3.2 POTENTIALLY AFFECTED AREA

This section describes the general geographic scope in which specific issues and potential effects associated with the interim surplus criteria alternatives were considered in this DEIS. Interim surplus criteria could affect the hydrologic operation of the Colorado River system (e.g., reservoir levels and river flow volumes) as a result of surplus determinations and associated water deliveries that may not have occurred in the absence of such criteria. Also discussed is the Glen Canyon Dam Adaptive Management Program. Specifically, Section 3.2.2 describes how the program influences flows between Lake Powell and Lake Mead.

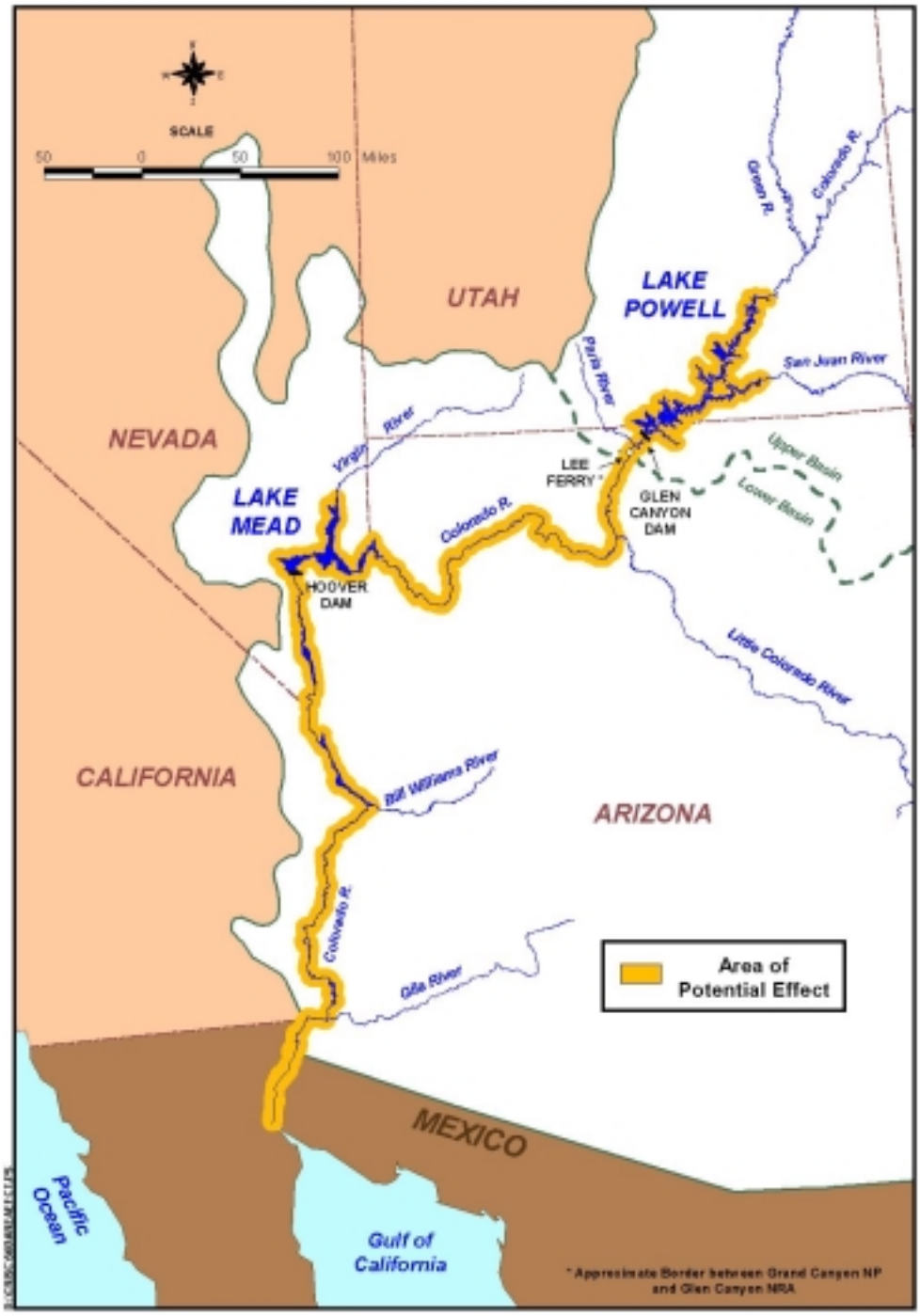
In addition to influencing conditions within the Colorado River system, it is recognized that changes in water supply, reservoir levels and river flows that could result from interim surplus criteria would influence decisions by entities other than Reclamation. These subsequent decisions could result in physical actions having environmental effects outside of the river corridor. Some examples of these actions are discussed in Section 3.4. However, due to the speculative nature of these activities and the environmental review that would likely be required prior to their implementation, Reclamation has limited the scope of this analysis to consider only those potential effects that could occur within the Colorado River corridor as defined by the 100-year flood plain and reservoir maximum water surface elevations.

