

3.4 FISHERIES RESOURCES

This section describes the existing environmental and regulatory setting as it relates to fisheries resources in the Alexander Valley reach of the Russian River. It also discloses, analyzes, and mitigates the project's potential environmental impacts on fisheries resources.

Water quality, hydrology, and geomorphology are addressed in Section 3.2, "Geomorphology, Hydrology and Water Quality." Biological resources are addressed in Section 3.3, "Vegetation and Wildlife."

The Russian River has been the subject of many biological studies, and this evaluation builds on the existing scientific knowledge of fisheries and aquatic resources in the study area. Information described below is based on this collection of existing data and studies, including the following documents:

- Upper Russian River Steelhead Distribution Study (SCWA 2003);
- Biological Opinion for Issuance of a 404 Permit for Instream Mining in the Russian River by DeWitt Sand and Gravel (NMFS 2003);
- annual versions of the Stream Inventory Report for the Russian River, Lower Alexander Valley, California (Syar 2003, 2004, 2005a);
- Russian River Biological Assessment (ENTRIX 2004);
- Sediment Removal from Freshwater Salmonid Habitat: Guidelines to NOAA Fisheries Staff for the Evaluation of Sediment Removal Actions from California Streams (NOAA 2004);
- Biological Assessment for Listed Salmonids that may be Affected by Syar Industries Inc.'s Sand and Gravel Extraction in the Alexander Valley Reach of the Russian River, Sonoma County, CA (Syar 2006); and
- Russian River—Alexander Valley River Enhancement Plan for Syar Industries Reach (Gill Creek Confluence to Jimtown Bridge) (Syar 2008).

A. Setting

REGIONAL SETTING

Aquatic habitats and fisheries resources in the region are found in the Russian River and tributaries. These habitats and the associated aquatic community are described below.

Russian River

The Russian River drains approximately 1,485 square miles in Mendocino and Sonoma Counties and is approximately 110 miles long. Numerous tributaries in the watershed drain the surrounding mountains and flow into the flat, alluvial valleys of the upper and middle river. The Russian River provides wildlife and fish habitat, many recreational use areas, and a drinking water supply. Sonoma County Water Agency (SCWA) and several cities and unincorporated communities divert drinking water from the river. Residents and vacationers swim, canoe, and fish along the river in many areas.

The Russian River is affected by numerous natural and human-caused influences. Runoff patterns closely follow winter rains because the watershed lacks a snowpack to sustain a baseflow. River flow is also controlled by impoundments at Lake Mendocino and Lake Sonoma. Releases from these reservoirs strongly influence river hydrology, temperature, and the composition of the riverine aquatic community. Treated wastewater discharges, gravel mining, summer dams, water diversions, septic system discharges, and urban and agricultural runoff also influence the river.

Historically, steelhead trout (*Oncorhynchus mykiss*) and coho salmon (*O. kisutch*) spawned and juveniles reared in much of the mainstem Russian River. Currently, many species of introduced and native warmwater fish reside in the river year round, whereas coldwater fish (e.g., steelhead and coho salmon) occur primarily as migrants between the ocean and spawning areas in tributaries. In recent years, Chinook salmon (*O. tshawytscha*) have established a consistent run (at least 1,500 adults in 2000 and 2001, 5,466 adults in 2002) (ENTRIX 2004) and spawn in areas in the mainstem above Asti. Steelhead have been observed spawning and rearing in the mainstem as far downstream as Healdsburg (SCWA 2003, ENTRIX 2004). Coho salmon are generally thought to inhabit tributary streams on the Russian River downstream of the study area. Few individuals are thought to use the upper portions of the Russian River (including the Alexander Valley Reach) or its tributaries (Syar 2006, SRC 2006). Steelhead and Chinook salmon in the Russian River watershed are federally listed as threatened. Coho salmon in the Russian River watershed are federally and state listed as endangered.

LOCAL SETTING

Aquatic habitats and fisheries resources in the study area are found in the Alexander Valley reach of the Russian River. Aquatic habitats and the fish community are described below.

Russian River—Alexander Valley Reach

Aquatic Habitats

The Alexander Valley reach extends from the confluence of Big Sulphur Creek near Cloverdale (approximately 8.5 miles upstream of the study area) to the Alexander Valley Road (Jimtown) Bridge (approximately 1.5 miles downstream of the study area). The study area includes approximately 6.5 miles of river (upstream bar to downstream bar) and is at the southern extent of the Alexander Valley. Land use along the reach consists of agricultural land (vineyard) outside of the riparian zone and occasional aggregate mining along the gravel bars. Elevation throughout the Alexander Valley ranges from 190 feet to 295 feet representing an approximate reachwide average gradient of 1.15%.

The Alexander Valley reach consists of a slow-moving meandering river in a broad channel with large exposed gravel bars and dense riparian vegetation along the outer banks. Results of a survey conducted in 2003 showed that flatwater (e.g., glides and runs) is the dominant flow habitat and consists of approximately 62% of the reach (Syar 2004, 2006). Pool habitat with depths ranging from 4.3 to 11.2 feet consisted of approximately 26% of the reach. Riffle habitats tended to occur at meander crossovers and made up approximately 12% of the reach length (Syar 2004).

Sediment grain sizes vary depending on the type of flow habitat. Pools tend to contain small grain sizes (e.g., sand and small gravel); flatwater tends to contain gravel and small cobble; and riffles tend to contain a mix of larger gravel to large cobble. Gravels and cobbles in riffles have

been observed to have high potential for salmonid spawning and egg incubation success (based on low embeddedness¹ values) (Syar 2004, 2006).

Summer water temperatures in the study area in 2003 were generally in the 20 degrees Celsius (°C) to 25°C range. The warmest period occurred in mid-July when temperatures rose to above 26°C (Syar 2004, 2006). These high temperatures result in substantially limited habitat values during summer months for cold-water species, including anadromous salmonids.

Shaded riverine aquatic (SRA) vegetation and instream tree and shrub debris provide important fish habitat. SRA habitat is defined as the nearshore aquatic habitat occurring at the interface between a river and adjacent woody riparian habitat. The principal attributes of this cover type are (1) an adjacent bank composed of natural, eroding substrates supporting riparian vegetation that either overhang or protrude into the water; and (2) water that contains variable amounts of woody debris, such as leaves, logs, branches, and roots and has variable depths, velocities, and currents. Riparian habitat provides structure (through SRA habitat) and food for fish species. Shade decreases water temperatures, while low overhanging branches can provide sources of food by attracting terrestrial insects. As riparian areas mature, the vegetation sloughs off into the rivers, creating structurally complex habitat consisting of large woody debris (LWD) that furnishes refugia from predators, creates higher water velocities, and provides habitat for aquatic invertebrates. For these reasons, many fish species are attracted to SRA habitat.

Seasonal Habitat Use

The use by fish species of different habitats within the study area is influenced by variations in habitat conditions, each species' habitat requirements, life history timing, and daily and seasonal movements and behavior. The study area contains nearly the full range of habitats preferred by anadromous salmonids including adult migration, holding, and spawning habitat; seasonal juvenile rearing habitat (temperature limited); edgewater with SRA habitat; and high-flow floodplain and backwater refugia. The only exception is mid-summer/early fall rearing habitat, which is nearly nonexistent because of high water temperatures.

In general, the Alexander Valley reach of the Russian River provides (Syar 2006, SRC 2006):

- a fall/winter migration route for adult Chinook salmon and steelhead;
- suitable spawning habitat for adult anadromous salmonids, especially Chinook salmon;
- migration route for juvenile Chinook salmon and steelhead;
- spring rearing habitat for juvenile Chinook salmon and steelhead;
- very limited summer rearing habitat for juvenile steelhead; and
- little to no habitat for coho salmon (this species generally occurs downstream).

Fish Community

The fish composition of the Alexander Valley reach contains several native and nonnative fish species common in the Russian River (SCWA 2003, ENTRIX 2004). Summer temperatures in

¹ Embeddedness is the degree to which rocks (gravel, cobble, and boulders) are covered or sunken into fine sediment in the river bottom. Generally, as rocks become embedded, the surface area available to macroinvertebrates and fish (shelter, spawning, and egg incubation) is decreased.

the Alexander Valley reach of the Russian River often exceed optimal ranges for cold-water species (steelhead trout, Chinook salmon, and coho salmon) and sometimes reach lethal levels (Winzler and Kelly 1978). However, the cooler water released from Lake Sonoma into Dry Creek produces an average 4°C decrease in the temperature of the Russian River below the Dry Creek confluence (ENTRIX 2004), approximately 18 miles downriver from the lowermost extent of the study area. This reduction in temperature in the mainstem presumably increases the probability of successful steelhead and salmon spawning and rearing downstream of the study area in the vicinity of the confluence (and for some further distance downstream).

Because of the elevated water temperatures in the summer, the Alexander Valley reach of the Russian River provides ideal habitat for many native and nonnative warmwater fish species and poor habitat for coldwater fishes for at least five months of each year (Roth et al. 1995, ENTRIX 2004). Warmwater fish species that occupy habitats in the river throughout the year include native species, such as Sacramento sucker (*Catostomus occidentalis*), hardhead (*Mylopharodon conocephalus*), Sacramento pikeminnow (*Ptychocheilus grandis*), Sacramento blackfish (*Orthodon microlepidotus*), Russian River tule perch (*Hysterothorax traskii pomo*), and Navarro roach (*Lavinia symmetricus navarroensis*). Introduced nonnative, warmwater species include carp (*Cyprinus carpio*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*M. salmoides*), bluegill (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), and several species of catfish (*Ictalurus* spp. and *Ameiurus* spp.).

