

Survey of Needs of EPA Regions For Science-Based Information On The Value Of Protecting Ecological Systems And Services

Background Document for the EPA Science Advisory Board Committee (SAB) on Valuing the Protection of Ecological Systems and Services (C-VPESS) Meeting in EPA Region 9 on September 13, 14, and 15, 2004

Table of Contents

Survey of Needs of EPA Regions For Science-Based Information On The Value Of Protecting Ecological Systems And Services	1
1. Background, Purpose, and Context	4
1.1. Background and Purpose of this survey for the SAB Committee on Valuing the Protection of Ecological Systems and Services (C-VPESS)	4
1.2. Survey Questions Sent to Regions	5
1.3. Overview of this document	6
2. Background on the Functions of EPA Regions	7
3. Summary Tables Showing Regional Identification of Innovative Methods and Science Issues for the C-VPESS Committee	11
4. Samples Of Different Regional Efforts To Use Science-Based Information On Valuing The Protection Of Ecological Systems And Services	13
4.1. Description of the 1999 Region 5 Prairie Grass Ecosystem Supplemental Environmental Project (SEP) with Ashland Oil Company.....	13
4.2. Region 5 Landscape Evaluation of Ecosystem Health Using Existing Data Sets	15
4.3. Identification and Mapping of Critical Ecosystems for Region 7 States	16
5. Survey Responses from EPA Regions	23
Region 1 Response	23
Region 3 Response	25
Region 4 Response	29
Region 5 Response	31
Region 7 Response	42
Region 8 Response	47
Region 9 Response	50
Region 10 Response	55
Table of Acronyms	57
Appendix 1: Definition of Supplemental Environmental Project (SEP) and Background on SEPs from <i>Beyond Compliance: Supplemental Environmental Projects</i> (EPA 325-R-01-001) January 2001	59
Appendix 2: Acknowledgement of Regional Contributors to this Survey	63

List of Tables

TABLE 1. EPA ACTIVITIES AND PROGRAMS THAT REGIONAL STAFF IDENTIFIED AS LINKED TO ECOLOGICAL PROTECTION AND WHERE INFORMATION ON THE VALUE OF PROTECTING ECOLOGICAL SYSTEMS AND SERVICES IS NEEDED OR USED BY THE REGIONS	9
TABLE 2: THE MAJOR ENVIRONMENTAL LAWS FORMING THE LEGAL BASIS FOR EPA PROGRAMS	10
TABLE 3: EXAMPLES OF OR CHARACTERISTICS OF INNOVATIVE SCIENCE METHODS IDENTIFIED BY REGION	11
TABLE 4: TYPES OF SCIENCE NEEDS IDENTIFIED BY REGION	12

1. Background, Purpose, and Context

1.1. Background and Purpose of this survey for the SAB Committee on Valuing the Protection of Ecological Systems and Services (C-VPES)

This survey was designed to provide information to the SAB C-VPES Committee, formed in August 2003, which will hold its third advisory meeting in September to focus on regional science issues related to valuing the protection of ecological systems and services.

The Committee has a broad charge: to assess Agency needs and the state of the art and science of valuing protection of ecological systems and services, and then will identify key areas for improving knowledge, methodologies, practice, and research. It has interpreted this broad charge to include advice on four specific types of EPA needs for advice:

- 1) Needs for benefit assessments supporting national regulations protecting ecological systems and services
- 2) Regional needs for assessing and communicating the value of protecting ecological systems and services
- 3) Needs for assessing and communicating to Congress, the Executive Branch, and the public the value of EPA's programs protecting ecological systems and services under the Government Performance and Results Act
- 4) Needs for information/communication products to communicate to the general public about EPA regulatory decisions protecting ecological systems and services and information/communication products encouraging voluntary actions to protect ecological systems and services

The purpose of this survey was to assess the science needs, current work-products, and activities of and methodologies used by EPA Regional Offices and their knowledge of the activities of state and tribal partners in assessing ecological benefits and valuing the protection of ecological systems and services. EPA contributors to this survey are listed in Appendix 6. The SAB Staff Office also asked a few state contacts who have indicated an interest in the work of the C-VPES committee for their responses to the survey. Comments from these state contacts are mentioned in the section of the report related to their region and the names of state contributors are also noted in Appendix.

The designated lead on the National Regional Science Council, Patti Tyler, worked with lead staff from the SAB Staff Office, Angela Nugent, to develop a report for the Committee integrating information from the survey responses. This report will be posted on the SAB website as background material for the C-VPES September meeting and provided to the Committee before the meeting.

The report will be discussed by the C-VPESSE Committee at the September meeting. The Committee plans to devote a section of its advisory report to the Agency to regional-level issues. In that section it plans to identify key areas for improving knowledge, methodologies, tools, practices, frameworks, guidance, and research to assist the regions in their work, including their work with state and tribal partners.

Questions for the September 13-15th session, based on the survey responses, include:

1. What kinds of ecological values were of concern to EPA regions? How were those values identified, characterized, and measured? What kinds of values might be missing from these analyses?
2. How would discussion/assessment of these values compare with discussions/assessments used elsewhere for comparable purposes?
3. Are there suggestions for improving the use of data, approaches and methods in the short term?
4. Looking at these regional activities as a whole, are there recommendations for research?

1.2. Survey Questions Sent to Regions

The following questions were sent to regional staff participating in several intra-Agency coordination groups (National Regional Science Council, Regional Science Liaisons, Hazardous Substance Technical Liaisons, Ecological Risk Assessment Forum, - Regional Ecosystem Protection Network, and EPA representatives of the Tribal Science Council). These contacts were asked to distribute the survey to Regional staff located in program offices potentially involved in activities related to valuing the protection of ecological systems and their services. In addition, National Regional Science Council representatives forwarded the survey through their Regional Science Councils.

1. What activities of your regional office, states, or tribes have impacts on ecological systems and services within the region?
 - a. Permitting?
 - b. Enforcement?
 - c. Other?
2. For each, what kinds of science-based information on the values of these impacts do you need for carrying out these activities?
3. How have the needs for this information been met in the past? Please give a short description, a reference or a pointer to the web to illustrate the kinds of approaches used.
4. Are there efforts underway now in your region, states, and tribes to develop capabilities to value the protection of ecological systems and services? Please

give a short description, a reference or a pointer to the web to illustrate these efforts.

5. Is there a document describing science-based information on the impacts of activities on ecological systems and services from your regional office, states or tribes that you think that the Committee would benefit from considering in depth? Please give a short description, a reference or a pointer to the web for this document.

1.3. Overview of this document

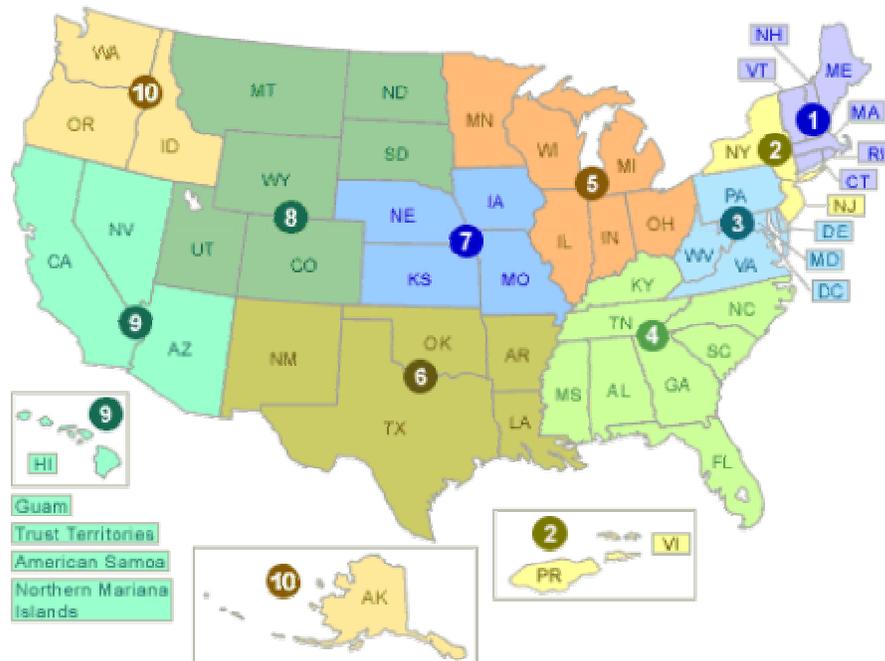
This document provides: a brief background on the functions of EPA regions; tables summarizing regional responses; samples of different regional efforts that use science-based information on valuing the protection of ecological systems and services and; the text from regional responses to the survey questions.

2. Background on the Functions of EPA Regions

2.1. General Description of the Functions of EPA Regions

Regional Administrators are responsible within the boundaries of their regions, for the execution of the programs of the Agency and such other responsibilities as may be assigned. Regional Administrators cooperate with Federal, state, tribal, interstate and local agencies, industry, and academic institutions, and other private groups to make sure regional needs are considered and Federal environmental laws implemented. Regional Administrators are responsible for developing, proposing, and implementing regional programs for comprehensive and integrated environmental protection activities; conducting effective regional enforcement and compliance programs; translating technical program direction and evaluation provided by various Assistant Administrators, Associate Administrators and Heads of Headquarters Staff Offices into effective operating programs at the Regional level, and assuring that such programs are executed efficiently; exercising approval authority for proposed State standards and implementation plans; and providing overall and specific evaluations of regional programs. EPA maintains its regional offices in the following cities: Region I in Boston; Region II in New York; Region III in Philadelphia; Region IV in Atlanta; Region V in Chicago; Region VI in Dallas; Region VII in Kansas City; Region VIII in Denver; Region IX in San Francisco; and Region X in Seattle.

Figure 1. Regional Map



2.2 Regional Activities Protecting Ecological Systems and Services

Programs differ across EPA Regions depending on the ecological protection needs presented by the ecosystems and ecological resources in those regions. Programs also differ depending on the amount of delegation to states and the nature of tribal environmental programs within those regions.

The relationship between regions and state environmental agencies varies from state to state and program to program, as demonstrated by the table of delegation decisions maintained by the organization, Environmental Council of the States

"Delegation, according to EPA, "is the review and 'approval' or 'authorization' process by which EPA assigns to competent and willing states the responsibility to operate a program mandated by federal statute. States that demonstrate their capabilities to operate federal environmental programs according to established criteria take the primary role, with EPA retaining responsibility to oversee each state's performance and to enforce federal laws, if necessary. EPA programs use different terms to describe this process; 'delegation,' 'authorization,' and 'primacy' have similar meanings.¹"

Information about specific activities delegated to the states by EPA can be found on the website for the Environmental Council of the States:

<http://www.sso.org/ecos/states/StateInfo.htm#Delegations>

The relationship between regions and tribes also varies by region and program. Regions work with EPA's American Indian Environmental Office (AIEO) to strengthen public health and environmental protection in Indian Country, with a special emphasis on building Tribal capacity to administer their own environmental programs. Regions implement Administration policy to work with Tribes on a government-to-government basis and EPA's trust responsibility to protect Tribal health and environments.

Table 1 below indicates the EPA activities and programs that regional staff identified as linked to ecological protection and where information on the value of protecting ecological systems and services is needed or used by the Regions.

¹ . National Academy of Public Administration, Resolving the Paradox of Environmental Protection; An Agenda for Congress, EPA, & the States, 1997. p197

Table 1. EPA activities and programs that regional staff identified as linked to ecological protection and where information on the value of protecting ecological systems and services is needed or used by the Regions

		1	3	4	5	7	8	9	10
Category of Response	Permitting			✓	✓	✓	✓	✓	✓
	Enforcement			✓	✓	✓	✓	✓	✓
	Water Programs	✓		✓	✓	✓	✓	✓	✓
	Dealing with Water Scarcity Issues						✓		
	NEPA		✓	✓	✓	✓	✓	✓	
	Oil Pollution Act				✓	✓			
	Superfund/ RCRA/ Brownfields/ UST	✓		✓	✓	✓	✓	✓	✓
	Tribal interactions					✓			✓
	Stakeholder Processes				✓	✓			
	State interactions			✓	✓	✓			✓
	Land Use-Related Decisions			✓	✓		✓		✓
	Wetland Decisions under Section 404 of CWA						✓		✓
	Invasive species (impact assessment, inventory/GIS mapping, management, dispersal routes, etc.).								✓
	Grants (i.e., Watershed Initiative, Wetland Plan Development Grant, NAWCA, RGI, 319, etc.)								✓

The major environmental laws forming the legal basis for EPA Programs are listed in Table 2. These laws provide the authorities under which Regions implementing

programs for comprehensive and integrated environmental protection activities; conduct regional enforcement and compliance programs; translate technical program direction and evaluation provided by Headquarters Staff Offices into effective operating programs at the Regional level, assure that such programs are executed efficiently; exercise approval authority for proposed State standards and implementation plans; and provide overall and specific evaluations of regional programs. For more information on each law, please visit <http://www.epa.gov/epahome/laws.htm>

Table 2: The Major Environmental Laws Forming The Legal Basis For EPA Programs
National Environmental Policy Act of 1969 (NEPA); 42 U.S.C. 4321-4347
Chemical Safety Information, Site Security and Fuels Regulatory Relief Act Public Law 106-40, Jan. 6, 1999; 42 U.S.C. 7412(r) Amendment to Section 112(r) of the Clean Air Act
The Clean Air Act (CAA); 42 U.S.C. s/s 7401 et seq. (1970)
The Clean Water Act (CWA); 33 U.S.C. ss/1251 et seq. (1977)
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) 42 U.S.C. s/s 9601 et seq. (1980)
The Emergency Planning & Community Right-To-Know Act (EPCRA); 42 U.S.C. 11011 et seq. (1986)
The Endangered Species Act (ESA); 7 U.S.C. 136;16 U.S.C. 460 et seq. (1973)
Federal Insecticide, Fungicide and Rodenticide Act (FIFRA); 7 U.S.C. s/s 135 et seq. (1972)
Federal Food, Drug, and Cosmetic Act (FFDCA) 21 U.S.C. 301 et seq.
Food Quality Protection Act (FQPA) Public Law 104-170, Aug. 3, 1996
The Freedom of Information Act (FOIA); U.S.C. s/s 552 (1966)
The Occupational Safety and Health Act (OSHA); 29 U.S.C. 651 et seq. (1970)
The Oil Pollution Act of 1990 (OPA); 33 U.S.C. 2702 to 2761
The Pollution Prevention Act (PPA); 42 U.S.C. 13101 and 13102, s/s et seq. (1990)
The Resource Conservation and Recovery Act (RCRA); 42 U.S.C. s/s 321 et seq. (1976)
The Safe Drinking Water Act (SDWA); 42 U.S.C. s/s 300f et seq. (1974)
The Superfund Amendments and Reauthorization Act (SARA); 42 U.S.C.9601 et seq. (1986)
The Toxic Substances Control Act (TSCA); 15 U.S.C. s/s 2601 et seq. (1976)

