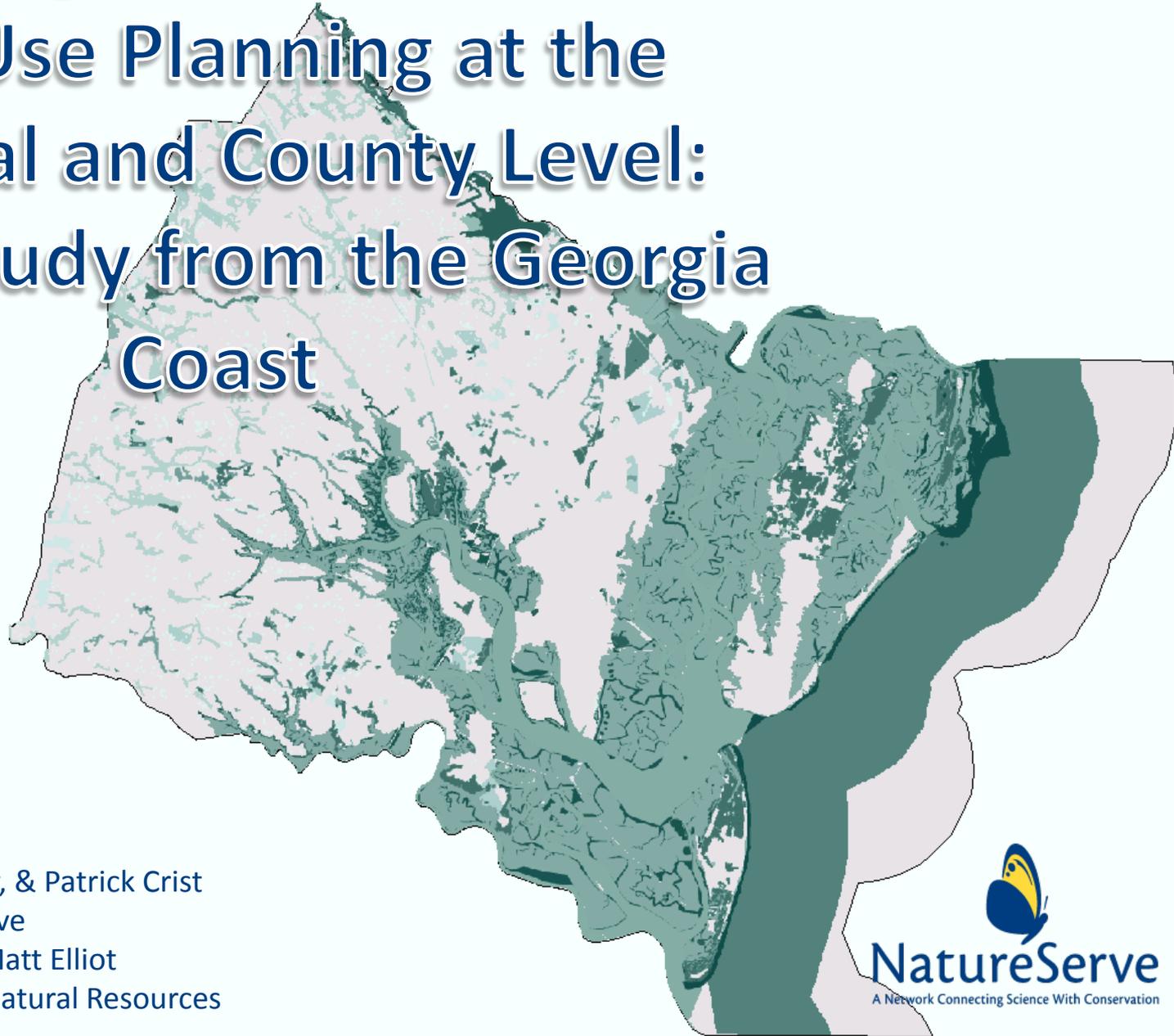


Integrating Conservation and Land Use Planning at the Regional and County Level: A Case Study from the Georgia Coast



Regan Smyth, Ian Varley, & Patrick Crist
NatureServe

Jon Ambrose & Matt Elliot
Georgia Department of Natural Resources

Coastal Georgia Land Conservation Initiative Goals

- Conserve critical coastal lands and ecosystems
- Promote appropriate economic growth and development
- Educate public about value of coastal resources



Project Objectives

- Better information on high priority habitats and species
- Tools to assess threats and develop adaptive plans
- Greater collaboration (local, regional, and state level)



Decision Support System (DSS) to assist planners, resource managers, and local communities in managing coastal resources

Regional Project + Two Pilot Counties



Primary Partners

- Georgia Conservancy
- Association County Commissioners of Georgia (ACCG)
- Georgia Department of Natural Resources
 - Wildlife Resources Division
 - Coastal Resources Division
- Glynn & Camden Counties



