

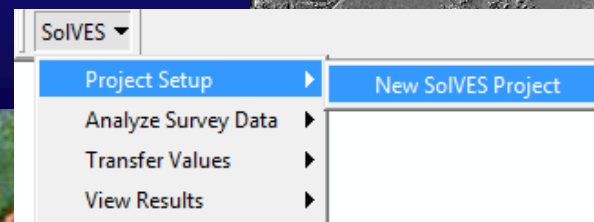
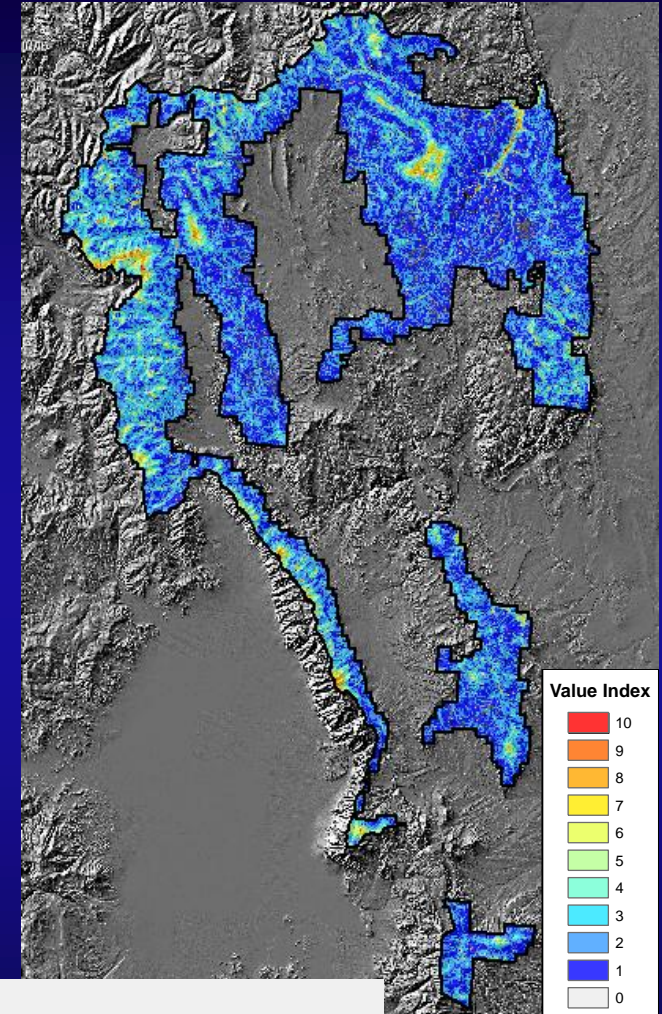
# **Social/ Values for Ecosystem Services (SoIVES)**

*Presented to the Chesapeake Bay Program Scientific, Technical Assessment and Reporting  
(STAR) Team Meeting*

