Salmon Viability Monitoring Model (SVMM)

Introduction and tutorial

Dec 11, 2008

Collaborative, Systemwide, Monitoring and Evaluation Project (CSMEP)

Objective:

Improve the quality and consistency of fish population and habitat data to answer key monitoring and evaluation questions relevant to major decisions in the Columbia Basin

http://www.cbfwa.org/csmep

Status & Trends Monitoring

Priority Question:

Are salmon viable using IC-TRT criteria?

Related Decision:

Has there been sufficient improvement in the status of a salmon population/ESU to justify delisting and allow removal of ESA restrictions?

What if we make the wrong decision?

De-listing when not warranted

→ Risk to populations

Not de-listing when warranted

→ Missed fishing opportunities

→ Lost land use opportunities

→ Unjustified cost of ESA protections

How likely to make the correct viability decision with different levels of monitoring intensity?

Data Needs:

- Abundance
- Productivity
- Spatial structure
- Diversity

Technical Recovery Team → viability criteria

Viability Status:

- **Not Viable**
- **Maintained**
- **Viable**
- **Highly Viable**

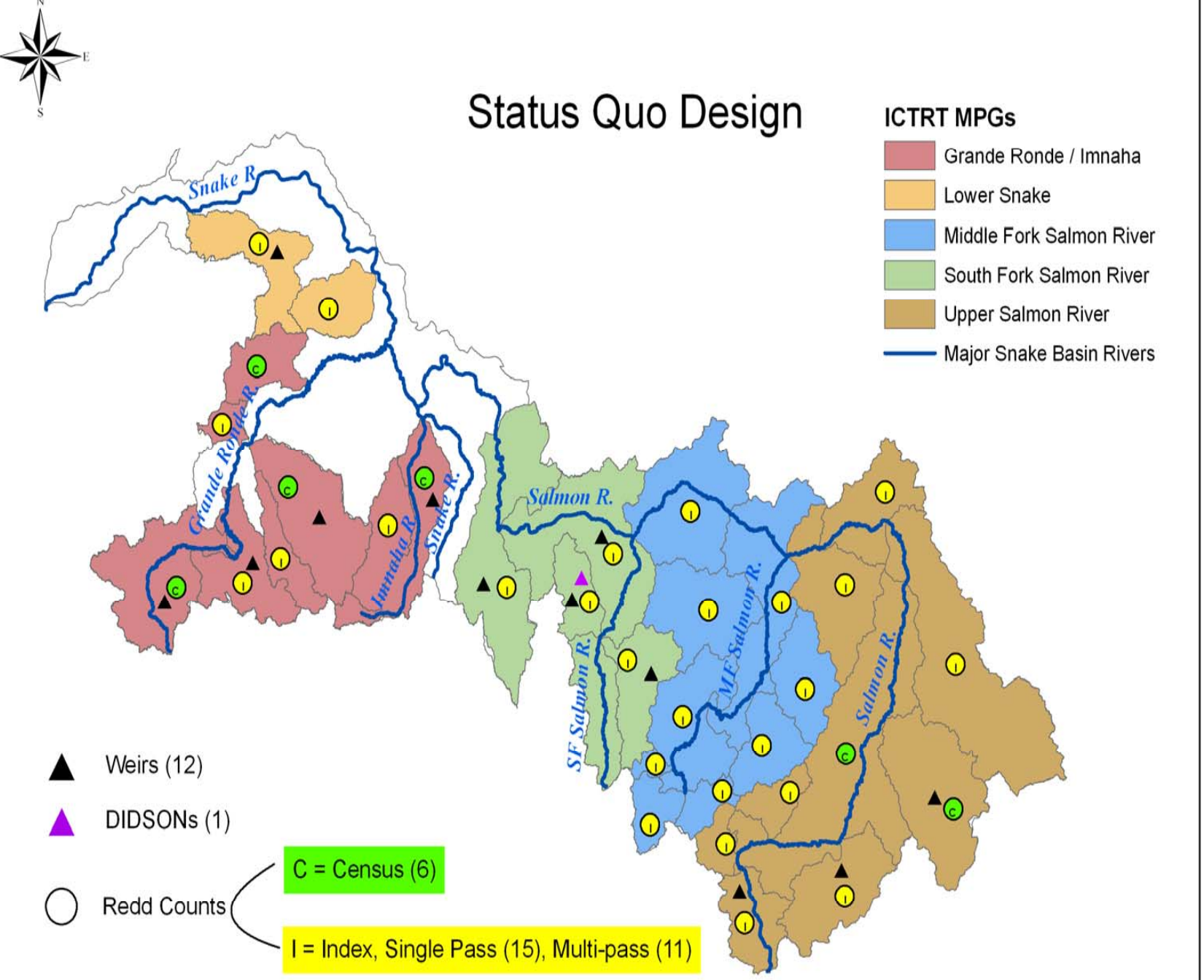
Study Objective:

Test the effect of uncertainty in monitoring data on our ability to correctly assess viability and make the correct listing decision

