BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Getting to a decision: Using structured decision making to gain consensus on approaches to invasive species control

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Making decisions

- Decision-making requires:
  - clear objectives
  - information to base decisions on
- Once decisions are made, they must be defensible

Invasive species

- Cause ecological, economic, cultural damage
- Control can be extremely costly
- BC has Early Detection, Rapid Response plan
- Rapid response planning is case-specific
  - Depends on:
    - Species
    - Local conditions
    - Objectives
    - Public buy-in

Structured decision making

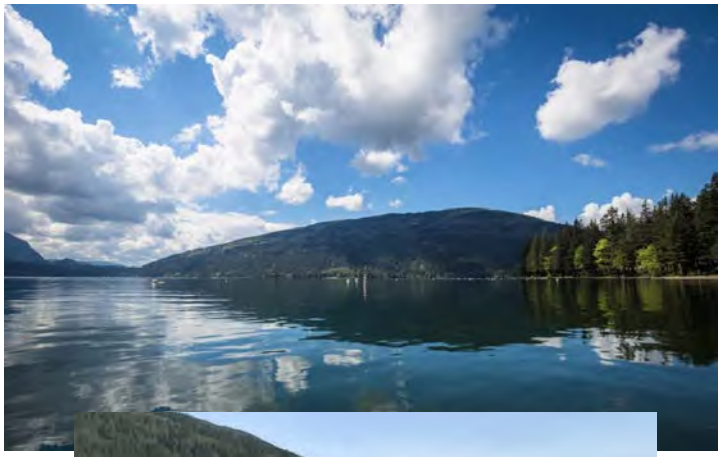
- Based on decision analysis
  - Tells you best option given objectives
- An organized approach to address problems
  - Engages stakeholders and experts
  - Ensures everyone is working from the same series of rules (models)
  - Builds rationale for making decisions

Steps

1. Clarify the decision context
2. Determine objectives
3. List control options
4. Identify alternate states of nature
5. Estimate consequences
6. Evaluate trade-offs
7. Implement and monitor

Case study: smallmouth bass in Cultus Lake

- Cultus Lake:
  - Within Soowahlie traditional territory
  - Popular for recreation
  - Endangered sockeye
  - Threatened pygmy sculpin
  - Smallmouth bass first seen in 2018
    - Stomach contents revealed sculpin and sockeye
    - predators

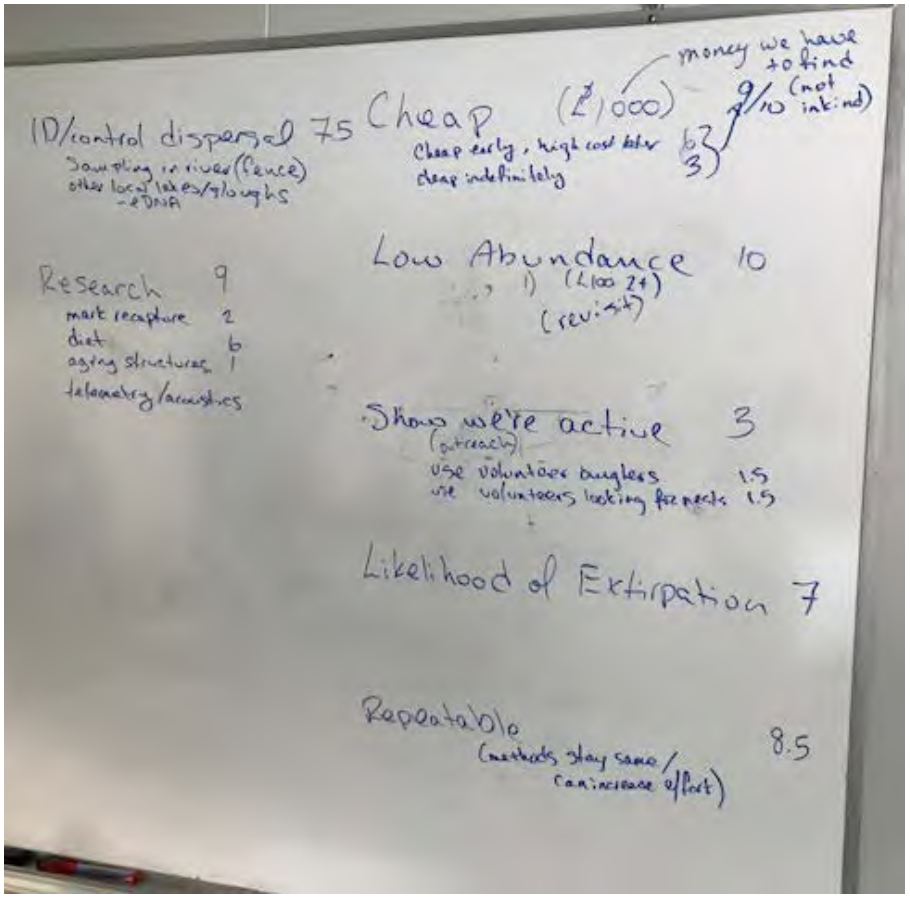


1. Clarify decision context

- Open discussion about Cultus Lake
  - History
  - First Nation values
  - Fish community
  - Community groups, stewards
  - Timing of smallmouth bass introduction

