**BRIDGE AND ROAD CONSTRUCTION/RECONSTRUCTION GUIDELINES FOR WETLAND AND RIPARIAN AREAS**

**NEW MEXICO DEPARTMENT OF GAME AND FISH**
**CONSERVATION SERVICES DIVISION**
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## BACKGROUND

In New Mexico, a large number of bridge and road projects disturb at least small areas of aquatic, wetland, or riparian habitat. The cumulative impact of such projects on these habitats is significant. The following recommendations were developed with the intent of avoiding or minimizing adverse effects of bridge and road projects on the fragile and limited aquatic, riparian and wetland habitats of New Mexico. The Department of Game and Fish (Department) is concerned about these habitats because 1) they are essential for the survival of a majority of the species of wildlife found in the state, and 2) the quantity and quality of these habitats have been significantly diminished.

Of the 867 species of vertebrates known to occur in New Mexico, approximately 479 (55%) rely wholly, or in part, on aquatic, wetland or riparian habitat for their survival (NMDGF 2006). Surface water comprises only 0.2 percent (141,440 acres) of the surface area of New Mexico (USGS 1970). Wetlands and riparian areas comprise another 0.6 percent (481,900 acres) (Dahl 1990). It is estimated that fully one third of the wetlands that once existed in New Mexico have been lost (Dahl 1990). On the main stem of the Rio Grande, the situation is worse. An 87 percent decrease in wetland acreage occurred along this river from 1918 to 1982 (Hink and Ohmart 1984). The quality of these habitats has also been diminished. Of the approximately 7,000 primarily perennial stream miles, almost 2,763 assessed miles, or 39%, have identified impaired designated or attainable uses while approximately 60,500 out of 94,000 acres, or 64%, publically-owned lake, reservoir, or playa do not fully support designated uses (waters are impaired). Heavy metal contamination, stream bottom deposits (sedimentation/siltation), high water temperature, nutrient/eutrophication, and *E. coli* are the major causes of surface water impairment in rivers (WQCC 2010). Mercury in fish tissue, PCBs in fish tissue, and dissolved oxygen are the major causes of impairment in lakes and reservoirs. The State of New Mexico has issued fish consumption advisories for twenty-eight lakes and reservoirs and three rivers due to elevated concentrations of various contaminants including mercury, dichlorodiphenyltrichloroethane (DDT), and polychlorinated biphenyls (PCBs).

## RECOMMENDATIONS

- Statewide transportation planning should involve NMGF as early as possible to meet requirements of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), which became law on August 10, 2005, regarding consideration of NMGF conservation plans, maps and inventories of natural resources, and discussion of potential environmental mitigation activities and potential areas to carry out these activities.
- For specific transportation project development, Department involvement as early as possible with the Project Development Team will insure that project designs incorporate environmental constraints and enhancements. Not taking into consideration natural resource concerns early in project design often results in having to redo project designs in later stages of development.
- The project sponsor, to ensure that specifications are adhered to, should conduct comprehensive on-site supervision of the project contractor. Post-construction mitigation should likewise be monitored to ensure that agreed-upon measures are implemented successfully.
- Efforts must be made during construction to minimize impacts on vegetative communities. Existing roads and rights-of-way should be used for all transportation. Off-road driving should be avoided. Staging areas should be located in previously disturbed sites, where possible, and kept as small as possible. Road realignments should be designed to minimize the amount of construction in previously undisturbed areas.
- All topsoil removed for construction should be stockpiled and used as surface fill in reclamation of the project area. Following construction, disturbed areas should be re-vegetated using native

species that approximate pre-disturbance plant community composition or native plant communities likely to be found in the area, whichever is more beneficial to wildlife.

