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quences of this change, and ways to cope with it, we need better predictive capabilities for forecasting their impacts on ecosystems. This challenges is to provide information not only on the effects of individual stresses, but to learn how multiple causes will interact to influence the ecosystem. The interagency Committee on Environment and Natural Resources Ecological Subcommittee has been working to frame a new initiative to build, improve, and apply ecological forecasts in response to this need. Fortunately, as the President's Committee of Advisors on Science and Technology said: "New technology can provide us with the tools of discovery and techniques of analysis that will catapult us into position to meet the challenges of the 21st century ... Our society is blessed with a dazzling array of new tools, from gene sequencers to global satellites. These tools can enable us to explore environmental questions at several different scales simultaneously, from sub-cellular to global." Ecological forecasting will be central to tackling the changes caused by the 5 key categories of ecosystem stress: climate change, extreme events, pollution, land and resource use, and invasive species. Enhanced ecological forecasting will aid resource managers, policy-makers and the public in making informed decisions to efficiently manage, conserve and restore ecosystem services. This report describes the areas of focus, the justification, the salient research needs and promises of ecological forecasting. Developing the full range of science information needed for wise adaptive management of natural resources will require targeted investments and agency collaboration over the coming years.

SCHLESINGER, WILLIAM H.* Department of Biology, Duke University, Durham, NC 27708 USA. **Changes in soil carbon stocks with land management and increasing atmospheric CO_2.**

Much attention has focused on the potential for carbon sinks to mediate the rise of CO_2 in Earth's atmosphere and to help the United States achieve its first commitment to the Kyoto Protocol. In agricultural lands, a sink for atmospheric carbon (i.e., CO_2) in soils may derive from the application of conservation tillage and the regrowth of native vegetation on abandoned agricultural land. Intensification of agricultural management may also increase soil carbon stocks, but the greater accumulation of soil organic matter in fertilized fields carries a carbon "cost" in the form of CO_2 emissions during the production and application of inorganic fertilizer. Similarly, soil carbon accumulations in irrigated semiarid lands must be discounted by CO_2 that is emitted when energy is used to pump irrigation water and when $CaCO_3$ precipitates in the soil profile. A sink for carbon in soils is also postulated to result from plant growth at high CO_2; however, in a Free-Air CO_2 Enrichment (FACE) experiment in North Carolina, higher %C in the 0-15 cm soil layer in fumigated plots (+200 ppm CO_2) of a pine forest is not associated with significant net C sequestration in soils after 3 years. The mass of carbon in the forest floor has increased significantly in fumigated plots, but wood growth remains the only major sink for carbon in the forest. These disparate studies suggest that soils are not likely to serve a major role as a carbon sink, and perhaps may become a significant additional source of atmospheric CO_2 with global warming.

SHAFROTH, PATRICK B.,[1,*] JONATHAN M. FRIEDMAN,[1] MICHAEL L. SCOTT,[1] GREGOR T. AUBLE[1] and JEFFREY H. BRAATNE.[2] [1] U.S. Geological Survey; [2] University of Washington. **Expected responses of riparian vegetation to dam removal.**

Responses of riparian vegetation to dam removal can be predicted by applying known relations between stream hydrology, fluvial geomorphology and the life history characteristics of riparian plant species to the conditions likely to result from a dam removal scenario. The species composition and structure of riparian vegetation are largely dependent upon streamflow and associated fluvial processes that create and destroy surfaces on which plants grow. Following dam removal, vegetation changes result from colonization of new surfaces formed by sediments released and deposited downstream of the dam, and new surfaces exposed in the former reservoir pool. Species composition on existing vegetated surfaces may also shift in favor of plants better suited to the new hydrologic and sediment regimes. We present conceptual models of vegetation response based on case studies of planned or completed dam removals, natural analogs of dam removal, and alternative strategies of releasing and exposing water and sediment. We consider relatively short-term, transient responses as well as longer-term trajectories, and the effects of different dam removal strategies on native vs. exotic plants. We use these models to propose approaches to dam removal that are most likely to restore riparian plant communities.

SHINDLER, BRUCE,* BRENT STEEL, DENISE LACH and PETER LIST. Oregon State University. **The role of scientists and scientific information in the natural resource and environmental policy process.**

Recent "science wars" challenging the primacy of scientific authority in technical decision-making, increasingly complex policy problems, and expanding demands for public participation have created tension among both the producers and users of science, especially in the highly visible policy arenas of natural resource management. This paper uses survey data collected in 2000 from four populations associated with the HJ Andrews LTER (Central Cascade Range). Scientists, natural resource professionals, leaders of NGO's, and the attentive public were surveyed to investigate perspectives on the potentially conflicting roles for science and scientists in the natural resource and environmental policy process. Determinants of support for involving scientists in policy making are characterized and measured. The paper identifies similarities and differences among groups and concludes that the public is most likely to approve of Kai Lee's concept of civic science, in which research scientists are more actively integrated into natural resource decision processes. This paper helps set the context for the model of integrated social and ecological research developed by the LTER social science committee. Scientists always have had a primary role in evaluating ecological processes; this research examines changing expectations about scientists' role in linking natural systems with human systems, including social patterns, information provision, and institutional decision-making.

SMITH, PETE.* Department of Plant and Soil Science, University of Aberdeen, Cruikshank Building, Aberdeen, AB24 3UU, UK. **Approaches to modeling soil biota to predict the impacts of global change at the ecosystem level.**

All current mathematical models of the soil system are underpinned by a wealth of research into soil biology and new research continues to improve the description of the real world by mathematical models. In this paper, we examine the various approaches for describing soil biology in mathematical models and discuss the use of each type of model in global change research. The approaches represented among models participating in the Global Change and Terrestrial Ecosystems (GCTE) Soil Organic Matter Network (SOMNET) are described and reviewed. We examine the relative advantages and constraints of each modelling approach and, using these, suggest appropriate uses of each. For predictive purposes at ecosystem scale and higher, process-oriented models (which have only an implicit description of soil organisms) are most commonly used. As a research tool at the ecosystem level, both process-oriented and organism-oriented models (in which functional or taxonomic groups of soil organisms are explicitly described) are commonly used. Because of uncertainties introduced in internal model parameter estimation and system feedbacks, the predictive use of organism-oriented models at the ecosystem scale and larger is currently less feasible than is the use of process-oriented models. In some specific circumstances, however, an explicit description of some functional groups of soil organisms within models may be required to adequately describe the effects of global change. No existing models can adequately predict the feedback between global change, a change in soil community function, and the response of the changed system to future global change. To find out if these feedbacks exist and to what extent they affect future global change, more research is urgently required into the response of soil community function to global change and its potential ecosystem-level effects.

STANLEY, EMILY H.[1]* and MARTIN W. DOYLE.[2] [1] University of Wisconsin, Madison, WI; [2] Purdue University, W. Lafayette, IN. **Ecosystem responses to removal of low-head dams from two Wisconsin Rivers.**

Removal of low-head dams produces conspicuous changes in physical attributes of riverine ecosystems. Coupled chemical and biological responses may be equally dramatic, but in the absence of detailed research, are less obvious. Many dams targeted for removal in Wisconsin are old (>100 years), and impoundments typically contain extensive sediment deposits. The fate of stored sediment represents a major research and management

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