



Yakima Basin Resource News

Washington Sea Grant

April 1989

Power Council Approves Work on More Fish Passage Projects

At its March 9th meeting in Missoula, Montana, the Northwest Power Planning Council adopted an amendment to its Fish and Wildlife Program that initiates predesign and design work on over 50 fish passage projects in the Yakima Basin. These projects, commonly referred to as "Phase II Screens," were originally included in an amendment submitted by the Yakima Indian Nation in 1987. Instead of incorporating the Phase II Screens in the Yakima Basin section as intended, however, the Power Council placed these projects in the appendix with a number of other projects. Design and construction of these projects could not begin until sub-basin planning was completed.

But with work on the major fish passage projects winding down, further delay of the Phase II Screens

would leave the Yakima Basin Fish Passage Technical Work Group (TWG) with little to do. The TWG would probably be disbanded, and the Basin would lose the services of this unique body of expertise.

See related photo, page 2.

In addition, engineers assigned by the Bureau of Reclamation to the fish passage projects would be available for other projects and might be transferred. In short, all the fish passage expertise assembled over the past six years very probably would evaporate. Collecting this ability once the Phase II Screens were approved would be time-consuming and expensive, if not impossible.

It was against this background that the Yakima Indian Nation, after consultation with irrigation districts, Pacific Northwest Public Utilities Conference Committee, and state and federal fisheries agencies, submitted the recent amendment to the 1987 Fish and Wildlife Program. The amendment allows predesign and design work to begin on the Phase II Screens in FY 89. Construction, however, is still contingent upon adoption of the Yakima Basin sub-basin plan by the Power Council, which is expected to occur sometime in 1990. Since final designs on the first Phase II Screens projects will not be ready until early FY 91, this sequence of effort will allow construction of Phase II Screens to begin as soon as the first designs are completed.

Completion of the entire list of Phase II Screens is scheduled for 1995. These new fish facilities will offer protection to migrating and rearing salmon and steelhead, and materially assist the restoration of salmon and steelhead runs in the Yakima Basin.

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Court Sets Schedule in Yakima Basin Water Adjudication Proceedings

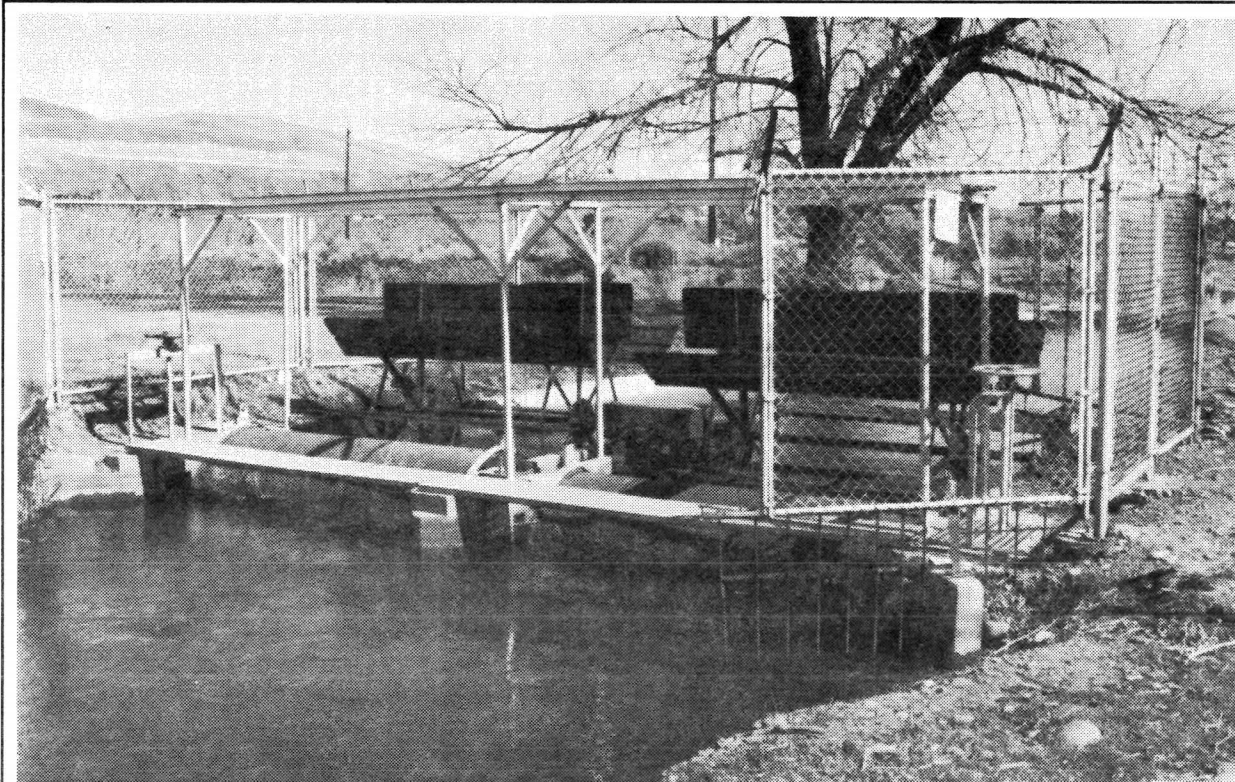
In December 1988, Judge Walter A. Stauffacher issued a Scheduling Order for the Yakima Basin Water Adjudication Case, commonly known as the Acquavella Case. This Order establishes the pace and sequence of events leading up to the hearing on the Motion for Summary Judgment filed by the Sunnyside Valley Irrigation District in 1988; the sequence and timing of discovery; and the date of trial.

With respect to the Motion for Summary Judgment, Judge Stauffacher's Scheduling Order gives the Sunnyside Valley Irrigation District until May 1, 1989 to file memoranda and records supporting their motion. The United States then has until June 15th to submit memoranda and records in opposition to the motion, after which the Sunnyside District has until July 15th to file reply memoranda and rebuttal records. The United States then has until August 15th to file any response documents. Hearing on the motion will then occur in September 1989.

