

APPENDIX "H"

THE FERN LAKE MINERAL METABOLISM PROGRAM

The Fern Lake Mineral Metabolism Program began in 1957 with a \$20,000 grant from the Atomic Energy Commission for a ten-year program, and with further funding the program lasted until 1971. The program's intent was to "yield answers as to how minerals circulate their way through a watershed and how humans could make such a watershed more productive."* The team of researchers from many countries and many fields of science was led by Lauren R. Donaldson, a University of Washington fisheries professor who was perhaps the leading authority on salmonid nutrition, growth, and navigation. His status in the field had been attained years earlier by genetically enhancing a species of rainbow trout that came to be known as the Donaldson Trout, which could weigh as much as 20 pounds and was capable of producing 27,000 eggs.

It is interesting to relate how the project came to be. Because of his prominence in the field of salmon nutrition and growth, Dr. Donaldson was selected as the lead scientist to study the effects of radiation on the aquatic life of the Columbia River in the summer of 1943. When Hanford was selected as the site for plutonium production, the U.S. government was aware of the potential damage to the Columbia River's salmon industry, and they hired Dr. Donaldson to study these effects. This established a link between the atomic people and Donaldson. After WWII, the government again turned to Dr. Donaldson to lead the aquatic radioecological survey team of Bikini atoll following the 1946 Operation Crossroads tests. It was there Dr. Donaldson discovered that the vegetation had taken up the radioactive minerals from the surroundings, and because you could follow these "tagged" minerals with a Geiger counter, you could determine the minerals' movements through the ecosystem.

During these years, the 1940s and early 1950s, it was apparent that the dams being erected on the nation's major rivers were devastating fish runs and populations. Donaldson hypothesized that if humans could introduce runs to previously marginal waters and fertilize the waters with the correct nutrients, then salmon runs could effectively be transferred from the dammed rivers to these smaller streams and lakes with no net loss. The problem had been knowing which nutrients were needed and how much. Now, because of the radioactive elements, scientists could measure how minerals move through an ecosystem and could learn what specific minerals were needed in a particular system to enhance fisheries production.

Dr. Donaldson was interested in steelhead and rainbow trout, and sockeye salmon: species of fish which were not in the Fern Lake ecosystem. In the fall of 1957, the lake was treated with Rotenone (one part per million) to kill all aquatic life. In May, 1958, 20,000 steelhead were planted. This was a common practice in the 1950s to "rehabilitate" a watershed by getting rid of undesirable species making it suitable for a desired specie. For the next six plantings of fish the scientists used steelhead. After that they tried a rainbow trout-steelhead hybrid fish, and lastly, the scientists planted sockeye salmon.

Although many things were learned during the Fern Lake Program, it never provided

*All quotes and information taken from University of Washington Graduate Student Matthew W. Klinge's paper, "Plying Atomic Waters: Lauren Donaldson, radioecology, and the 'Fern Lake Concept'," Spring, 1994, University of Washington.
the results Donaldson and the others had hoped for. Their quest for a controlled

experiment in a natural setting proved difficult to accomplish. The greatest continual problem was with the lack of fish migrating to sea in any appreciable numbers. This caused problems when the scientists introduced a new group of fingerlings the following year not only because of the competition for food from the one-year olds but also from the fact that the older fish tended to feed on the younger fish.

Because of this problem of competition and predation, the lake was treated with Rotenone three other times during the early years of the project (1958, 1960, 1962). All other times the scientists netted the yearlings to remove them but could not get them all. Other problems included some years of low stream flow at the time of fish migration, decreases in zooplankton and periods of algae blooms changing the feeding habits of the fish, and higher natural mortality rates in the case of the hybrid fish.

It is thought that Dr. Donaldson was influenced in his ideas about minerals circulating through an ecosystem by the writings of naturalist Aldo Leopold, who said the migrating salmon was the best way to bring minerals and nutrients back to their origin and replenish the ecosystem. Since the Fern Lake Project had little success migrating salmon to and then back from the sea, Dr. Donaldson and the others did not have enough data from which to assess the type and quantity of minerals needed to sustain and enhance an ecosystem.

From our perch in the latter part of the 20th century we can see the shortcomings of this project and the post-war philosophy of shaping, improving, and enhancing nature. One wonders if the project may have met with greater success had Dr. Donaldson chosen coho salmon, already with established runs to Fern Lake, for his specie to enhance. Then there would have been no need to apply Rotenone to the lake; an action which may have caused unknown changes in the balance of the ecosystem. What he was after was very much like what doctors do now: injecting a into a patient to see where the blood flows freely and where there are blood clots.