

The Value of Green

Economic Valuation of Ecosystem Services in West Michigan

Natural Connections Summit
Elaine Sterrett Isely, J.D.
Alan D. Steinman, Ph.D.
October 18, 2007



Project Collaborators

Grand Valley State University Annis Water Resources Institute	Alan Steinman, Principal Investigator
	Elaine Sterrett Isely, Project Manager
	Kurt Thompson, GIS
Grand Valley State University Seidman College of Business	Paul Isely Environmental Economics
Michigan State University Institute of Water Resources	Saichon Seedang Environmental Economics
Michigan State University Kellogg Biological Station	Kenneth Mulder Environmental Economics
IRN, Inc.	John Cleveland, Consultant

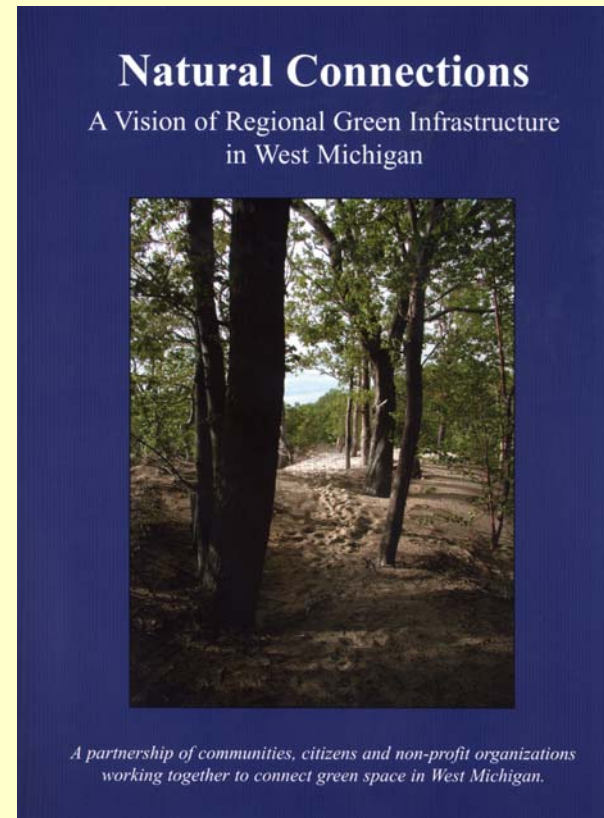


❖ West Michigan Strategic Alliance

❖ People and Land, W.K. Kellogg Foundation

What is the “Eco Val” project?

- ❖ Sub-component of the West Michigan Strategic Alliance’s Regional Green Infrastructure Asset Enhancement Project
- ❖ A “next step” to Green Infrastructure Leadership Council’s
 - Final report
 - Natural Connections Map



Project Goals



- ❖ Generate preliminary monetary values of green infrastructure and associated land uses for the region
- ❖ Identify uncertainties and data gaps
- ❖ Create web-based cost/benefit tool

Why Value Green Infrastructure?

- ❖ Rapid land use change in West Michigan results in loss of green infrastructure
 - Policy region population increased by ~4.5% from 2000-2005
 - New housing for that same period increased by 8%
- ❖ Value of green infrastructure not considered in decision-making
- ❖ Valuation information informs the policy discussion
 - Provides a more balanced and honest assessment of the value of the region's natural resources
 - Leads to better decision-making



West Michigan's Green Infrastructure

❖ Interconnected network of green spaces and environmental assets

- Dunes, grasslands, forests, and farmlands
- Wetlands, lakes, rivers, and streams
- Watersheds, shorelines and riparian habitats



❖ Conserves the function of the natural ecosystem

❖ Provides benefits to people



What are Ecosystem Services?



Ecosystem Services

Benefits people obtain directly or indirectly from ecological systems.

Provisioning Services

Goods provided or produced by ecosystems.

- ❖ Food Production
- ❖ Raw Materials
- ❖ Fresh Water Supply

Regulating Services

Benefits obtained from regulation of ecosystem services.

- ❖ Erosion Control
- ❖ Water Regulation

Cultural Services

Non-material benefits from ecosystems.

- ❖ Aesthetics
- ❖ Recreation

Supporting Services

Services necessary for production of other ecosystem services.

