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**DRY CREEK WATERSHED COORDINATED RESOURCE  
MANAGEMENT PLAN**

**PLACER AND SACRAMENTO COUNTIES, CALIFORNIA**

**DECEMBER 31, 2003**

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### 2.2.5.3 Fisheries

The Dry Creek watershed supports resident native and introduced fish populations, as well as annual runs of Chinook salmon and steelhead. Historical usage of Dry Creek by anadromous salmonids prior to urbanization and development of the Natomas East Main Drainage Canal (NEMDC, a.k.a., Steelhead Creek) is largely unknown; however, since the 1960's the annual run size of the fall run Chinook salmon has experienced a ten-fold decline. Currently, anadromous species present in Dry Creek include Pacific lamprey (*Lampetra tridentata*), Central Valley fall-run Evolutionarily Significant Unit (ESU) Chinook salmon (*Oncorhynchus tshawytscha*), and Central Valley ESU steelhead (*O. mykiss*). The Central Valley ESU steelhead is federally-listed by the National Marine Fisheries Service (NMFS) under the Endangered Species Act (ESA) as threatened, and the Dry Creek watershed is designated as critical habitat for Central Valley ESU steelhead. The Central Valley ESU fall-run Chinook salmon is not federally-listed under the ESA, but is considered a candidate species for future listing. Additionally an anadromous salmonid often receives a degree of special-status protection. The Pacific lamprey is not currently federally-listed, but is receiving more attention by fisheries scientists and federal and state agencies due to dwindling populations and run sizes throughout the Central Valley.

Special-status fish species (e.g., Sacramento splittail (*Pogonichthys macrolepidotus*) and Delta smelt (*Hypomesus transpacificus*)), other than the anadromous salmonids, may occasionally be present in the lowest portion of the Dry Creek watershed, particularly in Steelhead Creek. In particular, the NEMDC likely contains suitable spawning habitat for the splittail; however, the Sacramento splittail was recently delisted as a federally-threatened specie. Anadromous salmonids, steelhead and fall-run Chinook salmon, are both seasonally present during adult upstream and juvenile downstream migration periods.

The California Department of Fish and Game (CDFG) has conducted periodic Chinook salmon spawning escapement (migration out of the watershed) surveys in Dry Creek, primarily upstream of the confluences with Secret and Miners ravines, at least as far back as 1963. The fall-run Chinook salmon escapement to the Dry Creek watershed was estimated to be just over one thousand fish in 1964, with the majority of spawning occurring in Secret and Miners Ravines. Since the late 1990's, Chinook salmon escapement to Secret Ravine alone has averaged about 160 fish per year.

The CDFG Native Anadromous Fish and Watershed Branch initiated a reconnaissance level assessment of steelhead distribution and abundance, relative to stream habitat conditions, in 1998 and 1999. At that time, steelhead escapement to the upper Dry Creek watershed was estimated to be a few hundred fish, with the most suitable spawning and rearing habitat in Secret Ravine and to a lesser extent, Miners Ravine. Juvenile salmonid emigration monitoring was also conducted by the CDFG in 1999 and 2000. Steelhead and Chinook salmon juveniles were collected during both years in screw traps located immediately below the confluence of Secret and Miners ravines.

Annual spawner surveys were conducted by the DCC between the end of October and December for the years 1997 through 2002 (Dry Creek Conservancy, personal communication). Sampling effort and number of stations increased over the survey

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period. Overall, one station was located on each Dry Creek and Antelope Creek, two stations were located on Miners Ravine, and five stations on Secret Ravine. No fish were observed during surveys conducted in January and February 2002. Linda/Cirby Creek was sampled by Garcia and Associates during the 2001-2002 surveys and results were combined for each year. The highest number of salmon (live and carcasses) were found in Secret Ravine, ranging from 15 (1997) to 298 (2002) live fish and 5 (1997, 1998) to 125 (2000) carcasses. Miners Ravine had the second highest observed fish counts, ranging from 8 (1998) to 74 (2002) live fish and 0 (1998) to 18 (2001) carcasses. The other sections surveyed (Antelope and Linda/Cirby Creeks) had lower fish counts, indicating less utilization by salmon populations.

