Wetlands

CHARACTERISTICS AND BOUNDARIES

Committee on Characterization of Wetlands

Water Science and Technology Board
Board on Environmental Studies and Toxicology

Commission on Geosciences, Environment, and Resources

National Research Council

NATIONAL ACADEMY PRESS
Washington, D.C. 1995

6

Especially Controversial Wetlands

INTRODUCTION

The wetlands and associated landscape features discussed in this chapter have been the subject of particular controversy because of their location, their unusual characteristics, or their regulatory status. They include permafrost wetlands, riparian ecosystems, isolated and headwater wetlands, especially shallow wetlands, agricultural wetlands, nonagricultural altered sites, and transitional zones. These areas are the source of many problems related to wetland regulation and delineation; their classification is particularly sensitive to changes in delineation procedures.

PERMAFROST WETLANDS

Permafrost is soil that has a temperature continuously below 32°F (0°C) for 2 years or more. This definition distinguishes permafrost from seasonal frost. The distribution of permafrost in the United States is restricted to Alaska and a few high alpine areas in the conterminous states. Except at latitudes and elevations so high that there is no summer thaw, permafrost is overlain by a zone of seasonal thaw called the active layer, which typically is 14-79 in. (25-200 cm) thick. Maximum depths of thaw are found where the climate is warmest and the soils are driest; minimum depths of thaw are found in the coldest and wettest environments.

North of the Brooks Range in Alaska, permafrost is generally continuous. In south-central and interior Alaska, permafrost is discontinuous, and it is generally

Regulation of Permafrost Wetlands

Many proposals have been made to regulate permafrost wetlands differently from nonpermafrost wetlands. For example, the Food Security Act wetland definition excludes some permafrost wetlands of Alaska (Chapter 3), which has 174.7 million acres (70.8 million ha) of wetland (Hall et al., 1994). Permafrost is in part responsible for this large amount of wetland, although pleistocene glaciation and associated fluvial and lacustrine deposits contribute to Alaska's wetlands (Péwé, 1975). Alaska accounts for one-sixth of the total land area of United States, and it has about 63% of the nation's remaining wetlands (Hall et al., 1994). The regulatory treatment of permafrost wetlands is significant regionally, because of the abundance of wetlands in Alaska, and nationally, because so much of the nation's wetlands are in Alaska.

Wetland formation by permafrost is influenced by latitude, topography, and climate, as are other mechanisms of wetland formation. Precipitation and evapotranspiration, for example, vary with latitude and climate in ways that affect many kinds of wetlands. Furthermore, studies of the National Wetlands Working Group (1988) in Canada show that permafrost wetlands have the same functions as other kinds of wetlands. To argue that saturated soils underlain by permafrost cannot be wetlands because they are a phenomenon of climate is akin to arguing that bottomland hardwood forests are not wetlands because they are a result of high river discharge. The sensitivity of permafrost wetlands to altered thermal regimes induced by anthropogenic disturbance or by fire also has been suggested as a reason for treating them as problem wetlands (Ping et al., 1992). Most wetlands are, however, similarly subject to loss or change by natural and anthropogenic forces. Because permafrost wetlands do not differ in their essential characteristics from other wetlands, separate regulatory treatment of them is not justifiable scientifically. Recommendations on permafrost wetlands can be found at the end of this chapter, numbers 1 to 3.

RIPARIAN ECOSYSTEMS

Land adjacent to a stream or river is often called a riparian zone or riparian ecosystem. The riparian zone is a characteristic association of substrate, flora, and fauna within the 100-year floodplain of a stream or, if a floodplain is absent, a zone hydrologically influenced by a stream or river (Hunt, 1988). Riparian ecosystems are maintained by high water tables and periodic flooding. Examples include bosques of the American Southwest, streamside communities along high-gradient streams of the Pacific Northwest and Rocky Mountains, gallery forests of prairie regions, cove forests of the eastern mountains, and wetlands and adjacent slopes that border streams of humid eastern states (Brinson et al., 1981). Riparian zones, which can be defined several ways, contain or adjoin riverine wetlands and share with them a multitude of functions including surface and

subsurface water storage, sediment retention, nutrient and contaminant removal, and maintenance of habitat for plants and animals (Chapter 2).

Support of Biodiversity

Several studies document the importance of riparian ecosystems to regional biodiversity. Ohmart and Anderson (1986) conclude that the greatest densities of breeding birds in North America are found in riparian ecosystems, that more than 60% of the vertebrates in the arid Southwest are obligately associated with this ecosystem, and that another 10-20% of the vertebrates are facultative users of streamside vegetation. Mosconi and Hutto (1982) report that in western Montana, 59% of the species of land birds use riparian ecosystems for breeding, and 36% breed only there. Cottonwood and mesquite forests are very high in species richness of migratory birds (Stromberg, 1993). Thomas et al. (1979) found that 299 of the 363 species of land vertebrates in the Great Basin of southeast Oregon depend directly on riparian habitats or use them more than any other habitat type.