- ❖ Habitat
- ❖ Pollination
- ❖ Nutrient Cycling
- ❖ Waste Assimilation





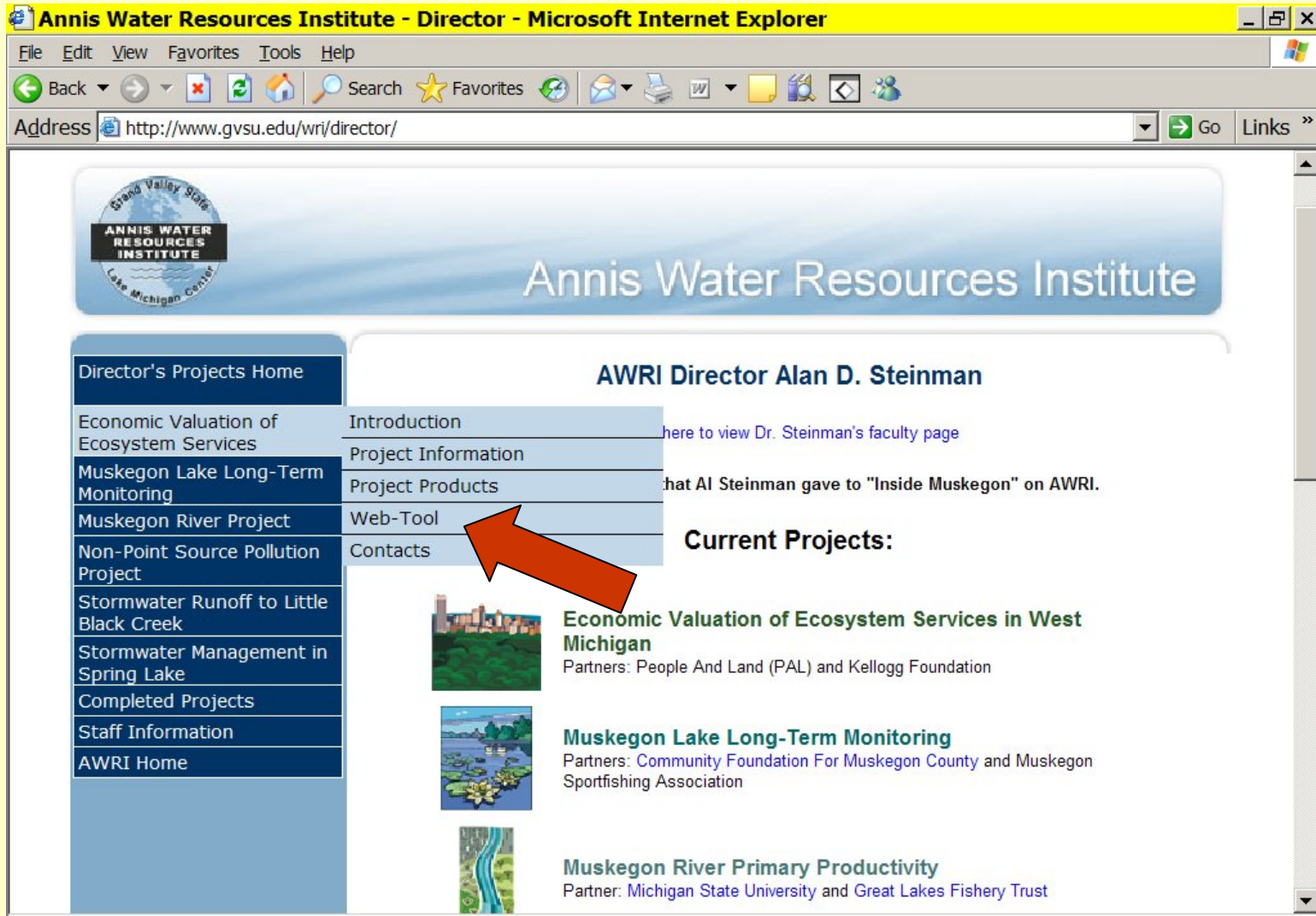
Economic Valuation

- ❖ Assignment of direct/indirect costs and benefits from a human point of view
- ❖ Benefits transfer valuation method
 - Values come from existing economic studies
 - Widely-practiced valuation method is relatively inexpensive and less time-consuming
 - Adjusted to West Michigan demographics and natural characteristics
 - Generates important information for decision-makers
 - Limitations
 - Data may not match West Michigan policy region
 - Data may not exist for selected land uses or ecosystem services



