The Fisheries section provides background information on fisheries and special status fish species within Napa County, the regulations and programs that provide for their protection, and an assessment of the potential impacts to them of implementing the Napa County General Plan Update. This section is based upon information presented in the Biological Resources Chapter of the Napa County Baseline Data Report (Napa County, BDR, 2005), Fisheries Technical Report for the Napa County General Plan and EIR (Rich 2007, see **Appendix F**) and Conservation and Mitigation Best Management Practices (BMPs) and Guidelines for Avoiding and Reducing Potentially Adverse Impacts on Fishery Resources and Aquatic Habitat within Napa County (Hanson, 2007, see **Appendix G**).

4.6.1 EXISTING SETTING

REGIONAL SETTING

The County is located in the Coast Ranges Geomorphic Province. This province is bounded on the west by the Pacific Ocean and on the east by the Great Valley geomorphic province. A dominant characteristic of the Coast Ranges Province is the general northwest-southeast orientation of its valleys and ridgelines. In Napa County, located in the eastern, central section of the province, this trend consists of a series of long, linear, major and lesser valleys, separated by steep, rugged ridge and hill systems of moderate relief that have been deeply incised by their drainage systems.

LOCAL SETTING

The County's highest topographic feature is Mount St. Helena, which is located in the northwest corner of the County and whose peak elevation is 4,339 feet. Principal ridgelines have maximum elevations that roughly vary between 1,800 and 2,500 feet. These elevations decrease in the southern part of the County. These physical features have influenced the local climate (creating a variety of microclimates) and the development of soils.

Napa Valley is the main valley in the County. It extends southeast along the west side of the County to near the edge of San Pablo Bay. Valley floor elevations are up to approximately 400 feet near the north end of the valley and approach sea level on the south. Pope Valley is a similar but smaller valley occupied in part by Lake Berryessa Reservoir (formerly Berryessa Valley) along the east central portion of the County. In the west and east, the County line coincides with the crest of major northwest-trending ridge systems that border on Sonoma and Yolo counties. Technically, Lake Berryessa is a catchment within the Putah Creek Watershed, isolating the upper watershed from the lower watershed since the completion of Monticello Dam in 1957. While water is released from the dam downstream, fish movement is not possible between the upper and lower watersheds and, thus, does not provide habitat for anadromous fisheries, including steelhead.

The County's baylands, at the mouth of the Napa River, are a component of the largest estuarine system on the west coast of North or South America—the San Francisco Bay-Delta—which supports a wealth of aquatic flora and fauna, including over 130 species of fish. The County's rivers and streams provide habitat for many species of fish and invertebrates.

In the following sections, known physical and biological characteristics of the Napa River, Lake Putah Creek/Lake Berryessa, and Suisun Creek watersheds will be discussed, with specific emphasis on those attributes most relevant to fisheries in each watershed and factors known to be limiting special status fisheries production in those watersheds. In the Napa River Watershed, human development of the watershed has resulted in alteration of stream flows necessary for

fish migration, alteration of bedload movement and sediment inputs, and disconnection of channel from floodplain habitat. In the Napa River Watershed, sediment transport is of specific concern, due to the listing of the Napa River as impaired for excess sediment by the State Water Resources Control Board (SWRCB). In the Putah Creek Watershed, the attributes of concern include hydrology, geomorphology, and water quality. All of the concerns are related, whether directly or indirectly, to the significant alteration of the catchment resulting from the construction of Monticello Dam in 1957. Under the discussion of each watershed, known fish assemblages are briefly reviewed. The reader is referred to Section 4.11 (Hydrology and Water Quality) for additional details regarding hydrologic and water quality conditions of these and other watersheds in the County.

Napa River Watershed

A variety of both native and non-native fish species inhabit the Napa River Watershed (see **Tables 4.6-1** and **4.6-2**) including several threatened and species of concern, such as the rainbow/steelhead, fall-run Chinook salmon, delta smelt, Sacramento splittail, and hardhead. Historically, the Napa River is estimated to have supported a run of 6,000 to 8,000 steelhead, and as many as 2,000 to 4,000 coho salmon (USFWS, 1968). By the late 1960's, coho salmon was no longer observed, and steelhead had declined significantly. The existing run of steelhead is believed to be fewer than a few hundred adults (DFG, 1987; Stillwater Sciences, 2004). Much less information is available to determine the historical abundance of Chinook salmon. However, the Napa River's hydrology and habitat suggests that potential habitat was historically available. In recent years, both juvenile and adult Chinook salmon have been observed in the Napa River. In a 2004 survey by the Napa County Resource Conservation District (NCRCD) (Koehler, 2005), spawning adult Chinook salmon were observed in a 3.6 mile stretch of the mainstem Napa River at Rutherford. Approximately 200 live Chinook salmon adults and 62 redds were observed (Rich, 2007). Chinook salmon have not been positively identified in any of the tributary streams [not true – NCRCD has documented adult Chinook in Napa Creek, Sulphur Creek (and juveniles), Redwood Creek (and juveniles), Selby Creek, Milliken Creek, Salvador Channel, Dry Creek, and Bell Creek.

The Napa River offers minimal spawning and rearing habitat for steelhead, but does appear to provide spawning habitat for Chinook salmon. In 2003 and 2004, spawner surveys, redd surveys, and carcass counts were undertaken along the Napa River. The results of these efforts documented over 100 live spawning Chinook salmon and 62 redds in a 3.6-mile reach of the Nap River near Rutherford. It is not known what percentage of the observed run was of hatchery origin or wild Napa River stock. Chinook salmon have the greatest rates of straying from their natal streams (Moyle, 2002). It has been speculated that the relatively recent surge in salmon returns to the Napa River may be attributed to either an increase in the number of hatchery strays entering the basin, or an increase in the progeny of fish that have successfully spawned in the river (NCRCD, 2005). Additional fishery surveys were conducted in 2005 and are discussed in Appendix F.

Similar to other California ecosystems, the introduction of exotic fish species has impacted the Napa River Watershed (Moyle, 2002). As many exotic fishes (e.g., bass and sunfishes) are much more hardy than the salmonids, the non-native fishes tend to replace both salmonids and other special status fish species.

Habitat conditions and limiting factors for fisheries in the Napa River Watershed are described in detail in **Appendix F** and are summarized in tables 16 through 20 of **Appendix F**. Limiting factors generally include: (1) barriers to fish passage; (2) high water temperatures; (3) siltation due to

bank erosion; (4) lack of spawning habitat due, in part, to lack of pool/riffle habitat; and, (5) lack of rearing habitat (i.e., lack of cover, high water temperatures, lack of structural complexity).

TABLE 4.6-1
NATIVE FISH SPECIES THAT OCCUR IN THE NAPA RIVER WATERSHED

Common Name	Scientific Name
Steelhead/Rainbow Trout	*Oncorhynchus mykiss*
Chinook Salmon	*O. tshawytscha*
Chum Salmon	*O. keta*
Delta Smelt	*Hypomesus transpacificus*
California Roach	*Hesperoleucus symmetricus*
Sacramento Splittail	*Pogonichthys macrolepidotus*
Sacramento Pikeminnow	*Ptychocheilus grandis*
Hardnead	*Mylopharodon conocephalus*
Sacrament Sucker	*Catostomus opccidentalis*
Threespine Stickleback	*Gasterosteus aculeatis*
Tule Perch	*Hysterocarpus traski*
Longjaw Mudsucker	*Gillichthys mirabilis*
Prickly Sculpin	*Cottus asper*
Riffle Sculpin	*C. gulosus*
Pacific Stagnorn Sculpin	*Leptocuttus amatus*
Starry Flounder	*Platichthys stellatus*
Longfin Smelt	*Spirinchus thaleichthys*
Northern Anchovy	*Engraulis mordax*
Speckled Sanddab	*Citharichthys stigmaeus*
Pacific Herring	*Clupea harengus*
White Sturgeon	*Acipenser transmontanus*
Pacific Lamprey	*Lampetra tridentate*

Sources: Leidy, 1997; Moyle, 2002; ACOE, 2005

TABLE 4.6-2
NON-NATIVE FISH SPECIES THAT OCCUR IN THE NAPA RIVER WATERSHED

Common Name	Scientific Name
American Shad	*Alosa sapidissima*
Threadfin Shad	*Dorosoma petenense*
Golden Shiner	*Notemigonus crysoleucas*
Goldfish	*Carassius auratus*
Carp	*Cyprinus carpio*
White Catfish	*Ameiurus catus*
Channel Catfish	*Ictalurus punctatus*
Rainwater Killifish	*Lucania parva*
Mosquitofish	*Gambusia affinis*
Inland Silverside	*Menidia beryline*
Striped Bass	*Morone saxatilis*
Bluegill	*Lepomis macrochirus*
Green Sunfish	*L. Cyanellus*
White Crappie	*Pomoxis annularis*
Black Crappie	*P. nigromaculatus*
Largemouth Bass	*Micropterus salmoides*
Smallmouth Bass	*M. dolomieui*
Yellowfish Goby	*Acanthogobius flavimanus*
Shimofuri Goby	*Tridentiger bifasciatus*
Wakasagi	*Hypomesus nipponensis*

Sources: Leidy, 1997; Moyle, 2002; ACOE, 2005

Putah Creek/Lake Berryessa Watershed

Studies have demonstrated high concentrations of mercury in various sports fishes from Lake Berryessa and Putah Creek (Stratton et al., 1987; OEHHA, 2006). The origin of the mercury is from mercury and gold mining around Lake Berryessa from the late 1880's through the 1990's. In addition, the geothermal springs in the area vent mercury into the surrounding water bodies. Mercury occurs both naturally in the environment and is also redistributed in the environment, as a result of human activities, such as mining. In aquatic systems, mercury undergoes chemical transformation to the more toxic organic form, methylmercury, which accumulates in fish and other organisms.

The Office of Environmental Health Hazard Assessment (OEHHA) issued a health advisory in 1987 for sport fish from Lake Beryessa, based on edible fish tissue collected from Lake Berryessa. Since that time, additional data have been collected for Lake Berryessa and Putah Creek (OEHHA, 2006). Sufficient data were available to characterize the concentrations of mercury and issue safe eating guidelines for the following fish species in Lake Berryessa: channel catfish; white

catfish; largemouth bass; rainbow trout; and, Chinook salmon. For Putah Creek, safe eating guidelines are now available for the Sacramento blackfish, Sacramento sucker; bluegill, carp, and crayfish. For the fish species that were analyzed from both waterbodies, mercury concentrations were generally lower in fish from Putah Creek than those in Lake Berryessa.

