Using Ecosystem Service Projects to Inspire Land Conservation

Frank Casey - Defenders of Wildlife
Frank Biasi – National Geographic
Timm Kroeger – Defenders of Wildlife
Rusty Painter – Conservation Trust for North Carolina

Living Lands Project

Session Topics

Mapping Ecosystem Services at Local Scales

Ecosystem Services Benefits Toolbox

Shopping in the Ecosystem Service Market: Land Trust Success Stories

Rationale

- Revenue Source for On-going Stewardship and Transactions Costs
- Rapidly Developing Markets for Ecosystem Services: Regulatory Carbon and Water Quality Markets; Mitigation and Habitat Banking; Federal and State Initiatives
- Increased Opportunities to Participate in Regional Markets: Williamette Partnership; Bay Bank; Florida Rangeland Water Markets, etc.

Mapping Ecosystem Services at "Local" Scales

Review of the state-of-the-art

Frank Biasi
Director, Conservation Projects
National Geographic Maps

Land Trust Alliance National Land Conservation Conference
Pittsburgh, PA
September 21, 2008

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Mapping Ecosystem Services at "Local" Scales

Review of the state-of-the-art

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Mapping Ecosystem Services in the Sierra Nevada, CA

Erik Haunreiter, Dick Cameron,
The Nature Conservancy, California Program

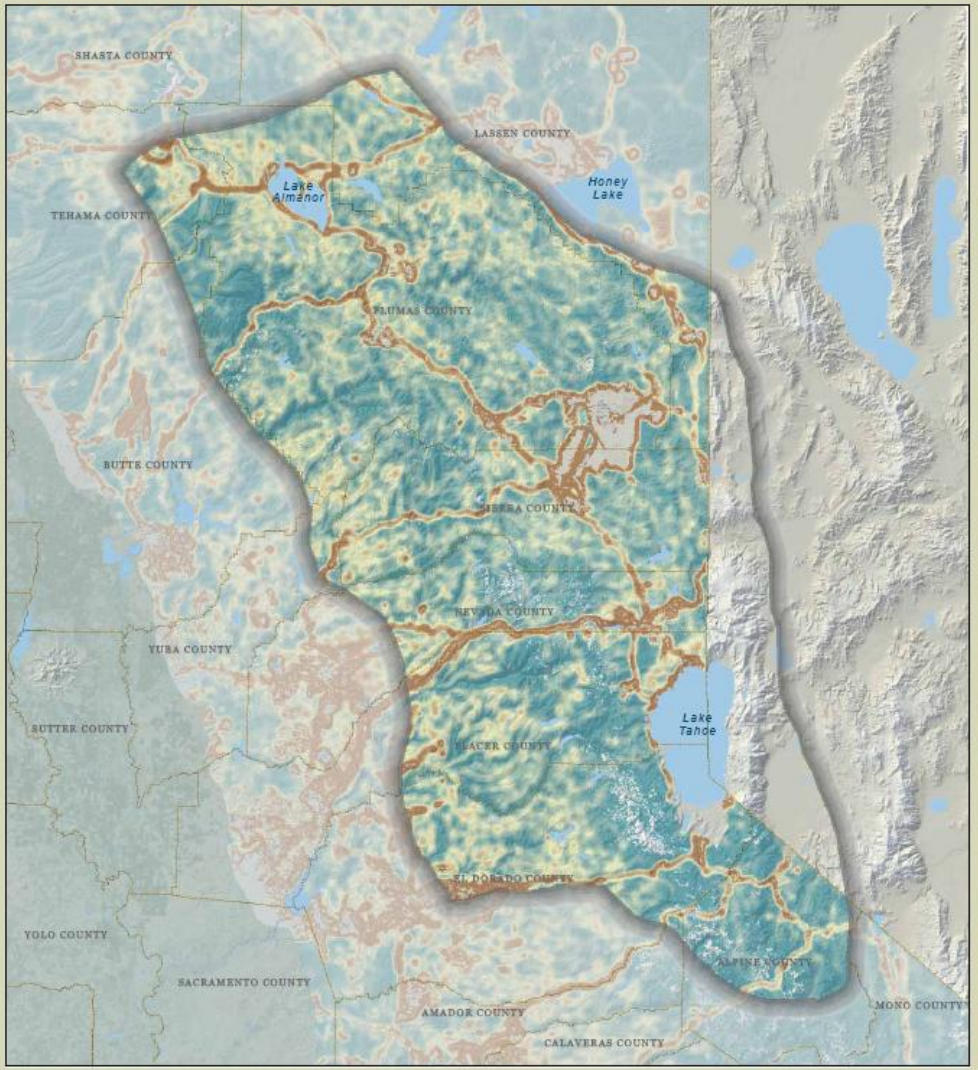
The Nature Conservancy
Protecting nature. Preserving life.

Data Sources: PRISM Group, Oregon State University; Soil Information for Environmental Modeling and Ecosystem Management, Pennsylvania State University; US EPA EMAP Program.

Acknowledgements: Guillermo Mendoza, Nasser Olwero, Heather Tallis, Erik Nelson.

Biodiversity: Habitat Quality

f(x) = (vegetation type, urban area, agricultural area, road density, sensitivity of vegetation to disturbances, distance of influence of degrading factors)



Study Area

Habitat Quality

More Intact

Less Intact

N

0 15 30 Miles

0 25 50 Kilometers

1:750,000

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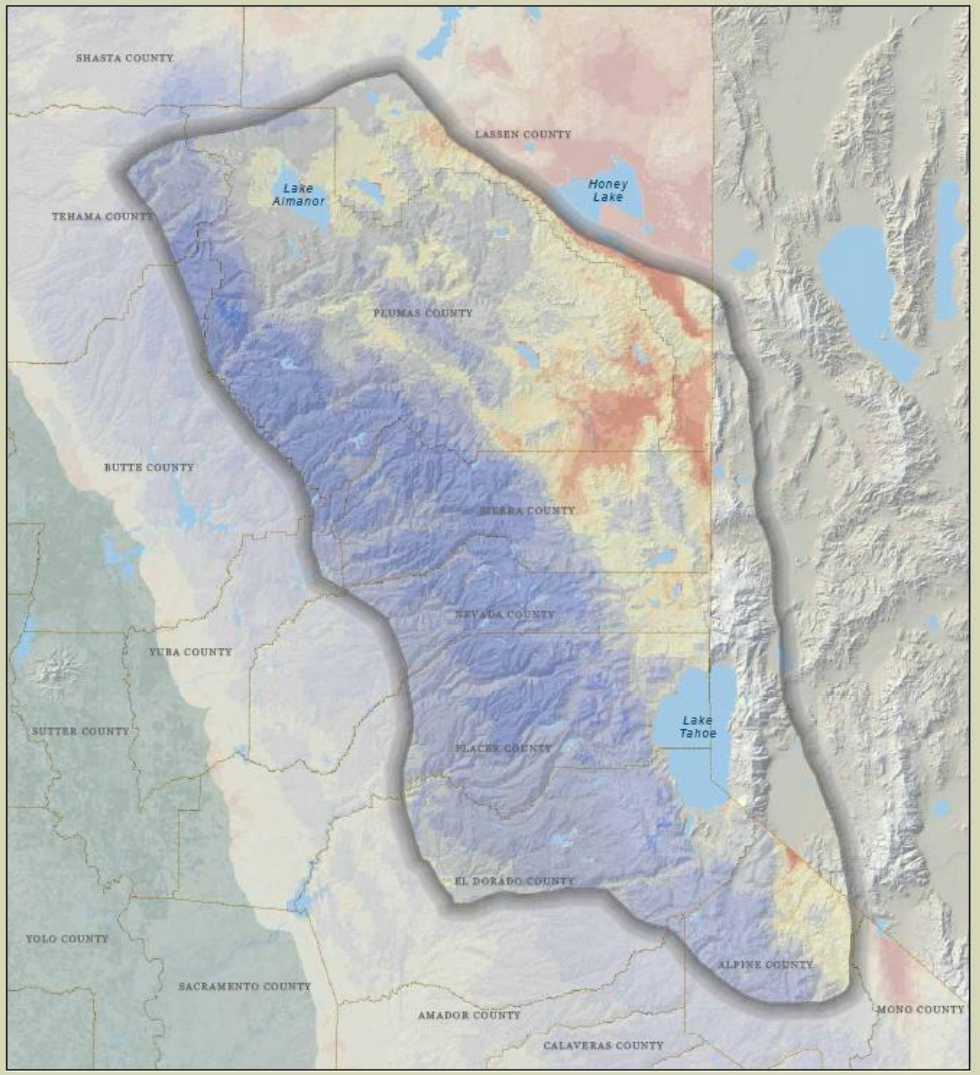
Water Yield

f(x) = (average annual precipitation, annual reference evapotranspiration, soil depth, plant available water content, plant root depth)



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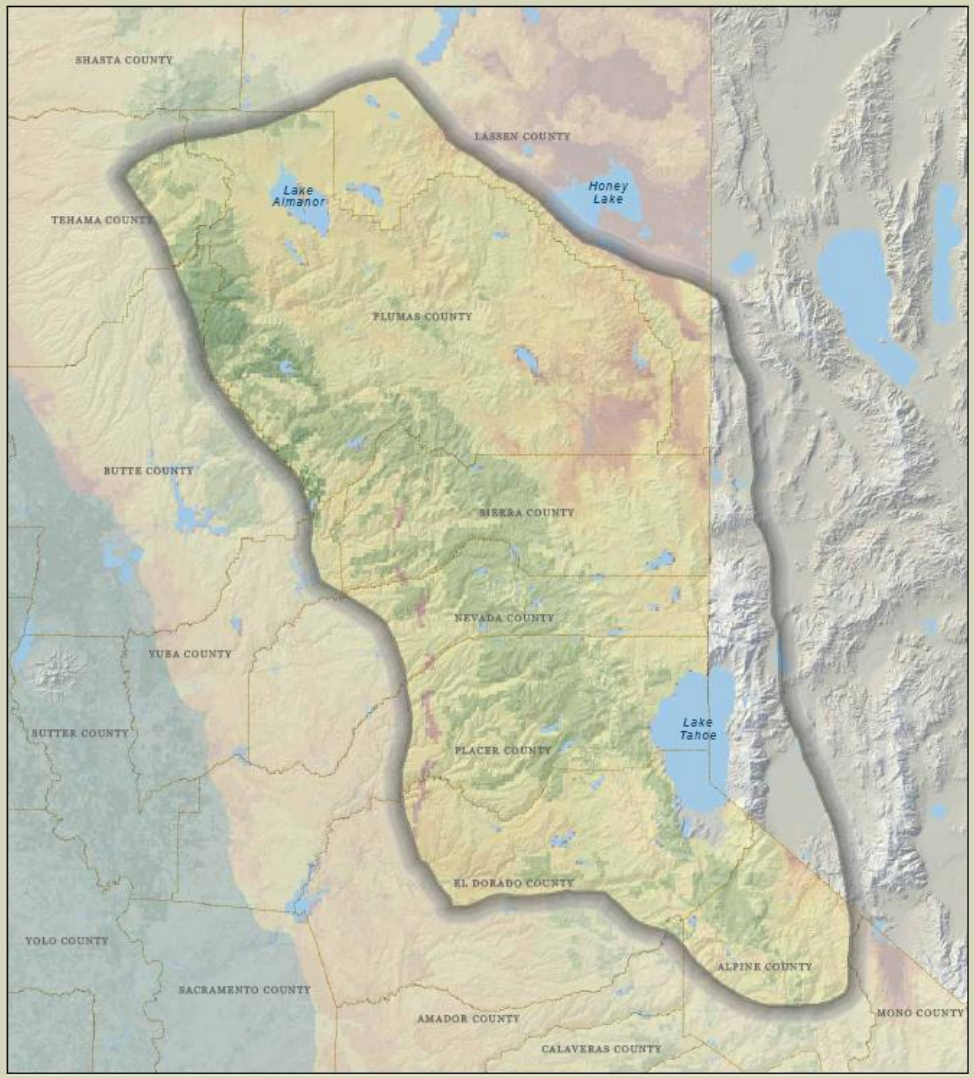
Water Retention

f(x) = (percent slope, cell distance, hydraulic connectivity, water yield, saturated hydraulic conductivity, water flow velocity)



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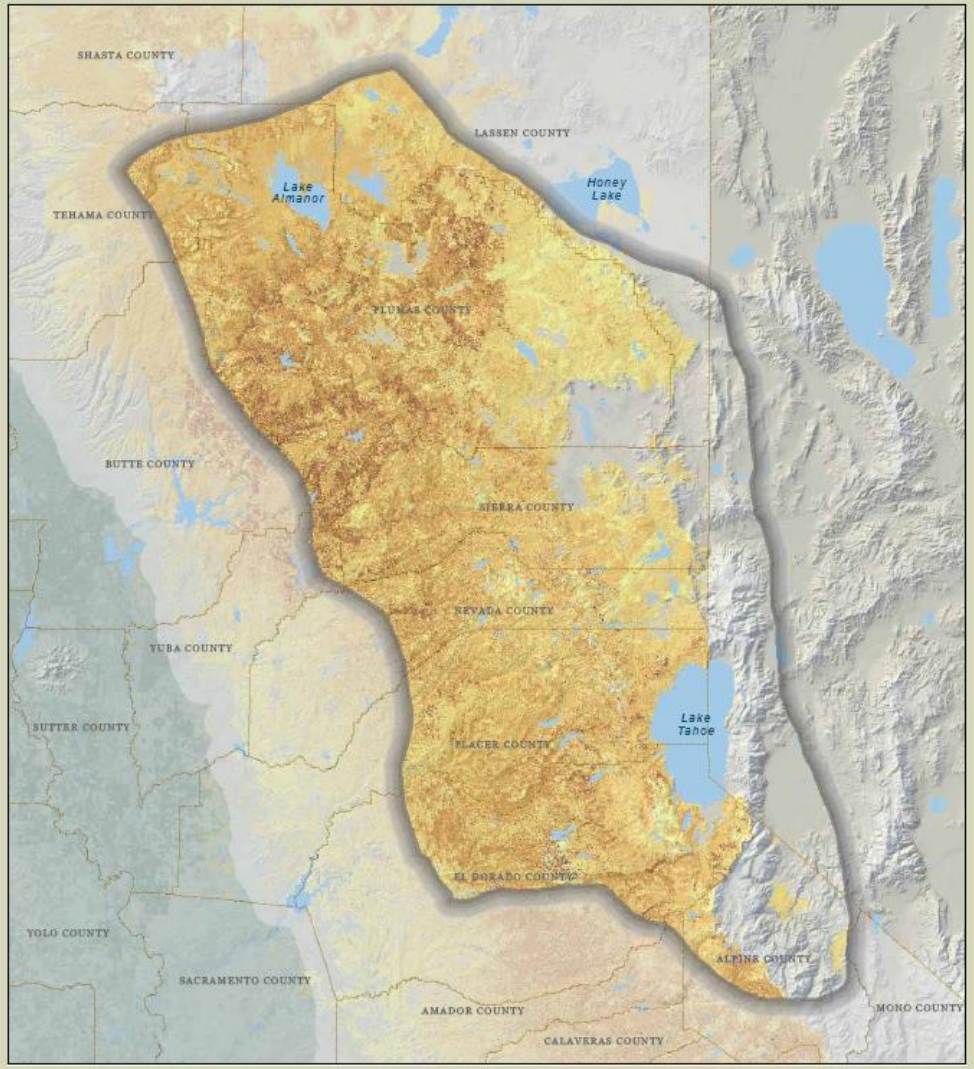
Acknowledgements: Guillermo Mendoza, Nasser Olwero, Heather Tallis, Erik Nelson.

