

Marine Science Review – 206

Miscellaneous publications

In this review:

- A. Recent articles – no abstract available
- B. Recent articles with abstracts

A. Recent articles – no abstract available

Kammen, D.M. **The rise of renewable energy.** *Scientific American* 295(3): 84-93, 2006.

Rosenberg, A.A. **Regional governance and ecosystem-based management of ocean and coastal resources: Can we get there from here?** *Duke Environmental Law and Policy Forum* 16(2): 179-186, 2006.

Sterner, T., Troell, M., Vincent, J., Aniyar, S., Barrett, S., Brock, W., Carpenter, S., Chopra, K., Ehrlich, P., Hoel, M., Levin, S., Maler, K.G., Norberg, J., Pihl, L., Soderqvist, T., Wilen, J., and Xepapadeas, A. **Quick fixes for the environment - Part of the solution or part of the problem?** *Environment* 48(10): 20-27, 2006.

B. Recent articles with abstracts

Johnston, R.J. and Roheim, C.A. **A battle of taste and environmental convictions for ecolabeled seafood: A contingent ranking experiment.** *Journal of Agricultural and Resource Economics* 31(2): 283-300, 2006.

Notes: Consumers face pressure from environmental groups to modify their seafood purchase decisions based on concerns about fisheries' production practices. Existing research provides little information indicating whether seafood consumers are willing to change purchasing behavior based on a product's environmental attributes, to the exclusion of other attributes. We describe a contingent ranking experiment addressing preferences for fresh seafood, allowing for choices among different species, some displaying an ecolabel. Results suggest consumers consider overfishing sufficiently important to contemplate changing the species of fish they buy; however, they are unwilling to choose a less-favored species based solely on the presence of an ecolabel.

Gillespie, A. **Establishing reliable foundations for the international scientific investigation of noise pollution in the oceans.** *Review of European Community and International Environmental Law* 15(2): 211-226, 2006.

Notes: Noise in the oceans is an issue that has become the subject of concern in a number of national, regional and international organizations. However, the current scientific investigations surrounding the topic of noise pollution are currently inadequate because they are often limited in their application, contradictory in places, and some of the current research is tarnished by assertions which suggest that it has less than full integrity. Against such a backdrop, multiple sections of the international community are calling for a comprehensive, global and robust analysis of the issue. This current impasse over the utility of the existing scientific material on noise pollution in the oceans, and the need for an internationally focused scientific endeavour to resolve the uncertainties, is not unique to this area. Rather, such impasses have a long history in a large number of areas in international environmental law. Accordingly, international environmental law and policy has developed a clear set of methods and rules to create reliable scientific reports, from which the political will to form agreements can be built. The necessary foundations from which reliable, internationally based, scientific reports are produced are strong membership of

scientific bodies; the facilitation of independent scientific opinion; a deliberative process which is open and transparent; information that is publicly available; and, finally, as much financial independence as possible. If these five requirements are applied to the scientific investigation of noise in the ocean, the first step will be taken in building the foundations from which national, regional and international agreements may be formed to address this issue meaningfully.

Carolan, M.S. **Scientific knowledge and environmental policy: why science needs values.** *Environmental Sciences* 3(4): 229-237, 2006.

Notes: While the term 'science' is evoked with immense frequency in the political arena, it continues to be misunderstood. Perhaps the most repeated example of this - particularly when dealing with environmental policy and regulatory issues - is when science is called upon to provide the unattainable: namely, proof. What is scientific knowledge and, more importantly, what is it capable of providing us? These questions must be answered - by policymakers, politicians, the public, and scientists themselves - if we hope to ever resolve today's environmental controversies in a just and equitable way. This paper begins by critically examining the concepts of uncertainty and proof as they apply to science. Discussion then turns to the issue of values in science. This is to speak of the normative decisions that are made routinely in the environmental sciences (but often without them being recognized as such). To conclude, insights are gleaned from the preceding sections to help us understand how science should be utilized and conducted, particularly as it applies to environmental policy.

Greaker, M. **Eco-labels, trade and protectionism.** *Environmental and Resource Economics* 33(1): 1-37, 2006.