3. Summary Tables Showing Regional Identification of Innovative Methods and Science Issues for the C-VPES Committee

Table 3: Examples of or Characteristics of Innovative Science Methods Identified by Region

		1	3	4	5	7	8	9	10
Characteristics of Innovation	Modeling			✓	✓	✓			✓
	GIS/Mapping			✓	✓	✓			✓
	Other Federal Agencies							✓	✓
	Compensation from Polluters								✓
	States		✓		✓	✓			✓
	NGOs				✓				✓
	University Research				✓				✓
	EMERGY analyses			✓					
	Tribes (i.e., watershed-based restoration; wetland inventory/GIS mapping; watershed management plans, etc.)								✓
	Restoration/preservation (through enforcement settlements, establishment of State/Federal mitigation ratios)								✓

Table 4: Types of Science Needs Identified by Region

		1	3	4	5	7	8	9	10
	Toxicity analyses affecting NEPA assessments involving endangered species				✓			✓	✓
	Science supporting NEPA				✓			✓	?
	Tools to Identify High Value Ecosystems				✓		✓		✓
	Quantitative Impact Information					✓	✓		✓
	Information on ecological thresholds						✓		✓
	Definition of Significant Impact						✓		
	Need for a standard approach							✓	✓
	Accounting for indirect effects						✓		✓
	Tools for communicating eco-risk							✓	?
	Definition of ecological systems and services						✓		
	Isolated waters & headwaters functional assessment (individual and cumulative water quality/quantity and other functional contribution(s) to down-gradient navigable waters)								✓
	Invasive/exotic species – identification/inventory; life history/genetics; control/management (including bio-control); public education, outreach; etc								✓
	Effects of hybrid poplars on riparian/aquatic/wetland ecosystems.								✓

4. Samples Of Different Regional Efforts To Use Science-Based Information On Valuing The Protection Of Ecological Systems And Services

4.1. Description of the 1999 Region 5 Prairie Grass Ecosystem Supplemental Environmental Project (SEP) with Ashland Oil Company

Through combined efforts involving EPA, Ashland Oil Company (Ashland), and state and local agencies, Ashland agreed to perform six SEPs to settle an enforcement action for environmental violations. These SEPs involve pollution reduction, environmental restoration, assessments and audits, and environmental compliance promotion. The SEPs are part of an unusual 1999 settlement which involved three of Ashland's geographically-dispersed petroleum refineries located in St. Paul Park, Minnesota; Canton, Ohio; and Catlettsburg, Kentucky. General background information on SEPs can be found in Appendix 1 of this survey report,

One SEP involved restoring Minnesota Prairie Lands. The Grey Cloud Dunes area incorporates high terraces, sandy soil, prairie grasslands, and distinct species of plants growing on dunes on high banks above the Mississippi River. Ashland held ownership of 274 acres of this prairie, and local groups were concerned about the potential for industrial development which could destroy this unique ecosystem. As one of its SEPs, Ashland renovated the Grey Cloud Dune Prairie and donated it to the State of Minnesota. The state has dedicated the land, located near Cottage Grove, Minnesota, as a permanent scientific and natural preservation and study area.

Region 5 calculated a SEP for the dollar value/ecological value for the 274 acres of prairie up in Minnesota under the January 1999 Ashland consent decree.

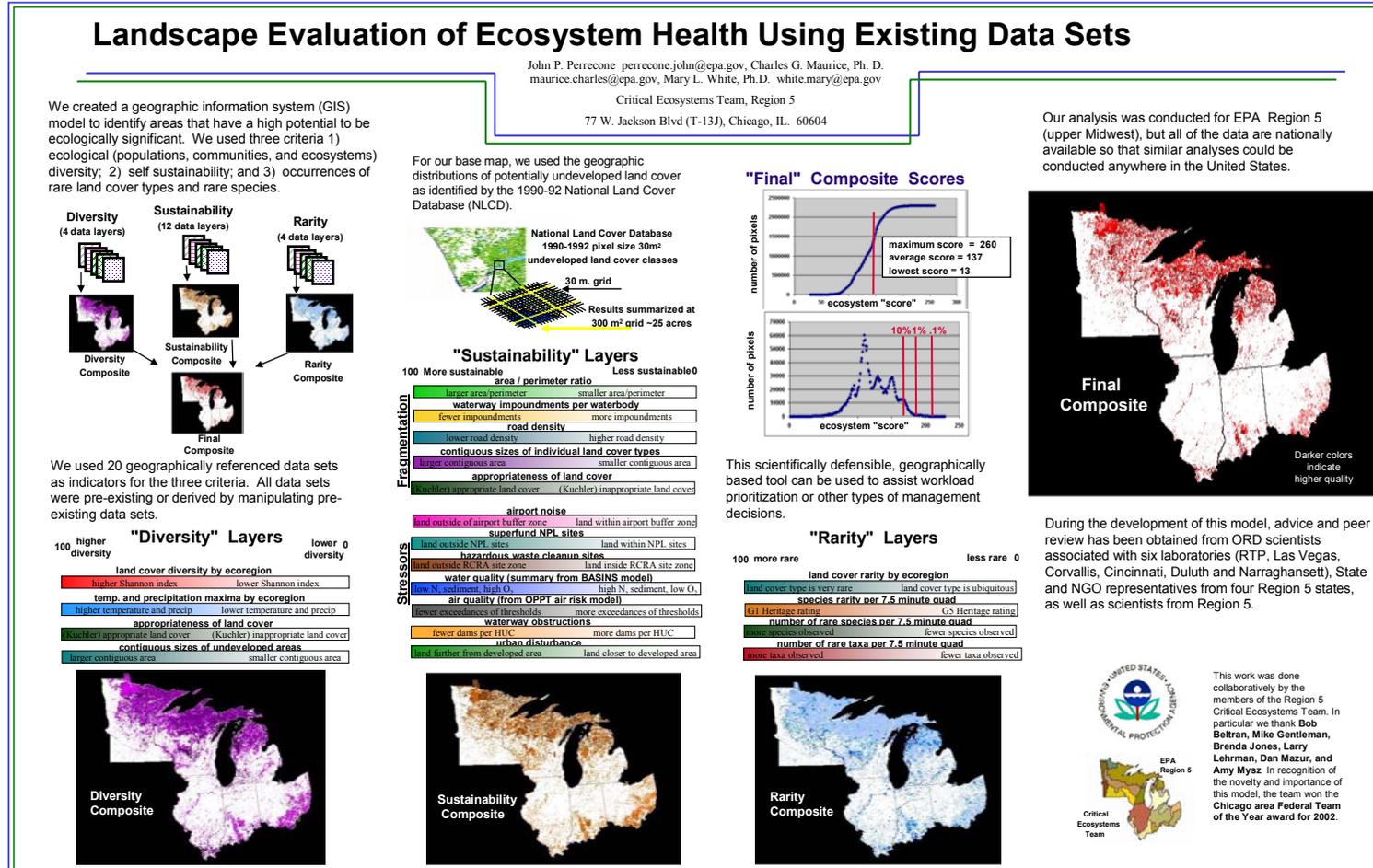
Appendix N to the Ashland consent decree is the "Grey Cloud Dune Prairie" which briefly describes the threatened status of the native sand prairie and attendant rare animal and plant species. The Appendix requires Ashland to donate the property (more fully described in a legal description) to the State of Minnesota with restrictions on its use.

Par. 24 of the consent decree says Ashland is required to spend at least \$1,000,000 for this SEP. Par. 28(a) says that Ashland is subject to a stipulated penalty of \$631,743 if Ashland doesn't satisfactorily complete this SEP. From a Region 5 internal document (FOIA exempt/Attorney Work Product) prepared at the time the consent decree was filed, files describe this SEP as, ". . .the renovation and donation by the company of a 274 acre prairie grass ecosystem to the State of Minnesota for dedication as a permanent scientific and natural preservation and study area. This SEP was credited in the settlement at \$631,000 and the unique ecosystem was appraised at a value of \$87 million."

Ashland hired a consultant to come up with an ecosystem valuation of maintaining the property in its natural state ad infinitum, which is where the \$87 million

came from. The valuation credited the loss of economic use of the property (how much would the shopping mall that won't be there make, etc.) and a calculation of the value of the preserve to future generations, etc. EPA did not use that figure at all in its SEP calculations. Instead, the Agency used the current real estate appraisal for the property alone, and used some percentage of that for SEP credit and the associated stipulated penalty.

4.2. Region 5 Landscape Evaluation of Ecosystem Health Using Existing Data Sets



4.3. Identification and Mapping of Critical Ecosystems for Region 7 States

This is a cooperative agreement between the Missouri Resource Assessment Partnership (MoRAP) in Columbia, Missouri and the Environmental Assessment Team at EPA, Region 7.

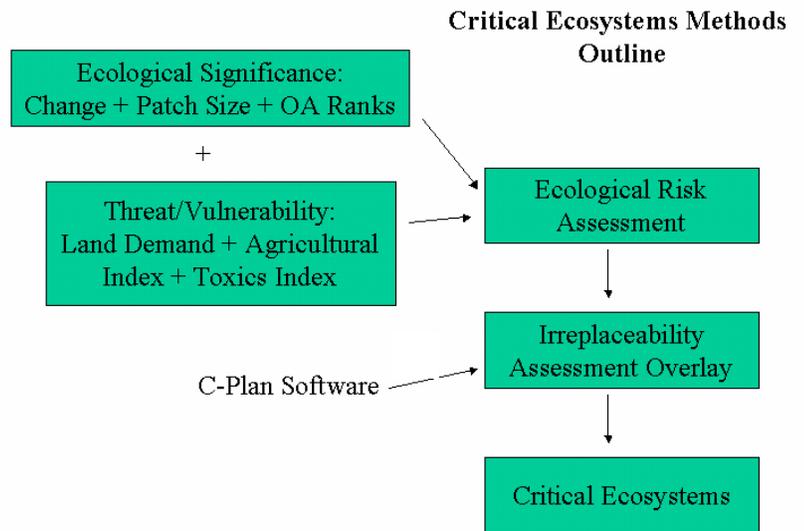
Project Background and Goals

EPA Region 7 set Critical Ecosystems as one of three major areas of emphasis in 2001. The mission of the Critical Ecosystems Team is to facilitate the protection and/or restoration of the ecosystems in EPA Region 7 that are critical to biodiversity, human quality of life, and/or landscape functions. The guiding principles include the definition of critical ecosystems and development of criteria for selection, integration of protection into EPA programs, and enabling ecosystem protection by providing better communication about Region 7 ecosystem protection strategies and initiatives.

MoRAP is working with Region 7's Environmental Assessment Team under a project funded by the Regional Geographic Initiative to define methodologies to identify critical ecosystems for terrestrial and aquatic ecosystems within pilot areas. Our approach has been unique within EPA to date in terms of the fine resolution and comprehensive nature of the analyses.

For **terrestrial ecosystems**, MoRAP has developed an ecological significance surface at 30-meter resolution and has taken results from a threats data layer developed by Region 7 to define ecological risk (significance plus threat).

MoRAP also developed conservation targets and thresholds for inputs for Region 7's irreplaceability analysis.



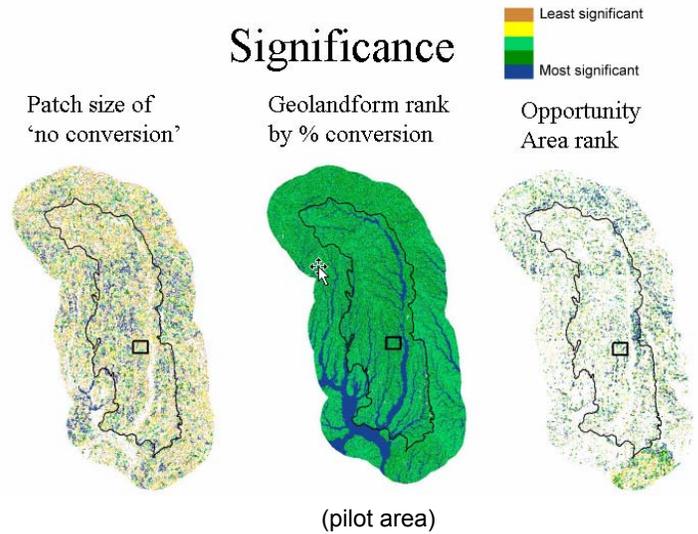
The final step will be to combine the fine-resolution risk surface with the coarse resolution irreplaceability analysis to identify critical ecosystems for the pilot regions.

