



NatureServe  
**VISTA**

Background



# *NatureServe Vista*

## **Decision Support: Integrating Conservation and Land-Use Planning**



- Comprehensive
- Multi-disciplinary
- Science-based
- Spatial
- Value-driven
- Results-oriented

# *Development History*

## **Extensive Development Effort: Research & Collaboration Informed Design**



- 5+ years in development
- Approximately \$3.4M in development costs
- Numerous collaborators

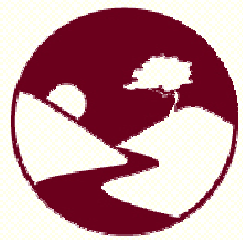
# Commercial-Grade Software

## Industry Standard Platform: ESRI ArcView 9.1 with Spatial Analyst



- Approximately \$1.6M endowment
- Numerous support products:
  - Integrated help manual
  - Live technical support
  - Training
  - Custom support services
- Commitment to ongoing enhancements



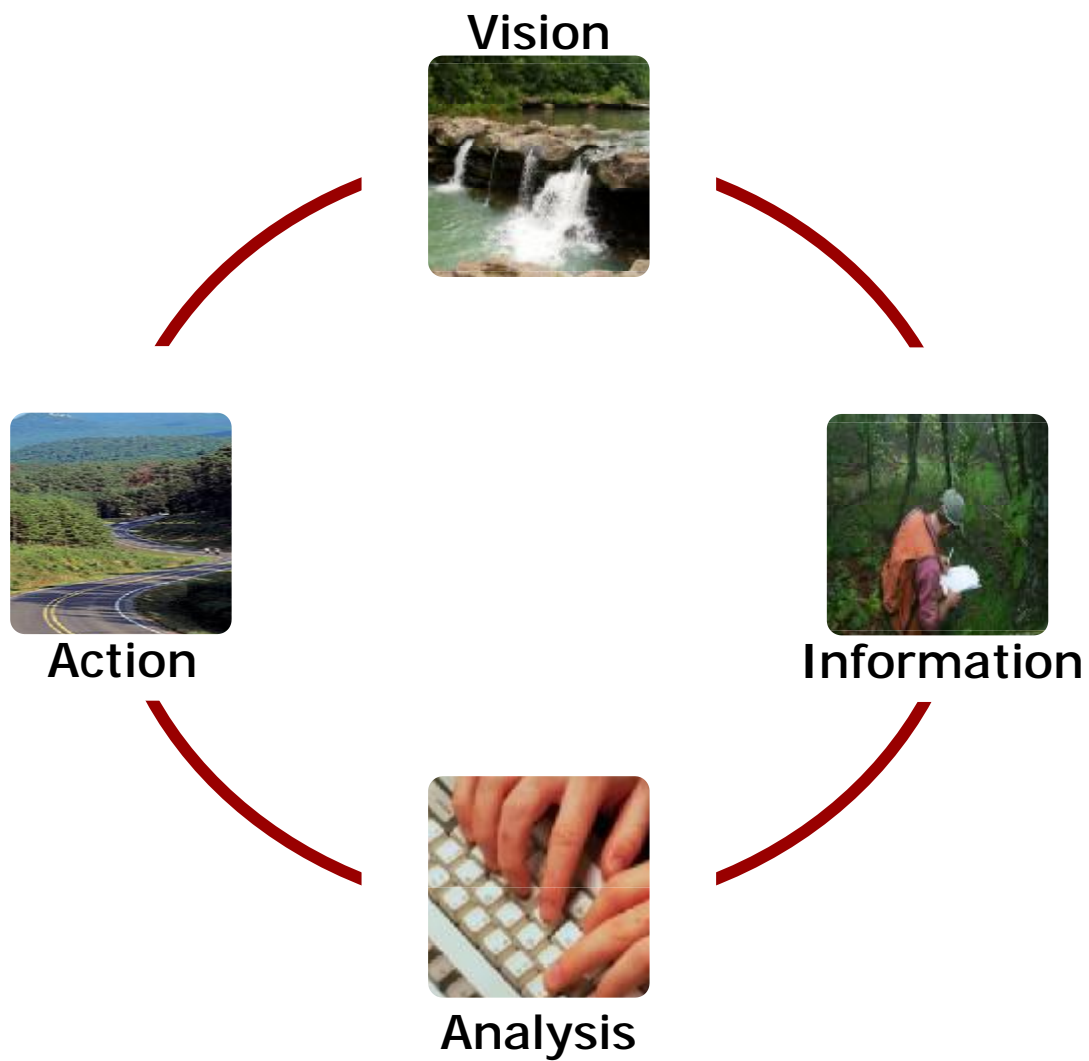


NatureServe  
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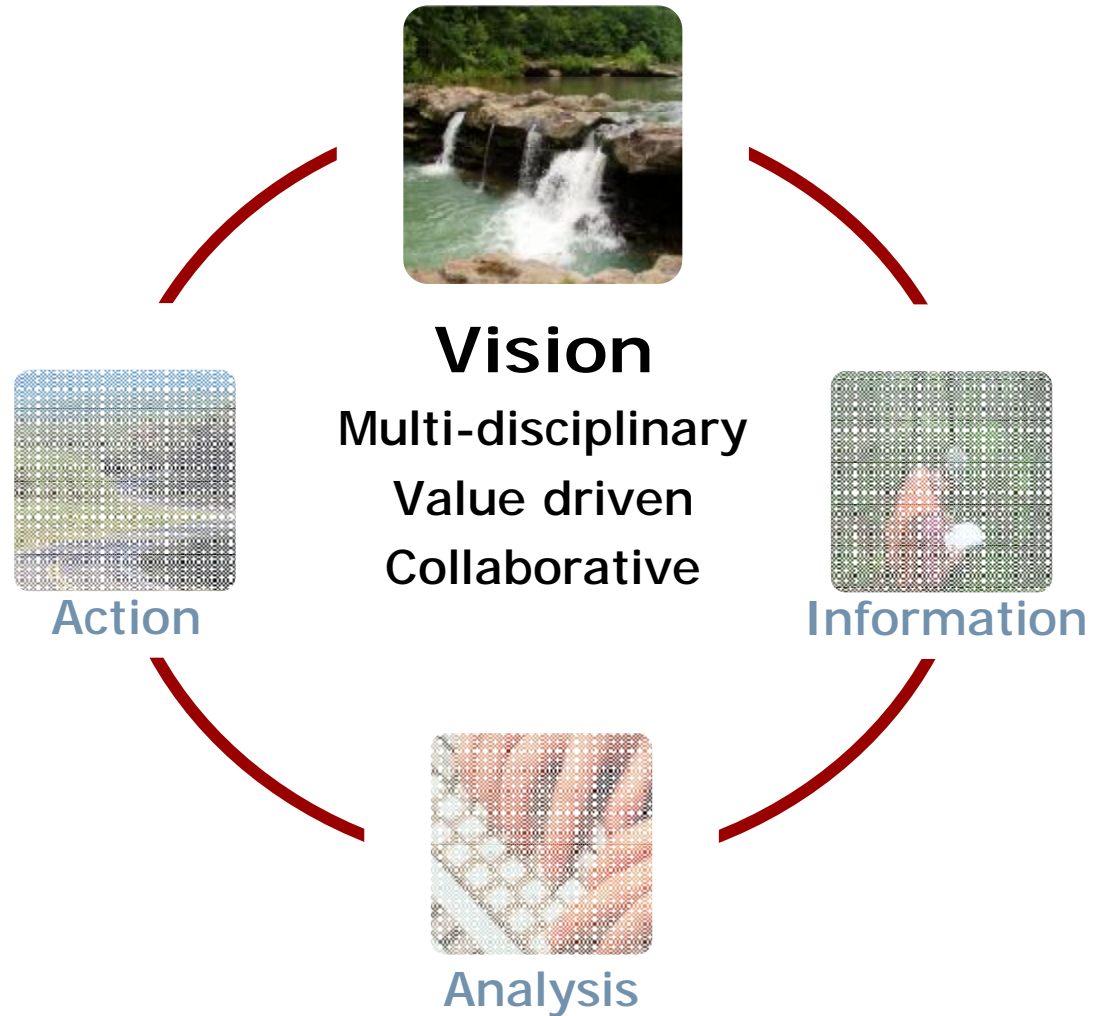
Conservation Planning  
Framework



