Comments on OMNRF's American Eel Engagement Workshop Report-Back

This well-written document provides a clear summary of workshop discussions, and a good progression from the backgrounder towards issuing a strong GRS. Several modifications and additions are recommended below.

Page 3, Timeframe: the timeframe for short-term goals and actions should include the 0-5 year period. Some actions, such as partially reducing downstream mortality via trap and transport (T&T) or spilling water can begin as early as 2017. For instance, a 10% reduction in downstream mortality could be required immediately at facilities where eels are present. Using spilling at the Moses-Saunders Generating Facility as an example:

- Assuming that 75% of eels outmigrate during an 8-hour period at night during a 4-month period, a 10% reduction in mortality at the facility could be achieved by spilling water for 8 hours for 16 nights this summer.
- This would reduce mortality at the facility from 26.5% to 23.85%.

The mortality reduction requirement could be increased (e.g., to 20% by year 5, and to 50%; by year 20). These numbers are presented as examples rather than recommended targets.

It may not be appropriate to establish long-term recruitment goals (because relationships between escapement and recruitment are currently poorly understood), but it is reasonable to establish longer-term (i.e., longer than 25 years) goals for reductions in the proportion of eels killed. Such goals would serve as benchmarks for long-term hydropower management planning. Another danger of limiting goals to a 20-25 year timeframe is that new projects and some renovations offer cost-effective opportunities to install the most effective downstream mitigation technologies (particularly screens coupled with bypass channels). Mitigation technologies should be considered for such projects occurring during the short-term timeframe at facilities where recovery actions are not currently prioritized, if there is a possibility that access to and above the facility will be restored within the next 25-50 years or within the lifecycle of the facility.

It is worth noting that during a major retrofit of the dam at the Temiscaming on the Ottawa River (crossing both Ontario and Quebec) this past year, a provision was put in place that will require the installation of fish passage at the dam within two years of the return of American Eel to this section of the river. Though cumulative effects should also be considered, including such requirements in association with new construction and major renovations is reasonable, and should be considered among other actions over the long-term and within the historical range of the American Eel.

Ultimately, the GRS should primarily focus on actions over the short (0-5 year) and medium (5-25) term, but longer-term (25-50+ years) considerations should not be excluded. Increasing uncertainty over time should be acknowledged, and the number of downstream barriers relative to a facility should be considered.

Page 3, Recovery Range: if collection records of stocked eels are to be excluded from assessments of the American Eel's current range in Ontario, quantitative and objective criteria must be established for determining whether collection records represent stocked or native eels. This can only be determined absolutely for an individual sample if otoliths were obtained and assessed for a tetracycline marker; however, other criteria provide indications of an individual's origin. In the absence of otolith data, the following criteria should be considered:

- Date: a maximum age of collection records should be established to standardize delineation between current and historic range. For example, if an eel was reported from a waterbody or river reach within the past 20 (or another agreed-upon number) years, that waterbody would be considered part of the current range. For areas where stocked eels are present, records older than the first stocking date but younger than this cut-off would qualify for establishing current range.
- Size: data on the size of stocked eels over time could be used to further delineate recent records in habitats where stocked eels are present. For instance, if a 1000-mm eel was captured in 2008, the record can be assumed to be native because stocked eels had not grown to that size by that date. Likewise, a 350-mm eel captured in 2016 can be assumed to be native because presumably no stocked eels remain this small. Annual size distributions of stocked eels can be used to establish such thresholds, excluding the largest and smallest individuals (e.g., based on rules such as 50% of the distribution, or 1 standard deviation of the mean).
- Abundance: by estimating the proportion of individuals in the 'stocked' size range that were native in Lake Ontario each year, an abundance threshold could also be established for determining whether native eels should be considered present in a waterbody or not. For instance, if 90% of Lake Ontario eels 500-900 mm were estimated to be of stocked origin in 2013, and three eels were collected from a waterbody that year, these individuals were most likely all stocked. However, if 10 eels were collected from that waterbody, at least one was likely to have been native, and that waterbody should be included in the native range.

Page 4, Abundance Targets: It is not clear what the difference is between "quantitative targets associated with increasing the proportion of recruited eels (i.e. those entering Ontario via eel ladders as juveniles) that escape Ontario as adults during spawning migration" and "reductions in cumulative mortality from anthropogenic sources over a set baseline (i.e. a decrease from X% to X%)." Do both simply refer to increasing the proportion of eels that survive, with the first including natural mortality and the second excluding this factor? If so, both offer strong possibilities for establishing objective quantitative goals that are relevant to eel conservation. Progress could be measured against such goals, and achieving these goals will deliver clear benefits to eel populations.