Judge Stauffacher established two rounds of discovery pertaining to the claims of the United States and other major claimants. ("Discovery" is the process by which each side obtains and evaluates the information, data, and other evidence possessed by the opposing party in a legal proceeding.) The first round of discovery is to be completed by June 30, 1991. The second round commences on July 1, 1991 and is to be completed by June 30, 1992.

The final portion of Judge Stauffacher's Order set October 1, 1992 as the date for trial to start on federal water rights claims and claims of other major claimants.

What this all means is that barring some sort of negotiated settlement, the Yakima Basin will go through very lengthy and expensive water litigation that will take many years to complete. As a result, the Yakima Basin will continue to experience many more years of uncertainty with respect to water rights and water supplies.



This fish passage screen on Union Gap Canal is one of the "Phase II Screens" that will be re-designed under the Power Council's Fish and Wildlife Program. See related article, page 1.

Yakima Project Update

By **Thomas J. Clune**
Yakima Basin Project Manager
Bonneville Power Administration

As has been previously discussed in the YAKIMA BASIN RESOURCE NEWS, the Bonneville Power Administration, pursuant to the Northwest Power Planning Council's Fish and Wildlife Program, is currently involved in the predesign of various types of anadromous fish production facilities in both the Yakima and Klickitat River Basins in Central Washington. These facilities would include a central hatchery, satellite, acclimation, and trap and haul installations in both basins. In order to determine feasibility and alternatives, a preliminary design report is currently being prepared. This report will incorporate biological and physical information about the project into one document. This report is expected to be completed in April 1990 and will be available for public review at that time.

This project began when the Yakima Indian Nation submitted a recommendation to the Northwest Power Planning Council (NPPC) identifying the need for facilities to supplement depleted natural runs. This recommendation was adopted by the Power Council and incorporated into Section 700 of their Columbia River Basin Fish and Wildlife Program (Program). Once this recommendation was adopted into the Program, a Master Plan was developed providing an outline for the preliminary design report.

Development of the preliminary design report for the Yakima/Klickitat Production Project began in November 1987. The main focus has been on environmental analysis, biological investigations, and coordination of these activities with all those interested or involved with the project. These include federal, state, and local agencies; the Yakima Indian Nation; landowners; irrigation districts; and the general public.

Public involvement activities continue on a frequent basis. A series of public meetings began during the week of August 21, 1988, as part of the Yakima-Klickitat sub-basin planning process. This process is related to the Yakima/Klickitat Production Project and is also an element of the Power Council's Fish and Wildlife Program. These meetings were held in Ellensburg, Yakima, Goldendale, Richland, and Vancouver. The concerns voiced at these meetings were consistent with those received at previous public meetings.

Technical workshops have been held with sport fishing groups to discuss concerns and exchange information. One meeting was held in Portland in December, and another meeting was held in Yakima during January. Among the concerns expressed by sport fishermen were potential inter-specific competition between salmon, steelhead, and resident trout; genetic impacts on current stocks of salmon and steelhead; and, the harvest implications of salmon and steelhead restoration. More technical workshops are being planned.

Individual meetings with landowners, irrigation districts, and others continue. One of the primary focus of such meetings is the question of fish production in the Yakima Basin tributaries. The tributary issues are being dealt with on a case-by-case basis, due to the unique features of each stream, species of fish, and agricultural requirements.

BPA is currently preparing an Environmental Assessment (EA) as part of the preliminary design effort. The EA will address various environmental issues related to this project.

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About Yakima News . . .



Yakima Basin Resource News is an aperiodic publication of the Columbia/Snake River Office of the Washington Sea Grant Program.

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Editor: Randy Anderson, Marine Resources Specialist, Washington State University
News Editor: Bob Tuck, Yakima Basin Environmental Consultant

Yakima Basin Resource News reserves the right to edit articles for clarity and length. Suggestions, encouragement and criticisms from the readers are welcomed. Address correspondence to Washington Sea Grant, 1919 NE 78th St., Vancouver, WA 98665. (206) 696-6018

Life Cycle of Anadromous Fish

Editor's Note: This is the first in a series of articles that profile the major anadromous fish runs in the Yakima River Basin.

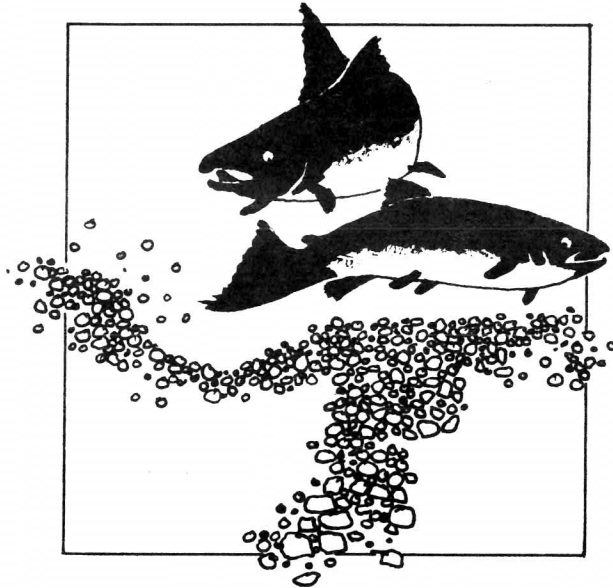
The following outline briefly describes each segment of the life cycle of salmon and steelhead.

