

PRELIMINARY PROPOSAL FOR MANAGING MINIMUM FLOW BASED ON FISHERY PERFORMANCE

February 2015

The Idaho and New Sweden Irrigation Districts (Districts) produced this proposal to outline a possible approach for developing and operating hydroelectric facilities on the Idaho and Great Western canals using water withdrawn from the Osgood Reach of the Snake River. Specifically, this proposal describes the principles that would be used to determine the minimum flow requirements for the Osgood Reach over the lifetime of the hydroelectric project. Minimum flow in the Osgood Reach is seen as a critical factor in sustaining the valuable salmonid fishery in this reach. The objectives of this proposal are:

- establish conservative startup minimum flow requirements in order to avoid unforeseen adverse effects on the salmonid fishery
- establish guidelines to continually improve knowledge of the Osgood Reach fishery over the project lifetime to inform decisions on minimum flow
- provide a set of rules under which the minimum flow requirement may be decreased to enhance power generation, or increased to sustain the fishery, over the life of the project
- establish other guidelines for cooperation between the Districts and project Stakeholders

It is the hope of the Districts that this proposal would lead to an Agreement between the Districts and Stakeholders that would become a part of the FERC license authorizing construction and operation of the hydroelectric project.

BACKGROUND

The Idaho and New Sweden Irrigation districts are proposing to construct two hydroelectric plants that would utilize Snake River water for power generation. Water would be diverted from the Snake River and conveyed downstream via existing canals for about 3 miles and then returned to the Snake River. Hydroelectric operations would reduce the quantity of water flowing in the mainstem Snake River and could potentially affect fish, wildlife and other resources dependent on water flow. The irrigation districts have conducted studies to evaluate these potential resource impacts including a two-dimensional flow model used to analyze fishery habitat and geomorphology of the Snake River in the project reach. One of the main purposes of these studies was to guide selection of a minimum flow requirement for the mainstem Snake River that would appropriately balance power generation with protection of the existing resources.

Reduced flows, as a result of power production, would occur in the Snake River from the Idaho/Great Western Diversion Dam to the power plants. This section of river is referred to by the Idaho Fish and Game as the Osgood Reach. Currently, median flow in this reach peaks at around

10,000 cfs during summer irrigation season and reduces to about 2,400 - 3,000 cfs during non-irrigation season.

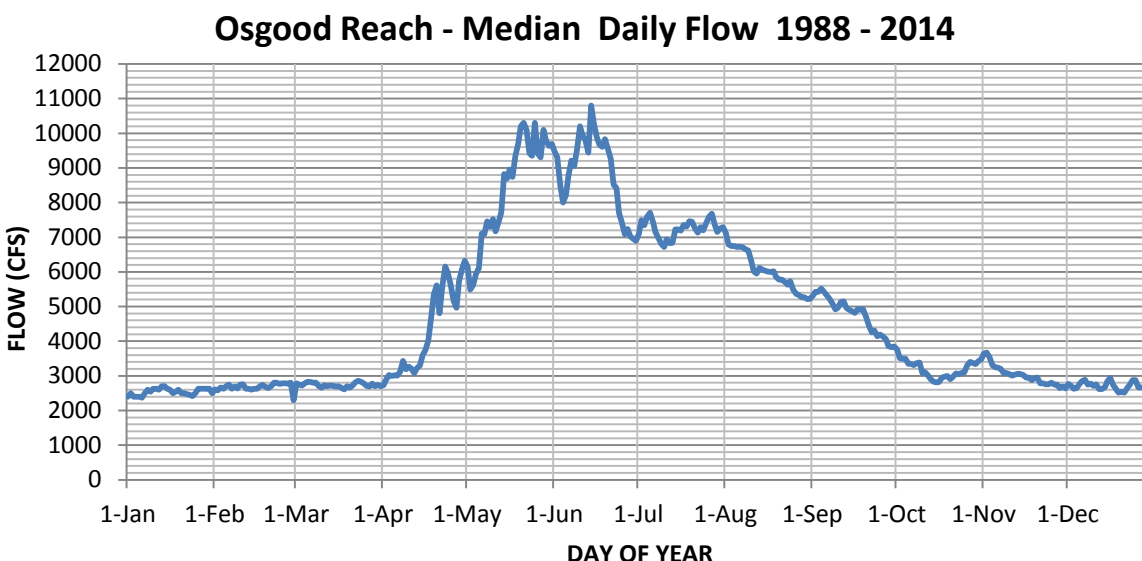


Figure 1. Median daily flow in the Osgood Reach of the Snake River (Figure based on data from USGS Gage No. 13057155).