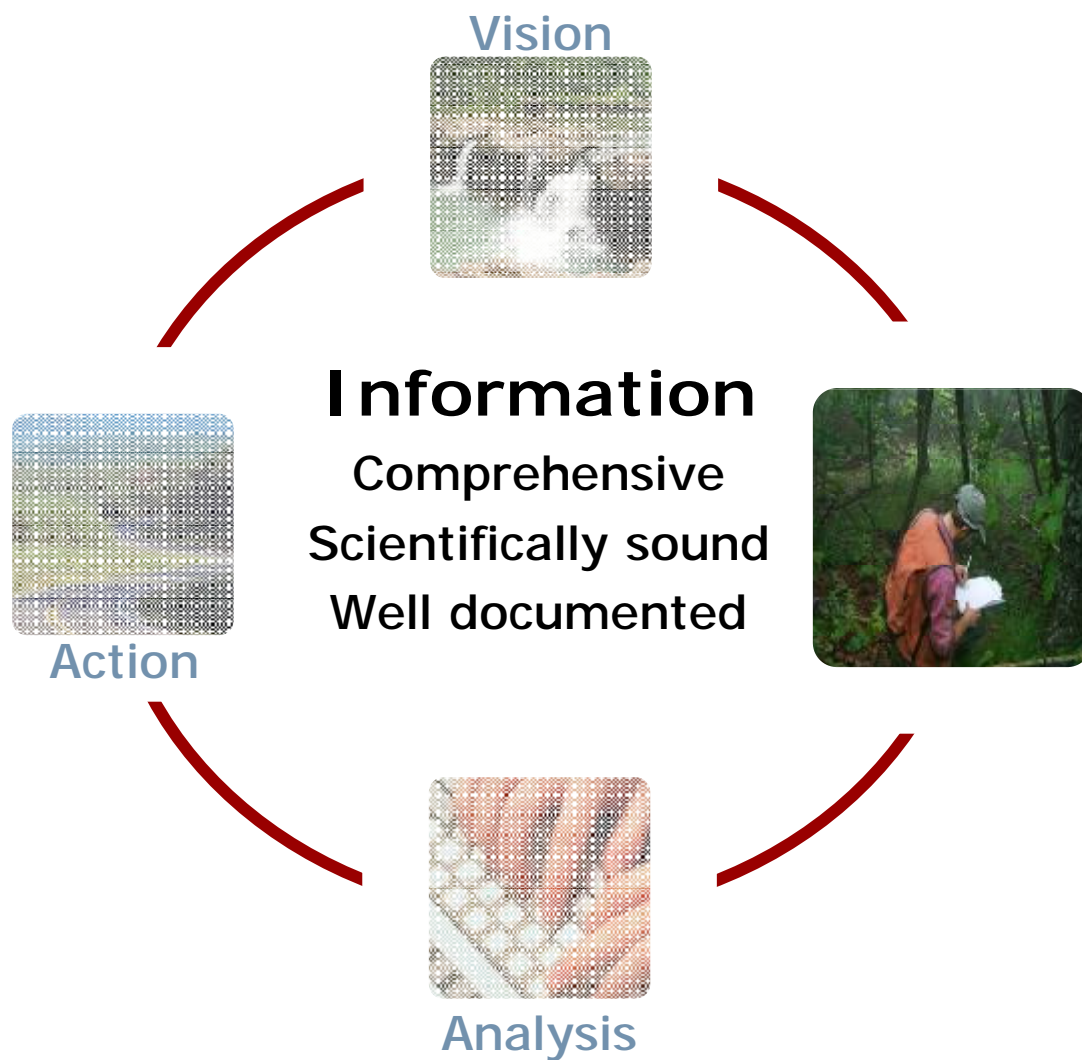
# Transportation Planning



# Planning Requirements

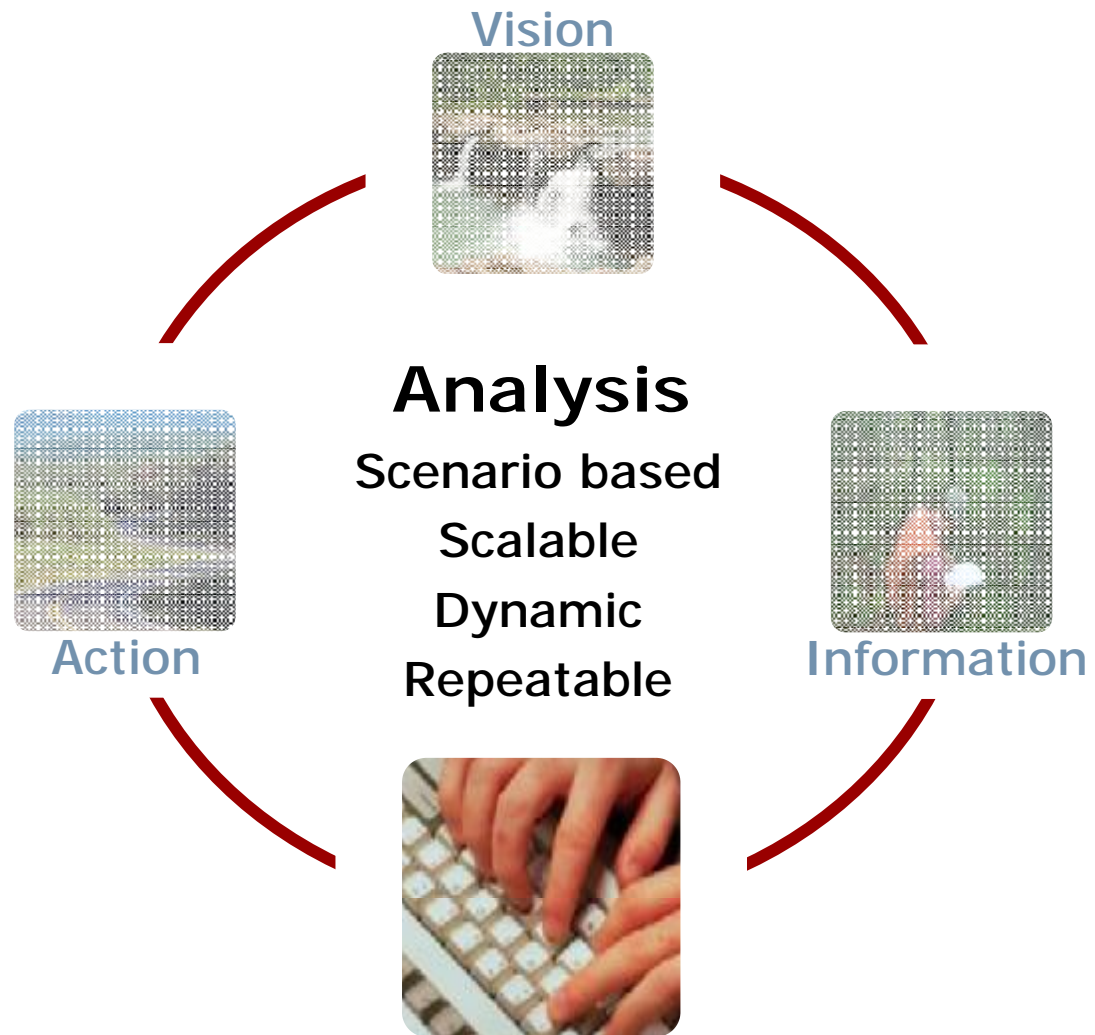


# Planning Requirements

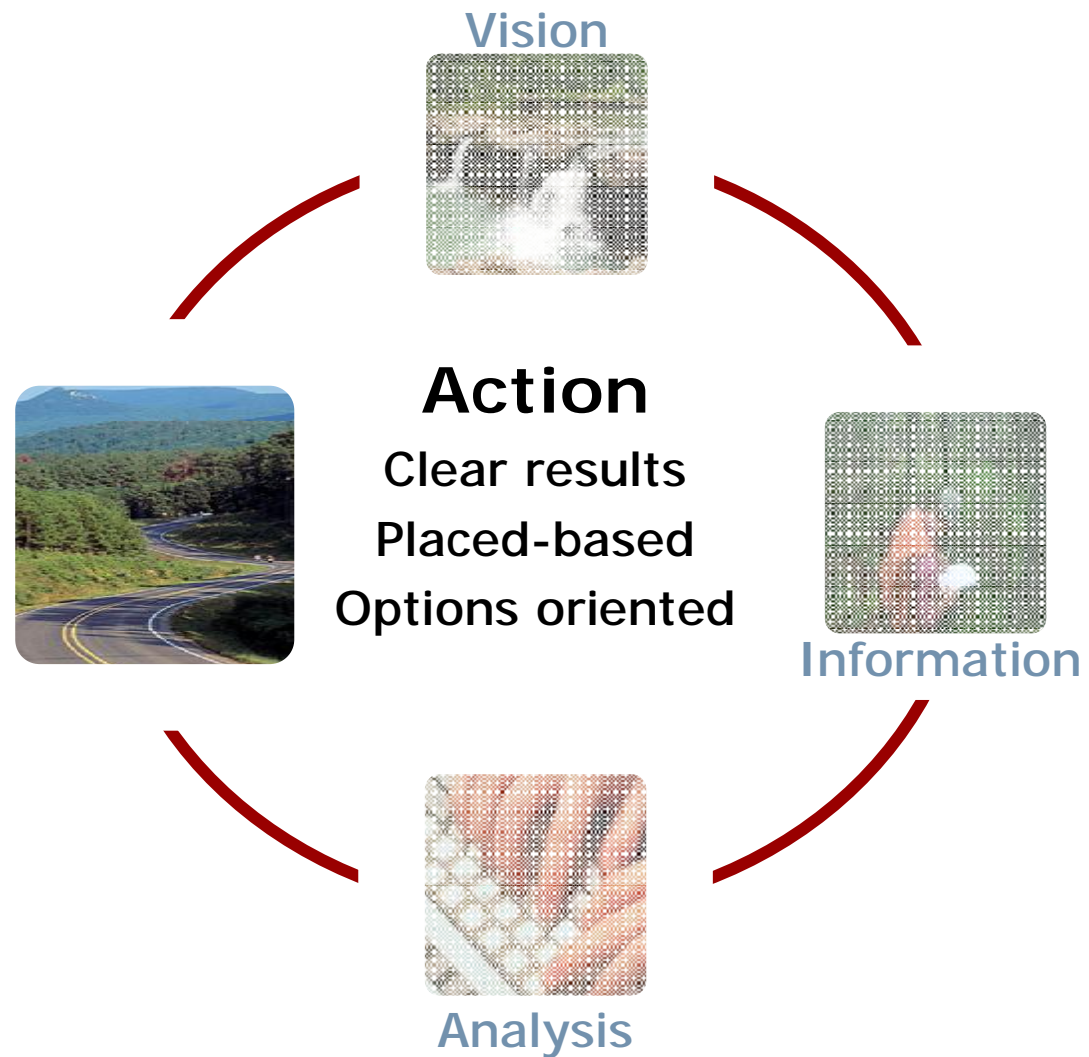




# Planning Requirements



# Planning Requirements



# Vista's Framework



## Vision: Defining the Problem



NatureServe Vista reflects stakeholder values by allowing users to:

- Create weighting criterion that emphasize their conservation objectives
- Define their own conservation goals

# Vista's Framework

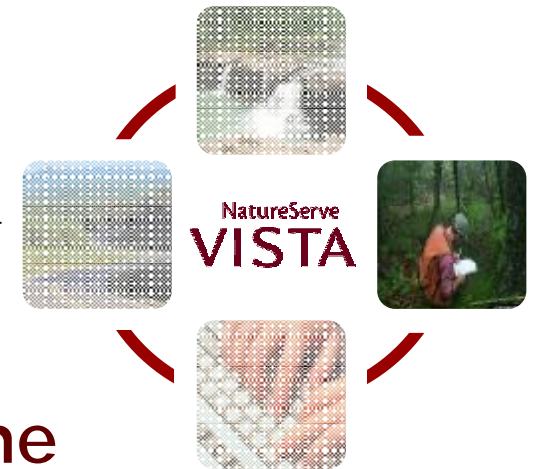


## Vision: Defining Goal Achievement



- Adequate number of element occurrences or area in a project region
- Adequate size of occurrences
- Occurring in areas of compatible land use supported by reliable policies

# Vista's Framework



## Information: Creating the Planning Database



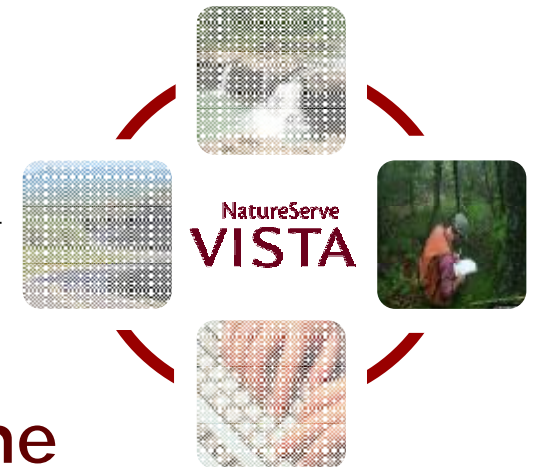
### Elements and Elements:

The **Species** you want to conserve in your planning region.

- Ecological communities
- Ecosystems
- Non-biological elements



# *Vista's Framework*



## Information: Creating the Planning Database

Elements are assigned:

- Spatial distribution
- Ecological integrity & confidence ratings
- Minimum size requirements
- Land use compatibility



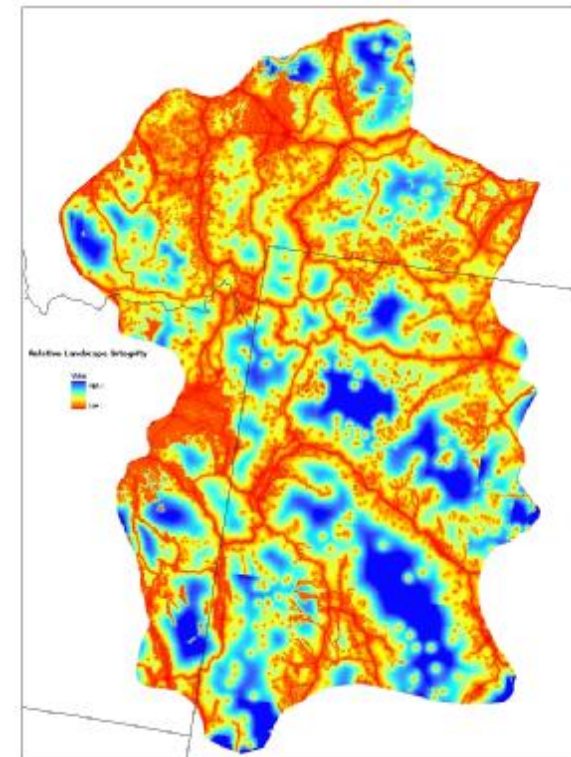
# Vista's Framework



## Information: Modeling Ecological Integrity

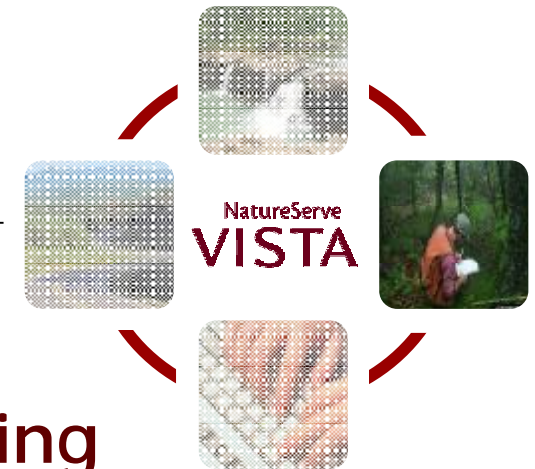


- Combines land use, roads, infrastructure, pollution, etc.
- Model weights effects, adds distance effect
- Can be element-specific