Fourteen fish species are known to currently inhabit Lake Berryessa (see **Table 4.6-3**). In 1957, DFG introduced largemouth bass, smallmouth bass, and red-eared sunfish to Lake Beryessa. The largemouth bass was intended to be the reservoir's principal game fish, supported by red-eared sunfish as its primary food sources for fish in the lake. Eventually, cold-water species including Kokanee salmon, silver salmon, brown trout, and rainbow trout were introduced. Threadfin shad were then introduced as the primary forage fish. During this same time period, channel catfish, white crappie, and black crappie were introduced to the lake.

In addition to the emphasis on warm water fisheries in Lake Berryessa, the DFG began a trophy trout program by stocking additional rainbow trout, brown trout, and silver salmon. Rainbow trout are the only trout currently being planted in Lake Berryessa; approximately 100,000 are planted in the lake each year, usually in the spring months. Half of the rainbow trout releases are of the Coleman Kamloops strain and the remainder are the Eagle Lake strain. In February 2001, the DFG made the first planting of Chinook salmon, an activity that continued into 2003. In March 2002, kokanee salmon were also planted. Brown trout were stocked in 1982 and silver salmon were stocked in 1976. In recent years, neither species has been observed (Napa County, BDR 2005).

TABLE 4.6-3
FISH SPECIES THAT OCCUR IN LAKE BERRYESSA

Common Name	Scientific Name
Coho Salmon	*Oncorhynchus kisutch*
Rainbow Trout	*O. mykiss*
Brook Trout	*Salvelinus fontinalis*
Brown Trout	*Salmo trutta*
Kokanee Salmon	*O. nerka*
Sacramento Pikeminnow	*Ptychocheilus grandis*
Threadfin Shad	*Dorosoma petenense*
Golden Shiner	*Notemigonus crysoleucas*
Carp	*Cyprinus carpio*
White Catfish	*Ameiurus catus*
Channel Catfish	*Ictalurus punctatus*
Redear Sunfish	*Lepomis microlophus*
Bluegill	*L. macrochirus*
Black Crappie	*Pomoxis. nigromaculatus*
Largemouth Bass	*Micropterus salmoides*
Smallmouth Bass	*M. dolomieui*

Source: Napa County, BDR 2005

Suisun Creek Watershed

The Suisun Creek Watershed covers 53 square miles and is largely rural, dominated by open space and agricultural land. The upper section of Suisun Creek lies within Napa County while its lower reaches flow through Solano County, connecting Suisun Marsh and Suisun Bay. Steelhead enter Suisun Creek and can migrate upstream. Operation of Lake Curry affects the magnitude and frequency of flows into Suisun Creek.

Studies associated with a watershed assessment and enhancement plan was conducted in 2002 and 2003 on the Suisun Creek Watershed (Laurel Marcus & Associates, 2004). The conditions in Suisun Creek were as follows: (1) water temperatures were too high and there was a need to release more water from Lake Curry during the summer months; (2) there was a high level of fine sediments in the channel in the areas that were monitored; (3) there were a large number of fish passage barriers (beaver dams and concrete structures); (4) riparian cover was inadequate on much of Suisun Creek; (5) there was a need for structure (such as large woody debris) for salmonid habitat; and, (6) several invasive non-native plant species had spread into many areas of the riparian corridor

Wooden Valley Creek, a tributary to Suisun Creek, was surveyed by the RCD in 2002 for steelhead presence. A number of fish species have been found in Wooden Valley Creek (see **Table 4.6-4**). In addition, the studies by Laurel Marcus & Associates (2004) demonstrated that: (1) water temperatures were too high in some areas, although cool water conditions predominated; (2) riparian canopy cover was inadequate in lower Wooden Valley Creek; (3) and, there were a number of fish passage barriers.

TABLE 4.6-4
FISH SPECIES THAT OCCUR IN WOODEN VALLEY CREEK

Common Name	Scientific Name
Rainbow Trout	Oncorhynchus mykiss
California Roach	Hesperoleucus symmetricus
Other cyprinids	
Threespine Stickleback	Gasterosteus aculeatus
Mosquitofish	Gambusia affinish
Bluegill	Lepomis macrochirus
Green Sunfish	L. cyanellus
Sculpin species	Cottus spp.

Source: Koehler, 2002

Special-Status Fish Species

Special-status fish are fish that meet the definition of "rare, endangered, or threatened" under CEQA (State CEQA Guidelines Section 15380). For the purposes of this document, this includes all species that meet any of the following criteria:

- Listed or proposed for listing as threatened or endangered under ESA (50 CFR 17-11 [listed animals] and various notices in the Federal Register [proposed species]).

- Candidates for possible future listing as threatened or endangered under ESA.
- Listed or candidates for listing by the State of California as threatened or endangered under CESA (14 CCR 670.5).
- Fully protected under California Fish and Game Code Section 5515 (fish)
- Considered by local experts in the field of rare fish to be rare in the County portion of its range, although it may be more common elsewhere.

Special-Status Fish

Special-status fish species are likely to be found or have potential to be found in the County (see **Table 4.6-5**) The life history stages and requirements of these special status fish species are discussed in detail in Biological Resources Chapter of the Napa County Baseline Data Report (Napa County, BDR 2005) and **Appendix F**.

TABLE 4.6-5
SUMMARY OF SPECIAL STATUS FISH SPECIES WITH POTENTIAL TO OCCUR IN NAPA COUNTY

Scientific Name and Common Name	Status	Habitat	Occurrences in Napa County
Acipenser medirostris Green sturgeon	—/SSC	In the Sacramento River, adult sturgeon are in the river, presumably spawning, when temperatures range between 45-58°F. Preferred spawning substrate likely is large cobble, but can range from clean sand to bedrock. Eggs are broadcast-spawned and externally fertilized in relatively high water velocities and probably at depths >3 m. Silt is known to prevent the eggs from adhering to each other.	A small number of individuals infrequently collected in DFG beach seines within San Pablo Bay near Napa Estuary, but not in Napa County (DFG 1999). Not found within freshwater reaches of the Napa River watershed. Individuals may stray into Napa County.
Hypomesus transpacificus Delta smelt	T/T	Tolerant of a wide salinity range. They have been collected from estuarine waters up to 14 ppt salinity. For a large part of their one-year life span, delta smelt live along the freshwater edge of the mixing zone(saltwater-freshwater interface), where the salinity is approximately 2 ppt.	Captured in the 20-mm seine surveys of San Pablo Bay (outside of Napa County) conducted by DFG from 1995 through 2001, with the exception of 1997 when delta smelt apparently were absent.
Lampetra ayresi River lamprey	—/SSC	The habitat requirements of spawning adults and ammocoetes have not been studied in California. Presumably, the adults need clean, gravelly riffles in permanent streams for spawning, while the ammocoetes require sandy backwaters or stream edges in which to bury themselves, where water quality is continuously high and temperatures do not exceed 77°F.	Infrequently collected in DFG beach seines within San Pablo Bay near the Napa Estuary, but not in the portion of the estuary in Napa County (DFG 1999). Historically collected within the Napa River watershed, but not currently known to occur.

Scientific Name and Common Name	Status	Habitat	Occurrences in Napa County
Oncorhynchus mykiss Central California Coast steelhead trout	T/—	Habitat requirements change as steelhead go through different life phases. Adults require access to natal streams. The majority of spawning occurs in the upper reaches of tributaries. Spawning also requires gravel in areas free of excessive sedimentation with adequate flow and cool, clear water. Escape cover such as logs, undercut banks, and deep pools for is also important. Cool (< 70° F), clean water is essential for survival.	The Napa River watershed appears to support one of the larger steelhead runs in the Bay Area. Anderson (1969) estimated that the Napa River watershed at that time might have supported a run of approximately 500 to 2,000 spawners. Accurate population estimates for the Napa River watershed as a whole are not available (Leidy 1984, Leidy 2001).
Oncorhynchus tshawytscha Fall/Late Fall run Chinook salmon Winter run Chinook salmon	C/SSC E/E	Water temperatures and suitable spawning substrates are the greatest habitat demands of Chinook salmon. Coarse gravel must be present in streambeds for successful spawning, and stream temperatures below 61°C are preferred. Chinook commonly spawn in larger mainstem rivers than other salmon species.	Both runs have been observed in the Napa River upstream to the base of the Kimball Canyon Dam north of Calistoga (Leidy and Sisco 1999). These populations may not be self-sustaining and may consist of strays from other basins (NMFS 1999). Winter run Chinook is likely limited to the area around Mare Island Strait in Solano County. This species is less likely to be found in the Napa County portion of the lower Napa River.
Pogonichthys macrolepidotus Sacramento splittail	SC/SSC	Found mainly in fresh water, but can live in moderate salinity of up to 10-18 ppt. Splittail lay their adhesive eggs on submerged vegetation in flooded areas in the lower reaches of rivers and sloughs. Larvae utilize the shallow, weedy regions close to spawning sites. As fish reach adult sizes, they move into deeper habitat.	Known to occur in the Napa and Petaluma Rivers and Petaluma Marsh (U.S. Fish and Wildlife Service 1993, 1996) near the Petaluma River and Novato Creek.
Spirinchus thaleichthys Longfin smelt	—/SSC	Occupy mostly the middle or bottom of the water column in the salt or brackish water portions of the estuary, although larval smelt are concentrated in near-surface brackish waters. Spawning takes place in fresh water, over sandy-gravel substrates, rocks, and aquatic plants. Spawning in the Sacramento-San Joaquin estuary occurs at water temperatures of 45-58°F. A strong positive correlation exists between winter and spring Delta outflow and longfin smelt abundance the following year.	Infrequently collected in DFG beach seines within San Pablo Bay near Napa Estuary, but outside of Napa County (DFG 1999). Not found within freshwater reaches of the Napa River watershed. Individuals may stray into Napa County.
Mylophardadon conocephalus hardhead	—/SSC	Widely distributed in low and mid-elevation streams in the main Sacramento-San Joaquin estuary, the Russian River, Napa River and Pit River drainages. Tend to be absent when centrarchids are present.	Present in the Napa River, though their population distribution is limited.

Source: Napa County, BDR 2005; Rich, 2007

Notes:

SSC: Species of special concern in California.
SC: Federal species of concern.
C: Candidate species for listing under the federal endangered species act.
T/T: Listed as "threatened" under the state and federal endangered species acts.
E/E: Listed as "endangered" under the state and federal endangered species acts.
T/-: Listed as "threatened" under the federal endangered species act.

It is essential to understand what Napa County watersheds have to offer salmonids and special-status fish species, before one can determine the impacts of present and future human actions (e.g., vineyard development) on the fisheries resources. the general habitat requirements of special-status fish species include:

- Appropriate water temperatures;
- Appropriate water quality;
- Abundant food;
- Accessibility to spawning and rearing areas; and,
- Appropriate physical habitat.