Carbon Storage (Live Tree Biomass)

f(x) = (remotely sensed forest type and structure assessed by stand surveys)
Sources include: USFS R5 Strata, Oregon State LEMMA program, Calfire 2005



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PLOS BIOLOGY

Conservation Planning for Ecosystem Services

Kai M. A. Chan[1*¤], M. Rebecca Shaw[2], David R. Cameron[2], Emma C. Underwood[3], Gretchen C. Daily[1]

1 Center for Conservation Biology, Department of Biological Sciences, Stanford University, Stanford, California, United States of America, **2** The Nature Conservancy, San Francisco, California, United States of America, **3** Department of Environmental Science and Policy, University of California Davis, Davis, California, United States of America

- How to integrate ecosystem services into biodiversity planning framework (MARXAN optimization)
- Assess spatial alignment of biodiversity and ecoservices goals
- Services:
  - Biodiversity
  - Carbon storage
  - Crop pollination
  - Flood control
  - Forage production
  - Outdoor recreation
  - Water provision

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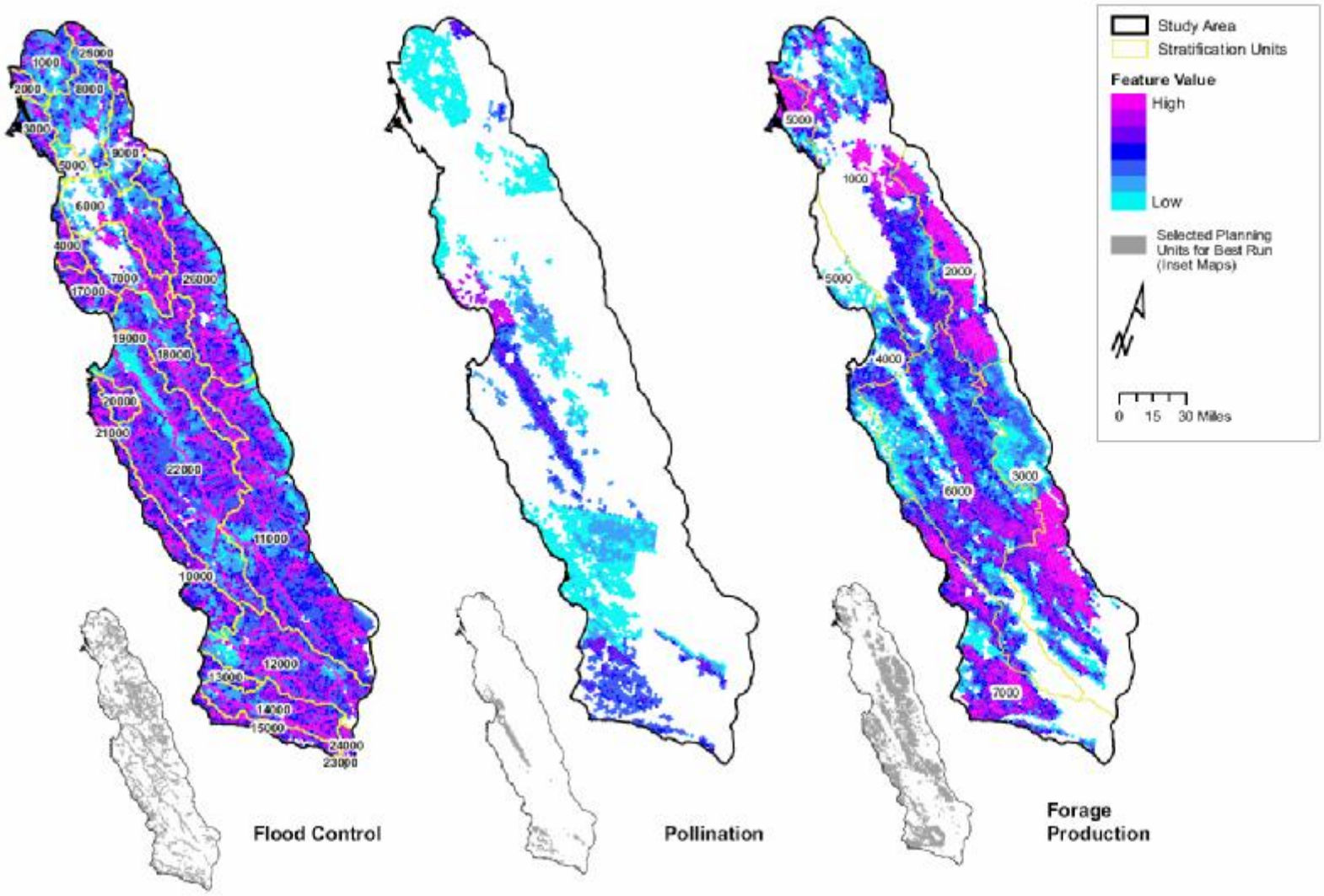
Conservation Planning for Ecosystem Services



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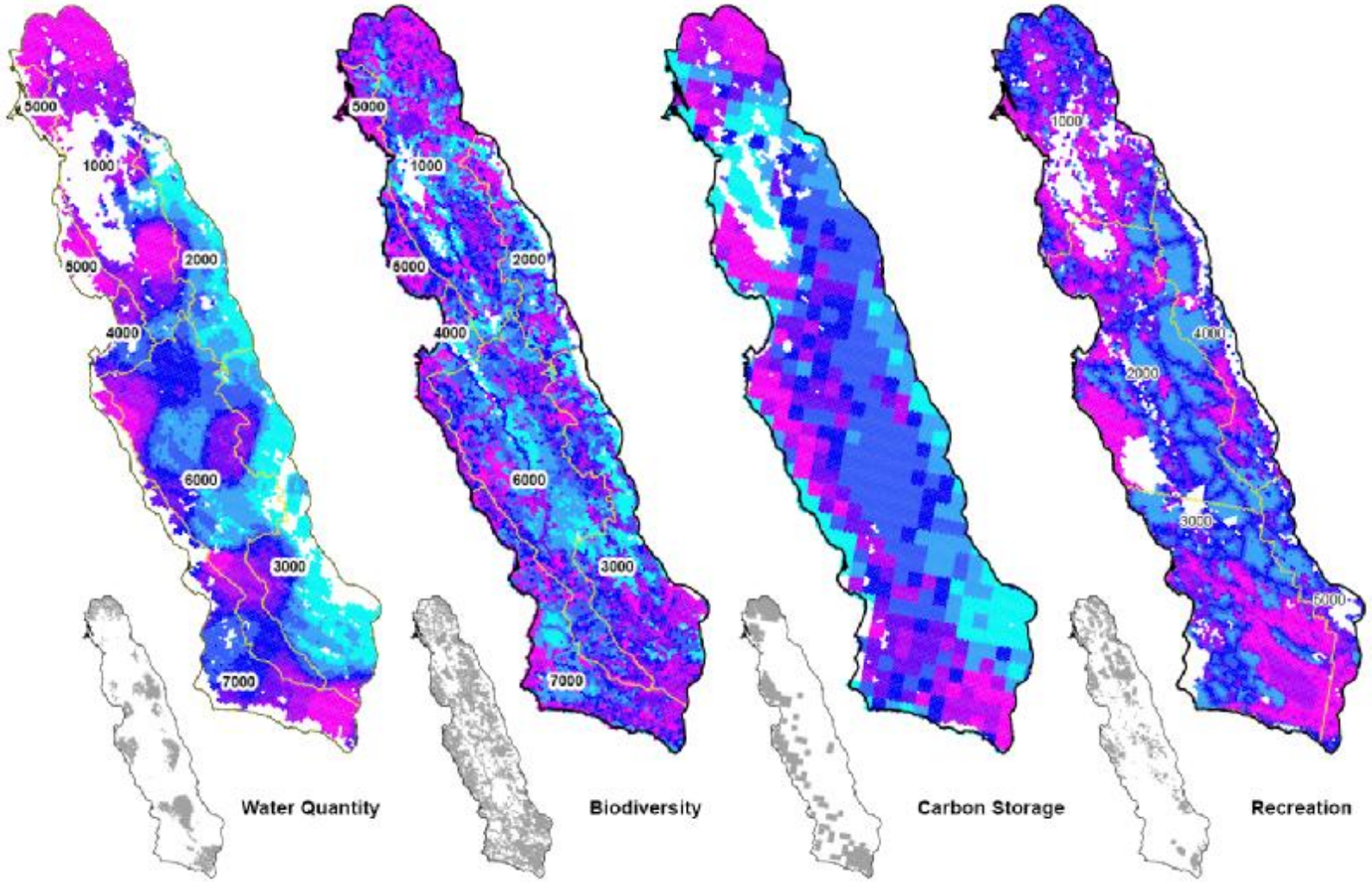

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Key Findings

- The seven services have distinctly different spatial distributions, thus the spatial correlations are low
- The highest correlation is between carbon storage and water provision (*0.58*).
- Recreation and water provision, and recreation and flood control are also relatively high (> *0.2*)
- Pollination and forage production are negatively associated with other services
- …

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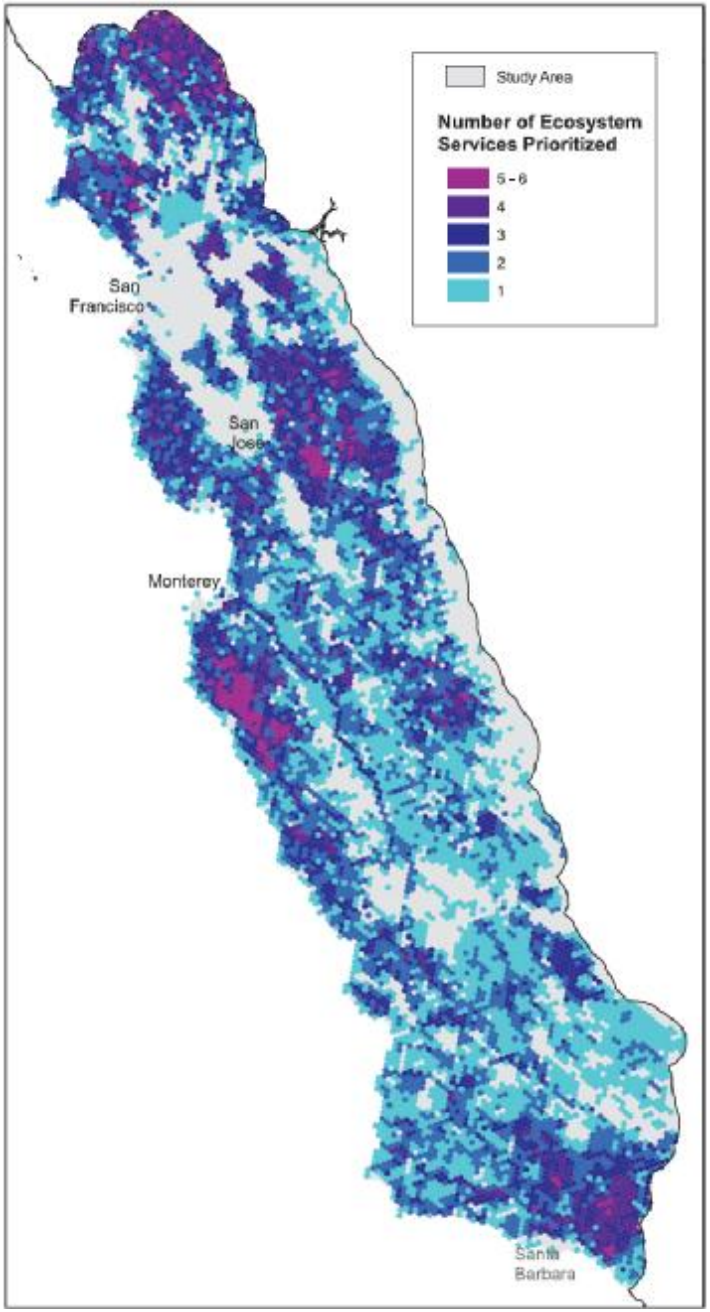
…Key Findings

- There are hotspots where high values of multiple services coincide
- However, selecting sites based on biodiversity alone will not maximize selection of other services (& vice-versa)
- Carbon storage, flood control, and recreation are best captured by biodiversity sites



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ECOLOGICAL ECONOMICS 60 (2006) 435–449

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Mapping ecosystem services: Practical challenges and opportunities in linking GIS and value transfer

Austin Troy [a,c,*], *Matthew A. Wilson* [b,c]

[a] *Rubenstein School of the Environment, University of Vermont, Burlington, VT 05405, United States*
[b] *School of Business Administration, University of Vermont, Burlington, VT 05405, United States*
[c] *Spatial Informatics Group, LLC 1990 Wayne Ave. San Leandro, CA 94577, United States*

- A framework for spatial mapping and analysis of ecosystem service values (ESV)
- Applied to three case studies (WA, CA, MA)

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ESV Analysis Steps

1. Spatial designation of the study extent
2. Establishment of a land cover typology whose classes predict significant differences in the flow and value of ecosystem services
3. Meta-analysis of peer-reviewed valuation literature to link per unit area coefficients to available cover types
4. Mapping land cover and associated ecosystem service flows;
5. Calculation of total ESV and breakdown by cover class
6. Tabulation and summary of ESVs by relevant management geographies
7. Scenario or historic change analysis

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Core Data: Land cover

Table 1 Land cover typologies for three case studies

Maury Island	Massachusetts	California
Disturbed [a]	Disturbed [a]	Disturbed [a]
Saltwater wetland	Saltwater wetland	Saltwater wetland
Freshwater wetland	Freshwater wetland	Freshwater wetland
Nearshore habitat [b]	Freshwater or	Estuaries
Coastal open water	coastal embayments	Open fresh water
Grassland/	Pasture	
herbaceous	Cropland	Agriculture [c]
		Vineyards [d]
Stream buffers		Forested river
Coastal riparian		buffers
	Urban green space	Urban green space
	Woody perennial	
Beach		
Beach near dwelling		
Forest	Forest	Hardwood forest
		Conifer forest
		Mixed forest
		Second growth redwood forest
		Old growth redwood forest
		Northern spotted owl forest habitat

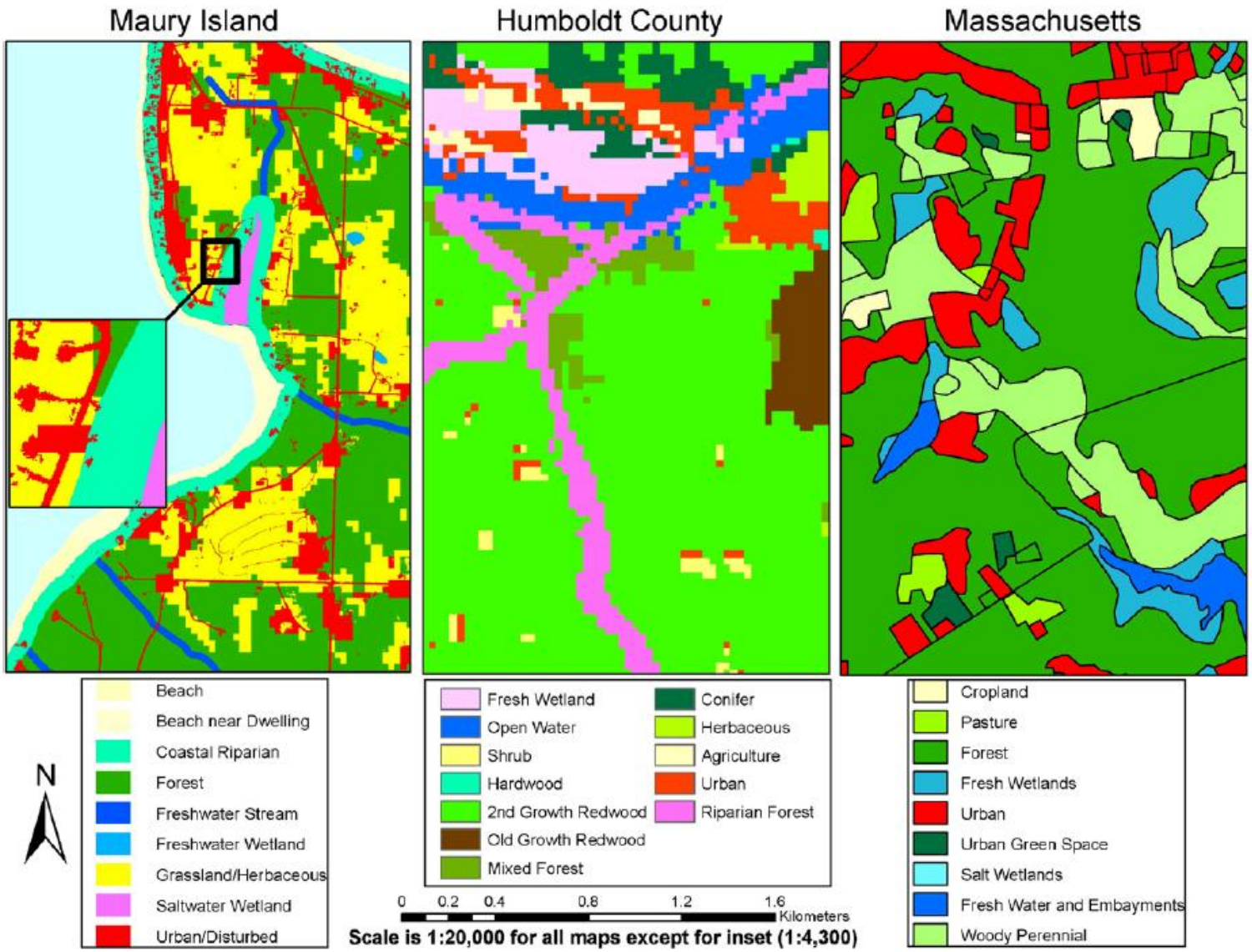

Fig. 2–Land cover map comparison of Maury Island, Massachusetts, and Humbolt County at 1:20,000 scale.

