
The Accidental Sociologist

Decision support systems for
forest biodiversity management:

A review of tools and
an analytical-deliberative framework for
understanding their successful application

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Research Background & Purposes

- ◆ US National Commission on Science for Sustainable Forestry
 - www.ncssf.org

Purposes

- ◆ Decision makers, analysts, stakeholders
 - How can I find and use a DSS effectively?
- ◆ DSS developers & funders
 - Considerations for future DSS research and development
- ◆ Both
 - What explains successful use of technical analysis in decision making?

Research Team

Phase I & II

- ◆ K. Norman Johnson, Forest Resources, Oregon State University
- ◆ Keith Reynolds, PNW Research Station, USDA Forest Service

Phase I

- ◆ Patrick Crist, Science Applications Mgr, NatureServe
- ◆ Nick Brown, Forestry Program Officer, NatureServe

Phase II

- ◆ Brenda McComb, Forest Wildlife, Univ. Massachusetts Amherst
- ◆ Denise Lach, Sociology, Oregon State Univ.
- ◆ Sally Duncan, Institute Natural Resources, OSU

Overview

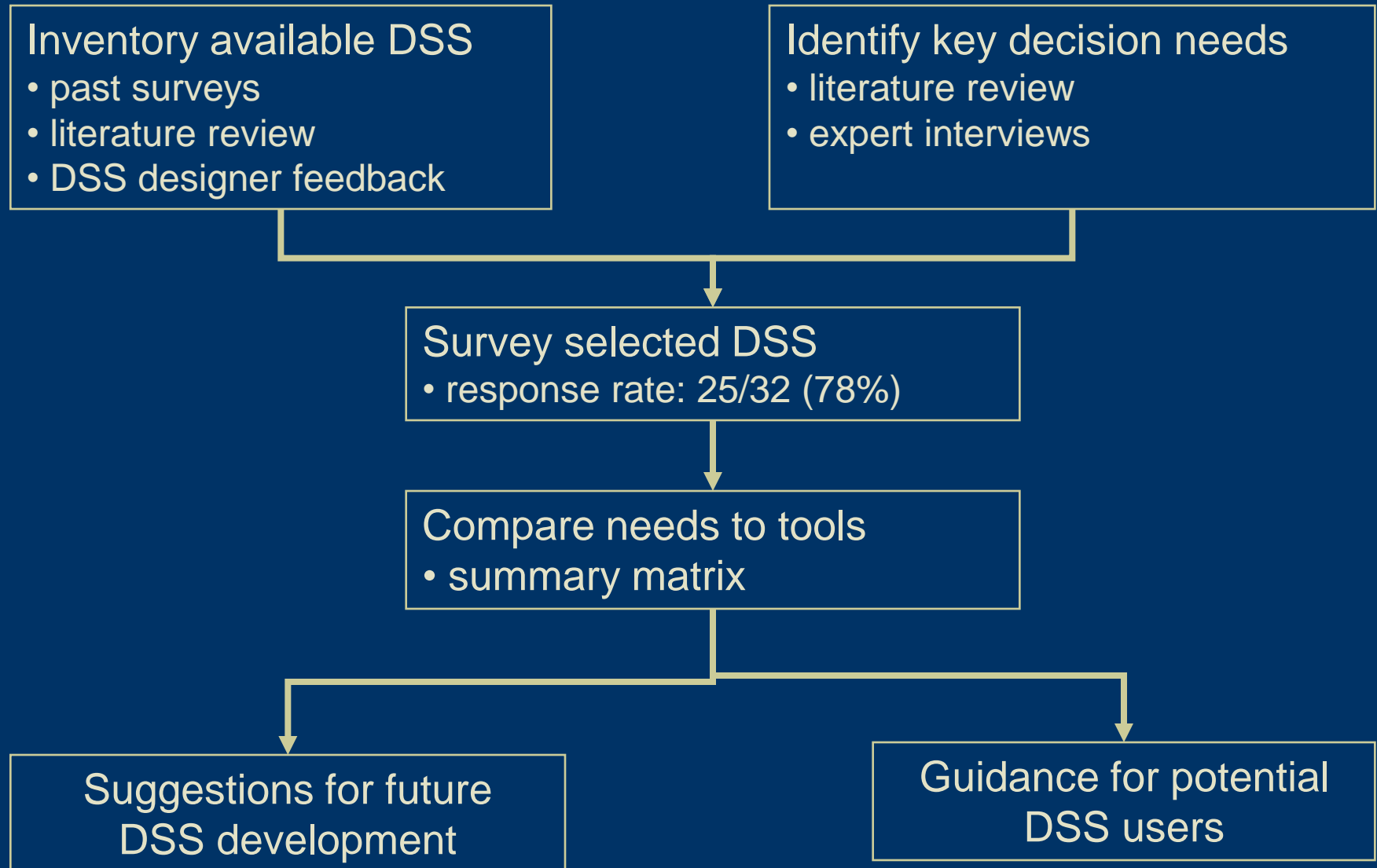
Phase I : DSS software survey

- What DSS are available?
- What decision-making needs do they address?

Phase II : DSS use case studies

- How are DSS used?
- What makes a particular DSS use successful?

Phase I: DSS Survey



Forest Biodiversity Decision Needs

1. How to characterize biodiversity

- Montreal Process Criterion 1 Indicators
- forest types, ages, protected areas, fragmentation, species diversity, viability, distribution, abundance

2. Predicting influences on forest habitats

- silviculture, fire, biological agents, development, climate

3. Complex political nature of problems (Mowrer 1997)

- integrate information types (biophysical, economic, social)
- results for multiple spatial scales (landowners to policymakers)
- facilitate social negotiation

Results: Forest Influences

Category	System Name	user defined	forest type	forest age	mgmt class	fragmentation	species diversity	species viability	species distribution	species abundance
Forestry	FVS		X	X						
Forestry	Habplan	X								
Forestry	Harvest		X	X	X	X				
Forestry	LANDIS		X	X		L	L	L	L	L
Forestry	LANDSUM		X	X	X					
Forestry	LMS		X	X	X					
Forestry	MAGIS	X	X	X	X					
Forestry	NED		X	X	X		X			
Forestry	RELM	X								
Forestry	RMLANDS		X	X	X	X				
Forestry	SIMPPLLE		X	X						
Forestry	Spectrum	X	X	X	X		a	a		
Forestry	VDDT / TELSA		X	X	X					
Forestry	Woodstock	X	X	X	X		a	a	a	

