

# MEMORANDUM

# State of Alaska

TO: Mr. James Dischinger  
Project Manager  
Alaska Power Authority

DATE: May 1, 1985

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TELEPHONE NO:

FROM: Dr. Dana Schmidt  
Acting Aquatic Studies Coordinator  
Su Hydro Aquatic Studies

SUBJECT: Comments to IFRR

Attached are the Susitna Aquatic Studies Team comments to the second draft of the Instream Flow Relationship Report (IFRR) authored by EWT&A and R & M Consultants. A advance copy of these comments is being submitted directly to EWT&A and Harza Ebasco today to expedite production of this report.

If additional assistance with this report by us is required, please feel free to telephone me.

cc: L. Gilbertson/HESJV  
E. Marchegiani/APA  
E. Woody Trihey/EWT&A

Comments to the  
Instream Flow Relationship Report  
Volume No. 1  
February, 1985

by

E. Woody Trihey & Associates

and

Woodward-Clyde Consultants

Comments submitted by  
Alaska Department of Fish and Game  
Susitna Aquatic Studies  
May 1, 1985

## General Comment

We have reviewed the second (working) draft of the Instream Flow Relationships Report (IFRR) and feel that, although substantial editing did take place, further review and editing is required and that although consideration was given some of our comments to the first draft, many of the important points were not given sufficient consideration. These points are presented in the specific comment section of this review.

A major problem with the report remains the description and explanation of the IFRR modelling process used to describe habitat changes in the middle river. The explanation, although improved, does not adequately describe the model and its components. Without a detailed description or explanation of the model, it is difficult for the reader to understand how the model will yield new quantitative analysis and impact results. Also, sufficient justification has not been presented to justify the selection of this modelling approach over other approaches available. We suggest that this section be rewritten to describe the general analytical approach for the study rather than the specific modelling approach, and delay and description of the specific modelling approach to Volume 2 when it is complete.

Another area of consideration is with the selection of evaluation species. We suggest using chinook overwintering and a resident species such as rainbow trout or burbot as additional primary evaluation species. These species and life stages rely on mainstem affected habitat and could be significantly affected by project operation.

A third problem area is the suspended sediment section. Portions of this discussion contradict and conflict with other sections of this report. It is suggested that the author of this section review the report and edit this section to clear up conflicts and assure continuity.

A final point rests with the several meetings held to address chum salmon velocity suitability criteria. Information presented in this report appears to conflict with agreements made at previous meetings. This situation should be explained.

Specific Comments:

Page Paragraph

iv	1	With all due respect to Mr. Bell, his age and his position, we doubt that he contributed "flawless insights". Valuable perhaps, but not flawless.
xvii		As we stated in comments to the 1st working draft, we wonder how a summary report can be written and critically reviewed if each of the supporting technical reports have not been distributed for review and comment. This is especially true for technical report #5 on Aquatic Habitat.
1-1	1	...report <u>may</u> assist... It <u>may</u> also not be used or an instream flow <u>may</u> not be agreed upon.
1-1	2	(3) discuss... In the preface this is part of Volume 2.
1-2	1	...in this <u>volume</u> . This is an important clarification.
1-2	3	Why are only the three principal freshwater life-phases of the Pacific salmon considered? Why not a resident fish?
1-4	2	Extreme flows (non-typical) should also be mentioned as they are important in determining habitat quality.
1-5	2	Cite table III-1 for the first sentence.  Lake trout should be included in the sport fishery of the Susitna basin.
1-5	2	Although Susitna chinook stocks generally are not intercepted by the commercial fishery, the Tyonek subsistence fishery is a notable consideration.
11-1	1	...goal is consistent... there is a big difference between the maintenance of existing fish resources and the maintenance of habitat. These are not consistent.  <u>Thus</u> , the focus...
11-1	2	...fluctuate for many reasons. Perhaps the reasons or at least the important ones, should be stated.

Figure II-1 We debate the linkages drawn throughout this diagram and suggest that the figures be deleted and replaced with one that describes the relative importance of specific habitat conditions as they influence the use of habitats by fish.