Notes: Eco-labels are suspected to serve protectionist purposes. We analyze the choice between an environmental standard and a voluntary eco-label scheme in a partial trade model with one domestic firm and one foreign firm. The environmental standard will only apply to the domestic firm, while both firms can adopt the eco-label. Pollution is production related, and domestic consumers demand products that are produced in an "environmentally friendly" way. Our results show that it may be optimal for the domestic government to introduce an eco-label and get both firms to adopt the label, instead of setting an environmental standard. However, to what extent this policy serves protectionist purposes is ambiguous. In particular, if the willingness to pay for green products is sufficient to cover the pollution abatement costs of the foreign firm, foreign firm profit will increase while domestic firm profit will decrease compared to the outcome with a domestic environmental standard. On the other hand, if the willingness to pay for green products is insufficient, the foreign firm would be better off with a domestic environmental standard.

Sutherland, W.J. **Predicting the ecological consequences of environmental change: a review of the methods.** *Journal of Applied Ecology* 43(4): 599-616, 2006.

Notes: 1. There is a clear need to increase our ability to predict the consequences of environmental change. The seven main approaches that are currently used are: extrapolation, experiments, phenomenological models, game-theory population models, expert opinion, outcome-driven modelling and scenarios. Each approach has different strengths and weaknesses. In practice, several approaches are often combined. 2. Adaptive management aimed at testing hypotheses is excellent in principle and widely advocated. In reality, however, it is almost never carried out because the changes in management usually have to be severe in order to bring about detectable changes in a reasonable time, and the political risks of such management are usually considered too high. 3. Game-theory population models are used to determine population-level phenomena based upon the decisions individuals make in response to resource depletion, interference, territoriality or rank. This allows predictions to be made regarding responses to novel conditions. The main drawback is that for some models considerable information is required. 4. Much of conservation practice is not based upon evidence. Evidence-based conservation is the practice of accumulating, reviewing and disseminating evidence with the aim of formulating appropriate management strategies. Evidence-based medicine revolutionized medical practice and similar opportunities exist to improve conservation practice. 5. *Synthesis and applications.* The conventional approach of making assumptions and deriving models to make predictions about the consequences of environmental change is often unsatisfactory for complex problems, with considerable uncertainty. Tackling such problems is likely to require greater exploration of techniques such as expert opinion, output-driven modelling and scenarios.

Jamieson, D. **An American paradox.** *Climatic Change* 77(1-2): 97-102, 2006.

Notes: This paper explores the paradox that while Americans generally identify themselves as environmentalists, they show little willingness to voluntarily restrain their behavior or to support specific fiscal policies that would result in increased levels of environmental protection. I explore the role of values in the explanation of this paradox, and discuss some of the difficulties involved in studying values and their role in human behavior.

Sullivan, P.J., Acheson, J.M., Angermeier, P.L., Faast, T., Flemma, J., Jones, C.M., Knudsen, E.E., Minello, T.J., Secor, D.H., Wunderlich, R., and Zanetell, B.A. **Defining and implementing - Best available science for fisheries and environmental science, policy, and management.** *Fisheries* 31(9): 460-465, 2006.

Notes: In the United States, many of the laws governing environmental conservation and management stipulate that the best available science be used as the basis for policy and decision making. The Endangered Species Act, for example, requires that decisions on listing a species as threatened or endangered be made on the basis of the "best scientific and commercial data available." Similarly, National Standard 2 of the Magnuson-Stevens Fishery Conservation and Management Act states that conservation and management measures shall be based on "the best scientific information available." Further, the U.S. Environmental Protection Agency has emphasized the role of best available science in implementing the Clean Water Act (USEPA 1997). Determining what constitutes the best available science, however, is not straightforward, and scientists, policymakers, and stakeholders often have disparate ideas on how the concept should be defined and interpreted. The American Fisheries Society and the Estuarine Research Federation established a committee to consider what determines the best available science and how it might be used to formulate natural resource policies and procedures. This synopsis examines how scientists and nonscientists perceive science, what factors affect the quality and use of science, and how changing technology and societal preferences influence the availability and application of science. Because the issues surrounding the definition of best available science surface when managers and policymakers interpret and use science, we also discuss the interface between science and policy and explore ways in which scientists, policymakers, and managers can more effectively apply science to environmental policy

Daly, H.E. **Population, migration, and globalization.** *Ecological Economics* 59(2): 187-190, 2006.

Notes: Environmentalists sometimes court political correctness by soft-pedaling the controversial issues of population, migration, and globalization. However, these interrelated problems are central to the very possibility of national policies in the service of democracy, environmental protection, and social justice.

Arkema, K.K., Abramson, S.C., and Dewsbury, B.M. **Marine ecosystem-based management: from characterization to implementation.** *Frontiers in Ecology and Environment* 10(4): 525-532, 2006.

