

## Supporting Landscape-Scale Planning with Decision Support Toolkits

IWC

Biodiversity, Threatened & Imperiled Species Symposium

September 11, 2014

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## The site in a landscape context

- All conservation is ultimately implemented at the site level
- Site level decisions benefit from a landscape context to:
  1. Understand patterns and connections from the site to the surrounding landscape
  2. Understand the relative value and importance of the site to all other potential sites

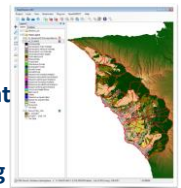
## Challenges

Putting site decisions in a landscape context has traditionally been very difficult

- Coarse data and assessments at the landscape scale not useful for site level
- Stove-piped conservation programs, decisions, funding sources
- Myriad of potential partners & stakeholders that may not agree on priorities
- Lack of tools that can move between site and landscape scales

## The role of tools

- Tools are software/applications that facilitate:
  - **Gathering and distributing relevant data**
    - Example: Regional data portals
  - **Conducting analyses and modeling**
    - Example: Tools for conducting vulnerability assessments
  - **Visualizing data and analysis/modeling results**
    - Example: online decision support systems/viewers
  - **Integrating information into planning for conservation, land use, and land management**
    - Example: planning decision support systems



**Many tools**

**Example: North Pacific LCC Tool Selection Matrix (-130 tools)**


Function	User		
	General Public	Resource Managers and Planners	Technical / Scientific Experts
Assess Data Quality	United States Geological Survey United States Environmental Protection Agency United States Department of the Interior	United States Environmental Protection Agency United States Geological Survey United States Department of the Interior	United States Environmental Protection Agency United States Geological Survey United States Department of the Interior
Assess Data Reliability	United States Geological Survey United States Environmental Protection Agency United States Department of the Interior	United States Environmental Protection Agency United States Geological Survey United States Department of the Interior	United States Environmental Protection Agency United States Geological Survey United States Department of the Interior
Assess Data Accuracy	United States Geological Survey United States Environmental Protection Agency United States Department of the Interior	United States Environmental Protection Agency United States Geological Survey United States Department of the Interior	United States Environmental Protection Agency United States Geological Survey United States Department of the Interior
Assess Data Completeness	United States Geological Survey United States Environmental Protection Agency United States Department of the Interior	United States Environmental Protection Agency United States Geological Survey United States Department of the Interior	United States Environmental Protection Agency United States Geological Survey United States Department of the Interior
Assess Data Consistency	United States Geological Survey United States Environmental Protection Agency United States Department of the Interior	United States Environmental Protection Agency United States Geological Survey United States Department of the Interior	United States Environmental Protection Agency United States Geological Survey United States Department of the Interior
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**How to make sense of it all?**

**A Toolkit Approach:  
A group of tools *interoperated* to perform a workflow**


Workflows diagram the flow of information from source data, through analytical processes, to decision products

### Examples of Published Toolkits




**Integrated Planning for Resilient Communities**  
Berkeley-Charleston-Dorchester, SC

**Function:**  
Supports integrated hazard- and ecosystem-based land use planning



**Integrated Land-Sea Toolkit**  
TX, DE, CA, PR, GA

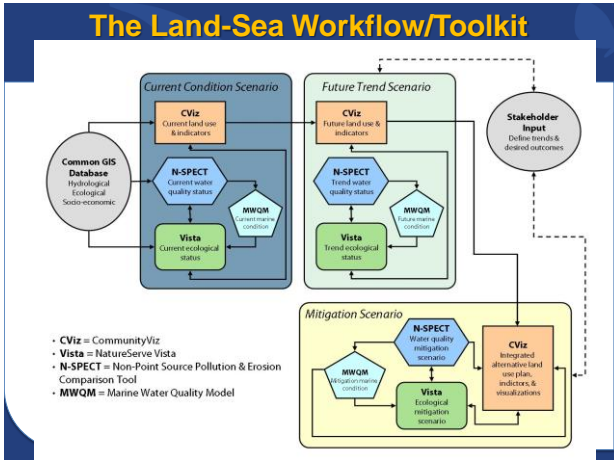
**Function:**  
DST to assess the effects of urbanization on water quality and biodiversity



