The Importance and Future Condition of Western Riparian Ecosystems as Migratory Bird Habitat[1]

Susan K. Skagen,[2] Rob Hazlewood,[3] and Michael L. Scott[4]

Abstract

Riparian forests have long been considered important habitats for breeding western landbirds, and growing evidence reinforces their importance during the migratory period as well. Extensive modification of natural flow regimes, grazing, and forest clearing along many rivers in the western U.S. have led to loss and simplification of native riparian forests and to declines and endangerment of riparian-dependent birds species. Efforts to conserve, restore, and manage the distinctive biological diversity of riparian ecosystems must rest upon a clear understanding of the primary physical and biological process that structure and maintain that diversity on a landscape scale.

Key words: ecosystem processes, flow regimes, riparian forests, western landbirds.

Introduction

Conservation of terrestrial birds depends on a clear understanding of their habitat requirements and the physical and biotic processes that create and maintain those habitats (Askins 2000). Riparian forests are typically more productive and biologically diverse than surrounding uplands and are structured by the distinctive fluvial geomorphic processes and hydrologic conditions found on bottomlands (Brinson 1990, Knutson et al. 1996). Riparian habitats cover less than 1.0 percent of the landscape in western North America (Knopf et al. 1988), yet they support a disproportionately large number of bird species and greater densities of birds than other forested habitats (Johnson et al. 1977, Mosconi and Hutto 1982, Woinarski et al. 2000).

Effective conservation must address critical habitats for birds during all phases of the annual migratory cycle. Riparian forests have long been considered important habitats for breeding western landbirds. Nearly 50 percent of breeding bird species in the western U.S. nest only in riparian vegetation types, including 45 percent of 235 known breeding species in Montana (R. L. Hutto, pers. comm.). In three southwestern states, 48 percent of bird species nest only in riparian and other wetland habitats and an additional 21 percent nest in greater densities in riparian than in other habitats (Johnson et al. 1985). During winter, avian densities and species richness are greater in lowland riparian forests than in other habitats in western Mexico (Hutto 1980). Growing evidence also reinforces the importance of riparian habitats during the en route migratory period (Hutto 1998, 2000; Skagen et al. 1998, Finch and Yong 2000). Densities of Yellow Warblers (*Dendroica petechia*) and Wilson's Warblers (*Wilsonia pusilla*) as great as 48.0 and 33.7 birds/ha, respectively, were recorded in southeastern Arizona riparian forests during spring migration (Skagen et al. 1998). Here, both isolated oases and extensive riparian corridors appeared to have high value for en route migrants.

Riparian forests in the semiarid western U.S. are dominated by early successional woody species, primarily Plains cottonwood (*Populus deltoides*), Fremont cottonwood (*Populus fremontii*), and willows (*Salix* spp.) (Friedman et al., in review). These forests are dependent upon flow-related geomorphic processes for the establishment of new cottonwood and willow patches. The regeneration of these woody species requires the presence of bare moist alluvial surfaces that are laid down during infrequent high intensity floods (Friedman et al. 1997). Cottonwoods are intolerant of shade and rarely become established from seed under existing trees. The bare, moist alluvial surfaces must be available for seed germination during a species-specific window of time after which seeds lose germinability. The seedlings require continuously moist substrates during the first week of growth. Further, survival and recruitment of cottonwood trees necessitates access to groundwater for developing saplings and safety from future disturbances.

Structural diversity of semiarid riparian forests reaches a maximum after approximately 90 years with the development of a mature cottonwood canopy and shrub

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[2]U.S. Geological Survey, Fort Collins Science Center, 2150 Centre Avenue, Bldg. C, Fort Collins, CO 80526. E-mail: susan_skagen@usgs.gov.

[3]U.S. Fish and Wildlife Service Helena Field Office, 100 N. Park, Suite 320, Helena, MT 59626.

[4]U.S. Geological Survey, Fort Collins Science Center, 2150 Centre Avenue, Bldg. C, Fort Collins, CO 80526.

understory. In the absence of stream flows and geomorphic processes to create suitable sites for new germination and establishment, forest structure declines with the attrition of mature cottonwoods and as stands give way to shrubs and ultimately upland grasses (Boggs and Weaver 1994). Friedman et al. (1997) present a clear description of the roles of fluvial processes and channel morphology in cottonwood regeneration and forest dynamics in the Great Plains.