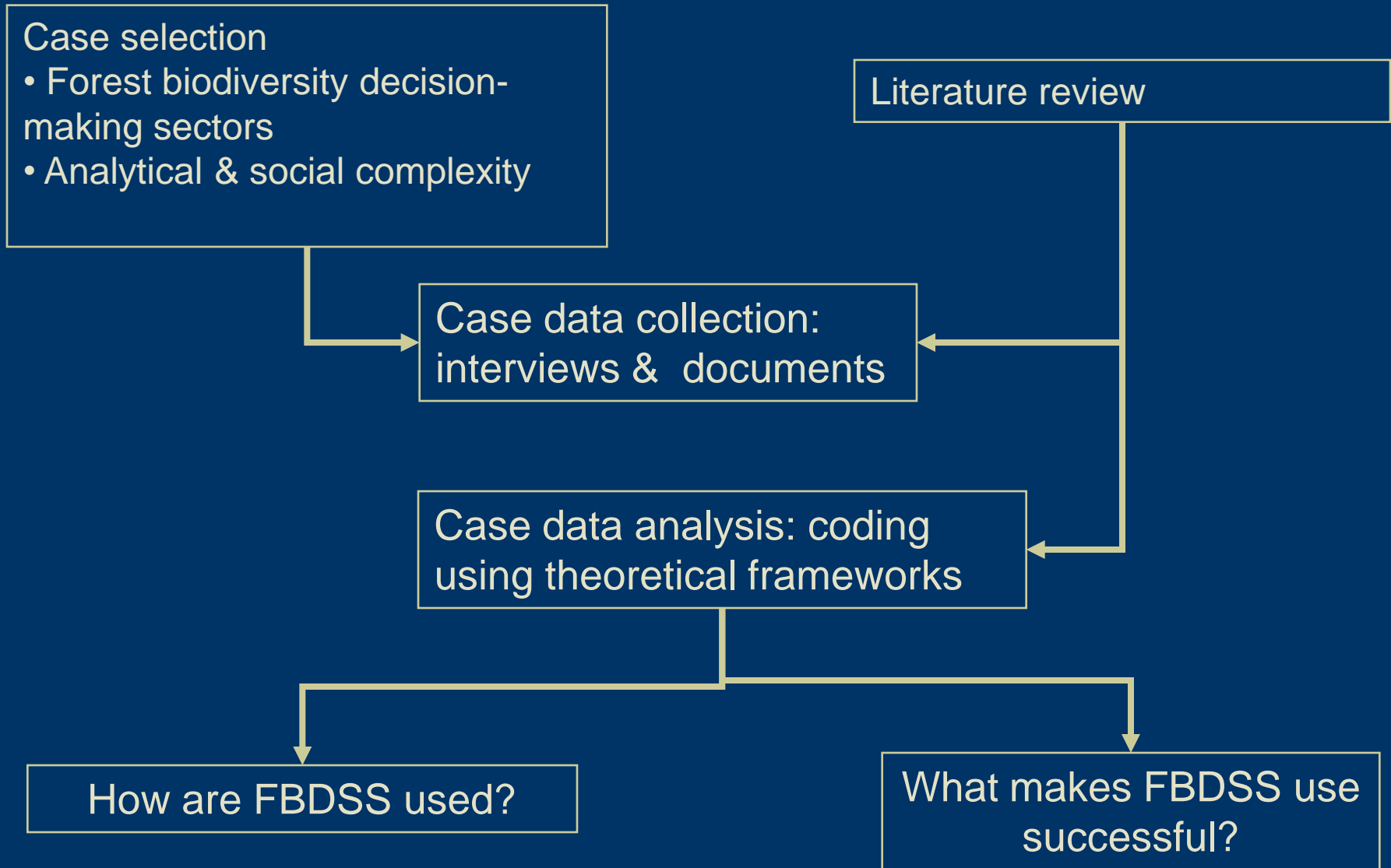
RAMAS

Category	System Name	Decision-making Needs		Biodiversity Indicators Supported							Forest Disturbances					Complexity		
		user defined	forest type	forest age	mgmt class	fragmentation	species diversity	species viability	species distribution	species abundance	silviculture	land use change	climate change	biological threats	fire	information integration	multiple scales	social negotiation
Biodiversity	BMAS		X					X										
Biodiversity	CAPS		X	X	X	X	X					X						
Biodiversity	C-Plan	X				X	X	X										
Biodiversity	MARXAN / SPEXAN	X				X	X	X							X			
Biodiversity	PATCH					X		X	X	X								
Biodiversity	RAMAS		L	L		X	X	X	X	X	L		L	L	L			
Biodiversity	Refuge GAP					X	X		X						X			
Biodiversity	ResNet & Surrogacy						X	X										
Biodiversity	Sites	X			X		X	X							X			
Biodiversity	Vista	X	X	X	X	X	X	X	X						X	X	X	
Forestry	FVS		X	X							X		X	X				
Forestry	Habplan	X									X					X		
Forestry	Harvest		X	X	X	X					X					X		
Forestry	LANDIS		X	X		L	L	L	L	L	X		X	X	X			
