EXHIBIT 19-B

Potential Mitigation Projects Resulting from Mitigation Workshop, November 18, 2005

Background

In response to ongoing illegal take of steelhead, Amanda Wheeland of NOAA General Counsel, requested the California American Water Company (Cal-Am) fund potential mitigation projects on the Carmel River to improve habitat conditions for steelhead until a long-term water supply project is constructed, *e.g.*, a desalination plant. Cal-Am asked to meet with National Marine Fisheries Service (NMFS) to discuss this issue, and as an outcome of this meeting, NMFS agreed to conduct a Mitigation Workshop, which took place on November 18, 2005. In attendance were Cal-Am, NMFS, Monterey Peninsula Water Management District (MPWMD), and members from the Carmel River Steelhead Association and the Carmel River Watershed Conservancy, all local agencies and groups knowledgeable in Carmel River steelhead issues. California Department of Fish and Game, US Fish and Wildlife Service, and the Sierra Club were invited but unable to attend. The goal of the workshop was to produce a list of potential mitigation projects that would improve the survival of steelhead in the Carmel River in this interim period before a water project is constructed.

Condition of the Carmel River

Historically, the Carmel River was one of the most productive steelhead rivers along the California Coast. The watershed encompasses 255 square-miles in the Santa Lucia Mountain range. In the upper watershed, the river and its tributaries flow in deep, steep-sided canyons. For its last 15 miles, the river flows across the relatively flat Carmel Valley floor to the Pacific Ocean.

In the lower river, there are a number of wells, which pump water from the underflow of the Carmel River. Cal-Am operates 21 of these wells and is the largest holder of water rights on the river. Cal-Am has a legal water right for 3,376 acre-feet (AF) and illegally diverts an additional 10,730 AF from the Carmel River. The State Division of Water Rights has ordered Cal-Am to find an alternate source for this illegal amount (Order No. WR 95-10). Additional wells are operated privately under much smaller water rights. Of these additional wells, the State Division of Water Rights has identified 14 as major diverters who cumulatively divert up to 1,729 AF annually from the underflow of the Carmel River. As a result of these withdrawals, the Carmel River usually goes dry downstream of river mile (RM) 7 by July. On average, over the past 10 years, 121 fish per 100 feet have occupied the stretch of river that dries up. Extrapolating out this average density, excessive water withdrawals eliminate habitat for approximately 44,700 juvenile steelhead each year.

In 1990, MPWMD certified the Water Allocation Program Final Environmental Impact Report (EIR) which set water allocation limits for annual Cal-Am water production (Jones and Stokes 1998). The EIR included a mitigation program to mitigate for significant environmental impacts from Cal-Am's diversions. This mitigation plan

provides for: (1) expansion of the program to capture and transport smolts during spring; (2) prevention of stranding of early fall and winter juvenile migrants; (3) rescuing of juveniles downstream of Robles del Rio during summer; and (4) implementation of an experimental smolt transport program at Los Padres Dam (MPWMD 1999).

Under this program, the Sleepy Hollow Rearing Facility (SHRF) was constructed in 1997 to hold and rear juvenile steelhead rescued during the summer months when the lower reaches of the river become dry. The SHRF endured power-outages, predation by birds and fish, warm water conditions, and pump failure due to sediment uptake in the past few years. While Cal-Am is finding a new source of water, they continue to overdraft from the Carmel River, making the SHRF integral in ensuring steelhead survival. NMFS is working with MPWMD to establish a hatchery genetic management plan (HGMP) for the facility.

Each year, MPWMD and local volunteers rescue stranded steelhead as the lower 7 miles of the river dry up, transporting the rescued steelhead to the lagoon, upstream habitat, or the SHRF. Approximately 2% of rescued fish and 100% of unrescued fish die, resulting in lethal take associated with the drying river in addition to the non-lethal impacts to all steelhead rescued from those 7 miles.