Special-Status Fish Species

Special-status fish species are legally protected or otherwise considered sensitive by federal, state, or local resource conservation agencies and organizations. Special-status fish species addressed in this section include:

- species listed as threatened or endangered under the California Endangered Species Act (CESA) or federal Endangered Species Act (ESA);
- species identified by the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), or California Department of Fish and Game (DFG) as species of special concern; and
- species fully protected in California under the California Fish and Game Code.

A total of seven special-status fish species occur or have the potential to occur in the Alexander Valley reach of the Russian River and are described below (see Table 3.4-1). Of these species, Central California Coast coho salmon evolutionarily significant unit (ESU), California Coastal Chinook salmon ESU, and Central California Coast steelhead distinct population segment (DPS) are federally listed as threatened or endangered species. The four remaining species—Navarro roach, hardhead, river lamprey (*Lampetra ayresi*), and Russian River tule perch (*Hysterothorax traskii pomo*)—are considered species of special concern by DFG and/or federal species of concern by USFWS or NMFS.

Brief descriptions for federally and/or state-listed fish species are provided below. Table 3.4-2 presents the life history, timing, and distributions of life stages for these species in the Alexander Valley reach of the Russian River.

Central California Coast Coho Salmon ESU

The Central California Coast coho salmon ESU was listed as a threatened species on October 31, 1996 (61 *Federal Register* [FR] 56138) and downgraded to endangered on June 28, 2005 (70 FR 37160). The ESU includes all naturally spawned populations of coho salmon from Punta Gorda in northern California south to and including the San Lorenzo River in central California, as well as populations in tributaries to San Francisco Bay, excluding the Sacramento–San Joaquin River system. Critical habitat for coho was designated on May 5, 1999 (64 FR 24049). Critical habitat is designated to include the portions of the Russian River within the study area.

**Table 3.4-1
 Special-Status Fish Species Potentially Occurring in the
 Alexander Valley Reach of the Russian River**

Species	Status ¹			Habitat	Likelihood of Occurrence
	USFWS	DFG	NMFS		
Coho Salmon, Central California Coast <i>Oncorhynchus kisutch</i>	–	CE	FE	High-quality, cool, perennial streams with clean, well-aerated gravel beds for spawning. Deep pools or glides with submerged root wads, downed woody debris, or other cover for juvenile rearing.	Low; Coho are not known to inhabit the Russian River within or upstream of the study area.
Chinook Salmon, California Coastal <i>Oncorhynchus tshawytscha</i>	–	–	FT	High-quality, cool, perennial rivers and larger coastal streams with clean, well-aerated gravel beds for spawning, deeper and larger gravel beds than needed for coho salmon or steelhead.	High; Adult migration, spawning, rearing (limited due to summer temperatures), and emigration life stages occur at or above the study area.
Steelhead, Central California Coast <i>Oncorhynchus mykiss</i>	–	–	FT	High-quality, cool, perennial streams with clean, well-aerated gravel beds for spawning, often in steep, rocky reaches of upper tributaries, as well as in broad riffles in larger rivers.	High; Adult migration, spawning, rearing (limited due to summer temperatures), and emigration life stages occur at or above the study area.
Russian River tule perch <i>Hysteroecarpus traskii pomo</i>	–	CSC	–	Low-elevation freshwater streams. Emergent plants or overhanging banks or tree root wads for feeding, shelter, spawning, and rearing–livebearers.	High; waters in the study area provide foraging, holding, and spawning habitat.

**Table 3.4-1
 Special-Status Fish Species Potentially Occurring in the
 Alexander Valley Reach of the Russian River**

Species	Status ¹			Habitat	Likelihood of Occurrence
	USFWS	DFG	NMFS		
Navarro roach <i>Lavinia symmetricus navarroensis</i>	–	CSC	–	Wide variety of river and stream habitat in Russian River watershed; broad tolerance of water quality conditions. Well-aerated gravel or emergent vegetation in flowing water for spawning.	High; waters in the study area provide foraging, holding, and spawning habitat.
Hardhead <i>Mylopharodon conocephalus</i>	–	CSC	–	Clear, high-quality streams with large, deep, rock- or sand-bottom pools. Clean gravel riffles for spawning.	High; waters in the study area provide foraging, holding, and spawning habitat.
River lamprey <i>Lampetra ayresi</i>	–	CSC	–	Cool, high-quality perennial streams for spawning and larval rearing. Clean, well-aerated gravel beds for spawning. Soft-bottom pools with abundant silt and detritus for larval rearing.	Uncertain; waters in the study area provide foraging, holding, and spawning habitat for river lamprey; however, use by this species is not well documented.

Notes:
 DFG = California Department of Fish and Game; NMFS = National Marine Fisheries Service; USFWS = U.S. Fish and Wildlife Service

¹ Legal Status Definitions
USFWS and NMFS:
 FT = Federal Threatened
 FE = Federal Endangered

DFG:
 CE = State Endangered
 CSC = Species of Special Concern

Sources: USFWS 2009, Bunnell 1999; data compiled by AECOM in 2009

The coho salmon has a relatively fixed 3-year life cycle. The best available information suggests that life-history stages occur during times shown in Table 3.4-2 (Chase et al. 2000, 2001, 2002; Moyle 2002; Moyle et al. 1995; Steiner Environmental Consulting 1996). Most coho salmon enter the Russian River in November and December and spawn in December and January. Spawning and rearing occur primarily in tributaries to the lower Russian River. The most upstream tributaries with coho salmon populations included Forsythe, Mariposa, Rocky, Fisher, and Corral Creeks, but coho salmon have not been found in these streams in recent years (ENTRIX 2004). The Alexander Valley reach of the river (including the study area) would likely

only serve as a passage corridor between the ocean and any potential upstream tributary habitat.

After hatching, young coho salmon spend approximately 1 year in freshwater before they become smolts (undergo a physiological change for adaptation to seawater) and migrate to the ocean. Freshwater habitat requirements for coho salmon rearing include adequate cover, food supply, and suitable water temperatures. Primary habitat for coho salmon includes pools with extensive cover. Outmigration takes place in late winter and spring. Coho salmon live in the ocean for a year and a half, return as 3-year-olds to spawn, and then die. The factors most limiting to juvenile coho salmon production are not completely understood, but may include high water temperatures, poor summer and winter habitat quality, and predation (ENTRIX 2004).

**Table 3.4-2
 Life History, Timing, and Distributions of Fish Species Life Stages
 in the Alexander Valley Reach of the Russian River**

LIFE STAGE/LOCATION	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL ¹	AUG ¹	SEP ¹
Chinook Salmon												
Upstream Migration	■	■	■	■								
Spawning					■	■	■	■	■	■	■	■
Incubation			■	■	■	■	■	■	■	■	■	■
Emergence		■	■	■	■	■	■	■	■	■	■	■
Juvenile Rearing				■	■	■	■	■	■	■	■	■
Smolt Emigration					■	■	■	■	■	■	■	■
Coho Salmon												
Upstream Migration		■	■	■	■	■	■	■	■	■	■	■
Spawning					■	■	■	■	■	■	■	■
Incubation		■	■	■	■	■	■	■	■	■	■	■
Emergence			■	■	■	■	■	■	■	■	■	■
Juvenile Rearing	■	■	■	■	■	■	■	■	■	■	■	■
Smolt Emigration				■	■	■	■	■	■	■	■	■
Steelhead Trout												
Upstream Migration		■	■	■	■	■	■	■	■	■	■	■
Spawning			■	■	■	■	■	■	■	■	■	■
Incubation					■	■	■	■	■	■	■	■
Emergence				■	■	■	■	■	■	■	■	■
Juvenile Rearing	■	■	■	■	■	■	■	■	■	■	■	■
Smolt Emigration			■	■	■	■	■	■	■	■	■	■
■ period of occurrence.												
¹ Juvenile rearing is temperature limited during summer months.												
Sources: ENTRIX 2004; SCWA 2003; Chase et al. 2000, 2001, 2002												

California Coastal Chinook Salmon ESU

California Coastal Chinook salmon ESU was listed as a threatened species on September 16, 1999 (64 FR 50394). The ESU includes all naturally spawned populations of Chinook salmon from rivers and streams south of the Klamath River to the Russian River, California. Critical habitat for Chinook salmon was designated on September 2, 2005 (70 FR 52487). Critical habitat is designated to include the portions of the Russian River within the study area.

Adult Chinook salmon begin returning to the Russian River as early as late August, but most upstream migration occurs in October and November (Chase et al. 2001, 2002). Chinook salmon may continue to enter the river through December and spawn into January (Table 3.4-2). Adult Chinook salmon migrate upstream to their spawning habitat, located primarily in the mainstem Russian River above Asti and in selected tributaries such as Dry Creek.

Unlike coho salmon and steelhead, the young Chinook salmon begin their outmigration soon after emerging from the gravel. Freshwater residence in coastal California stocks, including outmigration, usually ranges from 2 to 4 months. Juvenile Chinook salmon in the Russian River emigrate as fingerlings from late February through June.