11-6 1 ...six major microhabitat types...It would be helpful to be consistent with past terminology.

11-9 1 ...Studies, identification...has been of central...  
Because of this, physical processes...

11-9 2 ...analyzed to date to identify...  
...physical processes models...  
  
Insert the last sentence of this paragraph between the sentences ending with, "estimated" and beginning with, "thus".  
  
...application of a structured...  
  
Ground water upwelling can't be forecast, only estimated.

11-9 3 What does IFR mean?  
  
...make reliable tentative... How do we know whether or not they are reliable if the model isn't running and data has only been subjectively evaluated?

11-9 4 How can the IFR model be applied if it is not functional?

Figure 11-3 Ice processes and channel geometry conditions are important processes but have been omitted.

11-11 3 Volume I merely introduces the IFR models...

11-11 4 One major difference...  
...such as ice...there is no mention of ice in Figure 11-3.  
  
Another major difference is the that IFR analysis addresses only...  
...small number of evaluation species in a rigorous quantitative manner. Why? Justify these approaches and their differences from previous methodologies and why previous methods were changed.

- Figure 11-4 This appears to be more of an "analytical frame work" than a model framework.
- 11-13 2 These resevoir models...Reference the appropriate models.  
Sufficient progress...What about upwelling? It is questionable whether "sufficient progress" has been reached in this area.
- 111-1 1 Important resident species... This list is selective without rationale. What is merit be important? There could be several importance factors. Why are round whitefish more important than humback whitefish for example.
- 111-12 2 Most chum salmon in the middle Susitna River rear for one...  
The chum salmon rearing for one to three months does not agree with the May through mid-August outmigration time frame given. From what is known of emergence timing some chum salmon rear from May through about mid-august.
- 111-12 3 ...tributaries and upland...
- 111-12 4 Grayling use which aquatic habitats?
- 111-13 1 Burbot should be added to the resident species such as...
- Section III Comment. There is more information than what is presented here on the distribution and abundance of both juvenile anadromous and resident fish. It is suggested that this section be rewritten under the guidance of fishery biologists familiar with these species and their life phases in the Susitna River.
- 111-14 1 ...diversity of macro habitats...
- 111-14 2 We suggest you consider the possibility that habitat conditions are primarily influenced by channel structure as channel structure ultimately determines streamflow, water quality, and temperature conditions.
- Figure 111-1 This figure has been taken from an ADF&G report. Please reference it.
- 111-16 2 ...mainstem macro habitat types.
- 111-16 3 figure IV-2 contradicts the first sentence. Which is true?

111-16 5 Grayling and rainbow trout also utilize side channel habitats.

111-17 1 ...habitats are generally characterized...

111-17 2 ...a strong positive correlation... Is there a strong positive correlation? If so, please reference it.

111-19 3 Non-glacial may be a better term than clear water in this situation to avoid confusion.

111-22 1 Selection of evaluation species is not consistent with any ADF&G policy that we are aware of. If you feel it is, please reference the source.

111-22 1 ...evaluation species in this volume in thought to be... Other documents relative to this study have suggested other or additional species.

Therefore, the habitats of those species and their various life phases that are...

111-22 2 ...evaluation in this volume are...

We suggest adding chinook salmon overwintering juveniles as a primary evaluation species. This life phase has the highest mortality both species and could be significantly affected by project operation.

...may receive secondary... May receive is vague. What criteria will be used to decide whether secondary species or life phases will be considered?

Are the species listed in this paragraph in order of importance?

111-22 3 small numbers of salmon spawn...

111-24 4 ...than sockeye salmon (Sautner et. al, 1984).

111-25 3 Because juvenile chinook have...

Which habitats are to be selected as indicator habitats for these species?

111-25 4 See 111-1, 1 important resident species...

