

The Persistence and Characteristics of Chinook Salmon Migrations to the Upper Klamath River Prior to Exclusion by Dams

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FOR THOUSANDS OF YEARS, the Klamath (or Ewksiknii), Modoc, and Yahooskin band of Snake Indians — joined today as the Klamath Tribes — have inhabited the upstream portion of the Klamath River watershed, now part of Oregon. Early accounts by non-Indians visiting the area describe the Native people as primarily dependent on fishing, rather than hunting.¹ The Columbia River and the Klamath River, with its vast watershed covering 40,790 square kilometers, provide the only Pacific salmon habitat east of the Cascade mountain range in the United States. The harvest and the migration of ocean-going salmon in the Klamath River are prominent in Tribal culture and oral history.²

The following Indian legend about the Klamath River seems especially relevant today, as various interests are working to restore salmon migrations:

The Coyote went at length on his tour of inspection to the country of the Klamath river and found the people there in the most destitute condition. The river had had an abundance of salmon, but three Skookums [someone powerful or possibly a monster] at the mouth of the stream had constructed a dam so that they might get all the fish, and thus prevented the ascent of the customary food supply. By this selfishness of the Skookums he was much incensed and vowed that before many days so much fish should come up the river as to give all the men, women, and children, and even the dogs, all the food they could



Courtesy of Shaw Historical Library, Oregon Institute of Technology

IN THIS PHOTOGRAPH, a Native American holds a twenty-five-pound salmon likely caught just upstream from the Link River Bridge. According to new information found following the authors' 2005 report, salmon returning to the Klamath Upper Basin in the 1890s and early 1900s ranged from 4.5 to 35 kilograms (ten to eighty pounds), with an average of greater than twenty pounds.

eat. He went to the mouth of the river and found the house of the Skookums, and entering as a homeless coyote began his observations. Although he was hungry and whined for some of the fine fish that the Skookums had, he was not noticed, and his fast was unbroken, even with the smell of delicious salmon in his nostrils. He saw, however, where the Skookums kept their key for the gate of the dam, and the next morning, when one of the three women started down to open the trap and let out a fish for herself, he darted out of the lodge and running between her feet succeeded in tripping her, so that she fell and threw the key out of her hand. Seizing this instantly the Coyote went to the dam and opened the gate, letting the swarming salmon pass through, and up to the country of the Cahroes. He then broke down the dam and since that time the fish have gone every year to the upper stream.³

This legend is attributed to the Karuk (Cahroe) Tribe, but similar legends exist in the Klamath Tribes' oral history in Oregon.⁴ The story of the three Skookums illustrates the importance of unimpeded salmon migration throughout the Klamath River. We examined the history of salmon distribution in habitat

upstream from the current hydroelectric dams on the Klamath River in a publication by the lead author of this article and several co-authors in 2005. Since that synthesis, we have found extensive new information.⁵ Some of that newly considered information brings into question the previous conclusion that Chinook salmon migrated historically to the Klamath Upper Basin and has prompted further examination of the record.⁶ The new examination and analysis also allowed us to address some of the lingering questions regarding the role Klamath dams played in the decline of salmon migrations and the historical abundance of migrations upstream from the dams. Finally, this new synthesis also resolves the mystery of when historical migrations ceased and helps clarify the role of various impacts on Chinook salmon migrations upstream from Iron Gate Dam (IGD).

Many consider the three California dams on the Klamath River (Iron Gate and Copco 1 and 2) to be today's three Skookums, as they have excluded ocean-going salmon from migration to hundreds of kilometers of habitat upstream from IGD. At one time, Klamath River salmon migrations were the third-largest on the West Coast. Migrations have supported famous salmon recreational fisheries, ocean commercial fisheries, and a large in-river commercial fishery, which in turn supported several canneries near the mouth of the river.⁷ More recently, a limited ocean commercial fishery has continued but, in years when low returns are forecast, has been severely restricted in order to protect Klamath River stocks.⁸ In addition to the Klamath Tribes, there are five federally recognized tribes downstream in the Klamath River watershed as well as the unrecognized Shasta Tribe, all of which have a tradition of salmon fishing.⁹ The Yurok and Hoopa Valley Tribes, in the lower river, have federally reserved fishing rights. All of these fisheries would benefit from Chinook salmon that originated from historical habitat upstream from dams on the Klamath River.

Stakeholders signed an amended Klamath Hydroelectric Settlement Agreement in April 2016 that asked the Federal Energy Regulatory Commission (FERC) to order the decommissioning of the lower four dams on the Klamath River and restore salmon migration to their historical habitat. Alternatively, should the settlement agreement collapse and FERC relicense the dams, fishways (passageways over or through dams) would be required. Regardless of whether fishways are constructed or dams are removed, there is widespread interest in restoring salmon and other anadromous fish to the habitats that once supported them upstream from the dams on the Klamath River. The State of Oregon and the Klamath Tribes have taken initial steps toward planning reintroduction.¹⁰ More detailed plans to reintroduce Chinook salmon into their historical habitats upstream from IGD will be developed

in the near future. Those plans will be informed by understanding the characteristics of historical migrations, and we therefore offer here our analysis and conclusions.

In 1846, at what was to become Linkville and is now known as Klamath Falls, Oregon, western explorer John C. Frémont recorded that his party obtained salmon from one of the Indians, a chief. He thereby became the first known non-Indian to report salmon at the outlet of Upper Klamath Lake.¹¹ Over the past century and a half, anadromous fish migrations have ceased entirely to reach the location where Frémont traded with the Klamaths for salmon, and in the Klamath River as a whole, migrations have declined dramatically. It is estimated that Klamath River migrations of fall- and spring-run Chinook salmon have been reduced by over 90 percent from those in the early twentieth century.¹² Managers have attributed the losses to hydraulic mining, overfishing, intensive water diversions, erosion caused by numerous roads, extensive logging, floods, and catastrophic forest fires.¹³

The principle years for the drastic habitat alterations associated with mining were 1850 to 1865. Hydraulic mining continued until 1884, when it was outlawed by a federal court, but hydraulic-mined gold fields show the lasting effects of destructive mining well over a century later.¹⁴ As author Joaquin Miller put it in 1873: "The miners have filled its bed with tailings from sluice and tom; they have dumped, and dyked, and mined in this beautiful river-bed till it flows sullen and turbid enough."¹⁵ Overfishing also took a toll on the salmon migrations. A vigorous lower-river commercial fishery followed hydraulic mining in 1876, with its historical peak occurring in 1912 and the closure of its canneries, due to overfishing, in 1933.¹⁶ The building of dams and resulting blockage of salmon migration to the upper portion of the watershed certainly contributed to the losses, although many have questioned the extent to which dams damaged Klamath River migrations.¹⁷ In particular, in 1931, John O. Snyder attributed the loss of early, or spring-run, salmon to other impacts. He concluded that "the depletion of the early run was well under way, if not about complete long before the erection of the dam [the first hydroelectric dam on the Klamath River]."¹⁸ As our information and analysis show, early migrations were not depleted as early as Snyder concluded.

Today, declines in the migrations of Klamath River Chinook salmon have widespread impact on ocean commercial, Tribal, and sport fisheries. To ameliorate these losses, Public Law 99-552 (known as the Klamath Act) was signed by President Ronald Reagan in 1986 to authorize the federal-state cooperative, Klamath River Basin Conservation Area Restoration Program, tasked with rebuilding the river's fish resources. The act created

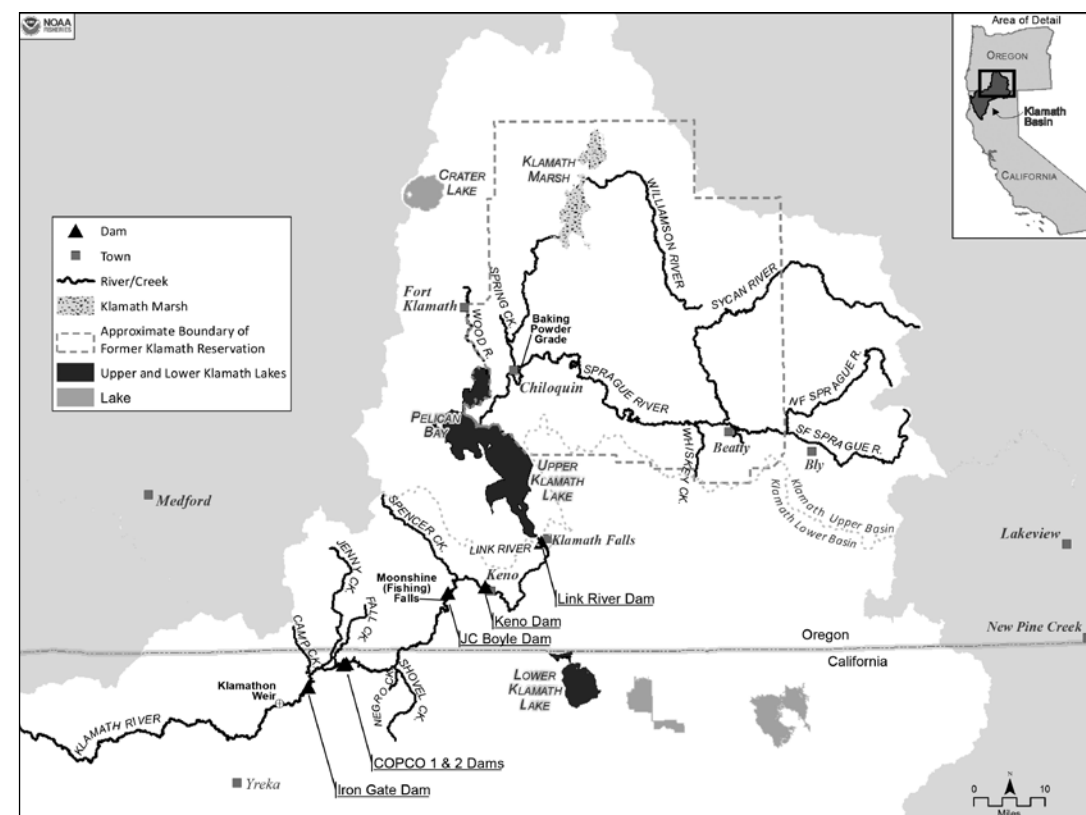
a sixteen-member Klamath River Basin Fisheries Task Force made up of representatives from Tribes, counties, federal and state agencies, and fishing organizations. It directed the Secretary of the Department of the Interior to cooperate with the task force in creating a long-range plan for restoration. In its plan, the task force identified access to habitat upstream from dams as an objective for restoring anadromous fish populations.¹⁹

One way to provide access to historical habitat is through fishways, including both fish ladders for upstream passage and screens that allow juvenile salmon to migrate safely downstream. The practice of using fishways as a vehicle for maintaining a public-trust resource is a principle rooted in English common law.²⁰ The modern-day manifestation of this precedent, as it relates to hydropower projects, is Section 18 of the Federal Power Act. To provide for the public trust, the Departments of Commerce and the Interior have mandatory authority to prescribe fishways during the licensing and relicensing of hydropower dams by FERC under Section 18. Licenses for dams are typically issued for thirty to fifty years. While the Departments of the Interior and Commerce use this authority judiciously, the record of historical fish migrations upstream from Klamath River dams, and their importance to fisheries on the Klamath River, warranted mandatory fishway prescriptions in 2007.

THE HISTORICAL PRESENCE OF CHINOOK SALMON UPSTREAM FROM IRON GATE DAM

Frémont traded for his salmon at the outlet of Upper Klamath Lake, from which a short waterway, referred to as Link River, flows to Lake Ewauna. Link River is entirely within the city limits of today’s Klamath Falls, Oregon. From Lake Ewauna downstream to the Pacific Ocean, the waterway is referred to as the Klamath River. In this article, we refer to historical habitat of Chinook salmon in two reaches: the complete river system upstream from the current location of IGD, which we refer to as “upstream from IGD,” and the portion of the river system within that section but only upstream from and including Link River, which we refer to as the “Klamath Upper Basin.” We have identified the locations of current dams on the map on the facing page from downstream to upstream: Iron Gate (river kilometer, or RK, 306, completed in 1962), Copco 2 (RK 319.5, completed in 1925), Copco 1 (RK 320, completed in 1918), J.C. Boyle (RK 362, completed in 1958), Keno (RK 375, replaced in 1967), and Link River (RK 410, completed in 1921). Of these dams, only Link River is within what we refer to as the Klamath Upper Basin.