Ocean residence can be from 1 to 7 years, but most Chinook salmon return to the Russian River as 2- to 4-year-old adults. Like coho salmon, Chinook salmon die soon after spawning.

Central California Coast Steelhead DPS

The Central California Coast steelhead DPS was listed as a threatened species on August 18, 1997 (62 FR 43937). The DPS includes all naturally spawned populations of steelhead (and their progeny) in California streams from the Russian River to Aptos Creek, and the drainages of San Francisco and San Pablo Bays eastward to the Napa River (inclusive), excluding the Sacramento–San Joaquin River Basin. Critical habitat for steelhead was designated on September 2, 2005 (70 FR 52487). Critical habitat is designated to include the portions of the Russian River within the study area.

Unlike coho salmon, steelhead do not have a fixed 3-year life cycle. Steelhead spend 1–2 years in the ocean before returning to spawn for the first time, and may return to the ocean and spawn again in a later year. Adult steelhead generally begin returning to the Russian River with the first heavy rains of the season in November or December, and continue to migrate upstream into March or April. The peak migration period tends to be January through March (see Table 3.4-2). Flow conditions are suitable for upstream migration in most of the Russian River and larger tributaries during most of the spawning period in most years. Sandbars blocking the river mouth in some years may delay entry into the river. However, when the sandbar is closed, the flow may be too low and water temperature too high to provide suitable conditions for migrating adults farther up the river (ENTRIX 2004).

Most steelhead spawning takes place from January through April, depending on the time of freshwater entry (Table 3.4-2). Steelhead spawn and rear in tributaries from Jenner Creek near the mouth to upper basin streams. After hatching, steelhead usually spend 2 years in freshwater, but can spend 1–4 years. Fry and juvenile steelhead are extremely adaptable in their habitat selection. Requirements for steelhead rearing include adequate cover, food supply, and suitable water temperatures. The mainstem above Cloverdale and upper reaches of the tributaries provide the most suitable habitat; these areas generally have excellent cover, adequate food supply, and suitable water temperatures for fry and juvenile rearing. The lower reaches of some tributaries provide less cover; these streams are often wide and shallow, have

little riparian vegetation, and water temperatures are often too warm to support steelhead (ENTRIX 2004). Distribution of steelhead correlates with water temperatures (SCWA 2003). The highest temperatures occurred in the Alexander Valley and Healdsburg reaches (25°C and 24°C, respectively).

Emigration usually occurs between February and June, depending on flow and water temperatures. Sufficient flow is required to cue smolt downstream migration (ENTRIX 2004). Excessively high water temperatures in late spring may inhibit smoltification in late migrants.

B. Regulatory Framework

FEDERAL REGULATORY ISSUES

Federal Endangered Species Act

Pursuant to the ESA, USFWS and NMFS have authority over projects that may result in take of a species federally listed as threatened or endangered. A description of the ESA is provided in the “Regulatory Framework” discussion in Section 3.3, “Vegetation and Wildlife.”

Sustainable Fisheries Act

In response to growing concern about the status of U.S. fisheries, Congress passed the Sustainable Fisheries Act of 1996 (Public Law [PL] 104-297) to amend the Magnuson-Stevens Fishery Conservation and Management Act (PL 94-265), the primary law governing marine fisheries management in the federal waters of the United States. Under the Sustainable Fisheries Act, consultation is required by NMFS on any activity that might adversely affect essential fish habitat (EFH). EFH includes those habitats that fish rely on throughout their life cycles. It encompasses habitats necessary to allow sufficient production of commercially valuable aquatic species to support a long-term sustainable fishery and contribute to a healthy ecosystem. The Russian River has been designated as EFH for Pacific salmon.

Section 404 of the Clean Water Act

Section 404 of the federal Clean Water Act (CWA) establishes a requirement for a project applicant to obtain a permit before engaging in any activity that involves any discharge of dredged or fill material into “waters of the United States,” including wetlands. A description of Section 404 is provided in the “Regulatory Framework” discussion in Section 3.3, “Vegetation and Wildlife.”

Section 401 of the Clean Water Act

CWA Section 401(a)(1) specifies that any applicant for a federal license or permit to conduct any activity that may result in any discharge into navigable waters shall provide the federal licensing or permitting agency with a certification that any such discharge will not violate state water quality standards. The regional water quality control boards administer the Section 401 program with the intent of prescribing measures for projects that are necessary to avoid, minimize, and mitigate adverse impacts on water quality and ecosystems. The project would require a Section 401 permit from the North Coast Regional Water Quality Control Board.

STATE REGULATORY ISSUES

California Endangered Species Act

Pursuant to the CESA and Section 2081 of the California Fish and Game Code, a permit from DFG is required for projects that could result in the take of a state-listed threatened or endangered species. A description of the CESA is provided in the “Regulatory Framework” discussion of Section 3.3, “Vegetation and Wildlife.”

State CEQA Guidelines, Section 15380

Endangered, rare, or threatened species are defined in Section 15380 of the State CEQA Guidelines. These definitions are provided in the “Regulatory Framework” discussion in Section 3.3, “Vegetation and Wildlife.”

California Fish and Game Code, Section 1602—Streambed Alteration Agreement

All diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake in California that supports wildlife resources are subject to regulation by DFG under Section 1602 of the California Fish and Game Code. A description of Section 1602 is provided in the “Regulatory Framework” discussion of Section 3.3, “Vegetation and Wildlife.”

LOCAL REGULATORY ISSUES

Goals in the Resource Conservation Element of the *Sonoma County General Plan* that apply to the project include RC-6 (special-status species) and RC-8 (freshwater fisheries resources).

Goal RC-6: Identify and protect rare and endangered species and their environment.

Objective RC-6.1: Identify the locations of rare and endangered plants and animals.

Objective RC-6.2: Require that any development on lands containing rare and endangered species be done in a manner which protects the resource or mitigates adverse impacts.

Goal RC-8: Encourage effective management of freshwater fishery resources and balance competing agricultural, development, and mining needs with protection of the stream environment.

Objective RC-8.1: Identify sources of sediment and erosion and minimize their impact on local water courses.

Objective RC-8.2: Manage riparian corridors along streams to provide protection for fish habitat.

Objective RC-8.3: Encourage the preparation of a fishery management plan.

C. Potential Impacts and Mitigation Measures

CRITERIA USED FOR DETERMINING IMPACT SIGNIFICANCE

According to Appendix G of the State CEQA Guidelines, a project would typically have a significant impact if it would:

- have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by DFG, USFWS, or NMFS;
- interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- substantially reduce the habitat of a fish or wildlife species;
- cause a fish or wildlife population to drop below self-sustaining levels;
- threaten to eliminate a plant or animal community; or
- substantially reduce the number or restrict the range of an endangered, rare, or threatened species.

PROGRAM IMPACTS

Findings in the ARM Plan PEIR and Project

The ARM Plan PEIR evaluated potential fisheries impacts in Section 8.5, “Fisheries.” The PEIR determined that instream operations could result in bank erosion, increased water temperatures, increased sedimentation, loss of cover, loss of spawning habitat, a reduction of food supply, an increased potential for stranding of juvenile fish, and interference with migratory patterns. The PEIR mitigated potential impacts to less-than-significant by establishing mining standards limiting the location, depth and timing of mining activities and requiring inspections and monitoring. When the ARM Plan was adopted in 1994, there were no threatened or endangered fish species in the Russian River watershed and few special status aquatic species (i.e. freshwater shrimp) as discussed in Section 3.3 “Vegetation and Wildlife”. The ARM Plan focused on minimizing degradation of the river channel bed and lateral bank erosion while maintaining flood capacities. There are no goals or objectives in the ARM Plan relating to the protection of aquatic habitat.

The project requires amendments to many ARM Plan and mining ordinance standards to allow a different method of mining (see Chapter 1, “Introduction and Project Description”). ARM Plan standards currently allow bar skimming only in the lower half of the bar (defined as the apex or widest point on a bar) at a 2% cross slope with a minimum 15-foot side bar buffer. The proposed project, however, is based on the federal Sediment Removal Guidelines (NOAA, 2004), which call for larger side bar buffers to retain the geomorphic processes that form aquatic habitat. Instead of skimming a bar at a cross slope, the proposed mining method would excavate a trough in a horseshoe shape down to 1 foot above the low flow water level and extending down the bar at the gradient of the channel to connect with the channel and allow for drainage of the mining area. Although not specifically called for in the federal guidelines, the proposed project seeks to mine the lower two-thirds of the bar and strengthen the bar head with transplanted vegetation. The project also identifies the Effective State Discharge Height (ESDH) method, which, according to the mining plan, would be based on a HEC-RAS model and define the mining area based on the level of the effective discharge (see Section 3.2 “Geomorphology, Hydrology and Water Quality”). The intent of the new horseshoe and ESDH mining methods is to better protect aquatic habitat and especially the processes that form pool and riffle habitat for threatened and endangered fish.

The project also proposes a separate River Enhancement Plan (REP) that includes an assessment of the mining reach, identification of opportunities for enhancing riparian habitat, and a range of options for enhancement including:

- excavation of alcoves to expand access to tributaries and oxbows; and
- floodplain benches or terraces to create low-lying areas for riparian and wetland restoration that would provide important off-channel refugia for fish during high flow events and an important source of food supply for young fry.

