THE WHITE HOUSE
WASHINGTON

Frontiers of Benefit-Cost Analysis

December 10, 2024

Subcommittee on the Frontiers of Benefit-Cost Analysis

- Established as National Science and Technology Council subcommittee in March 2023

- Co-chaired by:
  - Office of Information and Regulatory Affairs
  - Council on Economic Advisors
  - Office of Science and Technology

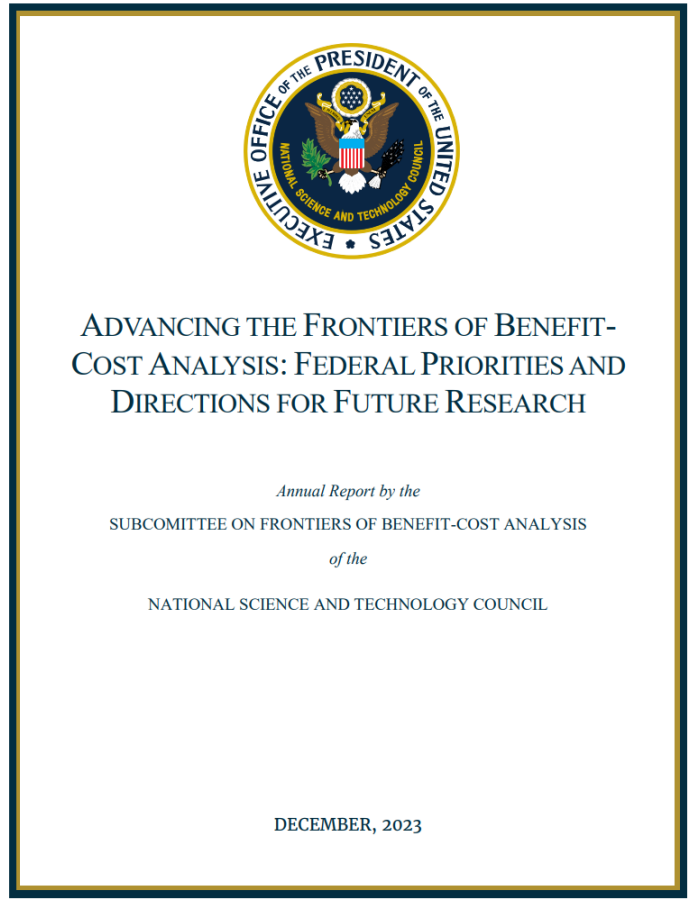
- Purpose: coordinate across agencies to identify and address challenges in quantifying and monetizing impacts in benefit-cost analyses

Subcommittee on the Frontiers of Benefit-Cost Analysis

- Members from more than 20 agencies
  - 80+ agency participants

Inaugural (2023) Frontiers of BCA Report

- Five focal topics:
  - Non-fatal health effects
  - Ecosystem services
  - Wildfire and extreme weather effects
  - Information and transparency
  - Effects of public benefit programs
- Two cross-cutting themes:
  - Analyzing distributional effects
  - Analyzing risk



EXECUTIVE OFFICE OF THE PRESIDENT OF THE UNITED STATES
NATIONAL SCIENCE AND TECHNOLOGY COUNCIL

ADVANCING THE FRONTIERS OF BENEFIT-COST ANALYSIS: FEDERAL PRIORITIES AND DIRECTIONS FOR FUTURE RESEARCH

Annual Report by the

SUBCOMITTEE ON FRONTIERS OF BENEFIT-COST ANALYSIS

of the

NATIONAL SCIENCE AND TECHNOLOGY COUNCIL

DECEMBER, 2023

In 2023, agencies identified key data gaps

Box 2. Ecosystem Services Effects: Key Data Gap Examples. *This list is not exhaustive.*

Ecological Data

- Habitat extents for understudied habitats (e.g., deep sea coral)
- Baseline surface water quality data (to estimate effects and calibrate models used for estimating effects)
- Carbon storage and sequestration data for specific coastal habitats and peatland forests (data, or estimation model to relate habitat changes to carbon changes)
- Effects of various levels of antibiotic use on ecosystem elements or processes related to disease prevention, agricultural productivity, species existence
- Relationship between wetlands and other natural features and flood risk reduction

Ecological-economic Data

- Existence values for specific endangered species and habitats
- Relationship between population size changes for some species (e.g., whales) and any benefits
- Incidence of mental health effects from storm events of different magnitudes and other extreme weather
- Preferences for Tribal Nations and Indigenous Peoples cultural uses of coral reefs
- Subsistence fish use rates (total, and by user group)
- Fisher behavior changes in response to fishery quota changes
- Dose-response functions for health effects from water quality changes

In 2024, the Subcommittee advanced the frontier

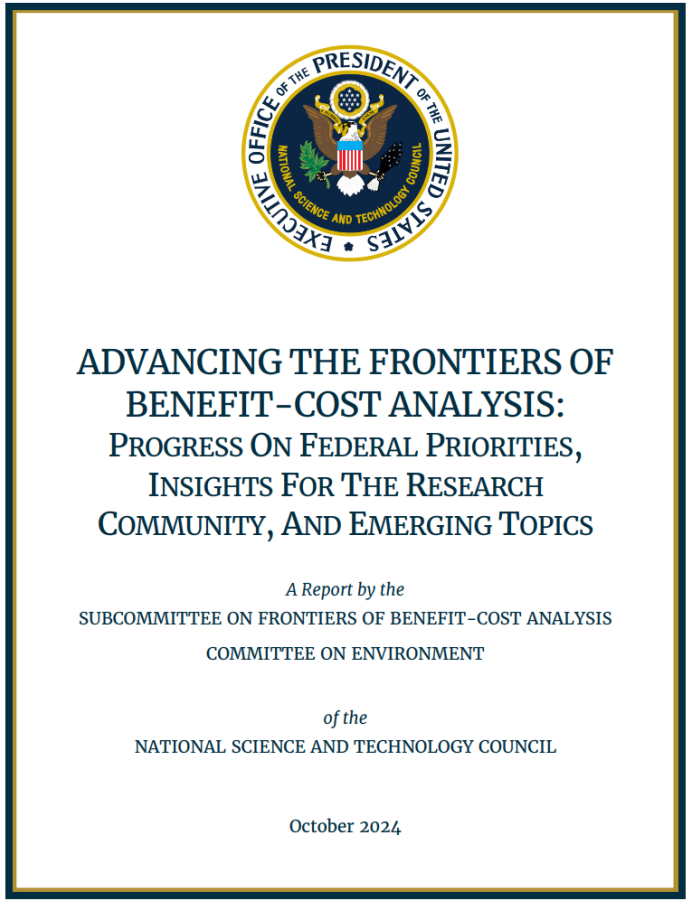
- Established 3 Interagency Working Groups (IWG) on:
  - Non-fatal health effects
  - Ecosystem services
  - Effects of public benefit programs
- Outreach to highlight agency needs and engage the research community:
  - Society for Benefit-Cost Analysis
  - Society for Risk Analysis
  - NBER Economic Analysis of Regulation
  - Association of Environmental and Resource Economists
  - A Community on Ecosystem Services

Ecosystem Services Workshop

- June of 2024
- Agency representatives
- Leading ecosystem services researchers:
  - Ecologists
  - Economists
- Considered hypothetical agency actions to:
  - Identify relevant ES effects
  - Further delineate needed data, models, tools, analyses

Second (2024) Frontiers of BCA Report

- Reports on progress on focal topics
- Identified a new focal topic – multi-market analysis
- Provides insights for researchers and agencies for producing policy-relevant research
  - How to comment on rules
  - Where to find out what agencies need to know
  - Checklist for policy-relevant research



ADVANCING THE FRONTIERS OF BENEFIT-COST ANALYSIS:
PROGRESS ON FEDERAL PRIORITIES, INSIGHTS FOR THE RESEARCH COMMUNITY, AND EMERGING TOPICS

A Report by the
SUBCOMMITTEE ON FRONTIERS OF BENEFIT-COST ANALYSIS
COMMITTEE ON ENVIRONMENT

of the
NATIONAL SCIENCE AND TECHNOLOGY COUNCIL

October 2024

Where can researchers find out what the Government needs to know?

- The Unified Regulatory Agenda
- Evaluation.gov
- Frontiers Website and Reports
- Challenge.gov
- Rules in Early States of OIRA Review
  - Reginfo.gov

Box 3. Where Can Researchers Find Out What the Government Needs To Know? *This discussion is not exhaustive.*

The Unified Regulatory Agenda: https://www.reginfo.gov/public/do/eAgendaMain
This page links to agency-specific regulatory agendas and preambles. These agendas focus primarily on rules that the agency expects to propose or finalize within the next twelve months. For rules at the proposal stage, researchers can contribute by offering public comments in response to the proposal that, for instance, containing original research or point agencies to relevant existing research. Importantly, agencies also list long-term regulatory plans in the Unified Regulatory Agenda, which can be accessed by following the link to "Current Long-Term Actions." These describe regulations which will not be proposed for at least twelve months, and potentially much longer. This longer lead time gives researchers even greater opportunity to engage in original research aimed at influencing the regulatory process. Lead times for such regulations are frequently long enough (often several years) that there is time for an academic working paper or publication to have influence.

Evaluation.gov: https://www.evaluation.gov/evidence-plans/learning-agenda/
The Evidence Act requires agencies to produce new learning agendas every four years. As of this writing, there are 24 agency learning agendas and 3 cross-government learning agendas, all linked from the page given above. While these documents vary by agency, they frequently list well-defined research questions and agency plans to answer analyze them. In some cases, learning plans describe corresponding opportunities for grant funding or collaboration with an agency. Evaluation.gov also provides the searchable Learning Agenda Questions Dashboard, a searchable: https://www.evaluation.gov/learning-agenda-questions-dashboard/. Agencies often invite public comment before amending their learning agendas.

SFBCA: https://www.whitehouse.gov/omb/information-regulatory-affairs/frontiers-of-benefit-cost-analysis/
This report, and other SFBCA reports, describe long-run agency knowledge needs in detail. Interested researchers are encouraged to contact relevant agencies or the SFBCA (Frontiers@omb.eop.gov) to join ongoing efforts, or to ensure a planned project is not redundant.

Challenge.gov: https://www.challenge.gov/
This portal offers prizes for contributions to government initiatives. Some are for research or research-adjacent work.

Rules in Early Stages of OIRA Review:
https://www.reginfo.gov/public/do/eoAdvancedSearchMain
Reginfo.gov provides information on regulations as they make their way through the OIRA review process. Rules in earlier stages of the process—"Prerule," "Proposed Rule," or "Notice"—either are taking public comments or will do so in the near future. The comment period that follows OIRA review offers researchers an opportunity to 1) bring existing research to bear; or 2) submit original research results. Agencies are required to respond to such significant comments, and comments from stakeholders are often and they can be influential.

Additional resources include **Grants.gov**: https://grants.gov/ and **Regulations.gov**: https://www.regulations.gov/

A Researcher's Checklist for Policy-Relevant Research

- Publish replication code and data…
- Clearly describe the baseline…

Box 4. A Researcher's Checklist for Policy-Relevant Research. *Not all items will be relevant to a given paper.*

☐ Publish replication code and data to a journal repository or an independent repository. Code and data that do not require expensive proprietary software are generally preferred. The replication package should cover any online appendices. Well-commented code is preferred. *While replication packages are helpful, they are often not sufficient for an agency to make use of a paper's results.*

☐ Clearly describe the baseline or counterfactual relative to which effects are estimated.