Web-Tool

<http://www.gvsu.edu/wri/director>




Annis Water Resources Institute - Director - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites

Address <http://www.gvsu.edu/wri/director/> Go Links »

 Annis Water Resources Institute

Director's Projects Home

- Economic Valuation of Ecosystem Services
- Muskegon Lake Long-Term Monitoring
- Muskegon River Project
- Non-Point Source Pollution Project
- Stormwater Runoff to Little Black Creek
- Stormwater Management in Spring Lake
- Completed Projects
- Staff Information
- AWRI Home

AWRI Director Alan D. Steinman


[Introduction](#) [here to view Dr. Steinman's faculty page](#)


[Project Information](#)


[Project Products](#) [that Al Steinman gave to "Inside Muskegon" on AWRI.](#)

[Web-Tool](#) **Current Projects:**

[Contacts](#)

 **Economic Valuation of Ecosystem Services in West Michigan**
Partners: People And Land (PAL) and Kellogg Foundation

 **Muskegon Lake Long-Term Monitoring**
Partners: [Community Foundation For Muskegon County](#) and Muskegon Sportfishing Association

 **Muskegon River Primary Productivity**
Partner: [Michigan State University](#) and Great Lakes Fishery Trust

Web-Tool Homepage

File Edit View Favorites Tools Help


Back Forward Stop Refresh Home Search Favorites Home Mail Print Word Pad Internet Explorer Links

Address <C:\EcosystemProject\index.html> Go Links

ECONOMIC VALUATION OF ECOSYSTEM SERVICES IN WEST MICHIGAN

[HOME](#) | [REGIONAL ECONOMIC VALUATION](#) | [ENVIRONMENTAL VALUATION CONCEPTS](#) | [ECOSYSTEM SERVICES](#) | [PROJECT DETAIL](#) | [ABOUT US](#) | [REFERENCES](#)

What is the economic value of these West Michigan land uses?



Land Use of 7-county West Michigan Region

- Developed Areas
- Forest Lands
- Grasses, Shrub and Prairie Lands
- Great Lakes Sand Dunes
- Orchards and Specialty Crops
- Other Bare Lands
- Water
- Wetlands

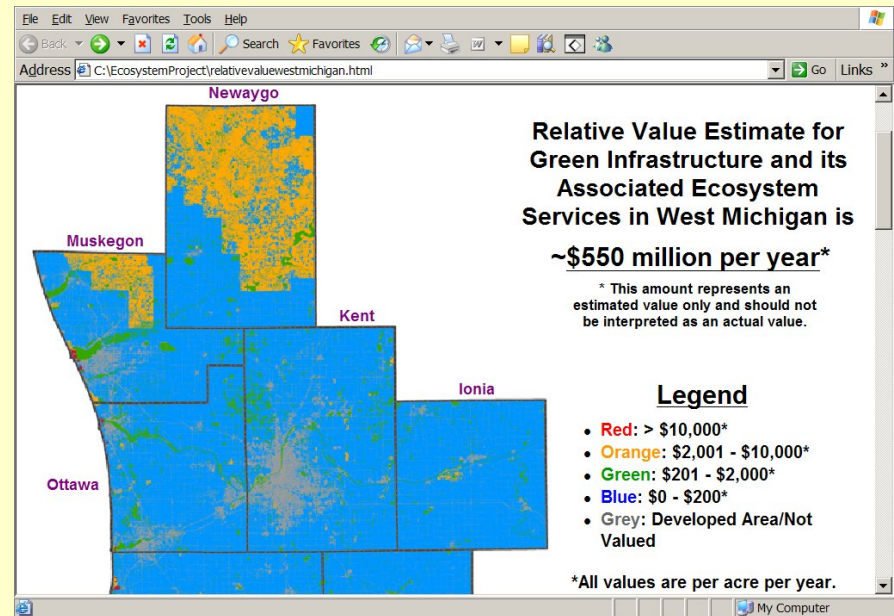
Shortcut to file:///C:/EcosystemProject/relativevaluewestmichigan.html (local) My Computer

Web-Tool Regional Economic Valuation Page

❖ The distribution of these annual per acre value estimates are shown spatially across the 7-county policy region