Each of the life stage requirements may vary, depending upon the season and the life stage and condition of the fish species. If any life stage of any species is deprived of a life stage requirement, the population as a whole can be negatively affected. In the following paragraphs, critical life stage requirement variables for the special-status fish species are discussed. Of the various federal- and state-listed fish species that inhabit Napa County, salmonids (namely steelhead and Chinook salmon) are the most sensitive to environmental perturbations.

Water Temperature

Of all of the life stage requisites, water temperature is the most important, yet, perhaps, least understood. A major problem hindering precise understanding of temperature effects is that many environmental factors (e.g., food availability, previous exposure to stress, genetic adaptation, age and size) simultaneously influence a fish's response to temperature. Water temperature can be considered in two ways: (1) as a factor affecting the rate of development, metabolism and growth; or, (2) as a stressful or lethal factor. The two, of course, are inseparable.

All fishes are poikilotherms, which means that their internal body temperature varies, according to the external environment (i.e. if the water is hot, the fish is hot and if the water is cold, the fish is cold). The poikilothermic fish, unlike the homeothermic mammal (which can thermoregulate), has no physiological way to acclimate quickly to changes in water temperature. Thus, a fish's metabolism, which controls all aspects of its body, is directly proportional to water temperature, within certain limits. Thus, as water temperatures increase, so does the metabolic rate and the need for food. If there is enough food available and dissolved oxygen and other conditions are satisfactory, then the fish will grow, within certain thermal ranges. However, if the amount of food is limited and/or other stressors exist (e.g., low dissolved oxygen, pollution), the fish will not grow. In addition, beyond certain physiological limits, even an increase in food availability will not assist the fish; beyond this point, water temperature can be stressful and even lethal.

Despite a fish's inability to change quickly, physiologically, they often use behavior to thermoregulate. This is of great importance when their habitat provides more than one thermal option. For example, in studies on the Navarro River Watershed (Rich, 1991), juvenile coho salmon were collected in water temperatures that would be considered stressful according to the results reported in the scientific literature. Yet, the fish had good growth rates and appeared to be healthy. It was surmised that both the abundant food resources and cool "thermal refugia" accounted for this apparent anomaly (Rich, 1991). Thus, within the thermocline in the pool, the cooler areas provided a refuge for the salmonids during the hot part of the day. The fish could then digest their food at physiologically acceptable water temperatures, even though high water temperatures characterized a large percentage of the pools.

Chronic sublethal stressful water temperatures are usually of more importance to long-term fish population health than acute lethal temperatures. Stressful water temperatures are more common and the results less easily studied and understood than a "fish kill", resulting from lethal water temperatures. However, sublethal water temperatures can effectively block migration, reduce growth rate, create disease problems, and inhibit smoltification. Hence, it is of paramount importance that the impacts of sublethal stressful water temperatures be understood and, when possible, mitigation measures be implemented, to reduce the long-term impacts: reduced productivity within the watershed.

Water temperature standards used for selected fish species by fisheries biologists are often subject to debate. One of the primary reasons for this problem stems from the fact that it is common to base water temperature standards on selected laboratory data, rather than site-specific field data for a given species. For example, water temperature requirements for salmonids are often developed without any understanding of the physiological and/or behavioral response of the fish to changes in water temperature. Therefore, water temperature standards often do not agree with field data for a given fish species.

Thus, to identify appropriate water temperature requirements for fishes, it is of paramount importance to use site-specific data, preferably temperature-physiology studies. The status of knowledge regarding the impacts of water temperature on steelhead trout is provided in **Appendix F**. Based on available information, physiological optimal water temperature ranges are summarized in **Appendix F** for the steelhead, rainbow trout, and Chinook salmon.

Water Quality

Sensitivities of fish species differ, with regard to dissolved oxygen (DO) concentrations, siltation/sediment, and pollutants. Salmonids are particularly sensitive to low DO, high sediment loads, and various pollutants.

Dissolved Oxygen

Although sensitivity of fish to low DO concentrations differs between species (e.g., salmonids are more sensitive than suckers), the requirements (e.g., feeding, growth, reproducing, etc.) for each life stage controls the amount of oxygen needed at any given time. If these requirements are not met, the fish undergoes a stress reaction. The stress reaction can influence the fish's life processes and, sometimes, whether or not the fish lives or dies. Chronic sublethal DO levels can result in the following impacts on salmonids: (1) Cessation of immigration; (2) Negative impact on swimming performance; (3) Reduced growth rate; (4) Reduced food consumption rate; and, (5) Avoidance reactions. Any of these responses can affect the fish's ability to complete its life cycle and perpetuate the species. For salmonids, DO concentrations should generally be above 7 mg/l, although at low water temperatures, 5 mg/l is probably also suitable (Brett and Blackburn, 1981; Jones, 1971; Whitmore et al., 1960).

Sedimentation and Turbidity

Salmonids require and seek out clean (silt-free) gravel. Although, they will spawn and rear in embedded substrate if nothing else is available, there may be a subsequent reduction in survival to emergence (Folmar and Dickhoff, 1982). It is well known that fine sediments can influence the survival of salmonids, particularly at the egg and alevin life stages. Fine sediments (defined in most studies as particles with a diameter of less than 3 mm or 0.85 mm) may reduce intergravel flow and the delivery of dissolved oxygen to incubating eggs and developing alevins in the redd. In addition, fine sediments impede or obstruct the emergence of alevins, reduce the

carrying capacity of rearing habitats for juvenile salmonids, and smother food organisms. Chronic turbidity that is caused by fine sediment suspended in the water column may interfere with feeding by juvenile salmonids and, thereby, reduce growth. Other potential effects of suspended sediment on salmonids include irritation of gill tissues, avoidance behavior, and mortality (Noggle, 1978; McNeil and Ahnell, 1964; Cooper, 1965; Koski, 1966; Cloern, 1976; Phillips et al., 1975).

Although it is generally accepted that increased input of fine sediments can be harmful to salmonids, determining the exact threshold amount that may limit production of salmonid populations in a watershed is more problematic. Many stream systems in California have high sediment loads, including an abundance of fine materials less than one mm diameter. Yet, historically these streams supported healthy populations of salmonids.

Food Resources

Salmonids are opportunistic predators that eat a wide variety of aquatic invertebrates, as well as terrestrial invertebrates that fall into the stream (Mundie, 1969; Tippets and Moyle, 1978). Abundant food is particularly important to salmonids during warm summer months, when water temperatures and metabolisms are high. In order to survive and grow, young salmonids require a large and constantly replenished supply of food.

Spawning And Rearing Habitat

Sometimes barriers (e.g., dams, shallow riffles, waterfalls, debris jams) will delay or even curtail immigration beyond the barrier. Migration barriers may limit the success of spawning for anadromous salmonids and the successful emigration of juvenile steelhead undergoing the parr-smolt transformation. Although resident rainbow trout populations can be productive upstream of such barriers and can become barriers to gene flow, man -made barriers can abruptly remove miles of streams that were historically used by steelhead.

Some barriers are insurmountable, but, given suitable conditions (e.g., deep pools at the base of a waterfall or cascade, etc.), steelhead may be able to get past many obstacles that appear to be barriers. The best method for determining whether or not a barrier to migration exists is to obtain site-specific information.

Barriers and potential barriers are depicted for each creek within the Napa River Watershed is identified in **Appendix F**. Following are the types of barriers that are identified in **Appendix F**:

- Permanent Natural Barrier (PNB), such as waterfalls, or a steep slope;
- Permanent Man-Made Barrier (PMMB), such as diversion dam or a dam; and,
- Partial Barrier, such as bridges, culverts, road crossings that may not be passable at times due to low flows.

In addition, there were some creeks that have obstacles, but it was not known whether or not the obstacle presented a barrier for anadromous fish migration. And, there were structures in creeks, such as logjams and large woody debris that were not considered barriers for anadromous fish.

The BDR divided barriers into the following categories:

1) Habitat that was disconnected, due to natural barriers and that was not expected to be used at any point in the future, save some catastrophic geologic change that eliminates the barrier. This type of barrier was considered to not have any potential to be used by steelhead. This corresponded to the category "Non-accessible habitat or naturally excluded, non-viable habitat" ; and,

2) Habitat disconnected by man-made barriers that would have historically provided usable habitat, but was not expected to in the future, unless a specific opportunity or need resulted in the removal of the barrier, is categorized as "disconnected potential habitat". This category could be used as a basis for restoration potential, based on the amount of usable habitat that lies behind the barrier.

According to the BDR, only complete barriers are considered as completely blocking access to habitat within the context of this analysis. It is assumed that populations can migrate in and out of partial reaches at high flows, although those high flows necessary for passage might not occur within a given water year.

Physical Habitat

The amount of streamflow, substrate quality and quantity, appropriate water depths, and adequate shelter or cover affect all life stages of salmonids. The amount of streamflow affects all life stages of trout. Of the factors known to influence anadromous salmonid's ascent of creeks, streamflow connected with storm events is one of the most important. Streamflow regulates the amount of spawning area available; as flows increase (up to a point), more gravel is covered and becomes suitable for spawning. During egg incubation and fry emergence, adequate streamflows are necessary to cover the eggs and wash away excretory products. During rearing, streamflow is related to the amount of food and physical habitat available.

Streamflow is also an important factor during the parr-smolt transformation and emigration of anadromous fishes. Salmonids require and seek out clean (silt free) gravel. Although they will spawn and rear in embedded substrate, if nothing else is available, there is usually a reduction in survival. Successful spawning, incubation, and fry emergence depends upon the following: (1) Size class composition of the substrate; (2) Existing degree of embeddedness; (3) Porosity of the substrate down to below the point of egg deposition in the fish's redd; and, (4) Percolation rate of water through the substrate.

Water depth is important to salmonids, particularly during the immigration and spawning season. Steelhead trout in California streams rarely choose redds that will later be exposed by receding stream levels. During egg development, there must be an abundance of well-oxygenated water flowing over the redds. Preferred depths have been determined by measuring the water depth over active redds (Smith, 1973; Hooper, 1973; Hunter, 1973; Thompson, 1972; Shapovolov and Taft, 1954).

Cover is an important factor in a fish's life. Cover provides protection from predators (e.g., birds, mammals, other fishes), as well as, sometimes, reduced water temperatures during hot days. Cover can be provided by overhanging vegetation, undercut banks, submerged rocks and vegetation, submerged objects such as logs, floating debris, and even turbulence and depth, sometimes. Young salmonids prefer habitats which are characterized by abundant cover. The nearness of cover to a spawning area may be a factor in the actual selection of spawning sites; some salmonids select areas adjacent to undercut banks and overhanging vegetation (Reiser and Bjornn, 1979; Moyle, 1976).

