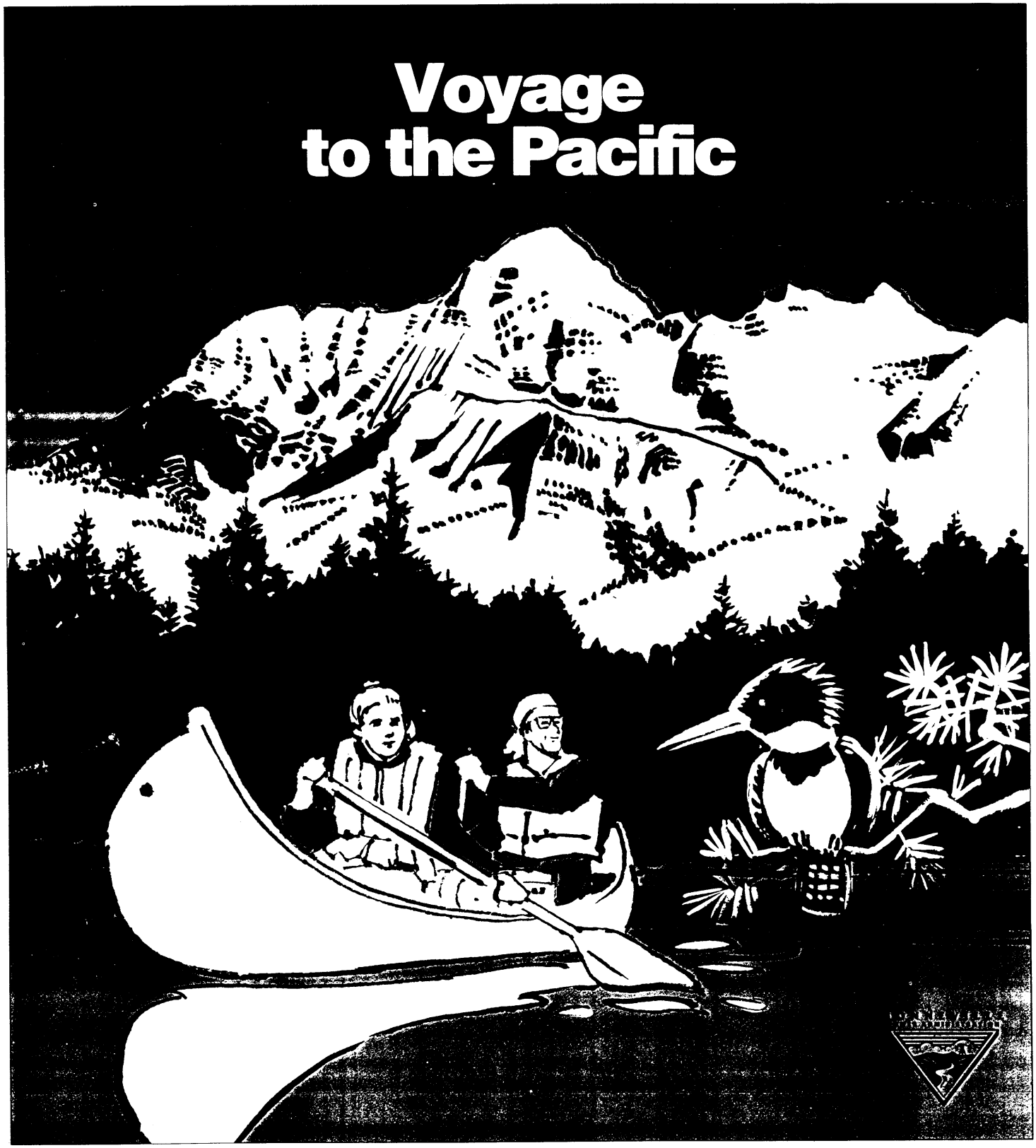
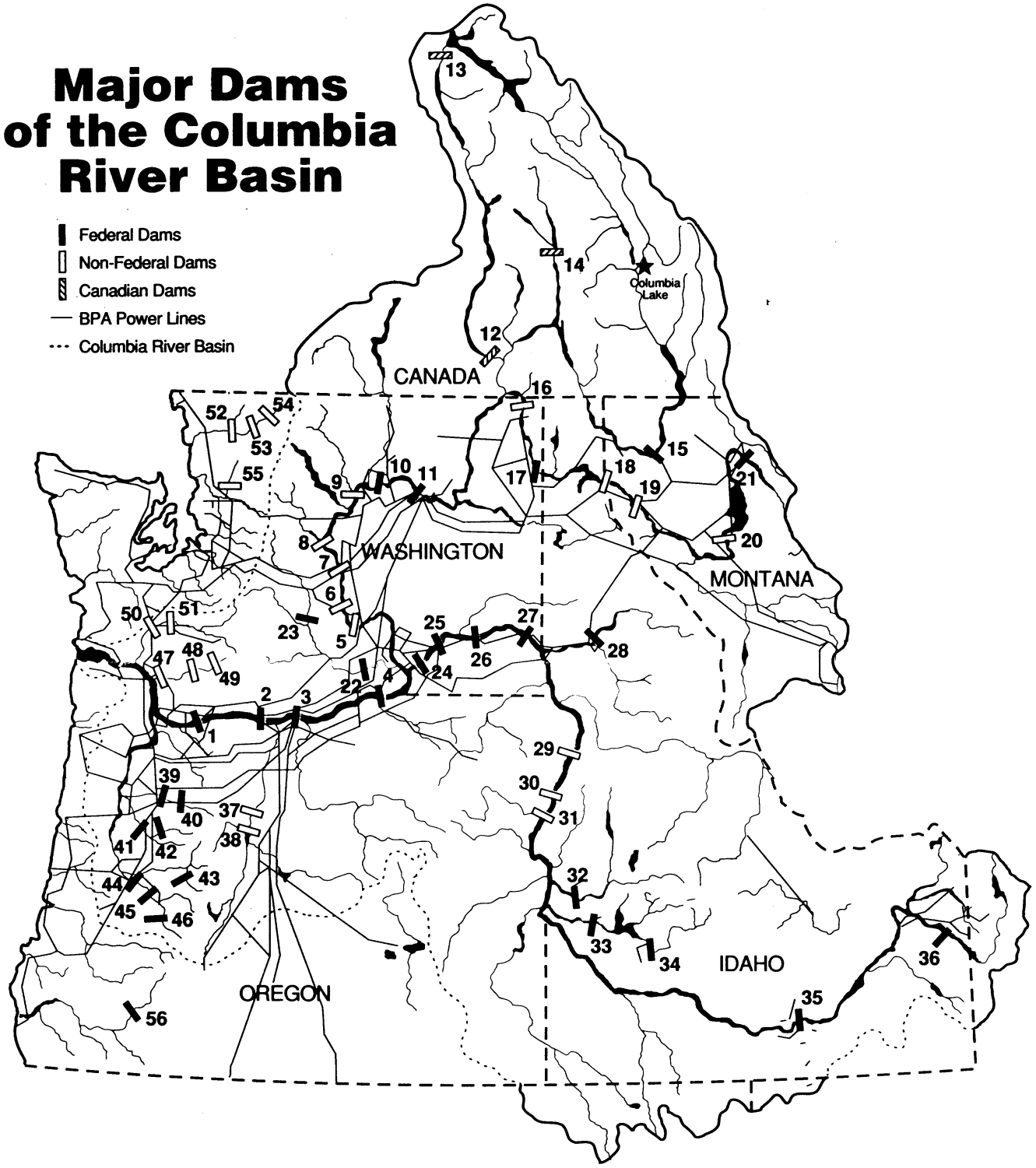
A PUBLICATION OF THE BONNEVILLE POWER ADMINISTRATION

Backgrounder



Major Dams of the Columbia River Basin



Caution:

This is not a travel guide. Free-flowing sections of the Columbia can be extremely hazardous for boaters. River and reservoir levels can change without warning. Powerful currents, sudden storms, stiff winds and high waves all appear on the river. There are long stretches of shoreline where exit is difficult or impossible. Only well-informed, cautious and expert canoeists should paddle the Columbia River.

1 Bonneville
2 The Dalles
3 John Day
4 McNary
5 Priest Rapids
6 Wanapum
7 Rock Island
8 Rocky Reach
9 Wells
10 Chief Joseph
11 Grand Coulee
12 Keenleyside
13 Mica
14 Duncan
15 Libby
16 Boundary
17 Albeni Falls
18 Cabinet Gorge
19 Noxon Rapids
20 Kerr
21 Hungry Horse
22 Chandler
23 Roza
24 Ice Harbor
25 Lower Monumental
26 Little Goose
27 Lower Granite
28 Dworshak
29 Hells Canyon
30 Oxbow
31 Brownlee
32 Black Canyon
33 Boise Diverson
34 Anderson Ranch
35 Minidoka
36 Palisades
37 Pelton
38 Round Butte
39 Big Cliff
40 Detroit
41 Foster
42 Cougar
43 Green Peter
44 Dexter
45 Lookout Point
46 Hills Creek
47 Merwin
48 Yale
49 Swift
50 Mayfield
51 Mossyrock
52 Gorge
53 Diablo
54 Ross
55 Culmback
56 Lost Creek

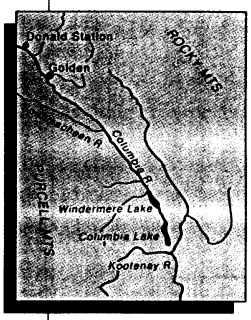
Straddle the Columbia

High in the Canadian Rockies, Leslie LaFont and her grandfather paddled their canoe from Columbia Lake into a gentle silver ribbon of springwater. The icy, crystal-clear stream got smaller until they could paddle no farther. Among willows and tall grass, Leslie and the old man left the canoe and walked the bank.

The stream became a trickle. Then it just stopped. Or rather, it just began. In a small oval pool, springwater bubbled from the earth. Craters the size of cereal bowls pocked the bed of the shallow pool. Water pushed aside sand and fine pebbles in each crater.

"This is it," her grandfather whispered. "We are standing at the source." Shivers crawled up the back of Leslie's neck. She was watching the start of one of the planet's mightiest rivers, the Columbia.

A few steps downstream, Leslie stood with one foot on the left bank of the Columbia River and her other foot on the right bank. Like a colossus, she straddled the great river's birthplace while LaFont snapped the picture.



The river begins in British Columbia, Canada.

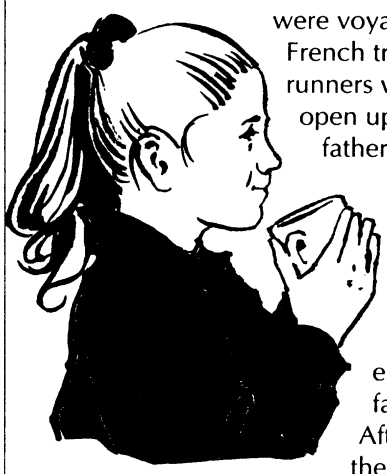
Leslie awoke the next morning to the smell of bacon frying. She rolled over in the sleeping bag and tried to remember where she was. The bus ride from her home in Seattle. Meeting her grandfather and his driver-friend in Spokane. The all-day trip in the van, up into British Columbia and over Crow's Nest Pass. To Columbia Lake. Thunderhill campground.

She and her grandfather were going to canoe the entire Columbia River, from its source in Canada to its mouth at the Pacific Ocean.

She and her grandfather were going to canoe the entire Columbia River.

"Leslie!" the old man called. "Up and at 'em, girl! Can't be late!"

Her grandfather, Leslie knew, had a thing about the Columbia River. As if the river flowed in his veins, he couldn't even talk about the river without his eyes filming over. Among his ancestors – her ancestors – were voyageurs, those French trappers and river runners who helped open up the West. His father had helped build Grand Coulee Dam. His own first job was on a power line crew, bringing electricity to farms and towns. After dams turned the river into a series of man-made lakes, LaFont piloted a tug up and down the Columbia. To him, the Columbia was no less than life itself.



"Leslie!"

When she stepped out of the tent, Pierre LaFont was sitting on a rock next to the camp-

Leslie straddles the infant river.

The Kootaney River flows southward within a mile of the north-bound Columbia.

fire. His bird-nesty white hair was almost corralled by the red bandana he always wore on canoe trips.

"I would have let you sleep in, Les'," he said, "but water boils faster at this altitude." We're half a mile above sea level." He handed her a steaming tin cup of cocoa.

"What time is it?" she said.

It was 5 a.m. This far north, in June, daylight came early. Columbia Lake, a deep blue-green, lay calm and waiting below the campground. The sun had not yet peeked over the jagged row of mountains east of the lake.

Already, LaFont was in one of his filmy-eyed moods. "The thing about the river," he said, "is it's hard to see the whole thing. People live on it, use it, and they know that part. But there are lots of parts."

People have put the river to work in many ways.