Other enhancement features include installation of Large Woody Debris (LWD) to increase channel complexity and bioengineered bank stabilization methods to prevent excessive erosion. The REP includes six specific enhancement projects, which are further discussed in the Project Impacts section below. The REP also requires an amendment to the ARM Plan to allow excavation below water levels for the enhancement features and temporary channel diversion and dewatering for the bank stabilization and LWD features. The project also includes a request to allow a waiver of the Russian River Gravel Mitigation Fee based on the implementation of the REP.

The proposal also requests an amendment to the ARM Plan to allow a longer term permit of 15-years, rather than the 10-year permit currently allowed, and includes an Adaptive Management Strategy (AMS) that would allow adjustments to the monitoring requirements, mining location and methods, enhancement features or other remediation as determined by PRMD in consultation with the Scientific Review Consultants (SRC) and resource agencies.

The requested changes to the ARM Plan and mining ordinance are intended to improve the mining standards to preserve the geomorphic processes that protect aquatic habitat, as further evaluated in Section 3.2 “Geomorphology, Hydrology and Water Quality”. Amendments to the ARM Plan and mining ordinance would be effective immediately and would apply not only to this project, but also to certain future permits or permit renewals, until modified or amended by the Board of Supervisors. The following discussion focuses on the program-wide impacts of the proposed ARM Plan and SMARO amendments on fisheries resources. The following identifies mitigation measures to be incorporated into the ARM Plan and mining ordinance that would apply to the proposed project, as well as other future mining permit or permit renewals.

Impacts of Revised Baseline Elevations and Slope

Impact 3.4-1 Lowered minimum baseline elevations to 1 foot above the low flow channel would maintain the channel vertical stability such that the geomorphic processes that maintain pool and riffle habitat would not be disrupted.

As discussed in the impact discussion Section 3.2-1 of “Geomorphology, Hydrology and Water Quality”, impacts of revising the minimum baseline elevations to 1 foot above the low flow channel would be less than significant. The proposed change in ARM Plan and SMARO standards would eliminate the required 2% slope, which could allow for deeper mining on parts of the bar, but would also establish a new baseline at 1 foot above the low flow channel elevation or previously established baseline levels (i.e. at the DeWitt Bars). The proposed change would not disrupt geomorphic processes or cause any significant change in channel morphology because of the added provision that the skimmed floor elevation shall be maintained at 1 foot above the baseline elevation established during the first year of mining following adoption of the amendments.

Mitigation Measures

None.

Impact 3.4-2 Deeper excavations in the mining area and construction of the alcoves, oxbows, floodplain benches or terraces could create depressions that entrap and result in a direct loss of fish, including endangered and threatened salmonids.

Instream mining or construction of enhancement features could cause a direct loss of fish, including special-status species, from fish stranding on enhanced bars or banks. The mining ordinance already requires mitigation measures including the establishment of finished grade slopes to drain to the low flow channel (Section 26A-11-010 (b)). However, even though a slope gradient is required for final grades, winter storms may deposit sediment that could trap fish as the flow recedes. This is a potentially significant impact.

Mitigation Measures

3.4-2 Each spring after mining or construction of enhancement features, the operator shall hire a qualified biologist to inspect each mined bar and excavated enhancement area after each high flow event equal to or greater than a 2-year storm. The biologist shall capture and release any stranded fish under permit with CDFG and/or NMFS and make recommendations for correcting the slope to drain properly. The inspections shall be conducted for a minimum of 3 years following mining or construction. The operator shall be required to complete any corrective actions necessary to prevent fish stranding. These measures shall be incorporated into the mining ordinance (SMARO) Section 26A-11-020 (b).

Impact Significance After Mitigation

Mitigation Measure 3.4-2 will reduce the impact of fish stranding to less-than-significant.

Impact of Revised Head of Bar Buffers

Impact 3.4-3 Reduced buffers at the head of bar could cause erosion or scour of the upstream and downstream riffles as well as increased sedimentation that could degrade spawning gravels.

The proposed ARM Plan amendment to allow mining of the lower two-thirds of the bar retaining the upper one-third of the bar as a buffer may not, in all cases, provide sufficient buffer area or height to prevent water from cutting through the bar head, potentially creating a high flow chute channel and disrupting the processes that maintain the pools and riffles, resulting in scour of the upstream or downstream riffles. The current ARM Plan standard of allowing mining only downstream of the bar apex has proven sufficient to maintain the bar head. Where the mining was permitted in the upper one-half impacts to channel form have been observed. This impact is potentially significant.

The NOAA (2004) Sediment Removal Guidelines suggest that the geomorphic processes that maintain the bar form should be preserved below the height equivalent to the dominant discharge. The dominant discharge in the lower Alexander Valley Reach is estimated to be approximately 11,000 cfs (at the Cloverdale gauge) or about a 1.2-year flow, which corresponds to approximately 8 feet above the low flow water surface elevation at the upstream riffle crest (see discussion in section 3.2.1.1). Mitigation Measure 3.2-2 would maintain the current ARM

Plan standard of allowing mining only downstream of the widest point, and allow an exception to mine up to two-thirds of the bar only when the head of bar buffer is at least 8-feet above the low flow water surface at the upstream riffle crest.

Mitigation Measures

The mitigation measures in Section 3.2, "Geomorphology, Hydrology, and Water Quality", including Mitigation Measure 3.2-2 shall apply to erosion and scour of the upstream and downstream riffles as well as increased sedimentation.

Impact Significance After Mitigation

Implementation of Mitigation Measure 3.2-2 would reduce all secondary impacts to a less-than-significant level.

Impact of Revised Side Bar Buffers

Impact 3.4-4 The increase in the side bar buffer standards would maintain the geomorphic processes that form and maintain pool habitat for endangered and threatened salmonids.

The proposed 20% side bar buffers proposed typically would be 150-200 feet wide, which is substantially larger than the minimum 15-foot setback contained in the current ARM Plan. The 15-foot setback has not been sufficient to protect the outer perimeter of the bar from being eroded or breached, and it has allowed flows into the mined portion of the bar during even relatively moderate flow events.

NOAA's (2004) Sediment Removal Guidelines suggest a more appropriate methodology for establishing the height of side bar buffers so they retain the topographic attributes of the bar up to at least the elevation of the dominant discharge, which is estimated at approximately 8-feet above the low flow water surface elevation (estimated at 200 cfs). The 15-foot minimum width of the side bar buffers required by the current ARM Plan should be increased to minimize the potential for their erosion, but the buffer width should not be so great as to contribute to braiding. Although the proposed side bar buffers could have other negative impacts of splitting the channel flow as described in Section 3.2 "Geomorphology, Hydrology and Water Quality" (see impact discussion in section 3.2-3), the effect of the increased side bar buffers at the 15% or 20% of the active channel width would provide sufficient strength to maintain the pool habitat during the dominant discharge flow. This is a beneficial impact.

Mitigation Measures

None. The change in required side bar buffers would benefit fisheries resources by maintaining pool habitat for threatened and endangered salmonids. See Mitigation Measure 3.2-3 for recommended minimum and maximum side bar buffers and other criteria.

Impact of Adaptive Management Strategy

Impact 3.4-5 The proposed AMS proposes to rely on monitoring data that is not adequate to detect changes in aquatic habitats related to mining or enhancement activities. These changes could result in disruption of sediment transport processes resulting in loss or degradation of aquatic habitat for special status fish or other aquatic species.

Instream mining or construction of enhancement features could result in temporary increases in fine sediment, turbidity, and disruption of sediment transport processes resulting in the loss or degradation of spawning beds from sediment deposition in the riffle substrates, reduction of pool volumes or riffle areas, and changes to hyporheic flow patterns (mixing of groundwater with surface waters) that could increase water temperatures. Although the proposed standards are designed to protect aquatic habitats and the geomorphic processes that maintain them, it is possible that impacts on riffle and pool function could still occur through an incremental loss of habitat area and/or degradation of habitat quality. The proposed amendments include an AMS that provide a mechanism to monitor instream habitat, but the AMS currently lacks specific performance criteria or mechanisms described to address potential impacts should they occur. The following mitigation measures shall be incorporated into the ARM Plan for the lower Alexander Valley Reach.

Mitigation Measures

Riffle habitat area and quality, pool depth, pool habitat quantity, and pool and riffle substrate grain size distribution trends shall be monitored against the following performance criteria incorporated into the site specific objectives of the ARM Plan for the lower Alexander Valley Reach.

3.4-5a Riffle and Pool Habitats. To address the potential impacts on riffle and pool habitats, the operator shall provide pre- and post-mining surveys of riffle and pool habitat as defined. The operator shall include a comparative analysis of pre- and post-mining fisheries habitat in the monitoring reports. Baseline monitoring shall be conducted for the permitted mining reach in the first year prior to mining after a 5-year or greater flood, or once every 3 years if no such flood occurs.

Riffle Habitat

- *Monitoring:* Riffle habitat shall be monitored through redd² counts and substrate grain size distribution measurements. Redd counts shall follow protocols described in Flosi et al. (1998). Substrate grain size distribution measurements shall use the freeze-core method.
- *Performance Criteria:*
 - The total redd counts shall not decrease more than 20% relative to the population abundance (migrating adults) in the baseline period.
 - The average riffle substrate grain size distribution trend, over a 3-year or greater period shall not increase the amount of fines (<1.6 mm) by more than 5% of baseline over the permitted reach.