☐ If data used in the analysis cannot be shared in a replication package, then provide a complete set of descriptive statistics of those data.

☐ Provide substantial evidence that the findings are robust and are not overly reliant on a small number of data points. Conversely, if any outliers in the data were removed from the analysis, provide complete data on all of those outliers and full explanations for why they were removed.

☐ Report standard errors and/or variance-covariance matrices for *all* quantitative results. This facilitates analysis of uncertainty and meta-analysis.

☐ Provide disaggregated results (e.g., marginal effects, elasticities) in an appendix. Disaggregation in time (often by year) and by income decile or quintile is particularly valuable. Disaggregation on other dimensions of interest (e.g., gender, race, if relevant) is encouraged.

☐ Provide non-monetized, undiscounted effects. This will allow continued use of the results under changes in monetization (e.g., a new value of a statistical life) and discount rates.

☐ Show results under different plausible assumptions, e.g., functional forms of utility or production.

☐ Address external validity quantitatively. Provide not only benefit-transfer (or cost-transfer) results, but also a transfer function mapping from covariates to an adjusted value.

☐ Where applicable, evaluate whether positive and negative changes in a variable of interest have effects of similar magnitude.

☐ If original data were collected, survey instruments should be included in an appendix or replication package.

☐ Provide details on non-monetized undiscounted, and non-inflation-adjusted effects. This will allow continued use of the results under changes in monetization (e.g., a new value of a statistical life), discount rates, and inflation. When not possible, report any steps taken in sufficient detail so as to allow for replication.

☐ Research content, including literature reviews and quantitative material, should demonstrate cross-disciplinary awareness, if relevant (e.g., inputs and context discussion for a cost-effectiveness study of a health policy intervention should draw from biomedical, policy, and economics).

☐ When reporting dollar figures, include the dollar-year and how the amount has been adjusted for inflation (if at all).

☐ Retain source code and internal documentation of analytic choices that may not rise to the level of documenting in paper and supporting material (e.g., decisions like approaches to raw data cleaning or compilation).

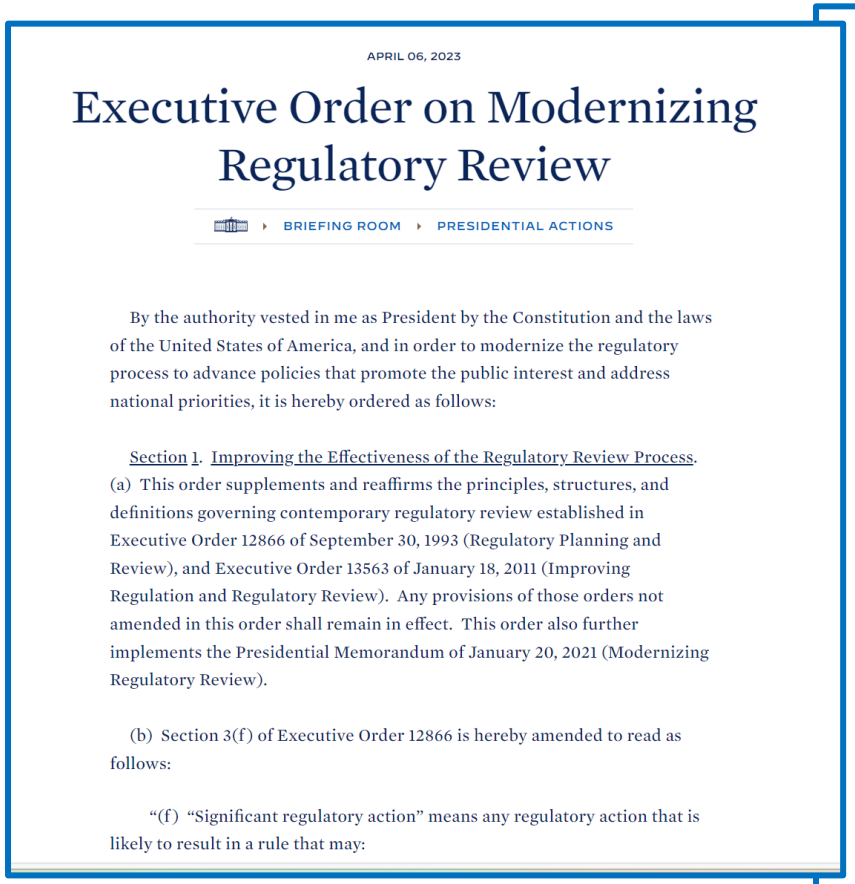
Ongoing Subcommittee Activities

- Near-term outreach to journal editors, early-career researchers
  - Provide guidance to researchers on how to engage with policy analysis

- Long term
  - Both 2023 and 2024 reports will remain productive guides for external researchers for years to come
  - Please share both reports with your networks
  - External researchers working on Frontiers-related projects should continue communicating with relevant agency experts

Modernizing Regulatory Review

Modernizing Regulatory Review



APRIL 06, 2023

Executive Order on Modernizing Regulatory Review

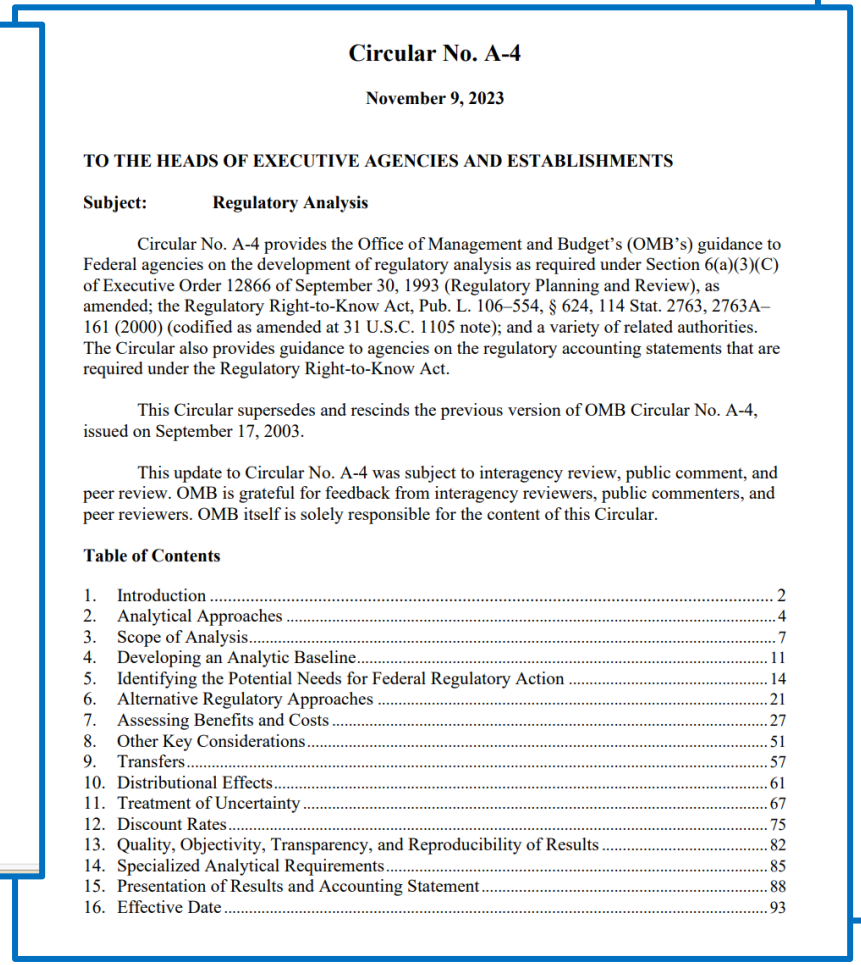
BRIEFING ROOM › PRESIDENTIAL ACTIONS

By the authority vested in me as President by the Constitution and the laws of the United States of America, and in order to modernize the regulatory process to advance policies that promote the public interest and address national priorities, it is hereby ordered as follows:

Section 1. Improving the Effectiveness of the Regulatory Review Process. (a) This order supplements and reaffirms the principles, structures, and definitions governing contemporary regulatory review established in Executive Order 12866 of September 30, 1993 (Regulatory Planning and Review), and Executive Order 13563 of January 18, 2011 (Improving Regulation and Regulatory Review). Any provisions of those orders not amended in this order shall remain in effect. This order also further implements the Presidential Memorandum of January 20, 2021 (Modernizing Regulatory Review).

(b) Section 3(f) of Executive Order 12866 is hereby amended to read as follows:

"(f) "Significant regulatory action" means any regulatory action that is likely to result in a rule that may:



Circular No. A-4

November 9, 2023

TO THE HEADS OF EXECUTIVE AGENCIES AND ESTABLISHMENTS

Subject: Regulatory Analysis

Circular No. A-4 provides the Office of Management and Budget's (OMB's) guidance to Federal agencies on the development of regulatory analysis as required under Section 6(a)(3)(C) of Executive Order 12866 of September 30, 1993 (Regulatory Planning and Review), as amended; the Regulatory Right-to-Know Act, Pub. L. 106–554, § 624, 114 Stat. 2763, 2763A–161 (2000) (codified as amended at 31 U.S.C. 1105 note); and a variety of related authorities. The Circular also provides guidance to agencies on the regulatory accounting statements that are required under the Regulatory Right-to-Know Act.

This Circular supersedes and rescinds the previous version of OMB Circular No. A-4, issued on September 17, 2003.

This update to Circular No. A-4 was subject to interagency review, public comment, and peer review. OMB is grateful for feedback from interagency reviewers, public commenters, and peer reviewers. OMB itself is solely responsible for the content of this Circular.

