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Research that contributes knowledge on the ecological impacts of policies governing the utilization and management of the Colorado River could be useful in developing future policy for this internationally shared resource. This dissertation examines legal protection of endangered species habitat in Mexico and the impacts of hydrologic variability on the ecosystem in the Colorado River Delta using Advanced Very High Resolution Radiometer (AVHRR) satellite images. The working hypothesis was that climatic variability impacts the ecosystem of the Colorado River Delta and Upper Gulf and the ecological impacts influence socioeconomic activities directed toward resource utilization or extraction.

The legal potentials for increasing water delivery to the Delta are evaluated and it is concluded that the Endangered Species Act (ESA) may be the only viable legal option to force greater water delivery in the region. An examination of the ESA indicates that Mexico will have to undertake certain actions to enable any legal suit to prevail and that such changes could benefit threatened habitat for endangered species and other animals. The effect of freshwater flows in the Delta and Gulf are evaluated using AVHRR Normalized Vegetation Difference Index (NDVI) data. The monthly data from 1989-2000 revealed that flood flows into the Rio Hardy wetland have a positive impact upon endangered species habitat. The flood flows were evaluated through the use of a Hydrologic Response Index (HRI) that related flood-dependent to flood-independent wetlands. The same data set was used to gauge the amount of floodwater flow into the Gulf and by estimating how much was diverted to a closed basin in Mexico called the Laguna Salada. Examination of impoundment area changes in the Laguna Salada during flooding indicated that inflows never exceeded capacity and the large volumes of water released across the US/Mexico border failed to reach the Gulf. It is suggested that public or private initiatives such as the rebuilding of natural earthworks in the Colorado River channel in the upper Delta by Ducks Unlimited should be considered seriously by policy makers as a way that could promote increased flow of water to the lower Delta and Gulf.