While the record indicates that Chinook salmon were historically present upstream from IGD but also within the Klamath Upper Basin, there continues



THIS MAP DETAILS part of the Klamath watershed in California and Oregon, showing dams (triangles) and Chinook salmon observation locations. The Link River and upstream are considered the Klamath Upper Basin.

to be skepticism from some parties regarding this conclusion. In particular, some have questioned whether early non-Native explorers of the region may have misidentified other fish as Chinook salmon in the Klamath River upstream from IGD. The presence and the correct identification of salmon were, however, particularly important guides for early explorers of western North America. As noted by Meriwether Lewis and William Clark in their 1804–1806 Expedition, for example, the presence of salmon confirmed that their location, a tributary of the Columbia River, was connected to the Pacific Ocean.²¹ The presence of salmon on the Klamath River in 1827 also confirmed for fur trader Peter Skene Ogden that he was on a waterway that discharged to the ocean.²² At the Link River portion of the waterway, Frémont also saw salmon as a signpost that the “Tlamath” [Klamath] River was connected to

the ocean: “Up this river the salmon crowd in great numbers to the lake [Upper Klamath Lake], which is more than four thousand feet above the sea.”²³

While a later report notes that there was some uncertainty regarding distinction “by early fishermen and old residents” between one anadromous salmonid species and another, other accounts clarify that most observers could discern salmon (*Oncorhynchus* sp.) from steelhead (*Oncorhynchus mykiss*, previously *Salmo gairdneri*) or resident redband trout (*Oncorhynchus mykiss* sp.) and that details on weights of fish indicated they could only be Chinook salmon.²⁴ Oregon fishing regulations for the Klamath River in the first part of the twentieth century, furthermore, were specific to salmon versus trout.²⁵ The Klamath Falls *Evening Herald* articles indicate that salmon migration was a front-page topic and that salmon were locally distinguished from other fish species.²⁶ Finally, Kenneth Simmons summarized extensive accounts indicating that affiants for a proposed Department of the Interior lawsuit on the behalf of the Klamath Tribes in the 1940s correctly identified Chinook salmon caught in the Klamath Upper Basin.²⁷

In this regard, correspondence between Dr. J.C. Merrill at Fort Klamath, Oregon, and staff of the U.S. National Museum (affiliated with the Smithsonian Institution) is of especially significant value. Merrill collected and prepared a large number of specimens for the museum and referred to them by their scientific names. While he did not catalogue the specimen in the Smithsonian collection, in an October 21, 1886, memoranda, Merrill wrote to Professor G. Brown Goode at the museum that he had identified a specimen from the vicinity of Fort Klamath that could only have been a Chinook salmon.²⁸ Finally, anatomical characteristics from historical photos in this publication clearly show that the fish were identified correctly as salmon. This information, together with the archeological and DNA studies that have identified the only salmon species in the Klamath Upper Basin as Chinook, supports our conclusion that the historical references to salmon were to Chinook salmon.²⁹

In working to further examine the record on Chinook salmon upstream from IGD, we generally continued the methods used in Hamilton et al. (2005) to address the uncertainty in the record and summarize information useful to salmon managers. Our summaries and analyses were based on reports, photos, historical documents, newspaper articles, and other available information (see Table 1A). Since 2005, however, we have taken advantage of recently digitized historical newspapers (California State Library — California Digital Newspaper Collection; University of Oregon Library — Historic Oregon Newspaper Collection). We also reviewed additional non-digital newspaper archives and Department of the Interior documents that we did not have

access to when researching the 2005 publication. We found a great deal of relevant technical information contained in affidavits prepared for the Department of the Interior lawsuit in the 1940s.³⁰

We found no new documents indicating that salmon did not migrate upstream from IGD, but we identified over one hundred additional documents, one audio recording, and seven additional photos regarding salmon or salmon fishing upstream from IGD (see Table 1B). We also found five additional documents stating that salmon did not migrate as far as the Klamath Upper Basin. In a 1947 PhD dissertation, G. Hewes concluded that salmon ascended only to “Copco Marsh” (location unknown but likely referring to habitat now under Copco 1 reservoir, at about RK 322).³¹ Ogden was informed by his Indian guide that salmon did not ascend the Klamath River past approximately the location of the current J.C. Boyle hydropower facility (RK 359). Earl Leitritz, in 1970, stated that salmon ascended the river at least to the vicinity of Spencer Creek (RK 369) but that investigations failed to show that any migrated upstream from that point.³² Leitritz believed that passage to the Sprague and Williamson rivers was questionable because of the falls on Link River. The explorer Stephen Powers indicated that salmon migrated only to the first rapids below Lower Klamath Lake (about RK 375).³³ Later, officials from the California-Oregon Power Company (COPCO) reported that salmon had never gone up the Sprague River “because of growth of fungus near the outlet of Klamath Lake” (RK 409).³⁴ We found nothing in the new information to support Leitritz’s that passage to the Sprague and Williamson rivers was questionable because of the falls on Link River. Quite the opposite, ethnographers Kroeber and Barrett concluded in a 1960 publication that both salmon and steelhead trout historically ran up the Klamath River “into the Klamath lakes and their tributaries,” thereby correcting Kroeber’s 1953 account to the contrary.³⁵ Unlike the five accounts from Ogden, Powers, Hewes, Leitritz, and COPCO, of the over one hundred new records, we found sixty five new records indicating that Chinook salmon migrated to the Klamath Upper Basin. We also found four new historical photos and one new personal communication documenting salmon in the Klamath Upper Basin (see Table 1B).

Short of the headwater cascades or falls like those just downstream from Klamath Marsh on the Williamson River, the Klamath River had no natural, permanent barriers that could have obstructed salmon from migrating upstream of IGD or to the Klamath Upper Basin. There were impediments that may have been difficult for salmon to migrate, but they were not impassable. In some cases, those impediments created concentrations of salmon that were easy to harvest. These probably included Ishi Pishi Falls (about RK 217), COPCO Canyon (about RK 321), the Caldera cascade reach (about RK

345), Moonshine or “Fishing” Falls (about RK 381), and the falls at Link River (about RK 408). Fishery managers often proposed to negate these impediments to migration by the installation of fish ladders or to alter the channel with dynamite to make salmon migration easier. The following account from an April 1910 newspaper article offers one example, apparently to assist spring-run Chinook salmon:

*Now that the salmon are beginning to make for their spawning grounds at the headwaters of the Klamath River and the lakes tributary, agitation for a fish ladder over the [Moonshine or Fishing] falls is being renewed.*³⁶

Numerous other newspaper accounts indicate it was widely understood that salmon migrated to Upper Klamath Lake and spawned in its tributaries.³⁷

THE HISTORICAL ABUNDANCE OF CHINOOK SALMON UPSTREAM FROM IRON GATE DAM

In the new information, we found three sources that, although confirming the presence of returning salmon upstream from IGD, have brought to question the abundance of those migrations (Table 2).³⁸ A 1901 Oregon Department of Fisheries report described the Klamath run as “small.”³⁹ Again, Hewes (1947) concluded that few salmon ascended the Klamath River and its tributaries upstream of “Copco Marsh.”⁴⁰ Historian Jeffrey LaLande concluded that before the first hydroelectric dam was built, only a hardy few Chinook salmon would reach Upper Klamath Lake and the Williamson River and that the major portion of the spawning migrations did not pass that far upstream; during some years, he noted, channel conditions blocked all the fish from reaching Upper Klamath Lake and the Williamson River.⁴¹ Contrary to these reports, we found many historical accounts, starting as early as Frémont’s 1846 memoir, indicating that salmon migrations were abundant not only upstream from IGD but in the Klamath Upper Basin as well (see Tables 1A, 1B, and 2). Anecdotal estimates of abundance ranged from thousands to millions of salmon returning upstream from IGD.⁴² The numbers of returning salmon likely numbered somewhere between these two orders of magnitude. While it is prudent to use caution in making extrapolations from numbers presented in anecdotal information, these historical accounts demonstrate that there were considerable returns of anadromous fish above the current location of IGD.

One partial exception is the account by Ogden, who was a chief trader for the Hudson’s Bay Company during the 1820s. A notable explorer of the American West, he was the first non-Indian to visit and write about Klamath Marsh, Upper Klamath Lake, and Native groups in what would become southern Oregon and northern California.⁴³ His expedition’s relations with the Klamath and Modoc were positive, and his journals provide the first

ethnographic accounts of their cultures. In December 1826, he and his brigade arrived in Klamath Indian territory from the high desert and the upper Deschutes country. Nearing starvation, they were keen to trade for food, and his party was able to obtain “40 dogs and some small fish not more than two inches in length.” Later, on the east side of Upper Klamath Lake, his party traded for more dogs, roots, and “20 fine Carp.”⁴⁴ But other than noting salmon ascending to the approximate location of the current John C. Boyle facility, Ogden made no mention of trading for salmon while among the Klamath Indians of the Williamson River and Upper Klamath Lake area, nor does he mention seeing any salmon in their villages.⁴⁵

Clearly, given Klamath Indian oral history and the archeological identification of Chinook salmon bones going back as far as 5,000 years, this species was present in the Klamath Upper Basin long before Ogden’s account.⁴⁶ Yet, if salmon did not ascend upstream past this location, as Ogden concluded in 1826, their migration may have been temporarily blocked by natural events. The Klamath River canyon in the vicinity of what is currently the J.C. Boyle facility is known as a potential landslide and rock fall area.⁴⁷ It is quite possible, if Ogden’s account and LaLande’s conclusions are correct, that migration was occasionally interrupted by those natural events.

We found one historical impediment to migration due to human activity. Klamathon Dam, a log-crib dam 1.5 to 2 meters high, constructed in 1889 by a timber company for its mill at Klamathon, California, temporarily blocked migrations during the fall of that year. Klamathon Dam blocked significant numbers of late-run salmon attempting to return to hundreds of kilometers of habitat upstream. It is notable that FERC later determined that the majority of the salmon that passed Klamathon also migrated further upstream, past where IGD now stands.⁴⁸ When first constructed, Klamathon Dam lacked fish passage, and many salmon either died downstream or ended up captured in boxes placed strategically on the lower face of the dam.⁴⁹ The illegally captured salmon were sold commercially. In September 1889, fifteen to twenty people were employed night and day taking large quantities of these salmon for sale and destroying thousands of others.⁵⁰ Most residents were appalled:

*The catching and killing of salmon in the vicinity of Klamath City [variously called Klamathon, Manistee, or Pokegema] by the wagon load, makes the people along the river disgusted and hope that the Fish Commissioner will see that such is stopped. Aside from the wholesale slaughter, the dead fish create a nauseating stench, and are eaten by hogs along the stream, to afford pork and bacon unfit for market.*⁵¹

This destruction of salmon bound for Oregon created a regional political issue and became the first precedent for fish ladders on the Klamath River.



THE REBUILT KLAMATHON MILL log-crib dam and fish ladder is pictured here in 1892. The original 1889 dam did not provide a path for fish passage, and many salmon died downstream or were captured and illegally sold.

From Salem, Oregon Governor Sylvester Pennoyer insisted that “measures be taken to stop the lawless acts and to have a fishway constructed that will allow the millions of salmon to pass up this important river, as this is the season they must go up to spawn.” Governor Robert Waterman of California responded by dispatching the Deputy Fish Commissioner of California to investigate.⁵² Within two weeks, Waterman had appointed a Siskiyou County representative, and the matter was brought to the State Fish Commissioners.⁵³ The Sheriff of Siskiyou County was instructed by telegraph to lend “every assistance possible” to the new Fish Commissioner. Authorities arrested seven violators.⁵⁴ Although the timber company complied with the law by immediately constructing a fish ladder to pass salmon, a portion of the dam was destroyed by high flows during the following winter of 1889–1890 and, as one newspaper put it, salmon again had “free run up the Klamath River this season, clear into the lakes at its head.”⁵⁵

The rebuilt, 1892 version of the ladder and the Klamathon Dam is shown above. The company maintained this ladder for fish migration in 1892, 1893,

and 1897, and salmon migration resumed after 1889 (see the accounts in Table 2).⁵⁶ Because its initial operation without a fish ladder was during the fall, when flows were low and passage was difficult, Klamathon Dam may have been more consequential for some seasonal migrations, such as fall-run Chinook salmon. A report from a visitor in early September 1902 indicates that migration had been fully re-established by then:

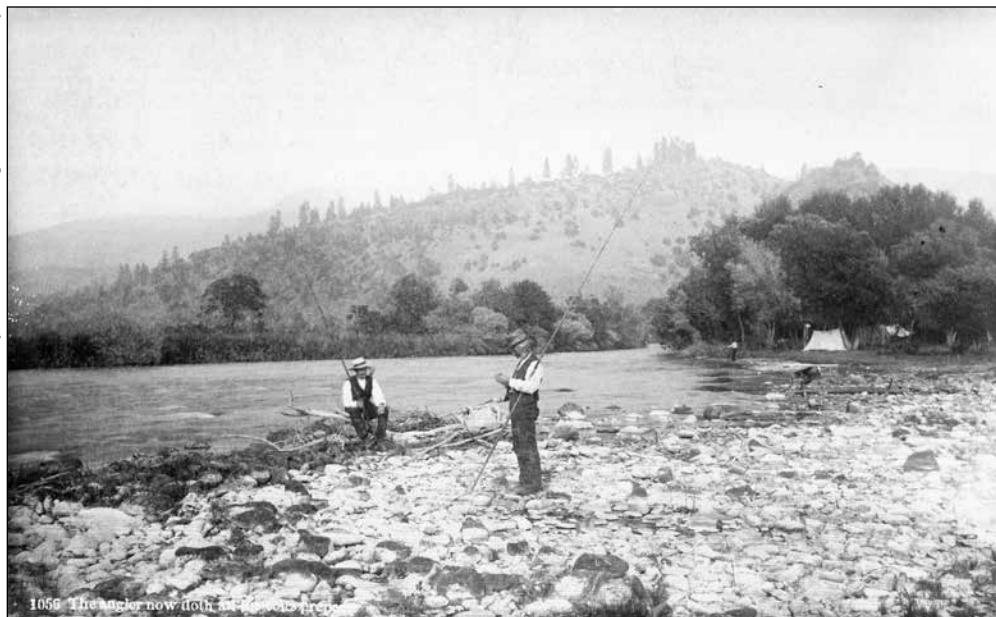
*On our arrival at the springs [Klamath Hot Springs Resort at Shovel Creek (about RK 366)] we heard the good news that the rainbows were running in the river and also that a great number of salmon were making their regular fall pilgrimage to the spawning grounds, thanks to the fish ladder at Klamathon which this year was in good condition. It is the earnest wish of all those living along the Klamath, as well as of all visiting sportsmen, that this ladder be at all times kept in first class condition.*⁵⁷