Diagram showing the steps taken to identify terrestrial critical areas

Steps in the Process: terrestrial

1. Create Ecological Significance Surface:

- Size of patches of non-converted landcover from modeled historic landcover
- Conversion value by geolandform (note: geolandforms are modeled by ecological subsections by major landscape using geology, soils, slope, and floodplain data layers)

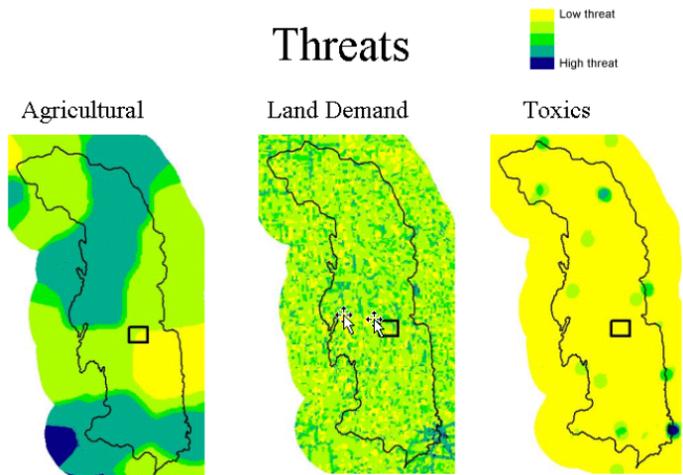


- Conservation Opportunity Areas (COAs) ranked by ecological subsection (note: COAs represent areas that are more than 75 meters into the interior of land cover patches and 75 meters away from roads, and are therefore potentially good areas to implement conservation management.)

2. Complete Ecological Threats Surface:

Agricultural

- Change in acres of agricultural land (pasture or grazing) from 1992 to 1997 (USDA-NASS)
- 1000-meter grids created using Inverse Distance Weighted interpolation
- Grid reclassified to -5 to 5 showing loss or gain in agriculture
- Created a new point shape file from the reclassified grid
- Ran IDW interpolation again to produce 100 meter grids
- Final range of values from -3 to 2.



Land Demand

- Combines population change density and proximity to urban use areas
- Population change density = population density in 2000 minus population density in 1990
- Values are normalized and reclassified from 1-5

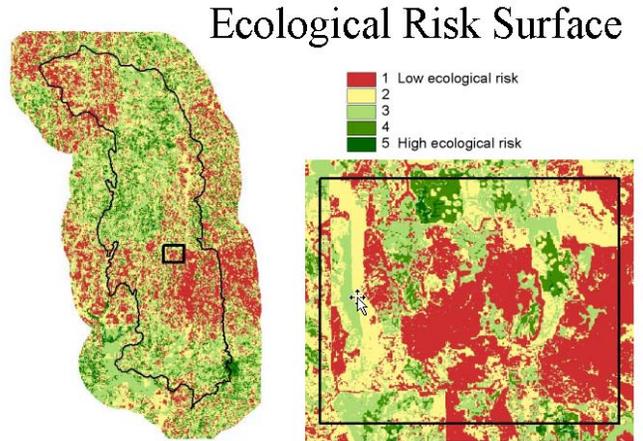
- **Proximity to urban areas creates buffers around cities, MSAs, and roads. A cells proximity to one or many of these buffered areas receives a rank of 1-5**
- Final land demand values range from 1-10

Toxics

- Collected all points for toxic sites
- Weighted facilities within a 137 cell window
- Summed all the weighted values
- Final values range from 1-5

3. Combine significance and threat layers to identify Ecological Risk:

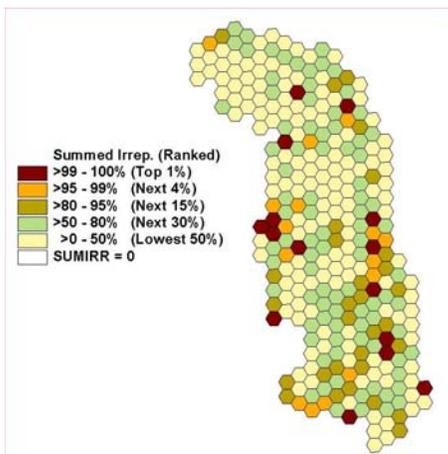
- Risk = Ecological significance (1 to 15) plus Threats (-5 to 20)
- High risk = high ecological significance and high threat



4. Select final targets for Irreplaceability Assessment and gather needed data

- Irreplaceability values are based on the capture of surrogate targets related to components and function of ecosystems
- *Irreplaceability*: the likelihood that a given site will need to be protected to ensure achievement of a regional set of conservation targets, or conversely, the extent to which options for achieving these targets are reduced if the site is not protected (Pressey et al., 1994).
- Coarse-resolution tool for setting regional protection priorities
- Provides quantitative value to planning units within assessment regions

Category	Target Name	Target Goal for Conservation
Historic Vegetation (habitats)	Tallgrass prairie	40 percent
	Woodland/savanna	
	Forest	
	Mesic Forest	
Bottomland Forest		25 percent
Conservation Opportunity Areas ranked as "1"		
Historic Vegetation (fine-resolution landforms)	Floodplain	
	Steep slope	
	Slope crest	
	Upper slope	
	Flat summit	
	Sideslope	
	Lower sideslope	
	High flat	
Low flat		
Course Landforms	Flat plains	
	Smooth plains	
	Irregular plains	
	Plains with low hills	
	Rugged plains	
Breaks		
Biological Richness (GAP data)	Reptiles	
	Mammals	
	Birds	



(pilot ecological subsection)

of ecological processes that sustain aquatic biodiversity; 2) priorities should be placed on preserving distinctive ecosystems with the highest ecological integrity and sustainability; and 3) watersheds are a fundamental conservation unit and define ecosystems for riverine systems.

The 11 focus areas shown here represent only 2.8% of entire network of streams in the Meremec ecological drainage unit, yet they characterize the broad diversity of watershed and stream types that occur throughout the basin. Also, all of the target species identified for this study area inhabit one or more of these focus areas.

Steps in the Process: aquatic

1.) Complete Aquatic Ecological Systems classification for the whole region

2.) Rank Aquatic Ecological Systems and Valley Segment Types by indicators to identify regional priorities

Criteria for Aquatic Ecological Systems Selection:

- Target species richness
- A high quality example using a Human Stressor Index
- Percentage of public ownership
- Ability to achieve connectivity among dominant VST size classes

Criteria for Valley Segment Type Selection:

- Best place to achieve connectivity
- Represent at least 1 km of dominant headwater, creek, and small river size classes within a single basin
- Basin includes at least three examples of the dominant headwater VST
- Low number or value for human stressors (CAFOs, gravel mines, point sources, etc.)
- High riparian corridor quality
- Capture of target species from species models or known occurrences
- High percentage of public ownership within drainage
- Proximity to floodplain wetland complexes
- High percentage of natural landcover

3.) Modify completed focus area assessment for Missouri to identify Critical Aquatic Ecosystems

This project builds on work done within Region 7 that has been funded by EPA along with a number of partners, most notably the USGS Gap Analysis Program, which has supported and continues to support the development of data layers required for riverine critical ecosystems assessment. This investment totals well over \$750,000 over the past five years provided to a variety of state partners within the region. Also, agencies such as the Missouri Department of Conservation, the Missouri Department of

Natural Resources, the U.S. Forest Service, and other MoRAP partners have invested more than \$500,000 annually to allow for the development of digital data and staff expertise required to complete the current project. Hence, this proposal will leverage a significant, long-term and continuing, investment by partner agencies and non-government organizations. Both the staff expertise represented within MoRAP and the volume of organized information available will facilitate the success of this project, and serve as models for similar projects across the nation.

5. Survey Responses from EPA Regions

Region 1 Response

1. What activities in your Region, states, or tribes have impacts on ecological systems and services within the region?

Activities happening regionally that may impact ecological systems include removal of Impoundments.

EPA activities that may have some ramifications on ecological systems based on findings (by no means the only ones) include: intermittent stream protection ; Superfund and RCRA corrective actions; wetland restoration and enhancement.

2. For each, what kinds of science-based information on the values of these impacts do you need for carrying out these activities?

Removal of Impoundments:

- fisheries implications e.g. cold water vs warm water, water quality before and after, habitat(s) present up and downstream of impoundment
- hydrologic changes
- instream microhabitats and species habitat preferences
- impounded material characterization

Intermittent stream protection:

- assessment methods development
- quantification of attributes associated to intermittent streams that directly impact the downgradient watershed

Through SF and RCRA corrective actions; wetland restoration and enhancement:

- functionality of the wetlands e.g. interactions with surface water and groundwater , habitat quality, contaminant retention

3. How have the needs for this information been met in the past? Please give a short description, a reference or a website address to illustrate the kinds of approaches used.

Removal of Impoundments

<http://www.crrel.usace.army.mil/ierd/tectran/27InDesign.pdf>

<http://www.friendsofsebago.org/presumplan.html>

http://www.maineenvironment.org/Edwards_Dam/AnniversaryFacts.htm

http://www.mainerivers.org/ken_facts.htm

Intermittent stream protection

<http://harvardforest.fas.harvard.edu/data/p09/hf095/hf095.html>

<http://www.ecst.csuchico.edu/~loggins/cyprin.html>

<http://ma.water.usgs.gov/projects/ma158.htm>

Assessment methods development contact Ken Fritz in EPA Cincinnati

Through SF and RCRA corrective actions; wetland restoration and enhancement

<http://www.epa.gov/region01/eco/wetland/>

<http://water.usgs.gov/nwsum/WSP2425/restoration.html>

4. Are there efforts underway now in your region, states, and tribes to develop capabilities to value the protection of ecological systems and services? Please give a short description, a reference or a website address to illustrate these efforts.

- Cited research on "Virtual Reference River – a model of reference habitat conditions" by Piotr Parasiewicz, John Nestler, LeRoy Poff, Mark Bain

5. Can you identify any documents or example projects that describe science-based information on the impacts of activities on ecological systems and services from your Region, states or tribes that you think that the Committee would benefit from considering in depth? Please give a short description, a literature reference or a website address for locating these documents

Removal of Impoundments

<http://www.friendsofsebago.org/presumplan.html>

http://www.maineenvironment.org/Edwards_Dam/AnniversaryFacts.htm

http://www.mainerivers.org/ken_facts.htm

Intermittent stream protection

<http://harvardforest.fas.harvard.edu/data/p09/hf095/hf095.html>

<http://www.ecst.csuchico.edu/~loggins/cyprin.html>

<http://ma.water.usgs.gov/projects/ma158.htm>

Assisting in assessment methods development is scheduled to begin sometime late summer of 2004 through Spring of 2005. A reference site will be identified at which the methods proposed/developed by Ken Fritz to measure physicochemical and biological parameters of headwater/intermittent/ephemeral streams will be performed in Region 1 to help assess the utility and functionality.

Region 3 Response

In response to all the survey questions:

The regional scientist from Region 3 commented "it appears there is work going on by academics in the region, but not being directly used by the Regional Office."

More specifically, one respondent reported that perhaps the pending economic analysis for the nonnative oyster Environmental Impact Statement (EIS) would be some of the most rigorous valuation done for resources we care about in this watershed. The EIS work was announced in the Federal Register on January 4, 2004 (see <http://www.epa.gov/fedrgstr/EPA-IMPACT/2004/January/Day-05/i073.htm>)

Information from EPA Press Statement: Through an Environmental Impact Statement, the U.S. Army Corps of Engineers will evaluate a proposal by the states of Maryland and Virginia to introduce the Asian oyster species, *Crassostrea ariakensis*, into the tidal waters of the Chesapeake Bay. The Corps will also evaluate alternatives to this proposal. The states and the Corps will continue native oyster restoration efforts throughout the Chesapeake Bay.

On January 5, 2004, the Federal Register published the U.S. Army Corps of Engineers' Notice of Intents to prepare a programmatic Environmental Impact Statement (EIS) to evaluate alternative approaches to increasing oyster populations into the tidal waters of Maryland and Virginia. The benefits of a rehabilitated oyster resource include the potential for improved water quality, creation of aquatic habitat, and the reestablishment of an economically viable oyster industry preserving the region's culture associated with working watermen.

The U.S. Army Corps of Engineers is the lead Federal agency in the project. The Maryland Department of Natural Resources on behalf of the State of Maryland, and the Virginia Marine Resources Commission on behalf of the Commonwealth of Virginia are the lead State agencies. The cooperating agencies include the U.S. Environmental Protection Agency, National Oceanographic and Atmospheric Administration, and the U.S. Fish and Wildlife Service.

The proposed action to be evaluated in the EIS will be a proposal by the states of Maryland and Virginia to introduce the Asian oyster species, *Crassostrea ariakensis*, propagated from existing third or later generation of the Oregon stock of this species, into the tidal waters of Maryland and Virginia. The States and the Corps will continue native oyster (*C. virginica*) restoration efforts throughout the Chesapeake Bay.

The objective of this proposal and continuing restoration of native oysters is to establish a self-sustaining oyster population that reaches a level of abundance in the Chesapeake Bay that would support sustainable harvests comparable to harvest levels during the period 1920-1970.

Several alternatives to this proposal will also be evaluated in the EIS. These alternatives currently include: continuing and expanding native oyster restoration efforts, implementing a temporary harvest moratorium and oyster industry compensation program, establishing native and/or non-native oyster aquaculture operations, introducing an alternative oyster species, or an alternative strain of *C. ariakensis*, and implementing of a combination of these alternatives.

A public scoping meeting was held in Maryland on Thursday, February 5 at 7 p.m. at the Radisson Hotel in Annapolis, and in Virginia on January 28th at 6 p.m. at Warwick High School in Newport News. Each meeting will begin with a briefing on the status of *C. virginica* in the Chesapeake Bay and tributaries, overview of the EIS process and timeframe, and review of the States' proposal and preliminary alternatives, and then request comments from the public.

Another example is work several years ago on Submerged Aquatic Vegetation (SAV) that was quoted in support of SAV restoration. Dr. Bob Orth at (Virginia Institute of Marine Science (VIMS) would be familiar with the literature.

1. What activities in your Region, states, or tribes have impacts on ecological systems and services within the region?

Comments from SAB State Contact of the SAB Staff Office in Region 5 Who Has Been Following the C-VPESS Work:

Nicholas A. DiPasquale, Deputy Secretary, Office of Air, Recycling and Radiation Protection, Department of Environmental Protection, State of Pennsylvania

... I would like to commend EPA and the SAB for taking up this effort. Most state and federal environmental regulatory programs do not take real but long-term impacts to ecological systems into account. This is not a criticism, but more a reflection of their legislative origins, legal and resource limitations and mandates. ... it is imperative that we assess and translate the impacts to ecological systems and services into a common currency that decision-makers can understand and that get incorporated into existing decision-making processes. While many of us are motivated by more abstract or aesthetic justifications for protecting the natural world and the vital services it provides, putting a dollar value on the cost of the impacts, which still are, for the most part, externalized to society as a whole, an important first step in appreciating the true value of the resource.