4.6.2 REGULATORY FRAMEWORK

FEDERAL

Endangered Species Act

The federal Endangered Species Act (ESA) protects fish and wildlife species that have been identified by the U.S. Fish and Wildlife Service (USFWS) and/or the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries) as endangered or threatened. It also protects the habitats in which they live. Endangered refers to species, subspecies, or distinct population segments that are in danger of extinction throughout all or a significant portion of their range while *threatened* applies to species, subspecies, or distinct population segments that are likely to become endangered in the near future.

USFWS and NOAA Fisheries administer the ESA. In general, NOAA Fisheries is responsible for protection of ESA-listed marine species and anadromous fish while other listed species come under USFWS jurisdiction. Key provisions of the ESA are summarized below under the section that implements them.

Section 10

Section 10 of the ESA provides a means for nonfederal entities (states, local agencies, and private parties) that are not permitted or funded by a federal agency to receive authorization to disturb, displace, or kill (i.e., take) threatened and endangered species. It allows USFWS and/or NOAA Fisheries to issue an incidental take permit authorizing take resulting from otherwise legal activities, as long as the take would not jeopardize the continued existence of the species. Section 10 requires the applicant to prepare a Habitat Conservation Plan (HCP) addressing project impacts and proposing mitigation measures to compensate for those impacts. The HCP is subject to USFWS and/or NOAA Fisheries review and must be approved by the reviewing agency or agencies before a project can be initiated. Because the issuance of the incidental take permit is a federal action, USFWS and/or NOAA Fisheries must also comply with the requirements of ESA Section 7 and the National Environmental Policy Act (NEPA).

Section 7

Section 7 of the ESA applies to the management of federal lands as well as other federal actions, such as federal approval of private activities through the issuance of federal permits, licenses, funding, or other actions that may affect listed species. Section 7 directs all federal agencies to use their existing authorities to conserve threatened and endangered species and, in consultation with USFWS, to ensure that their actions do not jeopardize listed species or destroy or adversely modify critical habitat. Critical habitat is defined as specific areas that are essential to the conservation of federally listed species.

Clean Water Act

The federal Clean Water Act (CWA) was enacted as an amendment to the federal Water Pollution Control Act of 1972, which outlined the basic structure for regulating discharges of pollutants to waters of the United States. The CWA serves as the primary federal law protecting the quality of the nation's surface waters, including lakes, rivers, and coastal wetlands. The following discussion gives background information as relevant to biological resources.

Section 404

CWA Section 404 regulates the discharge of dredged and fill materials into waters of the United States. Waters of the United States refers to oceans, bays, rivers, streams, lakes, ponds, and wetlands. Applicants must obtain a permit from the U.S. Army Corps of Engineers (Corps) for all discharges of dredged or fill material into waters of the United States, including wetlands, before proceeding with a proposed activity. Waters of the United States in Napa County are under the jurisdiction of the Corps.

Compliance with CWA Section 404 requires compliance with several other environmental laws and regulations. The Corps cannot issue an individual permit or verify the use of a general nationwide permit until the requirements of NEPA, ESA, and the National Historic Preservation Act (NHPA) have been met. In addition, the Corps cannot issue or verify any permit until a water quality certification or a waiver of certification has been issued pursuant to CWA Section 401.

Section 401

Under CWA Section 401, applicants for a federal license or permit to conduct activities which may result in the discharge of a pollutant into waters of the United States must obtain certification from the state in which the discharge would originate or, if appropriate, from the interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate. Therefore, all projects that have a federal component and may affect state water quality (including projects that require federal agency approval, such as issuance of a Section 404 permit) must also comply with CWA Section 401.

Rivers and Harbors Act of 1899

The Rivers and Harbors Act regulates projects and activities in navigable waters and harbor and river improvements. Section 10 prohibits the unauthorized obstruction or alteration of any navigable water of the United States. The construction of any structure in or over any navigable water of the United States and any work affecting the course, location, condition, or physical capacity of such waters is unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. Section 10 waters in the County include tidally influenced reaches of the Napa River.

STATE

California Endangered Species Act

The California Endangered Species Act (CESA) protects wildlife and plants listed as endangered or threatened under the act by the California Fish and Game Commission. The California Department of Fish and Game (DFG) administers the CESA. The CESA prohibits all persons from taking species that are state listed as endangered or threatened except under certain circumstances. The CESA definition of take is any action or attempt to "hunt, pursue, catch, capture, or kill." Section 2081 of the Fish and Game Code provides a means by which agencies or individuals may obtain authorization for incidental take of state-listed species, except for certain species designated as "fully protected" under the California Fish and Game Code (see California Fish and Game Code below). Take must be incidental to, not the purpose of, an otherwise lawful activity. Requirements for a Section 2081 permit are similar to those used in the ESA Section 7 process, including identification of impacts on listed species, development of mitigation measures that minimize and fully mitigate impacts, development of a monitoring plan, and assurance of funding to implement mitigation and monitoring.

California Fish and Game Code

Fully Protected Species

The California Fish and Game Code provides protection from take for a variety of species. Certain species are considered fully *protected*, meaning that the code explicitly prohibits all take of individuals of these species except for take permitted for scientific research. Section 5515 lists fully protected fish.

It is possible for a species to be protected under the California Fish and Game Code, but not fully protected.

Stream and Lake Protection

DFG has jurisdictional authority over streams and lakes and the wetland resources associated with these aquatic systems under California Fish and Game Code Sections 1600 et seq. California Fish and Game Code Section 1600 et seq. was repealed and replaced in October of 2003 with the new Section 1600–1616 that took effect on January 1, 2004 (Senate Bill No. 418 Sher). DFG has the authority to regulate work that will "substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass project proponent and can impose conditions in the agreement to minimize and mitigate impacts to fish and wildlife resources. A lake or streambed alteration agreement is not a permit, but rather a mutual agreement between DFG and the project proponent. Because DFG includes under its jurisdiction streamside habitats that may not qualify as wetlands under the federal CWA definition, DFG jurisdiction may be broader than Corps jurisdiction.

A project proponent must submit a notification of streambed alteration to DFG before construction. The notification requires an application fee for streambed alteration agreements, with a specific fee schedule to be determined by DFG. DFG can enter into programmatic agreements that cover recurring operation and maintenance activities and regional plans. These agreements are sometimes referred to as Master Streambed Alteration Agreements (MSAAs).

San Francisco Bay Conservation and Development Commission

The San Francisco Bay Conservation and Development Commission's (BCDC's) primary mission is to analyze, plan, and regulate the San Francisco Bay as an ecological unit. BCDC has permit jurisdiction over San Francisco Bay, San Pablo Bay, and the Suisun Marsh—including levees, waterways, marshes, and grasslands—below the 10-foot contour line (as measured off a USGS quadrangle map from mean high water). Any person or public agency other than a federal agency that proposes certain activities in or around these areas must obtain a development permit from the BCDC.

In Napa County, the BCDC's jurisdiction covers the areas listed below:

- Napa River from the southern boundary of the County to the northernmost point of Bull Island.
- Tidal marshes adjacent to the Napa River.

- Salt ponds adjacent to the Napa River.
- Major sloughs.
- Wetlands managed by duck clubs in the vicinity of Skaggs Island.

LOCAL POLICIES

Napa County Code

The following pertains to stream setbacks and tree and riparian vegetation protection provisions excerpted from Napa County Zoning Code, namely the Conservation Regulations, Chapter 18.108.

Section 18.108.100 – Erosion Hazard Areas; Vegetation Preservation and Management

Discretionary permits, and in some cases administrative permits, for projects in the County's jurisdiction on slopes greater than 5 percent are subject to a number of conditions, requiring the preservation of existing vegetation wherever feasible and where necessary for the preservation of threatened plant or animal species; and in some cases, no removal of trees 6 inches or more in diameter at breast height without authorization and replacement; and re-vegetation of graded/disturbed areas.

Napa County Code 18.108.100 may require the following conditions when granting a discretionary permit for activities on slopes greater than 5 percent:

- Existing vegetation shall be preserved to the maximum extent feasible. Vegetation shall not be removed if necessary for erosion control or preservation of habitat for threatened or endangered species.
- An approved erosion control plan (ECPA) permit or grading permit is required for the grading associated with the removal of trees or tree stands measuring six inches in diameter (dbh) or larger. Replacement of removed protected trees located outside of the approved project boundary may be required. Trees to be avoided by project activities shall be protected through fencing or other methods during construction.

Section 18.108.025 – General Provisions, Intermittent/Perennial Streams

This section of the County code establishes stream setbacks for earthmoving activities and grading for all new developments, including agricultural and residential developments, and for replanting of existing vineyards when replanting occurs outside of the existing vineyard footprint and when the project would require a grading permit pursuant to the California Building Code.

Under Section 18.108.030 a stream means any of the following:

- A watercourse designated by a solid line or dash and three dots symbol on the largest scale of the United States Geological Survey maps most recently published, or any replacement to that symbol.

- Any watercourse which has a well-defined channel with a depth greater than 4 feet and banks steeper than 3:1 (horizontal to vertical bank ratio) and contains hydrophilic (i.e. water adapted) vegetation, riparian vegetation or woody vegetation including tree species.

- Those watercourses listed in Resolution No. 94-16 and incorporated herein by reference.

Setbacks included in the Code range from 35 to 150 feet and are dependent on the slope of the terrain parallel to the top of bank of the stream, with wider setbacks required on steeper slopes. Where the outboard dripline of upper canopy vegetation is located outside the setback required by the slope steepness, the setback will extend to the outboard dripline. Re-vegetation of portions of the streamside setbacks may be required as a part of an erosion control plan.

Section 18.108.027 – Sensitive Domestic Water Supply Drainages

This section of the County code requires the maintenance/preservation of 60% tree canopy cover and 40% of shrubby and herbaceous cover present as of 1993 as part of land uses involving ground disturbance in sensitive domestic water supply drainages.

Ground-disturbing activities in the County's Domestic Water Supply Drainages are only allowed to take place during the dry season, between April 1 and September 1 of each year. Installation of winterization measures may take place during other times of the year, but must be in place by September 15 of any given year.

Napa County's Domestic Water Supply Drainages include the entire watershed areas associated with the following reservoirs (not sure where these acreages came from, revised acreages are from most recent GIS drainage layer):

- Kimball Reservoir Drainage
- Rector Reservoir Drainage
- Milliken Reservoir Drainage
- Bell Canyon Reservoir Drainage
- Lake Hennessey Drainage including Friesen Lakes
- Lake Curry Drainage
- Lake Madigan Drainage

In these Sensitive Domestic Water Supply Drainages concentration of runoff will, wherever feasible, be avoided. Those drainage facilities and outfalls that unavoidably must be installed are required to be sized and designed to handle the runoff from a one-hundred-year storm event without failure or unintentional bypassing. If a project will increase delivery of sediment or other pollutants from a drainage into a public water supply (reservoir) by more than 1% on an individual project basis or by more than 10% on a cumulative basis, the project will not be approved until a public hearing on the matter has been held and a use permit has been issued. A geotechnical report specifying the depth and nature of the soils and bedrock present and the stability of the area potentially affected by the project or project runoff is required for any project located in a Sensitive Domestic Water Supply Drainage.

