Meeting Summary

Battle Creek Salmon and Steelhead Restoration Project Public Meeting—Red Bluff, California March 15, 2004

Attendees

- At the beginning of the meeting, Mr. Canaday asked that the meeting attendees please introduce themselves and the organization each represents. (Please see Table 1 for the list of attendees.)

Meeting Purpose and Format—Jim Canaday, State Water Resources Control Board

- The purpose of the public meeting was to present the incremental biological benefits associated with the proposed project (i.e., 5 Dam Removal Alternative, as described in the 1999 Memorandum of Understanding and the July 2003 Draft Environmental Impact Statement/Environmental Impact Report [EIS/EIR]) and a new alternative (i.e., 8 Dam Removal Alternative, also known as Alternative B) for the Battle Creek Salmon and Steelhead Restoration Project (Restoration Project). The meeting will also present the uncertainties associated with both alternatives; and the schedule and process impacts associated with implementing Alternative B (8 Dam Removal Alternative) instead of the current proposed action (5 Dam Removal Alternative). The purpose for the meeting was not to debate, but rather to clarify the public understanding of the differences between the 5 Dam and the 8 Dam Removal Alternatives.
- Information was presented for each of the topics listed below, with 5 minutes for clarification questions after each block. Following the presentations, time was allowed for discussion and public feedback.
  - Restoration Project Update
  - Description of 5 Dam Removal and 8 Dam Removal Alternatives

- Incremental Biological Benefits (geomorphic analysis, habitat, passage, and uncertainties)
- Schedule and Process Impacts
- Contract for Power

Restoration Project Update—Mary Marshall, Bureau of Reclamation, and Rebecca Fris, California Bay Delta Authority

- Ms. Marshall explained that consideration of an 8 Dam Removal Alternative, stems from an Ecosystem Restoration Program (ERP) subcommittee meeting that took place January 15, 2004. At that meeting the economics of an 8 Dam Removal Alternative were discussed.
- The Battle Creek Team recently prepared an initial (draft) response to the California Bay-Delta Authority (CBDA) Technical Review Panel's comments on the Restoration Project, which was relayed to CBDA on January 26, 2004. Feedback on the initial response has been received from the Technical Review Panel, and the Battle Creek Team is hoping to have a final response to the panel at the end of April 2004.
- The Battle Creek Team is also working on the revised Adaptive Management Plan (AMP), which has required a tremendous effort from everyone involved. A meeting will be held at the Red Bluff U.S. Fish and Wildlife Service (USFWS) office with the Battle Creek Working Group and the Battle Creek Watershed Conservancy on March 16, 2004, to discuss the draft AMP.
- In addition, the Battle Creek Team has been working on the Action Specific Implementation Plan (ASIP) and hopes to have that completed by March 26, 2004. The ASIP is a CBDA document that serves as the biological assessment for the requirements of the federal Endangered Species Act (ESA) and the Natural Community Conservation Plan for the California Endangered Species Act (CESA) into one document.
- Ms. Fris explained that the CBDA is currently waiting to receive the final response to the Technical Review Panel's comments from the Battle Creek Team. Once CBDA receives the final response, the Technical Review Panel will review the response to assess if the technical comments have been adequately addressed. The next step would be for the ERP Selection Panel to review the proposal and make a recommendation on funding the Restoration Project. Following this initial recommendation would be a 30-day public review period. The final step would be to take the final recommendation to the CBDA Board, which should make a decision in August of this year.

Description of 5 Dam Removal and 8 Dam Removal Alternatives—Chip Stalica and Angela Risdon, Pacific Gas & Electric Company

- Mr. Stalica explained that there is a distinct boundary for the Restoration Project. On North Fork Battle Creek, the project boundary is just above the North Battle Creek Feeder Diversion Dam. On South Fork Battle Creek, the boundary is just above the South Diversion Dam. The western boundary for the Restoration Project ends on the mainstem of Battle Creek at Coleman Powerhouse, approximately 9 miles below the confluence of the North and South Forks.
- The 5 Dam Removal Alternative includes the removal of five dams. These include the South Diversion Dam and the Coleman Diversion Dam on South Fork Battle Creek. Soap Creek Feeder Diversion Dam, which is a spring fed diversion, and Lower Ripley Creek Feeder Diversion Dam would also be removed. On North Fork Battle Creek, Wildcat Canal Diversion Dam would be removed.
- Under the 8 Dam Removal Alternative, three additional dams would be removed—Eagle Canyon Diversion Dam, Inskip Diversion Dam, and North Battle Creek Feeder Diversion Dam.
- Some additional operational considerations would result from implementation of the 8 Dam Removal Alternative. Under this alternative, the only diversion points would be from the Lake Grace/Lake Nora area by the Al Smith and Keswick Diversion Dams. There would no longer be any diversions on the South Fork. All water that would be diverted on the North Fork would go through Al Smith to Keswick then run through the Volta and Volta 2 powerhouses, finally dropping into the Cross Country Canal. This would be the only source of water for the entire system. Operationally, this means that if any of the remaining canals (Cross Country, Inskip, or Coleman) were to be shut down for either maintenance or an emergency, there would be no other means for water to either enter or leave the system. In other words, there is no backup system under the 8 Dam Removal Alternative.
- Under existing conditions, the Pacific Gas & Electric Company (PG&E) shuts down the system for annual overhauls one at a time. If PG&E would be required to overhaul the entire system at once, there would be serious staff implications for handling this work. This is significant because in the case of an emergency, such as a blockage, all powerhouses would have to be shutdown until the blockage was cleared.
- Under both the 5 and 8 Dam Removal Alternatives, if there is a mechanical or electrical problem at one of the powerhouses, each alternative is designed so that it would be possible to bypass a powerhouse so that there would be no problem with power generation in the case of a possible powerhouse failure.
- Aside from the physical differences between the two alternatives, Ms. Risdon explained that one major difference is the AMP. The AMP allows one to monitor and study environmental changes along Battle Creek and to make adjustments to management practices as necessary. Under the 5 Dam Removal Alternative, the

AMP was based on requirements stipulated under the original Memorandum of Understanding (MOU). The AMP also meets requirements put forth by the CBDA Science Panel. Another feature of the AMP under the 5 Dam Removal is that it has an Adaptive Management Fund (AMF), which would provide funds for some of the management changes that may be required. The AMP also includes a Water Acquisition Fund that would allow for adaptively increasing flows as needed, and the AMP identifies dedicated water rights (as provided for under the MOU). Under the current agreement, PG&E would be transferring its water rights to the California Department of Fish and Game (DFG) with the cost for the forgone energy being fixed.

- An AMP would also be included under the 8 Dam Removal Alternative; however, this AMP would not have some of the other features present under the 5 Dam Removal Alternative, such as the AMF or the dedication of water rights, which are specified by the current MOU. For the Restoration Project to proceed with the 8 Dam Removal Alternative, agreements similar to those under the 5 Dam Removal Alternative would be necessary. This would require new types of agreements that do not currently exist. For example, there would have to be something in place to deal with the additional forgone energy costs that would result from the 8 Dam Removal Alternative.

Questions:

- How much power would be lost if the 8 Dam Removal took place versus the 5 Dam Removal? *Under the 5 Dam Removal Alternative, there would be a 30% power reduction. Under the 8 Dam Removal Alternative, there would be a reduction in power generation of 50%.*
- Who holds water rights under the 8 Dam Removal Alternative? *No agreement currently exists for the 8 Dam Removal Alternative, so one would have to be created. This agreement would be similar to the one that exists under the 5 Dam Removal Alternative.*
- Have you looked at how a blockage could affect either the North Fork or the South Fork? *There would be a similar type of scenario under either alternative. For both alternatives, once water enters the system, it cannot be released until farther downstream after the confluence of the two forks. The exception to this would be if there were some type of catastrophic event where the canal was blocked and water flooded over the sides. However, this has never happened.* Have you had an opportunity to do any probability analysis of this happening? *No. But as part of the maintenance of the system, during high flow events, PG&E walks the canals and monitors the flow and reduces it as necessary to ensure that something like this does not happen.* How would this affect the fish in the event that something like this did happen? *It is not a system that is very prone to catastrophic slides, especially since PG&E takes many precautions to prevent it.*
- Have you discussed fish ladders? *We will be presenting this information later.*
- What's the difference in cost between the two projects and what would be the time frame difference to implement either of the alternatives? *The question about time*

frame will be addressed later in the presentation. In response to your question regarding cost difference, PG&E analyzed this with the help of the California Hydropower Reform Coalition (CHRC) as an independent party. Several other alternatives were also analyzed in addition to the 5 and 8 Dam Removal Alternatives at that time. The difference between the two alternatives was found to be fairly small. For the 5 Dam Removal Alternative, the costs included the cost of the forgone energy (30%) plus construction costs of $70 million and resulted in a total project cost of $113 million net present value or in terms of the future cost of the project in today's dollar. This calculation was based on the best information we could obtain considering the uncertainties. For the 8 Dam Removal Alternative, there would be reduced construction costs, but increased forgone energy costs. The overall cost for the 8 Dam Removal Alternative ended up being $111 million net present value. Of course, there are a lot of uncertainties associated with construction and energy costs in the future. We did do some sensitivity analyses to bracket the cost, but for the purposes of comparison, you can think of the 5 Dam Removal Alternative costing $113 million versus the 8 Dam Alternative costing $111 million.

Did you project those future costs to a point that realistically you could expect construction? *Yes, the analysis was projected through the life of the license to 2026.* When would you start construction? *2005.*

Incremental Biological Benefit

Geomorphic Analysis—Mike Roberts, The Nature Conservancy

- The task at hand was to conduct a geomorphic analysis to compare the differences in sediment transport between the 5 and 8 Dam Removal Alternatives (Attachment A, Slide 1).
- The first part of this analysis consisted of a literature review (Attachment A, Slide 2). The first report analyzed was completed by Kondolf and Katzel (1998), who evaluated sediment transport occurring in the watershed using several techniques, which are described below. The second report by Greimann (2001) provided some hydrology information. Additional information was obtained from the data appendices included a California Department of Water Resources (DWR) report on a fish ladder design.
- The next step was to contact independent specialists for recommendations on how to conduct the geomorphology analysis. These discussions, along with the literature review, resulted in the identification of two main components to the geomorphology analysis: magnitude and duration of a threshold event. A threshold event occurs when there is enough water moving through a system that it weakens the forces holding gravel in place.
- The Kondolf and Katzel study was fortunate enough to capture a flood event that actually moved sediment (Attachment A, Slide 3). This is the only field data that Mr. Roberts was able to find by someone that was familiar with the system. Kondolf and

Katzel also evaluated sediment management practices and sediment sluicing through the radial gates at all the dams, which was found to be the best management practice. Kondolf and Katzel also found that there did not appear to be any serious locations of sediment imbalance in the Battle Creek system. This is important because regardless of how many dams might be removed, the conclusion is that even with all the dams in place, there does not seem to be much impact on sediment transport.

- The remaining reports provided some additional information (Attachment A, Slide 4). The Greimann Report provided the necessary hydrology information on the system. One of the key pieces of information used to do this kind of analysis is a discharge relationship, but unfortunately, this information is not available for all the dam sites. Therefore, discharge area relationships were used to create flood frequency curves. Mr. Roberts also obtained diversion data at the three dams in question from the DWR appendices.
- With respect to the specialists' recommendations on duration, Mr. Roberts found that more research has focused on how large an event must be rather than the specific duration of an event in order to result in sediment movement (Attachment A, Slide 5). However, there is general agreement among the specialists that there has to be a large event for a couple of days versus, for example, hours.
- With regard to magnitude, the specialists consulted agreed that the majority of sediment transport happens at something called bankfull (Attachment A, Slide 6). This is a geomorphology term for when the channel fills up with water then starts to overflow its banks. This typically correlates with something called the *1.5-year return interval*, which means that this type of flood event happens every 1.5 years. Newer information from a group looking at channel maintenance flows suggested that this type of sediment transport is actually initiated below this flow. That study found it to be more in the range of 0.6–0.8 years. This provides a conservative approach for the purposes of our comparison because it provides for less water being needed to move sediment.
- The first graph (Attachment A, Slide 7) shows the event magnitude or how large the flood has to be to move sediment at the three additional dam sites. The blue bars are the 1.5-year return intervals that tend to make gravel move. The gray blocks are the 0.6 to 0.8 range, and the red blocks represent the diversion quantities. The diversion quantities are small relative to the magnitude of the 1.5-year return floods, and they do not cause the blue area to drop down below the zone where sediment transport starts to occur. One specialist commented that these diversion areas are almost as large as the margin of error, so they probably do not have much of an impact on sediment transport. With respect to duration, there was agreement among the specialists that the event would have to last for 2 to 3 days for sediment to move.
- Slide 8 (Attachment A) shows several weeks from the Kondolf and Katzel Report, including the flood event they were lucky enough to witness. As a result of this flood event, they actually monitored some sediment transport. The x-axis shows time, and the y-axis shows discharge. The dashed horizontal black lines represent the 0.6 to 0.8 range. The blue lines show the flow with the diversions in place, and the pink line shows flow without the diversions in place. As shown in the graph, addition of the diversions does not significantly change the 2- or 3-day duration that the specialists mentioned.

- In summary, the 8 Dam Removal Alternative offers little benefit with respect to sediment bedload transport. There may be some portion of fine suspended sediment that would not go down the canal if the diversions were not in place. However, suspended sediment was not analyzed in this study, and it is unknown how much suspended sediment is currently moving in the system. Based on both the reports, there would be little impact on fine sediment with the entire hydropower project in place, regardless of whether it is the 5 or 8 Dam Removal Alternative (Attachment A, Slide 9).
- Some scientific uncertainty exists regarding sediment transport relations in the Battle Creek system. For example, in this study, "stage to X" relationships are not available at the dam sites that would allow a much better analysis to be prepared. However, much of this will be addressed in the Sediment Management Plan that will be part of the AMP.

Questions:

- Are you going to address dam removal and how that would impact sediment transport? *That was a comment from the CBDA Technical Review Panel. Stillwater Science has developed a robust sediment-modeling plan to better address at that question.*

Habitat and Temperature—Harry Rectenwald, California Department of Fish and Game

- The Restoration Project area targets an assemblage of fish, including four races of Chinook salmon and steelhead. On almost any given day of the year, there is some lifestage of these fish present in Battle Creek, whether it be spawning or rearing. The spring-run and winter-run Chinook salmon and steelhead are the priority target species for the Restoration Project.
- To provide some history of the Restoration Project, in 1998, the Battle Creek Working Group commissioned a biological technical team to begin looking at restoration in the area. This group functioned as an open forum. Several reports resulted from this effort. This information along with information from various public meetings was used to develop a flow prescription for Battle Creek. All the methods of this process are presented in the Draft EIS/EIR for the Restoration Project.
- Slide 10 (Attachment A) shows the relationship between mortality and temperature for the different life stages of Chinook salmon. The different colors represent optimal temperature, partial mortality, or 100% mortality. Each reach of Battle Creek has a different function for each month of the year. The message here is that incubating eggs have very little tolerance for temperature changes. You can go from being completely safe at 56°F to having total mortality at 62°F. The winter-run and

spring-run Chinook salmon are obligated to spring-fed reaches. There are very few spring-fed streams like Battle Creek, which is what makes it this system so unique.