Anadromous fish begin life in fresh water, migrate to the Pacific Ocean, where they spend from one to several years growing to maturity, and then return to their stream of origin, where the adults spawn and the cycle is renewed. In the Yakima Basin, anadromous salmonids originally occupied all available aquatic habitats, from small, even intermittent streams, to the lower mainstem Yakima River, including the major lakes. Since there were few physical barriers to migrating fish in the Yakima Basin, and these were limited to headwater areas, anadromous fish inhabited appropriate habitat throughout virtually the entire basin. With this rich habitat available, it is not hard to understand how the Yakima Basin supported runs totalling more than 500,000 salmon and steelhead.

Each species of anadromous fish has its particular habitat requirements. These include such items as spawning substrate, depth and velocity of water (for both spawning and rearing), cover, preferred food, wintering habitat, and adult holding areas. One species (sockeye) requires a lake to complete its life cycle. However, in general, all anadromous fish require the following in order to exist:

- Water of sufficient quantity and quality.
- Supply of appropriate food.
- Spawning gravel of appropriate size.
- Open access to and from the ocean.

Obviously, the life cycles of anadromous fish include major migrations over hundreds, if not thousands of miles, in both fresh and salt water. And this journey is undertaken not once but twice. If partial blockages are encountered during their freshwater journey, salmon and steelhead may be prevented from completing their life cycle, and the run will be reduced accordingly. If total blockages are present, the run will be lost entirely. Blockages, such as dams and dewatered streams, have been one of the primary causes of decreased salmon and steelhead runs in the Columbia Basin, and specifically in the Yakima Basin.



Spawning

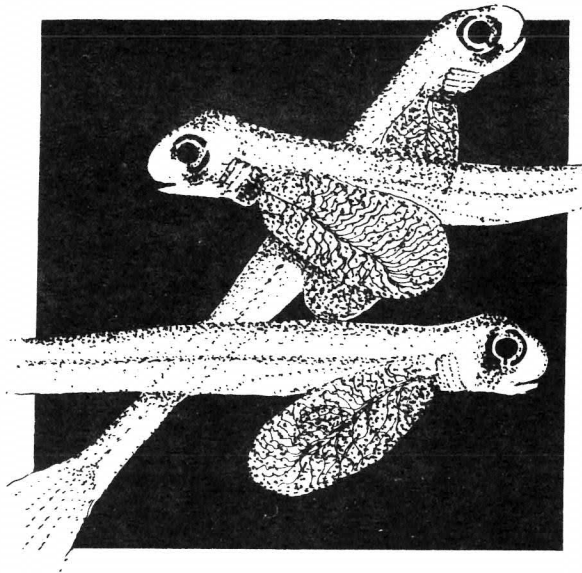
Here the cycle ends and begins. Adult salmon and steelhead engage in a series of activities that result in the construction of a depression in the stream bottom, called a redd, where the female deposits her eggs. As the eggs are laid, they are immediately fertilized by the male, and then sink into the depression, where they come to rest in the spaces between the gravel particles. After each session of egg-laying, the female moves slightly upstream and digs another depression, the gravel dislodged in this process covering the eggs just deposited. In this way all the eggs will be covered. When completed the entire redd is normally round, oblong or oval shape. Smaller species, such as sockeye or steelhead, produce redds that may be only 3 or 4 feet by 2 feet, while chinook redds may be 20 feet by 15 feet.

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Life Cycle...from page 4

Egg Incubation

Incubation begins as soon as the eggs are fertilized, and lasts from several weeks to several months, depending on water temperature. The warmer the water temperature, the shorter the incubation period. All salmon in the Yakima Basin spawn in the late summer to early winter time period, while steelhead spawn in the late winter to late spring time period. The embryos develop in the eggs, which are located as much as 1-1.5 feet under the surface of the stream bed. As hatching nears, the embryos begin to stir, finally splitting the eggs' shells and leaving the confines of the eggs.

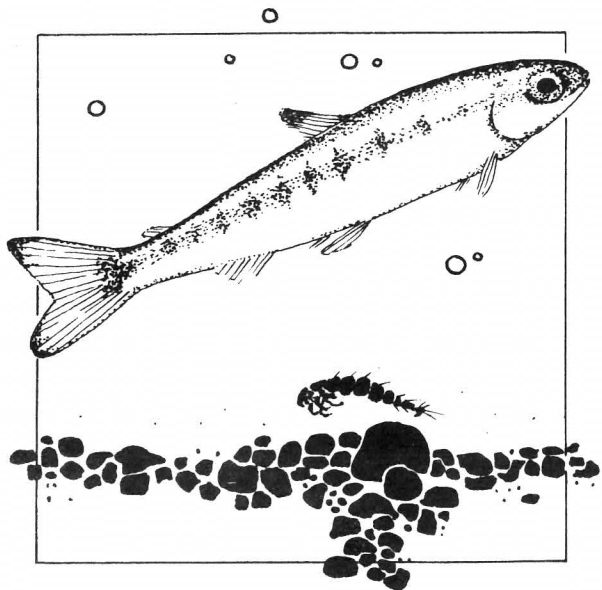


Juvenile Rearing

The newly hatched fry is hardly ready to take on the hazards of the stream environment. In fact, it is little more than an advanced embryo that is living outside the egg. It will stay in the gravel for up to several months more, before it begins its life as a free-swimming fish. During the alevin stage (also called sac fry), it will continue to draw nourishment from the yolk sac. As the weeks pass, the yolk sac is gradually absorbed, and the alevin begins to look more like a typical young salmon or steelhead. When the yolk sac is entirely absorbed, the fry is ready to begin life in the stream. It travels up through the gravel until it emerges into open water. This process is called swim-up. The fry now begins the freshwater rearing stage.

Young salmon and steelhead rear in fresh water from several months to several years, depending upon species. (Pink and chum fry move immediately towards salt water upon emergence from the gravel. They may spend as little as a few hours in fresh water. However, neither species was historically present in the Yakima Basin.) During the rearing period, the young fish take up residence in streams and lakes. Fall chinook spend only 3 months rearing in fresh water, while some steelhead and sockeye may spend 3 years before migrating to the ocean. Spring chinook, coho and many steelhead and sockeye rear for one year before undertaking this journey.

