bass fyke trapping and gill netting activities appear to have potential to take up to 1.8% of the Central Valley spring-run chinook salmon spawning escapement (23 adults based on the average 1991-94 run to Deer, Mill and Butte creeks). However, the population impact of trapping and netting Central Valley spring-run chinook salmon does not directly correspond to the capture rate, as most chinook salmon captured in the traps and gill nets are alive and in good condition when returned to the river. In 1994, 61 of 63 (97%) salmon captured in the traps and 13 of 17 (76%) salmon captured in the gill nets were released alive; thus, in 1994, 74 of 80 salmon (92%) were alive at release. Of those 74 live salmon, 55 were rated in good or excellent condition. In 1996, 81% of captured salmon were released alive (all of the eight salmon captured in the traps and 13 of 18 salmon captured in gill nets). All of the live fish released in 1996 were classified in good or excellent condition. Overall, for 1994 and 1996 combined, 95 of 106 (90%) of trap and net captured chinook salmon were released alive, resulting in a 10% mortality rate for all chinook salmon.

Assuming the 10% mortality of all chinook salmon associated with trapping and gill netting in 1994-1996 applies to captured Central Valley spring-run chinook salmon, direct mortality of Central Valley spring-run chinook salmon as a result of trapping and gill netting could be as high as 0.2% of the spawning escapement, based on the 1994 capture rate of 1.8% of the Central Valley spring-run chinook salmon spawning escapement (i.e., 10% of 1.8% is 0.18 % ≈ 0.2%). Assuming delayed mortality and reduced spawning success due to physiological stress affects another 10% of the trapped and netted salmon, the total potential population impact could be as much as 0.4% of the spawning escapement.

However, CDFG has agreed as a condition of this Conservation Plan (see Chapter 13, Monitoring, Minimization, and Mitigation) to limit the take of Central Valley spring-run chinook salmon or Sacramento River winter-run chinook salmon during mark-recapture studies to 1%. This limitation will likely reduce the mortality impact of netting and trapping on the Central Valley spring-run chinook salmon population to no more than 0.2% (i.e., 10% mortality x 1% capture rate = 0.1%, plus another 10% for delayed effects yields a total 0.2% impact). This negligible level of impact every two years is less than the impact of the baseline trapping and netting program; thus, it would not increase the probability of extinction from that associated with the baseline program.

C. Summary -- Take of Central Valley Spring-Run Chinook Salmon

The estimated maximum take of Central Valley spring-run chinook salmon by predation by stocked striped bass (0.8%) and as a result of striped bass monitoring (1.0%) combine to yield an estimated total maximum take of 1.8% of the annual Central Valley spring-run chinook salmon population. However, take may be substantially less than this estimate because stocking may not always be at the maximum level due to various factors that may reduce availability of fish. Further, the actual mortality associated with striped bass monitoring (i.e., netting and

trapping) probably will not exceed 0.2% of the Central Valley spring-run chinook salmon population since most captured fish would be released alive and unharmed.

Overall, average mortality of Central Valley spring-run chinook salmon as a result of the striped bass management program is not expected to exceed 1.0% (0.8% predation rate plus 0.2% from trapping and netting). This level of impact is not expected to significantly impair the survival and recovery of Central Valley spring-run chinook salmon because: 1) Smolt mortality and take by monitoring should not increase above the 1994 level; thus, the extinction probability of Central Valley spring-run chinook salmon should not increase. 2) Mitigation screening of water diversions will increase survival of Central Valley spring-run chinook salmon in the upper river system.

Chapter 6. ANALYSIS OF EFFECTS OF THE STRIPED BASS MANAGEMENT PROGRAM ON CENTRAL VALLEY FALL-/LATE-FALL-RUN CHINOOK SALMON

A. Expected Level of Take

1. Stocking Striped Bass

a. Estuary/River System in General. Stocking of yearling and 2-year old striped bass will occur each year in late June or July in San Pablo Bay, after most naturally produced Central Valley fall-run chinook salmon smolts have emigrated from the Estuary. Thus, stocking at that time and location will avoid immediate conflict between stocked striped bass and most Central Valley fall-run chinook salmon, except those reared in hatcheries and trucked and released in summer in San Pablo Bay and Carquinez Strait.

CDFG anticipates that the striped bass population would decrease to 515,000 adults if striped bass were not stocked. Without stocking, total predation by the expected striped bass population would be about 5.4% of the Central Valley fall-run chinook salmon outmigrants each year. Predation by stocked striped bass is estimated to cause maximum annual increase in mortality of Central Valley fall-run chinook salmon of 1.4% (as shown in Table 13) over that which would occur without stocking and the commensurate decrease in predation. In the initial years of stocking, the predation rate would be less than 1.4% because there would be fewer stocked fish in the population before it returns to 712,000 adults. Also, the lower stocking rates after the sixth year would reduce the predation impact in the later years of the program. Nevertheless, 1.4% is the anticipated level of annual "take" of Central Valley fall-run chinook salmon outmigrants resulting from predation by stocked striped bass to be covered by this Conservation Plan and its associated Section 10(a)(1)(B) permit

The estimated maximum annual consumption of Central Valley fall-run chinook salmon outmigrants by the total population of 712,000 adult striped bass maintained by the proposed stocking program is 6.8% (5.4% + 1.4% = 6.8%).

Emigration of Central Valley late-fall-run chinook salmon smolts occurs several months after stocking of yearling and 2-year old striped bass. Some predation could occur by these stocked bass at that time, although these bass will still be feeding primarily on invertebrates.

Predation potentially could occur on subsequent Central Valley late-fall-run chinook salmon year classes as the stocked striped bass grow and become increasingly pisciverous. Striped bass predation impacts on Central Valley late-fall-run chinook salmon were not quantified directly; however, reasonable inference can be made based on the quantified estimates for the fall- and winter-runs and differences in Central Valley late-fall-run life history. Central Valley late-fall-run chinook salmon smolts are larger during their outmigration and migrate in late fall and winter when water temperatures decline and turbidity increases due to storm runoff. Striped bass metabolism slows as temperature declines and they feed less frequently. They also

have more difficulty seeing and capturing prey when the water is turbid (cloudy). These factors will render Central Valley late-fall-run chinook salmon less vulnerable than Central Valley fall-run chinook salmon to striped bass predation. Thus, the estimate of predation at the population level of 712,000 adult striped bass is less than 6.8% (estimate for Central Valley fall-run chinook salmon). As the stocking program would stabilize striped bass abundance at the present (estimated 1994) level, stocking striped bass would not result in an increase in predation from the present (estimated 1994) level. However, the proposed striped bass stocking would lead to an increase in mortality of Central Valley late-fall-run chinook salmon smolts by less than 1.4% over that which would occur without stocking because of the expected decline in the striped bass population without stocking and the commensurate decrease in predation. Thus, 1.4% is the anticipated maximum level of annual "take" of Central Valley late-fall-run outmigrants resulting from predation by stocked striped bass to be covered by this Conservation Plan and its associated Section 10(a)(1)(B) permit.

b. Predation at Structures. To the extent that previous striped bass stomach sampling included bass captured at structures (see Chapter 2, Section F), effects of predation at structures are included in the expected level of take for the Estuary in general. With regard to predation in Clifton Court Forebay, increased take of Central Valley fall- and Central Valley late-fall-run chinook salmon due to stocked striped bass is unlikely for many of the same reasons discussed in the Sacramento River winter-run chinook salmon section (Chapter 4, Section A.1.b).

2. Maintaining Sport Fishing Regulations to Protect Striped Bass

Implementation of striped bass fishing regulations may indirectly result in take of Central Valley fall-and Central Valley late-fall run chinook salmon as a result of incidental catch of these salmon by striped bass anglers. Therefore, maintaining the existing striped bass fishing regulations or implementing changes to the regulations that lead to the target population of 712,000 adults are covered by this Conservation Plan and its associated incidental take permits. The CDFG does not currently contemplate recommending any changes to the regulations to the Fish and Game Commission however, CDFG may recommend to the Fish and Game Commission changes to the regulations during the permit period to assist in meeting the target population of 712,000 adult striped bass.

Modifying regulations to achieve striped bass abundance of 712,000 adults would not increase the level of take over that already described as a result of predation by stocked striped bass because that level of take assumes a population of 712,000 adult striped bass. Thus, if the Fish and Game Commission were to change the regulations in response to any CDFG recommendations for such changes, no additional predation impact on Central Valley fall- or Central Valley late-fall-run chinook salmon would result.

The striped bass fishery, however, does create potential incidental take of adult Central Valley fall- and Central Valley late-fall-run chinook salmon by striped bass anglers. There has been no monitoring of past incidental salmon catches by striped bass anglers, but it is likely that

such catches are infrequent and have a negligible impact on these salmon populations because salmon generally are not vulnerable to techniques employed by striped bass anglers. Nonetheless, any incidental take of salmon that does occur as a result of striped bass angling, which while not quantifiable is expected to be minimal, will be covered by this Conservation Plan and its associated incidental take permit.

3. Monitoring

See general information on monitoring in the Sacramento River winter-run chinook salmon chapter, (Chapter 4, Section A.3).

a. Summer Townet Survey. The summer townet survey does not result in catch of salmon; therefore, no incidental take is expected to occur as a result of this action.

b. Fall Midwater Trawl Survey. Based on the lengths of salmon measured during 23 survey years since 1973, the fall midwater trawl survey captured 249 Central Valley fall-run and 185 Central Valley late-fall-run outmigrants, respectively for an average of 10.8 Central Valley fall-run and 8.0 Central Valley late-fall-run chinook salmon annually. Also, a total of 44 adult chinook salmon of undetermined run, but probably primarily the Central Valley fall- and Central Valley late-fall-run were captured for an average of 1.9 per year. The combined catches of outmigrants and returning adults represent substantially less than 0.1% of these runs. No attempt was made to classify the origin of these salmon (hatchery or natural production). A similar level of take of salmon is anticipated to occur annually and will be covered by this Conservation Plan and its associated incidental take permit.

c. Mark-Recapture of Adult Striped Bass. Central Valley fall- and Central Valley late-fall-run chinook salmon do not migrate upstream during April-May when fyke traps and gill nets are used to capture striped bass for tagging; therefore, this trapping and netting is not anticipated to take any Central Valley fall- or Central Valley late-fall-run chinook salmon.

B. Impact of Take on Central Valley Fall-/Late-Fall-Run Chinook Salmon

1. Stocking Striped Bass

At maximum, predation by stocked striped bass would reduce each Central Valley fall-/late-fall-run chinook salmon cohort by about 1.4%. Under this scenario, the mean 1990-96 spawning escapement of 213,000 Central Valley fall-run chinook salmon would be reduced by about 2,982 fish and the mean 1990-94 spawning escapement of 7,170 Central Valley late-fall-run fish would be reduced by 100 fish (escapement estimates more recent than 1994 are not available due to open gates on the Red Bluff Diversion Dam allowing salmon to pass without using the fish ladder where they are counted).

If the actual numbers of striped bass stocked are less than proposed due to problems associated with culture such as unavailability of adequate numbers of fish from the SWP/CVP fish screens, lack of success in artificially spawning adult striped bass, and losses during rearing, the impact on Central Valley fall-/late-fall-run salmon would be commensurately lower.

This estimated level of impact is not expected to substantially increase the probability of extinction of Central Valley fall-/late-fall-run chinook salmon over the ten-year permit period from that associated with the 1994 striped bass population because the stocking program will not be increasing the striped bass population above that level.

2. Maintaining Sport Fishing Regulations to Protect Striped Bass

As previously described, there is probably a small incidental catch of Central Valley fall-/late-fall-run chinook salmon by striped bass anglers. However, considering that such catches are likely to be infrequent, take resulting from striped bass fishing is expected to have a negligible impact on the Central Valley fall-/late-fall-run chinook salmon population.

3. Monitoring

a. Fall Midwater Trawl Survey. The mean annual catch of Central Valley fall-/late-fall-run chinook salmon represents a negligible portion of these runs and salmon captured by the midwater trawl are released immediately and generally appear to be in good enough condition to survive. Hence, the fall midwater trawl survey is expected to have a negligible impact on the Central Valley fall-/late-fall-run chinook salmon population.

C. Summary -- Take of Central Valley Fall-/Late-Fall-Run Chinook Salmon

The estimated maximum take of Central Valley fall-/late-fall-run chinook salmon by predation by stocked striped bass is 1.4%. There would be less than 0.1% take of Central Valley fall-/late-fall-run chinook salmon by striped bass monitoring. Thus, predation and monitoring combine to yield an estimated total maximum take of 1.5% of the annual Central Valley fall-/late-fall-run population. However, take may be substantially less than this estimate because stocking may not always be at the maximum level due to various factors that may reduce availability of fish. This level of impact is not expected to significantly impair the status of Central Valley fall-/late-fall-run chinook salmon because: 1) smolt mortality and take by monitoring should not increase above the 1994 level; thus, the extinction probability of Central Valley fall-/late-fall-run chinook salmon should not increase, and 2) mitigation screening of water diversions will increase survival of Central Valley fall-/late-fall-run chinook salmon in the upper river system.

Chapter 7. ANALYSIS OF EFFECTS OF THE STRIPED BASS MANAGEMENT PROGRAM ON CENTRAL VALLEY STEELHEAD

A. Expected Level of Take

1. Stocking Striped Bass

a. Estuary/River system in General. Stocking yearling and two-year old striped bass in June or July in San Pablo Bay, as proposed in this Plan, will not have an immediate effect on Central Valley steelhead because all Central Valley steelhead smolts already have left the Estuary and yearling Central Valley steelhead are too large to be easily consumed by young striped bass. Predation on subsequent Central Valley steelhead year classes by stocked striped bass could occur as the stocked striped bass grow and become more pisciverous.

Central Valley steelhead have been found in only one of the thousands of striped bass stomachs examined from the Sacramento-San Joaquin Estuary. Based on this almost complete lack of Central Valley steelhead in striped bass stomachs analyzed to date, and the knowledge that out-migrant Central Valley steelhead are larger and can swim faster than salmon smolts, CDFG concludes that predation by stocked striped bass on naturally produced Central Valley steelhead would likely be substantially less than the predation impact estimated for any of the runs of chinook salmon (see Chapters 4-6). Thus, the level of incidental take of Central Valley steelhead resulting from predation by stocked striped bass is expected to be no greater than the 0.8% estimated for Central Valley spring-run chinook salmon. This level of take of Central Valley steelhead will be covered by this Conservation Plan and its associated Section 10(a)(1)(B) permit.

b. Predation at Structures. To the extent that previous striped bass stomach sampling included bass captured at structures (see Chapter 2, Section F), effects of predation at structures are included in the expected level of take for the Estuary in general. With regard to predation in Clifton Court Forebay (where the single striped bass with a Central Valley steelhead in its stomach was collected), increased take of Central Valley steelhead due to stocked striped bass is unlikely for many of the same reasons discussed in the Sacramento River winter-run chinook salmon section (Chapter 4, Section A.1.b).

In summary, the level of incidental take of Central Valley steelhead resulting from striped bass predation at CCF, is not expected to increase the overall anticipated take level of Central Valley steelhead described above for the Estuary and river system in general.

2. Maintaining Sport Fishing Regulations to Protect Striped Bass

Implementation of striped bass fishing regulations may indirectly result in take of Central Valley steelhead as a result of incidental catch by striped bass anglers. Therefore, maintaining

the existing striped bass fishing regulations or implementing changes to the regulations that lead to the target population of 712,000 adults are covered by this Conservation Plan and its associated incidental take permits. The CDFG does not currently contemplate recommending any changes to the regulations to the Fish and Game Commission however, CDFG may recommend to the Fish and Game Commission changes to the regulations during the permit period to assist in meeting the target population of 712,000 adult striped bass.

Modifying regulations to achieve striped bass abundance of 712,000 adults would not increase the level of take over that already described as a result of predation by stocked striped bass because that level of take assumes a population of 712,000 adult striped bass. Thus, if the Fish and Game Commission were to change the regulations in response to any CDFG recommendations for such changes, no additional predation impact on Central Valley steelhead would result.