- Slide 11 (Attachment A) shows a graph from the SNTEMP model of the different reaches of Battle Creek with distance from the Coleman Powerhouse on the x axis, and the temperature on the y axis. The graph shows that as you move away from Coleman Powerhouse going upstream along Battle Creek, the temperature of the reach declines, with the North Fork reaches being colder. The red line shows the temperature under the MOU alternative (5 Dam Removal Alternative). The blue line shows the temperature under Alternative B or the 8 Dam Removal Alternative, and the green line shows the temperature under unimpaired conditions with no dams or powerhouses below the Volta powerhouses. As shown in the graph, very few of the reaches get down to the optimal temperature for fish. In some cases, the water is actually cooler with the dam in than with the dam removed. However, for most reaches, more water means cooler temperatures because the water moves faster within the stream channel. It should be noted for comparison that the existing flow for the creek is around 3 cfs for North Fork and 5 cfs for South Fork, which is very warm. For sake of clarity, this information was not presented on this graph. This graph is of normal or average conditions for hydrology and air temperatures in the month of June. It may be necessary to look at another series of graphs for other runs and other life stages because this series of graphs presented June only.
- Slide 12 (Attachment A) shows the worst-case scenario with extremely warm and dry conditions, which are likely to occur only once in 100 years. Under these conditions, there is barely any winter-run habitat because water temperatures are too warm for incubating eggs.
- Slide 13 (Attachment A) shows the conditions for incubation of spring-run Chinook salmon in September. There is actually quite a bit of habitat under both alternatives.
- The next subject is coldwater refugia (Attachment A, Slide 14), which is an emerging area in science. It is an important concept for fish like spring-run and winter-run Chinook salmon and steelhead that complete some of their life stages in the summer months in this warm climate. Battle Creek has some very large springs that put in 10 to 15 cfs of 52°F water year-round. Under existing conditions, most of these springs are captured by the dams and directed away from the streams.
- The Restoration Project will restore the springs to their adjacent stream reach, returning cooler water to Battle Creek and creating coldwater refugia. In the upper reaches, this means that keeping a dam can actually make the water cooler at the lower reaches. For example, at Eagle Canyon Diversion Dam, there are colder water springs below the dam than above the dam because the dam diverts warmer water away from the creek and springs below the dam add cooler spring water to the creek. This creates coldwater refugia below the dam. There is a very precise way to calculate the temperature changes that would happen when the warmer surface water is taken away leaving the cooler 52°F spring water. There are periods of time when the dam could actually reduce the water temperature to below 56°F (Attachment A, Slide 15).
- In addition to the Eagle Canyon reach, there are several localized coldwater refugia along Battle Creek that could be managed for fish, especially when you consider the

small numbers of fish. For winter-run Chinook salmon, their population is in the tens; for spring-run, in the hundreds; and for steelhead, maybe the thousands. The fish do not need a lot of space to have good reliable coldwater refugia. This is one of the issues the Battle Creek Team considered when originally evaluating the removal of dams.

- It is difficult to predict the amount of habitat that would be created from increasing streamflow because of all the uncertainties. One tool, integrated with the SNTEMP Model and the Barrier Model, simulates physical habitat area under different flows. The output from this model is a habitat curve. Slides 16, 17, and 18 (Attachment A) show these curves in the mainstem above Coleman Powerhouse, Eagle Canyon, and Inskip reaches, respectively.
- It was initially predicted that spawning habitat would be the most limiting in North Fork and South Fork, with rearing habitat being more limited in the mainstem of Battle Creek. The curves generated by the INFM or PHABSIM Model are diminishing return curves. As the flow increases, the available habitat increases, reaches an optimum, and then begins to decline. The horizontal red line indicates the flows under the MOU or 5 Dam Removal Alternative, and the thicker horizontal band represents the range of flows you might get under the 8 Dam Removal Alternative. The Battle Creek Team confined their effort to define the flow prescription under the MOU to the summer months because based on the geomorphology analysis, there was no need for geomorphic flows in the Battle Creek system.
- Generally the difference between the 5 Dam Removal and 8 Dam Removal Alternatives is small and within the margin of error. The Battle Creek Team predicted that flows representing 90–95% of the habitat predicted by the model would be acceptable habitat for fish, which is what ended up in the MOU for target flows. Typically in a FERC relicensing proceeding, one only receives 70–75% of the predicted flows. Because of the level of public funding required to implement the Restoration Project, it was important to go beyond what is normally obtained in a regulatory process. In addition, because of the uncertainty associated with this type of modeling, the AMP was developed to deal with uncertainties and, as a result, included the AMF and Water Acquisition Fund totaling $6 million. This money will provide additional water to Battle Creek at times and places needed during the summer dry months.

Questions:

- Are the population sizes that were mentioned in the presentation current estimates? Yes, *but they are extremely* r*ough estimates. Actually, we are not absolutely sure if there are any winter-run present in Battle Creek at all given that some years are more spotted.* Given the experience with restoration on Clear Creek, what would you expect the population to be with the implementation of the 5 Dam Removal Alternative? *Many people are working on this question currently. Generally, the prognosis is good that the winter-run could be back in the system in a few years. There will also be a feasibility study to look at all the management options to assist in the restoration of fish.*

- You mentioned that Battle Creek is a unique stream…might it be useful to describe what other fish may be present at that time? What else might be present that might be affected by extreme temperatures over the summer? It looks clear that the green line is best because there is a 4°F temperature difference. *The green line is there for comparison only and is not one of the alternatives being considered.* Wouldn't the conditions under unimpaired flow be better for whatever is present in Battle Creek at that time of year because the temperature would be lower? *In June, the quality of the spawning habitat in the mainstem and lower reaches is quite low regardless of the alternative being considered (even under unimpaired flow conditions). This does not matter because the salmon would not be located in those reaches at that time of year. Rather, they would stay farther upstream where the water is cooler. In these reaches, there is actually a much smaller difference between the 5 Dam and 8 Dam Removal Alternatives, and for two of these reaches, the South Diversion Dam and North Battle Creek Feeder reaches, there is actually no difference between the two alternatives*. It was commented that the temperatures are really driving the discussion and should have a greater emphasis.
- There is a big concern about what energy costs will be in the future for the AMP. What is known about what the water costs will be? Is an AMP needed under the 8 Dam Removal Alternative? *The modelers that worked on the economic analysis for the 5 Dam Removal Alternative determined that the net present value used in that analysis would be appropriate for use in the AMP. Based on a set of assumptions for the construction timeframe and recovery period, they determined that 10 years from now, there would be sufficient purchasing power to add 25 cfs to the North and South Forks during the baseflow period. In response to the second question, you would clearly need an AMP for the 8 Dam Removal Alternative. For one thing it is a requirement of CBDA, and there would also be a need for monitoring.*

Hydrology—Steve Wald, California Hydropower Reform Coalition

- Mr. Wald explained that this portion of the presentation is focused on showing the flow differences between the 5 Dam and 8 Dam Removal Alternatives. Slide 19 (Attachment A) is a hydrograph, which shows flows at the Eagle Canyon Reach over the course of 1989. The red line shows the 5 Dam Removal Alternative, the blue line shows the 8 Dam Removal Alternative, and the green line shows flows under unimpaired conditions for a point of reference. The hydrograph shows that the winter months are rainy and stormy and flows are generally flashier. There are also months with flows so low that only groundwater contributes to the streamflow.
- The hydrograph shows that there is a lot of variability over the course of a year. This variability is good for the river ecosystem because plant and wildlife species have adapted to this. This natural flow period is increasingly becoming a guide that managers might use to make decisions and try to replicate when restoring a river system.
- Based on Slide 19, the main difference between the two alternatives is flow. The 8 Dam Removal Alternative is closer to achieving natural flows compared with the 5

Dam Removal Alternative. Based on his analysis, Mr. Wald feels that, because of limitations of the habitat model, the 8 Dam Removal Alternative might have benefits in addition to those shown in the temperature habitat curves. The extra flow under the 8 Dam Removal Alternative is flow that fits under the project's current price tag today. The savings is about $24–27 million from forgone power, so it's like having a $27 million flow fund today.

Questions:

- The graph shown here is for the North Fork. How would the South Fork look compared to this graph? *There is no more mixing under either the 5 Dam or 8 Dam Removal Alternatives, which is a benefit under both alternatives to avoid fish straying. For the South Fork, the blue and green lines would merge because there are no diversions happening on the South Fork. Therefore, under the 8 Dam Removal you get natural flow conditions on the South Fork. In addition, the South Fork has lower flows, so all the lines are much closer together.* How far down would you have to go for all the lines to merge? *All the flows would be the same below the Coleman National Fish Hatchery.*
- How much more could the AMP move the blue line up to the green lines? *Mr. Rectenwald: If the flow purchases began in 2013, we might be able to purchase 20–25 cfs for the summer months for both forks. Mr. Wald: We are not completely sure about this amount. There is some variability in this analysis. Mr. Wald has seen some analyses indicating that 20–40 cfs could be purchased for a duration of 10 years. At this point, this is a gray area that is too complicated to discuss at this time. It depends on the time value of money.*
- How long will the WAF last? Is it possible to run out of money? *The WAF is set up so that the flows in place become the floor for the next relicense period. There is an agreement in place that if the flows are adaptively managed, those flows become part of the project into the future. If the water flows are being adaptively managed to achieve temperature benefits, it is moving closer to the blue line, but not below it because the blue line represents no dams at those points. These temperature benefits are either significant or they are not, but if they are not, there are also no temperature benefits through adaptive management. One thing to note is that it really depends on your starting point. Under the 8 Dam Removal Alternative, additional water purchases would put you closer to the green line. Under the 5 Dam Removal Alternative, additional water purchases would put you closer to the blue line or levels under the 8 Dam Removal Alternative.*
- Is it true that temperatures in June would be the trigger to adaptively manage flows under the 5 Dam Removal Alternative and that the target flows would depend on a model that would tell you to reduce so much water to reach a certain reduction in temperature? And this reduction would hopefully be significant? *Yes.* Thank you for clarifying this at this time. It has not been clear up to this point. There is also the AMP meeting tomorrow morning. It seems we were going to discuss the incremental biological benefits. The hydrology seems very beneficial and obvious as well as the fact that there would be less delay of the fish under the 8 Dam Removal Alternative. What other environmental benefits are we going to touch on? *From here we will*

move on to the topic of passage, then on to uncertainties, where these issues will play out.

- There is a variant of the 8 Dam Removal Alternative that removes the powerhouses as well that basically turns the Volta Powerhouse water back into the North Fork. What would this alternative look like and how would it affect temperature? *That alternative is actually the green line that has been presented in many of the graphs. That alternative is not being presented at this time. It was significantly more expensive to implement*.

Passage—Chip Stalica, Pacific Gas & Electric Company

- Mr. Stalica explained that this section of the presentation is focused on describing what the current maintenance of the fish ladders entails and comparing the maintenance requirements associated with the 5 Dam and 8 Dam Removal Alternatives. Mr. Stalica also noted that he would make a comment on the design of the new ladders while trying to give a fair balance on the issue. He also noted that he could not describe future passage issues and encouraged the audience to draw their own conclusions based on his presentation.
- Currently, ladders exist at Inskip Diversion Dam, Eagle Canyon Diversion Dam, and North Battle Creek Feeder Diversion Dam. The ladders at these dams are quite small, allowing for flow of 3-5 cfs. By comparison, under the 5 Dam Removal Alternative, the new ladders would be very large. Based on agreement with the resource agencies some years ago, the existing ladders at Coleman and Eagle Canyon Diversion Dams were shut down and are currently not in operation.
- As far as maintenance is concerned, when the ladders were open and functioning PG&E closed down the ladders once per year to remove gravel. In addition, PG&E would occasionally shut down the ladders (more than once per year) to remove woody debris. Under the MOU, the proposed ladders would be larger, which would mean less maintenance because to some extent, they would be self-cleaning. Under the 5 Dam Removal Alternative, PG&E estimates it could continue future maintenance of the new ladders with its current staff.
- Many have been concerned that rock fall could damage the facilities at one project site: Eagle Canyon Diversion Dam. However, for the past 90 years, PG&E has never experienced any rock-fall damage. Although it is not impossible that rock fall damage could happen now, the chances of this happening are small as shown by PG&E experience in the past.
- The main difference with the 8 Dam Removal Alternative is that there would be fewer maintenance issues because under this alternative there are fewer facilities to maintain. The 5 Dam Removal Alternative would require more maintenance. However, regardless of the alternative, all PG&E facilities have sensors to detect emergencies. The design of the proposed ladders also incorporates features to minimize damage and maintenance as much as possible.

Natural Passage—Jim Smith, U.S. Fish and Wildlife Service

- The new ladders proposed under the 5 Dam Removal Alternative would be nothing like the existing ladders and are very "high tech."
- Compared with the science of fish ladders, passage at natural barriers is more like an art. Slide 20 (Attachment A) illustrates potential natural barriers along the Battle Creek system as surveyed by biologists. These points were identified as possible barriers to fish passage at a variety of flow levels. There is a lot of uncertainty associated with these barriers, especially because many of the boulders could move. Part of the AMP addresses the ability to manage these barriers; however, it should be noted that these barriers might produce a benefit by separating different runs of fish from habitat at different times of year during different flow levels.
- With regard to natural barriers to fish passage, the only difference between the 5 and 8 Dam Removal Alternatives is flow, with higher flows available under the 8 Dam Removal Alternative. Higher flows may or may not be beneficial with respect to passage. It might actually exacerbate passage problems under certain conditions. It is expected that all the barriers below the high waterfall areas are passable at some point. It is often thought that increased flows would be beneficial to fish passage, but this may not always be the case. There is a great deal of uncertainty associated with this issue.