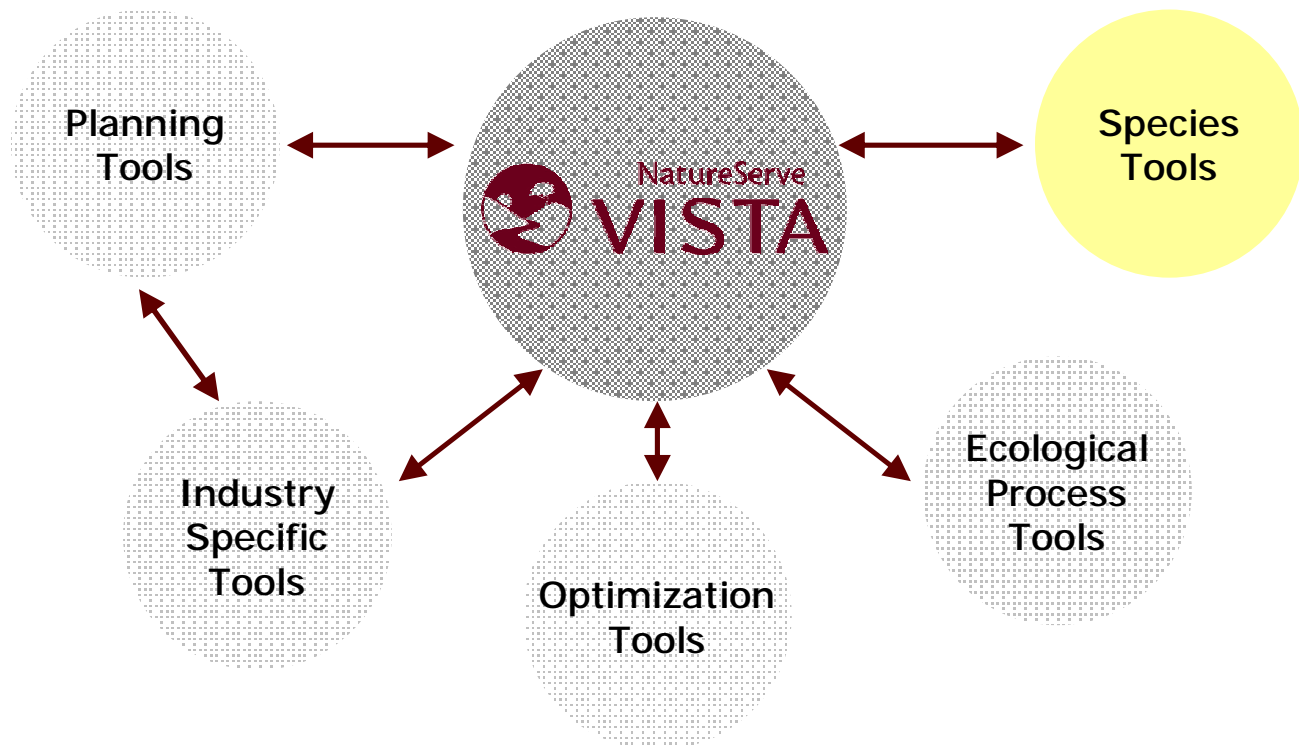




# Vista's Framework



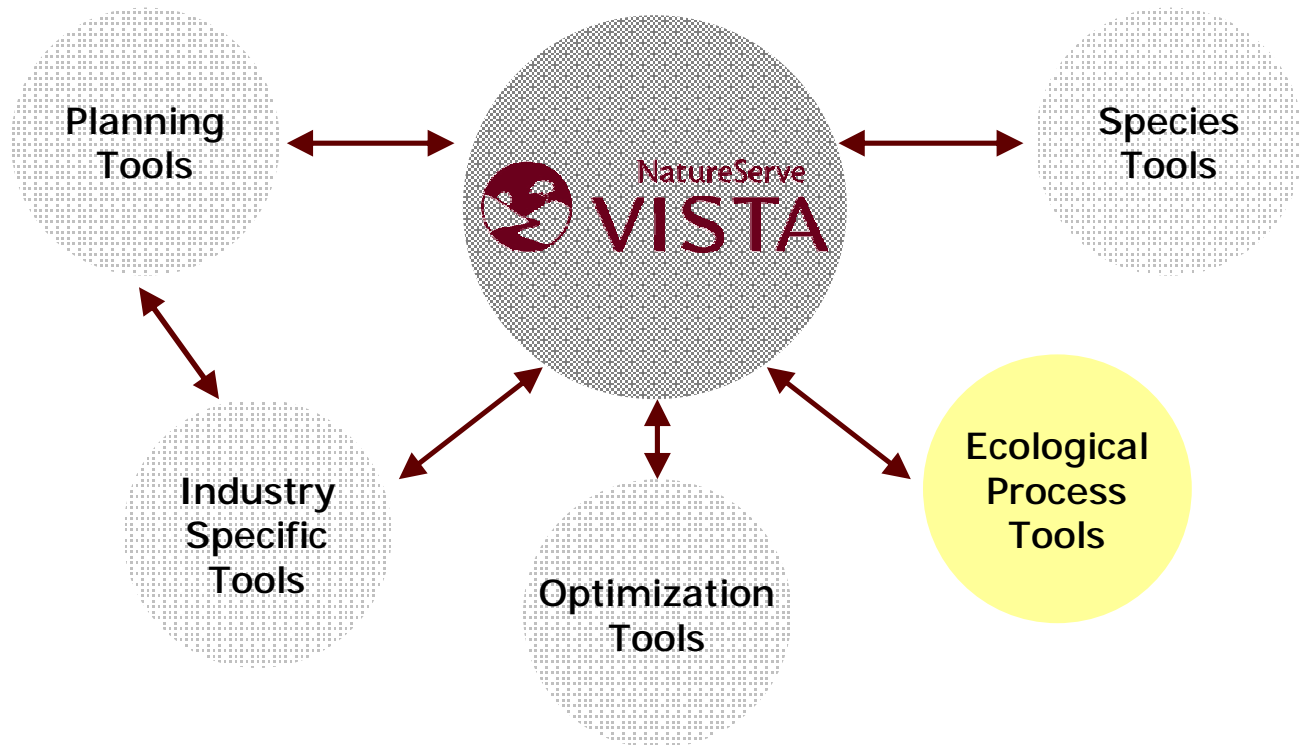
## Information: Incorporating Other Analyses