Notes: Over the past decade, policy makers, management agencies, and academic scientists have shown increasing interest in ecosystem-based management (EBM). Yet, the extent that EBM principles, deemed important by scientists, are adopted by managers is still uncertain. Here, we review scientific definitions of EBM and management plans for eight marine and coastal ecosystems to determine if management agencies and academics are approaching EBM in a similar manner. Although the scientific literature outlines specific ecological and social principles of EBM, we find that these details are only loosely incorporated into management plans and actions. Our results indicate that some principles of EBM are being put into practice, but the gap between the scientific literature and management plans suggests that these concepts need to be more effectively translated. Our results also reveal a need for operational tools to make scientific principles easier to put into practice, to further the implementation of EBM.

Gregory, R.G., Failing, L., Ohlson, D., and McDaniels, T.L. **Some pitfalls of an overemphasis on science in environmental risk management decisions.** *Journal of Risk Research* 9(7): 717-735, 2006.

Notes: This paper addresses the question whether calls for "more" and "better" science will have the intended effect of improving the quality of decisions about environmental risks. There are reasons to be skeptical: key judgment tasks that fundamentally shape many aspects of decisions about environmental risk management lie outside the domain of science. These tasks include making value judgments explicit, integrating facts and values to create innovative alternatives, and constructively addressing conflicts about uncertainty. To bring new specificity to an old debate, we highlight six pitfalls in environmental risk decisions that can occur as the result of an overemphasis on science as the basis for management choices.

Mont, O. and Bleischwitz, R. **Sustainable consumption and resource management in the light of life cycle thinking.** *European Environment* 17(1): 59-76, 2007.

Notes: Approaches to address unsustainable ways of societal development constantly proliferate, but total consumption of resources and aggregate environmental impacts continue rising. This could partially be explained by weak attempts to develop comprehensive sustainability strategies that address the entire life cycle of products and especially resource extraction and use phases. This paper seeks to explore to what extent these life cycle stages and associated impacts are taken into account when various actors employ life cycle thinking and how these concerns can be better attended to in policy-making, business strategies and lifestyle choices. To accomplish this, we evaluate the efforts of the main stakeholders in reaching sustainable consumption and sustainable resource management, and impediments to further progress, and study whether and how deficits in these phases coincide and can potentially contribute to more holistic practical realization of life cycle thinking. We demonstrate that new approaches are needed to be able to tackle the international dimension of production and consumption.

Jensen, H.H. **Changes in seafood consumer preference patterns and associated changes in risk exposure.** *Marine Pollution Bulletin* 53(10-12): 591-598, 2006.

Notes: Consumers world-wide are driving changes in the agriculture and food sector. Rising consumer income, changing demographics and lifestyles, and shifting preferences due to new information about the links between diet and health all contribute to new demands for foods. At the same time, technological changes in production, processing and distribution, growth in large-scale retailing, and changes in product availability, as well as expansion of trade world wide, have contributed to a rapidly changing market for food products. Changes in seafood consumption reflect these changes. The changes in consumer consumption patterns, new technologies and trade in product offer both expanded markets as well as new challenges to consumer exposure to food-borne risks. The strict quality control requirements of retail brokers, growth of private labels, and development of value-protecting marketing channels have become increasingly important in food markets. This paper addresses major trends that affect seafood consumption and the market for seafood products and the implications of these changes for consumer risk exposure to food safety hazards. The current economic environment highlights similarities and differences between the developed and developing countries, as well as diversity worldwide in consumption of seafood. Within this context, four major trends affect consumer consumption of foods, including seafood and fish products today: rising income; changing demographics; changing markets for food; and an increasingly global market for food products. Changes in consumer risk exposure to food safety problems are addressed in the context of these trends.

Carpenter, S.R., Brock, W.A., and Ludwig, D. **Appropriate discounting leads to forward-looking ecosystem management.** *Environmental Research* 22(1): 10-11, 2007.

Notes: Ecology and economics share many intellectual challenges, such as uncertainty about future system dynamics. An appropriate consideration of our uncertainty about our economic future leads to discounting of benefits of ecosystem services at the lowest possible rate over long time horizons. This more realistic discounting supports much more conservative and sustainable decisions than conventional discounting.

Hope, B.K. **An examination of ecological risk assessment and management practices.** *Environment International* 32(8): 983-995, 2006.