**Refuge Vulnerability Assessment Toolkit**  
VA, NV, OR

**Function:**  
Cumulative effects assessment for wildlife refuges and evaluate management scenarios

**E B Ecosystem-based Management Tools Network**

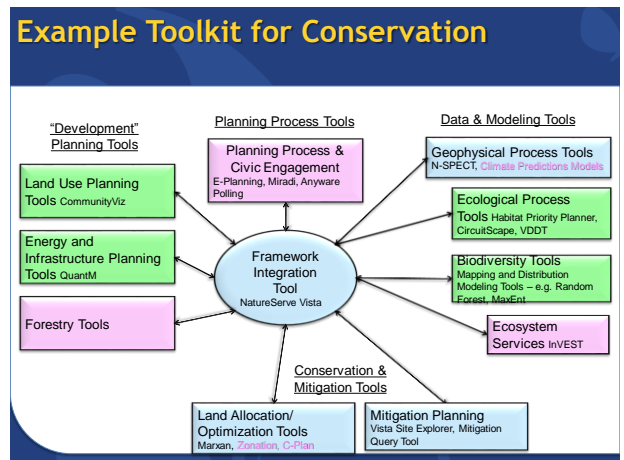
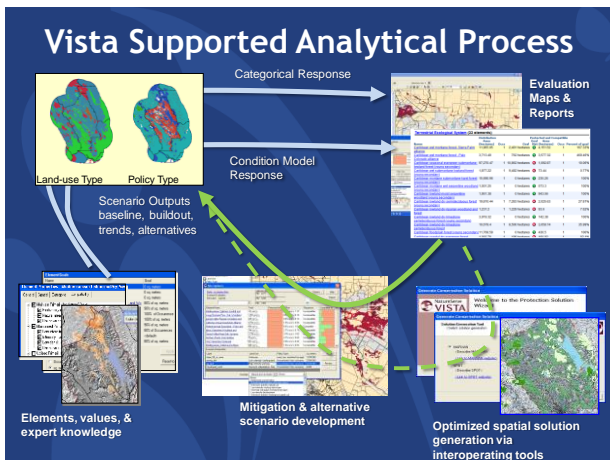


**NatureServe VISTA** On the land, in the water, anywhere on the globe

- ~\$4M investment in development with endowment for ongoing maintenance and development
- Free extension to ESRI's ArcMap 10.x with spatial analyst
- Provides automation, documentation, & repeatability of the planning process
- Supports both conservation experts & planners/managers
- Full integrated help manual, live technical support, available training in person or by web

## What Does Vista Help You Do?

- Helps you **organize and visualize spatial data**
- **Incorporate expert knowledge:** about species/habitat requirements and sensitivities is the scientific backbone that drives Vista analyses and good planning
- **Apply well-vetted concepts** from *scenario-based planning, cumulative effects assessment, mitigation hierarchy, systematic conservation planning, and ecosystem-based management & climate adaptation*
- **Define** a variety of **scenarios** that incorporate unlimited issues and **evaluate** their ability to support species and ecosystems
- **Create alternatives** at a site specific level or systematically across the planning region
- **Support ongoing monitoring and adaptive management**



**MISSION \* ARANSAS**  
NATIONAL ESTUARINE RESEARCH RESERVE

## Integrated land-Sea planning for Aransas Bay & Watershed, TX, USA

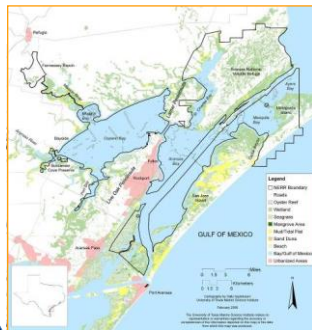
Patrick J. Crist (NatureServe)  
Kiersten Madden (MANERR)  
Dave Estlinger (NOAA)  
Doug Walker (Placeways)








