

Prepared in cooperation with the U.S. Department of  
the Interior Office of Policy Analysis

# Supporting Natural Resource-Management Decisions—The Role of Economics at the U.S. Department of the Interior (DOI)—2018 DOI Economics Training Workshop

Open-File Report 2020–1044

U.S. Department of the Interior  
U.S. Geological Survey



**Cover:** Compilation of natural resources and activities found on lands of, or managed by, the U.S. Department of the Interior. Artwork by Shonte Jenkins, U.S. Geological Survey.

# **Supporting Natural Resource-Management Decisions—The Role of Economics at the U.S. Department of the Interior (DOI)—2018 DOI Economics Training Workshop**

By Mustapha Alhassan, Emily J. Pindilli, Christian S.L. Crowley, Carl D. Shapiro,  
and Benjamin M. Simon

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**U.S. Department of the Interior  
U.S. Geological Survey**

**U.S. Department of the Interior**  
DAVID BERNHARDT, Secretary

**U.S. Geological Survey**  
James F. Reilly II, Director

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## Abbreviations

BIA	Bureau of Indian Affairs
BIE	Bureau of Indian Education
BLM	Bureau of Land Management
BOEM	Bureau of Ocean Energy Management
DOI	U.S. Department of the Interior
ECoP	Economics Community of Practice
IEED	Office of Indian Education and Economic Development
IMPLAN	Impact Analysis for Planning
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration (in the Commerce Department)
NPS	National Park Service
OSMRE	Office of Surface Mining, Reclamation, and Enforcement
PPA	Office of Policy Analysis
Reclamation	Bureau of Reclamation
SDC	Science and Decisions Center
USGS	U.S. Geological Survey
VOI	value of information

# Supporting Natural Resource-Management Decisions—The Role of Economics at the U.S. Department of the Interior (DOI)—2018 DOI Economics Training Workshop

By Mustapha Alhassan,<sup>1</sup> Emily J. Pindilli,<sup>1</sup> Christian S.L. Crowley,<sup>2</sup> Carl D. Shapiro,<sup>1</sup> and Benjamin M. Simon<sup>2</sup>

## Executive Summary

The second U.S. Department of the Interior (DOI) Economics Training Workshop (hereafter “Workshop”) was held during September 25–27, 2018, in Washington, D.C., to identify, highlight, and better understand needs and opportunities for economic analysis to support DOI’s mission. Building on the first workshop in 2017, the second Workshop, jointly convened by the DOI Office of Policy Analysis and the U.S. Geological Survey (USGS) Science and Decisions Center, provided an opportunity for DOI economists to share expertise and experiences and to build collaboration and communication channels across DOI. In addition, the second Workshop provided training sessions on a variety of relevant economic and modeling topics. More than 40 DOI economists gathered at the Workshop to share their work, discuss shared challenges, and identify approaches to advance the use and contribution of economics at the DOI.

## Workshop Findings

Workshop participants identified a set of findings including communication challenges, tips and best practices in communication, new ideas and techniques in communication, sharing capacity, developing training, increasing the visibility of DOI economics, the need for standardized methods used by DOI economists, and the formation of the DOI Economics Community of Practice (ECoP). Participants agreed that the focus of the ECoP should be solely economics and agreed to its formation, online presence, and participation of economists and noneconomists within and outside of DOI.

## Recommendations

To address the findings of the workshop, participants developed several recommendations. Participants suggested ideas to help reduce challenges of communication including

organizing economics information, clarifying technical and policy related questions, and organizing forums to define terms and avoid repetition.

Participants made recommendations on sharing capacity. They suggested a list of position openings across Bureaus, receiving feedback on data collection before collecting data, a document to show the location of economists in all organizations, and using the ECoP to share information on publications, models, and ideas. They also suggested that information on existing and planned projects be made available for DOI economists to facilitate collaboration.

## Summary

The Workshop had a variety of sessions including training in data analysis and visualization, opportunities to share research, panels on specific technical and policy issues, breakout groups to identify potential solutions, and open forums to brainstorm new ideas on economics research and the communication of solutions and ideas. The first day of the Workshop offered training in input-output analysis with Impact Analysis for Planning (known as “IMPLAN”), in statistical computing with R, and in the basics of ArcGIS for economists; and offered a discussion of data visualization best practices. The second day included an overview of each of the Bureaus and participating offices in DOI, as well as Federal partner agencies; a discussion of each agency’s economic capacity and function; and two lightning rounds of presentations that focused on case studies related to energy and minerals economics and to recreation, land, and other natural resource-management topics. On the third and final day, another lightning round focused on natural resource-valuation methods and provided a sample of many research efforts in quantifying values of resources. This day also included a panel discussion on the value of information of USGS science for selected information products.

<sup>1</sup>U.S. Geological Survey.

<sup>2</sup>U.S. Department of the Interior Office of Policy Analysis.





Attendees at the 2018 U.S. Department of the Interior (DOI) Economics Training Workshop. Photograph by Christian Crowley, DOI.

## **Conclusions**

The Workshop provided a forum to generate innovative ideas, share information on the latest projects at DOI, identify collaborations to develop best practices, and improve the skills of DOI economists. Participants in the Workshop shared their insights and provided diverse perspectives in addressing issues that DOI economists and policymakers may face on a regular basis.

Major outcomes of the Workshop include consensus on the following: formation of the DOI ECoP to enable sharing of ideas among DOI economists; the need to develop novel approaches to facilitate communication between DOI economists and noneconomists; the need to improve capacity to collaborate across Bureaus and offices; the desire for further training, when necessary, for DOI economists; and the desire for recurring DOI economics training workshops and ongoing collaboration with supplementary workgroups, webinars, blogs, and discussion forums.



## Introduction

Natural and cultural resource managers face complex questions and often have to balance competing stakeholder interests. The U.S. Department of the Interior (DOI) “protects and manages the Nation’s natural resources and cultural heritage; provides scientific and other information about those resources; and honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities” (DOI, 2018b). Economic analysis is relevant to issues integral to nearly all the land- and water-management decisions made by DOI. DOI economic analysis contributes to effective decision making in leasing minerals; implementing and managing royalties, revenues, and fees; developing infrastructure; managing water; evaluating the costs and benefits of alternative plans for projects including the societal tradeoffs associated with actions; managing timber; identifying unintended consequences of decisions; identifying externalities and their costs; estimating the market and nonmarket value of natural resources; and evaluating the value of scientific information in decision making. In 2017, the first DOI Economics Training Workshop brought together more than 80 economists from across DOI to consider challenges of conducting and communicating economics at DOI (Pindilli and others, 2018). The second workshop built on the foundation of the first to advance the use of economics at DOI, increase collaborative opportunities, provide knowledge transfer, and support an ongoing connection among economists at DOI.

The second DOI Economics Training Workshop (hereafter “Workshop”) was held from September 25 to 27, 2018, in Washington, D.C., jointly convened by the DOI Office of Policy Analysis (PPA) and the U.S. Geological Survey (USGS) Science and Decisions Center (SDC). The Workshop

had four primary objectives: (1) provide training on tools for economic analysis and data visualization; (2) discuss DOI’s current economics needs and approaches to meet those needs; (3) share the latest economics research being done across DOI; and (4) develop an Economics Community of Practice (ECOP) to continue leveraging expertise across DOI.

