Dungeness River Basin Plan

Technical Comments on the Instream Flow issues within

Proposed 173-518 WAC - July 9th, 2012 (FINAL)

Kris G. Kauffman, PE – President, Water Rights Inc.

BACKGROUND

The State of Washington water resource planning directions came initially from 90.54 RCW known as the Water Resource Act of 1971. Included in this act were fundamentals of allocation of water within the state and provisions for setting forth "**Base Flows**" in all perennial steams of the state. Separately, in 1969, the water code provided, under 90.22 RCW, that "Minimum Flows" may be adopted for protection of specific values related to stream flow. The language associated with the 90.54.020(3)(a) RCW included within a "Declaration of Fundamentals" that "Perennial Rivers and Streams ... **shall** be retained with Base Flows necessary for the preservation of ... values". The **Base Flow** provision was later set forth in more detail under 173-500 WAC, with a specific hydrological methodology set forth in the Western Washington Instream Resource Protection Programmatic EIS document at Appendix D (see Attachment 1). Under said Water Resources Act of 1971 nineteen major river basins in the state had some level of planning activity completed including the setting of "Instream flows". All of these basins, including the Columbia and Snake Rivers, incorporated the adoption of Base Flows, or a combination of Base and Minimum Flows, dependent upon the degree to which the stream system was a natural flow system or a system that had available stored water for release.

Much later 90.82 RCW was passed, enabling another broad-based water resource planning activity led, to some degree, by a variety of public and private interests in the given watershed planning area. This currently proposed 173-518 WAC is one effort within what came to be known as the 2514 water resource planning activity named after the legislative bill number. At this stage the 2514 water resource planning effort had the mandatory provisions for considering water quantity for existing and future water use and water supply and the option to address water quality, instream flows, aquatic and riparian habitat and water storage issues. Subject basin took the option to address all the noted issues. The State provided funding for a variety of study efforts relating to these functional water resource elements. The currently-proposed 173-518 WAC (see Attachment 2), inclusive of the Dungeness River Basin, is under the auspices of a 2514 planning effort.

These comments include the review by the undersigned of several background reports, obtaining certain background data used to determine the proposed instream flow regimes, and historic planning and administration considerations relative to said instream flows.

FOCUSING ON WATER ALLOCATION TO INSTREAM FLOWS

Basin water resource planning efforts may routinely include an allocation of waters to specific use categories, duly recognizing the first-in-time, first-in-right administration of Water Rights under Western Water Law generally and 90.03 RCW specifically for Washington State. Examples of water allocation budget elements to specific instream flow uses related to an average annual water year are set forth for four separate Washington State river basins. These are just four of several examples that could be used. In all cases the downstream gage or most appropriate gage data related thereto is used.

1. The Okanogan River of North central Washington (WAC 173-549 **adopted 7/76**).
   Average annual flow (34 years - Malott) 2,300,000 Acre Feet
   Instream flow protected (173-549) 1,043,000 Acre Feet
   Drainage area above RM 17 = 8,080 sq-mi
   Instream flow (base) as a % of average annual flow = 45 % actual[1].

2. The Newaukum River of Southwestern Washington (WAC 173-522 **adopted 7/76**).
   Average annual flow (58 years) 365,000 Acre Feet
   Instream flow protected (173-522) 110,662 Acre Feet
   Drainage area above RM 4.1 = 155 sq-mi
   Instream flow (base) as a % of average annual flow = 30 % actual[2].

3. The Deschutes River of Southwestern Washington (WAC 173-513 **adopted 6/80**).
   Average annual flow (24 years) 299,400 Acre Feet
   Instream flow protected (173-513) 173,860 Acre Feet
   Drainage area above RM 2.4 = 162 sq-mi
   Instream flow (base) as a % of average annual flow = 58 % actual[3].

4. The Dungeness River of the Olympic Peninsula (WAC 173-518 **proposed 7/12**).
   Average annual flow (69 years) 278,600 Acre Feet
   Instream flow proposed (173-518) 322,370 Acre Feet[4]
   Drainage area above RM 11.8 = 156 sq-mi
   Instream flow (proposed) as a % of average annual flow = 116% proposed

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1 The Okanogan River Basin may have the largest salmon runs in over 70 years this year (this may not relate to the Instream flow-setting; however, flows may have played some role). The Instream flow as adopted **ratio** to the average annual river flow is less than 45%; and, **less than 40%** of the ratio **proposed** for the Dungeness.

2 The Newaukum River drainage area is virtually the same as the Dungeness, with the Instream flow adopted **ratio** to the average annual river flow is about 30 %; or, **only 26%** of the ratio **proposed** for the Dungeness.

3 The Deschutes River drainage is less than 4% larger than the Dungeness yet the Instream flow **ratio** to the average annual river flow as adopted is ~58%; or, **one-half (50%)** of the ratio **proposed** for the Dungeness.

4 The Dungeness Instream flow proposed in 173-518 is about **1.16 times larger** than the average annual flow for the Dungeness River and is 2.0 to 3.3 times greater as a ratio to historic adopted instream flow examples above.

INSTREAM FLOW SETTING ON THE DUNGENESS RIVER

The instream flow-setting methodology being employed on the Dungeness River does not follow either the Base Flow or Minimum Flow processes set forth in earlier efforts; but, rather, is combined as "Instream Flows as necessary to meet the water resource management objectives..."; and, "The term"instream flow" means "base flow" under ...90.54...,"minimum flow" under ...90.03 and ...90.22...and "minimum instream flow" under ...90.82...."

Specifically, the "minimum instream flow" for the Dungeness River, in fact, keys off of an optimum or near maximizing habitat flow analysis as depicted graphically in the technical background information. (see Attachment 3, pgs. 1, 10, 14, 21 and 32).

The concept embodied in the 90.54 RCW Base Flow relates directly to the hydrologically-defined Base Flow, that is the dry period recessional flow component of streamflow. The afore-mentioned Appendix D derives the regulatory Base Flow by developing actual duration hydrographs for the involved stream reach throughout the year and then applying specific criteria to suggest a variable Base Flow hydrograph throughout the year. Part of this analysis includes a qualitative rating of the functional uses of the stream. The end product relates directly to the basic stream characteristics under normative flow ranges and conditions.

The methodology used for the Dungeness River as proposed in 173-518 WAC takes the fluvial geomorphically defined river system formed by high energy (flow) events and then assesses habitat functions (spawnable areas, juvenile rearing conditions, adult passage, etc.) without regard to normative flow conditions, thereby obtaining significantly higher flows than have historically occurred under a sustained natural flow condition. The primary authors of the *Instream Flows for the Dungeness River* note that:

> "Even though Chinook spawning habitat is maximum at 575 cfs, biologists chose 180 cfs for Chinook spawning based on the hydrograph showing the streamflow **did not reach 575 cfs with enough frequency during September.**"

This statement displays clearly the flawed methodology relative to natural flow conditions and the development of minimum or base flows: if the objective function is to define **maximum or optimum fish flows, then the applied methodology currently used in 173-518 WAC is appropriate**; however, the allocation of water to Instream flows directly relates to the policy decisions relative to water available for other uses and users other than fish and the historic language spoke to Base or Minimum flows, not maximum or optimum fish flows.