The juveniles of each species of salmon and steelhead have their own specific habitat requirements. Sockeye, for example, rear in lakes. The other species normally rear in streams, where each seeks out the combination of depth, water velocity, cover, and substrate that constitutes its version of preferred habitat. It is in these rearing areas that the juveniles will remain until their downstream journey begins.



Smoltification

During this dramatic process, two important events take place: (1) The individual juvenile salmon or steelhead undergoes a complex physiological process that allows

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Study Focuses on Restoration of

If anadromous sockeye salmon can be reintroduced into the Yakima River system, it would significantly enhance the Basin's salmonid resources.

Historically, the Yakima River Basin supported large runs of anadromous sockeye salmon that contributed significantly to the Columbia River harvest. Prior to development in the Yakima Valley, sockeye salmon probably returned annually to Cle Elum, Kachees, Keechelus, and Bumping Lakes. However, these runs declined rapidly between 1880 and 1900, and the development of irrigation storage reservoirs without fishways during the early 1900s effectively eliminated anadromous sockeye salmon in the Yakima Basin. Nevertheless, suitable spawning and rearing habitat still exist in and above lakes in the Yakima River system.

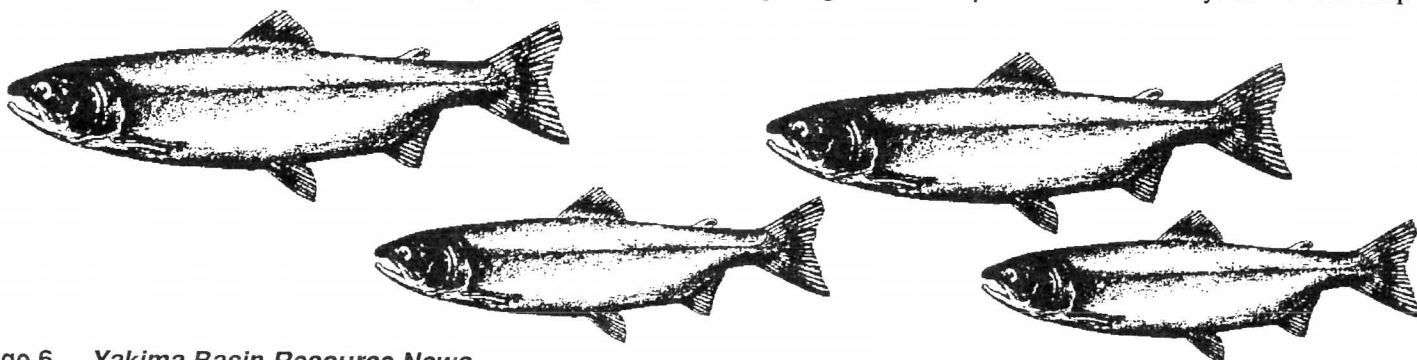
In 1986, a project to evaluate the feasibility of re-establishing anadromous sockeye salmon runs to Cle Elum Lake was initiated by the National Marine Fisheries Service (NMFS) and the Bonneville Power Administration (BPA). This research is part of the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program to enhance salmonid populations in the Yakima Basin. The immediate goal is to determine if sockeye salmon can successfully migrate from Cle Elum Lake.

Columbia River sockeye salmon are comparatively small fish (3 to 8 lb. average) that spawn during early fall in tributaries above lakes. The young emerge from the gravel in the spring, move downstream, and usually spend 1 to 2 years in the nursery lake before migrating to sea as

smolts. Springtime outmigration of smolts within the Columbia River Basin usually occurs between late March and early May. These fish remain 2 to 3 years in the ocean before returning as adults to spawn. Sockeye salmon have a strong homing instinct—adults enter their home river system from late June through early August, spend the summer months in their nursery lake and then ascend their natal river to spawn in late August and September.

Only two runs of sockeye salmon presently exist in the upper Columbia River Basin—the Lake Wenatchee stock (Wenatchee River) and the Lake Osoyoos stock (Okanogan River). The Wenatchee River Basin, which is adjacent to the Yakima Basin, has a viable anadromous sockeye salmon run with an average of 40,000 adults returning to the Columbia River annually. Lake Wenatchee has many geographical and limnological similarities to the lakes of the Yakima River Basin. Therefore, adult sockeye salmon from the Wenatchee Basin were selected as a suitable donor stock for Cle Elum Lake.

The first phase of the program (1987-88) centered on culturing healthy juveniles from the Lake Wenatchee donor stock. The techniques used were a modification of captive broodstock rearing concepts developed by NMFS for restoration of threatened runs of Atlantic and Pacific salmon. In 1987 and 1988, several hundred adult sockeye salmon were cap-



Basin's Sockeye Runs

By Thomas A. Flagg
Research Biologist
National Marine Fisheries Service

tured from the Wenatchee River and held for up to 90 days in net-pens in Lake Wenatchee. Prespawning survival was high in both years, averaging over 90% in 1987 and 85% in 1988. When ready, the adults were spawned at Lake Wenatchee and the eggs and milt were transported to quarantine facilities at NMFS Northwest Center in Seattle. Incubation of the fertilized eggs and rearing of the resultant fry were also conducted at this facility.

A primary concern of the fisheries agencies, tribes, and BPA is ensuring that broodstock and subsequent juveniles are free of infectious hematopoietic necrosis (IHN) virus. This viral disease can cause major losses of eggs and juveniles in salmon and steelhead hatcheries and is particularly prevalent in sockeye salmon on spawning grounds. All donor stock spawners were examined for the presence of IHN. In both years, all of the spawners from the net-pens were IHN-free, while natural river spawners have an infection rate of nearly 90%. The 1987-brood juveniles were periodically surveyed for viruses throughout rearing and remained IHN-free. The 1988-brood juveniles will also be surveyed during culture. Adult sockeye salmon held to maturity away from the spawning ground apparently do not contract, express, or transmit IHN. The net-pen isolation of prespawning sockeye salmon has proved to be a promising technique for producing IHN-free progeny.