The striped bass fishery, however, does create potential incidental take of adult Central Valley steelhead by striped bass anglers. There has been no monitoring of past incidental Central Valley steelhead catches by striped bass anglers, but it is likely that such catches are infrequent and have a negligible impact on the Central Valley steelhead population because Central Valley steelhead generally are not vulnerable to techniques employed by striped bass anglers. Nonetheless, any incidental take of Central Valley steelhead that does occur as a result of striped bass angling, which while not quantifiable is expected to be minimal, will be covered by this Conservation Plan and its associated Federal incidental take permit.

3. Monitoring

See general information on monitoring in the Sacramento River winter-run chinook salmon chapter, (Chapter 4, Section A.3).

a. Summer Townet Survey. The summer townet survey does not result in catch of Central Valley steelhead; therefore, no incidental take is expected to occur as a result of this action.

b. Fall Midwater Trawl Survey. The 30 fall midwater trawl surveys conducted to date have captured a total of 38 Central Valley steelhead for an average of 1.3 Central Valley steelhead per year. No attempt was made to classify the origin of these Central Valley steelhead (hatchery or natural production). A similar level of take of Central Valley steelhead is anticipated to occur annually (i.e., 1.3 per year) and will be covered by this Conservation Plan and its associated incidental take permit.

c. Mark-Recapture of Adult Striped Bass. Some Central Valley steelhead are caught in the fyke traps and gill nets used during striped bass tagging. Catches of fish other than striped bass are not routinely recorded for the gill nets, however, it is known through informal

observation that low numbers of Central Valley steelhead are caught every year (i.e., approximately one to three fish). Central Valley steelhead catches in the fyke traps used at Clarksburg from 1974 to 1988 ranged from zero to eight fish, with the exception of 1988, when 46 Central Valley steelhead were caught. The mean annual catch at Clarksburg was 7.3 Central Valley steelhead. Since the traps were moved in 1990 to Knights Landing, upstream of two Central Valley steelhead spawning streams (American and Feather rivers), catches of Central Valley steelhead have decreased to zero to four fish per year; the annual mean catch at this location is 1.6 Central Valley steelhead.

Thus, during the ten-year term of this Conservation Plan and its associated incidental take permit, the anticipated level of take of Central Valley steelhead is approximately three to five Central Valley steelhead every two years (this includes Central Valley steelhead caught in the fyke traps and gill nets combined). Assuming that five Central Valley steelhead are caught in the traps and nets in a given year and the run size is 2,200 fish (the most recent estimate of the run--for 1994), the catch of five Central Valley steelhead represents about 0.2% of the run. Furthermore, in the past, most Central Valley steelhead caught in the fyke traps and gill nets have been released alive; the same is anticipated for the future.

B. Impact of Take on Central Valley Steelhead

1. Stocking Striped Bass

At maximum, predation by stocked striped bass would reduce the Central Valley steelhead population by less than 0.8%. Assuming an annual total Central Valley steelhead run size of 2,200 adults, as in 1994, Central Valley steelhead spawning escapement would be reduced by less than 18 adults. Since the actual reduction is likely substantially less than 18 adults, this level of take of Central Valley steelhead is anticipated to have a negligible impact on the population.

If the actual numbers of striped bass stocked are less than proposed due to potential problems associated with culture, such as unavailability of adequate numbers of fish from the SWP/CVP fish screens, lack of success in artificially spawning adult striped bass, and losses during rearing, the impact on Central Valley steelhead would be commensurately lower.

2. Maintaining Sport Fishing Regulations to Protect Striped Bass

As previously described, there is probably a small incidental catch of Central Valley steelhead by striped bass anglers. However, considering that such catches are likely to be infrequent, take resulting from striped bass fishing is expected to have a negligible impact on the Central Valley steelhead population.

3. Monitoring

a. Fall Midwater Trawl Survey. The mean annual catch of Central Valley steelhead, 1.3 smolts, is low, and those few Central Valley steelhead captured by the midwater trawl are released immediately and generally appear to be in good enough condition to survive. Hence, the fall midwater trawl survey is expected to have a negligible impact on the Central Valley steelhead population.

b. Mark-Recapture of Adult Striped Bass. The striped bass fyke traps and gill nets are expected to catch about 0.2% of the Central Valley steelhead run every two years. The population impact of capturing these Central Valley steelhead does not directly correspond to the capture rate, as most Central Valley steelhead captured in the traps and gill nets are alive and in good condition when returned to the river. Based on this low capture rate and the generally good condition of Central Valley steelhead released alive, take as a result of striped bass trapping and gill netting is expected to have a negligible impact on Central Valley steelhead escapement.

Assuming the 10% trapping and netting mortality estimated for chinook salmon applies to Central Valley steelhead, direct mortality of Central Valley steelhead as a result of trapping and gill netting would amount to approximately 0.02% of the Central Valley steelhead escapement (i.e., 10% x 0.2% capture rate = 0.02%). Assuming delayed mortality and reduced spawning success due to physiological stress affects another 10% of the Central Valley steelhead escapement, the total population impact would be approximately 0.04% of the Central Valley steelhead escapement. In addition, the 1% take limit agreed to by CDFG and NMFS for Sacramento River winter-run chinook salmon (see Chapter 13, Section D, Actions to Minimize Take) may reduce the fyke trapping and gill netting effort and further reduce the take of Central Valley steelhead. This small amount of mortality is expected to have a negligible impact on the Central Valley steelhead population.

C. Summary--Take of Central Valley Steelhead

The potential maximum take of Central Valley steelhead by predation by stocked striped bass and as a result of striped bass monitoring combined is expected to be 1.0% of the annual Central Valley steelhead population (0.8% predation by stocked striped bass; 0.2% by striped bass monitoring). The actual level of take is likely to be substantially less than this estimate, however, because Central Valley steelhead smolts are larger and less vulnerable to predation than salmon smolts and the striped bass trapping/netting effort may be reduced due to the 1% take limit for Sacramento River winter-run chinook salmon and Central Valley spring-run chinook salmon. The anticipated amount of mortality is expected to have a negligible impact on the Central Valley steelhead population.

Chapter 8. ANALYSIS OF EFFECTS OF THE STRIPED BASS MANAGEMENT PROGRAM ON DELTA SMELT

A. Expected Level of Take

1. Stocking Striped Bass

a. Estuary/River System in General. Stocking yearling striped bass in San Pablo Bay in June, as proposed in this Plan, would have no immediate effect on delta smelt because the vast majority of delta smelt inhabit the Estuary farther upstream even in wet, high-runoff years when the salinity gradient is pushed westward. Even if some stocked striped bass move upstream, predation on delta smelt would not be significant because the bass would be feeding predominantly on larger invertebrates (e.g., mysids, bay shrimp, *Corophium*) rather than fish such as delta smelt or small invertebrates (copepods) that are eaten by delta smelt. In subsequent years, as stocked bass increase in size and become increasingly pisciverous, they could potentially prey on delta smelt.

The CDFG and USFWS estimated the rate of predation on delta smelt based on a striped bass population consisting of 765,000 adults (the mean of the 1992, 1993, and 1994 striped bass population estimates). The population level of 765,000 adult striped bass was used because a population size was essential to estimating predation impacts and this population level reflects the three most recent years for which striped bass population estimates are available. The estimated predation rate for a striped bass population of 765,000 adults is 5.3% of the annual delta smelt population (see Appendix E).

CDFG anticipates that the striped bass population would decrease to 515,000 adults if striped bass were *not* stocked. The estimated total predation of delta smelt each year by a population with 515,000 adult striped bass would be: 515,000 ÷ 765,000 x 5.3% = 3.6%. Age-specific delta smelt consumption by striped bass and the age distribution of stocked striped bass during the 10-year project period were used to estimate that predation by stocked striped bass will cause a maximum annual increase in mortality of delta smelt of 0.9% (Table 13 and Appendix E) over that which would occur without stocking and the commensurate decrease in predation. The estimated predation impact peaks at 0.9% in the first year of the project when 1.275 million yearlings will be stocked and decreases thereafter to 0.7% in years 6 to 10. Nevertheless, 0.9% of the delta smelt population is the anticipated level of annual "take" of smelt resulting from predation by stocked striped bass to be covered by this Conservation Plan and its associated Section 10(a)(1)(B) permit.

The estimated maximum annual consumption of delta smelt by the total population of 712,000 adult striped bass maintained by the proposed stocking program is 4.5% (3.6% + 0.9% = 4.5%).

b. Predation at Structures. To the extent that previous striped bass stomach sampling included bass captured at structures, e.g., the Clifton Court Forebay (CCF), the Suisun Marsh Salinity Control Structure (SMSCS), and others (see Chapter 2; section F.4.a), effects of predation at structures are included in the expected level of take for the Estuary/river system in general. With regard to CCF, increased take of delta smelt due to stocking striped bass is unlikely for many of the same reasons discussed in the Sacramento River winter-run chinook salmon section.

2. Maintaining Sport Fishing Regulations to Protect Striped Bass

Maintaining present striped bass fishing regulations or modifying regulations to achieve striped bass abundance of 712,000 adults will not result in take of delta smelt above that already described as a result of predation (i.e., 0.9% of the annual population) because that level of take assumes a population of 712,000 adult striped bass. Thus, if the regulations were to change in response to recommendations by CDFG for such changes, there would be no additional predation impact on delta smelt resulting from such changes to the striped bass fishing regulations. Further, there would be no take resulting from the striped bass fishery because delta smelt are not incidentally caught by striped bass anglers.

3. Monitoring

As noted previously, monitoring conducted to assess striped bass populations is an on-going activity, and is not, therefore, a "new" action proposed under this Conservation Plan. Furthermore, take of delta smelt associated with the current striped bass monitoring programs is covered by existing ESA Section 7 consultations for Interagency Ecological Program (IEP) activities. However, as noted in Chapter 3, Section C, if existing IEP monitoring programs should cease or change during the ten-year term of this Plan, CDFG will continue monitoring, as necessary, to measure the abundance of young and adult striped bass and the abundance and survival of stocked striped bass. In the unlikely event that CDFG does need to continue some of the monitoring programs now conducted by IEP to fulfill the goals of this Conservation Plan, take associated with such monitoring would be covered by this Plan and its associated incidental take permits. Therefore, this Plan includes a discussion of the take resulting from the relevant existing monitoring programs, which is representative of the level of take of delta smelt that could be expected to occur under this Plan should CDFG need to continue these monitoring programs. However, if substantial changes occur with respect to striped bass monitoring or the effects of monitoring on the covered species from what is described in this Conservation Plan, a permit amendment could be required, as described in Chapter 18, Section B, Permit Amendments.

a. Summer Tow Net Survey. Annual catch of delta smelt has ranged from 66 to 4,328 fish during this survey (Table 10). Total catch over the 36 survey years is 50,258 delta smelt for

an average of 1,396 per year. A similar level of take is anticipated annually throughout the term of this permit.

b. Fall Midwater Trawl Survey. Annual catch of delta smelt has ranged from 48 to 1,305 fish during this survey (Table 7). Total catch over the 30 survey years is 13,034 delta smelt for an average of 434 per year. A similar level of take is anticipated annually throughout the term of this permit.

c. Mark-recapture of Adult Striped Bass. No delta smelt are captured by the gill nets or fyke traps used for mark-recapture studies of striped bass; therefore, no take of delta smelt is expected to occur as a result of this striped bass monitoring activity.

B. Impact of Take on Delta Smelt

1. Stocking Striped Bass

At maximum, predation by stocked striped bass would reduce the delta smelt population by 0.9% each year. This impact is extremely small compared to the more than 1,000% variability in delta smelt abundance since its listing under the ESA in 1993. Based on this maximum predation estimate of 0.9%, the lowest midwater trawl abundance index since listing (101.2) would have been reduced by 0.9 index units and the greatest index (1079.4) would have been reduced by 9.7 units. The impact of such reductions on subsequent year classes would not be measurable because annual variation in delta smelt abundance measures indicate year class strength is largely controlled by environmental conditions, not abundance of spawners (see Chapter 2, Section D.5)

Further, the actual numbers of striped bass stocked may be less than proposed due to potential problems associated with culture, such as unavailability of adequate numbers of fish from the SWP/CVP fish screens, lack of success in artificially spawning adult striped bass, and losses during rearing. Under these conditions, the impact on delta smelt would be commensurately less.

2. Monitoring

a. Summer Tow Net Survey. Most delta smelt captured by the summer townet surveys probably die due to netting and handling. This capture has varied between 66 and 4,328 smelt annually (Table 10). However, this amount of take represents an extremely small portion of the delta smelt population; less than 0.02% of the delta smelt nursery is filtered by the townet and many delta smelt in the net path may avoid the net, further reducing the amount of take thatoccurs during this survey. This level of take is expected to continue but is not expected to

Table 10. Total Catch for Summer Townet Surveys in the Sacramento-San Joaquin Estuary for Years When Delta Smelt and Sacramento Splittail Were Enumerated.

Year	Delta Smelt	Sacramento Splittail
1959	1802	1
1960	1747	3
1961	2217	31
1962	2936	1
1963	301	50
1964	4018	0
1965	1078	11
1969	317	33
1970	3227	0
1971	2419	9
1972	3703	5
1973	1578	1
1974	1310	17
1975	1834	3
1976	4002	3
1977	4328	4
1978	3936	45
1979	952	3
1980	1067	5
1981	1255	1
1982	1263	100
1983	226	9
1984	74	11
1985	66	1
1986	355	34
1987	201	1
1988	194	11
1989	147	8
1990	123	1
1991	446	18
1992	158	4
1993	661	5
1994	1073	2
1995	562	64
1996	589	2
1997	228	1
1998	392	69
1999	883	37

have a significant or even measurable impact on overall delta smelt abundance, although it may result in small localized declines in abundance.

Furthermore, this take would occur even if monitoring striped bass was not an objective of this survey, as the summer townet survey is an essential part of annual monitoring of the status of delta smelt. Take of delta smelt during this survey is currently covered by an ESA Section 7 consultation addressing IEP sampling. However, should IEP surveys be discontinued and should CDFG need to maintain these surveys to fulfill its monitoring requirements under this Conservation Plan, a similar level of take (i.e., up to approximately 4,300 delta smelt each year - see Table 10) would likely occur and would be authorized under this Conservation Plan and its associated Section 10(a)(1)(B) permit.

b. Fall Midwater Trawl Survey. Many delta smelt captured by the fall midwater trawl survey may die due to netting and handling; in previous years, this capture varied between 48 and 1,305 smelt. As with the summer townet survey, however, this amount of take would be an extremely small portion of the delta smelt population; less than 0.2% of the delta smelt habitat is filtered by the survey, and many delta smelt in the trawl net path avoid the net further reducing take. This level of take is expected to continue but is not expected to have a significant or even measurable impact on overall delta smelt abundance, although it may result in small localized declines in abundance.

As with the summer townet surveys, this take would occur even if striped bass monitoring was not a fall survey objective as the midwater trawl survey is an essential part of monitoring the status of delta smelt and is required by the Recovery Plan for Sacramento-San Joaquin Delta Native Fishes. Take of delta smelt during this survey is currently covered by an ESA Section 7 consultation addressing IEP monitoring. However, should IEP surveys be discontinued and should CDFG need to maintain these surveys to fulfill its monitoring requirements under this Conservation Plan, a similar level of take (i.e., up to approximately 1,300 delta smelt each year) would likely occur and would be authorized under this Conservation Plan and its associated Section 10 (a)(1)(B) permit.

C. Summary--Take of Delta Smelt

The estimated maximum annual take of delta smelt due to predation by stocked striped bass is 0.9% of the population. Additional take resulting from monitoring would increase that percentage by less than 0.2%, for a maximum total annual take of 1.1% of the population. Take of delta smelt may be less, however, because stocking may not always be at the maximum level due to unavailability of fish and planned lower stocking levels during years six through ten of the permit period will reduce the predation rate. Overall, the effects of the take resulting from the Striped Bass Management Program on delta smelt are expected to be negligible because: (1) the maximum take of 1.1% of the annual population is relatively low, and (2) annual variation in delta smelt abundance is not strongly correlated with the size of the previous year's population.

