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Cooperative Fish-Rearing Programs in Hanford Site Excess Facilities

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COOPERATIVE FISH-REARING PROGRAMS IN HANFORD SITE EXCESS FACILITIES

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ABSTRACT

In 1993, two successful fish-rearing pilot projects were conducted in Hanford Site 100 K Area water treatment pools (K Pools) that are excess to the U.S. Department of Energy needs. Beginning this spring, two larger cooperative fish programs will be undertaken in the K Pools. One program will involve the Yakama Indian Nation, which will rear, acclimate, and release 500,000 fall chinook salmon. The other program involves the Washington Department of Fish and Wildlife, which will rear warm-water species (walleye and channel catfish) for planting in state lakes. Renewed economic vitality is the goal expected from these and follow-on fish programs.

I. INTRODUCTION

The legacy of the Cold War and the associated U.S. Department of Energy (DOE) national defense plutonium production mission at the Hanford Site in Washington State has resulted in a large, federally controlled area that requires a massive cleanup effort so the land can be restored to a useful condition. In anticipation of the eventual completion of this Hanford Site cleanup mission, the DOE has established the Office of Economic Transition (OET) to identify and implement policies and actions that will support the cleanup mission and the long-term economic development of the local Tri-Cities, Washington, area. The latter action is necessary because current Hanford Site employment represents 25% of all Tri-Cities jobs and more than 45% of total local income. Thus, conducting an economic transition program is important at a federal installation that is faced with transition from a defense production mission to a cleanup mission, which will be followed by rampdown and ultimate closure. At issue are the human and physical assets of the Hanford Site, and the final disposition of those assets. With an effective economic transition program, the potential exists to redeploy the highly skilled, well-trained, and educated workforce developed and used during the cleanup mission of the Site; and, equally as important, to find alternative productive uses for the land, facilities, and equipment.

The DOE is supported in this arena by Westinghouse Hanford Company's (WHC) Site Transition Center (STC) organization. An important goal of the STC is to redeploy excess and underused Hanford Site facilities, equipment, and land for new productive uses that can (1) eliminate the need for costly decommissioning, (2) help maintain and diversify the economy of the local region, (3) foster business development, and (4) generate economic and social benefits. An important underlying theme of all OET and STC activities is the economic transition of the local region. As time and money are spent to achieve environmental restoration of the Hanford Site, the aim is to leverage that investment into a stable economic future for the region based on the technologies involved and new uses for surplus facilities. The objective is not to clean up and close, but to clean up and convert to a new economic vitality.

A specific example of redeploying excess Hanford Site facilities to a productive new use is the rearing of fish in the 100 K Area river water treatment basins (K Pools). These pools provided clean water to the K Area plutonium production reactors until the 1970's.

II. FACILITY DESCRIPTION: K WATER TREATMENT POOL COMPLEX

Water treatment pools located in the 100 K Area of the Hanford Site were built in the early 1950's to provide cooling water to the K Area plutonium production reactors.

Raw river water was flocculated in these pools to remove sediment so that cooling water going to the reactors was free of abrasive particles. The pools are constructed of unlined concrete and located approximately one-half mile from the Columbia River. Twelve pools comprise the 100 K Area water filtration complex. Two of the K East pools are being used to provide treated water for serving the 100 Area environmental restoration mission.

These pools were designed to receive water pumped directly from the Columbia River. When operated for reactor-cooling purposes, three pumps were used to pump river water up to each pool. Currently, one pump remains operational for delivery of river water to the K East water treatment pools: a 1,500-hp pump with a design output of 32,000 gal/min.

The water treatment pools are at the highest elevation of the K Area facilities, located 77 ft above the maximum Columbia River flood stage, which occurred in 1894. When the K Reactors were in operation, water flowed down from the water treatment pools to clear wells (covered, reinforced concrete reservoirs), to and through the reactors, and eventually to an outfall structure for eventual release through an 84-in. diameter discharge line to the Columbia River. Thus, the cooling water made a one-way pass: from the river to the water treatment pools, through the reactors, and then back to the river.