Section 18.108.070 – Erosion Hazard Areas–Use Requirements

This section of the code stipulates that uses permitted within erosion hazard areas, those portions of land having slopes over five percent (5%), must include temporary and/or permanent erosion control measures in conformance with the County's National Pollution Discharge Elimination

System (NPDES) General Permit on file with the state (i.e., a suite of Best Management Practices to eliminate, control and or minimize sediment/soil particle detachment and transport). The section further requires erosion control plan approval for agricultural earthmoving activity on lands having slopes greater than 5%, and establishes grading deadlines (i.e., a winter shutdown period).

Additionally, this section, together with Chapter 18.108.100, limits the removal of vegetation in erosion hazard areas to only that necessary to accommodate the proposed project, sets conditions for the preservation and/or replacement of trees in excess of six inches in diameter, and requires projects to have no adverse affect on sensitive, rare, threatened of endangered plants or animal or their habitats as designated by state or federal agencies with jurisdiction, and mapped on the County's environmental sensitivity maps.

Section 18.108.075 – Requirements for Structural Erosion Control Measures

This section establishes erosion control requirements for structural developments (anything built or constructed on, above, or below the surface of the land), and requires the submission of Evidence of Erosion Control Measures, and the incorporation of such measures in all applicable building, grading, septic, or other required plans or plot plans submitted for County approval.

Section 18.108.135 – Oversight and Operation Requirements

Maintenance and monitoring is a requirement of any erosion control plan and is the ultimate responsibility of the property owner. Section 18.108.135 requires that maintenance and monitoring be implemented for any erosion control plan and includes the following components:

- Implementation of the ECP measures must be overseen by the preparer of the ECP.
- The property owner must provide weekly inspections of the control measures between October 1st and April 1st of each year, as well as during rainfall events, to assure the measures are installed properly and are effective in controlling offsite sediment transport, and to implement whatever actions are needed to keep them functioning properly.
- The property owner must implement a permanent, on-going self-monitoring program of the groundcover conditions and erosion control facility operations. The groundcover monitoring shall conform to the NRCS standards for determining rangeland conditions.
- The property owner must submit to the County an Annual Erosion Control Plan Operation Status Report that specifies the groundcover conditions and how the erosion control measures are operating. The report shall specify the proposed management and cultural measures to be used the following year to return or maintain the ground cover in optimal condition and any other remedial actions necessary to restore the disturbed areas in such a manner to minimize erosion and resultant sedimentation.

Specific actions are required under Napa County Code Section 18.108.135 in the event of existing or pending erosion control measure failures. These actions include:

- Issuance of notification to the County;
- Implementation of temporary measures to stabilize the situation;

- Modification of the temporary measures, if necessary, within 24-hours of receipt of County comment on the adequacy of temporary measures;
- Submit an engineered plan for measures needed to permanently correct the problem within 96 hours of the discovery;
- Submit a plan for clean-up of the damage done with and engineer's estimate of the cost of cleanup;
- Submit, if necessary, a modified plan and cost estimate for the problem within 48 hours of receipt of County comments on the adequacy of the plan;
- Pay the County the cost of review within 48 hours of request;
- Post a security in the amount of 100 percent of the total cost to correct the problem and cleanup the damage; and,
- Insure the final correction and cleanup plans are implemented within 96 hours of its approval.

Finally, to assure the erosion control measures are adequately in place, the County may perform annual inspections of the project site, after the first major storm event of each winter and until the project has been completed and stable for three years. During these inspections, County staff may require that remedial actions be implemented where non-functioning or ineffective measures are identified. Additionally, once the project has been deemed complete, random site inspections by County staff may also occur with the same consequences.

Chapter 16.04 – Floodplain Management

Floodplain management provisions regulate a variety of activities, including the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters. Floodplain management provisions seek to preserve riparian vegetation to preserve fish and wildlife habitat; prevent or reduce stream-bank erosion; maintain cool water temperatures for fish; prevent or reduce siltation; and promote wise uses and conservation of woodland and wildlife resources of the county. All development activities within riparian zones (50 feet beyond the top of streambanks, or 100 feet beyond the top of the Napa River banks downstream of Zinfandel Lane) must be permitted. Development activities include substantial improvements to a structure. Section 16.04.750 sets restrictions on the type and amount of riparian vegetation that may be removed within the riparian zone, and prohibits locating structures within 10 feet of the top of the bank, as well as leaving slopes unprotected.

Chapter 16.28 Stormwater Management and Discharge Control

The purpose of this chapter is to protect the health, safety and general welfare of Napa County residents; to protect water resources and to improve water quality; to cause the use of management practices by the county and its citizens that will reduce the adverse effects of polluted runoff discharges on waters of the state; to secure benefits from the use of stormwater as a resource; and to ensure the county is compliant with applicable state and federal law.

This chapter seeks to promote these purposes by:

A) Prohibiting illicit discharges to the stormwater conveyance system;

B) Establishing authority to adopt requirements for stormwater management, including source control requirements, to prevent and reduce pollution;

C) Establishing authority to adopt requirements for development projects to reduce stormwater pollution and erosion both during construction and after the project is complete;

D) Establishing authority to adopt requirements for the management of stormwater flows from development projects, both to prevent erosion and to protect existing water-dependent habitats;

E) Establishing authority to adopt standards for the use of off-site facilities for stormwater management to supplement on-site practices at new development sites. (Ord. 1240 § 1 (part), 2004)

Section 16.28.100 - Reduction of Pollutants in Stormwater

16.28.100 of County Code (Stormwater Management and Discharge Control Ordinance) requires the identification and use of BMPs to control the volume, rate and potential pollutant discharge from new development and redevelopment projects, existing businesses and other activity that may cause or contribute to stormwater pollution. The County currently accepts the California Stormwater Quality Association (CASQA) California Stormwater Best Management Practice Handbooks as effective standards for implementation and installation of stormwater pollution prevention measures, which provides detailed information on BMPs associated with use and design for maximum treatment effectiveness. The use of such BMPs for residential, commercial and recreational development has been demonstrated to effectively protect surface water quality."

4.6.3 IMPACTS AND MITIGATION MEASURES

A fisheries impact associated with the implementation of the proposed General Plan Update would be considered significant if it would result in any of the following actions (based on Appendix G of the CEQA Guidelines):

a) Have a substantial adverse effect, either directly or indirectly through habitat modifications, on any special-status fish species identified in local or regional plans, policies, or regulations, or by CDFG, NOAA Fisheries, or USFWS;

b) Have a substantial adverse effect on riparian habitat; and,

c) Interfere substantially with the movement of any native resident or migratory fish or with established native resident or migratory fish corridors, or impede the use of native fish spawning sites.

An evaluation of whether or not an impact on fisheries would be substantial must consider both the fisheries itself and how it fits into a regional or local context. Substantial impacts would be those that would diminish, or result in the loss of, an important fisheries resource, or those that would obviously conflict with local, state, or federal resource conservation plans, goals, or regulations.

Impacts are sometimes locally important, but not significant according to CEQA. The reason for this is that although impacts may result in an adverse alteration of existing conditions, they may not substantially diminish, or result in the permanent loss of, an important resource on a

population-wide or region-wide basis. Impacts on other biological resources is addressed in Section 4.5 (Biological Resources).

METHODOLOGY

The fisheries analysis is based on field review of the County; review of natural community conditions; review of data contained in the BDR (Napa County, BDR 2005) and **Appendix F**; review of the potential new growth and development associated with each alternative (A, B, and C); consideration of the potential environmental effects of policy provisions of the proposed General Plan Update. Analysis and consideration of the hydrologic and water quality impacts associated with the General Plan Update are provided in Section 4.11 (Hydrology and Water Quality) of this DEIR.

This impact analysis is essentially organized by the significance criteria noted above: special-status fish species, sensitive riparian communities; fish migration/movement. However, due to the functional overlap between impacts to special-status fish species and sensitive riparian communities, these categories are considered in tandem. Each impact category includes a description of the specific potential impacts, as well as avoidance and mitigation measures that can potentially reduce and mitigate potentially significant impacts.

The methodology used to evaluate impacts and design appropriate avoidance and mitigation measures followed a sequence of:

1) Establishing baseline understanding of fishery resources and associated current hydrologic and habitat conditions in the County (see discussion above as well as Section 4.11 [Hydrology and Water Quality]);

2) Identification of areas of fishery impact associated with direct impacts (e.g., habitat degradation or loss) and indirect impacts associated with changes to hydrologic conditions and water quality from implementation of the proposed General Plan Update Alternatives under evaluation in this DEIR (see Section 3.0, Project Description, for a detailed description of the alternatives under evaluation). This includes consideration of a hydrologic modeling analysis that was conducted to simulate current conditions and conditions under four vineyard development scenarios that could occur under the General Plan Update Alternatives in year 2030 (see **Appendix H**);

3) Identification of water quality and fishery BMPs and other required measures that are typically applied to address site-specific project conditions through the implementation of Napa County Conservation Regulations (County Code Chapter 18.108), which have been demonstrated to avoid, reduce, and mitigate both project and cumulative impacts described in the impacts description (Step 2 above) and demonstrated in the modeling information (Step 3 above) and associated scientific literature (see **Appendix G** and **I**); and

4) Developing any necessary monitoring and/or performance standard requirements to ensure that the avoidance, reduction, and mitigation measures are adequately working and are effectively mitigating the potential impacts identified through the implementation of the proposed General Plan Update.

Step 2 of this sequence involved developing detailed surface water/groundwater, water quality, and sediment erosion models of Napa County. Baseline hydrologic models were developed and calibrated for the Napa County BDR using MIKE SHE, MIKE 11, the Load Calculator, and SEAGIS (DHI, 2002, 2005). These models are dynamically linked which enables representation of

the integrated hydrologic system. These models provided a tool to simulate current and future water resource conditions and evaluate how hydrologic conditions may change under different land use conditions. The reader is referred to Section 4.11 (Hydrology and Water Quality) and **Appendix H** for further details regarding hydrologic modeling performed.