Chapter 9. ANALYSIS OF EFFECTS OF STRIPED BASS MANAGEMENT PROGRAM ON SACRAMENTO SPLITTAIL

A. Expected Level of Take

1. Stocking Striped Bass

a. Estuary/River System in General. Stocking yearling striped bass in San Pablo Bay in June or July, as proposed in this Plan, would have no immediate effect on Sacramento splittail because the vast majority of Sacramento splittail inhabit the Estuary farther upstream even in wet, high-runoff years when the salinity gradient is pushed westward. Even if some stocked striped bass move upstream, predation on Sacramento splittail would not be significant because the bass would most likely be feeding primarily on larger invertebrates (e.g., mysids, bay shrimp, *Corophium*) rather than fish. In subsequent years, as stocked striped bass increase in size and become increasingly pisciverous, they could potentially prey on Sacramento splittail.

No Sacramento splittail have been found during sampling of thousands of striped bass stomachs since the early 1960s. Therefore, take of Sacramento splittail due to predation by stocked striped bass is assumed to be significantly less than the 0.9% estimated predation on delta smelt. For the purpose of defining a take estimate for this Conservation Plan, a "worst case" level of take of Sacramento splittail by predation by stocked striped bass is 0.9% of the Sacramento splittail population each year.

Some competition for food may occur between stocked striped bass that move upstream and Sacramento splittail. It is not possible to quantify this effect, but it is likely to be extremely small because the number of stocked striped bass would be small compared to the myriad other fishes and larger invertebrates that feed on the same organisms.

b. Predation at Structures. To the extent that previous striped bass stomach sampling included bass captured at structures, such as Clifton Court Forebay (CCF) (see Chapter 2, Section D.4 and D.5), effects of predation at structures are included in the expected level of take for the Estuary in general. With regard to predation in CCF, increased take of Sacramento splittail is unlikely for many of the same reasons discussed in the Sacramento River winter-run chinook salmon section.

2. Maintaining Sport Fishing Regulations to Protect Striped Bass

Maintaining present striped bass fishing regulations or modifying regulations to achieve striped bass abundance of 712,000 adults would not increase the level of take of Sacramento splittail over that already described as a result of predation because that level of take assumes a population of 712,000 adult striped bass. Thus, if the Fish and Game Commission were to change the regulations in response to any CDFG recommendations for such changes, no additional predation impact on Sacramento splittail would result. Take of Sacramento splittail

resulting from the striped bass fishery is expected to be minimal because Sacramento splittail are incidentally caught by striped bass anglers very infrequently.

3. Monitoring

See general information on monitoring in the Sacramento River winter-run chinook salmon chapter, (Chapter 4, Section A.3).

a. Summer Tow Net Survey. Annual catch of Sacramento splittail has ranged from zero to 100 young fish during this survey (Table 10). Total catch over the 37 survey years is 567 Sacramento splittail for an average of 15 per year. A similar level of take is anticipated annually throughout the term of this permit.

b. Fall Midwater Trawl Survey. Annual catch of Sacramento splittail has ranged from zero to 291 fish during this survey (Table 7). Total catch over the 30 survey years is 881 Sacramento splittail for an average of about 29 per year. A similar level of take is anticipated annually throughout the term of this permit.

c. Mark-Recapture of Adult Striped Bass. Sacramento splittail captures in fyke traps used to capture adult striped bass for tagging have been recorded since 1974, but no Sacramento splittail catch data are available from the gill nets. It is unlikely, however, that many Sacramento splittail are caught by the gill nets because Sacramento splittail generally are too small to be caught by the 4- to 5½-inch stretched mesh. Sacramento splittail catches in fyke traps at Clarksburg and Freeport varied from six in 1982 to 347 in 1988 (Table 11). Although three Sacramento splittail were caught at Colusa in 1981, no Sacramento splittail have been captured since the traps were moved to Knights Landing in 1990. Most of the Sacramento splittail caught in the fyke traps appeared to have been in good condition when returned to the river after capture.

A similar range of take (i.e., zero to 347 Sacramento splittail per year) is possible throughout the ten-year term of this Plan and its associated incidental take permit. CDFG anticipates, however, that actual take of Sacramento splittail will be at the low end of that range because trapping is likely to continue at the Knights Landing location and no Sacramento splittail have been captured in traps at Knights Landing. In addition, trapping operations may be constrained by the 1% take limit for Sacramento River winter-run chinook salmon, which may also reduce the level of take of Sacramento splittail.

Table 11. Catch of Sacramento Splittail in Fyke Traps.

YEAR	LOCATION	TOTAL
1974	Clarksburg	39
1975	Clarksburg	50
1976	Clarksburg	78
1977	*Missing*	
1978	*Missing*	
1979	Clarksburg	64
1980	*Missing*	
1981	Colusa	3
1982	Clarksburg	6
1983	Clarksburg	12
1984	Clarksburg	33
1985	Clarksburg	80
1986	Clarksburg	98
1987	Clarksburg	217
1988	Clarksburg	347
1989	Freeport	21
1990	Knights Landing	0
1991	Knights Landing	0
1992	Knights Landing	0
1993	Knights Landing	0
1994	Knights Landing	0
1995	No Striped Bass Tagging	
1996	Knights Landing	0

TOTAL	Clarksburg	1024.0	MEAN	Clarksburg	93.1
	Freeport	21.0		Freeport	21.0
	Colusa	3.0		Colusa	3.0
	Knights Landing	0.0		Knights Landing	0.0

B. Impact of Take on Sacramento Splittail

1. Stocking Striped Bass

The complete absence of Sacramento splittail in thousands of striped bass stomach samples suggests that predation of Sacramento splittail by stocked striped bass is significantly less than predation of delta smelt by stocked striped bass. Therefore, CDFG estimates that predation by stocked striped bass would reduce the Sacramento splittail population by a maximum of 0.9% annually (the predation rate on delta smelt), and more likely, significantly less than that amount. Incidental take of 0.9% of the annual population is expected to have a negligible impact on Sacramento splittail. The effects of such reductions on subsequent year classes are not likely to be measurable because annual variation in Sacramento splittail year class strength is largely controlled by environmental conditions, not abundance of spawners (see Chapter 2, Section D.6 and Appendix D).

Further, the actual numbers of striped bass stocked may be less than proposed due to potential problems associated with culture, such as unavailability of adequate numbers of fish from the SWP/CVP fish screens, lack of success in artificially spawning adult striped bass, and losses during rearing. Under these conditions, the impact on Sacramento splittail would be commensurately less.

2. Monitoring

a. Summer Townet Survey. Many young Sacramento splittail captured by the summer townet surveys probably die due to netting and handling. This take, however, represents an extremely small portion of the Sacramento splittail population; less than 0.02% of the Sacramento splittail habitat is filtered by the townet during the survey and many Sacramento splittail in the net path may avoid the net, further reducing the take that occurs during this survey. This level of take is expected to continue but is not expected to have a significant or even measurable impact on overall Sacramento splittail abundance, although it may result in small, local declines in abundance.

Furthermore, this take would occur even if monitoring striped bass was not an objective of this survey as the summer townet survey is an important part of annual monitoring of the status of delta smelt. Take of Sacramento splittail during this survey is currently covered by an ESA Section 7 consultation addressing IEP sampling. However, should IEP surveys be discontinued and should CDFG need to continue these surveys to fulfill its monitoring requirements under this Conservation Plan, a similar level of take (i.e., up to approximately 100 Sacramento splittail each year -- see Table 10) would likely occur and would be authorized under this Conservation Plan and its associated Section 10 (a)(1)(B) permit.

b. **Fall Midwater Trawl Survey.** Most Sacramento splittail captured by the fall midwater trawl survey probably survive netting and handling; in previous years, this capture rate varied between zero and 291 Sacramento splittail. Further, most of these fish appeared to have been in good condition when released. As with the summer townet surveys, this amount of take of Sacramento splittail by the fall midwater trawl surveys would be an extremely small portion of the Sacramento splittail population; less than 0.2% of the Sacramento splittail habitat is filtered by the survey and many Sacramento splittail in the trawl net path are large enough and swim well enough to avoid the net, further reducing take. This level of take is expected to continue but is not expected to have a significant or even measurable impact on overall Sacramento splittail abundance.

This take would occur even if striped bass monitoring was not a fall survey objective, as the midwater trawl survey is an essential part of monitoring the status of delta smelt and is required by the Recovery Plan for Sacramento-San Joaquin Delta Native Fishes. Take of Sacramento splittail during this survey is currently covered by an ESA Section 7 consultation addressing IEP monitoring. However, should IEP surveys be discontinued and should CDFG need to maintain these surveys to fulfill its monitoring requirements under this Conservation Plan, a similar level of take (i.e., up to approximately 69 Sacramento splittail each year) would likely occur and would be authorized under this Conservation Plan and its associated Section 10 (a)(1)(B) permit.

c. **Mark-recapture of Adult Striped Bass.** The impact of the take of Sacramento splittail due to striped bass trapping activities is expected to be negligible because: (1) no Sacramento splittail have been captured during adult striped bass trapping activities in the five years since the traps were moved to the present sites near Knights Landing; (2) Sacramento splittail captured in the traps in earlier years were in good condition when released; and (3) future trapping operations will be constrained by a 1% take limit for Sacramento River winter-run chinook salmon.

C. Summary -- Take of Sacramento Splittail

The estimated maximum annual take of Sacramento splittail due to predation by stocked striped bass is 0.9% of the population; in all likelihood, however, actual take of Sacramento splittail by predation will be considerably less. Additional take of Sacramento splittail as a result of striped bass monitoring increases that percentage by less than 0.2%, for a maximum total take of 1.1% of the Sacramento splittail population each year. Actual annual take may be further reduced because stocking may not always be at the maximum level due to unavailability of fish and planned lower stocking levels during years six through ten of the permit period will reduce the predation rate. Overall, the effects of the take resulting from the Striped Bass Management Program on Sacramento splittail are expected to be negligible because: (1) the maximum take of 1.1% of the annual population is relatively low, and (2) Sacramento splittail abundance is largely controlled by environmental conditions.

Chapter 10. ANTICIPATED EFFECTS OF PROPOSED ACTIVITIES ON CRITICAL HABITAT

The location of the net-pens for rearing striped bass probably will vary during the permit period, as in the past, depending on the position of the salinity gradient in the Estuary. Disease problems increase in warm, fresh water, and experience has shown that striped bass growth is reduced in the cooler waters of San Francisco Bay; the location of net pens will be determined, in part, by the balancing of these factors. The CDFG anticipates that the pens will typically be located in sloughs of the Suisun or Napa marshes or in San Francisco Bay.

The net pens will be within Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon and Central Valley steelhead critical habitat if located in San Francisco Bay. The Suisun and Napa marshes are not within designated critical habitat for Sacramento River winter-run chinook salmon; however, these marshes are within the proposed critical habitat for Central Valley spring-run chinook salmon and Central Valley steelhead.

The pens have been located within delta smelt critical habitat only in 1992-1993 and 1993-1994 when they were located in Suisun Slough. Subsequently, in San Francisco Bay near Tiburon or the Napa Marsh near Vallejo, they have been outside of delta smelt critical habitat.

Net-pen rearing of striped bass could cause a minor detriment to water quality near the pens due to waste products excreted by young, growing fish. However, this impact would be temporary and minimal due to the large volume of channel flows, the fast currents, and the dispersing action of tidal flushing.

While typical pen sites would be within the migratory corridor of Sacramento River winter-run chinook salmon, no adverse impacts would be anticipated due to the dispersing and flushing action of tidal flows and peak freshwater outflows that often occur during the Sacramento River winter-run chinook salmon outmigration. In wetter years, when the pens are located downstream from Suisun Bay, there would be negligible adverse impacts to delta smelt which occur primarily upstream. In dry years when the pens may be located again in the Suisun Marsh, no adverse impacts to either delta smelt or Sacramento River winter-run chinook salmon critical habitat would be anticipated due to the dispersing and flushing action of tidal flows.

The primary constituent habitat elements identified for Delta native fishes in the Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes (U.S. Department of Interior, 1996) are spawning habitat, larval and juvenile transport, rearing habitat, and adult migration. The striped bass stocking program would not adversely modify any of these elements for the following reasons: (1) There would be no significant impact on water quality and no impact on substrates for egg attachment; therefore, spawning habitat would not be adversely modified; (2) there would be no significant physical disturbance -- water and small fish would easily flow around the anchored pens -- and the pens have no effect on river flow rates; therefore, larval and juvenile transport would not be adversely affected; (3) there would be no significant impact on

water quality and no effect on the position of the two-parts-per-thousand isohaline; therefore, rearing habitat would not be adversely modified; and (4) pens would not block access to spawning habitat; therefore, adult migration would not be adversely affected.

Chapter 11. IMPACTS ON OTHER LISTED SPECIES

Appendix G provides a list of state and federally listed species, candidate species, and other rare or sensitive species that occur within the Estuary. Of the species on that list, there is one species, other than the six fish species discussed above, that may be subject to incidental take as a result of striped bass management activities -- the giant garter snake (federally listed as threatened).

As noted previously in Chapter 2, Section F.6, there has been no documented evidence of striped bass predation on giant garter snakes. CDFG does not anticipate any significant level of take of giant garter snakes as a result of striped bass predation because (1) striped bass tend to feed near the bottom of the water column and any giant garter snakes in the water would be at the surface, and (2) the lack of any evidence to date of giant garter snakes in striped bass stomach contents. However, because the ranges of the two species overlap considerably and striped bass are opportunistic feeders, there is the remote possibility that striped bass may prey on young garter snakes. This Conservation Plan assumes that striped bass predation on giant garter snakes, if it occurs at all, will be minimal, and that such occasional and opportunistic take of giant garter snakes would have a negligible effect on the population.

Therefore, CDFG and USFWS have agreed that a minimal level of incidental take of giant garter snakes will be authorized under the Section 10(a)(1)(B) permit associated with this Conservation Plan. The level of take authorized under this Plan is two giant garter snakes over the ten-year term of the permit. Take will be measured as the number of giant garter snakes actually found in sampled striped bass stomachs. This take level was chosen as a reasonable "trigger" to alert CDFG and USFWS that some of the assumptions regarding striped bass predation on giant garter snakes under which this Plan was prepared may be inaccurate and should be further investigated.

In the event that striped bass diet monitoring reveals take of giant garter snake in excess of the authorized level, CDFG shall immediately undertake appropriate measures to adjust their Striped Bass Management Plan (see Chapter 13, Section B, Adaptive Management in Response to Monitoring). The purpose of such adjustment will be to reduce the impacts of striped bass predation on giant garter snakes. Such adjustment may include changes in the monitoring program to more accurately assess the impact on giant garter snakes; decreasing stocking levels; changing the stocking location; implementation of minimization or mitigation measures to benefit giant garter snakes (such as placing escape structures in water diversions to allow snakes to climb out of the water, and/or acquisition of wetland and associated upland areas to provide foraging and basking habitat); or other actions as appropriate. If CDFG and USFWS do *not* agree on the necessary adjustments, the adjustments will be determined by USFWS. It is the intention of both agencies, however, to develop a mutually agreeable adjustment as quickly as possible.

While the Estuary provides habitat for other species listed under the ESA (see Appendix G), the proposed Striped Bass Management Program is not expected to result in take of any of these species. Take is expected to be limited to the six fish species which are the subject of this Conservation Plan and possibly the giant garter snake.

Chapter 12. OTHER ISSUES RELATIVE TO THE STRIPED BASS MANAGEMENT PROGRAM

A. Estuarine Carrying Capacity

The carrying capacity of the Estuary is unknown and CDFG does not know of any meaningful way to calculate it. However, based on the following, there is reason to believe that it is still sufficient to support more striped bass:

- The striped bass population decline has been primarily caused by factors affecting production of young fish (losses of fish entrained in State and Federal water diversions being a major contributor). Stocking one-year old or older fish bypasses this critical period.

