INTEGRATED WATERSHED MANAGEMENT: A COMPREHENSIVE APPROACH TO LAND STEWARDSHIP

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The underlying goal of integrated watershed management is to provide people with their desired goods and services in ways that sustain the productive capabilities of the natural resources while minimizing the detrimental impacts to the basic soil and water resources (Gregersen et al. 2007). In varying combinations, people desire or demand a variety of goods and services from a watershed including water for their personal use, agricultural irrigation, or hydropower; trees for processing into primary and secondary products; agricultural crops, meat, and dairy products; quality habitats for indigenous wildlife populations; and outdoor recreational opportunities. Integrated watershed management practices involves developing and sustaining watershed production systems, protection capabilities, and social values that are inherently suited to the inherent landscape conditions for present and future generations of people. Included in these management practices are those maintaining or enhancing the flows of high-quality water; preventing excessive soil erosion from occurring; reducing downstream sedimentation and the flows of other pollutants; rehabilitating degraded watershed landscapes; or combinations of these practices.

Most of the management practices are closely linked to soil and water conservation efforts aimed at foresters, livestock producers, farmers, and other stakeholders who are dependent on the natural resources of a watershed for a variety of consumptive and non-consumptive uses. Integrated watershed management is distinguished from other strategies of land and natural resources management by its fundamental consideration of the linkages among all of the activities taking place on the watershed and how these linkages might affect each other. Included are key linkages between upland watersheds and downstream points of use.

AN INTEGRATED WATERSHED MANAGEMENT APPROACH TO LAND STEWARDSHIP

An integrated watershed management approach to land stewardship incorporates participatory land-use planning and soil and water conservation into a more holistic framework by focusing on how the interactions of soil, water, and other natural resources can impact people both beneficially and negatively (Brooks et al. 2003, Gregersen et al. 2007). In turn, people's activities on watersheds affect the nature and severity of these interactions by the ways in which the people use the natural resources and the quantities they use. Importantly, the intermingling effects of these interactions follow watershed boundaries not political boundaries. What people do on a land unit on upland watersheds, therefore, can affect significantly land units situated downstream. As a consequence of these spatial relationships, what is considered to be the appropriate use of soil, water, and other natural resources on upstream watersheds are not always the proper use of these resources on downstream landscapes because of undesirable effects such as flooding or the pollution of water flows. An integrated watershed management approach to land stewardship brings these off-site effects, called externalities by economists, into the planning process. Off-site effects encompass both the beneficial and negative effects of watershed management practices at one location on other locations and the effects of these activities at a specified time on future points in time.

INTEGRATED WATERSHED MANAGEMENT PRACTICES

Watershed managers often group integrated watershed management practices into three general categories or combinations of these categories. These categories are sustaining flows of high-quality water and other resources from a watershed; minimizing adverse impacts to basic soil resources to maintain a watershed in good condition; and rehabilitating a degraded watershed to restore a higher level of ecosystem productivity (Ffolliott et al. 2000). Accommodating people's desired goods and services are embedded within all of these categories of practices. While many land-use practices occur on the watersheds located within a larger river basin, the production of water and other natural resources is equally important to protecting the natural environment when implementing the integrated watershed management approach to land stewardship.

Sustaining the flows of high-quality water remains a key focus of integrated watershed management in the Southwest and, it is assumed, will become even more crucial as populations of people continue to grow in the region. What are called Best Management Practices are often implemented to sustain these flows of water (Brooks et al. 2003, Gregersen et al. 2007). Since adoption of the Clean Water Act of 1972, control of nonpoint sources of pollution has focused on the implementation of best

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management practices (Ice et al. 2010). Best management practices are defined as a practice or combination of practices that are determined by a designated organization or agency to be the most effective and practicable mean of controlling point and nonpoint source pollution at levels that are compatible with environmental quality goals (Hems 1998). Best management practices require the identification and proper implementation of watershed management practices that reduce the problems of sedimentation and non-point source pollution caused by improper, unwise, or poorly planned land-use activities. While many best management practices are known for control of the erosional-sedimentation processes that are influenced by forestry, agricultural, and road-construction activities, they are only partially known for controlling some of the other source of pollutants.