- 111-27 3 The physical characteristics... What relevance is this statement to the discussion?
- It is suggested that one resident species be used as a primary resident species. Specifically burbot or overwintering rainbow trout or burbot.
- Figure IV-I The scale is not valid if this figure was reduced. The figure should be referenced if it was taken from an earilier report.
- Figure IV-4 How were these estimated percent contribution calculated? Is there a reference? If not, please describe the process.
- Also, see the third sentence of the first paragraph on page 123 of the Fish report. Which is correct?
- IV-7 2 ...are not expected to exceed 10 percent... This is a fairly important point to cite as a personal communication? Something this important should be referenced to a project document instead of an individual.
- IV-7 3 ...generally results in inhospitable conditions... This statement is to broad to be taken seriously.
- IV-9 1 This does not consider that smaller substrates often embed and armor the larger substrates and thus affect habitat stability.
- IV-9 2 High streamflows also flush out sloughs and provide passage.
- IV-9 4 ...at least a few hunderd feet... A backwater often extends only tens of feet or sometimes thousands of feet. The distance reference should be omitted.
- IV-10 2 ...recognize the dominant influence...Is this statement meant to discuss the dominant influences? If so, what are the dominant influences? This paragraph needs to be expanded to clarify its meaning and to include information from Table IV-3.
- IV-10 4 Differentiation between three types of flow may be superfluous. The real question is what the fish require. They don't seem to care and use all three, so why differentiate.
- IV-13 1 Because the water... This statement is correct for downwelling but not for intergravel flow. Intergravel flow can have quite different characteristics especially if it comes from upland sources such as tributary confluences.

- ...soil properties. Include also transfer medium properties.
- IV-14 3 Please reference the last sentence of this paragraph.
- IV -15 1 The ground water component is not constant throughout the year. It varies in rate of flow, etc...
- IV-16 1 Under withproject... Currently ice staging causes actual winter stages of 20,000 cfs and above. It is thus very likely that upwelling will be reduced as stated in a comment on page IV-70. Please be consistant.
- IV-16 2 ...facilitate fish passage...Please reference Sautner et al (1984).
- IV-17 2 What about after ice formation? State what happens. See previous page.
- IV-18 4 ...six aquatic macro habitat types...
- Table IV-4 We believe that several of the catagories may be ranked incorrectly. A copy of this table is attached with suggested changes indicated.
- IV-20 1 As suggested in the first review, this paragraph is unclear. For example, how does plan form and channel formation differ? There is confusion in the description of channel forming processes. Once every several years? Once in 20 years?
- IV-20 2 Streambed material in... Is this statement referenced or only opinion?
- The cobbles and boulders...Smaller substrates are also worked out of tributaries by flood events but do result in armoring so what point is being made here? Would not smaller substrates consolidate the larger substrates to cause armoring?
- IV-21 2 It is stated previously that ice processes are the primary influences of channel shape (See table IV-4).
- Table IV-5 As in Table IV-4, tributaries and tributary mouths should be seperate catagories.
- There will be no project effect on sediment transport processes in tributaries, only at tributary mouths.

- 1V-27 1 Why is a warm-water release used to develop table IV-5 when a warm-water release hasn't been agreed to yet? It seems that a cold water release should also be considered. This report should be objective and discuss all facets of impact.
- 1V-28 2 ...Aquatic macro habitat...  
...six aquatic macro habitat...  
...each aquatic macro habitat...  
...turbid-water aquatic macro habitat types...  
...these aquatic macro habitat types...  
...quality if fish habitat with each of the aquatic macro habitat...
- IV-29 During winter months...Please reference this statement.  
  
What about Deadman or the Clarence lakes systems and the Oshetna Watershed?
- IV-3 1 ...maintain a few scattered...Some years there is more than a few scattered open leads present in this reach.
- IV-31 2 Is this referring to the Susitna River as implied? If so, is this a correct reference? What limits winter production? You need a Susitna reference for the last sentence.
- IV-32 1 What influence does temperature have? Is it all velocity dependent?
- IV-32 3 Some of this production... What effect does this have on downstream production?
- IV-33 3 Because side sloughs... Does this statement consider staging because of ice jamming?
- IV-34 2 What is the nutrient source for this algae? Do decaying salmon carcasses have a role?
- IV-34 4 These streams provide... What about side sloughs? They provide overwinter habitat.
- IV-35 2 Just what is the point being made here?
- IV-37 4 Additionally, if... Earlier in this report, it was stated that flows would not be sufficient to allow this to occur. Which is true?
- IV-38 1 Reduced turbidity and increased subsurface flow... This will be true only if it occurs.
- IV-38 1 ...primary production may increase... At 300-600 NTU's?