Notes: Ecological risk assessment has grown and evolved since the 1980s, as have new challenges (e.g. global climate change, loss of habitat and biodiversity and the effects of multiple anthropogenic chemicals on ecological systems) that need to be factored into the risk assessment processes. There is also an on-going shift from evaluating adverse health impacts on particular, often small scale, environments to undertaking more complex ecological assessments of whole populations and communities across ecologically meaningful landscapes. These trends are generating an increased demand for much more complex ecological assessments, making it increasingly clear that to achieve its potential as a management tool, methods must be developed to apply ecological risk assessment to larger and more complex scales. This paper reviews the development of the ecological risk assessment paradigm in the United States, identifies ways it is being applied and adapted in other countries, explores future research needs and practice improvements, and examines current issues that need to be considered in taking forward the scientific development of ecological risk assessment as a useful environmental management tool.

Linkov, I., Satterstrom, F.K., Kiker, G., Batchelor, C., Bridges, T., and Ferguson, E. **From comparative risk assessment to multi-criteria decision analysis and adaptive management: Recent developments and applications.** *Environment International* 32(8): 1072-1093, 2006.

Notes: Environmental risk assessment and decision-making strategies over the last several decades have become increasingly more sophisticated, information-intensive, and complex, including such approaches as expert judgment, cost-benefit analysis, and toxicological risk assessment. One tool that has been used to support environmental decision-making is comparative risk assessment (CRA), but CRA lacks a structured method for arriving at an optimal project alternative. Multi-criteria decision analysis (MCDA) provides better-supported techniques for the comparison of project alternatives based on decision matrices, and it also provides structured methods for the incorporation of project stakeholders' opinions in the ranking of alternatives. We argue that the inherent uncertainty in our ability to predict ecosystem evolution and response to different management policies requires shifting from optimization-based management to an adaptive management paradigm. This paper brings together a multidisciplinary review of existing decision-making approaches at regulatory agencies in the United States and Europe and synthesizes state-of-the-art research in CRA, MCDA, and adaptive management methods applicable to environmental remediation and restoration projects. We propose a basic decision analytic framework that couples MCDA with adaptive management and its public participation and stakeholder value elicitation methods, and we demonstrate application of the framework to a realistic case study based on contaminated sediment management issues in the New York/New Jersey Harbor.

Kinzig, A.P., Ryan, P., Etienne, M., Allison, H., Elmqvist, T., and Walker, B.H. **Resilience and regime shifts: Assessing cascading effects.** *Ecology and Society* 11(1): U765-U787, 2006.

Notes: Most accounts of thresholds between alternate regimes involve a single, dominant shift defined by one, often slowly changing variable in an ecosystem. This paper expands the focus to include similar dynamics in social and economic systems, in which multiple variables may act together in ways that produce interacting regime shifts in social-ecological systems. We use four different regions in the world, each of which contains multiple thresholds, to develop a proposed "general model" of threshold interactions in social-ecological systems. The model identifies patch-scale ecological thresholds, farm- or landscape-scale economic thresholds, and regional-scale sociocultural thresholds. "Cascading thresholds," i.e., the tendency of the crossing of one threshold to induce the crossing of other thresholds, often lead to very resilient, although often less desirable, alternative states.

Cumming, G.S., Cumming, D.H.M., and Redman, C.L. **Scale mismatches in social-ecological systems: Causes, consequences, and solutions.** *Ecology and Society* 11(1): U648-U667, 2006.

Notes: Scale is a concept that transcends disciplinary boundaries. In ecology and geography, scale is usually defined in terms of spatial and temporal dimensions. Sociological scale also incorporates space and time, but adds ideas about representation and organization. Although spatial and temporal location determine the context for social and ecological dynamics, social-

ecological interactions can create dynamic feedback loops in which humans both influence and are influenced by ecosystem processes. We hypothesize that many of the problems encountered by societies in managing natural resources arise because of a mismatch between the scale of management and the scale(s) of the ecological processes being managed. We use examples from southern Africa and the southern United States to address four main questions: (1) What is a "scale mismatch?" (2) How are scale mismatches generated? (3) What are the consequences of scale mismatches? (4) How can scale mismatches be resolved? Scale mismatches occur when the scale of environmental variation and the scale of social organization in which the responsibility for management resides are aligned in such a way that one or more functions of the social-ecological system are disrupted, inefficiencies occur, and/or important components of the system are lost. They are generated by a wide range of social, ecological, and linked social-ecological processes. Mismatches between the scales of ecological processes and the institutions that are responsible for managing them can contribute to a decrease in social-ecological resilience, including the mismanagement of natural resources and a decrease in human well-being. Solutions to scale mismatches usually require institutional changes at more than one hierarchical level. Long-term solutions to scale mismatch problems will depend on social learning and the development of flexible institutions that can adjust and reorganize in response to changes in ecosystems. Further research is needed to improve our ability to diagnose, understand, and resolve scale mismatches in linked social-ecological systems.