Fish populations were assessed by electrofishing a portion of the Osgood Reach in 2011 and 2013. Results showed that the population was relatively low (350 – 1050 trout/mile) for that size of river and consisted primarily of non-native brown trout and rainbow trout, with few native cutthroat trout present (Figure 2). However, fish were often large and growth rates were high. Table 1 compares fish densities in the Osgood Reach with other trout fisheries on the Snake River system in southeast Idaho.

Power production at the proposed plants would be maximized using a minimum flow of 1,000 cfs. The two-dimensional flow model predicted that overall fish habitat would be greater at 1,000 cfs than at 2,500 - 3,000 cfs. However, these habitat results were counterintuitive when viewed in comparison to other winter flow studies in nearby systems. Also, the two dimensional flow model predictions were derived assuming ice-free open water conditions, which is often not the case in the project reach during winter. Therefore Stakeholders were hesitant to support flows reduced to 1,000 cfs.

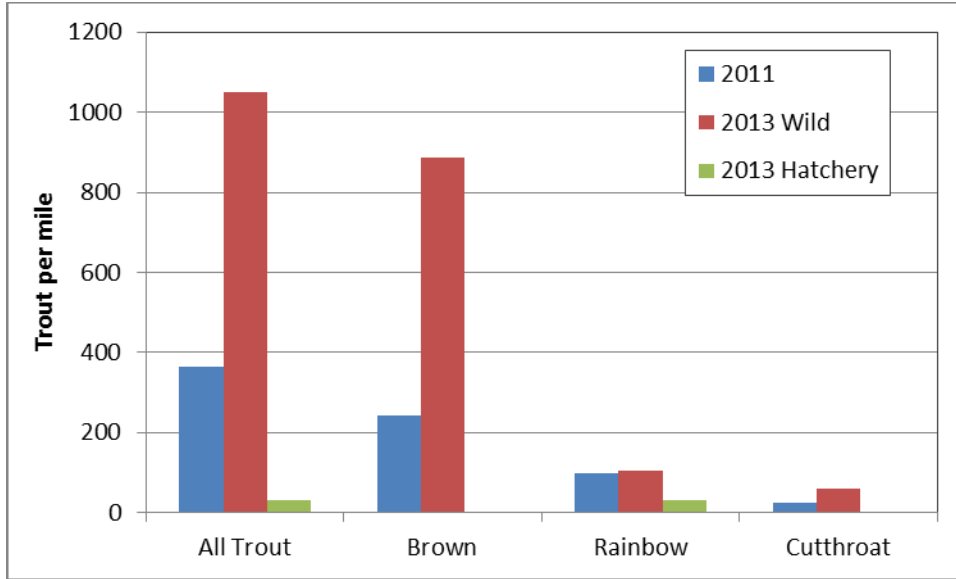


Figure 2. Trout population estimates completed by the Idaho Department of Fish and Game in the Osgood Reach of the Snake River (based on data from Schoby et al. [2013] and Idaho Fish and Game unpublished data).

Table 1. Comparison of trout density in selected reaches of the Snake River in southeast Idaho based on data from Schoby et al. [2013].

Fishery	Population
Osgood Reach	350 – 1,050 / mi
Henry’s Fork (Box Canyon)	3,200 / mi
South Fork (Lorenzo)	2,000 / mi
South Fork (Conant)	3,500 / mi

In 2013, IDFG observed that “The presence of juvenile brown trout, Yellowstone cutthroat trout, and rainbow trout indicate that reproduction is occurring in the Osgood reach. However, recruitment sufficient to support optimum densities in the adult population is likely limited, based on the minimal amount of available spawning habitat observed during our fall surveys” (Schoby et al. 2013). Despite results from flow modeling, fish managers remain concerned that reducing flows for hydropower could further reduce spawning habitat availability, particularly for fall spawning brown trout, and adversely impact fish populations in the Osgood Reach.