# Vista's Framework



## Information: Incorporating Other Analyses

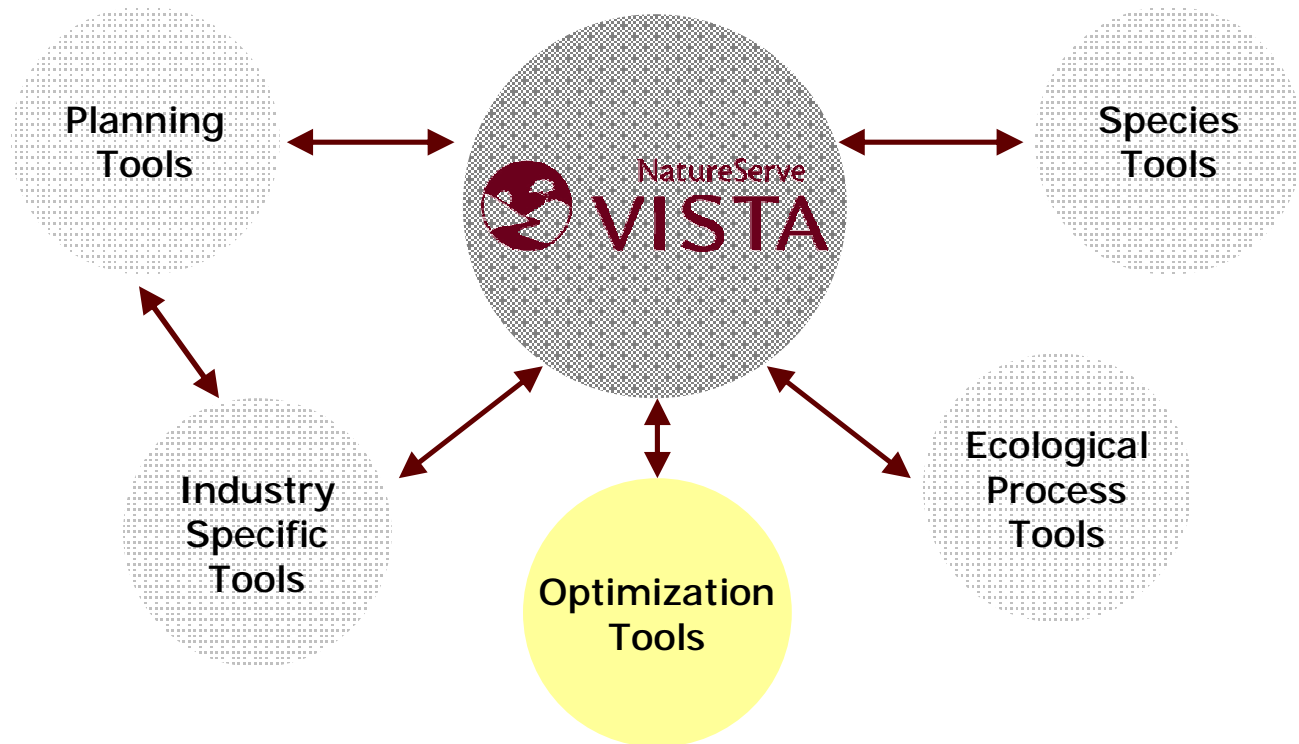




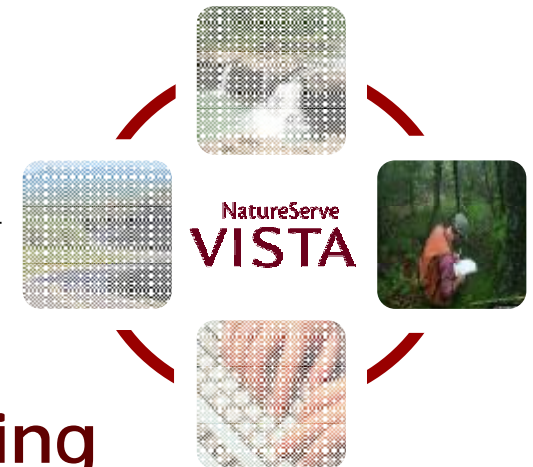
# Vista's Framework



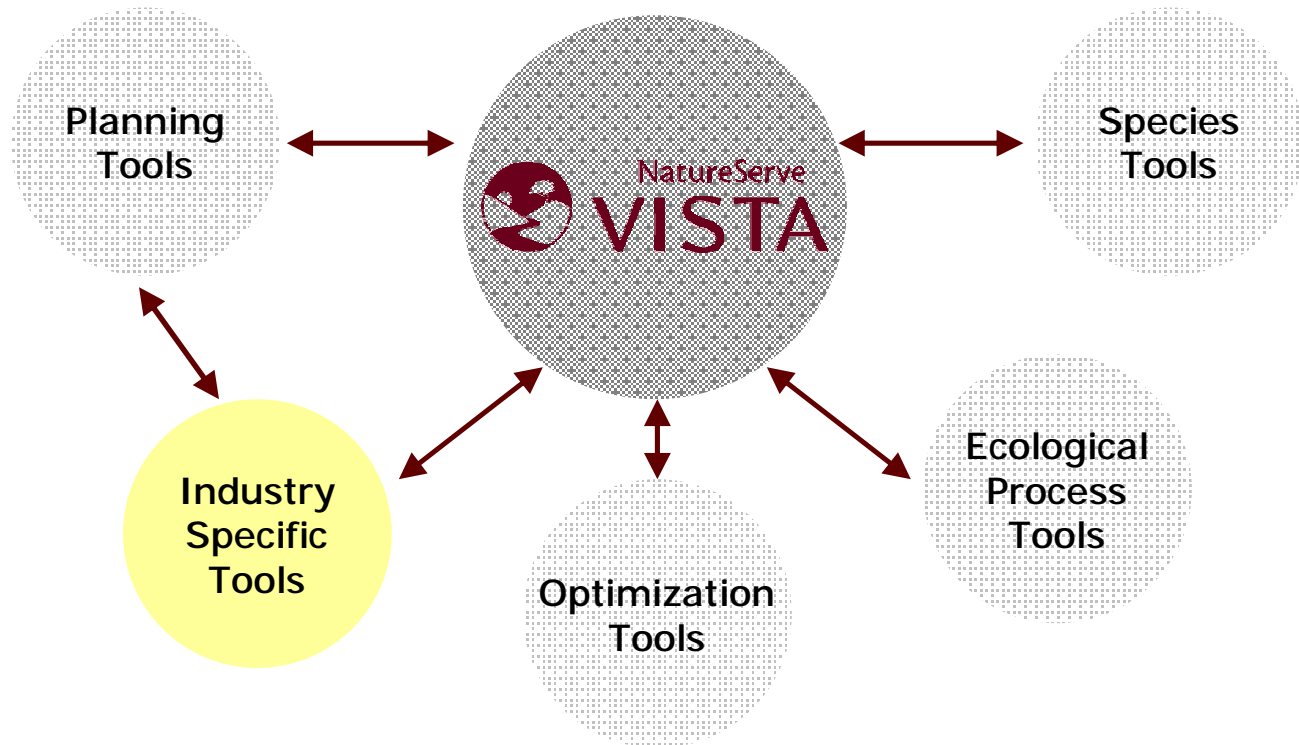
## Information: Incorporating Other Analyses



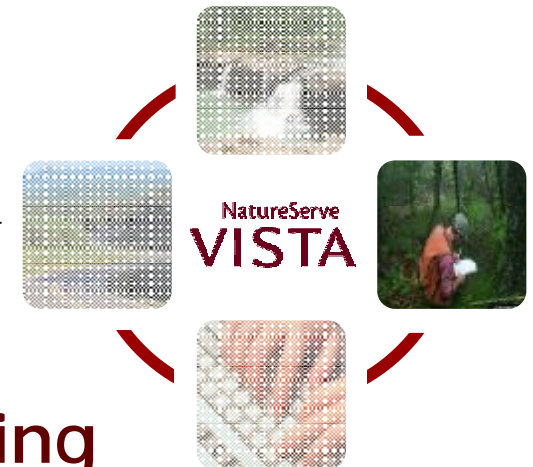
# Vista's Framework



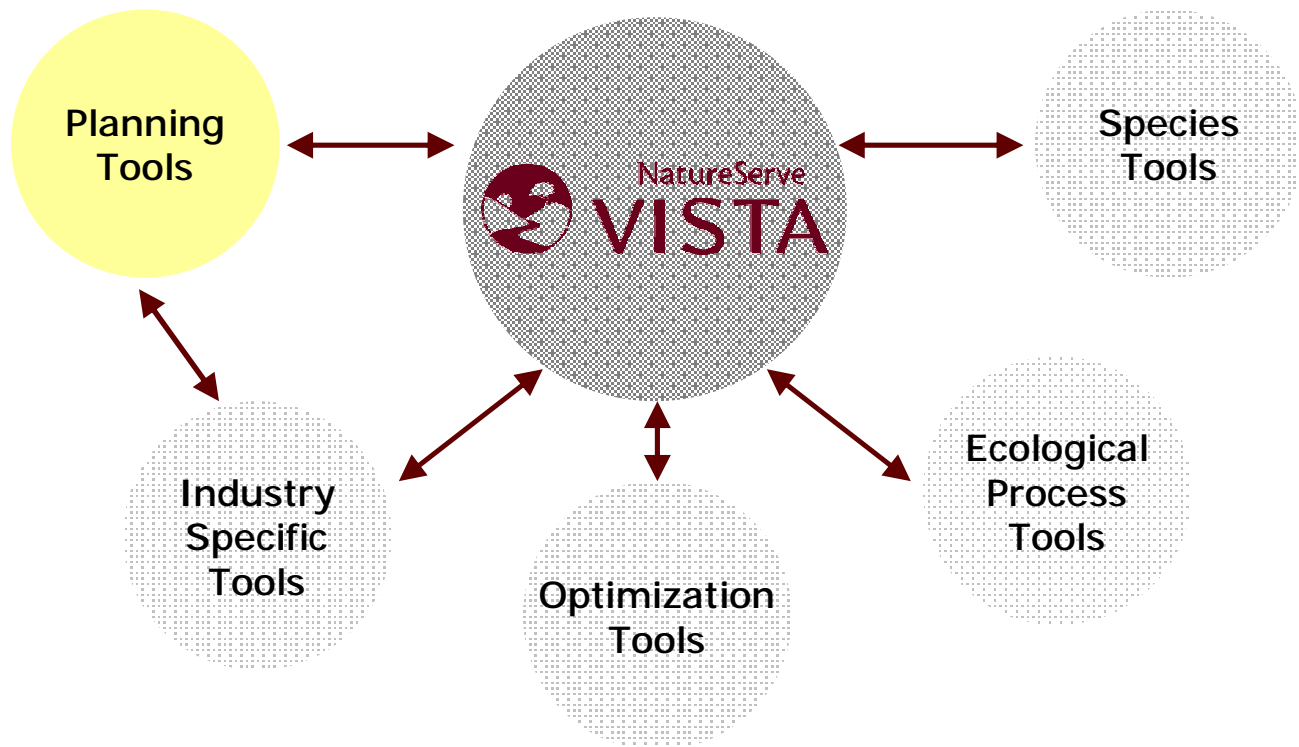
## Information: Incorporating Other Analyses



