

Socioeconomic Analyses and Tools for Restoration



USGS Social and Economic Analysis Branch

NRDAR Seminar Series

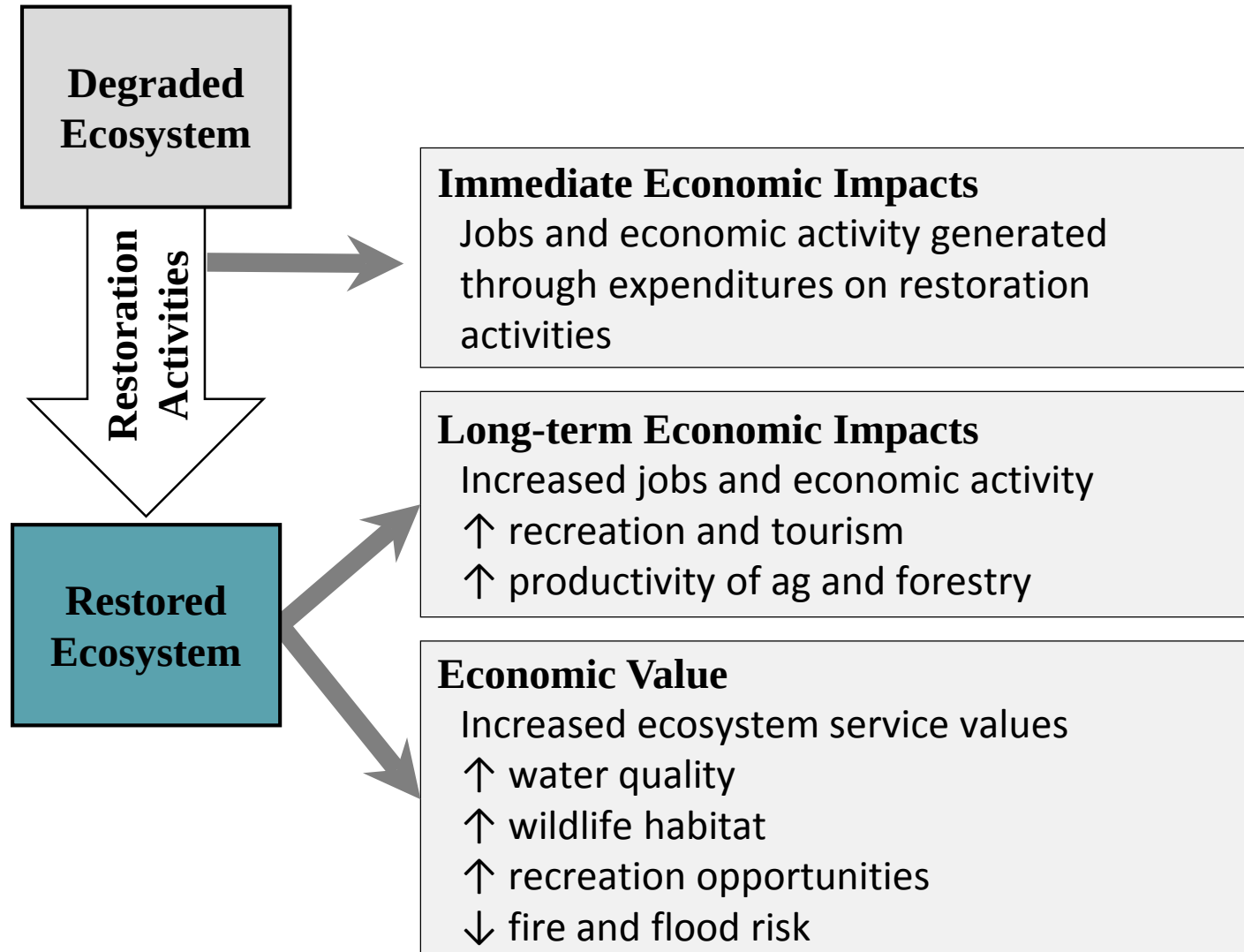
May 8, 2017

USGS Social and Economic Analysis Branch

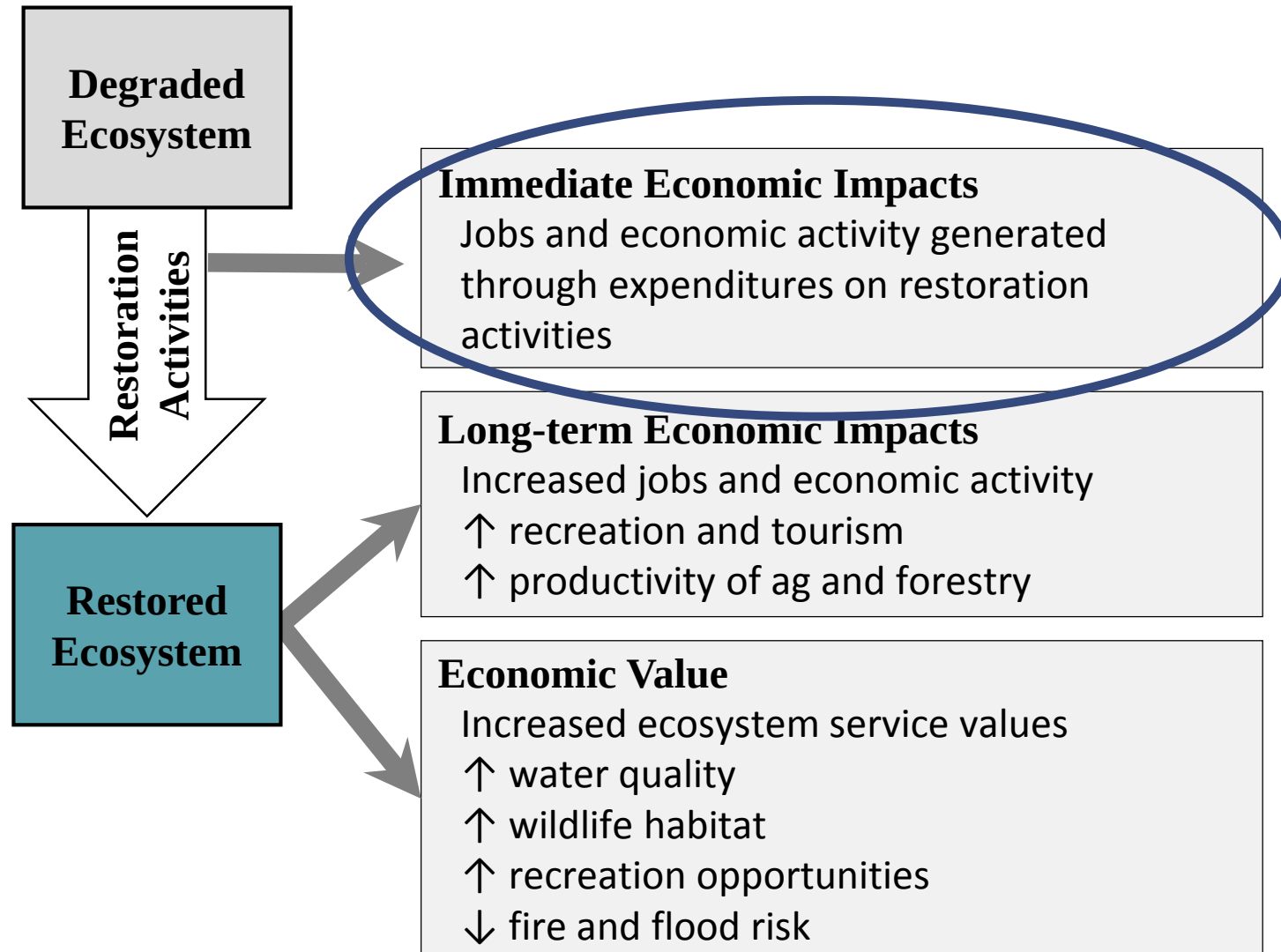
- USGS Fort Collins Science Center
- Economists, sociologists, and policy and institutional analysts
- Restoration relevant research:
 - Economic impacts of restoration projects
 - Nonmarket and ecosystem service valuation tools and analyses
 - Community engagement, risk perception, and behavior studies
 - Institutional analysis of cultural ecosystem service knowledge use in federal decision making