Carpenter, S.R., Bennett, E.M., and Peterson, G.D. **Scenarios for ecosystem services: An overview.** *Ecology and Society* 11(1): U214-U227, 2006.

Notes: The Millennium Ecosystem Assessment (MA) scenarios address changes in ecosystem services and their implications for human well-being. Ecological changes pose special challenges for long-term thinking, because of the possibility of regime shifts that occur rapidly yet alter the availability of ecosystem services for generations. Moreover, ecological feedbacks can intensify human modification of ecosystems, creating a spiral of poverty and ecosystem degradation. Such complex dynamics were evaluated by a mixture of qualitative and quantitative analyses in the MA scenarios. Collectively, the scenarios explore problems such as the connections of poverty reduction and ecosystem services, and trade-offs among ecosystem services. Several promising approaches are considered by the scenarios, including uses of biodiversity to build resilience of ecosystem services, actively adaptive management, and green technology. Although the scenarios do not prescribe an optimal path, they illuminate the consequences of different policies toward ecosystem services.

Berkes, F. **From community-based resource management to complex systems: The scale issue and marine commons.** *Ecology and Society* 11(1): U876-U890, 2006.

Notes: Most research in the area of common and common-pool resources in the past two or three decades sought the simplicity of community-based resource management cases to develop theory. This was done mainly because of the relative ease of observing processes of self-governance in simple cases, but it raises questions related to scale. To what extent can the findings of small-scale, community-based commons be scaled up to generalize about regional and global commons? Even though some of the principles from community-based studies are likely to be relevant across scale, new and different principles may also come into play at different levels. The study of cross-level institutions such as institutions of co-management, provides ways to approach scale-related questions and deal with linkages in complex adaptive systems. Looking beyond self-governance, community-based resource management needs to deal with multiple levels of governance and external drivers of change, as illustrated in this paper with examples of marine commons.

Christie, D.R. **Implementing an ecosystem approach to ocean management: An assessment of current regional governance models.** *Duke Environmental Law and Policy Forum* 16(2): 117-142, 2006.

Notes: The two recent national ocean policy studies considering the fate of United States' oceans in the twenty-first century, conducted by the Pew Oceans Commission and the United States Commission on Ocean Policy ("USCOP"), were largely in agreement on some very fundamental issues. First, both commissions concluded that human activities have severely stressed ocean systems and that major changes in ocean management are needed to stop degradation of ocean resources and to restore and protect the oceans for future generations. Second, the commissions found that better management of the oceans required an ecosystem-based approach, implemented through coordinated, regional mechanisms. However, the jurisdictions of our

federal and state governments currently are not organized to operate or take actions at regional levels. Any proposals to implement the goals of a regional, ecosystem-based approach to ocean management must therefore consider how regional mechanisms would be structured and how they would function in our federal system. Since the reports were released, the President has responded with an executive level Ocean Action Plan, and major legislation has been introduced in both the Senate and House of Representatives. It is clear from these responses that widespread agreement that a regional approach is needed has not led to consensus as to what kind of response is necessary to deal with the mismatch between governance structure and the need for eco-regional governance of the oceans. In this context, this paper will discuss the various regional governance structures and approaches to coordination and compliance that the reports, the executive order, and the current legislative initiatives propose.

Eagle, J. **Regional ocean governance: The perils of multiple-use management and the promise of agency diversity.** *Duke Environmental Law and Policy Forum* 16(2): 143-178, 2006.

Notes: Two high-level committees -- the United States Commission on Ocean Policy ("U.S. Commission") and the Pew Oceans Commission ("Pew Commission") -- have recently issued reports expressing grave concerns about the condition of America's oceans. These committees identified the large number of "overfished" American fisheries as an important problem. When a fishery is overfished and the size of the fish population is reduced to a suboptimal level, the result is economic harm to both fishermen and consumers. Excessive fishing also results in harder-to-price damage to marine ecosystems. Both the U.S. and Pew Commissions note the declining health of the ocean environment, as measured in terms of stability, productivity, and diversity. Recent studies show that the number of endangered species is increasing, with long-term damage to ocean habitats, dramatic shifts in the structure of marine food webs, and a decrease in the capacity of fish populations to recover from historic overfishing. While the economic costs of these impacts are more difficult to measure than the direct costs of overfishing, there is reason to believe they are significant. To their credit, the commissions do not place the blame for these two problems entirely on the fishing industry. It is true that fishing is among the most significant factors in the decline of ocean ecosystems. At the same time, fishing is a heavily regulated industry. The commissions thus recognize that the inadequacy of current institutions plays an important role in persistent overfishing and in the general deterioration of the United States' marine environment. Consistent with this conclusion, the commissions' reports contain a range of suggestions aimed at legislatively or administratively improving current management structures. In this paper, I critique one of the major recommendations common to both reports, that is, the call for "regional ocean governance." Although each commission's plan for implementing a regional approach is different, their rationales and design concepts are quite similar: After explaining that present institutions are too narrow in their geographic and substantive scope, the reports go on to advocate for the establishment of larger scale, more "comprehensive" management bodies.