### Mission-Aransas NERR



**Legend**

- Outer Boundary
- Inner Boundary
- Outer Point
- Inner Point
- Mangrove Area
- Salt Marsh Area
- Oak Motte Area
- Beach Area
- Riparian Area
- Urban Area

**Mangroves**



**Salt Marsh**



**Oak Motte**



**Urban**



**Beaches**




**Riparian**



### Project Concepts


- Land uses impact freshwater and marine aquatic habitats and biodiversity
- Analytical feedback loops that predict aquatic outcomes of different land use scenarios can be used to inform appropriate type and placement of land uses
- We can ID parcels that cause disproportionate impacts for conservation



MANERR Integrated Land Sea Planning

### Defining Conservation Elements

- Elements are the features of conservation interest
  - Can include also competing land/water use for multi-objective planning
- A key activity is to capture expert knowledge in the database about element responses to threats & conservation practices
  - E.g., what is the range of turbidity levels compatible with sea grass habitat health.

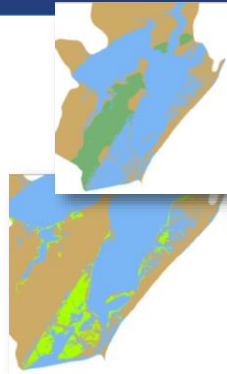


Live Oaks Photo courtesy of Rick Flamm  
 Wavering Grass Photo courtesy of Rick Flamm  
 Kemp's Ridley sea turtle Photo courtesy of Tony Amato  
 Seagrass Photo courtesy of Ken Dutton

MANERR Integrated Land Sea Planning

## Defining Conservation Elements & Goals

- Element information is comprised of spatial occurrence data, expert-derived parameters, and values such as representation goals

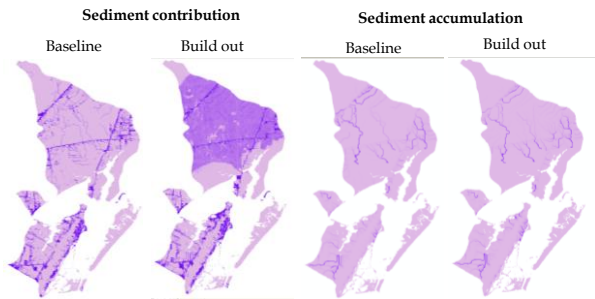


## Characterizing Scenarios



- ▣ Scenarios are used to assess conservation goal achievement
- ▣ Scenarios can be:
  - Current situation
  - Plan/policy based future scenario
  - Trend future scenario
  - Alternative plans, proposals, mitigations
- ▣ Scenario features can be anything mappable, e.g.,:
  - Land/water use & management
  - Infrastructure, energy
  - Invasives, fire
  - SLR, storm surge

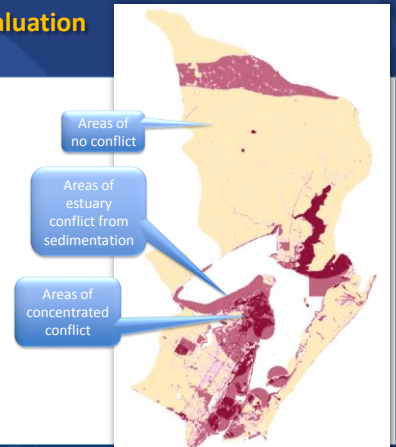
## Scenario Water Quality Components



MANERR Integrated Land Sea Planning

## Vista scenario evaluation

- Evaluations quantify and map impacts relative to element goal achievement
- Compatibility conflict map shows locations and richness of elements in conflict (red shades) with the scenario that have not met retention goals



### Vista scenario evaluation: terrestrial

Reports quantify goal achievement, new and cumulative impacts, and effects on viability