Both the irrigation districts and fish managers agree that conducting additional studies in an attempt to quantitatively predict effects of flow changes on fish populations would be expensive and, in the end, unlikely to substantially reduce uncertainty. Furthermore, based on habitat modeling results and on comparison to trout population densities in nearby rivers the Districts believe that the Osgood Reach fishery has significant potential for improvement. Therefore, the Districts propose an adaptive management approach whereby the hydroelectric power generation can be incrementally increased while closely monitoring and sustaining the fishery, wildlife and recreational resources of the Osgood Reach.

PART I - FERC LICENSING AND CONSTRUCTION

The Districts are pursuing a FERC license to install power plants on both the Idaho and Great Western Canals. Under this proposal the license application would specify that power generation would be limited by a requirement to provide, at all times, a suitable minimum flow past the Diversion Dam. The initial minimum flow at startup would be 2,000 cfs. Minimum flow would be measured at the existing USGS gauge¹.

Under this proposal the license application would also include a plan to modify the existing channel on the east side of the Snake River immediately downstream from the diversion structure (Figure 3). The channel would be modified to provide quality spawning habitat² that would function at high and low flows in order to support spring and fall salmonid spawning.

Under this proposal the license application would require ongoing monitoring of fishery conditions in the Osgood Reach. Minimum flow decreases below 2,000 cfs would be allowed subject to maintenance of fish populations at or above pre-project levels. However, the minimum flow requirement would never be more than 2,000 cfs or less than 1,000 cfs.

An Agreement between the Districts and Stakeholders would be developed based on this proposal. The Agreement could specify additional fishery enhancement measures that might augment fish populations or propose additional monitoring requirements that might improve understanding of Osgood Reach fishery dynamics. These measures could be implemented by consensus between the Districts and Stakeholders and, if successful, help support both fishery protection and enhanced power generation.

¹ Use of the Great Western North Spillback and Idaho Canal Spillback would cease during non-irrigation season so that the USGS gauge would measure flows representative of the flow past the dam.

² The Districts estimate that, with a reasonable development effort, this 2.5 acre channel can yield 1/4 acre or more of spawning habitat.