2. Objectives

- What do participants want to see at the ‘end’?
- Can include anything
  - Economic
  - Biologic
  - Social
  - Technical
- Group by primary and secondary
- Each are weighted

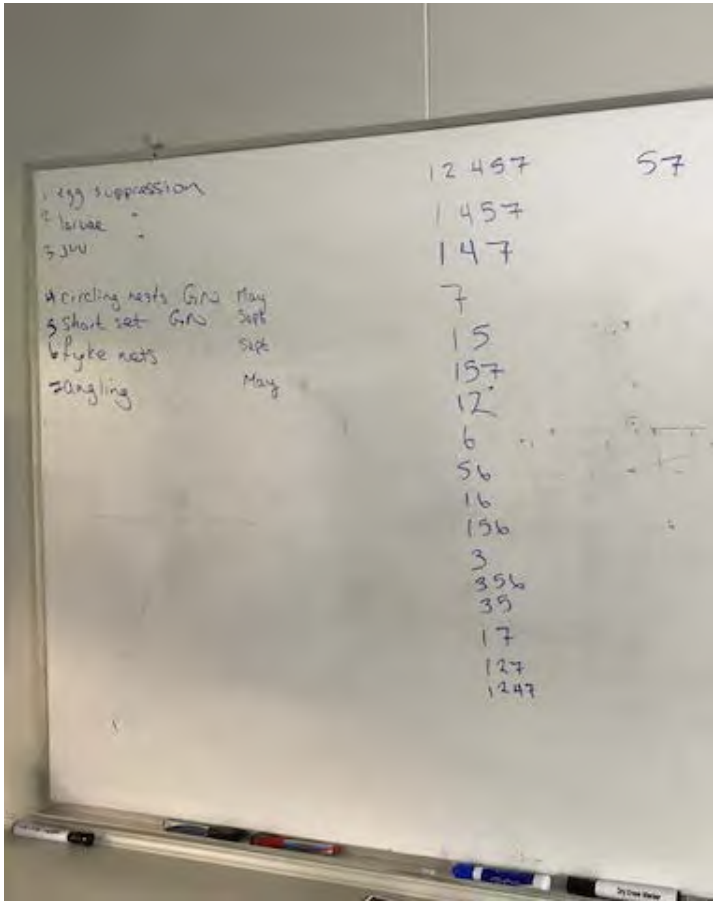


2. Objectives

Objective	Weight
Low final abundance	
Likelihood of extirpation	**0.12**
Few nests observed	**0.18**
Public participation	
Use volunteer anglers	**0.13**
Use volunteers looking for nests	**0.10**
Impact on other species	
Non-species at risk	**0.06**
Species at risk	**0.13**
Public awareness	**0.27**

3. Control options

- Consider discrete biological stages
- List anything that comes to mind
  - List gets shorter when you consider parameters and objectives
- Consider combinations of controls



4. Alternate states of nature

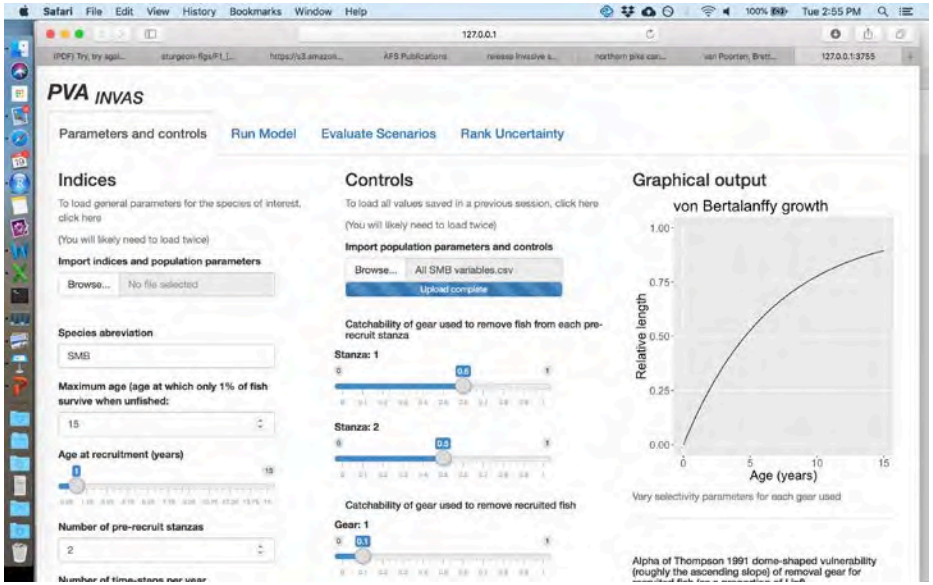
- Current abundance is unknown
- Assume current abundance is
  - 100
  - 500
  - 1000