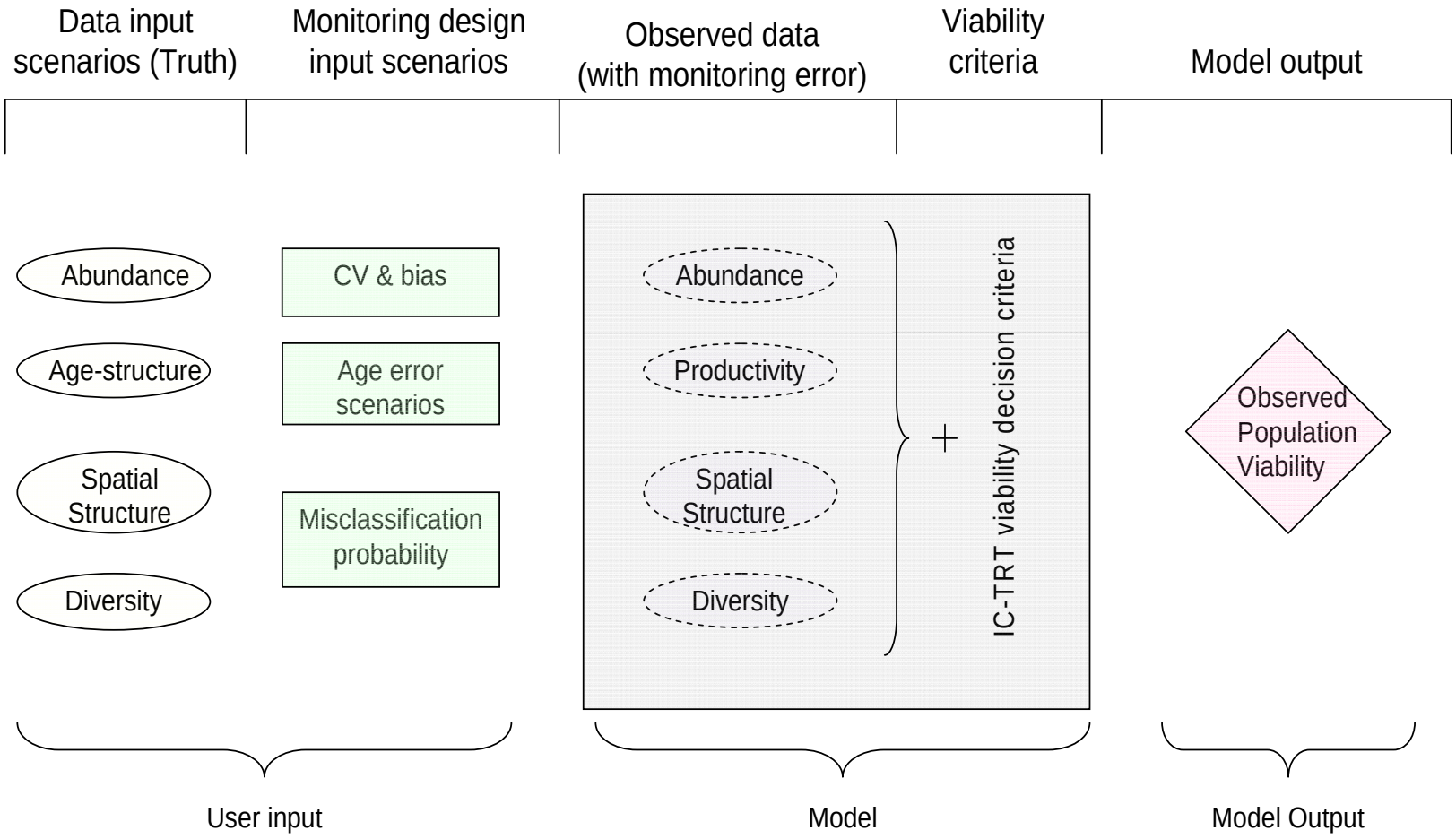
→ Used a simulation approach

SVMM Tutorial Outline

- Introduce:
  - User guide
  - IC-TRT Viability interpretation
  - Pilot ESU
  - Conceptual diagram of SVMM
  - Sample output
- Input monitoring designs
- Modeling scenario
- Running the model
- Viewing/exporting output
- Creating new input data scenarios
- Creating a new ESU
- Caveats
- Recommended strategy
- Utility of approach
- Questions?



Snake River Basin Spring/Summer Chinook ESU Monitoring (32 Populations)



Data input scenarios: The user inputs a realistic but fake time series for each population and data type. The data inputs represent a scenario of interest (e.g. 32 populations with high risk of extinction).

Monitoring design scenarios: The user inputs a description of the monitoring effort for each population and data type. These are the inputs the user will want to game with (i.e. manipulate) most frequently.

- Open the SVMM application and work through the different drop down menus according to the tutorial outline
- Refer to the online help if not sure how to work with each drop down menu

Caveats

- The SVMM was built using the IC-TRT viability criteria as a foundation.
- Designed for users with some expertise in MS Access, familiar with salmonid population dynamics, monitoring, TRTs, and VSP criteria
- The SVMM assumes a single reproductive event ; limitations for steelhead
- The model is only as good as the inputs provided
- SVMM can inform decision making by improving understanding of the tradeoffs in alternative monitoring designs, but can’t alone dictate management decisions.