Economic effects of ecosystem restoration



Economic impacts of ecosystem restoration

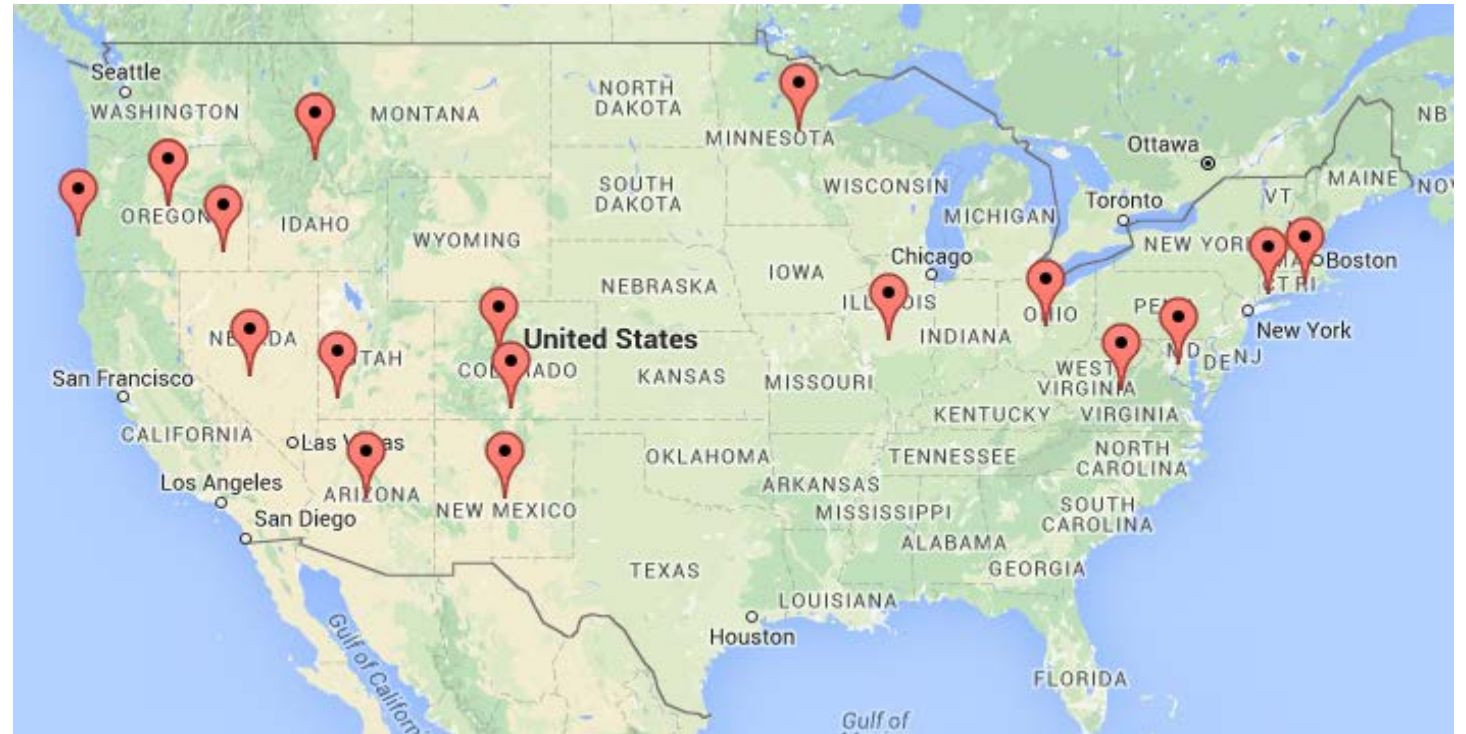


Economic impacts of ecosystem restoration

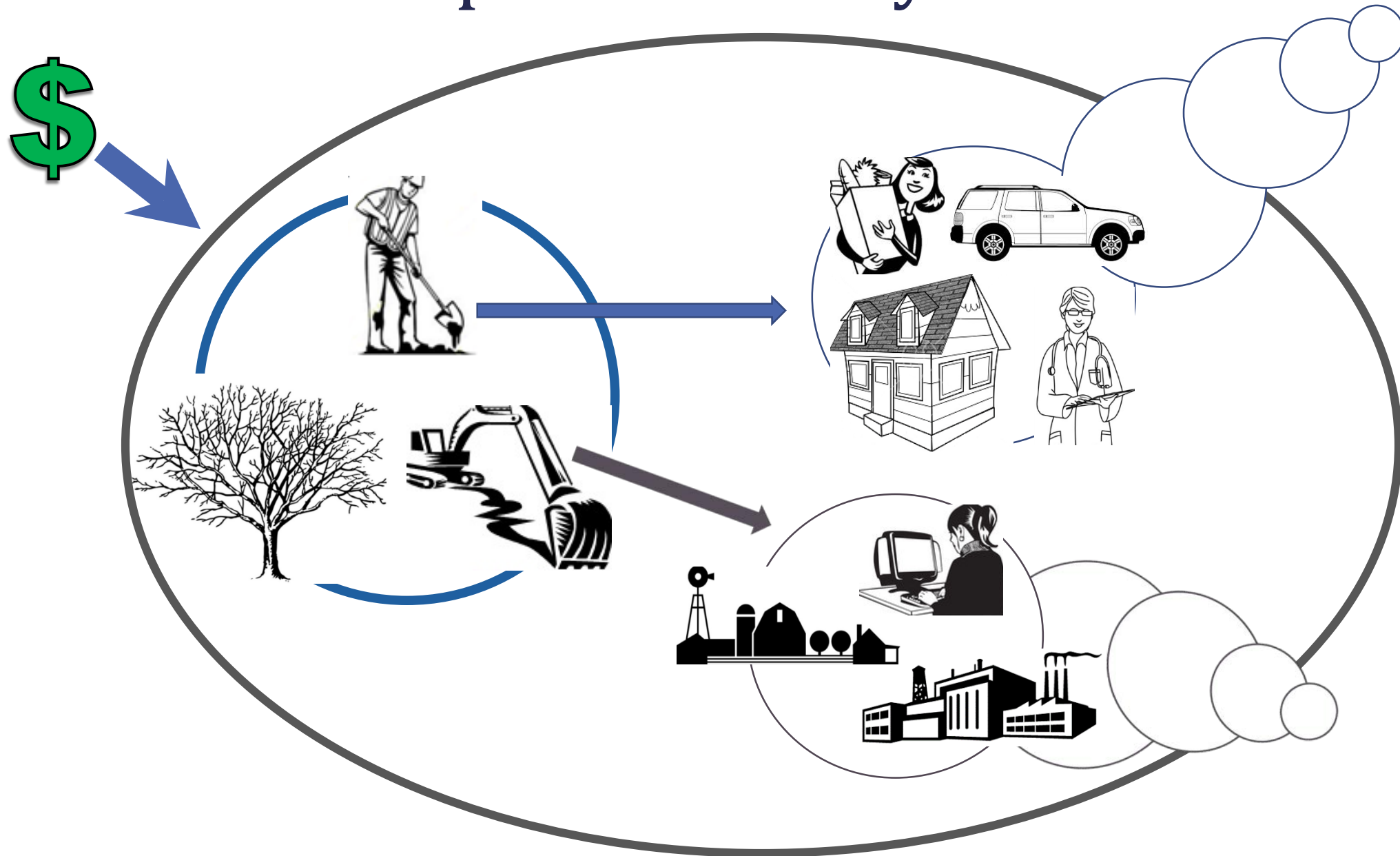
Case studies of over
30 DOI restoration
projects

Including 13 NRDAR-
related projects

<https://www.fort.usgs.gov/economic-impacts-restoration>



Economic impacts of ecosystem restoration



California Gulch NRDAR

Arkansas River In-Stream Habitat Restoration



Total cost: \$3.2M with 54% spent locally

	Local	National
Job-years	25	50
Labor Income	\$1.3M	\$3.1M
Value Added	\$1.7M	\$4.6M
Economic Output	\$3.3M	\$9.1M

Economic impacts of ecosystem restoration

Primary objectives of this study:

- (1) Collect restoration cost data in such a way as to enable economic impact analyses
- (2) Increase available information on the costs and compositions of restoration projects



Economic impacts of ecosystem restoration

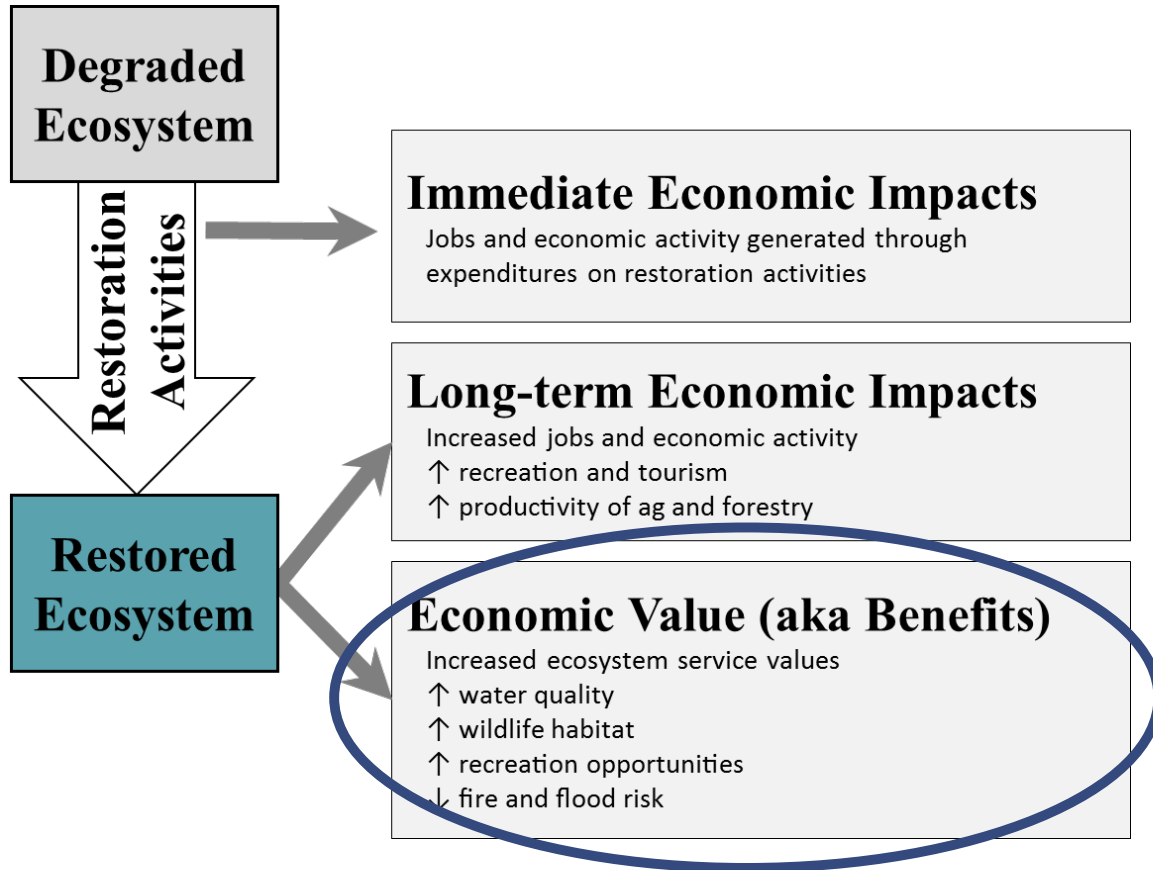
Next steps:

- Collaborating with the Office of Resource and Damage Assessment (ORDA) to pilot a system to collect expenditure data as projects occur
 - Integrated into the Damage Assessment Tracking System (DARTS)
- The new system will enable long-term development of a unit costs data set
- Useful for NRD assessments
 - Economic impact analyses



Seeking pilot restoration projects

Economic *value* of ecosystem restoration



Example: High-severity fire in Northern New Mexico



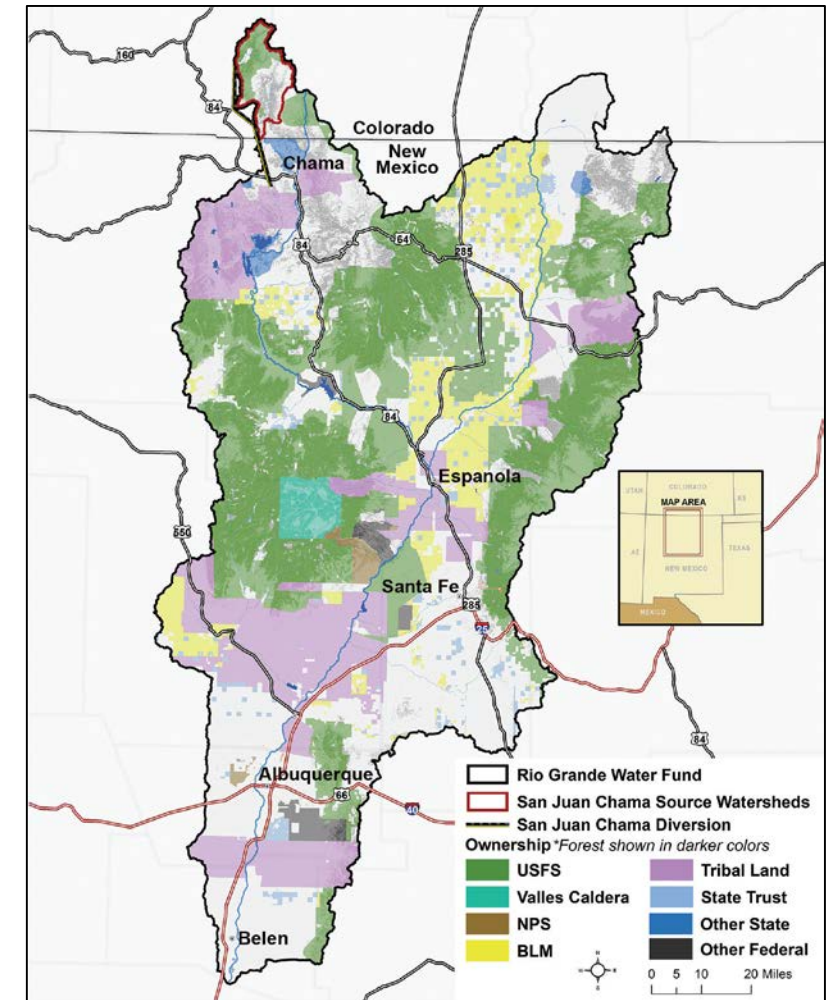
“In 2011, the Las Conchas Fire burned 156,000 forested acres in the Jemez Mountains of northern New Mexico. Post-fire thunderstorms then led to massive ash and debris flows in surrounding canyons...”



Credit: C. Haffey, USGS



Credit: C. Haffey, USGS



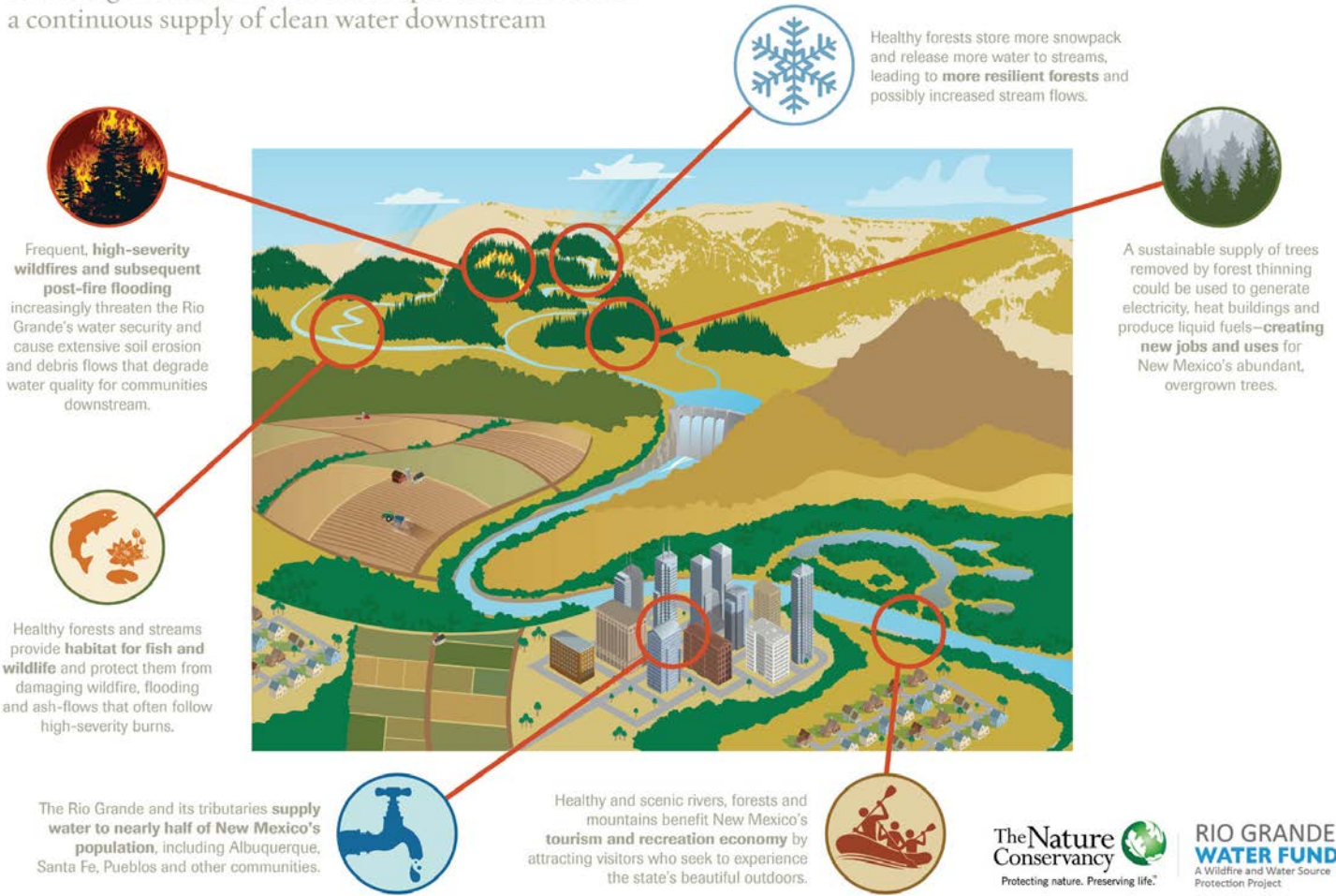
Map and text from *Rio Grande Water Fund: Comprehensive Plan for Wildfire and Water Source Protection*, July 2014



Collaborative efforts exist to plan and conduct forest restoration (fuels treatments) with a primary focus on water resources

New Mexico | Rio Grande Water Fund

Restoring essential forested lands upstream will ensure a continuous supply of clean water downstream



	FOREST RESTORATION	VALUES-AT-RISK (high-severity fire)
ECONOMIC IMPACTS	Timber industry A	Tourism industry B
ECOSYSTEM SERVICES BENEFITS	Water quality after restoration; Improved forest habitat C	Water quality post high-severity fire; Degraded fish habitat C

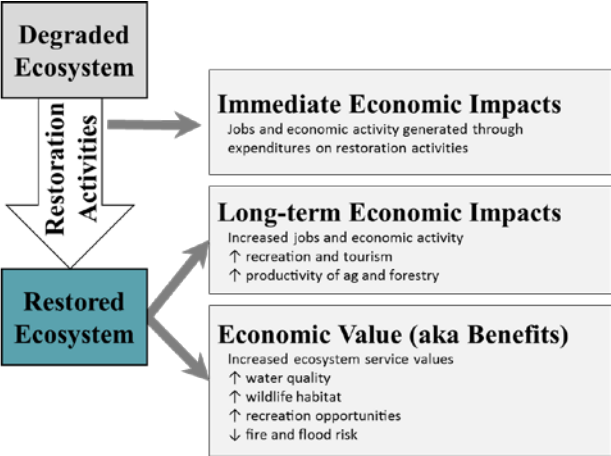


Image from *Rio Grande Water Fund: Comprehensive Plan for Wildfire and Water Source Protection*, July 2014