Step 3, the identification of appropriate Best Management Practices (BMPs), is a key step in the overall methodology. Due to inherent limitations associated with the regional scale hydrology modeling process and the required assumptions used to develop and run these models, it is important to recognize the role of several existing and standard BMP approaches that are used to mitigate potential development related impacts on a project and cumulative scale. It is also important to recognize that the spatial scale that the hydrologic modeling simulation occurs is more coarse (smaller scale) than the site-specific scales (individual project level) for which most BMPs are designed and implemented. As a result it is difficult to adequately simulate the mitigating effects of BMPs operating at site-specific scales within a modeling system that is comprehensive across the entire County. The scale at which the model has been developed limits the incorporation of site specific BMPs. Thus, the degree of impacts estimated by the modeling analysis are considered conservative and likely overestimate existing impact conditions as they don't consider the role of BMPs that are applied through compliance with the County's Conservation Regulations (see Appendix H for additional details on the hydrology and water quality modeling performed). According to the methodology as described in the sequence above, consideration of the avoidance, reduction, and mitigating qualities of BMPs was considered qualitatively in addition to the modeling analysis to provide a more accurate (or comprehensive) description of possible impact conditions. Documented effectiveness of water quality related BMPs is provided in **Appendix I**, while **Appendix G** identifies BMPs specifically related to the protection of fisheries.

PROJECT IMPACTS AND MITIGATION MEASURES

Sedimentation Impacts to Fisheries

Impact 4.6.1 Land use and development under the proposed General Plan Update could adversely affect sediment load and thus indirectly result in the loss of populations or degradation of spawning and rearing habitat for special-status fish species. (Significant and Mitigable - All Alternatives)

As identified under Impacts 4.11.1 through 4.11.4 in Section 4.11 (Hydrology and Water Quality), land use and development under the proposed General Plan Update would result in the following potential changes in sediment discharges within Napa County's watersheds that could degrade water quality in fish-bearing watercourses (see **Appendix F** for a description of fish-bearing watercourses):

- Increased soil erosion and sedimentation during construction activities.
- Alterations to existing drainage patterns resulting in increased erosion, both in overland flow paths, in drainage swales, and creeks.
- Agricultural and resource development (i.e., limited timber harvesting and mineral resources extraction) resulting in increased sediment supply (see **Appendix H** and Impact 4.11.3 for modeled increases in sediment associated with new vineyard development).
- Development related increases in watershed wide impervious surfaces, resulting in increased stormwater runoff and peak discharge, possible increased flood potential, and

potential higher rates of bank failure and increased net sediment discharge (i.e., load) to the drainage system.

Upland and stream bank erosion delivered to the County's waterways can result in sediment/siltation of downstream streams and rivers. Increased siltation in salmonid bearing waterbodies can reduce intragravel flow in spawning grounds, fill in salmonid rearing pools, and reduce or eliminate food resources. Hence, there would be a significant impact on fisheries resources. As noted in **Appendix F**, these sedimentation impacts to the Napa River Watershed and Suisun Creek Watershed are limiting factors for the continued production of steelhead and Chinook salmon fisheries and are the focus of the Napa River TMDL for sediment.

The County has addressed water quality impacts associated with soil erosion through the implementation of the Stormwater Management and Discharge Control Ordinance (Ordinance No. 1240) and County Conservation Regulations (Chapter 18.108 of the County Code), which requires the development of erosion control plans and associated environmental review documents under CEQA to address water quality impacts of development. As identified in **Appendix I**, the development of implementation and installation of stormwater pollution prevention measures and erosion control plans (as required under the County Conservation Regulations) has demonstrated the ability to effectively mitigate the effect of sediment loss through the use of BMPs. These BMPs are similar to BMPs typically recommended to protect fisheries (see **Appendix G**) and are summarized in **Table 4.11-2**. Additional BMPs identified in **Appendix G** that provide erosion control benefits for fisheries include the use of bioengineering techniques such as the use of boulders, large woody debris and riparian vegetation along stream channels and constructed wetlands (which when used in combination with other BMPs have documented to be effective in maintaining water quality [Placer County, 2004]). In addition, the modeling results have also demonstrated that the effective use of cover crop can reduce soil erosion potential (see Tables 22 through 24 of **Appendix H**).

Potential impacts specific to each of the three alternatives are further described below:

Alternative A

This alternative would retain the existing land use designations under the current General Plan Land Use Map as well as the policy guidance set forth under the existing General Plan. Between the year 2005 and 2030, it is projected that there would be an additional 2,235 dwelling units and 16,014,000 square feet of non-residential uses as well as between 10,000 and 12,500 acres of new vineyard development in the unincorporated portion of the County. This development could contribute to soil erosion from development activities described above and result in sediment/siltation of streams and rivers. This impact would be **significant and mitigable** with the implementation of mitigation measures identified below.

Alternative B

This alternative would generally retain the existing land use designations under the current General Plan Land Use Map, similar to Alternative A. However, this alternative would provide for additional growth within currently General Plan designated areas for rural and urban development (such as within the unincorporated community of Angwin) and re-use of the Pacific Coast/Boca site and Napa Pipe site. Between the year 2005 and 2030, it is projected that there would be an additional 3,885 dwelling units and 14,636,000 square feet of non-residential uses in the unincorporated portion of the County (as noted above, vineyard development would be the same as Alternative A). In addition to the proposed land use map, Alternative B would include roadway improvements (associated with the proposed General Plan Update Circulation Element), extension of recycled water to Coombsville and Carneros, as well as policy provisions for trails and public open space (proposed Recreation and Open Space Element Objectives ROS-1, ROS-2 and ROS-3). This development could contribute to soil erosion from development activities described above and result in sediment/siltation of streams and rivers. This impact would be **significant and mitigable** with the implementation of mitigation measures identified below.

Alternative C

Between the year 2005 and 2030, it is projected that there would be an additional 7,635 dwelling units and 12,990,000 square feet of non-residential uses in the unincorporated portion of the County under this alternative. Alternative C would involve some additional land use changes beyond Alternative B that would allow for additional development/redevelopment (e.g., redesignation of Napa Pipe and Pacific Coast/Boca sites, potential expansion of the rural and urban uses in Angwin and establishment of a new RUL for the City of American Canyon). However, this Alternative would have similar infrastructure and trail/recreation provisions as Alternative B. This development could contribute to soil erosion from development activities described above and result in sediment/siltation of streams and rivers. This impact would be **significant and mitigable** with the implementation of mitigation measures identified below.

Mitigation Measures

Implementation of Mitigation Measure MM 4.11.2a would ensure that current effective provisions of the County Code are continued to be implemented and demonstrate compliance with the Basin Water Quality Control Plans and the Napa River TMDL for sediment. As documented in **Appendix I**, implementation of the County Conservation Regulations has resulted in technical demonstration of the effectiveness of the use of erosion control plans and their associated BMPs for controlling soil erosion (the reader is referred to Impact 4.11.1 regarding the effectiveness of the County Stormwater Management and Discharge Control Ordinance). It should noted that a component of the Napa River TMDL implementation measures includes continued compliance with County Conservation Regulations and Stormwater Management and Discharge Control Ordinance. Mitigation Measure MM 4.11.2b would ensure that water quality monitoring occurs to identify and correct any water quality issues, while implementation of mitigation measures MM 4.11.4 (associated with the proposed ministerial process for environmentally superior vineyard development projects under Alternatives B and C) would establish performance standards that would ensure that fishery resources are not indirect or directly impacted. However, the following additional mitigation measures are proposed and would apply to all three alternatives:

MM 4.6.1a The County shall provide a policy in the General Plan (in coordination with Mitigation Measure MM 4.11.2b) that requires the establishment of fishery monitoring program(s) in coordination with the Regional Water Quality Control Boards, California Department of Fish and Game, U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration National Marine Fisheries Service in order to track the current condition of special status fisheries and associated habitats in the County's watersheds. This will include tracking of the effectiveness of BMPs for individual projects in the watersheds and the implementation of corrective actions for identified water quality issues that are identified as adversely impacting fisheries.

MM 4.6.1b The County shall provide a policy in the General Plan that requires the County shall develop or modify the County Code to ensure that all construction related activities within 0.25 miles of a stream or other drainage course that have a potential for excess soil erosion due to winter rains have protective measures in place or occur before September 30th. In addition, the County shall ensure enforceable fines are levied upon violators and violators are required to perform all necessary remediation activities.

Implementation of the above mitigation measures would ensure that sedimentation impacts to fisheries is reduced **less than significant**.

Other Water Quality Impacts to Fisheries

Impact 4.6.2 **Land use and development under the proposed General Plan Update could adversely affect water quality parameters other than sediment and thus indirectly result in the loss of populations or degradation of habitat for special-status fish species. (Significant and Mitigable - All Alternatives)**

As noted under Impacts 4.11.1 and 4.11.3 in Section 4.11 (Hydrology and Water Quality), subsequent land use activities associated with urban, rural, agricultural and resource extraction can result in generating sources of nutrients and contaminants in County waterways (e.g., paint, solvents, cement, petroleum-based products, pathogens, fertilizers and pesticides). As noted in modeling results in **Appendix H**, new vineyard development has the potential to increase concentrations of nutrients, but the degree to which this impact was assessed is likely overestimated given the limitations of the modeling process and the fertilizer application rates specific to vineyard management and irrigation methods employed in Napa County. Never the less, excess pollutants can be toxic to fisheries as well as alter dissolved oxygen and temperature conditions in waterways that also impact fish. As noted above and in **Appendix F**, fisheries, particularly salmonids, are sensitive to changes in dissolved oxygen, high temperatures, and various pollutants.

Elevated nutrients in creeks and rivers may lead to depleted dissolved oxygen (DO) concentrations. The reduction in DO concentrations can result in sub-lethal chronic effects or be lethal to salmonids and other fish species. Loss of riparian cover can result in increased temperatures throughout the watershed and temperature loading in the lower watershed. Increased water temperatures can result in sublethal chronic effects (e.g., reduced growth, disease, predation), and even on mortality, of salmonids. Temperature loading in the lower watershed can create potential barriers to upstream migration of adult spawners. Pesticides used in the County can flush or seep into streams. The numerous negative effects of pesticides on salmonids and other aquatic species are well-known. Non-point source pollution, such as oil, grease, and other pollutants from machinery, vehicles, and other sources, can flush or seep in

streams, either directly or indirectly. Numerous studies have demonstrated the effects of such pollutants on fisheries resources and other aquatic organisms.