- Short-term erosion control seed mixes are available for temporary control of surface erosion during project implementation. These plant species provide quick establishment of ground cover on disturbed areas. Following final grading, permanent seed mixes should be used for revegetation of ground cover. All seed mixtures should be certified as weed-free. New Mexico grass ecotypes are available commercially for seeding in the bosque that were developed by the Los Lunas Plant Materials Center and New Mexico State University. Seeding guidelines are available from NRCS (2005), Monsen et al. (2004), and Colorado Natural Areas Program (1998).
- A revegetation plan must be included as a component of project mitigation plan. The revegetation plan should specify areas to be planted; species to be planted; quantity of species (e.g., pounds of seed per acre, number of poles, number of saplings) to be planted at each location; monitoring and maintenance (e.g., protection from cattle, elk, beaver) of the plantings.
- The Los Lunas Plant Materials Center can provide guidelines for revegetation of wetland and riparian areas where irrigation is not available during plant establishment.
- Army Corps of Engineers (Corps) and Environmental Protection Agency (EPA) regulations governing compensatory mitigation for projects permitted under the Clean Water Act recommend locating mitigation sites on a watershed basis (71 FR 15520; 28 March 2006). A watershed approach recognizes the limitations of traditional on-site, in-kind project siting, supports the fact that wetland functions are best understood from a watershed perspective, which allows siting mitigation projects where restoration of wetland functions can be maximized. On-site mitigation may not be appropriate if no suitable areas occur (e.g., native riparian forest already exists, stocking level precludes planting additional trees, land ownership problems).
- Areas dominated by non-native species such as salt cedar, Russian olive, and Siberian elm should be restored to native vegetation.
- Erosion control measures must be in place prior to construction to prevent introduction of sediment-laden runoff into surface waters (e.g., hay bales, silt screens, settling basins, sediment traps). No material excavated for bridge approaches should be introduced into the stream.
- Exposed soils, particularly on slopes, must be stabilized with vegetation as soon as possible to prevent excessive erosion.
- Drainage control features of the project should be designed to prevent soil erosion and impacts to surface water quality. These measures should include, but not be limited to, the following:
    a) Culvert inverts should be level with the existing channel bottom at the inflow and outflow.
    b) If fish passage is required, culverts should be countersunk to simulate a natural bottom and provide optimal hydraulic conditions for passage.
    c) The slope of the culvert should match the gradient of the stream channel.
    d) In watercourses with high stream flow velocity, the outlet of the culvert should be armored to prevent stream bed degradation.
    e) Bar ditches and roadside drainage features should be designed to prevent excessive flow velocity and gully formation through consideration of slope and incorporation of energy dissipation features.
    f) Settling basins should be installed in areas where runoff contains high sediment loads, to prevent sedimentation of receiving waters.
    g) Based on site-specific conditions, raised culverts at road crossings of ephemeral streams may be employed to raise the water table upgradient and promote development of mesic or wetland habitat. The Department should be consulted during the planning stage to determine if a raised culvert is appropriate.
- No net loss of wetland habitat functions should result. If losses are unavoidable, mitigation should be designed to replace lost wetland functions using a recognized accounting method such as hydrogeomorphic (HGM) assessment models (Smith et al. 1995). The HGM model approach to assessing wetland functions is the method recommended by the Corps and EPA to account for functional losses and to determine the amount and type of compensatory mitigation required. Other recognized methods can also be used; whatever method is used should be fully explained and the procedures documented.