Comparing these two methodologies as represented in the examples in the prior section provides the apparent following differences: "The Dungeness Instream flow proposed in 173-518 WAC is about **116 % larger than the average annual flow for the Dungeness River and is 2.0 to 3.3 times greater as a ratio to historic adopted instream flows....**" noted above.

By optimizing/maximizing the flow for fish, significant additional resources are allocated thereto as compared to providing a Base Flow amount. Simply defining "Instream flow" to include all flow related methodologies is not appropriate when, in fact, a maximizing methodology is relied upon. An analysis using the developed data with the PHABSIM model used for the lower Dungeness site and comparing, for example, the specific habitat (**not actual fish use or production**) functions displayed for 100 cfs (the 1994 and 1998 Agreement's Target Flow) rather than the 180 cfs recommended showed that the 100 cfs still provides 97%, 92%, and 67% spawning habitat function values for Coho, Pink, and Chinook salmon species respectively, when compared to the 180 cfs (83%, 97% and 98% respectively) specified for August to October. See Table 1, page 5 herein for a more complete display and Attachment 4 for a graphical representation of this data interpretation. Since this analysis did not find any correlation data between the flow figures recommended for adoption in the proposed 173-518 WAC and actual historic fish run sizes, it is assumed that that data does not exist and that we are only reviewing the theoretical interpretation of actual measured field habitat environments in the Dungeness River Basin.

HYDRAULIC CONTINUITY

The result of statutory and case law application to Water Right Administration directs that the relationship of ground and surface waters, one to the other, must be considered. The 173-518 WAC planning activity and process has the option to set forth specific ways for that consideration to take place and be implemented. The work in assessing the stream gaging network as to accuracy was well done with clearly delineated results by gage; however, the proposed 173-518 WAC depends nearly entirely on mitigation strategies to accommodate any underlying potential hydraulic continuity of ground waters with surface waters in the planning area. Options not fully considered, in my judgment, include a de minimis or otherwise non-measurable impact area for (specified) quantities of ground water withdrawals; the use of interface ground waters that would not impact surface waters or induce salt-water intrusion; or, the importation of fracture zone ground waters (not deep aquifer zones that are referenced) into the defined hydrologic drainage basin.

The limited optional approaches noted above may provide a broader opportunity for general access to public ground waters than the total reliance on mitigation requirements proposed in the current draft.

CONCLUSIONS (7/9/12)

It is my considered opinion that viable options other than the currently-proposed 173-518 WAC exist for an efficient water resource management regulation, or guidance document, to be adopted for the Dungeness River Basin and that these options will provide for a more efficient water management framework going forward. It is my conclusion that, for example, a reduction of the Instream flow allocation to the highest ratio of the previously adopted examples used (30 + years in place) would free up over 115,000 Acre Feet per year (0.42 X 278,600 AF) with attendant significant impacts on allocation policy decisions.

Respectfully submitted,

Kris G. Kauffman, P. E.

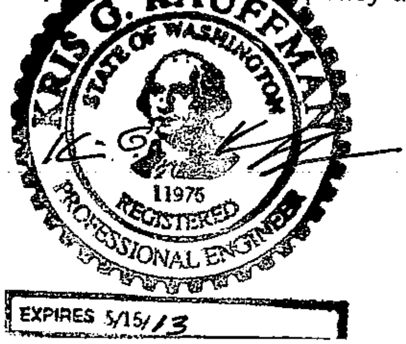


TABLE 1

A Comparison of Habitat Funtions for Two Flow Levels*
for the Lower Dungeness Test Reach**

	Species					
	COHO		PINK		CHINOOK	
	100 cfs	180 cfs	100 cfs	180 cfs	100 cfs	180 cfs
Habitat function						
Spawning	97%	83%	92%	97%	67%	98%
Juvenile	84%	59%			91%	68%
Adult					78%	89%

* Note that there are significant variations by species and habitat functions related to flow level, ie. 100 cfs provides 14% more spawning habitat and 25% more rearing habitat for Coho and 23% more rearing habitat for Chinook than does the 180 cfs; however, the 180 cfs provides 5% more spawning habitat for Pinks, 31% more for Chinook and 11% more adult passage for Chinook. This data **is not numbers of fish**, but does reflect habitat availability. The Biologists weigh this data and recommend the higher flow as the requirement and the 100 cfs as inadequate and indefensible.

**The Lower Reach is at River Mile 2.3 and is a non-braided channel as opposed to the Upper Reach that is a braided channel.

ATTACHMENTS:

1. Appendix D of WAC 173-500, Western Washington Instream Resources Protection Programmatic IES; June 1979; contact person – Ken Slattery, DOE
2. **WAC 173-518 (proposed)** comments due July 9, 2012.
3. **Instream Flows for the Dungeness River; pgs. 1, 10, 14, 21 and 32;** no date; Brad Caldwell (DOE) and Hal Beecher (WA Fish and Wildlife Dept.); 36 pages total.
4. Ibid; **page 14** expanded and annotated by Kris G. Kauffman; **Graphs 14 A – Coho; 14 B – Pink; and, 14 C - Chinook**

ATTACHMENT 1

COMMENTS ON 173-518 WAC

BY KRIS G. KAUFFMAN, P. E.

July 9, 2012

173-500 WAC

Appendix D

WAC 173-500 June 1979

APPENDIX D
BASE FLOW ANALYSIS

Base flow determination, consists of the following steps:

- Stream system analysis i.e., concurrent selection of streamflow measurement stations and stream management reaches
- Stream rating
- Conversion of stream rating to percent-of-time flow duration
- Discharge-duration hydrograph construction
- Base flow hydrograph construction

Each of these steps is discussed below.

Stream System Analysis

Fundamental to sound base flow management is the need for a well designed streamflow measurement network that is capable of adequately controlling water diversions in all parts of each basin. Since the effectiveness of a flow control station is inversely related to the size of the drainage system it measures and, similarly, to distance from the various diversions within that drainage system, it is necessary to employ enough flow measurement stations to obtain a reasonable degree of sensitivity to the water diversions being monitored.

Considering the critical nature of the monitoring network, the initial step in base flow analysis is to examine existing streamflow records to identify those sites best suited for flow management. Generally, existing or former continuous record stream gaging stations will be used for base flow control whenever possible while, in areas lacking such record, sites are selected where miscellaneous flow measurements have been made. Usually it is preferable to select flow control sites that are located near the mouth of the mainstem stream and the mouths of major tributaries.

Concurrent with streamflow station selection, the basin is subdivided into logical segments (tributary drainages or stream reach units) that can be managed by each control station. Ideally, flow from or through each management unit should be controlled by a station at or near its downstream end or outlet. With control at such locations, all diversions above the station are reflected in flows measured at the station.

Upstream control (control station located above all or some of the diversions in a management unit), while possible, presents some complex management problems. Unlike downstream control, water diversions below an upstream control station do not affect flows at the station. Consequently with this type of control, different regulatory flow levels are necessary for each affected diversion. Therefore, upstream control stations should be avoided whenver possible and employed only where downstream control is not feasible.

For purposes of clarity and organization, designated control stations and management units are identifed on WRIA base maps and tabulated in downstream order on forms developed for the stream rating process. An example of a stream system analysis as prepared for the Upper Chehalis River Basin, (WRIA 23) is shown in Figures D-1 and D-2 and Table D-1.