The first day of the workshop included four training sessions. The training sessions were on input-output analysis using the Impact Analysis for Planning (IMPLAN) model (<https://www.implan.com>), statistical computing with R (<https://www.r-project.org>), basics of ArcGIS (<https://www.esri.com/en-us/arcgis/products/arcgis-pro/overview>) for economists, and recommendations for data visualization based on Tufte (2001). The remainder of the workshop included oral and poster presentations, small-group working sessions, panel discussions, and open-forum discussions. On day two, participants were updated on the functions, capabilities, and capacity of the Bureaus and offices within DOI. Sessions also included some of DOI’s Federal partner agencies and information on Native American economic development. Another panel discussion focused on changes in the National Environmental Policy Act (NEPA; 42 U.S.C. § 4321 et seq.) and DOI implementation, value of information (VOI), and strategic directions of DOI economics. A small group discussed communicating with noneconomists, and a working session focused on building the DOI ECOP.

The Workshop covered a broad suite of topics including energy and minerals economics; recreation, land, and other natural resource-management case studies; natural resource-valuation methods, and VOI. The Workshop included 5- to 7-minute talks (called “lightning rounds”) that highlighted economics research and analysis efforts across the DOI. This report summarizes the Workshop, insights gained, and describes conclusions and recommendations generated by Workshop participants.



Small-group working session at the 2018 U.S. Department of the Interior (DOI) Economics Training Workshop. Photograph by Christian Crowley, DOI.

## Key Findings and Recommendations

Key findings and recommendations are provided in this section as a product of the Workshop discussions.

**Finding 1—Economic analysis can provide critical information to DOI decision makers. DOI economists need to communicate more effectively with DOI decision makers about the benefits of economic analysis in assessing issues of scarcity and tradeoffs.**

*Recommendations.*—DOI economists and communication specialists should work together to develop a communications strategy for more effectively explaining the benefits of economic analysis to DOI decision makers. This includes identifying situations that are best suited for economic analysis, including valuing natural resources, ecosystem services, and valuing scientific information, developing environmental markets, and assessing benefits, costs, and tradeoffs of alternatives and scenarios.

**Finding 2—Innovative approaches to improve communication with DOI decision makers need to be used to support the use of economic analysis to inform DOI policies and decisions.**

*Recommendations.*—When planning to communicate with noneconomists, crafting materials and questions in advance with clear objectives and language is important. Sharing knowledge across the DOI and the economics discipline is also important. DOI economists would benefit from reference guides on communication with noneconomists and a centralized DOI docket (for example, a spreadsheet of projects) that includes lessons learned and resources from other economists in DOI.

**Finding 3—Sharing economic expertise across DOI is needed to leverage scarce economic resources.**

*Recommendations.*—DOI economists should inform DOI decision makers about the benefits of sharing services across Bureaus to leverage resources and avoid gaps. This could start with a DOI economists' mission statement. An ECoP should be developed to facilitate sharing of information about research efforts and expertise across DOI. DOI should also develop a contact directory of its economists, as well as information on DOI's economics publications, trainings, ongoing projects, and calls for collaborators.

**Finding 4—DOI should develop a series of trainings to help its economists and decision makers learn about economic methods, tools, and analyses, as well as opportunities for using economic analyses more effectively across DOI.**

*Recommendations.*—Trainings can be online or short videos on DOI Talent (a training platform internal to DOI). DOI can also partner with universities or other training organizations to offer group trainings to DOI economists. Areas of training for DOI economists could include statistical packages like R, Tableau (<https://www.tableau.com/>), and SAS ([https://www.sas.com/en\\_us/home.html](https://www.sas.com/en_us/home.html)). DOI economists could also develop an “economics 101” type of training for decision makers.

**Finding 5—Standardized economics application methods used in DOI are lacking.**

*Recommendations.*—An inventory of methods and best practices used within DOI should be developed to provide the basis for a Bureau-wide effort to identify economics best practices and standard methods within DOI.

## U.S. Department of the Interior Economics Training Workshop Summary

This section provides additional detail on the Workshop sessions. Workshop participants are listed in appendix 1, and the detailed agenda is provided in appendix 2. The first day of the Workshop was allocated for training sessions on IMPLAN, R statistical software, ArcGIS, and data visualization.

### Day 1—Training Sessions

To expand the knowledge base of DOI economists, the workshop started with training sessions in input-output analysis with IMPLAN, statistical computing with R, the basics of ArcGIS for economists, and a review of recommendations for data visualization. The instructors for the IMPLAN training session were Maria Lucas and Jimmy Squibb, both from IMPLAN Group, LLC. The IMPLAN training covered many topics including an introduction to IMPLAN’s input-output modeling, how IMPLAN works, understanding economic sectors and commodities, exploring IMPLAN data, and the importance of framing an analysis. Practical examples of how IMPLAN works included demonstrations on regional economic impacts of an offshore wind farm that considered tax and tariff changes.

The statistical computing with R training was an introduction to R for economists, taught by Stephen Scott, a senior information system engineer and adjunct professor at George Mason University. Topics of the training included installation and background information of R and RStudio, using R for vector arithmetic, and visualizing data with basic graphics

and plots. The instructor also trained participants on built-in mathematical and statistical functions in R and allowed users to practice writing their own R functions.

The third training session covered the basics of ArcGIS for economists, taught by Collin Lawrence, a hydrologist at the SDC in Reston, Virginia. It covered importance of geographic information systems (GIS), GIS software, types of GIS data, and how ArcGIS is used to process data with examples. Lesli Kirsch-Burke, an economist at the Bureau of Reclamation (Reclamation) in Boulder City, Nevada, led the final session on data visualization. The training covered recommendations for presenting data following Tufte (2001). It also emphasized mistakes to avoid in the design and display of data graphics.

### Day 2—Welcome Addresses and Presentations

The second day of the Workshop started with welcome addresses by Carl Shapiro (SDC) and Benjamin Simon (PPA). USGS Director Jim Reilly gave a keynote address, describing the importance of economics to DOI. After the keynote address, a session was held that included updates from DOI Bureaus and offices: Bureau of Land Management (BLM), Bureau of Ocean Energy Management (BOEM), U.S. Fish and Wildlife Service, Office of Indian Energy and Economic Development (IEED), National Park Service (NPS), Office of Natural Resources Revenue, Office of Surface Mining, Reclamation, and Enforcement (OSMRE), PPA, Reclamation, and USGS. Representatives from three of DOI’s Federal partner agencies discussed the role of economics in their organizations: U.S. Environmental Protection Agency’s National Center for Environmental Economics, National Oceanic and Atmospheric Administration (within the U.S. Department of Commerce), and U.S. Forest Service (within the U.S. Department of Agriculture). A session on Native American economic development followed these agency updates. Two lightning rounds also took place: the first with four presentations on energy and minerals economics, and the second with seven presentations on recreation, land, and other natural resource-management case studies. The second day also included a panel discussion on the NEPA.