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Ecosystem Service Value Summaries

Table 2 Ecosystem service values by cover type for Massachusetts

Land cover type	Average $/ha/yr	Lower bound	Upper bound	Area (ha)	Total ESV flow
Cropland	$ 3427	$ 3427	$ 3427	90,087	$ 308,728,149
Pasture	$ 3412	$ 3412	$ 3412	36,940	$ 126,039,280
Forest	$ 2430	$ 1005	$ 4934	1,200,303	$ 2,916,736,290
Freshwater wetland	$ 38,167	$ 18,979	$78,476	46,460	$ 1,773,247,229
Salt wetland	$ 31,084	$24,678	$60,409	8439	$ 262,317,876
Urban green space	$ 8471	$6649	$10,293	58,535	$ 495,849,312
Woody perennial	$ 122	$ 122	$ 122	17,372	$ 2,119,384
Fresh water bodies/ coastal embayments	$2427	$ 159	$ 7374	69,657	$ 169,081,438
Disturbed and urban	$ –			556,075	$ –
Total				2,093,868	$ 6,054,118,958

Table 3 Ecosystem service values by cover type for Maury Island

Land cover	Ave. $/ ha/yr	Lower bound	Upper bound	Area (ha)	Total ESV flow
Disturbed and urban	$ –	$ –	$ –	253	$ –
Beach	$ 88,204	$ 77,016	$ 99,391	27	$ 2,371,006
Beach near dwelling	$ 117,254	$94,004	$140,505	65	$ 7,575,825
Coastal riparian	$ 9396	$ 5542	$ 13,248	132	$ 1,244,665
Forest	$ 1826	$ 511	$ 3142	1044	$ 1,906,410
Freshwater stream	$ 1595	$ 939	$ 1231	41	$ 66,059
Freshwater wetland	$ 72,787	$ 32,947	$ 96,095	4	$ 269,089
Grassland/ herbaceous	$ 118	$ 118	$ 118	321	$ 37,833
Nearshore aquatic habitat	$ 16,283	$ 4630	$ 27,935	565	$ 9,204,633
Saltwater wetland	$ 1413	$ 854	$ 1972	7	$ 9527
Total				2460	$ 22,685,047

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Ecosystem Service Values

Table 4 Ecosystem service values by cover type and county for California

Description	Ave. $/ha/yr	Humboldt County		Napa County		San Bernardino County	
		Area (ha)	Total ESV flow	Area	Total ESV flow	Area	Total ESV flow
Agriculture	$ 2192	15,937	$ 34,932,508	11,210	$ 24,571,316	29,041	$ 3,657,272
Conifer forest	$ 821	114,244	$ 93,823,306	7012	$ 5,758,593	135,033	$ 10,896,564
Desert shrub	NA	0	0	0	0	4,123,497	NA
Desert woodland	NA	0	0	0	0	245,288	NA
Estuary	$ 5898	2	$ 10,085	451	$ 2,661,834	0	0
Fresh wetland	$ 10,973	9593	$ 105,261,803	1785	$ 19,592,412	74,968	$822,650,494
Hardwood oak woodland	$ 439	112,182	$ 49,293,301	59,030	$ 25,938,010	19,404	$ 8,526,125
Herbaceous	NA	83,079	0	26,769	$ 0	22,595	NA
Mixed forest	$ 826	261,920	$ 216,293,687	5511	$ 4,551,190	34,790	$ 28,729,641
Spotted owl habitat	$ 998	89,670	$ 89,487,414	0	0	0	0
Riparian forest	$ 8792	49,472	$ 434,960,966	7073	$ 62,189,858	37,854	$ 332,816,821
Redwood 2nd growth	$ 815	99,632	$ 81,185,900	511	$ 416,315	0	0
Redwood old growth	$ 950	39,661	$ 37,682,967	0	0	0	0
Shrubs	NA	22,483	NA	48,549	NA	195,273	NA
Saltwater wetland	$ 6044	549	$ 3,317,256	1396	$ 8,438,390	0	0
Disturbed and urban	0	17,379	0	7471	0	267,097	0
Urban green	$ 5605	3255	$ 18,242,491	731	$ 4,099,948	62	$ 344,531
Vineyards	$ 2192	0	0	14,178	$ 31,075,280	0	0
Open fresh water	$ 7237	7145	$ 51,707,928	12,107	$ 87,621,444	17,044	$ 123,347,887
County totals		926,202	$1,216,199,612	203,786	$ 276,914,591	5,201,946	$1,490,969,335
Grand total for all counties	$2,984,083,539						

NA = value is expected to be greater than zero but is not known.

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Ecosystem Service Values by Service Type

Table 5 Ecosystem service values by land cover and service type for Maury Island

Land cover	Aesthetic and amenity	Climate and atmospheric regulation	Disturbance prevention	Food and raw materials	Habitat refugium	Recreation	Soil retention and formation	Waste assimilation	Water regulation and supply
Beach	$ –	$ –	$ –	$ –	$ –	$2,371,006	$ –	$ –	$ –
Beach near dwelling	$4,442,228	$ –	$ –	$ –	$ –	$ –	$3,133,597	$ –	$ –
Coastal riparian	$ 224,009	$ –	$ 48,622	$ –	$ 509,067	$ 10,732	$ 107,842	$ 29,872	$314,520
Forest	$ 7703	$1,391,576	$ –	$ –	$ 10,041	$ 483,395	$ –	$ –	$ 13,695
Freshwater stream	$ 25	$ –	$ –	$ –	$ 24,641	$ 17,585	$ –	$ –	$ 23,807
Freshwater wetland	$ 17,866	$ –	$ 56,893	$ –	$ 85,466	$ 4203	$ –	$104,642	$ 20
Grassland/ herbaceous	$ –	$ 2649	$ –	$ –	$ –	$ 755	$ 379	$ 32,915	$ 1135
Nearshore habitat	$ –	$ –	$ –	$2,080,557	$3,518,838	$3,605,238	$ –	$ –	$ –
Saltwater wetland	$ –	$ –	$ 3770	$ –	$ –	$ 173	$ –	$ 1,474	$ 4110
Column total	$ 4,691,832	$1,394,224	$ 109,284	$2,080,557	$4,148,054	$6,493,088	$ 3,241,818	$168,903	$357,286

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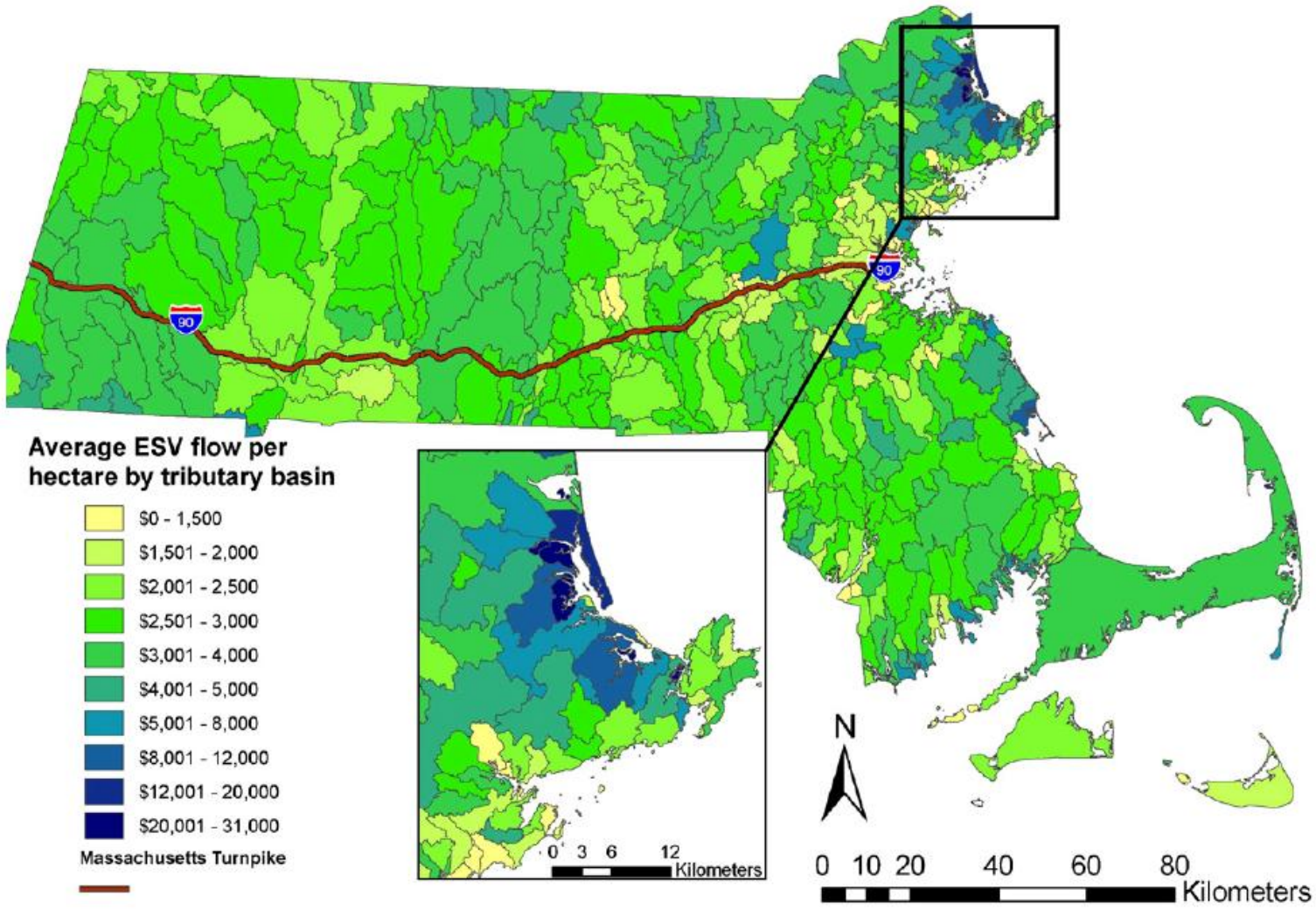
Statewide Summary Map



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Future ESV Loss Scenario

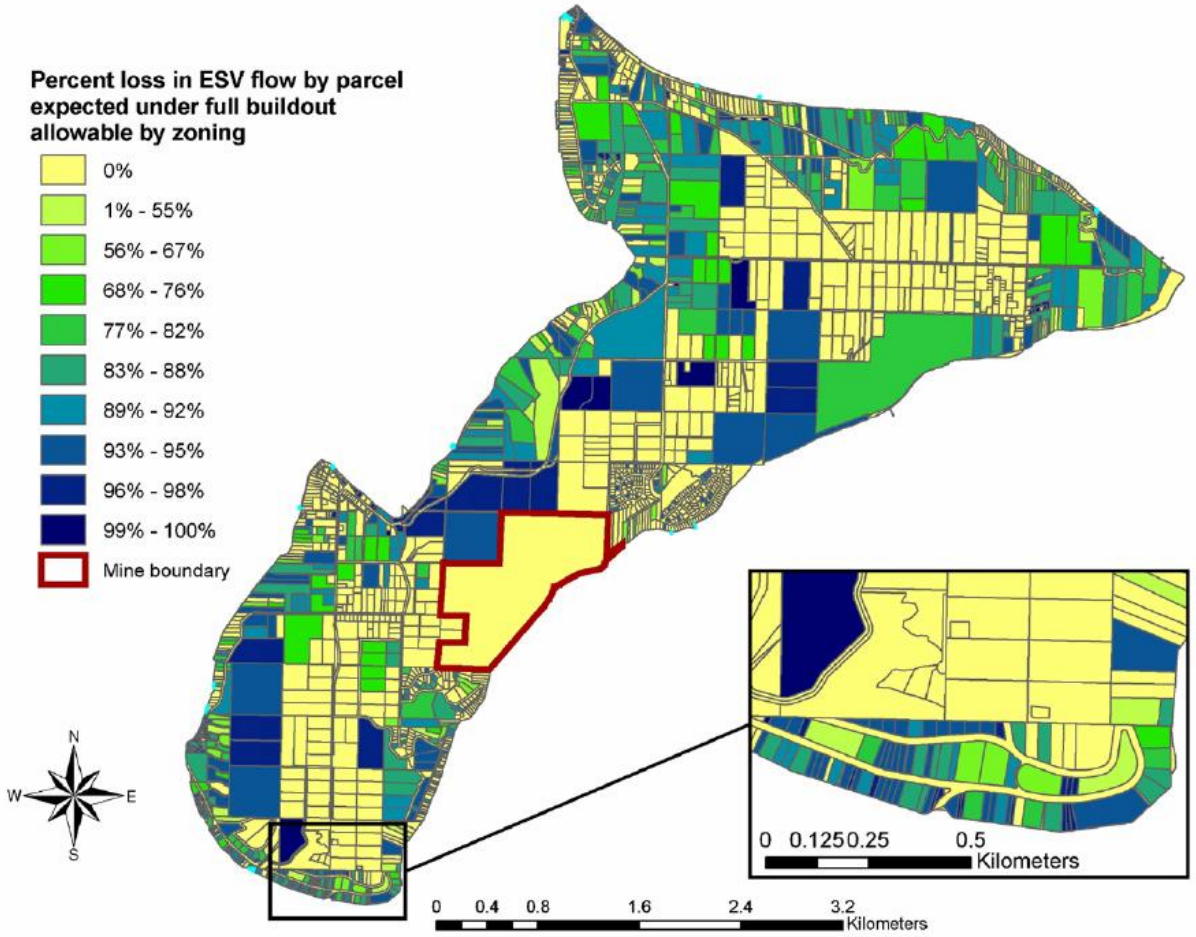

Fig. 5 – Estimated percentage reduction in yearly ecosystem service value flows between current conditions and full zoning buildout conditions by parcel for Maury Island in 2004 dollars.

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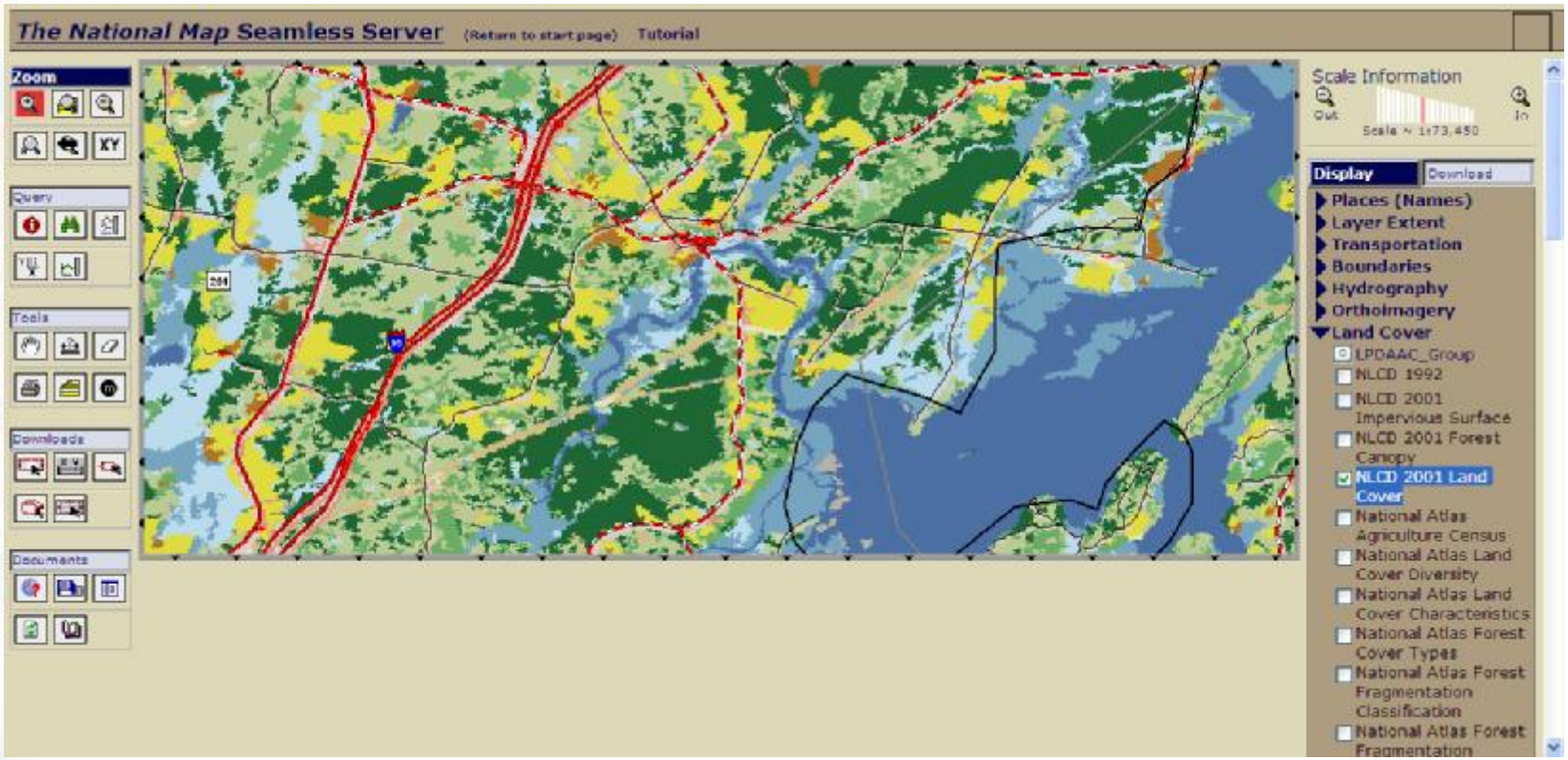
Limitations

- Availability of empirical economic valuation studies (with comparable context)
- Availability of spatial data (less of an issue in the US)
- GIS/data analysis capacity (i.e. someone capable of doing the work)