Cal-Am is responsible for maintaining three dams along the Carmel River, the San Clemente (SCD), Los Padres (LPD), and Old Carmel River Dams (OCRD). SCD is 108 ft high, was completed in 1921, and was originally a year round water diversion but now is used for winter flow diversions. LPD, completed in 1949, is 148 ft high with a current reservoir capacity of approximately 1,425 AF and is located about 5 miles upstream of SCD. During the low flow season when LPD is not spilling, water is released downstream at a minimum rate of 5 cfs from the Los Padres Reservoir. OCRD, completed in 1883, is located about 1800 feet downstream of SCD, has no utility, but is shorter at 20 feet in height. A fish ladder on the south side of SCD was constructed when the dam was built. A trap and truck operation is used at LPD to pass fish over the dam. OCRD has a fish ladder on the south side that does not function well. A notch was cut in the north side of OCRD in an effort to increase fish passage, but the notch is too narrow and during high flows is a velocity barrier.

Below San Clemente Reservoir and Los Padres Reservoir, which capture sediment bedload, the river became incised and armored. Armoring is common downstream of dams and occurs as fine riverbed materials are washed out, leaving coarse materials that prevent further erosion of the riverbed (except during the largest floods). The process of incision and armoring below SCD continued until about 1940, when a new dynamic equilibrium was established. This incision increased the depth and speed of water flow and the rate of bank erosion; although erosion was limited by the growth of riparian vegetation along the newly cut banks (Jones and Stokes 1998). The increased development within the floodplains created a greater emphasis on flood protection and preventing bank erosion, resulting in the placement of hard structures such as rip-rap, concrete rubble, cement walls, and cars along about 40% of the lower river. The bank protection measures have further degraded the habitat value of much of the lower 18

miles of river.

Spawning gravels below SCD and LPD have been washed downstream with high flows but have not been replaced because the reservoirs trap the bedload from upstream. As the gravels are washed from the system, riffles are changed or eliminated, which reduces the production of food organisms for rearing steelhead. Gravels provide habitat for emergent fry, which initially move to shallow point bars and other depositional areas to grow. Since adult returns are about three percent of their historic amounts, spawning gravels are not likely limiting at this time, but they are significantly reduced so slight increases in adult returns would make them a limiting factor. The reduced amount of food provided by aquatic invertebrate production in gravels may be limiting steelhead growth and survival.

Over 90% of the average annual precipitation within the Carmel River watershed occurs between November and April, with January and February being the wettest months. In the rainy season, Los Padres Reservoir refills after being drained by minimum flows during the summer. Because of water withdrawals from the aquifer underlying the river, the lower mainstem of the river remains dry until there are sustained flows of approximately 400 cfs past the dams for several days.

Water withdrawals from the Carmel River cause two important delays to steelhead migration. First, fall migrating smolts living upstream would normally begin swimming downstream with the first rains of the fall. Ward *et al.* (1989) noted that the largest smolts migrate on average 10 days before the peak smolt migration. The largest smolts rearing in the upper Carmel River watershed have the best chance of ocean survival, but are delayed up to 6 weeks some years due to lack of water in Los Padres Reservoir and the in lower mainstem river. Second, the lagoon breach is delayed because the underflow of the river is refilled before the lagoon begins filling. Under natural conditions, the water table in the fall would be above the river bed or just below it, resulting in nearly instantaneous passage of fall flows to the lagoon. The delay in inflow to the lagoon and resulting delay in breaching depends on the size of the early fall storms.

The Carmel River lagoon is a naturally occurring lagoon and wetlands area located at the mouth of the Carmel River, where the river flows to the Pacific Ocean at Carmel Bay. Lagoons provide essential rearing habitat for juvenile steelhead along California's central coast. Smith (1996) estimated that the lagoon on Pescadero Creek, just north of the Carmel River, provided as much rearing productivity as 8 miles of upstream habitat. The lagoon functions best when inflows are sufficient to maintain the water quality in the lagoon. As a result of Cal-Am's illegal pumping upstream, there is very little inflow to the lagoon during the low flow season. When inflow to the lagoon is low, the water quality at the bottom of the lagoon is poor, forcing steelhead to live at the surface in the only non-lethal water available. The summer conditions in the lagoon result in increased predation, stress, mortality, reduced growth, and delayed mortality of steelhead.