### Native American Economic Development and Other Issues Session

Through the American Recovery and Reinvestment Act of 2009 (Public Law 111-5, Stat. 115), DOI provided up to \$500 million for improving livelihoods in American Indian and Alaska Native communities (DOI, 2018a). The funding provided by DOI is through the IEED to help Tribal communities achieve economic growth in many sectors including management and development of their energy resources, job creation, workforce training, as well as creating safe learning environments for students in Bureau of Indian Education (BIE) schools.





ArcGIS training at the 2018 U.S. Department of the Interior (DOI) Economics Training Workshop. Photograph by Christian Crowley, DOI.

This session's presentations discussed labor force reports of the American Indian and Alaska Native populations; a human capital survey in BIE schools; teacher and principal tenure at BIE schools; and renewable energy development in Indian Country. A labor force report on employment estimates of the American Indian and Alaska Native populations is required by law to be published biennially (DOI, 2003). The estimates are at the national, State, Bureau of Indian Affairs (BIA) service area, and Tribal level. Carlann Unger (PPA) recounted the challenges of preparing the employment estimates regarding data collection, estimation methods, and demarcation of service areas for most tribes. Many BIE schools have difficulty recruiting and retaining teaching and nonteaching staff (BIE, 2014), and BIE is working to improve data-collection efforts to obtain a better understanding of human capital functions at the school level.

Turnover of principals and teachers is an issue at some BIE schools. Veronica Lane (BIE) presented analysis on the number of teacher vacancies in BIE schools by subject area. Chloe Mayne (PPA) described work on comparing BIE

principal and teacher tenure with those at the national level. Lastly, Steven Payson (BIA) presented an update on renewable energy development in Tribal areas.

## Energy and Minerals Economics Lightning Round

DOI economists contribute to research that helps in the management of the Nation's energy and minerals resources. This lightning round featured four presentations on the growth in productivity of Bakken oil production, on land-use planning for energy and mineral extraction and economic development, on Federal onshore oil and gas technically recoverable resources, and on price-based royalties in the oil and gas industry (appendix 3, [table 3.1](#)). Identifying factors that affect the productivity of oil wells can be helpful in understanding variations in the marginal cost of incremental oil production. Emil Attanasi (USGS) presented work that examines drivers of growth in productivity in oil wells from the middle Bakken Formation in North Dakota. Winter Jojola-Talbert (BIA) discussed research that shows how links between energy, minerals, economic development, and comprehensive land-use planning can support long-term economic development



goals. The Energy Act of 2000 (Public Law 106–469, 114 Stat. 2029) directed DOI, in consultation with other departments, to maintain an inventory of oil and natural gas resources beneath onshore Federal lands (DOI and others, 2008). In association with the DOI inventory of identified resources, Mike Ford (BLM) presented a review of efforts to account for oil and gas development, and trends on Federal lands since 2008. Priced-based royalties in the oil and gas industries may have spillover effects for other industries and local communities. Kevin Nguyen (BOEM) presented work focused on changes in price-based royalties and associated gains and losses.

## National Environmental Policy Act Panel

The NEPA of 1969 (42 U.S.C. § 4321 et seq.) is the basis for environmental policymaking in the United States. NEPA requires an environmental assessment of every “major” Federal decision. Secretarial Order 3355 requires streamlining of NEPA procedures at the DOI (DOI, 2017). DOI economists play a role in considering socioeconomic impacts of DOI land

and resource-management decisions as a part of the NEPA process. The panel was organized to discuss streamlining NEPA processes.

This panel was made up of Octavia Conerly (OSMRE), Mark Jensen (BOEM), Tatiana Marquez (NPS), and Josh Sidon (BLM). The discussion included the panelists’ roles and experiences with NEPA; how NEPA is handled at Bureaus and specific Bureau guidance; typical projects and decisions requiring NEPA analyses; persons responsible for analyzing the economic component of NEPA; how economists interact with other specialists on interdisciplinary NEPA teams; how economics is incorporated into public engagement or other outreach related to NEPA; and how agencies approach new limits on NEPA’s time to completion and page length.



A panel on issues related to the National Environmental Policy Act (42 U.S.C. § 4321 et seq.). Photography by Christian Crowley, U.S. Department of the Interior.

## Recreation, Land, and Other Natural Resource-Management Case Studies Lightning Round

This lightning round had seven presentations (appendix 3, table 3.1). To increase climate resilience in California, biophysical and economic research is assessing benefits and costs of increasing soil organic matter. Fabiano Franco (USGS) presented research on selected economic benefits of increasing soil organic matter on California rangelands. Understanding the socioeconomic impacts of environmental flows can be helpful in identifying ways to sustain ecosystems. Lucas Bair (USGS) presented work that suggests approaches for cost-effective management of invasive fish species in the Grand Canyon. John Primo (BOEM) discussed lessons learned, including challenges and success from ecosystem-service studies by multidisciplinary teams at BOEM. Knowing preferences of park visitors is critical to decisions on where parks and program managers should invest limited resources to generate best returns on investments. Leslie Richardson (NPS) presented research on the value of virtual visits by national park users. Frank Casey (USGS) presented on a range of ecosystem services research by the USGS SDC.

Other presentations focused on wildfire management. James Meldrum (USGS) presented research that proposes two methods of estimating damages from wildfire in sagebrush ecosystems. Relative values and risk of fire damage can be factors to consider when deciding wildfire mitigation

strategies. Christian Crowley (PPA) presented work on deciding the location of fuel treatment to achieve cost-effective wildland fire management.

## Day 3—Keynote Address, Presentations, Panels, and Small Group Sessions

The third day of the Workshop began with a keynote address by the Assistant Secretary for Water and Science Tim Petty, emphasizing the significance of DOI economics in management of resources and hazard mitigation. The keynote address was followed by a lightning round of seven presentations on natural resources and valuation methods, and a small-group working session to discuss communicating with noneconomists. There was a panel discussion on the VOI of USGS science on selected information products and a group activity on building the DOI ECoP. This was followed by a moderated discussion on strategic directions for DOI economics. Key takeaways from the Workshop were highlighted by Carl Shapiro and Benjamin Simon, followed by concluding remarks.

## Natural Resource Valuation Methods Lightning Round

Caroline DiRoll (Reclamation) presented on ongoing work comparing methods and assumptions across feasibility studies. Bill Taylor (Reclamation) presented work on



Attendees during a presentation. Photograph by Christian Crowley, U.S. Department of the Interior.



approaches to estimating the benefits of hydropower. Lesli Kirsch-Burke (Reclamation) presented work that focused on evaluating basin-wide solutions to declining lake levels, using two case studies on the Colorado River: Lake Powell in Utah and Arizona and Lake Mead in Nevada and Arizona. Mustapha Alhassan (USGS) presented a cost analysis of irrigated agriculture in the Mississippi Alluvial Plain region as part of an ongoing project to integrate economics into a physical groundwater model to guide decision making in the region. Steven Piper (Reclamation) presented new approaches to evaluating ability to pay for municipal and industrial water. Chris Huber (USGS) presented research on quantifying economic benefits from drylands and sagebrush ecosystems. Ken Bagstad (USGS) described work that addresses methodological issues and data challenges for natural capital accounting in the United States (see the full list of presentations in appendix 3, [table 3.1](#)).