"People have put the river to work in many ways," he said. "We've stopped floods and let the river make the desert bloom. Its energy runs homes and cities. It floats barges and sailboats, while it still carries fish to and from the sea."

"What's easy to forget, is that it's still a river. A whole thing. That's what we're here for," he said. "To feel the whole thing."

LaFont, for all his hurry-up bluster, was not really in a hurry. First, he wanted to spend a few days poking around Columbia Lake. On flat water, they could let callouses, before blisters, form on their hands.

Leslie wasn't worried about keeping up. She and her grandfather had canoed other waters, other summers. Slow parts of the Snake. The Willamette. Smaller Columbia Basin waters – the Yakima and Deschutes.

Always the idea had been to work up to the Columbia. She had done a report on it. The Columbia's 1,200 river miles were as far as

from Seattle to San Diego, if you could lift them off the map and straighten them out. This canoe trip would take all summer.

"Let's get on down the river," she told him.

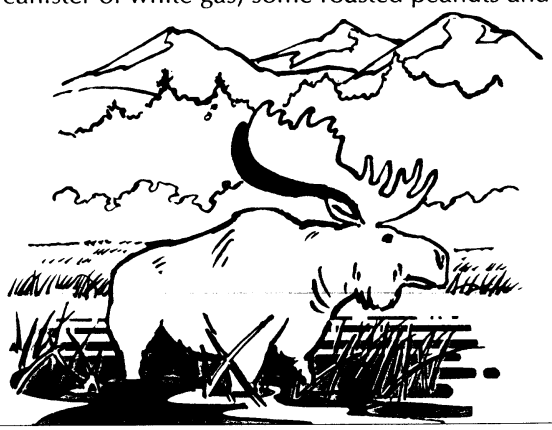
"Not quite yet," said LaFont. "The trouble with kids today," he said, "is they're always in a hurry."

Exploring the south end of Columbia Lake, they beached the canoe. A road led across flat, marshy land. Less than a mile from where Leslie had straddled the baby Columbia, they came to a river! "This here's the Kootenay River," LaFont said.

It was a big stream, more than Leslie could throw a rock across. The old man picked up a piece of gray-white alder bark that was shaped like Tennessee. He tossed it into the Kootenay. Leslie watched the bark disappear, south, around a bend. The Columbia River, she knew, started north out of Columbia Lake.

"Now that slab of bark," LaFont said, "will end up the same place we do. But it will take a whole different trip. It'll float into Montana, cut back across Northern Idaho, and then turn north again into Canada. About 400 miles later, downstream, the Kootenay will come back into the Columbia River."

They stopped at the store in Canal Flats for a canister of white gas, some roasted peanuts and



Moose and other wildlife flourish along the river.

pop. "I hear there used to be a canal," said LaFont to the clerk. "From the Kootenay River to Columbia Lake?"

"You'd be meanin' Grohman's Ditch," said a shopper. The way people clipped their words reminded Leslie that she was a foreigner, far from home.

"Built before the turn of the century," said a burly customer. "A chap named Baillie-Grohman, hey? Owned orchards downstream on the Kootenay," he said. "Grohman thought he'd divert Kootenay floodwaters into the Columbia."

"Did it work?" Leslie asked.

"Not much, hey?" said the man. "Folks on the Columbia didn't want Kootenay floods. They filled in the canal. You can see it," he said. "Over by the railway."

LaFont and Leslie walked toward the tracks. They came to a wide, overgrown ditch. "Looks like old Baillie-Grohman was a little ahead of his time, is all," said LaFont. "Later, people figured out better ways to put these rivers to work. You'll see," he said.

Paddle the Upper River

It took them a full day to paddle Columbia Lake, south to north. The next morning, the end of the lake was a fuzzy outline of willows and low brush. They kept paddling. The lake water became a small stream, heading north.

"The mighty Columbia River!" LaFont said.

"This is it?" Leslie said. "It's so lazy!"

The June sun, melting snow, had filled the river to the tops of its muddy banks. But those banks were not far apart. A narrow and slow brown channel split to form low islands. The river leaked into still-water sloughs. The Columbia River meandered into a broad, flat valley that stretched to the north as far as Leslie could see. Snow-capped mountains guarded the valley.

"They call this the Rocky Mountain Trench," her grandfather told her. "It's so big," he said, "you can see it from the moon. When you see satellite pictures on the weather show, look for a huge gash, like a wagon wheel rut, in the Rockies. That's where we are, where the Columbia gets its start."

In their third day paddling the river, the Columbia was still in no hurry. It wandered across the marshy valley floor. Geese and ducks were everywhere. They came across a moose, belly-deep in marsh grass. He turned his huge rack of horns toward the canoe and then looked away.

"This isn't much of a river, if you ask me," Leslie said. "I thought it would be a lot bigger."

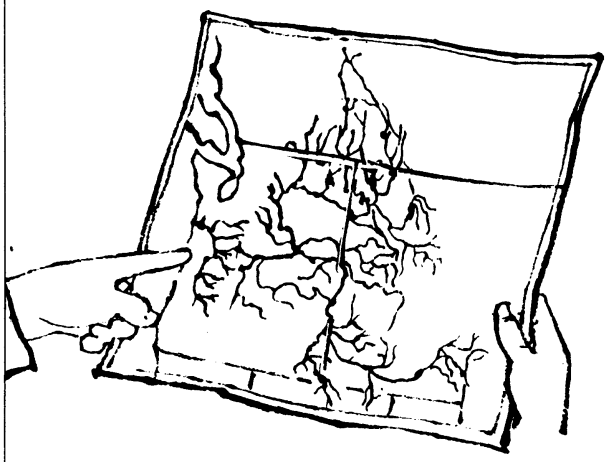
"Give it time," said her grandfather. "A river has to gather strength and become something." His voice startled a great blue heron, which stretched its wings and flapped away.

"OK," she said, "but this river's not as big as the Kootenay. And that was way back there. If the two rivers come together, later... Why isn't the Kootenay called the Columbia?"

When they stopped at a sandbar for lunch, LaFont dug into his pack and pulled out a large map. With a blue marker, he traced the route of the British trapper-explorer, David Thompson. Thompson and his band, in 1807 to 1811, had paddled and carried their canoes all up and down the Kootenay and the Columbia. Clear to the Pacific Ocean and back.

It took them a full day to paddle Columbia Lake.

Deep snows from the Rockies and other mountains melt and flow into the Columbia.



"Thompson was the first to write it down in English," said LaFont. "He called this branch we're on the Columbia."

"Now here," said LaFont, moving the marker up the Kootenay River, "he could have just as well called this branch the Columbia. Or here. Some people say Clark Fork is the true main stem of the Columbia. Or down here," he said, tracing a long U-shaped mark from Wyoming across Idaho. "What we call the Snake River comes a thousand miles before it joins the Columbia. Maybe that's the true source."

LaFont kept drawing until almost the whole map branched out from the stem of the Columbia. Like blue broccoli.

"Then there isn't just one source," Leslie said.

"Good girl," LaFont said. "People put labels on water. They need to think where a river starts and ends. But a river doesn't think that way at all."

Four days after leaving Columbia Lake, they were still paddling north. The Spillimacheen River came rollicking in from the left, milky green. It and other brash glacial streams gave the Columbia new color and force. The Columbia River was waking up, flexing its muscles. Now it was less of a job to paddle the canoe than just to steer it.

"What happens, see," said LaFont, "is you get as much as 300 inches — 25 feet — of snow each year on the slopes of this Rocky Mountain Trench. The Rockies catch thick clouds coming in from the Pacific Ocean, and rake the snow right out of them. As the snow melts, it feeds the river. The Columbia drains one of the world's greatest water machines."

At Golden, the area's big town, the Kicking Horse River bucked into the Columbia. Now the river surged beneath their canoe with new-found power. They reached the high bridge at

By the time it reaches Donald Station, the river's current is swift and strong.

Like blue broccoli, the river divides from one main stem into many branches.

A friendly lift carries Leslie and LaFont around any rapids.

Donald Station, where the Trans-Canada Highway crossed the Columbia. Great eddies formed around the concrete bridge footings as the river rushed past.

Truth is, the voyageur in LaFont's blood was thinning. He didn't know what lay in the stretch just ahead. Maps showed Kinbasket Lake backing up within 10 miles or so of Donald Station. But in June, now, the reservoir would be drawn down to catch and hold the summer runoff. They might go 20 or even 30 miles before reaching the lake. Dangerous rapids could be exposed.

LaFont pointed the canoe ashore at a big lumber mill. Workers were changing shifts.

"This time of year," said one, "you'll see more river than the map shows. There are rapids before you reach the lake."

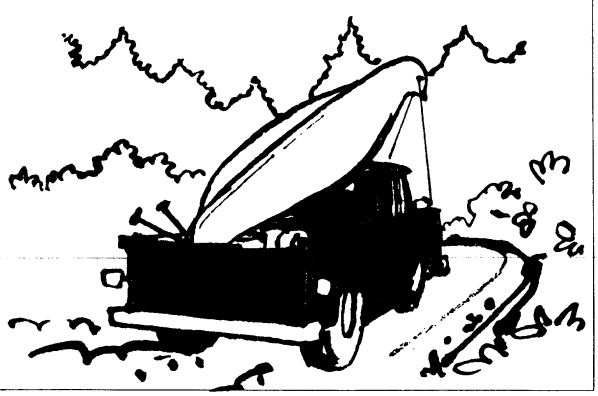
"But the river's high," said another. "It'll shoot you right through."

"The river butts into that cliff. Whirlpools cough up logs like toothpicks."

"The river changes, day to day. No telling what it'll be like."

Leslie was amazed that people had such a wide range of "knowledge" about the river. Or maybe the river had that many different faces. LaFont had seen enough of the river's force to be wary.

"Where's your canoe?" said a mill worker. "Toss it in the pickup, here. I'll drive you over to a fishing resort on Kinbasket Lake. It's only 25 kilometers by road."



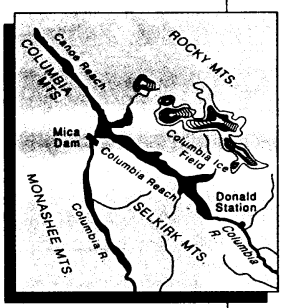
A Lake on the Roof of the World

At the resort, LaFont and Leslie lugged the canoe 100 yards across bare shore to reach water. The reservoir was way down.

As they paddled north, Kinbasket Lake – the reservoir behind Mica Dam – opened before them. Leslie could see no end to the lake. It disappeared over the curve of the earth.

"From here to the Pacific Ocean," said LaFont, "the river has been changed to serve humans. This reservoir is filling now," he said, "catching melting snow and ice."

Mica Dam, he explained, is a storage dam. It was built in the late 1960s to help smooth out the seasonal ups and downs of the river. "Storage dams," he said, "work like a sponge on the Columbia River System. They catch and hold water. Then they release it gradually as the water is needed."



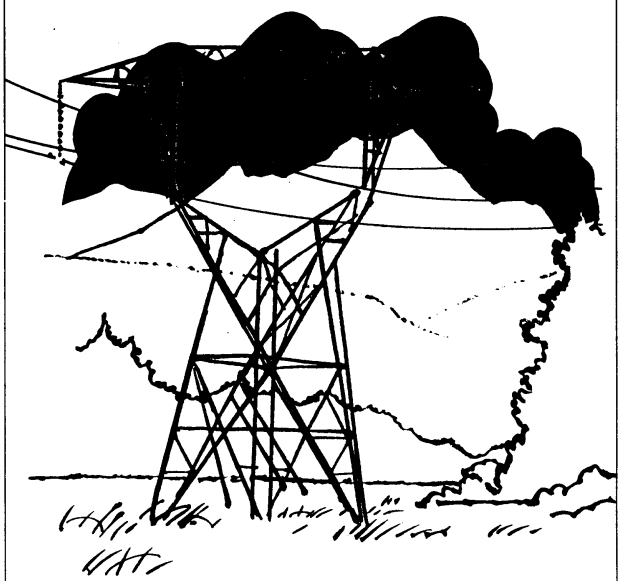
"So they stop the flooding?"

"That, and they help people use the river," he said. "They help float barge traffic year-around. They help farmers water their crops in the dry months downstream. And electric power," he said. "Homes, farms and businesses use

Storage dams release water when needed for power or other uses.

From Mica Dam to the Pacific Ocean, the river has been changed to serve humans.

With the reservoir filling, it's a long walk to water.