Each water treatment pool is 351 ft long and 127 ft wide, with a nominal water depth of 17 ft. The capacity of each pool is approximately 6.3 million gal of water. The pools are not covered or protected, other than being surrounded by a guardrail. The water surface open to the air for each pool is about 1 acre in area.

When the K Reactors were in operation, 260 million gal/day of cooling water were produced by the water treatment pools. In recent years, the maximum flow rate of water permitted to be discharged from the pools to the river is 5.28 million gal/day or about 2% of the original capacity.

III. USE OF WATER TREATMENT POOLS FOR FISH PROGRAMS

Recently, it was realized that the K Area water treatment facilities might be suitable for the rearing of fish. A "marketing" effort was undertaken to match the facility with potential users. At this time, four fish-rearing projects have either been conducted or are in various stages of progress or implementation. These will be described to explain the participants, the purposes, and the scope of each project.

IV. WASHINGTON DEPARTMENT OF FISH AND WILDLIFE - CHINOOK SALMON PROJECT

From April 5 to May 28, 1993, the DOE, Washington Department of Fish and Wildlife (WDF&W), Pacific Northwest Laboratory, WHC, and the Tri-Cities Industrial Development Council (TRIDEC) participated in a cooperative project in which 150,000 juvenile fall chinook salmon were held and fed in a floating net pen tethered in a K Pool. This constituted the "grow-out" phase of fish hatchery operations, which is a limiting factor in WDF&W hatchery production because of the large capital cost associated with building grow-out ponds. These juvenile salmon came from the Priest Rapids Hatchery on the Columbia River. (The Priest Rapids Hatchery is owned by the Grant County Public Utilities District and operated by the WDF&W.) When the salmon reached "smolt" stage, i.e., were ready to begin their migration to the sea, they were returned (via truck) to the Priest Rapids Hatchery for imprinting and release.

The growth and survival of the fall chinook salmon in the K Pools were similar to that experienced in WDF&W hatcheries, indicating that conditions in the K Pool net pen are suitable for rearing hatchery salmon through the grow-out phase. Less than 1% mortality occurred during the 2-month holding period. The juvenile salmon held in the pool contained no gamma-emitting radionuclides that could be attributed to operations at the Hanford Site.

During this project, about 20,000 juvenile fall chinook salmon escaped the net pen. These fish, which are swimming freely in the K Pools, survived the summer of 1993 and the winter of 1994. They are growing and continue to be an excellent test case of the viability of the K Pool environment for fish rearing.

If used at a higher capacity than was the case in this project, the productive capacity of the K Pools may add significantly to current salmon hatchery production.

V. PRIVATE AQUACULTURE COMPANIES - WHITE STURGEON PILOT PROJECT

In August 1993, a second pilot project was initiated in which white sturgeon were placed in a net pen in the K Pools, where they will be held and fed for at least 2 years. These fish had previously been raised in tanks, and some are as large as 3 ft long and weigh 25 lb. The fish are owned by two private companies, Stolt Sea Farm of Port Angeles, Washington, and FishPro, Inc. of Port Orchard, Washington, in cooperation with Jerry Schafer Farms of Odessa, Washington.

Through the auspices of TRIDEC, Stolt Sea Farm and Chevron Chemical Company installed an experimental demonstration facility at the Chevron Finley, Washington, fertilizer plant in December 1990 and stocked it with 200 small white sturgeon. Clean, warm cooling water from plant operations was routed through small (500 gal) tanks containing the fish before the water was returned to the Columbia River. This demonstration project examined the survival, growth rate, and health of the sturgeon. The sturgeon had outgrown the Chevron tanks, and an interim holding facility was needed while plans for expanded operations were developed.

FishPro, Inc., an engineering and environmental consulting firm, and Jerry Schafer, a farmer near Odessa, Washington, had conducted an experimental project rearing white sturgeon in geothermal warm groundwater. After passing through the four 4,000-gal fish tanks, the water was collected and used to irrigate field crops on Mr. Schafer's farm. This cooperative venture needed similar longer-term fish-holding capability. About 550 of the Stolt Sea Farm and FishPro/Schafer sturgeon were transferred to the K Pools. The intent is to raise these sturgeon as domestic broodstock to obtain eggs and young fish for sale as stock to other aquaculturists and to rear the sturgeon to a harvestable size.

