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Technical Memorandum

To: Larry Dunsmoor, Biologist, Klamath Tribes

From: C.W. Huntington, Aquatic Biologist

Subject: Estimates of anadromous fish runs above the site of Iron Gate Dam

Date: 15 January 2006

The following memorandum is intended to provide updates on two elements of work that has been done to estimate the potential for anadromous fish production above the site of Iron Gate Dam (IGD). These elements include:

- Preliminary estimates of the historic potential for chinook production above Upper Klamath Lake (UKL) that were included in a technical memo I submitted to you in April 2004 (see Huntington 2004).

- Estimates of historic and recently suitable habitat for anadromous fish in streams within the drainage basin above IGD, per Table 1 of the technical memo referenced above (i.e., Huntington 2004).

Estimates of the historic potential for chinook production above UKL

My April 2004 memo to you provided a rough estimate of the probable magnitude of historic returns of chinook salmon to the drainage basin above UKL in order to highlight the substantial potential that the basin would have had before aquatic conditions were degraded. The memo indicated that the lower end of a range of ~150-440 thousand chinook returning to the basin seemed more probable to me, and that more authoritative estimates of production potential would be developed through collaborative modeling efforts that were already underway at the time.

Since the April 2004 memo was first distributed, I have become more familiar with areas upstream of Upper Klamath Lake and am even more convinced that historic returns of chinook to the basin above UKL were closer to the lower end of the range of values given in the memo, and not to the upper end. Since efforts to use the Ecosystem Diagnosis and Treatment (EDT) model to estimate the basin's potential to produce anadromous fish have shifted completely away from discussions of pristine (Template) conditions, it no longer seems likely that the model will be used to refine my preliminary estimate of the area's historic potential for producing chinook. With this in mind, I offer a "better estimate" of the upper basin's historic potential to produce chinook, below. The "better estimate" is based on the same algorithm used to calculate the lower end of the range of estimates given in Table 3 of the April 2004 memo, but includes two improvements. These improvements include: (1) a drainage area reduction to account for a probable lack of consistent chinook access to the 568 mi^2 watershed draining into Sycan Marsh and (2) an improved estimate of the 266 mi^2 area drained by potential chinook streams on the west side of UKL (versus the 192 mi^2 "Wood River Valley" referenced in the earlier memo).

Better estimate of historic chinook potential above UKL = 1,427 mi^2 (production area above UKL)
x 61,811 adults/793 mi^2 (Shasta R. drainage)
= 111,230 adult chinook

The "better estimate" just given is based on a single basic assumption: that similar drainage basins of a similar size will develop aquatic habitats and salmon populations that are also similar. As indicated in the April 2004 memo, this approach may not fully account for the historic (and unknown) seasonal production potential of UKL itself, which could have been considerable. As was the case for estimates of the historic chinook run given in the April 2004 memo, the "better estimate" reflects the upper basin's historic production potential for a composite of spring-run and summer-fall run chinook. Spring-run fish likely accounted for the majority of the upper basin's actual salmon production under pristine conditions, but were apparently in substantial decline by the early 1900s.

The existing potential for chinook production within the drainage basin above UKL is clearly much lower than the "better estimate" of its historic potential. While there are extensive opportunities for rehabilitating habitat above and in UKL, it is important to recognize that significant portions of the historic production potential is unlikely to be recovered.

Estimates of habitat suitable for use by anadromous fish above UKL

The April 2004 memo summarized what was known about the kilometers of streams above the site of IGD that were historically, and in multiple cases recently, suitable for use by chinook salmon and/or steelhead trout. While this information set a context for discussions of fish passage options for PacifiCorp's hydroproject, it did not differentiate between damaged historic habitats that might

be rehabilitated versus those where rehabilitation efforts significant to salmon or steelhead would seem at best unlikely within the next ~30-50 years.

Table 1 represents an effort on my part to fill this gap. It provides a summary of the kilometers of streams above the site of IGD that are either currently thought to be suitable for use by anadromous fish or that it is thought could be rehabilitated to become functional for chinook salmon and/or steelhead trout within the time frame identified above. Identification of the streams and kilometers of habitat that could be rehabilitated into a functional condition was based on interactions with in-basin experts during 2004, and should be viewed as an approximation rather than an exact list. Actual success in rehabilitating anadromous fish habitat (both functional but degraded as well as non-functional habitat) would depend on allocations of resources and the cooperation of land managers and land owners, not simply technical feasibility.

Table 1. Estimates of the quantity (in kilometers) of recent and restorable habitat for anadromous fish in the drainage basin above the site of Iron Gate Dam.