The suspended sediment section does not fully agree with the temperature and ice section discussions. The author of this section should review these other sections to ensure continuity.

- IV-45 2 Does Table IV-9 support this statement. Table IV-9 doesn't portray a clear understanding of this situation.
- IV-48 2 What effect does this condition have on incubating salmon eggs?
- IV-48 4 What effect, if any, will the reservoir have on groundwater heat balances? Will increased ground water temperatures occur and what effect, both good and bad, would this have on the various life phases of fish.
- Table IV-10 Is this reservoir inflow matching or a warm water release? Should not winter temperature be presented also?
- Table IV-11 Which dam scenario is being referred to here?
- IV-51 The most notable effect... Other notable effects are reduced summer temperatures and increased winter temperatures. What are the impacts of these effects.
- Table IV-13 Which dam? See above table IV-11.
- IV-55 1 The section on project temperature effects is confusing. It does not clearly state the winter temperature effects of the project. It also does not clearly state how tabular data were derived. It needs clarification.
- Figure IV-8 Some frazil ice also occurs in backwater and slough habitats.
- IV-67 4 What will anchor ice formation, if any, be like under with-project conditions and what will its effect on staging be under both cold and warm releases?
- IV-69 4 What effect would a "thicker than normal" ice thickness have in the lower reach? Also, why is the lower reach discussed in this report?
- IV-70 2 Ice processes... This statement conflicts with earlier statements. See page IV-25.
- The river stage observed... this statement conflicts with earlier statements. See page IV-16.
- IV-71 1 The beneficial as well as adverse effects should be discussed.

- V-1 1 The relative fish habitat value of one habitat...  
Six major aquatic macro habitat types...
- V-1 3 Surface areas of... Are not side sloughs clear water habitats at times?
- V-4 2 A specific area... Specific areas? Were all areas of the river assigned to a specific area?
- V-11 1 ...outmigrate to marine... What about resident fish?
- V-12 3 Chinook spawn only in tributaries.  
... have shallower minimum.. This statement is confusing.
- V-15 2 Backwater from the mainstem...perhaps a table with supporting data could be presented.
- V-16 1 ...natural flow regimes. Give more data to support this statement or reference it.  
  
This paragraph could be expanded considerably as there is much data available on the subject matter.
- V-16 2 Beaver dams typically restrict passage in these habitats upstream of the backwater effects.
- V-19 1 ...will be breached, on the average, once every two years. Yes, but salmon spawn every year. What is the effect of three or four consecutive years of non-breaching conditions.
- Table V-3 There is an error in the frequency of slough 9. It should be  $31/35$  (years) = 89%.
- Figure V-6 Spawning areas should be noted on this figure.
- V-28 1 ...velocity criteria from the literature...As we have discussed with you in previous conversations, we disagree with this conclusion. We believe the literature data from other river systems do not warrant changes of Susitna based data. For this reason, we do not endorse the rise of literature based curves.
- V-28 3 Sockeye salmon at three side sloughs and four side channel locations.
- V-30 2 The magnitude... If this statement is true, why are WUA values addressed below as an index to spawning habitat and why do you plan to use surface area responses as a measure of habitat in the RR model.

for habitat category III sites... As commented on the preliminary draft, we disagree. It is related to flow, however, the magnitude of the relationship is lessened in comparison. This is especially true before overtopping.

A comparison of the WUA... A small amount of usable habitat exists in relation to total suitable area but not to that present in other habitats.

The magnitude of the WUA... This is only partially true as both upwelling and substrate are only partially fixed. Areas of both change in quantity and quality with changes in streamflow.