The culture or fish farm raising of white sturgeon has been under development for approximately 10 years. Fresh sturgeon commands a good price as a food source for white tablecloth restaurants, bringing about $5.00/lb finished weight to the aquaculturist, compared to $1.50/lb for trout. In addition, sturgeon eggs are highly prized as caviar.

The K Pools sturgeon project may play a role in bringing domesticated sturgeon breeding into practice and provide opportunities to conduct valuable research into this relatively recent field of fish culture.

VI. YAKAMA INDIAN NATION - CHINOOK SALMON PROJECT

The Yakama Indian Nation has proposed using the Hanford Site K Area water treatment pools for rearing and acclimating 500,000 upriver bright juvenile fall chinook salmon this spring. These fish will be 100% marked (wire tagged) at the hatchery before delivery to the K Pools so the fish may be tracked after release. This will allow evaluation of straying, a concern for two Snake River salmon species that are now listed under the *Endangered Species Act of 1973*.[1] The chinook salmon will be subsequently released into the Columbia River near the K Area to enhance the stock of returning adult fall chinook salmon to the Hanford Reach. These returning adults will contribute to the area's economy by increasing the salmon available for tribal, commercial, and sports fishermen. In addition, some of these returning adults will spawn naturally to continue the cycle for future generations.

As a co-manager of the Columbia River salmon resources, the Yakama Indian Nation has coordinated the development of this project with other fish management entities (e.g., WDF&W, National Marine Fisheries Service, and U.S. Fish and Wildlife Service). This project is authorized and endorsed by the 1993-94 Columbia River Production Agreement. The juvenile fall chinook salmon (1993 brood year) were obtained from the Bonneville Hatchery in early May 1994. Following delivery to the K Pools, the juvenile salmon were unloaded from trucks and placed in 14 net pens supported by aluminum frames and floats. The pens are approximately 20-ft long by 20-ft wide by 9-ft deep and tethered in place in the K Pool. The fall chinook will be reared in the net pens until late June 1994, at which time they will be removed from the net pens, transported to the Columbia River (about one-half mile away), and released.

In helping to rehabilitate an important natural resource in the Columbia River, this cooperative program involved a traditional food source used by all the Native American tribes in the Northwest. This resource is of the utmost importance in tribal culture for subsistence and ceremonial purposes. In addition, this program examined the viability of larger-scale fish-rearing activities in the K Pools.

VII. WASHINGTON DEPARTMENT OF FISH AND WILDLIFE - WALLEYE AND CHANNEL CATFISH PROJECT

The WDF&W, the Washington State legislature, and WHC are proposing to develop a project for using the K Pools to rear walleye and channel catfish and stock them in Washington lakes. Many newcomers to the state are interested in fishing for cool- and warm-water species (e.g., brown, rainbow, and brook trout; small- and large-mouth bass; walleye; blue gill; perch; and channel catfish). Thus, there is increasing pressure on the WDF&W to stock appropriate state waters with these species of fish. Capital expenditure requirements to build rearing facilities currently present a major obstacle. Thus, the adaptation of the K Pools to meet some of these needs was explored.

The WDF&W will conduct a demonstration project at the K Area in which about 250,000 walleye fry will be reared in one-half of a K Pool filled to a depth of about 3 ft with nearly-stagnant Columbia River water. The

WDF&W supplied the fry, which were hatched from eggs obtained from outside the state, in early May. The pool water was fertilized using inorganic and organic (e.g., hay and straw) material and allowed to heat up via direct sunshine before introduction of the walleye fry. Fertilization promoted fish production by increasing the quantity and quality of food organisms (i.e., promotes algal growth on which zooplankton graze, either or both of which supply food for the fry and fingerlings). The walleye fingerlings will be reared for about 1 month (until June 1994), at which time they will be collected using a kettle or catch basin arrangement installed at the north wall of the rearing pool. The walleye will be subsequently planted in landlocked state waters.