Degradation of watershed conditions in the Southwest has often been attributed to over-cutting of tree overstories, over-grazing by livestock, or occurrences of wildfire. These impacts are especially severe when these events are associated with recurring high-intensity rainfall events or prolonged drought conditions (Brooks et al. 2003, Gregersen et al. 2007). Because of the delicate balance between fragile soils and limited water flows from many watersheds in the Southwest, mitigative actions must continue through time to prevent further deterioration of these landscapes. Removal of protective vegetation has been curtailed on sites most vulnerable to accelerated soil losses. The intensity of livestock grazing is continuously monitored to determine when managerial actions are needed to control detrimental impacts of this land use on sensitive sites. Road construction has been largely eliminated near stream channels while many established road systems have been closed to the public and often seeded with herbaceous plants for protection. Rehabilitation of improperly functioning riparian corridors within otherwise properly functioning watersheds is another high priority activity because of the close linkage between watershed condition and riparian health (Baker et al. 2004, Ffolliott and Stropki 2007). Actions such as these that are mentioned are essential to maintaining watersheds in good condition; accommodating the sustainability of ecosystem-based, multiple-use management practices; and addressing people's increasing concerns about maintaining environmental quality.

LIMITATIONS

There are two sets of limitations that people must always consider in planning for the implementation of integrated watershed management practices (Gregersen at al. 2007). There are natural limitations that are expressed by the biological or physical relationships among the flows of high-quality water; availability of trees to process into wood products; maintaining forage resources for livestock production; protecting habitats for wildlife species; and providing suitable sites for recreational activities. These relationships are complementary when the resources of interest increase together; supplementary when the change in one resource has no significant influence on other resources; or competitive when one resource must be sacrificed to gain more of another resource. A watershed manager must ascertain which forms of relationships are confronted before making management decisions. Competitive relationships are crucial because it is here where a manager must decide which of the resources should be favored and which resources must be sacrificed to favor those resources are a particular concern.

Of equal importance to natural limitations are institutional limitations with the intersection of natural limitations and institutional limitations representing the options for implementing an integrated watershed management to land stewardship. The most important of the institutional limitations are often those sanctioned by the laws and regulations that deal with the ownership and rights to use the natural resources found on a watershed. With respect to water, for example, nobody actually owns the water that flows from a watershed in the Southwest as it is considered generally to be a public resource. However, people can control the rights to use this water. Less explicit than laws and regulations are the informal social values that evolve from cultural features and heritage of the people involved. Many of these social values have often been incorporated into local legal systems without formal legislative enactment or enforcement. It is imperative, however, that these social values be incorporated effectively into the planning and decision-making processes to arrive at an integrated watershed management strategy that optimizes the sustainable use of the natural resources on a watershed and insures the broadest possible acceptance of the strategy.

SUMMARY

As populations of people continue to expand in the Southwest and wealth increases, the demands placed on natural resources and the need to manage the environment in which people live also will increase. The management of land, water, and other natural

resources is especially critical in this region because the use of upstream watersheds are drastically affect the large number of people living downstream. It is fortunate that technologies, institutional arrangements, and integrated approaches that emphasize the importance of participatory planning of watershed management practices are also emerging to make dealing with the issues and opportunities of watershed management easier and more effective. Such is the purpose of a integrated watershed management approach to land stewardship.

ACKNOWLEDGMENT

This paper is based largely on a book on "Integrated Watershed Management: Connecting People to Their Land and Water," by Hans M. Gregersen, Peter F. Ffolliott, and Kenneth N. Brooks, published in 2008 by CAB International, Oxfordshire, United Kingdom.

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