*Annapolis, Maryland  
November 5, 2012*

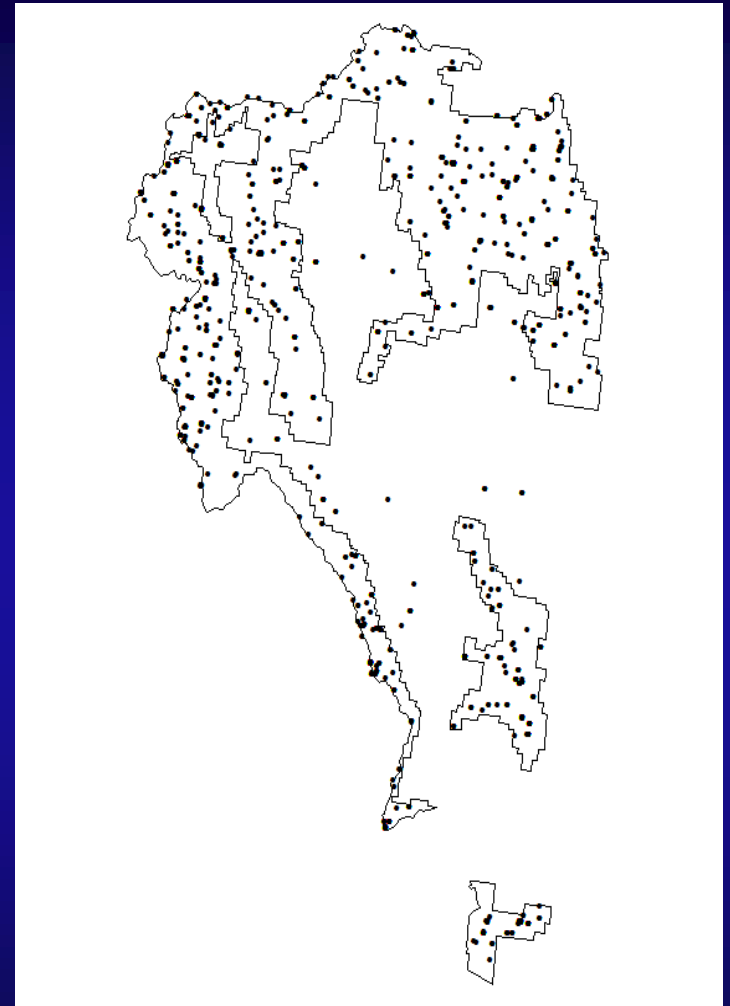
# What is SoIVES?

- A GIS tool for incorporating non-monetary social value information into the spatial context of ecosystem services assessment (Sherrouse, Clement & Semmens, 2011).
- Calculates and maps a 10-point “Value Index”, which is a standardized, quantitative metric of nonmarket, stakeholder-perceived social values that often correspond to cultural ecosystem services (e.g., aesthetics, recreation).
- ArcGIS 9.3 toolbar.



# What is SoLVES?

- Derives Value Index from points mapped in a value and preference survey of stakeholders to identify locations associated with a specified social value type.
- Models relationships between mapped Value Index and underlying environmental variables (e.g., elevation, land cover, distance to roads).
- Goal to assist land and resource managers with analysis and communication of trade-offs.





# What is SoLVES?



FAVOR  
or  
OPPOSE?

AESTHETIC  
BIODIVERSITY  
CULTURAL  
ECONOMIC  
FUTURE  
HISTORIC  
INTRINSIC  
LEARNING  
LIFE SUSTAINING  
RECREATION  
SPIRITUAL  
THERAPEUTIC

# SoIVES 2.0

- Integrated with Maxent maximum entropy modeling software.
  - Originally developed to model geographic distribution of species using presence only data.
  - Points mapped by survey respondents analogous to points where a species was observed.
  - Environmental variables serve as constraints to be satisfied by an estimated probability distribution.
  - Higher probability = higher social value intensity.



# SoIVES 2.0

- Integrated with Maxent maximum entropy modeling software.
  - Logistic output used in conjunction with SoIVES weighted kernel density output to generate social value maps that consider the points mapped by survey respondents along with the underlying environment.
  - Generates models describing relationship between points and environmental variables.
  - Calculates Area Under the Curve (AUC) statistics that can assist with evaluating model performance for the study area and its potential for value transfer.



# SolVES 2.0 Overview

## Ecosystem Services Social Values Model

User Selects  
Stakeholder Group  
(Defined according to attitude or  
preference regarding a public use.)



**Maximum Value** and  
Location of Highest-  
Rated Social Value  
Identified



## Value Mapping Model

User Selects  
Social Value(s)



Social Value(s) Scaled  
Relative to **Maximum  
Value** and Environmental  
Metrics Calculated