The WDF&W is also investigating a channel catfish rearing project that will be conducted in association with the walleye project in the same K Pool. Approximately 100,000 channel catfish fry about 2 to 3 in. long will be obtained by the WDF&W in June 1994. These fish will be placed in two net pens in the same K Pool in which the walleye were reared. This will occur after the walleye are removed. The water level in the pool will be raised to the point that the net pens can easily be accommodated, meaning that the entire basin will be used. Again, nearly-stagnant water conditions will be maintained. The WDF&W prefers to raise the catfish until they are at least 8 in. long before they are planted in order to reduce predation. (Incidentally, a catfish of this size is valued at about $1.00 each.) The catfish will be held and fed in the K Pool as long as practical. However, catfish stop feeding when the water temperature falls below 60 °F, so there is little incentive to keep them in the K Pool after this occurs. Thus, the catfish will be collected from the net pens in September and October 1994.

When it is time for the juvenile walleye and channel catfish to be released, the fish will be collected and transported to various locations, many of which will be in eastern Washington. When these walleye and catfish grow to a catchable size, they will contribute to the area's economy by increasing the supply of fish available for sports fishermen.

VIII. IMPLEMENTATION AND CONCLUSIONS

The foregoing discussion summarizes the Hanford Site fish projects that have been implemented to date. These projects have been at the forefront of the Site's effort to convert government facilities to new beneficial uses. To date, marketing efforts have consisted of bringing the availability and capability of the K Pools to the attention of potential users, and then encouraging them to make proposals.

Once an informal proposal is received, the next step in this pioneering effort has been to pursue implementation. Various impediments to implementation have been encountered, but up to now all have been overcome. An anticipated concern was that fishery projects undertaken at the Hanford Site may be associated with radioactive contamination and thus may be rejected by the public.

A tremendous effort has gone into providing public information on the Hanford Site fish programs. Media events were held when each rearing project was introduced and when the fish were collected. An information program, developed for use by the Hanford Speakers Bureau, has been presented at numerous speaking engagements. A stop at the K Pool fish projects has been added to the agenda for various groups touring the Hanford Site. A fish program exhibit was constructed and is on display in the Hanford Science Center. In addition, the fish projects have been incorporated into an exhibit of the overall STC conversion programs; the exhibit has been used at various conferences, trade shows, and symposia. Public acceptance of the program has generally been positive.

Hanford Site fish project implementation has called for addressing regulatory issues, such as compliance with *National Environmental Policy Act of 1969*[2] and water discharge permits, and for negotiating agreements addressing participant responsibilities and liabilities. To date, implementation of all four projects has required few site preparation or modification activities, and funding requirements have been moderate. The expenses that have been incurred and those presently anticipated are not expected to even begin to approach the $2.3 million estimated cost of decommissioning the K Pool facilities.

Cooperative fish-rearing programs between the DOE and fishery agencies and interests have been one activity occurring at the Hanford Site that seems to have the approval of all stakeholders because it satisfies almost everyone's value system. Specific benefits derived include the following:

- The ability to reuse an existing facility that is excess to the DOE's needs, thus demonstrating financial responsibility

- The ability to form a partnership between the DOE and fishery agencies and interests, thus establishing a situation for creating teamwork and goodwill.

Each project that is successful helps to create an atmosphere and an infrastructure that is able to "seed" new

fish-rearing activities for the K Pools. The information gained could lead to long-term productive reuse of the K Pool complex, which can positively impact the DOE's cleanup mission by delaying or avoiding the need for costly decommissioning of these useful facilities. These projects also serve as successful examples for other redeployment opportunities.

In conclusion, the Hanford Site K Pool fish projects have enjoyed wide acceptance and support. These early successes should make other conversion attempts easier to achieve. In the process, benefits in renewed economic vitality may accrue from the tremendous investments that were originally made in these and other federal facilities.

REFERENCES

1. *Endangered Species Act of 1973*, 16 USC 1531, et seq.

2. *National Environmental Policy Act of 1969*, 42 USC 4321, et seq.

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