




Risk Assessment Method for Salmon (RAMS)… Implementation and Lessons Learned

IYS Synthesis,
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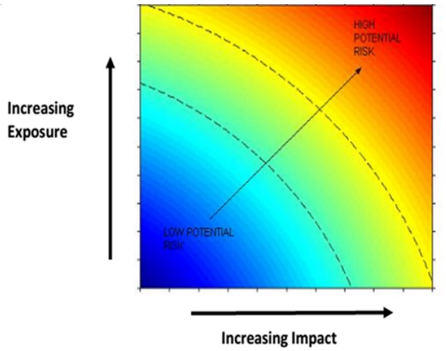
Ecosystem Units	Life Stage/metric	Chinook abundance	Average Mortality
estuary	migrating adults	300	
estuary to spawning areas	instream mortality		20.0%
upper river spawning areas	spawners	240	
upper river spawning areas	% female, fecundity	0.4	3800
upper river spawning areas	eggs in gravel	364,800	
upper river to estuary	egg to smolt mortality	*-306,192*	83.9%
estuary	smolts	58,608	
estuary to ocean	marine survival	*-58,198*	99.3%
ocean	Recruits	410	
ocean	fishing mortality	*-144*	35.0%
	terminal return	267	
	Rate of change	-11.1%	

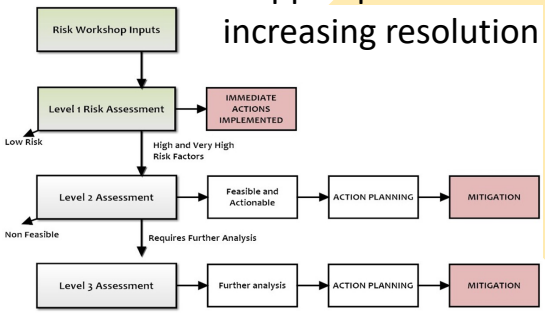
RAMS process overview

- RAMS methodology reviewed at the 2020 IYS workshop.
- RAMS very similar to IYS Likely Suspects
- Goal is to develop consensus on key risks to salmon, research priorities, and options to address risks… all toward rebuilding salmon populations and ecosystem health through a simple, scalable, structured process.



Risk Assessment

Stepped process increasing resolution

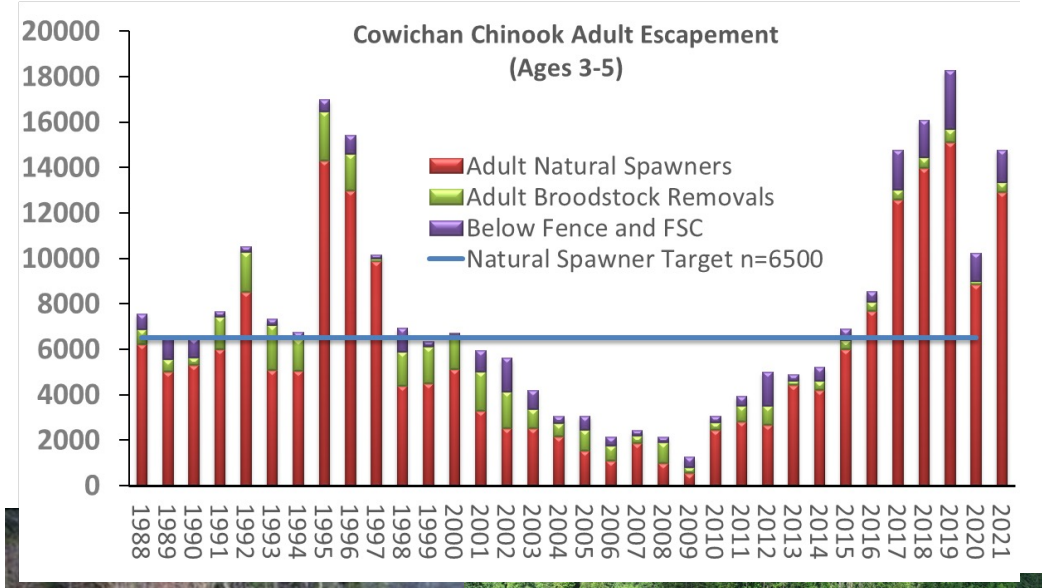


Key components.