The CDFG historically planted about 100,000 juvenile Chinook salmon from the Feather River hatchery (fall-run) each spring in lower Miners Ravine during years of excess production. At present, a resident rainbow trout population is thought to be present in upper sections of Secret Ravine and other headwaters of the Dry Creek watershed.

Seven species of resident fish were collected by Vanicek (1993) in his surveys of Dry Creek. Four of these species are native, including Pacific lamprey, Sacramento pikeminnow (*Ptychocheilus grandis*), hitch (*Lavinia exilicauda*), and Sacramento sucker (*Catostomus occidentalis*). Three are introduced game species, including bluegill (*Lepomis macrochirus*), green sunfish (*L. cyanellus*), and spotted bass (*Micropterus punctulatus*). Sampling conducted for the Cirby-Linda-Dry Creek Flood Control Project (GANDA 1998) identified the presence of additional introduced species, such as brown bullhead (*Ameiurus nebulosus*), western mosquitofish (*Gambusia affinis*), and golden shiner (*Notemigonus crysoleucas*). More recent non-published surveys have indicated a broader non-native fish community, primarily downstream of the confluence of Secret and Miners ravines, including species such as the common carp (*Cyprinus carpio*), largemouth bass (*M. salmoides*), black bullhead (*Ameiurus melas*), and fathead minnow (*Pimephales promelas*). A list of non-native fish species that have been found in Dry Creek is presented as Table 2.32.

The following section describes the life history of fish present within the Dry Creek watershed. Life histories are important for developing strategies to manage or control populations effectively.

#### **2.2.5.3.1 Life History Summaries**

##### **Native Anadromous Species**

###### ***Pacific lamprey (Lampetra tridentata)***

The Pacific lamprey, a parasitic anadromous species, was historically abundant in the Sacramento-San Joaquin River basin. They are still largely present throughout the basin, except where migration is blocked by dams or degraded stream conditions; however, migratory populations have declined. The Pacific lamprey remains common in the American River (up to Nimbus Dam), the Sacramento River (up to Red Bluff Dam), and in the Napa River. Adults migrate from the Pacific Ocean to natal spawning

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Table 2.32. Non-Native Fish Species Present, and Effects Upon Salmon

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Table 2.32. Non-Native Fish Species Present, and Effects Upon Salmon (Continued)

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streams, generally from March through June, but may occur as early as January in Dry Creek, due to its low elevation and historically warm, low flow conditions by June. Similar to salmon and steelhead, spawning occurs in riffle areas in swift current, and often many nests are found in close proximity. Both sexes construct the nest in gravel and occasionally sandy substrates, in water depths usually less than 1 m. The diameter of the nest is about 40 to 60 cm (Moyle 1976). Eggs are slightly adhesive and most are washed into the crevices of the rocks on the downstream side of the nest. Hatching occurs in about 19 days at 15 °C. Often, the eggs of other native species, particularly Sacramento sucker, are observed in lamprey nests. The newly hatched ammocoetes (larval/juvenile life stage) remain for a short time in the crevices of the rocks, but eventually swim up into the current. Ammocoetes are then carried downstream to suitable areas of soft mud and sand, to coarse sand. They generally burrow tail first into the substrate, but may lie on top of the substrate, and move from one place to another. Ammocoetes are filter feeders, subsisting on algae and organic matter, and may remain in freshwater from 5 to 7 years. Metamorphosis into the predatory adult stage results in formation of a sucker disc, large eyes, and other physiological changes, such as the ability to tolerate seawater. Downstream migration begins when metamorphosis is complete and is thought to occur mostly in winter and spring during elevated flow events.