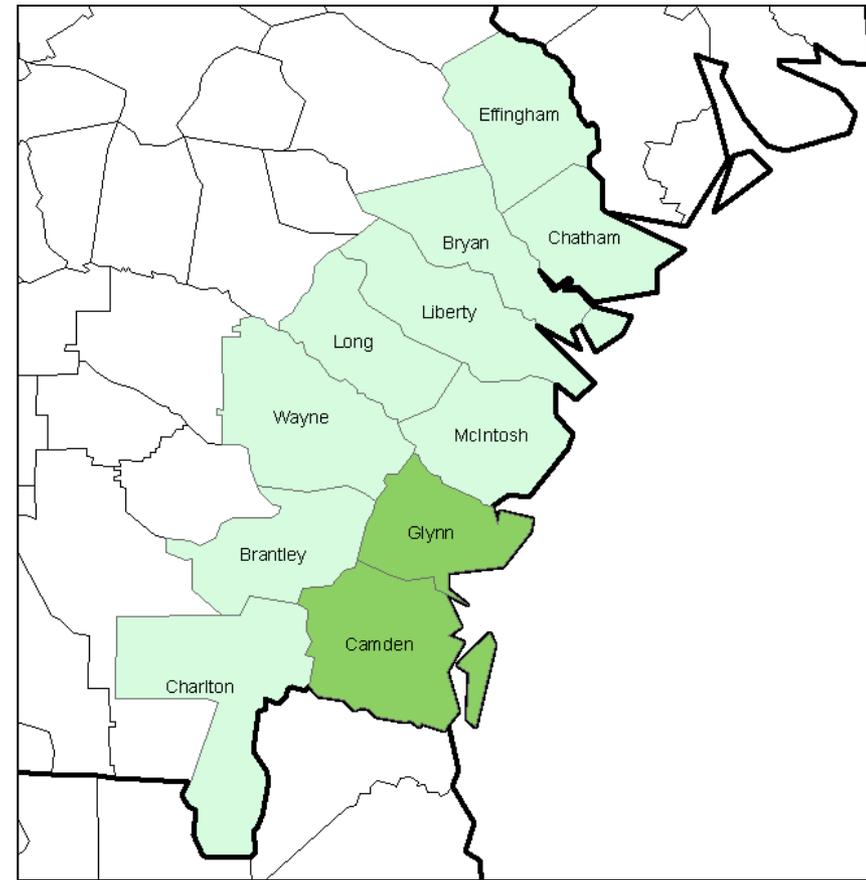
Study Area

Ecological Resources

- 150+ high priority plant & animal species
- 25 high priority habitats

Land Use Profile

- High concentration of wetlands and other sensitive habitats
- Significant forest resources
- Increasing Development



Approach

- Map resources of concern
- Incorporate expert knowledge
- Define scenarios
- Evaluate goal achievement
- Provide DSS to facilitate site exploration and identify development alternatives

Toolkit Approach

Integrated Multi-scale Analysis



Tools Overview

□ Biotics

- Biodiversity data management

□ Maxent

- Species distribution models

□ NatureServe Vista

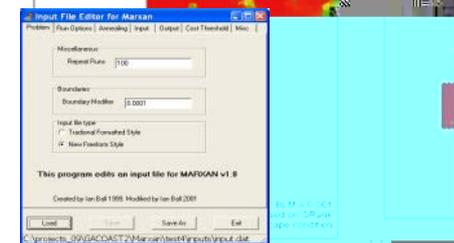
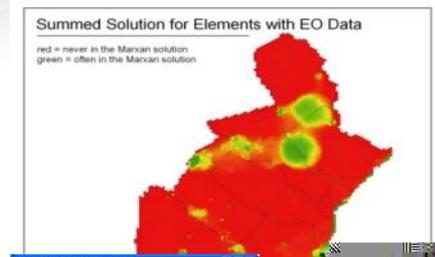
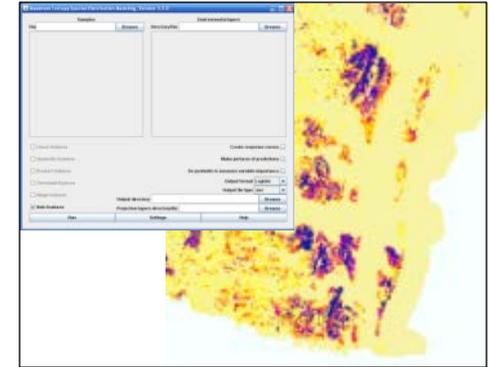
- Systematic conservation planning

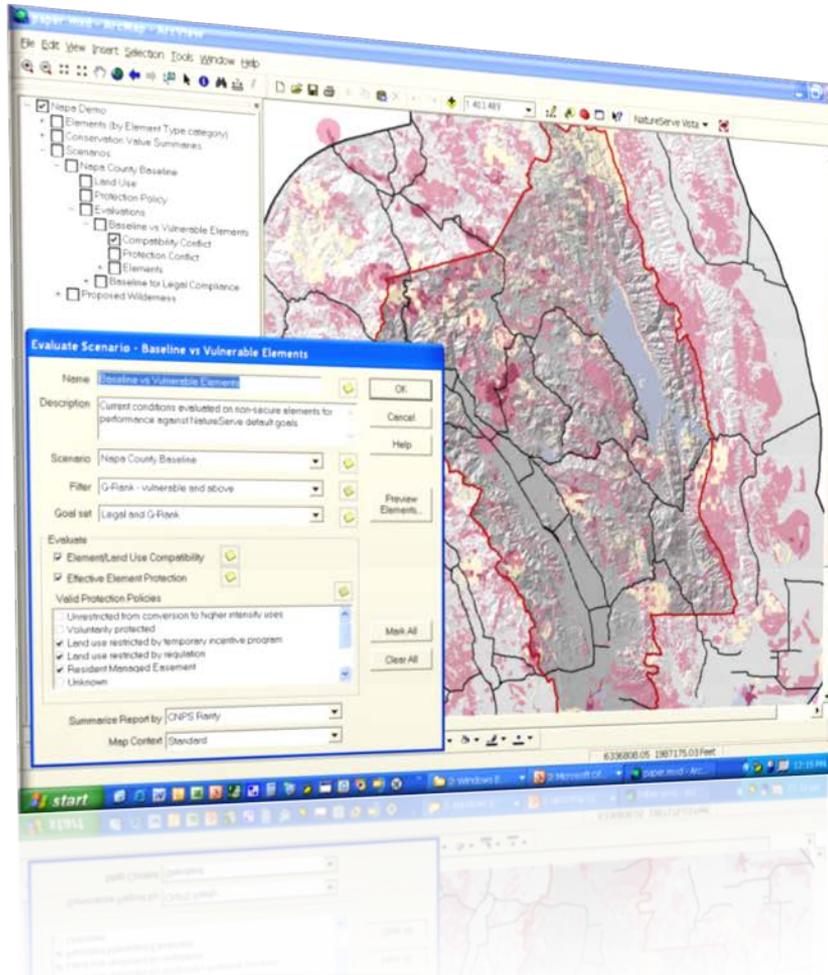
□ Circuitscape

- Habitat connectivity mapping

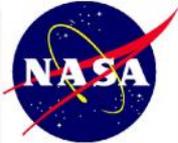
□ Marxan

- Conservation optimization

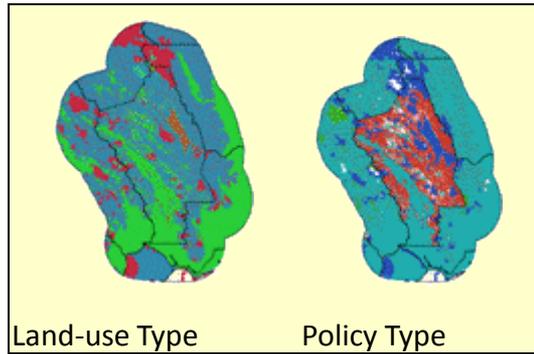




- Assessment and planning decision support tool
- **FREE** extension to ESRI's ArcMap with spatial analyst
- Supports both conservation experts & planners/managers
- Full integrated help manual, live technical support, available training in person or by web



