	100 ft	300 ft	1,000 ft	1,500 ft
Sediment Removal - Minimum	●	●	●	●	●	●
Maintain Stream Temperature	🐟	🐟	🐟	🐟	🐟	🐟
Nitrogen Removal - Minimum		●	●	●	●	●
Contaminant Removal		●	●	●	●	●
Large Woody Debris for Stream Habitat		🐟	🐟	🐟	🐟	🐟
Effective Sediment Removal			●	●	●	●
Short-Term Phosphorus Control			●	●	●	●
Effective Nitrogen Removal			●	●	●	●
Maintain Diverse Stream Invertebrates			🐟	🐟	🐟	🐟
Bird Corridors				🐦	🐦	🐦
Reptile and Amphibian Habitat					🐦	🐦
Habitat for Interior Forest Species					🐦	🐦
Flatwoods Salamander Habitat – Protected Species						🦎

Re-Establishing Riparian Zones may be the most Cost Effective way to address our current Environmental Problems

- Riparian zones have co-evolved in our landscapes overs thousands of years;
- Highly specialized relationship with native plants, birds, and insects;
- Invasive species of plants have caused a loss in diversity in plants by out-competing natives, which has resulted in a loss of biomass (birds and insects) which have the combined results of negatively impacting the ability of the food web to function as designed.
  - Exotic ornamentals support 50% fewer insect predators,
  - Insect predators provide protein to birds in the form or high energy lipids,
  - Terrestrial insect predators also fall into waters thus transferring protein to aquatic species.

Planning for the Future is Essential

- Re-establishing riparian corridors for wildlife and flood control;
- Re-establishing native plants for their biodiversity and their role in supporting the biological food web function;
- Consider expanding buffers between upland and aquatic systems to intercept soils/sediments, nutrients, and stormwater run-off;
- Recognize that the landscape is not static, so as we build roads and bridges we must consider that the role and function of the riparian zone must be considered and included in our planning and designs; and
- The health of our ecosystems depends on how we incorporate the many disciplines of science and technology into our future for more resilient and healthy communities.

Looking Forward Several Generations - What will they have left?