Fletcher, K.M. **Regional ocean governance: The role of the Public Trust Doctrine.** *Duke Environmental Law and Policy Forum* 16(2): 187-204, 2006.

Notes: In the two years since the Pew Ocean Commission and U.S. Ocean Commission recommendations, policymakers and ocean managers have begun considering regional ocean governance ("ROG") as a tool to better manage ocean and coastal resources and move toward ecosystem-based management of the oceans and coasts. A ROG mechanism would not start from scratch; to the contrary, regional (or in some circumstances "multi-state") efforts have existed for decades. The elevation of ROG to the position of a structural foundation for state, regional, and national marine resource management requires consideration of the historical underpinnings of ocean and coastal management, namely the Public Trust Doctrine ("PTD" or "Doctrine") and its role in moving governance structures toward effective ecosystem-based management. The PTD is relevant not only in the establishment of ROG, but also in its implementation. This article presents background and emerging questions for the role of the PTD, at state, regional, and national landscapes. First, from the state perspective, the PTD is an existing tool for management of marine public trust resources. Does the existence of the Doctrine negate the need for a state to participate in ROG and, if not, will conflicts that exist between states in their application of the Doctrine affect ROG? Second, from the regional perspective, does ROG create an underlying public trust responsibility on a regional level through an interest based on conservation or on use? Third, from a national perspective, given the emergence of ROG and the inherent role of states, will the Doctrine evolve into a multi-jurisdictional approach for the furtherance of ecosystem-based management? This article addresses these elements from the perspective of the Northeast region, within the context of two ROG related events in 2005: the establishment of the Northeast Regional Ocean Council ("NROC") and the ocean governance resolutions adopted by leaders in the region.

Hershman, M.J. and Russell, C.W. **Regional ocean governance in the United States: Concept and reality.** *Duke Environmental Law and Policy Forum* 16(2): 227-266, 2006.

Notes: The concept of regional ocean governance ("ROG") is gaining traction in ocean and coastal management as a new way of proactively governing cross-jurisdictional ocean uses, resources, and problems. Current ocean and coastal management activities typically take an issue by issue approach, addressing a single issue without addressing other connected issues within an ecosystem. Though it is not a new concept, ROG is experiencing a surge in interest and support at the national, state, and local levels because it offers a way to bring together a wide range of issues and serves as a vehicle for thinking about and utilizing ecosystem-based management. Two national reports were released in 2003 and 2004 on the state of our oceans and coasts, policies and practices, and were followed by a new U.S. Ocean Action Plan ("USOAP"), and numerous other federal responses. These two reports, the U.S. Commission on Ocean Policy's ("USCOP") *An Ocean Blueprint for the 21st Century* and the Pew Oceans Commission's ("Pew") *America's Living Oceans: Charting a Course for Sea Change*, emphasize new regional approaches in the United States to strengthen our economies, sustain our ecosystem resources, preserve our cultural and biogeophysical treasures, and shore up national security. Underpinning ROG is the concept of ecosystem-based management ("EBM"), or ecosystem approaches to management, that looks comprehensively at ocean issues connected to one another by the ecosystem inhabitants and processes. While existing examples of regional management of oceans and coasts have in many cases improved the status quo, not all of them reflect the notion of ROG as envisioned by the USCOP or Pew. Many of them are also not embodying the spirit of the ecosystem-based approach recommended for ROG. Many of these activities follow an issue by issue approach at specific scales (for example, state or federal jurisdictions).⁶ Others attempt to use a regional approach tackling a diverse, but not comprehensive set of issues. For example, the Gulf of Maine Council on the Marine Environment successfully coordinates habitat protection, water quality, public education, marine debris, and selected maritime activities on a watershed and ocean ecosystem scale. But it focuses primarily on environmental quality and does not engage in regional economic coordination or other nonenvironmental objectives (for example, offshore energy). The purpose of this paper is to provide the reader with a conceptual understanding of ROG based on contemporary definitions and applications as well as to reflect on the reality of its implementation in the U.S. given the current political, social, and economic conditions. Section II discusses and compares the rationale and definitions of ROG from Pew and USCOP to illustrate the basis and complexities driving the need for a regional approach to ocean management. Section III explores the conceptual underpinnings of ROG drawing from literature addressing the concepts of place, regionalism, governance, oceans, and place-based management. Section IV uses these concepts to identify three key elements of ROG: promoting institutional change, advancing ecosystem-based management, and developing regional stewards. Section V assesses current national, regional, and state level activities that are regional in nature and will influence the development of ROG. The paper concludes with an overall evaluation and forecast for the future of ROG in the U.S., including key barriers to, opportunities for, and steps to be taken to promote ROG development.