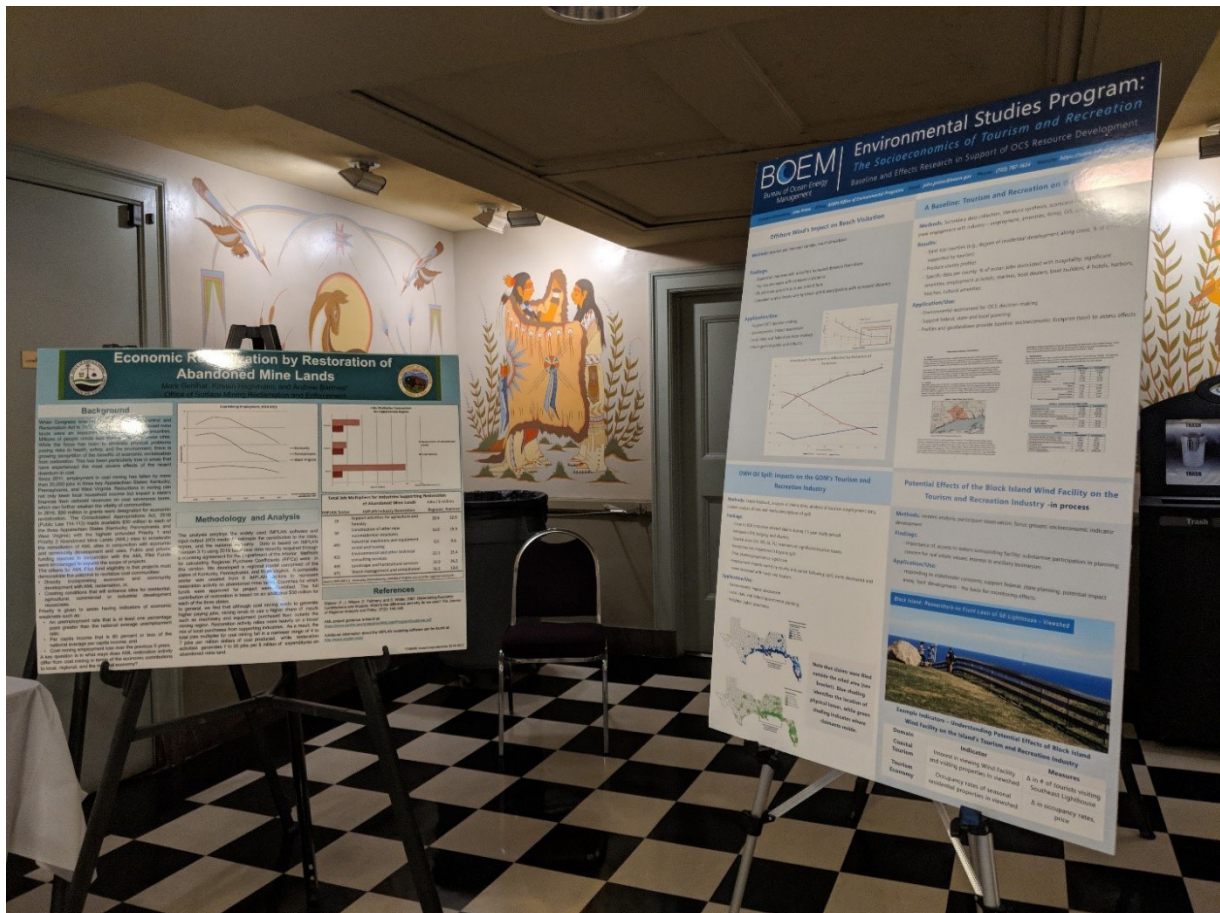
## Poster Presentations

John Primo (BOEM) presented a poster on the socioeconomics of tourism and recreation, using surveys and visual simulations to determine impacts of offshore wind turbines

on beach visitations. Tony Good (USGS) presented a poster on quantifying the value of carbon sequestration in mangrove ecosystems using an agent-based method. Mark Jensen (BOEM) presented a poster on recreational use of offshore oil and gas platforms. Mark Gehlhar (OSMRE) presented a poster on the economic revitalization effects of restoring abandoned mine lands (see full list of poster presentations in appendix 4, [table 4.1](#)).

## Small-Group Working Session—Communicating with Noneconomists

One of the challenges faced by economists is how to communicate economics research and findings with noneconomists, including land and resource managers, scientists, and other stakeholders. A session was devoted to sharing knowledge on how economists can better communicate about economics topics with noneconomists. The session was moderated by Ann Miller (PPA), and a small-group discussion focused on five areas: communication challenges, types of audiences, tips and best practices to enhance effective



Posters by Mark Gehlhar (Office of Surface Mining Reclamation and Enforcement) and John Primo (Bureau of Ocean Energy Management). Photograph by Christian Crowley, U.S. Department of the Interior.



communication, new ideas and techniques to help with communication, and communication goals of the DOI economics community in the short and long term.

Communication challenges in general focused on issues DOI economists have experienced in communicating economic concepts, results, priorities, and other information with noneconomists. Participants identified several factors that hinder the flow of information between DOI economists and noneconomists. These included noneconomists' lack of understanding of economics and economic terminologies coupled with economists' use of jargons. One example given was the use of the terms "economic impact" versus "economic value." Other factors that hinder the flow of information include inconsistent approaches to communication; transmissions of inappropriate breadth, too rigorous or too brief; public perceptions of economists as bearers of bad news; and bureaucratic constraints. In identifying audiences that DOI economists communicate with, participants listed field staff, Tribal leaders, communities, solicitors (attorneys), offices of communication, members of industry, interest groups, the public (including children), partners (Federal, State, nongovernmental organizations, and academics), Congress, international entities, political appointees, members of the Senior Executive Service, supervisors, contractors, and colleague economists.

The tips and best practices centered on the communication approaches DOI economists have found to be effective and the elements or considerations that are important to include or address. Participants identified many approaches or elements to consider, including properly organizing the information, using plain language with relevant examples, knowing the audience, summarizing, and, if possible, using face-to-face communication.

DOI economists also suggested new ideas and techniques, including novel approaches they would like to try or see developed to help in communicating with noneconomists. Participants suggested using pre-meeting questions to guide discussion, using interactive graphics and story maps, and sharing resources including documents, data, and ideas through training.

Ideas gathered by each group on flip charts were discussed in a panel consisting of selected group members. The discussions highlighted the important issues, including what DOI economists have experienced in communicating with noneconomists and approaches that have been effective, including using plain language and locally relevant references. The session also included a discussion of the novel approaches DOI economists would like to see in communicating with noneconomists. DOI economists indicated their main communication goals in the short and long term included educating the public and informing policies and decisions.