Land cover data from USGS



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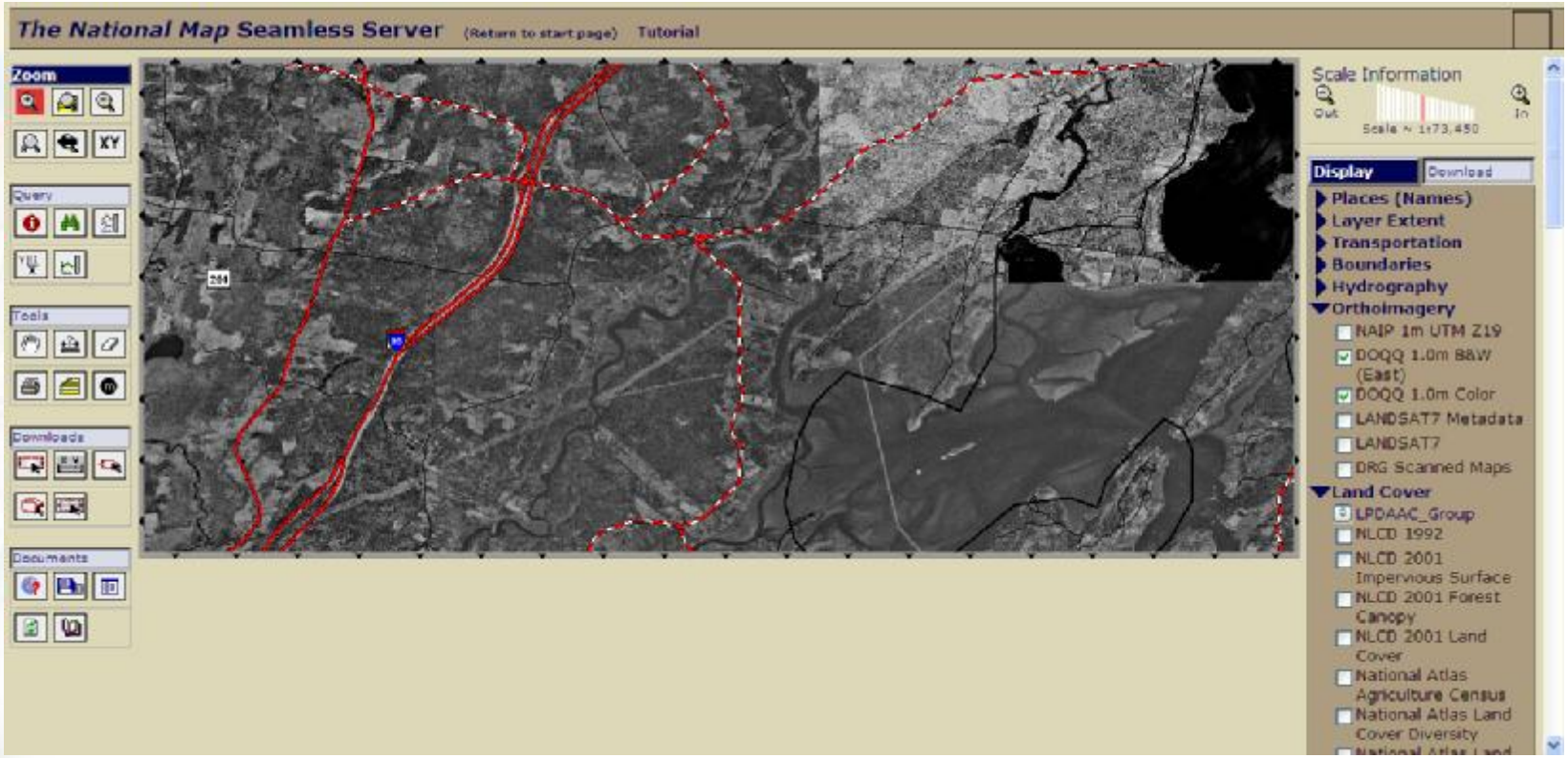

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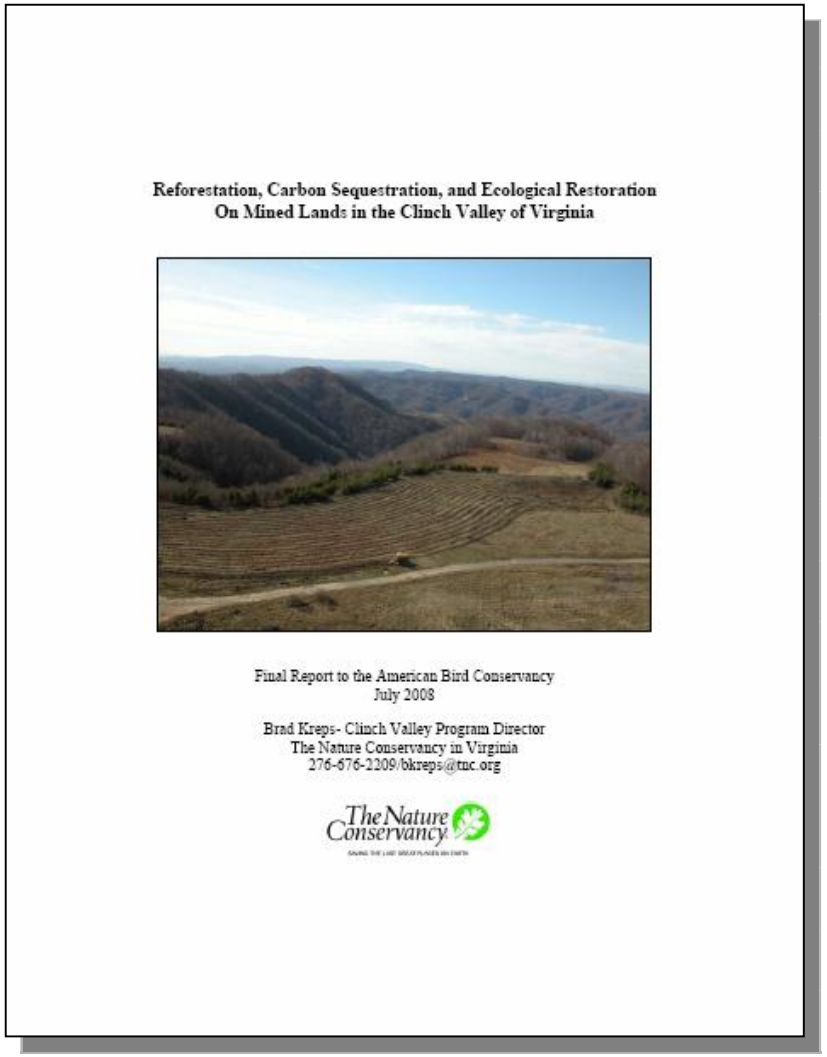
Flint Gap Carbon Sequestration Project

1. **Site Selection**
2. Site Acquisition
3. **Establish Baseline Carbon Storage**
4. **Site Preparation**
5. Tree Planting
6. **Periodic Environmental Monitoring**



Reforestation, Carbon Sequestration, and Ecological Restoration
On Mined Lands in the Clinch Valley of Virginia

Final Report to the American Bird Conservancy
July 2008

Brad Kreps- Clinch Valley Program Director
The Nature Conservancy in Virginia
276-676-2209/bkreps@tnc.org

The Nature Conservancy

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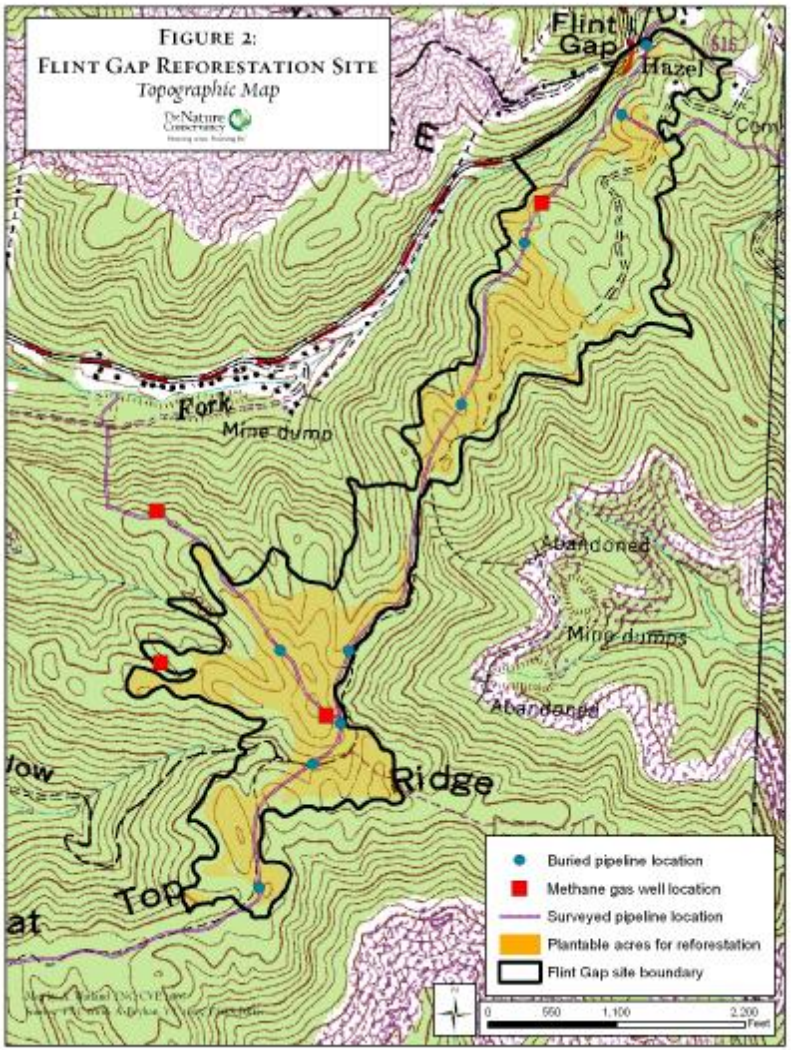
Site Selection

Spatial criteria:

- Land cover
- Access
- Steepness
- Soil properties
- Potential water quality benefits



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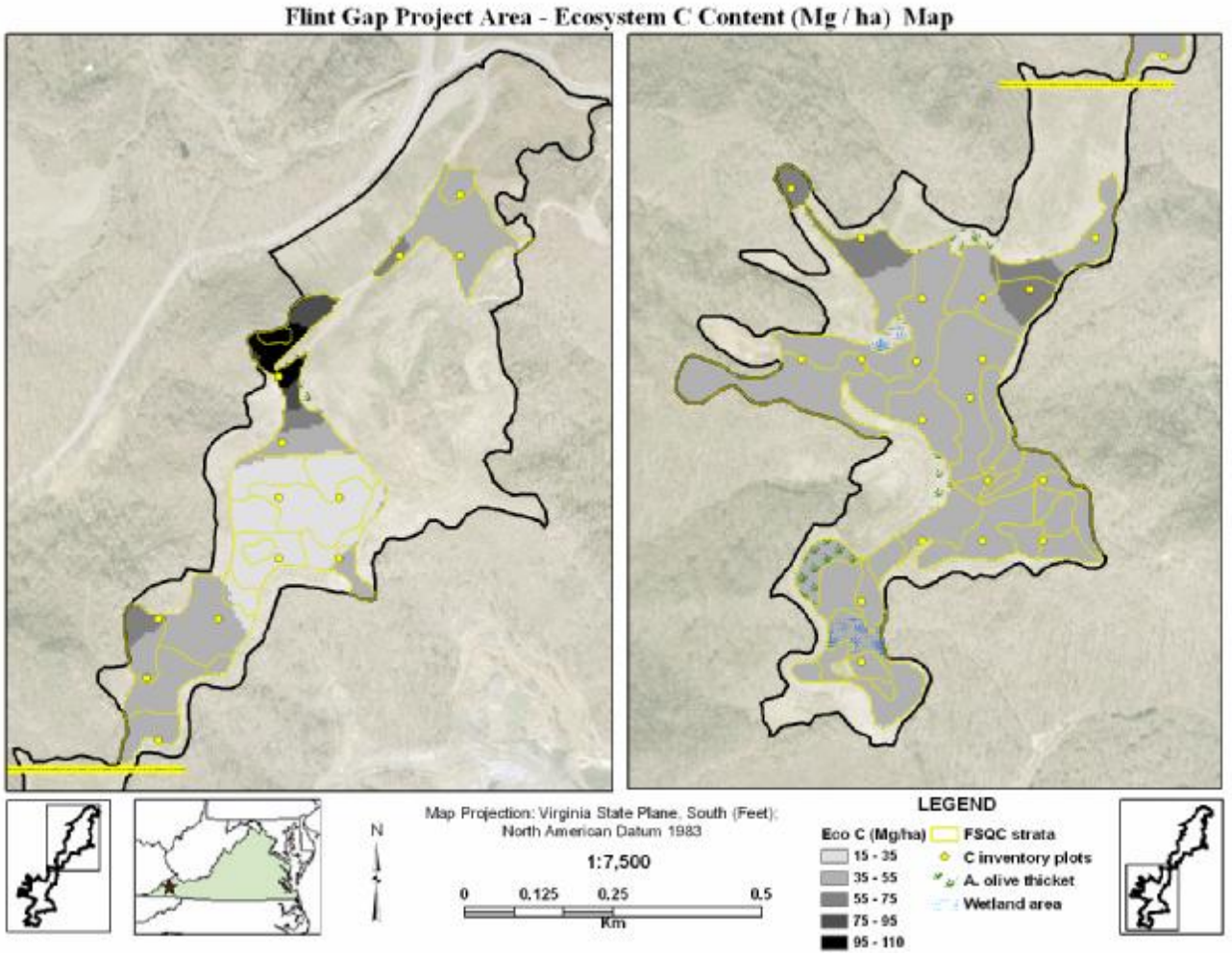
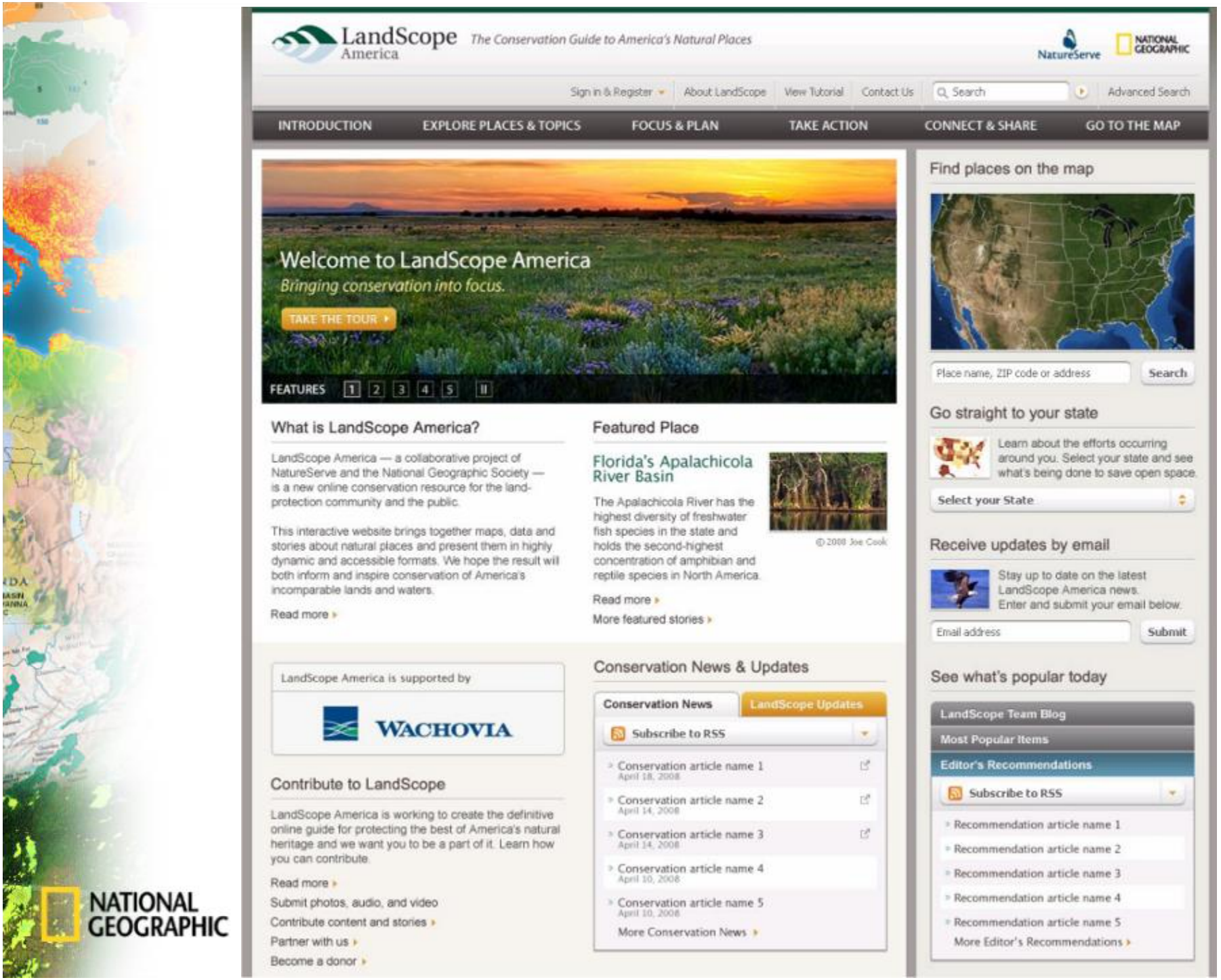
Establishing Baseline Carbon Storage, Site Preparation, and Monitoring