Approximately 70% of Carmel River spawning and rearing habitat is located upstream of LPD, and approximately 90% above SCD (Snider 1983). Currently, about 55% of adult

steelhead spawn downstream of the dams, about 45% migrate over SCD, and only about 11 to 16% are transported above LPD. One reason for the altered utilization of the river could be upstream passage issues with the dams causing too much stress resulting in reduced survival or spawning success. Other reasons could be juvenile and kelt mortality caused by downstream migrations over three dams, delayed migrations, or delayed mortality caused by stress. Densities of steelhead rearing above Los Padres Reservoir were assessed by Kelley (1983) to be one-third that of comparable-sized rivers.

Many aspects of the Carmel River are functionally degraded and should be repaired in order for steelhead populations to reach their historic abundances. Steelhead rearing success may be negatively impacted by lack of food, lack of cool-water refugia and pools, lack of gravel and sediment, seasonal lack of water in parts of the river, lack of large woody debris (LWD), poor water quality in the river and the lagoon, unnatural breaching of the lagoon, predation, and hardened stream banks. Steelhead spawning success may be negatively impacted by the Allee effect (trouble finding a mate), lack of spawning gravels, impeded access to historic spawning areas, and lack of adult steelhead habitat. Migration of adult and juvenile steelhead is negatively impacted by dams, the seasonally dry river bed, lack of resting pools, inadequate fish passage facilities, and long stretches of homogenous habitat.

NMFS determined there are four broad, primary limiting factors that contribute to the decline of Carmel River steelhead more so than any other factors. The most important issue in the watershed is seasonal lack of water and flow in the river, caused by excessive pumping in the lower river, eliminating historically productive rearing habitat and critically impairing the lagoon water quality. The second biggest problem in the Carmel River watershed is the lagoon, due to lack of water inflow in the summer, again as a result of excessive water withdrawals. Under natural conditions, the lagoon provides excellent rearing habitat and higher densities of rearing steelhead than anywhere else in the river. Impaired fish passage, the third limiting factor, limits access to the best spawning and rearing habitat, which is located above LPD. The system as a whole is also fragmented by two other dams and a long stretch of dry river in the summer, eliminating connectivity between the reaches. Degraded habitat in the lower mainstem river, the fourth limiting factor, also limits the Carmel River steelhead population, since steelhead naturally move to mainstem habitats to grow larger in preparation for the adult portion of their lives. This section of river now is dry for several months of the year and when it is wet, has limited food supply, and the homogenous habitat provides minimal refuge from predators. The mitigation projects are ranked according to their potential to address these four primary limiting factors and increase steelhead populations most efficiently. Proposed projects that didn't meet these criteria are ranked at the bottom of the final list or were eliminated altogether.

Proposed Restoration Projects

1. Lagoon Reverse Osmosis Water Project

Proposal: Cal-Am's pumping operations dry the river upstream of the lagoon, confining steelhead to the area downstream of the Highway 1 Bridge and causing the lagoon water level to drop, the water quality to worsen, and leaving steelhead more stressed and more susceptible to predators. Between 8,000 and 25,000 juvenile steelhead rear in the Carmel River lagoon each year, but under natural conditions, steelhead would move between the lagoon and the lower mainstem Carmel River depending on where optimal habitat could be found. Mortality in the lagoon is currently unknown, but is expected to be the highest of any location in the Carmel River.

The Carmel Area Wastewater District recently proposed the second phase of their Salinity Management Project, which plans to use reverse osmosis to make water for use on seven golf courses on the Monterey Peninsula. This project would generate water as waste that could be allowed to flow into infiltration ponds, constructed upstream of the South Arm of the lagoon in the Odello West fields. The water should indirectly raise lagoon levels as it filters through the sand beneath the ponds and into the aquifer. The additional water will improve the water level of the Carmel River lagoon during the summer juvenile steelhead rearing phase.

Biological Response: After completion of this mitigation project, the Carmel River lagoon will receive water inflow of 1.5 AF per day (approximately 3 cfs) via groundwater seepage during summer low flow periods. When the inflow to the lagoon is sufficient to maintain good water quality, the Main Bay, South Arm, and North Arm provide habitat for steelhead and refuge from predators. It is reasonable to expect increased survival and smolt size, which will improve ocean survival and adult returns.

