September 2, 1999

Mr. John Icanberry
United States Fish and Wildlife Service
4001 North Wilson Way
Stockton, California 95205

Dear Mr. Icanberry:

Attached are project status reports for the Dear and Mill creeks water quality assessment project. These status reports were recently presented to the conservancies for these watersheds.

As you know, the projects are monitoring a variety of physical, chemical, and biological parameters. We are continuing to monitor these parameters, but have excluded some that have been determined from results of this study to not be significant in the watersheds. We also will be targeting specific flows during upcoming sampling.

Several metals (cadmium, manganese, selenium, and silver) which have not been detected at environmentally significant levels from either watershed are no longer being sampled. In addition in the Deer Creek watershed, arsenic and nickel are no longer being sampled since these metals have not been found at significant levels.

Sculpin liver and muscle tissues were analyzed for trace metal and organic contaminants during the fail of 1998. Chromium was detected in both tissues from fish from both watersheds at levels higher than criteria, while zinc at levels higher than criteria was detected in fish from the Deer Creek watershed. Organic contaminants detected in fish included DBOB, ppDDD, and DBCE. We are currently resampling these watersheds for sculpin, as well as smallmouth bass and rainbow trout for tissue analyses.

Water column toxicity testing has found significant mortality of test species at times near the mouth of both Deer and Mill creeks. Significant bed sediment toxicity to test species was found during November of 1998 in samples collected from near the mouth of Mill Creek as well as an upstream station. Both water column and bed

sediment toxicity testing is continuing. Runoff events will be targeted for water column toxicity testing during upcoming monitoring.

Aquatic macroinvertebrate samples were collected during the fall of 1998 and are currently being analyzed. Results from pesticide samples collected during the past winter have not yet been received.

Results to date from this study have identified several parameters that exceed various criteria for the protection of aquatic life. These results and those from upcoming monitoring will allow determination of potential impacts to aquatic life in both Deer and Mill creeks. Identification of potentially adverse conditions and source evaluation will allow determination of appropriate mitigation measures to improve aquatic ecosystem conditions.

If you have any questions or need additional information, please contact me at the above address or by telephone at (530) 529-7326.

Sincerely,

Jerry Boles, Chief
Water Quality and Biology Section

Attachments

Mill Creek Progress Report-December 1998

The Mill Creek watershed assessment program was begun in May of 1997 by the Water Quality and Biology Section of the Northern District of the Department of Water Resources. The purpose of this comprehensive assessment program is to establish existing water quality conditions in the Mill Creek watershed.

Water quality data from Mill Creek are collected monthly at the mouth (above Highway 99 when Mill Creek is dry or when the Sacramento River is high), USGS gage (Mill Creek near Los Molinos), and below Highway 36. Samples are analyzed for minor elements (metals), nutrients, minerals, and coliform bacteria. Field measurements include dissolved oxygen, conductivity, temperature, and pH. DWR also collects aquatic insects, sediments, habitat assessment data, water samples for toxicity analyses, and continuous temperature data from these and other stations along Mill Creek.

Water quality monitoring results to date show levels of coliform bacteria, minerals, and nutrients to be low and not restrictive for beneficial use.

Aluminum and copper have at times exceeded the USEPA California Toxics Rule (proposed) criteria for the protection of freshwater organisms. It is not known whether concentrations of these minor elements are having a measurable effect on aquatic life in Mill Creek.

Toxicity of metals can vary depending on calcium and magnesium concentrations (expressed as CaCO3), pH, and other environmental conditions. Analyses of each potentially harmful constituent are useful in assessing and identifying water quality impairments. However, since stream conditions can vary greatly and stream chemistries are complex, other tests have been developed to assess the overall impact of creek conditions on selected indicator species.

Monthly toxicity testing began in January 1998 with water samples collected from the mouth of Mill Creek and at Black Rock. Water samples from Mill Creek were tested for toxicity to water fleas *(Ceriodaphnia)* and fathead minnows *(Pimephales)* by the U. C. Davis Toxicity Laboratory according to protocols outlined in EPAs *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms.* These indicator species were laboratory grown, considered sufficiently genetically similar, and therefore useful for toxicity comparisons. Any deviation in rates of reproduction, growth, or mortality from control group organisms were noted.

Data from water flea analyses have shown little statistical differences between organisms exposed to Mill Creek water and laboratory control water since collection began in January. However, mortality rates were higher for the fathead minnow in samples collected at the mouth in January (22.3 percent) and April (27.5 percent) than in the control group (7.5 percent and 0.0 percent, respectively). Data from April also showed fathead minnow mortalities were higher at Black Rock (15.0 percent) than in

the control group. However, the cause of higher mortality in the fathead minnow is unknown. Treatment with antibiotics have alleviated some of the high mortality and high variability between replicate samples. But the influence of protozoa or fungi discovered on some of these fish 24 hours prior to death is not well understood. Much more research needs to be conducted to determine the cause of the high mortality. As more samples are collected and analyzed, the causal effects will become clearer.