#### ***Chinook salmon (Oncorhynchus tshawytscha)***

Chinook salmon are anadromous, spending three to five years at sea before returning to freshwater to spawn. Central Valley ESUs of Chinook salmon pass through the Sacramento River and Delta to reach their upstream spawning grounds. Juvenile "smolt" salmon also use the Sacramento River and Delta as a migration corridor to reach the Pacific Ocean. Smoltification is the physiological acclimation of juvenile salmon to full strength seawater that occurs after completion of the freshwater rearing phase. The Chinook salmon population in the Sacramento River and Delta is composed of four races: fall-run, late fall-run, spring-run and winter-run. Each of these spawning populations is separated based on the timing of adult upstream migration, spawning, and juvenile downstream migration. The Central Valley ESU winter-run is federally listed as endangered (58 FR 33212) and the Central Valley ESU spring-run is federally listed as threatened (64 FR 50393). Neither of these races is present in Dry Creek. However the candidate Central Valley ESU fall-run is present. Upstream spawning migration of adults and downstream migration of juvenile steelhead and Chinook salmon generally occur after October 15 and prior to June 15. Consequently, most construction activities that may potentially affect instream habitat conditions, and that are permitted by the U.S. Army Corps of Engineers and National Marine Fisheries Service (NMFS), take place between June 15 and October 15.

Fall-run Chinook salmon may enter the American River, and its tributaries (e.g., Dry Creek), from mid-September through January. Peak upstream migration generally occurs from mid-October through December, though spawning may occur from mid-October through February. Fall-run Chinook salmon exhibit "ocean type" behavior, in which adult salmon spawn immediately upon entering the spawning tributary. This strategy is in contrast to "stream type" behavior, in which the sexual products (eggs and sperm) become mature while the fish is in the stream environment (e.g., winter-run and spring-run Chinook salmon). Adults of all races of Chinook salmon die soon after spawning. The range of water temperatures for optimal survival of incubating eggs is

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between 6.1 and 14.4 °C (43 and 58°F). Fall-run Chinook salmon fry are known to emerge from the American River (and from Dry Creek) spawning gravels from January through mid-April. They rear to smoltification in the American River from January through mid-July, leaving freshwater habitat within their first year of life. Data collected by CDFG in 1999 and 2000 indicate that emigration of juvenile Chinook salmon smolts in Secret Ravine largely occurs from February through June, with peak emigration occurring from March through May.

### ***Steelhead (Oncorhynchus mykiss)***

Steelhead populations in the Central Valley ESU have been listed by the National Marine Fisheries Service (NMFS) under the ESA (FR 62, No. 159) as threatened. Dry Creek is designated by NMFS as critical habitat for the Central Valley ESU steelhead. Steelhead, the anadromous form of rainbow trout, historically inhabited most tributaries to the Sacramento River, including Dry Creek. The life history of steelhead is similar to that of Chinook salmon with two major differences. First, steelhead do not necessarily die after spawning, thus maintaining their ability to return to the Pacific Ocean after spawning in freshwater. Second, juvenile steelhead may spend up to four years rearing in freshwater prior to emigrating to the ocean as smolts. Typically, juvenile steelhead emigrate as age class 1+ fish (one year in fresh water), through the Sacramento River and the Sacramento-San Joaquin Estuary, from November through May. Juvenile steelhead emigration from Dry Creek largely occurs from late March through May.

Spawning steelhead require gravel or cobble substrate (0.6 to 13 cm diameter) in which they lay their eggs. Fine sediments (e.g., silt, fine sand, and clay) may suffocate eggs by preventing the transport of dissolved oxygen from the water to the eggs. Generally, steelhead eggs require temperatures of less than 16.1°C (61°F) for successful hatching. Both fry and older juveniles require instream object cover, cobble or boulders, large woody debris, undercut banks, or submerged and overhanging vegetation, for protection against predators.

### **Native Resident Species**

#### ***Sacramento sucker (Catostomus occidentalis)***

The Sacramento sucker is a species widely distributed throughout the Sacramento-San Joaquin drainage and is common to Dry Creek. The Sacramento sucker is found in a wide variety of water temperatures from cold Sierran streams to warm tributaries and sloughs in the Central Valley ranging from 15.6 to 32.2 °C (60 to 90 °F). They are most abundant in clear, cool streams and rivers, and in lakes and reservoirs at moderate elevations (200 to 600 m). Adults are most abundant in larger streams; juveniles are often most abundant in tributary streams or shallow reaches of large streams where adults have previously spawned. Suckers often congregate at the mouths of streams prior to the spawning migration, and they begin movement into spawning streams as early as late December. The trigger for spawning is thought to be sudden warming of inflowing creeks after a series of warm days. Most spawning takes place over gravel riffles between late February and early June, with peak spawning between March and