Pool Habitat Quantity

- *Monitoring:* Pool habitat quantity shall be measured in number and area of pools deeper than 3 feet and mapped on aerial photographs.
- *Performance Criteria:*
 - Average number and area (deeper than 3 feet) of pools shall not decrease over the permitted reach.

² Redds are spawning nests made by fish, especially a salmon or trout.

- Pool habitat quantity shall not decrease by 15% or more at the localized mining area.

Pool Habitat Quality

- *Monitoring:* Pool habitat quality shall be monitored through measurements of residual pool depth (the difference between the downstream riffle crest elevation and the elevation at the deepest part of the pool).
- *Performance Criteria:*
 - Average residual pool depth for the permitted reach shall not decrease more than 5% of baseline or more than the average for the control area upstream of the mining reach.
 - Residual pool depths at each pool in the localized mining area shall not decrease more than 15% or the average for the control areas upstream of the mining site.

3.4-5b Adaptive Management: If any of the performance criteria for riffle or pool habitat are exceeded in any given year, it indicates that impacts to aquatic habitats may be occurring. The operator shall hire a qualified fisheries biologist to conduct an investigation and provide a report including proposed remediation measures to PRMD for review. The PRMD in consultation with the SRC and resource agencies will determine what steps should be taken to address habitat concerns, including but not limited to: suspension of mining, additional studies or monitoring requirements, modified mining methods, limitations on the location of future mining activities, additional enhancements or other remediation measures. The operator shall conduct any necessary studies and incorporate changes to the monitoring program, annual mining plan or Enhancement/Reclamation Plan, implement other remediation, and/or suspend mining to meet the performance criteria.

Impact Significance After Mitigation

Mitigation Measure 3.4-5 will reduce the impacts to pool and riffle habitats to less-than-significant.

Impact of Mitigation Fee Waiver With River Enhancement Plan

Impact 3.4-6 The proposed ARM Plan amendment to allow waiver of the established Russian River Gravel Mitigation Fund impact fee based on an Enhancement Plan could reduce mitigation requirements.

The ARM Plan PEIR recognized the potential for mining to impact riparian resources and required all instream operators to contribute to a new Russian River Gravel Mitigation Fund to mitigate these potential long-term effects. The fund addressed four specific programs for mitigation of long-term cumulative impacts, including: agricultural support; recreation enhancement; flood protection; and stream restoration. However, the ARM Plan also acknowledged that disputes regarding potential project impacts could be raised during County permit proceedings, and allow for the Board of Supervisors to make adjustments to the mitigation fee charges based on annual reports or other information demonstrating reduced impacts. Syar has proposed a more comprehensive River Enhancement Plan and therefore requests a waiver of the fees for past mining activities as well as the current project. The proposed ARM Plan changes would allow a fee waiver based on the approval of an Enhancement Plan incorporated into the Reclamation Plan.

To date the fund has not generated sufficient funds to implement any substantial stream restoration work, although the portion of the funds for fish barriers and recreation impacts have been used to construct the fish ladder installed in Healdsburg just below Memorial Beach, and acquire public access at Salmon Beach near Rio Nido. Furthermore, the cost of construction has increased substantially since the fee was adopted. The fee does not include the cost of planning, design, environmental review, and permitting (which can be as much as 20% of the total construction costs).

The proposed River Enhancement Plan (REP) or any future enhancement plan associated with future mining permits or permit renewals would be implemented as part of the mining permit approvals, and provide a more immediate mitigation than the ARM Plan program. However, the proposed amendment does not yet include any standards for the restoration work, or a monitoring program, performance criteria or financial assurance to ensure the success of the enhancement program. The future enhancement activities may therefore result in potentially significant impacts to fisheries resources.

Mitigation Measures Mitigation Measure 3.3-2 in Section 3.3, “Vegetation and Wildlife” establishes restoration standards, monitoring requirements, performance criteria and financial assurances that will substantially reduce the impact of enhancement plans to a less-than-significant level.

PROJECT IMPACTS

This section provides a full and independent analysis of all potential impacts on fisheries and aquatic resources that could occur as a result of implementation of the proposed mining permit and river enhancement plan.

Impact 3.4-7 The project could result in increases in sediment and turbidity and the loss or degradation of riffle and/or pool habitats from indirect, project-related effects on sediment transport and deposition processes.

Turbidity and Sedimentation

Mining and river enhancement activities would temporarily disturb soils and sediments on the surface of the floodplain and bars adjacent to the low-flow channel of the Russian River. Skimming activities often result in a higher proportion of sand and fine sediment on the mined surface compared to the pre-mining condition. Further, enhancement activities could result in disturbance of instream sediments in relatively small areas where these features interface with the low-flow channel (e.g., where alcoves connect with the low-flow channel of the river and where bank enhancements are planned). Any potential sediment input into and/or release within the river could result in temporary increases in turbidity and sedimentation downstream of the mining and enhancement sites throughout the study area.

Fish population levels and survival have been linked to levels of turbidity and silt deposition. Prolonged exposure to high levels of suspended sediment (as measured against ambient conditions) could create a loss of visual capability in fish in the study area aquatic habitats, potentially leading to a reduction in feeding and growth rates; a thickening of the gills, potentially causing the loss of respiratory function; clogging and abrasion of gills; and increases in stress levels, reducing the tolerance of fish to disease and toxicants (Waters 1995). Increased turbidity also could result in increased water temperatures and biological oxygen demand, which in turn could reduce dissolved oxygen levels and result in stress respiration.

High levels of suspended sediments could also cause the movement and redistribution of fish populations, and could diminish the character and quality of the physical habitat important to fish survival. Once suspended sediment is deposited, it could reduce water depths in pools, decreasing the water's physical carrying capacity for juvenile and adult fish (Waters 1995). Habitat disturbance and increased turbidity could also diminish fish forage species (e.g., macroinvertebrates) and degrade food web dependent microhabitats within and adjacent to extraction areas through interference with photosynthesis of aquatic flora and displacement of aquatic fauna. Salmonids and other fish are sight feeders, and turbid waters reduce the ability of these fish to locate and feed on prey. Some fish, particularly juveniles, likely would become disoriented and potentially leave areas where food resources are located, thus potentially reducing growth rates. Prey (e.g., macroinvertebrates, plankton) of resident and anadromous fish populations would decline as a result of disturbance, degradation of habitat (i.e., water quality conditions) such as increased turbidity, decrease in dissolved oxygen content, and increased level of pollutants (Coull and Chandler 1992). Avoidance of adverse habitat conditions by fish is the most common result of increases in turbidity. Fish would not occupy areas unsuitable for survival unless they have no other option and, when forced into such habitat, could eventually decline in population.

Potential sediment inputs into the river would generally occur after the mining and construction season has ended as a result of localized precipitation-generated runoff and/or from high-flow events that eventually overtop the mined bar, floodplain, and/or enhancement areas. To minimize localized precipitation-generated runoff, Syar proposes to conduct bar skimming, and enhancement activities in the dry season from June 1 to November 1, and generally outside the wetted stream and above the summer low-flow channel of the Russian River, thus limiting erosion potential and sediment discharge into the river. Syar would also implement best management practices (BMPs) to minimize erosion at access roads, staging areas, and areas where mining and/or construction would occur (see Chapter 1, "Introduction and Project Description").

The potential for sediment release within the river would generally occur during the construction of enhancement features at the interface of the bar/floodplain and low-flow channel of the river. Enhancement features located at the interface of the low-flow channel include alcoves (at the point of connection with the low flow channel) and streambank enhancements. These activities have been designed to include several measures to avoid and minimize potential impacts on aquatic habitats and fish. These measures include sequencing of construction activities to minimize disturbance to the wetted channel, implementing BMPs (including silt curtains) to reduce sedimentation and turbidity, and dewatering and fish translocation (where necessary) (see *Draft Russian River—Alexander Valley River Enhancement Plan for Syar Industries Reach (Gill Creek Confluence to Jimtown Bridge)* [Syar 2008] for additional description of BMPs proposed as part of the enhancement activities). Once construction is complete, the enhancement features would result in improved conditions for juvenile overwintering, increased opportunities for recruitment of LWD, increased production of food supply (e.g., benthic macroinvertebrates) and reduced sediment inputs into the river associated with existing, ongoing bank erosion. Implementation of the REP would thus result in long-term beneficial impacts to fisheries resources. Alcove construction would also provide improved connectivity and access to the tributaries resulting in a beneficial short-term impact.

After the mining and construction season, the first fall rains tend to occur without much runoff, as the dry, porous gravel bars and floodplain absorb much of the precipitation before becoming saturated. These early rains would cause a substantial portion of the exposed sand and fine sediment to infiltrate down into the post-mined surface, leaving a layer of relatively clean

exposed gravel. This gravel would help stabilize the post-mined surface and reduce the potential for erosion and transport of fines from the bar and floodplain during subsequent precipitation and localized runoff events and/or high-flow events that may overtop the bars and floodplain.

In regard to higher flows (generally in winter and early spring) that overtop gravel bars, inundate the floodplain, and entrain fine and coarser sediments, the project includes mining and river enhancement methods that maintain gravel bars with intact head and edge of water buffers (e.g., horseshoe and effective discharge stage height (EDSH) skims, and alcove and oxbow construction) that create a condition where the bars, oxbows, and alcoves initially become inundated through a backwater effect. This backwater effect would be generated by the head and edge of bar buffers directing the river flow around the mined and/or enhanced surfaces to the downstream end of the bar and/or enhancement feature (e.g., alcove). Low-flow velocity backwater would originate at the downstream end of the bar and/or enhancement feature and slowly inundate the disturbed area and eventually the floodplain as the river rises. During this period, fine sediments may become entrained in river flows and create increased turbidity in the excavated area and downstream.