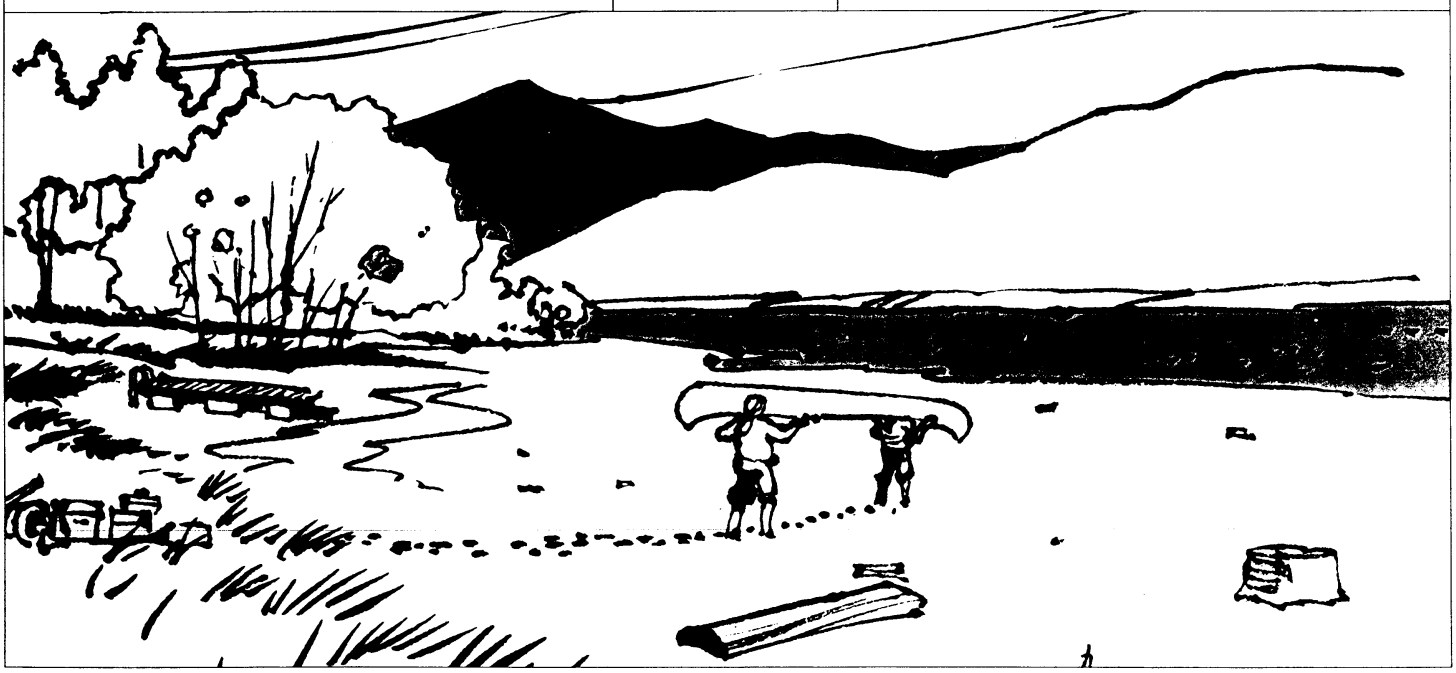


electricity all year. Left alone, the river would send down more water in spring and early summer than people could use. And less than enough in fall and winter. This reservoir makes life safer and more prosperous in British Columbia and four U.S. states."

Mica Dam, the highest earth-filled dam in North America, had backed up a lake so large that it made its own weather. Fierce, sudden squalls could raise waves up to five feet high. The safe thing was to paddle close to shore and be prepared to get off the lake very quickly.

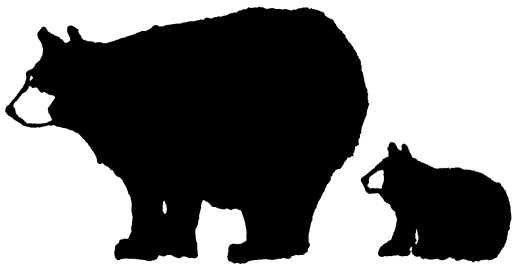
"How long will it take us to get to Mica Dam?" Leslie asked.

"Lord willing and the north wind don't blow," said LaFont, "we'll reach the dam in six or seven days."



They saw more deer than humans.

Mica is the largest earth-filled dam in North America.



The wind did blow. It was slow going, tough paddling. For one whole day and part of the next, they were in view of Mt. Columbia. Clinging to the mountain was the Columbia Ice Field, a blue-white cap of ice.

"Up there," LaFont said, "is your Continental Divide. One big icefield sends water this way and also to the Atlantic and Arctic oceans."

Kinbasket Lake reminded Leslie less of a sponge than of an enormous tub with multiple spigots. Streams poured into it from the glacier-capped mountains along the lake's flanks. Except for a logging camp, there was no sign of civilization. They saw more deer than humans. A scruffy black bear and her cub watched warily from the bank.

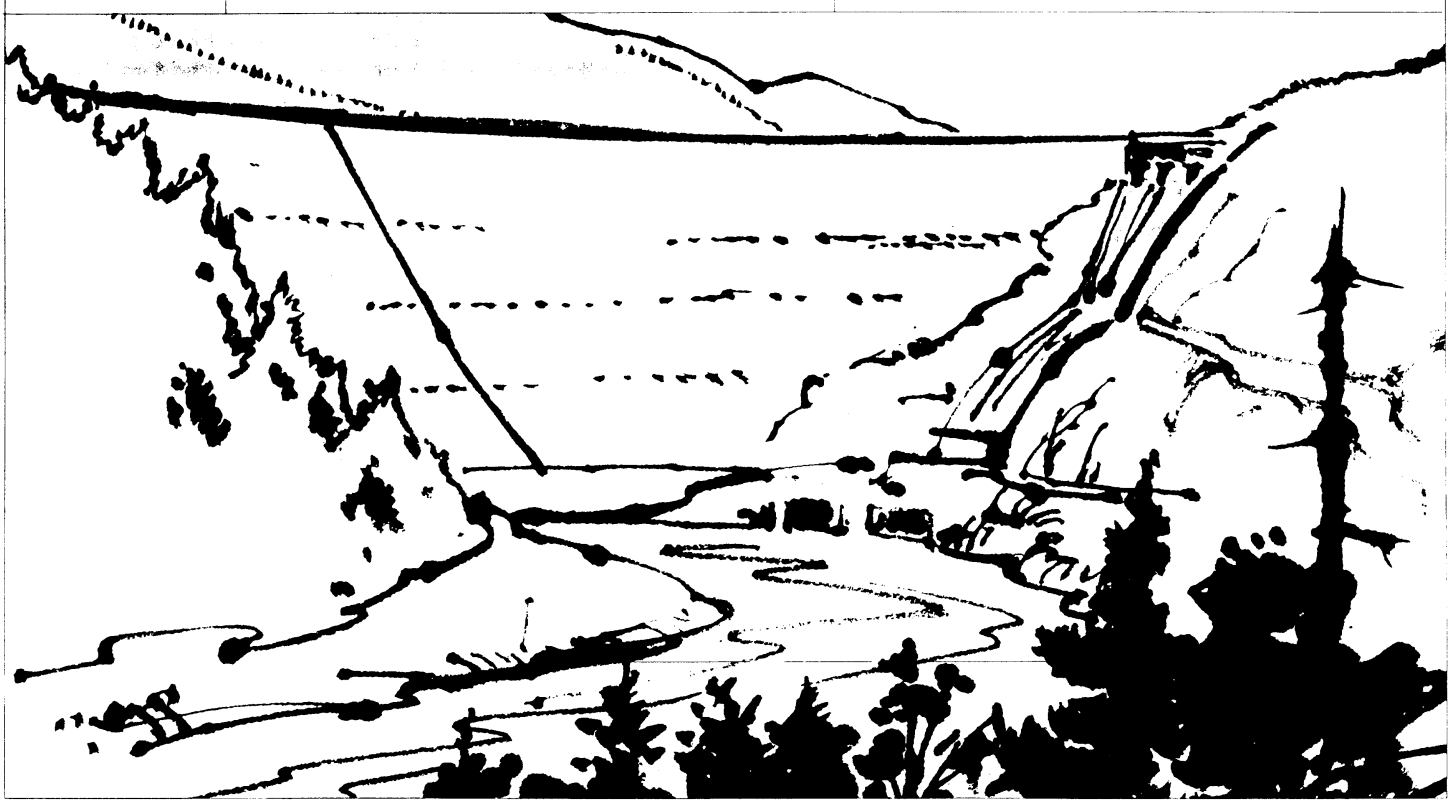
"A bad part about this reservoir," said LaFont, "is that it covered up a lot of area for caribou, deer and bears. Wildlife got forced into higher, colder territory. With less land per animal, many died. Any time you mess with a river," he said, "you get your good and your bad."

Leslie's job at each day's end was to pitch the tent, while LaFont fixed dinner. They ate soup, pork and beans, dried fruit, jerky and granola. At home, Leslie wouldn't have touched this stuff with a 10-inch fork. But up here, everything the old man stirred up tasted surprisingly good.

A squall set in one night on Kinbasket Lake. They stayed in the tent, played cards, and waited it out. By early afternoon, the clouds lowered and dropped a cold, steady rain.

"Nothing to bother a pair of rugged voyageurs like us," LaFont announced. They struck camp and pointed the canoe onto the gray, rain-dimpled lake.

To Leslie's surprise, rain was a good thing. Rain settled the wind. Each stroke of her paddle was followed by a smooth, jump-ahead glide of the canoe. As far as Leslie was concerned, it could rain another day. And it did. They made good time.



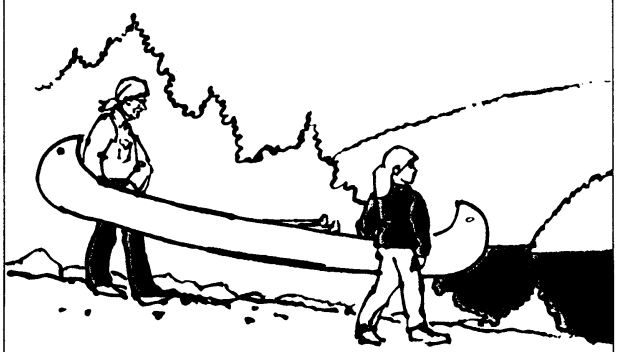
Back Toward Civilization

On the longest day of the year, June 21, LaFont and Leslie came to the northernmost reach of the Columbia River. They were still on Kinbasket Lake.

"Far below where we're floating, here," said LaFont, "was an important place to the voyageurs. Boat Encampment, they called it. Hudson's Bay Co. had a trading post here. The fur trade route was from Fort Vancouver, on the lower Columbia, to Boat Encampment and up over the Rockies toward Montreal."

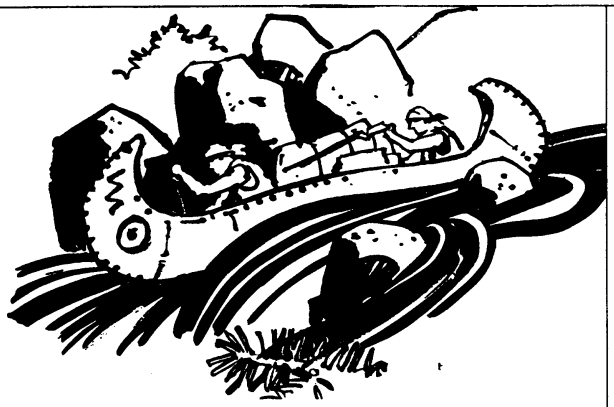
Kinbasket Lake's shoreline curved left, in a wide U-turn back to the world. With skies clear and wind at their backs, they soon came to Mica Dam.

A movie at the visitor center explained the river, before and after the dam. The U.S. and Canada agreed in a treaty to build Mica Dam and to share its benefits. Three other storage dams – two in Canada, one in the U.S. – were included in the treaty. The idea was to prevent flooding and share power from the water these dams hold back.



Mica Dam was so tall that Leslie's ears popped three times on the elevator ride down into the bowels of the dam. In a huge bedrock cavern below the former level of the river, four immense turbines were using the river's force to spin generators and make electricity .

"The advantage of hydro power," the tour guide said, "is that the fuel – falling water – can be used over and over again. As the river continues toward the sea, it passes through many other dams. And each year nature gives us a new supply of water."



Voyageurs shot the rapids of the old, wild river.

After touring Mica Dam, LaFont and Leslie carried their canoe down the left bank road until they reached the next level of river. Already, the Columbia was flat, another reservoir, although the current was strong.

In the long, narrow reservoirs behind Revelstoke and Keenleyside Dams, LaFont and Leslie paddled south. Days faded into weeks. Leslie looked up one day to discover that her grandfather's white stubble was now a short beard.

These long lakes were a place of great beauty. Above timberline, the Selkirk Mountains rose on the left, the Monashees on the right. They found campgrounds, but stores were rare.

"Somewhere below where we're floating is what they called Les Dalles du Mort," said LaFont. "Death Rapids." It was one of the roughest rapids the voyageurs had shot on the old, wild river. They tied red bandanas on their heads, he explained, so they could spot accident victims and fish them from the water.