- Concern has been expressed regarding potential food limitation because accidental introductions of exotic invertebrates apparently have reduced standing crops of phytoplankton (through high filter-feeding rates of the clam *Potamocorbula*) and perhaps the copepod, *Eurytemora affinis*, which historically has been a major food of young striped bass and other zooplankton feeders such as delta smelt. (*Eurytemora* is generally considered native, but considering that the same species occurs in east coast estuaries, it is possible that *Eurytemora* could have been accidentally introduced along with striped bass, American shad, etc. in the 1800s.) Nevertheless, young striped bass and delta smelt are known to also feed on recently introduced exotics such as the copepods, *Pseudodiaptomus forbesi* and *Sinocalanus doerii*, and the amphipod, *Gammarus daiberi.*

- Notably, the catch of fish (all species) during the 27 years of the fall midwater trawl survey provides evidence that while perhaps varying annually, the carrying capacity of the Estuary has not significantly declined (at least for fish within the approximate 75-250 mm size range vulnerable to the trawl) over that 27-year period (Figure 5).

B. Delta Accord

The USFWS and NMFS (via a joint February 13, 1997, letter to CDFG Director) requested that this Conservation Plan consider changes to the Delta anticipated to result from implementation of the following: (1) the December 1994 Bay Delta Accord (Accord), agreed to by the Governor's Water Policy Council of the State of California and the Federal Ecosystem Directorate (Appendix F); (2) the May 1995 State Water Resources Control Board (SWRCB) Water Quality Plan (WQCP); and (3) new biological opinions for delta smelt and Sacramento River winter-run chinook salmon rendered by the USFWS or NMFS under the ESA. The CDFG

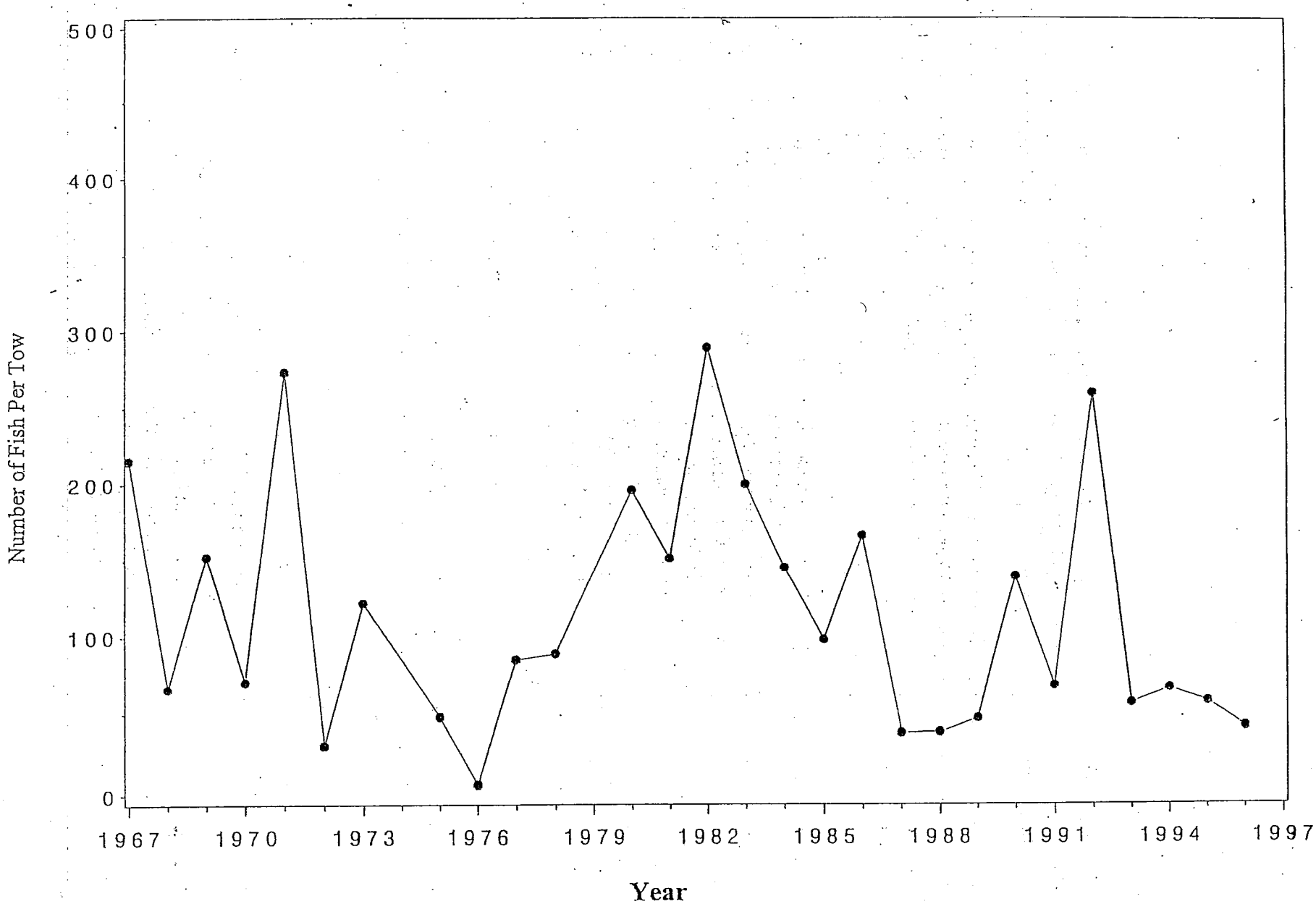

Figure 5. Catch per tow of fish other than striped bass in the fall midwater trawl survey.

has considered the effects of these programs in evaluating stocking levels required to restore striped bass abundance to 1.1 million adults.

In CDFG's view, the Accord, WQCP, and USFWS/NMFS biological opinions will have little effect, relative to conditions when the Accord was adopted, on environmental factors in the Delta that are important to striped bass production (Table 12). It is incorrect to assume that the Accord and WQCP will have a measurable effect on adult striped bass abundance, since they were designed primarily to address the needs of special status species; striped bass are affected incidently and to a minor extent. The effect of the Accord (almost wholly adopted in the SWRCB's May 1995 WQCP) on striped bass was evaluated utilizing CDFG's striped bass model, which is a series of regression equations developed from observed relationships between striped bass abundance and environmental variables from 1969 to 1991. The model uses water exports, outflows, and spawning stock size as input to predict the young-of-the-year index, the loss rate index after the young-of-the-year index is set (i.e., losses of young striped bass from 20 to 150 mm to CVP and SWP diversions divided by the young-of-the-year index), and adult abundance. The evaluation was based on simulated hydrology for 1922-1991. These simulations were obtained from DWRSIM (a hydrological model of the Delta) operations studies for the Accord, and the base condition (SWRCB Decision 1485 plus the biological opinions for delta smelt and Sacramento River winter-run chinook salmon in effect on December 15, 1994, when the Accord was adopted). The operations studies assumed a 1995 level of development and water demand that varied from 5.9 to 6.9 million-acre-feet annually.

On average, over the 70-year period simulated by the operations studies, the striped bass model indicates that the Accord provides conditions slightly worse for striped bass than conditions that would exist under the base condition (Figure 6). Adult striped bass abundance is predicted to be 3% less with the Accord in effect (442,000) compared to adult abundance under the base condition (458,000). The average young-of-the-year index is 19% lower under the Accord, but a 4% reduction in loss rate mitigates the impact of lower young bass abundance on the subsequent adult population. These results are consistent with overall higher spring and early summer exports under the Accord, which are detrimental to young bass survival, and slightly lower exports in late summer and fall, which reduce entrainment losses at State and Federal pumping plants (Table 12).

For perspective, striped bass abundance predicted under the operations study scenarios was compared with abundance predicted for historical conditions from 1956 to 1991. This comparison indicates that neither the Accord nor base conditions would restore the striped bass population to its average historical abundance. Average modeled adult abundance from 1956 to 1991 was 1.3 million compared to 424,000 under conditions of the Accord. Considering that average abundance of naturally-produced (excluding hatchery fish) adult striped bass from 1989 to 1993 (the most recent five-year period for which abundance estimates were available at the time of these calculations) was 603,000 fish, it is apparent that the Accord will result in further deterioration of the already depressed striped bass stock.

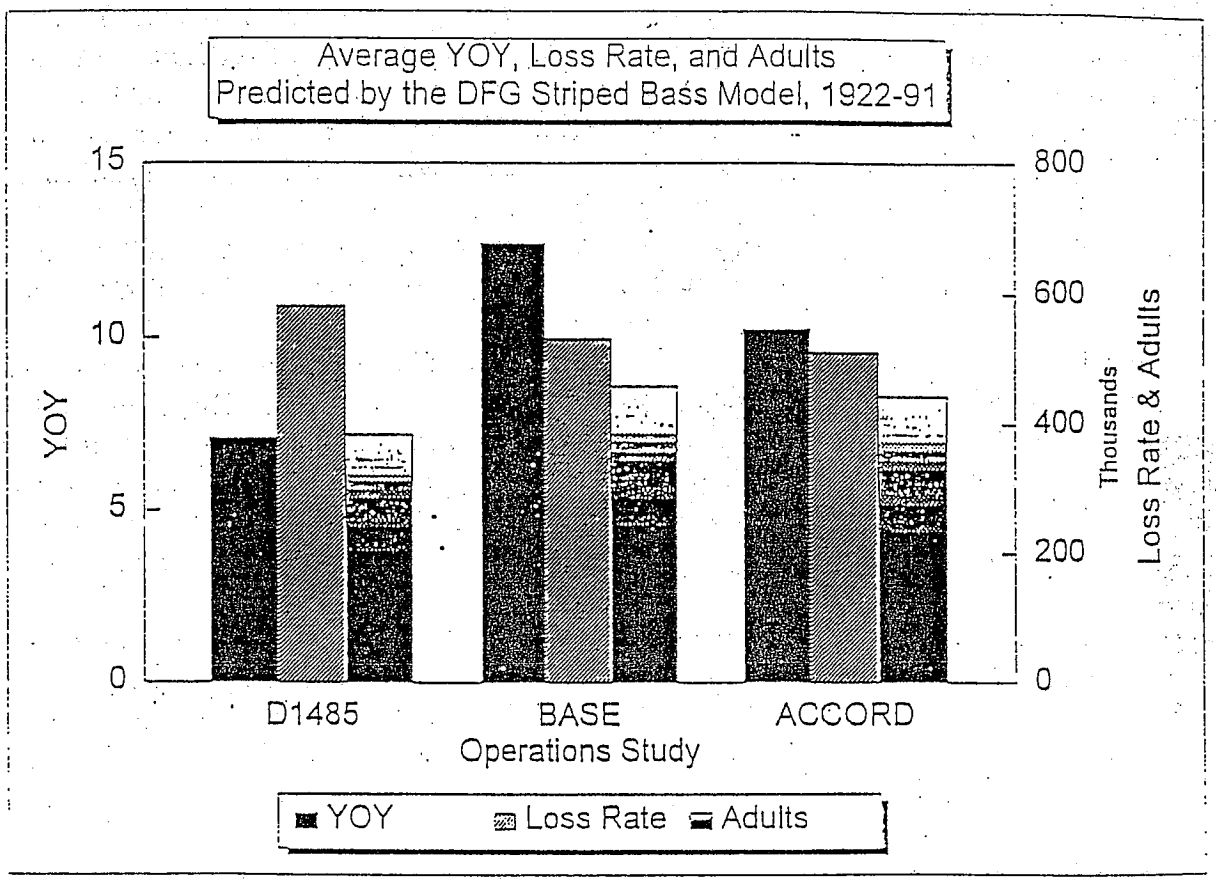

Figure 6. Estimated Effects of Delta Accord on Striped Bass Based on 70 Year Simulation by Department of Water Resources.

Table 12. Effect of Delta Accord on Water Export Rates and Delta Outflow.

Total Exports

MONTH	D1485	BASE	ACCORD	% change in Accord relative to: D1485	BASE
Jan	10,632	10,141	10,237	-4%	1%
Feb	10,213	8,807	8,953	-12%	2%
Mar	9,106	7,317	7,847	-14%	7%
Apr	9,319	6,796	6,057	-35%	-11%
May	5,682	5,740	6,009	6%	5%
June	5,290	5,416	7,193	36%	33%
July	8,146	8,266	9,269	14%	12%
Aug	8,107	8,718	7,219	-11%	-17%
Sept	6,984	7,778	7,457	7%	-4%
Oct	7,958	8,338	9,061	14%	9%
Nov	9,414	9,398	8,858	-6%	-6%
Dec	10,149	9,789	9,760	-4%	0%
Apr-Jul Mean	7,109	6,554	7,132	0%	9%
Aug-Mar Mean	9,070	8,786	8,674	-4%	-1%
Mean	8,417	8,042	8,160	-3%	1%
Annual Exports (taf)	6,088	5,823	5,909	-3%	1%

Delta Outflow

MONTH	D1485	BASE	ACCORD	% change in Accord relative to: D1485	BASE
Jan	36,531	36,532	36,125	-1%	-1%
Feb	48,402	49,291	48,912	1%	-1%
Mar	39,191	40,717	40,457	3%	-1%
Apr	23,389	25,161	26,477	13%	5%
May	17,038	17,377	17,951	5%	3%
June	12,677	13,108	11,308	-11%	-14%
July	8,002	8,096	7,811	-2%	-4%
Aug	5,799	5,953	5,388	-7%	-9%
Sept	4,503	4,907	4,997	11%	2%
Oct	7,652	7,394	7,743	1%	5%
Nov	10,945	10,928	11,722	7%	7%
Dec	22,325	21,925	22,721	2%	4%
Apr-Jul Mean	15,277	15,936	15,887	4%	0%
Aug-Mar Mean	21,918	22,206	22,258	2%	0%
Mean	19,704	20,116	20,134	2%	0%
Annual Exports (taf)	14,149	14,442	14,457	2%	0%

The new USFWS/NMFS biological opinions (NMFS 1995, USFWS 1995) for delta smelt and Sacramento River winter-run chinook salmon reach the conclusion that the Accord does not jeopardize the continued existence of these species. Alterations in operations of the CVP and SWP to be implemented in the event that take limits specified in the biological opinions are exceeded, are not specified in the opinions; such alterations, however, are not likely to significantly benefit striped bass.

At present, large habitat restoration measures are being considered by the CALFED Bay-Delta Program. This program has outlined a long-term comprehensive plan to restore ecosystem health and improve water management for beneficial uses of the Bay-Delta system. These restoration measures are outlined in the draft Ecosystem Restoration Program Plan (June 13, 1997). While this restoration program may benefit striped bass and other species, the ultimate extent of habitat restoration and associated benefits to any species are, as yet, unclear.

If habitat restoration activities and/or other measures improve survival of naturally produced striped bass and assist in achieving the Striped Bass Management Plan's goal to stabilize the population at 712,000 adults (and in the absence of improved Sacramento River winter-run chinook salmon and delta smelt populations), the striped bass stocking program will be adjusted as described in Chapter 13, Section B, Adaptive Management in Response to Monitoring.

