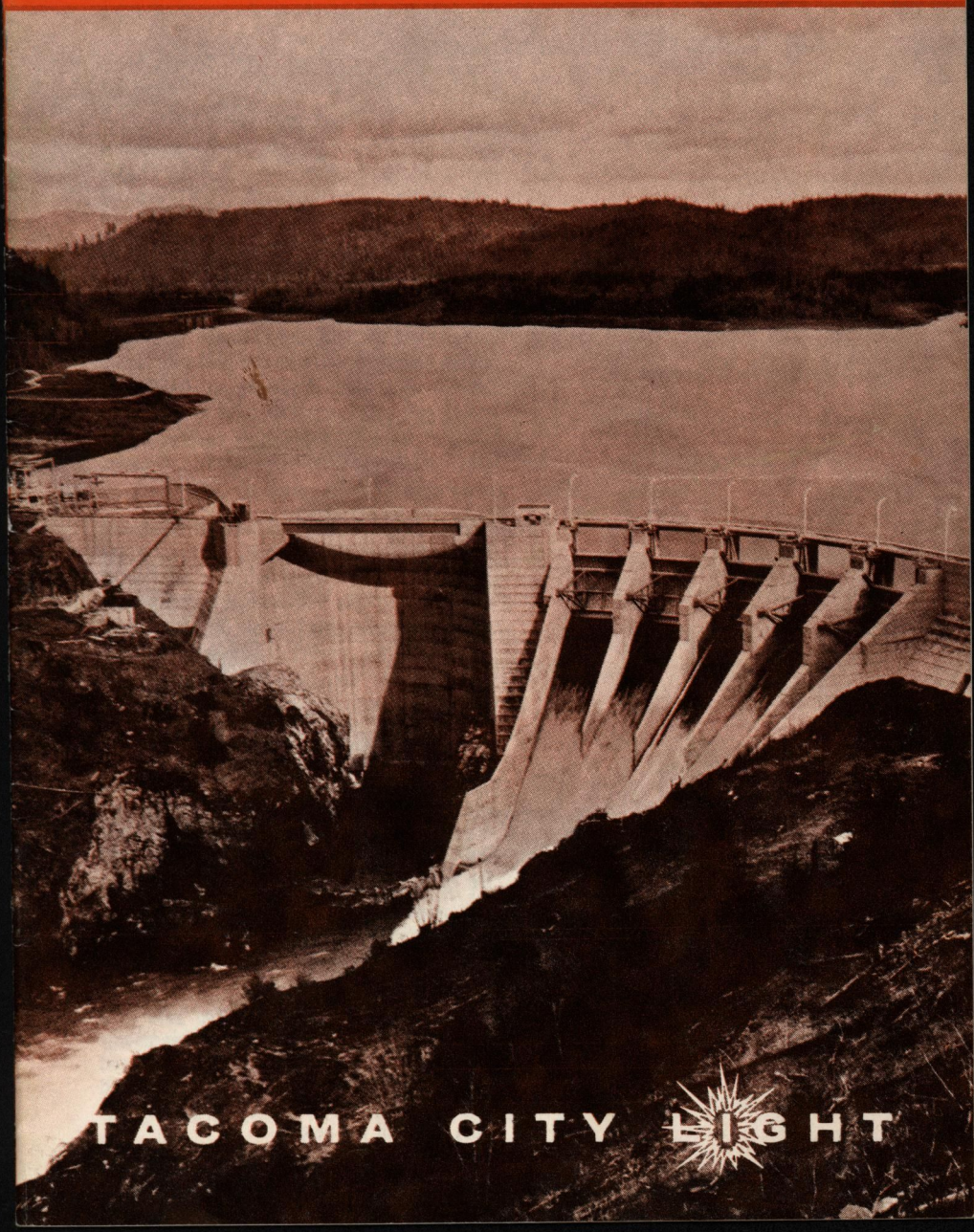
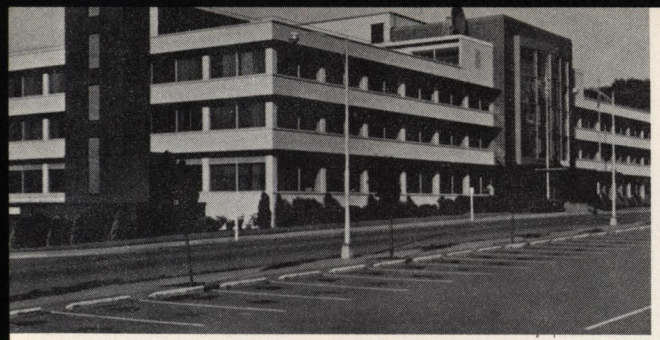
The Cowlitz River Development