Benefits of ecosystem services

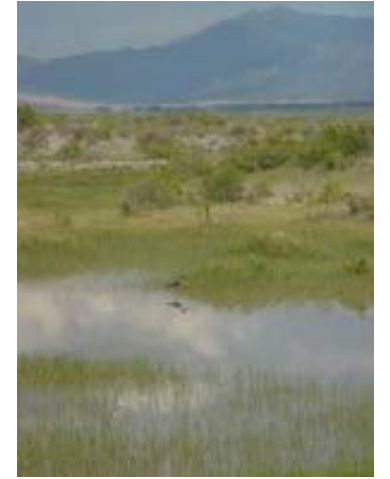
- Ecosystem services: goods and services from the environment that are enjoyed, used, consumed by individual people
- Typically:
 - Publicly provided
 - Interest in measuring in \$\$
 - Not traded in markets, and therefore lack prices



No price ≠ No value

Ways to estimate nonmarket values

Conduct new (“primary”) economic study
With *revealed* or *stated preference* techniques



Apply existing data from related studies
“*Benefit transfer*”

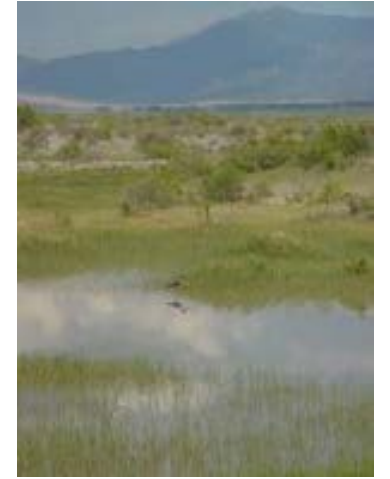


Develop qualitative understanding
Methods range from ad hoc discussion to
rigorous qualitative data collection and analysis



Ways to estimate nonmarket values

Conduct new (“primary”) economic study



Apply existing data from related studies



Develop qualitative understanding



Example: Improving Susquehanna River Basin water quality

Susquehanna River supports:

- Drinking water for 750,000 in PA
- Manufacturing, agriculture, and power plants
- Recreation (e.g., fishing, kayaking, canoeing, motor-boating)
- Habitat (for e.g., fish, eels, and freshwater mussels)

Current land management allows excess nutrients and sediment into waterways

- Increased algae that reduces oxygen and habitat for eels, mussels and fish
- Reduced aesthetics for recreational boating and fishing.



- Cloudy or discolored drinking water



- May be the cause of abnormalities observed in fish caught in the Susquehanna River, including lesions and discoloration



- 27,510 sq miles from New York to Maryland
- Largest river flowing into Chesapeake Bay



Question: What are the economic benefits of reducing nutrient and sediment runoff?



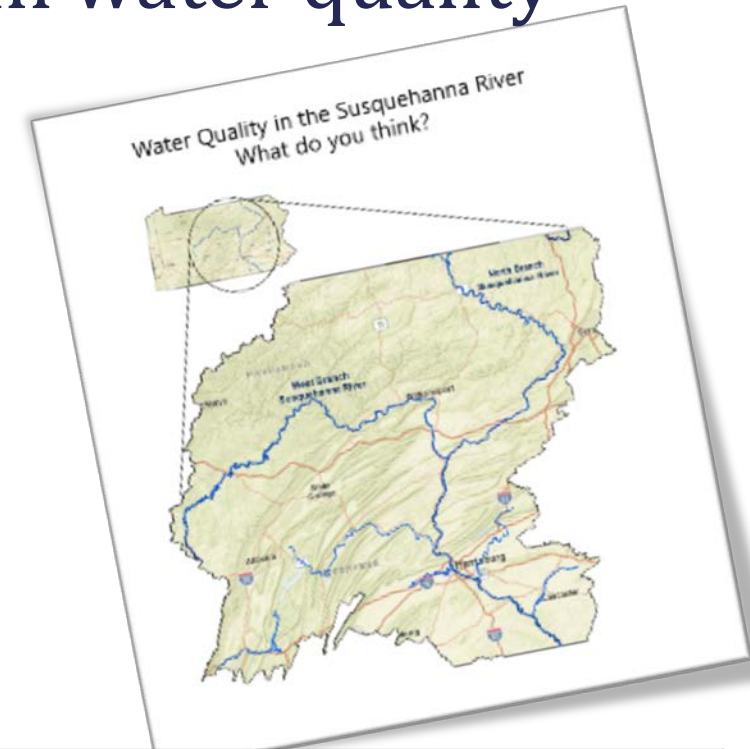
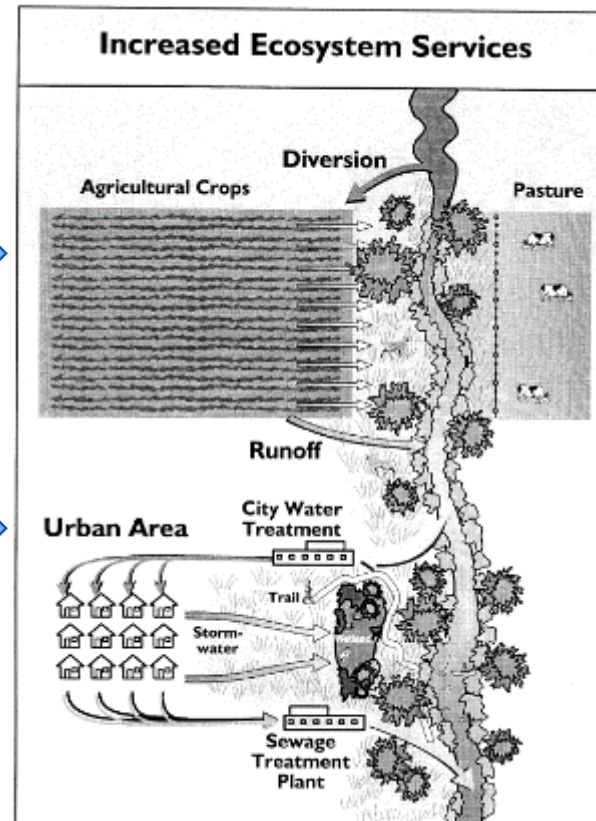
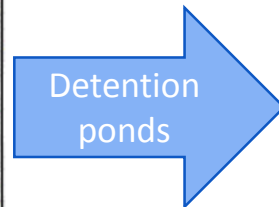
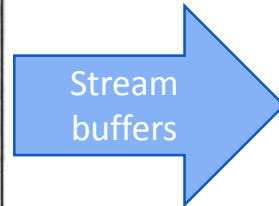
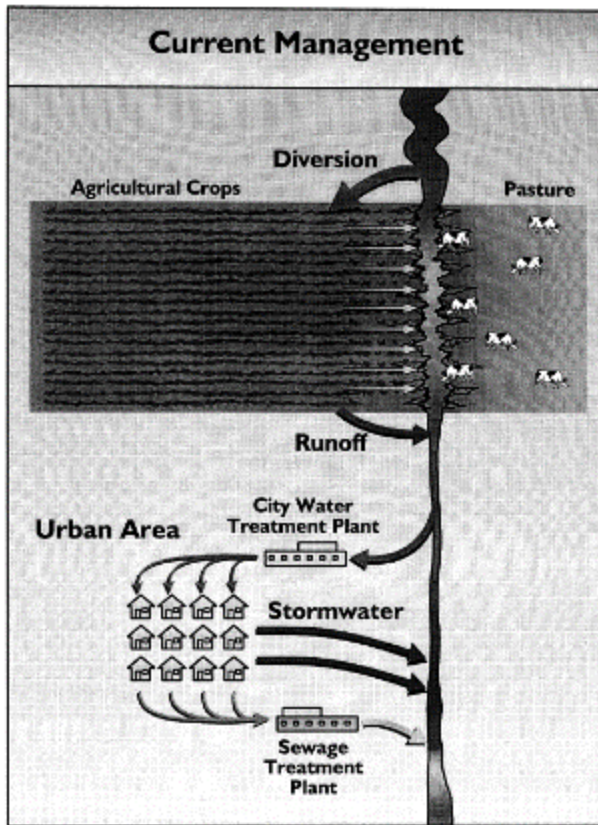
Susquehanna River Basin Commission
Shaded Relief showing Elevation, Water Features: USGS
Disclaimer: Intended for Educational Display Purposes Only
SRBC (1100) 00-27-2006



Example: Improving Susquehanna River Basin water quality

Stated preference study

- Use survey to ask a *contingent valuation* question
 - “Referendum-style” similar to voting
- Willingness to pay = benefits provided to people



If the cost to your household would be \$250 per year, would you vote in favor (Yes) or against (No) the Susquehanna River Water Quality Improvement Program? (check one box)