Questions:

- The only difference between the two alternatives is flow? *With respect to natural barriers, yes. If a dam is removed there is certainly less uncertainty at that point for fish passage. However, this may or may not be the case with respect to natural barriers.*
- Is someone going to discuss the incremental benefits associated with not having the barrier there with respect to delay in migration? *The ladders are designed to a standard of 3-day delay associated with 1 in 10 years. The ladders have a high level of design built into them to provide a low delay. When we go out and actually measure delay with radio telemetry, we will be able to determine what that is. Currently, the only way to evaluate that is with the current design standards.*
- Are any of the barriers on the North Fork essentially the same difficulty for winter-run salmon? *There is a variety of barriers. It is hard to say what a fish will do when it encounters a barrier. It depends on the state of the fish. There is a lot of uncertainty associated with this.*
- Are any of the barriers normally inundated by water being held back by the dams? *Some become inundated during periods of the year, but the dams do not serve as storage reservoirs. Removal of the dams will not necessarily improve passage over all natural barriers.*

- Inskip Dam is the highest dam. If it were removed, would it possibly inundate any natural barriers? *There is too much uncertainty. We do not know that.*

Uncertainties—Steve Wald, California Hydropower Reform Coalition

- Mr. Wald explained that uncertainties associated with the two alternatives is a big topic for many, but in the interest of leaving more time for public comments, Mr. Wald kept the presentation brief. The presentation provided an opportunity to step back and look at the original scope of the Restoration Project, keeping in mind the substantial public investment and how long the project is supposed to last over time. The next FERC license is 2026; however, the agencies look at a longer planning horizon, especially when endangered species are concerned, more like 75 to 100 years. It is difficult to predict that far into the future, however, actions need to be implemented today to guarantee a better success in the future.
- Mr. Wald identified a few questions to the group. According to Mr. Wald, the most critical question is: Will the best models and engineering practices today work for the long term or not? Should the 5 Dam Removal Alternative be selected as the proposed action, with flows based on the habitat model? If so, will the best engineering designs for fish passage facilities succeed into the future? Or with the same amount of money, should the Restoration Project come as close as possible to restoring natural flow conditions in a natural channel?
- Mr. Wald described the path that a fish must take to travel either up or down the fish ladder proposed at Inskip Diversion Dam (Attachment A, Slide 21). The CHRC identified a certain amount of risk for the proposed facilities to continue to provide safe passage over the next 100 years.

Uncertainties—Harry Rectenwald, California Department of Fish and Game

- Mr. Rectenwald explained that an additional uncertainty is the future of endangered species in Battle Creek. An endangered species cannot afford to miss opportunities that will improve their chance of survival. In order to implement an alternative other than the 5 Dam Removal Alternative, we would need to develop and sign a new MOU. It is currently uncertain if another MOU could be achieved. The agency representatives that were present at the public meeting are not the ones to decide which alternative to implement. FERC must decide what best serves the Federal Power Act, and they will take into consideration whatever MOU is available.
- Mr. Rectenwald also explained that the most important uncertainty is the availability of water because it takes water to give fish a chance. An important project goal is to guarantee water for fish in perpetuity. Under the 8 Dam Removal Alternative, there would be a slightly different decision to follow because all water in the 42 miles of restored habitat along Battle Creek would be available only for fish instead of other

beneficial uses. This use is more of a burden than deciding to use the stream for multiple purposes. Will the community accept a project where someone else is holding all the waters for only fish instead of other beneficial uses?

Questions:

- What have we seen so far in support of one of alternative or the other is that the fish ladder at Inskip Diversion Dam seems to be difficult for fish to pass through and difficult to keep clean. With that kind of apparatus and a flow regime that has warmer water on the way up than the way down—that is where the incremental assessment needs to be done before an EIS/EIR is final for people who are trying to make a decision. The fish ladder does not look like a fish-friendly design? *To help put this in perspective, Mill and Deer Creeks were chosen for comparison. The proposed ladders on Battle Creek are much larger than those at Mill and Deer Creeks and therefore should be easier for fish passage. Additionally, Battle Creek ladders are designed so that the hydrology at each site can result in a delay of no more than 3 days only 1 year in 10.*

Schedule and Project Impact—Mary Marshall, Bureau of Reclamation, and Colleen Lingappaiah, Jones & Stokes

- Ms. Marshall explained to the group that the schedule presented at the public meeting is a draft schedule. Three scenarios are presented. The first scenario represents the 5 Dam Removal Alternative as the proposed action. The second scenario represents the 8 Dam Removal as an additional action alternative. The third scenario represents the 8 Dam Removal Alternative as the proposed action.
  - Under the first scenario (i.e., the current project), information associated with the 8 Dam Removal Alternative would be described as a response to comments in the Final EIS/EIR. Regarding the MOU, an MOU that was negotiated in 1999 currently exists for the 5 Dam Removal Alternative. Because there would be no need for a new MOU in this scenario, the current schedule would remain unchanged.
  - Under the second scenario where the 8 Dam Removal Alternative would be considered only as an action alternative, there would still be no need to develop a new MOU.
  - If the 8 Dam Removal Alternative is selected as the proposed action, a new MOU would need to be negotiated among the agencies and PG&E. The current MOU required about 2.5 years to negotiate. It is uncertain how long it will take to prepare a new MOU; however, after talking with those who completed the first MOU, a new MOU could take approximately 2 years to develop and negotiate.

- Ms. Lingappaiah explained that we are currently waiting to see what is decided for the 8 Dam Removal Alternative before completing the final EIS/EIR.
  - If the 8 Dam Removal Alternative were not considered for further analysis, an explanation would be added to the project description in the EIS/EIR explaining why the alternative was not analyzed further. The current schedule would not change.
  - If the 8 Dam Removal Alternative is selected as an action alternative, but not as the proposed action, a supplemental EIS/EIR that analyzes impacts associated with only the 8 Dam Removal Alternative would be prepared. Preparation of the supplemental EIS/EIR is expected to take an additional year to complete. NEPA requires an equal level of analysis for each alternative and, therefore, the 8 Dam Removal Alternative would need to be analyzed at an equal level of detail as the other action alternatives. Additionally, an area along Eagle Canyon Canal has not been surveyed previously. Potential habitat for specific special status species located along the Eagle Canyon Canal may require USFWS protocol-level surveys to be performed for the potential decommissioning of the canal, which may not be complete until July 2004. The remaining environmental preparation and review process would take the remainder of the year, and a final EIS/EIR would likely be complete by early 2005.
  - If the 8 Dam Removal Alternative is selected as the proposed action, the environmental review process (i.e., compliance with the National Environmental Policy Act [NEPA] and the California Environmental Quality Act [CEQA]) would wait until a new MOU is signed, which is anticipated to take up to 2 years.
- Ms. Lingappaiah explained that along with NEPA/CEQA compliance, the Restoration Project would also comply with the federal ESA and CESA by preparing an Action Specific Implementation Plan (ASIP).
  - The ASIP is nearly complete for the current project. The ASIP should be ready near the end of March 2004 for USFWS and NOAA Fisheries to begin Section 7 consultation, as required under the federal ESA, and for DFG to begin the 30-day public review period, as required by CESA under the California Natural Community Conservation Planning Act.
  - If the 8 Dam Removal Alternative is selected as an alternative, the ASIP would not be submitted to the agencies until the Restoration Project is near completion of the draft supplemental EIS/EIR for public review.
  - If the 8 Dam Removal Alternative is selected as the proposed action, ESA compliance would be delayed by 2 years as attributable to the delay in obtaining a new MOU.
- The schedule for Sections 401 and 404 of the Clean Water Act is dependent upon when the Restoration Project receives a biological opinion on the ASIP and a Record of Decision has been finalized. Therefore, this schedule is dependent on the CEQA/NEPA and ESA compliance schedules for all three scenarios.
- Ms. Marshall continued by explaining that the AMP is currently being prepared by the Adaptive Management Technical Team and will be an appendix to the EIS/EIR and the ASIP under the current project. There would be up to a 2-year delay in

completing the AMP under the 8 Dam Removal Alternative as the proposed action scenario because of the delay in obtaining a new MOU.

- The CALFED schedule refers to when CBDA decides on funding and when funding would be ensured and secured for the Restoration Project. The Battle Creek Team is currently preparing a package responding to Technical Review Panel Comments. The final package is planned to be submitted to Ms. Fris (CBDA) by April 30, 2004, so that CBDA will have everything they need to make their decision at the August 12, 2004 CBDA meeting. With the 8 Dam Removal Alternative as an action alternative, it is projected that the funding process would be delayed by 6 months. With the 8 Dam Removal Alternative as the proposed action, the funding process might be delayed until 2007.
- Once the funding decision is made, it is necessary for that funding to be secured before PG&E can submit its final license amendment application to FERC. PG&E has already submitted a draft application for the Restoration Project with the 5 Dam Removal Alternative as the proposed action. Based on the current schedule, PG&E could receive the license amendment by December 2004. Under the second scenario where the 8 Dam Removal Alternative is analyzed as a new action alternative, the license would be obtained by August 2005. With the 8 Dam Removal Alternative as the proposed action, the license amendment could be obtained by August 2007.
- Similar to PG&E, Reclamation would need to have funding ensured before initiating the bid process for construction work. Once funding has been secured under the current project with the 5 Dam Removal Alternative as the proposed action, it is anticipated that Reclamation can award the bid by April 2005 with construction beginning in June 2005. Under the second scenario, the bid would be awarded in January 2006 with construction beginning in June 2006. Under the third scenario, construction would not begin until June 2008.
- There are costs associated with maintaining the Interim Flow Agreement. Under the current project, the interim flow process would be completed in June 2005. The Interim Flow Agreement would continue for an additional year under the second scenario, and for two more years under the third scenario.
- In summary, under the current schedule (5 Dam Removal as the proposed action), construction would be completed by August 2008. With the 3 Dam Removal as an action alternative, construction would be completed by July 2009, and with the 8 Dam Removal as the proposed action, construction would be completed by July 2011.

Questions/Comments:

- The schedule and process impacts associated with introducing a new alternative at such a late date ought to be a lesson to include all alternatives in the original scoping process. Additionally, there must be some way to creatively prepare a new MOU that would prevent the negotiation process from taking so long; the Battle Creek Team should not have to start over with a new MOU. Lastly, the Restoration Project should start removing dams associated with the 5 Dam Removal Alternative now

while deciding on the remaining dams associated with the 8 Dam Removal Alternative.

- Waiting 2 years to prepare a new MOU is not a deal breaker; however, past experience should help the MOU process to be more efficient this time. This delay might also provide additional time to deal with unresolved issues, such as those relating to the Coleman National Fish Hatchery. The uncertainty is not whether the Restoration Project receives funding, but rather whether the fish ladder at Inskip Diversion Dam is going to work.
- Is there enough money in the CBDA bank to fund this project? *There is more than $100 million in Proposition 50 funds that have not yet been allocated; however, these funds are not currently available.*

Contract for Power—Angela Risdon, Pacific Gas & Electric Company

- Ms. Risdon explained that her presentation focuses on power loss, which is a concern for PG&E. PG&E has some key principles and criteria that would need to be met before the project could proceed with the 8 Dam Removal Alternative. These include:
  - a seamless transfer to new energy generation for PG&E customers and rate payers in terms of cost;
  - equivalent hydropower operating reliability;
  - equivalent risk, such as energy costs; and
  - certainty around cost recovery.

  Additional criteria that must be met for PG&E to select the 8 Dam Removal include:

  - the need for a substantial biological benefit;
  - absence of significant delays; and
  - the ability to complete a new MOU.

  There are also requirements for the replacement power. Replacement power must

  - be renewable as required by the state legislation;
  - have a source of future funding for that replacement energy;
  - meet the reliability of hydropower; and
  - have an equivalent power block, meaning the load, shape, and amount of power must be the same.
- PG&E explored several options for replacement power. The first option was to build a new power generation facility, but this would have to be renewable. Uncertainties associated with the construction of a new facility are that the company is currently in

bankruptcy and cannot easily build a new plant. California Public Utilities Commission (CPUC) requirements must also be worked out. Timing is also an issue. Other options include spot market and short-term contracts; however, there is too much volatility associated with these to be good options.

- The more realistic option for replacement energy is a long-term contract; however, many uncertainties surround a long-term contract as well. For example, the purchasing entity would have to be identified. If the purchasing entity were PG&E, CPUC would have to agree to that. The purchasing entity would also have to guarantee that they would be available to make a long-term commitment and have the funding source to secure a long-term contract.
- PG&E has been having difficulty determining how a long-term contract would work given these uncertainties. PG&E has been working with the CHRC, who understands these challenges and suggested that they determine whether it would be possible to purchase the replacement energy for $24.4 million, the difference between the 5 and 8 Dam Removal Alternatives. PG&E procurement specialists determined the only way to conduct an accurate analysis would be to bid the energy contract on the open market; however, this would not be possible. In the interest of moving forward, the procurement specialists did the best they could. The result of their analysis was that a power contract replacing 37.9-gigawatt hours/year would exceed the $24.4 million price tag.

Questions:

- If you could not bid the contract, what was the comparative basis that you used to make the determination? *A lot of this information is competitive and proprietary, so the specific information is not available. PG&E's analysis was based on biomass energy. This was determined to be the closest to the existing hydropower source with regard to shape and load.*
- If the $24.4 million was not enough to purchase the replacement power, how close was it? *The only answer available is that the cost was more than $24.4 million.* Is there a way to find out how much the difference was? *That information is not available. Mr. Wald offered copies of a memo that describes a detailed economic analysis for those who might be interested. He also mentioned that wind power is by far the most affordable, but that it does not produce in the same shape as the power currently generated by the Battle Creek Hydroelectric Project facilities because it is so unreliable. Mr. Wald has been unable to find another party that thinks the shape really matters, while there is general agreement that the renewable credits do matter.*
- Is there a way in which a creative solution could be made where we would trade wind power energy for a non-self-sustaining source and still meet the design criteria at the same time as the intent of the law? *Mr. Wald responded that there is a note about that possibility in the memo he mentioned using firm power to supplement the times when the wind is not blowing.*
- Why is wind so cost effective right now? *There are federal subsidies for wind power. Also the price for wind power has plummeted because of its competitiveness.*

Discussion and Public Feedback—All Presenters

- In the discussion about the availability of coldwater resources, a point was made that the existence of a dam might be useful in controlling these coldwater resources and that by removing the dam, this ability would be lost. To what extent has siltation affected the existing dams, and was future siltation a consideration in projecting the benefit of those dams being kept that did create a cool water benefit? *The dam where this takes place is the Eagle Canyon Diversion Dam, which is located just above a major complex of coldwater springs. So the issue is not that there is a deep pool of cold water. Actually, it is almost brimful of sediment. It is a small dam without much storage capacity. It is more a question of diverting warmer surface water at the dam and allowing for colder water to continue downstream.*
- As part of this analysis could someone please deal with the issue of Mount Lassen Trout Farm? With the new alternative, there would be no need to mix North and South Fork water. Under the MOU there is still a pretty sophisticated plumbing to prevent this. If we chose the 5 Dam Removal Alternative, how would the impact be mitigated? Choosing the 8 Dam Removal Alternative seems to result in no impacts on Mount Lassen Trout Farm. *To introduce this subject, there is a trout farm that uses isolated coldwater springs as a water source. In two cases, the springs are downstream of unlined PG&E canals. It has been determined by fish pathologists that there is a chance that pathogens in the canals could seep into the underlying strata into those springs. This could be a substantial risk to the fish business because in California, for some diseases, the fish could not be sold and in some cases, may need to be destroyed. This poses a substantial risk to Mount Lassen Trout Farm under the 5 Dam Removal Alternative. With respect to the 8 Dam Removal Alternative, in one of the two situations the problems would be solved. There would still be a problem on the South Fork because the Inskip Canal and South Powerhouse would still be operational, so there could be some fish pathogens in the canal, although fewer than under the 5 Dam Removal Alternative. Under the 8 Dam Removal Alternative, Eagle Canyon Canal would be removed and, as a result, there would be no cross connection with the spring system that one of the trout farms uses as a water source. Under the 5 Dam Removal Alternative, a proposal is being developed to mitigate for Eagle Canyon Canal to avoid any cross connection with the spring system.*
- What would the impacts be on the fisheries resources at Oasis Springs Lodge if the 8 Dam Removal Alternative were selected? What aesthetics impacts would result by implementing the 5 Dam Removal Alternative; the fish ladder and other facilities proposed for that site appear to be quite industrial? *The impacts associated with the aesthetics of that site are addressed in the EIS/EIR, as are the mitigation measures associated with those impacts. Additional mitigation may be presented in the final EIS/EIR.*
- How many—by a show of hands—would support the 5 Dam Removal Alternative? *Everyone who signed the MOU supports the 5 Dam Removal Alternative.*
- What will the aesthetic impact be under the 5 Dam Removal Alternative? *All impacts associated with the 5 Dam Removal Alternative are addressed in the EIS/EIR. Mitigation has been proposed for all of these impacts. However, there is*

one site at the Oasis Springs Lodge where the aesthetic impact is significant and unavoidable. Reclamation is proposing to work this out with the landowner individually. There would be some changes made to the design to minimize visual impacts from the Restoration Project. For example, the road on the north bank of the creek across from Oasis Springs Lodge will be narrower to minimize aesthetic impacts. Reclamation plans to continue to make these changes, where feasible, as the design process continues.