# Vista's Framework



## Information: Incorporating Other Analyses



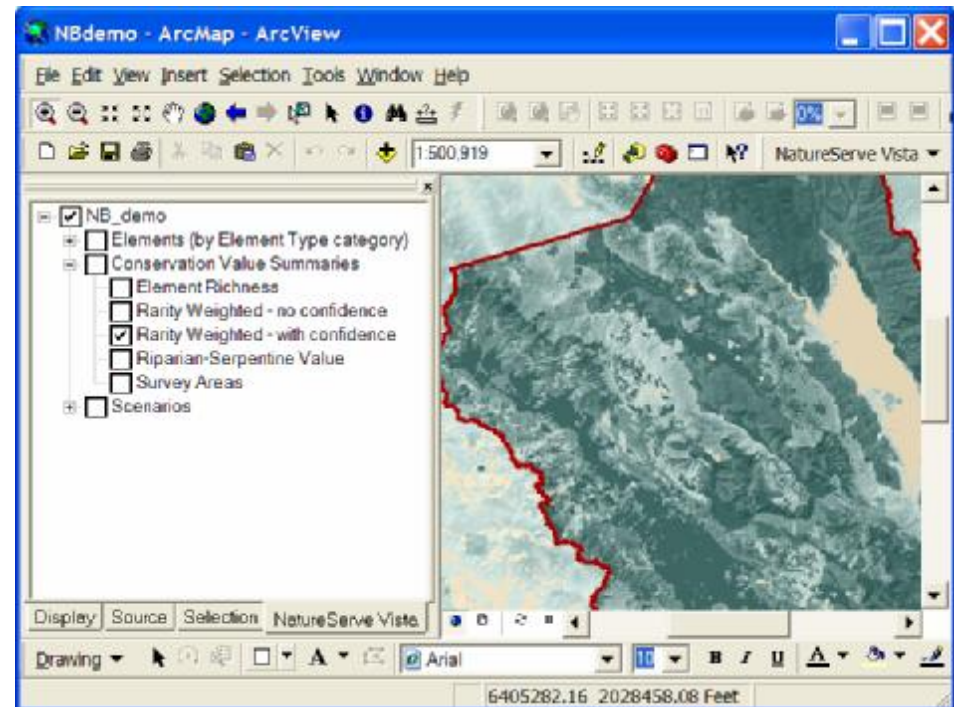
# Vista's Framework



## Analysis: 3 Complimentary Approaches



## Conservation Value Summary



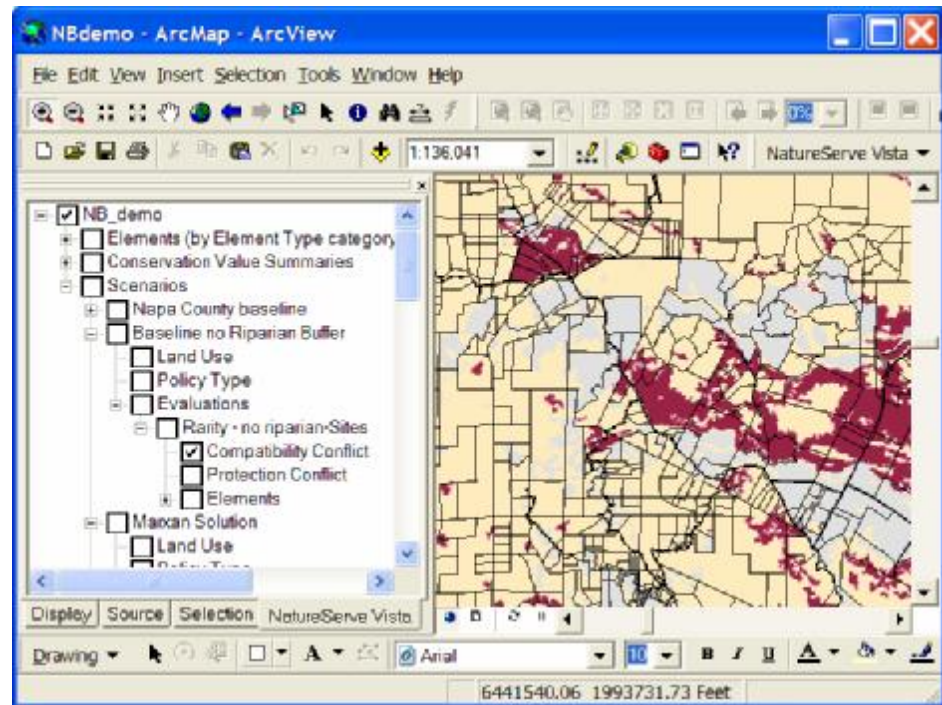
# Vista's Framework



## Analysis: 3 Complimentary Approaches



## Scenario Evaluation





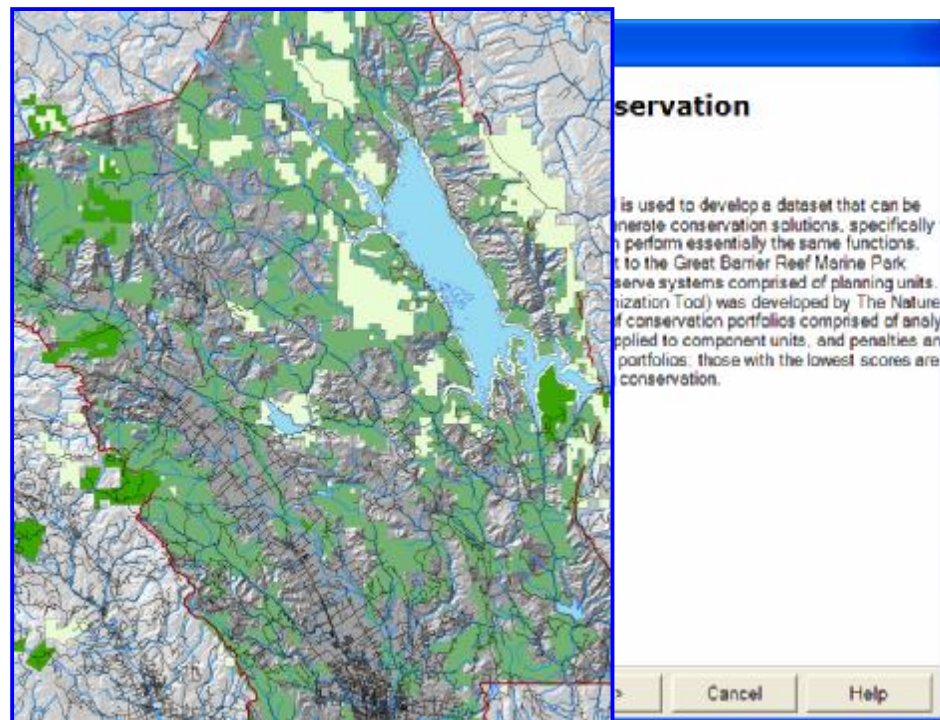
# Vista's Framework



## Analysis: 3 Complimentary Approaches



Solution  
Generation



# Vista's Framework



## Action: Creating Reports for Decision Makers



### Overall Scenario Performance

#### All Elements (35 Total)

	Goals Met For	% of Goals Met	Goals Unmet For	% of Goals Unmet
Protected and Compatible	30 elements	85.71%	5	14.29%
Compatible	31 elements	88.57%	4	11.43%

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### Goal Performance by Element Type

#### Summary

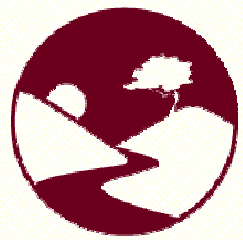
Name	Protected and Compatible		Compatible	
	Goal Met For	Goal Unmet For	Goal Met For	Goal Unmet For
<b>Terrestrial Ecological System</b> (27 elements)	22 elements (81.48%)	5 elements (18.52%)	23 elements (85.19%)	4 elements (14.81%)
<a href="#">Mammal</a> (1 elements)	1 elements (100%)	0 elements (0%)	1 elements (100%)	0 elements (0%)
<a href="#">Bird</a> (2 elements)	2 elements (100%)	0 elements (0%)	2 elements (100%)	0 elements (0%)
<a href="#">Reptile</a> (1 elements)	1 elements (100%)	0 elements (0%)	1 elements (100%)	0 elements (0%)
<a href="#">Vascular Plant</a> (3 elements)	3 elements (100%)	0 elements (0%)	3 elements (100%)	0 elements (0%)
<a href="#">Invertebrate Animal</a> (1 elements)	1 elements (100%)	0 elements (0%)	1 elements (100%)	0 elements (0%)

#### Details

#### [Terrestrial Ecological System](#) (27 elements)

Name	Distribution Area (sq. meters)	Occs	Protected and Compatible		Compatible				
			Goal Met	Goal Area (sq. meters)	Percent of goal Met	Goal Area (sq. meters)	Occs	Percent of goal	
<a href="#">Mediterranean California Foothill and Lower Montane Riparian Woodland</a>	6,493,000	131	0 sq. meters	73,000	3	100%	1,117,500	42	100%
<a href="#">Lower Montane Pine - Oak Woodland and Savanna</a>	178,153,500	135	1	190,500	7	100%	26,215,500	213	100%
<a href="#">Eucalyptus Alliance</a>	2,277,500	75	50 percent of area	88,500	1	7.77%	965,000	26	84.74%
<a href="#">Coastal Closed-cone Conifer Forest and Woodland</a>	505,000	1	0 sq. meters	0	0	100%	0	0	100%

[Metadata](#)



NatureServe  
**VISTA**

Transportation Planning  
Demonstration





# Transportation Planning Demo

## Method: Integration of Three Planning Tools



- 1 NatureServe Vista used to identify high conservation value areas
- 2 Transportation planning tool Quantm used to suggest transportation routes
- 3 Land use planning tool CommunityViz used to predict resulting urban growth
- 4 NatureServe Vista used to evaluate impacts of land use on conservation goals

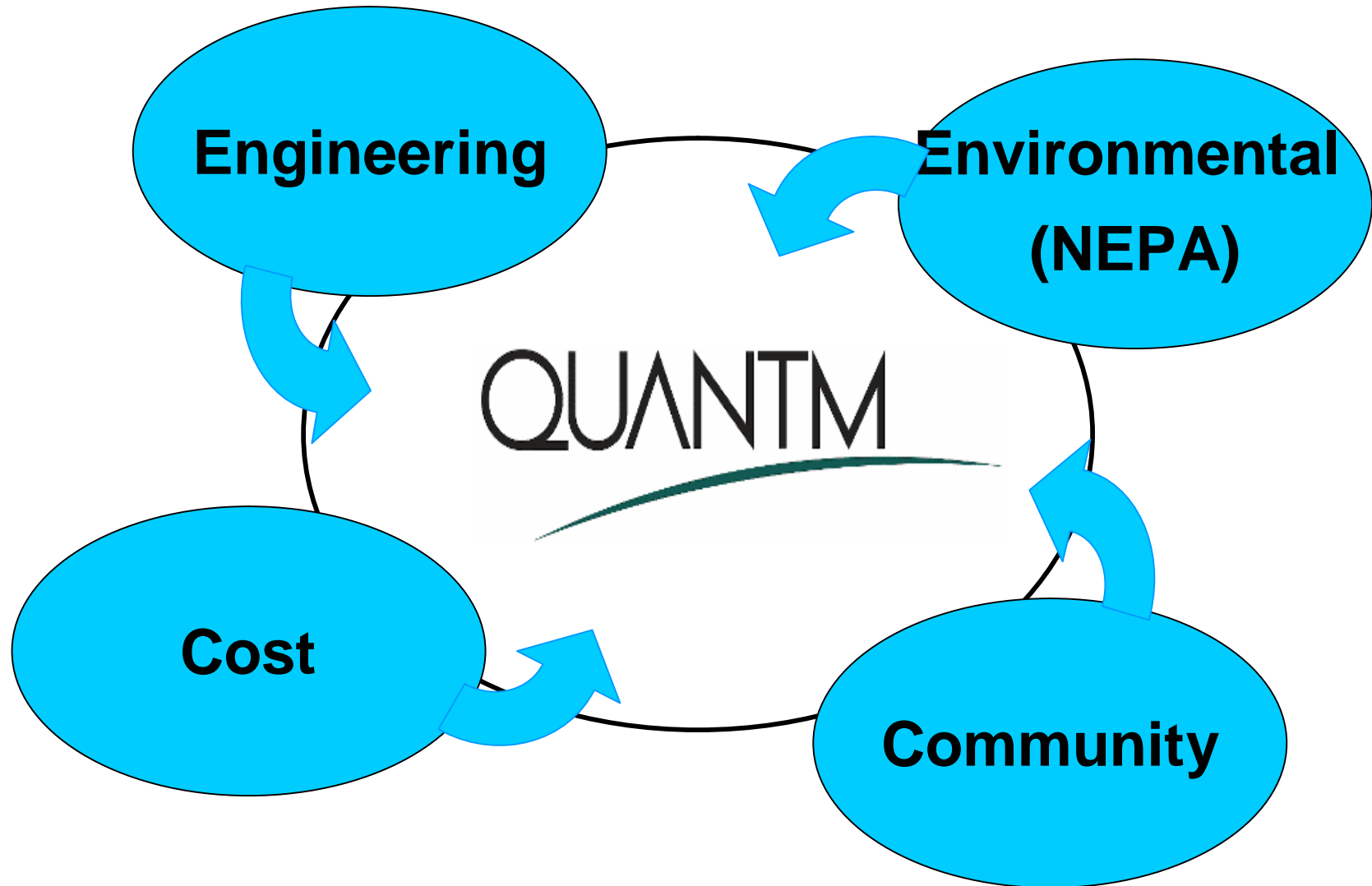
# QUANTM



## *What is Quantm?*

- World's first advanced planning system for corridor and route optimization developed over 15 years by Australian Government and Quantm.
- Addresses complex route planning issues, investigating millions of alignment options.
- A tool that empowers Planning Engineers with the ability to consider “all reasonable alternatives”, upfront and equally.
- Quantm provides training, support and system access – the system is applied by the agency or appointed consultant

*Facilitating integration of all planning aspects in a single analysis*





## *Inputs to QUANTM*

Ø **Terrain model** (DEM and/or DTM)