Interim surplus criteria are based on system conditions and hydrology. Water supply to the states of Arizona, California and Nevada is achieved primarily through releases and pumping from Lake Mead. As a result of Lake Powell and Lake Mead equalization requirements (discussed further in Section 3.3), interim surplus criteria effects on Lake Mead surface elevations could also influence Lake Powell surface elevations and Glen Canyon Dam releases. However, operation of the other Upper Basin reservoirs is independent of Lake Powell. Therefore, the northern limit of the potentially affected area under consideration in this DEIS is the upper reaches of Lake Powell. The southern limit is the Northerly International Boundary (NIB) between the United States and Mexico. However, this DEIS also addresses transboundary impacts extending to the mouth of the Colorado River in Mexico.

3.2.1 COLORADO RIVER SEGMENTS AND ISSUES ADDRESSED

As shown on Map 3.2-1, the Colorado River corridor from Lake Powell to Mexico consists of flowing river reaches, two large reservoirs (Lake Powell and Lake Mead) and a number of smaller reservoirs downstream of Lake Mead. The river corridor and adjacent areas comprise a heterogeneous composite of various geographic and hydrologic regimes, which differ in their resource composition and resource management administration. For the purposes of presentation, and to focus analysis

Map 3.2-1
Area of Potential Effect



of the potential effects of the interim surplus criteria, the river corridor has been divided into four areas including Lake Powell, the Colorado River between Glen Canyon Dam and Lake Mead, Lake Mead, and the Colorado River below Hoover Dam to the NIB. The following sections discuss the areas segmented for this analysis and introduce the issues considered within each area.

3.2.1.1 LAKE POWELL

Lake Powell is a large reservoir on the Colorado River formed by Glen Canyon Dam. The reservoir is narrow and long (over 100 miles). Lake Powell provides water storage for use in meeting delivery requirements to the Lower Basin.

The normal operating range of Lake Powell is between elevation 3490 and 3700 feet msl. Elevation 3490 feet msl corresponds to minimum power pool. Releases from Glen Canyon Dam can be made below 3490 feet msl down to elevation 3370 feet msl via the river bypass tubes. Elevation 3700 feet msl corresponds to the top of the spillway radial gates. During floods, the elevation of Lake Powell can go above 3700 feet msl by raising the radial spillway gates resulting in spillway releases. In 1983, Lake Powell reached a high elevation of 3708.34 feet msl.

Lake Powell is located within the Glen Canyon National Recreation Area (GCNRA), which is administered by the National Park Service (NPS). Reclamation retains authority and discretion for the operation of Glen Canyon Dam. Issues considered in this DEIS associated with Lake Powell include: hydrology (i.e., projected reservoir surface elevations); salinity; aquatic resources; special-status species; recreational facilities, boating and sport fishing; power generation from Glen Canyon Dam; visual and air quality effects associated with exposed reservoir shoreline; environmental justice; cultural resources and Indian sacred sites; and Indian Trust Assets (ITAs).

3.2.1.2 COLORADO RIVER FROM GLEN CANYON DAM TO LAKE MEAD

The segment of the Colorado River corridor between Glen Canyon Dam and Lake Mead is comprised primarily of a narrow river corridor through the Grand Canyon that is administered by the Grand Canyon National Park. Flows within this reach of the river consist primarily of releases from Glen Canyon Dam as discussed in Section 3.3.1. Issues considered in this DEIS within this segment of the river are limited to those associated with low steady summer flows and BHBF releases, as discussed in Section 3.2.2.

