Appendix A

I. Indicators of High-Quality Riparian Habitat

Riparian areas are the most important wildlife habitat type. Following are indicators of quality habitat which can be considered when designing management objectives for riparian area management in the Great Basin and similar areas, including the Great Plains, and toward which grazing management practices can be designed. These factors can also be used as indicators of quality habitat for other species as well.

A. Fish Habitat

Platts et al. (1977) list the following indicators of good fish habitat in the Great Basin (these are also good indicators of bank stability):

- Adequate vegetation canopy to maintain acceptable water temperatures for the fish species involved
- Well-vegetated streambanks to minimize soil loss and trampling damage
- Overhanging vegetation (within 1-2 feet of water surface) on 50 percent or more of the streambank, and especially on outside bends of streams, to provide fish cover

Individual sites may possess limitations that preclude accomplishing all of the above. However, the type, density, height, diameter, and age class of vegetation needed for good fish habitat should be included in the management objectives.

Bisson et al. (1992) provide further that management practices for quality fish habitat should:

- Provide for habitat complexity—land use practices that have led to simplified streams characterized by straightened, confined channels have had the most pervasive cumulative impacts on fish populations
- Preserve physical and biological linkages between streams, riparian zones, and upland areas that provide transfer processes for woody debris, coarse sediment, and organic matter
- Provide a greater range of vegetative species and structural diversity, thus providing future sources of large woody debris, floodplain connections, and other linkages important to ecosystem function

In designing grazing systems to improve fisheries, a fisheries biologist should be consulted to ensure the treatments are tailored to the site-specific and watershed resources present.

B. Waterfowl Habitat

Mazzoni et al. (1977) made several recommendations for management of waterfowl production habitat in the Omat Basin:

- Manage for native plant communities where possible. Where this is not practical, manage for introduced species best adapted to the site that give the greatest density with the tallest and most erect growth form.

- Ideally, areas managed for production should contain one-third open water and two-thirds marsh vegetation.

- Fence critical areas or place salt, water, and supplements for livestock away from critical production areas. Where fencing is impractical, islands or artificial structures are recommended.

- Where maximum nest density and nesting success is desired, manage for high, erect growth forms in 80-acre or larger blocks. These areas should be ungrazed until the vegetation begins to mat.

- Several years of nonuse may be required to promote homing, larger clutches, and earlier nesting of waterfowl species.

- Most nesting starts before the current year's vegetative growth is useable (tall enough or long enough) for nesting. Grazing should be managed to provide for increases in residual nesting cover which will carry over for the following year. This carryover should be comprised of abundant ground litter and erect and recumbent vegetation. These characteristics help deter predation and provide ideal temperature and moisture conditions for a good hatch.

- Grazing formulas that prescribe deferred grazing in areas with good residual vegetation from the previous year provide maximum benefits to nesting waterfowl (Mazzoni et al. 1977).

In a study of rest-rotation grazing and waterfowl production in Montana, Gjersing (1975) suggested that:

- Livestock should be moved from the pasture and gates closed at the end of the early treatment (spring and summer grazing) to provide for residual cover and regrowth.

- Grazing of these or other rested pastures with residual cover should be delayed the following year until incubation is complete (Gjersing 1975).

II. Willow and Cottonwood Stand Regeneration and Management

Although the following items do not specifically relate to grazing management, some are indirectly related and may prove useful in planning for proper management.

A. Willows

Pillmore (1983) reported the following findings on willow:

- Bare soil with moisture above or at the surface and temperatures above freezing are required for germination.
- The duration of seed viability is short (6-7 weeks).
- For survival, seedlings require continuous high soil moisture availability.
- Willows can tolerate 2 to 4 weeks of flooding, but no more than 200 to 400 mg/L of total dissolved solids.
- Willows can only tolerate 2 to 4 weeks of moisture stress and require that the water table be within 12 feet of the surface.

There are many species of willow native to the western rangeland. Habitat preference and growth form vary widely.

B. Cottonwoods

Cottonwoods usually don't regenerate naturally in existing stands until the overstory has declined due to harvest or death. This is due to competition for moisture and light. The best conditions for seed germination are moist gravel, sand, or silt exposed to full sun.

Soil disturbance or exposure is usually necessary to achieve sprouting or reproduction from seed (Beeson 1983). Seed viability is short-lived. A constant supply of moisture is essential during the first few weeks of seedling growth to ensure survival. Cottonwood seedlings frequently appear following high runoff and silt deposition in conjunction with peak seed dispersal (Fenner et al. 1985).

Studies on cottonwood in northeastern Colorado indicated that although the most important factor in cottonwood regeneration is water management, livestock and fire are beneficial in controlling competition from herbaceous vegetation during the period of the summer when cottonwood seed is disseminated and seedling growth is likely (Crouch 1979). If an area contains inadequate forage, grazing will likely result in loss of seedlings.

There should also be a number of age classes of cottonwoods. To obtain this result, the manager will need to ensure suitable site conditions and require protection from browsing or other damage of seedlings during establishment. Additionally, Pillmore (1983) found that cottonwoods:

- Can stand flooding for only 7-16 days
- Can tolerate only 200 to 400 mg/L of total dissolved solids
- Are capable of living under only 24 weeks of moisture stress
- Can survive when the water table is within 20 feet of the soil surface

Some streams in Colorado with much greater concentrations of dissolved solids support cottonwoods.

Willow, cottonwood, and aspen sprout from stumps and roots. Livestock, especially cattle, annually consume this reproduction when "overgrazing" during summer and fall is allowed. Beaver play a natural role in stimulating suckering and sprouting. If good beaver habitat is to be maintained, it is essential that stumps be protected from summer livestock use for 3 to 5 years following cutting by beaver (Kindschy pers. comm.). USDA (1985) provides an exhaustive treatment of aspen ecology and management.

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This document presents information from various land managers and researchers to guide livestock management in riparian areas using their unique responsiveness to accomplish management objectives. An ecosystem approach, in which riparian areas are considered as part of a larger landscape, is used. Development of site-specific grazing prescriptions based on the function, capability, and potential of the site is discussed, and examples of grazing treatments are provided

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