A central problem in reestablishing anadromous sockeye salmon runs above irrigation reservoirs in the Yakima River system appears to be the need to provide safe outmigration routes past the dams. This may be possible without disturbing operating conditions at Cle Elum Lake. Normally, water releases from Cle Elum Dam are controlled through a deep-draft discharge tube. However, in most years, the lake is filled to the level of the spillway radial gate during the springtime outmigration period. Therefore, it may be possible to release spring discharge over the spillway rather than through the draft tube allowing the surface-migrating sockeye smolts to leave of their own volition. This concept may require the addition of small sluice gates at the dam to provide the safest possible exit route. This is being coordinated with the U.S. Bureau of Reclamation and will be tested during the study.

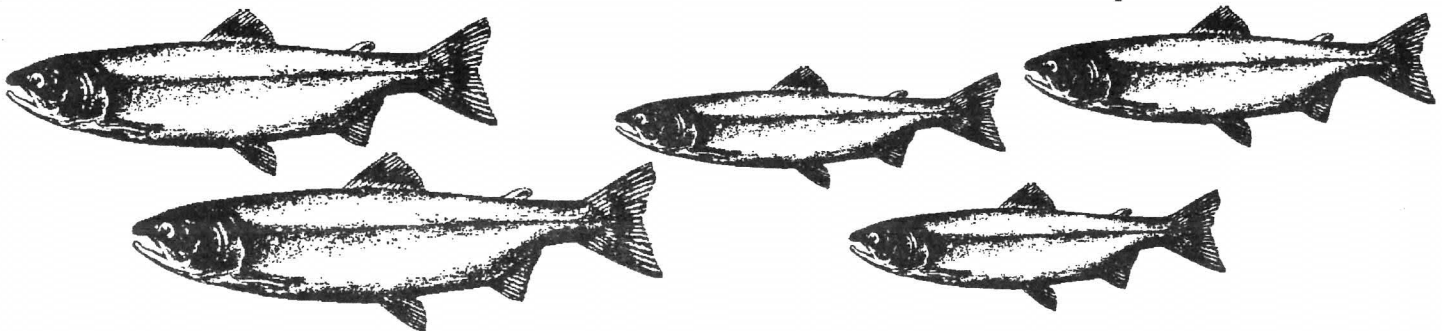
In 1989 and 1990, the Cle Elum Lake studies will examine the outmigration rate of juveniles from the lake and their success in migrating down the Yakima River. Several releases of 1987-brood juvenile sockeye salmon into Cle Elum Lake are planned for spring 1989. About 75,000 fish will be planted in the lake to determine if juveniles can successfully exit the lake. In addition, 18,000 fish will be released above and below the spillway at Cle Elum Dam to assess the ability of this structure to pass fish. In 1990, about 275,000 juvenile sockeye salmon will be released

into the lake to determine if population density affects outmigration rate.

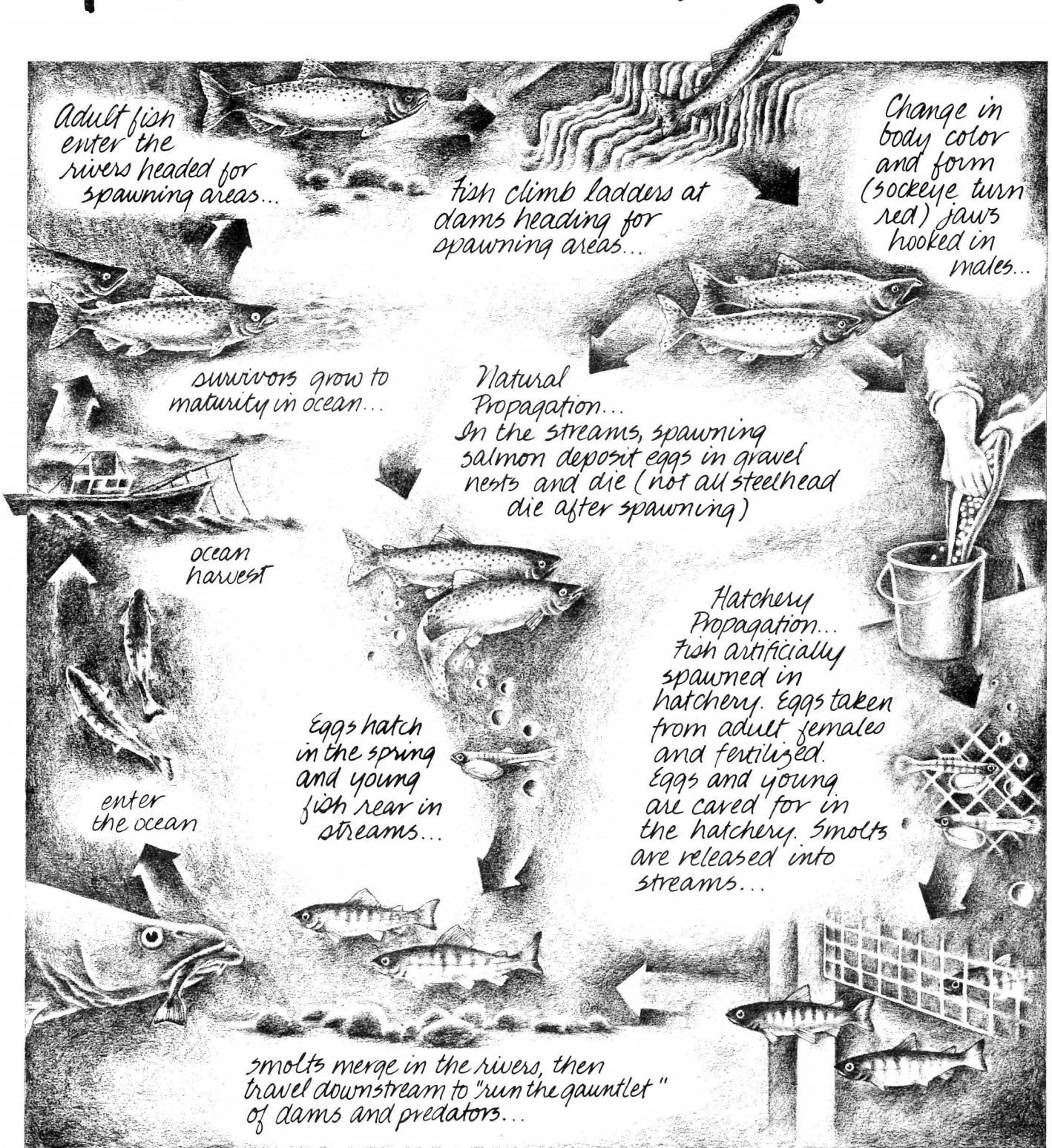
Each fish released into Cle Elum Lake will be marked by freeze-branding and coded-wire-tagging. In addition, some fish will be PIT-tagged, enabling researchers to electronically record individual fish without handling them. Outmigration rate and downstream survival will be assessed at the Prosser fish collection facility on the lower Yakima River in cooperation with the Yakima Indian Nation. The number and condition of fish recaptured at Prosser will be used to determine outmigration success. Recommendations for run restoration will be presented in 1991.