- A wetland creation/restoration/enhancement plan should be included as a component of the project mitigation plan if wetland impacts are unavoidable. This plan should include the following features, which will provide information necessary to evaluate the potential for success:
  a) A description of the desired biological and hydrological values and functions of the wetland creation/restoration/enhancement is necessary to establish the objectives of the mitigation.
  b) Scale plans that describe the location, configuration, areal extent, side slopes and depth contours of proposed wetland creation/restoration sites.
  c) Profiles of proposed wetland creation/restoration sites, including adjacent river bed elevation (where applicable), should be provided to allow for assessment of the capacity of the proposed wetland to accommodate fluctuations in size (i.e., expansion and contraction) that may result, from fluctuating hydrologic conditions.
  d) Characterization of ground water hydrology and quality at wetland creation/restoration sites, including temporal variations in ground water level and relationships between river stage (where applicable) and ground water level.
  e) A presentation of soil characteristics (e.g., salinity, permeability, organic matter content) at proposed wetland creation/restoration sites.
  f) A description of proposed plantings, including quantities and locations, should be presented along with the proposed sources of the plants or plant propagules.
  g) A monitoring and maintenance program, which includes consideration of trash removal, human-use monitoring and control, and vegetation management to maintain the stated wetland function and value goals. This information should be used as the basis for wetland mitigation design. It will also enable reviewing agencies to adequately evaluate the mitigation plan.
- Boulders and rootwads removed during project activities should be placed within the stream to provide fish habitat. This activity should be planned and coordinated with the Department and other natural resource agencies to maximize effectiveness and prevent detrimental impacts, such as accelerated bank erosion and channel destabilization.
- Instream equipment activity should be minimized, with no refueling, maintenance or cleaning of equipment (e.g., ready-mix concrete trucks) in or near the watercourse. All construction equipment shall be inspected daily to ensure that leaks or discharges of lubricants, fuels, or hydraulic fluids do not occur. All fuels, lubricants, and hydraulic fluids must be stored and dispensed at least 200 feet away from the stream bank or outside of the 100-year floodplain. Contain any poured concrete in forms and prevent introduction of uncured concrete into surface waters. The Department must be notified in the event of any spills of toxic material into the stream or if sediments are introduced into the stream at levels above State Water Quality Standards.
- Complete all in-water work in fish-bearing streams during the appropriate in-water work window (that period of time when fish are least likely to be present, or when the least adverse impacts to fish would be likely to occur) for specific streams and lakes as identified by the Department. Contact the Department and identify location of project, duration, and in-water work activities to be done. For project planning purposes in most streams in New Mexico, in-water work completed during late fall and winter would result in the least adverse impacts to fish.
- When instream equipment activity cannot be avoided, it is recommended that this activity take place during base flows and be done "in the dry" using such devices as coffer dams. This is generally when the least amount of biological damage to the system will be incurred. However, scheduling may be affected by the presence of fall-spawning fish or wintering wildlife (e.g., bald eagles, waterfowl) or site-specific environmental constraints. The Department should be contacted for recommendations under these circumstances.
- Coffer dams should be constructed of material that cannot be brought into suspension by flowing water (e.g., water bag barriers or concrete highway dividers). All instream work should be conducted "in the dry".
- Minimize disturbance of stream substrate to only that necessary for placing abutments or pilings. To preserve channel equilibrium and stability, stream channels should not be realigned, constricted, widened, changed in bed elevation or otherwise altered.

- Gravel for surfacing, riprap and other bank stabilizing materials, including all temporary and permanent structures placed into the watercourse, must be free of fines and chemical contaminants.
- Tarpaulins or other catchment devices should be slung under the bridge in order to prevent debris, wastes and toxic compounds from entering the stream.
- Sandblasting operations should include vacuum systems or the bridge should be completely "bagged" to ensure collection of all lead paint and concrete debris.
- All native trees greater than six inches diameter at breast height that are removed should be replaced at a suitable on-site or off-site location at a 4:1 ratio, with a guarantee by the project proponent to monitor and maintain the plantings over a four-year period to ensure at least 80 percent survival at the end of that period in each planting area. This guarantee should be specified in the mitigation plan. If monitoring and maintenance cannot be guaranteed, trees should be replaced at a 10:1 ratio with cottonwood poles or saplings or appropriate native tree species. All other woody vegetation should be replaced on an acre-by-acre basis with native species. Performance standards for establishment of replacement vegetation should be based on local knowledge and experience regarding site potential and growing conditions. The Department recommends that realistic performance standards be established prior to project design and implementation. Martin et al. (2005) discuss useful approaches to development of realistic performance standards. In the State of New Mexico, particularly along the Rio Grande, extensive monitoring of completed aquatic habitat restoration projects (including in-channel, riparian, and bosque habitats) has produced considerable information on what constitutes realistic performance standards for aquatic resource mitigation. This monitoring information should be applicable to specification of performance standards for restoration, establishment, enhancement, and preservation activities. In addition, the NRCS Plant Materials Center in Los Lunas is able to provide advice on performance standards based on years of experience doing bosque, riparian, and upland habitat restoration. Where no information is available to guide specification of performance standards, adaptive management principles should be used to observe project outcomes, determine appropriate levels of maintenance (replanting), modify performance standards (up or down) for the monitored project if appropriate, and modify project designs for future projects if necessary. Reducing performance standards would be appropriate if monitoring determined that the site could not support levels of growth and survival required in the performance standards. This is important to account for harsh growing conditions that exist in parts of New Mexico. How soon mitigation project performance standards are met will vary depending on whether the mitigation project involves restoration, establishment, enhancement, or preservation activities. Preservation projects should require the least amount of monitoring, primarily to determine if the project was implemented successfully. Enhancement project monitoring should take less time than restoration or establishment project monitoring. If establishment means creation, then restoration of functions, services, and values may take many years.