In the control station sections of Table D-1, each management unit is identified by stream name, reach description, control station number, and location of the station by river mile, section, township, and range. If a management unit is described by stream name only, the entire stream system from headwaters to mouth, including tributaries, is included within the unit. Abbreviated description, in addition ot the stream name (nonstandard reach description), is provided if the unit consists of only a part of the total named stream basin.

Small triangles on Figure D-1 identify beginning and end points of stream reaches or end points of entire streams and tributaries described in the stream system analysis.

Figure D-2 shows the location of flow measurement sites, designated as control stations, and some information about the type of streamflow record that is available for each site. Numbers assigned to each station generally correspond to the middle four digits of identifying numbers for United States Geological Survey stream gaging stations.

Stream Rating

Since stream and watershed environments vary widely, not only among different stream systems but also within each drainage, it is reasonable to assume that some streams will require higher levels of base flow than others to adequately preserve their environmental values. Therefore, a procedure was developed whereby these differences could be identified and, in turn, used as a foundation for defining appropriate levels of base flow.

As discussed previously, RCW 90.54.020(3) requires that base flows be retained in perennial streams to preserve various environmental and navigational values. Following this guidance, a simple stream rating system was devised for differentiating the relative value of these parameters. These parameters are defined as follows:

Wildlife Values include use values for wild animals and birds; exclude fish.

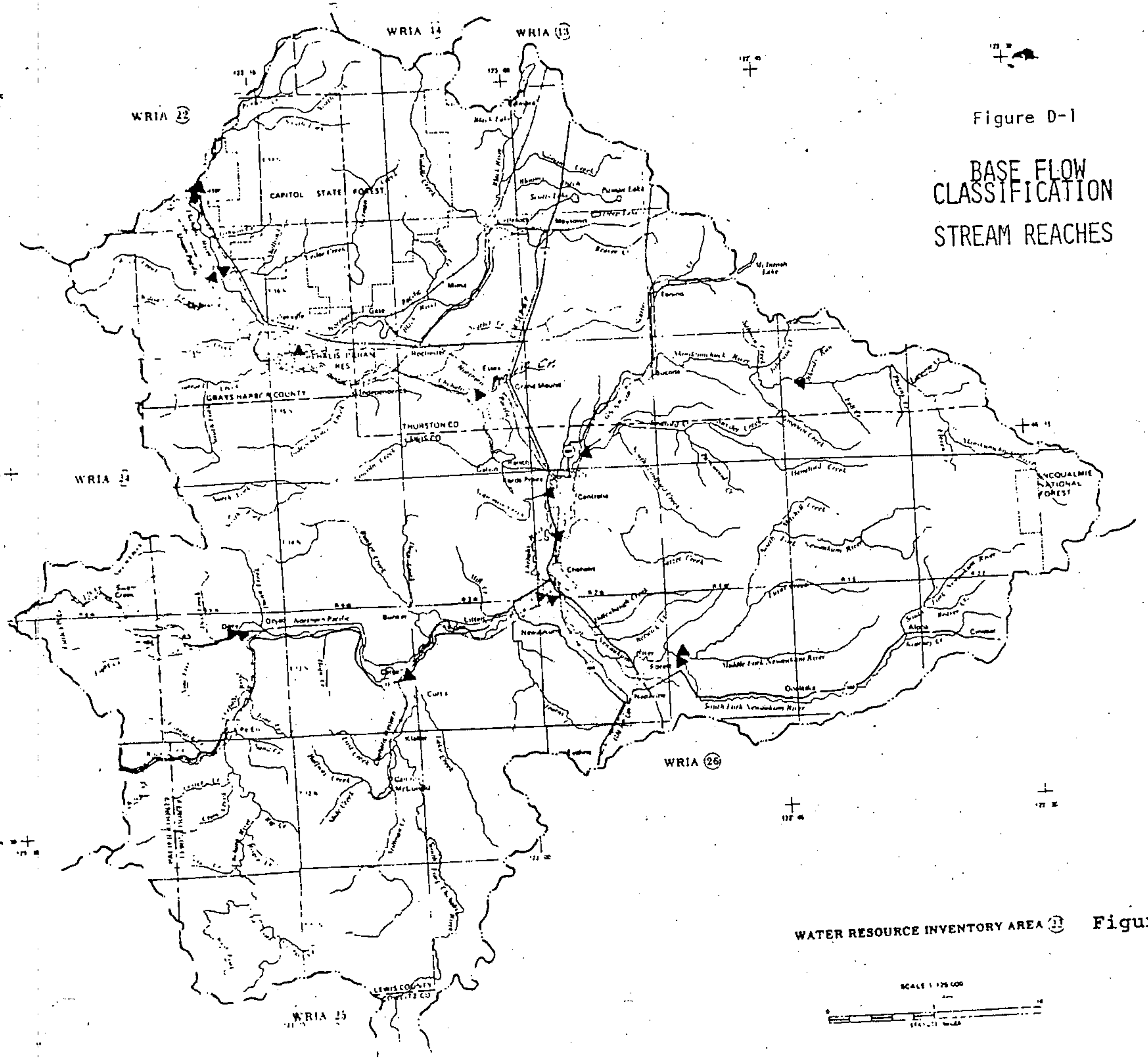
Fish Values include use values for propagation, rearing, and migration of fish, and values of streams for fishing.

Scenic and Aesthetic Values include audible and visual values of natural beauty associated with flowing streams and their surroundings, including recreational enjoyment of these values.

Navigational Values refer to commercial and recreational boating, including canoeing, kayaking, and rafting.

Figure D-1

BASE FLOW CLASSIFICATION STREAM REACHES



WATER RESOURCE INVENTORY AREA 23 Figure D-1

BASE FLOWS in WRIA-23

Control Station / Stream Name / (Non Standard Reach Description)	Number / River Mile / Sec. Twp. Rge.	Stream Rating: Wildlife	Fish	Scenic & Aes.	Navigation	Other Envir.	Quality Std.	Total Rating (Flow Levels)	Jan / May / Sep 1	Jan / May / Sep 15	Feb / Jun / Oct 1	Feb / Jun / Oct 15	Mar / July / Nov 1	Mar / July / Nov 15	Apr / Aug / Dec 1	Apr / Aug / Dec 15
S. Fk. Chehalis R. (Alternate Control)	12.0216.30	3.0	4.0	1.7	1.0	1.5	3.0	14.2	200							200
	0.3							(79)	145	105	75	55	40	29	21	15
	24-13-4W							(95)	15	15	21	28	56	105	200	200

Required Quantities in Cubic Feet per Second

Table D-1 (Continued)

Other Environmental Values refer to other miscellaneous environmental values not covered under the above parameters and include other forms of recreation, such as swimming and wading.

Water Quality Standards refer to Washington State Water Quality Standards.

The parameter rating system is presented in Table D-2.

To maintain a reasonable degree of uniformity and balance in the rating process, a stream rating committee was formed consisting of representatives of the state agencies that have a general interest or responsibility in stream related activities, namely the following:

- Department of Ecology
- Department of Fisheries
- Department of Game
- Department of Natural Resources
- Department of Highways
- Interagency Committee for Outdoor Recreation
- State Parks and Recreation Commission

The representaitve of the Department of Ecology serves as chairman of this group.