❖ Value Matrix

- Value estimates range from \$3 - \$62,000 per acre per year for the region
- NEI-INS-n/a fields could not be populated

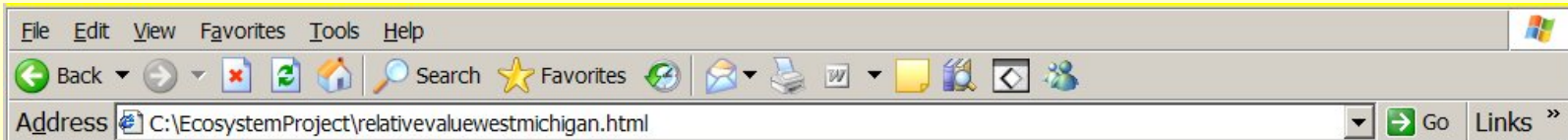


Select a value or descriptor for additional information.

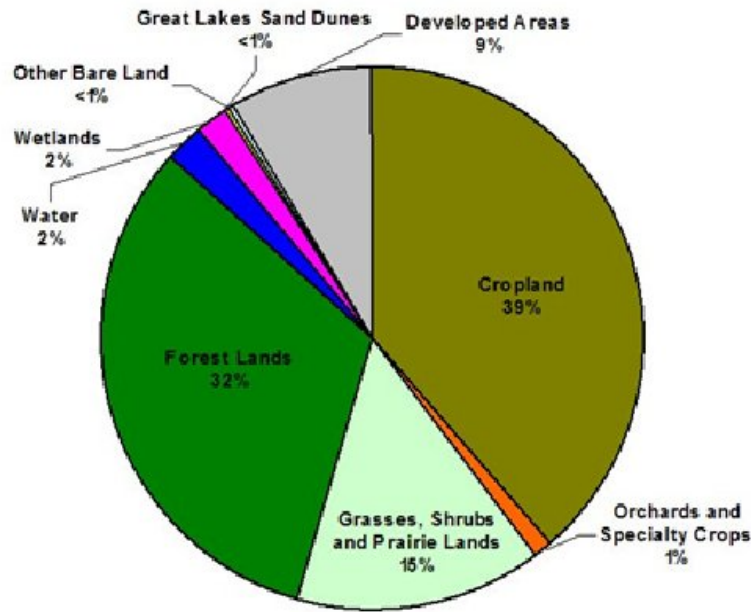
	Cropland	Orchards & Specialty Crops	Grass, Shrub & Prairie	Forest	Water	Wetlands	Great Lakes Sand Dunes & Beach	Other Bare Lands
Food Production	\$58	\$337	n/a	n/a	n/a	n/a	n/a	n/a
Raw Materials	n/a	n/a	n/a	\$48	INS	INS	\$369	\$369
Aesthetic/Amenity	\$23	\$23	\$23	Private: \$38	NEI	\$19 - \$30	Private: \$19,437	n/a
Recreation	\$19	\$19	\$19	Public: \$3,311	\$864	\$13 - \$76	Public: \$62,171	n/a
Fish/Wildlife Habitat	INS	INS	\$14	\$3		\$147 - \$1,513	NEI	n/a
Pollination	NEI	NEI	INS	NEI	n/a	NEI	INS	n/a
Nutrient Cycling	NEI	INS	NEI	NEI	NEI	\$1,067 - \$2,040	NEI	n/a
Waste Assimilation	n/a	n/a	NEI	NEI	NEI		NEI	n/a
Erosion Control	NEI	NEI	NEI	\$21	n/a	\$86 - \$485	NEI	n/a
Water Regulation	INS	INS	NEI	NEI	NEI	NEI	INS	n/a
Water Supply	n/a	n/a	n/a	n/a	\$59	\$59	n/a	NEI

NEI: Not enough information INS: Value presumed to be insignificant n/a: not applicable

Web-Tool Regional Economic Valuation Page

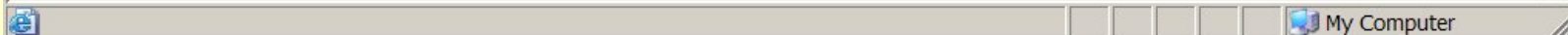


This pie chart and associated table show the break down of land use and the lower bound value estimates for the West Michigan policy region.

