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DISCLAIMER

This report presents results of investigations that may be limited or incomplete. Therefore, conclusions expressed or implied are tentative. Mention of trade names or commercial projects does not constitute endorsement or recommendation by the State of Alaska.

PURPOSE

The objective of this report is to summarize water quality monitoring data of Clearwater Creek and its adjacent wetlands near Delta, Alaska, and to determine any impacts from agricultural activity. This summary can be used to evaluate past monitoring activities and make recommendations for any future monitoring in the Clearwater Creek watershed.

HISTORY OF CLEARWATER CREEK WATER QUALITY MONITORING

In 1978 and 1979, Dr. Jacqueline LaPerriere conducted a study of water quality conditions in the Clearwater Creek, as part of the baseline studies for the Delta Agriculture Project I (LaPerriere 1978-79). The objective of this research was to record information and conditions characteristic of the area prior to large scale agricultural development. Water quality parameters tested were: alkalinity, conductivity, color, chemical oxygen demand (COD), dissolved oxygen (DO), hardness, pH, phosphorus (orthophosphate, total phosphorus, total dissolved phosphorus) nitrogen (nitrate, nitrite, organic), potassium, total dissolved solids, total suspended solids, silica, temperature and turbidity.

Public concern over a new undocumented brown staining in the waters of the North Fork of the Clearwater Creek in 1982, led the Alaska Department of Environmental Conservation (ADEC) to start a monitoring program utilizing some of Dr. LaPerriere's testing parameters and sampling locations from the baseline study. The testing results for the brown staining were inconclusive. It is thought that the brown stain observed flowing downstream from the North Fork of Clearwater Creek, was from the vegetative decay processes in the wetland bog area surrounding the North Fork. In addition to the existing sampling parameters used by Dr. LaPerriere, ADEC decided to conduct new tests for pesticides, tannin/lignins and coliform bacteria. A continuous sampling program was conducted from 1982 to 1986. Data was summarized in the Salcha-Big Delta Soil and Water Conservation District (SWCD) report published in 1987. ADEC sampling data for that period were comparable to the baseline ranges obtained by Dr. LaPerriere (See Data Summary, Table 1). Lack of staff and the Exxon Valdez oil spill kept ADEC from monitoring the Clearwater Creek in the ensuing years of 1987-89.

In 1990, water quality concerns over the Fairbanks Municipal Utilities System's (MUS) permit application to spread treated wastewater sludge on farms in the agricultural project prompted ADEC to renew monitoring activities in the Clearwater Creek watershed. Previous ADEC sampling locations were used, and new parameters were added, including tests for total recoverable metals, (iron, cadmium, copper, lead, zinc and nickel), measured

by the ICP method. Screening for pesticides was expanded to include water, sediment and fish tissue sampling. No major changes were noted in the 1990 sampling results except for higher potassium levels recorded at all three water sampling sites. With just one sampling event that year, it was difficult to infer any conclusions.

ADEC monitored the Clearwater Creek again in 1991. The water sampling consisted of one sample taken during the month of April at Cosgrove Farm, and a set of samples taken in August duplicating the 1990 water sampling effort. New sediment sample locations were established for pesticides and heavy metals near wetland bog areas inside the Delta Agricultural Project I. All 1991 water samples showed no major variation from the original baseline ranges (See Data Summary, Tables 1).

Fish Tissue Analysis for Pesticides

Both the United States Fish and Wildlife Service (USFWS) and ADEC have collected fish tissue samples from the Clearwater Creek. In 1982, tissue sampling by Dr. Howard Metsker (USFWS) found no detectable levels of 2,4 Dichlorophenoxyacetic acid (2,4-D) or 2,4,5, Trichlorphenoxy acetic acid (2,4,5,-T). Furthermore, he found no polychlorinated biphenols (PCBs) at levels above those specified by the EPA for acute and chronic toxicity in fish (Metsker 1981).

ADEC collected and analyzed fish tissue in 1983 and 1990. Insecticides and herbicides were found to be at non-detectable levels. Those parameters tested included 2,4,5-T, 2,4,5-TP, Dinoseb, Dicamba, 2,4-D, 2,4-DB, Dalapon and MCPP analyzed by EPA method 8150.

Water Sampling for Pesticides

ADEC's history of water sampling has found no detectable pesticides presence in Clearwater Creek using the EPA method 608.

