Assessing risks of hydroelectric project on Nuyakuk River

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Hydro project has some clear benefits - but what are the risks?

• ARWG (Aquatic Resources Working Group has had biweekly meetings for over a year to discuss design of studies to assess risks of project)
• Involves consultants (McMillen) doing most of the work, ADF&G, UW-FRI, WTSP, others
Sockeye production in the Nushagak has increased in last decade as climate has warmed.
Lots of different dimensions of the risk studies

• For example:
Nuyakuk Falls Hydro Climate Change Simulations

Cameron Wobus, CK Blueshift LLC
Bob Prucha, Integrated Hydro Systems LLC
Climate Change Results – Mid-Elevation Snow

- Both RCP scenarios REDUCE snowpack (SWE).
- Lower elevation SWE is affected more than higher elevation SWE
Monthly Flows – 2090 RCP 8.5

Future Flows: 2080 rcp85

- Observed
- Baseline
- GCM Ensemble Mean
- Individual GCMs

Monthly Average Flow (cfs)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Sockeye salmon “Life Cycle Model”

Sockeye LCM Update

25 Oct 2023
Noble Hendrix
QEDA Consulting, LLC
Simple life cycle — including direct project effects

Project Effects -
-Spawner passage delay and fallback
-Smolts have delayed passage and lower survival relative to baseline (e.g., increased predation above baseline)
Stage-structured Nuyakuk sockeye LCM

- Harvest
- Escapement

1+ Smolt
- Ocean 1
- Ocean 2
- Ocean 3

2+ Smolt
- Ocean 1
- Ocean 2
- Ocean 3

Age 4 (1.2)
- Ocean 1
- Ocean 2
- Ocean 3

Age 5 (1.3, 2.2)
- Ocean 1
- Ocean 2
- Ocean 3

Age 6 (2.3)
- Ocean 1
- Ocean 2
- Ocean 3
Data driven Nuyakuk LCM with density dependence and project effects

- Harvest
- Escapement
- 1+ Smolt
  - Ocean 1
  - Ocean 2
- 2+ Smolt
  - Ocean 1
  - Ocean 2
- Age 4 (1.2)
- Age 5 (1.3, 2.2)
- Age 6 (2.3)

Density Dependence (DD)
Project Effects (PE)
Other considerations for assessing risk

• Effects of project on downstream passage of smolts?
• Species other than sockeye salmon?
• Unknown changes to watershed and climate forcing?
• Is timeline of baseline studies long enough to understand the river and how it might respond to development of the hydro project?
• Impacts of infrastructure on other ecological risks (for example, opening up access via powerlines etc)?