Ø **Geology and Earthworks costs**

Ø **Geometry**

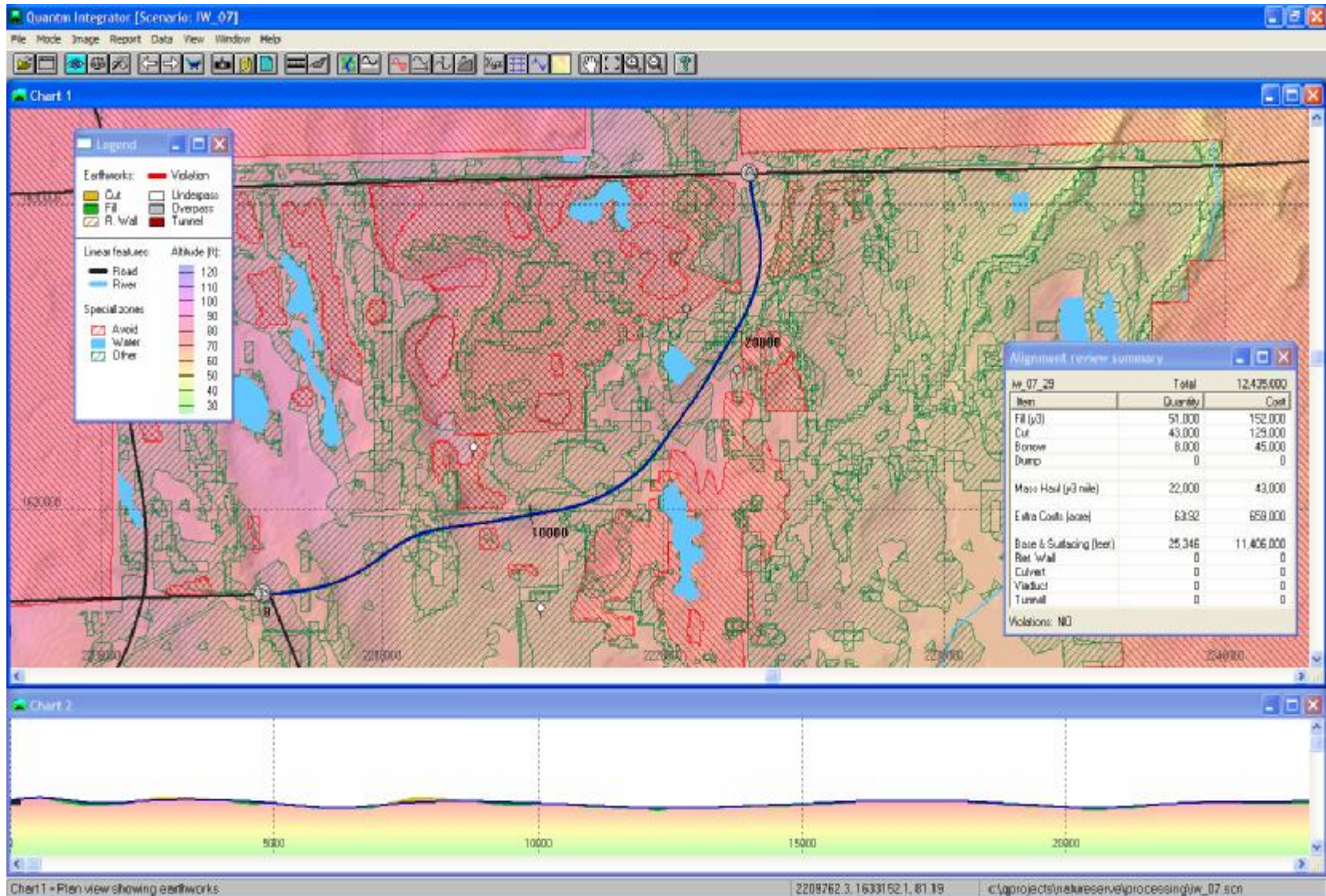
Ø **Structure Costs**

Ø **Constraints**

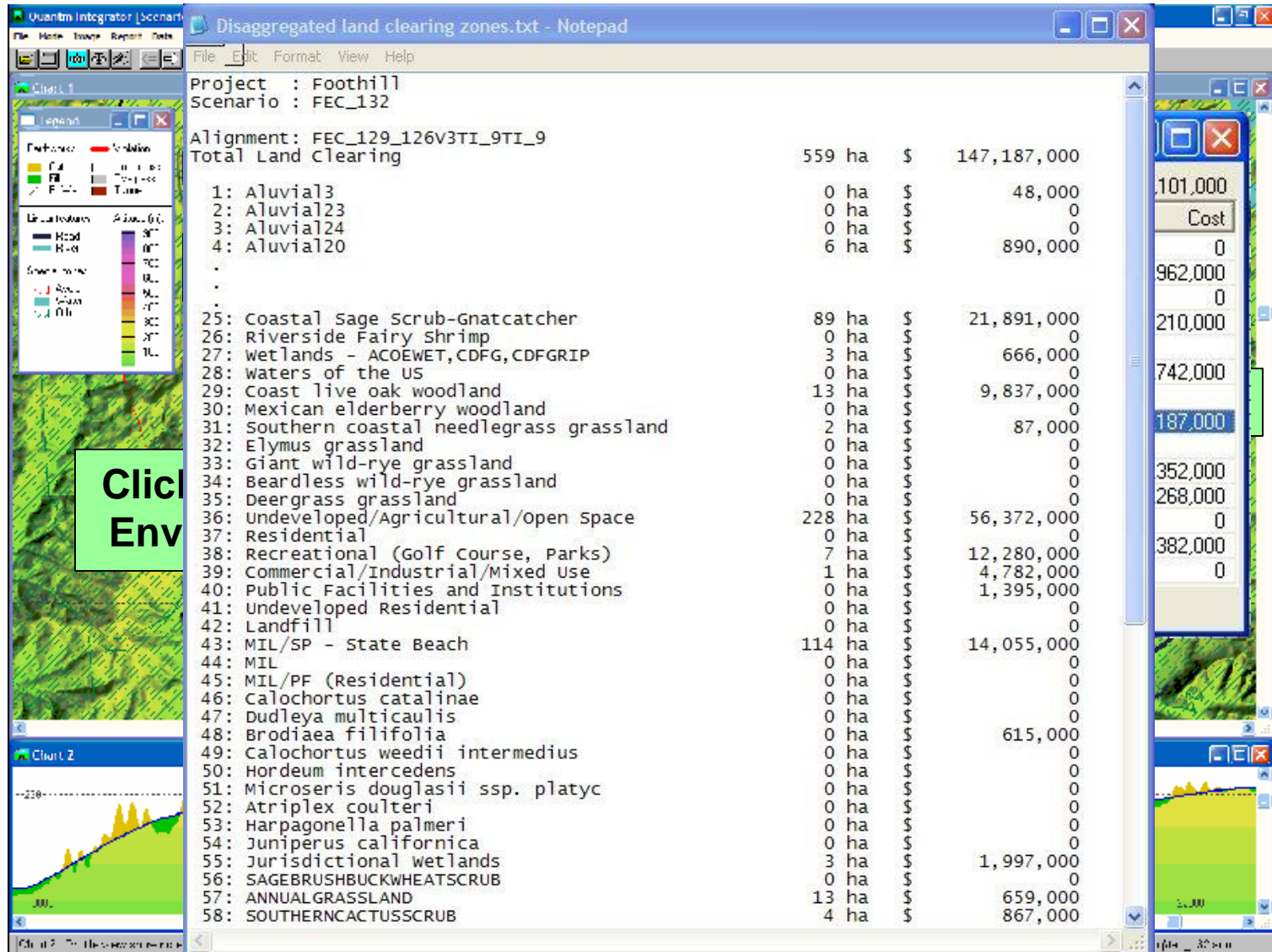
- Linear – engineering criteria
- Zone – **environmental, biological, cultural, resource, mitigation, ROW, etc.**



# 3-Dimensional analysis throughout



# Alternative showing earthworks and constraints





# About CommunityViz<sup>®</sup>

- GIS-based tool for geographic decisions
- Real-world 3D models
- Interactive scenario analysis
- Intuitive, powerful, and flexible
- Made available to the public at very low cost by the Orton Family Foundation

Uses ArcGIS technology

Formula-driven indicator charts update dynamically

Ready-made or custom analyses



Interactive 3D models

Multiple scenarios can be studied side by side

Dashboard for changing assumptions and settings

# CommunityViz Growth Modeling

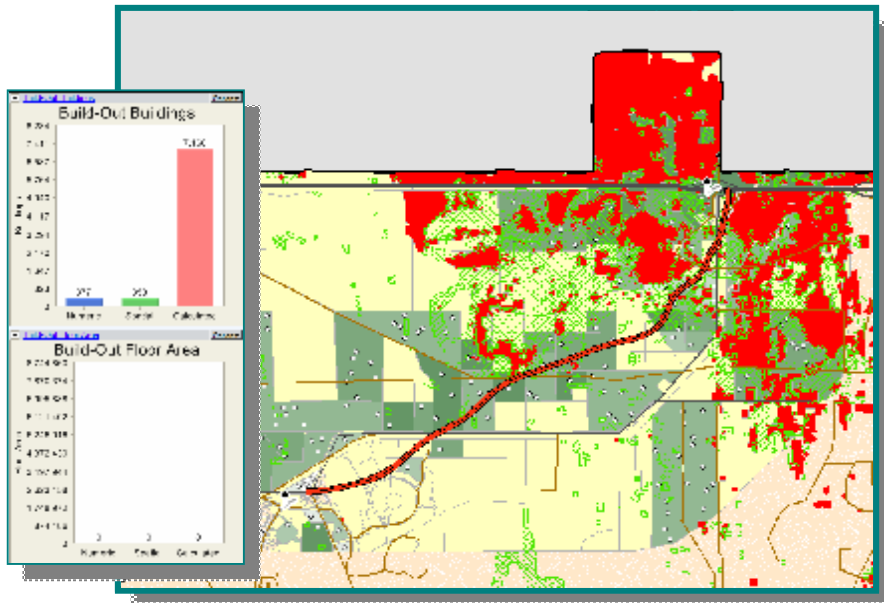
## Hypothetical “build-out” capacity for each scenario:

Road Proposal 11 shown here. Note that “Avoidance” areas are constrained from building.

### Scenario A:

Large-lot residential development

- Build-Out
- Buildings
  - Building Use
    - Single-Family Residential
- NatureServe Conservation
  - Cost
    - Avoidance
    - High Cost

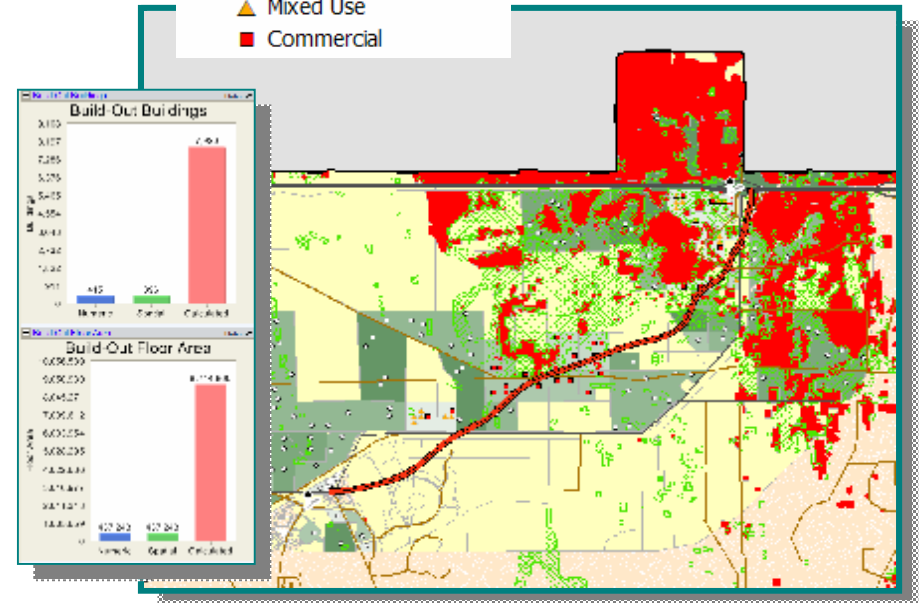


Land Use  
Scenario A

### Scenario B:

Commercial and mixed-use zones

- Build-Out
- Buildings
  - Building Use
    - Single-Family Residential
    - Mixed Use
    - Commercial

