WHITEWATER RECREATION ON THE UPPER KLAMATH RIVER

PLANNING AND PRIORITIES FOR DAM REMOVAL

(Revised December 2019)

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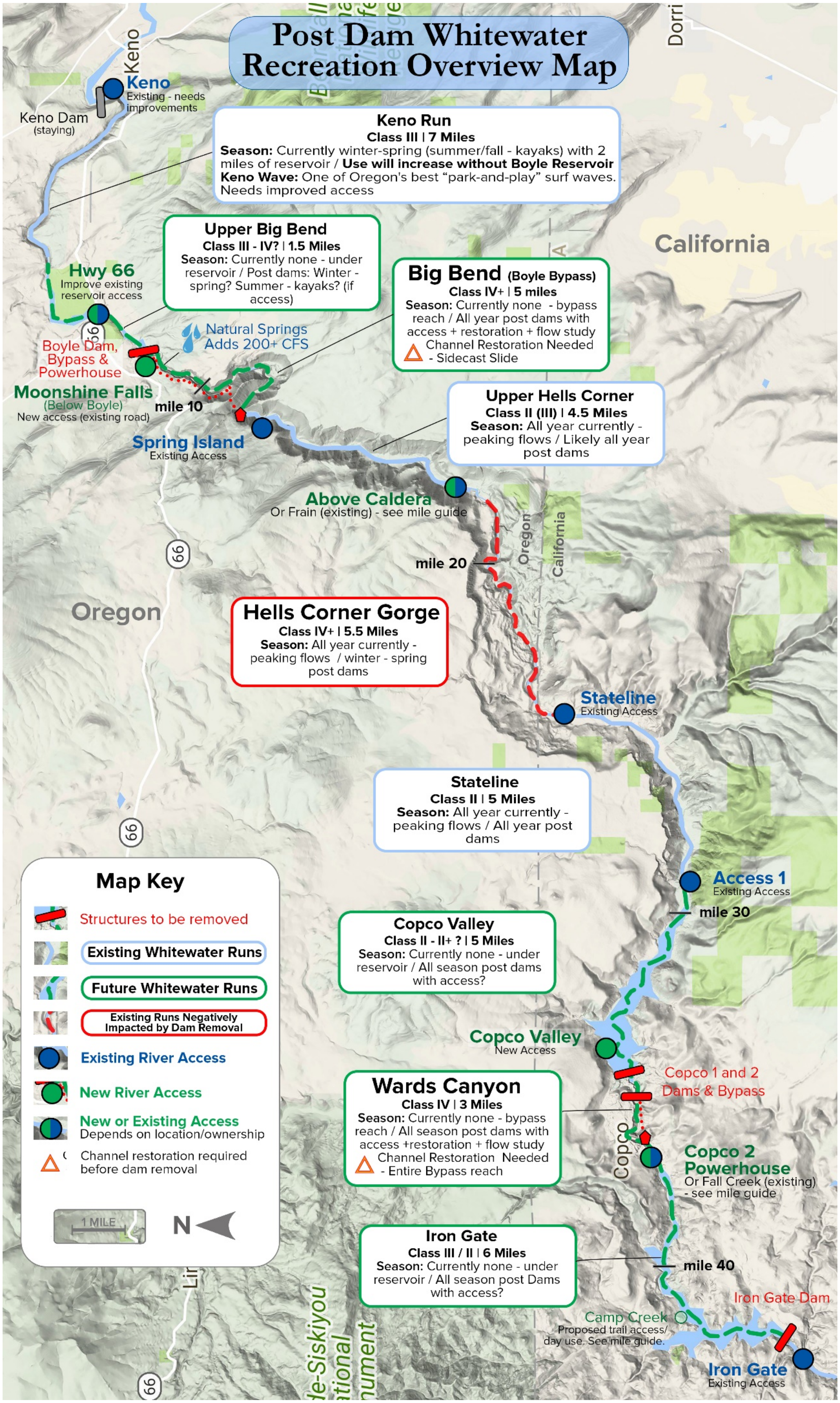
Post Dam Whitewater Recreation Overview Map
Keno
Existing - needs improvements
Keno Dam (staying)
Keno Run
Class III | 7 Miles
Season: Currently winter-spring (summer/fall - kayaks) with 2 miles of reservoir / Use will increase without Boyle Reservoir
Keno Wave: One of Oregon's best "park-and-play" surf waves. Needs improved access
Upper Big Bend
Class III - IV? | 1.5 Miles
Season: Currently none - under reservoir / Post dams: Winter - spring? Summer - kayaks? (if access)
Hwy 66
Improve existing reservoir access
Big Bend (Boyle Bypass)
Class IV+ | 5 miles
Season: Currently none - bypass reach / All year post dams with access + restoration + flow study
Channel Restoration Needed - Sidecast Slide
Natural Springs Adds 200+ CFS
Boyle Dam, Bypass & Powerhouse
Moonshine Falls
(Below Boyle)
New access (existing road)
mile 10
Spring Island
Existing Access
Upper Hells Corner
Class II (III) | 4.5 Miles
Season: All year currently - peaking flows / Likely all year post dams
California
Above Caldera
Or Frain (existing) - see mile guide
mile 20
Oregon
California
Oregon
Hells Corner Gorge
Class IV+ | 5.5 Miles
Season: All year currently - peaking flows / winter - spring post dams
Stateline
Existing Access
Stateline
Class II | 5 Miles
Season: All year currently - peaking flows / All year post dams
Access 1
Existing Access
mile 30
Map Key
Structures to be removed
Existing Whitewater Runs
Future Whitewater Runs
Existing Runs Negatively Impacted by Dam Removal
Existing River Access
New River Access
New or Existing Access
Depends on location/ownership
Channel restoration required before dam removal
1 MILE
N
Copco Valley
Class II - II+ ? | 5 Miles
Season: Currently none - under reservoir / All season post dams with access?
Copco Valley
New Access
Copco 1 and 2 Dams & Bypass
Wards Canyon
Class IV | 3 Miles
Season: Currently none - bypass reach / All season post dams with access +restoration + flow study
Channel Restoration Needed - Entire Bypass reach
Copco
Copco 2 Powerhouse
Or Fall Creek (existing) - see mile guide
Iron Gate
Class III / II | 6 Miles
Season: Currently none - under reservoir / All season post Dams with access?
mile 40
Iron Gate Dam
Camp Creek
Proposed trail access/ day use. See mile guide.
Iron Gate
Existing Access

Rapid Renewal on the Upper Klamath

Dam removal will bring major changes to whitewater recreation on the Upper Klamath. To ensure that those changes are positive will require careful planning now—before the dams come out. This pamphlet outlines the challenges, issues, and opportunities for post-dam whitewater recreation. Our goals are to minimize or mitigate losses to existing whitewater opportunities, to support the outdoor recreation economy and local businesses, and to provide opportunities for future river runners and the general public to enjoy the Upper Klamath and to develop personal connections to a restored river.

A Stubborn, Steep, Stairstep River

The Upper Klamath is a very determined river. Most rivers flow outward from mountain ranges, or skirt around them. Not the Upper Klamath. The "UK" cuts straight through the lofty Cascade Range. It's one of only three rivers—along with the Pit and the mighty Columbia—to pull off that trick.

The Upper Klamath's mountain-cleaving course is *steep*. In 44 miles from Keno to Iron Gate, the river drops 1,900 feet, for an average gradient of 43 feet per mile. For comparison, the Colorado River drops less than eight feet per mile in its passage through the Grand Canyon. Moreover, the Upper Klamath, like many rivers that cut through volcanic terrain, is not uniformly steep. It's uneven. As if knifes through the Cascades, the river swings radically between mild stretches with gradients as low as 15 feet per mile and precipitous sections with gradients near 100 feet per mile. Running a river like the Upper Klamath is like being in a plane descending through heavy turbulence: One moment you're flying straight and level, the next you plunge into a stomach-lurching air pocket. Or put another way, some whitewater rivers offer you a fast whoosh down a playground slide; the Upper Klamath gives you a butt-bumping ride down an uncarpeted staircase.

This steep, uneven descent explains the river's draw for both hydropower developers and whitewater boaters.

Hydropower Development

Over a hundred years ago, the Upper Klamath's steepest sections caught the eye of hydroelectric developers. Engineers with the California Oregon Power Company (COPCO), including John C. Boyle (for whom one of the dams is named), recognized that they could harness the river's fall to generate electricity. They targeted two stretches that combine two key characteristics: high gradient, and a sweeping curve in the canyon. In these reaches, engineers diverted the river into a bypass canal or pipeline, then into a tunnel bored *through* the ridge that the river curves around. That diversion through the ridge is shorter than the river's winding course, which translates into a big savings in construction costs.

After passing through the ridge, the diverted water drops through turbines and returns to the river. Importantly, dam operators release the water unevenly, in pulses of just a few hours per day. These "peaking flows" allow them to generate electricity during midday "peak demand" hours.

Whitewater Boating, Past and Present

For river runners, steep rivers mean rapids, and the Upper Klamath does not disappoint. In the 1970's and 80's, rafters and kayakers discovered that the middle portion of the UK, which had not been tapped for hydro development, held a classic Class IV whitewater run—the so-called "Hells Corner" reach. This steep cut through the heart of the Cascades had not been dammed because it lacked an easy damsite and a convenient river bend. The action-packed Hells Corner reach quickly became one of the region's most popular whitewater runs.

The key to Hells Corner's popularity is that it offers exciting, advanced Class IV and IV+ "big water" boating for the entire summer rafting season. Most rivers in the region get too low for boating by early to mid-summer. But because of peaking releases from the JC Boyle Powerhouse, rafters can run Hells Corner at strong, consistent flows all summer long. Without peaking releases, the river would fall too low for rafting by early June in most years. These unique, summer-long flows were recognized as one of the Upper Klamath's

"Outstandingly Remarkable Values"—a value of regional and national significance—when it was designated as a National Wild and Scenic River in 1994.