Sockeye salmon are excellent food fish that return to their home river in a bright, catchable condition. It is believed that Columbia River sockeye salmon stocks are rarely caught in the ocean.

Present stocks within the Columbia River Basin provide both a commercial and subsistence fishery on the lower Columbia River and a sports fishery at places like Lake Wenatchee. If anadromous sockeye salmon can be reintroduced into the Yakima River system, it would significantly enhance the Basin's salmonid resources. If juveniles can safely migrate out of Cle Elum Lake, a nursery area of over 3,000 acres and many miles of spawning habitat in the rivers above the lake may be recovered for prime sockeye salmon production.



Life Cycle Of Anadromous Fish



Source: Northwest Energy News

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the fish to change from a freshwater environment to a saltwater environment. (2) The juvenile salmon and steelhead migrate from their rearing areas to the ocean. In the case of juveniles that begin this journey from the upper Yakima, they will travel over 500 miles before exiting the Columbia River into the Pacific Ocean.

Although some juvenile outmigration may occur during the fall and winter, the bulk of the downstream migration takes place in the spring and early summer. This time frame corresponds with the historic period of high water in the streams and rivers of the Northwest, caused by the melting of the snowpack. Outmigrating during the high water is advantageous to the juvenile salmon and steelhead, as it hastens their journey to the ocean, and the turbid water tends to protect them from predators. If all goes well, the juvenile fish completes its physiological preparation and downstream journey at the same time, and it arrives at the mouth of the Columbia River, ready for the challenges of salt water.

Ocean Rearing

Juvenile salmon and steelhead spend from a few months to five or six years grazing on the oceanic pastures. (Eight years appears to be the maximum.) A few precocious males of some species may return to their stream of origin the fall of the same year that they entered the ocean. Most juveniles, however, spend at least one full year in the ocean before returning to spawn.

Many of the various Columbia River stocks range widely across the North Pacific Ocean. Some coho and chinook stocks turn left upon entering the Pacific, and range south along the Pacific Coast as far as northern California. Most stocks turn north, and it is these stocks that travel the farthest. Upper Columbia River chinook, including upriver fall chinook and spring chinook, swim vast distances across the Gulf of Alaska. Steelhead are also widely distributed across the North Pacific. Coho do not range as far north, primarily because they typically spend only a little over one year in the ocean.

No matter how far they migrate in the ocean, nor how many years they have spent away from fresh water, approaching maturity finds them nearing the mouth of the river from which they entered the ocean. In the case of Yakima River stocks, that entry point is the Columbia River. As they prepare to reenter fresh water, they likewise prepare to begin their final journey.



Up-stream Migration

The great up-stream migrations of adult salmon and steelhead in the Columbia River have awed man for thousands of years. The great pageant is as indicative of the passing seasons as migrating birds, or the turning of the leaves. These fish were the center of Native Americans' culture, religion, and food when the pyramids were being built.

Chinook enter the Columbia in late winter, and continue through late fall. Based upon the time of entering the Columbia, chinook stocks have been designated as spring, summer, and fall chinook. Steelhead enter during the spring, and continue through early fall. Coho and sockeye are basically summer run fish.

After completing their upstream journey, adult salmon and steelhead hold in some suitable area, such as a deep, quiet hole, waiting for the onset of spawning. During this time, the eggs and sperm become fully mature, ready for the final scene in their long play.

This time of waiting and resting may in fact be a prolonged period. Steelhead may spend close to a year in fresh water before spawning, while spring chinook may not spawn for nearly six months after entering the Columbia. Coho, summer chinook, fall chinook, and sockeye normally enter the Columbia 2-3 months before spawning. With the beginning of spawning, one cycle is completed, and another cycle begins.

Kittitas Reclamation District

By **Lee Henderson**
District Manager

The Kittitas Division in the earliest records was known as the "High Line" with a construction proposal in 1885 to take water out of the Teanaway River. In 1889, the County Commissioners appropriated funds for a survey near Easton.

Kittitas Reclamation District, organized under Washington State Laws in the early 1900s, planned to proceed with the project through issuance of bonds. However, it failed to get sufficient support. Then, in 1921, the District joined in an agreement with the Bureau of Reclamation under the Warren Act.