Funding Costs: This project would have a one-time estimated cost of approximately $50,000 for constructing ponds and a water delivery system to the ponds.

Conclusions: This project addresses three primary limiting factors: low flows in the river, fish passage, and lagoon water quality. The project is expected to result in increased growth and survival of many steelhead in the first year of its implementation. There is also the potential to relocate more rescued fish to the lagoon as opposed to other locations. This project is ranked as the top mitigation priority because it addresses three primary issues of concern, benefits many steelhead for little money, and will be ready to implement in the next two to three years.

2. Sleepy Hollow Steelhead Rearing Facility Water Intake Upgrade

Proposal: As Cal-Am pumps the lower river dry, MPWMD conducts steelhead rescues, transporting approximately 25,000 juvenile steelhead to the SHRF to be reared for approximately 6 months. The SHRF currently gets its water directly from the river via two submersible pumps, which could be damaged or destroyed if sediment enters through the water intake entrance. Turbidity in the Carmel River during high flows is enough to damage the pumps. Several years ago, the pumps failed due to sediment uptake so the facility was not used that year. Currently, to avoid the risk of sucking sediment into the pumps, all of the steelhead in the SHRF are released before high, turbid flows begin in

the late fall when parts of the river are sometimes still dry and disconnected from the lagoon. Releasing these fish in the fall creates competition for food and potentially space between the SHRF smolts and the resident smolts until the river is connected to the lagoon.

The proposed solution to this problem is to construct an underground, 80 square foot concrete settling basin, which will allow 98% of all sediment to settle out before pumping the water into the SHRF. This project will allow the SHRF to function in high flows so steelhead can be kept in the facility until the river is flowing to the lagoon. Access to the facility needs to be available year round, so the low water crossing to the facility will also need to be improved.

Biological Response: The MPWMD could release the smolts late in the season, when the lower river is completely rewetted so the SHRF smolts could emigrate directly to the ocean and avoid competition with resident smolts, increasing survival and fitness of all smolts.

This is viewed as a short-term solution, since, generally, there are problems associated with rearing facilities. The facility attempts to rear the steelhead in as natural a setting as possible, so they are similar to wild steelhead when they are released. However, there are extensive studies concerning the behavioral differences between wild steelhead and wild-origin steelhead raised in a hatchery environment (see Huntingford 2004 for overview). According to Huntingford (2004), steelhead produced in the wild, reared in facilities, and then released into the wild exhibit different feeding, anti-predator responses, aggression, and reproductive behavior than their counterparts rearing in the wild. Improvements at SHRF are needed to ensure survival and recovery until an alternate water supply is developed.

Funding Costs: Estimated costs for improvements would be a one-time cost of $570,000 for the settling basin and water intake, and additional costs for the water crossing improvement.

Conclusion: This project addresses three primary limiting factors: low flow in the river, fish passage, and degraded mainstem habitat. These limiting factors are addressed by producing large, healthy smolts rescued from low flows, which can be released late enough to pass unobstructed to the ocean, avoiding temporary residence in the degraded lower mainstem river. This project is considered the second most important project because it addresses three issues of concern, can benefit over 20,000 juvenile steelhead each year, only has a one-time cost associated with it, and can be implemented in the next year or two.

3. Los Padres Dam Fish Passage

Proposal: The habitat upstream of LPD provides approximately 70% of the spawning and rearing habitat in the Carmel River, but few adult steelhead make it to this area. When the dam was completed, the only upstream passage for steelhead was a short fish

ladder that led to a holding facility, where fish were trapped and then trucked over the top of the dam. Subsequently another ladder and trapping facility were constructed below the dam for upstream passage, along with a 9.5-inch by 36-inch notch in the spillway for downstream passage.

Passage at LPD is not adequate for up or down stream migration. Passage conditions need to be improved to increase the adult returns to spawning grounds above LPD. There is a need for: 1) an engineering study that could determine the best method to achieve both upstream and downstream passage; and 2) construction of a fish passage structure identified in the engineering study.