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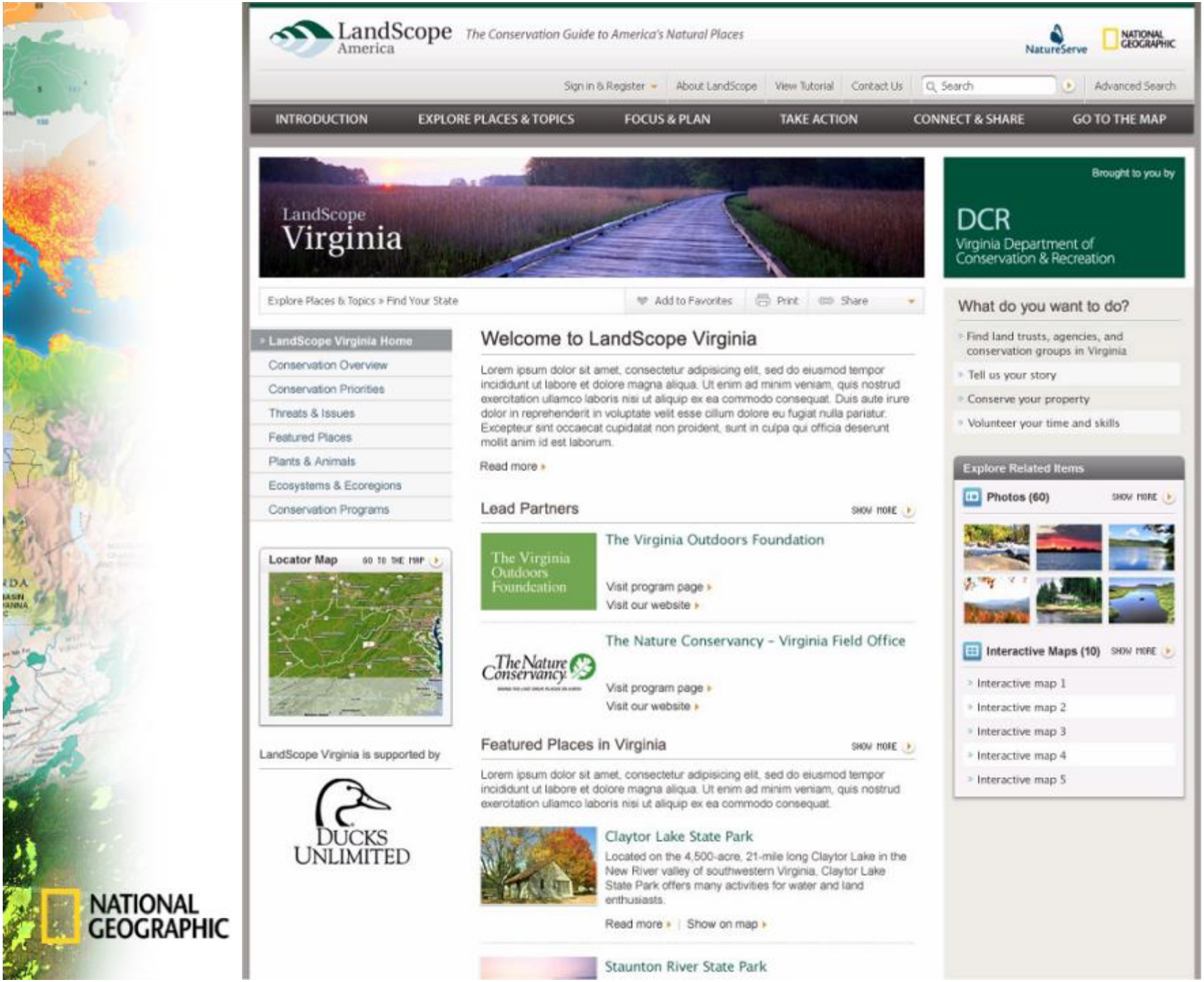
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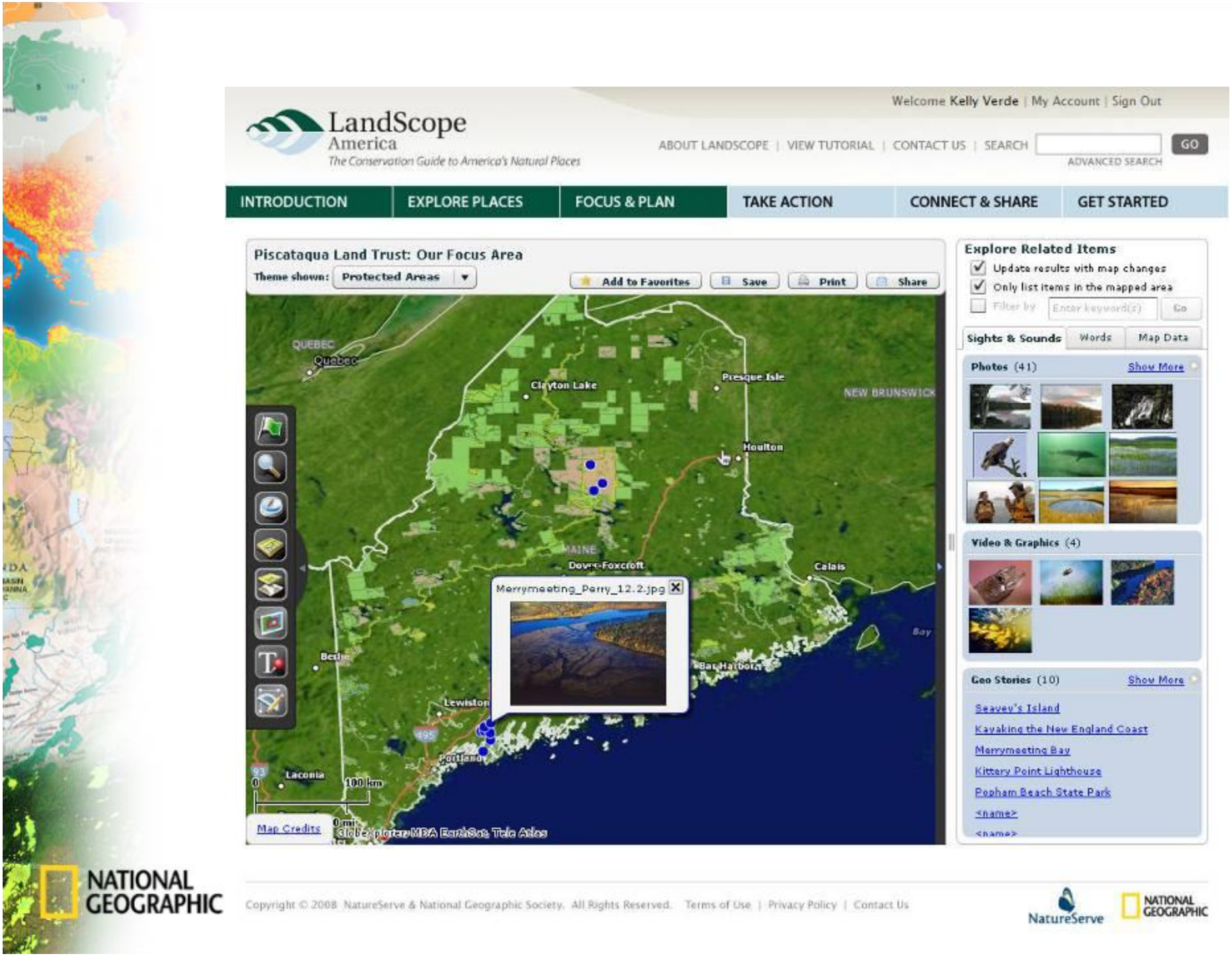
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QUEBEC
Quebec
Clayton Lake
Presque Isle
NEW BRUNSWICK
Houlton
MAINE
Dover-Foxcroft
Calais
Merrymeeting_Perry_12.2.jpg
Bar Harbor
Lewiston
Portland
Laconia
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Map Credits
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Only list items in the mapped area
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Kayaking the New England Coast
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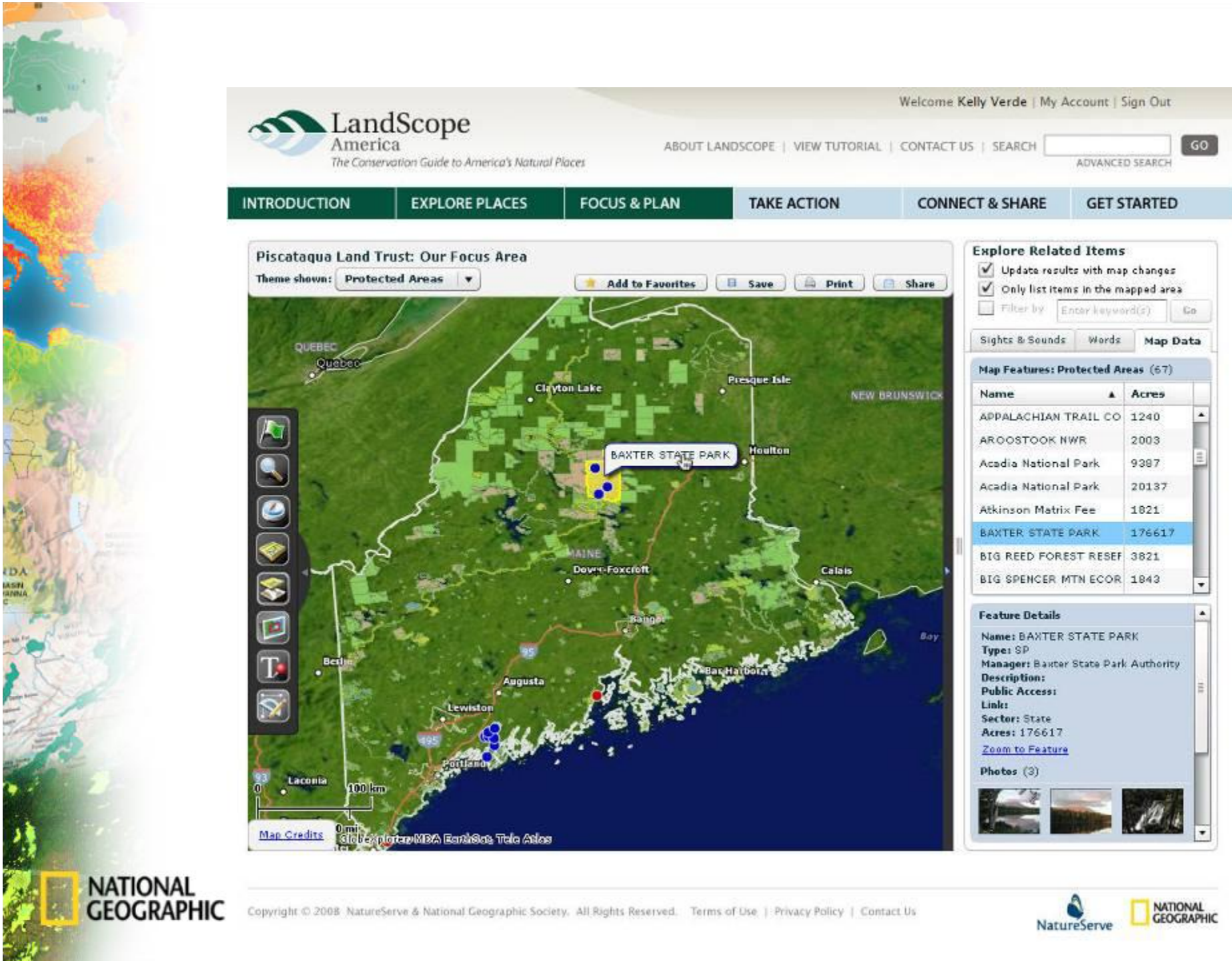
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Name
Acres
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AROOSTOOK NWR 2003
Acadia National Park 9397
Acadia National Park 20137
Atkinson Matrix Fee 1821
BAXTER STATE PARK 176617
BIG REED FOREST RESEF 3821
BIG SPENCER MTN ECOR 1843
Feature Details
Name: BAXTER STATE PARK
Type: SP
Manager: Baxter State Park Authority
Description:
Public Access:
Link:
Sector: State
Acres: 176617
Zoom to Feature
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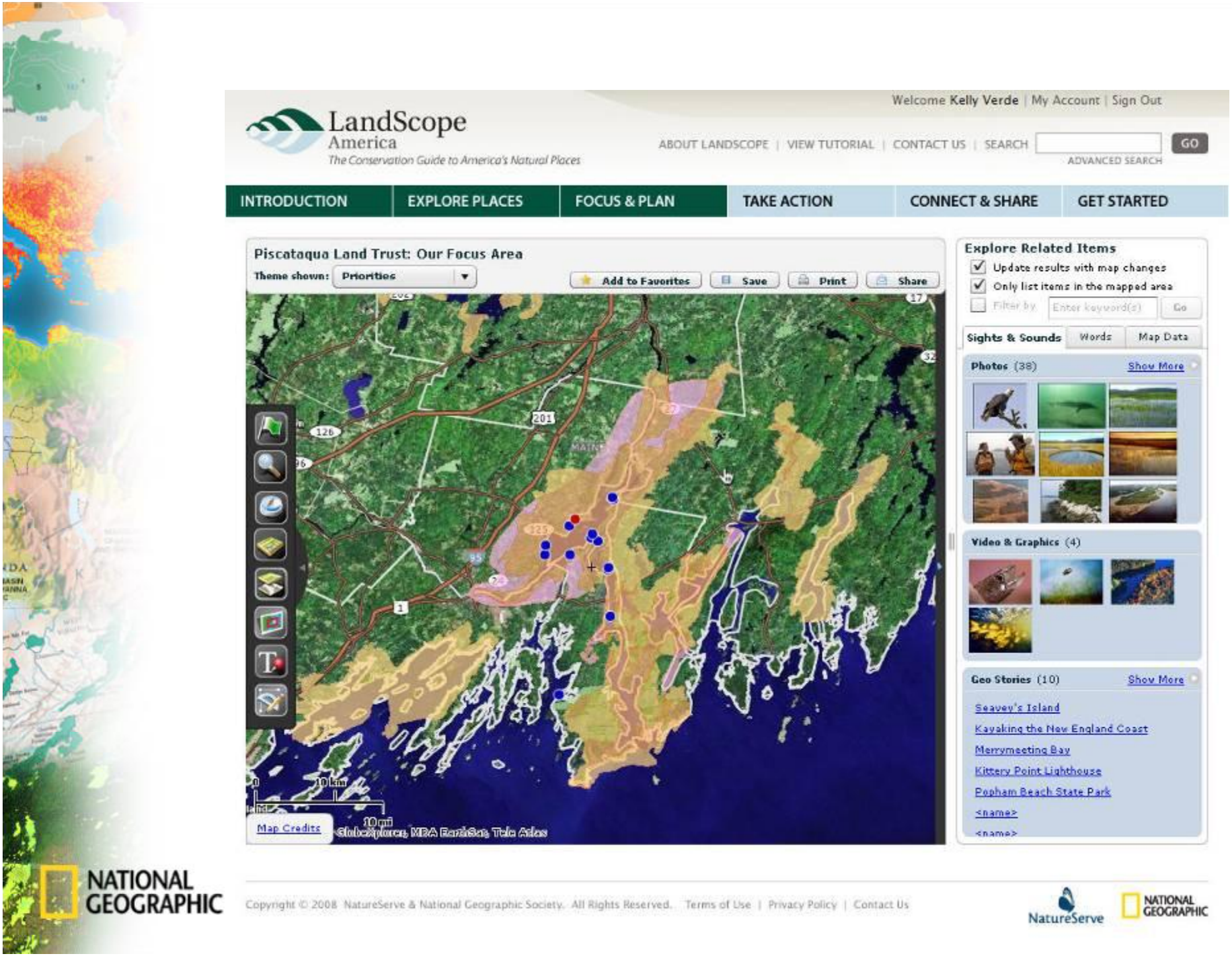
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Conclusions

- Communicating ES values can help justify and fund projects
- Mapping and valuing ecosystem services is in its infancy
- GIS data and tools enable us develop, analyze, and communicate ES values
- LandScope America, The Wildlife Habitat Benefits Toolkit, and The Natural Capital Project are providing tools to make it easier

NATIONAL GEOGRAPHIC

A USER-FRIENDLY TOOLKIT FOR ESTIMATING THE ECONOMIC BENEFITS OF HABITAT CONSERVATION

Timm Kroeger (Defenders of Wildlife)
John Loomis (CO State U.)
Frank Casey (Defenders of Wildlife)




Land Trust Alliance National Land Conservation Conference
Pittsburgh, September 21, 2008

Toolkit is result of 18-month research project:

"Development of an Operational Benefits Estimation Tool for Habitat Conservation in the U.S."