Resident fish (sculpin) were collected for tissue analyses in September 1998 to identify possible natural and man-made contaminants accumulating in the food chain. Data from the fish tissue testing are in the early stages of analyses and will be included in the next update.

DWR will again be collecting baseline data from Mill Creek this year. In addition to those tests listed above, groundwater sampling will begin in 1999. Selected wells will be monitored for minerals, nutrients, minor elements, pesticides and coliform bacteria. Surface waters will also be tested for pesticides in the upcoming year.

Favorable water quality conditions and stream temperatures are important for successful salmon reproduction. DWR will continue to collect continuous temperature data important for the study of all life stages of both fall and spring-run salmon in Mill Creek. Very few spring-run salmon fisheries remain viable in California. Mill Creek is one of the few watersheds sustaining, though precariously, a spring-run fishery. Great effort is being made by fishery biologists to understand temperature requirements for these fish. Adult spring-run chinook salmon oversummer in upper Mill Creek and hold until September or October to spawn. Adult salmon have been found in laboratory studies to have poor survival when held at temperatures above 60 degrees F and produce eggs less viable than those adult fish held at lower temperatures.

The data showed that in 1998, stream temperatures for over-summering spring-run salmon in Mill Creek were lower than in 1997, probably due to late spring rains and cooler than normal atmospheric conditions. Except for two days in early July at Black Rock, stream temperatures below Little Mill Creek and at Black Rock were lower than 1997 temperatures until late August. DFG biologists believe that these cooler water temperatures resulted in spring-run salmon over-summering and spawning unusually far downstream (redds were observed several miles below the confluence of Little Mill Creek). Spawning spring-run salmon are not usually found below Table Mountain (about the mid-point between Black Rock and Little Mill Creek). Though the salmon were distributed further downstream than normally observed, how this distribution may affect egg viability, juvenile escapement, or recruitment is not known.

DFG biologists estimate 424 adult spring-run salmon returned to spawn in Mill Creek in 1998 - more than double the counts (200) from 1997. Fish population surveys are challenging in Mill Creek. During much of the summer, high turbidity, largely due to runoff containing volcanic ash from the Sulfur Works area in the Lassen National Volcanic Park, reduces visibility downstream and makes fish population estimates difficult .

Data from aquatic insect studies are being analyzed and used as indicators for assessing the health of the aquatic environment. Low density and diversity may indicate unfavorable water quality or streambed conditions. Changes in the insect community profile could be an early indicator of changing creek conditions.

Sometimes stream conditions change rapidly as a result of catastrophic events. In January 1997 historic high water from heavy rains reshaped Mill Creek. A slide downstream from Highway 36 dumped large amounts of debris and sediment into the creek, filling in some deep holding areas used by spring-run salmon.

This spring DWR will enter the third year of the Mill Creek monitoring program and many opportunities lie ahead. Because pesticides can often persist in the soil and groundwater long after application, the data from upcoming tests will be of great interest. Also, when fish tissue data are analyzed and more toxicity and minor element testing are completed, the physical, biological, and chemical conditions in Mill Creek will become better understood.

Deer Creek Progress Report-December 1998

In April of 1998, DWR prepared a report describing and discussing progress of the Deer Creek watershed monitoring program by the Water Quality and Biology Section of the Northern District. This comprehensive monitoring program was begun in May of 1997 to establish baseline water quality conditions in the Deer Creek watershed. The report included results of water quality analyses and a discussion of temperature data.

Water quality data from Deer Creek were collected monthly at the mouth (above Highway 99 when Deer Creek is dry or when the Sacramento River is high), Upper Diversion Dam, Ponderosa Way (at A-Line Road in winter), and below Childs Meadows. Samples were analyzed for minor elements (metals), nutrients, minerals, and coliform bacteria. Field measurements included dissolved oxygen, conductivity, temperature, and pH. DWR also collected aquatic insects, sediments, data from habitat assessments, toxicity water samples, and continuous temperature data from these and other stations along Deer Creek.

Water quality monitoring results showed levels of coliform bacteria, minerals, and nutrients to be low and not restrictive for beneficial uses.

Concentrations of aluminum have at times exceeded the California Toxics Rule (proposed) and the EPA chronic criteria for the protection of freshwater organisms. It is unclear whether concentrations of this minor element have had a measurable effect on aquatic life in Deer Creek.