Scott et al. (2003) illustrate how fluvial geomorphic processes and long-term grazing can influence the structural complexity of riparian vegetation and the abundance and diversity of breeding birds along rivers in arid regions of western North America. Along the upper Missouri River in central Montana, recent geomorphic changes in the form of lateral and vertical sediment accretion in conjunction with establishment and succession of woody vegetation (primarily cottonwood and willow) on these new alluvial surfaces was correlated with higher vegetation structural complexity. Grazing activity simplified the structure of riparian vegetation. Correspondingly, the diversity and abundance of breeding bird communities increased significantly with increases in the structural complexity of habitat patches.

In contrast to structurally simple vegetation, structurally complex riparian vegetation hosts greater abundances of many species such as Yellow Warbler, Common Yellowthroat (*Geothlypis trichas*), Yellow-breasted Chat (*Icteria virens*), American Redstart (*Setophaga ruticilla*), American Goldfinch (*Carduelis tristis*), Lesser Goldfinch (*C. psaltria*), Song Sparrow (*Melospiza melodia*) (Krueper et al. 2003, Scott et al. 2003). Safeguarding the growth of structurally complex vegetation requires both the maintenance of the geomorphic processes responsible for tree establishment and management of grazing and other land-use activities in riparian forests. Protection from grazing can result in quick vegetative recovery (Krueper et al. 2003). Long-term conservation strategies, however, should go one step further. To ensure structurally complex habitats in the distant future, geomorphically active reaches that have potential for cottonwood and willow generation should be specifically identified and protected from grazing.

Anthropogenic disturbances to western riparian ecosystems are pervasive and increasing as a result of human population growth in the region. Extensive modification of natural flow regimes, development in flood plains, grazing, conversion of lands to agriculture, and forest clearing along many rivers in the western U.S. have led to loss and simplification of native riparian forests and to population declines of riparian-dependent bird species. Even the Yellowstone River, the longest free-flowing river remaining in the contiguous United States, is seriously threatened by land management decisions. Designated as one of only ten "American Heritage Rivers" by President Clinton and called "The Last Best River" by National Geographic (Chapple 1997), the Yellowstone River is clearly one of the premier aquatic resources in the nation. It is not as pristine, however, as it was when Lewis and Clark explored its banks in 1806. Bank stabilization, dikes, rock barbs, jetties, and other manmade channel and flood plain modifications have been and continue to be permitted at a pace that may cumulatively threaten the ecology of the entire river system.

Ultimately, avian conservation across broad regions and over long time scales will benefit from the insights of riparian ecologists who are well-versed in the biology of the plant species that comprise important habitat for avian species and who can predict how plant communities will change through time. Without this understanding, the future condition of specific tracts of riparian forests may be misjudged, with serious implications for migratory bird species associated with these systems.

For example, consider valuations of riparian stands based on current conditions alone. *Figure 1* portrays two hypothetical forests. The first is along a free-flowing river where vegetation structure has been simplified by intense grazing. The second is a diverse, multi-layered forest along a river where the flow has been recently altered by dam construction. Based on current conditions alone, the second stand may be valued highly and designated for “protection.” Yet, the first stand has great potential to persist and become more structurally diverse with the removal of grazing (Krueper et al. 2003) because the ecological processes are intact. In contrast, the second forest faces the attrition of the mature stand and a possible return to grasses and shrubs only. The prospects for future forest regeneration are limited because the river flow has been altered. Under these conditions, geomorphic activity may occur only in wide river reaches or along tributary confluences.

Efforts to conserve, restore, and manage the distinctive biological diversity of riparian ecosystems must rest upon a clear understanding of the primary physical and biological processes that structure and maintain that diversity on a landscape scale. Across the semiarid western U.S., the interplay of fluvial processes, channel morphology, and water management, modified by myriad physical, biological, and climatic factors, set in motion the series of events that ultimately determine the future condition of riparian forests. Because many forest sites will change dramatically through the decades, conservation efforts focused at a large spatial scale with consideration of fluvial geomorphic proc-

esses can help ensure that high quality migratory bird habitat persists through time.

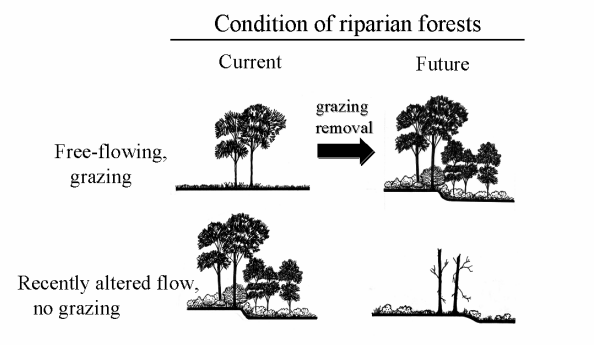

Figure 1— A hypothetical example of the present and predicted future conditions of riparian forests relative to flow regime (free-flowing rivers and rivers with recently altered flow) and grazing.

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