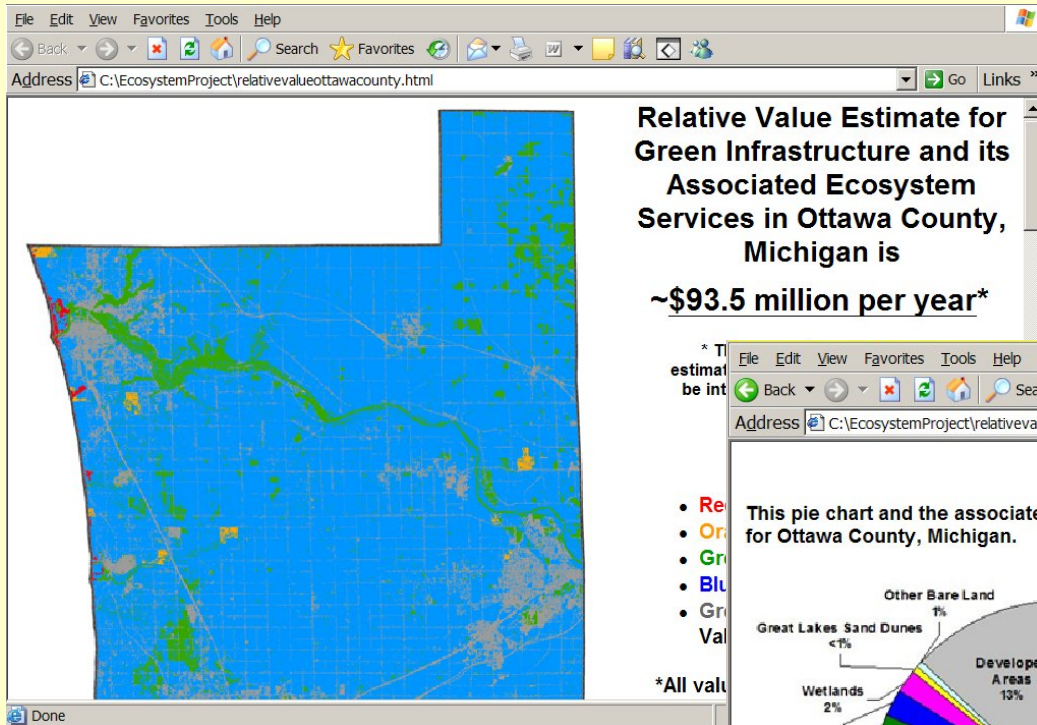


Land Use and Cover	Acres	Estimated Annual Value
Cropland	1,192,127	\$119,212,726
Orchards & Specialty Crops	39,519	\$14,977,686
Grasses, Shrubs & Prairie Lands	456,829	\$25,582,424
Forest Lands	996,189	\$109,580,747
Water	67,540	\$62,339,152
Wetlands	58,579	\$81,483,097
Great Lakes Sand Dunes & Beaches	4,762	\$94,314,191
Other Bare Lands	10,265	\$3,787,718
Developed Lands	268,387	Not valued
Total	3,094,197	\$511,277,742

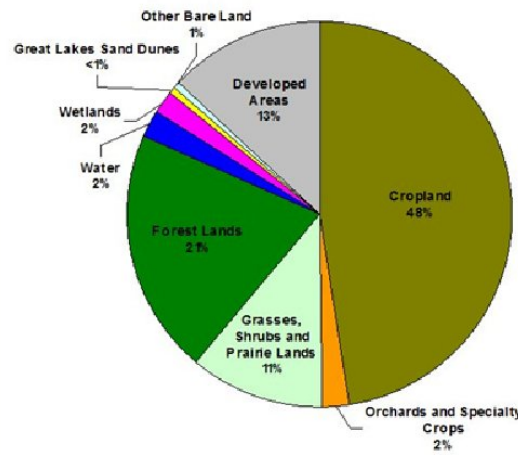
In addition to the data listed above in the **value matrix**, the Project Team estimated values for ecosystem services associated with rails-to-trails. The West Michigan policy region also has 123.16



Web-Tool Regional Economic Valuation: County-Level Data



This pie chart and the associated table show the break down of land use and the lower bound value estimates for Ottawa County, Michigan.



