WHOLE WATERSHED COMMUNITY APPROACH

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INTRODUCTION

Managing watershed ecosystems today means managing the relationship between human communities and their ecosystems using ecosystem-based management (EBM) approaches with the goal of increased resilience and sustainability for both communities and their ecosystems. Many social and ecological systems are undergoing rapid change processes, especially from inappropriate development and climate change, and many communities, especially coastal communities, are not resilient to these changes, stressors, hazards and risks. This compromises their long-term sustainability, viability and prosperity. Federal and state government alone cannot adequately prepare local communities for resilience and sustainability without full participation of these local communities and their local governments. New understandings of ecosystem sciences, social sciences and resilience science are leading us to new ways of approaching problem solving, policy making and natural resources management and governance. The following is a basic description of an emerging **Whole Watershed Community Approach** that integrates resilience and sustainability into community-based EBM.

A Whole Watershed Community Approach is an applied, adaptive planning and management process that helps local communities learn to live with change and uncertainties, builds community capacity to successfully adapt to change on an ongoing basis, creates more appropriate institutions and processes for collaborative management, enhances local residents' watershed ecology literacy and stewardship, restores and maintains resilient and sustainable watershed ecosystems and ecosystem services, and maximizes the benefits and opportunities of adapting to anticipated changes.

> **A community-based EBM approach promotes resilient systems thinking, collaborative adaptive governance and resident stewardship**

Science-based

A Whole Watershed Community Approach uses **science-based** and data-based (evidence-based) decision making that fully incorporates the ecological *and* **human dimensions**. It incorporates the latest knowledge from ecosystem sciences and watershed processes, **ecosystem-based management**,

resilience science, and **behavioral-based social sciences** (behavioral insights) and **resilience economics**. The science is not just "balanced" with other considerations, but is used to describe how the ecological and social world––together––actually works. Scientific knowledge alone is inadequate, since it must then be communicated effectively to inform human behaviors. Social science is used to survey the literacy, capacity and underlying social attitudes, values, norms, narratives and behaviors of the community to determine needs, anticipated social acceptance levels, community conflict levels and strategies. New science and social science tools are used for assessment of ecosystem services, resilience analysis, and economic analysis using full-cost accounting. A science-based approach ensures that decision making and policy making are as rooted in reality as possible.

Systems-based

A Whole Watershed Community Approach takes a systems approach that considers the interdependent relationships of complex adaptive social-ecological systems (CASES). Systems include nature and humans, are interdependent and nested within other systems at multiple levels (think cells, tissues, organs, systems, and body of human physiology), provide essential life support functions and ecosystem services, have intrinsic limits or thresholds, and are normally resilient and adaptable. A systems approach reflects the latest science, and new understandings and assumptions of non-linear, unpredictable and interdependent systems undergoing constant change, adaptation and evolution. Planning and management efforts should draft an accurate concept model of the whole system integrating the social-ecological systems' many interconnected components, relationships and scales including local watershed ecosystems, communities, economy, infrastructure, governance and climate. Attempts to oversimplify these complex systems may make it easier to make decisions, but oversimplifying a complex system almost always creates unanticipated problems or side effects down the road. Resilience science shows that complex social-ecological systems are constantly changing and adapting. If unanticipated stressors, shocks and catastrophic disturbances are allowed to erode natural resilience and thrust a system beyond its limits or thresholds, the system will shift into a different arrangement (regime) of functions and ecosystem services that may no longer support human communities. Because of this, complex systems reflect some scientific uncertainty and unpredictability. Using a systems approach to analysis, assessment, problem solving and implementation will improve desired outcomes.

Place-based and Community-based

A Whole Watershed Community Approach is a bioregional or place-based approach that considers an entire watershed. For a coastal watershed, this includes the shoreline and offshore area and the upland

area. It integrates rural, urban and offshore interactions and dynamics "from headwaters to hamlets to harbors." A Whole Watershed Community Approach considers the human-nature relationship by integrating ecological and natural resources concerns with the human dimensions. In this way, it is also a community-based approach that acknowledges the local human-caused roots of many ecological problems and the community source of solutions. In addition to science data, determining the community's values is essential in order to know what preferred and priority policy actions to take in response to available scientific data. In addition to defining natural watershed boundaries, identifying boundaries of communities within the watershed is essential. "Watershed communities" are networked human communities of affinity within watersheds (residents identify themselves as members). Participatory approaches using participatory scenario planning and mapping, citizen science, local ecological knowledge, appropriate science communication and education using behavioral insights, and full and equitable public engagement in decision making processes are all essential. Since there are human-induced and naturally occurring hazards and risks of living within watersheds prone to flooding, and especially along shorelines and coasts within coastal watershed, resilient and sustainable coastal watershed communities require creating behavior change and social change solutions that are often most effectively developed at the community level. Local resilience and sustainability planning with changes in local laws and regulations along with new or reformed local institutions for governance and management of coastal watershed communities can increase the effectiveness in responding to key local challenges of land use and offshore use, ecological protection, climate change adaptation and sustainable economic development. Fostering local resident stewardship of public property and private property is essential.