Map Output and  
**Statistical Model(s)**  
Generated by Maxent



Value Index Map and  
Environmental Metrics

## Value Transfer Mapping Model

User Selects  
Stakeholder Group  
and Social Value



Maxent **Statistical Model**  
Retrieved and Applied to  
Environmental Layers

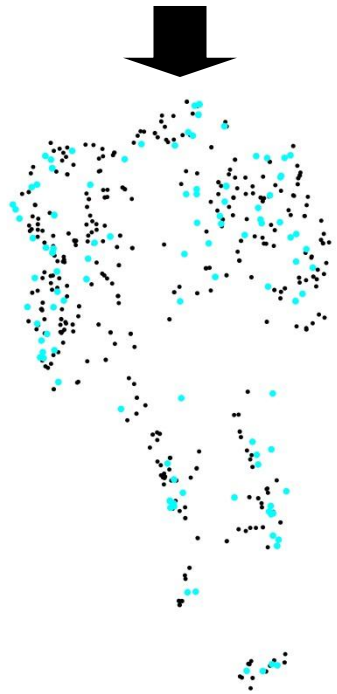


Predicted  
Value Index Map and  
Environmental Metrics



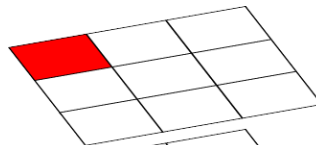
# Ecosystem Services Social Values Model

Survey Subgroup

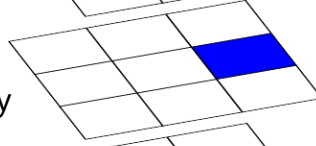


Weighted  
Kernel Density

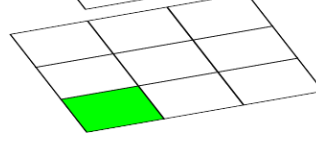
Aesthetic



Biodiversity



Cultural



Etc.

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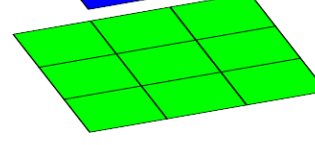
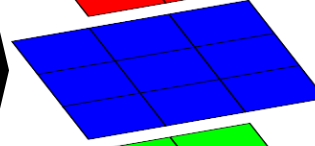
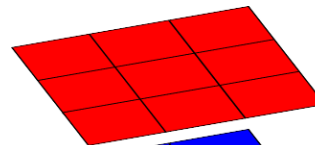
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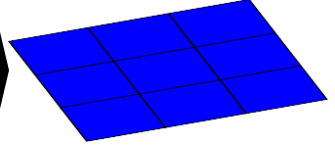
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Maximum  
Weighted Density