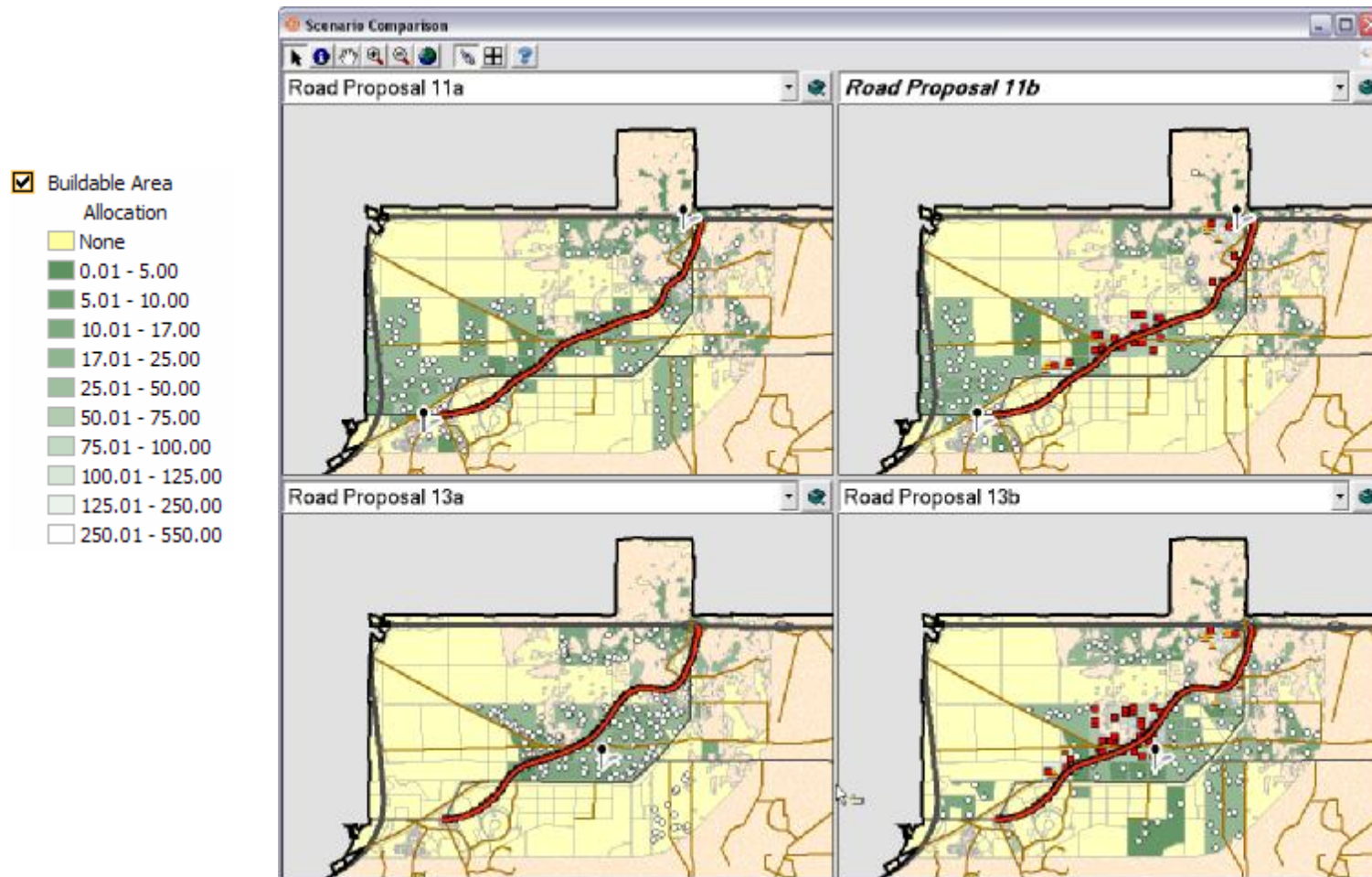


Land Use  
Scenario B

# CommunityViz Growth Modeling

Results are available for all 4 scenarios.

Potential changes to policies and assumptions can still be tested and explored.

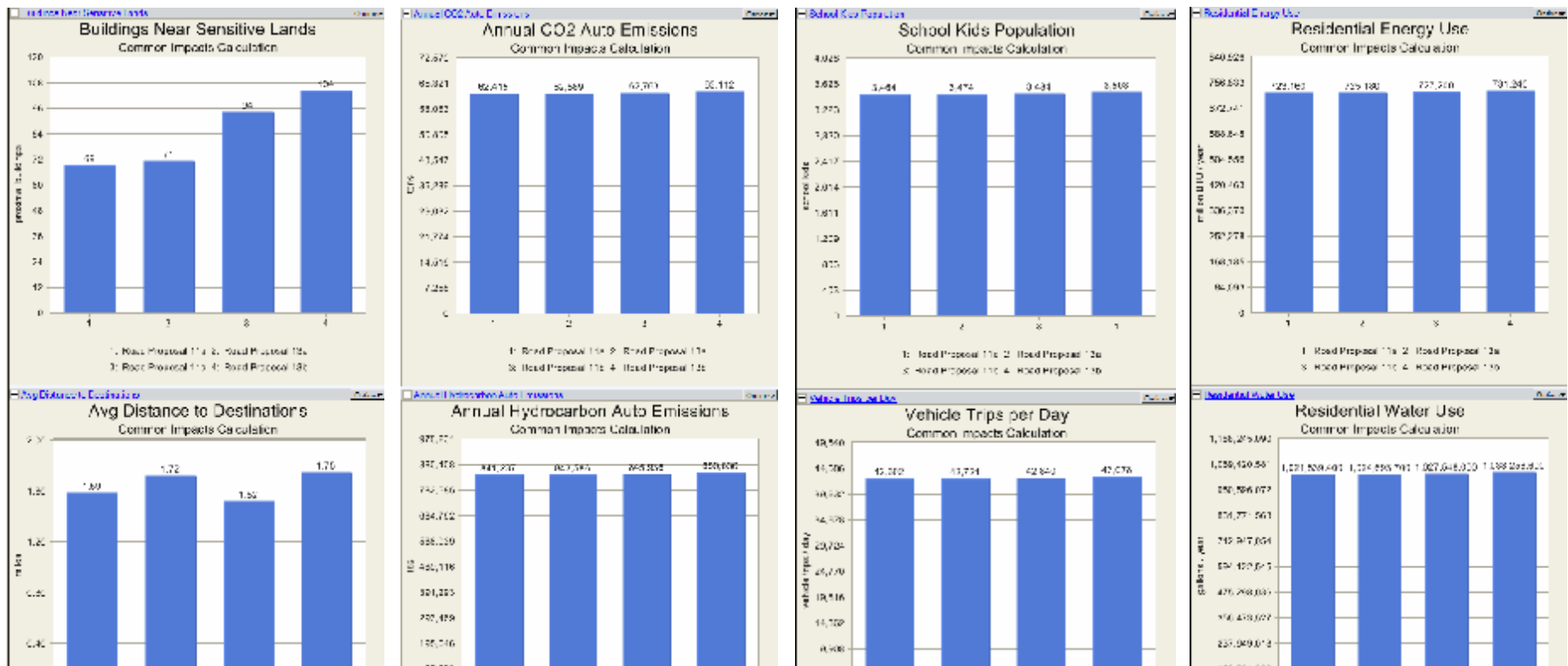




# CommunityViz Growth Modeling

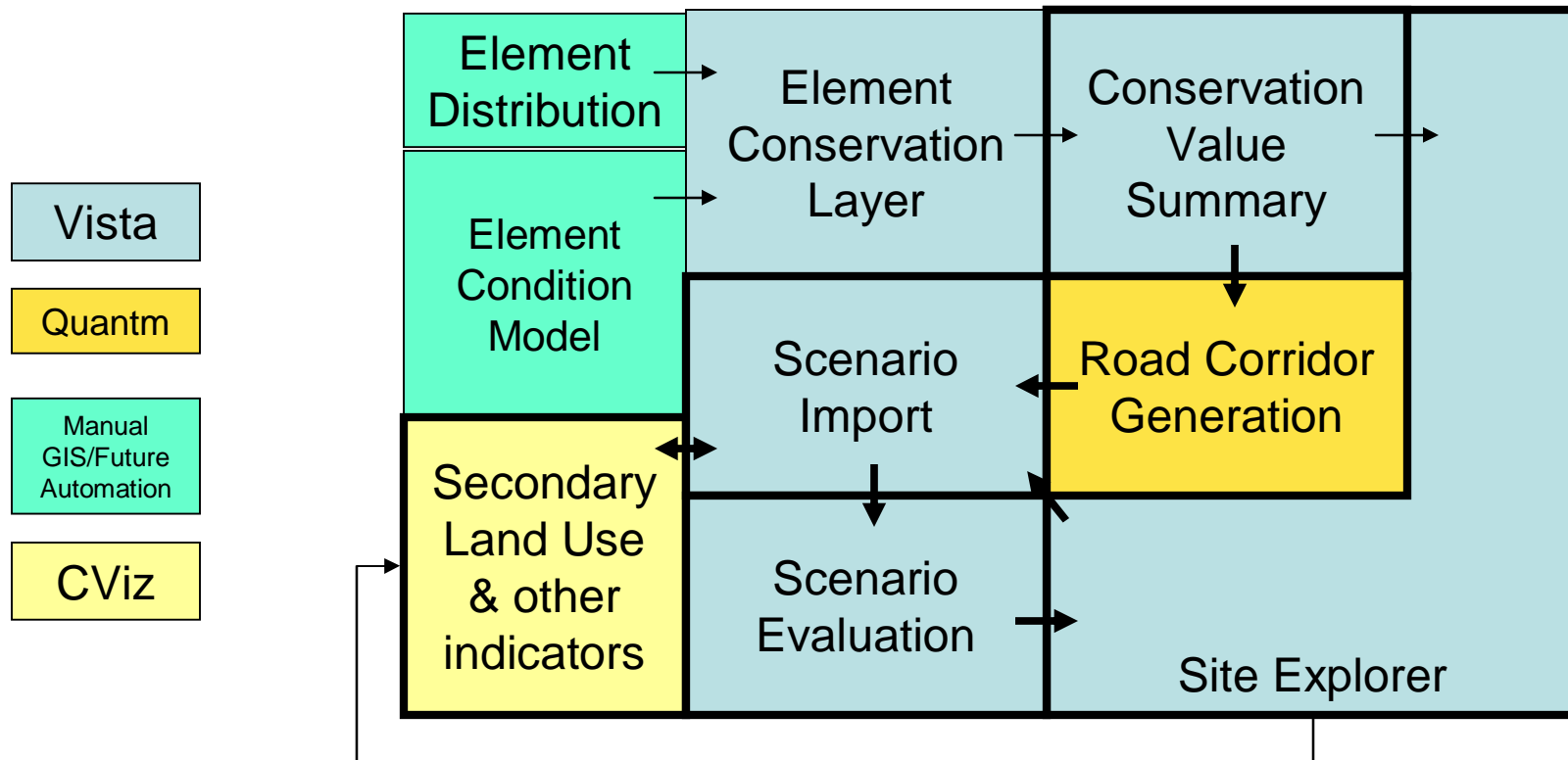
CommunityViz also estimates a wide variety of economic, environmental, and social impacts for each of the 4 scenarios:

Just a sample of the many impacts available, all variable by year and other assumptions, are shown here.



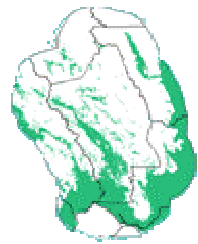
# *Tool Interoperability Model*

Diagram indicates interactions among Vista, Quantm, and CommunityViz. Bold lined boxes and arrows indicate primary path of information to be demonstrated.