Later that fall, on October 14, 1902, a catastrophic fire destroyed the mill, apparently including the log-crib dam, and most of the town of Klamathon.⁵⁸ The Klamathon Dam’s occasional interference with salmon migration from 1890 was over. As shown in Table 2, we found the annual abundance of salmon nearly continuous after 1901. Migrations to the Klamath Upper Basin may have strengthened in the absence of the Klamathon Dam. In 1910 and 1911, newspapers reported that a recently organized Klamath County Rod and Gun Club argued that salmon were abundant, but that local fishermen were unable to catch them:

*Thousands of salmon enter the Klamath River [in Oregon]. . . The Klamath County Rod and Gun Club desires a special provision lifting the protection from salmon to permit Klamath people to get at least some benefit from the large salmon runs here during the Fall and Spring months. Now no one is allowed to fish other than with hook and line, and as salmon will not bite a hook this law gives people here absolutely no benefit from the millions of salmon in these waters.*⁵⁹

The club lobbied for special legislation for Klamath County to allow the use of the grab hook (gaff), a method of harvest illegal in Oregon, for recreational salmon harvest in the Klamath Upper Basin. Rather than championing this cause, Oregon State Senator George Merryman, representing Klamath Falls, requested that the bag limit be increased from two to five salmon per day.⁶⁰

These two issues again draw on anecdotal accounts to reveal considerable returns of salmon to the Klamath Upper Basin. Two years before the club’s appeal, in late September 1908, the *Klamath Evening Herald* had reported “millions of salmon” in the Keno vicinity.⁶¹ With the club’s anecdotal



PHOTOGRAPHER PETER BRITT created this 1885 postcard showing his son Emil at the mouth of Shovel Creek near the Klamath Hot Springs Resort. One of the resort’s main attractions was fishing for migratory trout and salmon in the creek and Klamath River.

total estimates of thousands to millions of salmon returning to Oregon in 1910, the two reports are, at the high end, consistent with Pennoyer’s claim that millions of salmon returned to Oregon prior to the construction of Klamathon Dam.

UPPER KLAMATH RIVER CHINOOK SALMON HARVEST AND FISHING LOCATIONS

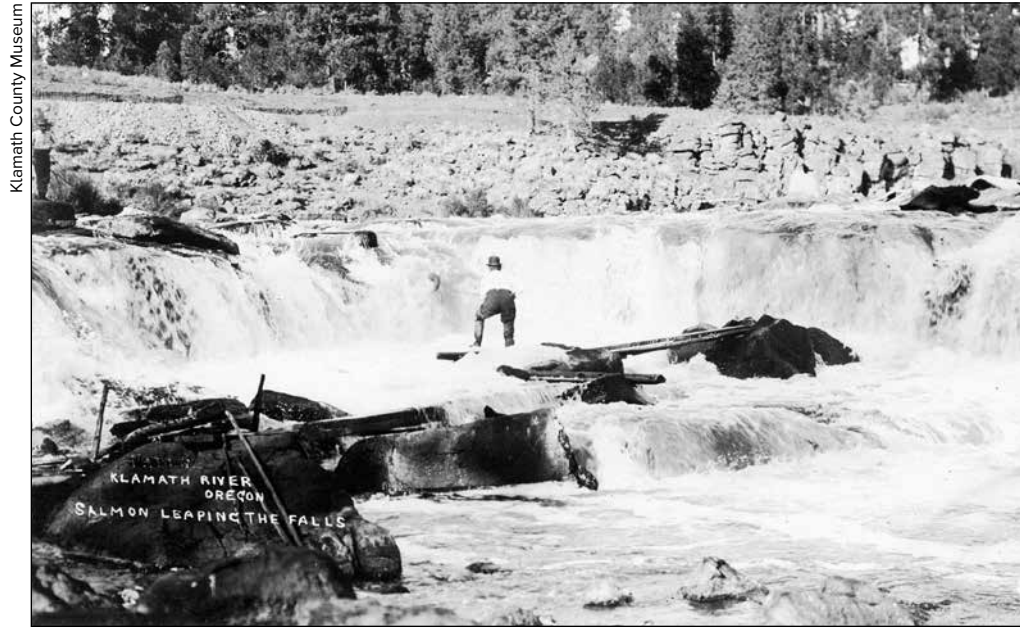
Long after Frémont’s 1846 account, sources document Tribal harvest of Chinook salmon at numerous locations upstream from IGD.⁶² New settlers in the region also relied on salmon for food and commerce. Including the Link River location where Frémont traded, we found four general areas upstream from IGD where salmon fishing was substantial enough to be associated with small-scale commercial harvest (see map on page 331).⁶³ Some markets for harvested salmon were located out of the watershed or across the state line.

At the furthest downstream area, small-scale commercial salmon harvest took place at Shovel Creek and its tributary, Negro Creek (RK 328), near Bes-

wick, California. During the California gold rush, African American families living in Yreka, California, would camp along the waterway when salmon were spawning, fish until their wagons were filled to capacity, and then take the fish into Yreka for sale to miners.⁶⁴ The Klamath (also called Beswick) Hot Springs Resort was established at the mouth of Shovel Creek in the 1880s. Among its major attractions was blue-ribbon fishing for migratory trout and salmon in Shovel Creek and the nearby Klamath River.⁶⁵ Perhaps as a promotion for the resort, famed photographer Peter Britt from Jacksonville, Oregon, created a postcard, featuring his son Emil, fishing at the mouth of Shovel Creek in 1885. Another famous early photographer, Maud Baldwin of Klamath Falls, Oregon, also created a photo advertisement for the resort. Southern Pacific Railroad dedicated a brochure to fishing near the resort, conveniently accessed by



INCLUDED IN A 1902 SPREAD in *Western Field* magazine, this photo is titled “My Best Day’s Catch” from the Klamath Hot Springs Resort. The two largest fish pictured are identified in the article as Chinook salmon (*Oncorhynchus tshawytscha*) weighing 8 and 10.5 lbs. Our examination of the photo confirms this identification based on anatomical characteristics.



A FISHING PLATFORM is pictured on this 1910 postcard showing leaping salmon (to the left of the person on the platform) at Moonshine or Fishing Falls, downriver from the current location of J.C. Boyle Dam.

rail.⁶⁶ During the early 1900s, fishing here was reported to be world famous.⁶⁷ Shovel Creek and the resort were regularly featured in trout-and salmon-fishing reports in San Francisco newspapers and magazine articles, including in a 1907 issue of *Sunset Magazine*.⁶⁸ A photograph from *Western Field* magazine displays two Chinook salmon caught at the resort in 1902.⁶⁹

The second general fishing area was a falls just downstream from the current location of J.C. Boyle Dam (RK 362). Referred to as Moonshine Falls or Fishing Falls, the falls, a leaping salmon, and a fishing platform are shown in a postcard from 1910.⁷⁰ Merle Anderson, descendent of settlers Hiram and Mary Spencer for whom Spencer Creek was named, recalled salmon fishing here:

I can show you where my Dad used to go down there and spear them as they jumped over the falls. It was right below where John Boyle dam is now. I can show you exactly where he stood to take the salmon out. But I never knew anything about it because I was too young. They had a smoke house and they smoked them as long as the salmon came up, but then Copco put in that dam down below, above Hornbrook and that was the end of the salmon run.⁷¹

Fish from Moonshine Falls were also packed to Yreka and sold commercially.⁷² In 1910, an Oregon Fish and Game warden proposed a fish ladder around the falls.⁷³ Moonshine Falls has since been physically altered, and flows today are greatly reduced due to water diversion to the J.C. Boyle powerhouse.⁷⁴ At least until the 1960s, however, the remains of these falls could still be observed, and the remnants of the old fishing platform persisted.⁷⁵

Upstream were fisheries for salmon at Link River (RK 410) in Klamath Falls. As the fish rested before attempting the city's namesake falls, they were vulnerable to capture.⁷⁶ Link River was a center of harvest by Indians.⁷⁷ It also continued as a popular fishing location for early settlers of Klamath Falls.⁷⁸ As at Negro Creek and Moonshine Falls, salmon harvested at Link River were packed to Yreka for commercial purposes. Baldwin took at least two photos of salmon fishing at Link River, one of which is reproduced below.⁷⁹



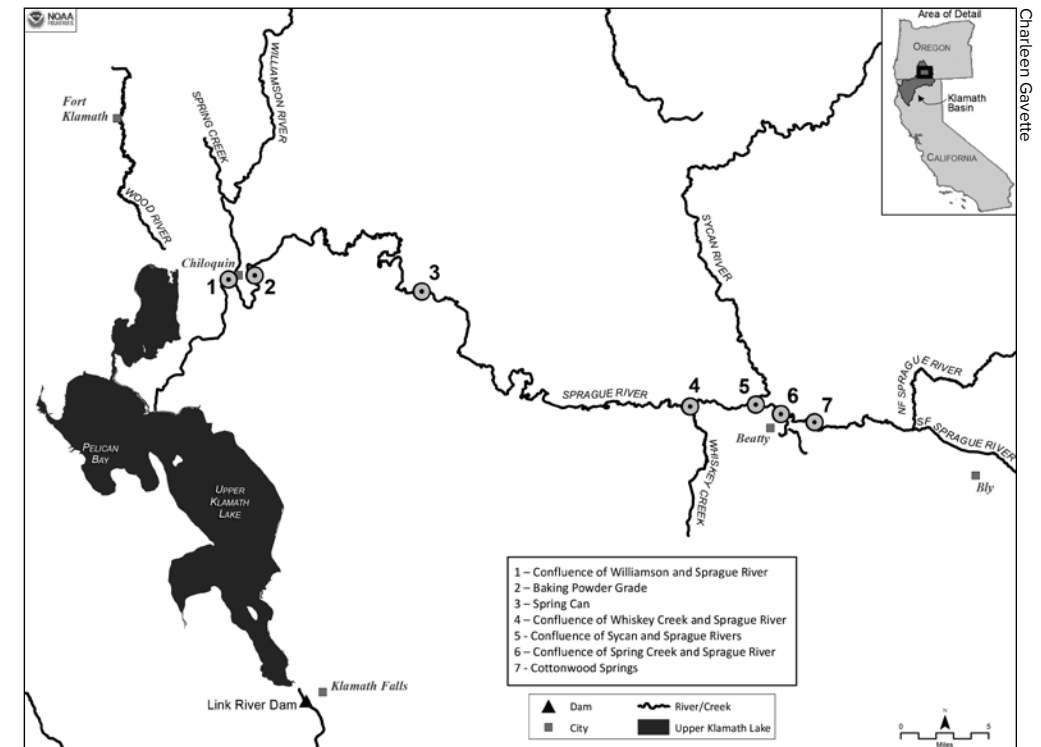
PHOTOGRAPHER MAUD BALDWIN took at least two photographs of salmon fishing on the Link River. This undated photograph shows fishing on the Link River below the Moore Mill.



THIS 1904 PHOTOGRAPH of Indians on the former Klamath Reservation drying salmon for winter use is believed to have been taken in the vicinity of the lower Sprague River. The river's clear water and shallow riffles made it a preferred location for spearing salmon.

Last, we found many accounts of salmon fishing throughout the length of the Sprague River, a tributary (at about RK 450 to RK 585) upstream from Upper Klamath Lake. Indians did much of this fishing on the former Klamath Indian Reservation, until the federal government terminated the tribe and reservation in the 1950s (the Klamath Tribes won restoration in 1986). Waters of the Williamson River, located on the former reservation, and Upper Klamath Lake (outside Pelican Bay) were reportedly too dark in color and perhaps too deep to fish. The Sprague River, however, was an easy tributary in which to spear salmon.⁸⁰ This may have been due to its clear water and shallow riffles. The Sprague River was used extensively for fishing salmon from late August through October (Table 3). Indians camped here near fishing holes, fished, and dried salmon for winter use.⁸¹ Local historians believe that the above 1904 photo of Indians on the former reservation drying salmon was taken in the vicinity of the lower Sprague River (somewhere between the railroad bridge at the confluence with the Williamson River, to two kilometers

or so upriver on the Sprague River).⁸² In 1941, based on affiant testimony, Superintendent B.G. Courtright of the Klamath Indian Agency provided to the Bureau of Indian Affairs District Counsel photos of several “Klamath Indian Salmon Fishing Holes” on the Sprague River. An index accompanied the photos. We were unable to find the images, but the index has survived.⁸³ The map below shows most of these significant salmon-fishing locations. Although Courtright reported the stretch of fishable water to be from the Sprague River confluence with the Williamson River to Beatty, Oregon, five affiants (O.T. Anderson, Frank Obenchain, Carrie Schmitz, John Smith, and Eva Mose) reported salmon further upstream in the North Fork of the Sprague River, beyond the reservation boundary.⁸⁴ One of the spearing techniques used in this vicinity for salmon, during the years 1902 to 1904, is detailed in an autobiography by Earl Moore:



IN 1941 KLAMATH INDIAN AGENCY Superintendent B.G. Courtright provided the Bureau of Indian Affairs several photos and an index of Klamath Indian salmon-fishing holes on the Sprague River. This map shows most of the significant fishing locations.