Whitewater boating on Hells Corner is an established and highly valued part of the local tourism and recreation economy. The Hells Corner run draws from 3,000 to 5,000 outfitted rafting customers to the area each summer, along with a smaller number of groups representing the general public and local paddling clubs. Outfitters pump millions of dollars into the local economy through direct revenues, overhead, and secondary spending by rafting customers.

Beyond this economic boon, rafting on Hells Corner offers less tangible benefits. In particular, outfitters introduce customers to the outdoors and help them to appreciate and value wild rivers. A raft trip on the Upper Klamath is an opportunity to get people outside and help them connect with the natural world. Moreover, people who experience wild rivers are more likely to want to protect them. In this way, whitewater recreation on the Upper Klamath contributes to environmental stewardship and support for river conservation and restoration, including dam removal.

THE FUTURE OF WHITEWATER RECREATION

Dam removal will forever change whitewater boating on the Upper Klamath. On the downside, without increased flows, the loss of peaking releases from Boyle Powerhouse will bring an end to summer-long boating on the Hells Corner run. The river will simply be too low in summer. On the plus side, new whitewater runs will emerge from beneath the reservoirs, and flows will return to two stretches of river that have been bypassed for decades by diversions.

However, these new stretches of river will be of little value for river runners without careful planning for ***new river accesses***, ***channel restoration***, and ***flow enhancement***. With proper planning, the Upper Klamath can support even more whitewater recreation than it does today. But without that preparation, whitewater boating will languish, local economies will suffer, and the public will lose a remarkable recreation resource.

After dam removal, the entire Upper Klamath below Keno Dam will likely be designated as a National Wild and Scenic River. When combined with the Lower Klamath, which was designated in 1981, the entire 234 miles of the Klamath—from Keno Dam to the Pacific—will become the longest Wild and Scenic River in the lower 48 states. That celebrity is sure to spark more interest in boating on this river. If we prepare now by focusing on strategic river accesses, channel restoration, and improved flows, then everyone will be able to enjoy this remarkable river to the fullest.

The Logic of River Access Placement

Obviously, river runners need places to put their boats in the river and to take them out again. But more than that, whitewater boaters need accesses that are strategically located.

- ***Above all, river runners need access points wherever rivers change in difficulty.***

While it might seem that the shift from, say, Class III to Class IV is a minor change, it's actually quite significant. All runnable rapids—from easy riffles suitable for novices to raging cataracts that only experts should run—fall within just four classifications. True, the International Scale of River Difficulty grades rivers and rapids from Class I all the way up to Class VI. But since Class I means flatwater—no rapids at all—and Class VI means unrunnable (think Niagara Falls), that leaves only four grades to classify everything else. Everything from a lazy afternoon float through mild riffles to an adrenaline-pumped, high-stakes, check-your-life-insurance descent through hair-raising rapids at the very limits of navigability. Thus each step up or down represents a major shift in difficulty.

River runners come in all skill levels, and they prefer different amounts of challenge. As already noted, the Upper Klamath has tremendous variation in gradient, which translates directly into variations in difficulty. It's vital to have accesses in the right places so that boaters can choose runs that match their whitewater skills and preferences. If there aren't enough strategically placed accesses, then boaters will be deterred by runs that include stretches that are either too mild or too wild for them. In the worst case, boaters who lack the skills to run challenging whitewater may get in over their heads unless they have a way to stop and take out above a steep stretch. In the following pages we'll provide detailed recommendations for river accesses.

Predicting the Difficulty of Submerged Runs

A novel challenge in siting river accesses on the Upper Klamath is that much of the river is hidden beneath reservoirs. Moreover, since the dams were built long before whitewater boaters were running the UK, we have no historical accounts of what the inundated rapids were like. That's where gradient comes in. Many factors affect whitewater difficulty, but gradient is the single most important variable.

- ***Gradient is our best tool for predicting the difficulty of runs that are buried beneath reservoirs.***

We can discover the gradient of inundated reaches in two ways: by examining topographic maps that were drawn before the dams were built, and by looking at depth-soundings from bathymetric surveys of the reservoirs. Though we can't predict exactly where individual rapids will fall, or precisely what they'll look like, we can make good guesses as to the overall whitewater difficulty of submerged reaches. Armed with that information, we can strategically plan for appropriate river accesses on sections of river that will be "daylighted" when the reservoirs are drained.

Trips of Various Lengths

Accesses let boaters choose runs of the right difficulty *and* of an appropriate length. On some long wilderness rivers, it is appropriate to have just two access points—one near where the river enters the wilderness, and one where it emerges again. But on a non-wilderness river such as the Upper Klamath, it is typical to provide more frequent access points, which allow for a greater variety of trips than simply running the entire river from one end to the other.

Trips on a post-dam Upper Klamath could range from a few hours to several days. Typically, boaters travel from nine to 14 river miles in one day. With 44 continuous miles of river available on the UK, river runners could boat for the better part of a week if they wanted to. Theoretically, someone could launch at Keno Dam and run all the way to the Pacific—though the time commitment and challenging logistics would deter most river runners.

Of greater significance are river runners at the opposite end of the time spectrum: those who have only a day or a half-day available. River runners appreciate the flexibility that shorter outings provide. Many outfitted guests book half-day trips, while those planning their own trips often make short runs after work on summer evenings. A post-dam Upper Klamath needs enough accesses to facilitate shorter runs.

Channel Restoration

River runners need a natural river channel, free from human-caused hazards like sharp metal or jagged concrete. At each damsite, it will be crucial to ensure safe passage for boaters once the dams are removed.[1]

Importantly, the two "bypass reaches" of the Upper Klamath—where the river is diverted into canals—have been greatly altered by dams. In one bypass reach, debris from blasting during canal construction has littered the channel with sharp rock. In both bypass reaches, artificially reduced flows have allowed riparian vegetation to grow unchecked in the river channel. These hazards to navigation must be eliminated to allow safe whitewater recreation. We'll discuss the details in the "Mile-By-Mile" guide that follows.

Flow Studies

To properly plan and prepare for whitewater boating opportunities on a post-dam river, we need to simulate future flow conditions now. In particular, we need to "test-drive" the two bypass reaches, as well as the Hells Corner reach, at typical post-dam summertime flows. In 2002, PacifiCorp organized a "Controlled Flow Study" on these reaches in collaboration with American Whitewater. These were valid studies that are part of the administrative record, but they didn't specifically focus on the typical midsummer flows of a post-dam river. **We need additional flow studies— conducted as early as possible in 2020, while there is still enough lead time in the planning process—to evaluate the rapids on these stretches.**

Flow Enhancement

Strategic accesses and restored channels aren't enough: If there's not enough water in the river, we can't boat. We recognize that KRRC does not control post-dam flows on the Upper Klamath. On the other hand, KRRC's efforts to enhance whitewater recreation cannot reach their full potential if the river doesn't have

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[1] This has been an ongoing issue at the Elwha Dam site. See Mapes, L.V., *After the dams: A river of junk runs through unleashed Elwha*, Seattle Times, June 2, 2016. <https://www.seattletimes.com/life/outdoors/after-the-dams-a-river-of-junk-runs-through-unleashed-elwha/>

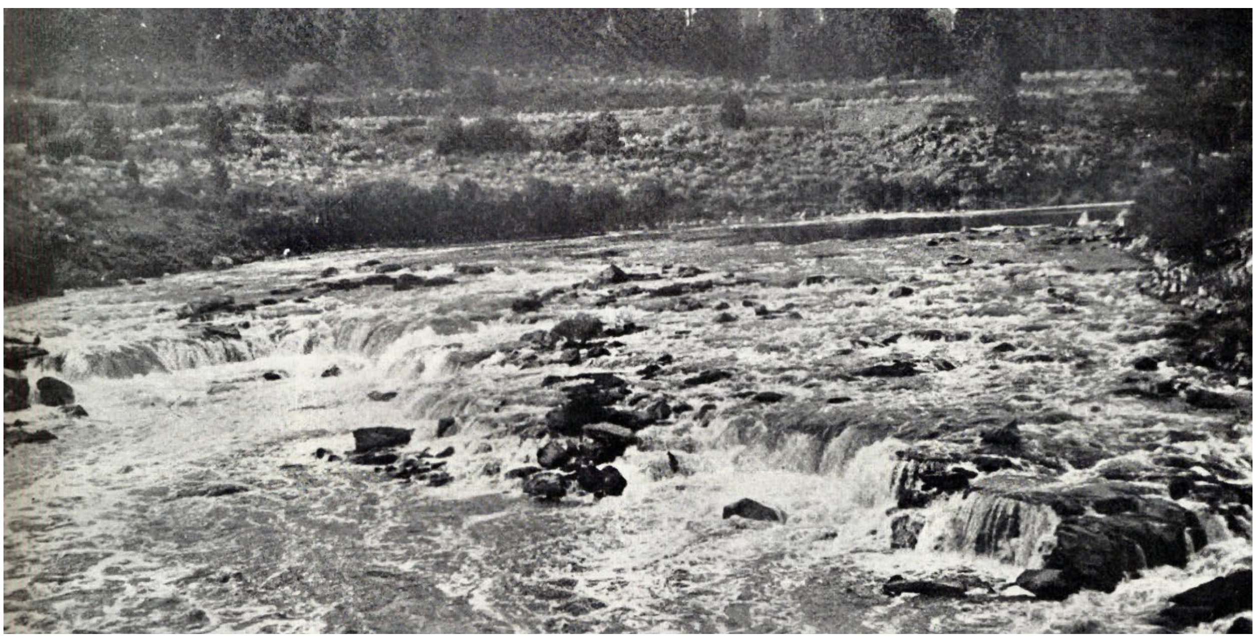
enough water. Summer is the critical period: That's when river runners most want to boat, and that's when the Upper Klamath is at its lowest. ***Every effort must be made to secure increased flows to the river below Keno Dam.***