Yes ☐

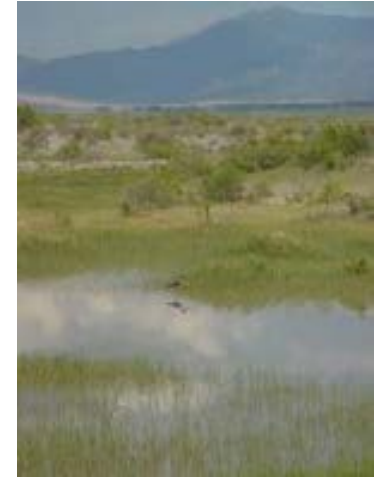
No ☐

Ways to estimate nonmarket values

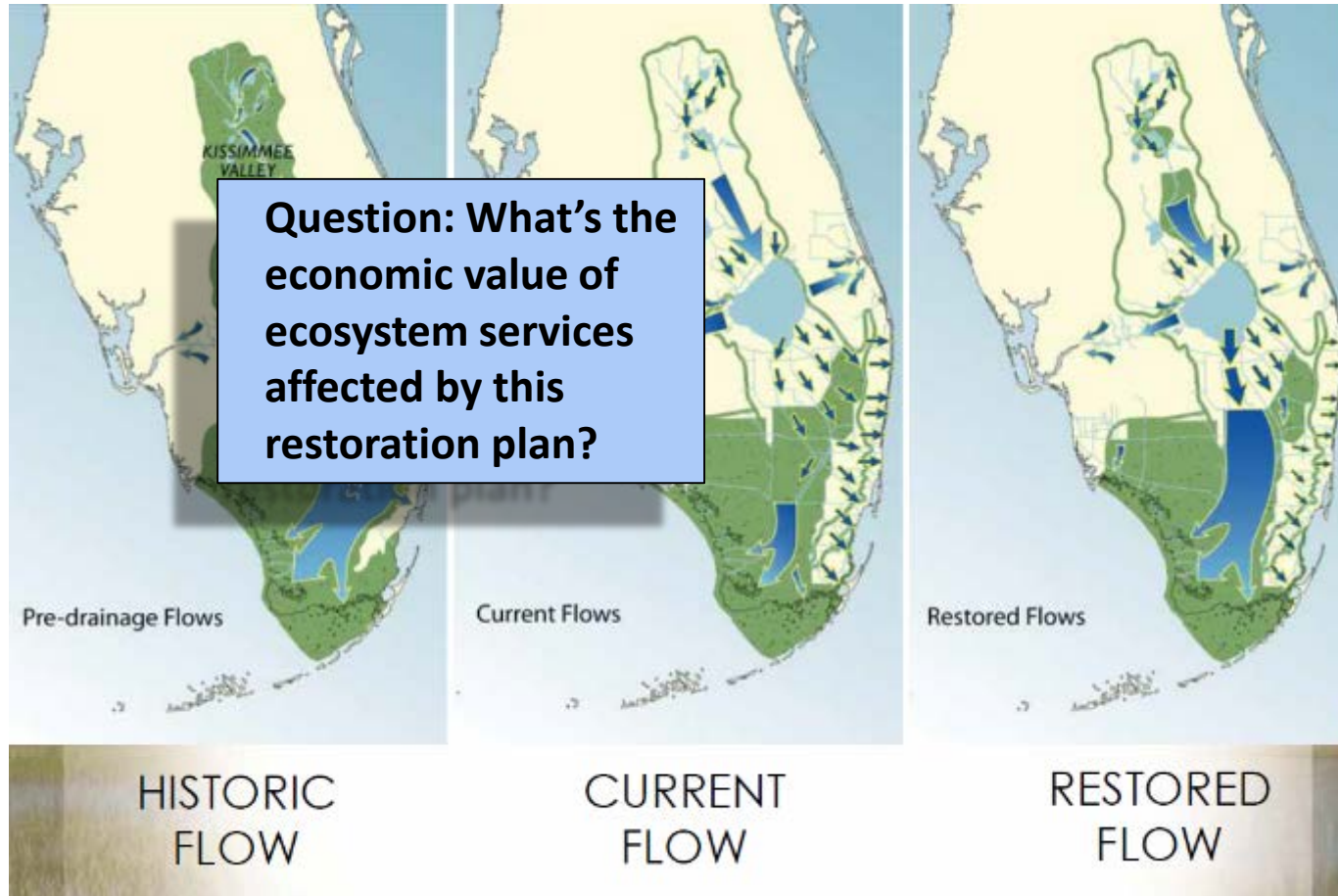
Conduct new (“primary”) economic study

Apply existing data from related studies

Develop qualitative understanding



Example: Value of Central Everglades Planning Project



An altered ecosystem

- Water management structures (dams, canals, levies)
- Land conversion for residential and agricultural purposes

Central Everglades Planning Project (CEPP)

- To restore more natural *quantity, quality, timing, and distribution* of water to remaining portions of the Everglades
- Most comprehensive and **costly** restoration project to date

Proposed Ecosystem Service	Will CEPP change it?	Tool/data to estimate change?	Economic data on value?
Aesthetics	Y		
Biodiversity and species composition	Y	Y	
Climate regulation from peat...	Y	Y	Y
SW coast stabilization (ENP)	Y	?	
Ecological connectivity of landscapes	Y	Y	
Education	Y		
Fishing: commercial	Y	Y	Y
Fishing: recreational, Bay	Y	Y	Y
Fishing: recreational, canals	Y		Y
Fishing: recreational, Lake Okeechobee	?		Y
Fishing: recreational in N. Estuaries	?		Y
Frogging	Y	Y	
Real estate values	?	?	Y

Even with limitations, CEPP values counter the construction cost estimate of the project.

**Recreation
access
>\$448K**

**Reduced
sediment
\$486K**

**Climate
regulation
>\$1B**

**FL Bay fishing
(limited data)
>\$23M**

**Water supply
>\$617M**

**+ many
ecosystem
services not
quantified
(including
existence
values)!**

Tools: Benefit Transfer Toolkit



Benefit Transfer Toolkit

[Toolkit Home](#) [Background](#) [View Databases](#) [Tools](#) [Recreation Studies Map](#) [login](#)



Welcome to the Benefit Transfer Toolkit

This toolkit is for natural resource planners, socioeconomic analysts, field staff and public land managers. This toolkit compiles economic values estimates and other information on resources not priced in conventional markets.



Nonmarket Valuation Databases

A set of reference databases that contains roughly 2900 value estimates. These databases can be sorted by citation, location, data years, valuation method, and economic value estimate.
(Full screen view only)

Statistical Forecasting Models

Interactive forecasting tools that can tailor economic value estimates for hunting, fishing, wildlife viewing, and trail-use recreation. The underlying statistical meta-regression models for these forecasting tools can also be accessed.
(Full screen view only)

Recreation Activities Map

A user-friendly map that displays the location of studies included in the recreation values databases. Users can filter mapped observations by recreation activities and U.S. regions.
(Full screen view only)



Tools: Benefit Transfer Toolkit



Existence of threatened and endangered species

(Richardson and Loomis, 2009)



Preservation of salmon

(Loomis et al., 2008; Weber, 2015)



Recreation use

(Rosenberger, 2016)



Improvement of water quality

(Johnston et al., 2016; Johnston and Thomassin, 2010)

Databases

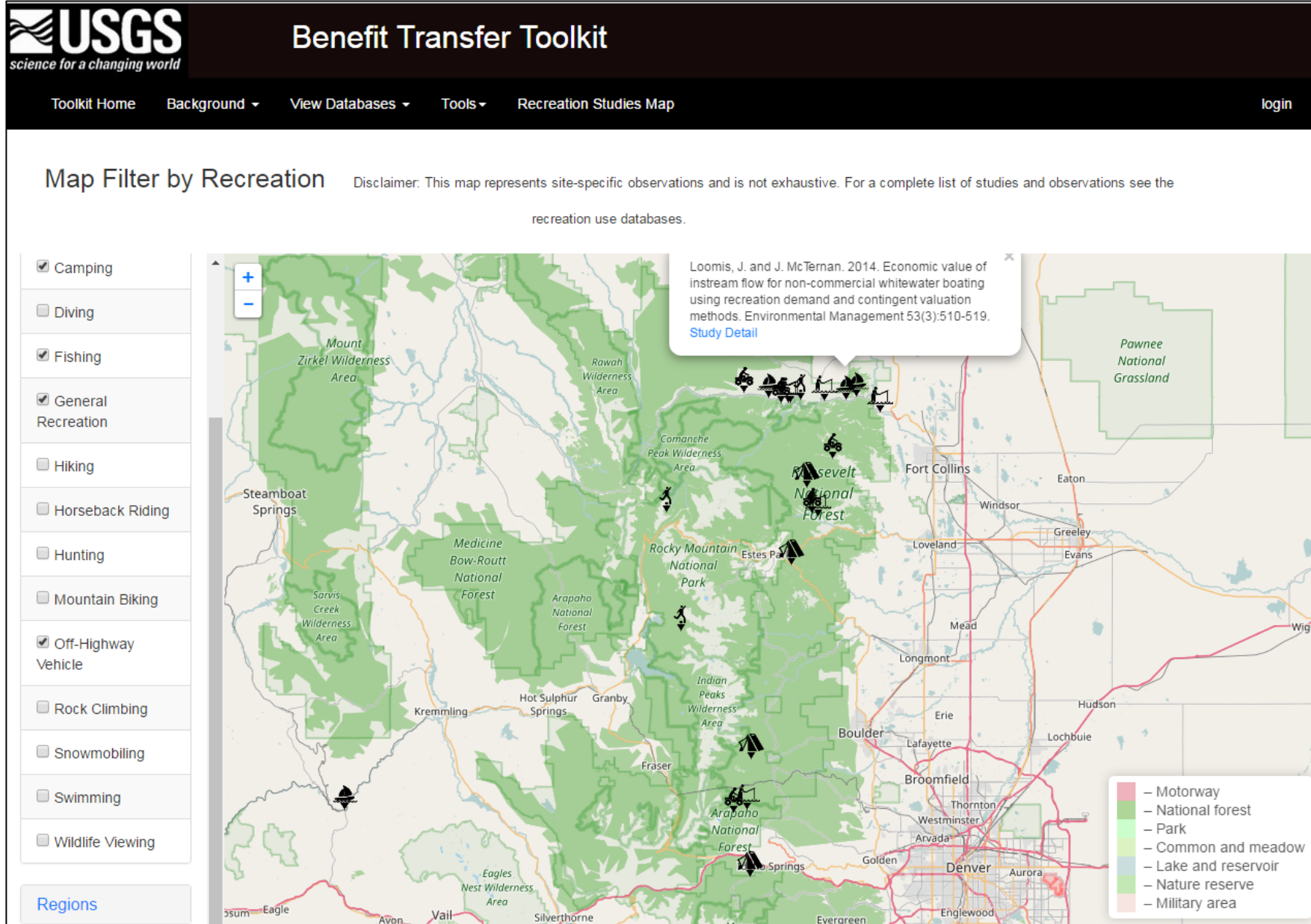
- 3,000+ estimates
- From 500+ primary studies
- Detailed, coded meta-data

Meta-regression calculators

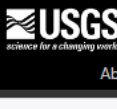
- Provide statistical value estimates for hunting, fishing, wildlife viewing, and trail-uses
- Accounts for differences across study methods, locations, and topics

Tools: Benefit Transfer Toolkit

Map of recreation study estimates



Tools: Natural Value Resource Center

**USGS**
science for a changing world

Department of the Interior Natural Value Resource Center

About the NVRC NVRC Search Efforts Tools & Resources Team Members

Search

All Data Sources All Tags All Types All Dates

NVRC Crawler Results

Query: "water" (392 items returned.)