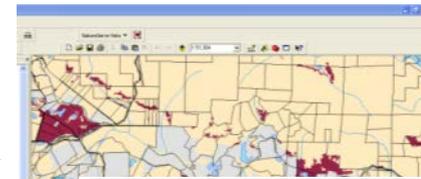
Vista Supported Analytical Process



Land-use Type

Policy Type

Scenario Outputs
baseline, buildout,
trends, alternatives



Evaluation
Maps &
Reports

Terrestrial Ecological System (33 elements)					
Name	Distribution Area (hectares)	Occs	Protected Goal Met (hectares)	Compatible Goal Met (hectares)	Percent of goal
Caribbean wet montane forest- Sierra Palm alliance	11,965.95	1	2,481 hectares	4,151.52	167.33%
Caribbean wet montane forest- Palo Colorado alliance	3,713.49	1	762 hectares	3,577.32	469.46%
Caribbean seasonal evergreen submontane-lowland forest (young secondary)	97,270.47	1	10,862 hectares	1,092.87	10.06%
Caribbean wet submontane lowland forest (young secondary)	1,877.22	1	9,482 hectares	73.44	0.77%
Caribbean montane submontane karst forest (young secondary)	15,090.96	1	0 hectares	235.26	100%
Caribbean montane wet serpentine woodland (young secondary)	1,001.25	1	0 hectares	573.3	100%
Caribbean lowland moist serpentine woodland (young secondary)	1,951.38	1	0 hectares	943.56	100%
Caribbean lowland dry semideciduous forest (young secondary)	19,810.44	1	7,283 hectares	2,025.63	27.81%
Caribbean lowland dry riparian woodland and forest	1,231.2	1	1,229 hectares	93.6	7.62%
Caribbean lowland dry limestone semideciduous forest (young secondary)	3,919.32	1	0 hectares	142.38	100%
Caribbean lowland dry limestone semideciduous forest	10,679.4	1	8,500 hectares	3,058.74	35.99%
Caribbean floodplain forest (young secondary)	11,768.58	1	0 hectares	436.5	100%
Caribbean coastal dry evergreen forest	1,012.78	1	196 hectares	168.92	82.1%

Element Goals

Name: Mediterranean California Dry Mes

Goal: 0 sq. meters

80% of sq. meters

100% of Occurrences

100% of sq. meters

80% of sq. meters

80% of Occurrences

<default>

80% of sq. meters

Apply

Reset to

Elements, values, & expert knowledge

Mitigation & alternative scenario development

Element Name	Total	Protected Area	Compat	Response	Compatible
Mediterranean California Floodplain	131 acs	0 acs	0.1%	Incompatible	
Wet Montane Everg. Oak Woodland	7,265 acs	0 acs	0.1%	Incompatible	
Central Valley Riparian Woodland and	339 acs	0 acs	0.1%	Incompatible	
California Annual Grasslands Alliance	4,793 acs	1.65 acs	0.0%	Compatible	
Central Valley Grasslands, Tall-stem	494 acs	6.42 acs	1.0%	Compatible	
Wetland Serpentine Woodland and	744 acs	2.75 acs	0.7%	Compatible	
Central Valley Mixed Oak Savanna	2,739 acs	2.76 acs	1.6%	Incompatible	
Wetland Dry Oak Woodland	75 acs	2.76 acs	0.0%	Incompatible	
Open Grasslands Chaparral	591 acs	4.80 acs	0.4%	Incompatible	
Mediterranean California Dry Mes	940 acs	1.65 acs	0.0%	Incompatible	

Mitigation & alternative scenario development

Generate Conservation Solution

NatureServe VISTA Welcome to the Protection Solution Wizard

Solution Generation Tool

<Select solution generator>

- MARSPAN <Describe MARSPAN>
- SPOT <Describe SPOT>

<Link to SPOT website>

Optimized spatial solution generation via interoperating tools

Vista Scenario Evaluation

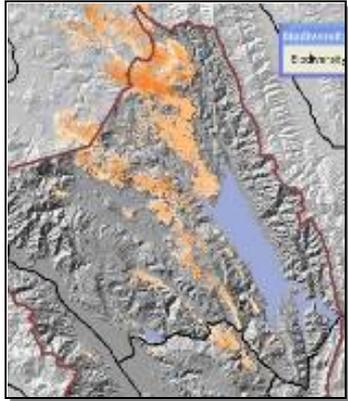
Element Conservation Goals

Element Goals	
Name	Goal
Historic Sites	0 sq. meters
Important Agriculture	0 sq. meters
Viewsheds	0 sq. meters
Mediterranean California Dry-Mesic Mixed Conifer Forest and Wo	80% of sq. meters
Xeric Serpentine Chapparral	90% of sq. meters
Napa Western Flax	100% of Occurrence
Central Valley Mixed Oak Savanna	100% of sq. meters
Mesic Serpentine Woodland and Chapparral	90% of sq. meters
Northwestern Pond Turtle	80% of Occurrences
California Annual Grasslands Alliance	<default>
California Coast Ranges Cliff and Canyon	80% of sq. meters

Conservation Goal: Percent

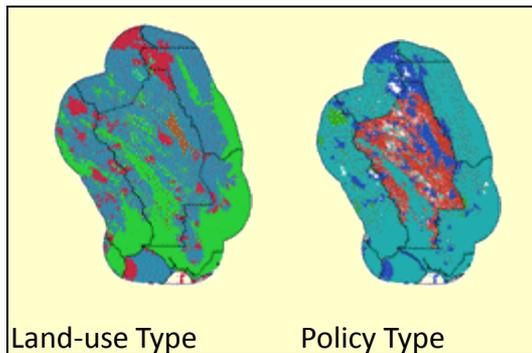
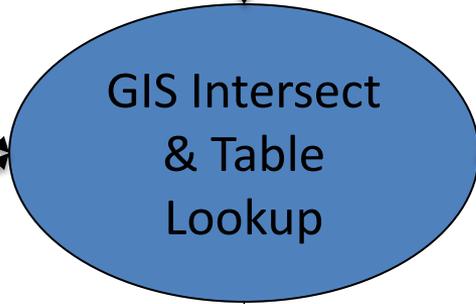
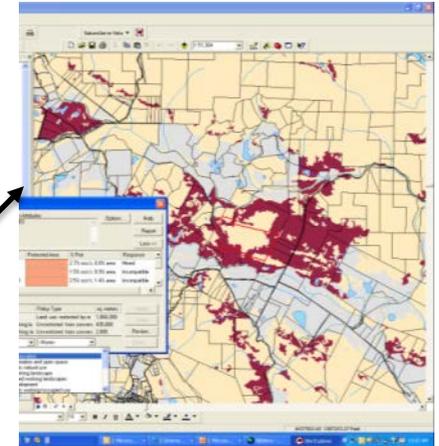
Units:
 Occurrences
 sq. meters