- Does either one of the alternatives provide optimal temperatures for winter-run in the summer? *It depends on the water type year. It also has to do with flows and ambient temperatures. What was presented at this meeting was an attempt to provide bookends. A lot of it depends on the environment. There is not a clear winner. The complex of springs at Eagle Canyon would provide some cold-water refugia in extreme drought conditions. There is also another complex of coldwater springs on South Fork Battle Creek.*
- It seems that we should choose the alternative that gets closer to providing optimal temperatures for winter-run. The only alternative that appears to get closest to that is the 8 Dam Removal Alternative plus the removal of the Volta Powerhouses. *If your focus were on winter-run, the most critical timeframe would be for spawning fish, which would require more flows and lower temperatures during the summer months. But there are other species in Battle Creek, all of which have different requirements. There is no other Sacramento River tributary that would comes close to Battle Creek spring water flows that provide beneficial conditions for winter-run. It should also be noted that removing all dams plus the powerhouses was not presented today. It is very expensive and is not being proposed as an alternative. The flows would be much higher, and the issue of passage over natural barriers would still occur because of the high amount of water. Issues associated with removing all dams plus the powerhouses have not been analyzed.*
- How would implementation of the 8 Dam Removal Alternative affect the aesthetics of the Oasis Springs Lodge and the recovery period for the fish, recognizing that there is an existing fishing business there? *These impacts have not been analyzed yet, but would be if a new supplemental EIS/EIR were prepared. In terms of fish recovery, if the dam were removed, it is expected that there would definitely be some changes. There would be less flat water and more riparian growth. We have not analyzed the timeframe for recovery yet, but that area would definitely recover. Most of the fish planted there are triploid, so it would be possible to put those right back in. Over time, the natural part of the fishery there would be improved.*
- According to the temperature graphs presented, the winter-run would always be dying. The blue and red lines were always above 57°F, and they reached 62°F and exceeded it in June, which is lethal for winter-run. In April and May, it would be cooler, but there would be higher flows at that time, and the weighted usable area goes down because of higher flows. The capacity of Battle Creek for winter-run seems to be minimal. *The best way to answer that question is to wait for the ASIP to be made available to the public. There will be a public review period for 1 month. In the ASIP there is a chart that specifies the number of acres available at certain temperatures. The winter-run has a spawning period from late April to July. It is possible that the late spawners will not do as well as they would in the Sacramento*

River. The goal for the Battle Creek Project is to reach 1,000 individuals, which would be 500 nest sites. This would not be a lot of acres, but the value of these nests would be large in terms of extinction probabilities. A feasibility study will be conducted to examine this question. But the first question to be answered is whether coldwater refugia could be created. The AMF is backing up that effort. With Eagle Canyon Diversion Dam in place, this would maximize the adaptive ability to create more coldwater refugia. If you started with the 5 Dam Removal Alternative and had an AMP in place, from there you could move closer to achieving optimal temperature flows by buying incrementally into available cold water through adaptive management.

- Recognizing that we are not the decision-makers, perhaps it would be best to simplify things here and put aside the political ramifications. The best-case scenario for the target species would be to have no ladders or dams. We should raise the bar here because of the importance of the project and the amount of money that we have. *The main focus of this question seems to be about passage. Not all dams create the same passage problems for fish, and some natural barriers may preclude passage under certain flow levels, but not others. Therefore, the 8 Dam Removal Alternative would not necessarily clearly offer more benefits with regard to fish passage. If fish ladders posed a problem for passage, there would be a bigger problem than just at Battle Creek.*
- Is it possible that the fish could get trapped at a facility and would have to be removed*? The question is in reference to the stilling basin located at the base of Keswick Dam. Fish would get attracted to the basin during a spill situation and then get trapped. There is nothing like that at Battle Creek.*
- Ecosystems are more complex than we can think. How can we proceed in a way that does not lock us into things in the future? What about building ladders at Eagle Canyon to see how it works. Then we will have only spent that much money. The Inskip Diversion Dam portion is so expensive that it should be saved for last. What about incremental implementation? *We have thought about it, but the main challenge is how you go about doing that within the FERC project. To apply for the license amendment, we need to have the entire project wrapped up in one package for FERC to review. They will not review one piece at a time.*
- What were the interest rates and time periods used for the economic analysis of the 8 Dam Removal Alternative? *Inflation was considered to be between 2.5 and 3%. The time period was extended to 30 years as a surrogate to perpetuity.* Why didn't you look at 50 years? *We could. It might be worth looking at.* What was the discount rate? *9%.*
- *Mr. Smith made the comment that the existing conditions are very inhospitable for salmon, especially in the summer months. The proposed project is a good project that improves these conditions for the fish. The 8 Dam Removal Alternative is better, but how much better is not entirely clear. The critical issue is what would be the challenges of starting a new process. The reality that we are faced with is that not all the involved parties want to take everything out of the system. We have a good project now that we can be proud of that improves the conditions for fish and is attainable.*

Next Steps—Jim Canaday, State Water Resources Control Board

- Mr. Canaday thanked everyone again for coming and participating and indicated that a summary of the meeting will be prepared and posted on the CBDA website.
- Note: A summary of the comparison between the Five Dam and Eight Dam Removal Alternatives is provided in Table 2 with comments made by the California Hydropower Reform Coalition present in Attachment B.

Meeting Adjournment

Table 1. Public Meeting, March 15, 2004, Red Bluff, California—List of Attendees

Name	Agency/Affiliation
Meeting Presenters	
Jim Canaday	State Water Resources Control Board
Rebecca Fris	California Bay-Delta Authority
Colleen Lingappaiah	Jones & Stokes
Mary Marshall	Bureau of Reclamation
Harry Rectenwald	California Department of Fish and Game
Angela Risdon	Pacific Gas & Electric Company
Mike Roberts	The Nature Conservancy
Jim Smith	U.S. Fish and Wildlife Service
Chip Stalica	Pacific Gas & Electric Company
Steve Wald	California Hydropower Reform Coalition
Meeting Attendees	
Mike Berry	California Department of Fish and Game
Serge Birk	Central Valley Water Project Association
Kurtis Brown	U.S. Fish and Wildlife Service
James Bryant	Private
Charles Bucaria	Private
Kerry Burke	Outfitter Properties
Dan Castleberry	California Bay-Delta Authority
Steve Centerwall	Jones & Stokes
Steve de Chesne	Private
Jim Early	U.S. Fish and Wildlife Service
Steve Evans	Friends of the River
Scott Ferris	NorCal Fishing Guides and Sportsmen Association
Bob Folsom	Pacific Gas & Electric Company
Steve Gilmore	Private
Jim Goodwin	Bureau of Reclamation
Dave Gore	Bureau of Reclamation
Zeke Grader	Pacific Coast Federation of Fishermen's Associations
Scott Hamelberg	Coleman National Fish Hatchery, U.S. Fish and Wildlife
Tom Hepler	Bureau of Reclamation
Lannie L. Johnson	Private
Bill Kier	Kier Associates
Bob Lee	Private

Table 1. Continued

Name	Agency/Affiliation
Randy Livingston	Pacific Gas & Electric Company
Kim Marcotte	Jones & Stokes
Mike McCulla	Bureau of Reclamation
Jess Newton	U.S. Fish and Wildlife Service
Kevin Niemela	U.S. Fish and Wildlife Service
Bob Null	U.S. Fish and Wildlife Service
Sharon Paquin Gilmore	Battle Creek Watershed Conservancy
Tricia Parker	U.S. Fish and Wildlife Service
Marshall Pike	Private
Russ Philbrick	Private
Suzanne Poetzch	Private
Dwight Russell	California Department of Water Resources
Jessica Salinas	California Department of Water Resources
Herbie Sansum	Private
Phil Schaefer	Private
Patrick Shannon	Private
Warren Shaul	Jones & Stokes
Rick Sitts	Metropolitan Water District of Southern California
Randall Smith	Private
Curtis Steitz	Pacific Gas & Electric Company
Steve Turek	California Department of Fish and Game
Janet Walther	Pacific Gas & Electric Company
Mike Ward	Terraqua, Inc.
Wayne White	U.S. Fish and Wildlife Service
Mark Winning	Private

Table 2. Summary Comparison of the Difference between the Five Dam and Eight Dam Removal Alternatives

Topic	Five Dam Removal Alternative	Eight Dam Removal Alternative
Power generation	The Five Dam Removal Alternative would result in the generation of 30% less power for the Hydroelectric Project.	The Eight Dam Removal Alternative would result in the generation of 50% less power for the Hydroelectric Project. There would also be no backup system if an emergency resulted in a system shutdown.
Sediment transport	There is little difference between the two alternatives with respect to sediment bedload transport. Differences between the two alternatives with respect to fine sediment transport are unknown but expected to be minimal.	There is little difference between the two alternatives with respect to sediment bedload transport. Differences between the two alternatives with respect to fine sediment transport are unknown but expected to be minimal.
Habitat—*spawning/rearing*	Water temperature is higher in the mainstem and lower run reaches, but this area is not used for winter-run Chinook salmon spawning habitat.	Water temperature is colder on the mainstem and lower run reaches, but still not cold enough to be beneficial for winter-run Chinook salmon spawning habitat.
	The colder upper reaches are only slightly warmer, and for the farthest reaches, there is no difference compared with the Eight Dam Removal Alternative.	The upper reaches are only slightly cooler, and for the farthest reaches, there is no difference from the Five Dam Removal Alternative.
Habitat—*temperature*	The Five Dam Removal Alternative provides more adaptive management opportunity for creating coldwater refugia below Eagle Canyon Diversion Dam.	Removal of all dams would result in less adaptability to manage coldwater refugia created by springs.
Habitat—*hydrology*	The Five Dam Removal Alternative uses the prescription flow set by the Battle Creek Team and described in the 1999 Memorandum of Understanding (1999) as the target flows. These flows more closely approximate the optimal flows for the various lifestages of Chinook salmon and steelhead than the Eight Dam Removal Alternative. However, given the natural variability of the system, the difference between the two alternatives is small.	The Eight Dam Removal Alternative appears to result in more variable flows that may or may not be optimal for all lifestages of Chinook salmon and steelhead. However, given the natural variability of the Battle Creek system, the difference between the two alternatives is small.

Table 2. Continued

Topic	Five Dam Removal Alternative	Eight Dam Removal Alternative
Hydrology	The main difference between the two alternatives is flow level. The Five Dam Removal Alternative would have lower flows than the Eight Dam Removal Alternative.	The Eight Dam Removal Alternative would have higher flows than the Five Dam Removal Alternative and would more closely approximate natural conditions. It is possible that there are additional ecosystem benefits from more closely approximating natural flow conditions.
Passage—*fish ladders*	Under the Five Dam Removal Alternative, there would be more maintenance work required of fish screens and fish ladders.	Under the Eight Dam Removal Alternative, there would be less maintenance required because no fish screens and fish ladders would be constructed at the project sites.
Passage—*natural barriers*	Because of all the uncertainty associated with fish passage of natural barriers, it is difficult to determine if one alternative is better than the other. Different areas may act as barriers at higher flows rather than lower flows.	Because of all the uncertainty associated with fish passage of natural barriers, it is difficult to determine whether one alternative is better than the other. Different areas may act as barriers at higher flows rather than lower flows.
Uncertainties—*project long-term success*	There is greater uncertainty associated with the continued successful operation of the fish proposed passage facilities.	Because there would be fewer human-made facilities, there would be more certainty associated with this alternative.
Uncertainties—*MOU*	The MOU is complete and was signed in 1999 by the five signatories (U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, NOAA Fisheries, California Department of Fish and Game, Pacific Gas & Electric Company)	There is some uncertainty associated with whether a new MOU could be negotiated in a timely manner.
Schedule	The Restoration Project would be completed in August 2008.	The Restoration Project would be completed in July 2011.
Power	The forgone power costs have already been addressed in the draft EIS/EIR.	The forgone power costs would need to be accurately quantified, and the power would need to be appropriately replaced.
Project cost—*construction cost plus forgone power*	$113 million	$111 million

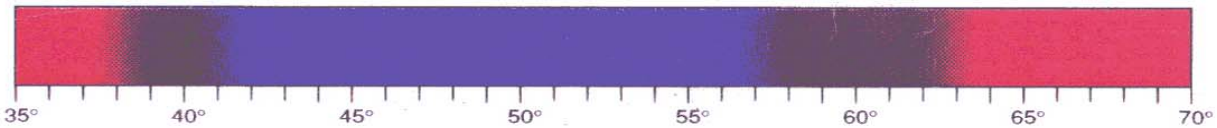
Attachment A

Power Point Presentation for Public Meeting—March 15, 2004

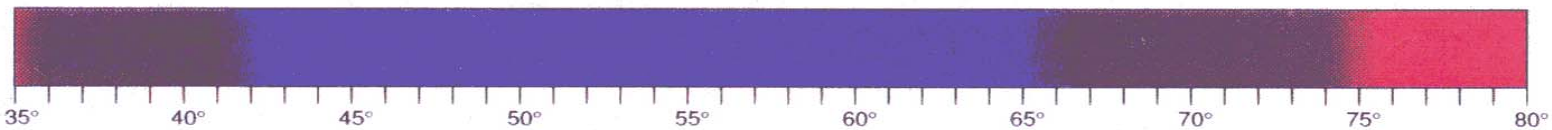
MORTALITY RELATED TO TEMPERATURE

CHINOOK SALMON

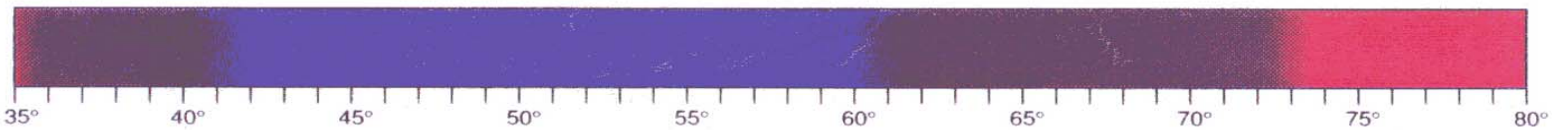
Incubating Eggs and Larva

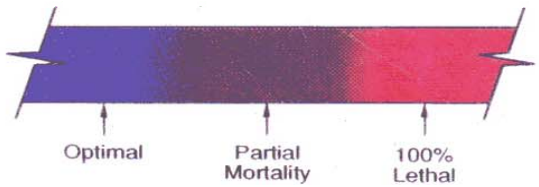


Fry and Fingerlings



Prespawning Adults





CH2M HILL

A comparison of the preferred alternative (five dam removal) for the Battle Creek Salmon and Steelhead Restoration Project and alternative B (eight dam removal) with respect to sediment transport.

