Here we collect and refine questions that can be addressed using our pedigree beyond the main objectives for the USACE report.

1. HOR vs NOR Fitness:
   1. F1s RRS: What is the relative reproductive success (or relative TLF) between HOR and NOR parents?
      1. Let’s not forget to make the presentation of these results as easy to compare to other studies as possible (e.g. Christie 2014 suggested analyses and terminology).
      2. Think hard about how to incorporate covariates into these estimates. Should we apply the same scrutiny as when we identify significant predictors of TLF? Or should we be less strict?
   2. F1 fitness, pairwise: What are the fitnesses of HORxHOR, HORxNOR and NORxNOR crosses?
      1. Do we have enough data to address this? Sample sizes are often small?
      2. Do not forget to think about how these results may be biased (e.g. HORxNOR crosses are less common because of assortative mating or genetic incompatibility, leading to mean fitness for this type of cross increased by more 0 fitness crosses).
   3. F2 NOR Fitness, pairwise: For a small subset of individuals in the larger dataset we can identify grandparents. In other words, we can compare fitness of individuals DESCENDED from HORxHOR, HORxNOR and NORxNOR crosses. This comparison allows us to parse genetic from plastic effects of hatchery rearing. For example, the fitness of individuals that were born in the wild, but with hatchery parents can be compared to the fitness of individuals with natural origin parents. If the effect of hatchery rearing is entirely plastic and reversible with a single generation, there should be no fitness differences between these groups.
      1. But what if hatchery selection eliminates heritable genetic variation? Given that only HOR salmon were placed above the dam for a long time, is the comparison above appropriate? What if the NORs above are the same genetically as HORs above because adaptation to natural conditions doesn’t take place in the absence of heritable variation (e.g. Ford 2006)? To address this see below.
   4. Adaptation to natural conditions using great-grandparentage. For a subset of our data we may be able to identify great grandparentage. For example (assuming 4 year age at maturity), 2007 HOR outplants produce 2011 NOR reintros, which in turn produce 2015 reintro, which in turn produce 2019 reintros. The same applies to 2008 outplants, and later years if we consider age 3 returns. Therefore we can evaluate fitness for individuals directly after captive breeding with no selection in the wild (generation zero), after 1 generation (F1s) and after 2 generations (F2).
      1. What is the fitness after 0, 1 and 2 generations of selection in the wild after captive breeding?
      2. We expect fitness of F1s to be higher than that of captive bred individuals. However, does a second generation of selection in the wild continue to affect fitness?
      3. Before committing to addressing this question we need to think about whether we have sufficient years of data. For example, later generations presumably have fewer of their potential offspring sampled in our dataset. This biases our results away from finding that a second generation of selection in the wild increases fitness over a single generation. Is there a way to control for this problem? How severe do we expect it to be?
2. RS vs TLF (let Nick take the lead here?) Is reproductive success measured by age 0 offspring predictive of TLF (ages 3-6 adult offspring)?
   1. What sample size is needed for RS of age 0 fish to be a reliable predictor of TLF. This has significant management implications, for example the relationship between RS and TLF determines the efficacy of labor at screw traps.
   2. Differences in RRS between RS and TLF measurements also informs us about the life stages at which hatchery effects on fitness are mediated. For example if we find that HOR fish are equally fit to NOR fish using age 0 offspring, but less fit using TLF, this indicates life-cycle stages after out-migration are mediating these diefferences.