At the same time, the backwater areas (mined or enhanced bar and/or floodplain surfaces) also may become depositional sites for existing fines that originate from the watershed (i.e., existing condition) suspended in the river flows. As river flows increase, the upper head and edge of bar areas would begin to be overtopped, but the backwater pool of water on the bar surface would create a velocity sink, decreasing the river's sediment transport ability at that location as a result of decreased velocity and causing river sediment to settle out. At this stage, the main channel would continue to have high water velocity, which may carry a large amount of fine and coarse sediment.

Eventually there may be sufficient flow over the mined and/or enhanced surface (both bar and floodplain) to mobilize a considerable amount of fines for transport downstream; however, the origin of these fine sediments is both from the post-mined surface as well as those background sediments that were originally deposited (from the river) on the rising leg of the hydrograph.

Instream mining and enhancement activities could result in increased turbidity and downstream sedimentation; however, the project's mining methods, BMPs, and adaptive management strategy (AMS) would tend to minimize this potential.

Riffle Habitats

Riffle habitats in the study area tend to occur at meander crossovers and make up approximately 12% of the reach length (Syar 2004). Riffles provide many important habitat functions for salmon and steelhead, including providing spawning areas for adults and rearing areas for juveniles. Important attributes for these two habitat functions include appropriately sized, stable gravels and cobbles with clear interstitial spaces (i.e., free of fine sediments) for spawning and egg incubation, and habitat complexity with periodic coarse cobbles and boulders for juvenile rearing (providing localized velocity refugia [i.e., pockets] that serve as important feeding stations). Conversely, riffles have the potential to serve as barriers to fish migration and movement if they become too uniformly shallow over an extended area. In addition to providing habitat function for fish, riffles are turbulent water areas that are important for maintaining high concentrations of dissolved oxygen in the water column and provide important habitat for benthic macroinvertebrates.

Adult Spawning and Egg Incubation—If not conducted appropriately, mining of bars has the potential to adversely affect riffle habitats. When channel bars are removed or partially removed, the channel could be effectively widened, resulting in increased shear stress at lower flows and therefore resulting in increases in migrating gravel particles. Historical spawning gravel deposits may be scoured and swept downstream as the result of increased shear stresses at riffles. Elevated bed shear stresses could also preclude the deposition of new spawning gravel supplied from upstream sources, and upstream sources could be depleted by sediment removal through mining. Although redd scour occurs at some critical discharge in unaltered streams, the effect of stream alteration is to lower that critical discharge and increase the probability of premature redd scour in a given year (NOAA 2004).

An opposite effect, increased deposition on riffles, could occur where sediment removal extends to bar areas that are adjacent to riffles. Instream mining has the potential to degrade spawning habitat by increasing the supply of fine sediments that could deposit and clog the interstitial pores of coarse substrates. An armor layer of coarse particles normally covers the surface of mature alternate bars. Because channel bars are coarser at their surface than at subsurface, bar skimming exposes smaller sediment particles that are readily transported downstream to clog coarse sediment interstices (NOAA 2004).

Observations and surveys indicate that the much of the Russian River watershed has a large proportion of fine sediments, even in areas where mining has not occurred (NMFS 2003, NHC 2003, Syar 2006, SRC 2006). Fine sediments may be mobilized and transported from the bar surface during the first substantial storms following mining. During these storms, large amounts of fine sediment are likely mobilized throughout the watershed, resulting in high turbidity even without mining (NMFS 2003, NHC 2003, Syar 2006). Because the bars and floodplain are depositional areas within the river, sediments would be deposited on a bar and/or floodplain at the same time other sediments wash from the bar and/or floodplain. Nonetheless, the proposed mining could temporarily disturb sediments on the surface of the bars, breaking up the coarser armor layer on the surface. This would expose gravels and fines below the armored surface layer, which then can enter the water column when flows over-top the bar. Thus, skimming activities often result in a higher proportion of sand and fine sediment on the mined surface compared to the pre-mining condition. In addition, the mining area creates a backwater effect allowing for deposition of sediments in the immediate vicinity which could result in temporary increases in sedimentation within and downstream of the mining site.

Habitat Complexity (Migration Barriers and Juvenile Rearing)—In natural streams, shallow riffles could be migration barriers to upstream migrating adult salmon and steelhead. Channel stability and its effect on the shape of the low-flow channel and flow depths govern the extent of the barrier during migration seasons. Mining activities that result in increases in channel width-to-depth ratios increase the probability that shallow flows at riffles could form migration barriers.

In addition to reducing stream water depths over riffles (as a result of increasing channel width-to-depth ratio), instream mining activities have the potential to increase current velocities, create more uniform substrate conditions, and reduce flow complexity (e.g., small pockets and eddies within riffles), thereby forcing migrating and rearing salmonids to expend additional energy. Reduced flow complexity and increased velocities, particularly reduced edge-water eddies and low-velocity zones, result from reduced sinuosity, increased channel width-to-depth ratio at bars, and reduced topographic complexity of geomorphic features. This could affect adult salmonids during their upstream migrations across riffles, and juvenile salmonids and other native fish species would face challenges finding and using localized velocity refuges during high flows in simplified, hydraulically smoother channels. Adult salmonid migration could also be

adversely affected when sediment removal activities diminish the size and frequency of main stem pools, habitat used for holding and resting (see also separate discussion on pool habitats below) (NOAA 2004).

By contrast, the proposed creation of alcoves and other enhancement features would improve habitat complexity conditions throughout the study area. Alcoves and oxbows provide increased passage conditions at tributaries and thermal and velocity refugia areas along the bar areas adjacent to the low flow channel.

Benthic Macroinvertebrate Production—Benthic macroinvertebrates are the principal food source for most juvenile salmonids (Spence et al. 1996). Immature mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera), referred to collectively as EPT taxa, are considered the most productive, preferred, and available foods for stream fishes (Waters 1995). The abundance of these three groups of aquatic macroinvertebrates is commonly used as a food availability index (Lenat 1988). These taxa groups have also been determined to be sensitive to environmental degradation; therefore, their diversity and abundance provide an indication of ecosystem health. The diversity and abundance of EPT taxa could be affected by sediment removal operations because they depend on substrate, water quality, and temperature conditions (NOAA 2004).

The EPT group typically inhabit the interstitial spaces of coarse substrates (i.e., gravel to cobble-sized particles), although some species of mayfly and certain other aquatic insects (e.g., chironomidae) prefer highly organic fine sediments. Sands and silt are the least productive substrates for aquatic macroinvertebrates (Hynes 1970) and are more easily mobilized, making them less suitable because they are less stable. Therefore, sediment intrusion that reduces the interstitial spaces of cobbles and gravel also directly decreases the habitable area for these taxa.

Changes in the biomass and structure of benthic macroinvertebrate assemblages could decrease the vigor of salmonid populations that depend on them. The importance of abundant food sources becomes even greater when stream temperatures are at the upper tolerance limits for steelhead and Chinook salmon. Fish may respond to thermal stress by decreased growth rates and reduced survival. Because food conversion efficiencies decline at elevated temperatures, and metabolic demands increase, fish must eat more food (Smith and Li 1983). Therefore, reductions in food availability caused by streambed sedimentation could compound adverse effects of elevated water temperatures.

Pool Habitats

Pool habitats with depths ranging from 4.3 to 11.2 feet consisted of approximately 26% of the reach in the study area (Syar 2004). These habitats provide important functions for the native fish community, including special-status Chinook salmon and steelhead. Pools provide deep, low-velocity areas with submerged structural elements that provide cover (Brown and Moyle 1991), winter habitat, and flood and thermal refugia for fish. During upstream migrations, adult salmon and steelhead typically move quickly through higher velocity riffles and rapids and pause for varying duration in deep holding pools (NOAA 2004). These holding pools provide salmon and steelhead with safe areas in which to rest when low flows and/or fatigue inhibit their migration. Instream mining projects have the potential to reduce the number and degrade the quality of these habitat elements and thereby reduce the population of salmon and steelhead in the affected river reach.

Absent mitigation, instream mining activities have the potential to result in adverse effects on fundamental physical processes related to pool maintenance. The partial sedimentation of pools during summer low-flow periods and their subsequent scour during winter high-flow periods are widely recognized seasonal processes. During high flows, coarse particles eroded from upstream riffles are transported through pools to downstream riffles. This process occurs because velocity and shear stress increase at pools at a faster rate than at riffles as flow increases toward bankfull (NOAA 2004). As discharge increases, the energy to transport coarse sediment increases in pools at a faster rate than at riffles. A threshold is generally reached when flows exceed about 60% of the effective discharge³ flow, the pool scour process begins and coarse sediment eroded from upstream reaches could continue through pools to downstream riffles where it may be deposited. The pool scour process becomes most dominant at the effective discharge flow in undisturbed stream channels, as flow depth increases only slightly once the bars or banks are overtopped and the floodplain is inundated (NOAA 2004).