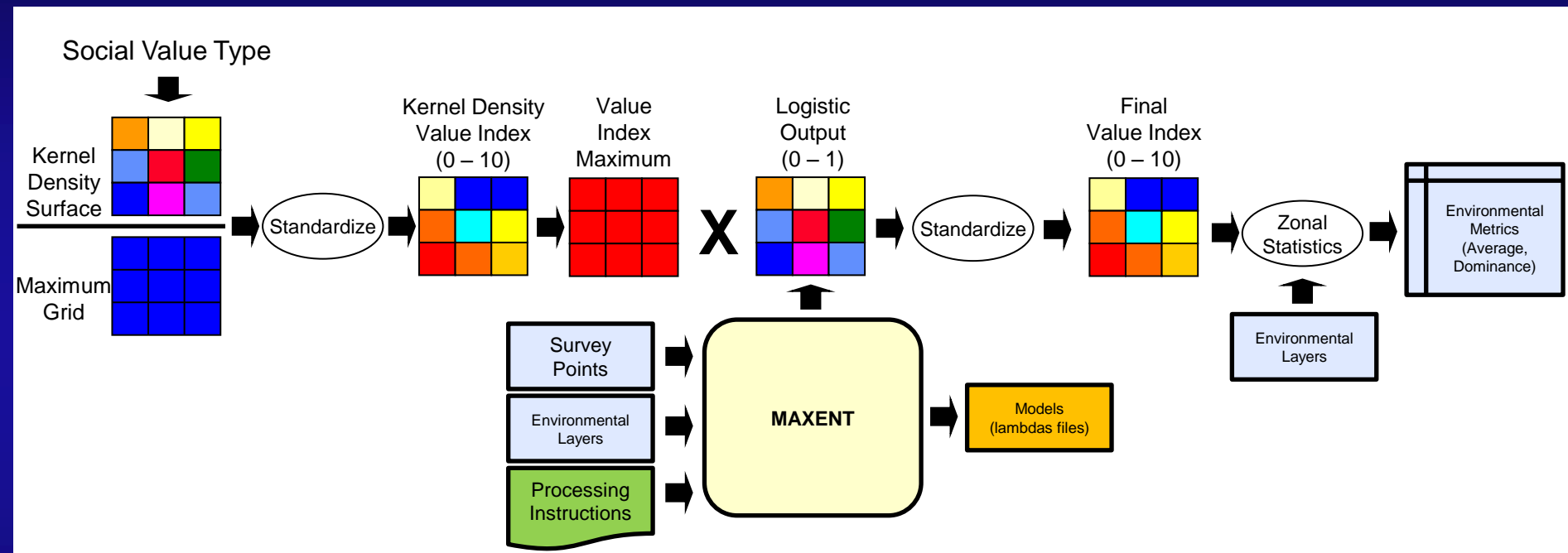


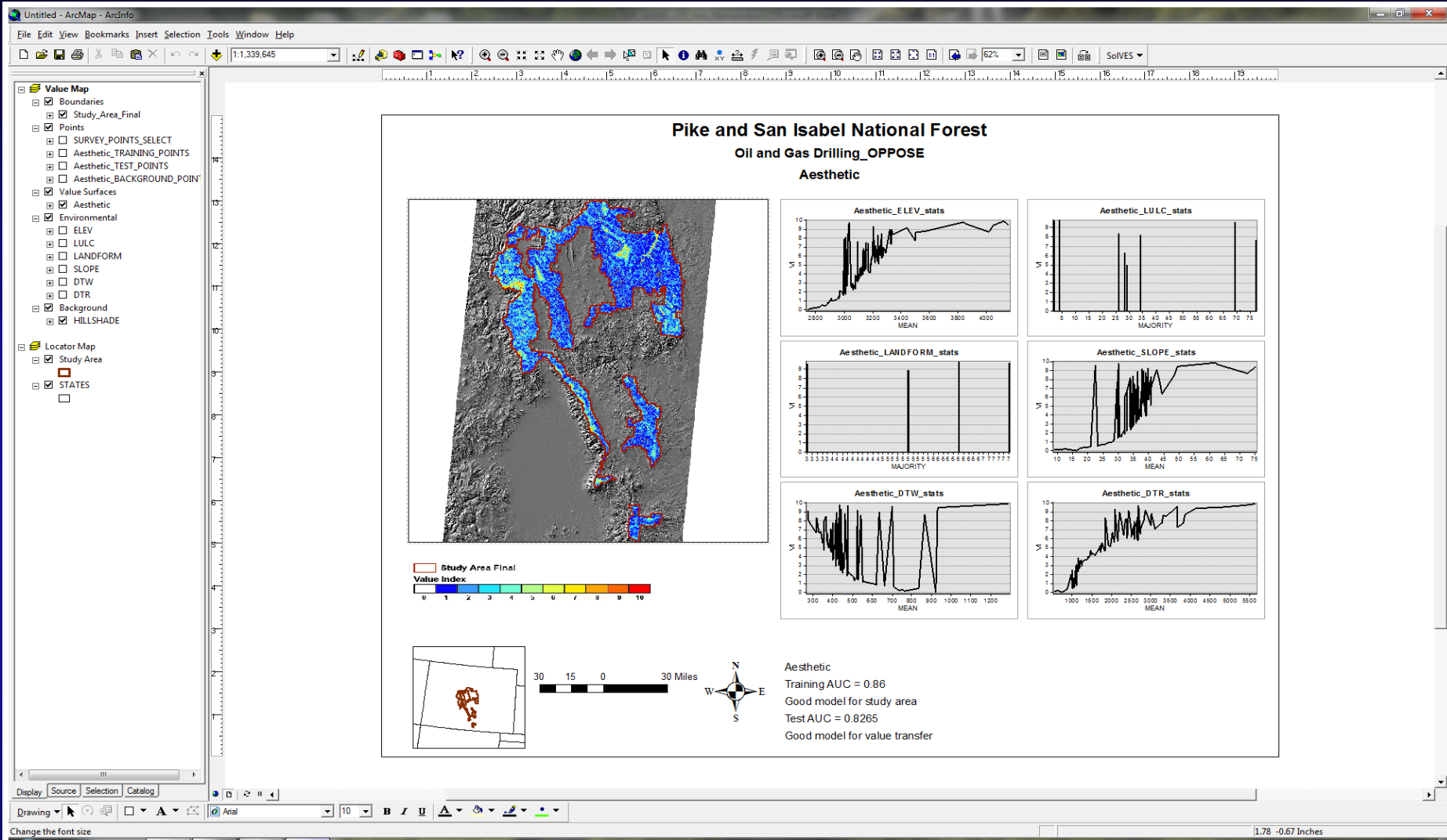
Maximum  
Grid





# Value Mapping Model





		Life					
		Aesthetic	Biodiversity	Future	Sustaining	Recreation	Therapeutic
Public use	Attitude or preference						
Communication sites and utility easements	Favor or strongly favor	10	6	6	8	9	4
	Oppose or strongly oppose	10	8	9	8	6	4
Logging for fuels reduction	Favor or strongly favor	10	7	7	8	10	4
	Oppose or strongly oppose	10	7	7	7	5	4
Logging for increased water collection	Favor or strongly favor	10	6	6	7	9	3
	Oppose or strongly oppose	10	8	9	9	6	5
Logging for wood products	Favor or strongly favor	9	7	8	7	10	4
	Oppose or strongly oppose	10	7	8	8	6	5
Motorized recreation	Favor or strongly favor	7	5	7	5	10	3
	Oppose or strongly oppose	10	6	6	8	5	4
Oil and gas drilling	Favor or strongly favor	7	5	5	6	10	3
	Oppose or strongly oppose	10	6	7	7	6	4
All surveys <sup>a</sup>	N/A	10	6	8	7	7	4

<sup>a</sup> Values are for all surveys regardless of public use, attitude or preference.

From Sherrouse, Clement & Semmens (2011)