Prior to the actual rating process, member agencies are assigned those parameters most closly associated with their area of interest and authority. Each committee member then rates these parameters for the management units identified through stream system analysis. In geographic areas where member agencies lack authority or background, a committee member may choose to withdraw from the rating process for that particular area or stream system. Finally, after all rating forms are submitted to the chairman, composite total rating values are prepared for each management unit, by adding average rating values for each parameter.

A stream classification rating for the Upper Chehalis River Basin is shown in the right half of Table D-1. The maximum possible rating for a stream management unit is 24 while the lowest score would be 1.

TABLE D-2

STREAM RATING SYSTEM

Parameters		Basis of Rating	Rating Value
Wildlife Values	)	(Very high value or usage	4
Fish Values	)	(High value or usage	3
Scenic and Aesthetic Values	)	(Moderate value or usage	2
Navigation Values	)	(Low value or usage	1
Other Environmental Values	)	(No value or usage	0
Water Quality Standards	)	Class AA	4
	)	Class A or Lake Class	3
	)	Class B	2
	)	Class C	1

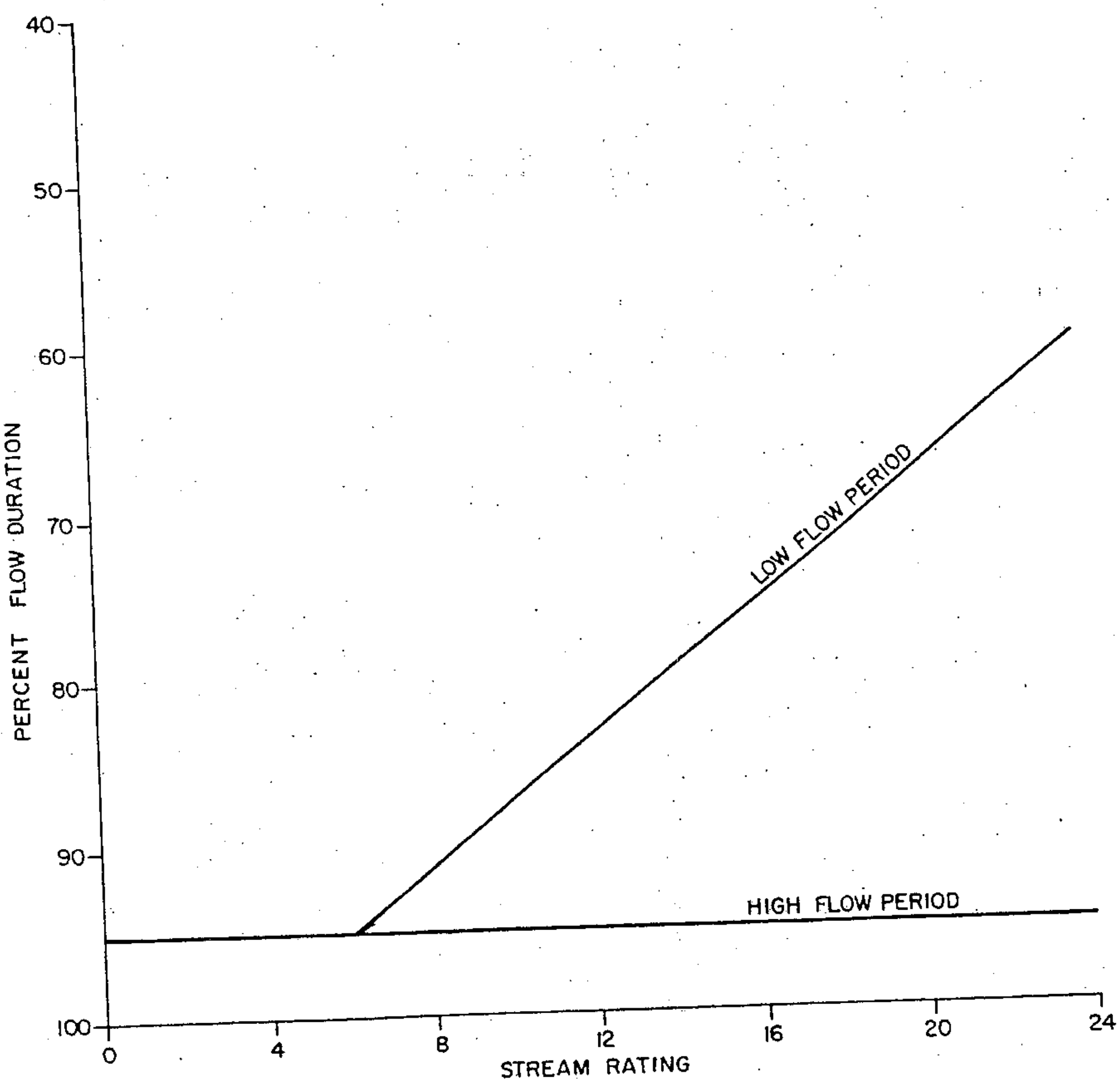


Figure D-3 CONVERSION CURVE
STREAM RATING TO PERCENT FLOW DURATION

ATTACHMENT 2

COMMENTS ON 173-518 WAC

BY KRIS G. KAUFFMAN, P. E.

July 9, 2012

173-518 WAC

Instream Flows for the Dungeness River

- **Brad Caldwell**
  - Washington Department of Ecology

- **Hal Beecher**
  - Washington Department of Fish and Wildlife

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Washington Department of FISH and WILDLIFE

2) Characterize stream bed and banks (survey, measure & categorize)

- Multiple transects to represent habitat types
- Fixed points (on transects) characterized by substrate and relative elevation (surveyed)

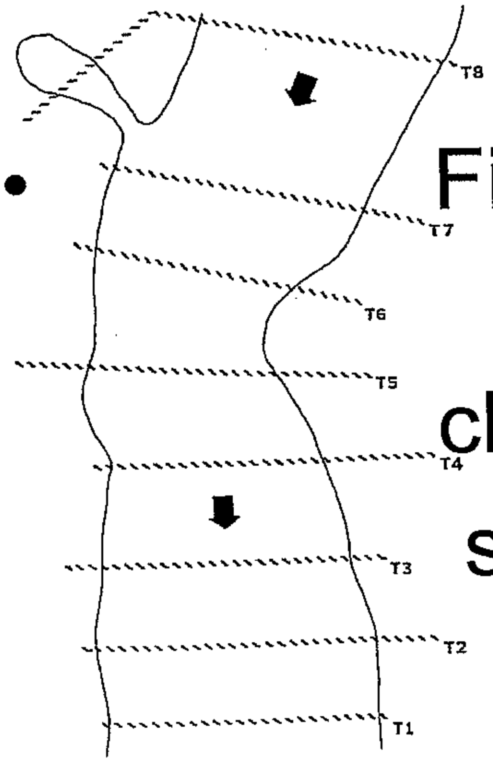


Figure 7. Plan view of the lower IFIM study site at river mile 2.3 on the Dungeness River.