So that's why the old man wore his red bandana when canoeing, Leslie thought. He was carrying a piece of history down the river.

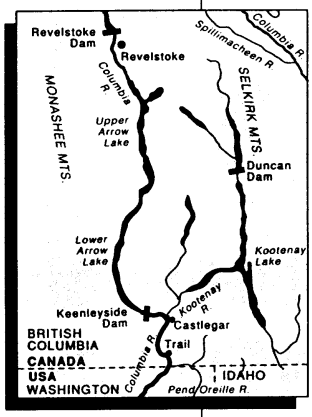
"Anglos and Americans ended up claiming the Columbia's territory," he said. "But French voyageurs left their language on the river. We say glaciers, not icefields," he said. "Canal, not ditch. Canoe is a French word. Paddle. Portage. We call this a reservoir," he said, "not an impoundment like the English would."

At the Nakusp marina, LaFont fixed a poleholder to the side of the canoe so he could troll for kokanee on Arrow Lake. Whenever he hooked one, he let Leslie reel the fish in.

"Now these kokanee," he said, "are modern cousins of your sockeye salmon. They're a landlocked salmon."

Before Grand Coulee Dam was built, he explained, salmon migrated all the way from the Canadian reaches of the Columbia to the Pacific Ocean and back. They would spend years out in the ocean. Those that survived would swim all the way back home to spawn.

The U.S. and Canada agreed in a treaty to build Mica Dam and share its benefits.



The Kootenay and Pend Oreille rivers join the Columbia near the U.S.-Canadian border.

"Now they can't do it," LaFont said. "There are no fish ladders at Grand Coulee or Chief Joseph dams, downstream. These kokanee do the best they can," he said. "The reservoir is their ocean. They spawn by the shoreline, and in creeks that feed the reservoir."

If that was odd – "the reservoir is their ocean" – it was no more odd than the idea that she and her grandfather were paddling over the sites of former villages and towns.

Kokanee are a landlocked salmon.

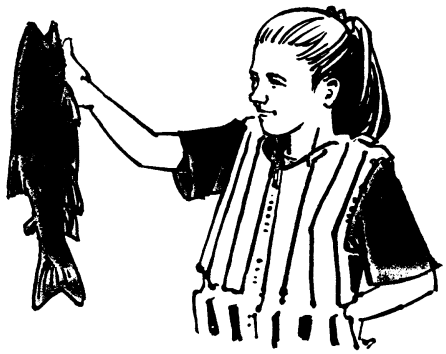
The river was working in new ways for people. At the end of Arrow Lake, Keenleyside Dam had a navigation lock. A tugboat was towing a boom of logs. The tug disappeared into the lock. The lock drained and dropped the tug 80 feet to the next level of the Columbia River. Just below the dam was a large lumber mill, where the logs were headed.

A tug pulls timber through the lock at Keenleyside Dam.

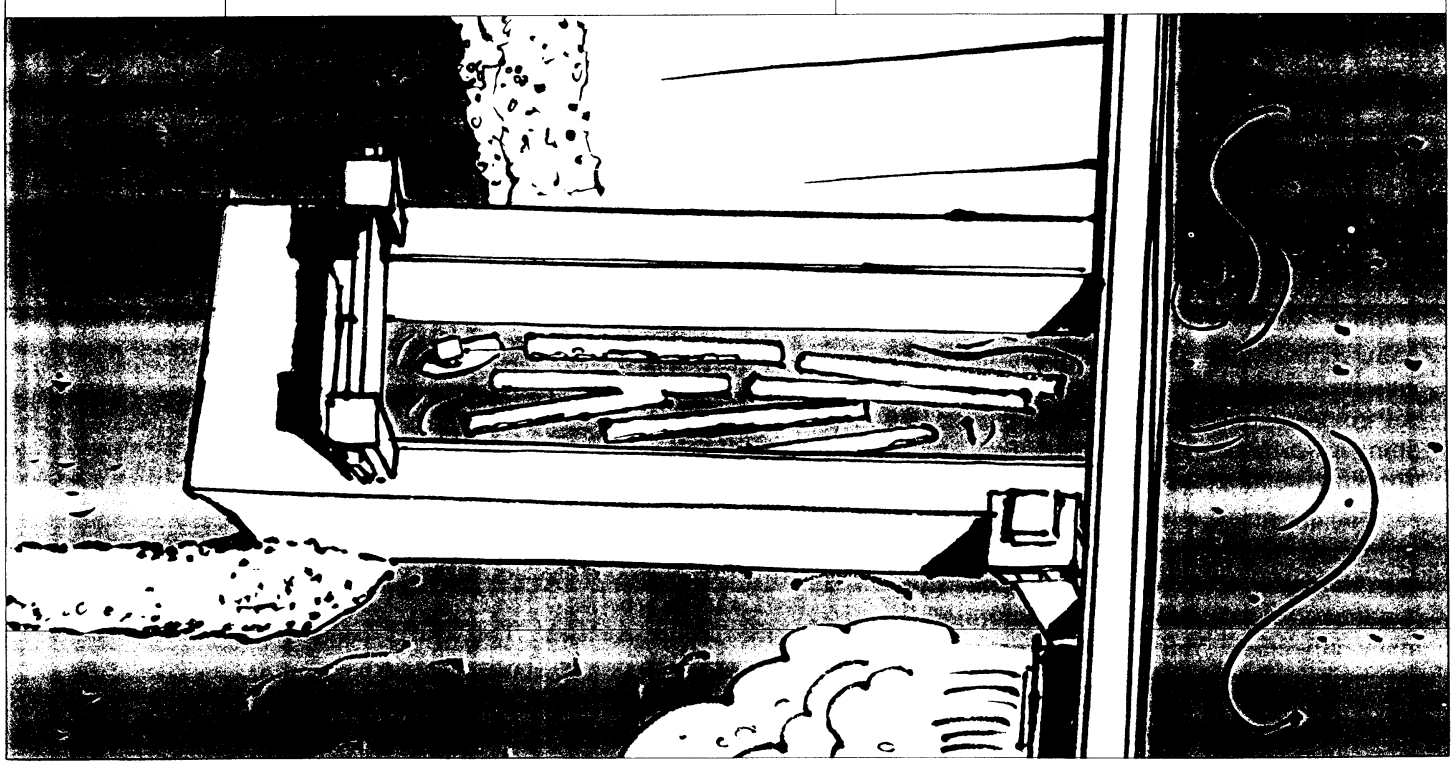
So the Columbia River was a series of steps, really. Each of the dams backed up a long flat reservoir to hold the river and put it to work. Yet here, below Keenleyside Dam, the Columbia was swift and powerful enough to flip their canoe in an instant if LaFont or Leslie made a mistake.

The Kootenay River came boiling in from the left. Leslie scanned the water, looking for the gray-white slab of bark LaFont had tossed into the Kootenay over a month ago. Could it really be here?

"Not likely," said LaFont. The Kootenay, like the Columbia, has dams on it. Libby Dam, a big storage dam in Montana, backs the Kootenay up into Canada. There are five more dams between Libby and the Columbia.



Almost all major tributaries of the Columbia, he explained, are harnessed. In addition to Libby and three others covered by the U.S.-Canadian Treaty, there are four big storage dams in the U.S. Together, "the big eight," can hold back 30 million acre-feet of water – enough to cover the state of Ohio a foot deep.



Factories use river water for cooling.

The river can give more when people work together.

"So how many dams are there?" she asked. Leslie knew they would pass 14 dams on the mainstream Columbia. Now she was thinking of the whole system.

"Altogether?" LaFont said. "About 125 dams. Every drop of water in the Columbia River system is spoken for – and then some."

They stopped at a cafe in the river-junction town of Castlegar. LaFont and some old-timers began telling flood stories, like war stories. LaFont had seen the 1948 flood wipe out Vanport, far downstream. The locals were not impressed. They had seen their own flooding of the Columbia and Kootenay Rivers, and more recently than 1948.

"I grew up in Bonner's Ferry," said the waitress, pouring coffee. "Up the Kootenai*, over in Idaho. Until Libby Dam got built and calmed things down," she said, "flooding was our big excitement. People went down and watched the water gauge. You'd have every available body patroling the dikes. You'd see a little trickle and heave sandbags at it."

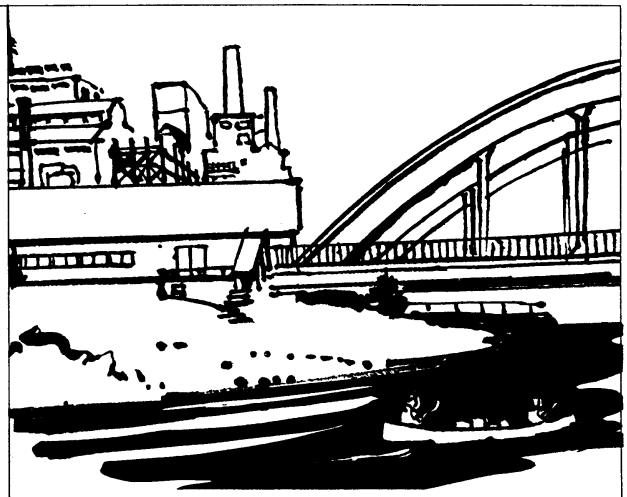
"The good old days, hey?"

Libby and other storage dams have stopped the Columbia's floods.

"Stuff the good old days," she said. "The last 20 years or so, you can live a normal life around here. I hope I never, ever, hear a flood-siren again."

The river narrowed between tall cliffs as it rushed from Castlegar toward the U.S. border. Fortress-like, on a plateau above Trail, sat an enormous zinc and lead smelter. "Why put a smelter on the river?" Leslie asked.

"It's another way people put the river to work," he said. "They use hydro power to purify metals," LaFont said. "The mining company owns five hydro plants on the Kootenay and



one on the Pend Oreille River," he said. "And they need lots of water for cooling."

Soon another large river joined the Columbia from the left. "This is the Pend Oreille," said LaFont. "If you followed the Pend Oreille," he said, "past Albeni Falls Dam, you could take the Clark Fork far into Western Montana. Another river into the Pend Oreille is the Flathead. That's where you'd find Hungry Horse, another big storage dam."

LaFont was so busy watching the Pend Oreille River meet the Columbia that they nearly missed the U.S.-Canadian border. Putting ashore, they passed through customs.

"How long have you been in Canada?"

"Since I was little," said Leslie, flexing her canoeing muscles.

"About five weeks, now," said LaFont.

As they paddled on, there was nothing like the color change on a map to separate the U.S. from Canada. Leslie was disappointed.

"Well, the river can't tell the difference either," said LaFont.

"So who decides?" she asked. "Canada or the U.S.? Who gets the electricity and who works the reservoirs?"

"That's part of what the treaty is for," said LaFont. Each country, he explained, runs its own dams. But they coordinate things. "Canada didn't need that much energy at the time," he said. "So when the storage dams were finished, in the late 1960s and early 70s, they sold their half of the electricity to the U.S. for 30 years."

Thirty years, Leslie thought, from the 1960s.... "What's going to happen now?"

"Canada wants its share back," he said. He paddled on a while. "The point is," he said, "the river can give more when both sides share. The river is a whole system, with many parts. By working together, both sides get more."

*The Kootenay River flows through Canada and the United States. In the U.S., it is spelled "Kootenai."

From Lake Roosevelt to the Grand Coulee

South of the Canada-U.S. border, the fast and swirling river settled into Franklin D. Roosevelt Lake — the reservoir behind Grand Coulee Dam. The next day, LaFont and Leslie floated eerily over Kettle Falls.

"Used to be," said LaFont, "Kettle Falls was a drop in the river. The water rushed between narrow cliffs and down over rock steps. Like Celilo, further downstream," he said. "Even the voyageurs had to portage Kettle Falls." The falls, he explained, were a famous Indian fishing place. "Indians used spears, pole nets, and wicker fish traps" he said, "to catch salmon as they leaped the falls."

Now there was only a narrowing of the lake and a bridge where the falls had been. Sailboats raced across the water.

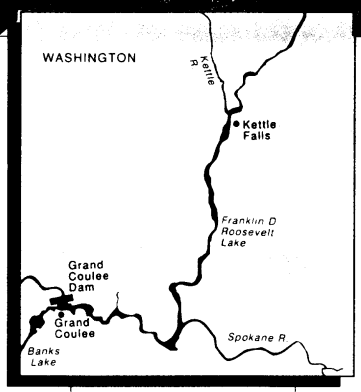
"Welcome to Kettle Falls Regatta," said a woman on shore. They beached the canoe and joined the crowd. A grassy viewing area with pine trees was separated from lake level by a strip of raw sandy shoreline.

In a line at a taco stand, Leslie overheard grumbling about the water level. "You'd think they could have brought the water up for the regatta," a man told his wife.

"The water is up," said another man. "The lake's higher than it's been for three summers. They never give us enough water anymore."