Ensuring a Smooth Transition

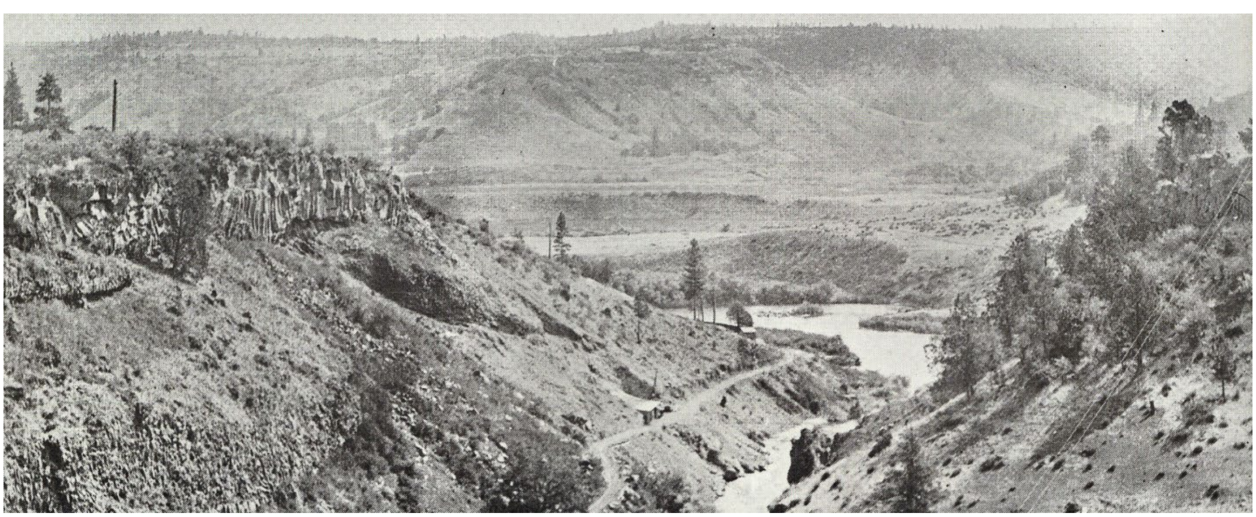
Beyond planning for whitewater recreation *after* the dams come out, we need to sustain recreation *during* removal. Outfitters face the greatest challenge. Paddlers who plan their own trips will survive if they have to wait an extra season for a new stretch of whitewater to emerge, but one lost summer can doom a small business. Outfitters need time to plan for, and adapt to, the new river. In particular, we need to ensure uninterrupted access to key runs up to dam removal and then the new runs following dam removal. We cannot allow outfitters to be shut off the river more than the year that it takes to remove these dams. In the following pages, we'll outline specific steps to ensure a smooth transition.

Our Goal

We look forward to working with KRRC, agencies, tribes, and NGO's as we plan for a successful transition to a post-dam Klamath. We believe there is a bright future for whitewater recreation on this remarkable river, and that the public should continue to have the opportunity to experience and appreciate this wild river and, as a result of that experience, to become advocates for environmental stewardship and river conservation.



Moonshine falls – Before Boyle Dam



Looking upstream from Wards Canyon into Copco Valley – Before Copco 1 and 2 dams

THE UPPER KLAMATH:

A MILE-BY-MILE GUIDE
TO
POST-DAM WHITEWATER RECREATION

The following section provides greater detail on issues, challenges, and opportunities that dam removal presents for river runners.

- Existing river accesses and whitewater runs have **BLUE** headings.
- Proposed accesses and future whitewater runs are in **GREEN**.
- Structures to be removed and river reaches that will have reduced whitewater opportunities are in **RED**.
- River reaches requiring channel restoration are in **ORANGE**.

Wards Canyon - Photo credit: 2002 Recreational Flow Study

0 *Keno Dam Access.* Existing accesses on both sides of the river need improvement.

- **Downriver Runs:** Boaters heading downriver launch on the left (east) bank at PacifiCorp's Keno Park, since it is easier and makes for a shorter shuttle. However, in its present state this access actually hinders downriver runs. Two key improvements are needed. First, all boaters—but especially rafters—must be able to drive closer to the river to unload gear. Rafts are too heavy to carry hundreds of feet from the Day Use parking area to the riverbank. Second, Keno Park is closed seasonally from autumn through spring—which is exactly when this stretch is most likely to have boatable flows.
- **Keno Wave:** When flows are over 1,100 cfs (as during spring runoff) kayakers come to surf the "Keno Wave," one of Oregon's best "park-and-play" surf waves. The wave is less than a half mile downstream from the dam, but reaching it is very difficult. If kayakers approach on the left (east) bank, they must paddle downriver from the dam to the wave, then after surfing they must lug their boats a half-mile back up the right bank, before paddling back across the river to their cars. And ironically, as noted above, this left bank access is closed in spring when the wave is most likely to be surfable. Alternatively, kayakers can approach on the right via a *terrible* mile-long unpaved road (the so-called "Wagon Road"). To improve access to the wave, the right-side road should be improved.

0-7 *Keno Run.* Class III (intermediate). Gradient: 40 ft/mi. From Keno Dam to the Highway 66 Bridge, the Klamath makes its first cut into the Cascades. This rugged canyon offers fun rapids, fine scenery, outstanding bird life, and excellent solitude. Highway 66 is far above the left bank. This run has boatable flows in spring, but gets less use in summer when flows drop. Many boaters are deterred by the two-mile flatwater paddle across the upper end of Boyle Reservoir at the end of the run. Removal of Boyle Dam will eliminate that drawback, so we expect use to increase following dam removal. Some boaters are also put off by poor water quality below Keno Dam, especially in summer and early autumn. Enhanced flows would help improve water quality.

- 7 *Highway 66 Bridge Access.* Existing access on the left (east) bank, serves as take-out for the Keno Run. KRRC has proposed shifting this access across the channel to the right bank at the Pioneer Park West day use site. This site would require only minimal upgrades to convert it to a river access point. Following dam removal, this access will serve both as the take-out for the Keno Run and the put-in for the much more challenging Big Bend Run. The final two miles of the Keno Run, presently buried by Boyle Reservoir, are likely to be gentle (pre-dam surveys show a gradient of only 10 ft/mi.). However, just below the Highway 66 bridge, the river abruptly steepens .

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7-8.5 *Upper Big Bend Run.* Below the Highway 66 bridge, gradient increases significantly. In the half-dozen miles below the bridge, the Klamath drops 500 vertical feet through a scenic, forested canyon. The first 1.5 miles of this reach are buried beneath Boyle Reservoir, so we can only speculate about rapids in this stretch. Based on the 45 ft/mi gradient, we predict that the Upper Big Bend run will have Class III-IV whitewater, though there could be stronger rapids. One unknown is the location and condition of "Moonshine Falls," AKA "Fishing Falls," an historical rapid located just downstream from Boyle damsite. Historical photos show a significant vertical drop; however, historians believe that the falls were dynamited and altered when Boyle Dam was built. The present difficulty and navigability of the rapid is unknown.[2]

8.5 *Boyle Damsite.* Boyle Dam, built in 1958, diverts up to 2,400 cfs out of the river for the next 4.5 miles.

8.6-9 *"Moonshine Falls" Access (Below Boyle Dam).* For two reasons, boaters need a launch point just below Boyle Dam.

- The flow regime changes here. Not far below Boyle Dam, roughly 225-250 cfs of groundwater enters the Klamath in a roughly mile-long stretch, mostly along the left (east) bank. This accretion boosts flows, notably in summer when the river drops to less than 750 cfs at Keno. After dam removal, the added groundwater will allow summer-long boating below Boyle damsite, even when the river above the damsite is too low. If the only access is farther upstream at the Highway 66 Bridge, then in summer boaters would have to drag their craft from there all the way down to where the springs enter. This would deter most boaters and would completely preclude professionally outfitted trips.
- 8.5-13.5 *Big Bend Run,* AKA **Boyle Bypass**. Class IV+ (advanced). Class V at high water. Gradient: 81 ft/mi.