Biological Response: Building a passage facility for upstream and downstream migrating steelhead will allow adult steelhead to spawn in the mainstem and tributaries above LPD and increase the survival of kelts, smolts, and juveniles migrating downstream. This project would provide a long-term solution to a major problem on the Carmel River, increasing the overall Carmel River steelhead population.

Funding Costs: The cost of this will depend on the engineering study's cost determination for a facility that provides safe upstream and downstream passage.

Conclusion: This project addresses two primary limiting factors: fish passage and degraded mainstem habitat, since historically fish reared in the headwaters and migrated to the mainstem as smolts and pre-smolts to grow more before entering the lagoon. The increased returns above LPD would increase spawning, allowing for use of the rearing habitat above LPD, and resulting in a significant increase in the number of smolts produced. Improved downstream passage would increase smolt health and survival, increasing the numbers of adults able to return to the headwaters of the Carmel River in future generations. This project is considered important because it addresses two issues of concern and could benefit a large portion of the Carmel River steelhead population. The expense of upstream and downstream passage is expected to be considerable and could take up to five years to complete the project.

4. Carmel River Enhancement – Mainstem, tributaries, and lagoon

Proposal: Much of the problem between SCD and the mouth of the Carmel River is related to the sediment trapped behind both SCD and LPD, resulting in an armored streambed lacking structure and heterogeneity below the dams. The degraded rearing habitat impacts juvenile abundance; therefore, improvements in habitat quality should improve juvenile abundance and growth rate. Instream habitat structures would be constructed in areas that are armored, lacking pools, and/or recommended by a hydrologist or geomorphologist to increase juvenile steelhead rearing habitat and adult resting pools. The structures should be designed to withstand a 100-year flood event and to prevent bank erosion, while scouring or maintaining pools and creating spawning and rearing habitat.

Biological Responses: Large pools provide thermal refuge for steelhead during the

summer months (Matthews and Berg 1997) and the tailouts provide well sorted gravels for steelhead spawning and macroinvertebrate production. These structures have been monitored in other systems and have been shown to provide statistically significant increases of between 1.5 and 6 times more steelhead (Paulsen and Fisher 2005, Roni and Quinn 2001, Diez *et al.* 2000, Kiefer and Lockhart 1999, Bisson and Bilby 1998, Bilby and Bisson 1998, Espinosa and Lee 1991). Jones and Tonn (2004) analyzed longer reaches though, and found the instream structures may condense all fish in the reach into the optimal habitat, vacating the mediocre to poor habitat, but not increasing carrying capacity. Winter rearing habitat is plentiful in the Carmel River, so these structures will be intended to increase summer rearing success (Morgan and Hinojosa 1996).

Funding Costs: One-time estimated cost for permitting, engineering plans, and project monitoring of $10,000 to $30,000 per habitat structure.

Conclusions: This project addresses two primary limiting factors: degraded mainstem habitat and the lagoon condition. The potential for the instream structures to provide optimal habitat are well documented in past studies. Structures could be installed in the mainstem of the Carmel River and in the lagoon to create habitat and benefit both areas. Monitoring of structures should focus on overall change in steelhead densities within the reach, at the structures, and the change in the size of the steelhead in the reaches. Constructing instream structures ranks fourth in priority of mitigation work because it addresses two issues of concern, each structure is very inexpensive for the potential benefit to rearing fish, and the structures can be designed and built in one year.

5. Old Carmel River Dam Removal

Proposal: Currently, there is a small notch in the north side of the OCRD, but during high flows, the water flowing through the notch creates a flow barrier. The thickness of the dam makes it very difficult for steelhead to jump and swim over during high flows as well. If adult steelhead spend too much energy navigating the barriers, they may die without spawning or suffer reduced reproductive fitness. Juveniles and kelts also suffer delayed mortality and reduced growth as a result of navigating dams on their downstream migration (Budy *et al.* 2002). The survival of kelts is particularly beneficial to the overall steelhead population because they return and spawn again, basically doubling their reproductive contribution compared to one-time spawners.