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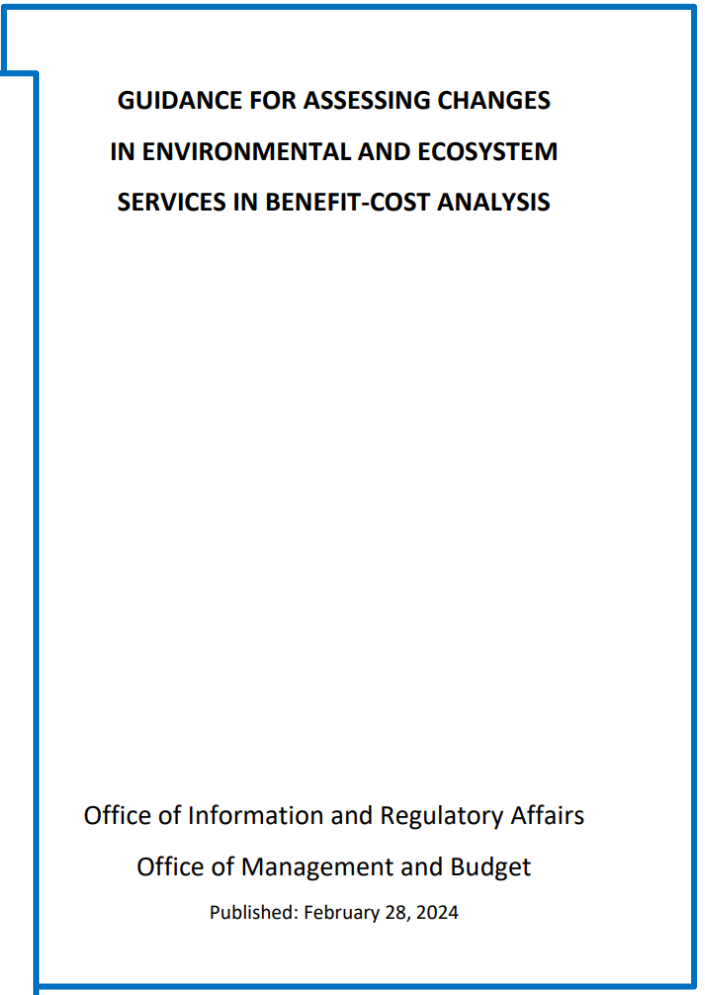


GUIDANCE FOR ASSESSING CHANGES IN ENVIRONMENTAL AND ECOSYSTEM SERVICES IN BENEFIT-COST ANALYSIS

Office of Information and Regulatory Affairs

Office of Management and Budget

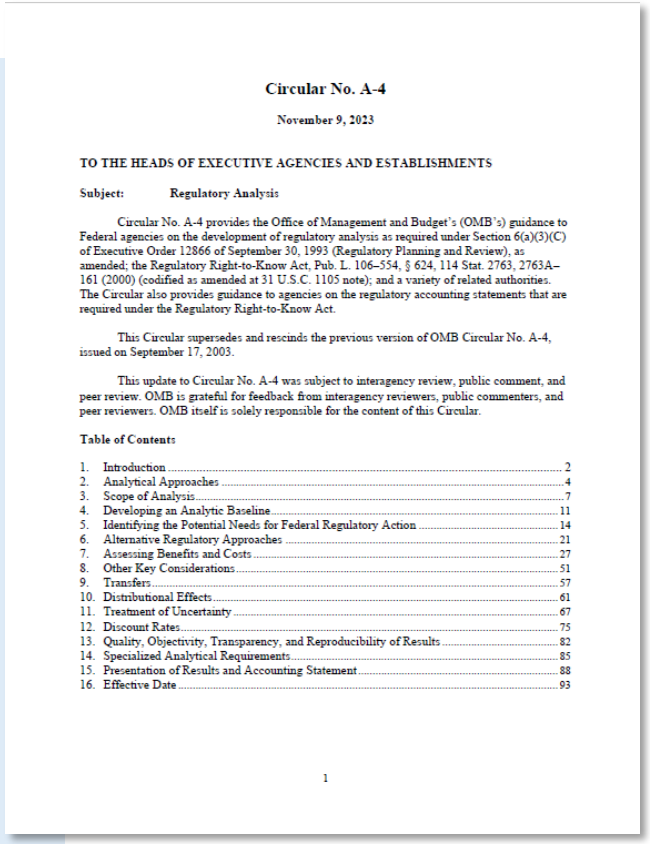
Published: February 28, 2024

Benefit-Cost Analysis

As described in OMB Circulars A-4 and A-94

How is benefit-cost analysis used to inform regulatory policies?

- Define the scope of the analysis.
- Develop an analysis baseline.
- Define alternative regulatory approaches.
- Identify benefits and costs of effects for each alternative relative to the baseline.
- Sum the incremental benefits and costs to determine the net benefits of each alternative.
- Identify the alternative that maximizes net benefits.
- Check for distributional effects.
- Present the analysis results.



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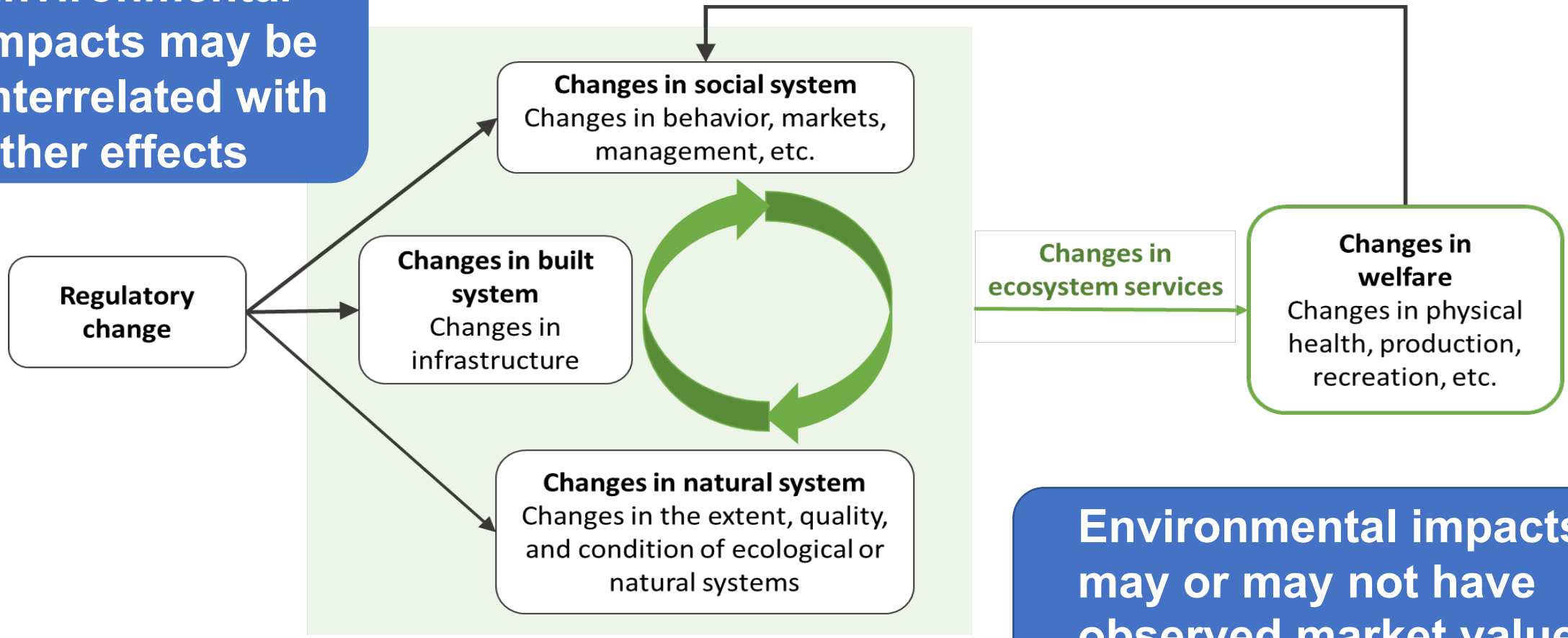
OMB Circular A-4 (2023)

The Environment in Benefit-Cost Analysis

As described in the OMB Guidance for Assessing Changes in Environmental and Ecosystem Services in Benefit-Cost Analysis (2024)

Environmental impacts may be interrelated with other effects



Environmental impacts may or may not have observed market values

OMB Ecosystem Service Guidance (2024) Figure 1
(whitehouse.gov/wp-content/uploads/2024/02/ESGuidance.pdf)

Ecosystem Services

Identify human beneficiaries of potentially affected ecosystems and/or environments

Definition:

For the purposes of the OMB (2024) guidance, ***ecosystem services*** are "contributions to human welfare from the environment or ecosystems."

Example Ecosystem Services
Water supply for drinking, energy production, agriculture, real estate value, etc.
Flood risk reduction for property protection
Wildfire risk reduction for property protection
Pollination for farmland value and crop productivity
Pest control for crop productivity
Production of timber, fish, crops, etc.
Air quality for recreation opportunities

Table adapted from OMB Ecosystem Service Guidance (2024) Table 2

Monetizing Ecosystem Service Effects

Benefit & Cost Analysis for Proposed Supplemental Effluent Limitation Guidelines & Standards for the Steam Electric Power Generating Category; February 2023

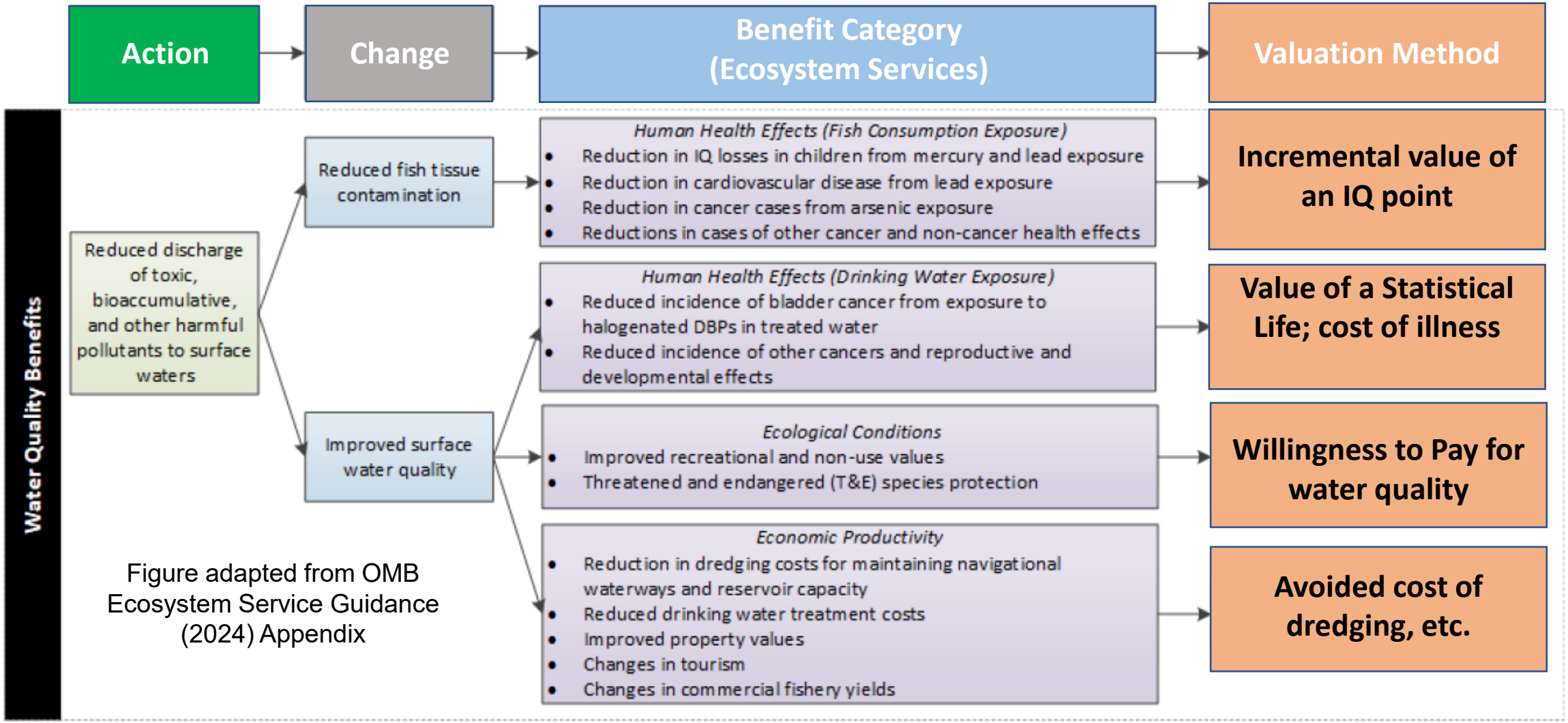


Figure adapted from OMB Ecosystem Service Guidance (2024) Appendix

Department of the Interior and Ecosystem Services

ACES, December 10, 2024 (Austin, TX)

Christian Crowley, US Department of the Interior

DOI Context for Applying Ecosystem Services

- Regulations
- NEPA, e.g., for permitting, land-use plans
- Other management of land, water, and resources
- Grant-making: CESU, NFWF, LWCF, CASCs, FWS Wildlife Restoration, etc.

