

## 5.8 Removal of larger anthropogenic barriers to upstream migration



### What

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The removal of existing man-made barriers to upstream migration by adult Chinook salmon through fishways or the provision of access over the man-made barriers. Provision of access could include trapping of adults downstream and release upstream of a barrier or the out-planting of artificially propagated juveniles upstream of a barrier.

### Where

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The only man-made obstruction that currently impedes upstream migration of adult Chinook in the Canadian portion of the Yukon River is the Wareham Dam on the Mayo River. The only other dam is in Whitehorse at the Whitehorse Rapids, where a fishway is in use to facilitate upstream migration.

### When

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- At least one full year of assessment of upstream habitats at flows low enough to characterize river bed materials is required to support a decision regarding provision of adult Chinook passage past anthropogenic obstructions. This is to assess suitability of spawning and rearing habitat which could have changed due to natural or anthropogenic (e.g., mining) processes since originally accessible.
- Detailed geotechnical investigations of all sites where fishways or related structures could be erected would be required at a range of flows. These geotechnical investigations may take one or more years to be satisfactorily completed.
- Site investigations would need to be carried out to estimate the capital cost of the asset (and associated infrastructure) and the operating and maintenance requirements. If a decision is made to proceed, hatchery produced fry, native fry captured in the river downstream, or adult salmon could be released above the obstruction prior to or during construction to start the process of attempting to build the stock in the previously inaccessible habitat.
- Capture and release of adults or juveniles could be conducted as soon as a decision to proceed was made and regulatory issues resolved. These regulatory issues would include licenses and authorizations from regulatory agencies, and assessment by the YESAB.

### Why

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- The upper Mayo River historically supported a significant Chinook population and the construction of the Wareham dam obstructed 38 km of historic Chinook habitat.
- This action would be taken to increase accessible spawning and rearing habitat to increase spawning success and egg-to-fry survival (via increased access to high quality spawning habitat) and juvenile growth and survival (via reduced influence of density dependent effects on growth and survival).



This assumes that spawning and rearing habitat in the Lower Mayo River are currently limiting the Mayo River Chinook population.

## Pros and Cons

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### Pros

- Construction of fishways, trap and haul of adults and/or modifications to hydro facilities to support outmigration are accepted methods of increasing salmon production in areas that have been made in-accessible to salmon. As a result such actions are typically within the comfort zone of the scientific/technical community and there is a wealth of experience with such actions for Chinook in the Pacific Northwest.
- There has already been some work done surveying habitat in the Upper Mayo River and assessing the feasibility of a trap and haul system at the Wareham dam.
- There is strong support for the reintroduction of Chinook into the Upper Mayo River from the Mayo community and the First Nation of the Na-Cho Nyak Dun.
- The re-establishment of access to previously accessible upstream habitat is an action that provides a relatively quick biological response that will likely last for decades with a high probability of success.

### Cons

- The design and construction of fishways is expensive, particularly if infrastructure such as roads is required. As a result it is likely that the cost of any fish-way would exceed, for example, the total value of the YRP R&E Fund (~ \$1 million USD per year), perhaps by many times.
- Ongoing industrial activities (e.g., placer mining) in the upper Mayo River has the potential to compromise the success of actions taken to re-grant access to spawning and rearing habitat.

## Critical Uncertainties

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- The primary uncertainty is the degree to which fresh water life stages of Mayo River Chinook salmon are currently limited and so the degree to which increased access to spawning and rearing habitat in the upper Mayo River would lead to eventual increased returns of adults.
- It is uncertain whether adults returned to the river upstream of obstructions would remain there or would attempt to move back downstream to spawn.
- The YESAB application and review process is at present open-ended and may result in considerable expense and uncertain outcomes.
- Uncertainty in those factors outside of freshwater habitats in the Yukon River that may be limiting Chinook survival means that the success of this action is also uncertain.



## Supporting Actions

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- All juveniles produced upstream of the Wareham dam must leave the system through the turbines or over the spillway and the magnitude of potential mortality associated with this downstream migration is currently unknown. A significant body of knowledge has been developed on upstream and downstream passage past dams in the Pacific Northwest and this knowledge and experience could be drawn upon during the design and assessment of alternative approaches to restoring access to upstream spawning and rearing habitat.
- Limiting conditions for both eggs and fry are likely to occur under ice in the winter and the quality and quantity of habitat upstream of the barrier should be confirmed through field studies in February or March.
- The extent to which adults spawn in areas upstream of the barrier after passage has been granted could be monitored by PIT tagging all relocated adults and placing a tag reader at the obstruction.
- Monitoring of upstream migrants would be required each year to evaluate the degree to which the structure is successful in meeting its objective. Modifications would be required if it did not. Annual inspections would be necessary to ensure that the channel or fishway was open. The integrity of the structure would have to be assessed, with the period between assessments depending on the performance of the structure.