TACOMA CITY LIGHT



Administration Building

City of Tacoma

DEPARTMENT OF PUBLIC UTILITIES

PUBLIC UTILITY BOARD

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PROJECT ENGINEER

Frankland Smith

The Spirit of **Tacoma City Light**

The greatest compliment a utility can treasure is the phrase, "Fine Service and Low Rates."

For over 70 years, the men and women of our pioneer municipal utility have used this phrase as a guide in helping to develop Tacoma City Light as one of the finest electric utilities in America.

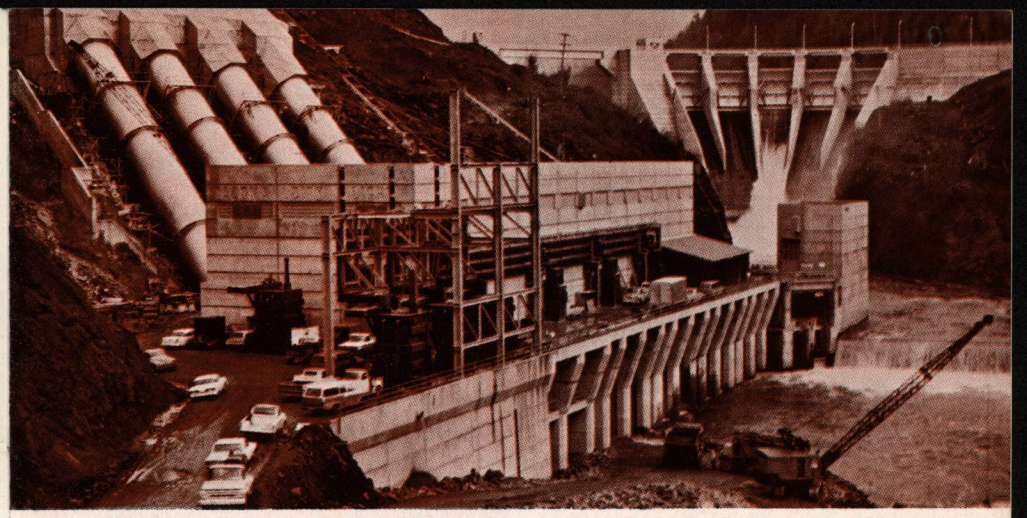
By popular vote, our City Light began service in 1893. It is one of the oldest municipal utilities west of the Mississippi River. The first power plant north of the Columbia River generated electricity for a lumber mill near downtown Tacoma, just off the present freeway, in 1882. On the day after Christmas in 1886, hundreds of residents and visitors cheered as the first street lights in the Northwest began beaming along Pacific Avenue.

When Cushman Dam No. 1 was completed in 1926, President Calvin Coolidge turned a key in the White House which activated the flow of energy through the transmission lines from the power plant near Hood Canal. City Light engineers built the longest transmission span in the world to carry the power across the Tacoma Narrows.

The pride of the United States Navy, the aircraft carrier Lexington, helped provide power during a shortage in the winter of 1929. It was the first time in history that a vessel had been engaged to serve a city with electricity and the feat is duly recorded in annals around the world.

Courage and perseverence were required to win the right to build the Cowlitz River dams. Challenges in the courts and problems in engineering have been overcome.

Mayfield Dam is far more than part of a plant that will produce low-cost electric energy and a host of other benefits. It is a living and working memorial to all the men and women who shared the vision of putting the river to work — for all the people.



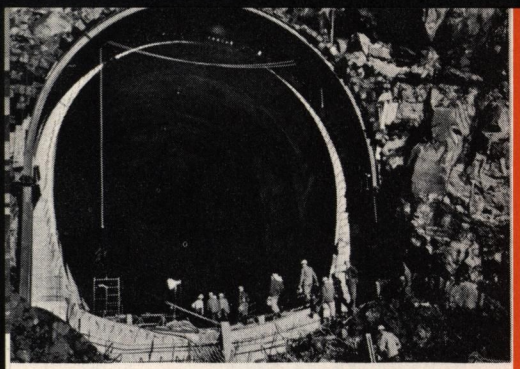
The powerhouse, in the left foreground, is about ¼ mile downstream from Mayfield Dam. Penstocks are 18 feet in diameter at the forebay, upper left, and gradually are reduced in diameter to 13 feet. Mayfield powerhouse, from its underground base, is higher than an 11-story building.