Clearly, state environmental agency permitting and enforcement activities have impacts on ecological systems and services. While many of the permitting standards are health-based, those standards by and large do not take into account cross-media impacts to the environment. One example is the emissions of nitrogen oxides (NOx) from fossil-fueled power plants and industrial boilers. Limitations on NOx emissions as a criteria air pollutant or as a precursor to the formation of ground-level ozone are health-based. We know that ozone has a secondary impact on photosynthesis and adversely affects plant

growth, although I would venture to say that we do not have a good understanding of the severity or extent of this impact.

Remediation activities also impact ecological systems and services, especially in many historic industrial areas located along waterways. Many large urban areas were located along rivers which provided cooling water or process water to industry or served as an open sewer for waste discharges. State and federal cleanup programs have traditionally looked at engineering solutions for cleanups - hot spot removal of contaminants and capping and engineered containment as the long-term remedy. These sites are often located in or along flood plains that were filled in with debris because the value of the land was considered marginal. We know now that much of this land was marsh or wetland that served to filter and control surface water runoff thus maintaining water quality and preventing flooding. There are often opportunities to use ecological techniques such as wetland treatment or phytoremediation to clean up the sites and restore their ecological functions. NOTE: The Wildlife Habitat Council is an organization that promotes ecological enhancements and restoration projects in lieu of or as a supplement to traditional engineering cleanup solutions. In many cases, ecologically-based cleanup projects are less expensive, more acceptable to community than incineration or long-term entombment and provide opportunities for recreation (hiking trails, bike paths) and wildlife viewing for the local community.

State environmental agencies also are often involved in reviewing road construction projects, subdivision developments and a variety of other land use proposals. In most cases, local governments are vested with land use decision-making authority. While environmental agencies retain jurisdiction in areas as wetland regulation, they more often provide information to local officials to assist them in the decision-making process. This role could be expanded to include broader information associated with the impacts on ecological services and systems if appropriate methodologies were available.

2. For each, what kinds of science-based information on the values of these impacts do you need for carrying out these activities?

We (states, in general) presently lack the ability to quantitatively assess the potential ecological impacts associated with permitting and land use decisions or actual impacts that occurred due to historical contamination of industrial sites. There is a lack of protocols or methodologies for determining the functions and values of land in filtering and controlling stormwater, for wildlife habitat, for recharging ground water or feeding surface waters that, in turn, are used for drinking water purposes or for supporting aquatic life. In some cases, we can use surrogate values for what it might cost to provide an alternate drinking water source or constructing flood control structures, but these values may not provide the full measure of the resource. Similarly, there is no technically or scientifically-based way to determine the value of trees and other forms of vegetation for preventing erosion, providing food and habitat for wildlife, stabilizing climate, cleansing the air or providing shade and cooling. For the most part, we tend to consider each discrete facility, development or site as an individual, isolated decision, divorced from

the larger ecological system within which it resides and disconnected from the ecological services that system provides.

3. How have the needs for this information been met in the past? Please give a short description, a reference or a website address to illustrate the kinds of approaches used.

For the most part, the needs for this information have not been met. Some states have developed GIS capabilities to graphically represent changes in landuse and landcover, to identify rare or endangered species and to protect or limit development in or around groundwater recharge areas. These GIS mapping capabilities have been used to direct growth or open space acquisition and agricultural lands protection investments. To my knowledge, no level of government has developed the capability for calculating the value of ecological services and systems, assessing potential impacts resulting from permitting or land use projects and routinely incorporating this information into decision-making processes.

4. Are there efforts underway now in your region, states, and tribes to develop capabilities to value the protection of ecological systems and services? Please give a short description, a reference or a website address to illustrate these efforts.

In PA, there is a recognition that this represents a significant information gap that needs to be addressed. This concept has been discussed in the context of the Pennsylvania Biodiversity Partnership initiative as an area that needs further investigation. The Department of Environmental Protection (in Pennsylvania) is currently examining opportunities for pursuing ecological enhancement and restoration through its various permitting, regulatory and remediation programs and well as supporting such efforts through its grant programs.

5. Can you identify any documents or example projects that describe science-based information on the impacts of activities on ecological systems and services from your Region, states or tribes that you think that the Committee would benefit from considering in depth? Please give a short description, a literature reference or a website address for locating these documents.

The Department (of Environmental Protection in Pennsylvania) has guidelines for conducting ecological assessments for purposes of determining whether mitigation is warranted, however this does not include any protocol or methodology for determining the value of ecological services or systems.

Region 4 Response

1. What activities in your Region, states, or tribes have impacts on ecological systems and services within the region?

- a. Permitting?
- b. Enforcement?
- c. Other?

All permitting and enforcement activities have impacts on ecological systems and services. EPA touches on land use planning activity all the time but is not specifically required to address this by our statutes/regulations. States have a role in large land purchases and management of reserves. EPA and states are involved in certain high profile initiatives such as the Florida Everglades Project and the Gulf of Mexico Program.

2. For each, what kinds of science-based information on the values of these impacts do you need for carrying out these activities?

Ecological risk assessments, toxicity analyses, ecological evaluations raise issues about the worth of various environments.

At the regional level we may have a lesser need for information on the value of impacts, because the regulations by which the region or states grant permits require best available technology as determined through guidelines set in HQ. Economics are often not explicitly part of the decision rule at the regional/state level. Enforcement decisions typically do not require a valuation of ecological services. NEPA might be the one area where an economic valuation is used. The region needs information to value the services provided by land and healthy biota and ecosystems. We need this type of information to explain the benefits of EPA and state decisions to the public.

3. How have the needs for this information been met in the past? Please give a short description, a reference or a website address to illustrate the kinds of approaches used.

For ecological risk assessments supporting CERCLA, many pieces of data are best guesses or are interpolated from other data as direct information is not available for specific sites.

The region is working with National Center for Environmental Economics to some extent in the development of air quality benefits associated with the protection of lands within the Southeastern Ecological Framework (SEF). We have also gone to the internet or academia to identify the latest thinking in the area of environmental service benefits. Information is typically limited to a few case studies that span significant values discrepancies, with very little consistency among techniques.

4. Are there efforts underway now in your region, states, and tribes to develop capabilities to value the protection of ecological systems and services? Please give a short description, a reference or a website address to illustrate these efforts.

The region has been an active Agency contact for the SAB Staff Office in its support for the EPA's Science Advisory Board's Committee on Valuing Ecological Systems and Services. The region has developed and maintains the Southeastern Ecological Framework, a GIS-based data base of important landscapes across the SE emphasizing functional ecosystems and connectivity. The framework characterizes the landscape into additional functional index categories such as recreational potential, environmental services and biodiversity that help to characterize the potential value in terms of functional land use, but not in terms of dollar benefit to the economy. It is through the additional characterization of the landscape and other GIS data layers that we hope to be able to focus our attention more specifically on the environmental services being provided and develop a method for identifying some dollar value that corresponds. For instance, at any given location the variety of landscape characteristics (wetlands, riparian buffers, recreational potential, and/or forests) support known environmental services (nutrient reduction, sediment removal, fishing, and/or carbon sequestration) that relate to some identifiable economic value for each environmental service based across the landscape. -The region is doing some work on its own in relation to EMERGY valuations in cooperation with ORD through their Regional Research Partnership. This study will use existing data sets generated during the development of the SEF project and additional baseline data sets developed for Region 4's Environmental Atlas to calculate the distributed energies for the spatially explicit EMERGY analysis on a 90-meter pixel basis. This project should be completed in early 2005. We have also sought support from EPA's National Center for Environmental Economics in conducting similar analysis during the past two years. The region is anticipating the opportunity to present the SEF in relation to developmental pressures at the C-VPSS meeting in September

5. Can you identify any documents or example projects that describe science-based information on the impacts of activities on ecological systems and services from your Region, states or tribes that you think that the Committee would benefit from considering in depth? Please give a short description, a literature reference or a website address for locating these documents.

Available documents related to the South East Ecological Framework are at the following web site. The information is primarily restricted to land use characterization and has limited information on valuation. A short description can be found on the web site.

<http://geoplan.ufl.edu/epa/index.html>

Region 5 Response

1. What activities in your Region, states, or tribes have impacts on ecological systems and services within the region?

- a. Permitting--Permitting activities sometimes trigger the Endangered Species Act, which, though it's focused on individual of listed species, often has implications for the protection and survival of ecosystems (e.g., critical habitats and protection of keystone species).
- b. Enforcement--Region 5 has used a few SEPs to increase the amount of habitat for certain species that were impacted by some enforcement cases. When Ashland Oil Company had a major spill in the Ohio River, they were required to purchase and donate to the State of Minnesota a fair amount of prairie (est. over 100 acres) in southern MN. The connection is that Ashland had a facility in MN so the settlement was very generous in terms of where they could do ecological mitigation. There is an interest in doing more ecological SEPs but it takes a lot of perseverance and constant communication between the ecological staff in the Region and the program and ORC enforcement staff. This is difficult given the amount of enforcement cases, the high costs involved in attorneys' pursuing such an eco case and the availability of an ecologist to facilitate this process.
- c. Superfund and RCRA cleanups: When the opportunity arises and an interested/enlightened project manager thinks of it, this program can be used to generate an ecological clean-up. A good example is when a Superfund OSC restored a site back to its original dune and swale ecosystem (found in the southern reach of Lake MI) as opposed to simply a dredge and removal of a lagoon. The OSC sought out the IN DNR, IN TNC and other experts to restore the ecosystem rather than conduct a traditional removal that would have met the requirements of CERCLA but would not have restored a high quality (and now extremely rare) ecosystem.

Both RCRA and Superfund support the Brownfields Initiative to redevelop industrial sites rather than developing new sites on existing wildlife habitats. Both programs have educated staff on reclaiming landscapes with native vegetation. EPA has provided a grant to the Wildlife Habitat Council to support wildlife habitat planning at industrial sites in northwest Indiana. When an ecological risk assessment is required for a RCRA/Superfund site, the adjoining ecological landscape is considered in selecting both risk assessment endpoints and risk management goals to protect natural wildlife communities.

Although many Water Division activities impact ecological systems and services the ongoing efforts by the Watersheds and Wetlands groups most visibly recognize the import services provided by the ecosystem components in those systems. One example of work done in Region 5 to acknowledge and understand a particular ecosystem and its services was the Midwest Ephemeral Wetlands workshop and conference co-sponsored by USEPA-Region 5 in 2002.

Much of the focus of the work done in the Great Lakes National Program Office (GLNPO) in Region 5 is based on the recognition of the Great Lakes as ecological systems and working to understand and improve the services provided by that large ecosystem and its smaller components. GLNPO and its Canadian partners sponsors an annual conference, State of the Lake Ecosystem Conference (SOLEC). In addition GLNPO has a grant program that funds among other things, research and projects on habitat protection and restoration.

- d. National Environmental Policy Act reviews conducted in the region under Section 309 of the Clean Air Act often touch on ecosystem issues (e.g., vegetation communities, wildlife, ESA species, maintenance of forest ecosystem, protection of wetlands, and pollutant risk to entire classes, families, and orders).
- e. Region 5 also conducts analyses and takes actions to enforce the Oil Pollution Act.

2. For each, what kinds of science-based information on the values of these impacts do you need for carrying out these activities?

For any given cleanup case, EPA needs to show what the costs of cleanup would be in a traditional manner as opposed to an ecological clean-up. In the case of the innovative dune and swale remediation the OSC could only spend PRP funds on the traditional cleanup and the extra ecological costs (nearly \$100,000) were absorbed by the EPA Superfund Removal program. We are not aware that an ecological value was placed on the cleanup other than the difference in cost between the two approaches. For Enforcement SEPs, we don't have the information to know what the calculation was that determined an oil spill in the OH River was equal to "X" number of acres of fairly pristine prairie in MN.

In regard to NEPA work, The agency could benefit by studying often-encountered species and groups, the agency might benefit by conducting or funding toxicity studies or studies to find the best surrogate species for listed species.

There is little independent information supporting our NEPA work, leaving us to rely upon the studies conducted by the implementing agency. New studies are rarely conducted by the implementing agencies, so the info provided for EPA's review and comment are often a mixture of traditional legal arguments, assumptions, information from older environmental impact statements, and best professional judgment in the face of little or no applicable data. Good examples from my personal experiences include carrying out reviews on military plans to continue use of islands and other lands known to be occupied by sensitive animals and plants and culturally significant resources for Naval missile ranges. In the absence of data to the contrary, it was assumed and asserted that the trainees would not miss the carefully-placed targets and hit the vulnerable areas by accident. Even interviews of local military staff or review of satellite images would have shed some useful light on whether sensitive resources had been/were likely to be protected, yet we didn't have any independent data to draw from. For projects like these,

frank discussions with scientists in the action agencies would be fruitful, but we need data to discuss and it's not often available. Also, cooperatively (EPA and the action agency) monitoring federal projects during implementation and operation of these projects could be very productive. Are the mitigations working? Are all the protections functioning in the real world as they were anticipated in the impact statement?

Region 5 uses scientific information to protect ecological resources via the Oil Pollution Act. Ann Whelan has led a massive effort to map ecological resources across Region 5 and that information is used for Net Environmental Benefit Analysis (NEBA) to evaluate the most protective/restorative technology for oil spill remediation in R5. NEBA is a resource management tool designed to improve the quality and results of environmental decision making. NEBA is a consensus-based process that brings natural resource science together with the reality of resource management decision making. When applied, it provides a means for considering proposed environmental actions, comparing and contrasting the trade-offs and environmental considerations of those actions, and then prioritizing the outcomes through a risk-ranking exercise. When used by natural resource scientists and resource management decision makers, the NEBA process creates an open, honest dialogue of the capabilities and limitations inherent in resource management and the decision-making tradeoffs faced by resource managers today. NEBA has also been used extensively in Region 9 in emergency planning to assist decision making during a response. Environmental issues are often too complex to work through in the time frame of an emergency. This process can be used in both freshwater and marine environments. Although the decisions for EPA differ in these two situations, the decision maker is provided with the best information available, based on a consensus process. This allows the decision maker to weigh the environmental concerns, public safety, response capabilities, and political influence, whereas previously the environmental concerns were diffuse and often not scientifically based.