Recommended strategy

1. Determine what *data input* scenarios are of interest
2. Quantify uncertainty estimates for *monitoring design inputs*, 2 approaches
3. Determine what *monitoring design scenarios* are of interest (across all data types and populations)
4. Evaluate tradeoffs

Data input scenarios

Determine the underlying scenario you wish to test:

- All populations are doing very poorly (Truth = not viable)
- All populations are doing very well (Truth = highly viable)
- Some populations viable, some are not viable, some are borderline
- A decreasing trend in viability (how long to detect a problem)
- An increasing trend in viability (how long before viability is established?)

**The results depend on the underlying viability of the data input as well as the monitoring design

Uncertainty estimates for monitoring design inputs

2 approaches:

i) Try to quantify variability/uncertainty in the quality of monitoring data (i.e. tie to on the ground monitoring):

- Summary of the statistical properties of different methods for estimating fish performance measures. Lit review. (Pickard 2004)
- Current research on quantifying uncertainty in monitoring data by Dan Rawding (WDFW) and Claire McGrath (USFS)
- Review existing unpublished data on uncertainty in the study region

ii) Test a range of uncertainty values and determine the accuracy needed to obtain satisfactory results. Then work to achieve the necessary accuracy in each population, recognizing that accuracy of a given method (i.e. a weir) will vary with population.

Monitoring design scenarios

- Evaluate status quo
- Look at CSMEP Strength & Weakness assessments
- Identify opportunities to improve upon weaknesses
- Consider shifts to either side of status quo and perhaps try to bound the problem by considering a very strong design and a very weak design
  - All populations with high quality monitoring
  - All populations with low quality monitoring
  - ...

Monitoring activities used to assess viability

x = monitoring occurs in at least one Major or Minor Spawning Area; a = PIT-tags scanned at weirs; b = CWT recoveries of hatchery adults at hatchery weirs.

	MPG		L. Snake		Grande Ronde River			
Data need	**Method/Description**		Asotin	Tucannon	Joseph	Wallowa	LGrande Ronde	U Grande Ronde
Abundance of adults	A1	census weir (number)				1		1
	A2	weir w/MR (number)	1			1		2
	A3	weir w/o MR (number)		1				
	A4	MR survey, no weir						
Abundance and distribution of redds	B1	Index-multi	x	x				
	B2	Index-once			x	x		x
Age structure of spawners	C1	Tags (CWT, PIT)	a	a		b		a,b
	C2	Hard parts, scales	x	x		x		x
	C3	Length at age						
	C4	Basinwide estimate						
Origin of spawners	D1	Marks , weirs (number)	1	1		2		3
	D2	marks, remote sense						
	D3	marks, carcasses						
Sex ratio of spawners	E1	Carcass survey						
	E2	Weirs (number)	1	1		2		3
Abundance and spatial distribution of juveniles/smolts	F1	Juvenile trap (number)	1	1		2		3
	F2	Electrofish						
	F3	Snorkel survey--random						
	F4	Snorkel survey--fixed						
	F5	Presence/absence						
Survival of juveniles/smolts	G1	mark-recapture	x	x				
Age structure of juveniles/smolts	H1	Juvenile trap	x	x				
	H2	other in-river sampling						

Summaries of the quality of **Status Quo** Monitoring (feeding the viability model)

Population	Redd count type	Weir	Proportion of spawning area covered by weir	Abundance Assumptions		Spatial coverage	Assess diversity metrics
Asotin Creek	two-time census ground	yes	100%	Unbiased, high precision		Good	Good
Tucannon River	multiple ground-census	yes	70%	Unbiased, high precision		Good	Good
Minam River	multiple ground-census	no	na	unbiased, medium precision		Good	Good
Little Salmon River	none	yes	50%	Overall: biased, medium precision		None	Poor
SF Salmon River mainstem	index (aerial)	yes	25%	Biased, low precision		None	Poor

Evaluate tradeoffs:

- Use the integrated cost database tool (ICDT) to help calculate the costs of the various monitoring designs
- For different designs and input data scenarios compare:
  - The probability of making a correct viability assessment
  - the cost of the design
  - The feasibility of the design
  - How the design integrates with existing monitoring or monitoring programs for different objectives
  - …

- Open the Integrated Cost Database Tool (ICDT) and briefly show how the tool can be used to assess the cost of the various designs which are being tested within the SVMM
- Refer to the ICDT help file if there are any detailed questions

Utility of Approach

- Verify biological criteria used to make decisions
- Evaluate sensitivity of a decision to quality of monitoring data
- Test influence of specific types of monitoring data on decisions
- The exercise of clearly framing a problem and quantifying inputs greatly improves understanding
- Provides a framework for integrating many complex inputs in a systematic and strategic way
- Provide a relatively simple framework for communicating information about uncertainty to decision makers.

Instructions for free download of the SVMM and ICDT will be made available on the CBFWA website:

http://www.cbfwa.org/

Questions?