Examples of DOI Applications: ES (and decisions)

- BLM & FWS Envi Impact State'm: **AK North Slope Oil & Gas** Dev'm (2024)
  Energy minerals, air quality, water, soil, and fish and wildlife habitat
  (balance energy development and protection of caribou migration, subsistence hunting and fishing, international fish and wildlife treaties)
- Reclamation & FWS ESA Consultation: CA **Central Valley Project** (2024)
  Water quality and quantity, and habitat for Delta smelt, green sturgeon, steelhead and Chinook salmon
  (support endangered species, agriculture, industry, and fisheries for local communities)
- BLM Resource Mgmt Plan: **Grand Staircase-Escalante** Nat'l Monu'm (2023)
  Recreation, cultural and scientific resources, water and air quality, and wildlife
  (balance Tribal and recreational use, grazing, energy, and conservation)

Examples of DOI Applications (cont.)

- BLM, NPS, Reclamation, USDA-FS, FERC Klamath River dam removals (2022)
  water quality and quantity, habitat for endangered fish
  (support endangered species, Tribal uses, agriculture, and recreation, and reduce harmful algal blooms)
- NPS General Management Plan: Point Reyes Nat'l Seashore (2021 amend)
  natural and cultural resources
  (balance historic ranching, wild elk herds, and visitation)

Regulatory categories (OMB's 2023 guidance for valuing ES in BCA)

Infrastructure & Energy production

- Leasing for oil & gas, coal, solar, wind, geothermal
- RoW for pipelines and transmission
- Reclamation water for irrigation, hydropower

Agriculture

- Timber
- Grazing
- Personal use of forest products

Public health

- Indian health service
- Bureau of Indian Education

Disaster mitigation and risk reduction

- Disaster mitigation or risk reduction
- Wildland fire management
- Flood-prone areas
- Invasive species
- Coastal area sea-level rise
- Relocating Alaska villages, roads, pipelines etc. (eroding coastlines and melting permafrost)

Vehicle fleets & Housing

- Land- and water-management agencies (BLM, NPS, Reclamation, FWS)
- Wildland fire management

DOI Examples: Issues with Quantification

- Limited availability of values and valuation techniques (specific to the location and resource in question)
  - Needed: replication studies for meta-analysis
  - Repeated studies for additional areas
  - Interdisciplinary projects
- Lack of a consistent, centralized framework for storing valuations and connecting databases
  - e.g., former USGS Benefit Transfer Toolkit
  - Federal Natural Capital Accounting efforts may play a role here
    - BEA satellite accounts, like Outdoor Recreation Satellite Account and Marine Economy
    - White House (2023) plan: Statistics for Environmental-Economic Decisions
- Many DOI decisions require small-scale data
  - e.g., County-level maps of USA population changes
- Federal staff have limited access to survey the public
  - Collect updated and new values
- Uncertainty about current and future demand for ES values

NOAA OFFICE FOR COASTAL MANAGEMENT

Valuation of Ecosystem Services in Benefit-Cost Analysis

December 2024

Usage of BCAs within NOAA

- **Satisfy regulatory requirements**
  - Fishery regulations (National Environmental Protection Act)
  - National Marine Sanctuaries

Usage of BCAs within NOAA

- **Major investments**
  - New satellite systems to monitor algal blooms, plankton, hypoxia, currents, etc.
  - Hurricane Hunter Aircraft

Usage of BCAs within NOAA

- **Produce talking points for outreach**
  - Benefit cost ratio of natural infrastructure investments
  - Digital Coast website and activities

Ecosystem Service Benefits Valuation

- National Marine Sanctuaries
- NOAA Fisheries - Commercial and recreational fishing
- Corals Program
- Coastal Zone Management Program
- Funded resilience projects

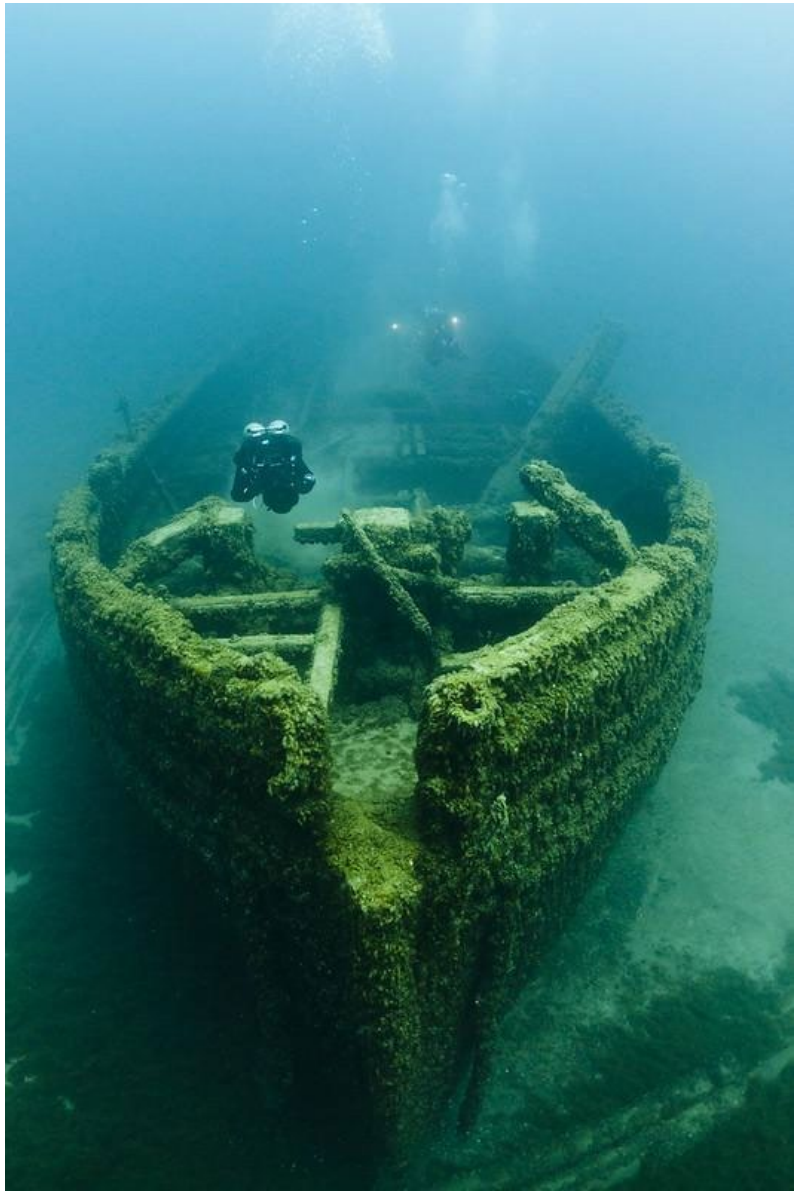
National Marine Sanctuaries ecosystem services tracked

- Provisioning
  - commercial harvest
  - subsistence harvest
  - ornamentals
  - drinking water
  - biotechnology
  - renewable energy

National Marine Sanctuaries ecosystem services tracked

- Cultural
  - consumptive and non-consumptive recreation
  - science - the capacity to acquire and contribute knowledge
  - education - the capacity to acquire and provide intellectual enrichment
  - heritage - recognition of historical and heritage legacy and cultural practices
  - sense of place - aesthetic attraction, spiritual identity and location identify

NOAA OFFICE FOR COASTAL MANAGEMENT



National Marine Sanctuaries ecosystem services tracked

- Regulating
  - Coastal protection

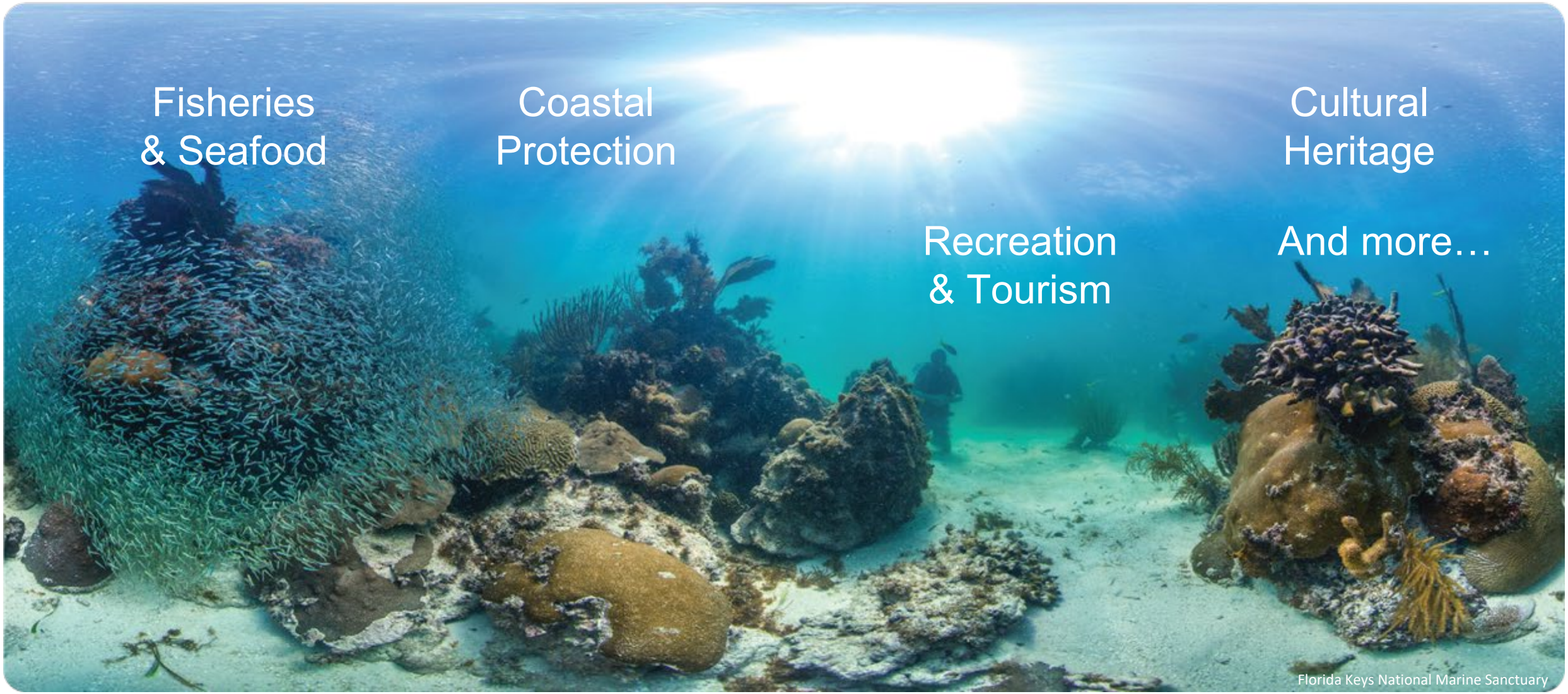
NOAA Coral Reef Conservation Program

Valuing the Monetary and Non-Monetary Ecosystem Services of U.S. Coral Reefs

Mary Allen and Polina Dineva
Lynker in support of NOAA Office for Coastal Management

