

## CHAPTER VII CONCLUSIONS

Major conclusions of this office report are:

- Ecosystem resource problems and needs in the Shasta Lake and Tributaries sub-area include:
  - Reductions in warm-water and cold-water fisheries in Shasta Lake, resulting primarily from (1) acid mine drainage, (2) lack of shallow-water, shoreline habitat, and (3) human disturbances.
  - Reductions in fisheries in the tributaries to Shasta Lake, resulting primarily from (1) modification of seasonal flows, (2) loss of access to historic spawning and rearing areas, and (3) acid mine drainage.
  - Reductions in riparian and wetland habitat in the sub-area, resulting primarily from increased erosion and sediment input, and non-native species.
- Ecosystem resource problems and needs in the Shasta Dam to Red Bluff sub-area include:
  - Reductions in anadromous fish populations in the upper Sacramento River, resulting primarily from (1) water temperature, (2) physical migration barriers, (3) diversions and flow regulation, (4) reduction in suitable spawning gravels, (5) acid mine drainage, and (6) unnatural predation rates.
  - Reductions in riparian, floodplain, and wetland habitat, resulting primarily from (1) changes to natural geomorphic processes, (2) urban and agricultural encroachment and other land management changes, and (3) invasive species.
- There are numerous Federal and State agencies, local working groups, and private organizations active in implementing ecosystem restoration programs and projects in the upper Sacramento River area. However, there remains residual opportunities to implement actions to help restore ecosystem values in the study area.
- Based on the problems, needs, and opportunities identified, ecosystem restoration measures can be formulated to address (1) the primary SLWRI objective to increase the survival of anadromous fish populations in the Sacramento River, primarily upstream from the Red Bluff Diversion Dam, and (2) the secondary SLWRI objective to preserve and restore ecosystem resources in the Shasta Lake area and along the upper Sacramento River.
- Over 40 potential resources management measures were identified that addressed the identified problems and needs while contributing to the primary and/or secondary study objectives.
- Of the resources management measures identified, nine measures were identified as warranting further consideration and six of the measures were given a high recommendation for potential consideration in multi-purpose alternatives being formulated in the feasibility scope studies;

- Four of the recommended management measures address the primary planning objective by helping to increase anadromous fish populations in the upper Sacramento River: (1) rehabilitating inactive gravel mines along the Sacramento River, (2) enlarging Shasta Lake cold water pool, (3) modifying storage and release operations at Shasta Dam, and (4) additional modifications to Shasta Dam for temperature control.
- Two of the recommended management measures address the secondary planning objective and are focused on helping restore ecosystem values in the Shasta Lake area. They include: (1) creating shoreline fish habitat around Shasta Lake and (2) constructing instream fish habitat on tributaries to Shasta Lake.
- One of the remaining management measures recommended for further consideration addresses riparian and flood plain restoration on the Sacramento River.
- Two measures potentially warranting additional consideration likely by non-federal interests include: (1) constructing instream habitat downstream from Keswick Dam and (2) replenishing spawning gravels in the Sacramento River.
- It is believed that future plan formulation efforts for the SLWRI should include further consideration of the recommended management measures.