Apply / Reset to



Element Distribution

Evaluation Maps



Scenario Outputs

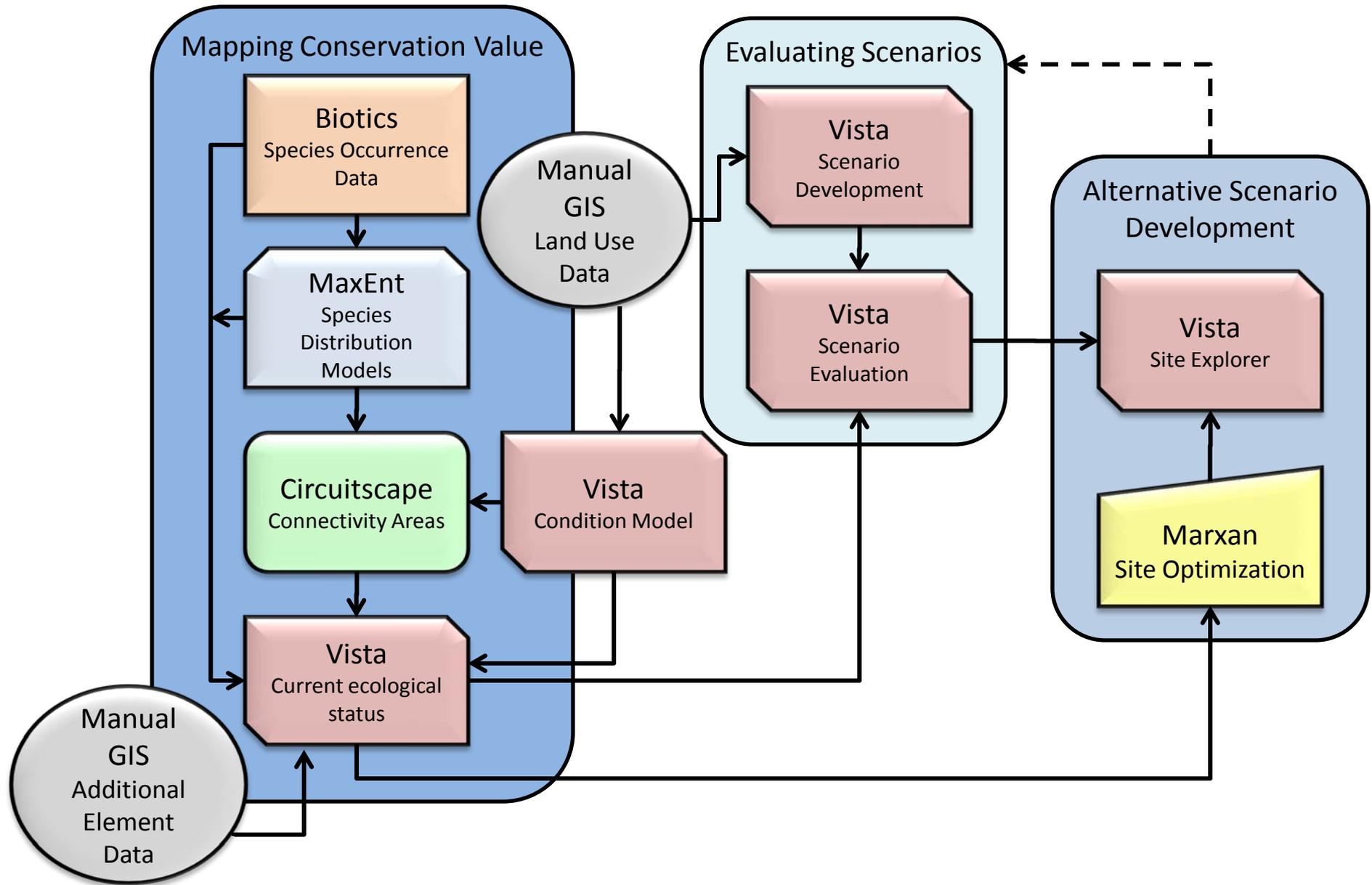
Element Properties - Mediterranean California Dry-Mes			
General	Spatial	Categories	Compatibility
<input checked="" type="checkbox"/> Maintain Primarily for Natural Values			
<input checked="" type="checkbox"/> Biodiversity conservation			
<input checked="" type="checkbox"/> Natural area recreation and open space			
<input checked="" type="checkbox"/> Unknown specific natural use			
<input checked="" type="checkbox"/> Maintained Primarily for Working/Occupied Natural Landscap			
<input checked="" type="checkbox"/> Low intensity working landscape			
<input checked="" type="checkbox"/> Intensely managed working landscapes			
<input checked="" type="checkbox"/> Low-density development			
<input checked="" type="checkbox"/> Unknown specific working/occupied use			
<input type="checkbox"/> Utilized Primarily for Infrastructure			

Element Response to Land Use/Activity

Goal Performance by Element					
Elements (14 elements)					
Name	Distribution Area (acres)	Occs	Protected and Compatible		
			Goal Met (acres)	Occs	Percent of goal
Wetlands	4,134.7	428	40 percent of 1,910.2 acres	145	15.52%
Watersheds: Priorities 4-2	7,095.1	167	40 percent of 3,121.2 acres	58	109.93%
Watersheds: Priority 3	4,832.5	84	60 percent of 1,833.2 acres	24	65.32%
Watersheds: Priority 2	224	40	70 percent of 30.3 acres	7	19.32%
woodstock	4,392.1	297	50 percent of 1,257.2 acres	34	67.27%