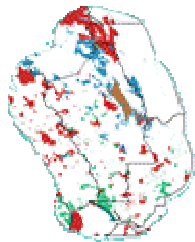


# Scenario Import & Integration

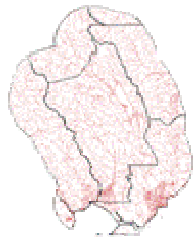
- Scenarios describe land-use policy of the planning area.
- Vista automates input from raw data sources
- Facilitates maintaining current baseline map and experimentation with alternatives



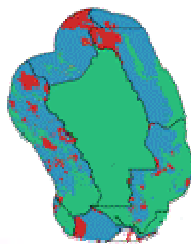
1) Current Land use



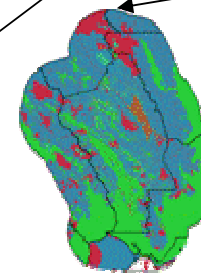
2) Conserved/regulated areas



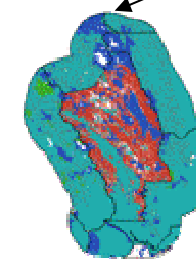
3) Infrastructure



4) Land use and management policies



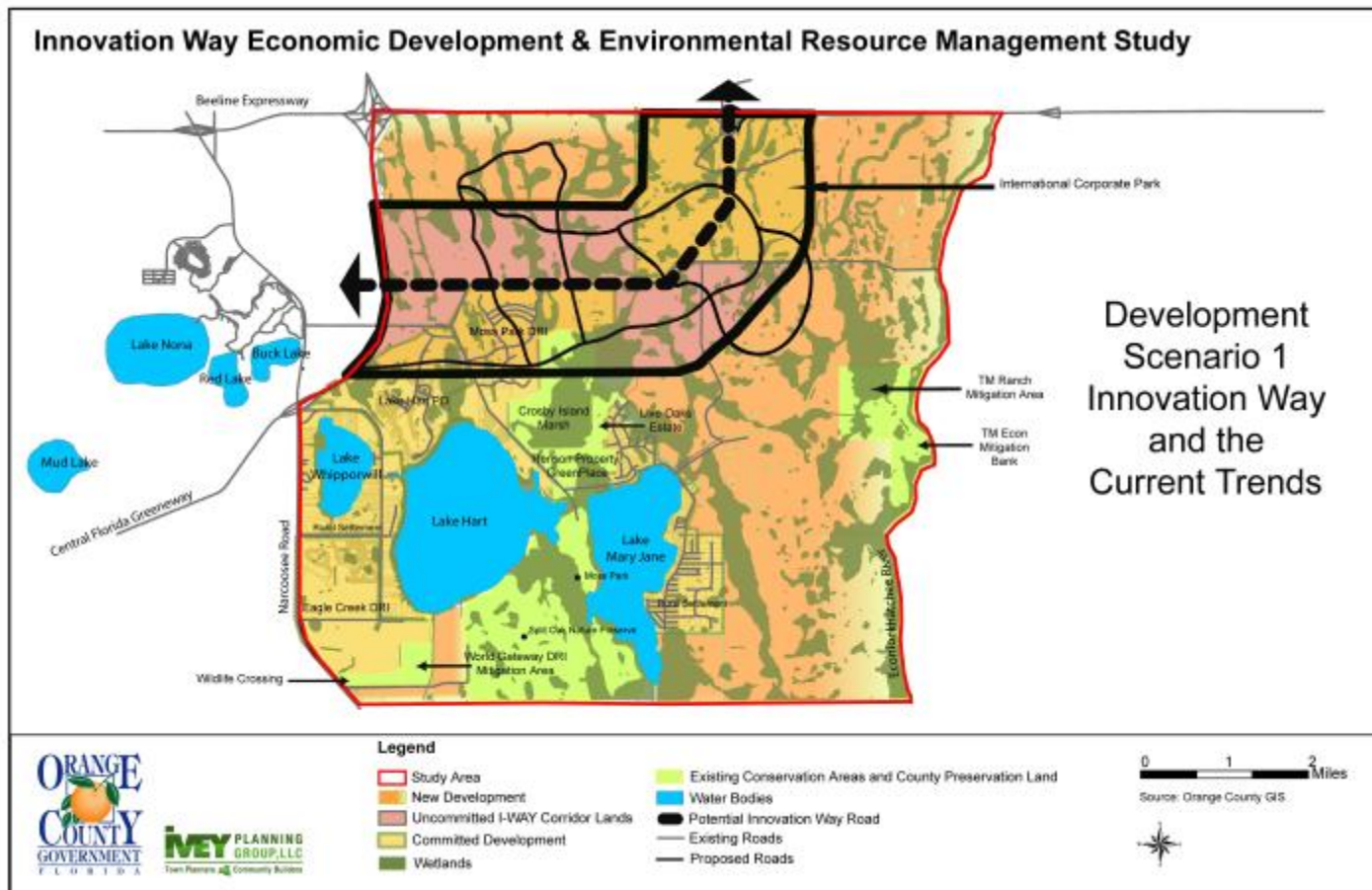
Land-use Type



Policy Type

# Transportation Planning Demo

**Objective: Plan new major road and urbanization in Orange County, FL**



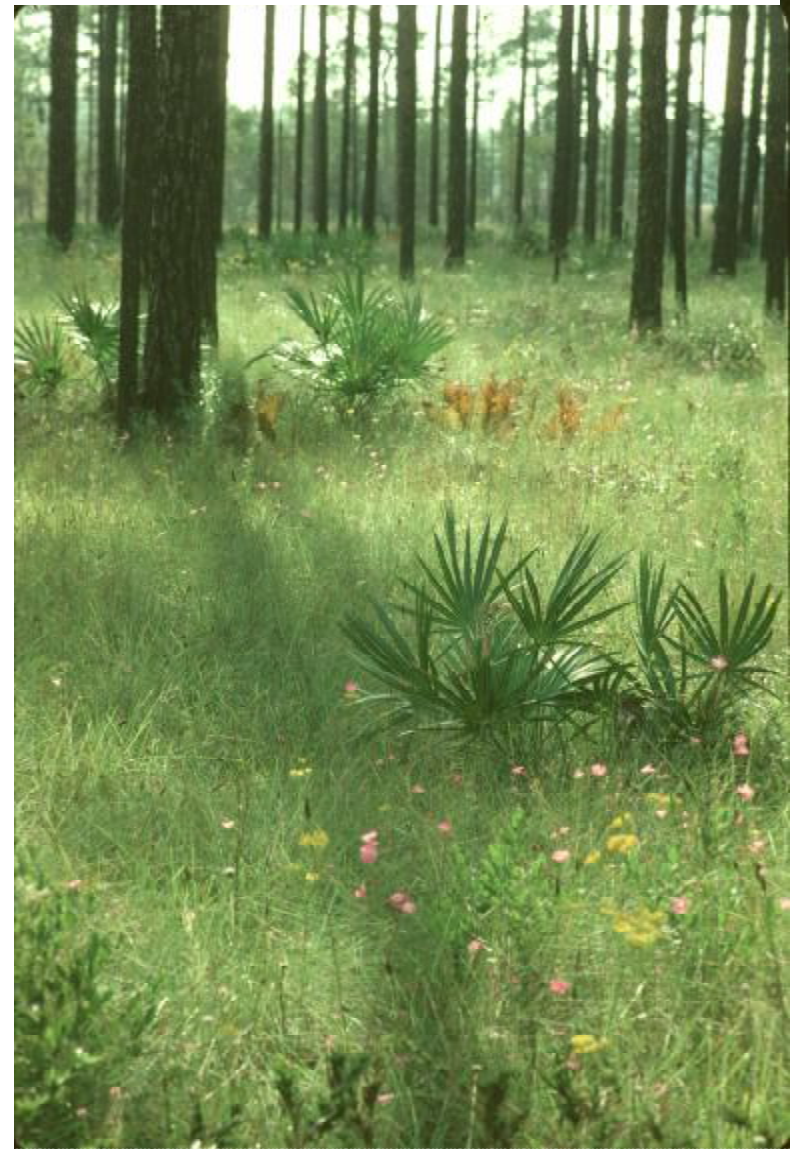
**Innovation Way Technology Corridor**

- Orange Co, FL
- 33,884 acres

# *The Conservation Elements*

## **Selected Elements**

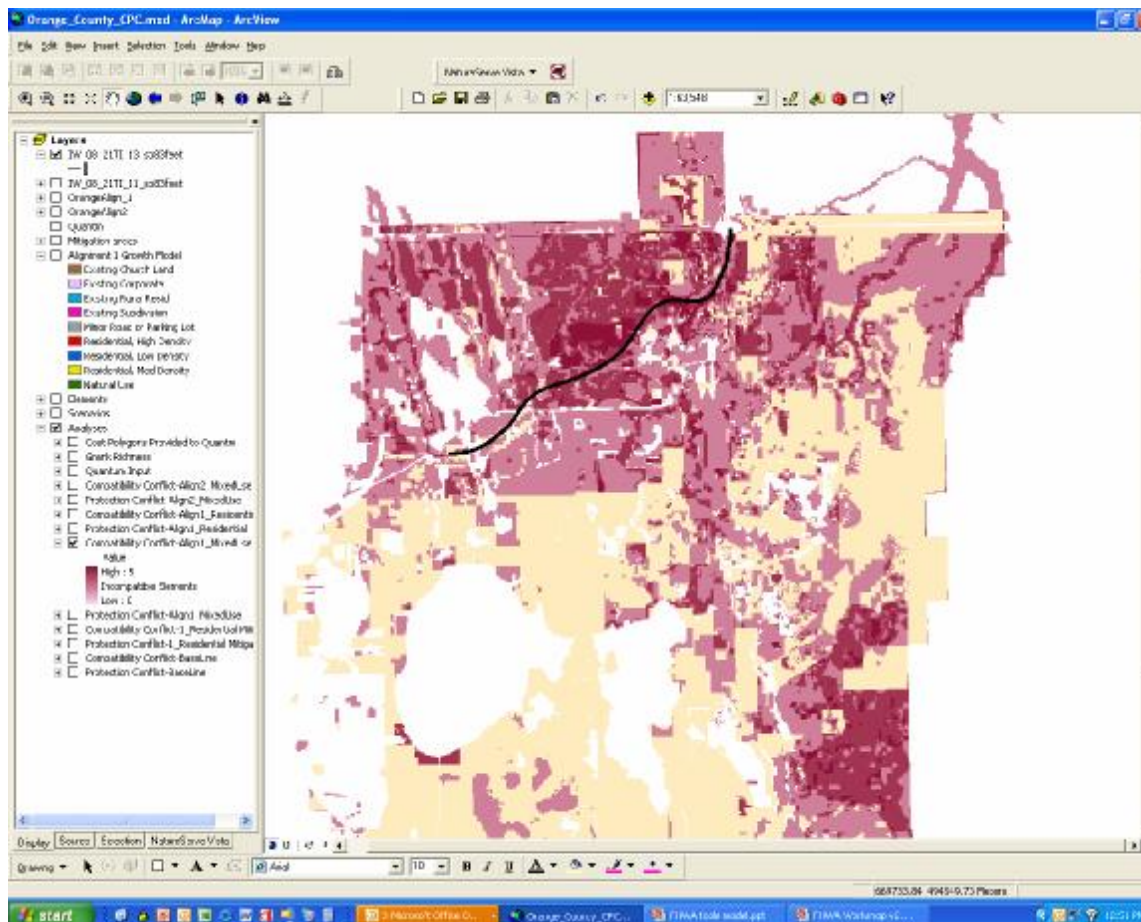
- scrub
- sandhill
- gopher frog
- red-cockaded woodpecker
- celestial lily
- wood stork
- bald eagle
- Florida sandhill crane
- flatwoods
- eastern indigo snake
- wetlands
- watersheds



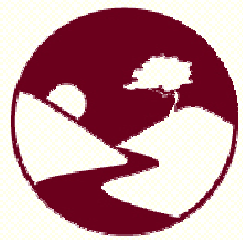


# Transportation Planning Demo

**Results:** Identify conflict between land use and conservation goals







NatureServe  
**VISTA**

Conclusions



## *Conclusions & Recommendations*

- Goals are more easily set and are more flexibly met over large regions
- Optimization of conservation solutions saves time and facilitates focus on implementation but must be done iteratively with transportation and land use tools



# *FL Demo Level of Effort*



Activity	Source	Approx. Time
Input conservation data into NatureServe Vista	Florida Natural Areas Inventory	2 weeks
Identify high conservation value areas	NatureServe Vista	<2 hours
Generate proposed highway routes	Quantm	1 week
Generate secondary growth effects	Community Viz	1.5 weeks
Identify areas of conflict between proposed transportation routes and conservation values	NatureServe Vista	1 day
Create optimal plan via alternative land use decisions and mitigation efforts	NatureServe Vista	4 hours
TOTAL		~4 weeks



## *Planned Features for Vista 2.0*

- Multiple uses per land unit (for compatibility/conflict mapping)
- User-defined element response to land use
- Assisted import from heritage Biotics system
- Tools for modeling landscape condition
- Calculating sub-region goals
- Aquatic analysis support?

# *Acknowledgments & Questions*

- FHWA
- Quantm
- Placeways/Orton Family Foundation (CommunityViz)