Eagle Canyon

Inskip

Mike Roberts
TNC
North Central Valley Office

Methods

- Reviewed existing Battle Creek literature.
  - Kondolf and Katzel 1989 report
  - Greimann 2001 hydrology report
  - Data appendices from a DWR report for fish ladder design
- Collected independent specialist recommendations.
  - Ellen Wohl- Fluvial Geomorphologist, Colorado State University
  - Charles Troendle- Hydrologist, SI International, Ft. Collins. CO
  - Sandra Ryan- Research Hydrologist/Geomorphologist, USDA FS, Laramie, WY.
  - Larry Schmidt- Hydrologist, Stream Research Center, Ft. Collins CO.
  - Scott McBain- Fluvial Geomorphologist, McBain and Trush, Inc. Arcata, CA.
- Combined existing literature with specialist's recommendations for a basic analysis of changes to *magnitude* and *duration* of a threshold event.

Kondolf and Katzel report

- Evaluated March 1989 event (7800 cfs at Coleman Hatchery) and documented sediment transport.
- Evaluated management practices of sediment sluicing through radial gates at dam locations.
- Found that “There do not appear to be any serious sediment imbalances (areas of persistent aggradation or degradation) in the Battle Creek system that demand immediate management or remediation”.

Other reports (hydrology information)

- Greimann report provided necessary hydrology information.
  - Discharge per unit area relationships
  - Flood frequency curves at dam sites using flow partitioning
- DWR data appendices provided diversion quantities at South, Eagle Canyon, and Inskip diversions used for this evaluation

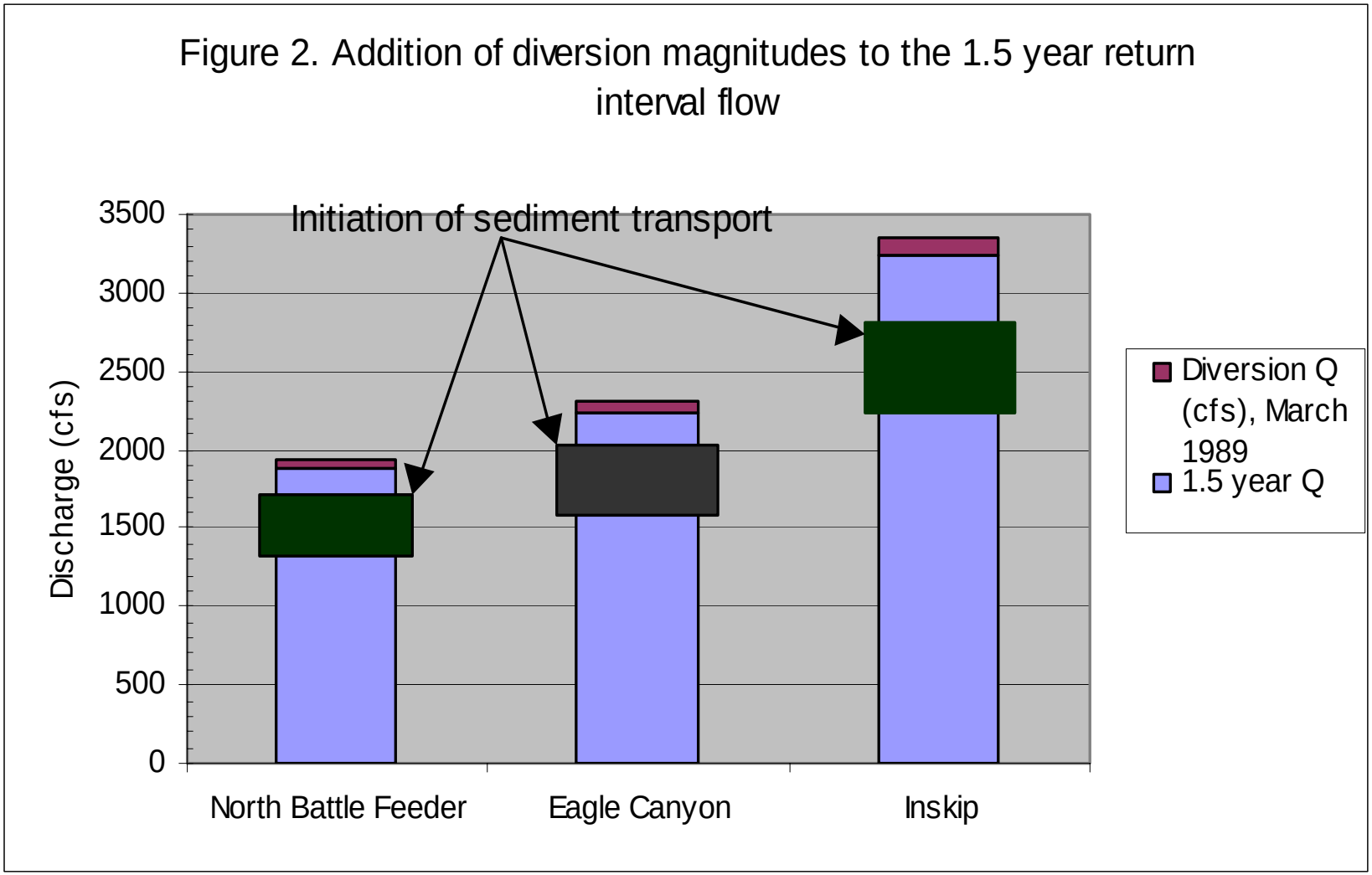
Specialist's recommendations regarding *duration* of a sediment transport event

- No definitive data specifying the necessary duration of a sediment transport event on Battle Creek.
- General agreement among the specialists that the appropriate temporal scale for evaluation of diversion impact is days (2-3) not hours.

Specialist's recommendations regarding *magnitude* of a sediment transport event

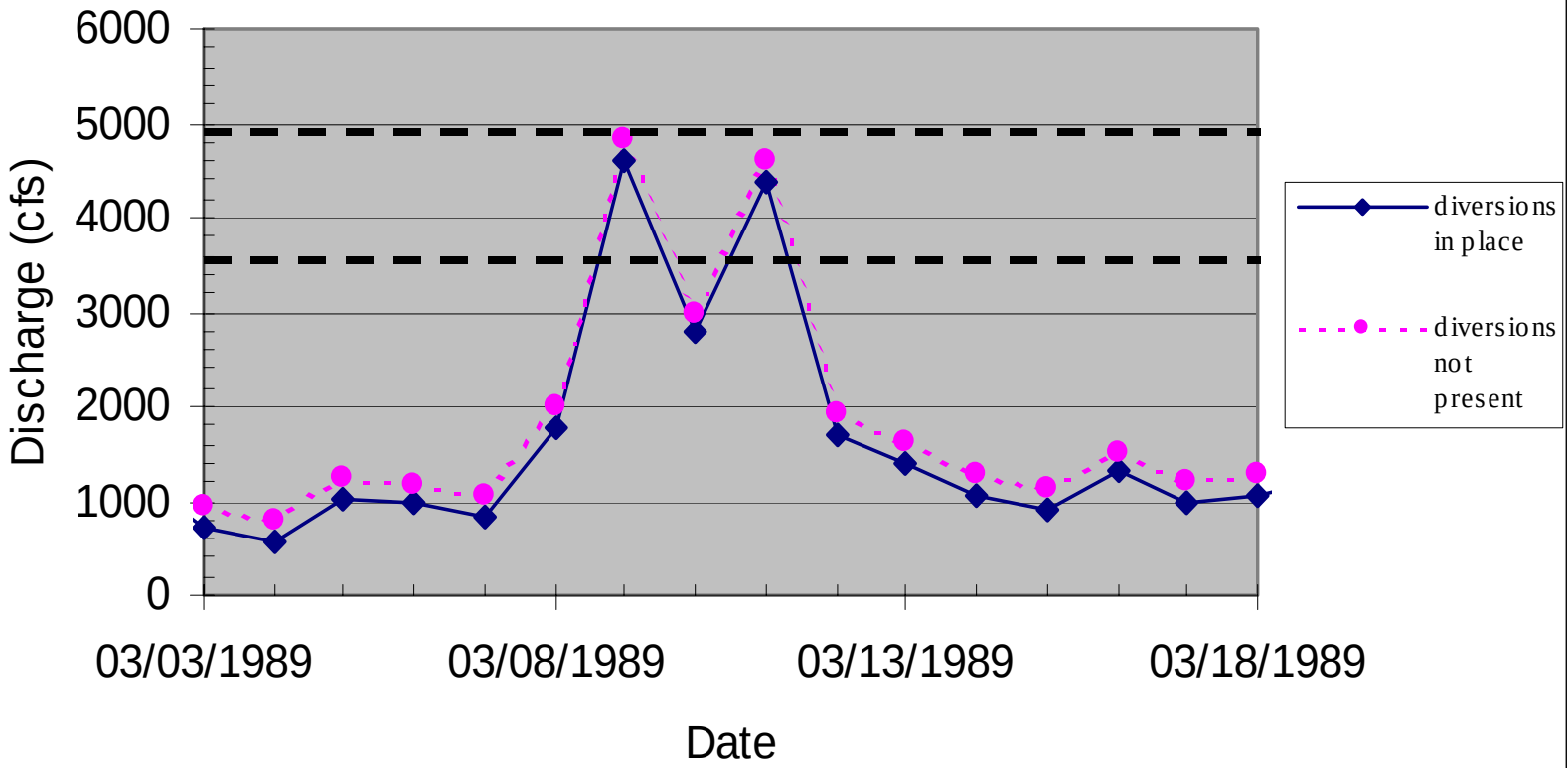
- A widely accepted concept in fluvial geomorphology is that the "bankfull" or 1.5 year return interval flood is most for sediment transport.
- New channel maintenance flow information suggests that noticeable bedload sediment transport initiates within a range of 0.6 – 0.8 of the 1.5 year return interval flow.

Affects of North Feeder, Eagle Canyon, And Inskip diversions on threshold event *magnitude*



Affects of North Feeder, Eagle Canyon, And Inskip diversions on threshold event *duration*

Figure 3. Comparison of mean daily discharge at the Coleman guage (USGS #11376550) with and without diversions in place



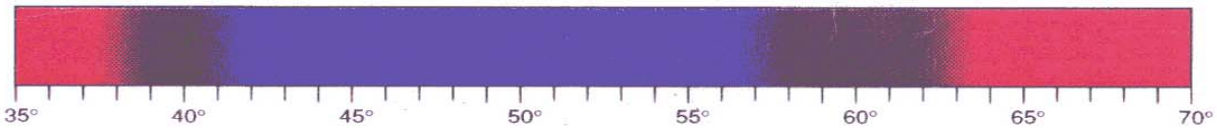
In summary

- Based on the findings of existing reports and further evaluation, removal of North Battle Feeder, Eagle Canyon, and Inskip Dams probably offers little benefit to the Battle Creek system's sediment transport characteristics.
- Both the Kondolf and Katzel (1989) and Greimann (2001) reports indicate that there is little impact to sediment transport processes due to the existing hydro-power project when all eight dams in question are present.
- There is remaining scientific uncertainty in sediment transport relationships and the affects of dam removal within the Battle Creek system. This uncertainty will be more fully addressed with robust studies called for in the Project adaptive management plan.