The Miracle of Power . . .

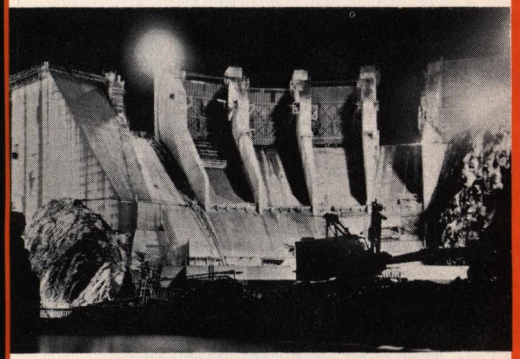
An aura of mystery, of might and magic surrounds the world of electricity. At one moment the energy is hidden in the depths of a lake which has been created behind a concrete or earthen dam. The water flows through a tunnel, plunges down a penstock, crashes against the paddles in a huge turbine, and the revolving unit passes a magnetic field in the generator to produce power. At the next instant, in a home many miles away, the electricity is drawn from the wall outlet in a home to run a refrigerator, a water heater, a television set, a toy train or a hundred other appliances, and to provide heat and light. Perhaps no other energy has as many uses as electricity. Yet, less than a hundred years ago, its practical application was limited.

Hydroelectric plants, such as Mayfield, are many things to many people tourist attractions, navigation aids, flood control projects, marine view properties, park sites for boating, picnicking and camping; they regulate stream flows and assist the fisheries resource.

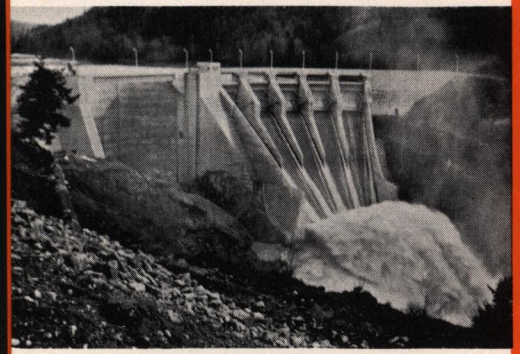
And, above all, dams provide the cheapest form of electric energy known to man. Water that turns the turbines is free. It is only borrowed for an instant and then continues to the sea.



The giant power tunnel carries water from Mayfield Lake to the forebay. The tunnel is wide enough for five cars to pass simultaneously and extends for 860 feet.



The spillway section is bathed in light as work continued through the night.



A spectacular view of Mayfield Dam as water plunged over the spillway during extremely high water conditions during the winter of 1962-63. Mayfield and Mossyrock Dams, together, will provide excellent flood control.

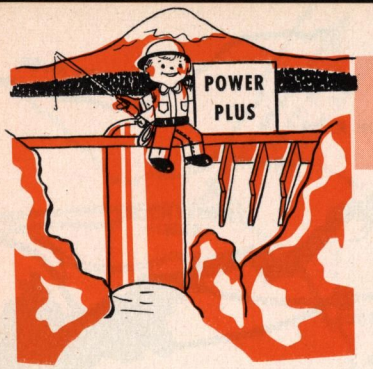
The Cowlitz River Project

MAYFIELD DAM

Type	Concrete arch with gravity wings and thrust blocks
Installed capacity (initially)	120,000 kilowatts
Installed capacity (ultimately)	160,000 kilowatts
Average annual generation	550,000,000 kilowatt-hours
Height	185 at river bed; 250 feet (total)
Length	850 feet
Width at base	23 feet
Volume of concrete	110,000 cu. yds.
Average flow of river	5,840 cu. ft. per second
Length of Mayfield Lake	10.6 miles
Shoreline	33½ miles
Reservoir area at max. elevation	2,250 acres
Turbines	55,000 h.p. each
Generators	40,000 kilowatts each
Investment	$44,000,000

MOSSYROCK DAM

Type	Concrete arch, gravity thrust blocks
Installed capacity (ultimate)	500,000 to 600,000 kilowatts
Average annual generation	1,100,000,000 kilowatt-hours
Height	325 above river bed; 590 (total)
Length	1,750 feet
Width at base	65 feet
Volume of concrete	1,041,000 cu. yds.
Average flow of river	5,420 cu. ft. per second
Length of Mossyrock Reservoir	17 miles
Shoreline	48½ miles
Reservoir area at max. elevation	10,188 acres
Estimated investment	$91,000,000



One of the finest "things" ever to happen to Southwest Washington

A prominent official of Longview made this declaration as he studied the benefits to be derived from development of the Cowlitz River by Tacoma City Light.