Mining in-channel bars has the potential to reduce or eliminate the convergence of flows through pools, thereby reducing the effectiveness of the scour mechanisms that maintain pools. Reduced confinement of flows could be expressed as an increased width-to-depth ratio of the active channel. Bar skimming for sediment production has the potential to increase the width-to-depth ratio by an order of magnitude or more. As a result, pool maintenance processes can be impaired when bars are removed. Additionally, spacing between pools could increase as a result of bar removal and resulting simplification of the channel (NOAA 2004).

Sediment removal from bars has the potential to create a wider, more uniform channel section with less lateral variation in depth, and reduced convergence of flows that are necessary to maintain pool depth and volume. However, the proposed mining activities include horseshoe skim, alcove, oxbow, and EDSH extraction methods that maintain buffers at the head and along the edge of bars to maintain width-to-depth ratios and resulting convergence of flows and pool scour mechanisms.

As discussed in Chapter 1, "Introduction and Project Description," Syar proposes buffers of 30 feet or 2.5 times the slope height, whichever is greater, from the outer river bank (top of bank) to the interior edge of skimming areas. The alignment of the summer low-flow channel of the Russian River would be protected by retaining a buffer at the upper one-third of each bar, as well as a buffer along the outer edge of each bar along the low-flow channel measuring approximately 20% of channel width. The project also includes activities that would strengthen the buffer area at the upper one-third of each bar by transplanting riparian vegetation removed from the skimmed areas. Although the proposed methods are designed to prevent impacts on pool habitats, it is possible that these impacts could still occur. The project includes an AMS that would provide a mechanism to monitor pool volume and instream habitats. No specific performance criteria have been identified by Syar to address potential impacts on pool habitat, however.

Impact 3.4-7a The project's proposed enhancement activities would result in long-term beneficial effects on aquatic habitats and the fish community in the Russian River. The proposed alcoves and oxbows would improve conditions for juvenile rearing and overwintering. The alcoves would also improve connectivity and access to tributaries before filling in over time. The proposed streambank enhancements, oxbows, and alcoves would increase habitat structure and complexity. The streambank enhancements would also increase food production

³ The effective discharge is defined as the flow that transports the most sediment over the period of record.

and reduce sediment inputs into the river from existing, ongoing bank erosion. This a beneficial impact.

Mitigation Measure

None. The impact of enhancement activities provides both short-term and long-term beneficial impacts to fisheries resources.

Impact 3.4-7b Instream mining and enhancement activities could result in increased turbidity and downstream sedimentation, which could reduce or adversely affect fish habitat and fish populations, including anadromous salmonids and other native and special-status fish species.

As discussed in section 3.4-4 above, the project and other instream mining activities have the potential to adversely affect the function of riffle and pool habitats by indirectly affecting sediment transport and deposition processes. Project effects could include exacerbating sedimentation of the substrates, reducing pool volumes, changing hyporheic⁴ flow patterns, reducing habitat complexity and causing barriers to adult migration, diminishing adult holding and juvenile rearing habitats, and reducing benthic macroinvertebrate production.

The project proposes mining horseshoe and EDSH skim extraction methods that would maintain buffers at the head and along the edge of the bar to prevent channel widening and the related physical processes that result in degradation to habitat. The buffers would be established with a setback of 30 feet or 2.5 times the slope height, whichever is greater, from the outer river bank (top of bank) to the interior edge of skimming areas. The alignment of the summer low-flow channel of the Russian River would be protected by retaining a buffer at the upper one-third of each bar, as well as a buffer along the outer edge of each bar along the low-flow channel measuring approximately 20% of channel width. The buffer area would be strengthened at the upper one-third of each bar by transplanting riparian vegetation removed from the skimmed areas. These buffers, with the exception of haul routes, would also be considered “no-equipment” zones intended to protect the river against disturbance during skimming operations.

The project also includes an AMS that would provide a further mechanism to monitor and correct potential effects on riffle and pool habitats associated with changes to sediment transport and deposition processes. The AMS currently lacks performance criteria to mitigate impacts on pool and riffle habitats, and thus, these impacts are potentially significant on a project level.

Mitigation Measures

3.4-7a Supplement the AMS with Performance Criteria for Riffle and Pool Habitats. This measure is identical to Mitigation Measure 3.4-5a above, and shall be applied to this impact.

3.4-7b Supplement the AMS with Performance Criteria for Channel Width. This measure is identical to Mitigation Measure 3.2-5d in Section 3.2, “Geomorphology, Hydrology and Water Quality,” and shall be applied to this impact.

⁴ The hyporheic zone is a region beneath and lateral to a stream bed, where there is mixing of shallow groundwater and surface water.

Impact Significance after Mitigation

Proposed enhancement activities would result in long-term beneficial effects on aquatic habitats and the fish community in the Russian River. These beneficial effects would result from improved conditions for juvenile rearing and overwintering, improved connectivity and access to tributaries, increased habitat structure and complexity, and reduced sediment inputs into the river associated with existing, ongoing bank erosion.

The proposed mining and enhancement activities also could result in increased turbidity and downstream sedimentation, but the project's mining methods, BMPs, AMS, and Mitigation Measures 3.4-6a and 3.4-6b would reduce all such impacts to less-than-significant.

Impact 3.4-7c Instream mining practices could adversely affect the function of riffle and pool habitats through project-related indirect effects on sediment transport and deposition processes. These effects include exacerbating sedimentation of the substrates, reducing pool volumes, changing hyporheic flow patterns, reducing habitat complexity and causing barriers to adult migration, diminishing adult holding and juvenile rearing habitats, and reducing benthic macroinvertebrate production.

Mitigation Measures

Mitigation Measures 3.4-5a and 3.4-5b noted above in the Program Impacts would apply to this impact.

Impact Significance after Mitigation

Mitigation Measures 3.4-5a and 3.4-5b would substantially reduce potential impacts on riffle and pool habitats from project-related indirect effects on sediment transport and deposition processes to a less-than-significant level.

Impact 3.4-8 The project would not result in direct loss of fish, including special-status species, from bridge installation or removal, or enhancement activities.

Syar would install temporary bridges to access sites that are not directly accessible via private roads (e.g., between gravel bars). These bridges would be in place from June 15 to October 15 to limit disturbance within the active stream when sensitive fish species may be present, consistent with NMFS's guidance regarding the placement of crossings. During the remainder of the operating season, skims would occur only on those bars that are directly connected to access roads and do not require temporary bridges. Minor disturbance of the river environment would occur when equipment crosses the river (and enter the wetted stream) only during installation and removal of the temporary bridges.

Temporary bridges would be installed using a railroad flatcar bridge or equivalent structures to provide a minimum of 4 feet clearance above the summer low-flow channel elevation and a 20-foot-minimum span across the waterway. Installation of the bridges would not involve any excavation activities, but would require the placement of a hard material and fill on either side of the channel above the natural grade to form the abutment for the bridge. Only clean, washed gravel would be used as fill in the water for bridge abutments and gravel placed in the river would be pushed out, rather than dropped in the river. Wet crossings of the equipment would be minimized. Before the placement of equipment or gravel, a qualified biologist would be present to inspect the area to ensure that fish would not be affected.

Syar also proposes several river enhancement activities, including bank enhancement that would require work in the wetted channel. The REP includes avoidance and minimization measures that would reduce potential impacts to fish and aquatic habitats, including: conducting all construction activities between June 1 and November 1; conducting pre-construction surveys for special-status species; implementing BMPs; and implementing a series of operational measures for dewatering including a fish salvage and rescue plan.

Because fisheries impact avoidance and minimization measures are required by the County's mining ordinance and included in the project for bridge installation, removal, and enhancement activities, this impact would be less than significant.

Mitigation Measures

None.

Impact 3.4-9 The project could result in the direct loss of fish, including special-status species, from fish stranding on bars that have been mined and/or enhanced.

Proposed mining of bars would include horseshoe skim and EDSH methods. Proposed enhancements include the creation of alcoves, oxbows, and streambank enhancements. The mining and alcove construction methods generally include cut slopes along the interior sides of the skimmed area that would be at a 2:1 ratio, while the cut slopes at the upper end of the skimmed area would be left at a 10:1 ratio to discourage scouring action during overtopping flows (reducing the potential for the initiation of head-cut erosion). The floor of the mined and/or enhanced areas would be excavated with a gradient that is similar to the river and would be open to the low-flow channel on the downstream end to avoid potential fish stranding. The finished grades/topography are intended to guide any potential fish downstream toward the low-flow channel at the downstream end of the bar as flows recede off of the bar after higher flow events. However, there may be cases where the finished bar lacks a horizontal cross-slope and/or longitudinal slope to promote complete and efficient drainage conditions that would limit the potential for fish stranding.

Additionally, at the end of each operating season, Syar would smooth the skimmed and enhanced bars using a motor grader followed by a bulldozer dragging a heavy, long rigid drag. The rigid drag would be 20 feet or longer so that it would span the potential width of depressions and irregularities in the bar. The procedure would further reduce potential ponding of water and any potential fish entrapment after high winter river flows across the bar have subsided.

However, subsequent high-flow events that overtop the bar could result in deposition of fine and coarse sediments in the floor of the mined and/or enhanced areas creating conditions where depressions are formed. After high flows pass over the bars, receding waters could collect in any potential depressions, pond, and become isolated from the river. Fish that enter the mined and/or enhanced portions of the bars during higher flows, particularly juvenile Chinook salmon and steelhead, could become stranded in these areas. Fish that become trapped for long periods of time would experience high mortality rates as a result of lethal water temperatures, poor water quality, predation, and/or desiccation of these areas.