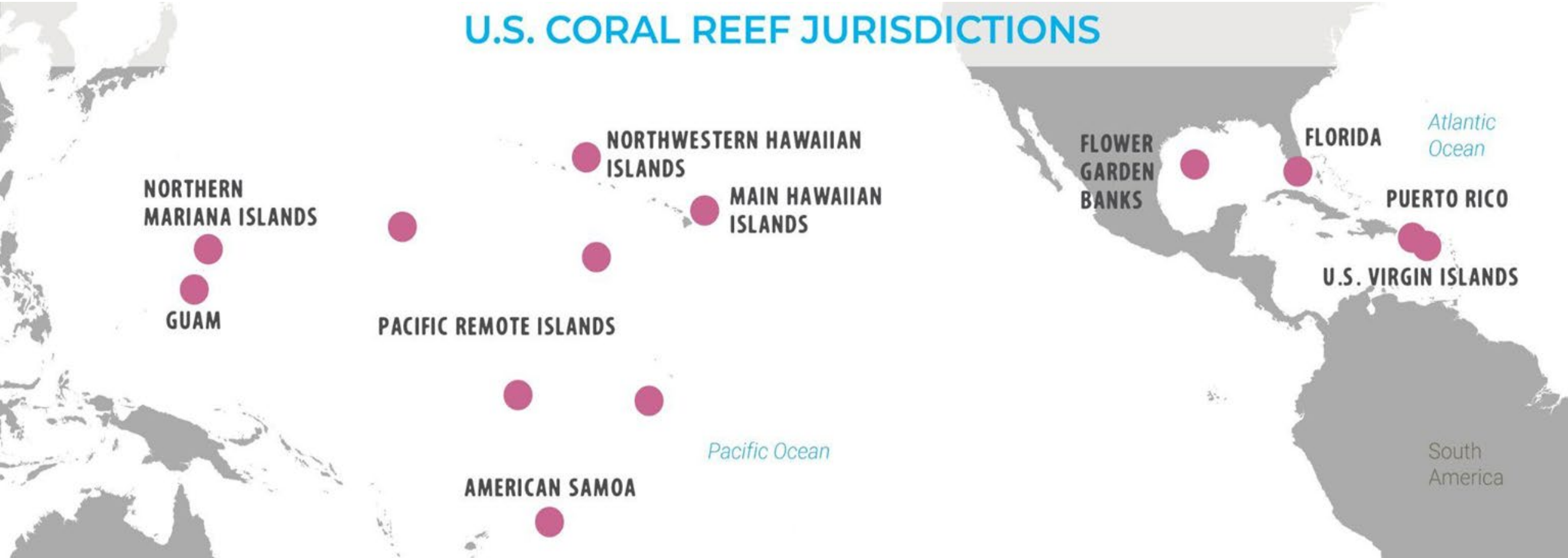
ACES Conference, December 12, 2024

Coral Reef Ecosystems



Project Goal

- Update the economic values of coral reef ecosystem services;
- Improve representation of cultural benefits



Coral Reefs Valuation

- Damages avoided
- Commercial fishing
- Recreational fishing
- Cultural values

Ecosystem Service Benefits Valuation

- **National Marine Sanctuaries**
- **Corals Program**
- NOAA Fisheries - Commercial and recreational fishing
- Coastal Zone Management Program
- Funded resilience projects
- Technical assistance to coastal communities*

Tell a story about benefits

Case Studies

Focus Groups

Interviews

Literature Review

Surveys

Highlight how proactive shoreline and wetlands management to protect communities from coastal hazards.

Show benefits of specific project

Case Studies

Benefits Valuation

Benefit-Cost Analysis

Illustrate the economic benefits of initiatives like managed retreat, living shorelines, or watershed management plans.

Compare projects with similar benefits

Cost-Effectiveness Analysis

Benefit-Cost Analysis

Compare nature-based solutions (e.g., living shorelines) to gray solutions (e.g., seawalls).

Calculate if benefits exceed costs

Benefit-Cost Analysis

Showcase how SLR adaptation for state facilities compares to no action.

Estimate how project spending flows thru economy

Regional Economic Accounting

Demonstrate how your program supports local industries, creates jobs, and supports coastal economies.

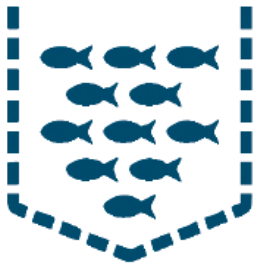
Show value of the coastal and or marine economy

Regional Economic Accounting

Showcase how your coast supports recreation, tourism, and property protection.

Major steps in a benefit-cost analysis

Aquaculture, increase in fish populations



Benefit Transfer

Market Price

EXAMPLE
Wetland restoration provides nursery habitat, helping to increase commercial fish populations

Coastal flood protection, hazard mitigation

Benefit Transfer

Damages Avoided

Replacement Cost

Hedonic Valuation

EXAMPLE
Coastal nature infrastructure projects result in avoided structural damages during disasters

Regulation of water flow and quality

Benefit Transfer

Replacement Cost

EXAMPLE
Wetland restoration results in increased water filtration, alleviating some need to provide that through man-made systems

Recreation, experiences

Benefit Transfer

Willingness to Pay

Travel Cost

Opportunity Cost

Market Price

Hedonic Valuation

EXAMPLE
Coastal beaches provide various recreation opportunities of value to society