Quantitative Reports

An Integrated Toolkit



Conservation Value Summary: EOs Only CVS

Settings

Name: EOs Only CVS

Description: Element Occurrence Data Only

Filter: All Elements in Glynn County

Weighting System: Importance Weighting

Incorporates occurrence viability/integrity

Incorporates distribution confidence

Summary Function: Sum

Cell Size: [Minimum based on input layers]

Included Elements (with weighting):

Name

Coastal Plain Spruce Pine - Oak Stream Forest

Northern Atlantic Right Whale

Blackwater Ogeechee Tupelo Swamp

Migrant Loggerhead Shrike

Rafinesque's Big-eared Bat

Bald Eagle

Sawgrass Head

Pine Woods Snake

Rouge Plant

Palafoxia

Sandhills Swamp Blackgum Hillside Seepage Forest

Gopher Tortoise

Pond Pine - Bay Swamp

Outer Coastal Plain Sweetbay Swamp Forest

Importance

Weight

1

1

1

0.8

0.6

0.5

1

0.5

0.8

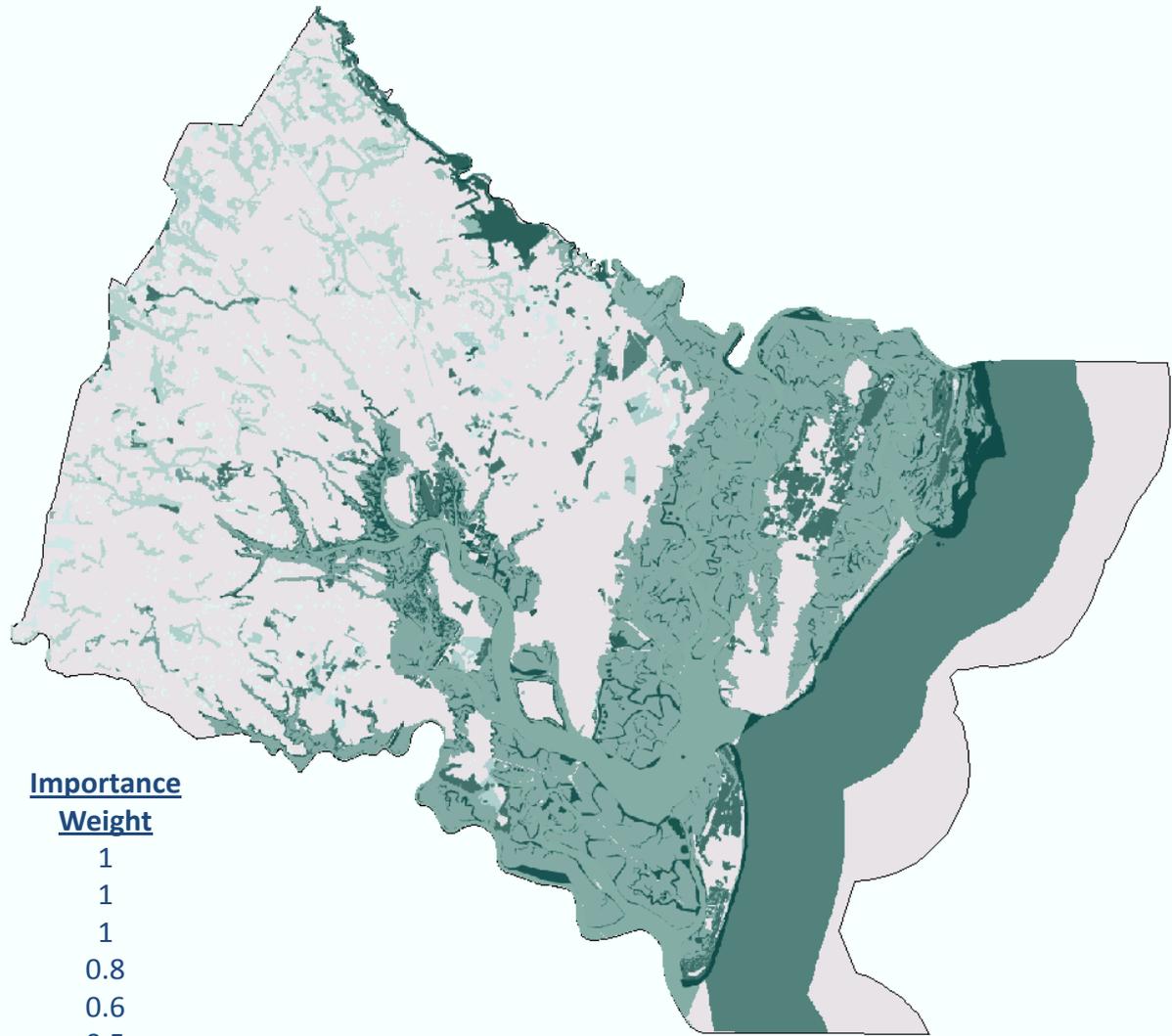
0.5

0.6

1

0.6

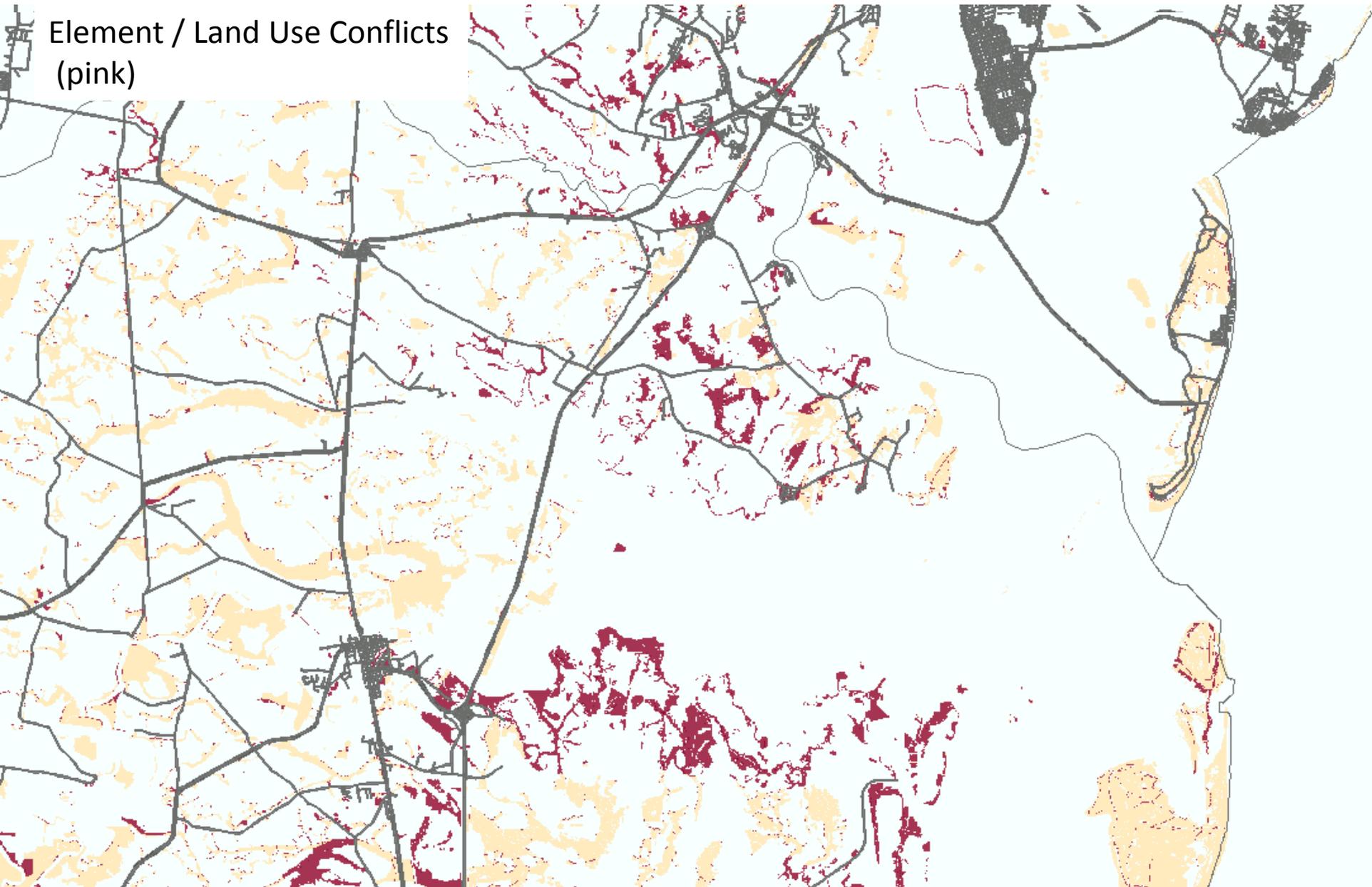
0.6



Vista Conservation Value Summary

Vista Compatibility / Conflict Map

Element / Land Use Conflicts
(pink)



Overall Scenario Performance

Vista Example Scenario Report



All Elements (40 Total)

	Goals Met For	% of Goals Met	Goals Unmet For	% of Goals Unmet
Compatible	15 elements	37.5%	25	62.5%

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Goal Performance by Element

Elements (40 elements)

Name	Distribution Area (acres)	Occs	Goal	Compatible		Occs	Percent of goal
				Goal Met	Area (acres)		
Shoreline	12,309.75	6960	80 percent of area	Y	11,446	6004	116.23%
Thierets skullcap	22.75	2	100 percent of area	N	11.25	2	49.45%
Tharps rhododon	222.5	1	100 percent of area	N	47.75	1	21.46%
Jaquarundi (high precision)	1,391.25	2	40 percent of area	N	237.5	2	42.68%
Texas Scarlet Snake (low precision)	3,568.25	1	100 percent of area	N	2,106.25	1	59.03%
Gulf Saltmarsh Snake (low precision)	18,340	1	40 percent of area	Y	16,755.75	1	228.4%
Texas diamondback terrapin	20,307.25	6	90 percent of area	Y	19,996.25	6	109.41%