As part of Cal-Am's SCD Seismic Safety Project EIS/EIR, Cal-Am has proposed to cut a larger notch in the OCRD. The mitigation proposal being considered here would completely remove the OCRD during the Seismic Safety Project rather than cutting a larger notch.

Biological Response: Removing the OCRD would result in a natural stream channel, reducing stress and potential delay of migration, resulting in less mortality and better health of upstream and downstream migrants.

Funding Costs: One-time cost for permitting, engineering, and demolition of the dam of

would be in the range of $300,000 to $500,000.

Conclusion: This project addresses two primary limiting factors: fish passage and mainstem habitat degradation. This project would benefit adult steelhead returning to spawn, which are relatively more important than individual juvenile steelhead to the population. This project is considered important because it will inexpensively benefit returning adults every year after the dam is removed.

6. Sediment/Gravel Injection

Proposal: In the past 80 years, San Clemente and Los Padres Reservoirs have trapped over 3,000 AF of sediment ranging from sands and silts to cobble and small boulders. Downstream of both dams, this has resulted in an armored stream channel and banks, degraded channels, and lack of invertebrate and fish habitat. The purpose of this project would be to dredge sediments and gravels from San Clemente Reservoir and/or Los Padres Reservoir and deposit the sediment into the river below each dam. The gravel would be placed along the edges of the river and in the plunge pool during low flows and would be distributed naturally during high flows to natural depositional areas.

Biological Response: Injecting 2 to 4 AF of gravels annually below each dam will increase the potential spawning habitat in the river (Wheaton *et al.* 2004) and will also increase macroinvertebrate production (Merz and Chan 2005, Death 2003, Bisson and Bilby 1998). Gravel injection projects have been studied in the past, revealing that spawning gravel enhancement projects result in significantly higher numbers of steelhead parr produced (Merz *et al.* 2004, Espinosa and Lee 1991).

Gravel injection and instream structure projects conducted coincidentally in streams lacking gravels and structure but not macroinvertebrates resulted in 1.5 to 6 times more juvenile steelhead than before enhancement (Keifer and Lockhart 1999, Espinosa and Lee 1991). The Carmel River is deficient in gravels, structures, and also macroinvertebrates. This project is expected to cause similar increases in steelhead density and may also increase their size since aquatic invertebrates are particularly important to California steelhead (Merz 2002). This project will increase steelhead populations if sufficient gravels are placed downstream of the dams.

Funding Costs: Estimated cost to inject 2 to 4 AF of gravel downstream of LPD and SCD approximately $60,000 to $100,000 annually. This could be conducted in conjunction with the dredging project for LPD, which would make both projects more cost effective.

Conclusion: This project addresses one issue of concern, which is mainstem habitat degradation. Monitoring of similar projects suggests that gravel injection is a good way to increase egg to juvenile survival and will increase macroinvertebrate production (McHenry *et al.* 1994). In the immediate future, gravel injections are more likely to provide benefits to juvenile fish by increasing macroinvertebrate production and in the more distant future the gravels will provide spawning habitat for adults. This is the sixth

ranked mitigation project because it addresses one issue of concern, benefiting many young-of-the-year steelhead, a moderate number of larger juveniles, and some adults for a moderate amount of money each year. The project could be implemented next year.

7. Los Padres Reservoir Sediment and Organic Debris Removal

Proposal: The Los Padres Reservoir provides minimum summer flows, releasing approximately 1,100 AF each year. Over the past 56 years, the reservoir has partially filled with sediment and debris, reducing the storage capacity from 3,030 AF to about 1,425 AF. The proposal for this project is to dredge Los Padres Reservoir to reclaim storage capacity, which would allow for higher summer releases keeping more water flowing farther downstream during the summer and fall.

Biological Response: This project would nearly double the volume of the reservoir, so 2,700 AF could be passed downstream during a summer. Allowing the Carmel River to flow farther downstream before going dry would protect steelhead and their critical habitat, eliminating the need for fish rescues in the area.

