Description of the DART-Applied NMFS-Method for Conversion Rates in the Columbia River System

https://www.cbr.washington.edu/dart/query/dart_nmfs_conrate

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- Start compiling the data set with all adult observations at Bonneville Dam adult ladder, and group them by tag_id and year.
- Next assign an ESU to each tag_id by using the DART ESU filter (https://www.cbr.washington.edu/dart/metadata/pit#esu). If a tag_id is not able to be assigned to an ESU, it is removed from the data set.
- Then remove any tag_id with an ESU that is not one of the following ESUs of interest: Snake River Spring/Summer Chinook, Snake River Fall Chinook, Snake River Sockeye, Snake River Steelhead, Upper Columbia Spring Chinook, Upper Columbia Steelhead, or Middle Columbia Steelhead. Okanogan River Sockeye and Wenatchee River Sockeye were also kept for the years 2018, 2019, and 2020 to use as a supplement for Snake River Sockeye due to low numbers of returning tagged Sockeye.
- Next assign a transportation status of T to each tag_id that was assigned a T or S by the DART Transportation filter (https://www.cbr.washington.edu/dart/metadata/pit#transport).
    - Sockeye juveniles transported and those that migrated inriver are combined in this analysis with a code of C for combined.
- For excluding jacks and mini-jacks, remove tag_ids that were observed at Bonneville Dam adult ladder in a year that is less than two years after it migrated downstream as a juvenile.
- For steelhead (particularly Snake River summer steelhead), some adults may start migrating past BON June-September and hold (and overwinter) below MCN until the following spring when they continue migration to spawn. Thus, to assign a return year for steelhead survival, any tag_id observed from June 1 in year *t* through May 31 in year *t* + 1, is assigned a return year *t*. So, for example, any tag_id observed between June 1st 2023 and May 31st 2024 will be assigned a return year of 2023.

- Create a new table using the tag_ids and years from the observations at Bonneville Dam and find observations at upstream adult ladders that occur after the observation at Bonneville Dam.
    - Upstream dams are The Dalles, John Day, McNary, Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dams.
    - For steelhead, these observations are limited to within a year of the observation at Bonneville Dam to separate out returning kelts
- Next, create a table using all the Bonneville Dam tag_ids, years, ESU/DPS, and Transportation code and then a column for each dam where a 1 indicates that tag_id had been observed at that dam and a 0 indicates that the tag_id has not been observed at that dam.
- From this table, group based on return year (the year of the first observation at Bonneville Dam), ESU, and Transportation status and sum the numbers in the columns for each dam to get the count of identified tag_id at Bonneville Dam, and the count of redetections at each upstream dam.
    - When the sum of detections at Bonneville Dam is less than 40 for a given year, the conversion rate is not calculated.
- Then take the number of re-detections at McNary Dam and divide by the number of detections at Bonneville Dam to get the unadjusted conversion rate from Bonneville to McNary dams.
    - Repeat the method above to get the unadjusted conversion rate from McNary to Lower Granite and Bonneville to Lower Granite dams.
- Harvest rates and stray rates are then needed to calculate an adjusted conversion rate from the unadjusted rate.
- The source for harvest rates is the Technical Advisory Committee's (TAC) Joint Staff Report on Stock status and Fisheries (https://wdfw.wa.gov/fishing/management/columbia-river/compact/other-information).
    - Zone 6 Harvest rates for Spring/Summer Chinook are found in the Spring TAC report Table 5 using the Zone 6 Total column divided by the Bonneville Dam Count column. Spring Chinook Harvest rates are used to approximate Spring/Summer Chinook rates.
    - Zone 6 Harvest rates for Sockeye are found in the Spring TAC report Table 15 using the Treaty Catch column divided by the Bonneville Dam Count column.
    - Zone 6 Harvest rates for Fall Chinook are found in the Fall TAC report Table 27 using the Kept Adult Chinook column from Bonneville Dam to Hwy 395 Recreational Fishery and the Adult Chinook column in Table 29 as the

numerator and the Cumulative Fall Chinook Adult Passage at Bonneville from the DART adult passage query as the denominator.
        - DART Adult Passage Counts Annual Summary for All Species | Columbia Basin Research
    - Zone 6 Harvest rates for Steelhead are calculated from the Fall TAC report using the sum of the Recreational BON Pool, Recreational TDA-Hwy 395, and Recreational Dip-Ins columns from Table 19a and Table 19b and the Steelhead column from Table 29 in the Numerator and the Total Passage column from Table 6 in the denominator.
    - Above McNary Dam Harvest for Spring/Summer Chinook are found in the Spring TAC report Table 25 using the Kept column for Snake River Spring Chinook Recreational Fishery section divided by the Escapement past Zone 6 fisheries Total column from Table 5.
- Stray rate estimates are from Blane citing from M.L. Keefer, C.A. Peery, J. Firehammer, and M.L. Moser. 2005 Straying Rates of known-origin adult Chinook salmon and steelhead within the Columbia River basin, 2000-2003. Technical Report 2005-5.
    - 4.7% for steelhead
    - 2.0% for spring and summer Chinook
    - 3.3% for Fall Chinook
    - 0.0% for Sockeye (Because no sockeye habitat or populations exist downstream of MCN, no stray rate is assumed in this analysis)
- Adjusted conversion rates are calculated as the number of re-detections at McNary Dam or Lower Granite Dam, divided by the number of detections at Bonneville Dam, all of which is in the numerator, and divided by the denominator of one minus the Harvest Rate multiplied by one minus the Stray Rate:
    - $$\frac{\frac{LGR}{BON}}{(1-Harvest\ Rate)*(1-Stray\ Rate)}$$