Nugent, I. and Cantral, L. **Charting a course toward ecosystem-based management in the Gulf of Mexico.** *Duke Environmental Law and Policy Forum* 16(2): 267-292, 2006.

Notes: It is becoming generally accepted that effective management of human impacts on the environment requires consideration of all interconnected ecosystem components. This approach, incorporated in the principle of "ecosystem-based management," has for years been the subject of much discussion in academic and government circles, and many distinguished authors have offered definitions and recommendations for its implementation. From these, three common themes emerge: systems management, meaningful integration of people, and adaptive management. Some success in applying ecosystem-based management has been realized on land. Progress on land has been facilitated by a relatively sophisticated land management system in the United States: Land ownership is clearly defined and our understanding of the interactions of terrestrial ecosystem components, including the way they are affected by various human activities, is relatively advanced. These characteristics, however, are not shared by marine environments. Several features of marine ecosystems make them particularly difficult to understand and manage:

- (1) Living and nonliving marine resources are difficult to inventory and monitor.
- (2) The vast majority of marine resources are held in the public trust, but private interests are deeply invested in their use.
- (3) Many land-based activities significantly affect marine environments, but the understanding of relationships between onshore and offshore processes is weak.
- (4) The scale at which management activities are needed varies and is difficult to identify.

While the concept of ecosystem-based management has evolved and gained growing recognition, there are numerous logistical, legal, and political barriers to effective implementation. As a result, marine systems continue to be managed around either single living marine species or objectives related to single uses, such as fishing or navigation. In recent years, two expert national ocean commissions identified several factors as principal barriers to effective ocean and coastal management: a dearth of interagency collaboration, a lack of coordination across jurisdictional levels, and a suite of laws that are too often conflicting, overlapping, and confusing. As a solution, the U.S. Commission on Ocean Policy ("USCOP"), in its 2004 report, recommended shifting toward an ecosystem-based approach, as did the privately funded Pew Oceans Commission in its 2003 report. In addition, both commissions proposed the implementation of ecosystem based-management through regional ocean governance approaches, but offered different ideas for the functions and authorities that regional ocean governance structures should assume. Regional ocean governance also appears as a feature, albeit briefly mentioned, in the Bush Administration's response to the USCOP report, the U.S. Ocean Action Plan. This paper discusses three elements important for moving regional ocean governance approaches forward on the path toward ecosystem-based management and describes frameworks for regional ocean governance laid out by the U.S. Commission on Ocean Policy, the Pew Oceans Commission, and the Bush Administration's U.S. Ocean Action Plan. This paper then focuses on the Gulf of Mexico Alliance, a regional management approach underway in the Gulf of Mexico region, and describes its process and progress thus far. Finally, certain aspects of the Alliance are discussed in relation to the three essential elements.

Folke, C. **Resilience: The emergence of a perspective for social-ecological systems analyses.** *Global Environmental Change* 16(3): 253-267, 2006.

Notes: The resilience perspective is increasingly used as an approach for understanding the dynamics of social-ecological systems. This article presents the origin of the resilience perspective and provides an overview of its development to date. With roots in one branch of ecology and the discovery of multiple basins of attraction in ecosystems in the 1960-1970s, it inspired social and environmental scientists to challenge the dominant stable equilibrium view. The resilience approach emphasizes non-linear dynamics, thresholds, uncertainty and surprise, how periods of gradual change interplay with periods of rapid change and how such dynamics interact across temporal and spatial scales. The history was dominated by empirical observations of ecosystem dynamics interpreted in mathematical models, developing into the adaptive management approach for responding to ecosystem change. Serious attempts to integrate the social dimension is currently taking place in resilience work reflected in the large numbers of sciences involved in explorative studies and new discoveries of linked social-ecological systems. Recent advances include understanding of social processes like, social learning and social memory, mental models and knowledge-system integration, visioning and scenario building, leadership, agents and actor groups, social networks, institutional and organizational inertia and change, adaptive capacity, transformability and systems of adaptive governance that allow for management of essential ecosystem services.