Stream	Estimates of potential anadromous fish habitat (km): Existing	Existing plus recoverable	Comments
Areas below Upper Klamath Lake (UKL)			
Klamath R.	44.6	44.6 (109.9?)	Value in parentheses includes habitat now inundated by slackwater.
Spencer Cr. *	23.6	23.6	
Shovel Cr. *	5.3	5.3	
Fall Cr.	1.4	1.4	
Jenny Cr.	1.8	1.8	
Others	21.1	21.1	
Total	**97.8**	**97.8 (163.1?)**	
Westside tributaries to UKL			
Wood R.	32.5	32.5	
Annie Cr.	---	19.9	Alterations and diversions affect access at present.
Sun Cr.	---	21.4	Alterations and bull trout barrier affect access at present; rehabilitation planned.
Fort Cr.	6.1	6.1	
Crooked Cr.	15.7	15.7	
Agency Cr.	1.3	1.3	
Sevenmile Cr.	30.4	30.4	Water diversions affect passage and would need to be modified.
Short Cr.	2.8	2.8	
Fourmile Cr.	---	16.7	
Cherry Cr. *	---	15.5	
Threemile Cr. *	---	8.1	
Recreation/Crystal Cr.	13.1	13.1	
Fourmile (Lake) Cr. *	---	---	Water exported to Rogue R. Basin.
Denny Cr.	---	---	Upper reaches suitable for use; bottomland reaches dysfunctional.
Total	**101.9**	**183.5**	
Williamson R. system (excluding Sprague)			
Williamson R.	37.4	37.4	
Larkin Cr.	6.4	6.4	
Sunnybrook Cr.	1.1	1.1	
Spring Cr.	4.0	4.0	
Total	**48.9**	**48.9**	
Sprague R. system			
Sprague R.	136.1	136.1	Much of mainstem strongly in need of rehabilitation.
N.Fk. Sprague R.	57.9	57.9	Lower-most reaches strongly in need of rehabilitation.
Dead Cow Cr. *	6.9	6.9	
School Cr.	6.1	6.1	
Cold Cr.	3.3	3.3	
Gearhart Cr. *	4.8	4.8	
Boulder Cr.	4.8	4.8	Steep and cold stream; will get only limited use (ODFW).
Sheepy Cr.	1.8	1.8	Steep and cold stream; will get only limited use (ODFW).
Meryl Cr. *	---	14.0	In need of substantial rehabilitation.
Fivemile Cr.	22.4	22.4	Lower-most reaches strongly in need of rehabilitation.
S.Fk. Sprague R.	55.5	55.5	Lower reaches very strongly in need of remedial actions.
Corral Cr.	2.5	2.5	
Camp Cr.	2.9	2.9	
Buckboard Cr.	6.6	6.6	
Whitworth Cr. *	17.4	17.4	
Brownsworth Cr. *	20.8	20.8	
Ish Tish Cr.	---	10.9?	Potential for rehabilitation uncertain.
Paradise Cr.	---	---	Rehabilitation appears infeasible.
Fishhole Cr. *	---	51.5?	Flow enhancement and other rehabilitation would be needed here.
Deming Cr.	---	---	ODFW considers the stream naturally isolated from the South Fork.
Sycan R. (above and within Sycan Marsh)	---	68.4?	Use of this habitat would require passage through Sycan Marsh.
Skull Cr.	---	10.3?	Use of this habitat would require passage through Sycan Marsh.
Paradise Cr. *	---	34.4?	Use of this habitat would require passage through Sycan Marsh.
Long Cr. *	---	45.2?	Use of this habitat would require passage through Sycan Marsh.
Sycan R. (below Sycan Marsh)	53.7	53.7	Strongly in need of rehabilitation.
Brown Springs Cr.	---	1.9	Rehabilitation of this small springbrook is in process.
Snake Cr. *	---	6.8	Rehabilitation may be infeasible.
Others	---	---	Multiple intermittent streams have uncertain anadromous potential.
Whisky Cr.	---	7.2	Rehabilitation of part of this springbrook will require major investments.
Rock Cr.	---	8.4	Lower-most reach of stream may be dysfunctional.
Trout Cr. *	11.3	11.3	
Whitehorse Cr.	---	3.2?	Rehabilitation of this small springbrook will be difficult but not infeasible.
Copperfield Cr.	---	---	Rehabilitation appears infeasible.
Others	---	---	Rehabilitation appears infeasible.
	421.4	**453.1 (669.3?)**	Value in parentheses includes areas within/above Sycan Marsh.
All Streams Above Iron Gate	**676.6**	**774.1 (1055.6?)**	Value in parentheses includes inundated areas and sites within/above Sycan Marsh.

* Streams that include additional unnamed tributaries with potential habitat.

? Kilometers of streams that may or may not be recoverable as habitat, depending on the circumstances.

Citations

Huntington, C.W. 2004. Preliminary estimates of the recent and historic potential for anadromous fish production above Iron Gate Dam. Technical memorandum to Larry Dunsmoor, Biologist, Klamath Tribes. Clearwater BioStudies, Inc., Canby, Oregon. 05 April 2004.

PacifiCorp. 2005. Ecosystem Diagnosis and Treatment analysis. Response to November 10, 2005, FERC AIR AR-2. PacifiCorp, Portland, Oregon. 16 December 2005.