3. How have the needs for this information been met in the past? Please give a short description, a reference or a website address to illustrate the kinds of approaches used.

For many programs, Region 5 reports that it doesn't have information on this.

For NEPA work, the Agency has worked by gathering data off the web, by comparing the EIS in question to the small body of similar past projects, and by talking with the action agency staff. However, even after that info gathering, a lot of uncertainty remains.

4. Are there efforts underway now in your region, states, and tribes to develop capabilities to value the protection of ecological systems and services? Please give a short description, a reference or a website address to illustrate these efforts.

Region 5 has developed the CrEAM model which identifies high quality ecosystems throughout Region 5. It can be used to show areas of high ecological diversity that are under stress as well as those areas that are somewhat protected. This model has just gone through peer review by the Science Advisory Board's Ecological Processes and Effects

Committee and the region is not able to share the model with external partners at this point. The region envisions it to be used in the near term for priority setting and screening for regional program activities and perhaps in the future, once more improvements are made, for more enforcement and permitting activities. In the near term, since EPA is very active in NEPA reviews, the CrEAM model can be used as a screening tool to tell Regional staff where these high quality areas are located and we can recommend that projects be altered based upon this information. In the future, once more improvements are made, the tool could be used for the actual NEPA review itself. (See graphic describing the CrEAM model is section 4 of this survey report.

Economic Valuation Study for the Great Lakes: The Northeast-Midwest Institute published a guidebook, *Revealing the Economic Value of Protecting the Great Lakes*, (on the web at <http://www.nemw.org/GLEconVal.pdf>) that is intended to make Great Lakes decision makers more familiar with the techniques available to measure environmental benefits using economic tools. It is intended as a means to begin a discussion on how to better make decisions that affect the great lakes. The economic tools identify provide more insight into the tradeoffs that decision makers must evaluate. These tools help address such issues as:

- Converting Great Lakes Benefits of the Future to Present-Day Value
- Managing Irreplaceable Amenities and Irreversible Outcomes
- Accounting for Natural Resource Capital
- Risk and Uncertainty
- Sorting Through Benefits from Multiple Projects
- Accounting for Secondary Impacts
- Distribution of Benefits Across Society
- Distribution of Benefits Across Generations
- Placing a Value on Human Life and Health

Economic Valuation Study for Lake Michigan: The Lake Michigan Federation released a study in July 2001 that estimates the economic value that the public places on southern Lake Michigan Natural Resources as between \$3 billion and \$5 billion dollars. The *Natural Capital of the Southern Lake Michigan Coastal Zone: First Steps Toward Economic Valuations* surveyed residents of Northeast Illinois and Northwest Indiana to determine how much they would be willing to pay each year through volunteer activities, donations to conservation groups and taxes to maintain 13 species of birds and six species of fish.

Economic Value of Cleaning Contaminated Sediments: The University of Wisconsin Sea Grant Institute completed a study that estimates the economic benefits of cleaning up contaminated sediments in Great Lake Areas of Concern. It uses the Lower Fox river/Green Bay as an example to provide a critical view of potential methods for identifying economic benefits of sediment remediation. The study is based upon the questions "Do we expect that the benefits of sediment cleanup will be larger than the cost of a particular alternative on a per household basis?" rather than simply asking "What are the benefits of remediation?" The researchers used contingent valuation analysis that estimated that citizens of the Fox -Wolf watershed are willing to pay \$100 to \$300 per

household to clean the Area of Concern. The estimates include a \$222 per household benefit from a 100 percent cleanup.

Waukegan Harbor Valuation Study: John Braden from the U of IL and Nicole Mays of the Northeast-Midwest Institute did an actual study of Waukegan Harbor. Here are some press clippings that can provide you with some actual numbers:

Clean advantage

Study says Waukegan can expect \$21,000 to \$53,000 boost in individual property values with decontamination

By Jim Newton

STAFF WRITER - NEWS SUN

WAUKEGAN — Completing the environmental cleanup of Waukegan Harbor would cause city property values to soar, according to the results of a study released at a public forum Monday.

The economic benefits study, completed by Washington, D.C.-based Northeast-Midwest Institute and economists from the University of Illinois, concluded that the property value of the average Waukegan homeowner would increase by \$21,000 to \$53,000 once the harbor is free of contaminants.

The aggregate increase for the Waukegan area could range from more than \$200 million to \$800 million, depending on whether the cleanup and subsequent lakefront redevelopment makes it a significant point of destination, according to John Braden, the University of Illinois economist who headed the study.

The study involved market research and a survey of residents to determine what would be needed to remove the Superfund stigma from the city and make it an attractive destination for commercial interests and homeowners.

The cost of completing the cleanup, which includes estimates ranging from \$9 million to \$20 million, would be largely covered by federal funding, according to U.S. Rep Mark Kirk, R-Highland Park.

"Once we clean up the harbor, we will wake this town up like never before," Kirk said, adding that a complete cleanup would lead to a remarkable redevelopment of the 1,600 acres around the harbor.

The ball is now in Waukegan's court. Kirk said he is confident that if Waukegan officials decide to move forward with the project and provide the estimated \$700,000 in local matching funds, federal funding will take care of the rest.

"What's left is a series of policy decisions. I don't think funding is an issue," he said.

Kirk stressed that cleanup "on the cheap" is not the way to go. He said major redevelopment investors will only move forward if the harbor is completely cleared of PCB contaminants, a project that he said should include dredging the harbor down to the "glacial till," which is the natural bottom of the lake.

A complete cleanup could lead to the harbor being de-listed as a Great Lakes Area of Concern by the International Joint Commission, a classification change that officials said would bring substantial environmental and monetary benefits.

Susie Schreiber, director of the Waukegan Harbor Citizens Advisory Group, also stressed that a full cleanup needs to include a dredging of the federal channel and would require lowering water lines and possibly some utilities located in the harbor.

"Waukegan will have to lower the water lines," she said.

Waukegan Mayor Richard Hyde said after the forum that the City Council will make such policy decisions this fall, but he said he is committed to the cleanup.

"We want the harbor cleaned to zero PCBs," he said. He added that he is confident the city will have the matching funds when the decision is made to move forward.

Representatives of the Illinois Environmental Protection Agency said that with approval from the city, the project could begin as early as fall 2004, although a 2005 start date is more likely.

Thomas Skinner, regional administrator for the U.S. Environmental Protection Agency and the mayor of Lake Bluff, also expressed confidence that the cleanup project is imminent.

"This is a situation that is turning around before our very eyes," Skinner said. "The city is going to experience a tremendous renaissance as a result of all this."

09/23/03

Harbor cleanup good for city

By Mick Zawislak Daily Herald Staff Writer

Cleaning Waukegan Harbor of remaining pollutants would have a ripple effect on home values in the city and Lake County that would far outweigh the cost, a collection of top political and environmental leaders reiterated Monday.

Heavy hitters, including U.S. Rep. Mark Kirk and Tom Skinner, head of the federal Environmental Protection Agency's six-state Great Lakes region, assembled at the College of Lake County's campus in downtown Waukegan. It was a show of force to emphasize the importance of the project and urge city leaders to proceed.

Kirk and others said the harbor cleanup is a key to redevelopment of 1,600 acres of Waukegan lakefront that could translate to \$1.2 billion in improvements.

"I am totally behind this. I will mobilize the federal resources. Once we clean up this harbor, we will wake this town up like never before," said Kirk, the Highland Park Republican who has made the economic revival of Waukegan a priority.

Monday's gathering centered on a study by the Northeast-Midwest Institute, a Washington, D.C.-based nonprofit think tank. The study showed a clean harbor would increase home values in Waukegan by a minimum of \$241 million, or about \$15,000 per home.

A best case scenario would boost that figure to \$832 million, study authors said, which would translate to about \$53,000 per home.

Although the results were released in early August, Monday's meeting was intended as an update information session. It was designated as one of 43 "areas of concern" on the Great Lakes in 1981.

Cleanup began in the early 1990s. Since then, more than 494 tons, or about 90 percent of the PCB-contaminated sediment has been removed at a cost of about \$21 million. It was paid for by Outboard Marine Corp.

Allowable standards changed, however, and the equivalent of another 10,000 dump trucks of contaminated sediment need to be removed.

Should the project proceed, it would be the first of the 43 sites - including 10 on Lake Michigan - to be removed from the list and become a national model, supporters said.

While federal and state officials are behind the effort, any cleanup carries a 35 percent

local match. Kirk estimated the cost at \$9 million, but that final figure hasn't been determined and could be much higher.

Waukegan's costs have been estimated at about \$5 million, including work to lower a water main that crosses the harbor. The city council hasn't decided whether to participate.

NE

By Susan Kuczka

Chicago Tribune staff reporter

September 23, 2003

Residential property values could soar as much as \$250 million in Waukegan if the harbor's polluted sediment is cleaned up, according to a report released Monday.

The report by University of Illinois researchers and the Northeast-Midwest Institute suggests that removing the sediment also would spur home development along the Lake Michigan shoreline, further increasing the city's property values.

"This study provides evidence the cleanup would provide environmental and economic benefits to those who live, work and do business in Waukegan," said Nicole Mays, policy analyst at the institute, a non-profit organization based in Washington.

Financed with a \$200,000 grant from the U.S. Environmental Protection Agency, the study surveyed more than 900 Lake County residents, most of them in Waukegan.

Conducted over the last two years, the study gauged their feelings about living near a harbor contaminated with PCBs, or polychlorinated biphenyl.

Asked if they would spend more for their home if the harbor were cleaned up, the majority said they would be willing to spend several hundred dollars more a month in house payments, which helped shape the report's conclusions.

The typical home in Waukegan is worth about \$120,000, which could increase to \$170,000 if the harbor was cleaned, said John Braden, an economist at the University of Illinois at Urbana-Champaign who worked on the study.

Craig Heneghan, chairman of the Task Force on Waukegan Neighborhoods, questioned the study's methodology. The group focuses on Waukegan housing issues.

"As we know, people don't purchase a home necessarily because of its [distance] from contaminated sites," he said. "I think one of the first things people look at is its schools, its crime rate. . . . I would be more comfortable with it if it were a more encompassing study."

The study comes out as Waukegan officials work on a \$1.2 billion redevelopment plan for the city's lakefront and downtown business district.

Officials hope to transform the lakefront from a mostly industrial area into one with restaurants, shops, office complexes and new condo developments.

While more than \$20 million was spent in the 1990s to remove PCBs from Waukegan Harbor after decades of industrial use, the water remains polluted.

The PCBs, known to cause tumors, reproductive failure and liver disorders, were linked to operations at Outboard Marine Corp., which paid for the dredging project that removed hundreds of tons of the contaminated sediment.

A re-examination of the 1,600-acre harbor earlier this year showed PCBs continue to contaminate the sediment, which the EPA estimates would cost up to \$20 million to remove.

Thomas Skinner, the EPA's Midwest region coordinator, said he supported the cleanup along with dredging the harbor to make its channels deeper--a project the Army Corps of Engineers is studying.

"There may be some minor inconveniences along the way, but it would be a shame to pass up the opportunity to do something that other communities around the Great Lakes are dying for--the opportunity to restore something to its natural state," Skinner said.

U.S. Rep. Mark Kirk, whose 10th Congressional District includes Waukegan, said he did not believe finding money for the cleanup would be difficult.

Kirk was among about 50 officials who discussed the study Monday at the College of Lake County campus in Waukegan.

Mayor Richard Hyde said that although city officials support cleaning up the harbor, dredging is not considered a priority.

Some city officials fear that if the harbor is dredged deeper, it would encourage more industrial development, he said.

Copyright (c) 2003, Chicago Tribune

The rest of the story: The study was one of a number of factors that led to Cong. Kirk securing 1.4 million dollars to help the City lower the water mains so that dredging can occur.

5. Can you identify any documents or example projects that describe science-based information on the impacts of activities on ecological systems and services from your Region, states or tribes that you think that the Committee would benefit from considering in depth? Please give a short description, a literature reference or a website address for locating these documents.

Thomas R. Crow, Alan Haney, and Donald M. Waller. 1994. *Report on the Scientific Roundtable on Biological Diversity Convened by the Chequamegon and Nicolet National Forests*. USDA Forest Service, North Central Forest Experiment Station, General Technical Report, NC-166.

Comments from SAB State Contact of the SAB Staff Office in Region 5 Who Has Been Following the C-VPES Work:

Keith G. Harrison, Executive Director, MI Environment Science Board
Special Projects Coordinator, MI Dept. of Environ. Quality

1. What activities in your Region, states, or tribes have impacts on ecological systems and services within the region?

- a. Permitting?**
- b. Enforcement?**
- c. Other?**

The question is extremely general since all human activities (permitting, enforcement, use and misuse of the environment, etc.) have some impact on ecological systems. Consequently, before you can begin to address the question, it is necessary to first identify what the impacts of the activity are and then determine the most scientifically

defensible and consistent way to measure them. Confounding this initial evaluation will be the fact that there often is a lag time (normally years) between when an activity occurs and when the benefit or harm of that activity is realized.

Within Michigan, there has been an attempt in recent years to begin to systematically and scientifically track and evaluate changes to the state's environment over time through the use of indicators. In 2003, the state released its environmental indicators report entitled, *State of Michigan's Environment 2003: Second Biennial Report*. The purpose of the document is to report on the quality and changes to the quality of the state's environment, based on scientifically supportable environmental indicators and using sound scientific methodologies. The first section of the report delineates the important ecological, physical, and chemical measures used to track the overall quality of the state's environment and fulfills the legislative mandate. The second section discusses additional state agency measures that are tracked to fulfill various state or federal environmental regulatory requirements. These latter measurements, while in and of themselves may ultimately detect a change in the overall quality of the environment, are designed more to assess how well a given regulatory program is functioning to correct or control more short-term, localized environmental problems. A total of 32 environmental and 18 programmatic indicators are tracked in the report.

