

AMERICA'S FUTURE

ENVIRONMENTAL RESEARCH
AND EDUCATION FOR A THRIVING CENTURY

A 10 YEAR
OUTLOOK

A REPORT BY THE
NSF ADVISORY COMMITTEE
FOR ENVIRONMENTAL RESEARCH & EDUCATION

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Background



- "Complex Environmental Systems: Synthesis for Earth, Life, and Society in the 21st Century" (January 2003)
- "Complex Environmental Systems: Pathways to the Future" (March 2005)
- "Transitions and Tipping Points in Complex Environmental Systems" (September 2009)



Rationale



- Need for a **new Outlook**
 - Past reports tied to past NSF successes
 - New developments in ERE
 - Sunsetting of SEES
- Enhance and vitalize the dialog between:
 - The Foundation
 - The Advisory Committee
- Advocate strong and sustained support for **interdisciplinary programs**
- Identify new challenges and advocate opportunities



Purpose and Audience

- To provide advice and recommendations concerning support of the NSF's environmental research and education portfolio
- Internal audience
 - NSF-wide
 - Director and Assistance Directors
- External audience
 - ERE funding stakeholders
 - ERE science community



Challenges

- The nation is at an **environmental crossroads** where the confluence of unprecedented global environmental change and transformative new capabilities create both an imperative and an opportunity.
- A time in which human society and technology are increasing the pace and rate of environmental change in ways for which **no precedent exists**
- Human systems are becoming **dominant forces in ecosystems** and the environment resulting in novel landscapes, natural and managed ecosystems,
- Society looks to science for answers to help solve current and future challenges. **And scientists are increasingly recognizing the need to work together with decision-makers, educators, community leaders, and other stakeholders to enable research and education that fosters well-being on our dynamic and rapidly changing planet.**



1. Understanding the Challenges

- Continuing NSF's emphasis on understanding complex environmental systems but expanding to socio-environmental systems
- Investments in systems science, coupled natural-human systems, improved abilities to forecast environmental change
- Improved capacity to forecast complex environmental trajectories



2. Designing the future, and Changing the Forecast

- A new area of emphasis in supporting science to inform **socio-environmental systems**
- Humans are dominant shapers of the environment; we can **use science to inform active designs of environments that are sustainable, resilient, and contribute to improved welfare of our citizens**
- **Resilient environmental systems** – landscapes, managed ecosystems, urban areas – that support human needs and economic well being



3. Enabling and Securing the Future

- **Stable investments** in infrastructure, research partnerships, collaborations, and translational activities
- Funding and Institutional Support
- Collaboration and Partnerships
- Diversity – watershed approach
- Environmental Literacy and Translation



Broader Impact Networks and Nodes (BINNS)

- Multi-institutional Collaborations
- Connect Education and Community Engagement Professionals with Researchers
- Help achieve Broader Impact goals



Value proposition of ERE investments

- Unprecedented Environmental Challenges can be met head-on with science, engineering and an educated workforce
- **Worsening trends and accelerating damage can be reversed**
- Science and evidence-based decision making can provide societal benefits, increased environmental resilience and contributions to economic growth
- **Problems that are not solvable by disciplinary science can be addressed**
- Helping society to shape a better future
- ERE is intrinsically attractive to diverse population



Main Themes

- As with most science, environmental research and education fuels the economy
- We must **anticipate and shape our future**, not merely adapt
- Humans as Drivers of Environmental Change
- Effects of Changes on Human Well-being
- Changing the Socio-Environmental Trajectories toward Resilience, Well-being and Prosperity
- Look for opportunities within **NSF to ensure institutional capacity to maintain long-term sustainability and continuity for ERE**
- Advances in Environmental Science Capacity – observation systems, sensors, models
- *Integration of Social Sciences, Natural Sciences and Engineering*
- Multi-scalar Understanding
- Capacity Building of Equal Weight to Discovery