Funding Costs: One-time cost for permitting, engineering design and dredging. There may be a potential to sell aggregate to recover some costs. The most expensive sediment removal cost is estimated at $9.90/cubic yard (per MWH). If the reservoir were dredged of the approximately 1,605 AF of sediment that has entered since 1949, that would amount to 2,589,400 cubic yards of sediment. The cost of this removal would be $25,635,060. Some of the recovered sediment could also be used to supplement spawning gravels downstream of the dams, reducing the costs associated with hauling. There would also be the issue of finding a disposal site for the unused sediment, which could add costs to this project.

Conclusion: This project addresses two primary limiting factors: downstream habitat and flow in the river. This is an important project because it addresses two issues and protects several thousand juvenile steelhead each summer. The price of removing the sediment and the timeframe to begin the project cause this project to be ranked lower than those in front of it.

8. Natural Broodstock Program

Proposal: This proposal is a safety net in case of extreme drought years or in times of habitat destruction sufficient to prevent natural spawning (e.g. dam failure). During normal years, when adults can migrate to the river from the ocean, this project will not occur. The wild broodstock program would go into effect in the second year of a major drought, after one year of no passage between the river and the ocean. In the second year, the wild broodstock program would capture smolts throughout their downstream migration to gather as diverse a genetic pool as possible. The captured smolts will be raised in a saltwater tank at a location to be determined and once mature they would be released into either Carmel Bay, Carmel River lagoon, or into the river directly if drought has made entry from saltwater impossible.

The project will be part of the HGMP and a technical advisory committee (TAC) would determine the period, locations, and methods of capture. Fish that are hatched and reared in facilities before being released are at a competitive disadvantage to wild fish relative to feeding, antipredator response, aggression, and reproductive behavior (Huntingford 2004, Berejikian *et al.* 1996). Our goal is to retain wild fish without any hatchery or rearing facility influence, but we understand that without the wild broodstock program, extreme events could cause extirpation of *O. mykiss* genetics with a propensity for anadromy (Thrower *et al.* 2004).

Biological Response: This project will retain Carmel River steelhead genetics in the event of a drought or catastrophic event. In most years, the natural broodstock program will not be necessary, but a plan will be developed as part of the HGMP in case of a catastrophic drought.

Funding Costs: The broodstock program will have overhead costs associated with it. Volunteers would be used to operate the facility. Funds would be needed to cover the cost of the facility, food, collection device, *etc.* The overall cost for one year of operation is estimated at $60,000 to $100,000.

Conclusions: This project addresses one issue of concern, which is lack of flow. Major droughts threaten the existence of steelhead in this system. Preserving the unique genetic qualities of anadromy, run timing, and outmigration timing would be key components to this project. This project may be the only way to maintain a steelhead run in the Carmel River during emergency situations. This project ranks eighth on the list because it addresses one issue of concern during emergencies only. The cost will be fairly inexpensive for saving steelhead during droughts or catastrophes and it could be implemented in three years.

9. Barrier Beach Sediment Budget Analysis

Proposal: Over the past century, the barrier beach at the mouth of the Carmel River may have become narrower. The width of the barrier beach is critical to the health of the lagoon and the private properties nearby. If the beach is getting narrower, there are concerns that the lagoon may cease to function or may become a tidal inlet. This proposal would design a sediment transport analysis between upstream bedload and the marine environment to determine the long-term trends of sediment replenishment at the barrier beach.

Biological Response: The barrier beach at the mouth of the Carmel River is vital to maintaining a lagoon for rearing of smolts and juveniles throughout the year. Understanding the dynamics of sediment transport to the barrier beach will help determine methods to ensure the lagoon remains functional to support steelhead. Better knowledge of sediment transport from the river to the beach will lead to better management of the lagoon, the beach, and the surrounding property.

Funding Costs: Estimated one-time cost for the sediment transport analysis of approximately $125,000.

Conclusion: This project addresses one issue of concern, which is the condition of the lagoon. Funding the study would not directly benefit any fish, but the study would assist regulatory agencies in making decisions about lagoon management, which would benefit steelhead in the future. This project ranks ninth because it addresses one issue of concern but will not directly benefit any fish. The cost of the study is not very expensive and planning could begin next year.

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