Page 4, Mechanism: Given recent discoveries of genetic differentiation among eel populations and genetic drivers underlying upstream migration, size and sex can no longer be considered the sole measures of success of stocking efforts. Further consideration of stocking as a recovery mechanism should include evaluation of whether stocked individuals provide benefits to maintaining the genetic contribution of Ontario eels (or of potential populations within Ontario) to the global population.

Page 4, Mechanism: Support for downstream T&T is tentative, and this mitigation technique should not be treated as a panacea. Survival during handling and transport (>98%) is high, but longer-term physiological and fitness effects have not been assessed. It is somewhat concerning that only 56-77% of transported eels outmigrated within three years. The fate of (and potential fitness consequences to) the remaining 23-44% of eels should be assessed. The effect of size should be explored (i.e., are smaller eels less likely to outmigrate immediately?) and size thresholds modified accordingly.

The decision analysis conducted by Greig et al. (2006) concluded that trap and transport was a long-term priority; however, this conclusion was based on a practice of diverting eels approaching the Iroquois Dam for capture. This was predicted to achieve a 29% reduction in eel mortality, compared to 4% estimated for the current practice (trapping by commercial fishers). Perhaps more importantly, diversion at the Iroquois Dam would have targeted outmigrating eels whereas current practices capture

both outmigrating eels and residential large yellow eels. There are certainly potential benefits of increasing downstream T&T efforts, but the present limitations of this strategy should be considered and further refinements explored.

Trap and transport efforts should prioritize moving native eels now that stocked eels are reaching sizes comparable to native eels. For instance, there are indications that a majority of stocked eels outmigrate later (September-November) than native eels (July-September). If trap and transport efforts are focused where catch rates are highest (i.e., September-November), they may disproportionately target stocked eels, limiting crucial benefits to the genetically unique native population.

This section indicated that stocking may be an effective temporary solution for re-establishing cultural connections with eels. Assuming that this refers to indigenous cultural connections, our understanding is that stocking is unlikely to be compatible with most indigenous cultural values. Such values do not only encompass local interactions between humans and other organisms; the freedom of other organisms to behave naturally is highly valued. Given the recent discovery of heritable genetic drivers of migration, the stocking of maritime strains in inland waters may not satisfy indigenous cultural needs with respect to American Eel. Shorter-distance translocations (e.g., around barriers within a watershed) may be more suitable and acceptable as a short-term solution that is more compatible with indigenous values. We also support consideration of short-distance translocations as a short-term management option where this action can be demonstrated to be cost-effective and biologically beneficial.

Page 5, Other significant points from…

- Bullet 2: this should more specifically refer to "providing *upstream* passage", which should begin at the lowermost barriers. For downstream passage, mortality should be reduced immediately at all barriers where eels are present or abundant, not simply at the lowermost barriers.
- Bullet 3: With caveats described above
- Bullet 9: In the absence of perfect solutions for downstream passage, it is essential that the best techniques currently available be attempted at these facilities and learned from. Any improvement in passage and knowledge gained through implementation and effectiveness monitoring is valuable.

Additional bullets should include:

- Spilling water is an effective strategy to mitigate downstream mortality, and should be included in this discussion. Partial mitigation can be achieved by focusing spilling operations during the 8-hour night time period during which 75% of eels outmigrate. The costs of spilling water should be reassessed (relative to 2006) based on Ontario's increased capacity to produce 'green' energy and current overproduction of energy. The number of eels that benefit from current routine hydropower management practices including shutdowns and partial spilling should be assessed. For example, at the Chats Falls Generating Station:
    - Canadian Wildlife Federation field staff observed water spilling over the spillway during the outmigration season in 2017;
    - The Lanark County Stewardship Council reported hearing from Ontario Power Generation Staff that only two of the six turbines continue to operate at night;
    - Ottawa Riverkeeper confirmed that flows are currently managed to support Walleye and Lake Sturgeon spawning.
- Partial improvements to current mortality rates need to begin immediately rather than after five years.

- When using assessments of cumulative mortality to guide upstream passage decisions, projected or potential reductions in downstream mortality rates should be considered. For instance, eels in the Ottawa River do not outmigrate for 25 years, providing opportunities to substantially increase downstream survival of eels arriving in 2017 compared to eels outmigrating in 2017.
- The Ontario Waterpower Association's 2010 Best Management Practices guide for American Eel and waterpower in Ontario lists 10 "proven effective" practices for mitigating downstream mortality (Table 1). Though some of these practices only partially reduce mortality and others are not effective on their own, a variety of solutions have existed for many years. The GRS must acknowledge that diverse effective management practices are available for mitigating downstream mortality.

Page 6, Research and Monitoring Needs:
Research and monitoring must be transparent and collaborative to ensure the best science and results are produced. Too often, assessments have been undertaken by parties working in isolation, and critical information that would have improved study design and results were not considered because people with expertise and experience were not consulted. Transparency and collaboration also improves opportunities to standardize assessment methods so that results are comparable across studies.