District construction began in 1926; had limited irrigation delivery beginning in 1930; and the project was completed in 1933. It is the only irrigation district in the Kittitas Valley constructed by the Bureau of Reclamation. Thus, the U.S. Government holds title to all government constructed facilities within the District.

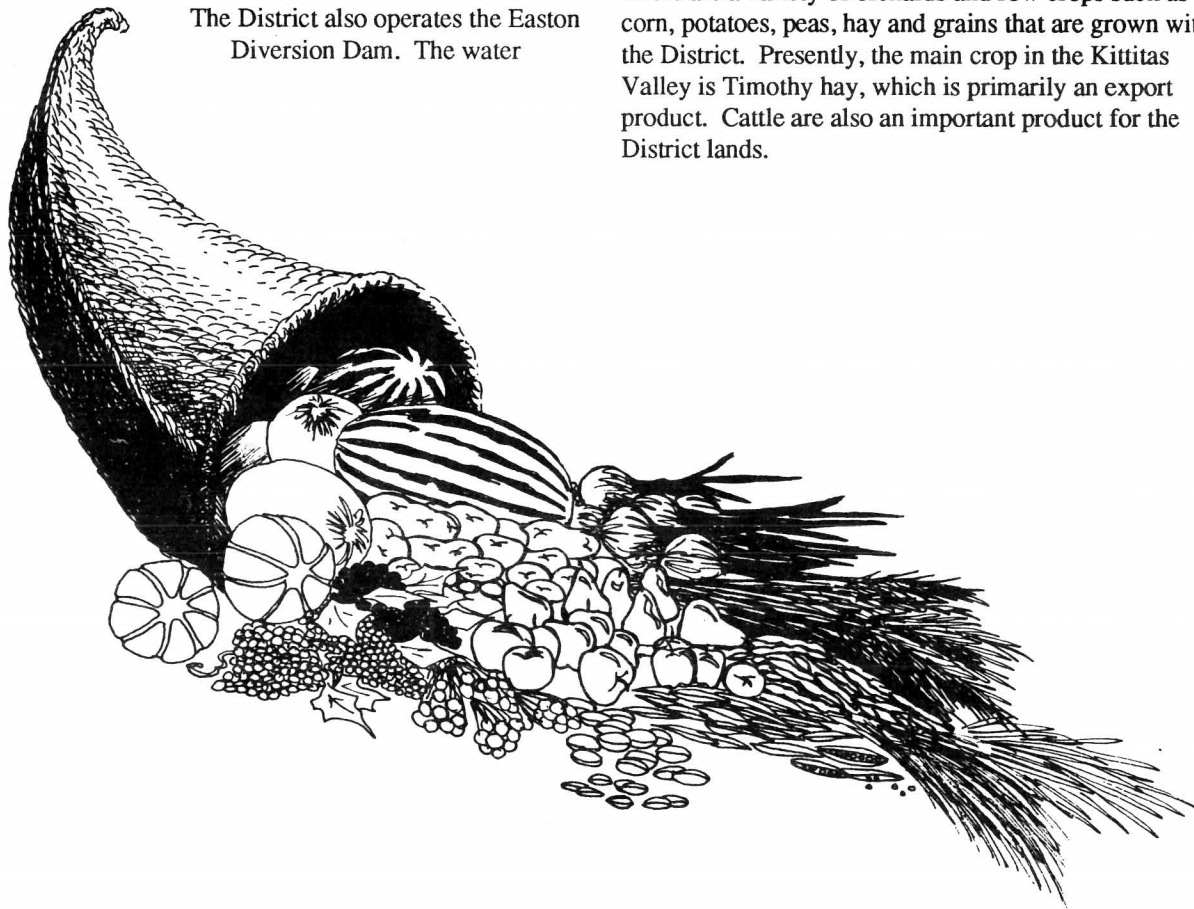
supply is contract water diverted from Keechelus and Kachees Reservoirs supplying the Main Canal at Easton. Easton Dam and the Main Canal are presently undergoing construction of new fish screens and updated fish ladders which are to be completed prior to the 1989 irrigation season.

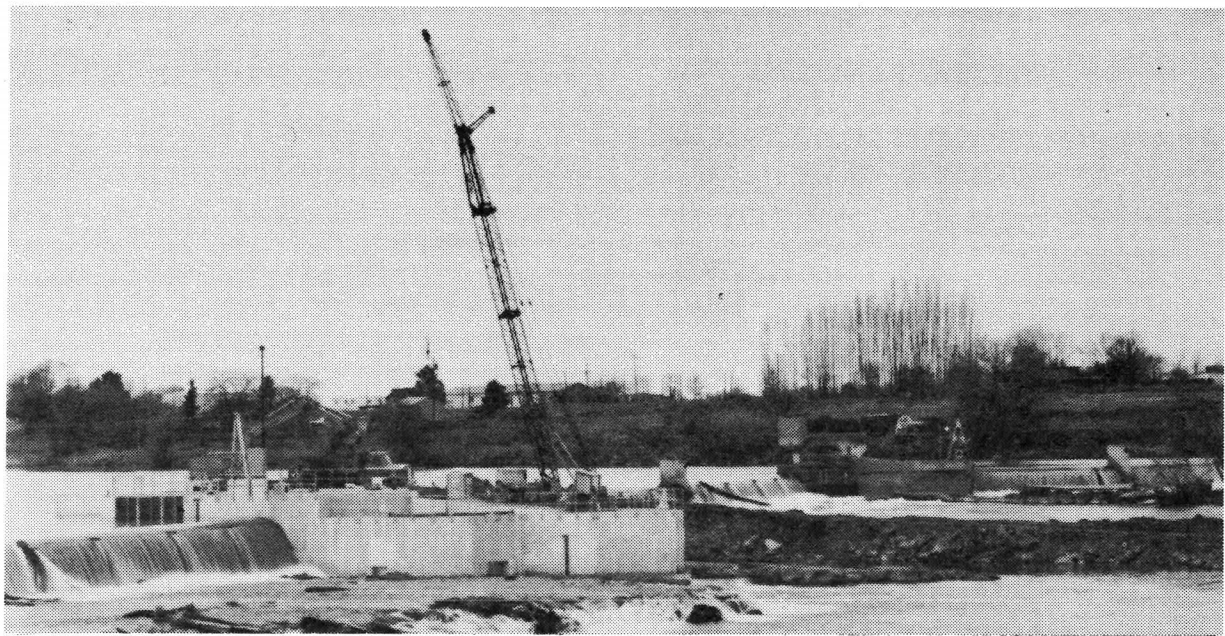
The District, which operates with an administrative and field staff of 20, is contracted by the Bureau of Reclamation for 60,000 acres. It presently serves 59,343 acres through a distribution system consisting of 330 miles of canals and laterals including the Wippel Pumping Plant located southeast of Ellensburg. The District is still indebted to the Bureau of Reclamation for construction charges.