[Sustainable Water Infrastructure | US EPA](#)

Search Search and create sustainable communities. What's new:

Tags:

- Connecticut
- Indiana
- Pennsylvania
- Washington
- Colorado
- Nebraska
- North Dakota
- Water Quantity
- Water Quality
- Illinois
- Louisiana
- Maine
- Massachusetts
- Mississippi
- Oregon
- Rhode Island
- Utah

Topics: clean water infrastructure, drinking water infrastructure, stormwater infrastructure, green infrastructure, asset management, sustainable water systems, Water Treatment Plants, water supply, water utility, wastewater utility, water facility, sustainable community

Data Source: EPA Ecosystem Services

Document Type: HTML Document

[Water Research | US EPA](#)

Water research conducted at EPA provides the science and tools necessary to develop sustainable solutions to 21st century water resource problems.

**USGS**
science for a changing world

Department of the Interior Natural Value Resource Center

About the NVRC NVRC Search Efforts Tools & Resources Team Members

Tools & Resources

A large number of tools and resources address ecosystem services. This page offers a guide to finding and selecting tools and resources pertinent to your needs.

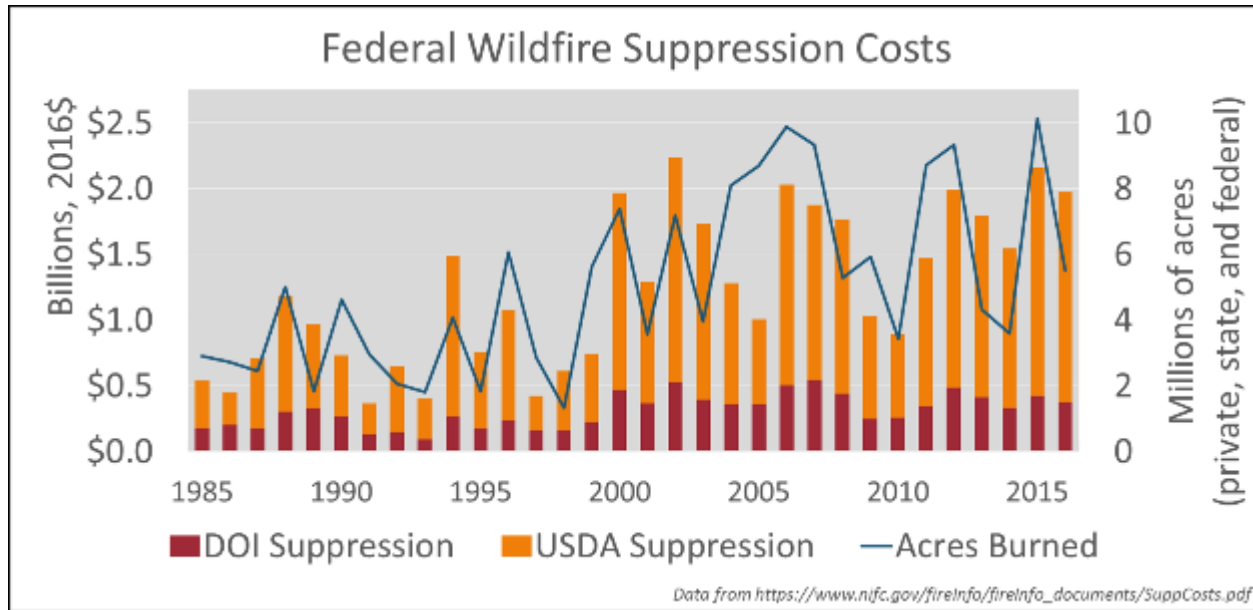
The list is based primarily on the work of the National Ecosystem Service Partnership (NESP), an initiative of Duke University's Nicholas Institute for Environmental Policy Solutions. Many sources provide a list or comparison of different tools, but the NESP represents a significant, collaborative effort of a large number of experts in the field. See [NESP](#) for more details about these tools and resources.

Use the dropdowns below to select the topic, sub-topic, and whether you seek data, models, or resources.

All topics All subtopics All types

Logo	Name	Topic	Subtopic	Description	Type
	Artificial Intelligence for Ecosystem Services (ARIES)	Ecological Data And Models	Water Quality Freshwater Supply	Maps the potential provision of ecosystem services (sources), their users (use), and biophysical features that can deplete service flows (sinks) using ecological process models or Bayesian models	Data Model
	National Water-Quality Assessment (NAWQA)	Ecological Data And Models	Water Quality	Provides an understanding of water quality conditions, trends over time, and how natural features and human activities affect those conditions	Data
	EnviroAtlas	Ecological Data And Models Social And Economic Data And Models	Biodiversity - Species Land Use And Land Cover Change Service In Cities And Urban Areas Recreational Use Of Biodiversity	Estimates four types of recreation demand (big game hunting, freshwater fishing, migratory bird hunting, and bird watching) derived from national survey data, namely the FHWAR	Data Model Resource
	Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST)	Ecological Data And Models	Water Quality Freshwater Supply Marine And Coastal	Suite of software models used to map and value the goods and services from nature that sustain and fulfill human life	Data Model
	SPAtially Referenced Regressions On Watershed attributes (SPARROW)	Ecological Data And Models	Water Quality	Used at the national and regional scales to track nitrogen, phosphorus, suspended sediment, and organic carbon delivered in watersheds	Data Model

Example: Supporting local solutions to wildfire risk



“There is no one-size-fits-all solution to reducing wildfire risk. Solutions must be tailored to landscapes and communities.” (National Cohesive Strategy)

Wildfire Research (WiRē) Team

Systematic, local data collection and analysis

- Parcel-level rapid wildfire risk assessments
- Household surveys



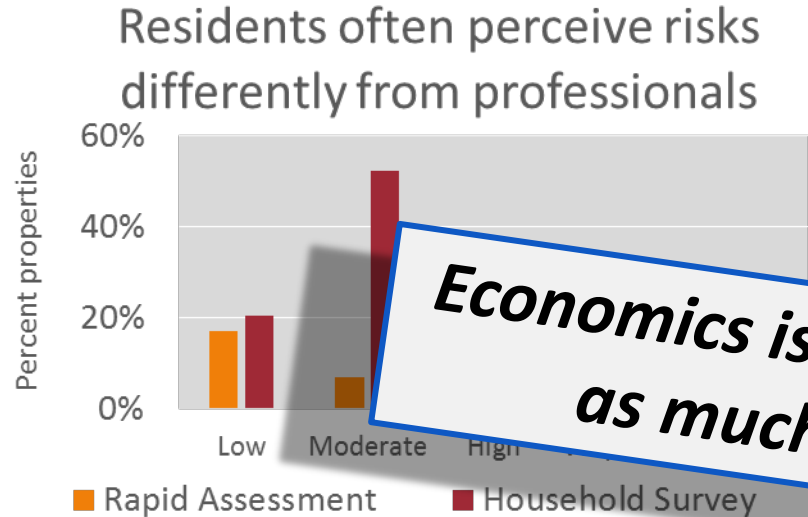
The National Cohesive Strategy coordinates agency & homeowner efforts toward three main goals:

- Restoring and maintaining fire resilient landscapes
- Promoting fire-adapted communities
- Safely and effectively responding to wildfires



Example: Supporting local solutions to wildfire risk

Informing programs



Economics is about UNDERSTANDING DECISIONS, as much as about values and valuation

Cost share programs for fuels treatments

- Amounts demanded vary by area
- Highest risk parcels often least likely to use

Outreach to community members

- Personalized outreach encourages follow-up
- Specific information (e.g. social comparison nudges) influences response