C. Central Valley Project Improvement Act (CVPIA)

Actions under the CVPIA specifically aim to double the striped bass population; however, the CVPIA has language limiting such requirements to "reasonable" use of water, which has led to the interpretation that doubling targets are not required if water costs are high. Predictions based on the CDFG striped bass model described above (this chapter, Section B) and a modification of that model by Dr. Louis Botsford (University of California, Davis), and used to evaluate the CVPIA restoration actions for striped bass (USFWS, 1995, Working Paper on Restoration Needs, Volume 3, May 9, 1995) indicate that very high outflow and greatly reduced exports are required to double the striped bass population -- outflows much higher and exports much lower than indicated in the Accord or proposed in the CVPIA Anadromous Fish Restoration Program (AFRP). While some potential AFRP actions, such as manipulation of the Delta Cross Channel closures during late spring, maintaining 13,000 cfs flow in the Sacramento River in May, and increasing flow requirements in May and June above those in the WQCP, would have minor and generally unquantifiable positive effects on striped bass abundance, these actions, and potential actions necessitated by the take limits in the new biological opinions for delta smelt and Sacramento River winter-run chinook salmon, would be unlikely to create measurable progress towards restoring striped bass in the Estuary. Not manipulating the Delta Cross Channel, not maintaining Sacramento River flows, and not increasing other flows would lead to further declines in striped bass abundance.

Chapter 13. MONITORING, MINIMIZATION, AND MITIGATION

This section of the Conservation Plan describes how CDFG will monitor the impacts of the proposed actions and the associated incidental take on the covered species (i.e., Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon, Central Valley fall-/late-fall-run chinook salmon, Central Valley steelhead, delta smelt, Sacramento splittail, and giant garter snake), and the measures that CDFG will undertake to minimize and mitigate the potential incidental take of these species. The minimization and mitigation measures described below are intended to allow for the recovery of the covered species.

A. Monitoring the Impacts of the Proposed Actions

As a part of this Conservation Plan, CDFG proposes to monitor: (1) striped bass predation on the covered species; (2) Sacramento River winter-run chinook salmon abundance; (3) Central Valley spring-run chinook salmon abundance; (4) Central Valley fall-/late-fall-run chinook salmon abundance; (5) Central Valley steelhead abundance; (6) delta smelt abundance; and (7) Sacramento splittail abundance throughout the term of this plan and its associated incidental take permits. The purpose of this monitoring is to assess the impacts of the incidental take on the covered species and assess the effectiveness of the minimization and mitigation measures. Based on this monitoring, it may be necessary and appropriate for CDFG to make adjustments to the Striped Bass Management Program including adjustment of stocking levels, and/or making adjustments to other aspects of this Conservation Plan as described in Chapter 14. To do this, CDFG will evaluate, to the extent possible, the abundance and distribution of the covered species to determine the effects of increasing striped bass abundance, and the extent to which each of the covered species occur in the striped bass diet.

Most of the monitoring needed to achieve the goals stated above is currently on-going as the result of existing programs and permits. Below is a discussion of these existing monitoring programs and how they will be used to provide the information needed under this Conservation Plan. Where new, additional monitoring is required to achieve the goals of this Plan, those programs also are described.

Striped Bass Predation on Covered Species

Existing Monitoring Programs

To supplement studies of more than 30 years ago, in 1994 CDFG began monitoring striped bass diet through collection of stomach contents of striped bass during a year-round creel census of the striped bass fishery. CDFG will continue this stomach content sampling throughout the term of this Plan. Stomachs will be collected from about 100 legal-sized fish per month in the area from San Pablo Bay through the Delta and upstream in the Sacramento River to Colusa. Stomach sampling efforts will move with the striped bass fishery, concentrating in San Pablo Bay and Carquinez Strait in the

summer, San Pablo Bay to the western Delta in the fall, Suisun Bay and the Delta in the winter, and the Delta and Sacramento River in spring. The anticipated 1,200 striped bass stomachs examined annually will represent about 0.2% of the adult population.

New Monitoring Programs

To improve the estimates of predation on the covered species, particularly Sacramento River winter-run chinook salmon, CDFG monitoring of striped bass stomachs will be expanded to include one- and two-year old striped bass in Suisun Bay-Carquinez Strait in the fall and early winter (these fish will be collected from September to December during the fall midwater trawl survey). Based on past catches of one- and two-year-old striped bass by this survey, it is reasonable to expect that 50 to 500 stomachs will be sampled in this area during this period each year.

Effort also will be expanded to monitor the diet of striped bass in the Sacramento River upstream from Sacramento in the fall through increased creel census and/or netting. The goal will be to examine 50 stomachs of striped bass from this area each fall throughout the ten-year term of the permits, although obtaining sufficient samples may not be possible because few striped bass inhabit this area in the fall. (Based on the 1991-1994 Sacramento River System Sport Catch Inventory, the total September-November angler harvest of striped bass upstream from Sacramento ranged from only 313 to 640 fish -- about 3 to 7 fish per day over more than 100 miles of river.)

In addition, to help measure the level of striped bass predation on the covered species at structures, CDFG will collect and analyze stomach contents of two-year and older bass during a special year-round gill net survey at various structures including Clifton Court Forebay (CCF) and the Suisun Marsh Salinity Control Structure (SMSCS). The goal will be to analyze stomachs of at least 100 striped bass collected at structures during each quarter of each year.

Each year all of the stomach content information will be analyzed and results will be compared with the estimates of striped bass predation on the covered species developed for this Conservation Plan. As described in the Adaptive Management section (Section B, this Chapter), this information may then lead to adjusting some aspects of the Striped Bass Management Program. The stomach content analyses will be documented in annual reports submitted to NMFS and USFWS (See Chapter 15, Reporting).

Chinook Salmon Abundance

Existing Monitoring Programs

CDFG and USFWS currently conduct annual counts of all runs of chinook salmon adults passing the Red Bluff Diversion Dam (RBDD), conduct annual surveys of Central

Valley spring-run chinook salmon in Deer, Mill and Butte creeks, and to the extent that river conditions allow, count redds of all runs in the Sacramento River. In addition, the USFWS currently conducts year-round seine and trawl surveys in the Sacramento River and western Delta which provide a measure of the occurrence of young chinook salmon of various runs in these areas. The on-going monitoring of adult Sacramento River winter-run chinook salmon abundance will be the basis for modifications to the CDFG Striped Bass Management Program if the abundance measures are outside of the thresholds described in the Adjustments to the Proposed Actions section of Chapter 14 (Section A). The monitoring of young chinook salmon will be used in conjunction with the striped bass stomach analyses data to refine the estimates of the impacts of striped bass predation on chinook salmon used for this Conservation Plan (Appendix E).

Central Valley Steelhead Abundance

Currently, Central Valley steelhead numbers are not adequately monitored. Central Valley steelhead were monitored at the RBDD fish ladder until 1994, but since that time the RBDD gates have been open during essentially the entire Central Valley steelhead migration period to improve conditions for Sacramento River winter-run chinook salmon. At present, there is no readily available alternative for monitoring Central Valley steelhead; however, if a monitoring program is developed, CDFG will use data from it to assess the status of Central Valley steelhead.

Considering that the anticipated level of striped bass predation on Central Valley steelhead is very low (see Chapter 7, Section A), the Striped Bass Management Program will not be adjusted in response to Central Valley steelhead population changes unless striped bass stomach content analyses substantiate that greater predation of Central Valley steelhead by striped bass than estimated for this Conservation Plan is occurring.

Delta Smelt Abundance

Existing Monitoring Programs

The fall midwater trawl survey (see Chapter 3, Section C and Appendix A for a description of the survey) provides the primary measure of delta smelt abundance. The Striped Bass Management Program will be modified as described in the Adjustments to the Proposed Actions due to Changed Circumstances section (Chapter 14, Section A) if the results of these surveys indicate that the delta smelt population falls below either of the thresholds described in that section.

Sacramento Splittail Abundance

Existing Monitoring Programs

Abundance of Sacramento splittail is measured in various ways, including the summer tow net and the fall midwater trawl surveys (see Chapter 3, Section C and Appendix A for a description of these surveys), an almost year-round otter trawl survey in the western Estuary conducted annually since 1980 by the IEP San Francisco Bay-Outflow Study, and salvage of fish at the CVP and SWP fish screens.

Considering that the anticipated level of striped bass predation on Sacramento splittail is very low, the Striped Bass Management Program will not be adjusted in response to Sacramento splittail population changes unless striped bass stomach content analyses substantiate that greater predation of Sacramento splittail by striped bass than estimated for this Conservation Plan is occurring.

Miscellaneous Surveys/Studies

Over the past decade, various special surveys have been developed on an "as needed" basis to determine the abundance and/or distribution of the covered species. For example, in 1994-1996 "real-time monitoring" surveys were conducted to monitor the distribution of listed species relative to their potential for becoming entrained in the water project diversions. CDFG anticipates that over the course of the next ten years, other special studies aimed at measuring population trends or factors affecting populations of the covered species will be initiated. Results of these surveys will be considered as part of the plan for adaptive management in response to monitoring.

B. Adaptive Management in Response to Monitoring

Striped Bass Population Status

Striped bass stocking levels will be adjusted if the goal of maintaining 712,000 adult striped bass is exceeded or if the striped bass population exhibits further decline below that level. Effects of sampling error on adult striped bass abundance estimates must be considered when assessing progress toward the target population goal. The coefficient of variation on individual abundance estimates measures reliability of these estimates. The average coefficient of variation is 33% for the ten historic (1977,1981,1982,1988-1994) annual abundance estimates of less than 1 million adult striped bass which means that sampling error causes about two-thirds of the abundance estimates to vary within ± 33% of actual abundance. Thus, estimates within the range of 477,000 (33% less than 712,000) to 947,000 (33% greater than 712,000) do not necessarily reflect abundances different than 712,000 fish. Estimates moderately outside this range could suggest erroneous abundance trends.

Based on the foregoing, if two consecutive adult striped bass abundance estimates (made at two-year intervals) exceed 947,000 fish or are less than 477,000 fish, CDFG,

NMFS, and USFWS will work cooperatively to adjust the Conservation Plan based on the extent to which the striped bass abundance estimates are outside of these thresholds, and the status of Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon, Central Valley fall-/late-fall-run chinook salmon, Central Valley steelhead, delta smelt, and Sacramento splittail at that time. Such adjustment may include:

- Increasing or decreasing stocking levels.
- Increasing mitigation.
- Changing the stocking location.
- Other actions as appropriate.

If agreement is *not* reached, the necessary adjustments will be determined by NMFS and USFWS. It is the intention of all the agencies to develop mutually agreeable adjustments as quickly as possible. Based on the every-second-year schedule for estimating adult striped bass abundance, and because there is about a one-year lag between tagging and compiling an adequate recapture sample, the earliest the Conservation Plan could be adjusted based on a change in striped bass population status would be May, 2001 (following the tagging of adults in the year 2000 and evaluation of population status for the years 1998 and 2000).

The CDFG, NMFS, and USFWS are committed to the striped bass stocking levels and program adjustments as described in this Conservation Plan and agree that striped bass stocking will not exceed the stocking rates described in Chapter 3.A. and Table 13 page__ unless there is significant recovery of all of the covered fish species or there are two consecutive years when striped bass abundance estimates are less than 477,000 adults.

Striped Bass Predation Impacts on the Covered Fish Species

The levels of incidental take of the covered fish species resulting from striped bass predation were estimated using the best data available (see previous sections of this Plan and Appendix E for a more detailed discussion of predation impacts). However, if monitoring of the striped bass diet, as described in Section A of this Chapter, substantiates that the consumption rate for any one of the covered fish species would yield a greater predation impact than estimated for this Conservation Plan, CDFG will adjust the Striped Bass Management Program as necessary. The purpose of such adjustment will be to reduce the impacts of striped bass on the covered fish species to a level no greater than the levels identified in this Plan.

The predation rates estimated in this Conservation Plan are primarily based on data collected in the early 1960s. The proposed Striped Bass Management Program includes the expansion of striped bass stomach content monitoring to include sampling

areas and times where past sampling was limited (See Chapter 2.F). These new data may improve precision and accuracy of the predation estimates. If future monitoring substantiates that predation is greater than expected, adjustments to this Conservation Plan may include:

- Decreasing stocking levels;
- Increasing mitigation;
- Changing the stocking location; or
- Other actions as appropriate.

If CDFG, NMFS, and USFWS do *not* agree on the necessary adjustments, the adjustments will be determined by NMFS and USFWS. It is the intention of all the agencies, however, to develop a mutually agreeable adjustment as quickly as possible.

Striped Bass Predation on the Giant Garter Snake

Incidental take of a limited number of giant garter snakes is requested under this Plan, as described in Chapter 11 Impacts on Other Listed Species. However, if the results of the striped bass diet monitoring indicate that giant garter snakes are being preyed upon by striped bass at a greater frequency than anticipated (i.e., if the number of giant garter snakes found in striped bass stomach contents exceeds the take level authorized under the incidental take permit associated with this Plan), CDFG will adjust the Conservation Plan as necessary. The purpose of such adjustment will be to reduce the impacts of striped bass predation on giant garter snakes. Such adjustment may include:

- Changes in the monitoring program to more accurately assess the impact on giant garter snakes;
- Decreasing stocking levels;
- Changing the stocking location;
- Implementation of minimization or mitigation measures to benefit giant garter snakes; or
- Other actions as appropriate.

If CDFG and USFWS do *not* agree on the necessary adjustments, the adjustments will be determined by USFWS. It is the intention of both agencies, however, to develop a mutually agreeable adjustment as quickly as possible

C. Authorizing Take Associated with Monitoring

Of the existing monitoring programs described above, the following programs have the potential to result in take of one or more of the covered fish species: (1) the USFWS's year-

-ound seine and trawl surveys in the Sacramento River and western Delta (all six covered fish species); (2) the fall midwater trawl survey (all six covered fish species); (3) the summer tow net survey (delta smelt and Sacramento splittail); and (4) the almost year-round otter trawl survey (all six covered fish species). CDFG anticipates that these existing monitoring programs will continue to be implemented as described above throughout the term of this Conservation Plan and its associated incidental take permits (i.e., ten years).. Take of delta smelt and Sacramento splittail resulting from these on-going monitoring programs and take of Sacramento River winter-run chinook salmon by the USFWS seine and trawl surveys and the otter trawl survey are covered by existing ESA Section 7 consultations. Take of all runs of chinook salmon and Central Valley steelhead associated with the fall midwater trawl survey shall be covered by this Conservation Plan and its associated incidental take permit issued by NMFS (see Chapters 4-7, Section A for discussion on take levels anticipated for chinook salmon and Central Valley steelhead).

In the event that existing on-going monitoring programs cease or change during the term of this Plan, CDFG will continue monitoring efforts, as necessary, to measure the effects of increasing striped bass abundance on the covered species and to measure the occurrence of the covered species in the striped bass diet. In the unlikely event that CDFG does need to continue or augment monitoring efforts under this Conservation Plan to compensate for changes to or loss of existing monitoring programs, take of all covered species associated with such monitoring programs shall be covered by this Plan and its associated incidental take permits, as appropriate. However, if substantial changes occur with respect to monitoring the impacts of the Striped Bass Management Program or the effects of monitoring on the covered species from what is described in this Conservation Plan, a permit amendment could be required, as described in Chapter 18, Section B, Permit Amendments.

Additionally, the new year-round gill net survey that CDFG will conduct at structures to monitor striped bass diet in such areas has the potential for incidental take of chinook salmon, Central Valley steelhead, and Sacramento splittail. Such take shall also be covered by this Plan and its associated incidental take permits.

Mitigation and monitoring programs sometimes require actions that, strictly speaking, may be construed as deliberate take (as opposed to "incidental" take). Some of the existing monitoring programs described above result in such deliberate take (e.g., all runs of chinook salmon by the USFWS seine and trawl surveys; delta smelt by the fall midwater trawl and summer tow net surveys; and Sacramento splittail by the almost year-round otter trawl survey). Generally, actions that result in deliberate take can be conducted under an incidental take permit, if: (1) the take results from mitigation measures (e.g., capture/relocation) specifically intended to minimize more serious forms of take (e.g., killing or injury) or is part of a monitoring program described in the HCP; and (2) such activities are directly associated in time or place with activities authorized under the incidental take permit.