Adger, W.N. **Vulnerability.** *Global Environmental Change* 16(3): 268-281, 2006.

Notes: This paper reviews research traditions of vulnerability to environmental change and the challenges for present vulnerability research in integrating with the domains of resilience and adaptation. Vulnerability is the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt. Antecedent traditions include theories of vulnerability as entitlement failure and theories of hazard. Each of these areas has contributed to present formulations of vulnerability to environmental change as a characteristic of social-ecological systems linked to resilience. Research on vulnerability to the impacts of climate change spans all the antecedent and successor traditions. The challenges for vulnerability research are to develop robust and credible measures, to incorporate diverse methods that include perceptions of risk and vulnerability, and to incorporate governance research on the mechanisms that mediate vulnerability and promote adaptive action and resilience. These challenges are common to the domains of vulnerability, adaptation and resilience and form common ground for consistency and integration.

Smit, B. and Wandel, J. **Adaptation, adaptive capacity and vulnerability.** *Global Environmental Change* 16(3): 282-292, 2006.

Notes: This paper reviews the concept of adaptation of human communities to global changes, especially climate change, in the context of adaptive capacity and vulnerability. It focuses on scholarship that contributes to practical implementation of

adaptations at the community scale. In numerous social science fields, adaptations are considered as responses to risks associated with the interaction of environmental hazards and human vulnerability or adaptive capacity. In the climate change field, adaptation analyses have been undertaken for several distinct purposes. Impact assessments assume adaptations to estimate damages to longer term climate scenarios with and without adjustments. Evaluations of specified adaptation options aim to identify preferred measures. Vulnerability indices seek to provide relative vulnerability scores for countries, regions or communities. The main purpose of participatory vulnerability assessments is to identify adaptation strategies that are feasible and practical in communities. The distinctive features of adaptation analyses with this purpose are outlined, and common elements of this approach are described. Practical adaptation initiatives tend to focus on risks that are already problematic, climate is considered together with other environmental and social stresses, and adaptations are mostly integrated or mainstreamed into other resource management, disaster preparedness and sustainable development programs.

Gallopín, G.C. **Linkages between vulnerability, resilience, and adaptive capacity.** *Global Environmental Change* 16(3): 293-303, 2006.

Notes: This article uses a systemic perspective to identify and analyze the conceptual relations among vulnerability, resilience, and adaptive capacity within socio-ecological systems (SES). Since different intellectual traditions use the terms in different, sometimes incompatible, ways, they emerge as strongly related but unclear in the precise nature of their relationships. A set of diagnostic questions is proposed regarding the specification of the terms to develop a shared conceptual framework for the natural and social dimensions of global change. Also, development of a general theory of change in SESs is suggested as an important agenda item for research on global change.

Young, O.R., Berkhout, F., Gallopín, G.C., Janssen, M.A., Ostrom, E., and Leeuw, S.V.D. **The globalization of socio-ecological systems: An agenda for scientific research.** *Global Environmental Change* 16(3): 304-316, 2006.

Notes: We argue that globalization is a central feature of coupled human-environment systems or, as we call them, socio-ecological systems (SESs). In this article, we focus on the effects of globalization on the resilience, vulnerability, and adaptability of these systems. We begin with a brief discussion of key terms, arguing that socio-economic resilience regularly substitutes for biophysical resilience in SESs with consequences that are often unforeseen. A discussion of several mega-trends (e.g. the rise of mega-cities, the demand for hydrocarbons, the revolution in information technologies) underpins our argument. We then proceed to identify key analytical dimensions of globalization, including rising connectedness, increased speed, spatial stretching, and declining diversity. We show how each of these phenomena can cut both ways in terms of impacts on the resilience and vulnerability of SESs. A particularly important insight flowing from this analysis centers on the reversal of the usual conditions in which large-scale things are slow and durable while small-scale things are fast and ephemeral. The fact that SESs are reflexive can lead either to initiatives aimed at avoiding or mitigating the dangers of globalization or to positive feedback processes that intensify the impacts of globalization. In the concluding section, we argue for sustained empirical research regarding these concerns and make suggestions about ways to enhance the incentives for individual researchers to work on these matters.