## Value of Information Panel

USGS economists, scientists, and non-USGS partners are working on estimating the societal benefits of selected USGS information products, including geologic maps, species

research, volcano science, and water-quality science. The VOI panel consisted of USGS economists Carl Shapiro, Emily Pindilli, Lucas Bair, and James Meldrum. Members of the panel were part of a larger team that did a 6-month study on the economic benefits of USGS science products. Each panelist gave a brief presentation on their analysis. Carl Shapiro (USGS) presented on the use of geologic maps to increase communication of radon hazards in homes leading to increased testing, mitigation, and avoidance of lung cancer. Emily Pindilli (USGS) presented work on the use of volcano science to reduce the cost of evacuation using a scenario of a Mauna Loa (Hawaii) eruption as a case study (fig. 1). James Meldrum (USGS) described work on species science that led to the protection of key mule deer habitat. Lucas Bair described work on USGS water-quality science that guides optimal placement of best-management practices leading to greater return on nutrient-reduction investments. The panelists discussed methods and challenges associated with doing VOI studies, increasing capability to do VOI studies, and communicating the VOI.

## Building the U.S. Department of the Interior Economics Community of Practice

This session was moderated by James Meldrum (USGS) and Chris Huber (USGS). The purpose of a DOI ECoP is to foster discussions of economics research and ideas among DOI economists and noneconomists. The formation of the ECoP was first discussed during the 2017 DOI Economics Training Workshop. The 2018 session on the ECoP was to update the group on progress since the 2017 workshop, including website development, and potential participants and managers of the community.

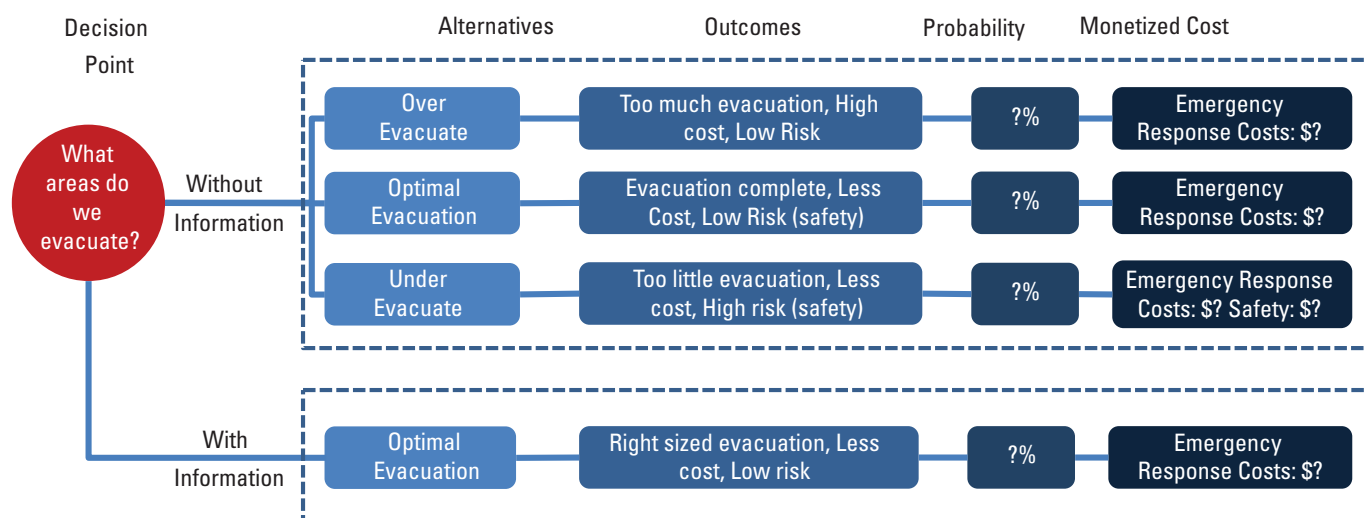
Participants showed interest in the ECoP and agreed that a website of the ECoP could be developed separately or added to the existing social, behavior, and economics website that is currently hosted on HDGov. DOI economists emphasized the main focus of the ECoP should be on economics even though noneconomists can participate. Participants also reached a consensus that other Federal employees from outside DOI can take part in the ECoP to benefit from sharing research and knowledge but could not manage the affairs of the ECoP. Agreement was also reached to have monthly phone calls lasting about 45 minutes to share research and ideas. Finally, participants agreed that DOI economists should have an in-person economics training workshop every 2 years or less and smaller, regional meetings more frequently.

## Strategic Directions

This session focused on future roles for economics in DOI and was moderated by Carl Shapiro (USGS) and Benjamin Simon (PPA). The session was a followup on matters discussed during the 2017 DOI Economics Training Workshop in addition to new proposals and issues to consider.



Small-group working session on communicating with noneconomists. Photograph by Christian Crowley, U.S. Department of the Interior.



**Figure 1.** Decision tree of the Mauna Loa eruption response from the value of information presentations.





Discussing the proposed U.S. Department of the Interior (DOI) Economics Community of Practice. Photograph by Christian Crowley, DOI.

Participants formed small groups and rotated among several flip charts to gather ideas on various topics including potential impacts of the proposed DOI reorganization; sharing capacity in terms of documents, ideas, and information among DOI economists and between DOI and non-DOI collaborators; developing training to improve knowledge and skills of DOI economists; raising the visibility of economics at DOI; and the need for standardization of work done at DOI.

Deliberations on the reorganization of DOI resulted in many ideas and responses. Participants anticipated that the reorganization will have little impact on how DOI economists communicate. To facilitate collaborations across Bureaus and to increase DOI economists' understanding of how other Bureaus work, participants emphasized the importance of having a conversation on the merits of a unified group of DOI economists across Bureaus. Participants also advocated a unified DOI economists' mission statement and a review policy.

DOI economists generated several ideas to help in sharing capacity across Bureaus. Participants first raised concerns about their inability to use collaborative platforms outside DOI, hindering effective collaboration between DOI economists and non-DOI partners. DOI economists also proposed making available list of position openings across Bureaus;

developing and sharing a contact list of DOI economists; and sharing information on publications, trainings, and available projects as some of the ways to share capacity. To update or increase knowledge of DOI economists, participants agreed training courses could be developed and suggested to DOI economists through DOI Talent or partnerships with universities and other organizations.

Participants had many suggestions on increasing the visibility of DOI economics. They noted that information DOI economists provide should target interests of the intended audience. Participants also suggested DOI economists should produce brief publications to serve as on-demand fact sheets and issue highlights. These could also be posted on websites.

Finally, participants recommended that DOI should develop guidelines or best-management practices to promote standardized DOI economics. They suggested many ways that standardization could be achieved including inventory work on DOI projects and provision of templates or style guides for economic work.

The session ended with concluding remarks from Carl Shapiro and Benjamin Simon that emphasized the need for DOI economists to continue meeting and thanked the participants for attending the 2018 Workshop.





Moderated discussion on strategic directions. Photograph by Christian Crowley, U.S. Department of the Interior.