Gulf Saltmarsh Snake (good precision)	1,283.5	6	40 percent of area	Y	1,158.75	6	225.7%
Tall dodder	111.5	2	90 percent of area	N	65.5	2	65.27%
Snowy plover	1,055.75	1	40 percent of area	Y	676.5	1	160.19%
Seacoast Blustem Gulf-dune Paspalum series	1,207.25	4	40 percent of area	Y	980.25	4	202.99%
Green Sea Turtle	3,094.75	1	90 percent of area	Y	2,944	1	105.7%
Seagrass	22,617.25	5229	100 percent of area	N	11,091.75	3184	49.04%
Plains gumweed	8	1	100 percent of area	Y	7.25	1	90.63%
Rookeries	10,907.25	31	100 percent of area	Y	9,988.25	30	91.57%
GLO and TPWD coastal preserve areas	1,823	7	100 percent of area	N	1,554	7	85.24%
Piping plover	10,444	4	90 percent of area	N	7,885.5	4	83.89%
Peregrine falcon	2,093	2	40 percent of area	Y	1,921	2	229.46%
Wetland	78,342.25	16968	100 percent of area	N	68,180.75	12041	87.03%
Coastal gay-feather (low precision)	2,220.75	2	100 percent of area	Y	2,206.25	2	99.35%
Bilvalve reef	3,057.5	630	80 percent of area	N	562	152	22.98%
Welder machaeranthera	54.75	14	100 percent of area	N	22.75	10	41.55%
Stream network	429.25	109	100 percent of area	N	384.5	104	89.57%
National Audubon Society Waterbird Sanctuaries	635	5	100 percent of area	N	361	5	56.85%
Coastal gay-feather (high precision)	91.5	4	100 percent of area	N	17.5	3	19.13%
Aquatic beds	3,572	1267	100 percent of area	Y	3,434.5	1116	96.15%
Mangroves	2,025.5	728	80 percent of area	Y	1,988.5	699	122.72%
Black-spotted Newt	5,435.25	1	100 percent of area	N	2,617.5	1	48.16%
Live Oak	67,907.75	242491	70 percent of area	Y	43,922.25	155122	92.4%
Wright's Yellowshow	264	1	30 percent of area	Y	161.25	1	203.6%
Grasslands	37,019.75	14568	70 percent of area	Y	27,726	10855	106.99%
Whooping Crane	28,287.5	1	100 percent of area	N	20,382.25	1	72.05%
Forestland	122,804	38892	70 percent of area	Y	96,873.25	26280	112.69%
Bald eagle	674.75	1	40 percent of area	Y	290.75	1	107.73%
Atlantic Hawksbill turtle	249.75	1	90 percent of area	Y	241.5	1	107.44%
Attwater's Greater Prairie Chicken	26,109.25	3	100 percent of area	N	13,476.5	3	51.62%