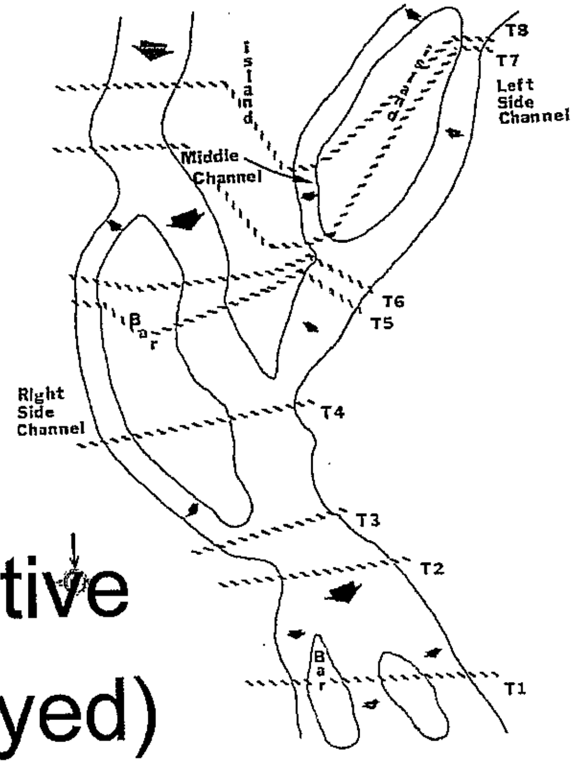


Figure 6. Plan view of the upper IFIM study site at river mile 4.2 on the Dungeness River.

Fish Habitat (WUA) results