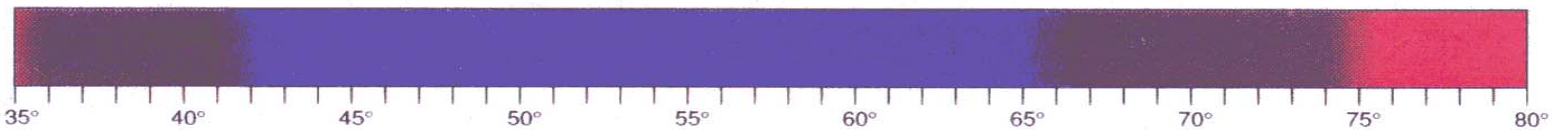
MORTALITY RELATED TO TEMPERATURE

CHINOOK SALMON

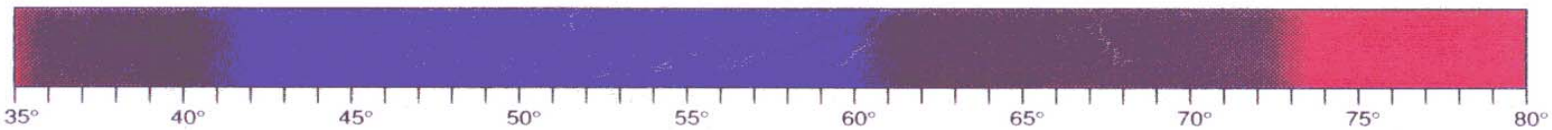
Incubating Eggs and Larva

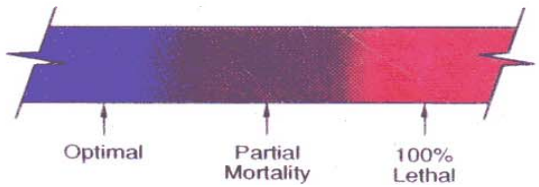


Fry and Fingerlings



Prespawning Adults



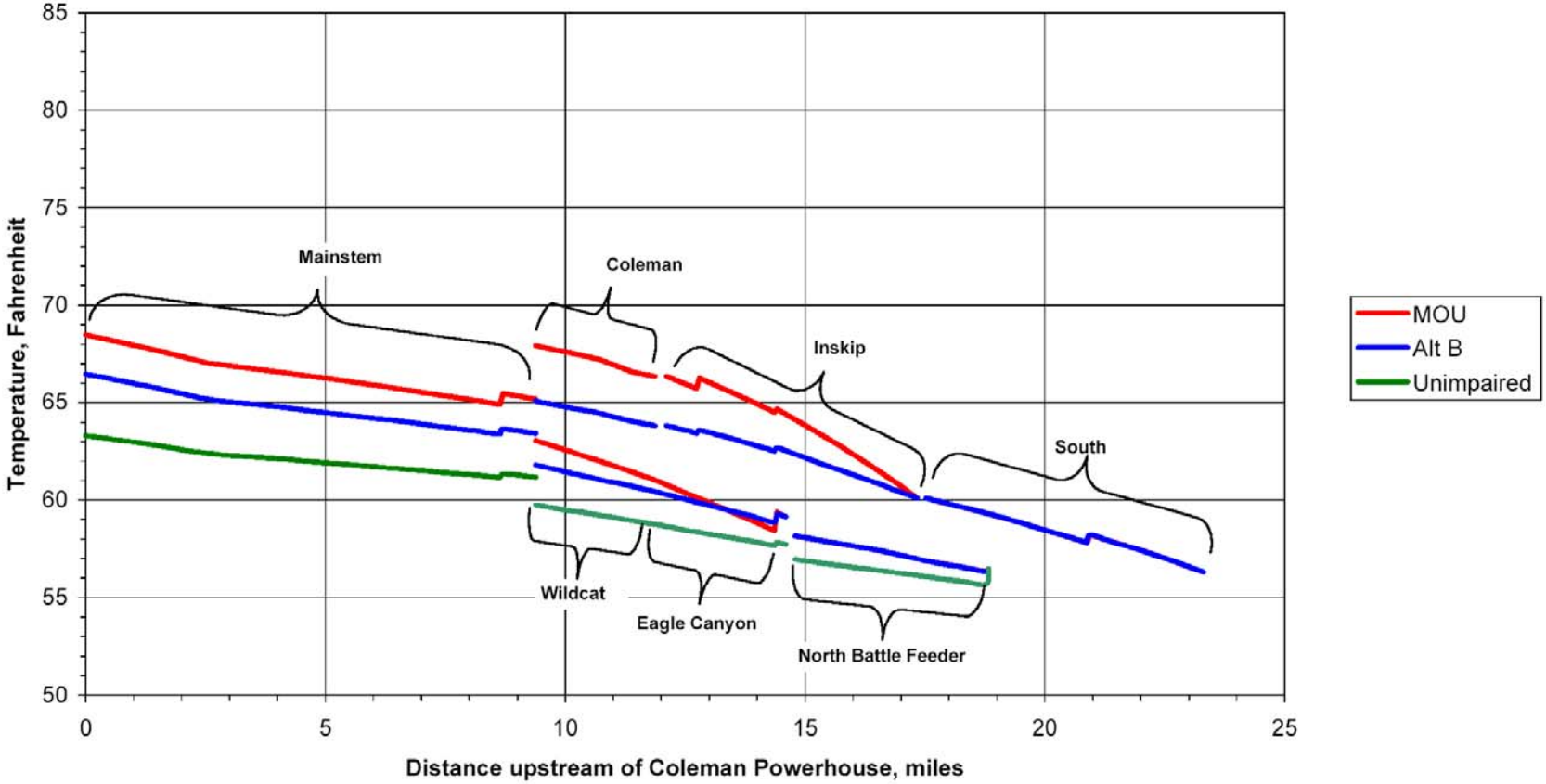


CH2M HILL

Figure T-1, Avg-June

Slide 11

Battle Creek SNTEMP
MOU, Alt B , Unimpaired Temperatures
Normal Condition
Daily Average Water Temperature Profile in June

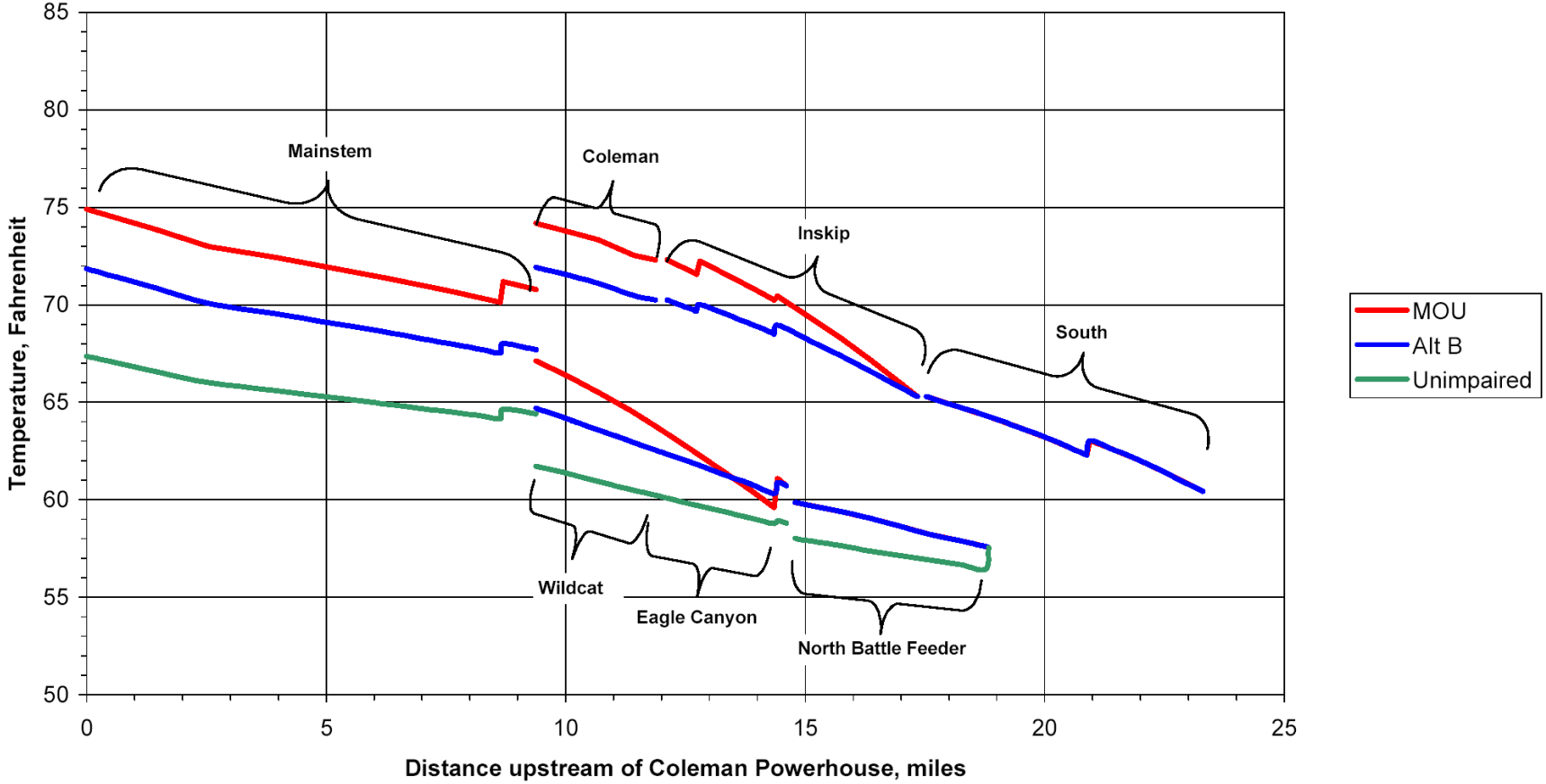


MOU Temp: SNTEMP Alt 3
Alt B Temp: North Fork and Mainstem, SNTEMP Alt 4; South Fork, SNTEMP Alt 6. **Alt B Mainstem does not account for SF cooling.**
Unimpaired: SNTEMP Alt 6 (no facilities below Volta)

Figure T-5, DryWarm-June

Slide 12

Battle Creek SNTEMP
MOU, Alt B , Unimpaired Temperatures
Dry and Warm Extreme Condition
Daily Average Water Temperature Profile in June

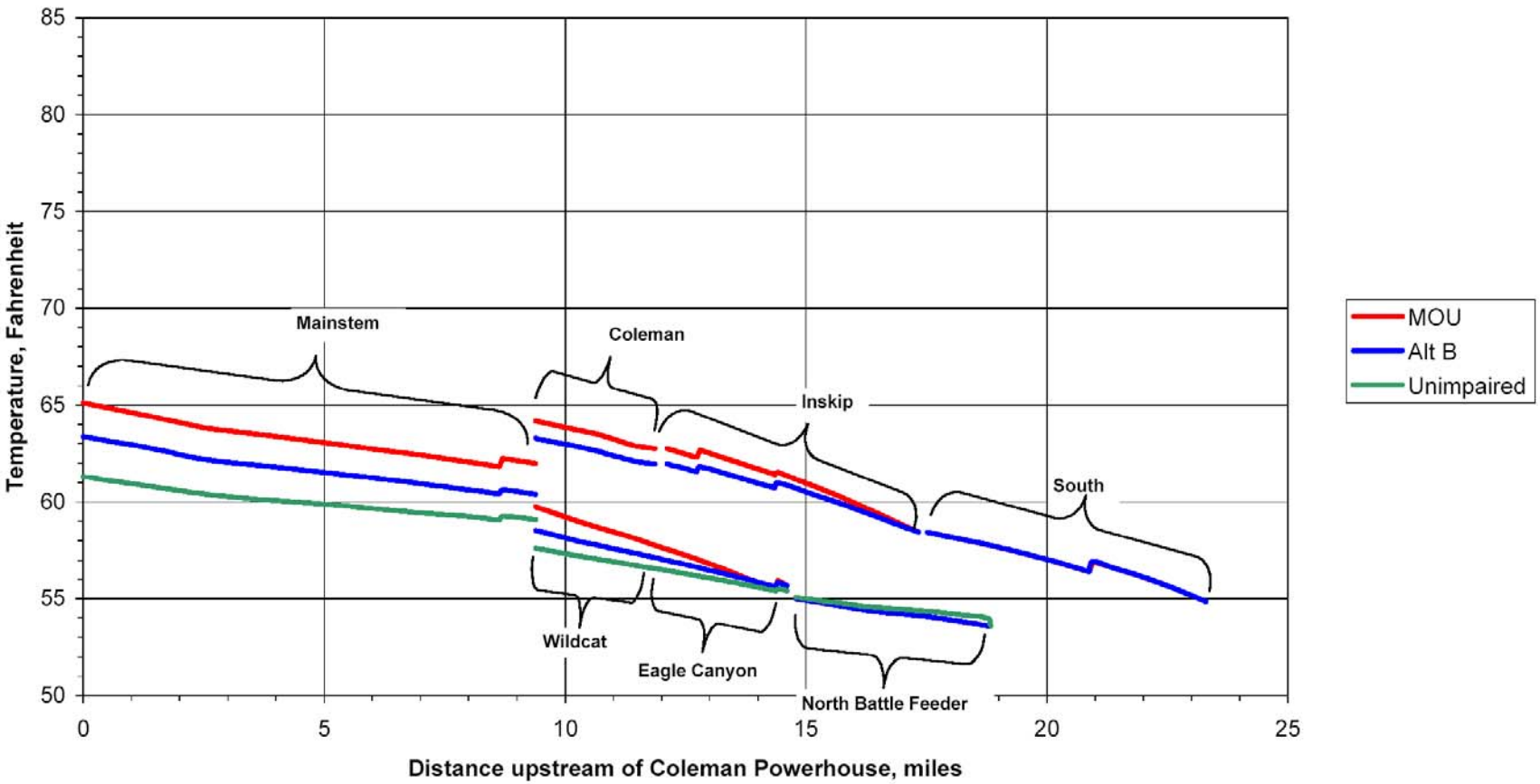


MOU Temp: SNTEMP Alt 3
Alt B Temp: North Fork and Mainstem, SNTEMP Alt 4; South Fork, SNTEMP Alt 6. **Alt B Mainstem does not account for SF cooling.**
Unimpaired: SNTEMP Alt 6 (no facilities below Volta)

Figure T-4, Avg-Sep

Slide 13

Battle Creek SNTEMP
MOU, Alt B , Unimpaired Temperatures
Normal Condition
Daily Average Water Temperature Profile in September



MOU Temp: SNTEMP Alt 3
Alt B Temp: North Fork and Mainstem, SNTEMP Alt 4; South Fork, SNTEMP Alt 6. **Alt B Mainstem does not account for SF cooling.**
Unimpaired: SNTEMP Alt 6 (no facilities below Volta)

COLD WATER

REFUGIA

Table 4.5-4
Comparison of Temperatures in North Fork Battle Creek
Downstream of Eagle Canyon Springs
with Identical Water Releases from Eagle Canyon Diversion Dam and the Springs[1]

Predicted Temperatures Above Eagle Canyon Dam[2]	With Eagle Canyon Diversion Dam	Without Eagle Canyon Diversion Dam
56ºF	54.6ºF	55.5ºF
57ºF	55.3ºF	56.4ºF
58ºF	55.9ºF	57.3ºF
59ºF	56.6ºF	58.2ºF

[1]Derived using mass balance equation.
[2]PG&E 2001a[IM1].