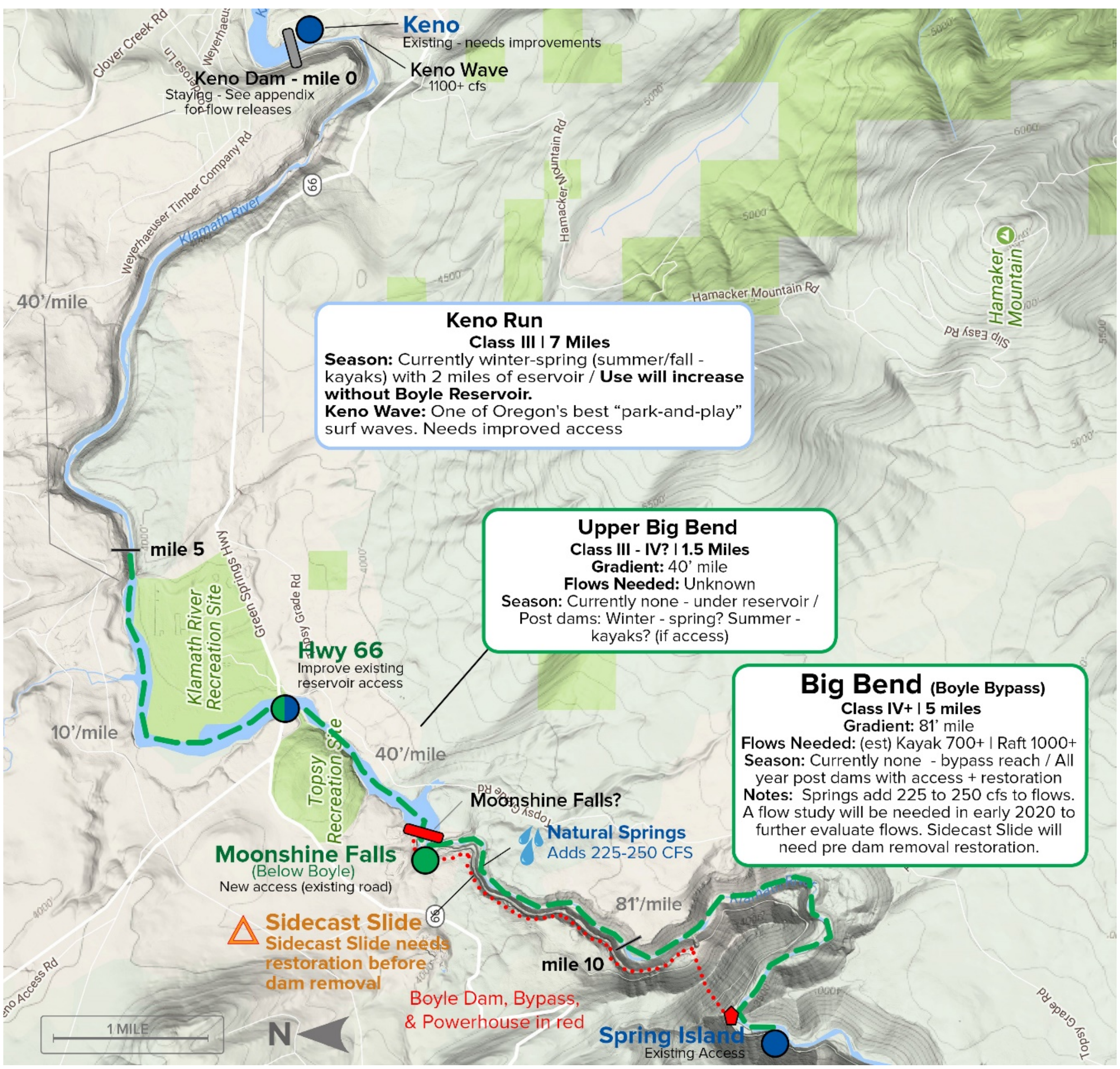
[2] Hamilton, John B., et al. The Persistence and Characteristics of Chinook Salmon Migrations to the Upper Klamath River Prior to Exclusion by Dams," Oregon Historical Society Quarterly, 2016, vol. 117, no 3: 340.

The main portion of the Big Bend Run lies below Boyle damsite, where the gradient increases as the river knifes through a narrow gorge. This reach includes a three-mile-long, thousand-foot-deep meander known as Big Bend. At present, this run has boatable flows only rarely during spring runoff, when inflows to Boyle Dam occasionally exceed its diversion capacity. After dam removal, this run will offer summer-long boating—at least for small rafts and kayaks—thanks to groundwater inflow. Under the present flow regime, it is unclear whether large rafts will be able to navigate this stretch in summer. To answer that question, a flow study is needed in early 2020. (See below.)

The Big Bend run has major recreation potential given its combination of exciting rapids, summer-long flows, spectacular forested canyon, short shuttle, and proximity to Klamath Falls and Rogue Valley population centers.

9.8 ***Sidecast Slide.*** This is the toughest rapid on the Big Bend run—anarrow, shallow washboard that is made unnaturally difficult by sharp boulders that cascaded into the river during blasting for the Boyle diversion canal on the right slope. During the 2002 flow study organized by PacifiCorp and American Whitewater, rafts were unable to run this rapid at moderate flows. This rapid was subsequently modified to improve fish passage, but it is unknown whether those changes improved navigability. **A new controlled flow study is needed in early 2020 to evaluate this rapid at typical summer flows.** If it is still impassable for rafts, then it will need further modification to make it passable at typical summer flows. This work must be performed *prior* to removal of JC Boyle Dam. Once the dam is removed and full flow is restored to the channel, it may be impractical to access riverbed rocks to make modifications.

12.8 ***Boyle Powerhouse.*** Water diverted at Boyle Dam is returned to the river in a peaking release pattern.



13.5 *Spring Island Access.* This existing BLM access is the standard launch point for the Hells Corner Run. In the future, it will also serve as a take-out for the Big Bend Run. It should be retained as a river access.

13.5-18.3 *Upper Hells Corner Run.* Class II (III). Gradient: 25 ft/mi. These first five miles of the Hells Corner reach have moderate gradient and difficulty. This section can be run at lower flows than Hells Corner Gorge just downstream, and should offer summer-long boating even after dam removal ends peaking flows.

18.3 *Above Caldera Access.* Access is needed here once peaking flows end. When Hells Corner Gorge downstream has insufficient flows in summer, rafters will need to take out here after running Big Bend. In addition, drift boaters launching at Spring Island for the Upper Hells Corner run will need to take out here. An access can be developed on the right, connecting to an existing dirt road. Alternatively, boaters could take out on the left at Frain Ranch, provided that: 1) the bridge over the Klamath below Boyle damsite is retained, and 2) Topsy Grade Road on the east side of the river is adequately maintained.

18.5-24 *Hells Corner Gorge.* Class IV+. Gradient: 83 ft/mi.

The abrupt "horizon line" of Caldera Rapid marks the beginning of one of the West's most thrilling whitewater runs. For the next half-dozen miles to the California border, the UK thunders through dozens of big, challenging, drenching rapids that delight thousands of rafting customers every summer. Members of the general public also use this run, but the long shuttle and rough roads deter many.

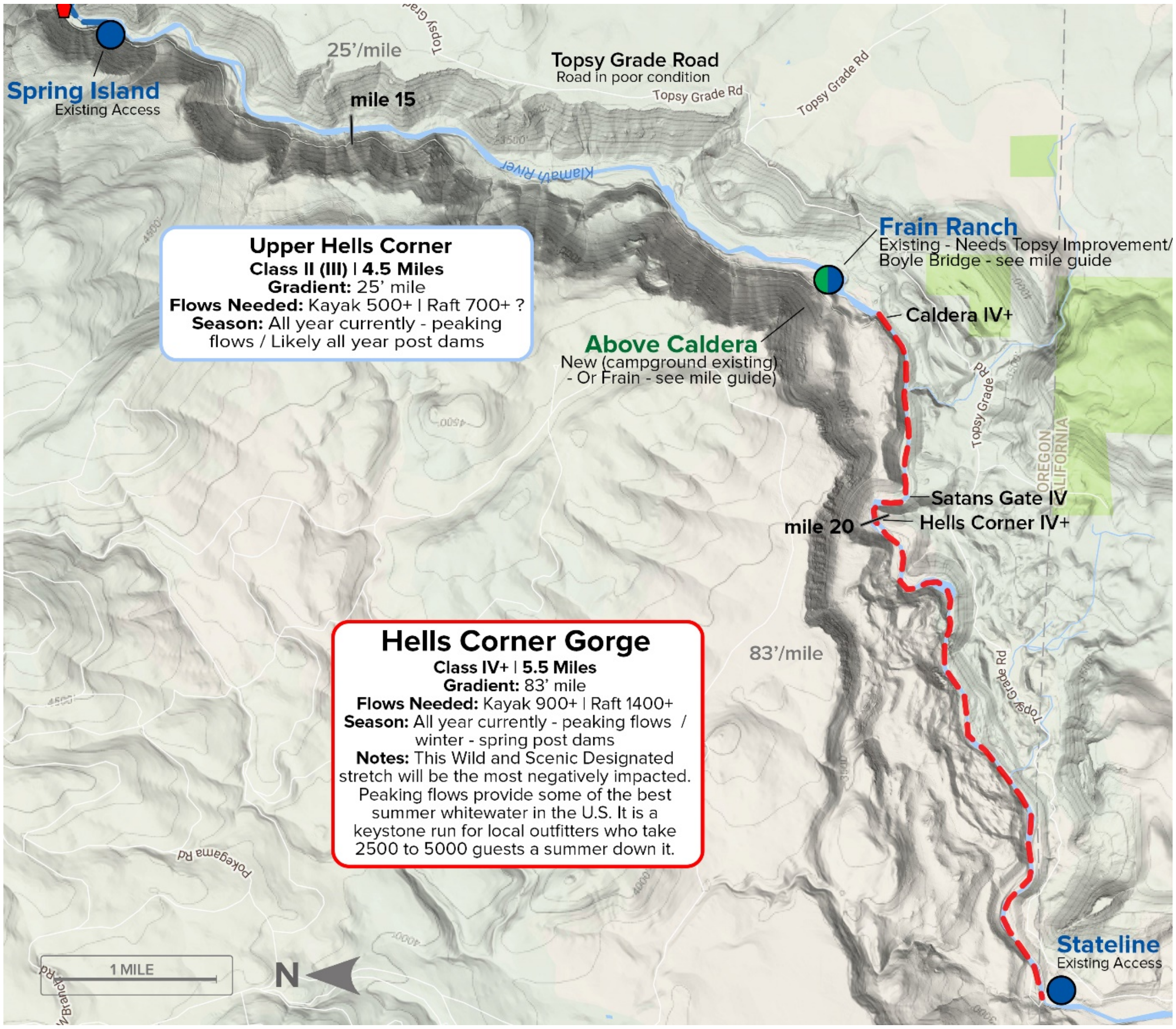
As mentioned earlier, the key to Hells Corner's popularity is peaking flows. Every night, PacifiCorp stores the Klamath's flow in Boyle Reservoir, releasing a paltry 100 cfs to the river. Then every morning, PacifiCorp releases that pent-up water through Boyle Powerhouse in an oversized pulse. Outfitters book clients all summer long knowing that every day, they can rely on a predictable surge of 1,600-1,900 cfs.

When dam removal brings these peaking flows to an end, it will mark the end of summer rafting in Hells Corner gorge. Due to the unusual geology and river morphology of this stretch, full-size rafts have difficulty negotiating it at flows below 1,500 cfs or above 3,400 cfs. Under the current flow regime, post-dam summertime flows in Hells Corner are likely to fall in the 900-1,000 cfs range. The significant impact that dam removal will have on this recreational opportunity requires analysis and appropriate mitigation measures to support other whitewater experiences within the project area. If flows can be enhanced in the future, then summertime rafting might once again be feasible on this stretch.