3.2.1.3 LAKE MEAD

Lake Mead is a large reservoir on the Colorado River formed by Hoover Dam. The reservoir provides water storage for use in regulating the water supply and meeting delivery requirements in the Lower Basin. The operating range of the reservoir is

from the maximum of 1229 feet msl when flood conditions occur down to a dead storage level of 895 feet msl. Since its initial filling in the late 1930s, the reservoir water level has fluctuated from a high of 1225.85 feet msl (as occurred in July, 1983) to a low of 1083.21 feet msl (as occurred in April, 1956).

The reservoir is located within the Lake Mead National Recreation Area (LMNRA), which is administered by the NPS. However, Reclamation retains authority and discretion for the operation of Hoover Dam. Issues considered in this DEIS associated with Lake Mead include: hydrology; water supply for Nevada; salinity; water quality associated with Las Vegas Wash and SNWA intakes; aquatic resources; special-status species; recreational facilities, boating and sport fishing; power generation from Hoover Dam; visual and air quality effects associated with exposed reservoir shoreline; environmental justice; cultural resources and Indian sacred sites; and ITAs.

3.2.1.4 COLORADO RIVER FROM HOOVER DAM TO THE NORTHERLY INTERNATIONAL BOUNDARY

The Colorado River from Hoover Dam to the NIB is contained within the shallow Colorado River Valley in which Lake Mohave, Lake Havasu and other smaller diversion reservoirs are located. Within this segment, especially along river reaches below Parker Dam, the Colorado River is fringed with riparian vegetation and marshy backwaters, and contains a number of diversion dams and a system of levees. The northern reach of this segment, including Lake Mohave, lies within the LMNRA. The lower reach is bordered by a combination of federal, Tribal and private land.

Under the *Law of the River*, discussed previously in Chapter 1, releases from Hoover Dam are governed by orders for downstream water deliveries to Arizona, California, Nevada and Mexico. However, releases may exceed orders when flood releases are required under the Corps' flood control criteria, as discussed in Chapter 1.

Issues considered in this DEIS associated with this river segment include hydrology; water supply for Arizona, California, Nevada and Mexico; flooding downstream of Hoover Dam; salinity; environmental justice; cultural resources and Indian sacred sites; and ITAs.

3.2.2 ADAPTIVE MANAGEMENT PROGRAM INFLUENCE ON GLEN CANYON DAM RELEASES

In March 1995, Reclamation completed an EIS on the operation of Glen Canyon Dam. The EIS developed and analyzed alternative operation scenarios designed to meet statutory responsibilities for conserving downstream resources, producing hydropower, and protecting Native American interests. Major issues of concern included native and endangered species, beach erosion, recreation (including white-

water boating, sport fishing, and camping), vegetation, wildlife habitat and food base, water supply, hydroelectric power generation, cultural resources, and Native American interests. The Secretary signed a ROD on October 8, 1996, which specified certain types of releases from Glen Canyon Dam. Prior to the ROD, Glen Canyon Dam was operated as a peaking power facility, maximizing the value of power produced. The pattern of releases resulting from this type of operation was recognized to be detrimental to downstream resources and was therefore modified by the ROD. Reclamation also consulted with the Service under the ESA. The Service issued a biological opinion containing a recommendation for a reasonable and prudent alternative, which was incorporated into the ROD (see Section 1.4.2.1).

To determine if the operation of Glen Canyon Dam under the ROD is meeting the objectives of downstream resource protection, an adaptive management program was instituted as described in Section 1.4.2.1. Through this process, the effects of dam operations and the status of resources are monitored and studied. The results are used to formulate potential recommendations to the Secretary on refinements to dam operations to ensure that the purposes of the Grand Canyon Protection Act are met. As long as the Adaptive Management Program continues to successfully function, the natural and cultural resources within the Colorado River corridor between Glen Canyon Dam and the headwaters of Lake Mead will be protected and conserved.

Two types of releases from Glen Canyon Dam, BHBFs and the low steady summer flows described in the biological opinion, are of particular concern to the Adaptive Management Program. There may be a potential for the interim surplus criteria alternatives to affect the frequency at which these two types of releases could be made; therefore, they are analyzed in Section 3.6. The unaffected aspects of dam operations and the effect on downstream resources need no further analysis outside of the ROD and the Adaptive Management Program.