The County has addressed water quality impacts through the implementation of the Stormwater Management and Discharge Control Ordinance (Ordinance No. 1240) and County Conservation Regulations (Chapter 18.108 of the County Code), which requires the development of erosion control plans and associated environmental review documents under CEQA to address water quality impacts of development. As identified in **Appendix I**, the development of implementation and installation of stormwater pollution prevention measures and erosion control plans (as required under the County Conservation Regulations) has demonstrated the ability to effectively mitigate the effect of water quality impacts through the use of site specific BMPs. These BMPs are similar to BMPs typically recommended to protect fisheries (see **Appendix G**) and are summarized in **Table 4.11-2**. Additional site specific BMPs identified in **Appendix G** that provide erosion control benefits for fisheries include the use of bioengineering techniques such as the use of boulders, large woody debris and riparian vegetation along stream channels and constructed wetlands (which when used in combination with other BMPs have documented to be effective in maintaining water quality [Placer County, 2004).

Section 16.28.100 of County Code (Stormwater Management and Discharge Control Ordinance) requires the identification and use of BMPs to control the volume, rate and potential pollutant discharge from new development and redevelopment projects, existing businesses and other activity that may cause or contribute to stormwater pollution. The County currently accepts the California Stormwater Quality Association (CASQA) California Stormwater Best Management Practice Handbooks as effective standards for implementation and installation of stormwater pollution prevention measures, which provides detailed information on BMPs associated with use and design for maximum treatment effectiveness. The use of such BMPs for residential, commercial and recreational development have been demonstrated to effectively protect surface water quality. For example, the Lahontan development in Eastern Placer County (which consists of 436 single-family residential units, 18-hole golf course and supporting commercial uses and other active recreational features) has been designed with several similar BMP features used in Napa County (e.g., energy dissipaters and vegetated buffer strips) that have been determined effective in avoiding water quality impacts based on over 6 years of water quality sampling (Placer County, 2004).

Potential impacts specific to each of the three alternatives are further described below:

Alternative A

This alternative would retain the existing land use designations under the current General Plan Land Use Map as well as the policy guidance set forth under the existing General Plan. Between the year 2005 and 2030, it is projected that there would be an additional 2,235 dwelling units and 16,014,000 square feet of non-residential uses as well as between 10,000 and 12,500 acres of new vineyard development in the unincorporated portion of the County. This development could generate nutrients and contaminants in County waterways from development activities described above and result in adverse effects to fisheries. This impact would be **significant and mitigable** with the implementation of mitigation measures identified below.

Alternative B

This alternative would generally retain the existing land use designations under the current General Plan Land Use Map, similar to Alternative A. However, this alternative would provide for additional growth within currently General Plan designated areas for rural and urban development (such as within the unincorporated community of Angwin) and re-use of the Pacific Coast/Boca site and Napa Pipe site. Between the year 2005 and 2030, it is projected that there would be an additional 3,885 dwelling units and 14,636,000 square feet of non-residential uses in the unincorporated portion of the County (as noted above, vineyard development would be the same as Alternative A). In addition to the proposed land use map, Alternative B would include roadway improvements (associated with the proposed General Plan Update Circulation Element), extension of recycled water to Coombsville and Carneros, as well as policy provisions for trails and public open space (proposed Recreation and Open Space Element Objectives ROS-1, ROS-2 and ROS-3). This development could generate nutrients and contaminants in County waterways from development activities described above and result in adverse effects to fisheries. This impact would be **significant and mitigable** with the implementation of mitigation measures identified below.

Alternative C

Between the year 2005 and 2030, it is projected that there would be an additional 7,635 dwelling units and 12,990,000 square feet of non-residential uses in the unincorporated portion of the County under this alternative. Alternative C would involve some additional land use changes beyond Alternative B that would allow for additional development/redevelopment (e.g., redesignation of Napa Pipe and Pacific Coast/Boca sites, potential expansion of the rural and urban uses in Angwin and establishment of a new RUL for the City of American Canyon). However, this Alternative would have similar infrastructure and trail/recreation provisions as Alternative B. This development could generate nutrients and contaminants in County waterways from development activities described above and result in adverse effects to fisheries. This impact would be **significant and mitigable** with the implementation of mitigation measures identified below.

Mitigation Measures

Implementation Mitigation Measure MM 4.11.3b would work with MM 4.11.2a to demonstrate that BMPs would ensure water quality in compliance with applicable Basin Plans and the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bay, and Estuaries of California that would also provide protection of fisheries. Implementation of mitigation measures MM 4.11.4 (associated with the proposed ministerial process for environmentally superior vineyard development projects under Alternatives B and C) would establish performance standards that would ensure that fishery resources are not indirect or directly impacted. Also, implementation of Mitigation Measure MM 4.6.1a would require monitoring of fisheries and corrective actions for identified water quality issues. Thus, implementation of these mitigation measures as well as implementation of County Code (e.g., Conservation Regulations and Stormwater Management and Discharge Control Ordinance) would reduce this impact to **less than significant** for Alternatives A, B and C.

Hydrologic Alteration Impacts to Fisheries

Impact 4.6.3 Land use and development under the proposed General Plan Update could adversely change surface hydrologic conditions and thus indirectly result in the loss of populations or degradation of habitat for special-status fish species. (Significant and Mitigable - All Alternatives)

As identified in Impacts 4.11.7 and 4.11.8, land use and development, including vineyard and other agricultural development, under the proposed General Plan Update would result a loss of natural ground cover and an increase in impervious areas that could result in a substantial increase in surface runoff and peak discharge. Existing storm drain systems, including fish-bearing watercourses, could be incapable of accommodating increased flows, potentially resulting in alteration of channel conditions from flooding events. Such events could result in: (a) scouring out channels, thereby suffocating salmonid eggs, alevins, and fry; (2) displacing fish, as flooding results in creeks overtopping the creek banks; and (3) harming fish later when oils, grease, and other pollutants from flooded streets, and other areas, flow or seep in the creeks.

Potential impacts specific to each of the three alternatives are further described below:

Alternative A

This alternative would retain the existing land use designations under the current General Plan Land Use Map as well as the policy guidance set forth under the existing General Plan. Between the year 2005 and 2030, it is projected that there would be an additional 2,235 dwelling units and 16,014,000 square feet of non-residential uses under Alternative A. As noted above, new vineyard development by year 2030 under Alternative A is anticipated to range from 10,000 and 12,500 acres, which does not include growth of other agricultural activities. In addition, other resource extraction activities (e.g., timber harvesting and mineral extraction) could also occur in the County by 2030. These activities (as noted above) would result in drainage impacts from the alteration of drainage patterns and features that could impact fisheries and associated habitat in County waterways. This impact would be considered **significant and mitigable** and would require the implementation of mitigation measures identified below.

Alternative B

This alternative would have similar land use patterns as Alternative A. However, this alternative would provide for additional growth within currently General Plan designated areas for rural and urban development. Between the year 2005 and 2030, it is projected that there would be an additional 3,885 dwelling units and 14,636,000 square feet of non-residential uses in the unincorporated portion of the County (as noted above, vineyard development would be the same as Alternative A). Alternative B would include the same opportunity for agricultural and other resource extraction activities as Alternative A. In addition to the proposed land use map, Alternative B would include roadway improvements (associated with the proposed General Plan Update Circulation Element), extension of recycled water to Coombsville and Carneros, as well as policy provisions for trails and public open space (proposed Recreation and Open Space Element Objectives ROS-1, ROS-2 and ROS-3). These activities (as noted above) would result in drainage impacts from the alteration of drainage patterns and features that could impact fisheries and associated habitat in County waterways. This impact would be considered **significant and mitigable** and would require the implementation of mitigation measures identified below.

Alternative C

Alternative C would involve some additional land use changes beyond Alternative B that would allow for additional development/redevelopment (e.g., redesignation of Napa Pipe and Pacific Coast/Boca sites, potential expansion of the rural and urban uses in Angwin and establishment of a new RUL for the City of American Canyon). Alternative C would include the same opportunity for agricultural and other resource extraction activities as Alternative A. Alternative C would include roadway improvements (associated with the proposed General Plan Update Circulation Element), extension of recycled water to Coombsville and Carneros, as well as policy provisions for trails and public open space (proposed Recreation and Open Space Element Objectives ROS-1, ROS-2 and ROS-3). These activities (as noted above) would result in drainage impacts from the alteration of drainage patterns and features that could impact fisheries and associated habitat in County waterways. This impact would be considered **significant and mitigable** and would require the implementation of mitigation measures identified below.

Mitigation Measures

Implementation of Mitigation Measure MM 4.11.3a and MM 4.11.3b would ensure no increase scour events along waterways by requiring the retention of pre-development peak flow conditions when scour events occur, while implementation of Mitigation Measure MM 4.11.9 would ensure that subsequent land uses under the General Plan Update would not result in new or increased flood impacts. Implementation of this mitigation measure would reduce this impact to **less than significant** for all alternatives.

Groundwater Interactions With Surface Water Flows

Impact 4.6.4 Land use and development under the proposed General Plan Update could result in localized groundwater drawdowns that could impact surface water flows and groundwater interflow that provide necessary habitat for fisheries. (Significant and Mitigable - All Alternatives)

As described under Impact 4.11.5, land use and development, including vineyard and agricultural development, under the proposed General Plan Update could result in depletion of groundwater levels that could result in decreasing or eliminating stream baseflows. Hydrologic modeling results show most evaluation areas with decreases in groundwater discharge to the channel network (baseflow), while in the Berryessa and Suisun areas, baseflow increased (see **Appendix H**). In general, groundwater recharge and pumping for irrigation and residential consumption were identified to increase. The changes in groundwater recharge and groundwater pumping relative to current conditions indicate groundwater recharge generally increased, however these increases would not keep pace with the associated increases in groundwater pumping, and thus could result in changes in groundwater discharge (interflow) to surface waters. Loss of stream baseflow could result in loss of intragravel flows to spawning beds in spring and adversely direct egg mortality; increases in temperature; reduction in flows that reduce summer rearing habitat, and localized water elevation changes that create barriers to intra-watershed movement and/or migration to and from Napa County watersheds.

Potential impacts specific to each of the three alternatives are further described below:

Alternative A

This alternative would retain the existing land use designations under the current General Plan Land Use Map as well as the policy guidance set forth under the existing General Plan. Between the year 2005 and 2030, it is projected that there would be an additional 2,235 dwelling units and 16,014,000 square feet of non-residential uses as well as between 10,000 and 12,500 acres of new vineyard development in the unincorporated portion of the County. This development would contribute to further demand for groundwater supply that could impact surface water flows that provide habitat for fisheries. This impact would be **significant and mitigable** and would require the implementation of mitigation measures identified below.