from PHABSIM model for lower site

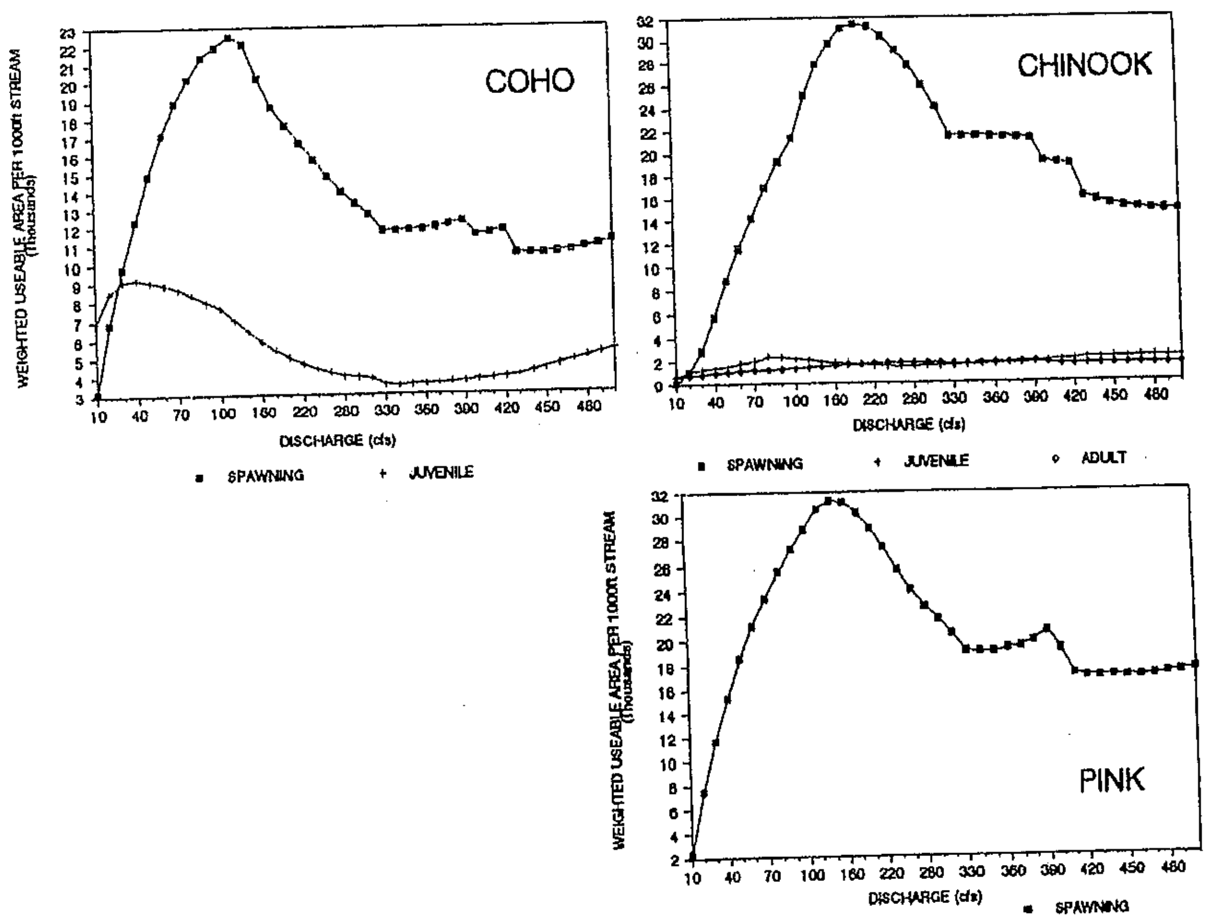
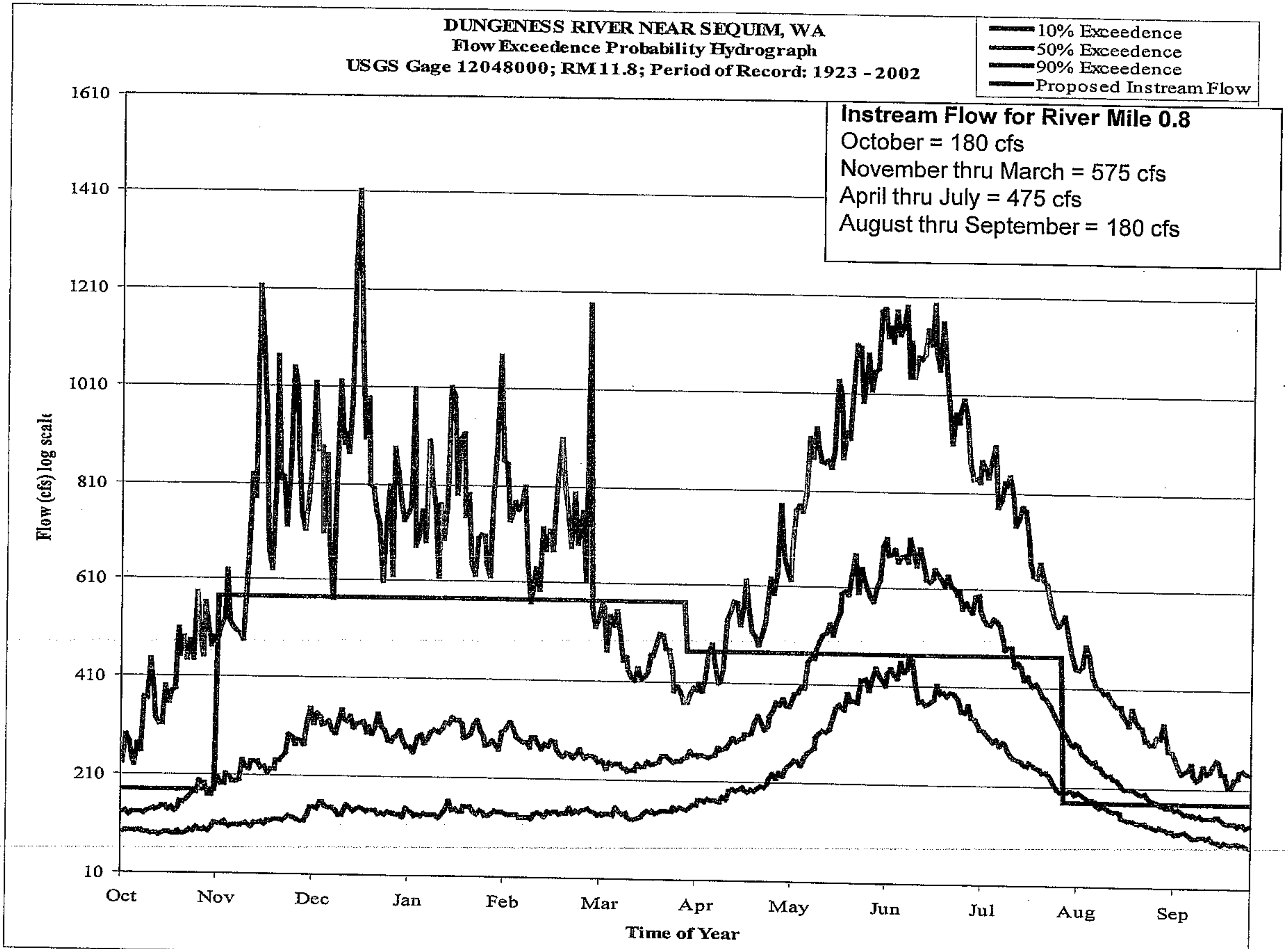
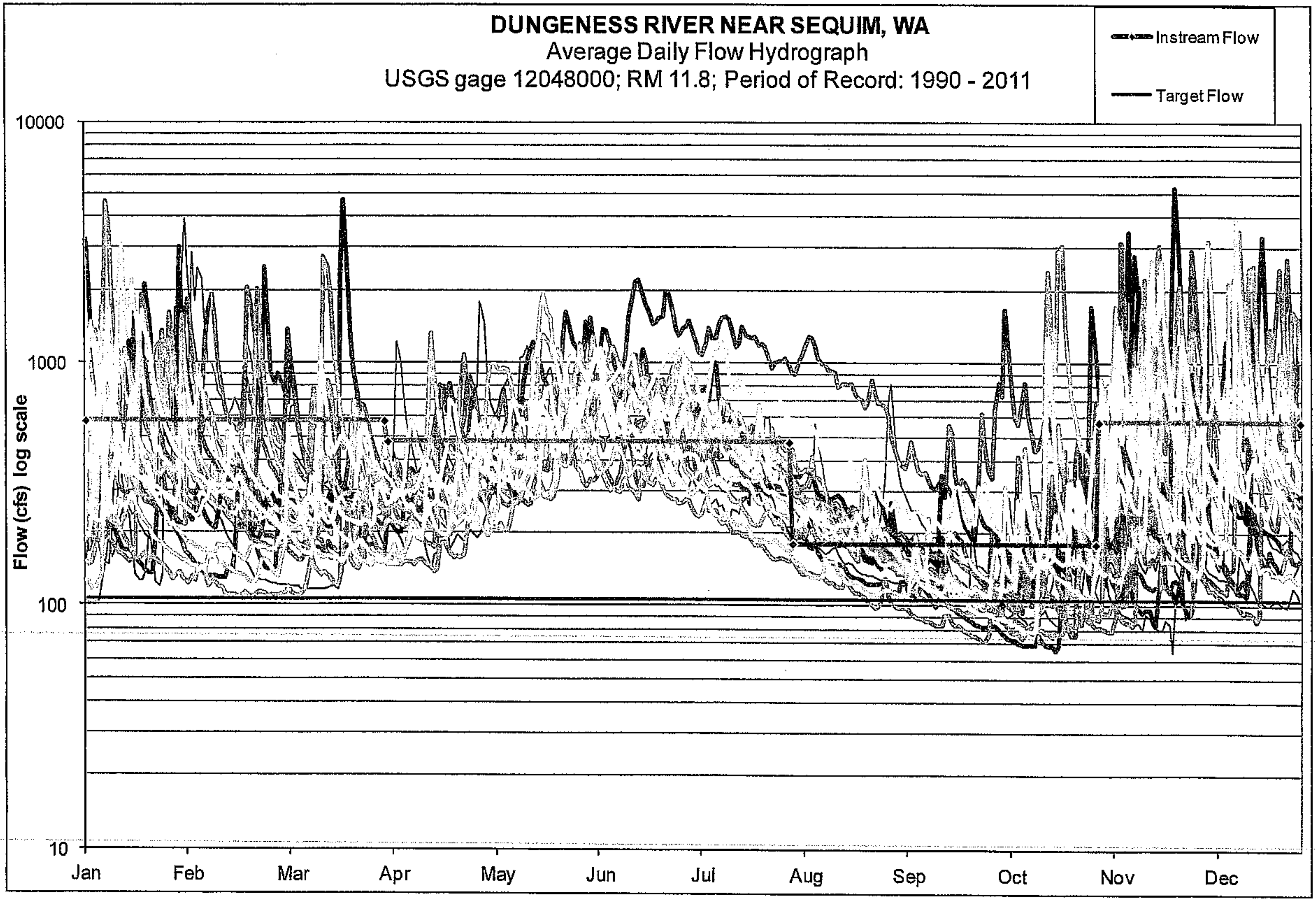