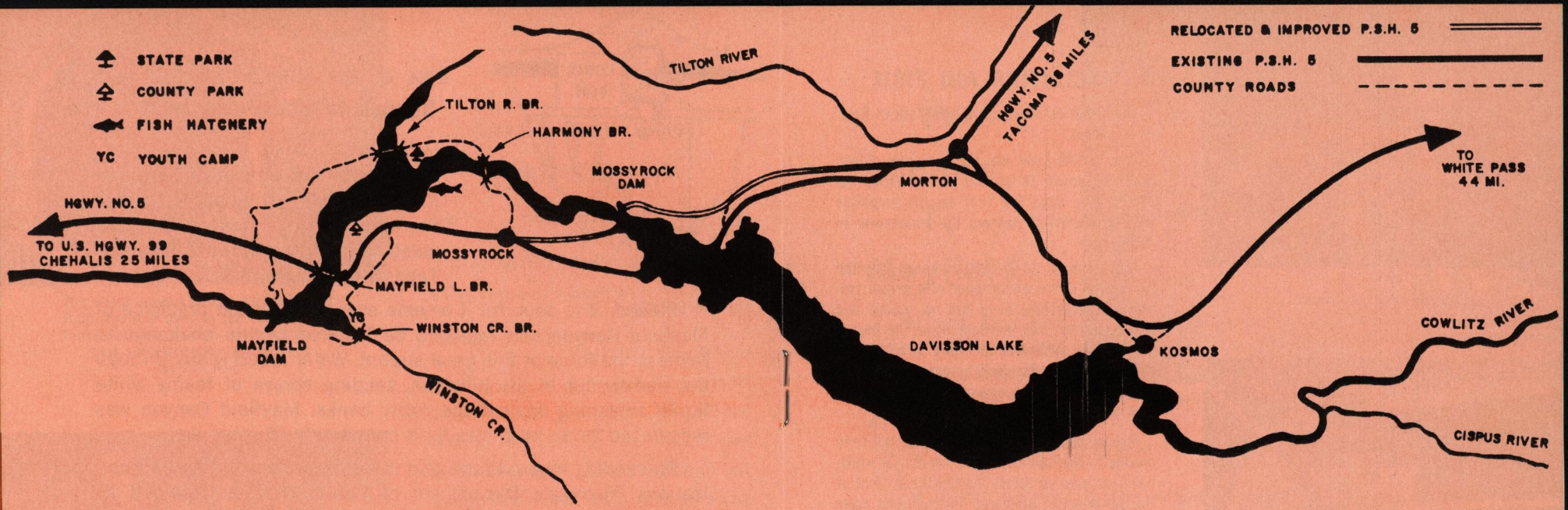
Indeed, it is doubtful if anyone ever stood at the precipice of Mayfield Canyon and failed to be inspired by the challenge to harness the force of this great stream. Water raced wildly through the narrow cut in the hillsides, sending sprays of foamy white liquid smashing against the rocky banks. Mayfield Canyon was recognized as an ideal site for a dam nearly 60 years ago.

Proceeding in good faith and in accordance with legal authorizations, Tacoma's Department of Public Utilities obtained its license to construct the dams from the Federal Power Commission in 1951. On three separate occasions, matters relating to the Cowlitz project were considered by the United States Supreme Court. Each time the highest court in the land ruled in favor of Tacoma.

Mayfield is ready to help serve a large number of communities with low-cost energy. More than 800 men were at work during the peak of construction. Two years were required to build the power tunnel, 860 feet long and wide enough for five cars to pass through simultaneously. The tunnel will carry water from the lake behind Mayfield Dam to the penstocks and powerhouse several hundred yards downstream.