Changing conversations

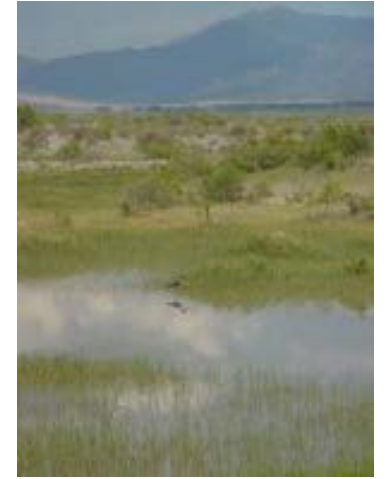


Ways to estimate nonmarket values

Conduct new (“primary”) economic study

Apply existing data from related studies

Develop qualitative understanding

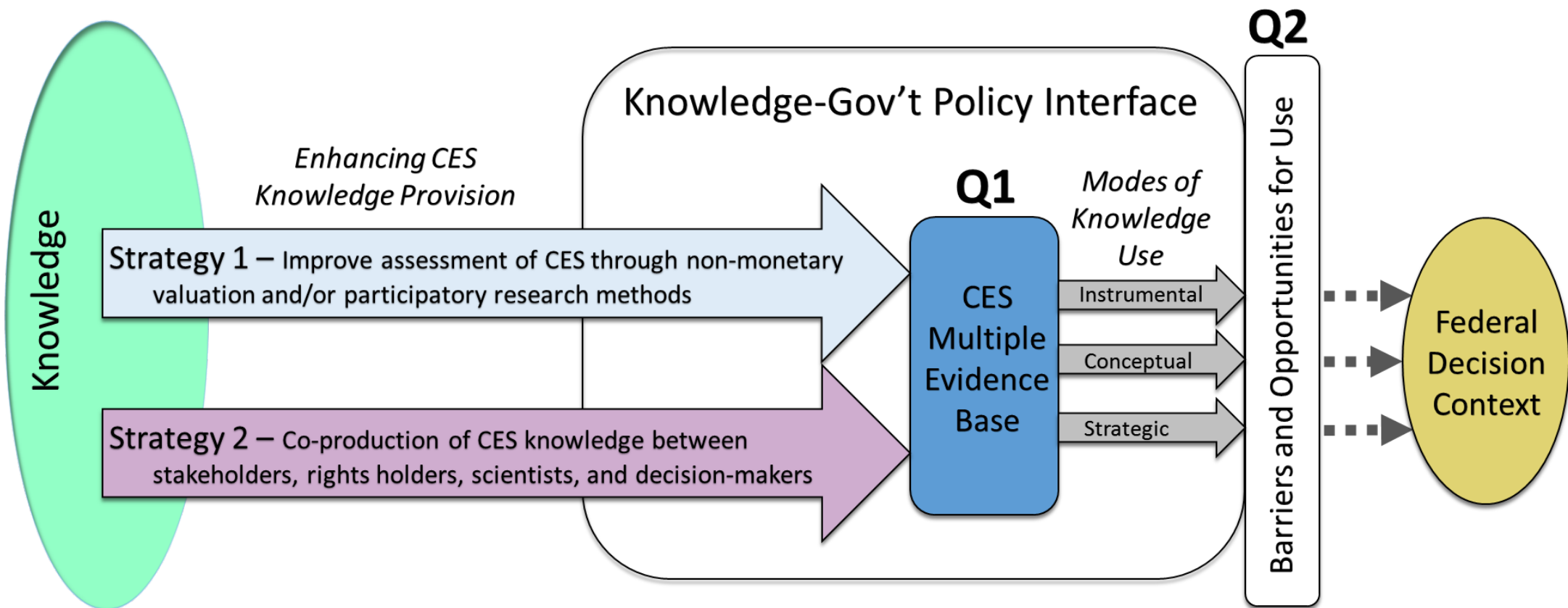


Research Topic:

Identifying Approaches for Integrating Cultural Ecosystem Services Information in Federal Decision-Making

Cultural Ecosystem Services (CES): “ecosystems’ contributions to the non-material benefits (e.g., capabilities and experiences) that arise from human–ecosystem relationships” (*Chan et al., 2012, p. 9*).

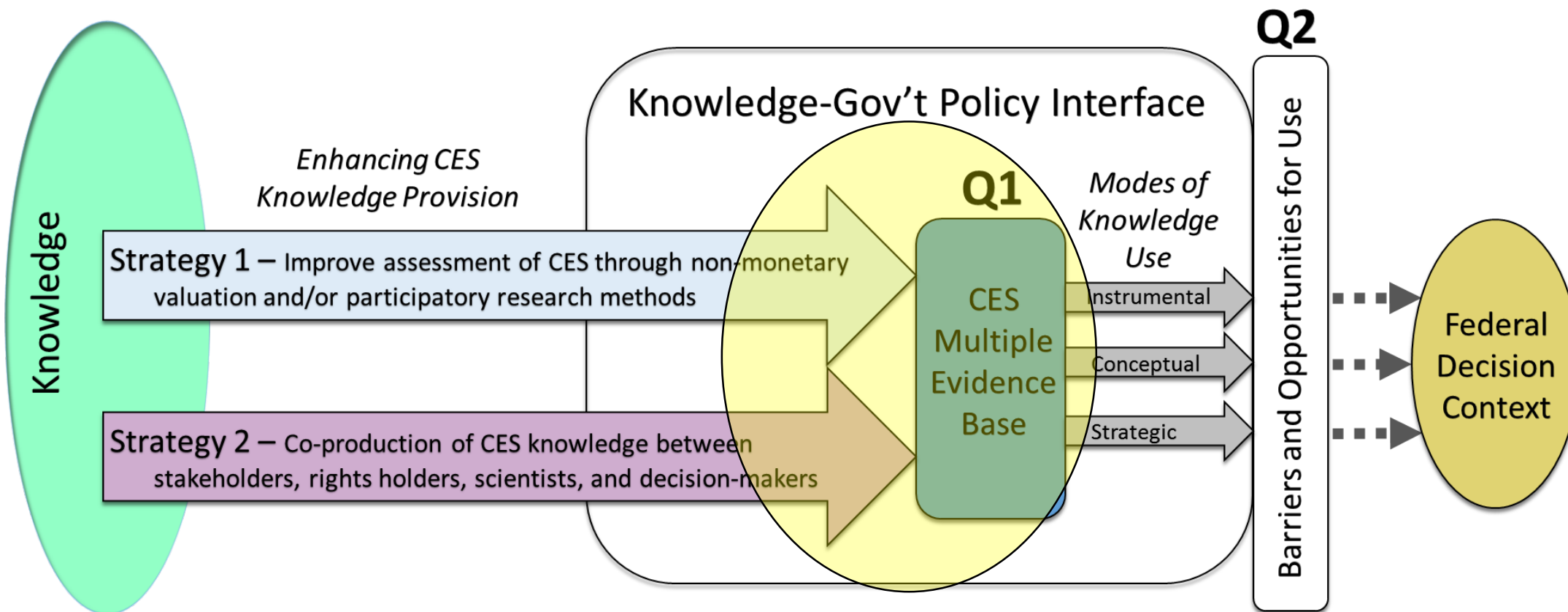
Pathways to Improve Integration of CES Information



Q1: How comprehensive is the CES knowledge provided to decision-makers? Can provision of knowledge be enhanced?

Q2: What are decision-specific opportunities and barriers for integration of different forms of CES knowledge?

Pathways to Improve Integration of CES Information



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Non-monetary Tools & Applications

- Value Assessments

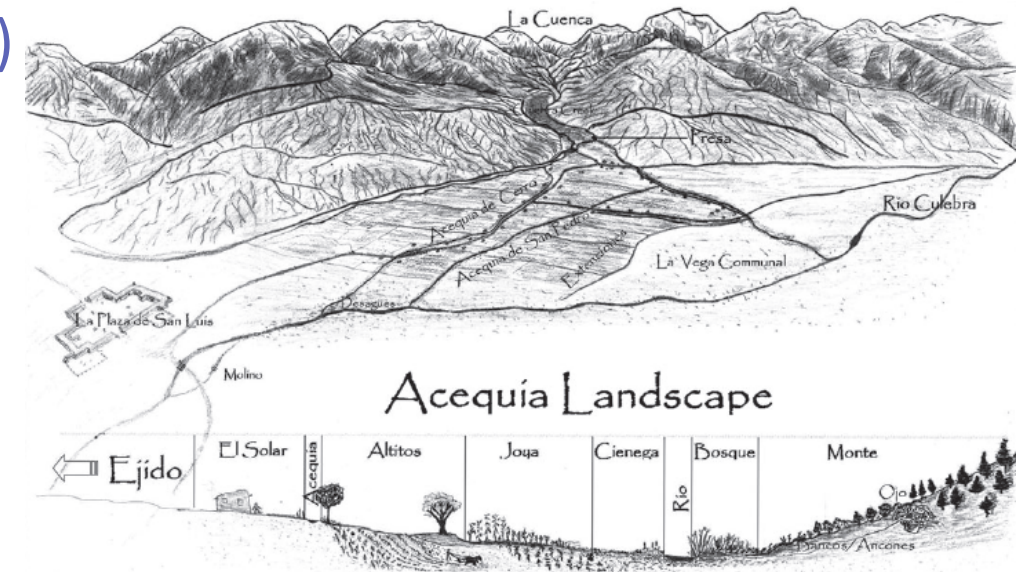
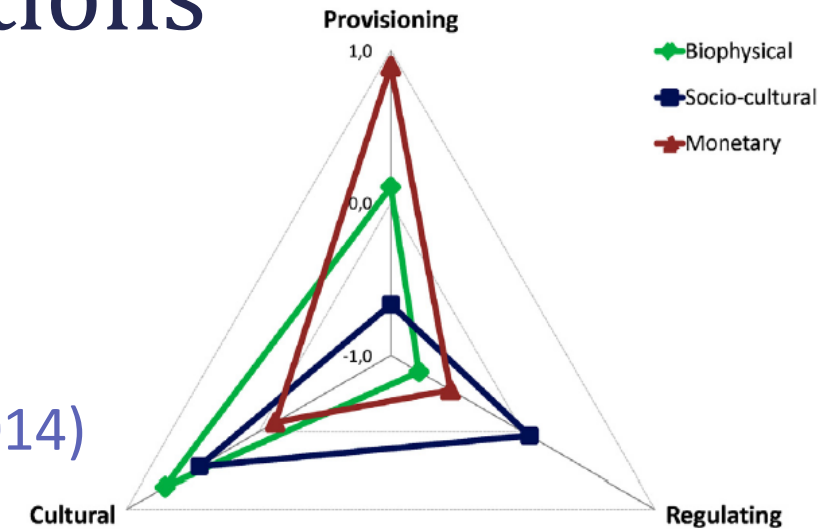
- Multi-Criteria Analysis (Martín-López et al., 2014)
- Q-Methodology (Armatas et al., 2014)
- Photovoice (Berbés-Blázquez, 2012)
- Interviews or Storytelling (Beiling, 2014; Gould et al., 2014)