Figure 22. Predicted WUA of habitat for coho, chinook and pink salmon, from the combined models for the lower study site, river mile 2.3.



DUNGENESS RIVER NEAR SEQUIM, WA
Flow Exceedence Probability Hydrograph
USGS Gage 12048000; RM11.8; Period of Record: 1923 - 2002
10% Exceedence
50% Exceedence
90% Exceedence
Proposed Instream Flow
Instream Flow for River Mile 0.8
October = 180 cfs
November thru March = 575 cfs
April thru July = 475 cfs
August thru September = 180 cfs
1610
1410
1210
1010
810
610
410
210
10
Flow (cfs) log scale
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Time of Year


DUNGENESS RIVER NEAR SEQUIM, WA
Average Daily Flow Hydrograph
USGS gage 12048000; RM 11.8; Period of Record: 1990 - 2011
Instream Flow
Target Flow
Flow (cfs) log scale
10000
1000
100
10
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

ATTACHMENT 4
COMMENTS ON 173-518 WAC
BY KRIS G. KAUFFMAN, P. E.
July 9, 2012

Fish Habitat (WUA) results from PHABSIM model for lower site

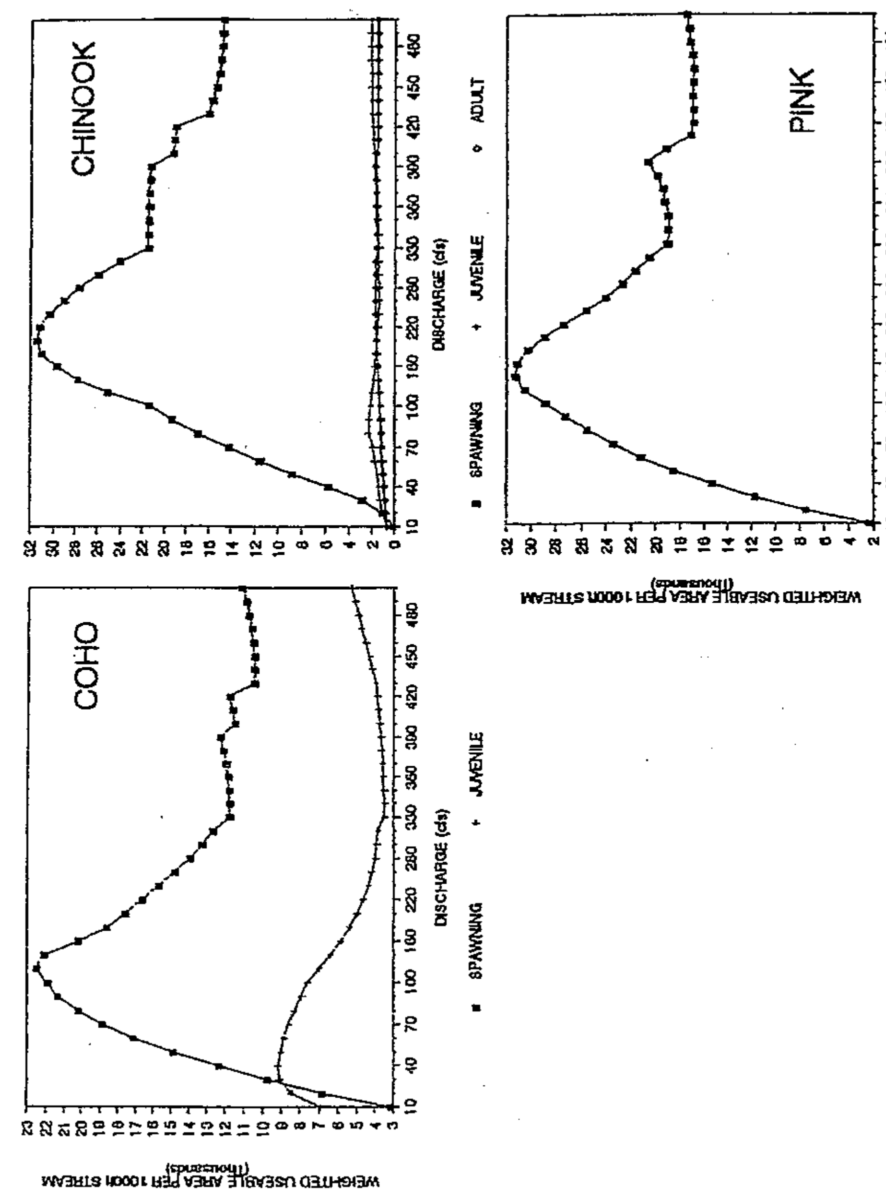
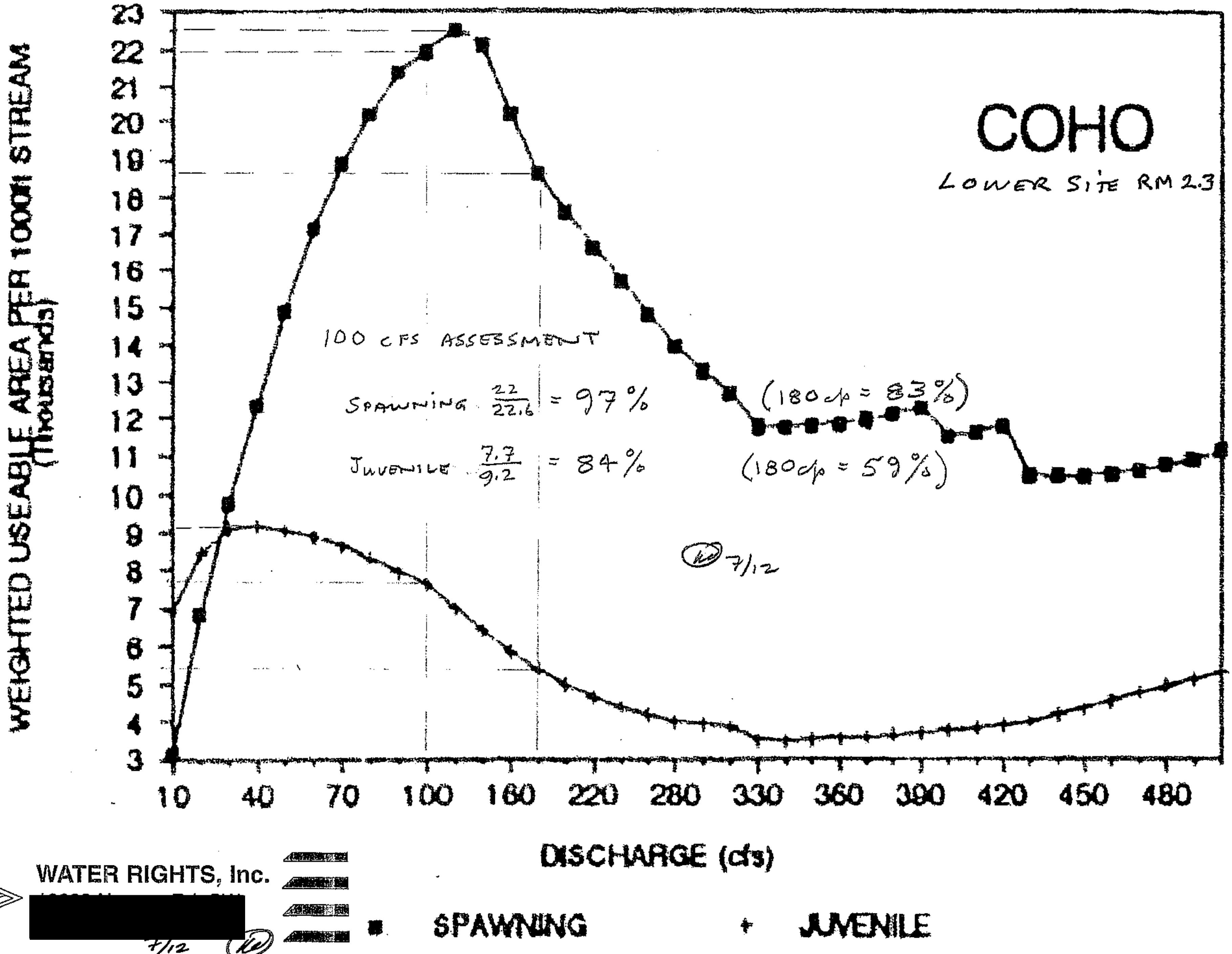


Figure 22. Predicted WUA of habitat for coho, chinook and pink salmon, from the combined models for the lower study site, river mile 2.3.