Already new businesses and other developments are sprouting in central Lewis County as a result of Mayfield Dam and its large lake with over 33 miles of shoreline. Over three miles of State Highway No. 5 were improved. Tacoma City Light invested over $1,000,000 in the new Mayfield Lake Bridge, eliminating an outdated narrow span and a dangerous intersection. Five county roads have been replaced and improved. Tacoma also has paid nearly $500,000 to build the Tilton River, Winston Creek and Harmony Bridges.

Mayfield Lake is destined to be one of the primary tourist attractions in Southwest Washington. From different points, three mountain peaks can be observed – Mt. Rainier, Mt. St. Helens and Mt. Adams. Mayfield is another "scenic storehouse of power."



The COWLITZ in a CAPSULE

Hopes for the development of the Cowlitz River have presented a challenge to a large number of Western Washington residents for nearly 60 years.

Here, in a capsule summary, is a brief record of the major milestones passed along the route to put the Cowlitz River to work:

1906 – The first published comments on hopes for construction of dams near the Mayfield and Mossyrock sites of the Cowlitz were printed in the **Chehalis Bee-Nugget.**

1923 – City of Chehalis obtained development rights of the Cowlitz from the State of Washington.

1926 – A Minneapolis paper firm, the Backus-Brooks Co., purchased the rights from Chehalis.

1933 – Preliminary permits for Mayfield and Mossyrock Dams were issued to the Backus-Brooks Co. by the State of Washington.

1946 – Rights owned by Backus-Brooks were purchased by City of Tacoma.

1948 – Tacoma City Light announced plans to build Mayfield and Mossyrock Dams; Federal Power Commission accepted jurisdiction of river.

1951 – Following extensive hearings, Federal Power Commission issues licenses to Tacoma for Mayfield and Mossyrock Dams, ruling that dams are in best interests of all the people.

1953 – Washington State Supreme Court rules fish sanctuary act of 1949 is **not a bar to construction** since Tacoma has federal license.

1954 – United States Supreme Court confirms Tacoma's right to proceed with construction.

1955 – Construction begins at Mayfield; bonds sold but delivery blocked by superior court action in Olympia.

1957 – State Supreme Court rules Tacoma cannot condemn Game Department's hatchery without express permission of Legislature; Mayfield contracts subsequently cancelled and project "mothballed."

1958 – United States Supreme Court rules unanimously that Tacoma can condemn hatchery; high court calls legal action against city since 1953 "impermissible collateral attacks;" says no state law can bar construction.

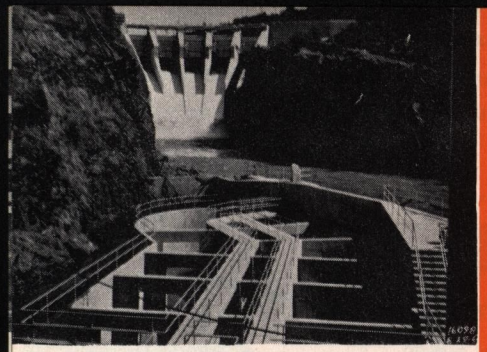
1959 – Mayfield work resumes on tunnel.

1960 – General contract for Mayfield won by Perini Corporation; Tacoma builds modern Mossyrock hatchery; 650 men continue work on strength of U. S. Supreme Court decision.

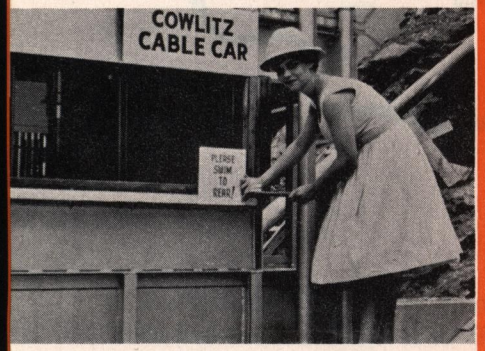
1961 – Upstream cable car and fish ladder begin operating; first concrete poured for main arch.

1962 – State Supreme Court again rules Cowlitz project is legal, says Initiative 25 cannot block completion of dams.

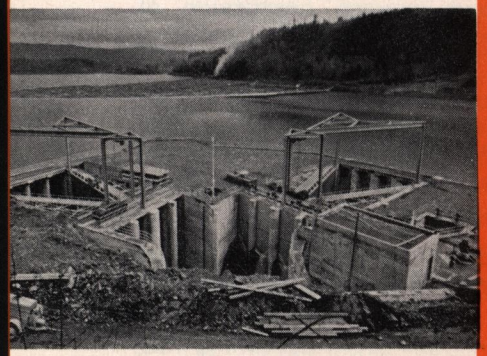
1963 – Official observance of first commercial energy from Mayfield Dam and powerhouse, March 30.