Wildlife Habitat Policy Research Program (WHPRP)

National Council for Science and the Environment
Improving the scientific basis for environmental decisionmaking

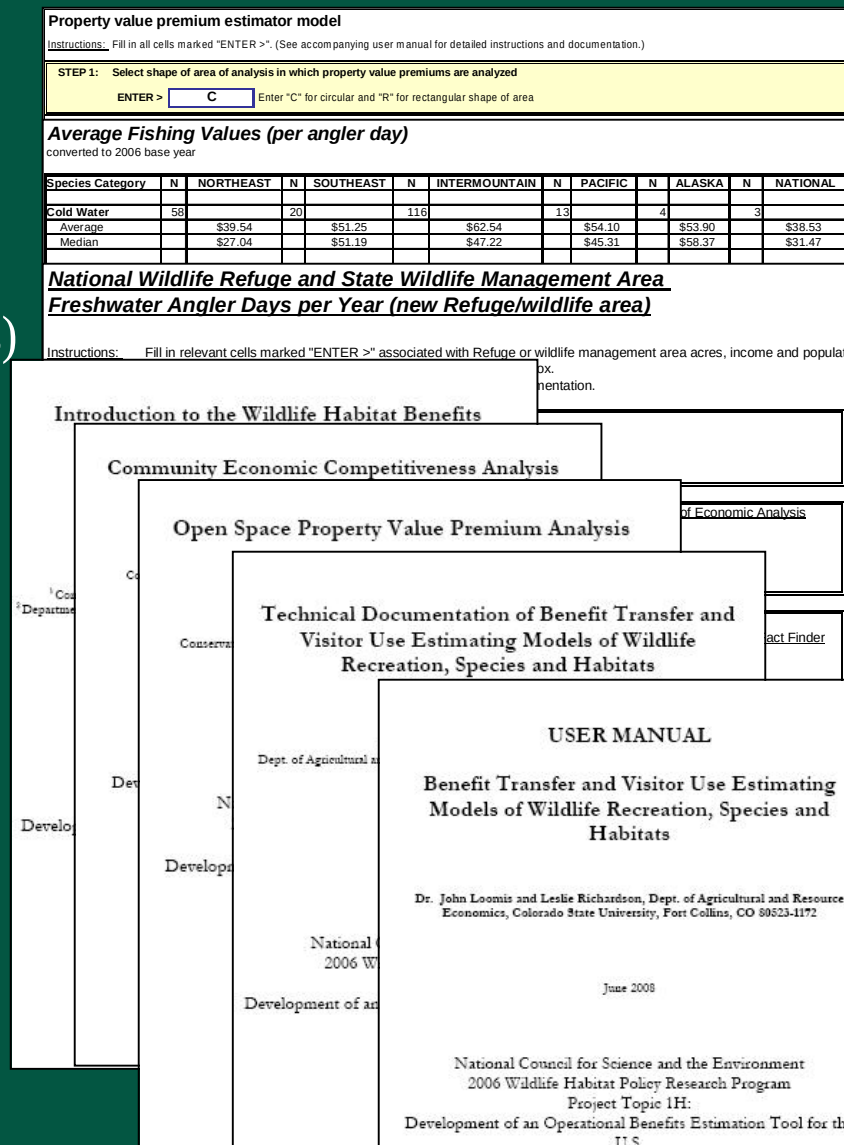
Main objective: Develop set of easy-to-use tools for quantifying the economic benefits generated by conservation of specific areas:

- Ecosystem service
- Species conservation (passive use)
- Recreation use (fishing, hunting, wildlife viewing)
- Open space-related residential property premiums

THE WILDLIFE HABITAT BENEFITS TOOLKIT

- Toolkit components and associated materials -

- **Valuation models** (spreadsheet-based)
- **Value tables** (by activity, region, species)
- **Recreation use models** (number of visitors)
- **Technical reports** detailing analysis and model estimation; literature reviews
- **User manuals** for application of individual models (incl. examples)



Property value premium estimator model

Instructions: Fill in all cells marked "ENTER >". (See accompanying user manual for detailed instructions and documentation.)

STEP 1: Select shape of area of analysis in which property value premiums are analyzed

ENTER > C Enter "C" for circular and "R" for rectangular shape of area

Average Fishing Values (per angler day)

converted to 2006 base year

Species Category	N	NORTHEAST	N	SOUTHEAST	N	INTERMOUNTAIN	N	PACIFIC	N	ALASKA	N	NATIONAL
Cold Water	58		20		116		13		4		3	
Average		$39.54		$51.25		$62.54		$54.10		$53.90		$38.53
Median		$27.04		$51.19		$47.22		$45.31		$58.37		$31.47

National Wildlife Refuge and State Wildlife Management Area Freshwater Angler Days per Year (new Refuge/wildlife area)

Instructions: Fill in relevant cells marked "ENTER >" associated with Refuge or wildlife management area acres, income and popula

Introduction to the Wildlife Habitat Benefits

Community Economic Competitiveness Analysis

Open Space Property Value Premium Analysis

Technical Documentation of Benefit Transfer and Visitor Use Estimating Models of Wildlife Recreation, Species and Habitats

USER MANUAL

Benefit Transfer and Visitor Use Estimating Models of Wildlife Recreation, Species and Habitats

Dr. John Loomis and Leslie Richardson, Dept. of Agricultural and Resource Economics, Colorado State University, Fort Collins, CO 80523-1172

June 2008

National Council for Science and the Environment
2006 Wildlife Habitat Policy Research Program
Project Topic 1H:
Development of an Operational Benefits Estimation Tool for th
U.S.

- OVERVIEW OF MODELS -

Valuation models

Open space property value premiums

% of property value

Habitats/ improvements — *Value/acre*

- Terrestrial
- Aquatic habitat improve-ments
- Wetlands — **+Value Table**

Activities — *Value/day*

- Fishing — **+Value Table**
- Wildlife viewing — **Table only**
- Hunting — **+Value Table**

Species — *Value/ Δ population*

- T&E species — **+Value Table**
- Salmon — **+Value Table**

Visitor use estimation models

NWR/ Wildlife Management Area	State-level
Fishing	Fishing
Hunting	Hunting
Wildlife viewing	Wildlife viewing

# of Activity days/yr

- **Valuation models** (**habitat**, **species**, **recreation**, **open space property value premium**) and **visitor use estimation models** are the result of statistical (meta) analyses of literature findings.

  ► **predictive models, estimated on the basis of the findings of dozens to hundreds of studies.**

- Models contain variables identified as significant in meta-analysis of studies
- User sets **key variables** such that they reflect the reality of the area of interest, thus generating customized value estimates
- Can be used to predict changes in values associated with specific projects (habitat size increase, T&E species population increase, water quality improvement)

Marc Del Sentro

ECONOMIC VALUES INCLUDED IN TOOLKIT

"Economic value" defined: Total Economic Value (TEV)

TEV = **Use Value** + **Passive-use Value**

Direct Use Value

+

Option Value

+

Ecosystem Services*

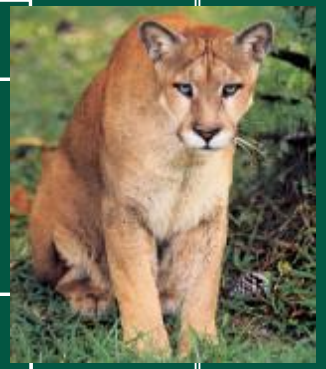
Existence Value

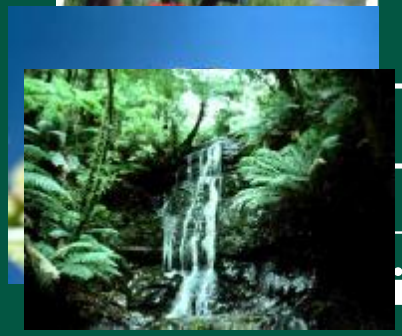
+

Stewardship Value

+

Bequest Value



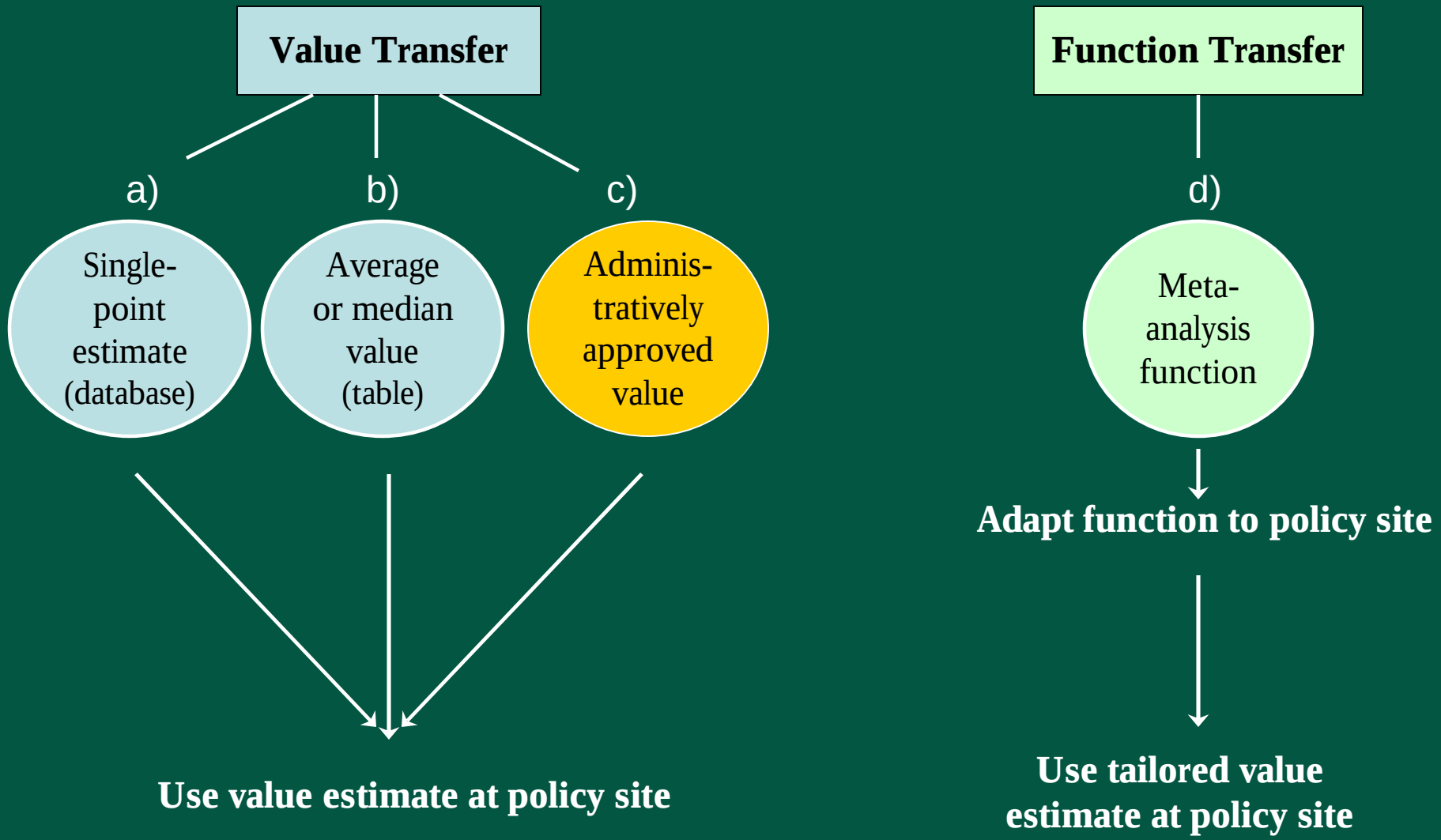


ith boxes around them are reflected in toolkit

(* some ecosystem services are captured in the wetlands models).

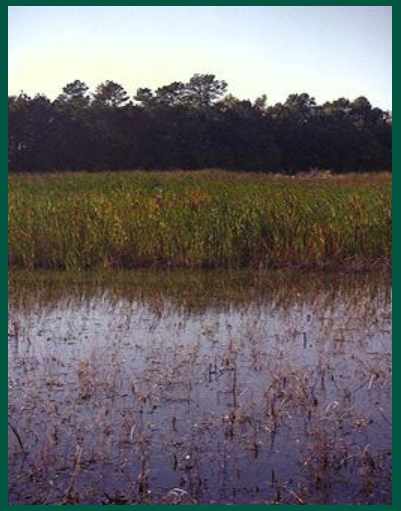
! **Since not all values associated with a particular resource are capable of being measured with the existing literature, toolkit-based estimates are conservative estimates of TEV of an area.**

VALUATION APPROACHES OFFERED BY THE TOOLKIT



EXAMPLES

1) Wetland conservation



2) Protection of an area open to wildlife-associated recreation

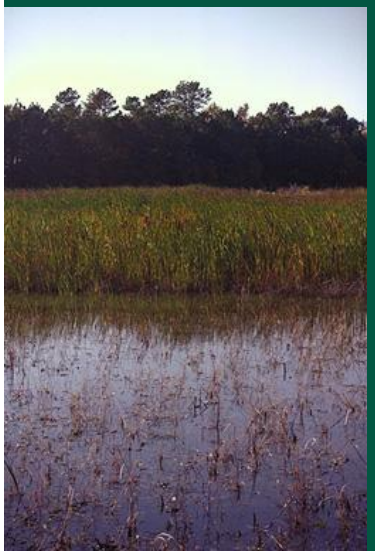
Example 1: **Wetland conservation**

- Using wetland value

MODEL

Wetland Value per acre Meta Function 2

Wetland Valuation Model 2



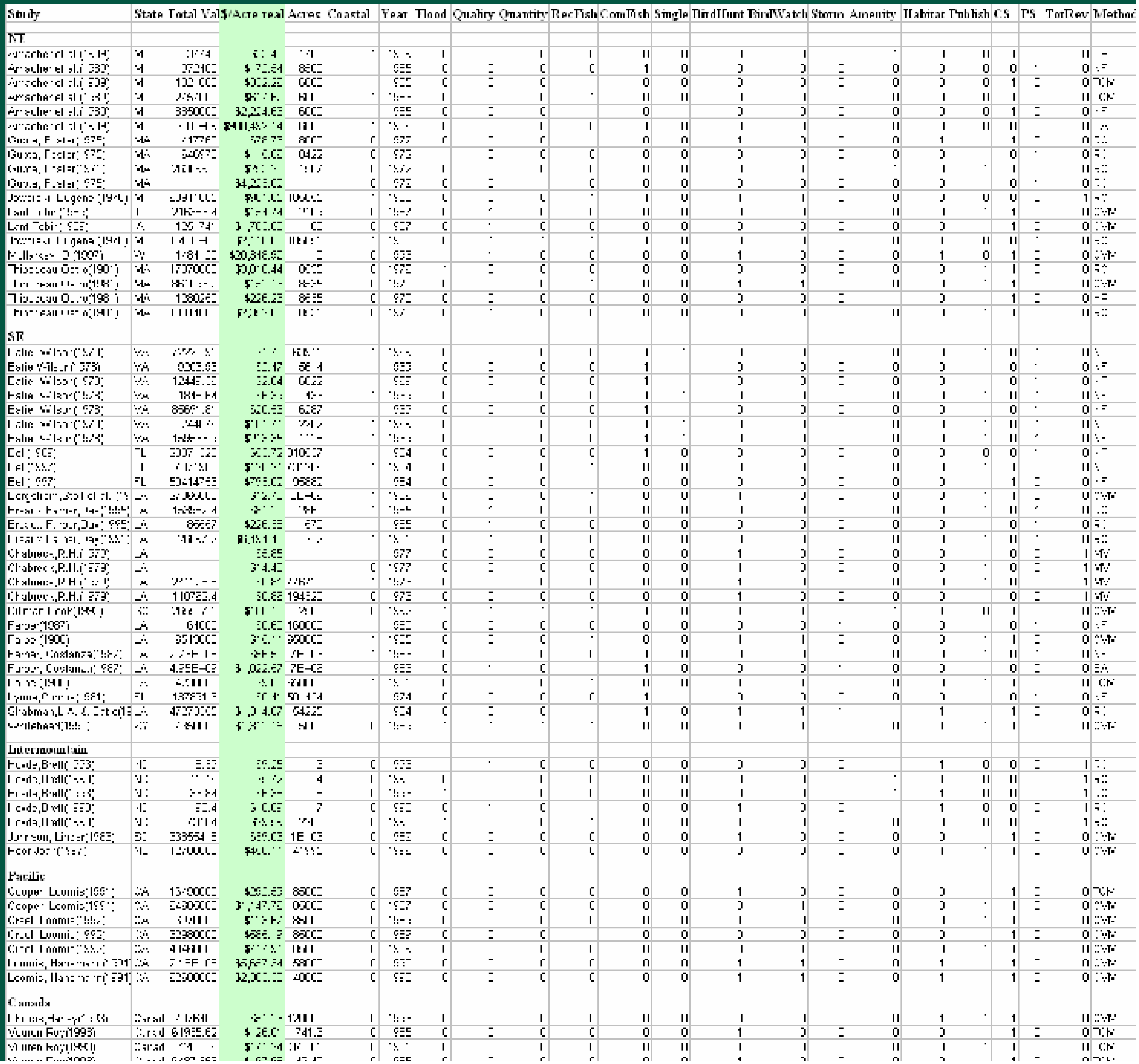
Total Economic Value of Wetlands per Acre