- V-30 3 The highest value occurs... Is this statement referring to slough flows?
- V-32 1 ...by 16 and 53 percent... Where did you get these numbers?
- V-32 2 Five cfs seems high for upper side channel 11.
- V-37 1 This paragraph is well done.
- V-37 2 ... spawning habitat results primarily...
- V-37 2 ...flows for non-breached conditions... Are these the same as presented in Chapter 7 of the ADF&G Report No. 3?
- V-40 1 As commented before, this is a reasonably good discussion of ADF&G material except for the problems noted. It needs to be made clearer that the important factor is the shape of the curve and not necessarily its magnitude.
- V-40 3 Cover is used... This sentence should be referenced.
- VI-1 2 Channel morphology should be considered. Although it is relatively constant, it in effect determines streamflow, and the thermal and the water quality regimes of each habitat type.
- VI-2 2 Suspended sediment load also limits spawning and rearing potential by cementing substrates making them unusable.
- VI-2 3 Channel gradient and morphology should be included in this discussion as they determine overtopping flows which appear to be a prime determinant of habitat quality in the middle river reach.
- VI-3 2 Resident fish should be included in this discussion. They also utilize these habitat types.
- VI-3 3 ...result in relatively high survival...  
...rear near their natal....
- Figure VI-I Chum salmon should be added to tributary rearing from May through July.
- VI-6 1 Chinook overwintering should be mentioned as a rearing phase because this period has the highest mortality. See page 111-22.

- VI-6 2 The quantity of these also change with changes in discharge. Especially with fixed boundry variables such as substrate and upwelling.
- Table VI-2 How were these numbers assigned? If methods are not presentable, say that they are professionally judged. ADF&G staff should be consulted about these.
- VI-8 2 In winter pools... Earlier in this volume it was clearly stated that interstitial spaces in pools are filled with fines. Which is true?
- Table VI-3 The headers would be best arranged from left to right as Side Slough, Tributary Mouth, Upland Slough, Side Channel, and Mainstem.
- VI-12 1 Both positive and negative effects of high summer streamflows effects should be discussed.
- VI-12 2 ...sediment transport regimes (Figure VI-2)...
- VI-12 3 ...increase five-fold... Which flow scenerio are you referring to?
- VI-15 3 ...stimulate algae growth..Not at 600 NTU's. See page IV-38.
- Figure VI-3 See attached copy for suggested relationship.
- VI-17 1 It is likely... It is clearly stated on page IV-70 that a mainstem staging discharge of 20,000 cfs is needed to maintain upwelling at present levels. Please explain how a winter discharge of 10,000 cfs without ice cover can increase upwelling.
- The effect of possible elevated winter upwelling temperatures or incubation should be mentioned.
- A lack of ice cover would also reduce upwelling influenced by ice cover.
- VI-18 As previously commented, this section generally sounds like a endoresement of the project. It gives only the positive aspects of project construction and operation on the fishery. It does not objectively present any detrimental impacts which surely will occur. Both adverse and beneficial impacts should be objectively discussed.
- VII-2 Ashton, George D. 1978. Is this reference complete?
- VII-7 Please delete the reference to Schmidt, D. 1984 personal communication and reference reports or referencable technical memoranda.