It is believed that Delta farmers will continue the practice of applying standard pesticides to agricultural lands in the Clearwater Creek watershed. These pesticides are chemically attracted to particles of clay and organic matter in the soil. Yet, agricultural chemicals and pesticides show no signs of leaching downward in the soil (Knight et. al. 1981). Also, net moisture movement appears to be upward to the crop's root layer rather than downward to the water table (Knight et. al. 1979).

ADEC's major concern with farm chemicals is that flood waters may carry sediments and agricultural chemicals into Clearwater Creek. Another concern is the danger of pesticide spray drifting into surface water bodies. The use of buffer strips along streams and surface water bodies is the single most effective means for

minimizing both the direct and indirect adverse effects of herbicides and insecticides on water quality. The economics of spraying dictate preplanning with most farmers practicing judicial use of farm chemicals. However, chemical monitoring for pesticides should continue, especially if predictions for future grasshopper outbreaks are correct.

The problem of sporadic pesticide sampling is that of timing the sampling to the application events. Only when pesticides sprays are wind carried directly to surface water bodies, or when high water flow events carry eroded clay particles to the river system would the presence of pesticides be readily detectable by water sampling.

Sediment Sampling for Pesticides in Clearwater Creek

In 1990, ADEC took sediment samples at three locations for the analysis of pesticides. These Creek bottom samples found no pesticides presence at detectable levels (See Sediment Sampling Sites Map).

The most effective way to address the potential presence of pesticides in the Clearwater Creek drainage would be to sample water and sediments in the adjacent wetland bog areas and also to analyze fish tissues collected from Clearwater Creek for accumulation of agricultural toxins.

WATER QUALITY MONITORING ADJACENT TO CLEARWATER CREEK

Water Sampling

ADEC is concerned with the water quality in the wetland bog areas surrounding the Clearwater Creek. In the water quality monitoring of Clearwater Creek, ADEC has attempted to document migration of fertilizers and pesticides from the farm fields. Potassium testing is an indicator of the presence of fertilizer. In 1983, a water sample along a fire break adjacent to the North Fork of Clearwater Creek, found potassium levels of 5.5 mg/L, twice the baseline levels. A water sample from a ditch adjacent to Sawmill Creek detected potassium levels of 16 mg/L. A spring 1991 ADF&G water sample obtained from a culvert on the corner of Clearwater and Remington Roads found a potassium level of 5.32 mg/L. There was no previous baseline information on potassium levels from these sites. Many of these sample site locations drain working farms, and potassium levels higher than the Creek's baseline (1.92 mg/L) would be expected. Furthermore, these sites were sampled during high water flows when runoff from farm fields carried high sediment loads.

A prevailing hypothesis is that the wetland bog vegetation absorbs and filters out agricultural chemicals and sediments transported from surrounding farms and land clearing operations.

In the North Fork, after heavy rainfall, the problem of brown staining has repeatedly been documented (SWCD 1987). It is possible that the wetland bog vegetation barrier can no longer absorb and filter all the surface water it receives.

Sediment Sampling

ADEC has identified the wetland bog areas as an important protector of the water quality in Clearwater Creek. Further study is needed to understand the natural wetland processes of filtering and nutrient uptake. A better understanding of existing levels of agricultural chemicals in the soil is also necessary. Previous bog sediment samples were analyzed for pesticides, heavy metals and potassium levels. ADEC's sediment sampling history has not found detectable levels of pesticides nor has the sampling established the presence of potassium build-up in the Delta area soils. In 1990-91, wetland bog samples were taken at pre-determined locations.

Although, ADEC has never found a detectable pesticide presence in its sediment samples, the University of Alaska (UAF) has found pesticide levels in farm soils within the agricultural project. Sediment sampling by Dr. Stolzberg in 1979 found DDT at one site along the Alaskan Highway, and the alpha isomer of the chemical Benzenehexachloride (BHC) was found in four out of twelve test sites (Stolzberg 1980). The gamma isomer of BHC is lindane, a widely used insecticide. The alpha isomer is less toxic than the gamma isomer but is more persistent in the soil. In the past, mixtures of the BHC isomers were used together as an insecticide. However, Dr. Stolzberg hypothesized that BHC is related to recent heavy equipment and clearing operations and not related to the use of BHC as a insecticide.