To be taken along on one of those night, salmon spearing trips with the ranch hands, well there was nothing dull about that night. Salmon runs were watched closely. A few of those red-meated beauties were a ranch table specialty; a rare treat from traditional beef. One fellow handled the fourtined spear while another slowly worked the long pole with pitch fire out over the salmon resting near the surface or grass bank dropoff. Then came the breathless, tense seconds as the spear poised for the strike under an uneasy, flickering light from the pitchfire basket.⁸⁵

Salmon with flesh as Moore described would likely have been a spring migrating fish and highly marketable. Salmon harvested from the Sprague River benefited Indian trade, in particular for communities located at the eastern end of the former reservation.⁸⁶ Newspaper articles and other records show that salmon harvested from the Sprague River were transported by Indians out of the Klamath Upper Basin to the towns of Lakeview and Pine Creek, Oregon, for sale and trade.⁸⁷

SEASONAL OCCURRENCE OF CHINOOK SALMON UPSTREAM FROM IRON GATE DAM

Frémont's party traded for salmon in May 1846 at Link River. Those fish are what we now consider spring-run Chinook salmon. Albert S. Gatschet — one of the first ethnographers and also a linguist — reported salmon up the Klamath River to the lake region much later in the year. Gatschet gathered information from Klamath Indian elders and published his work in 1890, providing the Klamath word (*etchmû'na*) for fall-migrating Chinook salmon and describing them as a purple salmon 0.9 to 1.2 meters long, arriving in the later part of November.⁸⁸

Each migration of salmon generally has a different life history, or path, to adulthood, reproduction, and the persistence of the population. Spring-migrating salmon, for example, have a life history that most commonly includes adults returning upstream from the ocean in the months of April through June, holding in protected freshwater pools and thermal refuges as their eggs mature, and then spawning in the late summer or early fall, with hatchlings having an extended period of growth in freshwater prior to their downstream migration to the ocean either in the late fall or spring. In contrast, fall-migrating salmon adults generally return upstream from the ocean in September through November, arrive with mature eggs, and do not hold in freshwater for extended periods. Fall-migrating salmon hatchlings generally move downstream to the ocean after a relatively brief period of

growth in freshwater, usually beginning during February or March. Spring and fall migrations are the most distinct runs, but some rivers have summer and/or winter adult migrations as well. This appears to be the case for the Klamath Upper Basin.⁸⁹

In considering restoration and reintroduction in the Klamath River upstream from IGD, it is important to understand the differences between seasonal migrations of salmon and their associated historical life histories. It is of interest to managers to know whether past threats, such as hydraulic mining or overfishing, diminished or extirpated any of these seasonal salmon life histories before dams blocked migration. In our summary of seasonal observations, we regarded salmon observed between December 1 and March 31 to have been winter migration; between April 1 and June 30 to have been spring migration; between July 1 and August 31 to have been summer migration; and between September 1 and November 30 to have been fall migration. The following affidavit from 1946 is one example of information about seasonal migration and fish size we found:

I am 70 years old and was born at Whiskey Creek on the Klamath Indian Reservation. . . . I used to fish for salmon every year in September and October and did spear fishing at Cottonwood Springs. Some salmon weighed as much as 40 pounds [18.1 kilograms (kg)]. . . . Some of the Indians sold salmon at Lakeview and Klamath Falls for \$1.50, \$2.00 and \$2.50 a fish. They would haul 30 to 40 fish to Lakeview from Cottonwood Springs. These Indians are all dead now.⁹⁰

Clearly, salmon harvested at this time of year were an important part of commerce at this location. Spring-migrating salmon in the Klamath River Basin were also important historically and, according to one source, outnumbered fall-migrating Chinook salmon in the Klamath Upper Basin. This same source also noted: "There were two fairly distinct runs, noted even to the headwaters. The first was the spring or summer run, which was followed by the fall run."⁹¹

We found fourteen records documenting spring migration and one document that concluded there was no spring run to the Klamath Upper Basin.⁹² Nearly all of the records of spring migration of salmon we found upstream from IGD were in the Klamath Upper Basin. We found four accounts of winter migration and seven accounts of summer migration. By far, we found the greatest number of historical salmon observations (fifty) during the fall months, with many during the month of October. Fall observations were at various locations upstream from IGD (Table 3).

As we explain below, however, these fall observations should be viewed with caution in interpreting the historical salmon life histories. A report by the Commissioner of the U.S. Bureau of Fisheries provides some notable clues about spring or summer migrations upstream from IGD and, thus, about historical Klamath Upper Basin Chinook salmon life histories. Anticipating that salmon would be blocked by Copco 1 Dam, and intending to compensate for the loss of upstream habitat, the Bureau of Fisheries in 1910 established a weir at Klamathon, California, about sixteen kilometers downstream from the construction of the dam, and harvested salmon eggs there for hatchery propagation.⁹³ It has been conventional wisdom that, after 1910, the Klamathon weir blocked all salmon and anadromous fish, year round, from upstream migration.⁹⁴

But the Bureau of Fisheries report shows that this conventional wisdom was flawed. The annual operation of the Klamathon weir, first erected in 1910, took place only from September through December and therefore only blocked salmon runs during those months. Before these seasonal operations began, the report identifies salmon migrating past the Klamathon vicinity as spring-run or summer-run.⁹⁵ Thus, the salmon that were observed upstream in the Klamath Upper Basin after 1910 in the fall, including the salmon captured on the Klamath Indian Reservation in October 1911 and sold in Lakeview, Oregon (Table 2), could only have been spring migrating or summer migrating.⁹⁶ With this life history, they would have returned to the Klamath Upper Basin before September, and then held upstream in deep, groundwater-influenced habitats until their eggs matured. Some of these holding areas may have been in the deep, cool water of the lower Williamson River, just above Upper Klamath Lake.⁹⁷ If so, those fish likely contributed to the observed spawning and harvest beginning in late August in the Sprague River (see Table 3). Additional data and our analysis support this conclusion. Where salmon entered the Klamath Upper Basin at Link River, the distribution of observations was about equal for winter, spring, and summer/fall periods. The seasonal distribution of observations specific to the tributary rivers of the Upper Klamath Lake, however, did not match those from Link River, with zero accounts from the tributaries during winter, seven during spring, and twenty-eight during summer and fall (see Table 3). Many of these summer and fall observations were in the Sprague River. While the seasonal observation of salmon in the remote tributaries of Upper Klamath Lake may have been less likely than at Link River, the available information suggests that returns to the tributary rivers of Upper Klamath Lake were probably made up of salmon with various migration times and associated

life histories. The multiple life histories of a similar species in the Klamath Upper Basin, redband trout, support this conclusion.⁹⁸

THE PERSISTENCE AND EXTIRPATION OF CHINOOK SALMON MIGRATION UPSTREAM FROM IRON GATE DAM

Historians have been uncertain about when salmon migrations were blocked from the Klamath Upper Basin and the former Klamath Indian reservation.⁹⁹ One author concluded that migrations to the Sprague and Williamson rivers were probably extirpated before 1900.¹⁰⁰ A review of Chinook populations stated that migration was blocked at Klamath Falls by the Link River hydroelectric dam in 1895.¹⁰¹ Others have concluded that migrations persisted upstream from the first hydroelectric dam until 1917, or its completion in 1918.¹⁰² Lane and Lane Associates' summary of available information put the year between 1908 and 1918.¹⁰³ Courtright was specific in setting 1911 as the year migrations ceased. Another account stated that the migrations stopped in 1912.¹⁰⁴ Accordingly, Lane and Lane Associates proposed that, to resolve the issue of when migrations ceased, "the skills needed to unravel the mystery are those of fishway experts."¹⁰⁵ To pinpoint the date, we examined the question from three perspectives: the historical record, the role of the Bureau of Fisheries weir, and fish-passage hydraulics.

The failure of migrations to the Klamath Upper Basin in 1913 was front-page news for the Klamath Falls *Evening Herald*. It was a grave matter. Most members of the Klamath Tribes participated in subsistence fishing for salmon in Upper Klamath Lake and the Williamson and Sprague rivers.¹⁰⁶ Reliant on those salmon, Indians, along with local sportsmen, demanded an investigation.¹⁰⁷ The *Evening Herald* reported that the Indians believed the cause to be the Bureau of Fisheries weir at Klamathon.¹⁰⁸ Representatives from Oregon and COPCO concurred.¹⁰⁹

More recent reports state that the Klamathon weir blocked all salmon and anadromous fish from upstream migration.¹¹⁰ If this were the case, however, there would be no records of anadromous fish upstream from Klamathon after 1910. To the contrary, newspaper articles corroborate the Klamathon weir report that migration continued after 1910 (Table 2). In 1911, salmon were still being harvested from the Klamath Upper Basin and sold commercially in Lakeview, Oregon.¹¹¹ According to the *Evening Herald*, a steelhead trout (an ocean-going fish) was caught at Klamath Falls in February 1912.¹¹² According to the *San Francisco Call* in August 1912, salmon were observed upstream from the ongoing construction on the Copco 1 Dam, and in September 1912, the



THE TUNNEL used to divert the Klamath River during the construction of Copco 1 Dam is still apparent. This photo was taken in 2003.

Portland *Morning Oregonian* reported that salmon were running strong in Link River and vicinity.¹¹³ Thus, salmon migrations did not, as alleged, cease in 1910.

As recommended by Lane and Lane Associates, the question regarding whether migration was first blocked by the construction of Copco 1 Dam and when, can be addressed by examining fish-passage hydraulics — that is, the relationship between the velocity of water going through the dam’s diversion tunnel, through which the fish would have had to pass to continue upstream, and the swimming capability of the salmon.¹¹⁴ To assess the likelihood of fish passage we reviewed construction and engineering details, historical flows, and information on hydraulics at the time of construction. We focused on the Copco 1 diversion tunnel pictured above.

We estimate the likelihood of fish passage based on flow conditions at the site during dam construction. As of October 12, 1912, when water was

first diverted through the headgates and into the diversion tunnel at the Copco 1 site, and assuming optimal conditions for fish passage, the lowest estimated velocity in the tunnel was approximately 3.3 meters per second (mps).¹¹⁵ While Chinook salmon are able to swim at burst speeds up to 6.8 mps, they can only maintain such activity for 5 to 10 seconds.¹¹⁶ The maximum swimming distance of Chinook salmon under ideal conditions at a water velocity of 3.3 mps is estimated to be 35 meters, well short of the 108.5 meters required to get through the tunnel, let alone the headgate entrance. Even if the velocity at the walls or corners of the tunnel was 50 percent lower (or 1.7 mps), the maximum swimming distance of Chinook salmon under ideal conditions would be about 51 meters, or less than half the distance through the tunnel.¹¹⁷ Thus, based on this analysis, migration upstream from Copco 1 Dam was effectively blocked on October 12, 1912.

Somewhat confusing, in identifying October 1912 as the date when migrations were blocked, were the reports of salmon in the Klamath Upper Basin in the fall of 1912 (Table 2). Spring and summer migrating salmon that had passed the Klamathon weir before September 1912, and the Copco 1 Dam construction site prior to October 12, 1912, were observed in the Klamath Upper Basin that same year, misleading observers to conclude that the runs did not cease in 1912. Assertions that the blockage of the salmon migration was due to the construction of the Bureau of Fisheries weir in 1910 disregarded the absence of annual weir operation prior to September and may even have been specious arguments.

By late 1914, the Medford *Tribune* reported that salmon migration had been blocked to all bodies of water upstream from Copco 1 Dam.¹¹⁸ While John Smith recalled in the 1940s that migrations continued until about 1914 or 1915, we found no additional documentation or records indicating the occurrence of ocean-going salmon upstream from Copco 1 Dam after 1912.¹¹⁹ The downstream completion of Copco 2 Dam in 1925 and IGD in 1962 further restricted runs of Chinook salmon.

Using the accounts of early explorers Peter Skene Ogden and John C. Frémont, documentation from pioneer ethnographer Albert Gatschet, images from turn-of-the-century photographer Maud Baldwin, and information from archaeologists, anthropologists, magazines, newspapers, and government reports, we have updated the historical record of salmon upstream from the location of IGD. While the expanded record now contains several references suggesting that salmon did not migrate upstream of Link River, the information as a whole is conclusive that salmon historically migrated to the Klamath Upper Basin. Reports to the contrary may have been during periods of intermittent interruption. Examined in total, the updated record

now provides a glimpse of the characteristics of historical migrations. Most of the observations of returning adult salmon occurred in the fall, but they were recorded during all seasons of the year, suggesting that migrations were seasonally diverse and consisted of various salmon life histories. The majority of accounts indicate that salmon were abundant and provided robust in-river Tribal and recreational fisheries upstream from IGD. In addition, migrations were prolific enough to support four general fishing areas that included small-scale commercial harvest at least through 1911. The greatest focus on adult Chinook salmon was in the Sprague River in the fall and was associated with significant harvest.

This analysis resolves the question of when historical migrations of Chinook salmon to the Klamath Upper Basin ceased. It also makes it clear that the Bureau of Commercial Fisheries efforts did not destroy salmon migrations as alleged. While salmon runs were impacted by an 1889 dam at Klamathon, California, by exploitation by in-river fisheries supporting canneries, by abusive mining practices, and by other destruction of their habitat, we found that migrations persisted in the Klamath Upper Basin through the fall of 1912, when they were completely excluded by an early phase of the construction of Copco 1 Dam.