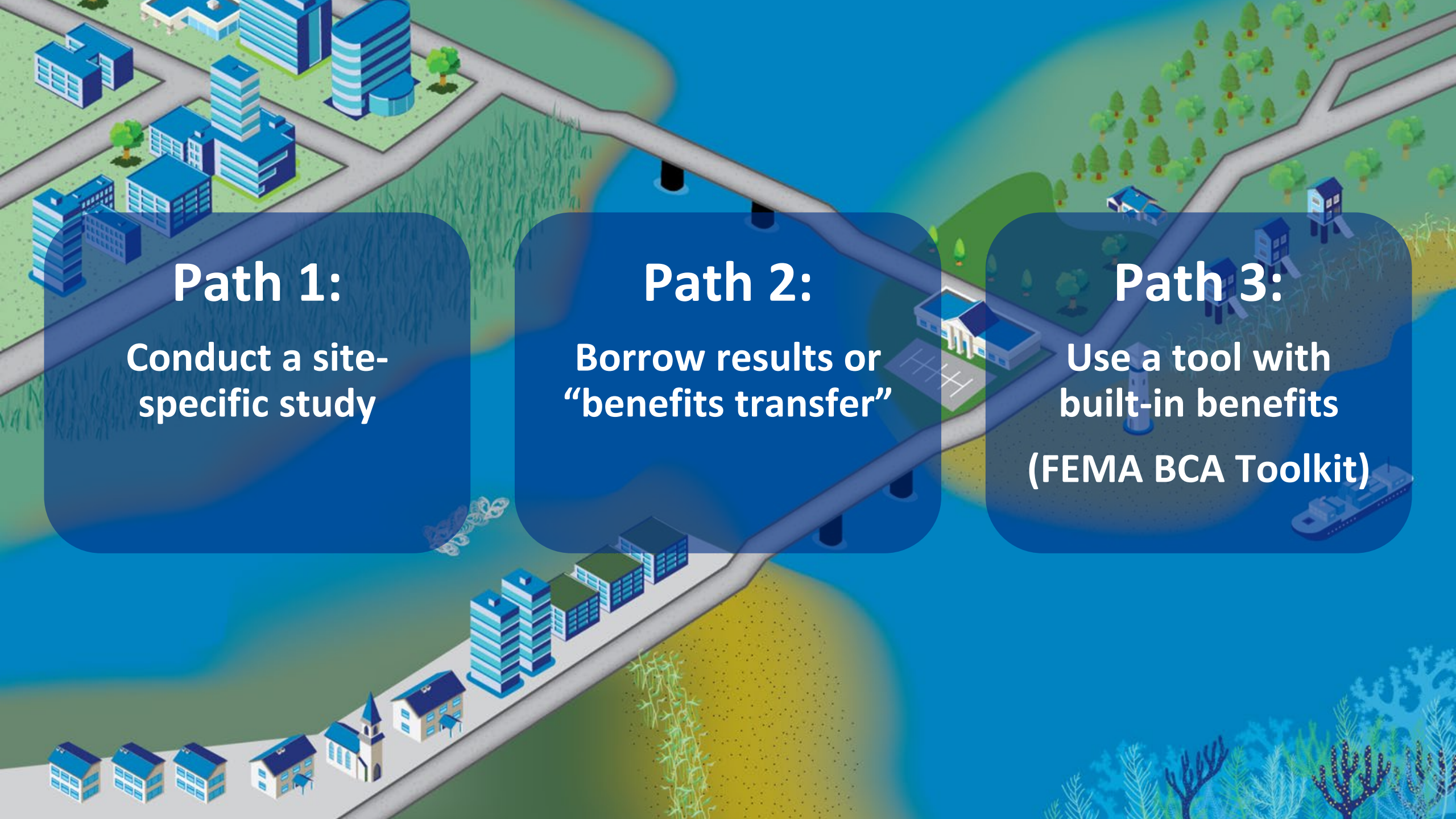
Science, training, education

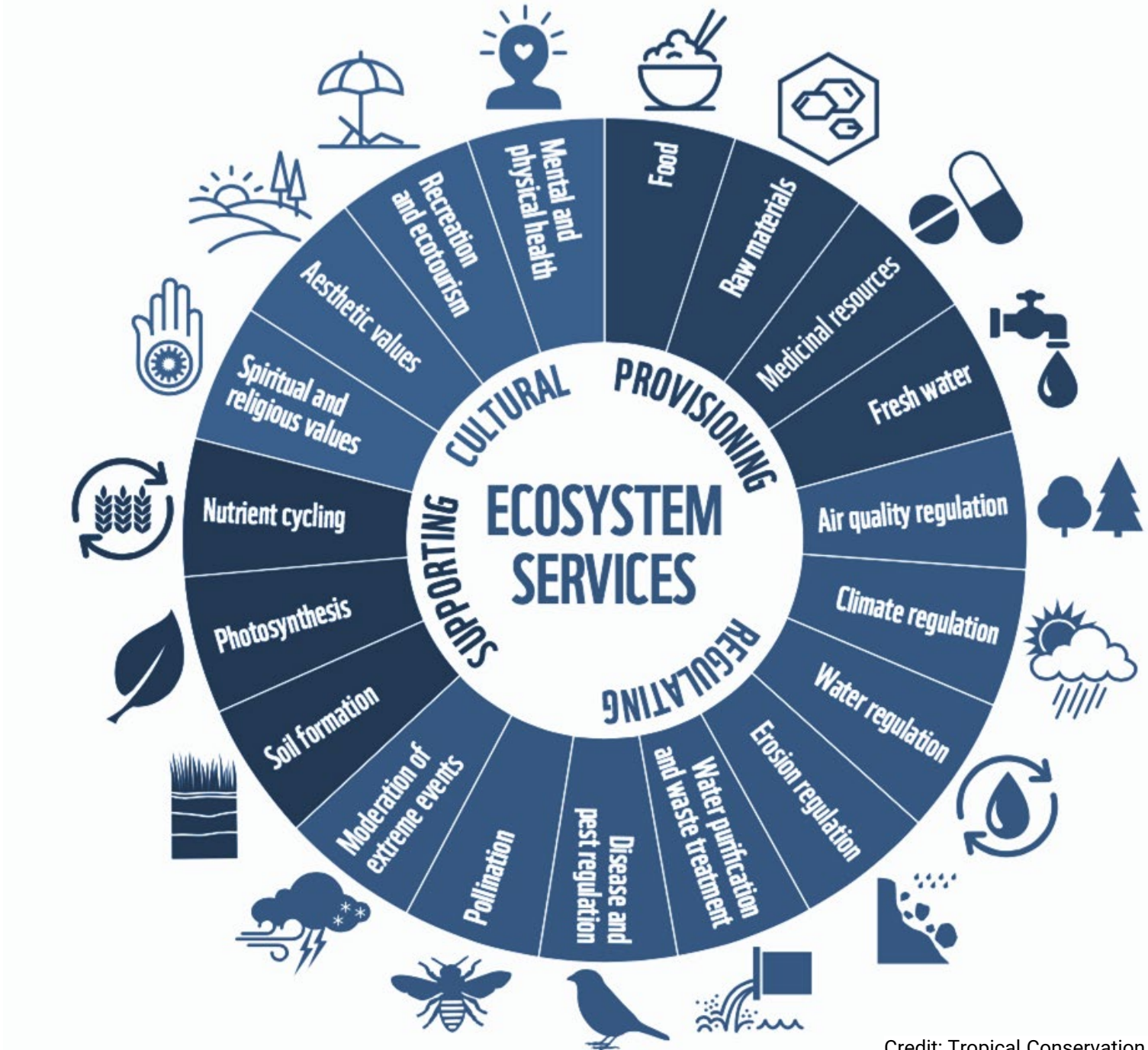
Benefit Transfer

Travel Cost

Opportunity Cost

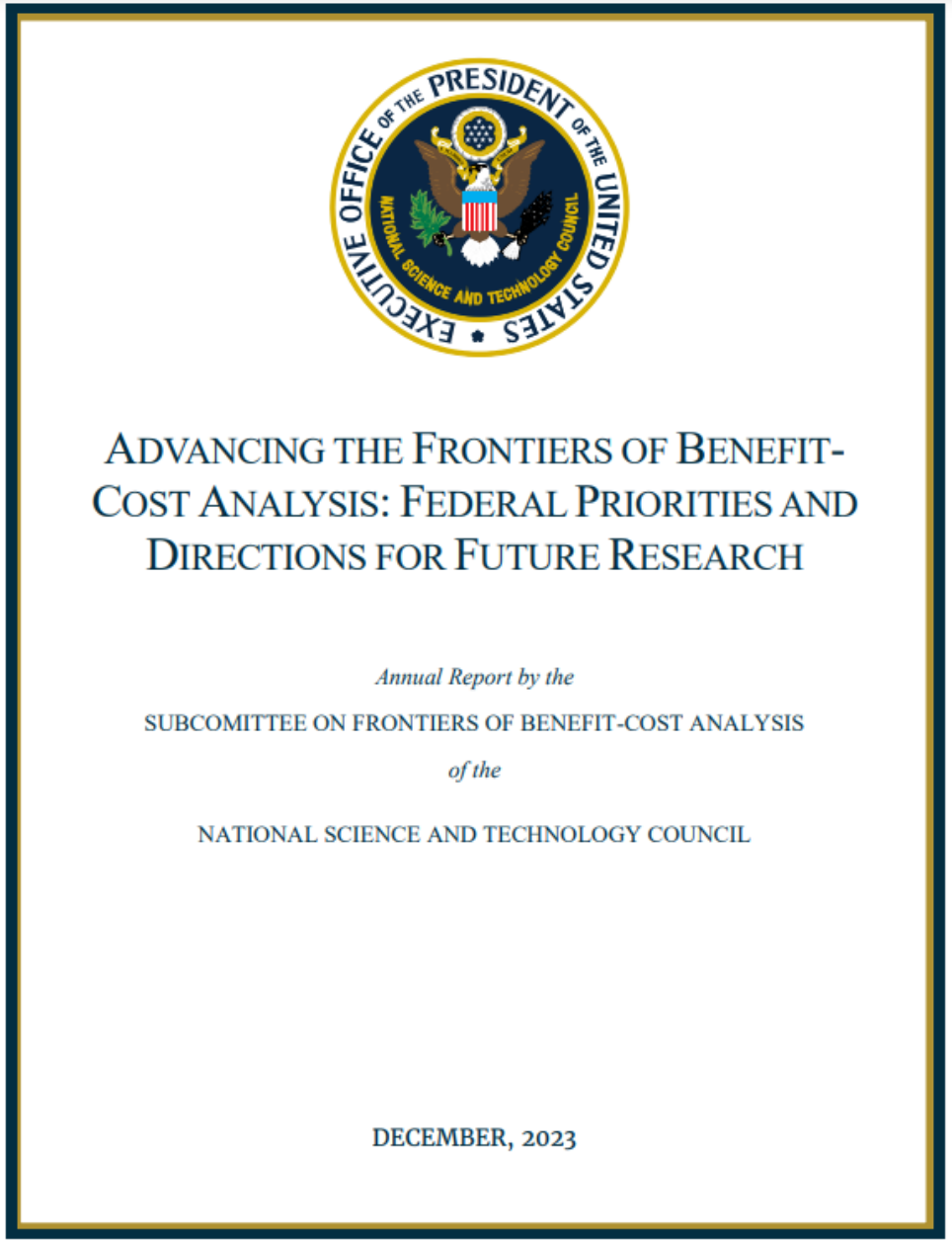
EXAMPLE
People expend time and resources of value to attend educational coastal management seminars; in turn, these seminars also can be tied to improved management decisions and healthier wetlands


Path 1:
Conduct a site-specific study
Path 2:
Borrow results or "benefits transfer"
Path 3:
Use a tool with built-in benefits
(FEMA BCA Toolkit)



Credit: Tropical Conservation Fund

Cultural heritage and identity	**Sense of place**
Traditions and customs	**Aesthetic value and inspiration**
Social relations	**Cultural keystone species**
Spiritual and religious values	**Recreation**



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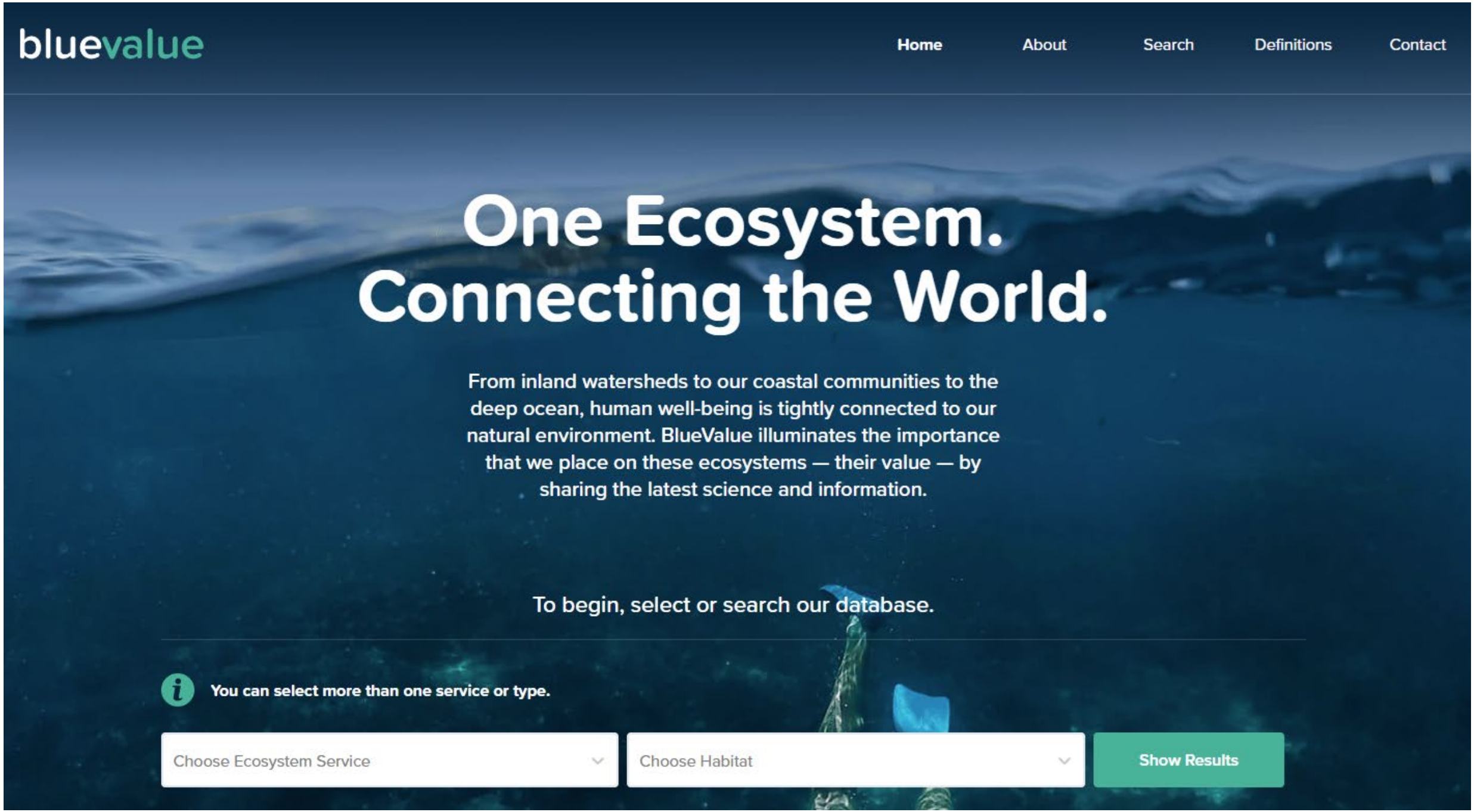
DECEMBER, 2023

Some Challenges for NOAA

- ES values for benefit transfer approach, especially in remote or rural areas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Some Challenges for NOAA

- ES values for benefit transfer approach, especially in remote or rural areas
- Quantification or description of cultural services done in a way deemed appropriate by rights holders

Some Challenges for NOAA

- ES values for benefit transfer approach, especially in remote or rural areas
- Quantification or description of cultural services done in a way deemed appropriate by rights holders
- Tools for easy use by grant applicants, especially nature based solutions infrastructure projects

Thank you!