After dam removal, Hells Corner will still offer full-flow rafting during spring snowmelt. However, due to more demanding weather and flow conditions, springtime runs are not well suited for introducing less experienced boaters to advanced whitewater.

24 *Stateline Access.* This access on PacifiCorp Parcel A land serves as take-out for the Hells Corner Gorge or put-in for the mild Stateline Run just downstream.

Caldera Rapid at current summer flows - Photo credit: Momentum River Expeditions



Hells Corner Gorge - Photo credit: Momentum River Expeditions

24-29 *Stateline Run.* Class II (beginner). Gradient: 26 ft/mi. In the five miles from Stateline to Copco, the UK winds swiftly through a scenic, open valley dotted with ranches. Class II rapids keep things lively.

25 *Access 6.* Access on PacifiCorp Parcel A land. Alternative to Stateline Access. This access point is recognized in the 1972 agreement between California Department of Fish and Game and PacifiCorp.

29 *Access 1.* Today, this vital access on PacifiCorp Parcel A land serves as take-out for the Stateline Run. In the future, it will also serve as put-in for the Copco Valley Run just downstream. This access point is recognized in the 1972 agreement between California Department of Fish and Game and PacifiCorp.

29-34 *Copco Valley Run.* Probable Class II to II+ (predicted). Gradient: 18 ft/mi.

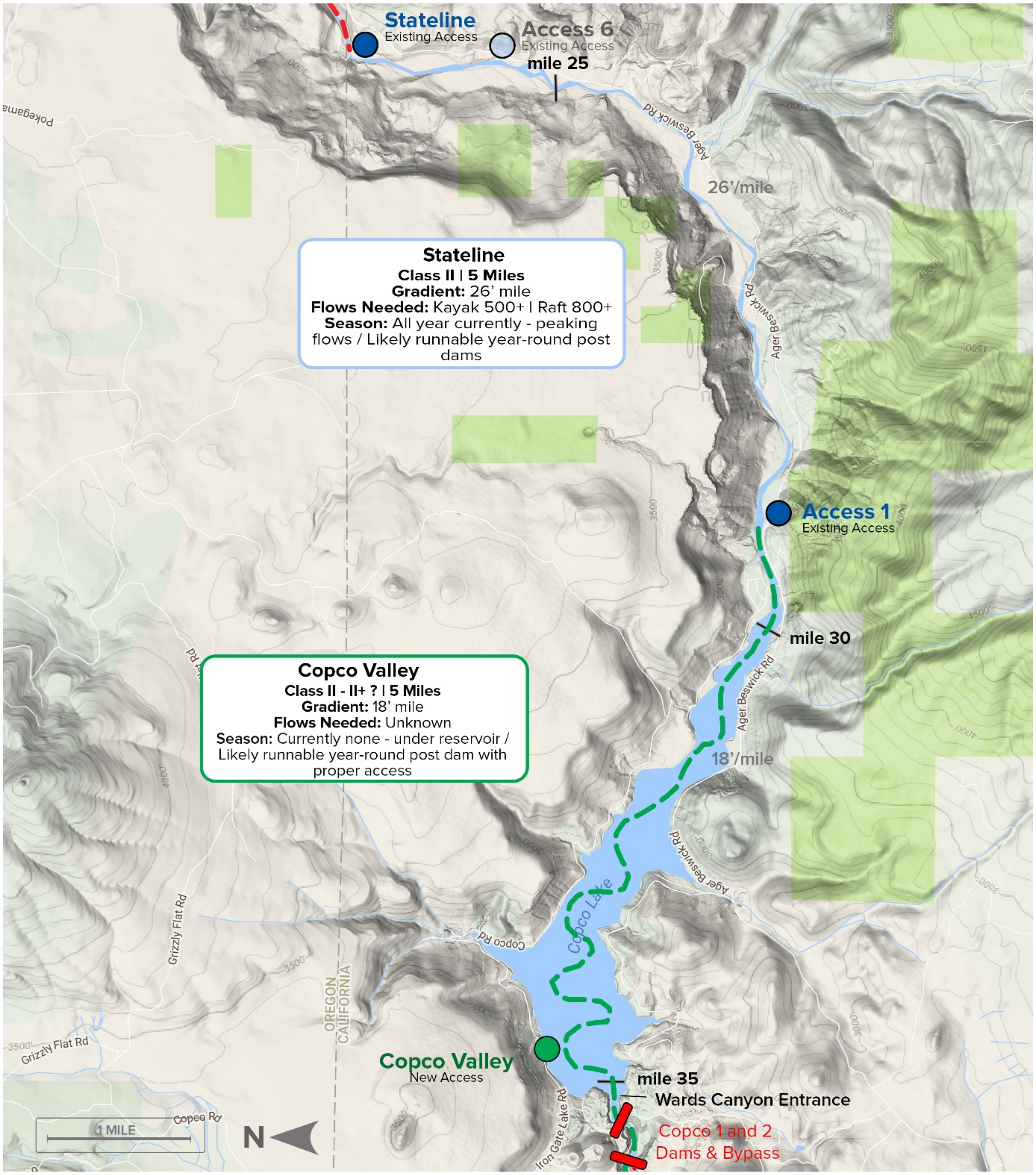
This five-mile reach through a gentle valley will likely offer easy rapids and riffles, well-suited for beginners and for drift boat fishing. Riverside lands under Copco Reservoir should be transferred to public ownership and should be protected in their natural condition.

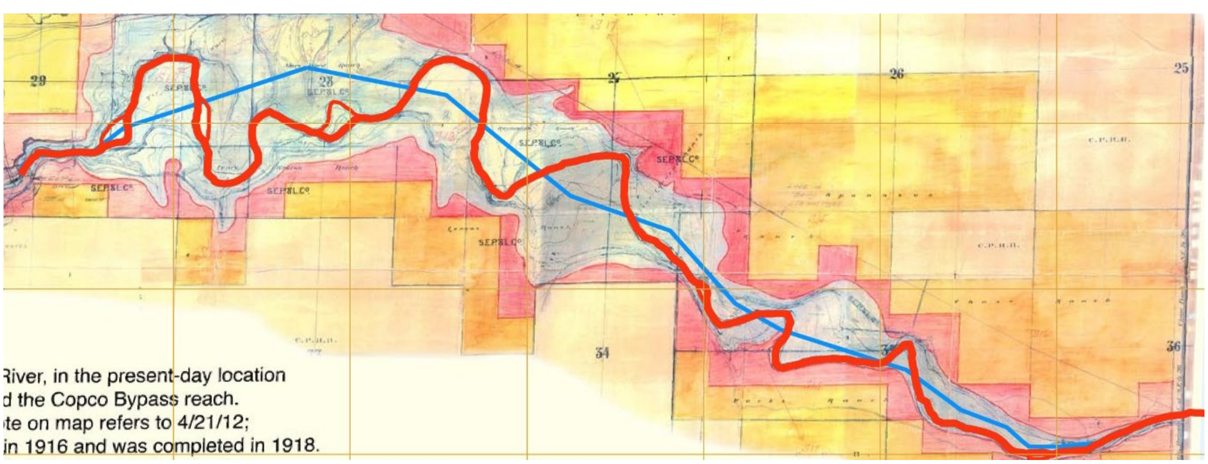
34 *Copco Valley Access.* This critical proposed access corresponds to a major change in gradient and difficulty. It will provide a take-out for beginners on the Copco Valley Run who do not want to tackle the challenging Class IV rapids of Wards Canyon just downstream. Conversely, this access will provide a put-in for experienced boaters wanting to run Wards Canyon. This access must be developed on the right (north) bank to allow short shuttles for boaters running the Copco Valley and Wards Canyon runs.

35 *Wards Canyon Entrance.* Not far below the proposed Copco Valley Access, the Klamath abruptly enters the gunsight notch of a narrow basalt canyon. On old maps this is Wards Canyon, named for a ranching family that homesteaded near the canyon entrance. When John C. Boyle came here in the early 1900's, he quickly identified Wards Canyon as the Upper Klamath's premier damsite.

35.5 *Copco 1 Dam.* Completed in 1922, this 132-foot-high dam—oldest in the Klamath project—is located about 500 yards below the Wards Canyon entrance.

Wards Canyon Entrance viewed looking downstream from Copco Valley before construction of Copco dam





Historic map of Copco Valley showing river course and reservoir

35-37.7 *Wards Canyon.* Class IV. Gradient: 85 ft/mi.

Wards Canyon is the most visually striking canyon on the Upper Klamath. Here, dark lava flowed directly across the Klamath's course, creating a natural dam. Over time, the river carved a 300-foot-deep gorge through the lava flow. The Klamath's passage through the canyon is tumultuous, as the river tumbles over dozens of bedrock rapids. At the canyon's deepest point, the river sweeps for nearly half a mile past sheer colonnades of columnar basalt. Peregrine falcon are a common sight along the canyon walls.

This section will likely be boatable all summer, possibly even for full-size rafts. Wards Canyon was run in the 2002 controlled flow study, but the test flows did not include the most typical flow that would be expected in July and August following dam removal. **For this reason, a further controlled flow study is needed in early 2020.**

In the 2002 study, boaters found Class IV rapids through the entire exposed length of Wards Canyon. However, no boater has ever seen the first half-mile of the canyon, which was buried under Copco 1 and 2 dams long before anyone was running rapids for fun. Still, we can glean important clues from John Boyle's original 1911 engineering notes on the Copco 1 Damsite. Boyle described a 70-foot-wide channel, filled by the river from wall to wall, with a gradient of 100 ft/mi and a current velocity of almost 15 miles per hour. Based on Boyle's dramatic description, it is possible that the river near the Copco 1 damsite—that is, in the first half-mile of Wards Canyon—may hold rapids even greater than Class IV in difficulty.