Current Regulation of Riparian Ecosystems

Riparian ecosystems are among the nation's highly valued and threatened natural resources (Johnson and McCormick, 1979). Alteration of riparian ecosystems has been of special concern in the West. Alteration has accompanied regulated activities such as gravel mining, bridge crossings, and the creation of new dams and diversions, and such unregulated activities as reduction of surface discharge or lowering of water tables due to ground water pumping or surface water withdrawal. Other activities that can alter riparian zones include clearing of land for agricultural development, logging, or recreation (Stromberg, 1993). Degradation of riparian habitat has also resulted from the spread of exotic species such as saltcedar and Russian olive. In some areas, native riparian plant and animal species are greatly suppressed or have become locally extinct (Stromberg et al., 1991).

Because of their proximity to flowing water, riparian ecosystems are closely associated with the maintenance of the physical, chemical, and biological processes of streams. Although widely recognized as important to the goals of the Clean Water Act, riparian zones are not fully protected by it. Some parts of riparian ecosystems are regulated because they are located at an elevation below ordinary high-water, which qualifies them as waters of the United States, or because they conform to regulatory definitions of wetlands. Other parts of riparian ecosystems are unregulated because they do not satisfy any of the broadly-used definitions of wetlands and they lie outside the ordinary high-water mark. Unregulated riparian areas in arid climatic regions such as the Southwest and the Great Basin include cottonwood-willow streamside forests as well as bosques on

the higher portions of floodplains. These riparian ecosystems often include jurisdictional wetlands (Appendix B, Verde River case study).

The overstory of arid zone riparian ecosystems is typically dominated by phreatophytes, plant species that rely on water drawn from points below the water table. Riparian phreatophytes of the West typically cannot live on uplands where the water table is inaccessible. Thus, whereas upland species can tolerate drought, riparian species avoid the effects of drought by use of shallow ground water near streams or rivers. Although ground water is close enough to the surface to support phreatophytes in arid zone riparian ecosystems, it is not close enough to sustain a hydrophyte-dominated wetland. Furthermore, full inundation might occur only during occasional floods at intervals of many years. Also, soils of arid riparian ecosystems generally lack hydric properties because organic matter seldom accumulates in sufficient quantities to cause the development of redoximorphic features and because saturation at or very near the surface is infrequent.

Riparian ecosystems also can be found along headwater streams and annually inundated floodplains in humid regions such as the eastern United States and the Pacific Northwest. Significant proportions of these riparian zones often qualify as wetlands, but the uppermost portions typically do not. The upper zones of floodplains do flood periodically, but not often enough to qualify as wetlands. Even so, riparian zones outside wetland boundaries perform functions that are similar or complementary to those of wetlands. Even where the riparian zones of headwater streams are jurisdictional wetlands, however, protection is weak because of Nationwide Permit 26, through which significant alteration of headwater wetlands can occur (see following section on isolated and headwater wetlands).

Since 1968, the National Flood Insurance Program has conditioned the availability of flood insurance on the adoption of local regulations designed to limit construction in the 100-year floodplain. Areas that receive flood disaster relief also must submit hazard mitigation plans for approval by the Federal Emergency Management Agency. These statutory programs are supplemented by Executive Order 11988, which directs federal agencies to avoid supporting development in floodplains if there is a practical alternative. Although federal policies are not oriented toward protection of the natural functions of floodplains, they have slowed the alteration of floodplains. Many state and local governments have supplemented the federal programs with even more restrictive regulations. Complementary programs that acknowledge the importance of riparian zones in hydrologic buffering and in the maintenance of water quality and biodiversity are warranted but have not yet been developed.

Riparian zones may contain wetlands that meet the present regulatory definitions of wetland as well as the reference definition that is given in Chapter 3. Examples include floodplain depressions that are inundated every year or in most years, abandoned channel remnants that extend to contact with groundwater, or

that accumulate considerable precipitation that causes them to be wet for extended intervals. In addition, however, riparian zones often contain substantial amounts of land that cannot be classified as wetland according to present regulatory definitions or the reference definition given in Chapter 3. For example, a broad definition of the riparian zone would correspond to the high-water mark of the hundred-year flood near a river channel. The uppermost portion of this zone would be inundated only once every hundred years on average, and even when inundated, it might not retain water very long. Thus this upper margin of the floodplain would not meet the requirements for recurrent, sustained inundation or saturation at or near the surface. Vegetation in this part of the riparian zone would not be predominantly hydrophytic, although the zone might contain some phreatophyte species dependent on a water table several feet below the surface of the substrate. The substrate would not show any physical or chemical evidence of repeated, sustained inundation. Thus riparian zones are not wholly contained within the set of ecosystems defined as wetlands by existing regulatory definitions or by the reference definition of Chapter 3. This conclusion does not imply that riparian zones are unimportant to the goals of the Clean Water Act, or that riparian zones are not critically threatened in much the same way that wetlands are threatened, but rather that extension of the definition of wetland to cover all riparian zones would unreasonably broaden the definition of wetland and undermine the specificity of criteria and indicators that have developed around wetland delineation. A recommendation from this section can be found at the end of this chapter, recommendation number 4.