- Bullet 3: It is unclear what is meant by the "three most downstream facilities on each river system". For instance, in the Trent-Severn Waterway (TSW) is this meant to include the Beauharnois and Moses-Saunders generating stations along with the first barrier in the TSW, or the first three barriers in the TSW? In other words, does this refer to the tributaries, excluding barriers in the mainstem reaches of the St. Lawrence and Ottawa rivers?
- Bullet 12: standardized PIT tagging protocols and protocols for collecting public reports should also be developed.
- The number of native eels escaping Lake Ontario should be assessed. In particular, ongoing tailrace surveys could be used to estimate this if two parameters were estimated:
    - What proportion of eels killed are recovered via tailrace surveys (e.g., versus floating downstream or remaining submerged), and how does this vary with survey effort, timing, frequency, methods, and location?
    - What proportion of outmigration eels are native?

  The current acoustic telemetry study of large Lake Ontario eels provides an excellent opportunity to estimate the first parameter. If carcasses found in the tailrace survey are inspected for acoustic transmitters and the number of fish carrying transmitters that were killed is estimated from detection data, then the proportion of carcasses that are recovered during tailrace surveys can be estimated. Existing data on size and migration timing of stocked eels, coupled with tetracycline data from tailrace eel carcasses may be sufficient to estimate the second parameter.
- Though reports on the efficiency of ladders at the Beauharnois and Moses-Saunders generating stations are not publically available, it is our understanding that such assessments have occurred. It is also our understanding that efficiency estimates have focused on the proportion of fish that ascend a ladder after entering it, and the proportion of fish that remain upstream after passing the ladder. These are important considerations, but eel behaviour when approaching the ladder and prior to entering it is equally important. We understand that it is currently unknown what proportion of eels approaching the Beauharnois Generating Station actually enter the ladder, and how long this takes. If a significant proportion of eels approaching a station do not enter the associated ladder, then this could limit recruitment. If migration is

delayed because a significant portion of individuals take weeks or years to enter the ladder upon arrival at a station, this could have significant fitness consequences.

- Related to the question above, the movement of juvenile eels upstream of Montreal is poorly understood. It is not clear what proportion of eels follow the St. Lawrence River, versus Rivière des Mille Isles or Rivière des Prairies (and are blocked by the barrier there). Once individuals do arrive at either the Beauharnois or Carillon generating stations, it is not clear whether they remain in the St. Lawrence and Ottawa rivers respectively, or if they move between these two barriers until they find an upstream migration route.
- It is not clear how cumulative effects models (i.e., Tim Haxton's presentation) account for the proportion of eels that survive via passage at spillways (i.e., how the proportion of water passing over spillways versus turbines was calculated), or other existing bypass channels, or because of other hydropower management activities such as temporary shutdowns or spilling water. Existing conditions that reduce mortality rates should be incorporated into such models if cumulative effects estimates are to guide management decisions.

Page 7, Inter-jurisdictional: The draft joint management plan from 2009 should be resurrected and finalized. It is our understanding that a memorandum of understanding to implement the plan was signed by the Minister of Fisheries and Oceans, but that finalization stalled when Ontario refused to sign on, citing a preference to wait until the government response statement was issued. If this is true, then the onus is on Ontario to re-start this initiative and ensure that the plan is finalized and implemented in a timely fashion.

Upstream passage and downstream mortality mitigation at the Carillon Generating Station must be a priority for discussions between the provinces of Ontario and Quebec. The province of Quebec and Hydro Quebec are currently working on another action plan that includes priorities for eels in that province, but the plan excludes significant action for the Ottawa River. Ontario has an important role in asserting the need for Quebec's cooperation on conservation efforts in the Ottawa River. It is our understanding that half of the Carillon Generating Station is in Ontario waters, and as such the facility is subject to provisions in Ontario's Endangered Species Act. These provisions require the operator to file a notice of activity and develop and implement a mitigation plan that involves reasonable steps to reduce the adverse effects of the facility on American Eel.

As a potential next step for the Ottawa River, we recommend assessing a suitable location for a ladder at the Carillon Generating Station over the next 1-2 migration seasons coupled with a commitment to providing passage the following year. Studies conducted by Hydro QC and Milieu Inc. in 2001 and 2010 revealed that more elvers approach the southern turbines than northern ones; however, shorelines, the shipping canal, and the spillway were not assessed. It is reasonable to delay installing a permanent ladder until such assessments are completed; however, free passage should be provided by the 2019 migration season. Consideration should be given to translocating elvers captured during such assessments above the Carillon Generating Station.

Signed,

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