Blocked salmon migrations are now slated to be reversed either through fishways or dam removal, enabling adult salmon to migrate to historical habitats. The diverse seasonal migrations of salmon historically and the life histories likely associated with those migrations would have provided various strategies for surviving to reproduce, an important element for viable populations.¹²⁰ Diversity in salmon populations can provide a similar benefit to diversity in financial portfolios (for salmon populations, this is referred to as the portfolio effect), spreading risk and buffering fluctuations in the environment.¹²¹ The benefits of the portfolio effect have been demonstrated in the robust salmon population of Bristol Bay, Alaska, and threatened populations of the Snake River, Idaho, and the Sacramento and San Joaquin rivers of California.¹²² The portfolio effect in salmon populations contributes to their resilience and ability to survive local ecological disturbance (such as floods and droughts) and unnatural changes ranging from land use to climate change or perhaps years where water quality is poor in portions of the river.¹²³

As managers consider habitat restoration, reintroduction, and associated monitoring plans for Chinook salmon upstream from the current location of IGD and in the Klamath Upper Basin, they will likely look to the historical record for guidance. Our review substantiates the historical persistence of salmon, their migration characteristics, and the broad population baseline that will be key to future commercial, recreational, and Tribal fisheries in the Klamath River and beyond.

TABLE 1A: DOCUMENTATION OF THE PRESENCE AND EXTENT OF CHINOOK SALMON DISTRIBUTION IN THE KLAMATH RIVER SYSTEM UPSTREAM FROM IRON GATE DAM AS PUBLISHED IN HAMILTON ET AL. (2005)

DOCUMENTATION		Chinook Salmon Runs in Klamath Upper Basin
Images	Photo 2: Link River salmon “fishing” around 1860. Site of present Klamath Falls., Klamath County Historical Society, 1860.	✓
	Photo 3: Gentlemen display their catch while salmon fishing on the rapids of Link River, 1891. Klamath County Historical Society, 1891.	✓
Written Sources	A. Gatschet, <i>The Klamath Indians of Southwestern Oregon</i> (Washington, D.C.: USDI U.S. Geographical and Geological Survey of the Rocky Mountain Region, 1890), 711.	✓
	L. Spier, <i>Klamath Ethnography</i> (Berkeley: University of California Press, 1930).	✓
	J. Wales and M. Coots, “Efficiency of Chinook Salmon Spawning in Fall Creek, California,” <i>Transactions of the American Fisheries Society</i> 84 (1954): 134–49.	
	L. Cressman, W. Haag, W. Laughlin, “Klamath Prehistory: The Prehistory of the Culture of the Klamath Lake Area, Oregon.” <i>Transactions of the American Philosophical Society</i> 46:4 (1956): 375–513.	✓
	M. Coots, <i>The Spawning Efficiency of King Salmon (Oncorhynchus tshawytscha) in Fall Creek, Siskiyou County: 1954–55 Investigations</i> , Report 57-1, Redding, California Department of Fish and Game, Inland Fisheries, 1967	
	A. Kroeber and S. Barrett, “Fishing Among the Indians of Northwestern California,” <i>Anthropological Records</i> 21:1 (1960): 5.	✓
	M. Coots, <i>Klamath River 1957 and 1958 King Salmon Counts, Klamathon Racks Siskiyou County, Report No. 62</i> , Redding, California Department of Fish and Game, Inland Fisheries, 1962.	✓
	M. Coots, California Department of Fish and Game, to Jack Hanel, Pacific Power and Light Company, July 1, 1965, in J. Hanel, ed., Redding, Calif. 1965.	
	J. Fortune, A. Gerlach, and J. Hanel, <i>A Study to Determine the Feasibility of Establishing Salmon and Steelhead in the Upper Klamath Basin</i> , Oregon State Game Commission and Pacific Power and Light Company, Portland, Oregon, 1966.	✓
	Lane and Lane Associates, <i>The Copco Dams and the Fisheries of the Klamath Tribe: Report of Lane and Lane Associates to the USDI Bureau of Indian Affairs</i> , Portland, Oregon, 1981.	✓
W. Nehlsen, J. Williams, and J. Lichatowich, “Pacific salmon at the crossroads: Stocks at risk from California, Oregon, Idaho, and Washington,” <i>Fisheries</i> 16:2 (1991):4–21.		

DOCUMENTATION		Chinook Salmon Runs in Klamath Upper Basin
Written Sources	USDI Bureau of Land Management, USDA Forest Service, Environmental Protection Agency, USDI Fish and Wildlife Service, <i>Spencer Creek Pilot Watershed Analysis</i> , Klamath Falls, Ore., USDI Bureau of Land Management, Klamath Falls Field Office, 1995.	
	R. Thurow, D. Lee, and B. Rieman, "Distribution and Status of Seven Native Salmonids in the Interior Columbia River Basin and Portions of the Klamath River and Great Basins," <i>North American Journal of Fisheries Management</i> 17 (1997): 1094–1110.	✓
	P. Moyle, <i>Inland Fishes of California</i> , 2nd ed. (Berkeley: University of California Press, 2002).	✓
Interview	Robert Scarber, interview by author, 2004.	✓

DOCUMENTATION		Chinook Salmon Runs in Klamath Upper Basin
Written and Other Sources	Jeffrey LaLande, <i>First Over the Siskiyous: Peter Skene Ogden's 1826–1827 Journey through the Oregon-California Borderlands</i> (Portland: OHS Press, 1987).	
	Frémont (1846) in D. Walker, <i>Bear Flag Rising: The Conquest of California, 1846</i> (New York: Tom Doherty Associates, 1999).	✓
	Frémont (1846) in D. Helfrich, "The First Boats," <i>Klamath Echoes</i> 1:2 (1965).	✓
	Stephen Powers, <i>Tribes of California</i> (Berkeley: University of California Press, 1877).	
	<i>Linkville Star</i> , May 10, 1884.	✓
	Correspondence (1886) between J. Merrill and G. Brown Goode and S.F. Baird from Ft. Klamath, Oregon, Record Unit 305, Accession no. 19748, Smithsonian Institution Archives, Washington, D.C.	✓
	<i>The Great Klamath Basin and Klamath County</i> (Linkville: Klamath County Museum, 1888), 2.	✓
	"The Pacific Coast: Seven Men Have Been Arrested for Violating the Salmon Law on the Klamath River Near the State Line, and the Dam Complained of by Governor Pennoyer has been Removed," <i>Oregon Scout</i> , October 17, 1889.	
	"Salmon Have Free Run up the River," <i>Yreka Journal</i> , September 10, 1890.	✓
	"Rod and Reel," <i>San Francisco Call</i> , October 5, 1890.	✓
	"Pacific Coast News: Incidents of the Week in Condensed Form—Salmon Are Now Running up the Klamath River Clear to Lakes at Its Head. The Dam at Klamath City Was Washed Away Last Winter," <i>Sausalito News</i> , October 10, 1890.	✓
	"The Fish Ladder at Pokegama," <i>Yreka Journal</i> , October 4, 1893.	✓
	"The Twentieth Century—First Salmon of the Season Was on Sale at Fitzgerald's Market Last Week. The Fish Came from Sprague River," <i>Lake County Examiner</i> , October 10, 1901.	✓
	Judah, "A Siskiyou Vacation," 262–67.	
	"Local News: Roy Wright Has Caught Four Large Salmon from the River at This Place the Past Week," <i>Klamath Republican</i> , September 18, 1902.	✓
	"Local News: It Is Reported That the Fish Ladder at Klamathon Is a Poor Arrangement," <i>Klamath Republican</i> , October 16, 1902.	✓
	"Trout Streams Are Beckoning Angling Hosts: Stories of the Sport on the Klamath River Stir the Blood of Many Sportsmen," <i>San Francisco Call</i> , June 4, 1904.	
	Oregon Department of Fisheries, <i>Annual Report of the Master Fish Warden 1904</i> (Salem: Oregon Department of Fisheries, 1905).	
	F.A. Shaver, with Arthur P. Rose, R.F. Steele, and A.E. Adams, comps., <i>Illustrated History of Central Oregon Embracing Wasco, Sherman, Gilliam, Wheeler, Crook, Lake, and Klamath Counties —State of Oregon</i> (Spokane, Wash.: Western Historical Publishing Company, 1905).	✓
	Klamath Falls Chamber of Commerce, <i>Klamath Falls Oregon: The New Eldorado of the West — Always Health, Wealth, and Happiness</i> (1906), Digital Collection, Western Waters Digital Library, Courtesy of University of Oregon Libraries.	✓

TABLE 1B: ADDITIONAL DOCUMENTATION OF THE PRESENCE AND EXTENT OF CHINOOK SALMON DISTRIBUTION IN THE KLAMATH RIVER SYSTEM UPSTREAM FROM IRON GATE DAM SINCE HAMILTON ET AL. (2005) PUBLICATION

DOCUMENTATION		Chinook Salmon Runs in Klamath Upper Basin
Images	"My Best Day's Catch" at Shovel Creek, in F.A. Judah, "A Siskiyou Vacation," <i>Western Field</i> 1:5 (1902): 266.	
	"Drying salmon, Klamath Indian Reservation" (1904), Gerald W. Williams Collections (MSS Williams G) [hereafter Gerald W. Williams Collections], Oregon State University Special Collections and Archives Research Center, Corvallis, Oregon [hereafter OSU Special Collections].	✓
	Postcard of Salmon Leaping Falls (dated 1910), Klamath County Museum.	
	"Fishing for salmon in Link River below the Moore Mill and Link River Falls" (undated) in Floyd Wynne, "Link River," <i>Klamath Echoes</i> 1:4 (1967) Centennial Issue, Part 1.	✓
	"25# salmon caught by an Indian who lived upstream from Link River bridge" (undated), SHL014, series 1, Alfred D. Collier Collection (1880–1982), Shaw Historical Library, Oregon Institute of Technology, Klamath Falls, Oregon.	✓
	Salmon fishing at Fall Creek (1950) in J. Wales, <i>Management of King Salmon Spawning in the Klamath River, Siskiyou County</i> , Bureau of Fish Conservation, California Division of Fish and Game, 1950.	
	Williamson River salmon featured in C.F. Holder, <i>Game Fishes of the World</i> (London: Hodder and Stoughton, 1913).	✓

DOCUMENTATION		Chinook Salmon Runs in Klamath Upper Basin
Written and Other Sources	A. Cumming, "Angling on the Klamath," <i>Sunset</i> (April 1907), 573–83.	
	"Keno Items: Arrested Several Parties for Fishing for Salmon Otherwise Than with a Hook and Line," <i>Klamath Republican</i> , September 16, 1909, p. 1.	
	"Where Shovel Creek Reaches the Klamath: The Famous Fishing and Hunting Ground of Northern California," <i>San Francisco Call</i> , June 27, 1909.	
	"Crater Lake: Where a Mountain Fell Inward," <i>San Francisco Call</i> , August 15, 1907.	✓
	R. Steele, "The Big One up Shovel Creek," <i>Western Field</i> (October 1909): 49–56.	
	H. Whyte, "Fall Outings for Everyone," <i>The Outings Magazine</i> LV (1909), 254–55.	
	"Build the Fish Ladder," <i>Klamath Falls Express</i> , April 14, 1910.	
	S. Barrett, "The Material Culture of the Klamath Lake and Modoc Indians of Northeastern California and Southern Oregon," <i>University of California Publications in American Archaeology and Ethnology</i> 5:4 (June 27, 1910): 239–52.	✓
	"Fish Ladder Needed," <i>Oregonian</i> , April 10, 1910.	
	"Klamath Has Gun Club," <i>Oregonian</i> , October 30, 1910, p. 2.	
	"State News," <i>Salem Daily Capitol Journal</i> , April 12, 1910, p. 7.	
	"Fish Laws Demanded," <i>Morning Oregonian</i> , December 10, 1910, p. 3.	✓
	"Bills Passed Legislature: New Senate Bills," <i>Coos Bay Times</i> , February 9, 1911, p. 4.	
	"Rogue River Bill Vetoed," <i>Coos Bay Times</i> , February 27, 1911, p. 2.	
	"Indian Fishers Sell Fine Wares," <i>Evening Herald</i> , October 15, 1911.	✓
	"Some Salmon Were Brought into Town the Forepart of the Week by the Indians from the Klamath Reservation. The Fish Were Caught in Sprague River," <i>Lake County Examiner</i> , October 12, 1911.	✓
	<i>Lake County Examiner</i> , October 19, 1911.	✓
	Oregon Department of Fisheries, <i>Report of the Master Fish Warden: Biennial Report of the Department of Fisheries of the State of Oregon: Natural Obstructions—Keno Falls</i> , (Salem, Ore., 1911), 40.	
	"Crippled Fisherman Handy with the Rod," <i>San Francisco Call</i> , September 24, 1911.	
	"Salmon Running in Rivers," <i>Morning Oregonian</i> , September 9, 1912, p. 3.	✓
Photo caption "J. Bernard Frisbee of Berkeley with a Limit of Rainbow trout at Klamath Hot Springs. The Fall Run of Salmon and Trout is Now On," <i>San Francisco Call</i> , August 29, 1912.		
"Inspect the Klamath Dam — Officials Will Investigate Salmon Shortage," <i>Evening Herald</i> (Klamath Falls), October 28, 1913.	✓	
"Indians Oppose Salmon Racks at Hatcheries — Future Supply in Serious Danger," <i>Klamath Evening Herald</i> , November 3, 1913, p. 1.	✓	