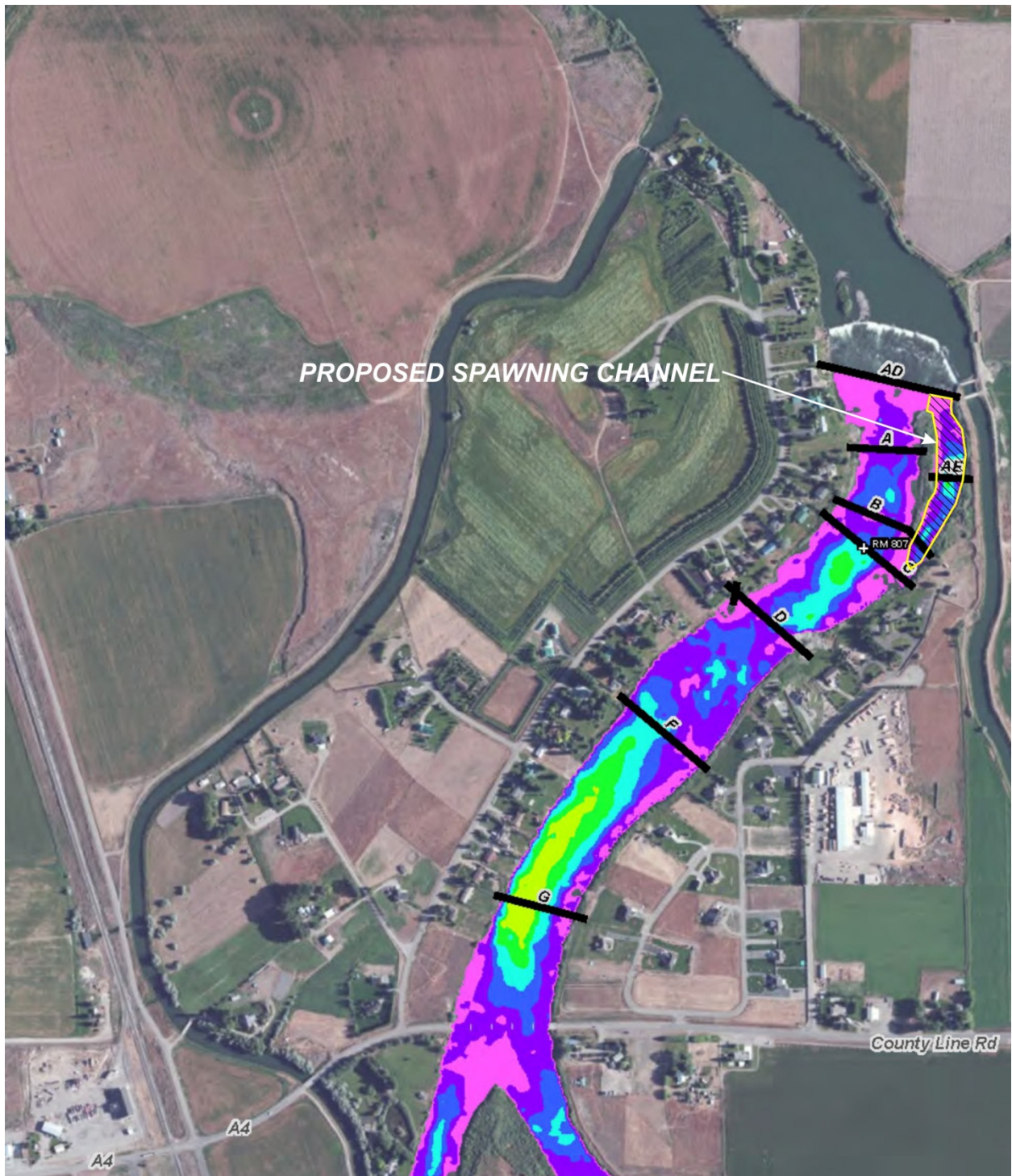


Figure 3. Location of proposed spawning channel.

As part of the Agreement project Stakeholders would support the Districts' efforts to obtain their FERC license. Once the FERC license is obtained the Districts would construct the project according to the requirements of the license and the Agreement. Stakeholders would cooperate with the Districts in their efforts to operate the project and implement measures aimed at fishery monitoring and enhancement.

PART II - OPERATION

The Districts are interested in reducing the minimum flow requirement below the 2,000 cfs startup level in order to use additional water for power production. Stakeholders wish to protect fish populations from declines related to lowered flows. Therefore, the Districts propose to implement measures to boost fish populations in the Osgood Reach with the intent that minimum flow requirements would be progressively lowered as long as fish abundance remains at or above background levels. Development of a high-quality spawning channel is one of these measures.

Background levels will be determined by IDFG sampling of the Osgood reach during 2015, 2016 and 2017 using the same methods that were employed during the 2011 and 2013 surveys. Background population levels will be assumed to be the average of the 2011, 2013, 2015, 2016, and 2017 population levels and will be based on all salmonids without criteria for the proportion of the population made up of various species.

The Districts wish to begin measures to augment fish populations immediately in order to enable lowering of the minimum flow as soon as possible after project startup. Therefore, the Districts propose to install and operate egg hatch boxes at the head of the Osgood Reach beginning in the spring of 2014. Eggs planted in the hatch box will be obtained from IDFG as eyed eggs and will be fertile offspring of either South Fork or Henrys Lake Yellowstone cutthroat trout (YCT) stocks, Jackson Lake Fine-Spotted Cutthroat stock, or other stock recommended by IDFG. Fish introduced in this manner will not be included in the fall 2015 fish sampling since they will be too small to be recruited to the electrofishing gear. However, hatch box produced fish will be large enough to be collected during 2016 and 2017 sampling and should not count as part of the overall background population. For the purpose of determining the background fish population the Districts propose that the background number of YCT present in the Osgood Reach be taken as the average of YCT present during 2011, 2013, and 2015 only.

The hatch box strategy should enable the Districts to determine if increasing the fish population in the Osgood Reach using YCT is viable. Using YCT would be preferable, as they are native to the area, but may not be practical. IDFG's out-planting of 10,000 marked hatchery YCT in 2012 resulted in none of them being collected during the fall of 2013 (D. Garren, pers. comm.). Marked hatchery rainbow trout fingerlings out-planted under the same circumstances were collected during 2013. If the YCT experiment fails to increase fish populations, the Districts may switch to hatch box out-plants of rainbow trout and/or brown trout. Using hatch boxes to out-plant fish in the location of the spawning channel will also induce adults to return to that area and use the spawning channel as adults, thus sustaining increased fish populations. If rainbow trout out-planting is needed, the Districts will request that IDFG allow out-planting of fertile rainbow trout, as continued population

increases are highly dependent on use and success of the spawning channel, which may take several years to fully seed at current population abundances.