**Overall Scenario Performance**

Goals Met: 13 elements

**Goal Performance by Element**

Element	Goal	Performance
Whooping Crane	100% of eq. habitat	100% of eq. habitat
Whooping Crane	100% of eq. habitat	100% of eq. habitat
Whooping Crane	100% of eq. habitat	100% of eq. habitat

**Element Evaluation: Whooping Crane**

Element: Whooping Crane  
 Evaluation: Traditional, Terrestrial  
 Filter: Selection cell sites  
 Selection cell size: 30 sq. meters  
 Element cell size: 30 sq. meters  
 Goal: 100 percent of area

**Element evaluation details**

Element: Whooping Crane  
 Name: Whooping Crane  
 Total: 8 acrs, 320,480.00 sq. m.  
 Selection: 8 acrs, 320,480.00 sq. m.  
 Selection Average CV: 0.201  
 Selection Maximum CV: 0.201  
 Goal: 100% of eq. habitat  
 Response: Met  
 % Visible: 100%  
 % Visible: 100%  
 Selection % Visible: 100%  
 Selection % Visible: 100%  
 Chart: Visible Occurrences  
 Chart: Visible Area  
 Compatible: 8 acrs, 320,480.00 sq. m.  
 % of Goal Compatible: 100%  
 Selection % Compatible: 100%  
 Selection % of Goal: 100%  
 Chart: Compatible Area  
 Chart: Compatible Area

### Assessing Results, Identifying Opportunities

Site Explorer (Vista) provides context for site to determine mitigation need and opportunity

**Site Explorer (Vista)** provides context for site to determine mitigation need and opportunity

Selected site: area generating sediment

Site scenario results

### Creating Alternative Scenarios & Site Mitigations

**Site Explorer**

Predicted increase in goal achievement w/land use change

• Specify alternative uses for the site & view immediate results. Save results to create alternative scenario

Element Name	Total	Compatible Area	% Compatible	Response
Whooping Crane	8 acrs, 320,480.00 sq. m.	8 acrs, 320,480.00 sq. m.	100%	Compatible
Whooping Crane	8 acrs, 320,480.00 sq. m.	8 acrs, 320,480.00 sq. m.	100%	Compatible
Whooping Crane	8 acrs, 320,480.00 sq. m.	8 acrs, 320,480.00 sq. m.	100%	Compatible

### Comparing Alternatives

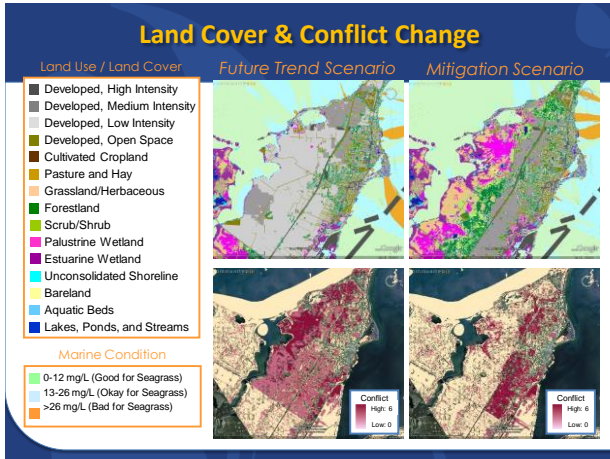
Future Trend Scenario vs Mitigation Scenario