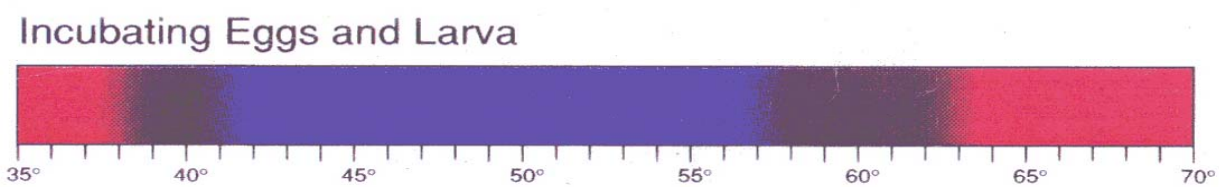
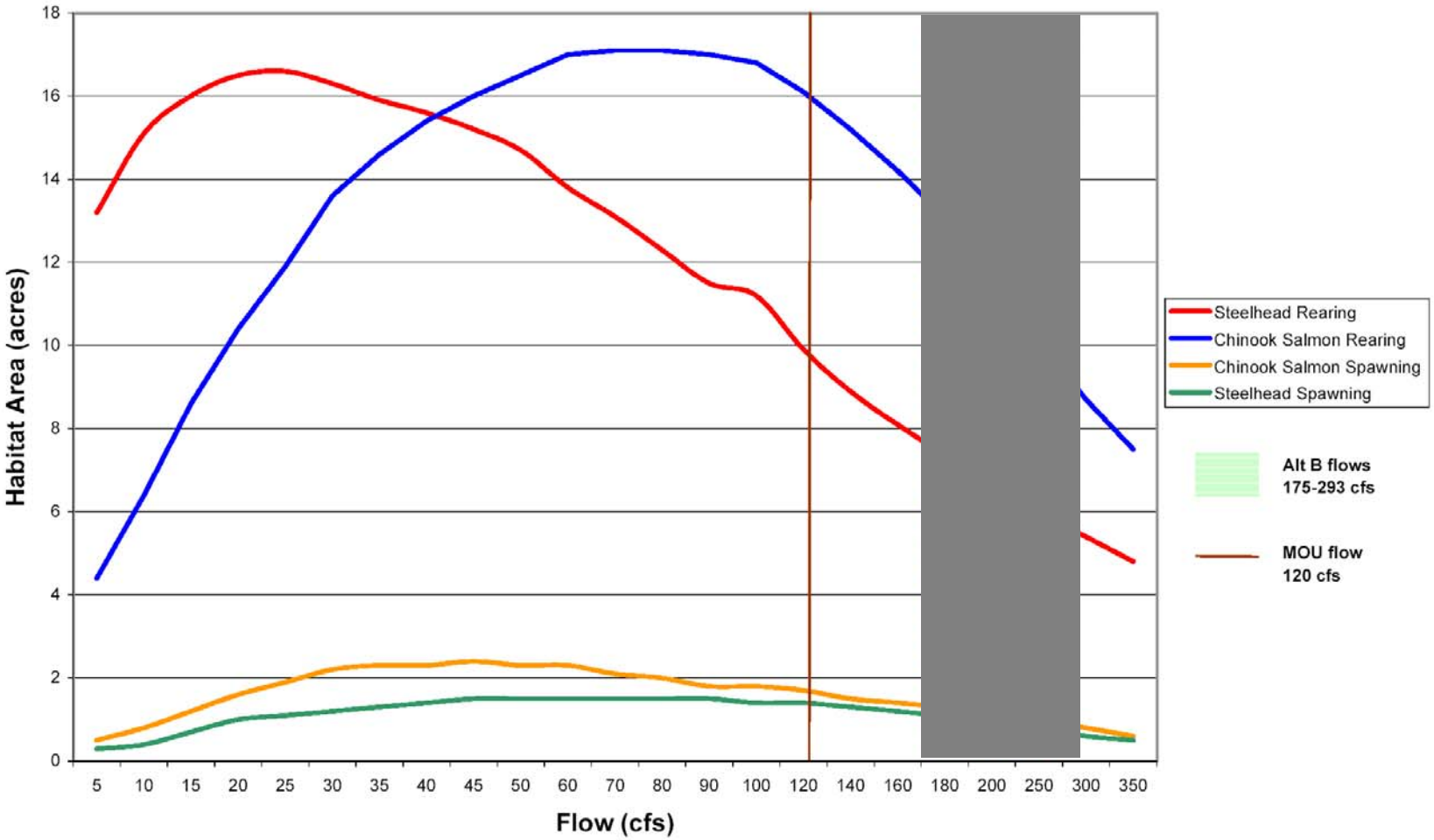


Figure P-1, Mainstem

MOU and Alt B Flow/Habitat Curves June - Sep, Normal Year (1989)

Mainstem Battle Creek Above Coleman PH



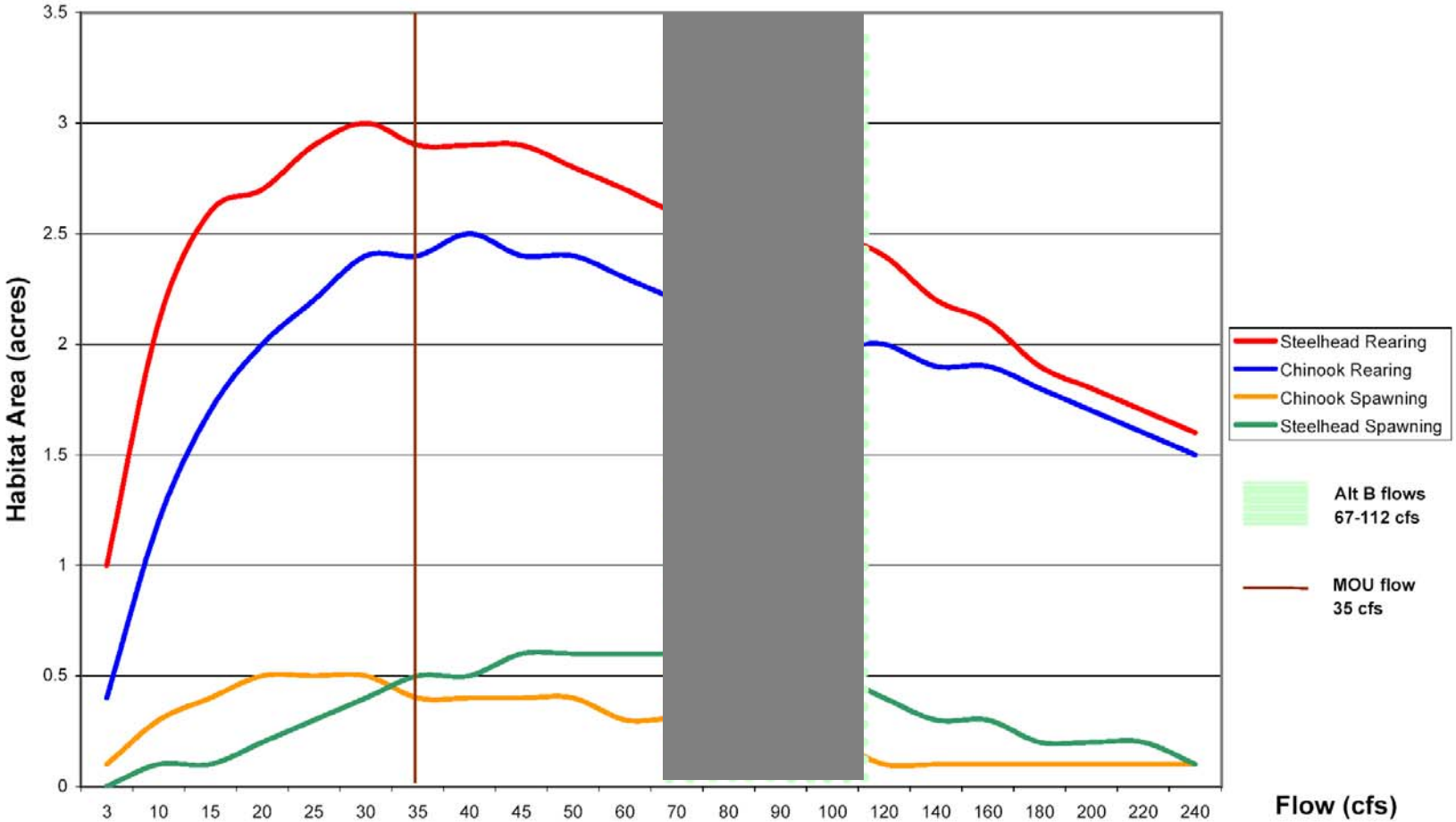
MOU flow: summer minimum flow release plus applicable inflow.
Alt B flow: high and low monthly average flow in WY 1989, RMI/Navigant monthly flow model.

Figure P-3, Eagle Canyon

MOU and Alt B Flow/Habitat Curves June - Sep, Normal Year (1989)

Slide 17

North Fork Battle Creek, Eagle Canyon Reach

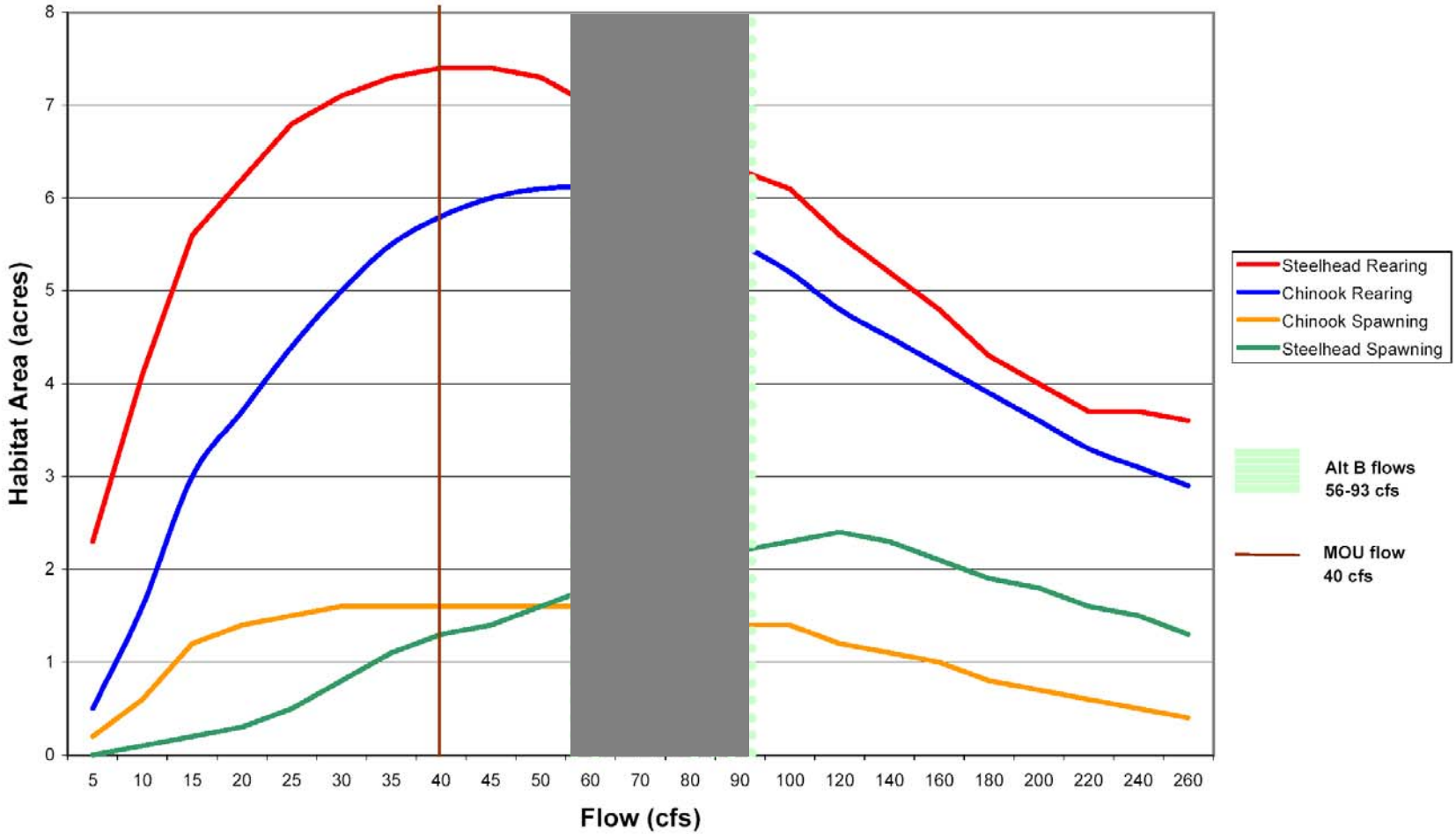


MOU flow: summer minimum flow release plus applicable inflow.
Alt B flow: high and low monthly average flow in WY 1989, RMI/Navigant monthly flow model.

Figure P-5, Inskip

Slide 18

MOU and Alt B Flow/Habitat Curves
June - Sep, Normal Year (1989)
South Fork Battle Creek, Inskip Reach

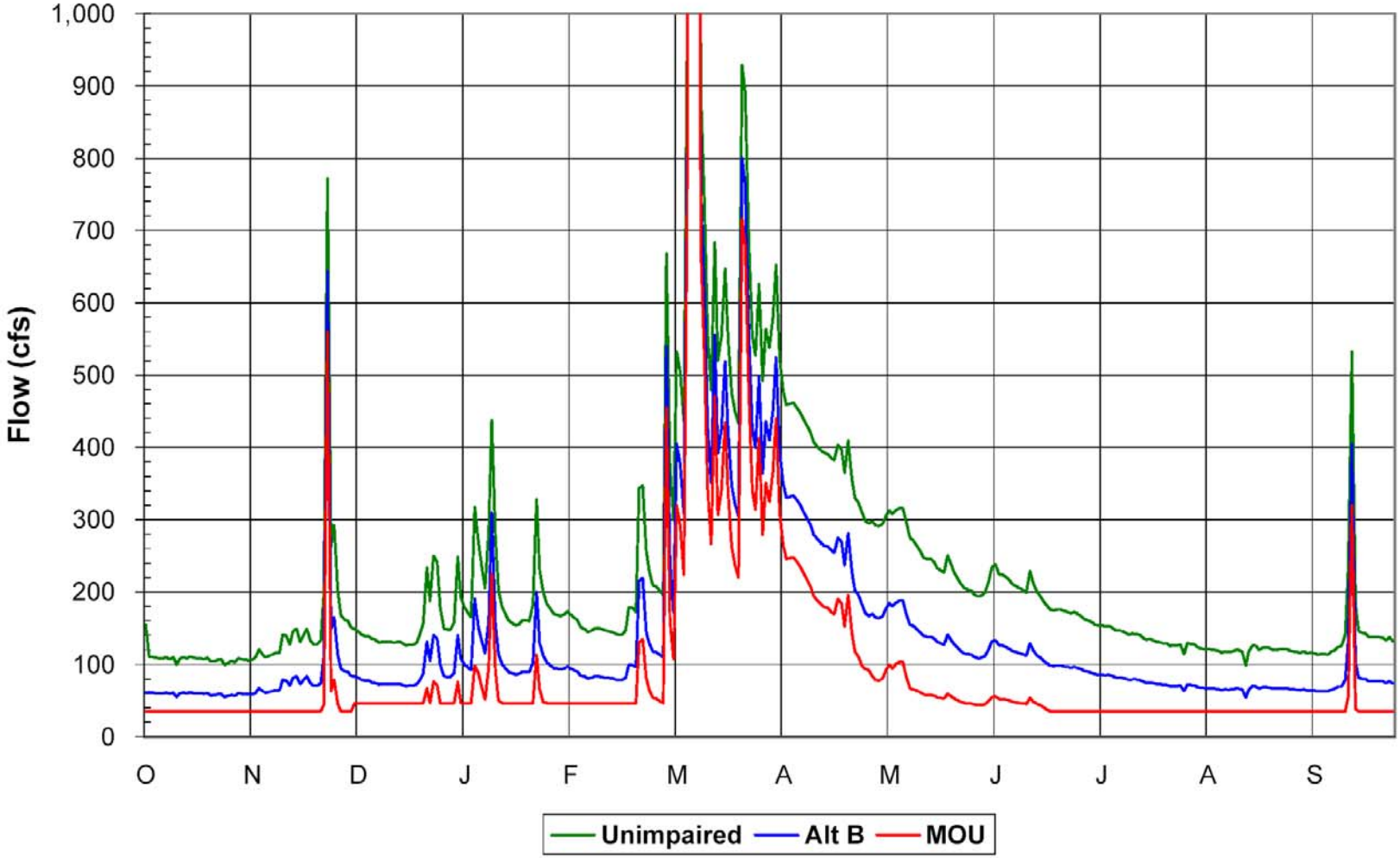


MOU flow: summer minimum flow release plus applicable inflow.
Alt B flow: high and low monthly average flow in WY 1989, RMI/Navigant monthly flow model.