Land Use and Cover	Acres	Estimated Annual Value
Cropland	174,804	\$24,647,408
Orchards & Specialty Crops	8,478	\$4,264,263
Grasses, Shrubs & Prairie Lands	41,850	\$3,473,557
Forest Lands	76,375	\$8,248,548
Water	7,603	\$7,017,144
Wetlands	7,731	\$10,753,626
Great Lakes Sand Dunes & Beaches	1,565	\$30,987,279
Other Bare Lands	2,284	\$842,626
Developed Lands	48,375	Not valued
Total	369,065	\$90,234,451

Web-Tool Regional Economic Valuation: County-Level Data

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites

Address C:\EcosystemProject\relativevalueottawacounty.html Go Links »

Select a value or descriptor for additional information.

	Cropland	Orchards & Specialty Crops	Grass, Shrub & Prairie	Forest	Water	Wetlands	Great Lakes Sand Dunes & Beach	Other Bare Lands
Food Production	\$72	\$434	n/a	n/a	n/a	n/a	n/a	n/a
Raw Materials	n/a	n/a	n/a	\$48	INS	INS	\$369	\$369
Aesthetic/Amenity	\$53	\$53	\$53	Private: \$38	NEI	\$19 - \$30	Private: \$19,437	n/a
Recreation	\$16	\$16	\$16	Public: \$3,311		\$13 - \$76	Public: \$176,254	n/a
Fish/Wildlife Habitat	INS	INS	\$14	\$3	\$864	\$147 - \$1,513	NEI	n/a
Pollination	NEI	NEI	INS	NEI	n/a	NEI	INS	n/a
Nutrient Cycling	NEI	INS	NEI	NEI	NEI	\$1,067 - \$2,040	NEI	n/a
Waste Assimilation	n/a	n/a	NEI	NEI	NEI		NEI	n/a
Erosion Control	NEI	NEI	NEI	\$21	n/a	\$86 - \$485	NEI	n/a
Water Regulation	INS	INS	NEI	NEI	NEI	NEI	INS	n/a
Water Supply	n/a	n/a	n/a	n/a	\$59	\$59	n/a	NEI

My Computer

Market-Based Ecosystem Services

The screenshot shows a web browser window with the address bar containing the file path: C:\EcosystemProject\croplandfoodproductionvalues.html. The page content is as follows:

Land Use: Cropland **Ecosystem Service: Food Production**

Preliminary Value Estimate: \$58 per acre per year **Confidence Level (in estimated value): Very High**

How was value determined:

1. The regional value for cropland food production was taken from averaging the 2005 Michigan agricultural land values and leasing rates reported by Michigan State University Extension for the seven-county region ([Wittenberg and Harsh 2006](#)).
2. The lease rates reported for each county are based on survey responses from across the state. Results were averaged across agricultural districts, which were delineated based on variations in soil and climate characteristics. Three agricultural districts are represented in our project area, although data from outside the project area were combined where survey response rates were low ([Wittenberg and Harsh 2006](#)).

Value estimate limitations:

1. There are significant variations in the estimated value for this ecosystem service across counties in the policy region because of the variations in crop, population densities and distributions, soil and climate conditions, topography, proximity to neighboring cropland, etc.
2. Data were not resported at the county-level, but by "Agricultural Statistics District". Each includes anywhere from 5-15 counties. Where district reporting was low, data from neighboring districts were combined.

	Allegan	Barry	Ionia	Kent	Muskegon	Newaygo	Ottawa
Estimated Cropland Food	\$72	\$65	\$65	\$72	\$30	\$30	\$72

The browser interface includes a menu bar (File, Edit, View, Favorites, Tools, Help), a toolbar with navigation icons, and a status bar at the bottom showing "Done" and "My Computer".

Values Could Not Be Determined: INS

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites

Address <C:\EcosystemProject\grassshrubpollinationvalues.html> Go Links »

Land Use: Grass, Shrub & Prairie Lands	Ecosystem Service: Pollination
Preliminary Value Estimate: \$0 per acre per year	Confidence Level (in estimated value): n/a

How was value determined:

1. Value was not determined for grass, shrub and prairie lands pollination because this ecosystem service was presumed to have an insignificant value for this land use.