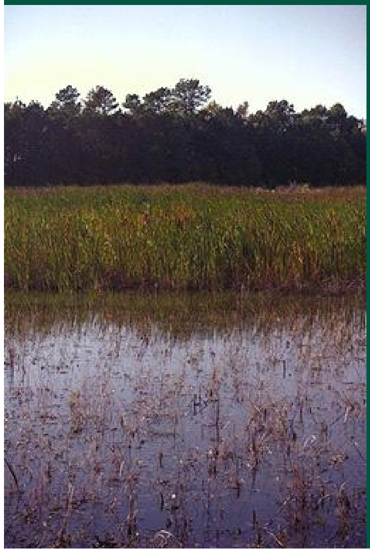
STEP 1:	Enter average household income for the particular state the wetland is in; can be found in 'State HH Income' Tab- column B These are 2006 estimates, for updated information go to: U.S. Census Bureau, Fact Finder		
	ENTER >	$ 5,185	
STEP 2:	Enter the total acres of the wetland to be valued		
	ENTER >	1	
STEP 3:	Enter share of wetland acres for the particular state the wetland is in, can be found on 'Share' Tab, Column D		
	ENTER >	.022	
STEP 4:	Place a 1 next to the type of wetland to be valued; 0 otherwise.		
	ENTER >	1	Freshwater Marsh
	ENTER >		Saltwater Marsh
	ENTER >	0	Prairie Potholes
STEP 5:	Place a 1 next to the region the wetland is in; 0 otherwise Explanation of regions can be found in the 'USDA Farm Regions' Tab		
	ENTER >	0	Heartland
	ENTER >		Northern Crescent
	ENTER >	0	Mississippi Portal
	ENTER >	1	All Other Regions
STEP 6:	Place a 1 next to the ecosystem service to be valued; 0 otherwise		
	ENTER >	1	Flood Protection
	ENTER >	1	Water Quality
	ENTER >		Water Supply
	ENTER >	1	Recreational Fishing
	ENTER >		Commercial Fishing
	ENTER >	0	Birdhunting
	ENTER >	1	Birdwatching
	ENTER >	0	Amenity
	ENTER >		Habitat
OUTPUT			
		$26	Flood protection
		$139	Water quality
		$0	Water supply
		$ 0	Recreational fishing
		$0	Commercial fishing
		$0	Birdhunting
		$194	Birdwatching
		$0	Amenity
		$0	Habitat
Total for all Ecosystem Services--->		$359	$/ Acre (2006 base year)
		$ 39,211	Total Annual $ Value of Wetland

Example 1: **Wetland conservation**

- Using wetland value TABLE / DATABASE

Wetland Value Table



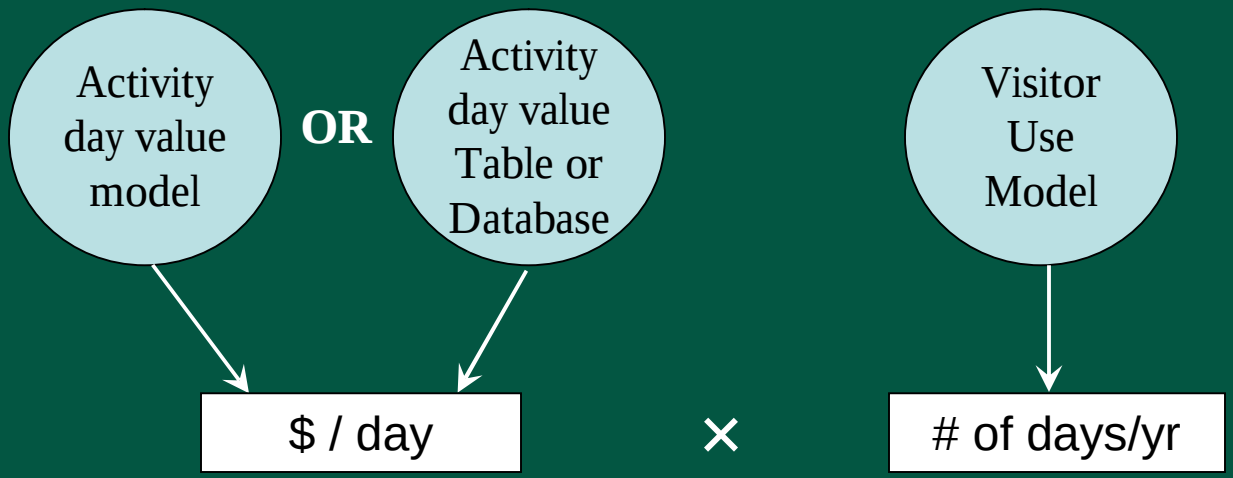


Example 2: Estimating the net value (consumer surplus) of a site for wildlife-associated recreation:

- Fishing
- Hunting
- Wildlife viewing

STEP 1: Estimate value / visitor day

STEP 2: Estimate # of visitors / year



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$ / yr for activity at the site

Example 2: Hunting

STEP 1: Value per activity day – OPTION 1: Use value Table with average values

Hunting Value Table

Average Hunting Values (per hunter day)

converted to 2006 base year

Species Category	N	NORTHEAST	N	SOUTHEAST	N	INTERMOUNTAIN	N	PACIFIC	N	ALASKA	N	NATION
Big Game	142		66		141		30		13		6	
Average		$58.45		$54.94		$71.37		$59.16		$62.82		$186.12
Median		$52.15		$50.34		$58.43		$54.31		$50.07		$192.02
Small Game	11		1		27		4				7	
Average		$32.40		$165.04		$65.51		$155.62				$69.07
Median		$33.88		$165.04		$46.67		$140.07				$74.57
Waterfowl	39		24		31		12				2	
Average		$35.99		$45.85		$51.77		$64.82				$134.23
Median		$29.21		$35.42		$35.42		$47.98				$134.23
AVERAGE, all game		$42.28		$88.61		$62.88		$93.20		$62.82		$129.81

OPTION 2: Use value Database with over 500 observations for hunting values to search for a study that matches your context

Example 2: Hiking

STEP 1: Value per activity day – OPTION 3: Use value Model

Value of Hunting per Hunter Day

Hit the enter key to get the value per day in cells below.
See accompanying user manual for detailed instructions and documentation.

STEP 1: Enter a 1 next to the site location; 0 otherwise

ENTER >	1	Intermountain region (AZ, CO, ID, NM, NV, UT, WY)
ENTER >	0	Northeast region (CT, DE, IL, IN, MA, MD, ME, NH, NJ, NY, OH, PA, RI, VT, WV)
ENTER >	0	Pacific region (CA, HI, OR, WA)
ENTER >	0	Southeast region (AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA)

STEP 2: Enter a 1 if land ownership is public; 0 if private or mixed public private)

ENTER >	0	

STEP 3: Enter BIG, SMALL or WATER in the apropriate cell(s) depending on the type(s) of hunting practiced

ENTER >		Enter "BIG" if the site supports BIG GAME hunting OR if you want to estimate TOTAL hunting instead of individual BIG/SMALL/Waterfowl hunting; otherwise, leave cell blank
ENTER >		Enter "SMALL" if the site supports SMALL GAME hunting; otherwise, leave cell blank.
ENTER >	Water	Enter "WATER" if the site supports WATERFOWL hunting; otherwise, leave cell blank.

OUTPUT: Big Game/TOTAL hunting:	$0.00	$/ Hunter Day (2006 base year)
OUTPUT: Small Game:	$0.00	$/ Hunter Day (2006 base year)
OUTPUT: Waterfowl:	$57.13	$/ Hunter Day (2006 base year)

Hunting Value Per Day Model

Example 2: Hunting

STEP 2: State-level visitation change caused by the site

Example: change in state-wide bird hunting days from a 500-acre wetland

State Level Wildlife Viewing Visitor Use Estimating Model

State Migratory Bird Hunting Days

Instructions: Fill in relevant cells marked "ENTER >" associated with acres of land and state income and population.
Hit the enter key to get the change in migratory bird hunting days.
See accompanying user manual for detailed instructions and documentation.

CURRENT STATE VALUES (from the 'State Variable Input Tab')

STEP 1: **Enter the two-letter state abbreviation to obtain the current acres of each type of land within the state of interest (from the 'State Variable Input Values' Tab)**

		acres:	
ENTER >	MD		
		168,900	Federal Land
		1,616,400	Cropland
		2,373,300	Private Forest Land
		957,900	Total Wetlands

STEP 2: **Household median income for the state of interest (from the 'State Variable Input Values' Tab)**
These are 2006 estimates, for updated information go to: U.S. Census Bureau Fact Finder

ENTER >	$65,144	(The 2006 value is filled in automatically; if you have more recent data, enter that into the cell)
OUTPUT	0.03	**State Migratory Bird Hunting Days / capita / year**

STEP 3: **State population (from the 'State Variable Input Values' Tab)**
These are 2007 estimates, for updated information go to: U.S. Census Bureau Fact Finder

ENTER >	5,618,344	(The 2007 value is filled in automatically; if you have more recent data, enter that into the cell)
OUTPUT	175,456	**State Total Migratory Bird Hunting Days / year**

STATE VALUES WITH MANAGEMENT/POLICY ACTION

STEP 1a: **Enter the total state-wide number of acres of each type of land under the proposed project**

ENTER >	168,900	Federal Land
ENTER >	1,616,400	Cropland
ENTER >	2,373,300	Private Forest Land
ENTER >	958,400	Total Wetlands
OUTPUT	175,470	**Total Migratory Hunting Days / year for the site of interest**

CHANGE

OUTPUT	14	**Change in Total Migratory Bird Hunting Days / year**

ADDING THE OUTPUTS OF INDIVIDUAL TOOLKIT COMPONENTS

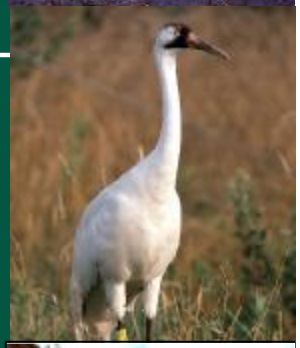
Activity value models (wildlife-associated recreation)

+ Ecosystem Service value models (wetlands, terrestrial, aquatic)

+ T&E/R Species value models (T&E/R, Salmon)

+ Open Space Property Value Premium model

= "Total" conservation value of the site



SUMMARY OUTPUT MODEL

- User enters data in individual model spreadsheets
- Summary Output model compiles all model outputs in one place

Input Area

◄ Enter discount rate (in %) for NPV calculation

◄ Enter number of years included in analysis

For ACTIVITY VALUES

Hunting breakdown		**Activity day values**	**Visitation**	**IF NWR/SWMA:**
Enter "**T**" if you want to use the Total Hunting models/values, or "**I**" for individual (big/small/ waterfowl) models/values	*Activity:*	Enter "**T**" for tabular value or "**M**" for model-based activity day value, depending on which of the two you want to use for the Summary Output	Enter "**NWR**" for NWR/State wildlife management area or "**S**" for state-level visitation	If NWR/SWMA, Enter "**N**" for new NWR/SWMA or "**E**" for change to existing NWR/SWMA
▼	Total hunting	▼	▼	▼
	Big game hunting			
	Small game hunting			
	Waterfowl hunting			
	Freshwater fishing			
	Saltwater fishing			

◄ For wetlands, Enter "**T**" for tabular values or "**M**" for model-based values

◄ If using wetland meta model, specify whether to use model "**1**" or "**2**"

◄ Enter "T&E" to use data from T&E/R species dadaset or "S" for salmon dataset

◄ Enter "T" to use tabular value estimatesor "M" for model-based estimates *

* If >1 T&E/R species is present, we suggest using only one species in order to generate conservative value estimates. If inclusion of more than one species is desired, then use the E&T Value Table file. In this case, enter the combined value per household of the species in the indicated (blue border) cell on the Summary Table sheet of that file.

Output Area

Benefits Associated with *Proposed/New Conservation Area/Habitat Acreage*

OPEN SPACE PROPERTY VALUE PREMIUMS

Discount rate and time period used to derive Net Present Values of annual benefits:

Discount rate: **0%** */year*

Time period **0** *years*

ACTIVITY-RELATED BENEFITS (Wildlife associated recreation)	*2006 $/year*	*NPV (2006$)*
Hunting-Total		
or: Hunting - Small game		
Hunting - Big game		
Hunting - Waterfowl		
Fishing - Freshwater		
Fishing - Saltwater		
Wildlife viewing/non-consumptive*		
TOTAL ACTIVITY-RELATED:		

HABITAT-RELATED BENEFITS	*2006 $/year*	*NPV (2006$)*
Terrestrial		
Aquatic habitat improvements		
Wetlands		

E&T/R SPECIES-RELATED BENEFITS

AVOIDED COST OF PUBLIC SERVICES: not included *(user estimate)*

TOTAL BENEFITS, Net Present Value: 0

Note: Only selected ecosystem services are included in estimates (see models for detail)

* Non-consumptive: includes wildlife viewing, picnicking, photography, nature trails, observation platforms, and beach/water use.

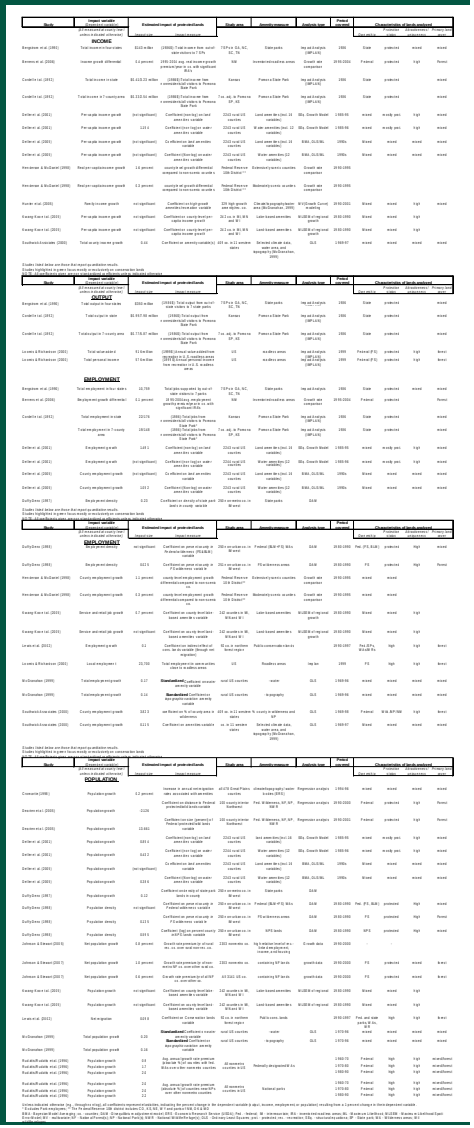
POTENTIAL USES OF THE TOOLKIT FOR LAND TRUSTS:

- **Identify** conservation sites that generate the highest value per $
- **Help in assessing** the potential financial return from a conservation site **1) for site owners**: carbon sequestration estimates [through external models]; **2) for municipality / county**: property tax increases from OS
- **Compare** value of alternative restoration and management practices (land cover type → associated property premiums; types of ecosystem services provided different wetlands; recreational access to land or not)
- **Quantify** the public value of a site (recreation; ecosystem service values; property value premiums) to strengthen the case for public cost-share of conservation projects or for tax credits, or to help qualify for state wildlife grants or federal conservation funds;
- **Get buy-in** from municipalities for protection of land near residential areas, because of increase in assessment value of homes

Toolkit also includes a “Community Economic Competitiveness Analysis”

- Reviews literature findings on impacts of conservation lands on county-level income, economic growth, output and employment

Database: Database



Findings of studies focusing particularly on local economic impacts of protected lands

Impact analyzed: Change in	*Number of studies showing impact of conservation lands is*		
	Positive	*Negative*	*Not significant*
Income / Output	6	0	2
Employment	9	0	2
Population	7	0	2

Questions and comments:

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Natural Resources Economist
tkroeger@defenders.org
(202) 772-3204

Shopping in the Ecosystem Service Market
Land Trust Success Stories

Rusty Painter

Conservation Trust for North Carolina

September 21, 2008 · LTA Rally · Pittsburgh, PA

CONSERVATION TRUST FOR NORTH CAROLINA

The Conservation Trust for North Carolina

- Our mission is to preserve our natural resources as a legacy for the people who love North Carolina now and in generations to come
- Conservation Trust for North Carolina (CTNC) serves as the resource center for North Carolina's 24 local & regional land trusts (over 200,000 ac.)
- CTNC also **is** a land trust, carrying out direct land conservation
- 28,050 acres protected since 1991, primarily along the Blue Ridge Parkway in North Carolina

CONSERVATION TRUST
FOR NORTH CAROLINA

Ecosystem Service Payment Opportunities for Land Trusts

- Carbon Sequestration
- Farmland Protection
- Biodiversity / Endangered Species
- Settlement Funding / Mitigation Banking
- Outdoor Recreation
- Water Quality

All provide value beyond the specific service

How have land trusts used these markets to protect more land?