Vista Example Element Evaluation Report

Element Evaluation : Ambystoma cingulatum

- [Settings](#)
- [Element evaluation details](#)
- [Map](#)

Settings

Element	Ambystoma cingulatum
Evaluation:	current_eos
Filter:	filter_element_ocurrences
Scenario cell size:	10 acres
Element cell size:	1 acres
Goal:	30 percent of area

[Back to top](#)

Element evaluation details

Element	http://aldo/Elements/Ambystoma_cingulatu-1486985133.html?name=Ambystoma_cingulatum
Name	Ambystoma cingulatum
Total	9 occ's.; 156,248 ac.
Selection	9 occ's.; 156,248 ac.
Selection Average CV	1
Selection Minimum CV	0.95
Selection Maximum CV	1
Goal	30% of acres
Response	(None)
Viable	3 occ's.; 156,202 ac.
% Viable	33.3% occ's; 100% area
Selection Viable	3 occ's.; 156,202 ac.
Selection %Viable	33.3% occ's; 100% area
Chart: Viable Occurrences	
Chart: Viable Area	
Compatible	2 occ's.; 61,798 ac.
% Compatible	22.2% occ's; 39.6% area

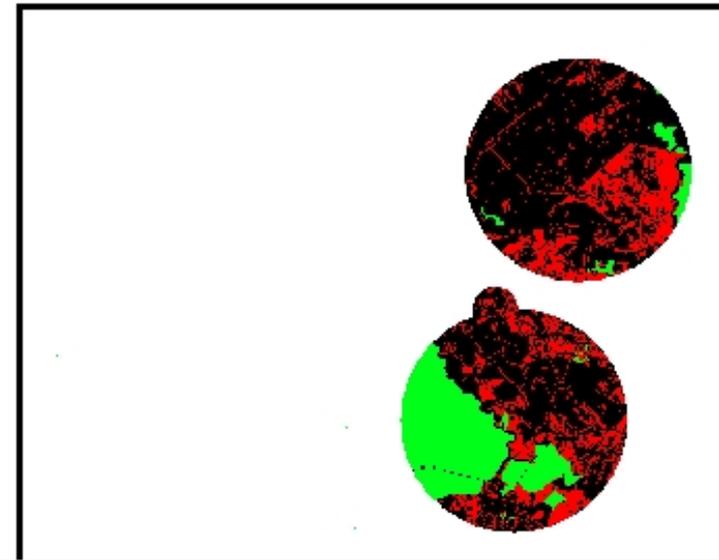
ation: Ambystoma cingulatum in current_eos

ard Stop Refresh Print Export Show XML

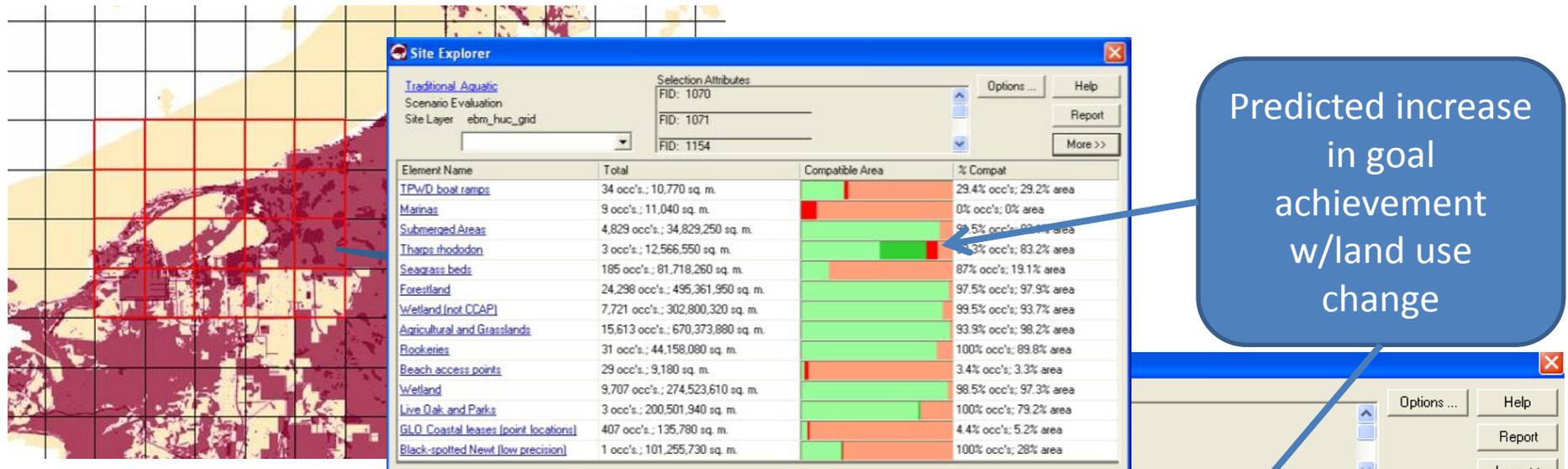
Selection Minimum CV	0.95
Selection Maximum CV	1
Goal	30% of acres
Response	(None)
Viable	3 occ's.; 156,202 ac.
% Viable	33.3% occ's; 100% area
Selection Viable	3 occ's.; 156,202 ac.
Selection %Viable	33.3% occ's; 100% area
Chart: Viable Occurrences	
Chart: Viable Area	
Compatible	2 occ's.; 61,798 ac.
% Compatible	22.2% occ's; 39.6% area
% of Goal: Compatible	131.88%
Selection Compatible	2 occ's.; 61,798 ac.
Selection % Compatible	22.2% occ's; 39.6% area
Selection % of Goal, Compatible	131.88%
Chart: Compatible Occurrences	
Chart: Compatible Area	

[Back to top](#)