Value estimate limitations: n/a

	Allegan	Barry	Ionia	Kent	Muskegon	Newaygo	Ottawa
Estimated Grass, Shrub & Prairie Lands Pollination Values	Value was not determined for this land use ecosystem service at the county-level because there were insufficient data to do so.						

Done My Computer

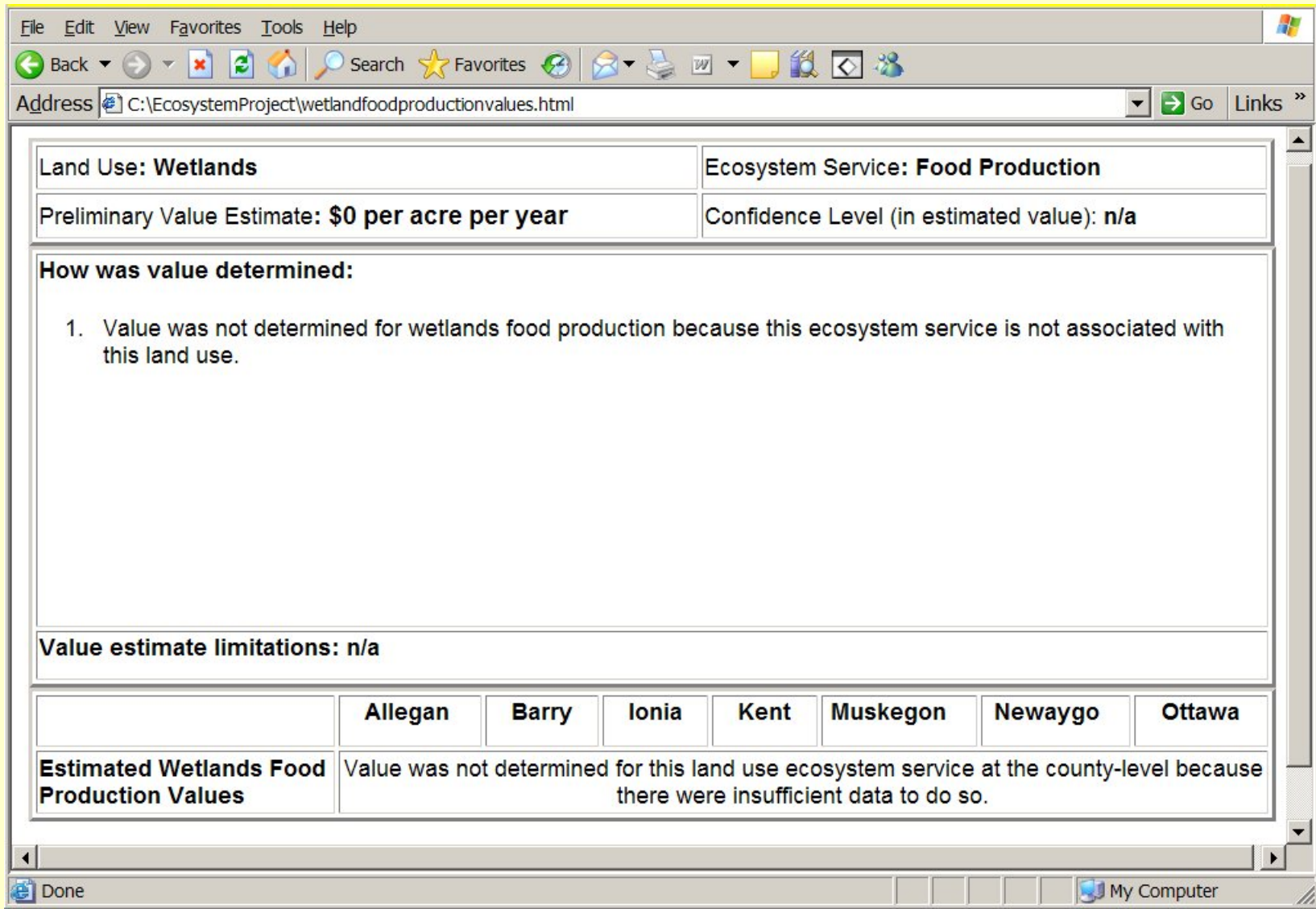
Values Could Not Be Determined: NEI

The screenshot shows a web browser window with the following content:

Land Use: Forest Lands	Ecosystem Service: Waste Assimilation
Preliminary Value Estimate: \$0 per acre per year	Confidence Level (in estimated value): n/a
How was value determined:	
<ol style="list-style-type: none">1. Value could not be determined for forest lands waste assimilation because there was insufficient information from other studies that could be transferred to West Michigan for this ecosystem service and/or land use.	
Value estimate limitations: n/a	
	Allegan Barry Ionia Kent Muskegon Newaygo Ottawa
Estimated Forest Lands Waste Assimilation Values	Value was not determined for this land use ecosystem service at the county-level because there were insufficient data to do so.