Approximately 12 miles in the Main Canal have a flooring of rehabed concrete. Plus, several engineering studies are in progress for improved operation and conservation, including automation and the lining and piping of canals and laterals.

There are a variety of orchards and row crops such as corn, potatoes, peas, hay and grains that are grown within the District. Presently, the main crop in the Kittitas Valley is Timothy hay, which is primarily an export product. Cattle are also an important product for the District lands.

The District also operates the Easton Diversion Dam. The water





Construction work on the center fish ladder at Prosser Diversion Dam nears completion.

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Analysis is being prepared on possible environmental effects the construction, operation, and maintenance of this project could have on such areas as water resources, fish and wildlife, recreation, and land use. Eastern Washington University is preparing the investigation for cultural and historical resources, and Central Washington University is conducting a study to determine the economic impact on the construction, operation, maintenance, and production of the Yakima/Klickitat Production Project.

A draft EA will be sent to the public in May 1989 for review and comments. All comments received will be incorporated into the final EA to be reviewed by the U.S. Department of Energy. The final EA will be completed by the end of 1989.

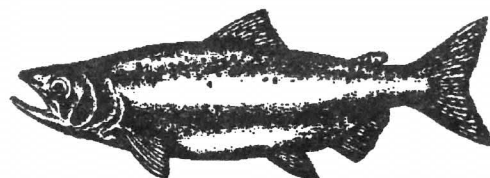
The Yakima Nation and Washington Departments of Fisheries and Wildlife have completed the Refined Project Goals report. This report identified goals for production, harvest, and management of genetic effects on salmon and steelhead stocks. The effort will now shift to identifying critical uncertainties and developing the experimental program to test hypotheses associated with the project.

The water analysis study for the project is in the process of identifying and confirming hatchery water

sources, tributary streamflows, and fish passage conditions. Stream gauges are being acquired and installed, and coordination with tributary landowners is continuing. The U.S. Bureau of Reclamation is investigating the availability of groundwater data at various proposed hatchery and satellite sites. Test wells will be drilled in the near future as part of the preliminary engineering work. Data collection for water analysis will continue through the summer of 1989, and the final water analysis report is scheduled for December 1989.

In summary, a number of major efforts relating to the Yakima/Klickitat Production Project are in progress. By the end of 1989, several reports will be available for public review and comment. To allow interested parties an opportunity to remain informed of the progress of the predesign planning process, public meetings will continue to be held periodically through 1989.

BPA's Yakima Project Office has recently moved to a new location in the Sunfair Professional Building, 103 S. Third Street. The phone number remains the same at 509-575-5805.



Water Year Update

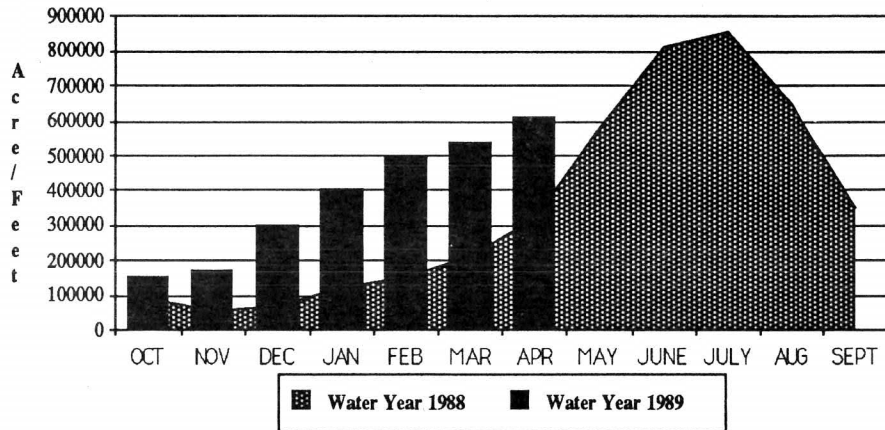
The 1989 water outlook for the Yakima Basin appears much improved over the past several years. A series of winter storms have produced an ample snowpack in the Cascade Mountains. After an unusually severe cold spell in early February, a moist weather system deposited wet snow across the basin, adding to the existing snowpack. For the first time in several years, it appears that farmers and ranchers will not face the prospect of water shortages.

content at the end of February was 542,000 A/F, almost 2.75 times what it was last year on the same date.

Provided that the basin does not experience a downturn in precipitation patterns over the next three months, farmers and ranchers should receive normal water supplies during the 1989 irrigation season.

YAKIMA BASIN RESERVOIR CONTENT

Although reservoir content fell to 125,000 A/F in October 1988, at the end of the irrigation season, mild temperatures and good precipitation through the fall provided a rapid refill. Reservoir content was over 300,000 A/F by December 1st—over 400,000 A/F by the end of the year—and almost 500,000 A/F by the end of January. Reservoir



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