Collaboration-based

Some forces and impacts on local watersheds are beyond the control of local communities, like climate change, siting of energy infrastructure, atmospheric deposition from industrial emissions, and natural disasters from non-resilient infrastructure, including dams, channelized streams, sewage plants, sewer lines, drinking water filtration plants and groundwater wells. These are appropriate scales for state, interstate and federal government efforts. In many cases, it is appropriate for local communities to take the lead to address watershed resilience issues that federal and state governments cannot effectively address due to limited authority, funding, staffing, and public priorities in other regions. Federal and state governments, however, are often in a good position to support and empower local communities and residents, and provide some funding and technical assistance to build the capacity of local communities. Coordinating the various levels of government and community efforts to fit the scale and scope of issues will require collaborative, multi-scale (multilevel), networked (coordinated) governance and management

on a bioregional (watershed) scale. This will also include valuable nongovernmental agency partners and groups of community residents, integrating top-down, bottom-up and horizontal peer-to-peer communication and cooperation via networks. Collaborative governance includes processes that are participatory, inclusive, networked, equitable, transparent, accountable, adaptive and effective. The collaborative community-based approach can only be adopted by communities and local governments that demonstrate some level of readiness, which includes the willingness of local residents to take on the responsibilities of democratic civic engagement and stewardship. Ongoing capacity building of local communities will be needed to prepare local residents and local government staff to take the initiative and the lead in planning, management, governance, implementation and adaptation.

Anticipation-based

Rapid changes are creating ecological stressors and pressures on governments and society. Some of these pressures include population growth and demographic change, urbanization, globalization, natural disasters, and reduced capacity and funding from federal and state government downsizing. Climate change is revealing just how pervasive human impacts have become, and how quickly ecosystems can be transformed or collapse when a combination of legacy industrial stressors, current development stressors, and rapidly unfolding climate change stressors are too great. In this way, the earlier stages of climate change impacts serve as a threat multiplier, exacerbating already existing stressors just enough to push systems beyond their limits. Resilience science is helping us understand that changing, non-resilient systems under extreme stress and catastrophic disturbances may be thrust beyond their limits into completely new arrangements and functions that may not be what human communities want and need. We do not know enough about the "new normal" or when these system tipping points will be triggered, and there is rarely enough data available to know with certainty these unfolding changes. System complexity means we cannot accurately predict how this will affect human and ecological communities. Anticipatory approaches allow local communities to deal with unknowns, uncertainties and the unpredictable by considering possible and probable futures using participatory scenario planning. Exploring future scenarios through participatory GIS, photorealistic visualizations, probabilistic tools, science-based narratives, and table-top simulations can help communities anticipate surprises, plan for a variety of futures, improve decision making, adopt appropriate wellbeing indicators, and choose better management options on an ongoing basis. Innovation teams can be used to develop more creative and out-of-the-box policy innovations and even local sustainable economic development opportunities as needed.

Adaptation-based

When governance at one level is inappropriate or unresponsive, governance from other levels can emerge under adaptive governance in order to deal with ongoing change, uncertainty and complexity. Collaborative adaptive governance and management (or adaptive co-management) combines collaborative aspects and adaptive aspects to build adaptive capacity to cope, adjust and transform to changing conditions by enhancing social capital, system diversity, redundancy and overlap, innovation, and monitoring with feedback loops that allow learning and quicker, more responsive decision making. Often local level governance can be the most adaptive and responsive within their watershed ecosystems. Collaborative adaptive governance is used within the Whole Watershed Community Approach to create networks that bridge institutions and transcend organizational boundaries, build capacity, improve institutional factors, increase democratic participation, increase knowledge sharing, promote equity, mediate and manage conflicts, provide leadership, share responsibility, improve trust, and take concrete actions that achieve of effective outcomes and desired impacts.

Conclusion

A **Whole Watershed Community Approach** uses community-based EBM and local resident stewardship to foster sustainability and resilience of watersheds and their human communities in their ecological, social, economic, climate, governance and infrastructure dimensions in the face of change and uncertainty due to urbanization, globalization, new government dynamics, climate change, and new scientific knowledge.