Leslie brought tacos and pop back to LaFont. She asked why they hadn't brought the water up. "They, who?" she asked. "Who runs it?"

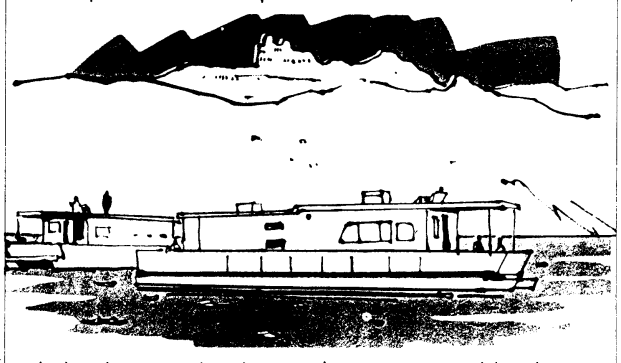
"Well, you'd need a bigger story than I can tell," he said. "But basically it's your government. The U.S. Army Corps of Engineers and the Bureau of Reclamation built, and now run, the government dams. BPA – Bonneville Power Administration – sells the power from those dams. You got your fish agencies and Indian tribes and a whole alphabet soup of groups, private and government, that have a stake in the river."



Franklin D. Roosevelt Lake stretches 151 miles from Grand Coulee Dam to the Canadian border when full.

There isn't one owner that coordinates the whole system, he explained. But the different parties get together and run the system as if there were.

Computerized control centers, he explained, set reservoir levels for flood control. Forecasters and planners also spread water around for fish,



People enjoy sailing and houseboating on the reservoir.

irrigation, navigation and recreation – like the Kettle Falls Regatta. Then the power guys try to predict how much power is going to be used. That's balanced with what can be churned out at dams up and down the river. All these things influence reservoir levels.

"They play the whole river like an organ," said LaFont. "The dams are the organ stops.

And not everybody thinks they always hit the right chords. Some years," he said, "there's not enough water to make everybody happy. You get a few dry years, like we've had," he said, "and the river gets stretched mighty thin."

On the banks of Roosevelt Lake, pine trees gave way to junipers and sage. "We're gettin' into the dry country," said LaFont.

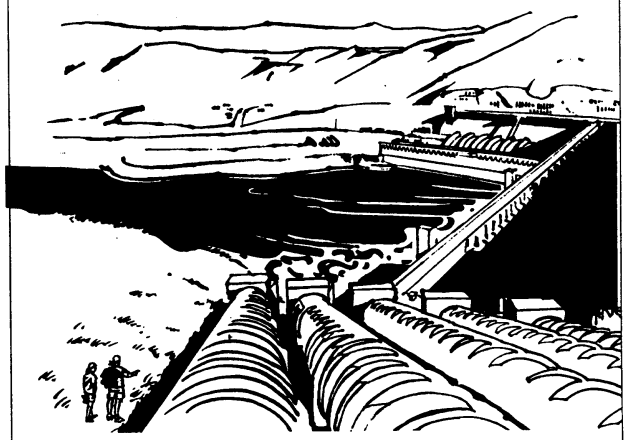
The sun beat down so hard that Leslie had to wear a long-sleeved shirt for protection. White salt-lines formed around the edges of LaFont's red bandana. The water, too, warmed enough for good swimming.

For all the work it did, Leslie noticed, the river at Roosevelt Lake was also a playground. Marinas and boat ramps hummed with fishermen, waterskiers, sailers. Well into July, now, the reservoir had filled, bringing the water line closer to the campgrounds on its banks. Houseboats were scattered in coves and quiet inlets along the vast shoreline.

Whenever the lake bulged and widened, Leslie looked for Grand Coulee Dam. But Roosevelt Lake just kept going. Now they were paddling west. The banks showed layers of lava from volcanic eruptions. Gravel beaches had been left behind by receding glaciers.

Grand Coulee Dam finally came into view. A concrete wall nearly a mile wide crossed the lake. They beached the canoe at a cove. Above the cove perched the town of Grand Coulee. "This is where I used to live," said LaFont, "when I was your age."

Huge pipes lift irrigation water from Lake Roosevelt into Banks Lake.

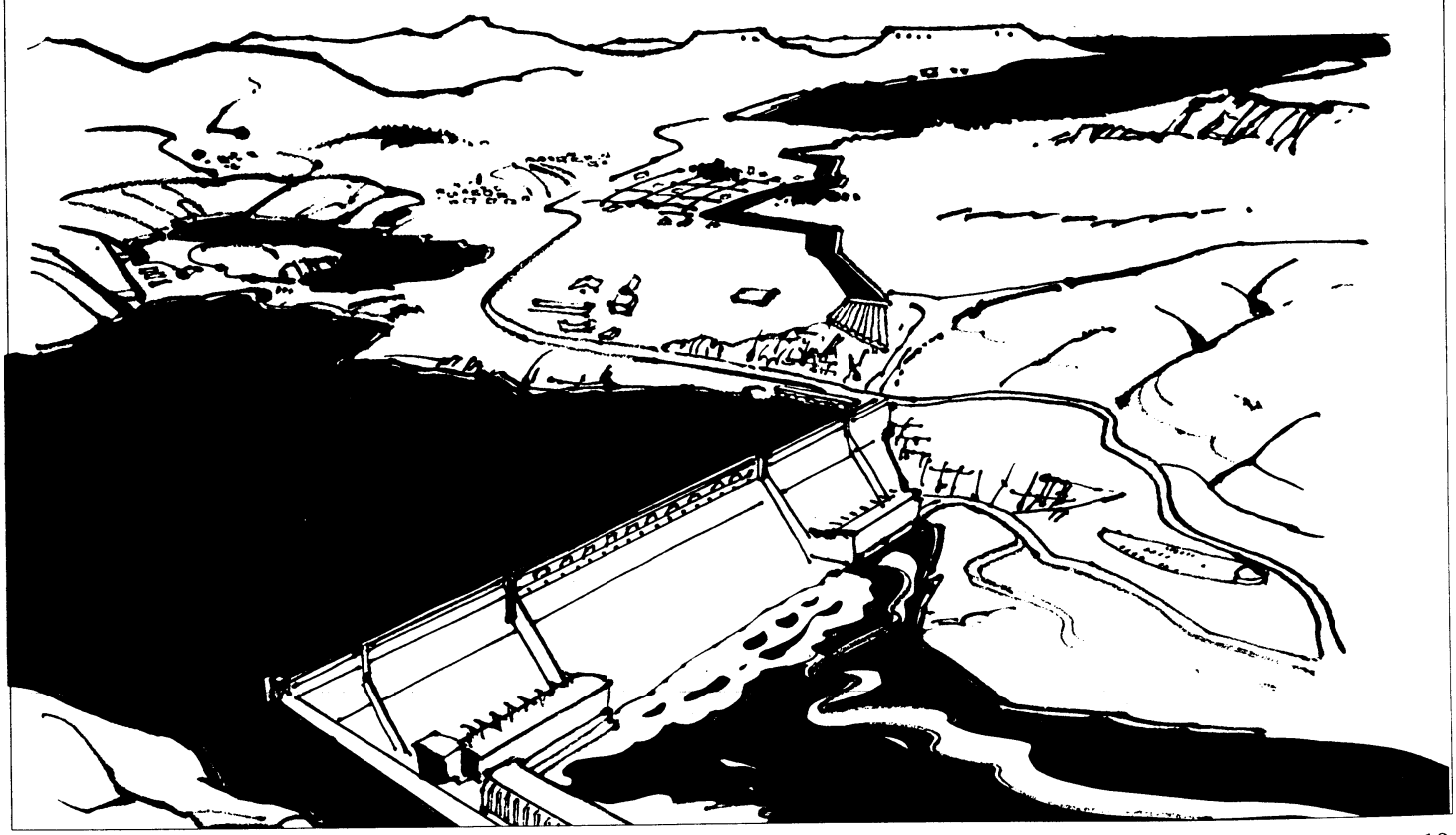


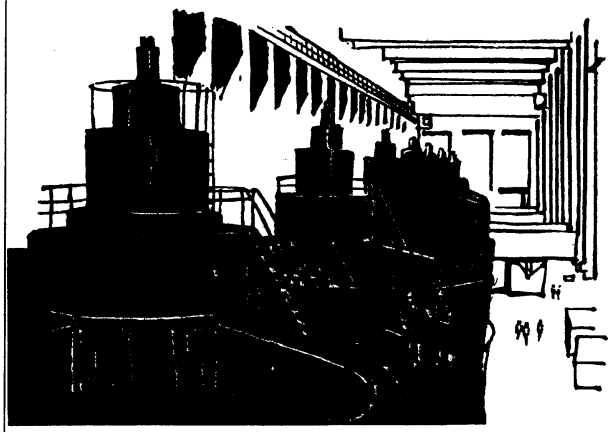
Some years, there's not enough water to make everybody happy.

Grand Coulee Dam stretches almost a mile across the river.

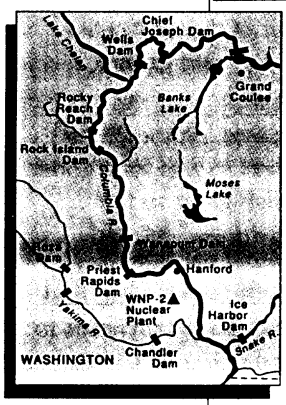
Street names were the same, although the pre-fab housing he had lived in was long gone. E Street, D Street. "This town grew so fast nobody had time to name things," he said. "Seven thousand men worked for eight years, starting in 1933," he said. "B Street, here, had the saloons and dance halls. It was off limits to us kids. But you could hear it all night long."

They hiked up a knobby hill. From the top, LaFont and Leslie had a panoramic view of the mammoth dam. "My papa was as proud of this dam as if he'd built it all himself," said LaFont. "For 7,000 years," he said, "the Great Pyramid at Giza was the world's largest structure. Grand Coulee Dam is three times its size."





Working at full bore, Grand Coulee turbines can churn out enough electricity for six Seattles.



Looking south, Leslie saw an ancient river bed lying at right angles to the Columbia. It seemed to have nothing to do with the current course of the river.

"This is the grand coulee," said LaFont. "Coulee is French for river valley, or ravine. Back in the Ice Age," he said, "a big glacier dammed the river gorge. That made the river cut this new coulee. When the glacier melted," he said, "the river went back to its original bed, where it is now."

In the coulee's bed was another reservoir. "The world's largest pumps," said LaFont, "push water from Roosevelt Lake up these pipes. From here the water goes into Banks Lake, in the coulee. And from there," he said, "it goes another 50 miles through tunnels and siphons and canals to the farm country."

The government's sales of electricity cover most of the cost of irrigation.

Over the horizon, down around Ephrata, was where LaFont's papa had failed at dryland potato farming. "The soil was good," he said. "All we needed was water. Some years we had enough rain. Other years – sometimes three, four years in a row – we didn't."

"Water is life," said LaFont, scratching his beard. "And Grand Coulee Dam spreads it around. Potatoes, sugar beets, wheat, vegetables... The water makes the brown land green. Without Grand Coulee Dam, you wouldn't have big towns like Moses Lake, Ephrata, Othello. Lots of people," he said, "lots of life."

A big commercial jet curved toward an airport in the direction they were looking. "Who pays for all this?" Leslie asked. "The farmers?"

"Farmers pay some," he said, "but not all it costs. The money people pay for electricity from the federal dams covers most of the cost of irrigation up here. That's the beauty of it, Les," he said. "The river pays for it."

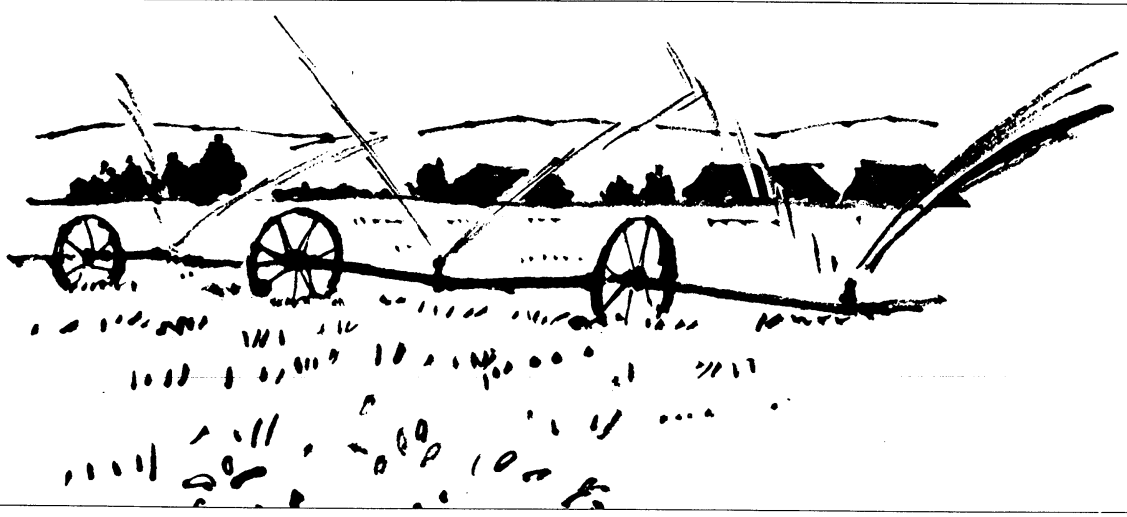
The hike up the hill had taken its toll on Leslie's canoe-dead legs. By the time she and LaFont walked down to Grand Coulee Dam, her legs were rubbery. With her back to Roosevelt Lake, Leslie peeked over the railing into the chasm of the Columbia River, 350 feet down.