This particular approach (i.e., to identify and measure change resulting from human and natural activities), however, has inherent problems. For example, a human activity that presumably has had and continues to have an impact on the Great Lakes' ecosystems has been the banning and regulated cleanup of polychlorinated biphenyls (PCB) beginning in the 1980s. We can demonstrate through measured changes of PCB concentrations in bald eagle feathers and blood that PCBs have dramatically declined in the Great Lakes bald eagle populations since the 1980s following the institution of regulations to ban and cleanup of PCBs. We also can show that the numbers occupied bald eagle nests and the success rate for bald eagle young to fledge per occupied nest has increased during the same time frame. While we may intuitively presume, we cannot conclusively prove (due to other confounding problems) a direct cause and effect that the observed changes in bald eagle populations are the direct result of the PCB regulatory activities that were instituted in the 1980s.

On the other hand, for some of the other state regulatory activities, we can show that certain regulations have had a direct impact on the improvement of the environment. For example, due to the removal of a contaminating underground storage tank and the subsequent cleanup of the localized environment where the tank once sat, the localized environment has been improved (i.e., contamination levels permanently reduced).

Qualitatively, we can demonstrate an improvement in the environment in both of the two examples above. Placing a dollar value on either one of them would be difficult and at best, highly subjective.

In terms of services, a problem exists in determining what is meant by the term, services. Ecosystems provide all sorts of services including life support to various components

within the ecosystem. For example, by services we could mean the energy made available from one ecosystem component to another; the creation and maintenance of habitat to support certain plant or animal species; or the real or perceived benefits that humans may derive either through a financial gain (e.g., selling of harvested trees), or from a feeling of pleasure from being able to spend time camping or fishing or even just looking at a beautiful scene. Given the above, it is difficult to address the question. Suffice it to say, I would suggest that most people do not normally think in terms of services provided in conjunction with ecosystems.

2. For each, what kinds of science-based information on the values of these impacts do you need for carrying out these activities?

Again, there is a problem with the question. Value is a highly subjective term and can mean many different things to different people. Consequently, it is not clear what is meant by the term value.

Despite this, there has been scientific literature around for over 30 years (e.g., Siena, 2002; Odum and Odum, 2000; Martinez-Alier, 1987; Odum, 1971) that attempts to objectively and systematically look at human activities, ecosystems, impacts to ecosystems, their economics and value through the use of energetics. Based on a cursory review of what has been (and what is currently being) looked at by the U.S. Environmental Protection Agency and its Science Advisory Board regarding concepts and methodologies to address ecosystem valuation, this type of literature appears to have been largely ignored.

3. How have the needs for this information been met in the past? Please give a short description, a reference or a website address to illustrate the kinds of approaches used.

Within Michigan State Government, the states' needs have not been met since the state does not subscribe to any uniform approach to consider ecosystem value.

4. Are there efforts underway now in your region, states, and tribes to develop capabilities to value the protection of ecological systems and services?

No. In addition, I am not aware that people – including state regulators and legislators - generally think along the lines of the question. There exists nothing, to my knowledge, in any of our state regulations or policies that speak to the development of capabilities to value or to place a value on how well or not ecosystems are protected.

5. Can you identify any documents or example projects that describe science-based information on the impacts of activities on ecological systems and services from your Region, states or tribes that you think that the Committee would benefit from considering in depth? Please give a short description, a literature reference or a website address for locating these documents.

Nothing from our region:

Martinez-Alier, J. 1987. *Ecological Economics*. Basil Blackwell, New York

Odum, H.T. 1971. *Environment, Power, and Society*. Wiley-Interscience, New York.

Odum, H.T. and E.P. Odum. 2000. The energetic basis for valuation of ecosystem services. *Ecosystems*, 3: 21-23.

Ulgiati, S. 2002. Energy flows in ecology and in the economy, pp 441-459. IN *Encyclopedia of Physical Science and Technology*, Vol 5., Academic Press, New York.

Region 7 Response

1. What activities in your Region, states, or tribes have impacts on ecological systems and services within the region?

Protection of Critical Ecosystems is one of the three strategic priorities in Region 7. As such, one of the goals of our Critical Ecosystems team is to identify linkages to programs and activities. In Kansas City, we have found that nearly all programs can be shown to exhibit a link and accordingly have some impact on ecological systems. These activities and associated impacts are likely to be the same across all Regions and include such functions as:

- OPA enforcement
- RCRA and Superfund Cleanup
- NEPA Review
- Risk Assessment Support
- WQS and TMDL development
- Water Grants

On the ecological risk assessment side we have provided support to NEPA in the past and have worked with the RCRA enforcement program to evaluate whether there are concerns at sites undergoing enforcement action. We also may be asked to play a larger role in brownfields work in the coming years.

2. For each, what kinds of science-based information on the values of these impacts do you need for carrying out these activities?

A review of these activities found that there was not a great deal of information regarding valuing impacts from a quantitative perspective. Programs indicated that where possible they did qualitatively consider the impacts to ecological systems, however emphasis is placed more often than not on a presence/absence determination. In coming to this conclusion there are several datasets that are evaluated. These include threatened and endangered species information from the four-state Heritage data sets, significant ecological resources data coverage developed by the Region 7 Environmental Assessment Team with the help of State partners, the Region 7 Inland Sensitivity Atlas the spans the Missouri River, and the forthcoming Critical Ecosystems Coverage (discussed in greater detail below).

3. How have the needs for this information been met in the past?

Since past activities have not relied on the quantitative valuation of impacts to ecological systems, there has not previously been a demand for this information. However, most staff indicated the utility of collecting and utilizing such information as is contemplated being developed through the Ecological Benefits Assessment Strategic Plan (being developed by EPA's National Center for Environmental Economics).

(Information and analytical) products we have developed in conjunction with our partner Missouri Resource Assessment Partnership (MORAP) have been presented at numerous conferences around the country. MORAP itself has a technical advisory board consisting of folks from the US Forest Service, USGS, Missouri Department of Natural Resources, Missouri Department of Conservation, Missouri Department of Transportation, the Natural Resources Conservation Service, the University of Missouri, and the American Bird Conservancy. For other products we have developed internally, we traditionally will interact with our States via conferences and meetings. On the larger products such as the identification of critical ecosystems, we have engaged them at the beginning of the process soliciting input on the approach.

4. Are there efforts underway now in your region to develop capabilities to value the protection of ecological systems and services?

As indicated previously, the bulk of the work conducted in Kansas City has focused on qualitative rather than quantitative efforts. However, our work in identifying the Region's Critical Ecosystems will help us prioritize ecosystems and may foster future efforts that could aid in quantifying ecological benefits, especially those in heavily agricultural areas.

Our Critical Ecosystems team has undertaken a two-year project to identify "critical terrestrial ecosystems" through an analytical approach based on ecological importance of resources and threats to those resources. An irreplaceability analysis of remnant areas is being performed, which will identify areas to where protection can most optimally achieve a set of conservation targets. Ecological significance is also being calculated for ecoregion subsections through a characterization of ecological diversity in each section coupled with other factors such as current and historic landscape function, and areas maximizing conservation opportunities. Threat is also assigned to ecological subsections using algorithms for urban land demand, agricultural stress, and potential threats from toxic sources. Together these layers comprise an Ecological Risk Surface. In the final analysis, areas with high irreplaceability that have high risk due to threats are the terrestrial critical ecosystems. This analysis should allow some relatively macro-level qualitative valuation/prioritization based on a comparison levels of risk, significance, and irreplaceability.

Region 7's approach to identifying riverine critical ecosystems utilizes an aquatic gap methodology and an aquatic ecological classification framework. Aquatic ecological system types and valley segment types with high quality are selected as priority assessment areas within ecological drainage units. The objective of these methods is to classify and map relatively distinct riverine ecosystems at multiple spatial scales in order to provide a geographic framework for effective biodiversity conservation. A few of the assumptions and principles forming the basis of this work, are: 1) Conserving a diversity of biotic and abiotic targets is the best and most efficient approach to conservation management of ecological processes that sustain aquatic biodiversity; 2) priorities should be placed on preserving distinctive ecosystems with the highest ecological integrity and

sustainability; and 3) watersheds are a fundamental conservation unit and define ecosystems for riverine systems.

John Madras, Policy Coordinator, for the Air and Land Protection Division, of the Missouri Department of Natural Resources indicated that Missouri has efforts underway to value the protection of ecological systems and services through the department's Natural Resource Damages (NRD) program. Natural Resource Trustees are responsible for restoring, replacing, rehabilitating or acquiring the equivalent of injured natural resources to ensure that the public is fully compensated. Trustees accomplish this by assessing damages and seeking compensation from potentially responsible parties in the form of restoration projects, monetary payment or a combination of both. The department primarily works with the Department of the Interior as co-trustees for injured resources in the State of Missouri. There are no state or federally recognized tribes within Missouri, but there is a Tri-State Mining District partnership that includes trustee representatives from Missouri, Kansas, Oklahoma; three different U.S. Fish & Wildlife Service regions; and eight Native American tribes. There are numerous methodologies used for valuation purposes. A listing of these and other applicable documents used by the state are found at the following address www.astswmo.org/Publications/CERCLA in the document entitled "Natural Resource Damages Documents and Resource Listing."

Theresa Hodges, Director of the Bureau of Environmental Field Services with the Kansas Department of Health and Environment (KDHE) indicated that their State did attempt to develop an approach for evaluating the net benefits of classifying (i.e. designating uses and setting water quality standards for) non-flowing streams that lack any known T & E species, and lack any NPDES discharges, but that do have remnant pools that serve as important ecological refugia. After announcing two (2) Requests for Proposal (RFP) which were unsuccessful, KDHE hosted a workshop which included the following: a consultant (who had expressed some interest in the RFP), an economist from the consulting firm, 3 persons from academia, USGS, Kansas Wildlife and Parks, staff from EPA Region 7, staff from EPA-Cincinnati, and KDHE. The group looked at techniques for estimating environmental benefits of classification/restoration (estimating ecological efficacy and estimating economic value); techniques for measuring costs of classification/restoration and other economic issues. In the end, it was determined that the cost and reliability/acceptance of methods was not available to the State. It was not pursued further.

Kansas is also involved in a Natural Resource Damage Assessment in the Southeast part of the state. This assessment includes the states of Missouri and Oklahoma and several tribes. The State has used the following two approaches:

Habitat Equivalency Analysis (HEA) A HEA is an approach used for valuation of injured natural resources. This methodology assesses the value of lost services of the natural resource such as terrestrial, surface water and groundwater. Appropriate compensatory restoration projects are selected and scaled so that the

replacement services are equal to the lost services. The damages are the monetary value attributed to the injury.

Resource Equivalency Analysis (REA) A REA is a variation of a HEA that enables Trustees to value or quantify injury to a specific resource such as a certain number of dead mussels or fish or a number of birds with impaired reproduction capabilities. The REA allows for inclusion of direct injury from the dead bodies and indirect injury from lost progeny. The two approaches for compensation using REA are cost of restocking or habitat enhancement.

5. Can you identify any documents or example projects that describe science-based information on the impacts of activities on ecological systems and services from your Region, states or tribes that you think that the Committee would benefit from considering in depth?

There are a number of recent projects that Region 7 and its partners have worked on that may aid the committee. They include:

1. **State-based Ranking of Watersheds Using the Synoptic Assessment of Wetland Function Model.** 2003. The Missouri Resource Assessment Partnership. Columbia, Missouri
2. **Conservation Opportunity Areas (COAs) Data Layer:** The COA coverage represents areas that are more than 75 meters into the interior of land cover patches and 75 meters away from roads. They are potentially good areas to implement conservation management because they are relatively large patches of natural land cover that are fairly distant from roads. This layer represents patches of grassland (or forest, or forest-grassland mosaic) that meet those criteria.
3. ***An Ecoregion-based Conservation Assessment for EPA Region 7.*** 2001. The Missouri Resource Assessment Partnership. Columbia, Missouri.
4. ***Regional Environmental Assessment.*** 2002. U.S. Environmental Protection Agency, Region 7. Kansas City, KS:
<http://r7atwork.r07.epa.gov/intranet/informationources/r7gis/EA2000/index.html>

Part 4 of the above report is an ecological assessment, entitled:

Status and Trends of Ecological Resources in the Central Plains, Ozark Plateau and Mississippi Alluvial Basin of the U.S. 2002. U.S. Environmental Protection Agency, Region 7. Kansas City, KS:

5. **EcoMapper:** a web-based tool that EPA program staff can utilize to query ecological resource information near facilities and sites:
<http://bragg.r07.epa.gov/ArcIMS/EcoMapper12/viewer.htm>

6. **James River Initiative**, funded in part by Region 7:
<http://www.jrbp.smsu.edu/about.htm>

Additionally, John Madras, Policy Coordinator, for the Air and Land Protection Division, of the Missouri Department of Natural Resources indicated that the ASTSWMO website contains numerous documents that have been prepared by the NRD Focus Group with regards to compensation for injured natural resources, including "Cooperation in the Natural Resource Damages Process; Initiation, Assessment and Restoration," and, "Compendium of Groundwater Valuation Methodologies" and Compendium of Restoration Methodologies." Madras also indicated that the Interstate Technology Regulatory Council (ITRC) has also been investigating this issue and recently released a white paper/case study entitled "Making the Case for Ecological Enhancements." Kansas also cited the same resources.

Region 8 Response

1. What activities in your Region have impacts on ecological systems and services?

Activities in Region 8 that have impacts on ecological systems and their services include:

- Smart growth activities
- Oil and gas development
- Water Supply Projects
- Transportation Projects (creation of new roads, expansion of existing ones and cumulative impacts)
- Wetlands mitigation, restoration and banking
- Hazardous Waste Site clean-ups (both CERCLA and RCRA)
- Permitting (air and water)
- Enforcement (e.g., SEPs)
- TMDL development
- WQS setting
- Forest management
- Mining
- Concentrated Animal Feeding Operations
- Agriculture
- Sediment loading

As part of the NEPA process, EPA reviews the Environmental Impact Statements that are being prepared by other federal agencies like the U.S. Forest Service, Bureau of Land Management, Bureau of Reclamation, Federal Highways, Department of Transportation, Bureau of Indian Affairs and Corps of Engineers.