- Important Cultural Resources or Uses

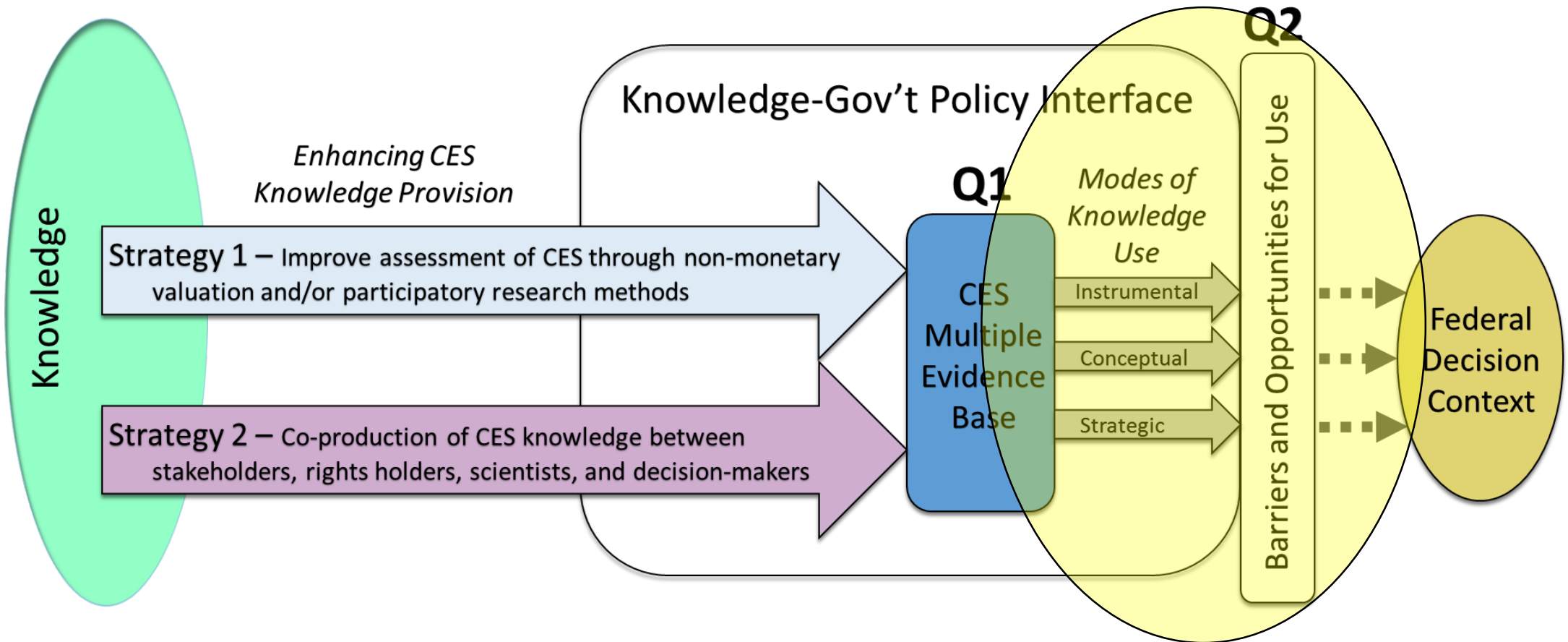
- Identified Cultural Influence Index (Garibaldi and Turner, 2004)
- Cultural Landscape Services (Raheem et al. 2015)

- CES Mapping Approaches

- Tenure and Resource Use (e.g., Subsistence)
- Local Ecological Knowledge
- Sense of Place
 - Cultural Values Mapping (Tipa and Nelson, 2008)
- Health of CES (Pert et al., 2015)



Pathways to Improve Integration of CES Information



Q1: How comprehensive is the CES knowledge provided to decision-makers? Can provision of knowledge be enhanced?

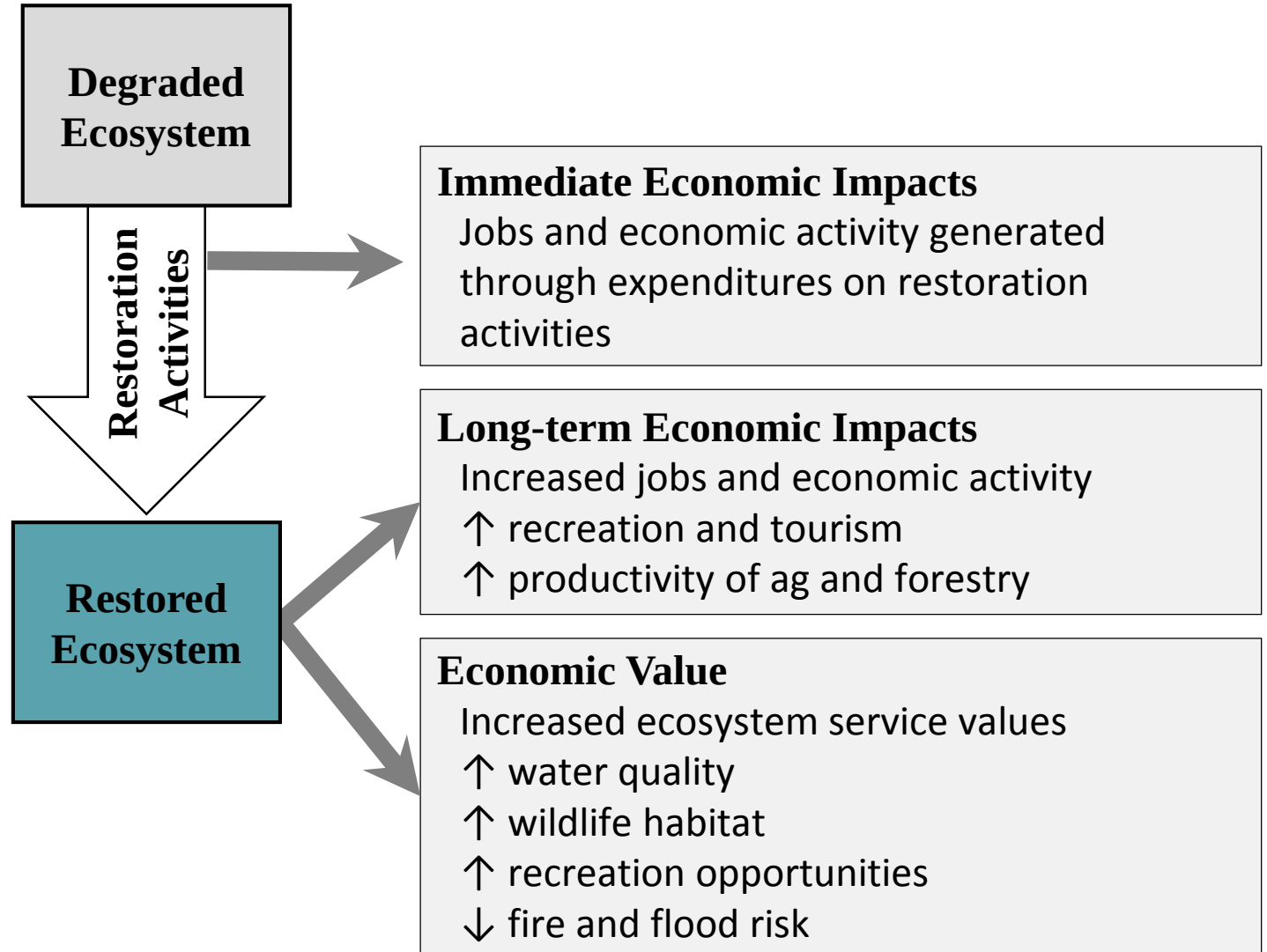
Q2: What are decision-specific opportunities and barriers for integration of different forms of CES knowledge?

Analytical Framework

- Characteristics of Decision Context
 - Resources for knowledge generation (e.g., finances, time)
 - Institutional structure (e.g., clarity of rules, availability of incentives, opening vs. resistance)
 - Information needs of managers
 - Legal restrictions on types of information that can be considered
 - Whether or not use of CES is perceived to enhance legitimacy of decision-making
 - Level of public support
- Characteristics of Individual Managers
 - Leadership, skill, level of interest/motivation of managers to utilize CES knowledge
 - Quality of relationships between managers and knowledge producers
- Characteristics of Information / Knowledge
 - Methodology quality; adequate theory; validity (Credibility)
 - Relevance to needs of decision makers, fits legal requirements (Salience)
 - Process of knowledge generation is respectful, unbiased, and fair (Legitimacy)
 - Findings support/negate current practices or beliefs within management agency
- Characteristics of CES Provision
 - Type(s) of CES identified in the local landscape
 - Shared vs. divergent understandings of CES values within community or across groups

Discussion

- What kind of social and economic questions do you face in the field?
- What sort of research do you think would be most useful for addressing your needs?



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