The dam, wedged between cliffs, had been enlarged to add a new power plant since LaFont had last seen it. Now it lay across the river in the shape of a hockey stick, to use more of Lake Roosevelt's stored water for power.

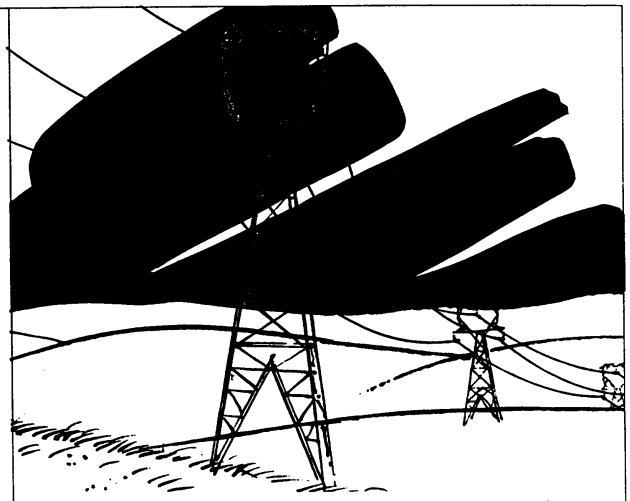
"Used to be," he said, "great flows hurtled over this spillway. Didn't do anybody much good. Now that we have storage reservoirs and the new power plant," he said, "that doesn't happen. The river can do more work."

They joined a tour group headed toward the right side of the dam. They saw generators that had been in place since Grand Coulee Dam was finished. Leslie didn't think she'd ever seen machinery so big.

Size, however, is relative. The next part of the tour took them to the new power plant. Here she saw generators twice as large, each producing five times as much power as Grand Coulee Dam's original generators. When all the turbines hum to capacity, this single dam generates enough electric power to run six Seattles.



Water from Lake Roosevelt turns the desert green.



BPA lines carry power from Columbia River dams to Northwest cities.

"You know, people ask an awful lot of this old river," said LaFont. "We stopped floods. We evened out the flow to spread the power around. We made the desert bloom. And people will be asking even more of the river," he said. "When Congress set up Grand Coulee," the old man said, "they authorized a million acres of irrigation. Only half that land's been watered. Now there is talk of irrigating more."

"Is it going to happen?" Leslie asked.

"I don't know," he said. "Maybe a little bit at a time. People these days are more aware of the river's limits, too."

Paddling a Desert River

Downstream from Grand Coulee Dam, the Columbia began a wide, 10-day western bend – in the shape of a ragged letter C – across the center of the state of Washington. They came to Chief Joseph Dam. People at the dams, Leslie noticed, liked to tell visitors how many cities the size of Seattle their dam could power.

"So which of these dams does send electricity to Seattle?" Leslie asked LaFont.

"Well, it's not that simple," he said. "Power goes out in just the opposite of the way streams and rivers flow into the main Columbia River. At the start," he said, "electricity gets collected from dams into what they call a main grid. Big power lines."

LaFont explained how the government built, and runs, the main grid. Over the grid, BPA sells big blocks of electricity to utilities. "Who delivers the electricity to your house in Seattle?" he asked. "Do you know?"

"Seattle City Light."

"OK," he said. "That's your utility. The utility has some dams and power plants of its own. But it also buys electricity over the main grid. Think of the government's grid as the main river of electricity," he said. "If the main grid is the river, the utility is the stream. The power lines going down the street to your house are the creeks. If you drew a map of electricity branching out from the grid to people, it would look like our river map of blue broccoli."

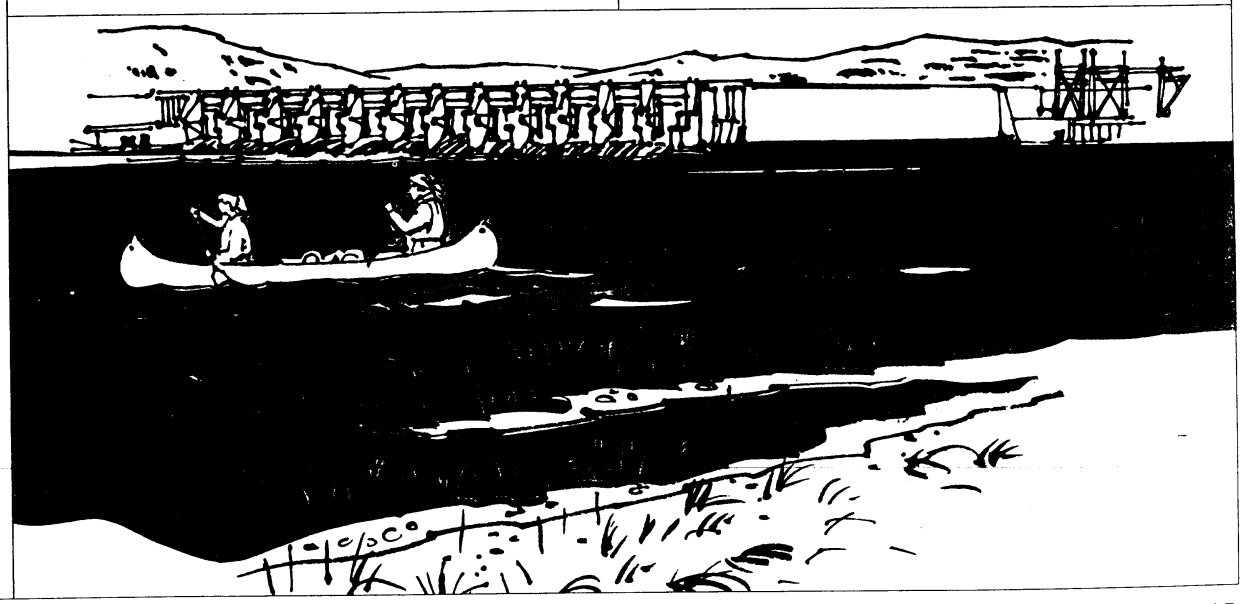
"In reverse," she said.

"Green broccoli."

The Okanogan River joined the Columbia below Chief Joseph Dam. Then came a series of five dams – Wells, Rocky Reach, Rock Island, Wanapum and Priest Rapids. These dams were lower than the kind they had passed.

"They call these 'run-of-river' dams," said LaFont. "As opposed to storage dams. Their main job is to generate power as the water goes by."

And people will be asking even more of the river.



Low-slung run-of-the-river dams were built to make electricity.

Hatcheries help replace fish runs lost to upstream dams.

Another thing different about these five dams, he explained, is they weren't built by the government. Utilities built them. Rock Island Dam was the very first dam on the Columbia, built in 1933.

"People formed their own utilities. They built dams. Now they own them," he said. "They charge their members what it costs for electricity. And it's not much. Some of the lowest electric bills in the whole world are right here. If the utility has power left over – and it usually does –" he said, "it might send power over the government lines. They sell it on the other side of the Cascades, where there're more people."

At Wells Dam, a twisting artificial stream led to a salmon and steelhead hatchery. Some returning fish went up a fish ladder toward the Okanogan and Methow Rivers. Others swam straight to the hatchery, where they had begun life. Their young, in turn, would be raised at the hatchery and released either here or upstream. On the river, Leslie noticed more eagles than she had seen recently. Fishermen lined the banks in wait for summer steelhead.

Even though the river looks natural here, it's regulated for fish.

As they paddled on, flat green benches of farmland flanked the river. Neat rows of apple trees criss-crossed in orchards around the busy city of Wenatchee. Pumps at shoreline pulled water from reservoirs to irrigate the orchards.

"Wouldn't the voyageurs be surprised," said LaFont, crunching a Washington apple, "to see the changes in this dry place."

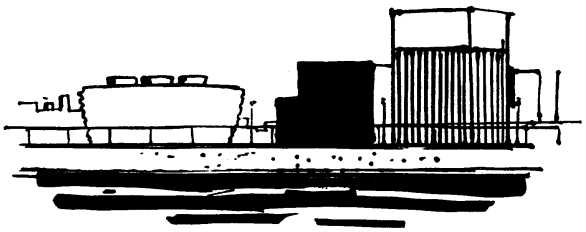
Northwest winds pushed them along the river's C through central Washington. Below Priest Rapids Dam, they came to – surprise! – a free-flowing stretch of the Columbia. Not since the Canadian border had they seen more than an hour at a time of live current. Now the river picked up their canoe and hurried it along for one whole day. They stopped at an island for lunch. Leslie wondered why this part of the river wasn't dammed.

"There was a dam on the drawing boards," said LaFont. "But Congress passed a law to prevent damming or dredging this stretch."

One reason, he explained, is fish. Gravelly islets around Vernita Bar are the last place salmon can spawn in the main Columbia River. They lay their eggs in shallow nests, or redds, in swift-flowing water that has lots of oxygen. Reservoirs don't work for spawning.

"Even though the river looks natural, here," he said, "it's regulated for fish. Every year the river coordinators send enough water from storage dams like Mica and Hungry Horse to cover the redds until the fish eggs hatch. And they send extra water down the river from mid-April to mid-June," he said. "That helps young salmon and steelhead make their way out to sea."

Salmon spawn in swift, shallow water.



The WNP-2 nuclear plant adds to the power system.

The Hanford Nuclear Reservation borders the Columbia River.

Beyond Vernita Bridge, they saw no roads. No towns. On the bank were large factory-looking buildings with dead smoke stacks. The bank was posted with No Trespassing signs.

"Plutonium reactors," said LaFont. "They're not running anymore. This is Hanford, where the U.S. brewed plutonium for the first atom bombs, like the one dropped on Nagasaki."

Only the abandoned shell of a high school was left of the town of Hanford. "I knew a guy who lived here in World War II," said LaFont. "They shipped in construction workers. My friend didn't know what he was building, and he swears nobody else did. Not until the bomb was dropped in 1945 were Hanford workers told what they'd been doing. They had changed the course of history."

The river hurried to the left of a bald island. It cut into cliffs of white sandstone. Great flocks of geese and ducks fanned into the sky. On the sandy shore, a coyote loped along the bank.

"The nuclear plant that is working," LaFont said, "has nothing to do with plutonium or bombs. You can't see it from here, but there's a nuclear power plant just over the rise." He pointed off to the right. "Actually there are two of them, but only one has been finished. It's been working since 1984."

The Snake River has the most pressure on its water supply.

The Snake River is the Columbia's largest tributary.

A River Highway

The river's C behind them, the Columbia bent south and began a wide turn back west. The Yakima River came in from the right. At the Tri-Cities of Richland, Kennewick and Pasco, the Columbia became a reservoir again and was joined by the Snake River.

In a park at the river-junction stood a monument to Sacajawea, Lewis and Clark's Shoshone Indian guide. Lewis and Clark had come over the Rockies and down the Snake exploring the Northwest wilderness for young America.

The modern river here became a highway of commerce. Huge tugs nosed barges up and down the reservoir, into and out of the Snake River. Leslie was reminded of those social studies maps with their little sheaths of grain, oil derricks, cattle.

"I used to shove these barges all the way to Lewiston, Idaho," said LaFont. "The Snake is a big workhorse these days."

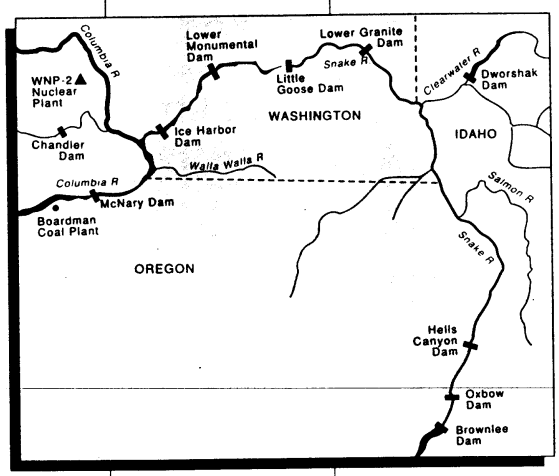
On its way from the Grand Tetons in Wyoming, the Snake irrigates a wide swath of southern Idaho. It is the lifeblood of most of the state's population, and for Idaho's famous potatoes. Dworshak Dam, on the Snake's Clearwater River tributary, is a big storage dam. Dams on the lower Snake float barges and spin out electric power.

