Supporting Landscape-Scale Planning with Decision Support Toolkits

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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)

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
WA, NV, OR
Function:
Cumulative effects assessment for wildlife refuges and evaluate management scenarios

The Land-Sea Workflow/Toolkit

Cement Condition Scenario
Future Trend Scenario

Common GIS Database: Hydrological - Climatic data

- CHyS = Community(y)s
- Vista = NaturalResource Vista
- N-SPECT = Non-Point Source Pollution & Erosion
- Competition Tool
- MGET = Marine Water Quality Model

Mitigation Scenario

Stakeholder

- Modifiable Area Unit Schemes
- Marine Ecosystems Databases

- Link
- MAXENT
- See5
- PRISM
- EMDS
- SDMap/Yalmpute
- Random Forest
- MC1/VDDT
- RHESSys
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- Project,
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

Vista Supported Analytical Process

Example Toolkit for Conservation
Integrated land-Sea planning for Aransas Bay & Watershed, TX, USA

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

Mission-Aransas NERR

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

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.
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 Water Quality Components

- 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

- Scenario features can be anything mappable, e.g.:
  - Land/water use & management
  - Infrastructure, energy
  - Invasives, fire
  - SLR, storm surge
Vista scenario evaluation: terrestrial
Reports quantify goal achievement, new and cumulative impacts, and effects on viability

Assessing Results, Identifying Opportunities
Site Explorer (Vista) provides context for site to determine mitigation need and opportunity

Creating Alternative Scenarios & Site Mitigations
- Specify alternative uses for the site & view immediate results. Save results to create alternative scenario

Comparing Alternatives
- Predicted increase in goal achievement w/land use change
- Reduced terrestrial impacts
- Reduced marine impacts
Land Cover & Conflict Change

Local scale planning in a regional context
Coastal Georgia, USA

Future Trend Scenario
Mitigation Scenario

Marine Condition:
- 0-12 mg/L (Good for Seagrass)
- 13-26 mg/L (Okay for Seagrass)
- >26 mg/L (Bad for Seagrass)

Future Trend Scenario:
- Developed, High Intensity
- Developed, Medium Intensity
- Developed, Low Intensity
- Developed, Open Space
- Cultivated Cropland
- Pasture and Hay
- Grassland/Herbaceous
- Forestland
- Scrub/Shrub
- Estuarine Wetland
- Eukarine Wetland
- Unconsolidated Shoreline
- Bareland
- Aquatic Beds
- Lakes, Ponds, and Streams

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County Analysis
Camden & Glynn County Pilot Projects

Sites in Context

Large parcels proposed for "Development of Regional Impact" (pink)
Areas of sea level rise
Traditional areas of mixed forest management
Protected conservation areas
Evaluating cumulative impacts—onsite and in landscape context

Portion protected in landscape
Portion threatened onsite
Portion threatened in landscape

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
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Questions, comments?
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