2. For each, what kinds of science-based information on the values of these impacts do you need for carrying out these activities?

In order to determine the type of science-based information that would be needed, the decision criteria needs to be identified first. Obtaining a measurable environmental result is dependent upon the decision criteria. Many of EPA's regional programs were not designed with the goal of assessing the impacts to ecosystem values and services. It becomes challenging to make the connection between the specific value or service and the particular measure. Currently, we use monitoring to make the statement that we have X miles of a particular stream that is in compliance with the standards and how that directly relates to the value of that ecosystems and its services in unclear.

For carrying out valuations associated with water projects, aquatic life use assessment could be used to assess the aquatic ecological systems along with the evaluation of biocriteria, bioassessment tools, physical habitat indicators, diagnostic bioindicators.

For assessing the ecological impact from hazardous waste activities, analytical data, biological community data, toxicity data and bioaccumulation data are used to determine the potential impacts of chemical substances on ecological receptors within the hazardous waste site programs.

3. How have the needs for this information been met in the past?

Some of these needs have been met through using EPA's aquatic life criteria or state water quality standards for the protection of aquatic life. In Section 404 of the Clean Water Act, wetlands are protected as waters of the U.S. and the 404 (b) (1) guidelines set the hierarchy for evaluating work in wetlands. Those are avoidance, minimize, restore and replace and there is mention of functional equivalence. However, typically impacted wetlands are restored based on acreage and there is little consideration for the ecological impact of fragmentation.

There are a number of reasons why quantitative valuation studies have not been conducted in the past. One of which is the lack of a standard or accepted methodology for performing valuations. The National Research Council is working on the report: "Assessing and Valuing the Services of Aquatic Ecosystems." The committee for this study will evaluate methods for assessing services and the associated economic values of aquatic and related terrestrial ecosystems. EPA should take this information and consider it before making decisions about ecosystem valuation and identify standard and consistent methods to be used throughout the various programs. It is important to choose an approach that will be well accepted outside of the Agency, possibly a collaborative effort with other Federal agencies, States and tribes in adopting a standard approach.

The data collection activities in support of the ecological risk assessments for the hazardous waste programs have been primarily been supplied by contractors. However, in Region 8, in-house capabilities have dramatically increased.

4. Are there efforts underway now in your Region to develop capabilities to value the protection of ecological systems and services?

There are efforts to utilize ecosystem assessment methods which may be on the way in developing a tool to value the protection of ecological systems and their services.

For assessing aquatic resources, as reference conditions and biocriteria are better established and State programs come together, this information will be integrated into the protection of aquatic resources.

Within the hazardous waste sites programs, there are a few recent examples in which biomonitoring activities are being initiated and designed to assess the impact of EPA activities as a result of remedial construction. No data has been collected yet.

5. Can you identify any documents or example projects that describe science-based information on the impacts of activities on ecological systems and services from your Region that you think the Committee would benefit from considering in depth?

Apparently, EPA's Office of Federal Activities prepared a document titled: *Evaluating Cumulative Impacts from Highways*. Also, DOI has prepared an analysis on the recreational value of game animals. NOAA and DOI have also prepared Natural Resource Damage Assessment calculations for estimating the cost of an injury to a trust resource and these calculations are used typically at hazardous waste sites when a Natural Resource Damage claim is going to be filed.

6. Other comments

How is conservation or preserved quantitatively evaluated or compared to the evaluation once the ecosystem is impacted or lost and needs to be mitigated. How are these comparisons determined?

There is a real need for the development of ecological thresholds, screening levels and thresholds that provide some indication of incremental change.

What is the definition of a **significant impact** for different ecosystems?

Where in the Region do we have intact ecosystems? How can we maintain and improve the quality of ecosystems in targeted areas of ecological significance?

There is a need for maps that identify areas for preservation.

NEPA regulations has language requesting performance of a cost benefit analysis and those analyses are typically only conducted on behalf of human health. There does not appear to be a recommended mechanism or approach for conducting a cost benefit analysis for ecosystems and their services. The economics related to environmental impacts appears to focus on the loss of money, time, or human lives with the absence of the recommended transportation improvements.

Some language included in environmental impact statements may indicate that 0.5% of the particular ecosystem is being impacted and further concludes that amount of loss is not significant, but the quantitative data to support the statement is missing.

The valuation of habitat may be a challenge for EPA since EPA does not have the authority to regulate habitat.

How can indirect ecological consequences be accounted for in the planning process of these various NEPA activities?

Region 9 Response

1. What activities in your Region, states, or tribes have impacts on ecological systems and services within the region?

a. Permitting?

Permit issuances/renewals/mods and corrective action at RCRA/CERCLA sites.

b. Enforcement?

Corrective actions at RCRA/CERCLA sites, enforcement orders, SEPs

c. Other?

Brownfield projects, solid waste program projects, UST/LUST projects

In the Office of Federal Activities, Cross Media Division provides formal EPA review and comments on major Federal Actions taken by other Federal Agencies. Projects include transportation projects (e.g., highways, airport expansions); land, fishery, grazing, and recreation management plans; water supply projects, flood control projects, habitat conservation plans, timber harvests, subdivision developments, harbor expansions, dredging projects, power plants, pipelines, and mining. To the degree that our comments influence the final outcome of the project, they affect the impacts to ecological systems and services.

Within the Superfund program in Region 9, there are no activities intended to measure impacts on ecological systems and services. The ecological risk assessments done for Superfund sites have a narrow focus on site-specific toxicological effects to a few organisms. Neither responsible parties nor project managers are inclined to consider cumulative effects on ecological systems at a scale greater than site boundaries.

In the water program, the following activities are involved:

- a. Permitting: TMDLs, NPDES, permits relate to ambient water quality, i.e., the water that all living things need and use, in rivers, lakes, wetlands, ocean.
- b. Enforcement: Again, these programs seek to protect ambient water quality
- c. Other: Underground Injection Control program assumes a relationship between subsurface and surface water quality.
Setting water quality standards characterize “clean water” for all water bodies, identifying the need to control specific contaminants for certain water bodies, depending on the human activity impacting the watershed.

In water, water quality standards are established based on contaminant loads that may impact aquatic life, which implies that there is value in maintaining/sustaining the ecosystem.

Watershed approaches to Total Maximum Daily Load programs acknowledge that the ecosystem as whole must meet standards, and that a reach-by-reach approach may not be sufficient for ecosystem function to be maintained. While local efforts to improve water quality are encouraged for administrative and perhaps political reasons, they must be related to the hydrologic characteristics of the watershed. Within this framework, the requirement that water bodies sustain aquatic life implies that ecosystem health has a socio-economic value.

Endangered Species Act consultations with Fish & Wildlife Service on various aspects of water quality programs are also underlain by the assumption that the capacity of water and water-related habitats to sustain populations of threatened and endangered wildlife has societal value.

Deposition of air-borne contaminants in water bodies requires that we extend our perspective out to airsheds as well as watersheds

2. For each, what kinds of science-based information on the values of these impacts do you need for carrying out these activities?

Although research by other federal agencies, universities and research organizations continues, there are many gaps in the science-based information regarding the causal connection and extent of impact from various land management practices and federal actions.

Examples (examples are based upon knowledge of Forest Service and Bureau of Reclamation projects):

1. Ecological effects of harvesting old-growth forest trees up to 30 inches diameter-at-breast-height (dbh) versus 24 inches dbh.
2. Ecosystem and endangered species effects of different grazing management systems, especially within wet meadows and riparian areas; e.g., rotation systems, length and season of grazing, level of grazing utilization allowed.
3. Level of protection provided by different habitat conservation management strategies. For instance, preservation of limited high quality habitat, preservation of larger quantities of moderate quality habitat, restoration of poor habitat, preservation and creation of habitat corridors.
4. Effects of fire retardants and fire fighting activities on fisheries, endangered species, watersheds.
5. Effectiveness and impacts of different fuel management/fire protection methods, such as defensible fuel profile zones, selection harvests, group selection harvests.

For the risk assessments done at permits/corrective action sites we generally need to know if regulated TES species are currently or have been historically present at the site. Some permitting sites on tribal land are covered under NHPA consultations, so there are intrinsic values that need to be taken into consideration. It would be helpful if there were ways to present the value of ecosystems/ecoservices to the public in readily

understandable terms. Also need better definition of ecological system/ecological services. The current definitions in the SAB documents tend to be broad when looked at from the field. More problematic is how to motivate a positive response to the issue. The trend has been to look only at what is regulated (i.e., the minimum) and often it seems that mankind tends to look at natural resources only in terms of direct use.

The TMDL process seems like the best way to interest Superfund project managers (with aquatic contamination) in the value of protecting ecological systems. Ultimately, this would require ways to measure the impact of a Superfund sites on ecological systems and services relative to other stressors in the Region.

In the context of the water program, water scarcity throughout the Region (with the exception of Hawaii) brings ecosystem needs in direct conflict with human uses. Diversion of water from watercourses, sending the resource out of its original basin causes impacts that weren't on the table when the policy was set and put in motion. We need robust analysis to help us understand the ecosystem implications for this loss of resource. We also need help connecting the environmentally-related human problems that we face to the major hydrologic changes that we have made throughout the Southwest Region.

We also need to understand the relationship between air deposition of contaminants to reduced ecosystem function, especially in the Central and Imperial Valleys.

3. How have the needs for this information been met in the past? Please give a short description, a reference or a website address to illustrate the kinds of approaches used.

The majority of information is obtained from review of the Draft and Final Environmental Impact Statements and technical appendices developed by the action Agency. We also obtain information from scientific journals, sources given to us by other agency contacts, the websites for specific agencies and scientific organizations, and general reading/research. Individual reviewers try to develop their expertise in specific issue areas such as water supply, mining, forest management practices, land management; via personal reading and research of relevant literature, inasmuch as time and workload allow.

It would be useful to have other, easily accessible, information that could substantiate or rebut the assumptions and evaluations made by action Agencies in regard to the potential impacts on ecological systems and services.

For the site work, we use EPA risk assessment methodology and guidance. Also tap into expertise from USFWS and other agencies for particular species/habitats.

We have the alternatives analysis required by the NEPA process, which helps us to evaluate a project's impact on the ecosystem. All too often, however, the alternatives presented focus too narrowly to reveal larger-scale ecosystem impacts. Even cumulative

impacts analysis can keep an eyes-to-the-ground approach by evaluating each identified potential action in relation to the preferred alternative rather than providing a picture of how all the potential actions plus the proposed project may impact ecosystem function.

In addition, there is a tendency to focus the Environmental Impact Statement around the preconceived “best” project, evaluating impacts to the ecosystem at a very local level. The assumption is that the historic impact to the ecosystem has little bearing, because our preference is to keep on doing what we have been doing.

Alternatives analysis should be more rigorous. It should describe existing conditions relative to ecosystem function (answering the question: Is it able to function?) as background. Then, even if the decision to go forward with a project is ultimately not the best environmental decision, there would be some thought and discussion to how the ecosystem within which the project is located could or should work. Eventually, perhaps, this information would start to inform alternatives analysis, resulting in better projects.

4. Are there efforts underway now in your region, states, and tribes to develop capabilities to value the protection of ecological systems and services? Please give a short description, a reference or a website address to illustrate these efforts.

The Office of Federal Activities may have efforts underway at a national level. Land management agencies, such as the Forest Service, Bureau of Land Management, and Bureau of Reclamation, have extensive research programs trying to address the management effects on the value of ecological systems and services under their care. See below.

There are no efforts within the Superfund Program to develop capabilities to value the protection of ecological systems and services.

One respondent in the water program replied that she does not know of direct efforts to change “business as usual”, but certain activities occurring in the Region point in that direction, for example, the population pressure coupled with the fact of water scarcity is forcing people at all levels to consider the sustainability of the human activities. Ecosystem value inevitably comes into the discussion. The value of “open space” is acknowledged throughout the region. “Smart growth” has not taken hold the way it has, say, in the Pacific Northwest (i.e., the City of Portland), but there is definitely more interest in in-filling developed areas, public transportation, “green” building and other public planning practices that are informed by our understanding of the need to protect the ecosystem.

5. Can you identify any documents or example projects that describe science-based information on the impacts of activities on ecological systems and services from your Region, states or tribes that you think that the Committee would benefit from considering in depth? Please give a short description, a literature reference or a website address for locating these documents.

Forest Service/Bureau of Land Management work on maintaining and enhancing ecological functions and functional equivalency of specific mitigation measures.

Forest Service website: www.fs.fed.us

Bureau of Reclamation website: www.usbr.gov

Bureau of Land Management website: www.blm.gov

Johnston Atoll - JACADS permitting/closure and Johnston Atoll USAF/DTRA corrective action projects. JACADS permitting and closure have risk assessments either completed or in progress. JA corrective action work has completed risk assessments and biomonitoring plans which will be implemented.

Selenium TMDL for the Grassland Ecological Area and the San Joaquin River is one of the first agricultural TMDLs in the nation. The goal is to protect wildlife and improve the health of the remaining natural ecosystem of the Central Valley. Other TMDL efforts in the Region include ecosystem parameters such as temperature and sediment. The interest in these parameters relates directly to the restoration of ecosystem function.

California Toxics Rule negotiations with Fish & Wildlife Service have led EPA Region 9 Water Division to provide sound scientific support for California-specific water quality criteria for selenium.

EPA Las Vegas (ORD) participated in a world-wide effort to characterize the resources and current uses of the San Pedro River Watershed. The San Pedro, the last free-flowing river, and its riparian corridor crossing the U.S. –Mexico border, is an internationally recognized region of biological significance. Models were used to predict impacts on the ecosystem from various levels of pressure from human population growth. Region 9 would like to build on that work to support a characterization of the entire watershed with Mexico using state-of-the art imaging techniques to acquire water quality and ecosystem information.