Alternative B

As identified in Section 3.0 (Project Description), this alternative would generally retain the existing land use designations under the current General Plan Land Use Map similar to Alternative A. However, this alternative would provide for additional growth within currently General Plan designated areas for rural and urban development (such as within the unincorporated community of Angwin) as well as re-use of the Pacific Coast/Boca site and Napa Pipe site. Between the year 2005 and 2030, it is projected that there would be an additional 3,885 dwelling units and 14,636,000 square feet of non-residential uses in the unincorporated portion of the County (as noted above, vineyard development would be the same as Alternative A). However, Alternative B would include the extension of recycled water to Coombsville and Carneros for vineyard use, which would consist of approximately 2,000 acre-feet annually. This would reduce groundwater demands in these areas from vineyard development in year 2030. This development would contribute to further demand for groundwater supply that could impact surface water flows that provide habitat for fisheries. This impact would be **significant and mitigable** and would require the implementation of mitigation measures identified below.

Alternative C

Between the year 2005 and 2030, it is projected that there would be an additional 7,635 dwelling units and 12,990,000 square feet of non-residential uses in the unincorporated portion of the County under this alternative. Alternative C would involve some additional land use changes beyond Alternative B that would allow for additional development/redevelopment (e.g., redesignation of Napa Pipe and Pacific Coast/Boca sites, potential expansion of the rural and urban uses in Angwin and establishment of a new RUL for the City of American Canyon). However, this Alternative also include the use of recycled water for vineyards Coombsville and Carneros similar to Alternative B. This development would contribute to further demand for groundwater supply that could impact surface water flows that provide habitat for fisheries. This impact would be **significant and mitigable** and would require the implementation of mitigation measures identified below.

Mitigation Measures

Implementation of Mitigation Measure MM 4.11.5e would require demonstration of no substantial reductions in groundwater discharge to surface waters that would alter critical flows to sustain riparian habitat and fisheries. Thus, implementation of this mitigation measure and MM 4.11.4 would reduce this impact to **less than significant** for all alternatives.

Direct Impacts to Habitat

Impact 4.6.5 Land use and development [direct physical construction] under the proposed General Plan Update could adversely affect riparian vegetation, rearing, and spawning habitat and thus indirectly result in the loss of populations or degradation of habitat for special-status fish species. (Significant and Mitigable - All Alternatives)

Construction consistent with development proposed under the General Plan Update could require the crossing of streams or incursion into riparian habitats adjacent to streams, resulting in direct loss or degradation of aquatic habitats and/or adjacent riparian vegetation (the reader is referred to Section 4.5 [Biological Resources] for further details regarding riparian habitat loss). Loss of riparian habitat adjacent to stream channels can result in increased water temperatures (see Impact 4.6.1 above); loss of instream rearing habitat features, such as woody debris and gravels; and loss of food resources that feed on detrital inputs (i.e. leaf litter). Any net loss of these sensitive natural communities, designated by the Department of Fish and Game, would constitute a significant impact.

Potential impacts specific to each of the three alternatives are further described below:

Alternative A

As identified in Section 3.0 (Project Description), this alternative would retain the existing land use designations under the current General Plan Land Use Map as well as the policy guidance set forth under the existing General Plan. As noted above, new vineyard development by year 2030 under Alternative A is anticipated to range from 10,000 and 12,500 acres, which does not include growth of other agricultural activities. In addition to agricultural operations, other resource extraction activities (e.g., timber harvesting and mineral extraction) could also occur in the County by 2030. As noted above, these activities could result in the loss of riparian habitat as well as loss of instream rearing habitat features (the reader is referred to Section 4.5 [Biological Resources] for further details regarding riparian habitat loss). This impact would be considered **significant and mitigable** and would require the implementation of mitigation measures identified below.

Alternative B

This alternative would generally retain the existing land use designations under the current General Plan Land Use Map, similar to Alternative A. However, this alternative would provide for additional growth within currently General Plan designated areas for rural and urban development (such as within the unincorporated community of Angwin) and re-use of the Pacific Coast/Boca site and Napa Pipe site. Between the year 2005 and 2030, it is projected that there would be an additional 3,885 dwelling units and 14,636,000 square feet of non-residential uses in the unincorporated portion of the County (as noted above, vineyard development would be the same as Alternative A). In addition to the proposed land use map, Alternative B would include roadway improvements (associated with the proposed General Plan Update Circulation Element), extension of recycled water to Coombsville and Carneros, as well as policy provisions for trails and public open space (proposed Recreation and Open Space Element Objectives ROS-1, ROS-2 and ROS-3). As noted above, these activities could result in the loss of riparian habitat as well as loss of instream rearing habitat features (the reader is referred to Section 4.5 [Biological Resources] for further details regarding riparian habitat loss). This impact would be considered **significant and mitigable** and would require the implementation of mitigation measures identified below.

Alternative C

Between the year 2005 and 2030, it is projected that there would be an additional 7,635 dwelling units and 12,990,000 square feet of non-residential uses in the unincorporated portion of the County under this alternative. Alternative C would involve some additional land use changes beyond Alternative B that would allow for additional development/redevelopment (e.g., redesignation of Napa Pipe and Pacific Coast/Boca sites, potential expansion of the rural and urban uses in Angwin and establishment of a new RUL for the City of American Canyon). However, this Alternative would have similar infrastructure and trail/recreation provisions as Alternative B. As noted above, these activities could result in the loss of riparian habitat as well as loss of instream rearing habitat features (the reader is referred to Section 4.5 [Biological Resources] for further details regarding riparian habitat loss). This impact would be considered **significant and mitigable** and would require the implementation of mitigation measures identified below.

Mitigation Measures

The following mitigation measures would apply to all three alternatives:

MM 4.6.5a The County shall provide a policy in the General Plan that requires the County to modify County Code or establish an ordinance that prohibits the removal of riparian vegetation and ensures the restoration of historic riparian vegetation where feasible for projects requiring discretionary approval. The County shall develop a stream program in coordination with Regional Water Quality Control Boards, California Department of Fish and Game, U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration National Marine Fisheries Service and other coordinating resource agencies that identifies essential stream and stream reaches necessary for the health of populations of native fisheries and other sensitive aquatic organisms within the County's watersheds. Where avoidance of impacts to riparian habitat is infeasible along stream reaches, appropriate measures will be undertaken to ensure that protection, restoration and enhancement activities will occur within these identified stream reaches that support or could support native fisheries and other sensitive aquatic organisms to ensure a no net loss of aquatic habitat functions and values within the county's watersheds.

MM 4.6.5b The County shall provide a policy in the General Plan that requires the County to develop CEQA standards that require disclosure of gravel removal that results in adverse effects to native fisheries during project review. The County shall require mitigation that results in no net adverse effects to stream bed attributes necessary for native fisheries health. This may include restoration and improvement of impacted habitat areas (e.g., gravel areas and pools woody debris areas).

MM 4.6.5c The County shall provide a policy in the General Plan that requires the County to modify County Code or establish an ordinance that prohibits construction activities within the channel of any waterway identified (based on information in the BDR and **Appendix G** of the DEIR) to contain existing or potential spawning habitat for special-status fish species during limited time periods of spawning activities.

Implementation of the above mitigation measures would ensure that potential direct impacts to fish habitat is mitigated to no net loss and that construction activities avoid spawning periods. Thus, implementation of the above mitigation measures would reduce this impact to **less than significant** for all alternatives.

Interfere Substantially with Movement or Migratory Corridors

Impact 4.6.6 Land use and development under the proposed General Plan Update could adversely affect fish migration and thus directly result in the loss of populations or degradation habitat for special-status fish species. (Significant and Mitigable - All Alternatives)

Water diversions (whether surface or groundwater) as well as drainage improvements and roadway crossing can result in creating barriers to anadromous fish migration to spawning and rearing areas, reduce or eliminate salmonid habitat and food resources (e.g., insects), and increase water temperatures. Additionally, stream crossings associated with development near streams can impede fish movement and migration if not properly designed. All of these impacts could result in restricting fisheries resources populations and, hence, have significantly negative impacts on the populations.

Typical BMPs associated with mitigating fish barrier issues are identified in **Appendix G**.

Potential impacts specific to each of the three alternatives are further described below:

Alternative A

As identified in Section 3.0 (Project Description), this alternative would retain the existing land use designations under the current General Plan Land Use Map as well as the policy guidance set forth under the existing General Plan. As noted above, new vineyard development by year 2030 under Alternative A is anticipated to range from 10,000 and 12,500 acres, which does not include growth of other agricultural activities. In addition to agricultural operations, other resource extraction activities (e.g., timber harvesting and mineral extraction) could also occur in the County by 2030. As noted above, these activities could result in the creation of barriers for fish passage. This impact would be considered **significant and mitigable** and would require the implementation of mitigation measures identified below.

Alternative B

This alternative would generally retain the existing land use designations under the current General Plan Land Use Map, similar to Alternative A. However, this alternative would provide for additional growth within currently General Plan designated areas for rural and urban development (such as within the unincorporated community of Angwin) and re-use of the Pacific Coast/Boca site and Napa Pipe site. Between the year 2005 and 2030, it is projected that there would be an additional 3,885 dwelling units and 14,636,000 square feet of non-residential uses in the unincorporated portion of the County (as noted above, vineyard development would be the same as Alternative A). In addition to the proposed land use map, Alternative B would include roadway improvements (associated with the proposed General Plan Update Circulation Element), extension of recycled water to Coombsville and Carneros, as well as policy provisions for trails and public open space (proposed Recreation and Open Space Element Objectives ROS-1, ROS-2 and ROS-3). As noted above, these activities could result in the creation of barriers for fish passage. This impact would be considered **significant and mitigable** and would require the implementation of mitigation measures identified below.

Alternative C

Between the year 2005 and 2030, it is projected that there would be an additional 7,635 dwelling units and 12,990,000 square feet of non-residential uses in the unincorporated portion of the County under this alternative. Alternative C would involve some additional land use changes beyond Alternative B that would allow for additional development/redevelopment (e.g., redesignation of Napa Pipe and Pacific Coast/Boca sites, potential expansion of the rural and urban uses in Angwin and establishment of a new RUL for the City of American Canyon). However, this Alternative would have similar infrastructure and trail/recreation provisions as Alternative B. As noted above, these activities could result in the creation of barriers for fish passage. This impact would be considered **significant and mitigable** and would require the implementation of mitigation measures identified below.

Mitigation Measures

The following mitigation measure would apply to all three alternatives:

MM 4.6.6 The County shall provide a policy in the General Plan that requires that subsequent development activities and roadway improvements not directly disturb the bed and bank of any waterway known or suspected to contain fishery resources to the maximum extent feasible. If avoidance is determined to be infeasible by the County, then BMPs and/or habitat restoration shall be shall be incorporated (in consultation with California Department of Fish and Game, U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration National Marine Fisheries Service) into the project design that demonstrates no adverse impacts to fishery resources and allows for fish passage.

Implementation of the above mitigation measure and associated BMPs (see Appendix G) would ensure fish barriers are avoided. Thus, this impact would be mitigated to **less than significant** for all alternatives.

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