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Incorporating Ecosystem Services in Forest Service Decision-Making

Travis Warziniack
USDA Forest Service

ACES December 2024
Austin, Texas

Guiding documents

Multiple-Use and Sustained-Yield Act of 1960: Timber, Range, Water, Recreation, Wildlife

National Forest Management Act of 1976 & the 2012 Planning Rule

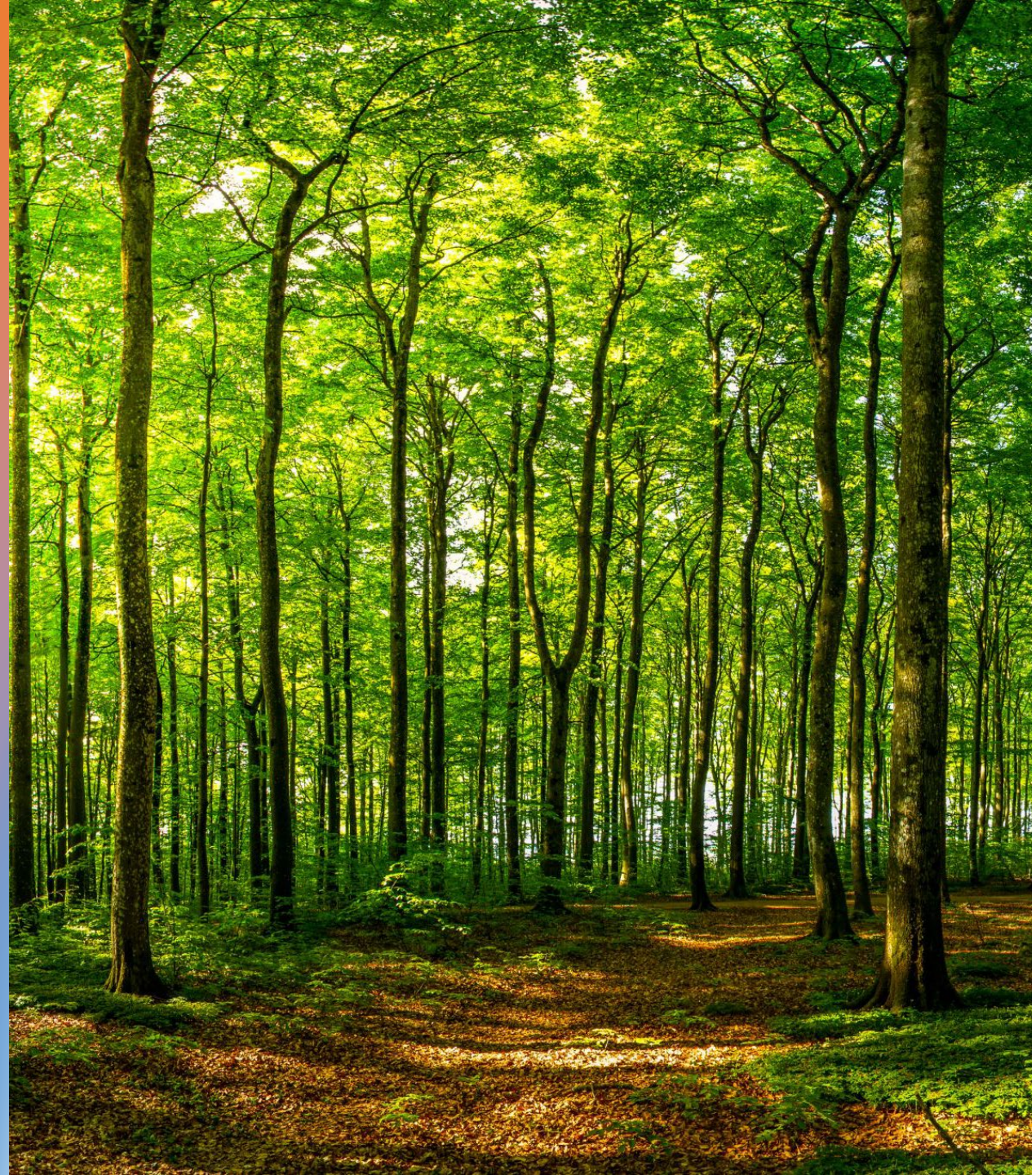
Forests and Rangeland Renewable Resources Planning Act (RPA) of 1976. National report of status, conditions, and trends of renewable resources on **all forests and rangelands** every 10 years.

Three core areas for ecosystem services in the Forest Service

Forest planning

Outcome Performance Metrics

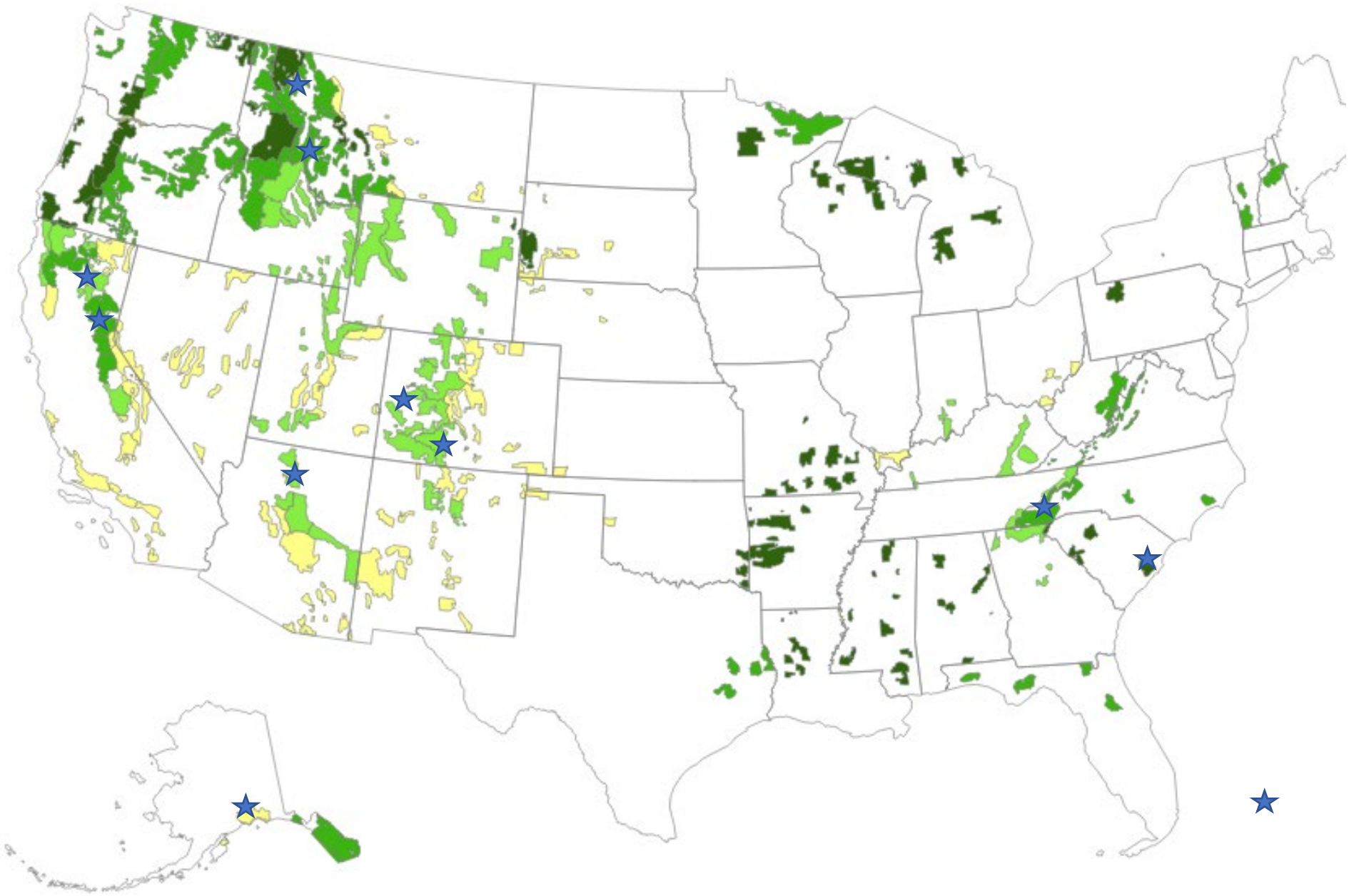
Conservation finance



2012 Forest Planning Rules

- **2012 Planning Rule:**
  - Highlights social and economic sustainability goals
  - Directs National Forests and Grasslands to assess and account for “key” ecosystem services

- **1982 Planning Rule:**
  - Emphasized maximizing net public benefits



10 national forests with EIS available under 2012 Rule

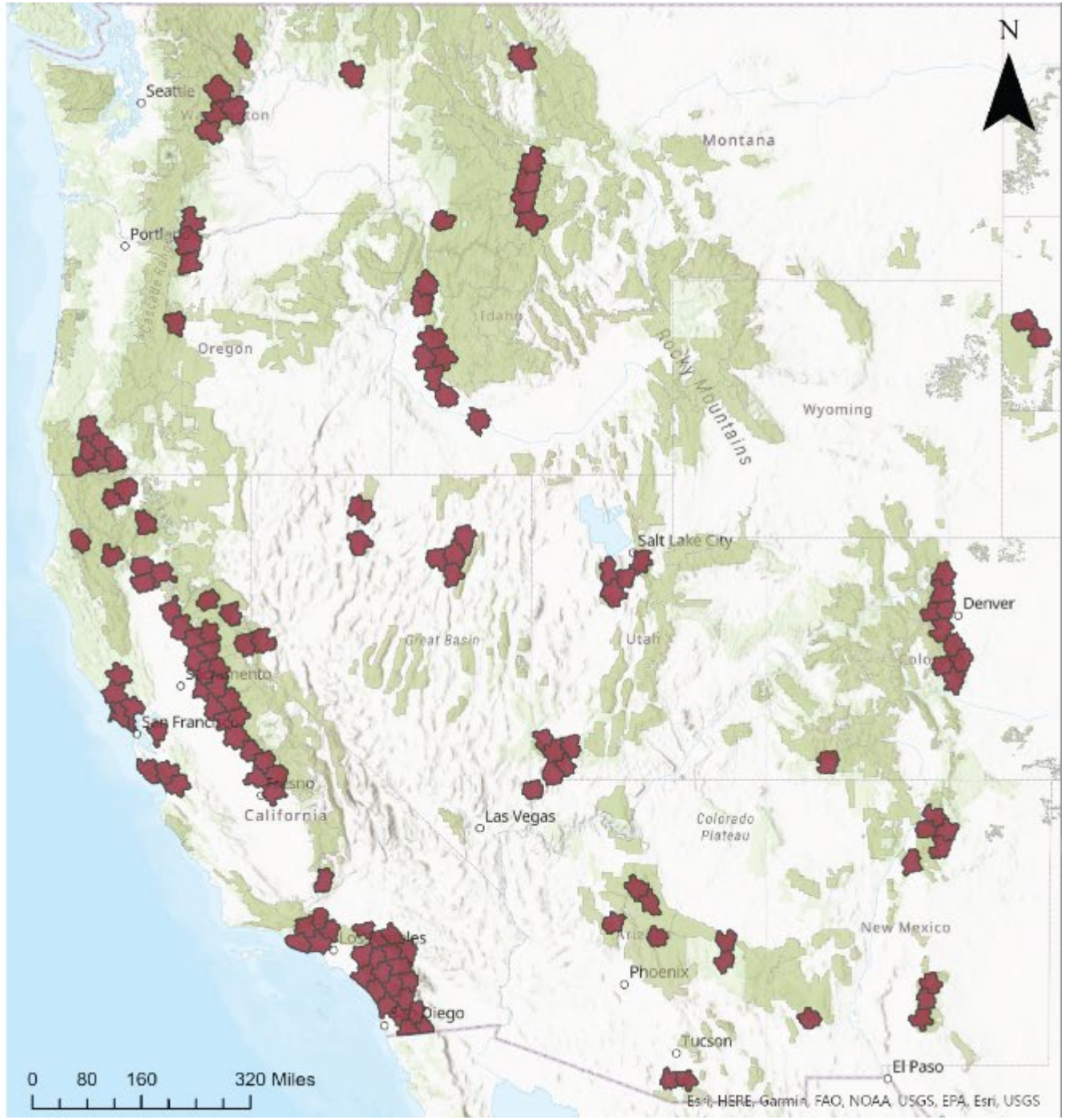
Review of 10 forest plans

1. Lacked a consistent classification of ecosystem services (MEA, USEPA, etc.)
2. Indicators often qualitative, but some quantitative, some measured by population size or exposure
3. Values and benefits characterized with a range of approaches, often reflecting limited data, time, and resources