Types of compensatory mitigation projects where monitoring periods of less than five years is appropriate include projects that plant wetland or riparian species that become established in less than five years, assuming a stable and adequate water supply. In the floodplain of the Rio Grande in New Mexico, floodplain wetland and riparian species typically become established in two years where distance to groundwater is optimal. If groundwater availability at planting sites is marginal and irrigation is not possible, then establishment may take more than two years. Establishment periods aside, how soon restoration of function and services occurs is hard to predict. Restoration of values is probably more closely tied to plant establishment than is restoration of function or services. Since growth potential of the site influences habitat development, it should also influence how long monitoring is required.

If plant establishment fails and remedial planting is required, then longer monitoring periods will be required. Monitoring requirements should be based on adaptive management where it would be difficult to predict establishment periods or success. In such cases, requiring a specific number of years of monitoring is unrealistic.

The length of time monitoring is required is a function of mitigation project performance standards. Since restoration of aquatic habitat functions requires successional growth and development beyond plant establishment, determining whether habitat functions have been restored may require more than five years. For example, along the Rio Grande in New Mexico, studies of Southwestern willow flycatcher habitat use have shown that newly regenerated riparian shrubs and trees begin to provide suitable habitat in about five years. If mitigation project performance standards are tied to flycatcher habitat suitability, then more than five years of monitoring is probably required. If performance standards are tied more generally to riparian or wetland health, less monitoring is probably required. If performance standards for lentic or lotic aquatic habitats are tied to presence of a target species or taxonomic structure, monitoring will take longer than just monitoring the development of lentic or lotic conditions.

Mitigation performance standards and monitoring requirements should reflect regional ecosystem processes and influences, such as climate, hydrologic processes, evapotranspiration, and soil moisture dynamics. Mitigation performance standards and monitoring requirements should also account for altered ecosystem processes such as modified flow regimes. Flow regulation, infrastructure, channelization, regular channel clearing, and emergency flood control measures implemented in the 20th century has prevented the Rio Grande from forming the kinds of environments that are associated with dynamic channels. The four primary flow control measures that have been implemented on the Rio Grande include flow regulation, channelization, structural controls (e.g., bridges, diversions, levees), and channel maintenance (island and bar clearing) (TetraTech 2004 - Habitat Restoration Plan for the MRG). Floodplain functions have been lost or severely reduced following the loss of the natural flow regime necessary for spring flood pulses and overbank flooding. These functions have been lost due to damming and flow regulation, construction of levees, and placement of jetty jacks. Loss of connectivity of the channel to the floodplain and constriction of floodplain width by levees has reduced the availability of floodplain features. Loss of connectivity has reduced the capacity of the system for nutrient cycling, has reduced primary productivity, and has reduced the diversity of invertebrate taxa preferred as food by riverine fishes. Reaches of the Rio Grande below dams are undergoing channel degradation and incision, transport of smaller substrate particles downstream, and channel armoring as wash load and bedload is washed downstream and non-native phreatophytes invade the floodplain. Reservoirs, arroyo dams, bank stabilization (e.g., levees), and non-native vegetation have all contributed to starvation of sediment. Diversions, storage of flows, regulated flows, drains that cause loss of channel flows through seepage, and groundwater pumping all result in a cumulative loss of river flow and un-natural channel drying.

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