Wards Canyon has outstanding potential for both outfitters and the general boating public. It offers a combination of exciting rapids, spectacular scenery, potentially summer-long boatable flows, a short shuttle, and a location just 20 miles from I-5 and only an hour from Rogue Valley and Yreka/Mt.Shasta population centers. Outfitters could offer half-day runs of Wards Canyon alone, or full-day trips in combination with the Iron Gate Run just downstream.

36 *Copco 2 Dam* Located 500 yards below Copco 1, Copco 2 dam is the smallest dam in the Klamath project at only 38 feet in height.

36-37.5 ***Copco Bypass Reach.*** At Copco 2 Dam, almost the entire flow of the Upper Klamath is diverted into a pipeline and tunnel for 1.5 miles. Except during unusual high water, only 10 cfs—the flow of a small creek—is released from Copco 2 Dam into this bypassed river channel. This constant trickle of water, combined with the unnatural lack of occasional high flows that would naturally clear out vegetation, has allowed a thick growth of riparian vegetation—mostly willows and alders—to colonize the river channel.

This human-caused overgrowth poses a severe hazard to whitewater boaters. Brush or branches in the river are known as "strainers," because they allow water to pass through but hold back boats and boaters. Many drownings result from boaters becoming ensnared in strainers, and brush growing in the channel is particularly problematic. It is important to note that the vegetation growing in the active channel is distinct from mature forest found in riparian zones, which provides important habitat value as large woody debris.

The unnatural overgrowth in the Copco 2 Bypass portion of Wards Canyon must be removed *before* flows are restored to this channel. This work must be performed in 2020 or 2021. ***Once flows are restored to the channel in 2022, it will be too late to remove brush and trees and to restore the channel to its natural, pre-project condition***. Similar mitigation measures have been implemented on other projects where flow has been restored to a reach that was dewatered for decades.[3]

37.5 *Copco 2 Powerhouse* on the left. KRRC has agreed with our proposal for a new river access at this site, using the existing footprint of PacifiCorp's Copco 2 Powerhouse facility. This access is located at a major shift in difficulty and gradient, where the river transitions abruptly from the advanced rapids of Wards Canyon to the intermediate rapids of the Iron Gate Run. This access will serve as both a take-out for Wards Canyon and a put-in for the Iron Gate Run. It is essential that the Daggett Road Bridge be retained in order this site to serve as a river access. This access must be kept open year-round to accommodate boating in all seasons on the Wards Canyon and Irongate runs.

37.8-44 *Iron Gate Run.* Predicted Class III for approximately four miles, then II. Stronger rapids possible. Gradient: 24 ft/mi average. 30 ft/mi first four miles, 15 ft/mi last two miles.

[3] See for example License Article 407, Alocoa Power Generating, Inc., 110 FERC ¶ 61,056, at 61,093 (2005): "the plan shall also describe the methods for vegetation removal in the bypassed Cheoah River, including the linear distance that vegetation shall be removed as well as the distance from the center line of the bypassed reach."

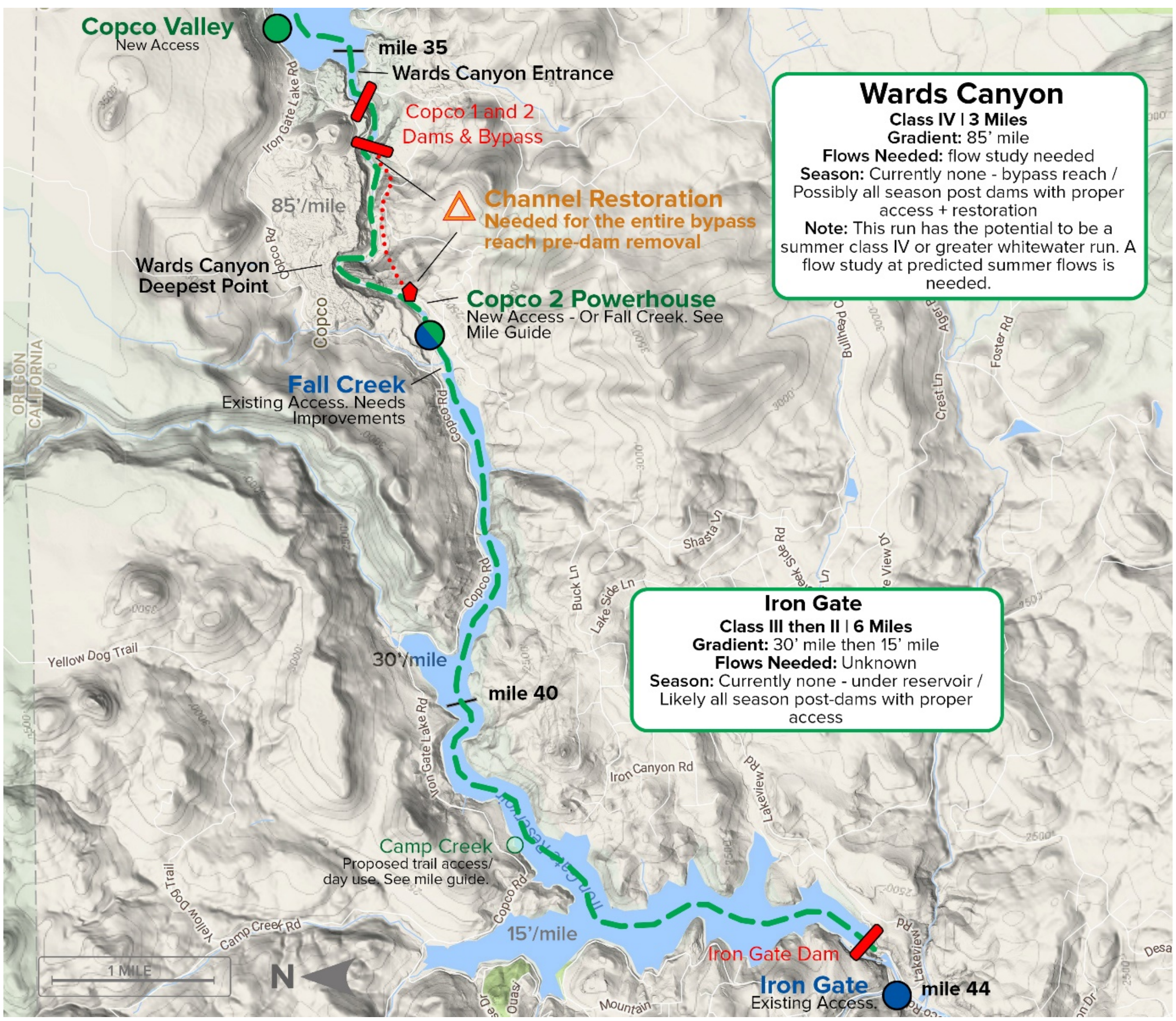
This reach has major recreation potential given its moderate gradient and proximity to I-5 and to population centers in the Rogue Valley and Yreka/Mt.Shasta. The take-out is only nine miles from the Interstate. Here the river flows through a scenic, semi-arid canyon dotted with oak, juniper, and pine. The Iron Gate reach could be a stand-alone half-day run, or it could be combined with Wards Canyon upstream for a full-day run. Depending on the nature of the whitewater, it could also be popular for drift boat fishing. Lands under Iron Gate Reservoir should be transferred to public ownership and should be protected in their natural condition.

40 ***Jenny Creek confluence.*** Jenny Creek, an important tributary draining the Cascade-Siskiyou National Monument, enters on the right. .

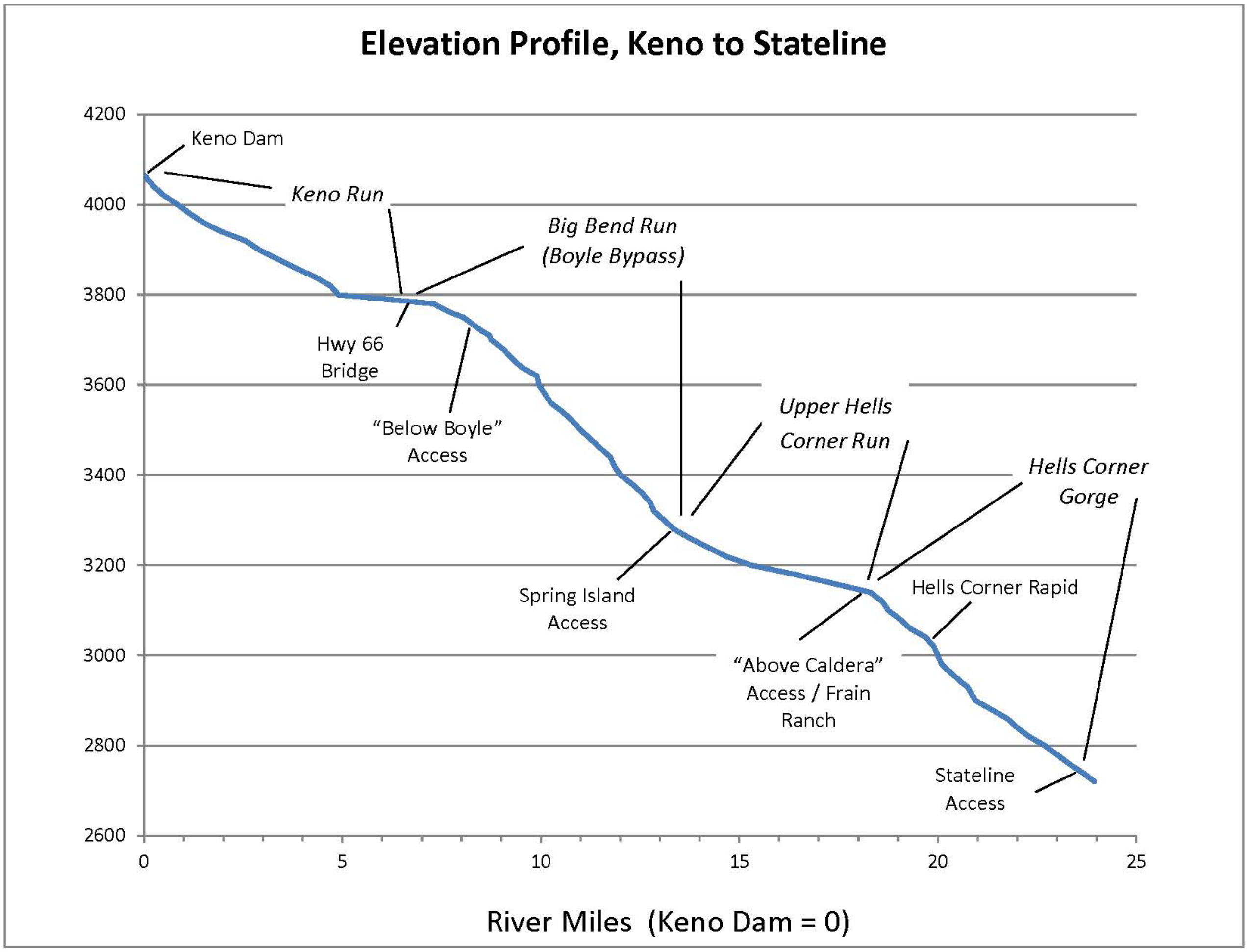
41.8 *Camp Creek Access.* Proposed walk-in access point, located where Camp Creek enters on the right. Camp Creek, another important tributary draining the Cascade-Siskiyou National Monument, enters on the right. KRRC has proposed and designed a trail at this location, leading from Copco Road to the right bank of the Klamath. KRRC proposed this trail as a walk-in access for whitewater boaters, but given the proximity of a more convenient vehicle-accessible river access just two miles downstream at Iron Gate, this trail is not needed for whitewater recreation. However, a trail at this location would provide valuable access for hikers, anglers, and other outdoor enthusiasts.