## Summary and Conclusions

The U.S. Department of the Interior (DOI) Economics Training Workshop (hereafter “Workshop”) is a forum for generating dynamic and innovative ideas, informing DOI economists about the projects their colleagues are working on, promoting collaborations on best practices, as well as improving the skills of DOI economists. Participants of the Workshop discussed and addressed several issues facing DOI economists and policymakers. Similar to the 2017 DOI Economics Training Workshop, the 2018 Workshop provided opportunities for DOI economists to share ideas, to make important connections, to acquire skills in data analysis, to discuss past,

current, and future projects, and to build a foundation for future collaborative efforts to improve economic methodologies, data, and communication of results.

Major outcomes of the Workshop include consensus on formation of the Economics Community of Practice, the need to develop and adopt improved approaches to facilitate communication about opportunities to more effectively use economic analysis to inform critical DOI decisions, the importance of developing capacity to collaborate across Bureaus and offices, an interest in further training when necessary for DOI economists, and a desire for recurring DOI economics training workshops and ongoing collaborations with supplementary workgroups using webinars, blogs, and discussion forums.





Touring constitution gardens in Washington, D.C., with Park Ranger Steven Hazelton. Photograph by Christian Crowley, U.S. Department of the Interior.

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## Appendix 1.    List of Participants

The participants in the 2018 U.S. Department of the Interior Economics Training Workshop are listed in [table 1.1](#). The list also includes their affiliations, duty stations, and email addresses to facilitate communication.



**Table 1.1.** List of participants in the 2018 U.S. Department of the Interior Economics Training Workshop.

[USGS, U.S. Geological Survey; Va., Virginia; Colo., Colorado; Ariz., Arizona; BOEM, Bureau of Energy Management; OSMRE, Office of Surface Mining, Reclamation, and Enforcement; PPA, Office of Policy Analysis; Reclamation, Bureau of Reclamation; USFS, U.S. Forest Service; BLM, Bureau of Land Management; NCEE, National Center for Environmental Economics; La., Louisiana; BIA, Bureau of Indian Affairs; Nev., Nevada; BIE, Bureau of Indian Education; NOAA, National Oceanic and Atmospheric Administration; Md., Maryland; NPS, National Park Service]

Last name	First name	Affiliation	Duty station	Email address
Alhassan	Mustapha	USGS	Reston, Va.	malhassan@usgs.gov
Attanasi	Emil	USGS	Reston, Va.	attanasi@usgs.gov
Bagstad	Ken	USGS	Lakewood, Colo.	kjbagstad@usgs.gov
Bair	Lucas	USGS	Flagstaff, Ariz.	lbair@usgs.gov
Casey	Frank	USGS	Reston, Va.	ccasey@usgs.gov
Chiavacci	Scott	USGS	Reston, Va.	schiaivacci@usgs.gov
Coffman	Kim	BOEM	Sterling, Va.	Kim.coffman@boem.gov
Conerly	Octavia	OSMRE	Washington, D.C.	oconerly@osmre.gov
Crowley	Christian	PPA	Washington, D.C.	christian.crowley@ios.doi.gov
DiRoll	Caroline	Reclamation	Denver, Colo.	cdiroll@usbr.gov
English	Don	USFS	Washington, D.C.	don.english@usda.gov
Ford	Michael	BLM	Washington, D.C.	mmford@blm.gov
Franco	Fabiano	USGS	Reston, Va.	ffranco@usgs.gov
Freeman	Philip	BLM	Reston, Va.	pfreeman@usgs.gov
Gehlhar	Mark	OSMRE	Washington, D.C.	mgehlhar@osmre.gov
Good	Tony	USGS	Reston, Va.	agood@usgs.gov
Huber	Chris	USGS	Fort Collins, Colo.	chuber@usgs.gov
Jenkis	Robin	NCEE	Washington, D.C.	robin.jenkins@epa.gov
Jenni	Karen	USGS	Denver, Colo.	kjenni@usgs.gov
Jensen	Mark	BOEM	New Orleans, La.	mark.jensen@boem.gov
Jojola-Talburt	Winter	BIA	Lakewood, Colo.	winter.jojola-talburt@bia.gov
Kirsch-Burke	Lesli	Reclamation	Boulder City, Nev.	lkirsch@usbr.gov
Lane	Veronica	BIE	Washington, D.C.	Veronica.Lane@bie.edu
Lauer	Chris	NOAA	Silver Spring, Md.	chris.lauer@noaa.gov
Lawrence	Collin	USGS	Reston, Va.	cblawrence@usgs.gov
Lohr	Luanne	USFS	Washington, D.C.	luanne.lohr@usda.gov
Marquez	Tatiana	NPS	Denver, Colo.	tatiana_marquez@nps.gov
Mayne	Chloe	PPA	Washington, D.C.	chloe_mayne@ios.doi.gov
Meldrum	James	USGS	Fort Collins, Colo.	jmeldrum@usgs.gov
Miller	Ann	PPA	Washington, D.C.	ann_miller@ios.doi.gov
Moore	Chris	NCEE	Washington, D.C.	chris.moore@epa.gov
Moore	Rebecca	BLM	Washington, D.C.	rmoore@blm.gov
Nguyen	Kevin	BOEM	Sterling, Va.	Kevin.nguyen@boem.gov
O’Kray	Caleb	USFS	Washington, D.C.	cokray@fs.fed.us
Payson	Steve	BIA	Washington, D.C.	steven.payson@bia.gov
Pindilli	Emily	USGS	Reston, Va.	epindilli@usgs.gov
Piper	Steve	Reclamation	Denver, Colo.	spiper@usbr.gov
Primo	John	BOEM	Sterling, Va.	john.primo@boem.gov
Richardson	Leslie	NPS	Fort Collins, Colo.	leslie_a_richardson@nps.gov
Richardson	Steven	USGS	Reston, Va.	srichardson@usgs.gov
Shapiro	Carl	USGS	Reston, Va.	cshapiro@usgs.gov

**Table 1.1.**    List of participants in the 2018 U.S. Department of the Interior Economics Training Workshop.—Continued

[USGS, U.S. Geological Survey; Va., Virginia; Colo., Colorado; Ariz., Arizona; BOEM, Bureau of Energy Management; OSMRE, Office of Surface Mining, Reclamation, and Enforcement; PPA, Office of Policy Analysis; Reclamation, Bureau of Reclamation; USFS, U.S. Forest Service; BLM, Bureau of Land Management; NCEE, National Center for Environmental Economics; La., Louisiana; BIA, Bureau of Indian Affairs; Nev., Nevada; BIE, Bureau of Indian Education; NOAA, National Oceanic and Atmospheric Administration; Md., Maryland; NPS, National Park Service]

Last name	First name	Affiliation	Duty station	Email address
Sidon	Josh	BLM	Denver, Colo.	jsidon@blm.gov
Simon	Ben	PPA	Washington, D.C.	benjamin_simon@ios.doi.gov
Skrabis	Kristin	PPA	Washington, D.C.	Kristin_skrabis@ios.doi.gov
Taylor	Bill	Reclamation	Denver, Colo.	wtaylor@usbr.gov
Unger	Carlann	PPA	Washington, D.C.	Carlann_unger@ios.doi.edu

## Appendix 2. Agenda

The agenda for the 2018 U.S. Department of the Interior Economics Training Workshop (hereafter “Workshop”) is provided below. The agenda is in the same format that was used for the Workshop, so please refer to the main text for abbreviation definitions and more detailed information.