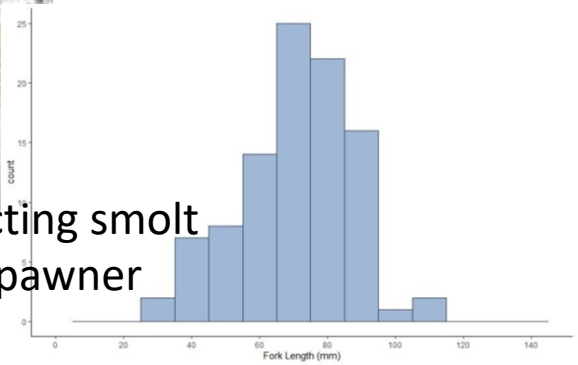
- Assess current status. Create understanding between salmon ecology and habitat / ecosystem status… don't just report on habitat indicators. Building consensus at this stage requires that we don't point fingers at WHO is causing the problem. Leave linkage to human and natural pressures to development of mitigation/restoration options.
- Build good governance. Need expertise and knowledge to input into process - integrate salmon biological science with watershed physical science and local knowledge. Respect First Nations relationship with salmon. Build good governance.
- Develop achievable goals for abundance, genetic diversity, distribution… and in what timeframe?
- Identify and assess current and future risk, working through a suite of potential limiting factors which follow the fish.
- Work sequentially from higher level to finer resolution. Do this in a sequential fashion, increasing resolution and knowledge with each iteration.
- Develop mitigation options, covering all the Hs. Assess feasibility and benefit/cost. Address knowledge gaps with research and monitoring before re-assessing risk.
- Implement and monitor and adapt.

Case study: Cowichan Chinook

- Single medium-large watershed on Vancouver Island. High salmon production potential. High ecosystem services and value. Cultural importance to Cowichan Tribes.
- Decline from 20,000+ Chinook in the early 1990s to a low of a few hundred in 2009.
- We worked hard on community engagement, garnering interest and support. Key was Cowichan Tribes leadership, a few good community champions, local government buy-in with a commitment to action.
- Rams process identified top 5 risks (limiting factors). Actions were initiated by appropriate jurisdiction with our help.
    1. Water use planning, flow management rules, plans to increase water storage in Cowichan Lake.
    2. Stoltz Bluff remediation to lower sediment load in the river.
    3. Significantly improved rearing area by linking key risk of lack of rearing area to proposed work on dykes/flood prevention.
    4. Cowichan became a focus of research.
    5. Improved governance with start of Cowichan Watershed Board.
- Success! Chinook salmon rebuilt to exceed spawner goals within 2 generations.