DOCUMENTATION		Chinook Salmon Runs in Klamath Upper Basin
Written and Other Sources	H.W. Hincks, Engineer, to L.M. Holt, Superintendent of Irrigation for the U.S. Indian Service, March 24, 1914, copy held by author.	✓
	"May Ask U.S. to See That River is Kept Clear: Is Shutting off Indians Salmon Supply," <i>Evening Herald</i> (Klamath Falls), October 23, 1914.	✓
	"New Dam Stops Fish in Klamath," <i>Medford Mail Tribune</i> , October 26, 1914.	✓
	E.B. Meritt, Assistant Commissioner of Indian Affairs, to Supt. Klamath School, Klamath Agency, August 15, 1916, including handwritten notes by Fred Hendricks, Klamath Agency, Oregon, filed with 2446-1915-Klamath Agency-115, Central Classified Files, 1907–1939 [hereafter Klamath Agency Central Classified Files, 1907–1939], RG 75, Commission of Indian Affairs, National Archives and Records Administration, Washington, D.C. [hereafter NARA]	✓
	H. Wilson, handwritten report on salmon fishing on the Klamath Indian Reservation, 1916, filed with Klamath Agency Central Classified Files, 1907–1939, RG 75, NARA.	✓
	California Fish and Game Commission, <i>Twenty-Fifth Biennial Report: For the Years 1916–1918</i> (Sacramento: State Printing Office, 1918), 38.	
	E.B. Meritt, Assistant Commissioner of Indian Affairs, to Oregon Fish and Game Commission, August 14, 1918, filed with Klamath Agency Central Classified Files, 1907–1939, RG 75, NARA.	✓
	California Fish and Game Commission, <i>Twenty-Sixth Biennial Report: For the Years 1918–1920</i> (Sacramento: State Printing Office, 1920), 25.	
	"Sportsmen Get Organization Well Started," <i>Evening Herald</i> (Klamath Falls), January 10, 1920, p. 1.	✓
	Holder, <i>Game Fishes of the World</i> .	✓
	"Says Fishway over Dam Impractical," <i>Evening Herald</i> , February 16, 1921.	
	"Sportsmen Urge Many Improvements," <i>Evening Herald</i> , July 8, 1921, 1–2.	
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	J. Snyder, "Salmon of the Klamath River California," <i>Fish Bulletin</i> 34 (1931).	✓
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	B. Courtright to Kenneth R. L. Simmons, August 13, 1941, file 3 of 3 of a series of files titled, "419.4 COPCO Case, 1940–1946," Decimal Correspondence, Klamath Agency, RG 75, NARA Pacific Alaska Region.	✓
	Rachel Applegate Good, <i>History of Klamath County Oregon: Its Resources and Its People</i> (Klamath Falls: Klamath County Historical Society, 1941).	✓

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Written and Other Sources	K. Simmons to B.G. Courtright, Superintendent, Klamath Indian Agency, Klamath Agency, Oregon, August 21, 1941, file 3 of 3 of a series of files titled, "419.4 COPCO Case, 1940–1946," Decimal Correspondence, Klamath Agency, RG 75, NARA Pacific Alaska Region.	✓
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	"As Told to Me . . . by Rod Frain," October 24, 1948 interview in <i>Klamath Echoes</i> 1:3 (1966): 7–8.	✓
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	M. Coots, <i>Efficiency of King Salmon Spawning in Fall Creek, Siskiyou County—Progress Report for 1953–54</i> , California Department of Fish and Game, Inland Fisheries Branch, 1954.	
	M. Coots, <i>Klamath River 1954 King Salmon Count, Klamathon Racks, Siskiyou County, and Some Notes on Marked King Salmon Recoveries in the Upper Klamath River</i> , Inland Fisheries Branch, California Department of Fish and Game, 1954.	
USDI Fish and Wildlife Service, <i>A Special Report on Fish and Wildlife Resources Affected by Developments Proposed for the Upper Klamath Basin, Oregon and California</i> , United States Department of the Interior, Fish and Wildlife Service, Portland Oregon, 1954.	✓	
E. Hughes and G. Weber, <i>Report on North Coast Salmon Carcass Recovery Work—1955</i> , California Department of Fish and Game, 1955.		

DOCUMENTATION		Chinook Salmon Runs in Klamath Upper Basin
Written and Other Sources	G. Wright, <i>Tidbits of Greensprings and Klamath River Canyon History</i> , 1957, typescript at Bureau of Land Management Klamath Falls Resource Area, Lakeview District, Klamath Falls, Oregon.	
	M. Coots, <i>Klamath River 1956 King Salmon Count, Klamathon Racks, Siskiyou County</i> , California Department of Fish and Game Inland Fisheries 1958, Administrative Report 58–9.	
	Klamath County Pomona Grange, <i>Resolution Favoring the Building of a Fish Ladder or Other Means for the Passing of Salmon and Other Fish to the Waterways of Klamath County, 1958</i> , California Department of Fish and Game Executive/Legal Litigation Files, Copco Case, no. 2001-09-35, California State Archives, Sacramento, California.	✓
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	W. Wright, "Biography of Robert Whittle," 1962, Siskiyou County Historical Society.	
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	Ray Telford, age 83, longtime Klamath Falls resident, interview by F. Landrum, November 18, 1965, on CD, Francis S. and Patricia L. Landrum Collection, Shaw Historical Library, Oregon Institute of Technology, Klamath Falls.	✓
	T. Stern, <i>The Klamath Tribe</i> (Seattle: University of Washington Press, 1965).	✓
	"Klamath Salmon Report Ready; Meeting Called for Tuesday," <i>Klamath Herald and News</i> , September 25, 1966, p. 1-A.	✓
	F. Wynne, "Link River. . ." <i>Klamath Echoes</i> , Centennial Issue 1:4 (1967): 15–16.	✓
	C. Howe, <i>Ancient Tribes of the Klamath Country</i> (Portland, Ore.: Binford and Mort, 1968).	✓
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	Devere Helfrich, "Keno and Vicinity," <i>Klamath Echoes</i> , Merril-Keno Issue 1:7 (1969): 47–50.	✓
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Written and Other Sources	Alice Overton Hessig, <i>Looking Back: The California-Oregon Stage Road from Ager, California to Topsy, Oregon</i> (Carson City, Nev.: Printers, Inc., 1979).	
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	E. Moore, <i>Western Echoes</i> (Klamath Falls: Paul Tremaine Publishing, 1981).	✓
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	California Department of Fish and Game, <i>Status and Management of Spring-Run Chinook Salmon</i> , Inland Fisheries Division, 1990.	✓
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	R. Carter to Oregon Department of Fish and Wildlife regarding the History of Spring Creek, Klamath County, Oregon, March 2001, Oregon Department of Fish and Wildlife, Klamath Falls Office.	✓
	D. Deur, <i>Final Report Traditional Cultural Properties and Sensitive Resource Study: Klamath Hydroelectric Project FERC Relicensing Documentation</i> , Report to the Klamath Tribes, 2003.	✓
	Stephen Dow Beckham, <i>Historical Landscape Overview of the Upper Klamath River Canyon of Oregon and California</i> , Cultural Resource Series no. 13, U.S. Department of Interior, Bureau of Land Management, Oregon State Office, Portland, Oregon, 2006.	
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V. Butler, A.E. Stevenson, J.A. Miller, D.Y. Yang, C.F. Speller, N. Misarti, <i>The Use of Archaeological Fish Remains to Establish Pre-Development Salmonid Biogeography in the Upper Klamath Basin</i> , Final Report, Portland State University Department of Anthropology, Portland, Oregon, 2010.	✓	

DOCUMENTATION		Chinook Salmon Runs in Klamath Upper Basin
Interview	Laura Pickard Grabner, interview by author, 2013.	✓

TABLE 2. ACCOUNTS OF CHINOOK SALMON NON-ABUNDANCE/ABUNDANCE UPSTREAM FROM IRON GATE DAM SITE

	ACCOUNT	DATE	SOURCE
Indicating Non-Abundance Upstream from Iron Gate Dam Site	"...salmon were available only in the Klamath River and its tributaries below Copco Marsh, to which a few ascended."	Prior to dams	G. Hewes, <i>Aboriginal Use of Fishery Resources in Northwestern North America</i> (Ph.D. diss.: Univ. of California, 1947).
	"According to Oregon State Department of Fish and Wildlife records, before Copco Dam was built . . . a hardy few Chinook salmon commonly would ascend beyond Big Bend Canyon each year—some of them reaching Upper Klamath Lake and the Williamson River. However, the major portion of the annual spawning runs did not pass above the canyon."	Prior to dams	J. LaLande, <i>First over the Siskiyou: Peter Skene Ogden's 1826–1827 Journey through the Oregon–California Borderlands</i> (Portland: OHS Press, 1987).
	"A small run enters the Klamath and Umpqua rivers"	Prior to dams	Oregon Department of Fisheries, <i>Annual Report to the Legislative Assembly 21st Regular Session</i> (1901).
Indicating Abundance (in general, without dates) Upstream from Iron Gate Dam Site	"Salmon, varieties of trout, suckers, and smaller fish were all to be had in abundance."	Prior to dams	L. Spier, <i>Klamath Ethnography</i> (Berkeley: Univ. of California Press, 1930).
	"For years the [Klamath] Indians have spent much of the spring, summer, and fall months catching salmon and drying them for winter food, and it is said that during the last winter some of them actually suffered because they did not have this supply."	Prior to dams	"New Dam Stops Fish in Klamath," <i>Medford Mail Tribune</i> , October 26, 1914.
	"The Klamath Indians caught a great many salmon in October every year, which helped materially in their food supply"	Prior to dams	H. Wilson, Report on Salmon Fishing on the Klamath Indian Reservation, 1916, filed with 2446–1915–Klamath Agency–115, Central Classified Files, 1907–1939, Office of Indian Affairs, RG 75, NARA.

	ACCOUNT	DATE	SOURCE
<p style="text-align: center;">Indicating Abundance (in general, without dates) Upstream from Iron Gate Dam Site</p>	<p>"I have asked a great many Indians and white people as to the effect of this dam on the fish in the streams of this locality [the Reservation]. There has been but one answer and that is that in the past a great many salmon were caught where the Indians secured a large part of their sustenance, and since this dam was begun four years ago there has been no salmon caught, and I have inquired of white people who have lived in the country for some time, and without exception as far as I have heard they concur absolutely in that report."</p>	Prior to dams	C. Ashbury to E.B. Meritt, June 7, 1917, Filed with 2446-1915-Klamath Agency-115, Central Classified Files, 1907-1939, Klamath Agency, Oregon, United States Indian Service, RG 75, NARA, Washington D.C.
	<p>"the largest village. . . on the banks of the Link River. . . was . . . the scene of winter fishing grounds, unexcelled for salmon."</p>	Prior to dams	Good, <i>History of Klamath County Oregon</i> .
	<p>"No salmon [were] in Klamath Marsh but abundant elsewhere in area."</p>	Prior to dams	E. Voegelin, "Culture Element Distributions, XX: Northeast California," <i>University of California Anthropological Records</i> 7:2 (1942): 194.
	<p>"The older Indians tell me the Sprague was 'full of salmon.' There were several holes along the river and fishing was had at these places all day long and most of the night when torches were used. Fish were taken out by the wagonload."</p>	Prior to dams	B. Courtright, "Memorandum — Salmon on the Klamath," January 16, 1941, file 3 of 3 of a series of files titled, "419.4 COPCO Case, 1940–1946," Decimal Correspondence, Klamath Agency, box 109, BIA, RG 75, NARA Pacific Alaska Region.
	<p>"The blocking of the river marked the end of those years when salmon teemed in waterways throughout the basin, at least to the upper limits of the Sprague River." September 25, 1966</p>	Prior to dams	"Klamath Salmon Report Ready; Meeting Called for Tuesday," <i>Klamath Herald and News</i> , September 25, 1966, p. 1-A.
	<p>At Link River "enormous quantities of salmon and steelhead and mullet were taken each year by the Indians who dried them for their winter food supply." (Wynne 1967).</p>	Prior to dams	F. Wynne, "Link River," <i>Klamath Echoes</i> 1:4 (1967): 15–16.
	<p>"It was here [Fishing (or Moonshine) Falls] that salmon would 'stack up like cordwood' and were easily secured by those early fishermen (Indians and early whites)."</p>	Prior to dams	D. Helfrich, "Keno and Vicinity," <i>Klamath Echoes</i> 1:7 (1969) Merrill-Keno Issue: 47–50.
	<p>"the salmon run [Sprague River] was so heavy they could run between your legs and almost knock you down."</p>	Prior to dams	H. Wright, in Lane and Lane Associates, <i>The Copco Dams and the Fisheries of the Klamath Tribe: Report of Lane and Lane Associates to the USDI Bureau of Indian Affairs</i> , Portland, Oregon, 1981, 61
	<p>"I remember that salmon used to go up the Sprague River to Bly. There used to be lots of salmon and many times I saw Indians fishing at Baking Powder Grade."</p>	Prior to dams	G. Duvall, 1946, in Courtright and Simmons Affidavits 1941–1946, NARA Pacific Alaska Region.