5. Estimate consequences

- Use ***PVA$_{INVAS}$*** to determine outcomes

  (van Poorten et al. 2019)

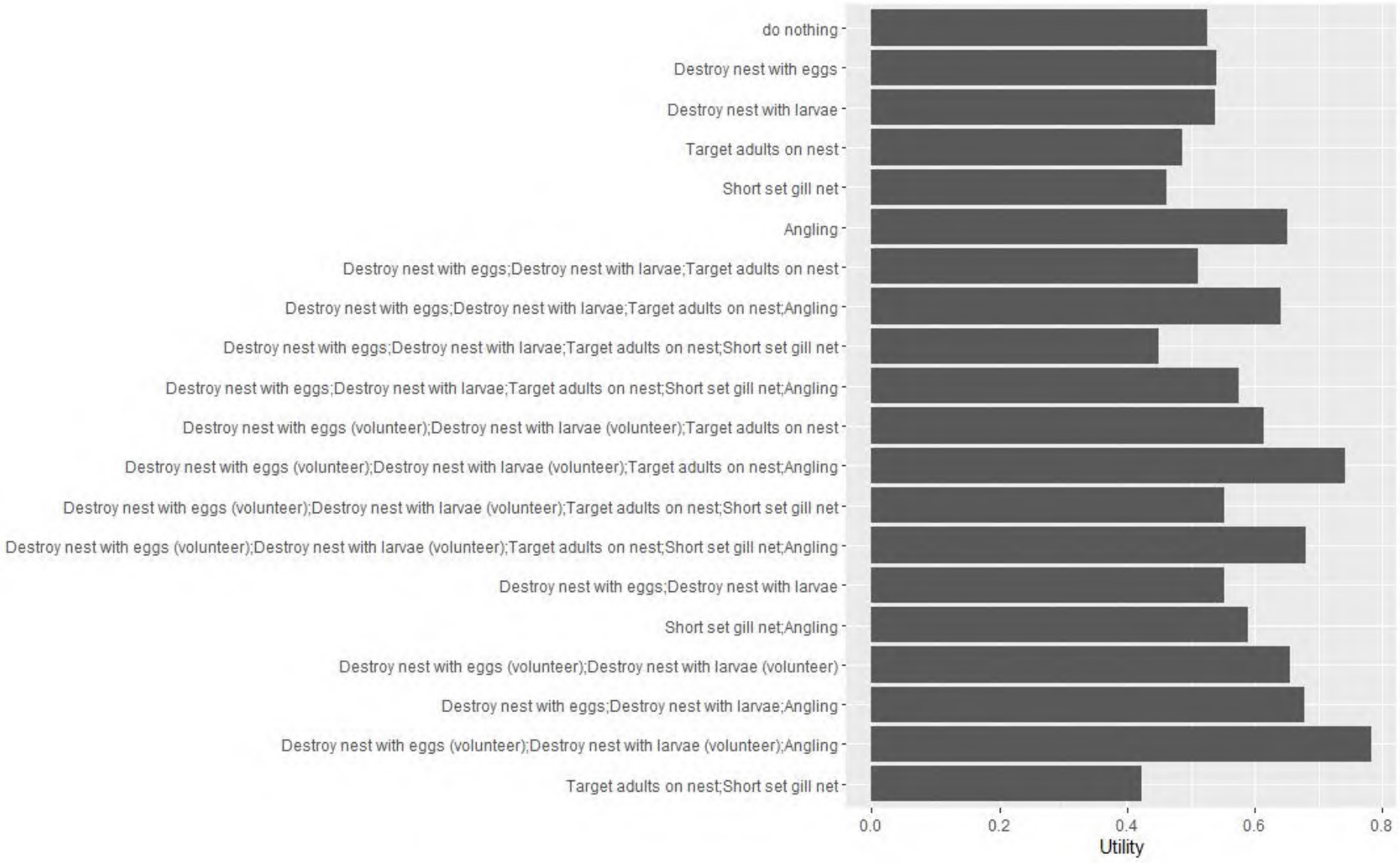
- Parameterize
  - Scenarios
  - Biology
  - Controls
- Takes time
- Forces careful consideration