RECOMMENDATIONS

ADEC's objective in monitoring the water quality of the Clearwater Creek and adjacent wetlands is to document potential impacts of agricultural activity in this watershed. Agricultural practices and major erosion problems from high water flows from the Granite Mountains via Rhoads/Granite and Sawmill Creeks still pose a threat to the water quality in the Clearwater Creek. However, the potential problems of a large scale agricultural project have diminished with many farms being foreclosed on and formerly cleared land returning to vegetated cover. The following recommendations are proposed improvements in any future ADEC Clearwater Creek water quality, sediment and fish tissue monitoring program.

1. Continue to monitor water quality to assess impacts, identify trends and document problems.

2. Recommend a multi-agency meeting to update agencies on current Clearwater Creek studies and develop a consensus on future monitoring. The recommendations of the Salcha-Big Delta Soil Water Conservation District (SWCD, 1987) report on controlling water flows and erosion from Rhoads/Granite and Sawmill Creeks need to be discussed and re-evaluated. The threat of sediment and agricultural chemical discharge into the Clearwater Creek is still a reality. Any erosion control that keeps high water flows from impacting farm lands would be an important key to maintaining water quality in the Clearwater Creek watershed.

3. Continue to coordinate with the Salcha-Big Delta Soil and Water District Board and the Alaska Department of Fish and Game and other key agencies/organizations prior to implementing future water quality monitoring activities.

4. Coordinate with ADF&G and the SWCD a minimum of three sampling dates a year; one high water river sample conducted during spring break-up, and two water samples taken in the summer, one of which might be a storm event.

5. As a supplement to regular water quality monitoring, provide adequate sampling bottles and training for Delta ADF&G and SWCD staff to sample any unforeseen flooding or chemical application event.

6. Re-establish a summer sampling point below Cosgrove Farm. Re-establishing the 1979 sampling location (Charles Forck residence) would allow new information to be compared to the original baseline data, and would also permit the study of residential development and farming impacts along the lower river. The addition of this sampling location would increase summer testing to four locations.

7. Support land use planning to prevent erosion problems on new state farm land sales. Support bison range and military trail improvements within the watershed of Rhoads/Granite, Sawmill and Clearwater Creek to minimize and/or eliminate erosion problems.

8. Cancel the testing for Total Coliform bacteria, but continue to test for Fecal Coliform bacteria. Fecal Coliform testing is used to identify potential domestic wastewater discharges into Clearwater Creek.

9. Reduce pesticide water testing to a maximum of two sampling events a year in wetland bog areas; during

spring break-up and significant storm events. Sample timing is critical, the half life of sprays and costs of individual tests make it prohibitive to conduct random summer water sampling. In addition, pesticide monitoring should include a yearly composite sediment sampling in wetland bog areas, and a scheduled fish tissue sampling program once every three years. Water Quality Monitoring budgets should reflect this sampling schedule.

10. Stop Orthophosphate sampling. Time and money could be could be saved by discontinuing this test. Instead, sample and analyze for potassium as a indicator of fertilizer movement into the wetland bogs and into the Creek.

11. Identify exact sampling sites on the river corridor with permanent markers. Ensure that sampling and analytical methods for all tests are consistent from year to year. Ideally, a water quality monitoring program should have a sufficient number of sampling locations, sampling events, and samples per location to be statistically significant.

12. Identify and mark exact wetland bog sampling locations to maintain sample location consistency. Maps identifying all present and past sampling locations should be made available to ADF&G and SWCD.

13. There have been five major pesticides identified in use in the farmlands adjacent to the Clearwater Creek watershed (Malathion, Roundup, Sevin/Carbryl, 2,4-D, MCPA). All five major pesticides in use should be analyzed.

14. During high water events, it is important to analyze for tannin/lignins in Clearwater Creek water samples. Information as to how well the wetland bogs are functioning may be indicated through this test. Detection limits should be set at the lowest levels possible.

CONCLUSION

Water quality monitoring of the Clearwater Creek watershed and adjacent wetlands should continue with a minimum of three sampling events a year. There should also be annual assessment of data generated so that potential negative environmental impacts can be identified and sound management decisions made to protect the Clearwater Creek watershed. A composite program of water, sediment and fish tissue sampling to identify agricultural impacts would be fundamental to any future monitoring program.

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