Fish ladder or "stairway"



Cable car gives fish a free ride from end of ladder to top of Cowlitz cliffside



Elaborate facility to help tiny fish move downstream past Mayfield Dam and powerhouse. V-shaped structures near surface of lake are louvers which help to separate the fish from the water.

FACILITIES AID FISH

The fisheries resource of the Cowlitz River is important.

Tacoma City Light has recognized its obligation and desire to protect the fisheries resource ever since the first serious proposals were presented to harness the horsepower in the river.

Approximately $4,000,000 has been invested by Tacoma in the construction of a unique system to successfully carry fish up, around and back again to pass Mayfield Dam. The investment in fish protection facilities for Mossyrock Dam cannot be accurately estimated since the project's design is incomplete. It is anticipated that they, too, will cost millions of dollars.

Fish swimming upstream are prevented from moving to Mayfield Dam by a fish barrier which has been erected across the Cowlitz in front of the powerhouse. Gradually, the migrants make their way upstream to the face of the powerhouse. They swim into fish entrances and move up a 24-foot ladder or "stairway," then proceed into two retaining pools.

Once there are sufficient fish in a pool, the gate is opened to the "Cowlitz cable car" and the migrants move inside. The specially-designed "cable car," operating on a tramway, is pulled up 228 feet to the top of the cliff above the powerhouse. Here, a trap door is opened and the fish are released into a long flume or pipe. The salmon, steelhead, trout and other species are then conveyed by this flume into Mayfield Lake. Then they swim to the spawning grounds upstream.

A "Venetian blind" or louver system has been constructed to safeguard the passage of tiny fingerlings headed for the sea. Biologists have found that downstream migrants swim near the surface of a reservoir. In addition, they determined that fish can be attracted by creating a current near the lake's surface. Instinctively, the small fish swim with the current maintaining direction by pointing upstream and guiding around obstacles. Thus, as they approach the entrance to the power tunnel, the fish are deflected by the small currents flowing around the louvers of aluminum "Venetian blinds" suspended in a V-shaped fashion. The tiny fish slowly guide their way along the aluminum slats and slip into a flume carrying them down past the dam and back into the Cowlitz River again.

TV Comes To Mayfield

Micro-wave station at Capitol Peak south of Olympia with Mt. Rainier in background.

The new Micro-wave system will enable the operation of Mayfield powerhouse by skilled power dispatchers in Tacoma City Light's Administration Building approximately 65 airline miles away.

The modern electronic system initially will operate with seven channels. The communications system has the capability of carrying 600 different conversations simultaneously!

A separate closed circuit TV channel, to be installed soon, will enable dispatchers in Tacoma to watch instruments and a host of other equipment at work in the powerhouse at Mayfield Dam. One viewing camera will be focused on the switchyard. Another camera, also equipped with a zoom lens for close-ups, will be at work watching dials, meters and switches on a panel in the powerhouse.

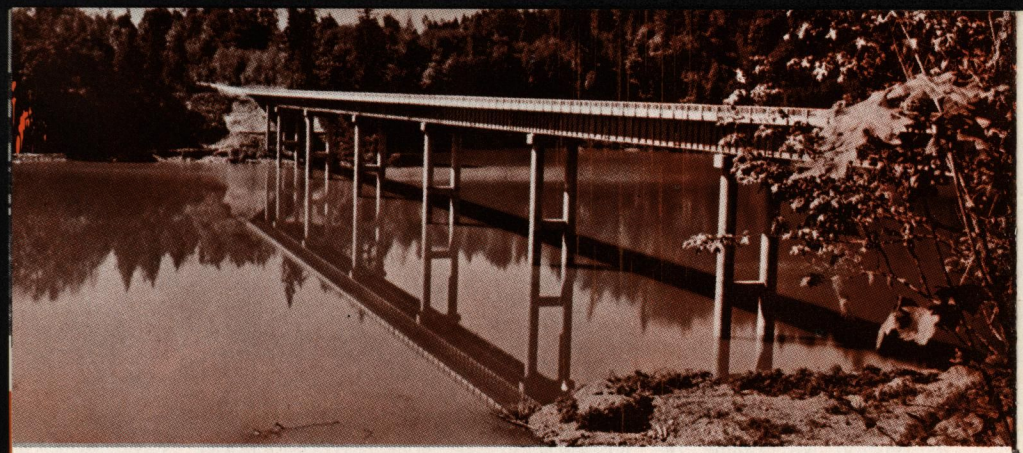
Signals will be dispatched from a parabolic reflector atop Mayfield powerhouse to a "booster" or repeater station southwest of Olympia. The direction will be altered here to send the signal to a reflector near Cheney Stadium and then to Tacoma City Light's Administration Building.