In addition to this potential project-related effect, fish stranding has the potential to occur under existing conditions. In this scenario, depressions (and subsequent ponds) are formed on the bars through natural sediment transport and deposition processes that include scour behind LWD, riparian vegetation, or large boulders, formation and dissolution of temporary secondary channels, and seasonal hydrologic connection and dissolution of tributaries.

Mining methods, end-of-season bar reclamation, and construction of enhancement features would minimize the potential for fish stranding and potentially improve conditions compared to baseline over the short term (i.e., the period from the end of mining season to the time when subsequent high flows overtop the mined area of the bar) at most locations. However, there may be conditions at certain locations where the finished bar lacks a horizontal cross-slope and/or longitudinal slope to promote complete and efficient drainage off of the bar to limit the potential for fish stranding. Further, mining and constructing enhancements on the bars could result in conditions where subsequent high-flow events could result in increases (in the likelihood and magnitude) in the formation of depressions, ponding of water, fish entrapment, and mortality compared to the existing condition. There are no provisions in the AMS to address the potential for substantial increases in fish stranding that could result from the project. This impact would be potentially significant.

Mitigation Measure

3.4-9a Finish Grade the Floor of the Skimmed Area to Promote Complete Drainage. End-of-season bar reclamation shall include a finish grade at the floor of the bar with a minimum 0.20% longitudinal slope and a 0.25% horizontal cross-slope gradient that is consistent with recommendations determined by the SRC.

3.4-9b Supplement the AMS with Actions Addressing Fish Stranding. As part of the proposed AMS, the following specific actions shall be conducted to address the potential fish stranding impact:

- *Monitoring:* For the first 3 years following the completion of mining at an individual bar, visual surveys of the bar shall be conducted by a qualified biologist (possessing the necessary permits to conduct fish relocation, if needed) after at least one high flow event per year that inundates the mined bar area, and after every high flow event equal to or greater than the 2-year storm. The purpose of these surveys is to identify the extent of any depressions and associated ponded areas that cannot drain to the low-flow channel. Photographic documentation will be conducted, as necessary, to document the condition of the mined bar area.
- *Reporting:* Following each year when monitoring is conducted, a letter report shall be submitted to the SRC summarizing the overall condition (with an emphasis on bar topography and identification of depressions) of the mined bar and any changes that have occurred since the previous report. The report will assess the potential for fish stranding.
- *Performance Criteria:* If depressions or associated ponded areas that cannot drain to the low-flow channel are found, or other conditions exist that could lead to fish stranding, the SRC shall make recommendations to PRMD to correct the situation. Syar shall suspend mining or incorporate changes to the annual mining plan or Reclamation Plan, and/or implement other remediation, to meet these criteria. The ultimate goal is that the mined bar and associated drainage features (e.g., horseshoe skim, alcoves, oxbows) function naturally to provide beneficial floodplain/bar habitat conditions with minimal human intervention and maintenance.

Impact Significance after Mitigation

Mitigation Measure 3.4-9a and 3.4-9b would reduce the potential fish stranding impact to a less-than-significant level.

Impact 3.4-10 The project could result in substantial loss or degradation of overhead cover and instream woody material from skimming activities and post-mining processes.

The presence of riparian vegetation and SRA habitat adjacent to the low-flow channel and within the floodplain contributes to morphological stability, habitat complexity, and cover in several ways. Vegetation, particularly when it is mature, provides root structure that consolidates the substrate material and resists erosion forces (Beschta 1991). By enhancing the form of gravel bars, vegetation enhances the frictional resistance of the bar that acts to dissipate hydraulic energy (Kondolf 1997). This decreases the effective channel gradient, moderates flow velocities, and prevents undue erosion downstream. As riparian areas mature, the vegetation sloughs off into the rivers, creating structurally complex habitat consisting of LWD, which in turn furnishes complex structure and shelter that provides refugia from predators, creates velocity gradients, and provides habitat for aquatic benthic macroinvertebrates (NOAA 2004).

Instream sediment removal projects have the potential to cause direct or indirect destruction of riparian vegetation along bars, streambanks, and the floodplain. If not avoided, annual skimming would remove riparian vegetation that would otherwise colonize gravel bar and floodplain surfaces. In the stream reaches that are not confined by levees or naturally resistant boundaries, long-term or repeated modification of gravel bars at low elevations promotes frequent channel shifting, which precludes the establishment of riparian vegetation. In the absence of this disturbance, this vegetation would have the potential to grow and develop through several stages of ecological succession.

Riparian vegetation could also be adversely affected by the removal of LWD on bars and the floodplain during sediment removal activities (OWRRI 1995). LWD often protects and enhances the reestablishment of vegetation in streamside areas because it influences hydraulics and disrupts sediment transport (NOAA 2004). Sediment extraction could also remove portions of undercut banks, thereby decreasing vegetative bank cover, reducing shading and resulting in increased water temperatures. Increased water temperatures are of particular concern, given that salmon and steelhead prefer relatively coldwater habitats.

The project includes several activities and measures designed to prevent the loss or degradation of riparian vegetation, overhead cover, and instream woody debris. As discussed in Chapter 1, "Introduction and Project Description," these activities include removal and relocation of LWD, removal of giant reed and other invasive species, avoidance of large stands of riparian vegetation, transplanting and monitoring of riparian vegetation, and revegetation of areas affected by mining activities (bars and floodplains). Further, the proposed *Draft Russian River—Alexander Valley River Enhancement Plan for Syar Industries Reach (Gill Creek Confluence to Jimtown Bridge)* (Syar 2008) includes aquatic habitat enhancement through the placement of LWD and minimum of 11 acres of riparian forest planting. A minimum of six acres of riparian forest would be planted in conjunction with the creation of alcoves and oxbows and a minimum of five additional acres of would be planted in other areas on the bars.

The proposed AMS would provide a further mechanism to ensure that loss or degradation of riparian vegetation would not occur on the extraction bars and/or floodplain through monitoring and evaluation of results against performance criteria. In addition, Mitigation Measure 3.3-8 in

Section 3.3, "Vegetation and Wildlife" would supplement the AMS by providing the procedures on how transplantation would occur.

However, absent mitigation, the project and AMS would not necessarily prevent the loss or degradation of riparian vegetation that could result from bank erosion, channel instability, or channel widening. Because loss or degradation of riparian vegetation, overhead cover, and instream woody debris could result from project-related bank erosion, channel instability, or channel widening, this would be a potentially significant impact.

Mitigation Measures

3.4-10a Supplement the AMS with Performance Criteria for Bar Area. This measure is identical to Mitigation Measure 3.2-5c in Section 3.2, "Hydrology and Water Quality," and shall be applied to this impact. This measure would protect against loss of overhead cover and instream woody material by providing protection of the bar area (where the cover and woody material exists).

3.4-10b Supplement the AMS with Performance Criteria for Channel Width. This measure is identical to Mitigation Measure 3.2-5d in Section 3.2, "Hydrology and Water Quality," and shall be applied to this impact. This measure would protect against loss of overhead cover and instream woody material by providing protection of the banks (where the cover and woody material exists).

3.4-10c Supplement the AMS with Performance Criteria for Riparian Vegetation. This measure is identical to Mitigation Measure 3.3-8 in Section 3.3, "Vegetation and Wildlife," and shall be applied to this impact.

Impact Significance after Mitigation

Mitigation Measures 3.4-10a through 3.4-10c would reduce the remaining potential impacts on riparian vegetation, overhead cover, and instream woody debris to a less-than-significant level.

Impact 3.4-11 Project-related activities could result in the release and exposure of contaminants, resulting in adverse effects on aquatic habitats, the aquatic food web, and fish populations, including special-status species, within the study area and in areas downstream of project mining and enhancement activities.

The potential exists for contaminants such as fuels, oils, hydraulic fluids, and other petroleum products used in mining and construction equipment to be introduced accidentally through spills into the waterway directly or incrementally through surface runoff from haul routes and staging areas. Contaminants in sufficient concentrations would be toxic to fish and prey organisms (e.g., benthic macroinvertebrates) occupying study area habitats or may alter oxygen diffusion rates and cause acute and chronic toxicity to aquatic organisms, thereby reducing growth and survival and/or leading to mortality. Please refer to Section 3.11, "Hazards and Hazardous Materials," for a discussion of potential effects associated with the accidental release of hazardous materials into the river.

Impact Conclusion

The potential release of hazardous materials into the Russian River could result in the reduction of aquatic habitats and fish populations if proper procedures are not implemented to contain the discharge. Potential impacts associated with the accidental release of hazardous materials and the consequent impact on aquatic habitat and fish populations would be potentially significant.

Mitigation Measure

3.4-11 **Develop (Update) and Implement Spill Prevention Fueling and Lubrication Plan (SPLP)**. This measure is identical to Mitigation Measure 3.11-1 in Section 3.11, “Hazards and Hazardous Materials,” and shall be applied to this impact.

Impact Significance after Mitigation

Mitigation Measure 3.11-1 would reduce potential impacts associated with the accidental release of hazardous materials, which would in turn reduce the potential for the direct loss of fish habitat or fish populations, to a less-than-significant level.

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