

NMFS OCAP EFFECTS SUMMARY AND RPA ACTIONS

- 1) Starting in the Northern part of the Central Valley, proposed water operations at Shasta reservoir would result in elevated water temperatures that have lethal and sub-lethal effects on egg incubation and juvenile rearing of listed salmon in the upper Sacramento River. We predict 16 – 65 percent egg mortality resulting from high temperatures. The NMFS RPA includes a new year-round temperature and Shasta reservoir storage management program to minimize effects to endangered winter-run salmon that spawn only in the Sacramento River, as well as long-term passage prescriptions at Shasta Dam and re-introduction of winter-run to its native habitat in the McCloud and/or Upper Sacramento Rivers.
- 2) In Clear Creek, a tributary to the Upper Sacramento River, recent project operations have led to an increase in spring-run salmon abundance. However, the proposed project operations were uncertain to retain this successful effort for 21 years into the future. The RPA ensures that these essential flows and temperatures will be maintained.
- 3) Red Bluff Diversion dam is a series of antiquated operable gates that are installed to back up the Sacramento River to allow for an agricultural diversion. The proposed operation of this structure would delay 15 percent of winter-run salmon and 70 percent of main stem spring run salmon from their upstream migration. Also, the gates, if operated as proposed, would completely block up to 35 percent of green sturgeon from their only known spawning ground. The NMFS Alternative allows for modified gate operations while an alternative diversion structure is being built; then complete gate removal by 2012.
- 4) Both project and non-project effects have led to a significant reduction in necessary juvenile rearing habitat in the Sacramento River Basin and Delta. This RPA contains both short-term and long-term actions for improving juvenile rearing habitat in the Lower Sacramento River and northern Delta.
- 5) A major effect of water operations is diversion of out-migrating juveniles from the north Delta tributaries into the interior Delta through the open Delta Cross Channel (DCC) gates. Instead of migrating directly to the outer estuary and then to sea, these juveniles are caught in the interior Delta and subjected to pollution, predators, and altered food webs that cause either direct mortality or impaired growth. This RPA mandates additional gate closures to keep young fish out of artificial channels and allow them to migrate safely towards the Ocean.
- 6) Water pumping at the State and Federal export facilities in the South Delta causes reverse flows, leading to loss of juvenile salmon migrating out from the Sacramento River system in the interior Delta and more juvenile salmon being exposed to the State and Federal pumps, where they are entrained at the pumps. The mortality of

winter-run salmon juveniles that enter the Delta interior (through the Delta Cross Channel or Georgiana Slough) is expected to range from 35-90 percent, resulting in the loss of approximately 5-20 percent of the juveniles entering the Delta at Freeport. The effects on spring-run salmon are similar. This RPA prescribes Old and Middle River flow levels limiting the strength of the reverse flows, thereby keeping more salmon away from exposure to the pumps.

- 7) Survival rates at the State and Federal pumping plants are one juvenile salmon in six exposed survive for state facilities, and one in three for Federal facilities. The RPA prescribes additional technological measures at the facilities themselves to enhance screening and increase survival of fish.
- 8) Juvenile steelhead migrating out from the San Joaquin River basin have a particularly high rate of loss due to both project and non-project-related stressors. NMFS estimates between 90-99 percent mortality of juvenile steelhead originating in the San Joaquin River Basin. This RPA prescribes additional measures to improve survival of San Joaquin steelhead smolts, including both increased San Joaquin River flows and exports curtailments. Given the uncertainty of the relationship between flow and exports, the RPA also prescribes a significant new study of acoustic tagged fish in the San Joaquin Basin to evaluate the effectiveness of the RPA and refine it over the lifetime of the project.
- 9) On the American River, project-related effects on steelhead are pronounced due to the inability to consistently provide suitable temperatures for various life stages and flow-related effects caused by operations. This NMFS RPA prescribes a flow management standard, a temperature management plan, additional technological fixes to temperature control structures, and, in the long term, a passage at Nimbus and Folsom dam to restore steelhead to native habitat.
- 10) On the Stanislaus River, project operations have led to significant degradation of flood plain and rearing habitat for steelhead. Low flows also impede cues associated with out-migration. This RPA includes a year-round minimum flow regime necessary to minimize project effects to each life-stage of steelhead, including new springtime flows that will support rearing habitat formation and inundation, and create pulses that allow salmon to migrate out successfully.
- 11) Hatchery practices at Nimbus hatchery contribute to loss of genetic diversity and mixing of wild and hatchery stocks of steelhead. The RPA prescribes development of Hatchery Genetic Management Plans to increase the diversity, and therefore, resiliency of salmon to withstand a wide range of conditions. This will also allow for a stabilized and adequate salmon prey base over 21 years, necessary for the survival of Southern Resident Killer Whales.