Thus, deliberate take as a result of monitoring activities shall be covered under this Plan and its associated incidental take permits provided that: (1) such take results from activities that CDFG initiates or otherwise undertakes (e.g., in the event of IEP program reductions) to fulfill the monitoring goals described in this Conservation Plan; (2) such take is consistent with the Conservation Plan and associated incidental take permits; and (3) CDFG implements such additional terms and conditions as may, from time to time, be requested by USFWS and/or NMFS to govern monitoring and associated activities. However, if substantial changes occur with respect to monitoring or the effects of monitoring on the covered species from what is described in this Conservation Plan, a permit amendment could be required, as described in Chapter 18, Section B, Permit Amendments. Further, should such substantial changes occur to the monitoring program and depending on the nature of those changes, the USFWS and NMFS may determine that resulting take should be authorized through a scientific or recovery permit under Section 10(a)(1)(A) of the ESA and recommend that CDFG apply for that type of permit.

D. Actions to Minimize Take

1. Stocking Striped Bass

To minimize the take of covered species resulting from the Striped Bass Management Program, CDFG has substantially reduced the level of striped bass stocking from its original proposal of 3 million yearlings annually with a goal of restoring the striped bass population to 1.1 million adults, to the current proposal of stocking 1.275 million yearling-equivalents annually with a goal of maintaining the population at 712,000 adults.

In addition, CDFG will undertake the following actions to minimize take of all runs of chinook salmon, Central Valley steelhead, delta smelt, and Sacramento splittail:

a. Delay the stocking of striped bass until June or July and stock in San Pablo Bay. Stocking at that time and location will avoid immediate conflict between stocked striped bass and all runs of chinook salmon except for a few late migrants of naturally spawned Central Valley fall-run chinook salmon and Central Valley fall-run chinook salmon released from hatcheries. This stocking will avoid immediate conflict with Central Valley steelhead because Central Valley steelhead smolts will have already emigrated from the Estuary. Stocking at that location also will avoid immediate conflict between stocked striped bass and both delta smelt and Sacramento splittail because San Pablo Bay is downstream from the normal distribution of delta smelt and Sacramento splittail.

b. Comprise part of the stocking allotment of 1.275 million yearling equivalents with two-year old bass to reduce striped bass predation impacts on the covered species. Table 5 shows the reductions in predation associated with stocking varying amounts of two-year old bass. For example, after 5 years, stocking only yearlings (i.e., 1.275 million yearlings) results in a predation impact on Sacramento River winter-run chinook salmon

of 1.6%; stocking 500,000 yearling and 168,000 age-two fish annually (equivalent to 1.275 million yearlings), yields an estimated predation impact of 1.1% on Sacramento River winter-run chinook salmon.

The CDFG intends to implement the stocking program as shown in the schedule in Table 13. This schedule will reduce predation impacts and, if survival assumptions are correct, yield striped bass population benefits equivalent to stocking 1.275 million yearlings from years two to six and 860,000 yearlings subsequently. In any case, annual stocking will not exceed 1.275 million yearling equivalents, and no more than 500,000 yearlings will be stocked in any year except the second year. Changes in the stocking schedule in Table 13 that would result in take of any of the covered species above the permitted predation levels must be approved in writing by NMFS and USFWS and may require an amendment to the permits.

2. Maintaining Sport Fishing Regulations to Protect Striped Bass

CDFG will evaluate the incidental take of salmon and Central Valley steelhead by striped bass anglers. This will be done primarily by recording any catches of salmon or Central Valley steelhead by striped bass anglers interviewed during the year-round adult striped bass mark-recapture creel census. Any catch of salmon or Central Valley steelhead will be reported to NMFS. If NMFS believes such incidental catches are of significant magnitude, CDFG and NMFS agree to work cooperatively to develop proposals for alternative or amended regulations that will reduce or eliminate incidental take of Sacramento River winter-run chinook salmon and/or Central Valley steelhead; CDFG will then submit such alternative or amended regulations to the Fish and Game Commission for consideration.

3. Monitoring Striped Bass Population

CDFG will make the following modification to gill netting and fyke trapping activities to reduce impacts of striped bass monitoring on Sacramento River winter- and Central Valley spring-run chinook salmon. Other runs of chinook salmon are not affected by these activities. The modifications will also reduce impacts to Central Valley steelhead and Sacramento splittail.

- Remove fish from traps daily and not fish the traps over the weekends during times when salmon are being caught in order to minimize the time fish are stressed by confinement.

- Stop fishing or move traps that are consistently catching salmon, Central Valley steelhead, or Sacramento splittail, as some trapping locations may capture more of these species than others.

Table 13. Striped Bass Rearing and Stocking Schedule and Annual Impact of Stocked Fish. WR–Winter-Run Chinook Salmon, SR–Spring-Run Chinook Salmon, F-LF–Fall- and Late-Fall-Run Chinook Salmon, STH–Steelhead, DS–Delta Smelt, ST–Splittail.

Year	Approximate Number of Fish Reared		Number of Fish Stocked in June/July of Each Year		Percent Consumed by Stocked Striped Bass					
	New	Age 1 (to be stocked at age 2)	Age 1	Age 2	WR	SR	F-LF	STH	DS	ST
1	1,443,000	0	1,275,000	0	0.8	0.5	1.0	0.6	0.9	0.9
2	668,000	0	500,000	168,000	1.0	0.8	1.3	0.8	0.8	0.8
3	668,000	168,000	500,000	168,000	1.0	0.6	1.3	0.6	0.8	0.8
4	668,000	168,000	500,000	168,000	1.1	0.6	1.4	0.6	0.8	0.8
5	628,000	168,000	500,000	168,000	1.1	0.6	1.4	0.6	0.8	0.8
6	528,000	128,000	400,000	128,000	1.0	0.5	1.3	0.5	0.7	0.7
7	528,000	128,000	400,000	128,000	0.9	0.5	1.1	0.5	0.7	0.7
8	528,000	128,000	400,000	128,000	0.9	0.5	1.1	0.5	0.7	0.7
9	528,000	128,000	400,000	128,000	0.9	0.5	1.1	0.5	0.7	0.7
10	400,000	128,000	400,000	128,000	0.9	0.5	1.1	0.5	0.7	0.7

- Alter the fishing locations for the gill nets based on in-season catch and catches in 1994. Specifically, do not fish the gill nets at Chipps Island, where catch rate of salmon was highest in 1994 (1.0 salmon/day). Concentrate fishing in Broad Slough and near Antioch, where no salmon were caught in 1994.

- Reduce gill net drift time (from completion of laying the net out to the beginning of retrieval) to 20 minutes maximum to reduce stress on captured salmon and increase probability of survival after release.

- Tag adult striped bass every second year rather than annually. Although initiated for reasons other than protecting chinook salmon, this action will reduce the impact of adult striped bass monitoring on salmon by about one-half.

- Retain and freeze all salmon that die in the gill nets or fyke traps for examination by NMFS.

- To the extent feasible, without excessive handling, provide tissue samples from captured salmon to the University of California Bodega Marine Laboratory for genetic analyses of run identification.

- Limit capture of adult winter- and spring- run chinook salmon during each year of tagging to 1% of the escapement of the run three years earlier. The run three years earlier is the parent stock and the best surrogate for the, yet unknown, abundance of each year's escapement. The 1% "take" limit will not exceed ten Sacramento River winter-run chinook salmon adults, regardless of the escapement of the run three years earlier. When the take limit is reached, trapping and netting will cease. The fall-/late-fall-runs of chinook salmon do not migrate upstream during the trapping and netting period; therefore, they are not affected by these activities.

E. Mitigation for Adverse Effects of Striped Bass Management

1. Chinook Salmon and Central Valley Steelhead.

a. Screening Program

The intent of this Conservation Plan is to mitigate the impacts of take of chinook salmon and Central Valley steelhead by the Striped Bass Management Program through screening of water diversions. However, the amount of screening required to fully offset impacts cannot be precisely determined. Estimates range from screening diversions totaling less than 10 cfs to 600 cfs depending on untested assumptions regarding the vulnerability of young salmon and Central Valley steelhead to being entrained in diverted

water. Thus, CDFG and NMFS have agreed upon the following program that both agencies believe is reasonable mitigation for the take of chinook salmon and Central Valley steelhead considering the level of uncertainty about entrainment vulnerability and also the uncertainty in the striped bass predation rate estimates:

i. The CDFG will fund screening projects in the Sacramento River. Screens covering at least 100 cfs of diversions will be installed during the first four years of the program (i.e., within four years of permit issuance). In addition, another approximately 100 cfs of diversions will be screened sometime during the first eight years of the program, for a total screening obligation of at least 200 cfs for the ten-year program. If NMFS does not list Central Valley fall-/late-fall-run chinook salmon pursuant to the ESA, the total screening obligations will drop to 150 cfs (75 cfs during the first four years and a total of 150 cfs during the first eight years).

ii. If the Striped Bass Management Program is terminated for any reason within the first four years of permit issuance, the CDFG's screening obligation will be reduced to 100 cfs of diversions (75 cfs if Central Valley fall-/late-fall-run chinook salmon are not listed). If the Program is terminated for any reason within the second four years after permit issuance, NMFS and CDFG will reevaluate CDFG's obligation for mitigation screening with the intent of reducing the obligation from a total of 200 cfs (150 cfs if Central Valley fall-/late-fall-run chinook salmon are not listed) to a level commensurate with the amount of stocking that occurred.

iii. If the stocking program is reduced from the proposed level of 1.275 million yearling equivalents during years one through five of the Striped Bass Management Program, NMFS and CDFG will reevaluate CDFG's obligation for mitigation screening with the intent of reducing the obligation from 200 cfs (reducing from 150 cfs if Central Valley fall-/late-fall-run chinook salmon are not listed) to a level commensurate with the lower stocking rate; as noted above, however, a minimum of 100 cfs (75 cfs if Central Valley fall-/late-fall-run chinook salmon are not listed) will be screened regardless of any reduction in the stocking program or termination of the program altogether within the first four years of the program. A request for a reduction in mitigation for chinook salmon and Central Valley steelhead, i.e., a reduction in the amount of cfs to be screened, based on a substantially reduced stocking program, must be made by CDFG in writing to NMFS. The written request should include a description of the reduced stocking program, the size of the overall striped bass population expected to occur with the reduced stocking, and an analysis of the change in potential predation rates of chinook salmon and Central Valley steelhead based on the reduced level of stocking. Any reduction in screening requirements for chinook salmon and Central Valley steelhead must be approved in writing by NMFS. Such an

approved change to this Conservation Plan will **not** require an amendment to the Conservation Plan or Section 10(a)(1)(B) permits.

iv. The following areas are in order of priority for screening diversions:

1. Red Bluff to Redding
2. Hamilton City to Red Bluff
3. Colusa to Hamilton City
4. Verona to Colusa

CDFG will target diversions for screening in the priority 1 area first. If suitable sites are not available there, sites will be sought in the priority 2 area, etc.

v. Potential projects include either fully funding or cost-sharing screening of small diversions not currently scheduled for screens. If small diversions are not available for screening, CDFG may cost-share screening of large diversions. (If CDFG fulfills all or part of its screening obligation through cost-sharing, only that portion of the screening project funded by CDFG will "count" toward its obligation to screen a minimum of 200 cfs (150 cfs if fall-/late-fall-run chinook salmon are not listed) under this Conservation Plan.)

vi. NMFS must approve in writing all screening projects considered as mitigation under this Conservation Plan.

b. Screen Project Requirements

The requirements below are specific to screens installed as mitigation for impacts to chinook salmon and Central Valley steelhead. In addition, Section 3 below (Requirements Applicable to All Screen Projects) specifies requirements that apply to all screens installed under this Conservation Plan.

i. Screens shall be conventional, positive barrier types of screens.

ii. Screen designs must be reviewed and approved by NMFS prior to installation. Screen designs will include a drawing package and/or photos describing the types of screens and site conditions.

iii. For fish screens placed on diversions with a total combined diversion rate of up to 40 cfs, NMFS shall have 30 days after receipt of the proposed screen design from CDFG to notify CDFG whether there are specific circumstances surrounding the screen design or location which require coordination between NMFS and CDFG prior to installation of the screen(s).

iv. For fish screens placed on diversions with a total combined diversion rate of 40 cfs or more, the following requirements apply:

1. CDFG will submit the fish screen design and construction schedule to NMFS Southwest Region for review and approval 90 days prior to construction.

2. CDFG will submit a hydraulic evaluation program for evaluating the performance of the fish screens and conformance with NMFS criteria to NMFS Southwest Region for review and approval at least 60 days prior to the start of operations.

2. Delta Smelt and Sacramento Splittail.

a. Screening Program

CDFG intends to mitigate the impacts of take of delta smelt and Sacramento splittail resulting from striped bass stocking through screening or funding the screening of water diversions in the western Delta or Suisun Marsh. Such screening is consistent with actions specified in the Recovery Plan for Sacramento/San Joaquin Delta Native Fishes (U.S. Department of Interior, 1996).

The amount of screening required to fully offset impacts of the Striped Bass Management Program cannot be precisely determined. However, based on densities of delta smelt in the western Delta and Suisun Bay as measured by Kodiak trawl sampling and the estimated predation rate (Appendix E), the CDFG and the USFWS have agreed that screening 18 cfs would be required to offset the loss of 0.76 to 1% of the delta smelt population. Thus, mitigating the take of 0.9% of the delta smelt population resulting from the proposed striped bass stocking program (Table 13) would require installing and maintaining screens on diversions totaling 18 cfs in Suisun Marsh or the western Delta. If fewer striped bass are actually stocked, the screening obligation would be commensurately less (Table 14). The same screens will provide a benefit to, and therefore serve as mitigation for incidental take of, both delta smelt and Sacramento splittail.

Table 14. Mitigation Schedule for Impact of Striped Bass Stocking on Delta Smelt and Sacramento Splittail

Impact of Striped Bass Predation (by percent of the population)				
	up to 0.25%	0.25% to 0.50%	0.51% to 0.75%	0.76% to 1.00%
CFS to be screened in Suisun Marsh or Western Delta	4.5	9.0	13.5	18.0

Each of the above mitigation amounts represents full mitigation for the 10-year project.

i. CDFG will ensure that screens covering approximately 9 cfs will be installed during the first two years of the Program (i.e., within two years of permit issuance). This obligation continues if, for any reason, the Striped Bass Management Program is terminated after the first year of its implementation. Any remaining screening obligation, as determined based on the predation impact to delta smelt anticipated from the actual number and composition of striped bass stocked, will be fulfilled in total by the end of the fifth year of the Program (i.e., within five years of permit issuance).

ii. The USFWS must approve in writing all screening projects considered as mitigation under this Conservation Plan.

b. Screen Project Requirements

The requirements below are specific to screens installed as mitigation for impacts to delta smelt and Sacramento splittail. In addition, Section 3 below specifies requirements that apply to all screens installed under this Conservation Plan.

i. Any screen installation work in the western Delta must occur between August 1 and November 30. Any screen installation work in Suisun Marsh must occur between June 15 and September 30.

ii. Screens should be constructed of stainless steel and should be a 3/32 inch profile bar type or 5/32 inch perforated plate type.

iii. Screens should not exceed a 0.2 foot-per-second approach velocity.

iv. All screen installation work must be conducted in accordance with the Army Corps of Engineers' Best Management Practices for in-water work.

v. Future improvements in screen technology or methods for increasing the effectiveness of fish screens for delta smelt and Sacramento splittail should be incorporated into this Plan, as appropriate.

vi. Disturbance to aquatic habitat should be minimized to the greatest extent possible (i.e., disturbance to emersed aquatic plants should be avoided; disturbance to submersed aquatic plants should be minimized). If disturbance to aquatic habitat exceeds 0.1 acre for any one screen, CDFG will mitigate such impacts through revegetation of the site.

vii. Screen designs must be reviewed and approved by USFWS prior to installation. Screen designs submitted to USFWS by CDFG will include a drawing package and/or photos describing the types of screens and site conditions.