woodproducts
educationalprograms
tourism
berries
aquatic
climateregulation
climatechange
floodcontrol
solitude
plants
fishing
jobs
spiritualvalues
fuel
habitat
timber
grazing
wildlife
inspiration
ecosystems
culturalvalues
water
air
hunting
forestproducts
fish
carbonsequestration
historic
recreation
energy
scenery
research
wood
intact
heritagevalues
food
wildlifeviewing
minerals
animals
sites
infrastructure
education
resources
income
firesuppression
fuelsmanagement
biodiversity
volunteerprograms
christmastrees
firewood

HIGH-RISK FIRESHEDS

Community exposure is a central factor in the strategy to confront the wildfire crisis. Other factors include Tribal and State plans, watersheds, equity, climate forecasts, and partner priorities.

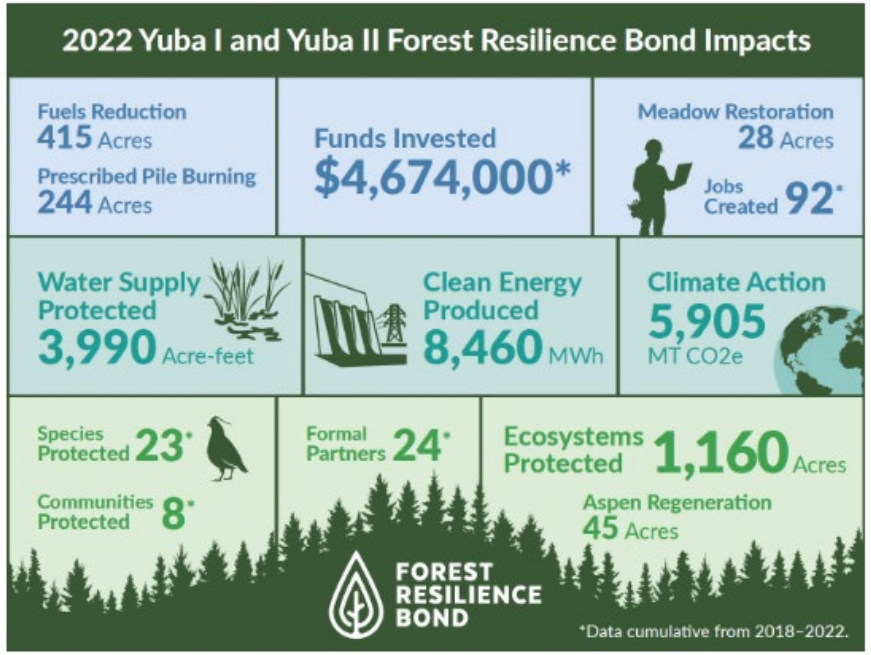


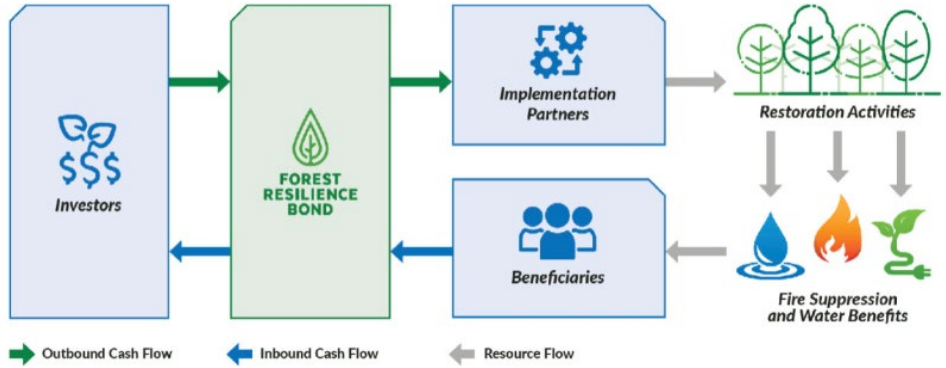
High Risk Firesheds

National Forest System Lands

USDA

	Surface water from all lands			Surface water from NFS lands		
Landscape	Population dependent on surface water	Gallons of drinking water	Expenditures on drinking water	Population dependent on surface water	Gallons of drinking water	Expenditures on drinking water
4FRI	113,125	7,227,302,386	$38,973,825	95,934	6,128,986,253	$33,051,065
Central Oregon	393,645	20,221,646,386	$213,843,710	300,971	15,460,972,176	$163,499,627
Central Washington Initiative	109,168	4,815,389,326	$45,051,450	84,293	3,718,159,146	$34,786,068
Colorado Front Range	3,601,149	203,610,332,291	$1,824,283,356	2,412,544	136,450,105,601	$1,221,885,323
Southern California Fireshed Risk Reduction Strategy	17,905,353	850,756,594,886	$10,055,646,218	6,450,001	306,465,934,207	$3,622,320,451
Southwest Idaho	241,538	14,691,844,308	$86,054,981	16,921	1,029,242,350	$6,028,612
Stanislaus	570,692	27,115,912,428	$320,500,627	175,421	8,334,960,102	$98,516,321
Trinity Forest Health and Fire-Resilient Rural Communities	305,096	14,496,359,539	$171,341,914	69,900	3,321,242,662	$39,255,930
Wasatch	488,418	36,632,104,958	$362,205,518	268,567	20,155,425,481	$199,455,783
Total	29,754,844	1,543,788,717,355	$15,560,667,312	12,530,165	658,391,617,691	$6,536,264,463





Forest Resilience Bond: Yuba Watershed of Tahoe National Forest

ADVANCING THE FRONTIERS OF BENEFIT-COST ANALYSIS:
PROGRESS ON FEDERAL PRIORITIES, INSIGHTS FOR THE RESEARCH COMMUNITY, AND EMERGING TOPICS

A Report by the

SUBCOMMITTEE ON FRONTIERS OF BENEFIT-COST ANALYSIS

COMMITTEE ON ENVIRONMENT

of the

NATIONAL SCIENCE AND TECHNOLOGY COUNCIL

Current Challenges & Advancing This Frontier

- Clarity on ecosystem-service concepts and terminology and a common ecosystem-service classification framework
- Moving beyond qualitative descriptions
- Valuation methods and tools
  - Stated preference methods
  - Valuation databases
- Distributional impacts
- General equilibrium and multi-market analysis
- Opportunities
  - Temporary assignment to government
  - Engage early with agencies

Thank you

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THE WHITE HOUSE
WASHINGTON

Open Discussion

Table 2. Ecosystem Services Effects: Specific Effects Identified as Challenging to Fully Monetize

Specific Effect	Specific Challenge: Lack…
Habitat designation effects on commercial and recreational fishing	Data on area of some habitats (e.g., deep water corals).
Habitat designation effects on species existence value	Data on existence value estimates for specific endangered species (or clarity on how benefit transfer can be applied in these cases under A-4)
Habitat restoration effects on species existence values	Data on existence values for specific species
Species recovery benefits	Data on relationship between whale population changes and any benefits
Forest and other land-cover regrowth effect on climate mitigation values	Data on long-term temporal changes in carbon sequestration as ecosystems recover from wildfire
Effects of antibiotic use on disease prevention, agriculture productivity, existence values	Data on effects of various levels of antibiotic use on ecosystem changes related to disease prevention, agricultural productivity, species existence value
Flood/storm risk reduction effects from restored ecosystems	Sufficient certainty in relationship between restoration of various wetland features and flood risk Method to reflect benefit to vulnerable, lower-income neighborhoods
River or coastal management effects on loss of life from floods or storms	Relationship between river or coastal habitat management and indirect loss of life from floods or storms
Mental health effects of flooding or coastal storms	Data on incidence of mental health effects from storm events of different magnitudes Valuation data on mental health impacts
Mental health effects of climate change anxiety	Data on incidence of mental health effects from climate change anxiety

Table 2. Ecosystem Services Effects: Specific Effects Identified as Challenging to Fully Monetize cont.

Specific Effect	Specific Challenge: Lack…
Coastal habitat effects on existence value	Data on existence value of coastal areas Time to conduct surveys, or need alternate method
Coastal ecosystem effects on recreational use values	Regional data on coastal habitat (e.g., beach) use values Data on coastal ecosystem use values by income level
Coastal ecosystem effects on climate mitigation values	Data on carbon storage and sequestration rates in various coastal habitat types, or estimation model to relate habitat changes to carbon changes
Coral reef effects on Tribal Nations and Indigenous Peoples use values	Data on preferences for Tribal Nations and Indigenous Peoples cultural uses of coral reefs
Fishery or habitat management effect on subsistence fish use	Data on subsistence harvest levels (total and by cultural group) Consistent definitions and units across agencies
Coastal habitat effects on existence value	Data on existence value of coastal areas Time to conduct surveys, or need alternate method
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Table 2. Ecosystem Services Effects: Specific Effects Identified as Challenging to Fully Monetize cont.

Specific Effect	Specific Challenge: Lack…
Fishery or habitat management effect on subsistence fish use	Data on subsistence harvest levels (total and by cultural group) Consistent definitions and units across agencies
Effects of allocating catch between recreational and commercial fisheries	Cost data for some commercial fisheries Data on marginal net benefit of fish in non-ITQ managed commercial fisheries (require surveys) Data on marginal net benefit of fish in recreational fisheries (require surveys) Data on behavior changes in response to quota changes
Infrastructure or facility effects on recreation values	Higher frequency, higher resolution visitation data Values associated with attributes of recreation experience (e.g., crowding, visual and physical amenities) Values for specific recreational opportunities (e.g., biking, hiking, canoeing, kayaking, horseback riding, climbing)
Tourism and outdoor recreation benefits	Data and methodology to measure benefits of outdoor activities
Willingness to pay for cultural resource prevention	Lack of data on willingness to pay
Visitation estimates of outdoor spaces	Lack of data and resources to collect the data
Value of blue carbon in coastal wetlands	Data on carbon content