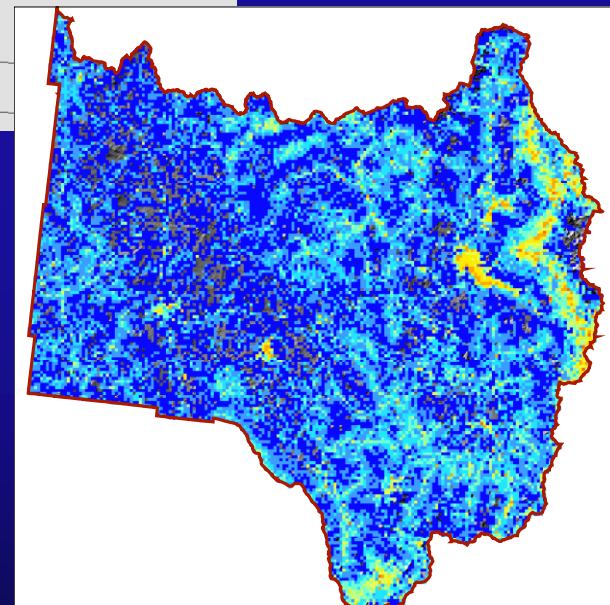
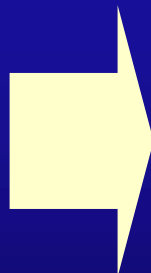
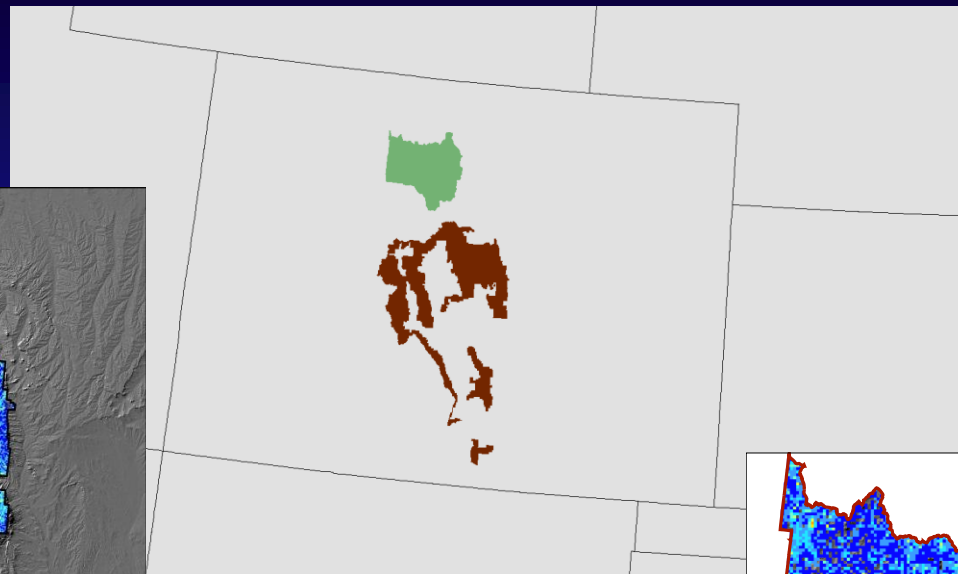
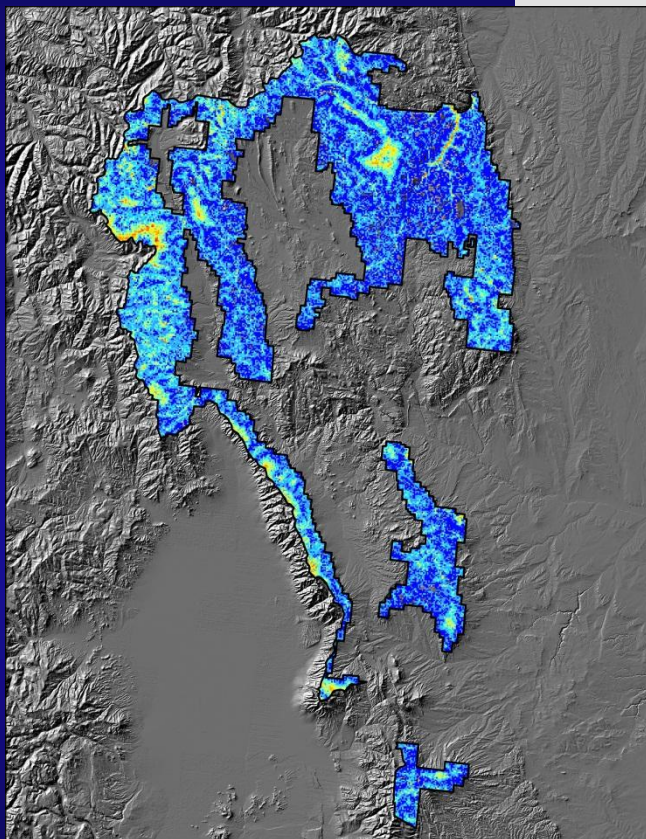


# Value Transfer

- Generate models describing relationship between Value Index and environmental variables in areas where survey data are available.
- Apply models in socially and physically similar areas where no survey data are available.







# Future Research and Development

- Continue to pursue opportunities to apply and test the tool where spatially explicit social value information can be followed through to management decisions in both terrestrial and marine environments.
- Identify environmental variables that better describe ecosystems and improve modeling of social values in a variety of environments.
- Evaluate how SolVES results compare to and complement more traditional statistical methods of social survey data analysis.
- Validate value transfer functionality in other selected study areas where primary data are available.
- Address compatibility with ArcGIS 10.x → SolVES 2.1.
- Web-based tool?



# solves.cr.usgs.gov

The screenshot shows the SolVES 2.0 web application interface. At the top, there's a navigation bar with the USGS logo and the text "Social Values for Ecosystem Services (SolVES)". Below this, a sidebar on the left contains links for "Downloads", "Quick-Start Tutorial", "User Manual", "Publications", "Sample Survey", "Contacts", and "Contact Information". The main content area features a heading "SolVES 2.0 Now Available!" followed by a subheading "A GIS Application for Assessing, Mapping, and Quantifying the Social Values of Ecosystem Services". The text describes the application's purpose and its use in assessing ecosystem services. A section titled "Getting Started with SolVES 2.0" lists several steps: downloading the software, the quick-start tutorial, the user manual, and a sample data set. To the right of the text, there is a figure titled "Pine and San Isabel National Forests" showing a map of the study area and several line graphs representing social values for different ecosystem services. The bottom of the page includes a footer with links for "Accessibility", "FOIA", "Privacy", "Policies and Notices", and "U.S. Department of the Interior | U.S. Geological Survey".