Beginning in 2018 (the projected first year of hydroelectric operation) and continuing through 2022 the Districts will operate the project with a 2,000 cfs minimum flow. The Districts will hire a contractor to conduct annual sampling in the Osgood Reach. The contractor will be approved by the stakeholders and an IDFG (or other stakeholder representative) will be invited to be present during sampling. The contractor will produce a report once collections have been completed. The "current" fish population will be taken as the 5-year moving average count of all salmonid species combined.

After 2022, if the current population is above background, the Districts will request lowering of the minimum flow requirement. IDFG has expressed an interest in making any minimum flow requirement reductions slowly, with time to evaluate the effects prior to any further flow reductions. The Districts agree to this method and suggest that the basic minimum flow increment be set at 250 cfs and that any change in minimum flow be sustained for five years before any additional change is considered. However, the Districts request that larger minimum flow reductions be allowed in cases where substantial population increases above background have been achieved. For example, if the fish population doubles compared to background, a larger flow reduction may be considered versus a fish population that is 10% above background. If minimum flow becomes reduced below 2,000 cfs, then the criteria for requiring increases in minimum flow will be based on the same 5-year moving average population used for minimum flow reductions.

IDFG planting of hatchery fish has the potential to increase fish populations in the area. Before background population level has been determined this has the potential to adversely impact the Districts since it would artificially inflate background levels. After background population level has been determined it has the potential to benefit the Districts since it would artificially compensate for any adverse effects that may occur due to lowered flows. Therefore, Stakeholders would agree that all hatchery fish would be marked and will not be included in the population estimates for either background or comparison to background purposes.

Table 2. Example of the proposed minimum flow adjustment proposal based on a 2018 startup date.

Year	Hydro status at year end	Minimum Flow	Background population estimates ¹	Current population estimates ²	Fishery enhancement status
2015	Licensing	None	2011, 2013, 2015	-	Hatch boxes (YCT)
2016	Licensing	None	2011, 2013, 2015, 2016	-	Hatch boxes (YCT)
2017	Hydro plant construction	None	Final: avg of 2011, 2013, 2015, 2016, 2017	-	Hatch boxes ³ and spawning channel construction
2018	Year 1 operations	2,000 cfs	-	Current: 2018	Hatch boxes and spawning channel maintenance
2019	Year 2	2,000 cfs	-	Current: 2018, 2019	Hatch boxes and spawning channel maintenance
2020	Year 3	2,000 cfs	-	Current: 2018, 2019, 2020	Hatch boxes and spawning channel maintenance
2021	Year 4	2,000 cfs	-	Current: 2018, 2019, 2020, 2021	Hatch boxes and spawning channel maintenance
2022	Year 5	2,000 cfs	-	Current: 2018, 2019, 2020, 2021, 2022	Hatch boxes and spawning channel maintenance
2023	Year 6	1,750 cfs ⁴ (if Current > Backg)	-	Current: 2019, 2020, 2021, 2022, 2023	Spawning channel maintenance ⁵
2024	Year 7	1,750 cfs ⁶	-	Current: 2020, 2021, 2022, 2023, 2024	Spawning channel maintenance
2025	Year 8	1,750 cfs		Current: 2021, 2022, 2023, 2024, 2025	Spawning channel maintenance
2026	Year 9	1,750 cfs		Current: 2022, 2023, 2024, 2025, 2026	Spawning channel maintenance
2027	Year 10	1,750 cfs		Current: 2023, 2024, 2025, 2026, 2027	Spawning channel maintenance
2028	Year 11	1,500 cfs (if Current > Backg) 2,000 cfs (if Current ≤ Backg)		Current: 2024, 2025, 2026, 2027, 2028	Spawning channel maintenance

¹ Excludes hatchery rainbows and hatch box enhanced YCT

² Excludes hatchery rainbows

³ Evaluate and if necessary modify to include rainbow and/or brown trout

⁴ Minimum flow step size negotiated based on population data, with minimum step of 250 cfs

