Federal Policy

OMB & CEQ memo (M-16-01):

- Directs agencies to develop and institutionalize policies to promote consideration of ecosystem services in planning.
- Provides direction for relevant Federal programmatic and planning activities, including environmental reviews under NEPA.

USFS 2012 Planning Rule (CFR 36.219):

- Requirements to provide for ecosystem services
- 36 CFR 219.1(c) -- Plans will guide management of NFS lands so that they are ecologically sustainable and contribute to social and economic sustainability; consist of ecosystems and watersheds with ecological integrity and diverse plant and animal communities, and *have the capacity to provide people and communities with ecosystem services* and multiple uses that provide a range of social, economic, and ecological benefits for the present and into the future.

SECI - Sustaining Ecological Capital initiative

- USGS response to OMB/CEQ memo, tho never fully funded did receive ~$1.5m from the Ecosystems "Mission Area" (Fort Collins Science Center)
- SECI goals are to coordinate ecosystem services research (identify gaps and integrate efforts), contribute to standardizing and developing ecosystem services science methods, and build a public facing dashboard for ecosystem service research and applications.
- SECI effort emphasizes integrating ES into land management decision making.
- This link provides a short introduction to the overall effort: https://my.usgs.gov/seci. This site is being developed, but the "about" and "efforts" tabs provide useful background.

Pilot Projects

- SECI includes numerous pilot projects in different stages, including three in later stages:
    - *Delaware River Basin* – links biophysical information on freshwater mussels with original economic data (stated preference nonmarket valuation) to estimate ES benefits of clean water supply to downstream users.
    - *Chesapeake Bay Watershed* – focuses on ES provided by floodplains including: flood control; in-stream nutrient and sediment reduction; carbon sequestration.
    - *National Water Quality Assessment (NAWQA)* –ES benefits of water quality by linking NAWQA database with economic modeling of residential property prices.

Intersections in New Mexico

SECI is seeking a new site for a pilot study, to add new dimensions to its effort of integrating ES science into decision-making. At the same time, the ARIES program and the Aldo Leopold Wilderness Research Institute were looking for areas to develop new projects. Coordination between the Fort Collins Science Center and the other groups brought all three projects to northern New Mexico. The

New Mexico case study is in the early stages of development and is looking for input from local experts on priority ecosystem services, land management decisions, impacted stakeholders and project partners.

SECI - New Mexico
- Broad range of ecosystem services (ES) research potentials
- Interested in cultural, economic, & biophysical ES; how to integrate understanding of them
- Potential to be incorporated into Taos Valley Watershed, Santa Fe Fire shed or other CF(L)RP projects.
- SECI Team comprised of economists, social scientists, software developers and natural resource

ARIES - Artificial Intelligence for Ecosystem Services
- Simulation modeling platform that enables enhanced understanding of how ecosystem services (ES) flow through a system.
- Beneficiaries of ES are identified along with ES sources, sinks and flow pathways
- Have successfully modeled a range of provisioning and preventative ES for multiple different user types (beneficiaries)
- Capable of integrating deterministic, probabilistic and process-based models to develop spatially explicit models which incorporate local information, accounts for uncertainty (Bayesian Network models), and uses machine learning to determine the "best" model for a specific area or ES
- Creates maps of ES potential and actual use. This allows for the identification of areas where supply is "blocked" along a specific flow path (i.e., areas where treatment may be most effective at maximizing ES). For example, a lack of wildfire risk mitigation in lower-elevation forests near potential ignition sources may "block" a secure supply of water from higher elevation forests by increasing the fire risk to the high elevation forests.

ARIES & SolVES, Rocky Mountain ES case study
- Biophysically modeled maps of carbon sequestration and storage, scenic viewsheds, sediment regulation, and water yield were generated using the Artificial Intelligence for Ecosystem Services tool (ARIES).
- Social-value maps for the Colorado Rockies were developed using the Social Values for Ecosystem Services (SOLVES) a public participatory GIS tool. Used to created a spatially explicit map of cultural ecosystem services, including aesthetic, biodiversity, and life-sustaining values.
- Identified social and biophysical ecosystem service hotspots, showed spatial overlap and differences. Use hotspot mapping as management tool to identify areas of cultural significance, areas were support for management may be highest, and areas where public outreach may be necessary before taking management action.

Wilderness Study
- Part of a broader report on values associated with Federal Wilderness management
- Looking at the ES derived from Wilderness areas, including economic valuations, cultural ES, and recreation.
- USGS authors writing chapter specifically on economic value of water resources associated with wilderness
- Use this as a starting point for a broader study that includes Wilderness and other lands
- Preliminary plans for economic survey (choice experiment) building on 2011 Santa Fe poll supporting Water Fund; looking at wilderness, water resources, fire risk, cultural resources

Help from NM Collaborators:
- What has already been done with regard to Ecosystem Services research & development in northern New Mexico?
- What ES research is planned/ongoing?
- What is needed in terms of continued ecosystem services research & development? Are there gaps in model development, data acquisition, etc.?
- Can you help identify key end users of the research (i.e., land managers, water users, and beneficiaries of ES)?
- Planning a field trip for the week of 13 February, any time preferences?

People involved:
- Brian Voigt - ARIES, Gund Institute for Ecological Economics, University of Vermont
- James Meldrum - SECI New Mexico & Wilderness Ecosystem Services Lead, USGS Fort Collins
- Rudy Shuster - SECI coordinator, USGS Fort Collins
- Collin Haffey - Ecologist, USGS Jemez Mountains Field Station
- Chris Huber - Economist, USGS Fort Collins
- Brian Quay - Economist, USGS Fort Collins
- Kristin Hoelting - Cultural ecosystem services, Colorado State Univ and USGS
- Ken Bagstad – ARIES & SolVES, USGS & World Bank