### **DOI Economics Training Workshop**

**September 25–27, 2018**

**Main Interior Building and State Plaza Hotel**

**Washington, DC**

#### **Statement of Objectives:**

This 2018 DOI Economics Training Workshop has the following primary objectives:

1. Provide training on new tools for economic analysis and data visualization;
2. Discuss Interior’s current economics needs, and approaches to meet those needs;
3. Share the latest research being done across the Department; and
4. Develop an Economics Community of Practice to continue leveraging expertise across the Department.

**Tuesday, September 25 - Location: Main Interior Building (1849 C Street NW DC)**

**9:00 am: Training Session 1 (Room 2529)**

- Input-Output analysis with IMPLAN
- Instructors: Maria Lucas and Jimmy Squibb (IMPLAN)

**12:00 pm: Lunch** (Bison Bistro, local restaurants and food trucks)

**1:00 pm: Training Session 2 (Kiowa Room: Basement, between Bison Bistro and the Credit Union)**

- Statistical computing with R
- Instructor: Stephen Scott, PhD, Senior Information Systems Engineer, The MITRE Corporation; Adjunct Professor, Computational Social Science Program, Department of Computational and Data Sciences, College of Science, George Mason University

**2:30 pm: Break**

**2:45 pm: Training Session 3 (Kiowa Room: Basement, between Bison Bistro and the Credit Union)**

- Basics of ArcGIS for Economists (Collin Lawrence)

**3:30 pm: Training Session 4 (Kiowa Room: Basement, between Bison Bistro and the Credit Union)**

- Data Visualization Tips from Tufte (Lesli Kirsch-Burke)

**4:30 pm: Adjourn**

**4:45–5:30 pm: Social Activity** (“No Spectators: the Art of Burning Man” at the Renwick Gallery)

**6:00 pm: Optional Group Dinner** (Zaytinya Turkish cuisine, 701 9th Street NW)

**Wednesday, September 26 - Location: State Plaza Hotel (2116 F Street NW, Diplomat Room)**

**9:00 am: Welcome Day 2**

- Logistics for the Workshop
- Welcome from Carl Shapiro (USGS) and Benjamin Simon (PPA)
- Participant Introductions

**9:30 am: Opening Keynote Session**

- Keynote address by Jim Reilly (Director, USGS)
- Discussion moderator: Carl Shapiro

**10:00 am: Bureau Update Session**

Moderator: Benjamin Simon

Bureau/Office	Full Name	Scheduled Speaker
BLM	Bureau of Land Management	Rebecca Moore
BOEM	Bureau of Ocean Energy Management	
FWS	U.S. Fish and Wildlife Service	
IEED	Office of Indian Energy and Economic Development	Steve Payson
NPS	National Park Service	Leslie Richardson
ONRR	Office of Natural Resources Revenue	(Robert Sudar, on film)
OSMRE	Office of Surface Mining Regulation & Enforcement	Mark Gehlhar
PPA	Office of Policy Analysis	Ben Simon
Reclamation	Bureau of Reclamation	Bill Taylor
USGS	U.S. Geological Survey	Carl Shapiro

**11:00 am: Break** (Networking and Poster Viewing)

**11:30 am: Federal Partner Agencies**

Moderator: Benjamin Simon

- USFS: U.S. Forest Service
- EPA: U.S. Environmental Protection Agency
- NOAA: National Oceanic and Atmospheric Administration

**12:00 pm: Lunch** (State Plaza Hotel Restaurant, local restaurants, and food trucks)

**1:30 pm: Native American Economic Development and Other Issues**

Moderator: Carlann Unger (*each speaker has 7 minutes*)

- Labor force report (Carlann Unger)
- Human capital survey (Veronica Lane)
- Teacher and principal tenure at BIE schools (Chloe Mayne)
- Renewable energy development in Indian Country (Steve Payson)

**2:00 pm: Lightning Round 1 - Energy & Minerals Economics**

(*each speaker has 7 minutes*)

1.	Emil Attanasi and Philip Freeman	Drivers of the growth in productivity of Bakken oil wells
2.	Winter Jojola-Talburt	Energy, Minerals, and Economic Development - Putting it all together through Comprehensive Land Use Planning.
3.	Mike Ford	Review efforts to estimate Federal onshore oil and gas technically recoverable resources
4.	Kevin Nguyen	Price-Based Royalty in the oil and gas industry

**2:30 pm: Panel 1 - National Environmental Policy Act (NEPA)**

*Each panelist will give a brief (~7-minute) presentation drawing from their experience, then participate in a group discussion*

Rebecca Moore	Octavia Conerly	Tatiana Marquez	Mark Jensen	Josh Sidon
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**3:30 pm: Break** (Networking and Poster Viewing)**4:00 pm: Lightning Round 2 - Recreation, Land, and Other Natural Resource Management Case Studies**

*(each speaker has 8 minutes)*

<b>1. James Meldrum</b>	<b>Two methods for estimating damages from wildfire in sagebrush ecosystems</b>
2. Fabiano Franco	Select economic benefits of increasing soil organic matter on California rangelands and croplands
3. Lucas Bair	Socioeconomic considerations of environmental flows: using bioeconomic modeling to identify cost-effective approaches for managing invasive species in the Grand Canyon, USA
4. John Primo & Kim Coffman	Lessons Learned from a Multi-Disciplinary Team's Experiences: BOEM's Ecosystem Service Task Team
5. Leslie Richardson	Valuing Virtual Visitation in the National Park Service
6. Frank Casey	Recent Papers on the Identification and Valuation on Ecosystem Services
7. Christian Crowley & Ann Miller	Wildland Fire Management: Strategic Placement of Fuels Treatments

**5:00 pm: Adjourn****5:30 pm: Happy Hour** (The Hive Hotel Rooftop, 2224 F Street NW)**7:30 pm: Optional Group Dinner** (District Commons, 2200 Pennsylvania Ave NW)**Thursday, September 27 - Location: South Penthouse, Main Interior Building** (1849 C Street NW DC)**9:00 am: Welcome and Logistics for Day 3****9:15 am: Keynote Session**

- Keynote address by Tim Petty (Assistant Secretary for Water and Science)
- Discussion moderator: Benjamin Simon

**9:45 am: Lightning Round 3 - Natural Resource Valuation Methods**

*(each speaker has 8 minutes)*

<b>1. Caroline DiRoll</b>	<b><u>Economic Valuation Issues or Examples where economics did or did not play a role in decision making</u></b>
2. Bill Taylor	<u>Central Valley Project Cost Allocation Study</u>
3. Lesli Kirsch-Burke	<u>Reclamation's Pilot System Conservation Program</u>
4. Mustapha Alhassan	A Translog Cost Function Analysis of Agriculture in the Mississippi Alluvial Plain
5. Steven Piper	<u>Economic Valuation Issues</u>
6. Chris Huber	Economic Value of Ecosystem Services Supported by Dryland and Grassland Environments
7. Ken Bagstad	Natural Capital Accounting in the U.S.: Preliminary Tables, Methodological Issues, and Data Challenges