WATER RIGHTS, Inc.
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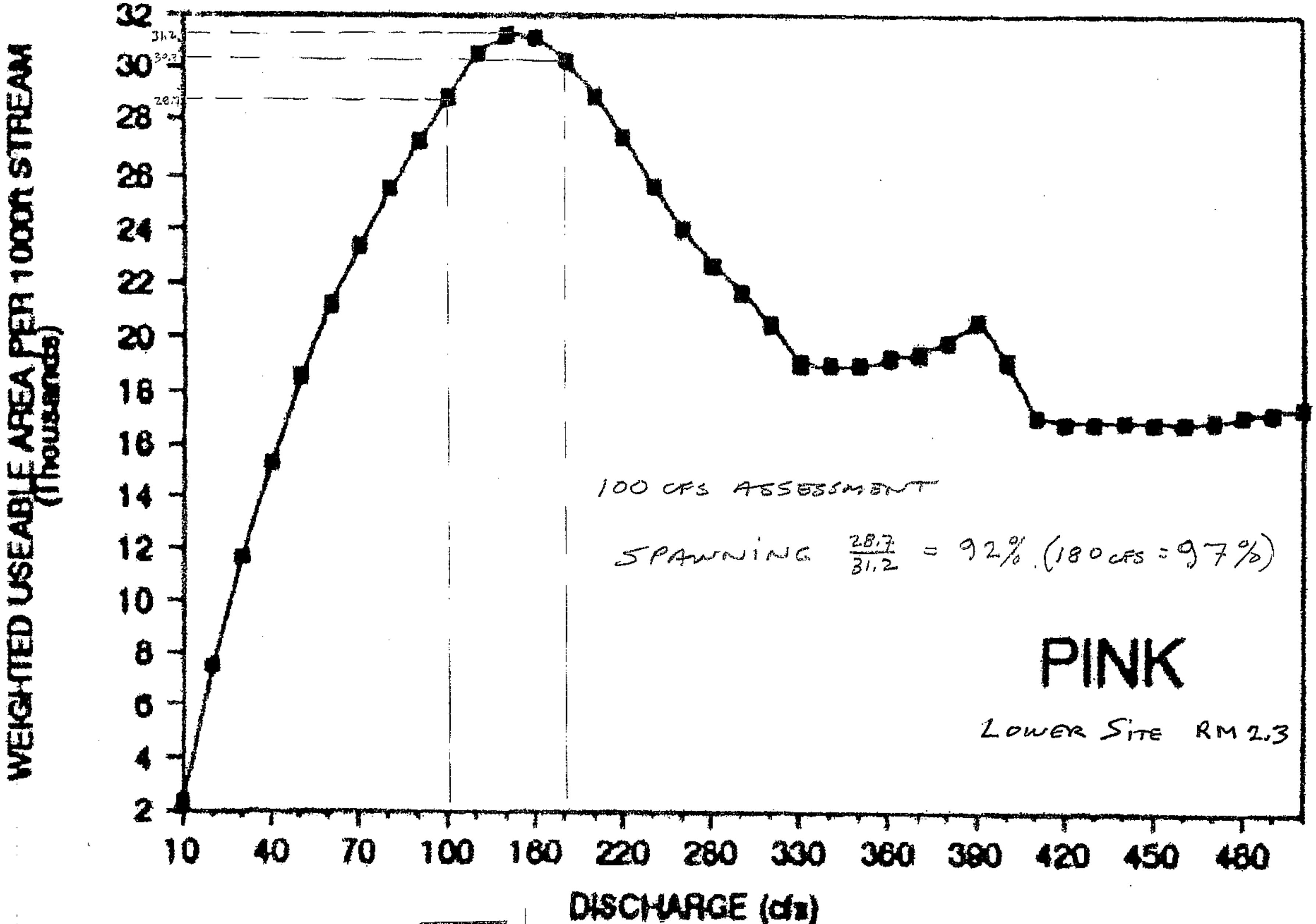
7/12
GRAPH 14-A COHO



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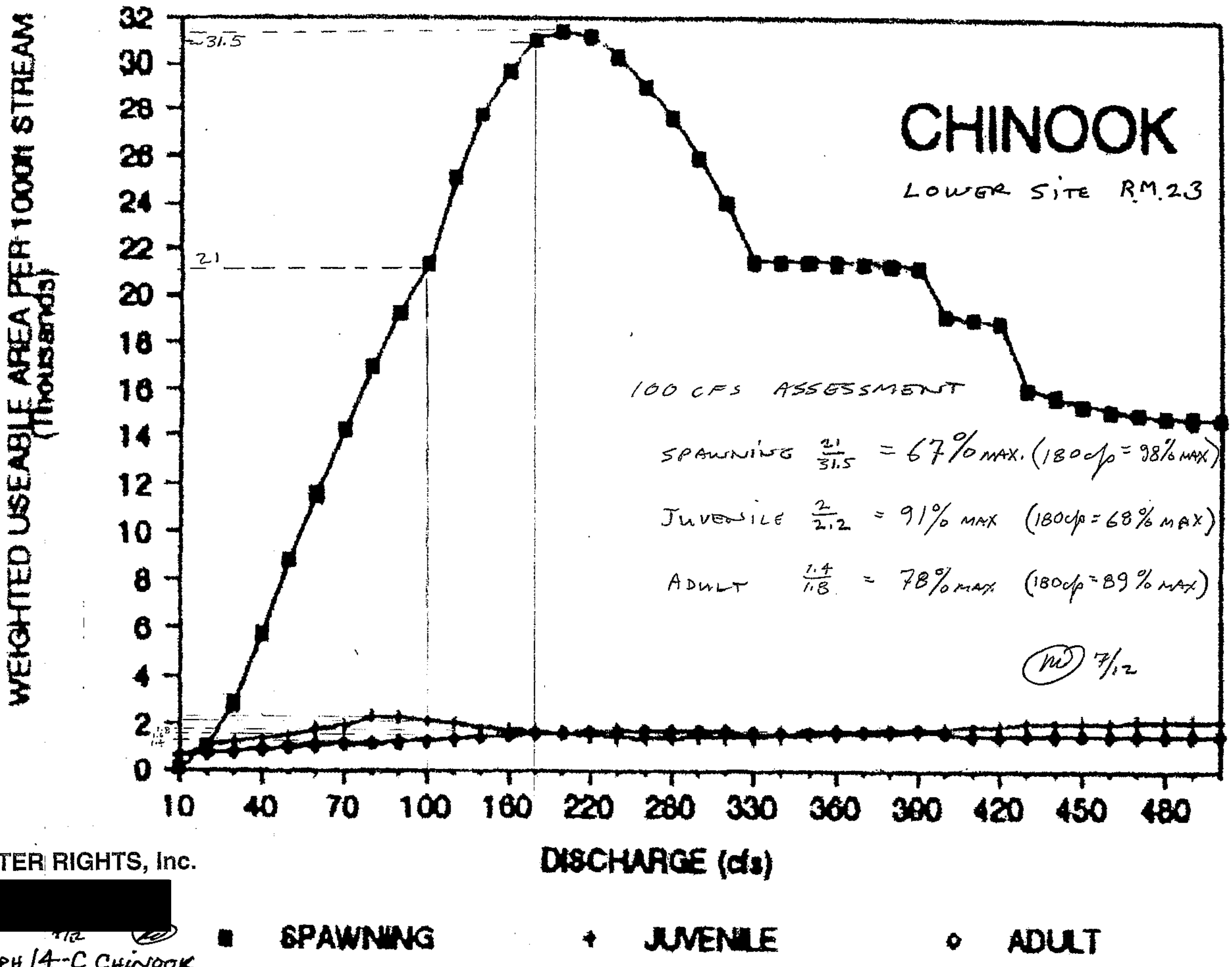
1/12
GRAPH 14-B PINK



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GRAPH 14-C CHINOOK