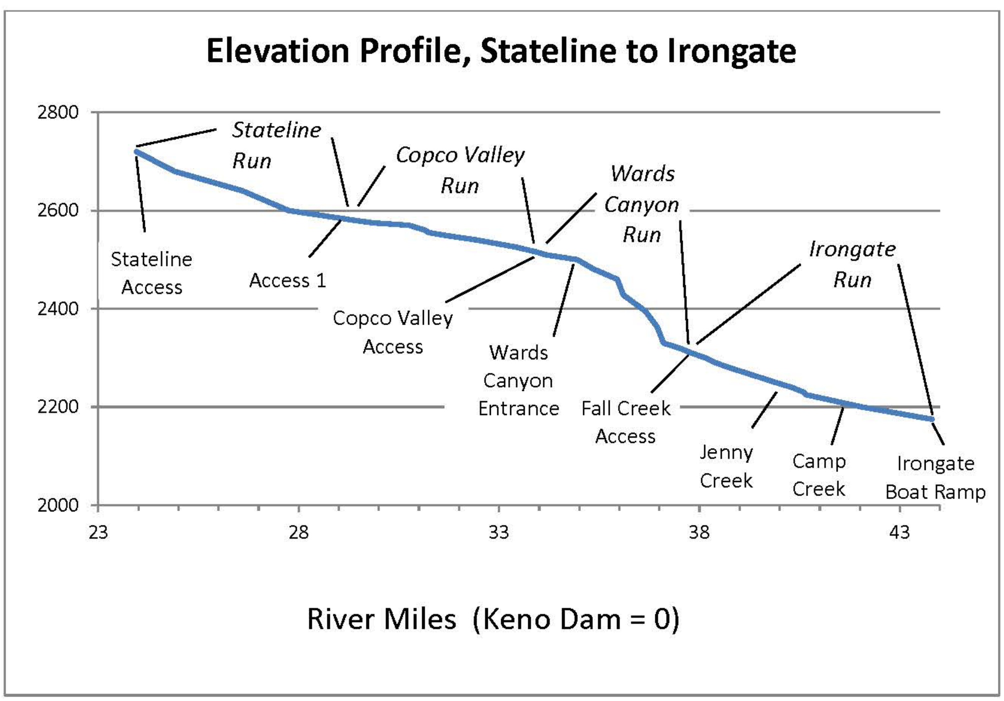
43.5 *Iron Gate Dam.* Reregulating dam built in 1962 in the scenic Iron Gate narrows.

44 *Iron Gate Access.* KRRC has proposed a new river access on the right bank, within the existing impacted footprint of PacifiCorp's equipment yard, immediately downstream from the foot of the Iron Gate Dam spillway. Iron Gate marks the end of the Upper Klamath. From here, it's just a 190-mile paddle to the Pacific!



ELEVATION PROFILES





KENO FLOW RELEASES

Note: Add 225 to 250 cfs for runs below big bend springs (near the current J.C. Boyle Dam)

AVERAGE FROM 2003 TO MAY 2018

USGS Link >

USGS 11509500 KLAMATH RIVER AT KENO, OR

Available data for this site | Time-series: Daily statistics | GO

Klamath County, Oregon Hydrologic Unit Code 18010206 Latitude 42°08'00", Longitude 121°57'40" NAD27 Drainage area 3,920 square miles Gage datum 3,961 feet above NGVD29	**Output formats** HTML table of all data Tab-separated data Reselect output format

00060, Discharge, cubic feet per second,												
Day of month	Mean of daily mean values for each day for 15 - 16 years of record in, ft3/s (Calculation Period 2002-10-01 -> 2018-09-30) Period-of-record for statistical calculation restricted by user											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	983	836	1,170	1,960	1,690	1,200	917	622	706	686	851	814
2	1,140	925	1,170	1,900	1,610	1,200	907	628	709	716	861	813
3	1,120	1,030	1,170	1,850	1,580	1,210	893	634	712	711	872	845
4	1,130	1,120	1,130	1,830	1,650	1,190	854	622	737	707	892	794
5	1,120	1,180	1,130	1,800	1,740	1,180	799	625	742	700	853	735
6	1,190	1,170	1,160	1,910	1,730	1,150	766	624	725	716	852	737
7	1,210	1,130	1,180	2,010	1,810	1,090	745	628	729	767	850	763
8	1,180	1,090	1,200	2,140	1,890	1,110	726	627	731	818	875	852
9	1,080	1,170	1,170	2,110	1,910	1,150	721	631	742	823	929	881
10	1,000	1,290	1,250	2,030	1,810	1,200	714	641	702	809	886	863
11	998	1,290	1,320	2,000	1,710	1,220	699	654	722	820	859	811
12	990	1,130	1,330	2,090	1,640	1,190	673	657	755	823	831	719
13	991	1,040	1,380	2,170	1,570	1,160	645	650	756	810	814	671
14	986	940	1,460	2,200	1,570	1,180	636	656	729	825	807	747
15	1,040	943	1,730	2,180	1,570	1,160	633	680	695	798	810	836
16	1,050	889	1,840	2,040	1,590	1,120	633	722	660	786	802	829
17	1,040	844	1,830	1,940	1,630	1,120	630	700	666	793	779	780
18	1,050	837	1,760	1,910	1,640	1,110	628	706	670	769	811	751
19	992	888	1,790	1,890	1,560	1,080	632	729	696	796	876	729
20	978	882	1,830	1,830	1,430	1,050	624	727	729	795	878	731
21	1,000	914	1,760	1,740	1,420	1,010	621	719	726	805	842	827
22	1,010	1,060	1,760	1,690	1,410	1,000	623	712	679	764	838	967
23	998	1,320	1,830	1,700	1,380	1,000	638	689	687	760	820	972
24	1,030	1,230	1,850	1,690	1,350	1,010	637	692	696	777	846	976
25	1,010	1,120	1,840	1,640	1,320	1,030	643	709	699	787	820	959
26	969	1,120	1,850	1,660	1,320	1,030	656	716	700	806	825	958
27	950	1,130	1,930	1,680	1,360	1,020	654	719	684	816	835	922
28	933	1,130	1,980	1,690	1,410	975	652	696	668	810	857	924
29	936	869	1,940	1,720	1,350	942	656	662	670	838	875	908
30	917		1,910	1,740	1,320	923	643	682	661	852	854	835
31	897		1,980		1,230		635	695		834		872