	ACCOUNT	DATE	SOURCE
<p style="text-align: center;">Indicating Abundance (in general, without dates) Upstream from Iron Gate Dam Site</p>	<p>"Mr. Howard stated that his father would drive a wagon to the crossing (where the Applegate Trail crosses Spencer Creek) and using a pitchfork, load it with salmon. The wagon would be so full, the salmon would flop out going up the hill" (Hinton pers. comm. 1995 In USDI Bureau of Land Management, USDA Forest Service et al. 1995).</p>	Prior to dams	USDI BLM, USDA Forest Service, EPA, and USDI Fish and Wildlife Service, <i>Spencer Creek Pilot Watershed Analysis</i> , U.S. Department of the Interior, BLM, Klamath Falls Field Office, 1995.
	<p>"I remember fording Spencer Creek; about 20 miles [32 kilometers] below Klamath Falls, and the salmon were so thick the horses became frightened."</p>	Prior to dams	H.H. Cole, 1946, in B. Courtright and K. Simmons, Affidavits 1941–1946 regarding historical salmon fishery upstream from Copco 1 Dam, U.S. Department of the Interior, Office of Indian Affairs, Klamath Agency, Record Group 75, Decimal Correspondence, box 109, Copco Case File, folders 1 and 3, U.S. Department of the Interior, Office of Indian Affairs [hereafter Courtright and Simmons Affidavits 1941–1946], NARA Pacific Alaska Region.
	<p>"I remember the runs of salmon in the north fork of the Sprague River in the fall and the Indians catching them. One of the most colorful was one named 'Whiskey John' who used to spear salmon dressed only in a red undershirt. The Indians caught lots of salmon and would dry them on racks to provide food in the winter."</p>	Prior to dams	C. Schmitz, 1946, in Courtright and Simmons Affidavits 1941–1946, NARA Pacific Alaska Region.
	<p>"I saw salmon hurling themselves at this [COPCO Dam] in thousands and beating their heads in, many of them had battered their heads completely off back to the eyes."</p>	Prior to IGD	W. Knight to B.G. Courtright, letter and map, December 12, 1941, Copco Case File, Decimal Correspondence, Box 109, folders 1 and 3, Klamath Agency, BIA, RG 75, NARA Pacific Alaska Region.
	<p>"I would say that the salmon fish obtained by these Indians during those years provided one-half of the food consumed by them."</p>	Prior to dams	D. Skeen in Lane and Lane Associates, <i>The Copco Dams and the Fisheries of the Klamath Tribe: Report of Lane and Lane Associates to the USDI Bureau of Indian Affairs</i> , Portland, Oregon, 1981.
	<p>"We Indians depended to a great extent on the salmon for our food supply. I would state that about one-third to a half of our food supply was provided by the salmon."</p>	Prior to dams	R. David in Ibid.
	<p>"The salmon provided the Indians with about one-third of their food supply each year."</p>	Prior to dams	D. Chocktoot in Ibid.

	ACCOUNT	DATE	SOURCE
Indicating Abundance (in general, without dates) Upstream from Iron Gate Dam Site	"I would estimate that 1/6 of the subsistence of all of the Indians residing on the Klamath river between 1890 and 1909 was provided by the salmon fish caught in the reservation streams. . . ."	Prior to dams	C. Kirk in Ibid.
	"Speared salmon, lots of salmon dried."	Prior to dams	I. Mose in Ibid.
	"Recalled salmon in Spencer Creek, 20 miles below Klamath Falls, so thick that they frightened the horses fording the creek."	Prior to dams	H. Ogle in Ibid.
	Natural Obstructions — Keno Falls: These natural falls have been a detriment to the fishing industry on the Klamath River for years past inasmuch as large numbers of salmon and other fish would congregate in the pools below the falls and injure themselves, if not kill themselves outright, trying to surmount the obstruction.	Prior to dams	Oregon Dept. of Fisheries, <i>Report of the Master Fish Warden. Biennial Report of the Dept. of Fisheries of the State of Oregon: Natural Obstructions — Keno Falls</i> , Salem, Oregon, 1911, p. 40.
Indicating Abundance Pre-1910 Upstream from Copco 1 Dam Site and Klamathon Racks	"Up this [Klamath] river the salmon crowd in great numbers to the lake [Upper Klamath Lake] . . ."	1846	J.C. Frémont, <i>Narratives of Exploration and Adventure</i> (Longmans, Green, and Co., Inc., 1956).
	"Robert Whittle, about 1865, annually for several years came up the Klamath River [to Keno, Oregon] from Yreka to catch salmon, salmon trout, and silversides to sell in Yreka."	1865	G. Duncan, "Klamath Falls to Pokegama by the Old Stage and Freight Stations," <i>Yearbook, Siskiyou County Historical Society</i> 1:3 (1948): 45.
	"The lake [Upper Klamath Lake] abounds in both salmon and trout, a source of pleasure and profit to our citizens, and especially to Poor Lo [Indians], who takes them out in the spring by the wagon load, and piles them up like cordwood to dry in the sun for his winter's food."	1884	<i>Linkville Star</i> , May 10, 1884.
	"The lakes and streams of this country literally team with 'speckled trout' of the following varieties: . . . salmon. . ."	1888	<i>The Great Klamath Basin and Klamath County</i> (Linkville: Klamath County Museum, 1888), 2.
	"The Indians obtained a large part of their livelihood from the salmon fish they caught. . . . I would say that approximately 3,000 pounds [1361 kg] of salmon fish were taken out at Baking Powder Grade [Sprague River] each day for 90 days." Victor Nelson, member of the Klamath Tribes.	1888–1909	V. Nelson, in Lane and Lane Assoc., <i>The Copco Dams and the Fisheries of the Klamath Tribe</i> ; K. Simmons, <i>Proposed Action for Injunction and Damages: U.S. v. California Oregon Power Company</i> (Washington, D.C., 1942).
	"There were ten of us in the family and I supplied the salmon for the use of my family. What salmon I caught I did not need, my family would give to their friends. I would take between 300 to 400 salmon out of the reservation streams each and every fall during the salmon runs." James Johnson, born 1887, member of the Klamath Tribes.	1888–1909	J. Johnson, in Lane and Lane Assoc., <i>The Copco Dams and the Fisheries of the Klamath Tribe</i> ; Simmons, <i>Proposed Action for Injunction and Damages</i> .

	ACCOUNT	DATE	SOURCE
Indicating Abundance Pre-1910 Upstream from Copco 1 Dam Site and Klamathon Racks	"I know from my own knowledge . . . The salmon taken out . . . provided approximately one-half of the food that all of the Klamath Indians used from 1898 to the time when the fish were stopped by the dam of the California Oregon Power Company in 1910." Delford Lang, member of the Klamath Tribes.	1898 to 1910	D. Lang in Lane and Lane Assoc., <i>The Copco Dams and the Fisheries of the Klamath Tribe</i> .
	"My husband fished salmon in all the fishing spots at Sprague River . . . He would take between 3-400 salmon a year." Bertha Lotches, born 1889, member of the Klamath Tribes	1901 (until runs stopped)	B. Lotches in Ibid.
	"Salmon and lake trout are now being caught in great abundance."	1901	Local News, <i>Klamath Republican</i> , February 21, 1901.
	"Roy Wright has caught four large salmon from the river at this place [Link River] the last week. He pulled one out yesterday that weighed 25 pounds [11.3 kg]. Lots of them are in the river, he says."	1902	Local News, <i>Klamath Republican</i> , September 18, 1902.
	"It is reported that the fish ladder at Klamathon is a poor arrangement and has not accommodated the salmon during their run, thousands have been killed in attempting to go over it . . . If a sufficient ladder were provided there would be an abundance of salmon here."	1902	Local News, <i>Klamath Republican</i> , October 16, 1902.
	"I would personally salt down 400 or 500 pounds of fish following each salmon runs while I was here on the reservation. . . . After 1902 I fished every year during each salmon run until the spring of 1909 . . . During each of those year following 1902 the salmon runs were about the same. There were sufficient salmon running in the streams for all of the Indians to obtain the salmon they needed in sufficient quantity."	1902	J. Cole, in Lane and Lane Assoc., <i>The Copco Dams and the Fisheries of the Klamath Tribe</i> .
	"salmon were running in the Klamath River at that time and several loads had been brought to town [Klamath Falls] from downriver"	1903	"Local News—The Salmon Are Now Running in the Klamath River," <i>Klamath Republican</i> , September 10, 1903.
	"I remember distinctly during 1904 on several occasions I would drive a spring wagon to the fishing holes and fish all night with the Indians getting sufficient salmon to load this wagon full of salmon fish. The wagon would hold approximately 35 to 40 salmon, the salmon varying in weight between 10 and 40 pounds [4.5 to 18.1 kg]. . . There would sometimes be between 100 and 125 Indian fishermen spearing fish during these runs. Thousands of pounds of salmon would be taken out during heavy runs. . . ."	1904	E. Beal in K. Simmons, <i>Proposed Action for Injunction and Damages: United States vs California Oregon Power Company</i> (Washington, D. C.: United States, 1942).
	". . . There are millions of the fish [salmon] below the falls near Keno. . . ."	1908	"Millions of Salmon: Cannot Reach the Lake on Account of Rocks in River at Keno," <i>Klamath Evening Herald</i> , September 24, 1908, p. 1.

	ACCOUNT	DATE	SOURCE
Indicating Abundance Pre-1910 Upstream from Copco 1 Dam Site and Klamath Racks	"The salmon run up the river and go up Shovel Creek in such numbers as to be almost beyond belief. It is a fact that at narrow points in the river the salmon sometimes crowd each other out upon the bank."	1909	"Where Shovel Creek Reaches Klamath: The Famous Fishing and Hunting Ground of Northern California," <i>San Francisco Call</i> , June 27, 1909.
	"Sometimes the salmon crowd narrow Shovel Creek until it would appear possible to use pitchforks and supply a cannery."	1909	R. Steele, "The Big One up Shovel Creek (Illustrated)," <i>Western Field</i> , October 1909, p. 49–56.
	"Salmon are still running in large numbers [at Link River]"	1909	"Great Sport on the River: Trout Are Plentiful and Easy to Catch—Salmon Are still Running," <i>Klamath Republican</i> , October 14 1909, p. 1.
Indicating Abundance 1910–1912 Upstream from Copco 1 Dam Site and Klamath Racks	"thousands of salmon are beating their lives out in an attempt to scale the falls [Moonshine Falls]. A fish ladder could be built at a cost not to exceed. . ."	1910	"Fish Ladder Needed," <i>Sunday Oregonian</i> , April 10, 1910.
	"Thousands of salmon enter the Klamath River [in Oregon]. . . The Klamath County Rod and Gun Club desires a special provision lifting the protection from salmon to permit Klamath people to get at least some benefit from the large salmon runs here during the Fall and Spring months. Now no one is allowed to fish other than with hook and line, and as salmon will not bite a hook this law gives people here absolutely no benefit from the millions of salmon in these waters."	1910	"Fish Laws Demanded," <i>Morning Oregonian</i> , December 10, 1910, p. 3.
	"Lakeview — Indians from the Klamath Reservation are . . . selling . . . some of the finest salmon that they have ever had brought over to this part of the country. The fish are running this year in largely increased numbers, and are of better quality than usual at this time of the year."	1911	"Indian Fishers Sell Fine Wares," <i>Klamath Evening Herald</i> , October 15, 1911.
	". . .one of the Klamath Indians, last week came over from the Reservation [to Lakeview Oregon] bringing with him a large load of salmon which were caught in the Sprague River. It is needless to say that he found a ready sale for the fish."	1911	<i>Lake County Examiner</i> , October 19, 1911.
	"Salmon are running in fine style in the Klamath and Link Rivers and are also ascending Lost River through the recently opened Diversion Canal. None have been taken with hook and line as yet, although a number of fishermen have been whipping Link River for them."	1912	"Salmon Running in Rivers," <i>Portland Morning Oregonian</i> , September 9, 1912, p. 3.
	"large numbers of salmon are dried, smoked and salted during this time of the year."	Through 1912	"Indians Oppose Salmon Racks at Hatcheries—Future Supply in Serious Danger," <i>Klamath Evening Herald</i> , November 3, 1913, p. 1.

TABLE 3: ADDITIONAL DOCUMENTATION OF THE PRESENCE AND EXTENT OF CHINOOK SALMON DISTRIBUTION IN THE KLAMATH RIVER SYSTEM UPSTREAM FROM IRON GATE DAM SINCE HAMILTON ET AL. (2005) PUBLICATION

SEASON	WATERSHED REFERENCE	LOCATION	DATE	SOURCE
Winter	Klamath Upper Basin (Link River to Headwaters)	Link River	February 21, 1901	"Local News: Salmon and lake trout now being caught in great abundance," <i>Klamath Republican</i> , February 21, 1901.
	Klamath Upper Basin	Link River	March 21, 1901	Article on fish runs from the March 21, 1901 edition of the <i>Klamath Republican</i> , reprinted in the <i>Klamath Echoes</i> , 1965.
	Klamath Upper Basin	Link River	Winter	Good, <i>History of Klamath County Oregon</i> .
	Klamath Upper Basin	Link River	March	Fortune, et al, <i>A study to Determine the Feasibility of Establishing Salmon</i> .
Spring	IGD to Keno	Upper Klamath River Canyon	April	Theodoratus, et al., <i>Klamath River Canyon Ethnology Study</i> .
	IGD to Keno (downstream from Link River)	"Moonshine Falls"	April 12, 1910	"Fish Ladder Needed," <i>Oregonian</i> , April 10, 1910; "State News," <i>Daily Capitol Journal</i> , April 12, 1910.
	Klamath Upper Basin	Link River	May 6, 1846	Frémont, <i>Narratives of Exploration and Adventure</i>
	Klamath Upper Basin	Link River	May 9, 1846	Frémont in Walker, <i>Bear Flag Rising</i> .
	Klamath Upper Basin	Link River	May 10, 1884	<i>Linkville Star</i> , May 10, 1884.
	Klamath Upper Basin	Link River	Spring 1888	<i>The Great Klamath Basin and Klamath County</i> (Linkville: Klamath County Museum, 1888), 2.
	Klamath Upper Basin	Link River/ Klamath Falls	Spring 1910	"Fish Laws Demanded," <i>Morning Oregonian</i> , December 10, 1910.
	Klamath Upper Basin	UKL tributaries	May–June 1890	Spier, <i>Klamath Ethnography</i> .
	Klamath Upper Basin	UKL tributaries	Spring 1914	"New Dam Stops Fish in Klamath," <i>Medford Tribune</i> , October 26, 1914.
Klamath Upper Basin	UKL tributaries	Spring 1916	E.B. Meritt to Supt. Klamath School, Klamath Agency, dated August 15, 1916, 2446-1915-Klamath Agency-115, RG 75, Central Classified Files, 1907–1939, NARA.	