Map



Creating Alternative Scenarios & Site Mitigations



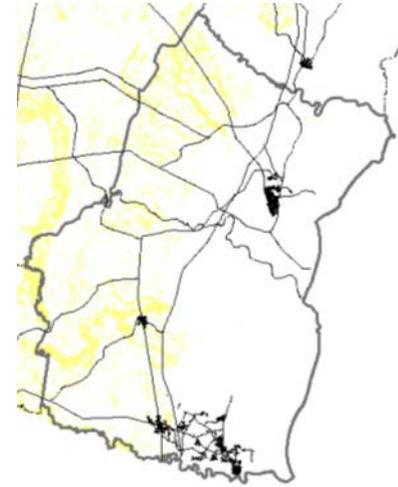
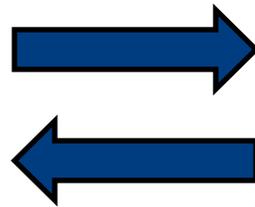
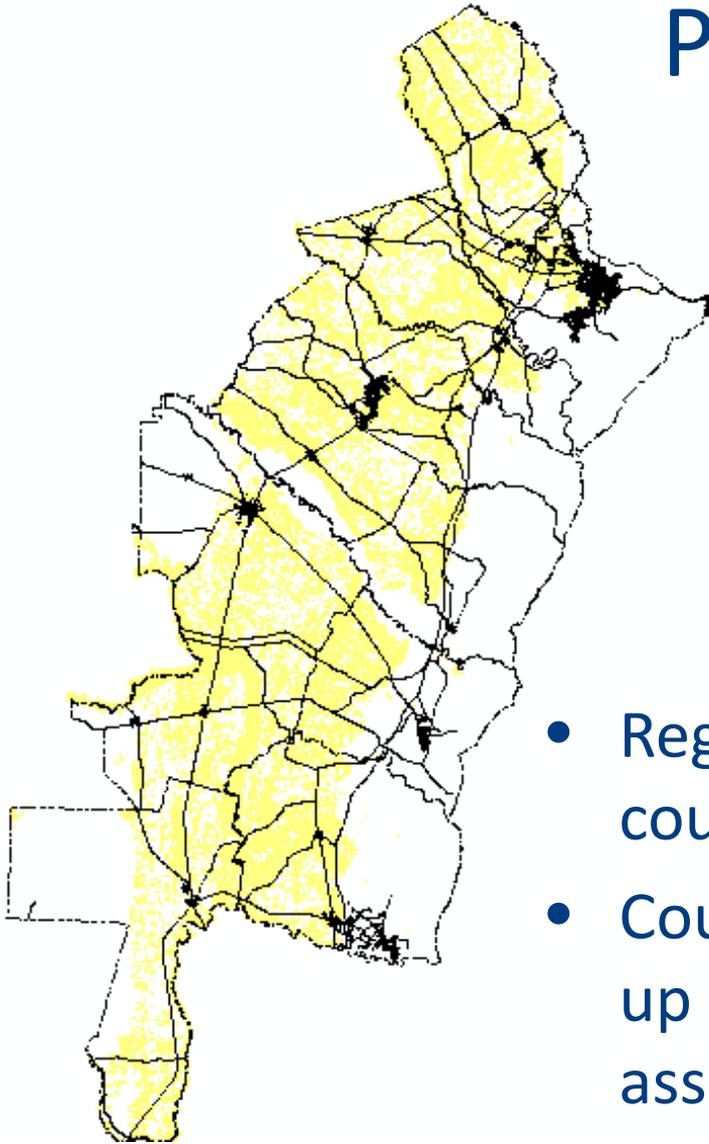
Site Explorer:

- Select a site of interest and view inventory and analyses
- Specify alternative uses for the site & view immediate results. Save results to create alternative scenario

Element Name	Total	Compatible Area	% Compat	Response
TPWD boat ramps	34 occ's.; 10,770 sq. m.		29.4% occ's.; 29.2% area	Incompatible
Marinas	9 occ's.; 11,040 sq. m.		0% occ's.; 0% area	Incompatible
Submerged Areas	4,829 occ's.; 34,829,250 sq.		91.7% occ's.; 92.1% area	Compatible
Tharps rhododon	3 occ's.; 12,566,550 sq. m.		33.3% occ's.; 91% area	Compatible
Seagrass beds	185 occ's.; 81,718,260 sq. m.		87% occ's.; 19.6% area	Compatible
Forestland	24,298 occ's.; 495,361,950		97.5% occ's.; 97.9% area	Compatible
Wetland (not CCAP)	7,721 occ's.; 302,800,320 sq.		98.8% occ's.; 93.6% area	Incompatible
Agricultural and Grasslands	15,613 occ's.; 670,373,880		94.1% occ's.; 98.2% area	Compatible
Rookeries	31 occ's.; 44,158,080 sq. m.		100% occ's.; 90.2% area	Compatible
Beach access points	29 occ's.; 9,180 sq. m.		3.4% occ's.; 3.3% area	Incompatible
Wetland	9,707 occ's.; 274,523,610 sq.		97.6% occ's.; 97.1% area	Incompatible
Live Oak and Parks	3 occ's.; 200,501,940 sq. m.		100% occ's.; 79.8% area	Compatible
GLO Coastal leases (point locations)	407 occ's.; 135,780 sq. m.		4.4% occ's.; 5.2% area	Incompatible
Black-spotted Newt (low precision)	1 occ's.; 101,255,730 sq. m.		100% occ's.; 29.2% area	Compatible

Scenario Composition		
Layer	Land Use	sq. meters
(none)	Natural area recreation and open space	119,970
dredgesites_utm_huc	Natural area recreation and open space	149,580
pipesglo_buf1m	Natural area recreation and open space	420
highway_buf15m	Natural area recreation and open space	70,140
countryrd_paved_buf10m	Natural area recreation and open space	178,050
unclassified_rds_buf8m	Natural area recreation and open space	20,550

Integrated Multiscale Analyses & Planning



- Regional assessment informs county focus
- County implementation rolls back up into future regional assessments



Next Steps

- Refining regional and county projects to include
 - Species distribution models
 - Circuitscape connectivity results
 - Updated Marxan priority areas
- DSS transfer workshops planned for late spring 2011
 - Fully documented Vista database
 - Training in use of Vista software
 - Other products including static conservation priority maps



Conclusions

- Toolkit and work to date provide effective means to map important resources and evaluate scenarios
- Much potential for future applications: alternative scenario development, integrating climate change, adaptive management
- So far all groups of local involvement appear to understand and support the application
- Ultimate value dependent on success of technology transfer, building out technical capacity, and maintaining collaborative relationships

For more Information

- ❑ www.natureserve.org/vista
- ❑ Follow up: regan_smyth@natureserve.org