3. Requirements Applicable to all Screen Projects

The requirements below, apply to *all* screening projects installed as mitigation under this Conservation Plan (i.e., screens installed to mitigate for take of chinook salmon and Central Valley steelhead and screens installed to mitigate for take of delta smelt/Sacramento splittail).

a. CDFG will ensure the fish screens are adequately operated and maintained throughout their normal operational life (about 15 years) by developing a proposed operations and maintenance plan for each screen installed under this Plan. Such plans will include at a minimum:

i. periodic visual inspections;

ii. periodic assessment of screen performance - component reliability, component durability, and screen cleaning system effectiveness; and

iii. a schedule of regular maintenance required to keep the screens in reliable working condition.

b. During the periodic visual inspections of the screens, any impinged larval, juvenile, or adult fish should be collected and identified, to the extent possible.

c. CDFG will include in its annual reports submitted to NMFS and USFWS (see Chapter 15, Reporting): (1) documentation of compliance with measures a.i

through a.iii above, and (2) the number and age or size of any of the covered species found impinged on any of the screens (as identified per measure b. above).

d. All pilings, bulkheads and dock materials associated with the fish screen facilities shall be non-toxic. Any combination of wood, plastic, concrete, or steel pilings is acceptable, provided that there are no toxic coatings, chemical anti-fouling products or treatments that may leach into the surrounding environment.

e. Landowners will be responsible for operating and maintaining screens functioning after 15 years.

F. Take Associated with Mitigation

The mitigation measures described above (i.e., the screening of diversions in the Bay, Delta, and/or Sacramento River) may result in unquantifiable but low levels of incidental take of one or more of the covered species by the CDFG or private landowners or contractors installing, operating and/or maintaining screens. Direct take of covered species is unlikely because: 1) allowable construction "windows" avoid periods when the covered species are abundant and 2) screen installation activities such as driving piles and associated modifications to river or slough banks at diversion sites would not entrain or otherwise remove the covered species. A small loss of habitat may occur at the diversion sites due to the placement of pilings and other screen structures. The incidental take authorized under this Plan that may occur as a result of CDFG's implementation of the Striped Bass Management Program, includes take of any of the covered species incidental to the installation, operation, and/or maintenance of screens installed to fulfill the mitigation requirements of this Plan insofar as all applicable regulations are followed and CDFG maintains jurisdiction over any third party contractors. The extent of take incidental to installation, operation, and/or maintenance is expected to be minimal with negligible impacts to any of the covered species because the mitigation screens will be small installations requiring minimal habitat modifications and the screen project requirements specified in this Chapter Sections E.2.b and E.3 are designed to minimize impacts. The long term benefits of screen installation greatly outweigh any short term impacts of take resulting from these mitigation actions. Additional measures may be needed, however, to comply with the ESA should implementation of the mitigation measures affect any listed species not covered by this Plan and its associated incidental take permits.

Chapter 14. UNFORESEEN CIRCUMSTANCES/CHANGED CIRCUMSTANCES

The term "unforeseen circumstances" as defined in this Conservation Plan is intended to have the same meaning as "unforeseen circumstances" as defined in the Habitat Conservation Plan Assurances ("No Surprises") Rule (*Federal Register*, Vol. 63, No. 35, February 23, 1998) that amended Part 17 and Part 222 of Title 50 of the Code of Federal Regulations. For purposes of this Conservation Plan, the term "Unforeseen Circumstances" shall mean: (a) any significant, adverse change in the biological status (i.e., population abundance or distributional changes beyond normal fluctuation) of any run of chinook salmon, Central Valley steelhead, delta smelt, Sacramento splittail, giant garter snake, or their habitats; (b) any significant, adverse change in the impacts of the Striped Bass Management Program on any run of chinook salmon, Central Valley steelhead, delta smelt, Sacramento splittail, or giant garter snake, or in the other factors upon which this Conservation Plan is based; or (c) any new and substantial scientific information relevant to the Conservation Plan that was not anticipated by USFWS, NMFS, or CDFG at the time of permit issuance and that would be likely to result in a significant adverse change in (a) or (b) above.

The Habitat Conservation Plan Assurances Rule provides that "In negotiating unforeseen circumstances, the [USFWS or NMFS] will not require the commitment of additional land, water or financial compensation or additional restrictions on the use of land, water, or other natural resources beyond the level otherwise agreed upon for the species covered by the conservation plan without the consent of the permittee." The No Surprises Rule provides assurances only where the conservation plan is being properly implemented, and applies only with respect to species adequately covered by the conservation plan. The No Surprises Rule states further, "If additional conservation and mitigation measures are deemed necessary to respond to unforeseen circumstances, the [USFWS or NMFS] may require additional measures of the permittee where the conservation plan is being properly implemented, but only if such measures are limited to modifications within conserved habitat areas, if any, or to the conservation plan's operating conservation program for the affected species, and maintain the original terms of the conservation plan to the maximum extent possible." A species is considered to be "adequately covered" by a conservation plan when the implementation of the plan continues to meet the permit issuance criteria set out in 50 CFR 17 for USFWS and 50 CFR 217, 220, and 222 for NMFS.

Thus, in the event that unforeseen circumstances adversely affecting Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon, Central Valley fall-/late-fall-run chinook salmon, Central Valley steelhead, delta smelt, Sacramento splittail, and/or giant garter snake occur within the life of the Striped Bass Management Program Conservation Plan, CDFG would not be required to provide additional mitigation or additional restrictions on the Striped Bass Management Program above those measures specified in the Conservation Plan, provided that the Conservation Plan is being "properly implemented," as defined in 50 CFR Part 17.3 and Part 222.102. However, CDFG may consent to additional mitigation measures or restrictions.

The term "changed circumstances" as defined in this Conservation Plan is intended to have the same meaning as "changed circumstances" as defined in the Habitat Conservation Plan Assurances ("No Surprises") Rule. The No Surprises Rule defines "changed circumstances" as changes in circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the USFWS and NMFS and that can be planned for (e.g., the listing of new species, or a fire or other natural catastrophic event in areas prone to such events).

The Habitat Conservation Plan No Surprises Rule provides that, "If additional conservation and mitigation measures are deemed necessary to respond to changed circumstances and were provided for in the plan's operating conservation program, the permittee will implement the measures specified in the plan." The No Surprises Rule provides further that, "If additional conservation or mitigation measures are deemed necessary to respond to changed circumstances and such measures were *not* provided for in the plan's operating conservation program, the [USFWS or NMFS] will not require any conservation or mitigation measures in addition to those provided for in the plan without the consent of the permittee, provided the plan is being properly implemented."

The situations or circumstances described below are considered "changed circumstances" that have been provided for in the Conservation Plan and therefore, additional mitigation or restrictions on Program actions, as described in this Plan, may be required in the future if any of the changed circumstances occur.

A. Adjustments to the Proposed Actions Due to Changed Circumstances

Under certain conditions it may be necessary and appropriate for CDFG to make adjustments to the Striped Bass Management Program, including adjustment of the striped bass stocking levels, and/or making adjustments to other aspects of this Conservation Plan. These adjustments constitute "changed circumstances" as described above. The purpose of building flexibility into this Plan is to take into account those unpredictable situations in which any of the covered species or the striped bass is faring considerably better or considerably worse than anticipated, or the future listing under the ESA of a species not covered under this Conservation Plan occurs. If and when any of the situations or thresholds described below occurs, CDFG will adjust its Striped Bass Management Program as indicated.

1. Changes in the Status of Covered Species

Changes in environmental conditions such as extended droughts or flooding events can adversely affect the survival and population levels of covered species. Changes in environmental conditions can also benefit covered species and increase population levels. The following sections describe situations or thresholds for some of the covered species and the management actions CDFG, NMFS, and USFWS may take to address these changed circumstances.

a. Sacramento River Winter-Run Chinook Salmon: Low Cohort Replacement Rates

NMFS has developed a statistical model to test if Sacramento River winter-run chinook salmon are meeting recovery objectives. NMFS analyses indicate that the estimated adult cohort replacement rate (CRR) of Sacramento River winter-run chinook salmon needs to increase by 31% above the estimated adult replacement rate for the 1989-1993 base period in order to achieve positive population growth with an 0.80 probability (NMFS 1997a, 1997b). A 31% increase in the base period estimated adult replacement rate (of 1.35) would increase the estimated adult replacement rate to 1.77. NMFS developed these analyses and criteria as a basis for their Section 7 consultation on the Fishery Management Plan for commercial and recreational salmon fisheries off the coasts of Washington, Oregon and California (NMFS 1997a, 1997b).

Statistical testing of whether the CRR meets the 1.77 level requires CRR measurements from at least two Sacramento River winter-run chinook salmon cohorts affected by striped bass stocking. Since Sacramento River winter-run chinook salmon have a three-year life cycle, the first juvenile cohort affected by the conservation plan will emigrate during the winter of 1999-2000 and will return in 2002 and the second cohort will return in 2003. Thus, the initial testing will occur by CDFG and NMFS in 2003. Subsequently, testing will occur annually and the trigger will be based on the average of the three most recent CRRs. This will result in all three population cohorts being included in the analysis.

If results indicate that the CRR is significantly less than 1.77, CDFG and NMFS will work cooperatively to identify appropriate adjustments to this Conservation Plan that will reduce the impacts of striped bass on Sacramento River winter-run chinook salmon CRR. Such adjustments are described in section 3 of this chapter.

b. Delta Smelt Abundance

An adverse change in the status of delta smelt also will require modification of the Striped Bass Management Program. Modification will occur if the annual total fall midwater trawl index of delta smelt abundance is equal to or less than 239 in any year. If that occurs, stocking will occur in the following year at the proposed level, but farther west in San Pablo Bay (i.e., west of a straight line between Pinole Point and Midshipman Point), or in San Francisco Bay. This westward shift in stocking location will further reduce the probability of interaction between stocked striped bass and delta smelt (and also on hatchery-reared Central Valley fall-run chinook salmon released farther east in San Pablo Bay). If the decline in delta smelt abundance is especially severe with a fall midwater trawl abundance index equal to or less than 84, USFWS and CDFG will work cooperatively to adjust the Conservation Plan as needed. Such adjustments are described in section 3 of this chapter.

c. Central Valley Steelhead

Currently, no analyses or indicators exist which describe or quantify appropriate Central Valley steelhead population thresholds for use in adaptive management. Until such information is available, NMFS and CDFG shall work cooperatively to ensure that the Conservation Plan continues to adequately cover the Central Valley steelhead and make any necessary adjustments as described in section 2. Once threshold information is available, NMFS and CDFG shall work to amend this conservation plan to incorporate use of the identified thresholds as the basis for implementing possible adjustments as described in section 3 of this chapter.

d. Central Valley Spring-Run Chinook Salmon

NMFS will initiate recovery planning efforts which will include analysis of the population parameters required to recover the Central Valley spring-run chinook salmon. Currently, no analyses or indicators exist which describe or quantify appropriate Central Valley spring-run chinook salmon population thresholds for use in adaptive management. Until such information is available, NMFS and CDFG shall work cooperatively to ensure that the Conservation Plan continues to adequately cover the Central Valley spring-run chinook salmon and make any necessary adjustments as described in section 3 of this chapter. Once threshold information is available, NMFS and CDFG shall work to amend this conservation plan to incorporate use of the identified thresholds as the basis for implementing possible adjustments as described in section 3 of this chapter.

e. Central Valley Fall-/Late-Fall-Run Chinook Salmon

In the event that this species is listed, NMFS will initiate recovery planning efforts which will include analysis of the population parameters required to recover the Central Valley fall-/late-fall-run chinook salmon. Currently, no analyses or indicators exist which describe or quantify appropriate Central Valley fall-/late fall-run chinook salmon population thresholds for use in adaptive management. Until such information is available, NMFS and CDFG shall work cooperatively to ensure that the Conservation Plan continues to adequately cover the Central Valley fall-/late fall-run chinook salmon and make any necessary adjustments as described in section 2. Once threshold information is available, NMFS and CDFG shall work to amend this conservation plan to incorporate use of the identified thresholds as the basis for implementing possible adjustments as described in section 3 of this chapter.

2. Adding Unlisted Species to the Permit or Permits

CDFG is seeking incidental take authorization under section 10(a)(1)(B) of the Federal Endangered Species Act of 1973, as amended, for the federally listed Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon, Central Valley steelhead, delta smelt, Sacramento splittail, and giant garter snake. In addition, CDFG considers this

Conservation Plan to adequately address Central Valley fall-/late-fall-run chinook salmon, should it become listed pursuant to the ESA and requests that Central Valley fall-/late-fall-run chinook salmon be included as covered on the incidental take permits issued by NMFS and USFWS with the effective date delayed to any future Federal listing.

If a species that is not covered by the Conservation Plan is listed under the ESA during the term of the Section 10 permits, and the newly listed species may be affected by activities covered by the Conservation Plan, the Section 10 permits will be reevaluated and the activities covered by the Conservation Plan may be modified, as necessary, to insure that the activities and associated minimization, mitigation, and monitoring measures adequately cover the newly listed species or designated critical habitat. Addition of a newly listed species or designated critical habitat to the Section 10 permits may require additional resources and is not covered by the No Surprises Rule assurances. Once adopted as part of this Conservation Plan, those measures will be covered by the No Surprises Rule.

CDFG shall implement the modifications to the Conservation Plan covered activities identified by the USFWS and/or NMFS as necessary to adequately cover the species and critical habitat, and/or to avoid take, jeopardy, and/or adverse modification of the newly listed species. CDFG shall continue to implement such modifications until such time as CDFG has applied for and USFWS and/or NMFS have approved an application to amend the Section 10 permit or permits, in accordance with applicable statutory and regulatory requirements, to cover the newly listed species or, if take of the newly listed species is not prohibited by Section 9 of the ESA (e.g., as for listed plant species on private lands), until the USFWS and/or NMFS notifies CDFG in writing that the modifications to the Conservation Plan covered activities are no longer required to avoid the take of the newly listed species.

3. Conservation Plan Adjustments

The following list details possible remedial actions that can be taken by CDFG in response to the changed circumstances described above:

- Increasing mitigation, including screening more diversions;
- Stocking fewer yearlings and more two-year-olds;
- Stocking fewer total striped bass;
- Elimination of stocking;
- Other actions as appropriate.

CDFG, NMFS, and USFWS will work cooperatively to agree upon the appropriate course of action. In the event that agreement on adjustments to the Program is *not* reached, the necessary adjustments will be determined by USFWS or NMFS, as appropriate. CDFG will suspend stocking until all issues are resolved and a final agreement is reached. It is the intention of all agencies to come to a mutually agreeable solution as quickly as possible.

In the event that CDFG, USFWS, and NMFS agree that reductions in total stocking levels of striped bass are the appropriate response to changed circumstances in the status of the covered species, mitigation requirements may be reduced, with NMFS and USFWS agreement, commensurate with the reductions in stocking. Reduction in required mitigation would not apply to stocking reductions in response to increased striped bass populations.

4. Funding for Adjustments to the Proposed Management Actions

Potential costs of changing stocking locations, changing the age composition of stocked striped bass, and reducing numbers of fish stocked are either minimal or result in less cost (reducing numbers of fish stocked) and fall within the current program budget. Costs of additional mitigation, if required, could be substantial (potentially several hundred thousand dollars for additional fish screens) and would be borne by the CDFG Striped Bass Stamp Fund which will have annual revenues of about $1.4 million. In the event of reduced extinction risk (i.e., increased population and distribution indicating recovery) for Sacramento River winter-run chinook salmon, greater stocking and associated mitigation would only be done to the extent that sufficient funding is available for both activities.

5. Continuation of Monitoring Programs

CDFG anticipates that existing monitoring programs, as described in Chapter 3, Section C, will continue throughout the term of this Conservation Plan and its associated Federal incidental take permits (i.e., ten years). Take of delta smelt and Sacramento splittail resulting from these on-going monitoring programs is covered by existing ESA Section 7 consultations for IEP monitoring. Take of chinook salmon and Central Valley steelhead associated with these monitoring programs shall be covered by this Conservation Plan and its associated incidental take permit issued by NMFS. In the event that the IEP surveys cease or change during the term of this Plan, CDFG will continue monitoring, as necessary, to determine the abundance of adult striped bass, abundance of young striped bass, and survival and abundance of stocked striped bass. A term in the NMFS and USFWS incidental take permits will automatically cover the CDFG for incidental take of any of the covered fish species by these surveys should the IEP be terminated for any reason. The cost of these programs is already largely borne by the CDFG as part of its contribution to the IEP and would continue to be borne by the CDFG. Any substantial changes with respect to striped bass monitoring or effects of striped bass monitoring on the covered species from what is described in the Conservation Plan could require an amendment to the incidental take permits, as described in Chapter 18, Section B, Permit Amendments.