**SolVES 2.0 Now Available!**

**A GIS Application for Assessing, Mapping, and Quantifying the Social Values of Ecosystem Services**

Ecosystem services can be defined in various ways; simply put, they are the benefits provided by nature, which contribute to human well-being. These benefits can range from tangible products such as food and fresh water to cultural services such as recreation and aesthetics. As the use of these benefits continues to increase, additional pressures are placed on the natural ecosystems providing them. This makes it all the more important when assessing possible tradeoffs among ecosystem services to consider the human attitudes and preferences that express underlying social values associated with their benefits. While some of these values can be accounted for through economic markets, other values can be more difficult to quantify, and attaching dollar amounts to them may not be very useful in all cases. Regardless of the processes or units used for quantifying such values, the ability to map them and relate them to the ecosystem services to which they are attributed is necessary for effective assessments.

In response to the need for incorporating quantified and spatially explicit measures of social values into ecosystem services assessments, the Rocky Mountain Geographic Science Center (RMGSC), in collaboration with Dr. Jessica Clement at Colorado State University, developed a geographic information system (GIS) application, Social Values for Ecosystem Services (SolVES). SolVES is designed to assess, map, and quantify the perceived social values for ecosystems, such as aesthetics, biodiversity, and recreation. These values, often equating to cultural ecosystem services, can be analyzed for various stakeholder groups as distinguished by their attitudes and preferences regarding public uses, such as motorized recreation or logging. SolVES derives a quantitative, 10-point, social-values metric, the Value Index, from a combination of spatial and nonspatial responses to public attitude and preference surveys and calculates metrics characterizing the underlying environment, such as average distance to water and dominant landcover.

With version 2.0 (SolVES 2.0), RMGSC has improved and extended the functionality of SolVES, most notably via integrating the Maxent maximum entropy modeling software to generate more complete social-value maps and to produce robust statistical models describing the relationship between social values and explanatory environmental variables. The addition of Maxent more readily permits the transfer of social-value models to areas where primary survey data are not available. SolVES 2.0 also introduces the flexibility for users to define their own social values and public uses, model any number and type of environmental variables, and modify the spatial resolution of analysis. With these enhancements, SolVES 2.0 provides an improved public-domain tool for decision-makers and researchers to evaluate the social value of ecosystems and to facilitate discussions among diverse stakeholders regarding the tradeoffs among different management options in a variety of physical and social contexts, ranging from forest and rangeland to coastal and marine.

**Getting Started with SolVES 2.0**

- ✓ SolVES 2.0 requires ArcGIS 9.3 software.
- ✓ Download the SolVES 2.0 tool.
- ✓ Download the Sample Data for use with the Quick-Start Tutorial.
- ✓ The Quick-Start Tutorial includes instructions for installing SolVES 2.0 and exercises providing immediate, hands-on experiencing using SolVES 2.0 with the provided Sample Data.
- ✓ More detailed information about how SolVES 2.0 works, data requirements, advanced options, and troubleshooting is included in the User Manual.
- ✓ An Applied Geography journal article describing the initial development and case study application of the first version of SolVES along with an official Fact Sheet are available under Publications.
- ✓ A blank, sample copy of the public attitude and preference survey described in the journal article is also available.

Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

**INFORMATION COLLECTION DISCLAIMER:** SolVES is a tool for mapping and analyzing social survey response data. It is not a tool designed for the collection of survey data, nor is any survey attached to SolVES. Any survey or survey response data referred to in the SolVES documentation, sample data, or publications is the work and responsibility of the persons or groups who developed and conducted that survey. Please note that before a Federal agency may collect information or sponsor a collection of information, the Paperwork Reduction Act (PRA) requires approval from the Office of Management and Budget (OMB). Any Federal agency or sponsored program interested in developing and conducting a survey for use with SolVES is wholly responsible for submitting an Information Collection Request (ICR) to OMB.

Accessibility FOIA Privacy Policies and Notices  
U.S. Department of the Interior | U.S. Geological Survey  
URL: <http://solves.cr.usgs.gov>

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