**10:45 am: Break** (Networking and Poster Viewing)

**11:00 am: Small Group Working Session - Communicating with Noneconomists**

(land and resource managers, scientists, and stakeholders)

Moderator: Ann Miller

We'll break into small groups and rotate among several flip-charts to gather ideas about various topics:

<b>1. Communication Challenges</b>	<i><b>What issues have you experienced in communicating economic concepts, results, priorities, and so on?</b></i>
2. Our Audiences	<i>Which audiences do you communicate with, and what special considerations do these require?</i>
3. Tips and Best Practices	<i>What communication approaches have you found effective? What elements or considerations are important to include or address?</i>
4. New Ideas and Techniques	<i>What novel approaches would you like to try or see developed?</i>
5. Our Goals	<i>What are the communication goals of the Interior economics community in the short-term and the long-term?</i>

Then we'll return to the large group, and each small group's moderator will report out for a moderated discussion.

**12:00 pm: Lunch** (Bison Bistro, local restaurants and food trucks)

**1:30 pm: Panel 2 - Value of Information**

*Each panelist will give a brief (~5-minute) presentation drawing from their experience, then participate in a group discussion*

Emily Pindilli	Lucas Bair	James Meldrum	Carl Shapiro
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**2:30 pm: Small-group activity - Building DOI's Economics Community of Practice (ECoP)**

Moderators: James Meldrum and Chris Huber

- We'll have an update presentation on our progress since our 2018 workshop, including the website USGS is developing.
- We'll break into small focus groups to view the website on a laptop, and discuss suggestions relevant for the ECoP
- Then we'll return to the large group, and each focus group's moderator will report out for a moderated discussion.

**3:30 pm: Break** (Networking and Poster Viewing)

**4:00 pm: Moderated Discussion - Strategic Directions**

(Follow-up on issues discussed last year, plus new proposals and new issues to consider)

Moderator: Benjamin Simon and Carl Shapiro

We'll break into small groups and rotate among several flip-charts to gather ideas about various topics:

- Supporting Secretarial priorities
- Effects of a proposed DOI reorganization (shift to a regional "unified joint command" model)
- Collaboration, capacity, and working together

**4:45 pm: Wrap-up Messages** - Carl Shapiro (USGS) and Benjamin Simon (PPA)

**5:00 pm: Adjourn**

**5:15 pm: Monuments walk, or Happy Hour** (Hotel Lombardy, 2019 Pennsylvania Ave, on "Eye" Street)

**7:30 pm: Optional Group Dinner** (Bombay Club Indian Cuisine, 815 Connecticut Ave NW)





## Appendix 3.    Lightning Round Presentations

Lightening round presentations from the 2018 U.S. Department of the Interior Economics Training Workshop are listed in [table 3.1](#). The lightning rounds included presentations about valuation methods; energy and minerals; and recreation, land, and other natural resource-management case studies.

**Table 3.1.** Lightning round presentations from the 2018 U.S. Department of the Interior Economics Training Workshop.

[USGS, U.S. Geological Survey; USA, United States of America; SDC, Science and Decisions Center; BOEM, Bureau of Energy Management; PPA, Office of Policy Analysis; Reclamation, Bureau of Reclamation; BLM, Bureau of Land Management; BIA, Bureau of Indian Affairs; NPS, National Park Service]

Last name	First name	Presentation title	Affiliation	Session
Alhassan	Mustapha	A translog cost function analysis of agriculture in the Mississippi Alluvial Plain	USGS	Valuation Methods
Attanasi	Emil	Drivers of the growth in productivity of Bakken oil wells	USGS	Energy and Minerals
Bagstad	Ken	Natural capital accounting in the U.S.: Preliminary tables, methodological issues, and data challenges	USGS	Valuation Methods
Bair	Lucas	Socioeconomic considerations of environmental flows: using bioeconomic modeling to identify cost-effective approaches for managing invasive species in the Grand Canyon, USA	USGS	Recreation, Land, and Other Natural Resource-Management Case Studies
Casey	Frank	Recent ecosystem service analyses from SDC	USGS	Recreation, Land, and Other Natural Resource-Management Case Studies
Coffman	Kim	Lessons learned from a multi-disciplinary team's experiences: BOEM's Ecosystem Service Task Team	BOEM	Recreation, Land, and Other Natural Resource-Management Case Studies
Crowley	Christian	Wildland fire management: Strategic placement of fuels treatments	PPA	Recreation, Land, and Other Natural Resource-Management Case Studies
DiRoll	Caroline	Economic valuation issues or examples where economics did or did not play a role in decision making	Reclamation	Valuation Methods
Ford	Mike	Review efforts to estimate Federal onshore oil and gas technically recoverable resources	BLM	Energy and Minerals
Franco	Fabiano	Select economic benefits of increasing soil organic matter on California rangelands and croplands	USGS	Recreation, Land, and Other Natural Resource-Management Case Studies
Huber	Chris	Economic value of ecosystem services supported by dryland and grassland environments	USGS	Valuation Methods
Jojola-Talbert	Winter	Energy, minerals, and economic development - Putting it all together through comprehensive land use planning	BIA	Energy and Minerals
Kirsch-Burke	Lesli	Reclamation's pilot system conservation program	Reclamation	Valuation Methods
Meldrum	James	Two methods for estimating damages from wildfire in sagebrush ecosystems	USGS	Recreation, Land, and Other Natural Resource-Management Case Studies
Nguyen	Kevin	Price-based royalty in the oil and gas industry	BOEM	Energy and Minerals
Piper	Steven	Economic valuation issues	Reclamation	Valuation Methods
Richardson	Leslie	Valuing virtual visitation in the National Park Service	NPS	Recreation, Land, and Other Natural Resource-Management Case Studies
Taylor	Bill	Central Valley project cost allocation study	Reclamation	Valuation Methods

## Appendix 4. Poster Presentations

Poster presentations from the 2018 U.S. Department of the Interior Economics Training Workshop are listed in [table 4.1](#). Presentations covered topics from economic revitalization to recreational use of offshore oil and gas platforms.

**Table 4.1.** Poster presentations from the 2018 U.S. Department of the Interior Economics Workshop.

[OSMRE, Office of Surface Mining, Reclamation, and Enforcement; USGS, U.S. Geological Survey; BOEM, Bureau of Energy Management]

Last name	First name	Poster title	Affiliation
Gehlhar	Mark	Economic revitalization by restoration of abandoned mine lands	OSMRE
Good	Tony	Estimating the value of carbon sequestration in mangroves: An agent-based model approach	USGS
Jensen	Mark	Recreational use of offshore oil and gas platforms	BOEM
Primo	John	BOEM studies: The socioeconomics of recreation and tourism – A programmatic perspective	BOEM