Stoltz Bluff
< -Before
After ->

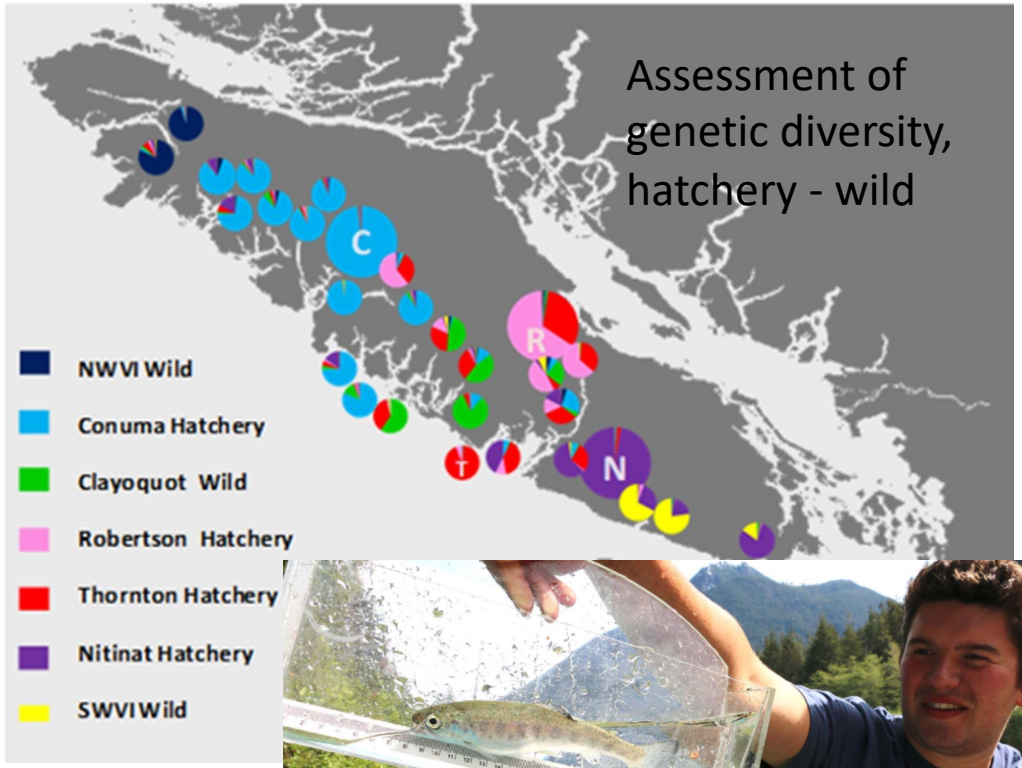


Reconstructing smolt size from spawner otoliths

Case study: West Coast Vancouver Island Chinook

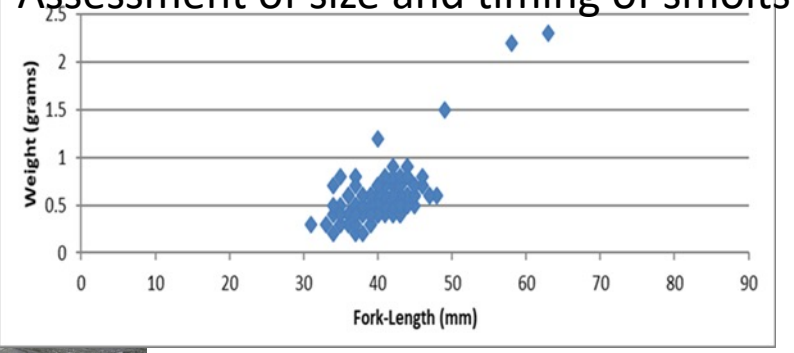
- Complex: 60 plus rivers in 5 Sounds comprising 3 CU/DU and a single big WCVI SMU stretching 400km from top to bottom. 17 First Nations. Variable population status. Hatchery – wild interactions.

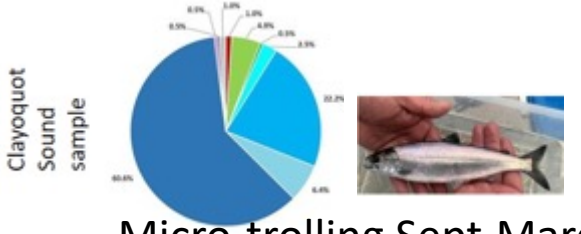
- Split up the process to deal with complexity.
  - Sub-sampled rivers for habitat status assessment. 1-3 per Sound.
  - Roundtables in each Sound dealing with freshwater habitat… being summarized by Sound and then WCVI to find key risks and assess level of commonality.
  - Marine risk assessment on a WCVI scale split into 7 topics:
    Large ocean factors; Local ocean factors; Nutrition; Pathogens, Parasites, Contaminants; Predation; Hatcheries, Harvest



Assessment of genetic diversity, hatchery - wild

Assessment of size and timing of smolts





Micro-trolling Sept-March

Some key lessons to date:

- Manage ecosystem health with salmon as a keystone indicator… this is a broad objective all levels of government were able to agree to. DFO coming in with salmon rebuilding as the key objective was often rebuked by local government as downloading costs.

- Connect the science, the local knowledge, the local community, and all levels of government. Find local champions, especially leadership from First Nations. You need them to secure change at various levels of government.

- Use collective skills to be good ecological detectives, hypothesize and learn from existing literature and other experience, applied to the local environment. This means rebuilding is not build it and go away… you are in it for the long haul. Monitor and adapt.

- The RAMS process and tools evolved and adapted with each new experience. The biggest evolution came from scaling up from a single watershed like the Cowichan to the WCVI. Simple models with instant access and results were important to transparency in the risk assessment and benefit/cost.

- The RAMS process is only the beginning. E.g. Identifying that lack of water was a key limiting factor in the Cowichan initiated further assessment and development of a comprehensive water use plan by the Province of BC. Evaluation of mitigation/restoration options is a significant piece of work.

- Limiting Factor Analysis -> risk ranking -> mitigation options -> evaluation and implementation through a lens of Watershed Process Based Restoration or other management framework. … Beechie, Roni, Booth, etc.