6. Evaluate trade-offs

- Run population model using each control option under parameter uncertainty
- Evaluate output against objectives

	Starting abundance: 100	Starting abundance: 500	Starting abundance: 1000	Expected value
do nothing	0.7922	0.1244	0.0335	0.3167
Destroy nest with eggs	0.8609	0.2258	0.0853	0.3906
Destroy nest with larvae	0.8547	0.2102	0.066	0.377
Target adults on nest	0.7837	0.1412	0.0307	0.3185
Short set gill net	0.7801	0.1262	0.0331	0.3131
Angling	0.786	0.1341	0.0351	0.3184
Destroy nest with eggs;Destroy nest with larvae;Target adults on nest	0.896	0.3566	0.1315	0.4614
Destroy nest with eggs;Destroy nest with larvae;Target adults on nest;Angling	0.9051	0.3593	0.1442	0.4695
Destroy nest with eggs;Destroy nest with larvae;Target adults on nest;Short set gill net	0.8936	0.3423	0.1349	0.4569
Destroy nest with eggs;Destroy nest with larvae;Target adults on nest;Short set gill net;Angling	0.8953	0.337	0.1351	0.4558
Destroy nest with eggs (volunteer);Destroy nest with larvae (volunteer);Target adults on nest	0.9076	0.3882	0.1557	0.4838
Destroy nest with eggs (volunteer);Destroy nest with larvae (volunteer);Target adults on nest;Angling	0.9104	0.3872	0.1702	0.4893
Destroy nest with eggs (volunteer);Destroy nest with larvae (volunteer);Target adults on nest;Short set gill net	0.9123	0.393	0.1617	0.489
troy nest with eggs (volunteer);Destroy nest with larvae (volunteer);Target adults on nest;Short set gill net;Angling	0.9178	0.4036	0.1651	0.4955
Destroy nest with eggs;Destroy nest with larvae	0.8982	0.3586	0.1352	0.464
Short set gill net;Angling	0.7889	0.1383	0.0281	0.3184
Destroy nest with eggs (volunteer);Destroy nest with larvae (volunteer)	0.9158	0.4008	0.164	0.4936
Destroy nest with eggs;Destroy nest with larvae;Angling	0.8978	0.3613	0.119	0.4594
Destroy nest with eggs (volunteer);Destroy nest with larvae (volunteer);Angling	0.9125	0.4093	0.1681	0.4966
Target adults on nest;Short set gill net	0.7901	0.117	0.0306	0.3126


do nothing
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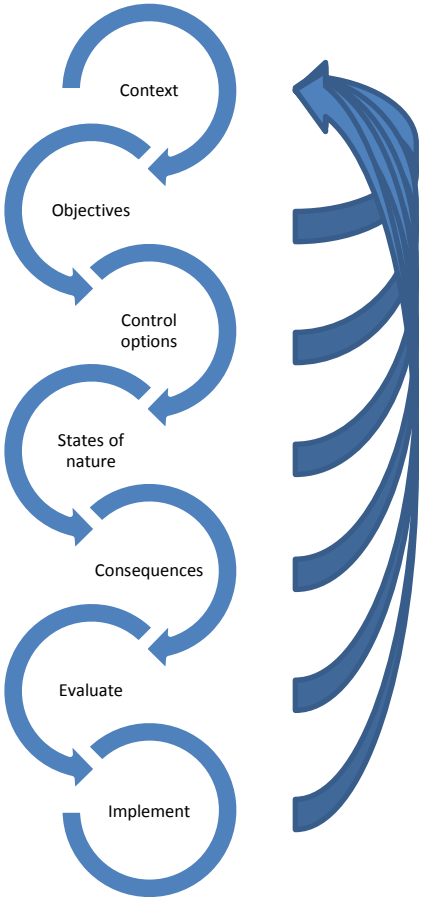
Destroy nest with eggs (volunteer);Destroy nest with larvae (volunteer);Angling
Target adults on nest;Short set gill net
0.0
0.2
0.4
0.6
0.8
Utility

6. Implement and monitor

- Implement control
- Monitor the population
- Evaluate as data come in
- Re-evaluate



Value of Structured Decision Making

- Agreement on objectives
- Clear direction on next steps
- Ecology weighted against other objectives
  - Clear, defensible, documented decisions
- Buy-in from participants and their agencies

Questions?

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