FLOOD CONTROL

Mayfield alone will provide a measure of flood control. The reservoir has a capacity of 133,700 acre feet of water. Tacoma City Light will make every effort to use Mayfield Lake to help reduce the threat of flood downstream.

Combined with Mossyrock Dam, Mayfield can prevent the recurrence of a flood on the Cowlitz River that would be equal to any flood recorded in history. Tacoma's license granted by the Federal Power Commission specifies the levels at which Davisson Lake will be maintained throughout the year. This reservoir behind Mossyrock Dam must be drawn down 23 feet gradually between October 1 and December 1 each year. Between December 1 and February 1 it will remain level, then rise again slowly to its summer level.

The flow of the Cowlitz has dropped as low as 500 cubic feet per second in the summer. These dry periods have been injurious to fish, interfered with irrigation needs and prevented proper navigation. With Mayfield Dam, the minimum flow will be four times better not less than 2,000 cubic feet per second. The rate of change in the water level cannot be more than one foot an hour at Castle Rock.



BEAUTIFUL TILTON BRIDGE

As a result of the Mayfield project, **four new bridges** and several miles of **improved highways** have been replaced. The long steel and concrete span across Mayfield Lake was constructed with over $1,000,000 provided by Tacoma City Light and approximately $250,000 by the State Highway Department. The Tilton Bridge above, also financed by Tacoma, is in a romantic country setting. It will be a center of attention near Mayfield Lake State Park which is being developed by the State Parks Commission. Land for the park was provided by Tacoma and the Parks Commission. Tacoma's Public Utility Board also authorized acreage for Mayfield Lake Youth Camp and the Lewis County Park.

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MODERN MOSSYROCK HATCHERY

Described as one of the finest in the Northwest, Mossyrock Hatchery replaces an earlier facility owned and operated by the State Game Department. Tacoma City Light invested approximately $400,000 in the new hatchery, and additional funds were provided by the Game Department.

PARKS and PLAYGROUNDS from POWER-FULL PLACES

Famous Kamloops trout, rainbow trout and silvers have been planted by the State Game Department in the new Mayfield Lake. It is open all year around for fishing and recreation. Tacoma City Light invites you to use the recreation facilities and to enjoy the scenic beauty of this new lake in central Lewis County. And here's wishing . . . good fishing!

-:- -:- -:-

- Tacoma's Department of Public Utilities has assisted financially in the construction of **five different fish hatcheries** – Green River, Puyallup Maplewood Springs, South Tacoma, Mossyrock and George N. Adams.
- Lake Cushman, created by Cushman Dam No. 1 and many times larger than the original natural lake, attracts as many as 2,000 fishermen each week during the season; one of the finest fishing lakes in the state.
- In cooperation with Eatonville Sportsmen's Club, Tacoma City Light built free boat launching area at Alder Lake and picnic grounds.
- Tacoma City Light has provided over 10,250 acres of lake area for recreation behind Cushman, Alder and Mayfield Dams.
- Provided over 500 acres of land for Lake Cushman State Park being developed by State Parks Commission.
- Invested approximately $500,000 to clear and beautify Alder Lake on Tacoma-Mt. Rainier Highway and Lake Cushman north of Shelton.
- Cooperating with State Parks Commission and Lewis County in development of two park areas along Mayfield Lake.
- Provided over $200,000 for State Fisheries and Game Departments and U. S. Fish and Wildlife Service for fish research; assisting University of Washington personnel in fish breeding program.

LAKE CUSHMAN – Pearl of the Olympics

ANDERSON PRINTING CO., TACOMA

EDITED BY
William Dugovich


TACOMA CITY LIGHT
70th YEAR OF FINE SERVICE AND LOW RATES