HIGH SNOWPACK YEAR - 2011

USGS Link >

Daily Mean Discharge, cubic feet per second												
DATE	Jan 2011	Feb 2011	Mar 2011	Apr 2011	May 2011	Jun 2011	Jul 2011	Aug 2011	Sep 2011	Oct 2011	Nov 2011	Dec 2011
1	776[A]	1,300[A]	1,300[A]	4,160[A]	3,180[A]	2,310[A]	1,020[A]	887[A]	760[A]	795[A]	1,050[A]	999[A]
2	780[A]	1,390[A]	1,410[A]	4,070[A]	3,000[A]	2,300[A]	1,150[A]	918[A]	765[A]	806[A]	1,050[A]	994[A]
3	692[A]	1,310[A]	1,970[A]	3,990[A]	2,940[A]	2,300[A]	1,150[A]	824[A]	776[A]	798[A]	1,060[A]	1,000[A]
4	771[A]	1,590[A]	2,090[A]	3,480[A]	2,760[A]	2,300[A]	1,140[A]	678[A]	830[A]	799[A]	1,060[A]	998[A]
5	794[A]	1,590[A]	2,120[A]	2,650[A]	2,730[A]	2,310[A]	1,130[A]	677[A]	844[A]	810[A]	1,060[A]	996[A]
6	700[A]	1,410[A]	2,130[A]	2,630[A]	2,730[A]	2,320[A]	1,130[A]	678[A]	885[A]	855[A]	1,060[A]	996[A]
7	720[A]	2,010[A]	2,120[A]	2,920[A]	2,720[A]	2,320[A]	1,140[A]	682[A]	886[A]	835[A]	1,060[A]	999[A]
8	721[A]	2,730[A]	2,100[A]	3,270[A]	2,720[A]	2,280[A]	1,150[A]	677[A]	885[A]	832[A]	1,330[A]	995[A]
9	735[A]	2,720[A]	1,940[A]	3,260[A]	2,730[A]	2,230[A]	1,160[A]	743[A]	885[A]	825[A]	1,480[A]	993[A]
10	744[A]	2,830[A]	1,800[A]	2,930[A]	2,710[A]	2,230[A]	1,160[A]	816[A]	864[A]	820[A]	1,120[A]	993[A]
11	752[A]	2,850[A]	1,640[A]	2,750[A]	2,590[A]	2,210[A]	1,160[A]	814[A]	831[A]	815[A]	980[A]	995[A]
12	785[A]	2,810[A]	1,100[A]	2,800[A]	2,440[A]	1,900[A]	1,000[A]	812[A]	874[A]	716[A]	982[A]	994[A]
13	798[A]	2,770[A]	1,070[A]	2,770[A]	2,420[A]	1,880[A]	814[A]	812[A]	895[A]	620[A]	982[A]	995[A]
14	868[A]	1,850[A]	1,020[A]	2,700[A]	2,420[A]	1,890[A]	735[A]	792[A]	886[A]	568[A]	987[A]	995[A]
15	1,100[A]	794[A]	1,440[A]	2,440[A]	2,270[A]	1,890[A]	626[A]	788[A]	890[A]	480[A]	949[A]	993[A]
16	1,120[A]	699[A]	1,400[A]	1,920[A]	2,280[A]	1,930[A]	634[A]	795[A]	911[A]	455[A]	536[A]	918[A]
17	1,180[A]	701[A]	1,540[A]	1,910[A]	2,400[A]	1,980[A]	642[A]	802[A]	915[A]	457[A]	580[A]	848[A]
18	1,440[A]	703[A]	1,640[A]	1,910[A]	2,400[A]	1,980[A]	580[A]	858[A]	911[A]	454[A]	961[A]	844[A]
19	502[A]	700[A]	1,770[A]	2,210[A]	2,390[A]	1,970[A]	554[A]	910[A]	910[A]	448[A]	1,200[A]	780[A]
20	431[A]	699[A]	2,200[A]	2,560[A]	2,310[A]	1,820[A]	555[A]	895[A]	899[A]	451[A]	1,200[A]	737[A]
21	817[A]	749[A]	2,520[A]	2,690[A]	2,310[A]	1,590[A]	507[A]	863[A]	818[A]	555[A]	1,350[A]	733[A]
22	978[A]	943[A]	2,800[A]	2,760[A]	2,300[A]	1,480[A]	344[A]	818[A]	800[A]	665[A]	1,530[A]	730[A]
23	963[A]	1,010[A]	2,700[A]	3,000[A]	2,300[A]	1,380[A]	550[A]	700[A]	796[A]	665[A]	1,260[A]	724[A]
24	964[A]	1,180[A]	2,290[A]	3,300[A]	2,300[A]	1,310[A]	632[A]	700[A]	808[A]	733[A]	998[A]	718[A]
25	964[A]	1,330[A]	2,330[A]	3,330[A]	2,310[A]	1,380[A]	717[A]	694[A]	807[A]	772[A]	997[A]	714[A]
26	965[A]	1,000[A]	2,650[A]	3,430[A]	2,320[A]	1,380[A]	819[A]	696[A]	806[A]	767[A]	996[A]	718[A]
27	965[A]	981[A]	2,660[A]	3,470[A]	2,320[A]	1,270[A]	804[A]	699[A]	803[A]	761[A]	994[A]	730[A]
28	1,000[A]	1,100[A]	2,660[A]	3,480[A]	2,310[A]	986[A]	841[A]	687[A]	799[A]	760[A]	993[A]	729[A]
29	1,030[A]		3,110[A]	3,640[A]	2,310[A]	991[A]	890[A]	678[A]	796[A]	760[A]	995[A]	724[A]
30	1,030[A]		3,650[A]	3,760[A]	2,310[A]	995[A]	891[A]	696[A]	791[A]	770[A]	998[A]	721[A]
31	1,030[A]		3,970[A]		2,300[A]		890[A]	703[A]		882[A]		722[A]
COUNT	31	28	31	30	31	30	31	31	30	31	30	31
MAX	1,440	2,850	3,970	4,160	3,180	2,320	1,160	918	915	882	1,530	1,000
MIN	431	699	1,020	1,910	2,270	986	344	677	760	448	536	714

Low Snowpack Year - 2014

USGS Link >

Daily Mean Discharge, cubic feet per second												
DATE	**Jan 2014**	**Feb 2014**	**Mar 2014**	**Apr 2014**	**May 2014**	**Jun 2014**	**Jul 2014**	**Aug 2014**	**Sep 2014**	**Oct 2014**	**Nov 2014**	**Dec 2014**
1	553[A]	599[A]	804[A]	1,010[A]	843[A]	990[A]	697[A]	734[A]	749[A]	411[A]	663[A]	609[A]
2	554[A]	598[A]	738[A]	977[A]	640[A]	1,070[A]	659[A]	734[A]	789[A]	413[A]	662[A]	609[A]
3	546[A]	600[A]	682[A]	1,000[A]	420[A]	871[A]	644[A]	730[A]	791[A]	400[A]	662[A]	609[A]
4	554[A]	603[A]	702[A]	988[A]	408[A]	712[A]	643[A]	725[A]	856[A]	392[A]	755[A]	605[A]
5	570[A]	971[A]	767[A]	994[A]	716[A]	684[A]	643[A]	726[A]	903[A]	392[A]	769[A]	602[A]
6	521[A]	1,090[A]	731[A]	995[A]	987[A]	683[A]	654[A]	711[A]	900[A]	392[A]	1,050[A]	600[A]
7	506[A]	766[A]	728[A]	990[A]	1,170[A]	684[A]	669[A]	695[A]	899[A]	765[A]	907[A]	602[A]
8	536[A]	525[A]	730[A]	988[A]	1,310[A]	686[A]	669[A]	693[A]	896[A]	1,130[A]	816[A]	600[A]
9	518[A]	518[A]	734[A]	983[A]	1,100[A]	685[A]	669[A]	688[A]	801[A]	1,160[A]	810[A]	599[A]
10	481[A]	515[A]	775[A]	981[A]	993[A]	765[A]	749[A]	687[A]	711[A]	1,160[A]	809[A]	599[A]
11	478[A]	514[A]	699[A]	979[A]	988[A]	851[A]	731[A]	685[A]	711[A]	1,110[A]	714[A]	623[A]
12	483[A]	538[A]	618[A]	976[A]	816[A]	847[A]	711[A]	685[A]	711[A]	1,050[A]	606[A]	625[A]
13	492[A]	602[A]	706[A]	981[A]	706[A]	849[A]	708[A]	684[A]	709[A]	922[A]	683[A]	624[A]
14	443[A]	552[A]	814[A]	986[A]	706[A]	852[A]	735[A]	686[A]	707[A]	1,260[A]	713[A]	622[A]
15	455[A]	597[A]	852[A]	983[A]	754[A]	854[A]	746[A]	654[A]	672[A]	1,100[A]	714[A]	608[A]
16	496[A]	657[A]	834[A]	984[A]	798[A]	853[A]	743[A]	650[A]	641[A]	818[A]	716[A]	597[A]
17	477[A]	617[A]	932[A]	934[A]	791[A]	847[A]	740[A]	648[A]	666[A]	713[A]	715[A]	597[A]
18	455[A]	503[A]	1,140[A]	894[A]	792[A]	846[A]	708[A]	646[A]	582[A]	710[A]	643[A]	598[A]
19	475[A]	500[A]	1,420[A]	890[A]	796[A]	847[A]	705[A]	641[A]	649[A]	710[A]	618[A]	596[A]
20	476[A]	552[A]	1,540[A]	889[A]	766[A]	878[A]	714[A]	638[A]	693[A]	686[A]	577[A]	598[A]
21	468[A]	550[A]	1,440[A]	894[A]	858[A]	891[A]	714[A]	637[A]	695[A]	661[A]	598[A]	636[A]
22	467[A]	528[A]	1,310[A]	896[A]	787[A]	888[A]	711[A]	636[A]	655[A]	659[A]	597[A]	1,270[A]
23	467[A]	527[A]	1,310[A]	900[A]	797[A]	884[A]	706[A]	637[A]	609[A]	663[A]	563[A]	1,080[A]
24	467[A]	527[A]	1,310[A]	835[A]	812[A]	885[A]	704[A]	640[A]	656[A]	690[A]	524[A]	779[A]
25	467[A]	527[A]	1,310[A]	788[A]	811[A]	994[A]	705[A]	643[A]	538[A]	687[A]	508[A]	580[A]
26	467[A]	586[A]	1,200[A]	779[A]	811[A]	1,070[A]	702[A]	644[A]	396[A]	662[A]	507[A]	573[A]
27	471[A]	725[A]	1,020[A]	794[A]	812[A]	955[A]	703[A]	647[A]	410[A]	662[A]	505[A]	604[A]
28	489[A]	818[A]	1,040[A]	804[A]	912[A]	888[A]	703[A]	646[A]	410[A]	662[A]	504[A]	602[A]
29	502[A]		1,050[A]	801[A]	862[A]	894[A]	705[A]	646[A]	411[A]	661[A]	583[A]	560[A]
30	502[A]		1,050[A]	818[A]	797[A]	807[A]	703[A]	650[A]	413[A]	661[A]	610[A]	736[A]
31	563[A]		1,040[A]		801[A]		727[A]	652[A]		663[A]		609[A]
COUNT	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**
MAX	**570**	**1,090**	**1,540**	**1,010**	**1,310**	**1,070**	**749**	**734**	**903**	**1,260**	**1,050**	**1,270**
MIN	**443**	**500**	**618**	**779**	**408**	**683**	**643**	**636**	**396**	**392**	**504**	**560**