Figure H-3, Eagle Canyon

Water Year 1989

North Fork Battle Creek at Eagle Canyon



All flows from RMI/Navigant flow model, modified to use historic daily data from USGS 11376550.
Unimpaired and Alt B flows are equal for SF Battle Creek.

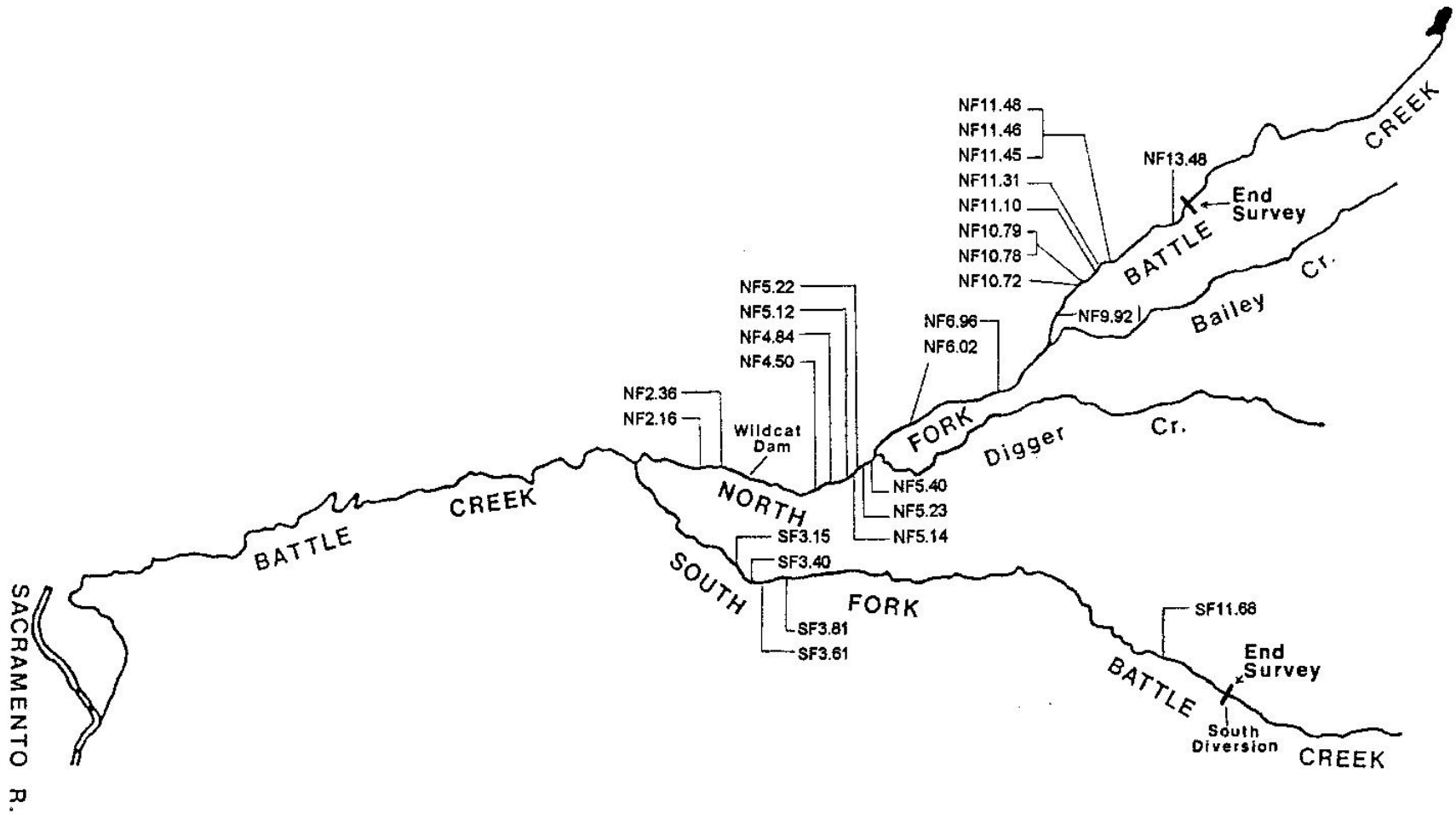
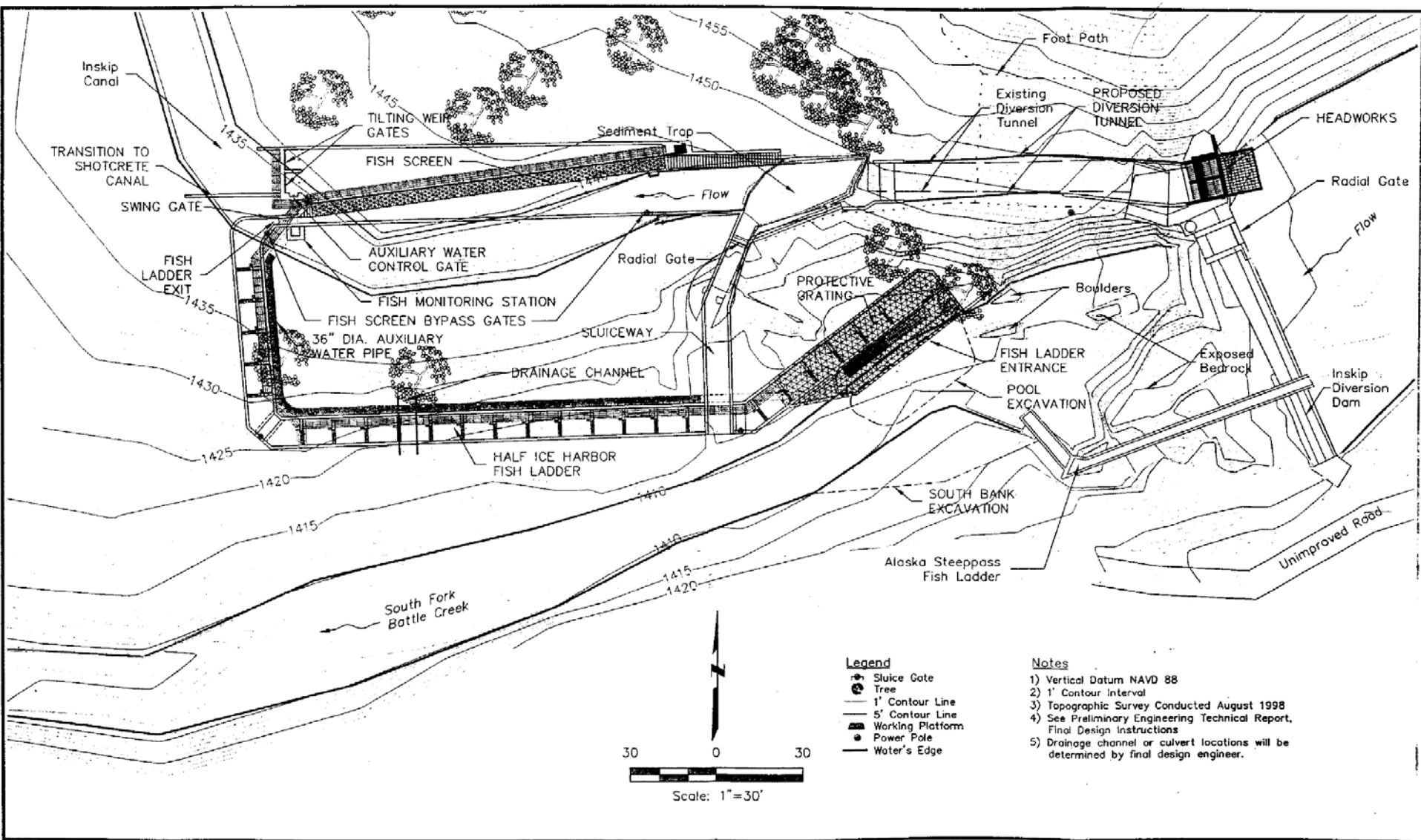


Figure 2. Location (ID number) of potential barriers surveyed in Battle Creek, California, 1988-1990.



INSKIP DIVERSION South Fork Battle Creek near Manton, California	Site Plan	DEPARTMENT OF WATER RESOURCES Revision Date: May 19, 2000	DRAWING : Inskipg3g.dwg Sheet 3 of 22

Attachment B

Summary Comparison of the Difference between the Five Dam and Eight Dam Removal Alternatives with the Comments of the California Hydropower Reform Coalition

Summary Comparison of the Difference between the Five Dam and Eight Dam Removal Alternatives with the Comments of the California Hydropower Reform Coalition[1]

Topic	Five Dam Removal Alternative	Eight Dam Removal Alternative
Power generation	The Five Dam Removal Alternative would result in the generation of 30% less power for the Hydroelectric Project.	The Eight Dam Removal Alternative would result in the generation of 50% less power for the Hydroelectric Project. There would also be no backup system if an emergency resulted in a system shutdown.
Sediment transport	There is little difference between the two alternatives with respect to sediment bedload transport. Differences between the two alternatives with respect to fine sediment transport are unknown but expected to be minimal.	There is little difference between the two alternatives with respect to sediment bedload transport. Differences between the two alternatives with respect to fine sediment transport are unknown but expected to be minimal.
Habitat—*spawning/rearing*	Water temperature is higher in the mainstem and lower run reaches, but this area is not used for winter-run Chinook salmon spawning habitat.	Water temperature is colder on the mainstem and lower run reaches, but still not cold enough to be beneficial for winter-run Chinook salmon spawning habitat.
	The colder upper reaches are only slightly warmer, and for the farthest reaches, there is no difference compared with the Eight Dam Removal Alternative.	The upper reaches are only slightly cooler, and for the farthest reaches, there is no difference from the Five Dam Removal Alternative.
Habitat—*temperature*	The Five Dam Removal Alternative provides more adaptive management opportunity for creating coldwater refugia below Eagle Canyon Diversion Dam.	Removal of all dams would result in less adaptability to manage coldwater refugia created by springs.
Habitat—*hydrology*	The Five Dam Removal Alternative uses the prescription flow set by the Battle Creek Team and described in the 1999 Memorandum of Understanding (1999) as the target flows. These flows more closely approximate the predicted optimal flows for the various lifestages of Chinook salmon and steelhead than the Eight Dam Removal Alternative. ~~However, given the natural variability of the system, the difference between the two alternatives is small.~~	The Eight Dam Removal Alternative ~~appears to~~ would ~~result~~ provide substantially higher and ~~in~~ more variable flows that more closely approximate natural flows, but may or may not be optimal for all lifestages of Chinook salmon and steelhead. ~~However, given the natural variability of the Battle Creek system, the difference between the two alternatives is small.~~

[1] While the comments of the California Hydropower Reform Coalition are appreciated, the resource agencies do not agree with the majority of these changes. For example, the comments made with respect to flow comparisons are based on two different sets of flow data, that from the Interim Flow Agreement and the flows associated with the MOU. Only the MOU flow data should be considered for the purpose of comparison between the Five Dam Removal Alternative and the Eight Dam Removal Alternative. Flow conditions under the Interim Agreement are temporary in nature and are not part of the baseline evaluation for the Restoration Project. For these reasons, these changes are being disclosed for the public, but are not being incorporated into the summary table.

Topic	Five Dam Removal Alternative	Eight Dam Removal Alternative
Hydrology	The main difference between the two alternatives is flow level. The Five Dam Removal Alternative would have lower flows than the Eight Dam Removal Alternative.	The Eight Dam Removal Alternative would have higher flows than the Five Dam Removal Alternative and would more closely approximate natural conditions. It is possible that there are additional ecosystem benefits from more closely approximating natural flow conditions.
Passage—*fish ladders*	Under the Five Dam Removal Alternative, there would be more maintenance work required of fish screens and fish ladders.	Under the Eight Dam Removal Alternative, there would be less maintenance required because no fish screens and fish ladders would be constructed at the project sites.
Passage—*natural barriers*	Because of all the uncertainty associated with fish passage of natural barriers, it is difficult to determine if one alternative is better than the other. A natural barrier on the North Fork has been identified at interim flows that are similar to MOU flows. Different areas may act as barriers at higher flows rather than lower flows.	Because of all the uncertainty associated with fish passage of natural barriers, it is difficult to determine whether one alternative is better than the other, although the existing record (TRPA 1998b) and professional judgement suggests additional flow helps passage at naturally occurring low flow barriers. Different areas may act as barriers at higher flows rather than lower flows.
Uncertainties—*project long-term success*	There is greater uncertainty associated with the continued successful operation of the fish proposed passage facilities.	Because there would be fewer human-made facilities, there would be more certainty associated with this alternative.
Uncertainties—*MOU*	The MOU is complete and was signed in 1999 by the five signatories (U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, NOAA Fisheries, California Department of Fish and Game, Pacific Gas & Electric Company)	There is some uncertainty associated with whether a new MOU could be negotiated in a timely manner.
Schedule	The Restoration Project would be completed in August 2008.	The Restoration Project would be completed in July 2011.
Power	The forgone power costs have already been addressed in the draft EIS/EIR.	The forgone power costs would need to be accurately quantified, and the power would need to be appropriately replaced.
Project cost—*construction cost plus forgone power*	$~~213~~ 113 million	$~~211~~ 111 million