The browser's address bar shows the file path: C:\EcosystemProject\forestlandswasteassimilationvalues.html. The status bar at the bottom indicates 'Done' and 'My Computer'.

Values Could Not Be Determined: n/a



The screenshot shows a web browser window with the address bar containing the file path: C:\EcosystemProject\wetlandfoodproductionvalues.html. The main content area is a table with the following information:

Land Use: Wetlands	Ecosystem Service: Food Production
Preliminary Value Estimate: \$0 per acre per year	Confidence Level (in estimated value): n/a
How was value determined: 1. Value was not determined for wetlands food production because this ecosystem service is not associated with this land use.	
Value estimate limitations: n/a	
	Allegan Barry Ionia Kent Muskegon Newaygo Ottawa
Estimated Wetlands Food Production Values	Value was not determined for this land use ecosystem service at the county-level because there were insufficient data to do so.

The browser's status bar at the bottom shows "Done" and "My Computer".

Ecosystem Services Values on Private vs. Public Lands

❖ Valuation data for some ecosystem services varies greatly if the land use is public or private

	Cropland	Orchards & Specialty Crops	Grass, Shrub & Prairie	Forest	Water	Wetlands	Great Lakes Sand Dunes & Beach	Other Bare Lands
Food Production	\$72	\$434	n/a	n/a	n/a	n/a	n/a	n/a
Raw Materials	n/a	n/a	n/a	\$48	INS	INS	\$369	\$369
Aesthetic/Amenity	\$53	\$53	\$53	Private: \$38	NEI	\$19 - \$30	Private: \$19,437	n/a
Recreation	\$16	\$16	\$16	Public: \$3,311	\$864	\$13 - \$76	Public: \$176,254	n/a

❖ Public land values vary widely because of park counting practices

- County-level data vary widely in large part because of inconsistencies in keeping track of annual beach users. Ottawa County had more complete data on annual usage numbers for Grand Haven and Holland state parks. The user numbers recorded for beaches in Allegan and Muskegon counties are low.
- Beach values vary widely based on local attitudes, availability of amenities, and beach quality. We did not take into consideration these variables because there was insufficient information from other studies that could be transferred to West Michigan for this ecosystem service and/or land use.

	Allegan	Barry	Ionia	Kent	Muskegon	Newaygo	Ottawa
Estimated Great Lakes Sand Dunes & Beaches Aesthetic/Amenity-Recreation - Public Lands Values	\$2,288	n/a	n/a	n/a	\$7,972	n/a	\$176,254

Project Challenges

- ❖ Data gaps are substantial
 - Valuation data do not exist for some land uses or ecosystem services
 - Large amounts of valuation data are not transferable to the West Michigan policy region
 - Study sites tend to be unique in natural features or other characteristics
 - Ecosystem services are difficult to quantify with current economic valuation methods
 - ~ 25% of our value matrix fields could not be populated



Project Challenges

- ❖ Application of existing economic valuation information to West Michigan policy region
 - Much of these data are from outside our policy region
 - Valuation data are affected by differences in demographics, natural features, and other regional characteristics
 - In some cases, valuation data may not be separable for different ecosystem services associated with particular land uses



Summary and Recommendations

- ❖ This is a preliminary effort to educate local policy-makers and the public
- ❖ These data are a good first step, but have many limitations
- ❖ More detailed economic studies within the West Michigan policy region are recommended to fill data gaps and reduce uncertainties in the current estimated values



Contacts

Alan D. Steinman, Ph.D.
Principal Investigator
Annis Water Resources Institute
steinmaa@gvsu.edu
(616) 331-3739

Elaine Sterrett Isely, J.D.
Project Manager
Annis Water Resources Institute
iselyel@gvsu.edu
(616) 331-8788