Chapter 15. REPORTING

CDFG will prepare an annual written report for each year during which the Conservation Plan is in effect, describing for that year:

1. An estimate of the population status of:

   - striped bass
   - each run of chinook salmon
   - Central Valley steelhead
   - delta smelt
   - Sacramento splittail

2. Actual or estimated incidental take of each run of chinook salmon, Central Valley steelhead, delta smelt, and Sacramento splittail during:

   - Summer townet survey
   - Fall midwater trawl survey
   - Trapping and gill netting of adult striped bass (including reporting of condition; estimated run composition based on size, color and genetic identification; and retention of salmon that die due to capture)
   - Sampling of the striped bass population (for predation studies) in the vicinity of structures

3. Striped bass stocked:

   - Numbers stocked and rearing method (pen-reared salvaged fish, pen-reared hatchery produced fish, hatchery reared fish)
   - Age composition of stocked bass
   - Stocking location
   - Stocking dates
   - Estimated contribution of stocked fish to adult population of striped bass

4. The results of striped bass stomach content analysis:

   - Numbers and locations of striped bass collected for this purpose.
   - Stomach contents stratified by location, season, and striped bass size.
   - Numbers, size composition, and stomach contents of striped bass collected during sampling at structures.
   - Actual or estimated numbers of salmon, Central Valley steelhead, delta smelt and Sacramento splittail per striped bass stomach.
   - Stomach contents for each striped bass with capture area and time.
   - Any indication of giant garter snake found in striped bass stomachs.

5. An estimate of the likely predation rates of striped bass on the covered species based on the results of stomach content analyses, and a comparison of those results with the estimated predation rates of striped bass on the covered species developed for this Conservation Plan.

6. To the extent possible, estimated total levels of take (annual and cumulative) of each run of chinook salmon, Central Valley Steelhead, delta smelt, Sacramento splittail, and giant garter snake resulting from the Striped Bass Management Program. This section of the report should include a discussion on how such estimates were determined.

7. Mitigation activities conducted:

   - Fish screen installation and maintenance including locations of screens installed; diversion sizes; operation schedules; dates and results of periodic visual inspections; number and age or size of any of the covered species found impinged on any of the screens; dates and results of periodic assessment of screen performance - component reliability, component durability, and screen cleaning system effectiveness; and dates of regular maintenance required to keep the screens in reliable working condition.

   - Funding sources and amount spent on each screen.

Annual reports will be submitted to NMFS and USFWS by February 28 of the year following the calendar year to which the report applies, beginning with the first calendar year in which the incidental take permits are issued. Each report shall be submitted to:

Field Supervisor
Sacramento Fish and Wildlife Office
U.S. Fish and Wildlife Service
2800 Cottage Way, Rm W-2605
Sacramento, CA 95825
(916) 414-6620

Re: Striped Bass Management Program
Conservation Plan

Regional Administrator
National Marine Fisheries Service
501 West Ocean Boulevard, Suite 4200
Long Beach, CA 90802-4213
(562) 980-4001

Re: Striped Bass Management Program
Conservation Plan

Chapter 16. FUNDING

A. Monitoring

Current funding for the striped bass population monitoring program comes from several sources including California Department of Water Resources, U.S. Bureau of Reclamation, Sport Fish Restoration Act funds, CDFG Striped Bass Stamp Fund, and the CVPIA. Most of the striped bass population monitoring is a high priority of the IEP, CDFG, and the CVPIA; thus, funding is likely to be secure. Additional monitoring of striped bass stomach contents, as required under this Conservation Plan (see Chapter 13, Section A), will be funded by the CDFG through its Striped Bass Stamp Fund. If funds from sources that are not controlled by CDFG become unavailable, CDFG will conduct the required monitoring, as specified in this Conservation Plan, using its own funds.

B. Mitigation

The CDFG controls the Striped Bass Stamp Fund and pledges that this Fund, which currently has a balance of about $1.5 million and anticipated annual revenue of $1.4 million, will be used to fund mitigation required under this Conservation Plan. The CDFG also may consider other funding sources if opportunities arise.

The Striped Bass Stamp Fund is more than sufficient to implement the fish screen mitigation projects. Based on a cost estimate of $2,500 per cfs in the Sacramento River, 200 cfs could be screened for approximately $500,000. That quantity of screening meets the mitigation requirement for Sacramento River winter-run chinook salmon and Central Valley steelhead. Based on a cost estimate of $50,000 per 10 cfs screen in the Suisun Marsh or western Delta, and assuming the maximum predation impact of 1.1% on delta smelt, mitigation for delta smelt and Sacramento splittail would consist of installation of screens on one to three diversions totaling 22.5 cfs in the Suisun Marsh or western Delta (Table 13) for a cost of about $112,500. Mean total annual maintenance and management costs for these screens (200 cfs on the Sacramento River and 22.5 cfs in Suisun Marsh or the western Delta) probably will not exceed $100,000; although other funds may be sought, these costs will also be guaranteed by the Striped Bass Stamp Fund.

The striped bass stamp currently is authorized through 2001. If the stamp is not renewed by legislation at that time, other funding sources would need to be located or striped bass stocking would have to be reduced or halted. Nevertheless, CDFG guarantees full funding for any mitigation requirement remaining at that time. The striped bass stocking program will not proceed if adequate funding to implement this Conservation Plan is not secured.

The CDFG accepts responsibility for evaluating, administering, and maintaining all fish screening projects identified as mitigation for stocking striped bass under this Conservation Plan, except as may be otherwise provided for in any subsequent agreements between the CDFG and

NMFS or USFWS. The CDFG further understands that failure to provide adequate funding to implement the terms of this Conservation Plan in full could result in permit suspension or revocation.

C. Annual Budget

Based on present funding commitments[1/], the estimated annual Striped Bass Management Program budget is as follows:

Activity	Funding Sources	
1. Monitoring status of striped bass population, contribution of stocked fish, and impacts on covered species	Striped Bass Stamp	206,000
	Central Valley Project Improvement Act	166,000
	Sport Fish Restoration Act	163,000
	California Dept. of Water Resources	65,000
	U.S. Bureau of Reclamation	65,000
	Pacific Gas & Electric Company	40,000
	Total Monitoring	$705,000
2. Rearing and stocking striped bass (1.275 million yearling equivalents @ $1.00 per yearling)	Striped Bass Stamp	500,000
	California Dept. of Water Resources	400,000
	U.S. Bureau of Reclamation	200,000
	Pacific Gas & Electric Company	100,000
	Sport Fish Restoration Act	75,000
	Total Rearing and Stocking	$1,275,000
3. Mitigation Fish Screens (25 cfs, Sacramento River @ $2,500 per cfs = $62,500; 10 cfs, Suisun Marsh @ $5,000 per cfs = $50,000)	Striped Bass Stamp	$112,500
4. Fish Screen Maintenance	Striped Bass Stamp	$100,000
	Total Annual Budget for Monitoring, Rearing and Stocking, and Mitigation	$2,192,500

1/ Funding sources may deviate from this budget contingent upon decisions during various budget and proposal review processes.

Chapter 17. ALTERNATIVE ACTIONS CONSIDERED

A. Alternative 1 -- Water Management/No Stocking Alternative

Under this alternative CDFG would not stock striped bass, but instead rely upon: 1) recommending flow standards and water export limitation in various forums such as State Water Resources Control Board hearings and the CALFED process, and 2) direct negotiations with the water management agencies (California Department of Water Resources, U.S. Bureau of Reclamation). In the past such actions have led to some water management measures being implemented to protect striped bass, but these measures have not been sufficient to avoid the decline of striped bass. Future reliance upon this approach is likely to result in further decline of striped bass. Increased water demands associated with the burgeoning human population of California and the priority of using "environmental water" to protect ESA listed species will further reduce chances for successfully managing striped bass through water management. Under this alternative, predation on chinook salmon, Central Valley steelhead, delta smelt, and Sacramento splittail would still occur by the existing striped bass population, albeit at lower rates (declines of about 1.1% for Sacramento River winter-run chinook salmon, 0.8% for Central Valley spring-run chinook salmon, 1.4% for Central Valley fall-/late-fall-run chinook salmon, < 1.4% for Central Valley steelhead, 1.0% for delta smelt, <1.0% for Sacramento splittail) than if the population, on average, was maintained at its 1994 level of 712,000 adults.

Without stocking, the CDFG estimates that the striped bass population would decline to about 515,000 adults on average. This further degradation of the striped bass population was considered and rejected as unacceptable for the following reasons: (1) for the past century the striped bass fishery has been the most important recreational fishery within the Sacramento-San Joaquin Estuary, and (2) it provides major social and economic benefits to the State of California.

B. Alternative 2 -- Tying Striped Bass Stocking Levels to Natural Production Levels

This alternative differs from the proposed project in that the number of striped bass stocked would vary annually based on young striped bass abundance indices (i.e., if striped bass production increased, stocking would decrease and vice versa). The goal of maintaining 712,000 adults would be identical to the proposed project. However, annual impacts would be more variable because there would have to be a lag of one year between natural production and the associated rearing level (because the natural production level would not be known until after fish were collected from the water project fish screens or artificially spawned). This lag would result in stocking more than 2 million yearling equivalent striped bass in some years with commensurately greater predation on the covered species by stocked striped bass. Overall, total striped bass predation impacts, would be greater than for the proposed stocking program in some years, but less in others, depending on how the lagged rearing and stocking levels coincide with natural production. Predation rates by stocked-striped bass could be as great as 1.7% on Sacramento River winter-run chinook salmon, 1.3% on Central Valley spring-run chinook

salmon and Central Valley steelhead, 2.2% on Central Valley fall-run salmon and 1.6% on delta smelt and Sacramento splittail in some years. Alternatively, large numbers of fish could be reared at the start of each year with some, possibly large, portion disposed of after the natural production level became known. This approach would be more costly than the proposed project because larger numbers of fish would have to be collected at the water project fish screens (which would be difficult or impossible in some years) or artificially spawned. Larger numbers would be required because the proposed project is based on average natural production and Alternative 2 would have to provide greater numbers of fish in years of low natural production.

C. Alternative 3 -- Fishing Regulations

An alternative consisting of increasing the striped bass population by recommending that the Fish and Game Commission make sport fishing regulations more restrictive was considered. A regression model of factors affecting adult striped bass abundance, developed by the CDFG, was used to evaluate the effectiveness of this alternative. Under existing environmental conditions in the Estuary, fishing would have to be severely restricted to maintain adult striped bass abundance at the present (estimated 1994) level (712,000). For example, increasing the minimum size limit to 26" would result in a population of 721,000 adults after 13 years, but this minimum size would also reduce annual harvest by 70% from the harvest level possible with present regulations and maintenance of 712,000 adults with the proposed stocking program. A 30 inch minimum length would yield about 732,000 adult bass after 9 years, but reduce annual harvest by 89%. In both cases, harvest would be even lower in the years before adult abundance reached approximately 712,000. Hence, this alternative is undesirable because the main value of striped bass in the Estuary is the consumptive fishery which supports many businesses, economies, and lifestyles. Other impacts of this alternative would be essentially the same as those described for the stocking program. However, there is the potential for increased predation on Central Valley steelhead smolts and Sacramento splittail as the average size of striped bass would increase as a result of a decrease in fishing mortality.

D. Alternative 4 -- Stocking up to 275,000 Two-Year-Old Striped Bass

Like the proposed program, this alternative is based on stocking 1.275 million yearling equivalents to restore 712,000 adult striped bass during years 1-5 and 860,000 yearling equivalents to maintain 712,000 adult striped bass during years 6-10. However, instead of annually stocking 500,000 yearlings and 168,000 two-year-olds in years 1 through 5, the CDFG would not stock any yearlings but would stock 275,000 two-year-olds. In years 6 through 10, instead of annually stocking 400,000 yearlings and 128,000 two-year-olds, the CDFG would not stock any yearlings but would stock 234,000 two-year-olds.

Relying entirely on two-year-olds may further reduce predation impacts on the covered species (Table 5); however, since stocking two-year-olds has not been tested, there is significant

uncertainty regarding survival of two-year-olds relative to that of yearlings which has implications regarding: 1) success or failure of the stocking program to attain the striped bass population goal, and 2) predation on the covered species. If two-year-olds do not survive as well as assumed, predation would be less than estimated, but the stocking program would not achieve its population goal. Conversely, if survival of two-year-olds is greater than assumed, there is a greater chance of exceeding the striped bass population goal and predation on the covered species could be greater than estimated. Considering this uncertainty, the CDFG, NMFS, and USFWS believe that the proposed stocking program consisting of yearlings and two-year-olds is a more prudent approach.

Chapter 18. SECTION 10(a)(1)(B) PERMIT AMENDMENTS

A. Permit Amendments

1. Amendments to the Permits

Amendment of the Striped Bass Management Program Section 10 (a)(1)(B) permits would be required for any change in the following: (1) the listing under the ESA of a new species not currently addressed in the Conservation Plan that may be taken by project actions; (2) modification of any project action or mitigation component under the Conservation Plan, including funding, that may significantly affect authorized take levels, effects of the project, or the nature or scope of the mitigation program, with the exception of those Plan modifications specifically addressed in the original Conservation Plan and permit application; and (3) any other modification of the project likely to result in significant adverse effects to chinook salmon, Central Valley steelhead, delta smelt, Sacramento splittail, and/or giant garter snake not addressed in the original Conservation Plan and permit application.

Amendment of a section 10(a)(1)(B) permit must be treated in the same manner as an original permit application. Permit amendments typically require a revised Conservation Plan, a permit application form and applicable fee, an Implementing Agreement, NEPA compliance, and a public comment period. However, the specific documentation needed in support of a permit amendment may vary depending on the nature of the amendment.

2. Amendments to the Conservation Plan

The Striped Bass Management Program Conservation Plan may, under certain circumstances, be amended without amending its associated permits, provided that such amendments are of a minor or technical nature and that the effect on the species involved and the levels of take resulting from the amendment are not significantly different than those described in the original Conservation Plan. Examples of minor amendments to the Striped Bass Management Program Conservation Plan that would not require permit amendment include, but are not limited to: (1) minor revisions to survey, monitoring, or reporting protocols; and (2) minor revisions in striped bass stocking procedures.

To amend the Conservation Plan without amending the permits, CDFG must submit to the USFWS and NMFS, in writing, a description of: (1) the proposed amendment; (2) an explanation of why the amendment is necessary or desirable; and (3) an explanation of why CDFG believes the effects of the proposal are not significantly different than those described in the original Conservation Plan. If the USFWS and NMFS concur with CDFG's proposal, they shall authorize the Conservation Plan amendment in writing, and the amendment shall be considered effective upon the date of the written authorization from USFWS and NMFS.

B. Other Measures Required

Section 10(a)(2)(A)(iv) of the ESA states that a Conservation Plan must specify "such other measures that the Secretary may require as being necessary or appropriate for purposes of the plan." NMFS and Region 1 of the USFWS (the west coast region) believe it is generally necessary and appropriate to prepare an Implementing Agreement for Conservation Plans. The purpose of an Implementing Agreement is to ensure that each party understands its obligations under the Conservation Plan and Section 10(a)(1)(B) permits and to provide remedies should any party fail to fulfill their obligations. Therefore, an Implementing Agreement has been prepared for this Conservation Plan and is attached as Appendix I. At the time of this writing, no other measures other than an Implementing Agreement have been identified by NMFS or USFWS.

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