Toxicity can vary depending on calcium and magnesium concentrations (expressed as CaCO3), pH, and other environmental conditions. Analyses of each potentially harmful constituent are useful in assessing and identifying water quality impairments. However, since stream conditions can vary greatly and stream chemistries are complex, other tests have been developed to assess the overall impact of creek conditions on selected indicator species.

Monthly toxicity testing began in January with water samples collected from the mouth of Deer Creek and at either Ponderosa Way or A-line Road (depending on winter access). Water samples from Deer Creek were tested for toxicity to water fleas *(Ceriodaphnia)* and fathead minnows *(Pimephales)* by the U.C. Davis Toxicity Laboratory according to protocols outlined in EPAs *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms.* These indicator species were laboratory grown, considered genetically similar, and therefore useful for toxicity comparisons. Any deviation in rates of reproduction, growth, or mortality from control group organisms were noted.

Data from water flea analyses have shown little statistical differences between organisms exposed to Deer Creek water and the laboratory control group water since collection began in January. Mortality rates were higher for the fathead minnow in samples collected at the mouth in January (42.5 percent), April (30.0 percent), and

March (27.5 percent) than in the control group (7.5 percent, 0.0 percent, and 0.0 percent, respectively). However, the cause of higher mortality in the fathead minnow is unknown. Treatment with antibiotics have alleviated some of the high mortality and high variability between replicates. But the influence of protozoa or fungi discovered on some of these fish 24 hours prior to death is not well understood. Much more research is needed to determine the cause of the high mortality. As more samples are collected and analyzed, the causal effects will become clearer.

Resident fish (sculpin) were collected for tissue analyses in September 1998 to identify possible natural and man-made contaminants accumulating in the food chain. Data from the fish tissue testing are in the early stages of analyses and will be included in the next update.

DWR will again be collecting baseline data from Deer Creek this year. In addition to those tests listed above, groundwater sampling will also begin in 1999. Selected wells will be monitored for minerals, nutrients, minor elements, pesticides, and coliform bacteria. Deer Creek will also be tested for pesticides in the upcoming year.

Favorable water quality conditions and stream temperatures are important for successful salmon reproduction. DWR will continue to collect continuous temperature data important for the study of all life stages of both fall and spring-run salmon in Deer Creek. Very few spring-run salmon fisheries remain viable in California. Deer Creek is one of the few watersheds sustaining, though precariously, a spring-run fishery. Great effort is being made by fishery biologists to understand temperature requirements for these fish. Adult spring-run chinook salmon oversummer in upper Deer Creek and hold until September or October to spawn. Adult salmon have been found in laboratory studies to have poor survival when held at temperatures above 60 degrees F and produce eggs less viable than those adult fish held at lower temperatures.

The data show that in 1998, stream temperatures for over-summering spring-run salmon in Deer Creek were lower than in 1997, probably due to late spring rains and cooler than normal atmospheric conditions. Not until early July 1998 did maximum daily stream temperatures above A-Line Road and at Ponderosa Way exceed 1997 temperatures. DFG biologists believe that these cooler water temperatures resulted in spring-run salmon over-summering and spawning unusually far downstream (redds were observed about seven miles below Apperson Cow Camp). Spawning spring-run salmon are not usually found below Ponderosa Way. Though the salmon were distributed further downstream than normally observed, how this distribution may affect egg viability, juvenile escapement, or recruitment is not known.

DFG biologists estimated 1,879 adult spring-run salmon returned to spawn in Deer Creek in 1998; about four times the number estimated (466) in 1997. Population estimates are challenging in Deer Creek due largely to inaccessibility. With the exception of Ponderosa Way, few usable roads exist between A-Line Road and the Upper Diversion Dam at the canyon=s mouth.

Data from aquatic insect studies are being analyzed and used as indicators for assessing the health of the aquatic environment. Low density and diversity may indicate unfavorable water quality or streambed conditions. Changes in the insect community profile could be an early indicator of changing creek conditions.

Sometimes stream conditions change rapidly as a result of catastrophic events. In January 1997, historic high water from heavy rains reshaped Deer Creek. At many sites, levees were overtopped, and in some cases failed. Below Red Bridge at Leininger Road, hundreds of feet of levee disappeared causing considerable flooding all the way to the mouth.

This spring DWR will enter the third year of the Deer Creek monitoring program and many opportunities lie ahead. Because pesticides can often persist in the soil and groundwater long after application, the data from upcoming tests will be of great interest. Also, when fish tissue data are analyzed and more toxicity and minor element testing are completed, the physical, biological, and chemical conditions in Deer Creek will become better understood.