Of all the Columbia's tributaries, LaFont said, the Snake has the most pressure on its water supply. Competing uses – for power, irrigation, navigation and fish – keep people arguing about how to use the river.

It was August. As the Columbia turned west, stiff winds lifted the water to white waves. Some days it was too dangerous to paddle, because sharp rocks lined the shore next to railroad tracks. Leslie began to wonder: Would they make it all the way to the Pacific?

A grain barge idled before the lock at McNary Dam. LaFont pointed his paddle at the tug boat. He shouted at the captain. "Shuv Nordquist!" he bellowed.

The weathered captain, wearing a Seattle Mariners cap, did a double-take as he



recognized his old tugmaster friend. "LaFont!" he shouted back.

The captain climbed down from the bridge and dropped a short ladder over the side of the tug. Leslie climbed on board. Her grandfather and the captain whacked and hugged one another. LaFont did the introductions. "When push comes to shove," he said, "Shuv comes to push. Is that right, Shuv? Shuv Nordquist, this here's my granddaughter, Leslie."

Shuv ordered a crew guy to hoist the canoe aboard the tug. "We'll carry you through the lock," he said. "You two look about beat."

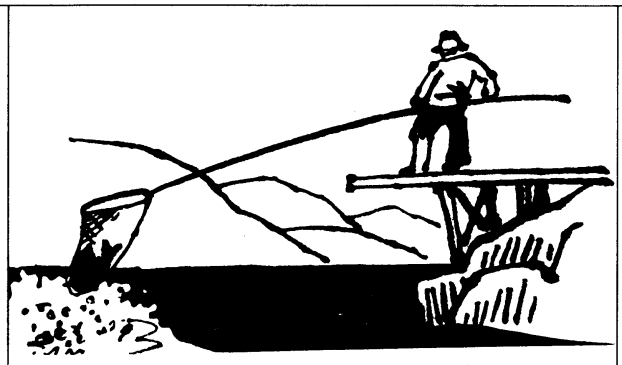
Shuv demanded that they stay on the tug for dinner. They had thick T-bone steaks and baked potatoes in the galley. The two men talked. Shuv Nordquist was riled up about how the Snake River was silting. In spite of regular dredging, it was getting dangerous for barges below Little Goose Dam. "They'll either have to dredge deeper or release more water," he said.

"There's always something," said LaFont. "As much as this river does, people always want more."

Leslie noticed the tug's bunk beds. When Shuv invited them to stay the night, she caught her grandfather's eye and gave him a nod.

"I guess it wouldn't hurt if we didn't paddle every inch of this river," said LaFont. "We're still on it." John Day Dam was a pause in the night, unnoticed by Leslie as she slept. The next day, when she awoke, they were gliding between brown-baked hills. The Columbia formed the border between the state of Washington, on the right, and Oregon.

They passed the site of the famous Indian fishing village of Celilo Falls. Like Kettle Falls, Celilo was once a major gathering and trading place for Northwest Indians. Salmon caught at



Indians hold special fishing rights.

the falls were the Indians' food, their currency, and a big part in their religion. Now Celilo Falls is under water. A park and a boat launch mark the spot, next to the flat reservoir.

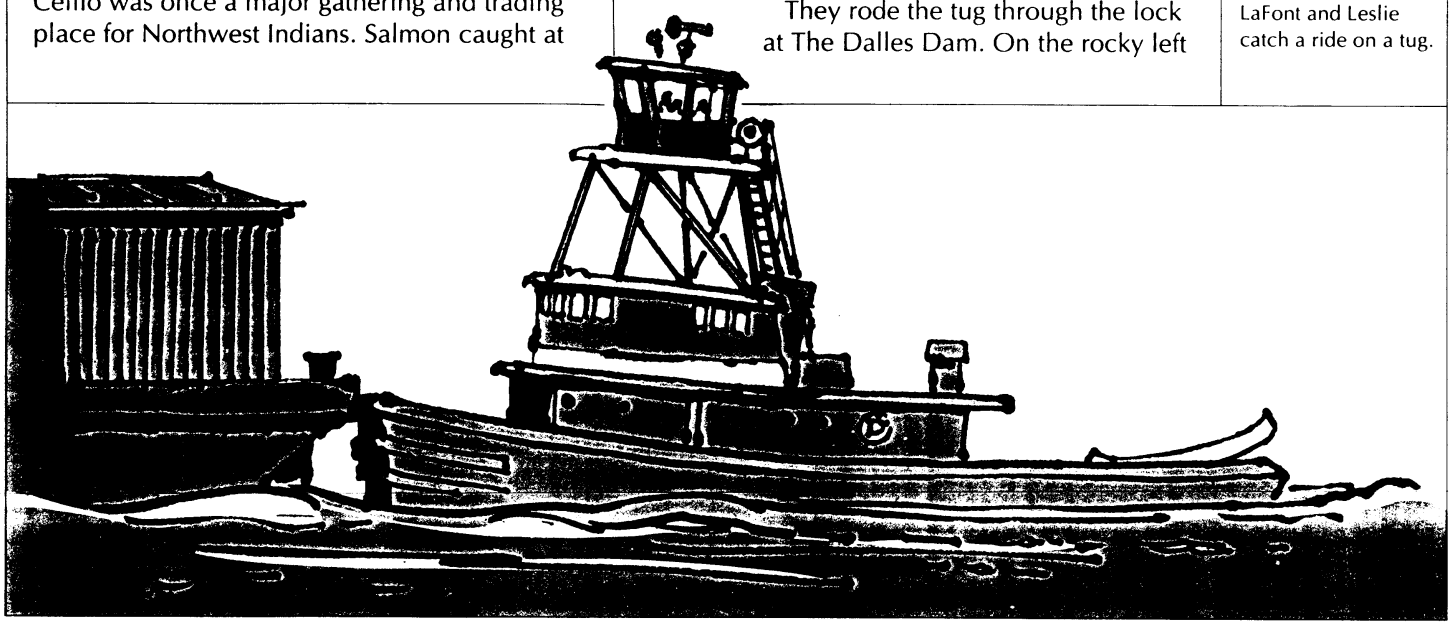
"This used to be a nasty set of rapids," said LaFont. "Wagons on the Oregon Trail," he said, "got to Celilo and had to make a choice. Some took the Barlow Trail – around Mt. Hood and into the Willamette Valley. Others put their wagons on rafts to float down the Columbia River Gorge. A lot of folks didn't make it," he said. "Or they lost everything in the rapids."

LaFont and Leslie rode the tug toward The Dalles Dam. A hill on the left was capped with many power lines. "Celilo Converter Station," said LaFont. "That's where they convert electricity from alternating current to direct current. AC is how we use it," he said. "DC is how we send it long distance. That power is going all the way to Los Angeles," he said. "Non-stop."

In spring and summer, he explained, the Northwest sells power it doesn't need to California. Because of air-conditioning, California uses more power in summer. In winter, California might return power to help heat the Northwest. "Exchanges," he said, "even out peaks and valleys in the way different areas use electricity. They're a good deal for everybody."

They rode the tug through the lock at The Dalles Dam. On the rocky left

Reservoirs and locks make a 470-mile highway for tugs and barges.



LaFont and Leslie catch a ride on a tug.

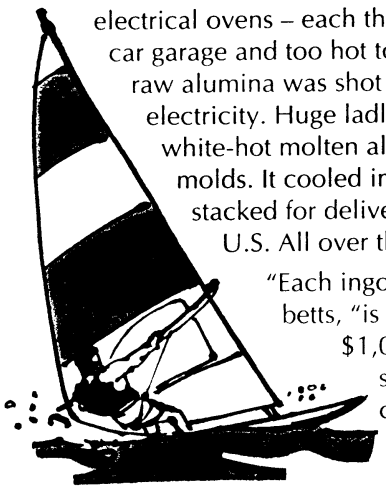
shore, Indians were fishing. Rickety wooden platforms extended from the bank. Indians dropped fishing nets into the river for salmon.

"There's not much left of the Indians' traditional fishing grounds," said Shuv Nordquist. "But Indians have special fishing rights between John Day Dam and Bonneville. They can use nets and fish at night. They catch enough fish for their own food and ceremonies. Sport and commercial fishermen can't use these Indian fishing sites."

Leslie was getting restless on the tug. Riding down the river was a lot like cheating. Shuv Nordquist idled the tug. They lowered the canoe over the side.

Instead of paddling much more, however, LaFont aimed them ashore at a tiny cove near the industrial area of The Dalles. He marched Leslie to the office of Northwest Aluminum Co. and demanded to see Bernie Ribbetts. "Tell him Pierre LaFont is here," he said.

Ribbetts, it turned out, was head of the local aluminum workers' union. He and LaFont were old friends. Ribbetts found them hard hats and safety glasses. He showed them through the aluminum smelter. In row after row of electrical ovens – each the size of a two-car garage and too hot to get close to – raw alumina was shot through with electricity. Huge ladles poured white-hot molten aluminum into molds. It cooled into ingots, stacked for delivery all over the U.S. All over the world.

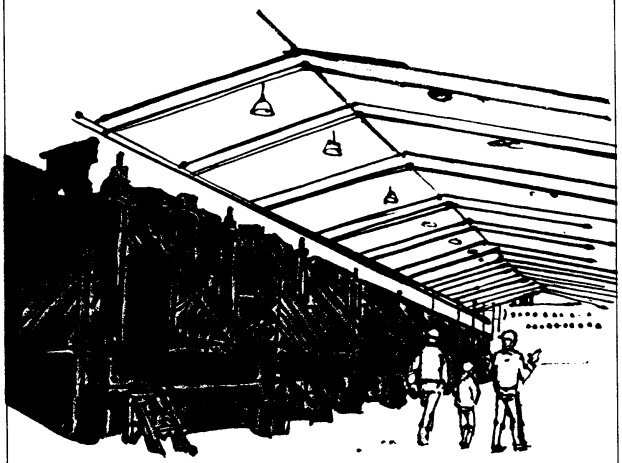


"Each ingot," said Ribbetts, "is worth over $1,000." In one stack, Leslie counted 50 ingots before she gave up.

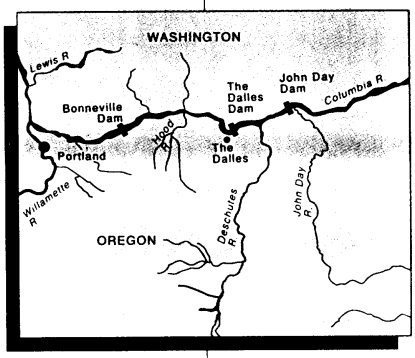
"Tell her about the electricity," said LaFont.

"Last month our power bill at this smelter was $3 million," said Ribbetts. "Aluminum plants use as much electricity as whole cities about the size of Eugene, Oregon," he said. "We buy power straight over the government's main grid. The Columbia River makes it less expensive here than in most other places. Low-cost power is why we came here. But it has gotten more expensive in the last 10 years."

A stiff east wind whistled off the hot wheatfield country of Eastern Oregon and into the Columbia River Gorge. It was blowing the right way for LaFont and Leslie, but the wind raised a frothy white chop on Lake Bonneville. They paddled close to shore.



Aluminum smelters were built in the Northwest to use Columbia River hydro power.



The land changed. Rounded hills gave way to steep cliffs as the river sliced the Cascade Mountain Range. Sagebrush and pine yielded to Douglas fir, alder and cottonwoods. The brown country turned green. Sailboarders rode the wind from shore to shore.

On Lake Bonneville was the site of Cascades, a series of rapids that used to stop river traffic. Now the site was smooth and navigable behind Bonneville Dam. They put ashore on Bradford Island, near Bonneville Dam's visitor center. There they watched a slide show about how the dam was built in the mid-1930s. The dam was to provide electric power and to make the Cascades passable for river traffic.

"Another thing the dam did," said LaFont, "was it gave jobs. During the Great Depression, building Bonneville and Grand Coulee put a good many people, like my papa, to work."

In the basement of the visitor center, viewing windows opened onto a liquid cross-section of fish ladder. Leslie watched, below water level, as salmon made their way upstream past the dam. Fish traffic was slow. A fish counter fingered her recording machine as a coho salmon – then another – swam past the windows.

"Come late September, October," said LaFont, "it's rush-hour. Fall chinook. Coho," he said, "which are called silvers. And steelhead."

On the wall, charts showed the ups and downs of returning fish runs – chum, sockeye, steelhead, chinook – since 1940. Leslie was surprised to see some major ups as well as downs.

"Last month our power bill at this smelter was $3 million."

The Columbia River Gorge offers some of the world's best sailboarding.

Bonneville Dam was built to provide power and make the river passable for river traffic.