Reduced marine impacts

Reduced terrestrial impacts

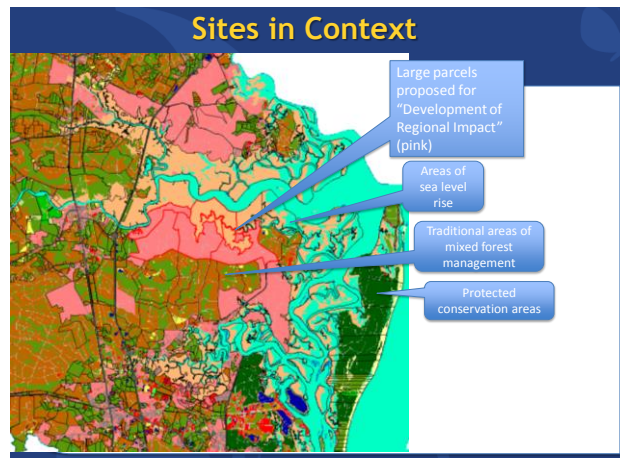
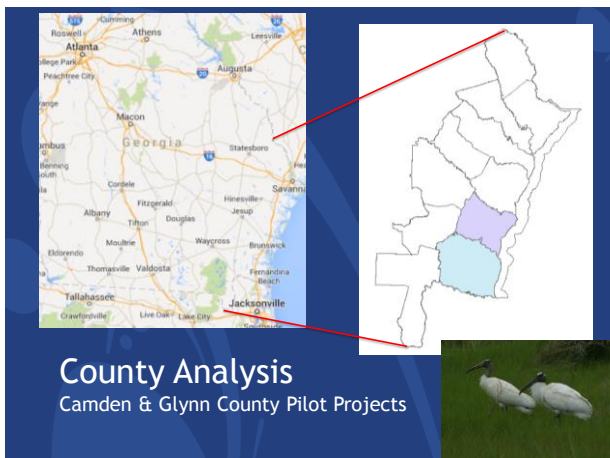
Future Trend TSS: High: 99, Low: 0

Future Trend TSS (mg/L): High: 107, Low: 0

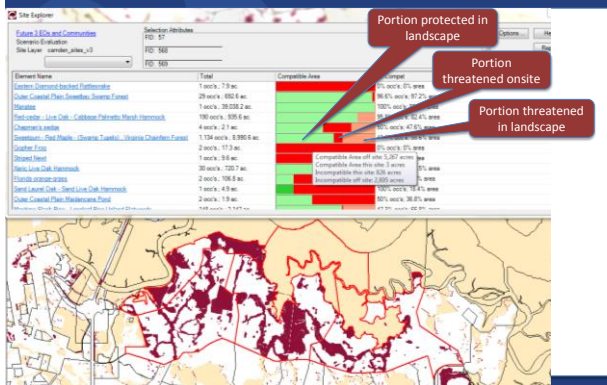


## Local scale planning in a regional context

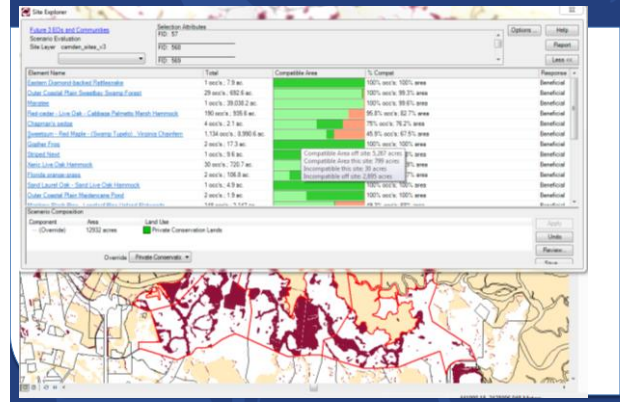
### Coastal Georgia, USA



## Evaluating cumulative impacts—onsite and in landscape context



## Conservation/mitigation planning



## Implementation & Adaptive Management

- Update scenarios as decisions are made
- Update data and scientific knowledge
- Re-evaluate for wins and losses to always know where you stand against goals
- Apply adaptive management given changes and new opportunities

## Conclusion

- Site decisions benefit from landscape context
- Plenty of tools exist for most problems and situations
- Data typically exist to allow multi-scale analyses and planning
- A collaborative approach to applying tools and decisions works best



## Acknowledgements

NatureServe Vista endowment for support for this presentation

## Questions, comments?

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Learn more or download Vista at  
[www.natureserve.org/vista](http://www.natureserve.org/vista)