EPA (ORD) has supported the work of the Southwest Research Center for Environment and Policy (SCERP), to characterize various elements within in the Tijuana Watershed, locating extant information from the U.S. and Mexico within a Geographical Information System. A binational effort to provide this information to watershed residents and query them as to their concerns for the future of the watershed is currently underway. The balance here between ecosystem function and human impact is particularly lopsided, with 95% of the water consumed coming from outside the basin and continuing pressure from a high urban growth rate.

Region 10 Response

1. What activities in your Region, states, or tribes have impacts on ecological systems and services with the region?

- Regulatory review (i.e. CWA Section 404, dredge material management/ocean dumping, NEPA, WQ standards, TMDLs, etc.)
- Remediation (i.e. Superfund, underground storage tanks, RCRA/CERCLA, Brownfields, UST, etc.)
- Enforcement (CWA Section 404, NPDES, etc.)
- Invasive species (impact assessment, inventory, management, public outreach)
- Grants review/financial assistance (watershed initiative, wetland plan development, NAWCA, RGI, 319)
- Land use planning (assistance, resource inventory/assessment)
- Ecosystem assessment, restoration/enhancement, management and monitoring (technical/financial assistance, training/education, tools/methods development)
- National Estuary Program (Puget Sound, Tillamook Estuary, Columbia River Estuary) – technical/financial assistance
- Oil and gas development
- ESA/CWA coordination
- Program interactions with other federal agencies (i.e. FERC, mining, FAA/Dept. Transportation, Forest Service, NRCS, BLM, Bonneville Power, etc.)
- Outreach, training, education, research design
- Integrated pest management (technical/educational literature, outreach)

2. What kinds of science-based information on the values of these impacts do you need for carrying out these activities?

- Watershed-based qualitative and quantitative resource inventory, impact assessment and monitoring protocols.
- Resource restoration design, implementation, long-term stewardship/management and monitoring.
- Inventory, life history/dispersal mechanism(s), impact assessment, monitoring and management (including biological controls) of invasive species.
- Cumulative and secondary/indirect (impacts beyond “footprint” of project/activity impact assessment.
- Lesser impacting alternatives (i.e. incorporation of bioengineering in construction design; naturoscaping/bioswales for stormwater quality management, etc.).
- Ecological risk assessment, toxicity analysis.
- Isolated waters & headwaters/intermittent streams functional assessment (individual and cumulative water quality/quantity and other functional contribution(s) to down-gradient navigable waters).
- Effects of hybrid poplars on riparian/aquatic/wetland ecosystems.

- Potential for using macro-invertebrates as wetland assessment and monitoring tool.

Table of Acronyms

CALM: Consolidated Assessment and Listing Methodology

CBP: The Chesapeake Bay Program (CBP) awards grants to reduce and prevent pollution and to improve the living resources in the Chesapeake Bay.

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act

dbh: diameter-at-breast-height

EIS: Environmental Impact Statement

EMAP: Environmental Monitoring and Assessment Program is designed to use environmental monitoring data from multiple spatial and temporal scales to assess ecological condition and forecast potential risk to our natural resources.

ETAGS/BTAGS: Ecological/Biological Technical Assistance Groups

FHWA: Federal Highway Administration

NEPA: National Environmental Policy Act requires federal agencies to integrate environmental values into their decision making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions. To meet this requirement, federal agencies prepare a detailed statement known as an Environmental Impact Statement (EIS).

NPDES: National Pollutant Discharge Elimination System

NOAA: National Oceanic and Atmospheric Administration

OPA: Oil Pollution Act of 1990

OST: EPA Office of Science and Technology

PBT: Persistent Bioaccumulative and Toxic (PBT)

RCRA: Resource Conservation and Recovery Act of 1976

SAV: Submerged Aquatic Vegetation

TMDL: Total Maximum Daily Load, is a tool for implementing water quality standards and is based on the relationship between pollution sources and in-stream water quality conditions.

VIMS: Virginia Institute of Marine Science.

WQS: Water Quality Standards

Appendix 1: Definition of Supplemental Environmental Project (SEP) and Background on SEPs from *Beyond Compliance: Supplemental Environmental Projects* (EPA 325-R-01-001) January 2001

INTRODUCTION

Americans have the right to air that is clean, water that is safe to drink, food that is free from dangerous pesticide residues, and communities that are free of hazardous wastes. The United States Environmental Protection Agency (EPA) helps protect these rights through fair, effective enforcement of federal environmental laws, such as the Clean Air Act, Clean Water Act, Safe Drinking Water Act, Federal Insecticide, Fungicide and Rodenticide Act, Toxic Substances Control Act, and Resource Conservation and Recovery Act.

If the Agency believes that an individual or company has failed to comply with Federal environmental laws, it may initiate an enforcement action. Enforcement actions are taken in order to compel the individual or company to return to compliance, and deter others from violating these laws. In settling an enforcement action, EPA usually requires individuals or companies to pay cash penalties and to take injunctive relief -actions needed to eliminate noncompliance, correct environmental damage, and restore the environment.

In addition, enforcement settlements may also include Supplemental Environmental Projects (SEPs). SEPs are actions taken by an individual or company that are in addition to what is required to return to compliance with environmental laws. SEPs benefit public health or the environment. They offer a unique opportunity to further our Nation's goals of ensuring clean air and water, safe food, better waste management, and expanding the public's right to know about their environment. SEP projects have existed since the early 1980s, and their use has increased steadily through the 1990s. For instance, while more than 200 SEPs were approved in 1992, a total of 336 SEPs were agreed to as part of 197 case settlements in fiscal year 1999. The total monetary value of these SEPs was over \$230 million. Approximately one half of these projects were classified as pollution prevention or pollution reduction activities.

This booklet offers a description of SEPs, highlights a number of SEPs that have either been completed or are currently in progress, and discusses the benefits to public health and the environment that can be achieved through these projects.

What is a SEP?

Through its SEP policy, EPA allows a violator of environmental laws to do more than simply correct its violation(s). A SEP is an environmentally beneficial project that a violator voluntarily agrees to perform, in addition to actions required to correct the violation(s), as part of an enforcement settlement. When volunteering to perform a SEP, a company must show that it can and will complete the project, and must provide all funds

used to finance the project. EPA provides oversight to ensure that the company does what it promises to do. EPA, however, does not manage or control the funds.

How do SEPs benefit the public?

SEPs are designed to protect and improve the environment and public health, beyond that achieved by compliance with applicable laws. SEPs may directly or indirectly benefit the public by preventing pollution or addressing environmental justice concerns. Finding more effective ways to address community environmental concerns that result from a company's violations is a major objective of EPA's SEP policy. Not only can community involvement assure greater consideration of community needs in specific SEPs, but it can lead to increased communication and trust between all concerned parties—a foundation for long-term environmental improvement.

Who may do a SEP, and what is the benefit for the violating company?

In addition to correcting the violation(s), a violating company may propose one or more SEPs as part of a settlement. As the examples in this report demonstrate, SEPs have been implemented by large and small companies, hospitals, federal facilities, and state and local governments. To gain approval for conducting a SEP, a company must identify and demonstrate a willingness and ability to implement an appropriate project that primarily benefits public health or the environment. These projects must provide benefits beyond what compliance with the law requires.

If a company performs a SEP, EPA may reduce the penalty assessed. In addition to this economic incentive, a company may improve the quality of life for the surrounding community and as a result, build a better relationship with the community.

What are the categories of acceptable SEPs?

As described below, EPA has seven specific categories of projects that can be acceptable SEPs. In addition to these SEPs, EPA allows companies to perform other types of projects that have environmental or public health benefits.

Pollution Prevention: These SEPs involve changes that reduce or eliminate some form of pollution, or that reduce a pollutant's toxicity prior to recycling, treatment, or disposal. Examples include use of less toxic materials to make products, modifications in the production process to reduce material losses, changes in product design which require less polluting processes, or improved housekeeping. EPA places a high priority on pollution prevention approaches, since these reduce the potential for future pollution, and may lead to more widespread, environmentally-beneficial changes in their business or industry activities. As a result, EPA may allow greater mitigation in penalties for pollution prevention projects than for other SEPs.

Pollution Reduction: These SEPs are similar to pollution prevention SEPs in terms of outcome. But instead of eliminating a source of pollution, they reduce the amount or

danger of the pollution which reaches the environment. Examples include improved treatment or control of pollutants and recycling and reuse of chemicals or materials.

Public Health: Such SEPs may include examining residents in the community put at risk by the violations to determine if anyone has experienced health problems related to the violation, as well as related medical treatment or rehabilitation therapy.

Environmental Restoration and Protection: These SEPs improve the condition of the land, air, or water in the area damaged by the violation. For example, by purchasing land or developing conservation programs for the land, a company could protect a natural habitat for wildlife or a source of drinking water. Beyond preservation, such a SEP might involve restoring natural areas that are vital to long-term protection of the environment or public health.

Assessments and Audits: Any violating company may agree to examine its operations for pollution prevention opportunities, and determine if it can reduce the use, production, or generation of hazardous materials and other wastes. These audits go well beyond standard business practices. In addition, small businesses (with less than 100 employees) or small communities (less than 2,500 residents) can receive credit for agreeing to conduct audits to determine their compliance with environmental laws in order to avoid future violations.

Environmental Compliance Promotion: These are SEPs in which the violator helps other companies achieve compliance and reduce pollution related to the type of violation. For example, a company which violated the Clean Air Act may train other companies on how to comply with the Act.

Emergency Planning and Preparedness: These SEPs provide technical assistance and training to state or local emergency planning and response organizations to help them better respond to chemical emergencies. For example, a company may provide a local fire department with additional equipment to deal with a hazardous waste situation. Your participation can have a beneficial impact in your community. adopted as part of final settlement agreements when they fall within the scope of the SEP policy. cases, SEP ideas have been modified to accommodate community priorities. strongly encouraged by EPA to participate in the SEP process. You can:

- Attend public meetings to suggest SEPs or comment on proposed SEPs.
- Provide comments on a proposed settlement published in the Federal Register.
- Learn more about SEPs by visiting EPA's SEP Webpage at <http://www.epa.gov/oeca/sep>.

How can I participate in the SEP Process? SEPs proposed by communities have been In other If you are interested, you are Other Types of Projects: Other acceptable SEPs would be those that have environmental merit but do not fit within the categories listed above. These types of projects must be fully consistent with all other provisions of the SEP.

EPA's May 1998 SEP Policy

Environmental Restoration and Protection (pages 8-9) states that:

"In some projects where the parties intend that the property be protected so that the ecological and pollution reduction purposes of the land are maintained in perpetuity, the defendants may sell or transfer the land to another party with the established resources and expertise to perform this function such as a state park authority. In some cases, the U.S. Fish and Wildlife Service or the National Park Service may be able to perform his function." This was the case with the Ashland Oil SEP.

Calculation of Final Penalty (page 12) states that:

As a general rule, the net costs to be incurred by a violator performing a SEP may be considered as one factor in determining an appropriate settlement amount. In settlements in which defendants/respondents commit to conduct a SEP, the final settlement penalty must equal or exceed either: a) the economic benefit of noncompliance plus 10% of the gravity component; or b) 25% of the gravity component only; whichever is greater.

SEPS must go through a five step process (pages 13-17) which I have simply summarized here as:

- Step 1 Settlement Amount Without a SEP
- Step 2 Minimum Penalty Amount With a SEP
- Step 3 Calculate the SEP Cost
- Step 4 Determine the SEP Mitigation Percentage and then the Mitigation Amount
- Step 5 Final Settlement Penalty

Appendix 2: Acknowledgement of Regional Contributors to this Survey

EPA Survey Respondents

Dana Allen. Environmental Engineer. NEPA Team. EPA Region 8.
Ned Black. Regional CERCLA Ecologist/Microbiologist. EPA Region 9.
Mary Blevins. Environmental Scientist. EPA Region 9.
Brad Crowder. Economist. NEPA Team. EPA Region 8.
Rick Durbrow. Program Analyst. Office of Policy and Management. Region 4.
Michael A. Fritz. Coordinator, Living Resources Subcommittee, EPA Chesapeake Bay Program Office.
Laura Fujii. Life Scientist. Federal Activities Office. EPA Region 9.
Simeon Hahn. NOAA Coastal Resource Coordinator to EPA Region 3.
Dale Hoff. Ecotoxicologist. Technical Assistance Unit. EPA Region 8.
Roselyn Johnson. Life Scientist. EPA Region 5.
Norm Kulujian. ORD Hazardous Waste Technical Liaison to EPA Region 3.
Deborah Lebow. Environmental Protection Specialist. NEPA Team. EPA Region 8.
Barbara Mazur. Ecologist. Office of Strategic Environmental Analysis. EPA Region 5.
Eugenia McNaughton, Environmental Scientist, Water Division, Region 9
Dave McDonald, New England Regional Laboratory, Region 1.
Holly Mehl. Ecologist. Environmental Services Division. EPA Region 7.
Jill Minter. Life Scientist. Water Quality Unit. EPA Region 8.
Gregory Oberley. Environmental Scientist. NEPA Team. EPA Region 8.
John Perrecone. Region 5
Robert Pope. EPA Region 4.
Jeffrey Robichaud. Chief, Data Integration and Support Operations Branch.
EPA Region 7.
Ralph Rogers, Regional Wetland Ecologist, Region 9
David Ruiter. Environmental Scientist. Wetlands and Watersheds Unit. EPA Region 8.
Sharon Thoms. Life Scientist. EPA Region 4.
Christine Yost. Regional Indian Program Coordinator. EPA Region 2.

State Contacts of the SAB Staff Office Who Have Been Following the SAB C-VPESS Activities:

Keith G. Harrison, M.A., R.S., Cert. Senior Ecologist
Executive Director, MI Environment Science Board
Special Projects Coordinator, MI Dept. of Environ. Quality
Michigan's Science Representative, USEPA Reg 5 STSN

Nicholas A. DiPasquale, Deputy Secretary, Office of Air, Recycling and Radiation Protection, Department of Environmental Protection, State of Pennsylvania