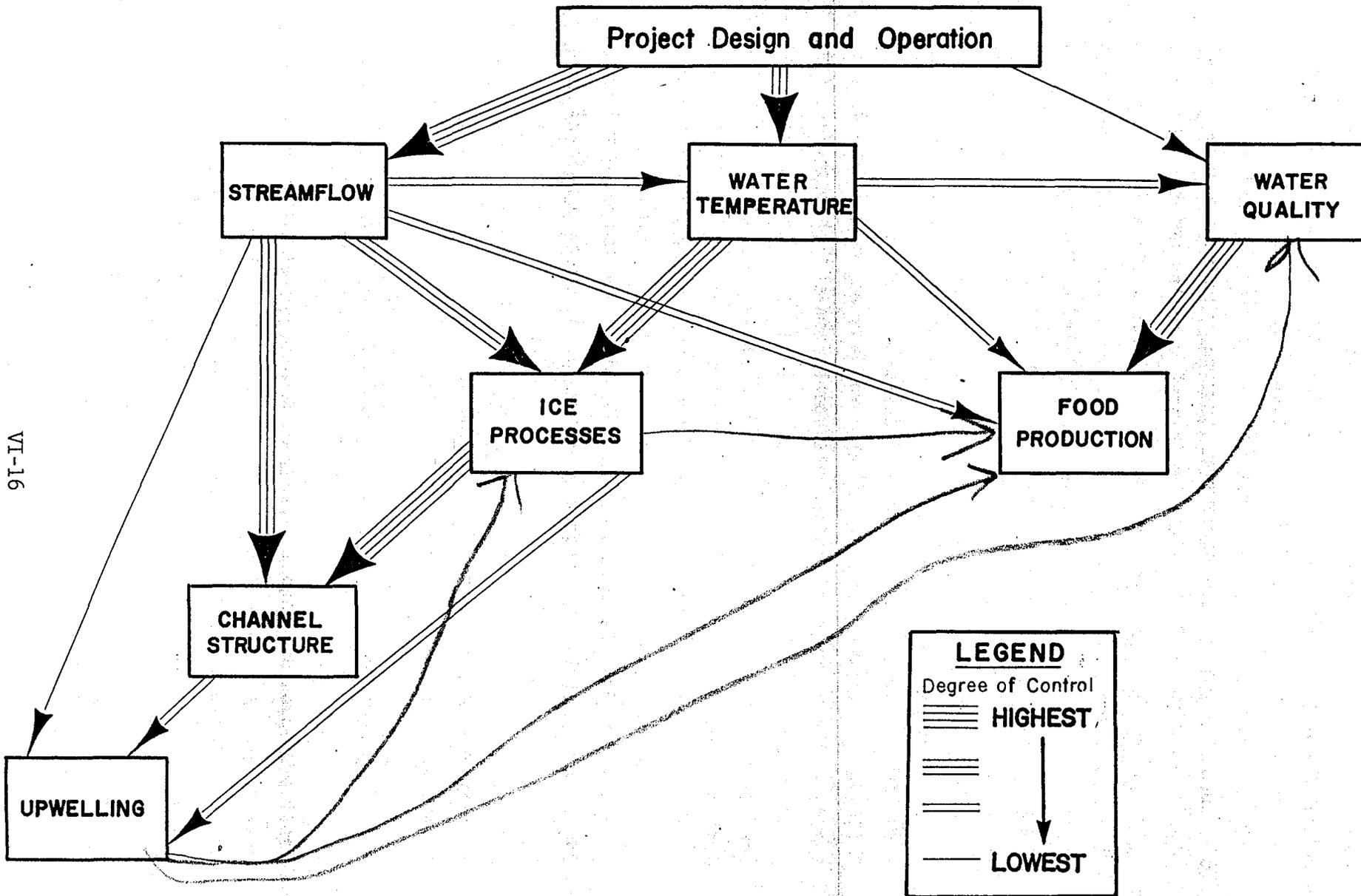


Figure VI-3. Ranking of habitat component in accord with the degree of control project design and operation might provide them.

Table IV-4. Sediment transport processes and components and their relative importance in the formation and maintenance of habitat.

Habitat Type	Sediment Load Components		Sediment Transport Processes				
	Suspended	Bed	High Flow Events	Flooding Due to Ice Jams During Breakup	Mechanical Scour by Ice Blocks	Anchor Ice Processes	Shore Ice Processes
Mainstem and Large Side Channels	Secondary	Primary	Primary	Secondary	Primary Secondary	Secondary Minor	Minor
Side Channels and Side Sloughs	Primary	Secondary	Primary	Primary	Secondary	Minor	Minor
Tributary and Tributary Mouth	Minor	Primary	Primary	Minor	Secondary Minor	Minor	Secondary Minor
Upland Slough	Secondary	Minor	Secondary	Minor	Minor	Minor	Minor

6I-19

Suggest separating into 2 categories.

Doesn't one of these have to be primary?

See page IV-20 should this be primary