⁵ Hatch box effort discontinued after 5 years to transition to self-sustaining fishry

⁶ Sustain each new minimum flow level for 5 yrs

OTHER RESOURCES AND STUDY REQUIREMENTS

Impacts to other resources, especially recreation and wildlife (particularly waterfowl), may be dependent on the amount of minimum flow during the non-irrigation season. Under this proposal, where minimum flow is potentially adjustable over time, the Districts suggest that these resources be addressed as follows:

RECREATION

Recreation use of the Osgood Reach for fishing will be sustained or increased depending on the fishery health, which will be carefully monitored and potentially enhanced under this proposal. Fishing and hunting access in winter could be reduced for power boats if minimum flows become as low as 1,000 cfs. As mitigation for this impact the Districts propose working with Stakeholders to find and develop alternate access that would make the reach available in winter to a variety of recreationists.

WILDLIFE

Lower winter flows are likely to reduce the amount of open water in the Osgood Reach during extreme cold winter conditions. Use of open water by wintering waterfowl would be adversely affected by this change. This loss will be partially mitigated by the development of new open water areas below the new power plant discharges and in the newly constructed spawning channel since water velocity in these areas will be increased compared with existing conditions. However, a net loss in open water during cold weather could be an unavoidable consequence of the proposed project. Over the first five years of operation, the Districts and Stakeholders would determine the extent of open water loss due to reduced flows and any effects on waterfowl use. Once the effects are better understood the Districts and Stakeholders would discuss the need for mitigation, but the mitigation options would not include raising the minimum flow ceiling above 2,000 cfs. The Districts would be responsible for completing any mitigation requirements that may be developed.

ADDITIONAL STUDY REQUIREMENTS

The Districts believe that, by virtue of this proposal for careful management of minimum flow, the potential for adverse resource impacts is greatly reduced and that the level of study effort required to assess these impacts should be commensurate. The following study plan is proposed:

1. Instream Flow Study – no additional study required; however, make use of two-dimensional flow model in future decision making and design of enhancement measures.
2. Canal entrainment – no additional study since fish population will be monitored and managed by this proposal.
3. Turbine mortality - no additional study since fish population will be monitored and managed by this proposal.
4. Fish use – no additional study since fish population surveys will become an annual requirement of the FERC license.
5. Recreation – use existing IDFG vehicle counter and creel survey data.
6. Land cover mapping - Detailed mapping of riparian vegetation in the project reach will be developed through a combination of aerial photography and ground surveys. The level of

detail will permit identification of suitable habitat for federally listed Ute ladies'-tresses (*Spiranthes diluvialis*) and yellow-billed cuckoo (*Coccyzus americanus*). If such habitat is found, the study plan includes a provision to conduct appropriate surveys for these species.

7. Wildlife – Conduct surveys for yellow-billed cuckoo if habitat exists. Compile existing survey data for trumpeter swan and waterfowl. All other species, including deer and bald eagles, would be addressed on a habitat basis using information from land cover mapping, i.e. the assessment would be based on the presence of suitable habitat and on whether the project has any potential to affect the suitable habitat. Effects on trumpeter swan and waterfowl would be monitored for five years following project startup. Monitoring would be a joint effort between the Districts, IDFG and USFWS.³
8. Water quality – The Districts began continuous monitoring of water temperature in June 2014 and will continue through June 2015. Temperature is being monitored in both the bypass reach and in the canals. Flow study data provides information on wetted area and water depth as a function of flow. This data will be sufficient to estimate any temperature effects arising from water withdrawal for hydropower. The Districts would also collect invertebrate data according to the IDEQ protocol and believe this would be adequate for assessing project impacts.
9. Icing - The effects of icing on aquatic habitat available for fish and wildlife will be assessed based on a review of existing literature, landowner/agency observations, and historic ice cover photographs.

CITATIONS

Schoby, G., B. High, J. Fry, and D. Garren. 2013. Fishery Management Investigations, Idaho Department of Fish and Game, Fishery Management Annual Report Upper Snake Region 2011. July 2013. IDFG 13-117.

³ The Districts suggest that monitoring focus on measuring the amount of open water during cold weather conditions.