ISOLATED WETLANDS AND HEADWATERS

As explained in Chapter 4, Nationwide Permit 26 affects isolated wetlands and headwaters, by authorizing the filling of relatively small areas if the permitted activity is consistent with CWA regulations. Most of the nationwide general permits refer to categories of activities, such as construction of aids to navigation, rather than to categories of wetlands. Unlike the other nationwide permits, Nationwide Permit 26 authorizes discharge to wetlands on the basis of their position in the drainage network, rather than on the basis of the activity itself. It permits filling of up to 1 acre (0.4 ha) with no review and 10 acres (4 ha) with minimal review in headwaters and isolated waters. Isolated waters, which include vernal pools, playas, potholes, and alpine wet meadows, are defined as the nontidal waters of the United States that are not a part of a surface tributary system to interstate or navigable waters of the United States and that are not adjacent to such tributary bodies of water (33 CFR 330.2). Even though such wetlands qualify for protection under Section 404 jurisdiction, Nationwide Permit 26 excludes some types of wetlands from individual permit requirements, except when overridden by the USACE division engineer. Nationwide Permit 26 has been controversial because of the cumulative wetland losses that can result through its

TRANSITIONAL ZONES

On gentle gradients, or where microtopography causes wetlands to be interspersed with uplands on fine scales, the wetland boundary can be difficult to locate (Chapters 2 and 5). The same is true of marginal sites where wetland status is questionable because evidence is weak or inconsistent. These transitional and marginal areas have stirred debate and criticism of current and past identification and delineation of wetlands. In these difficult cases, the evidence must be carefully weighed against the minimum essential characteristics of wetlands, namely: hydrologic features associated with flooding or saturation and the presence of organisms and physical and chemical features that reflect continuous or frequently recurring saturation or flooding. Evidence should be calibrated regionally for specific wetland types to facilitate more consistent delineation; reference wetlands are useful for this purpose.

An approach that requires no conflicting evidence might have the effect of excluding some wetlands. In contrast, an approach that does not require strong evidence and that ignores conflicting evidence could include some uplands. For these reasons, the consequences of delineation procedures must be carefully considered on a regional basis. A recommendation concerning transitional zones is listed as recommendation number 11 at the end of this chapter.

RECOMMENDATIONS

1. Permafrost wetlands, which have structure and function similar to those of nonpermafrost wetlands, should be identified and delineated by the same principles as are other wetlands.
2. A better scientific understanding of permafrost wetlands should be developed.
3. The correlation of soils and hydrology as well as vegetation and hydrology should be studied for permafrost wetlands.
4. Riparian zones perform many of the same functions as do wetlands, including maintenance of water quality, storage of floodwaters, and enhancement of biodiversity, especially in the western United States. Although they typically contain wetlands, riparian zones cannot be defined wholly as wetlands by any broad definition. If national policy extends to protection of riparian zones pursuant to the goals of the Clean Water Act, regulation must be achieved through legislation that recognizes the special attributes of these landscape features, and not by attempting to define them as wetlands.
5. The scientific basis for special permitting of wetlands in headwaters or isolated wetlands is weak. Nationwide Permit 26 has been controversial because of the cumulative wetland losses that can result through its application. Conse-

quently, Nationwide Permit 26 should be reviewed for validity in the context of the Clean Water Act and for consistency with other permitting practices.

6. Especially shallow wetlands or wetlands that are only intermittently wet perform the same kinds of functions as other wetlands and can be delineated by the same procedures as those used for other wetlands.

7. Wetlands on agricultural lands should not be regulated differently from other wetlands. These wetlands may have many of the same attributes as do other wetlands, including maintenance of water quality, and there is no scientific basis for delineating them under definitions or federal manuals different from those applicable to other wetlands.

8. Wetlands in agricultural settings can enhance runoff water quality; the impairment of this function by agricultural practice should be considered when wetlands are proposed for agricultural use.

9. When wetlands are to be constructed or restored using agricultural lands, it is preferable to locate such projects near natural wetlands. Restoration on agricultural lands should be encouraged whenever these practices can reduce impairment of the remaining natural wetlands on or near agricultural lands.

10. Inference of wetland features that have been removed or changed by natural or anthropogenic means should be allowed as part of wetland delineation on altered lands. Federal manuals should instruct delineators on the valid use of inference for this purpose.

11. Application of delineation methods should be tested on transitional and marginal lands in all regions.