Carbon Sequestration

Regulated Markets

- Carbon trading market(s)
- The Conservation Fund's Carbon Sequestration Program
- Conservation Trust for North Carolina and NC GreenPower

Unofficial Markets

- Marketing non-verified, 'feel good' credits to donors/customers
  - Corporate and private players
  - Offset your carbon footprint

Photo by Jeffrey Pippen

Carbon Sequestration

The Trust for Public Land, The Carbonfund and Entergy

Tensas River Valley in Louisiana

- 1,100 acre reforestation project with 2,900 more in progress
- Working with U.S. Fish and Wildlife Service and Volkswagen
- Lower Mississippi Basin is a hot spot for carbon sequestration projects (TNC, TCF, TPL and others are active there)

Photo from Carbonfund.org

Carbon Sequestration

Land Trusts' Role as Aggregators

- Enroll landowners
- Achieve critical mass of available credits
- Negotiate with brokers
- Share proceeds
- North Dakota Farmers Union, International Copper Association other private firms are enlisting as aggregators

Farmland Protection

Federal Farm Bill Programs

- EQIP – Environmental Quality Incentives Program
- CSP – Conservation Security Program
- PLPP – Private Lands Protection Program
- FRPP – Farm and Ranchland Protection Program
- WRP – Wetlands Reserve Program
- FLP – Forest Legacy Program

State Farmland Protection Programs

Present Use Tax Value

Farmland Protection

USDA 2007 Farm Bill Conservation Programs

Excerpts from 'Summary of Conservation Title Reform' Recommendations:

"Invest $50 million over 10 years to encourage new private sector environmental markets to supplement existing conservation and forestry programs. Introduce market forces into existing conservation programs to provide greater environmental returns from Federal and landowner investments in conservation."

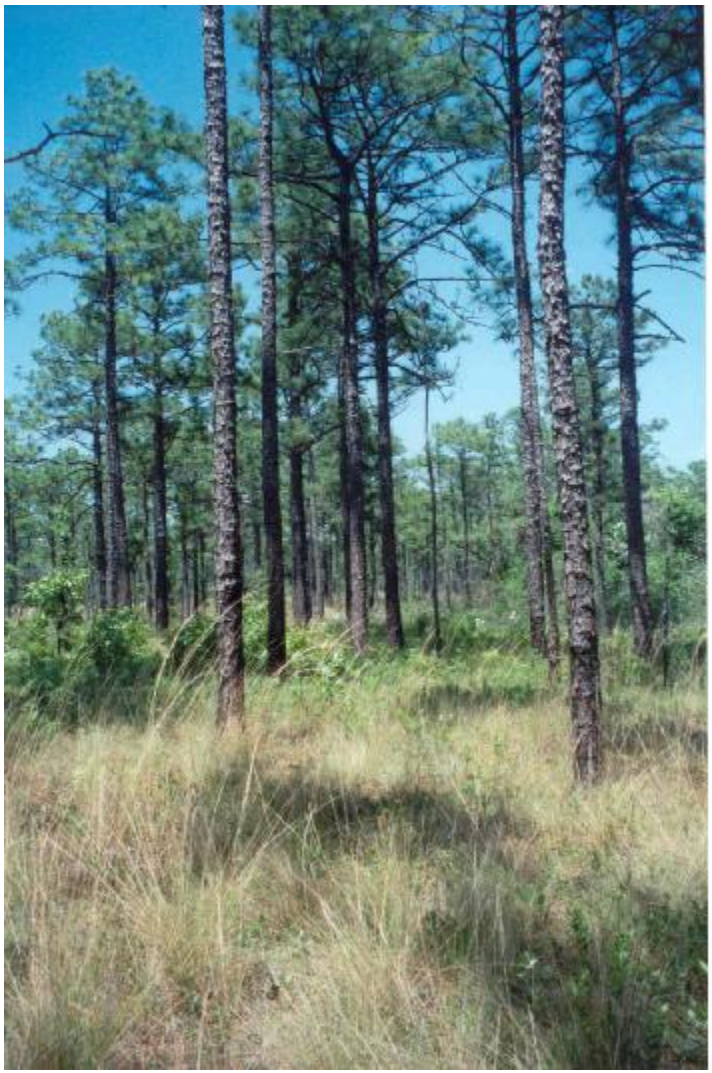
"In addition, several current conservation programs use static payment systems for costshare, rental, and easement payments. Under more market-based approaches, existing conservation programs could be restructured to foster competition, allowing resources to reach more farmers and landowners."

Title II – Conservation *http://www.usda.gov/documents/07title2.pdf*

Biodiversity / Endangered Species

Pettiford Creek Project, Carteret County, NC

- 881 acres adjacent to the Croatan National Forest
- U.S. Fish & Wildlife Service's Recovery Credit System and Forest Legacy Program
- Partnership between NC Coastal Land Trust and NC Wildlife Resources Commission
- Federally endangered red-cockaded woodpecker habitat protection and restoration

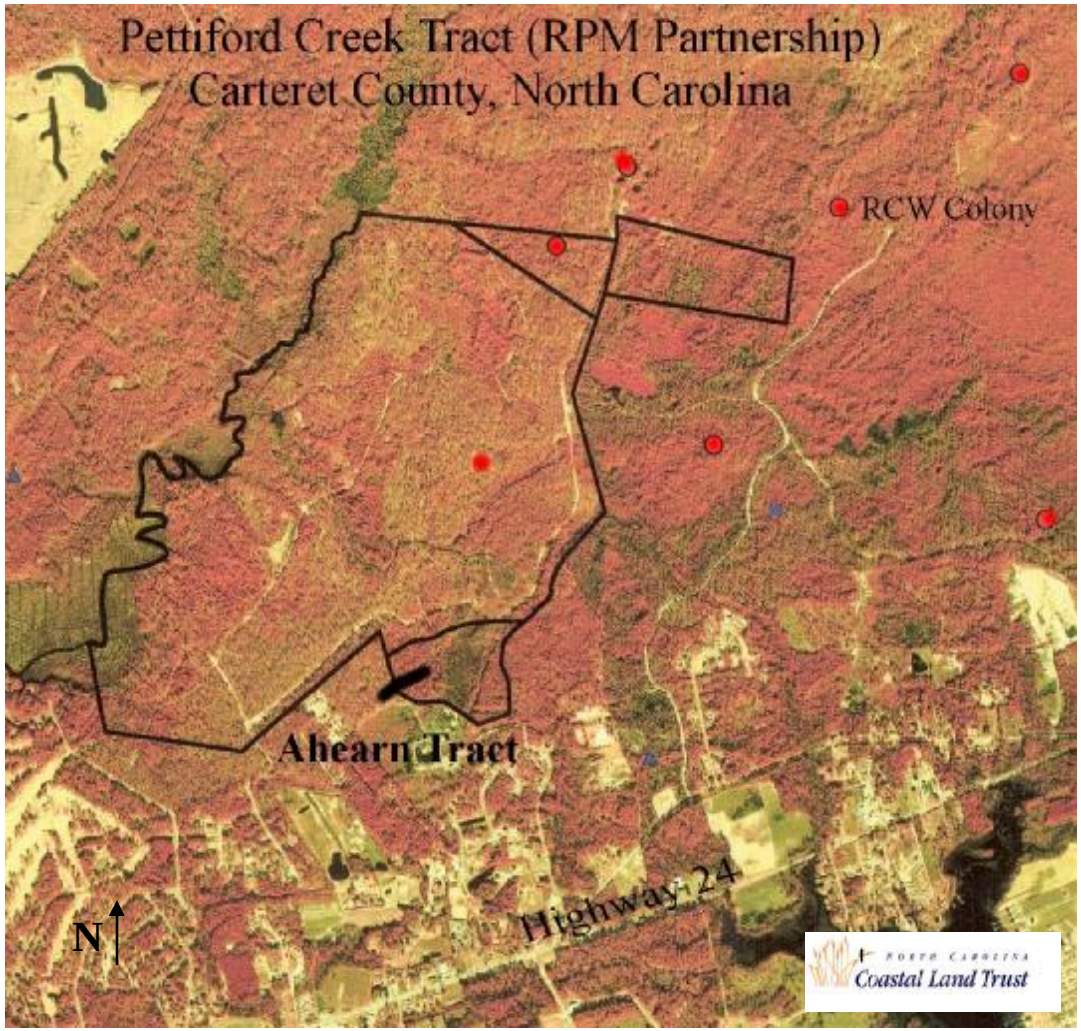


North Carolina Coastal Land Trust

Biodiversity / Endangered Species

Pettiford Creek Project

- Managed by NC Wildlife Resources Commission
- Additional funds available through state agencies
  - NC Natural Heritage Trust Fund
  - NC Dept. of Agriculture's Plant Conservation Program



Settlement Funding / Mitigation Banks

NC Environmental Enhancement Grants Program

- Smithfield Foods lawsuit settlement funds
- Grants up to $500,000 annually

National Fish & Wildlife Foundation

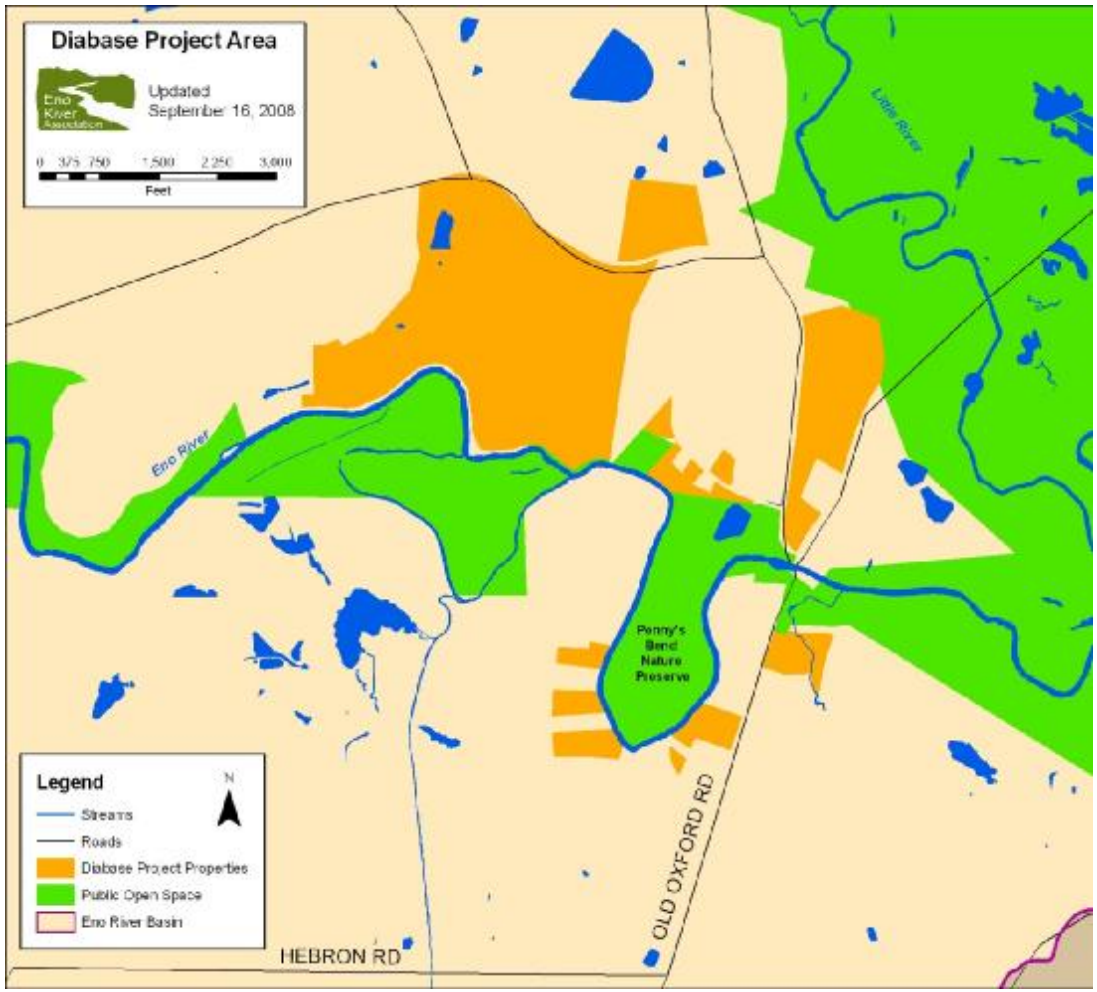
- Manages over $150M in settlement funds
- Since 1984 issued 9,500 grants to over 3,000 organizations
- More than $400 million

NC Plant Conservation Program

Settlement Funding / Mitigation Banks

Penny's Bend Nature Preserve Eno River State Park, Durham, NC

- 296 acres protected
- Site protection and restoration
- Mitigates for highway construction and legal settlement
- Also protects drinking water supply



Outdoor Recreation

Elk Knob State Park

Watauga Co., NC

- Created by The Nature Conservancy and NC Parks & Recreation in 2002
- Originally 1,100 acres, now nearly 3,000 ac.
- High Country Conservancy has added 250 acres with more in progress
- NC Parks & Recreation Trust Fund ($50M/year)

Water Quality

N.C. Clean Water Management Trust Fund

- Legislatively established fund
- Largest source of funding for conservation in North Carolina
- $50M available for acquisition – received almost $94M in requests in 2008
- Purchases 300-foot riparian buffer easements and fee acquisitions for public agencies
- Funds conservation planning along priority river and stream segments through CTNC

‘Stacking’ Ecosystem Service Payments

NC Parks & Recreation Trust Fund

Recreation Trails Program

NC Natural Heritage Trust Fund

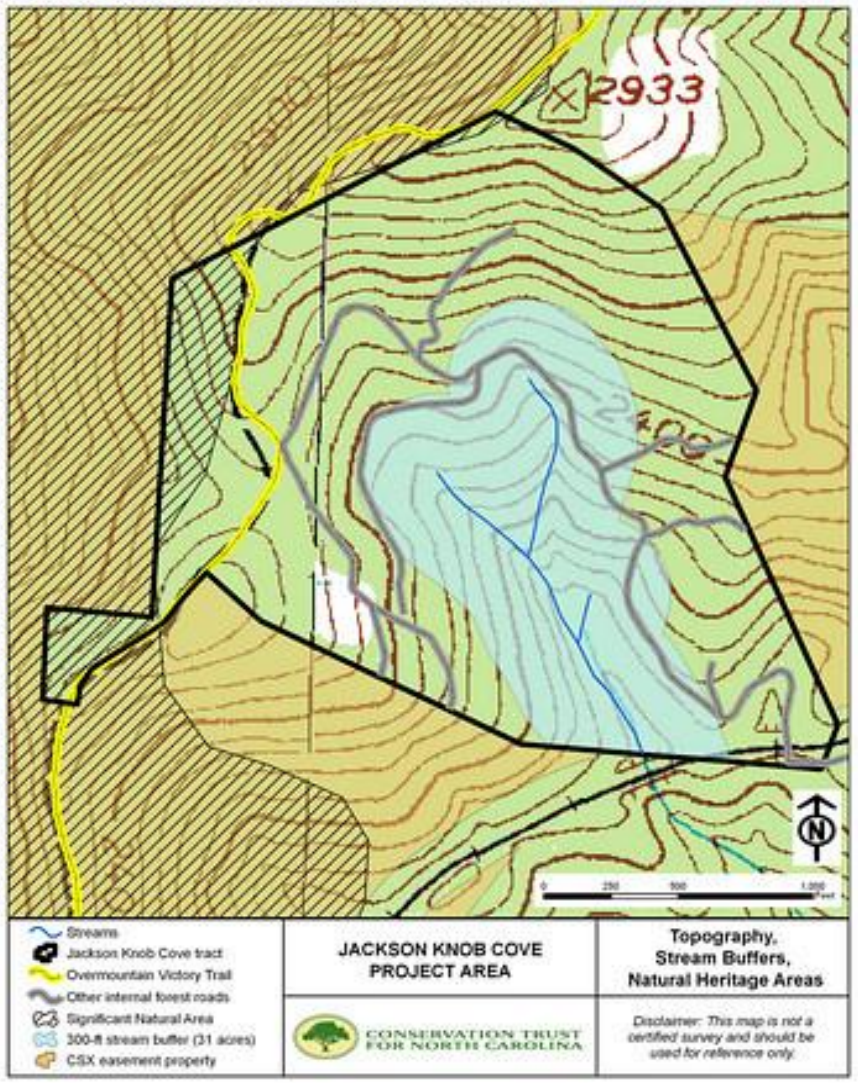
Overmountain Victory Trail

NC Clean Water Management Trust Fund

300-foot riparian buffers

Carbon Sequestration ?

Hunting Lease ?



Resources

- Defenders of Wildlife www.defenders.org/programs_and_policy
- LandScope www.landscope.org
- U.S. Forest Service www.fs.fed.us/ecosystemservices
- U.S. Fish and Wildlife Service www.fws.gov/endangered
- U.S.D.A. Farm Bill www.usda.gov
- The Conservation Fund www.conservationfund.org
- The Nature Conservancy www.nature.org/initiatives/climatechange
- The Trust for Public Land www.tpl.org
- Environmental Defense Fund www.edf.org
- N.C. Clean Water Management Trust Fund www.cwmtf.net
- N.C. Natural Heritage Trust Fund www.ncnhtf.org
- N.C. Parks and Recreation Trust Fund www.ncparks.gov
- N.C. GreenPower www.ncgreenpower.org
- Ecosystem Marketplace www.ecosystemmarketplace.com
- Carbonfund.org www.carbonfund.org
- National Fish & Wildlife Foundation www.nfwf.org

…and much more available on the web

Questions, ideas, your experiences…

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CONSERVATION TRUST FOR NORTH CAROLINA