SEASON	WATERSHED REFERENCE	LOCATION	DATE	SOURCE
Spring	Klamath Upper Basin	UKL tributaries	Spring (two runs "noted even to the headwaters")	Snyder, <i>Salmon of the Klamath River California</i>
	Klamath Upper Basin	UKL tributaries	May–June	Spier, <i>Klamath Ethnography</i> .
	Klamath Upper Basin	UKL tributaries	Spring	Stern, <i>The Klamath Tribe</i> .
	Klamath Upper Basin	UKL tributaries	Spring	Voegelin, "Culture Element Distributions: XX, Northeast California," 194
Summer	IGD to Keno	Shovel Creek	July	"Trout Streams are Beckoning Angling Hosts," <i>San Francisco Call</i> , June 4, 1904.
	IGD to Keno	Shovel Creek	August 10	Cumming, "Angling on the Klamath," 577–583.
	IGD to Keno	Shovel Creek	September 8, 1909	Judah, "A Siskiyou vacation," 262-67.
	IGD to Keno	Shovel Creek	August 29, 1912	"Photo - J. Bernard Frisbee of Berkeley with a limit of rainbow trout at Klamath Hot Springs," <i>San Francisco Call</i> , August 29, 1912.
	Klamath Upper Basin	UKL tributaries	Summer (starts about August 15)	E.B. Meritt to Supt. Klamath School, Klamath Agency, dated August 15, 1916, 2446-1915-Klamath Agency-115, RG 75, Central Classified Files, 1907–1939, NARA.
	Klamath Upper Basin	UKL tributaries, Williamson River	August	Fortune, et al, <i>A study to Determine the Feasibility of Establishing Salmon</i> .
	Klamath Upper Basin	UKL tributaries	Summer	"New Dam Stops Fish in Klamath," <i>Mail Tribune</i> , October 26, 1914.
	Klamath Upper Basin	UKL tributaries, Chiloquin Area	Summer	"Dr. McLean Will Go Fishing," <i>Morning Oregonian</i> , July 12, 1900, p 8; Brewster, <i>William Mead Ladd of Portland Oregon</i>
Fall	IGD to Keno	Camp Creek	October 25, 1953	Coots, <i>King Salmon Count — Klamath River, Klamathon Racks</i>
	IGD to Keno	Upper Klamath River Canyon	Late Fall	Theodoratus, et al., <i>Klamath River Canyon Ethnology Study</i> .
	IGD to Keno	Jenny Creek	October 14 to November 3, 1955	Hughes and Weber, <i>Report on North Coast Salmon Carcass Recovery Work</i> .
	IGD to Keno	Jenny Creek	October 4 and October 6, 1953	Coots, <i>King Salmon Count — Klamath River, Klamathon Racks</i>
	IGD to Keno	Jenny Creek; Old channel below Copco 2	October 27, 1952	Coots and Wales, <i>King Salmon Activity in Jenny Creek</i>

SEASON	WATERSHED REFERENCE	LOCATION	DATE	SOURCE
Fall	IGD to Keno	Old channel below Copco 2	October 22, 1953	Coots, <i>King Salmon Count — Klamath River, Klamathon Racks</i>
	IGD to Keno	Copco 2 Dam to Copco 2 Powerhouse	October 16 to November 3, 1955	Hughes and Weber, <i>Report on North Coast Salmon Carcass Recovery Work</i> .
	IGD to Keno	Fall Creek	September 7 to November 1, 1953	Coots, <i>King Salmon Count — Klamath River, Klamathon Racks</i>
	IGD to Keno	Fall Creek	As early as September 9	Wales and Coots, "Efficiency of Chinook Salmon Spawning in Fall Creek, California," 137–49.
	IGD to Keno	Fall Creek	September 9 to October 28, 1954	Coots, <i>Efficiency of King Salmon Spawning in Fall Creek, Siskiyou County — Progress Report for 1953–54</i> .
	IGD to Keno	Fall Creek	September 20 to October 25, 1954	Coots, <i>Klamath River 1954 King Salmon Count</i>
	IGD to Keno	Fall Creek	September 25 to November 6	Wales, <i>Management of King salmon spawning in the Klamath River</i>
	IGD to Keno	Fall Creek	October	Wright, "George Wright's Transcribed Diary-Origin of the Place Names of Southern Oregon and Northern California with History from Late 1800s to 1950s."
	IGD to Keno	Shovel Creek	Early September to October	Steele, "The Big One up Shovel Creek."
	IGD to Keno	Shovel Creek	September 1 to November 1	"Where Shovel Creek Reaches the Klamath," <i>San Francisco Call</i> , June 27, 1909.
	IGD to Keno	Shovel Creek	Fall	"Crippled Fisherman Handy with the Rod," <i>San Francisco Call</i> , September 24, 1911.
	IGD to Keno	Spencer Creek	September and October	U.S. Department of Interior, et. al, <i>Spencer Creek Pilot Watershed Analysis</i> , 1995.
	IGD to Keno	Spencer Creek	Fall	High, <i>History of Alice Isobell Spencer High, of Ashland</i> .
	IGD to Keno	Keno	September 10, 1908	Fortune, et. al, <i>A study to Determine the Feasibility of Establishing Salmon and Steelhead in the Upper Klamath Basin</i> .
	IGD to Keno	Keno	September 16, 1909	"Keno Items," <i>Klamath Republican</i> , September 16, 1909.
IGD to Keno	Keno	September 24, 1908	"Millions of Salmon," <i>Evening Herald</i> , September 24, 1908.	

SEASON	WATERSHED REFERENCE	LOCATION	DATE	SOURCE
Fall	IGD to Keno	Downstream from Link River	September 10, 1903	"Local News — The Salmon are Now Running," <i>Klamath Republican</i> , September 10, 1903.
	Klamath Upper Basin	Link River	August through October	Fortune, et. al, <i>A study to Determine the Feasibility of Establishing Salmon and Steelhead in the Upper Klamath Basin</i> .
	Klamath Upper Basin	Link River/ Klamath Falls	September 18, 1902	Ibid.
	Klamath Upper Basin	Link River/Lost River	September 20, 1912.	"Salmon Running in Rivers," <i>Morning Oregonian</i> , September 9, 1912
	Klamath Upper Basin	Link River and downstream	Fall	Shaver, et. al, <i>Illustrated History of Central Oregon</i> .
	Klamath Upper Basin	Link River/ Klamath Falls	Fall	"Fish Laws Demanded," <i>Morning Oregonian</i> , December 10, 1910.
	Klamath Upper Basin	UKL tributaries, Sprague River	End of August and September	Lane and Lane Associates, <i>The Copco Dams and the Fisheries of the Klamath Tribe</i> .
	Klamath Upper Basin	UKL tributaries, Sprague River	End of August into October	Ibid.
	Klamath Upper Basin	UKL tributaries, Sprague River	End of August into October	Ibid.
	Klamath Upper Basin	UKL tributaries, Sprague River	September	Dice Crane, 1946, in Courtright and Simmons, Affidavits 1941–1946, NARA Pacific Alaska Region.
	Klamath Upper Basin	UKL tributaries, North Fork Sprague River	Late September/ early October	Carrie Schmitz, 1946, in Courtright and Simmons, Affidavits 1941–1946, NARA Pacific Alaska Region.
	Klamath Upper Basin	UKL tributaries, Sprague River	Last part of September	Frank Obenchain, 1946, in Courtright and Simmons, Affidavits 1941–1946, NARA Pacific Alaska Region.
	Klamath Upper Basin	UKL tributaries, Williamson and Sprague rivers	September and October	H. Gullickson, "Memorandum to the Commissioner of Indian Affairs: Report covering recommended damages in the proposed suit against the California-Oregon Power Company, resulting from the destruction of Indian fisheries on the Klamath River," U.S. Department of the Interior, Office of Indian Affairs, Billings, Montana, 1946; NARA Pacific Alaska Region.

SEASON	WATERSHED REFERENCE	LOCATION	DATE	SOURCE
Fall	Klamath Upper Basin	UKL tributaries, Sprague River	September and October	Delford Lang, 1946, in Courtright and Simmons Affidavits 1941–1946, NARA Pacific Alaska Region.
	Klamath Upper Basin	UKL tributaries, Sprague River	September and October	Simmons, <i>Proposed Action for Injunction and Damages: United States vs California Oregon Power Company</i> . Washington, D.C.: United States, 1942.
	Klamath Upper Basin	UKL tributaries, Sprague River (Cottonwood Springs)	September and October	Watson Duffy, 1946, in Courtright and Simmons Affidavits 1941–1946, NARA Pacific Alaska Region.
	Klamath Upper Basin	UKL tributaries	October 6, 1911	Fortune, et. al, <i>A study to Determine the Feasibility of Establishing Salmon and Steelhead in the Upper Klamath Basin</i> .
	Klamath Upper Basin	UKL tributaries, Klamath Agency	Around October 7, 1886	Correspondence (1886) between J. Merrill and G. Brown Goode and S.F. Baird from Ft. Klamath, Oregon, Record Unit 305, Accession no. 19748, Smithsonian Institution Archives, Washington, D.C.
	Klamath Upper Basin	UKL tributaries, Sprague River	October 10, 1901	"The Twentieth Century — First salmon of the season. . ." <i>Lake County Examiner</i> , October 10, 1901.
	Klamath Upper Basin	UKL tributaries, UKL	October 10, 1890	"Pacific Coast News," <i>Sausalito News</i> , October 10, 1890.
	Klamath Upper Basin	UKL tributaries Sprague River/	October 12, 1911	"Some salmon were brought into town. . ." <i>Lake County Examiner</i> , October 12, 1911.
	Klamath Upper Basin	UKL tributaries	October 14, 1909	"Great Sport on the River," <i>Klamath Republican</i> , October 14, 1909.
	Klamath Upper Basin	UKL tributaries, Sprague River	October 19, 1911	"Charlie Baker, one of the Klamath Indians. . ." <i>Lake County Examiner</i> , October 19, 1911.
	Klamath Upper Basin	UKL tributaries	October	H. Wilson, Handwritten report on salmon fishing on the Klamath Indian Reservation, 1916, in 1915-Klamath Agency-115, Record Group 75, Central Classified Files, 1907–1939, NARA.
	Klamath Upper Basin	UKL tributaries	November 3	"Indians Oppose Salmon Racks at Hatcheries," <i>Klamath Evening Herald</i> , November 3, 1913.
	Klamath Upper Basin	UKL tributaries	Fall	Spier, <i>Klamath Ethnography</i> .

SEASON	WATERSHED REFERENCE	LOCATION	DATE	SOURCE
Fall	Klamath Upper Basin	UKL tributaries	Fall (2 runs "noted even to the headwaters")	Snyder, <i>Salmon of the Klamath River California</i> .
	Klamath Upper Basin	UKL tributaries	Fall	"New Dam Stops Fish in Klamath," <i>Medford Tribune</i> , October 26, 1914.
	Klamath Upper Basin	UKL tributaries	Later part of November	Gatschet, <i>The Klamath Indians of Southwestern Oregon</i> , 30.

NOTES

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of 4.9 meters by 5.5 meters and a grade of 2 percent. (See Boyle, *50 Years on the Klamath* for specifics and a photo of the tunnel in 1911 during construction.) Water entered the tunnel through three headgates on three 1.8 meter diameter, 9.1 meter length pipes secured in concrete to form a solid block to the tunnel entrance. The headgates and pipes were designed to carry the average flow of the river under a three meter head. Work on the headgates began in June 1912 and the first water was diverted through the headgates on October 12, 1912. (See Sprout, Boyle, and Sprout, *Report of Work on Klamath River, Report on the headgates, Project no. 1, 1912–1913*.)

The minimum average daily flow measured during the years 1911 to 1913 was approximately 42.5 cubic meters per second (cms) and occurred in early fall of each year. (See Sprout, Boyle, Sprout, *Report of Work on Klamath River, Project no. 1, 1913–1915*.) Due to the lowest water velocities, this would have been when flows were most suitable for fish passage through the tunnel. We used Manning's equation for an open channel flow at 42.5 cms, a slope of 2.0 percent, a Manning's 'n' of 0.05 for an excavated rock channel, and a cross sectional area of flow (constrained by the tunnel dimensions) of 4.9 meters by 5.5 meters to estimate water velocities in the tunnel. A conservative estimate of the velocity in the tunnel, assuming the pipes were completely full, would be approximately 3.3 meters per second (mps).

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