In the late 1980s, steelhead and fall chinook had done well. It surprised her. She had begun to think every man-made twist of the river was bad for fish.

"Fish are getting more help these days," said a fish counter, taking a coffee break. "Thanks to a law passed in 1980, more money from power goes back to protect fish runs. It helps compensate for damage the dams have done. Some runs are coming back," she said, "others are still small. We have a ways to go."

She explained how money from sales of power helps improve fish ladders. Power money is used to open up new upstream habitat. It helps pay for fish screens to keep young fish out of turbines as they migrate to sea. It supports hatcheries and research on fish diseases.

On the Oregon shore, near the visitor center, they visited the Bonneville Fish Hatchery. Opened in 1909, it is one of the oldest – and now the biggest – fish hatcheries in Oregon.

"I don't get it," said Leslie. "The hatchery was here before the dam?"

Fish are getting more help these days.

"Oh, yes," said LaFont. "Fish runs were in trouble long before dams. Early in the century," he said, "people about fished the river to death. Early logging and farming, too, were very hard on salmon. Shoot," he said, "you got troubled fish runs around Puget Sound that have nothing to do with dams. But dams on the Columbia made it worse," he said.

At a row of rearing ponds, a worker tossed food-pellets onto the water. Each fistful brought thousands of fingerlings to the surface in a feeding frenzy. "What do we have here?" LaFont asked the worker.

"These are upriver brights," she said. "Fall chinook. We'll keep them here over the winter and release them in May." In other rearing ponds were different kinds of chinook and coho, she explained. "We'll release some of these in Tanner Creek," she said. "Others we'll take up the river by tanker truck, so they'll know where to go back to."

Some fish runs are improving, but others are not.

Storage dams upstream prevent floods on the lower river.

Paddle to the Pacific

The river below Bonneville began its unhindered final flow to the Pacific. Although the ocean was 140 miles away, the Columbia River from here was tidal.

"Not that you can taste saltwater," said LaFont, "but the river slows and speeds with the rhythms of tides." They were still in the Columbia Gorge. From clifftops, creeks emerged into nothing but air and came fanning toward the river. Multnomah Falls. Bridal Veil Falls.

Downstream, cliffs backed away from the river. The canoe passed a big aluminum plant and a paper mill. On the Oregon side, the river was thick with sailboats, yachts and waterskiers. Sun bathers crowded the sandy shore. An earthen dike separated the river from jumbo jets at Portland International Airport.

"Back in 1948," said LaFont, "the river broke through this dike a bit downstream. That's the Vanport flood I was telling you about," he said. "Vanport was housing for shipworkers during World War II. The river took everything in its path. It floated houses, drowned people and cows. Now, with the storage dams upstream, people are building again on the flood plain."

Downstream from the interstate highway bridges, they paddled into the shadows of huge ocean-going cargo ships docked along the

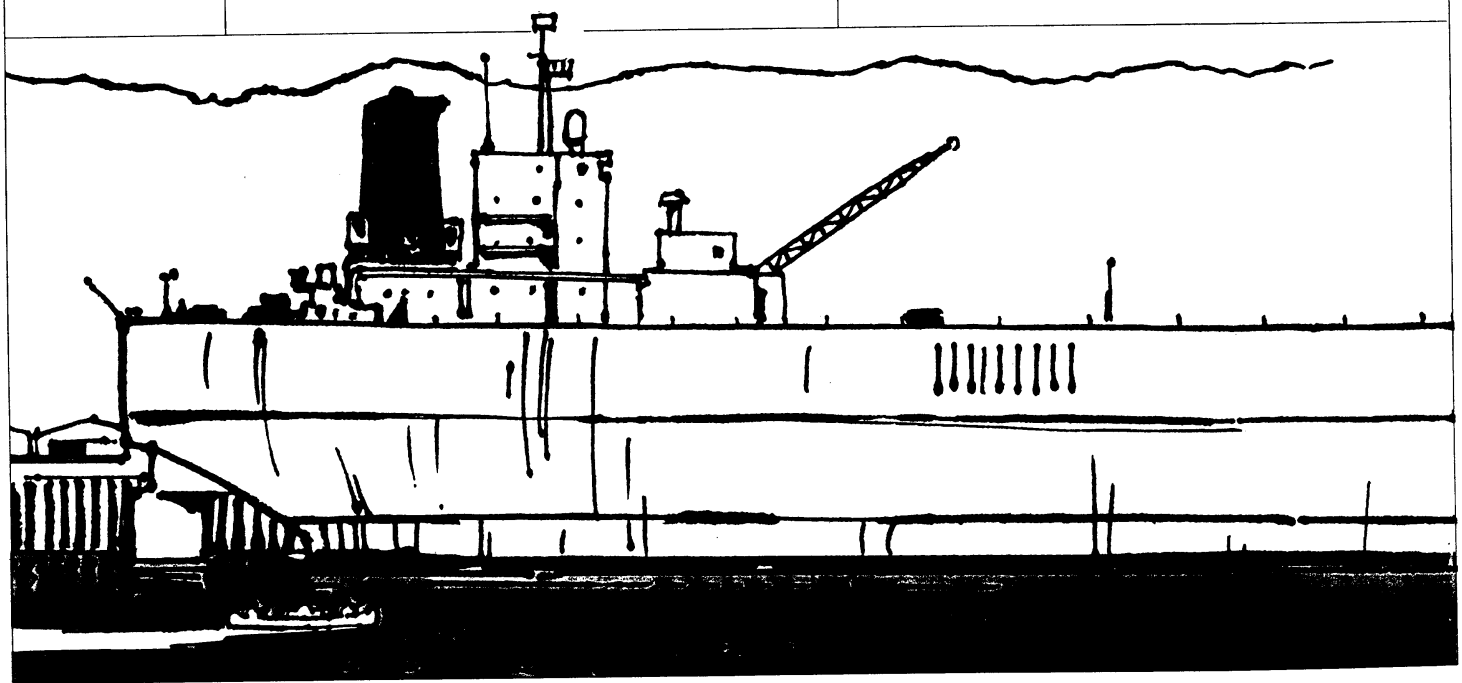
Oregon shore. LaFont took her on a short detour up the Willamette River. "The Willamette," said LaFont, "drains a long fertile valley that has half the population of Oregon." Here in Portland, a ship from Japan was off-loading new cars. A tall yellow crane lifted logs into the hold of a ship flying the Panamanian flag.

"The thing people tend to forget," said LaFont, "is how much we owe the river. Flip a switch, and electricity flows. The Northwest enjoys the cleanest and most reliable power in the whole country," he said. "Without hydro, we'd have to burn coal or oil for electricity, fouling the air. It's a great gift, the river," he said. "We tend to take it for granted because it's always there."

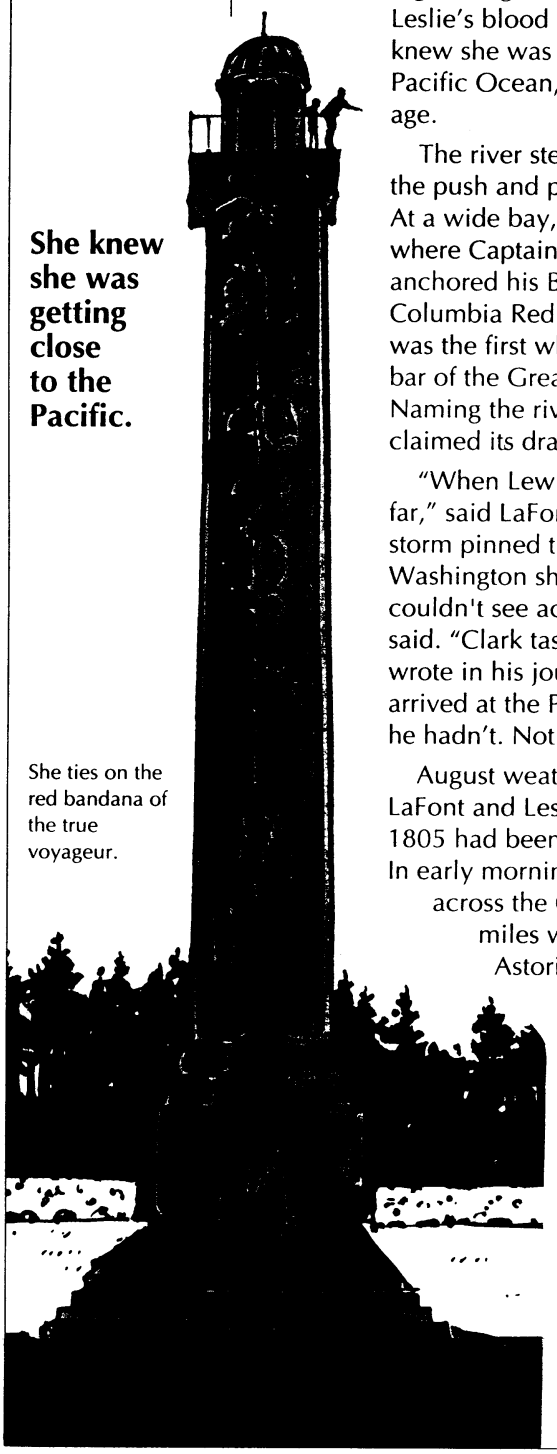
Leaving Portland, the river turned north. Wind was a problem. Whitecaps formed on the river. They could canoe safely only in early mornings and late afternoons, when the wind calmed. They covered a mere 10 miles a day for five days.

The Northwest enjoys the cleanest and most reliable power in the whole country.

Ships from all over the world dock in the Columbia nearly 100 miles from the sea.



Leslie views the mouth of the Columbia River from the Astoria Column.



She knew she was getting close to the Pacific.

She ties on the red bandana of the true voyageur.

"What do you say, Les?" said LaFont. "Shall I phone my man Eldo and have him drive us to Astoria in the van?"

Had her grandfather gone completely out of his red bandana? "No way," she said. "Weren't you the voyageur who said we were going to do the whole river?"

Finally the river bent west again. They paddled in the protection of the Washington shore. The river passed the rotting piers of old-time canneries and abandoned saw mills.

Sea gulls and brown pelicans began appearing among herons and fish hawks. Leslie's blood pumped faster. She knew she was getting closer to the Pacific Ocean, the end of the voyage.

The river steadily widened. Now the push and pull of tide was strong. At a wide bay, they spent the night where Captain Robert Gray had anchored his Boston schooner, the Columbia Rediviva, in 1792. Gray was the first white man to cross the bar of the Great River of the West. Naming the river after his ship, he claimed its drainage for America.

"When Lewis and Clark got this far," said LaFont, "a cold winter storm pinned them here on the Washington shore for six days. They couldn't see across the river," he said. "Clark tasted saltwater, so he wrote in his journal that he had arrived at the Pacific," he said. "But he hadn't. Not yet."

August weather was kinder to LaFont and Leslie than November of 1805 had been to Lewis and Clark. In early morning calm, they paddled across the Columbia, now four miles wide, to Astoria. At Astoria, the first American settlement west of the Missouri, fishing boats unloaded their catch. Sea lions roiled the water.

When they reached shore, LaFont called his friend Eldo, in Portland, to pick them up the next day.

Before Eldo arrived, that next and last day, Leslie and LaFont hiked up to the Astoria Column. On a hill above town, they mounted the tower to view the river's finish. From the column they saw the river meet the sea. They saw where Lewis and Clark had spent the cold, rainy winter of 1805-6 before heading back to report their discoveries.

This voyage down the Columbia had taken LaFont and Leslie 82 days. In 1,200 miles, they had seen the river grow from trickle to torrent – and then to a vast and interconnected system at work. From snow-capped glaciers, through desert, past cities, they had followed the great river and seen how people had changed it. Clean and abundant electric power makes the Northwest a very different place from other parts of the country. The river, now checked against floods, brings life-giving water to the dry heartlands. Reservoirs and locks make a 470-mile river highway for tugs and barges.

Huge changes had come about since the voyageurs used the river, but now Leslie felt a special kinship with those early river runners, her ancestors. And with her grandfather. Standing atop the Astoria Column, Leslie felt as tall as the sky. With a giant stride, she might span the four-mile width of the mighty Columbia River – just as she had straddled the springwater Columbia at Canal Flats.

From his shirt pocket, LaFont pulled a small package with a green ribbon. He gave it to Leslie. "Open it," he said.

It was a red bandana.

Leslie tied the red bandana around her head, voyageur-style. LaFont eyed his granddaughter as if he were measuring something. "The trouble with kids today," he said, with a wink, "is they're always grinning about something."

For More Information

For more information on the Columbia River multipurpose system, contact the nearest BPA office listed below or BPA's Public Information and Involvement office. You may also call the U.S. Army Corps of Engineers at 503-326-3768, or the U.S. Bureau of Reclamation at 208-334-1938. For more copies of this brochure, call the BPA document request line at 1-800-622-4520.

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They followed the great river and saw how people had changed it.

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