Forestry	LANDSUM		X	X	X						X			X	X			
Forestry	LMS		X	X	X						X							
Forestry	MAGIS	X	X	X	X						X					X		
Forestry	NED		X	X	X		X				X				X			
Forestry	RELM	X									X					X		
Forestry	RMLANDS		X	X	X	X					X		X	X				
Forestry	SIMPPLLE		X	X							X		X	X				
Forestry	Spectrum	X	X	X	X		a	a			X			X	X	X		
Forestry	VDDT / TELSA		X	X	X						X		X	X				
Forestry	Woodstock	X	X	X	X	a	a	a			X		a		X	X	X	
General	DEFINITE	X													X			
General	EMDS	X	a	a	a	a	a	a	a	a	a	a	a	a	X	a		
General	Netica	X	a	a	a	a	a	a	a	a	a	a	a	a	X	a		
RegAssess	CLAMS		X	X	X	X	X	X			X	X			X	X		
RegAssess	LUCAS		X	X	X	X	X	X			X	X			X			
RegAssess	MRLAM		X	X	X	X		X			X				X	X		
RegAssess	Restore		X	X	X	X	X				X				X	X		
RegAssess	WBAFA		X	X	X	X	X	X	X	X	X				X		X	

Phase I Conclusions

- ◆ Few options for fire, biological, climate effects
- ◆ Need to link forest and wildlife DSS
- ◆ Better access to HSI's
- ◆ Lack of widely accepted problem definition
- ◆ What facilitates social negotiation?

Phase II: DSS Use Case Studies



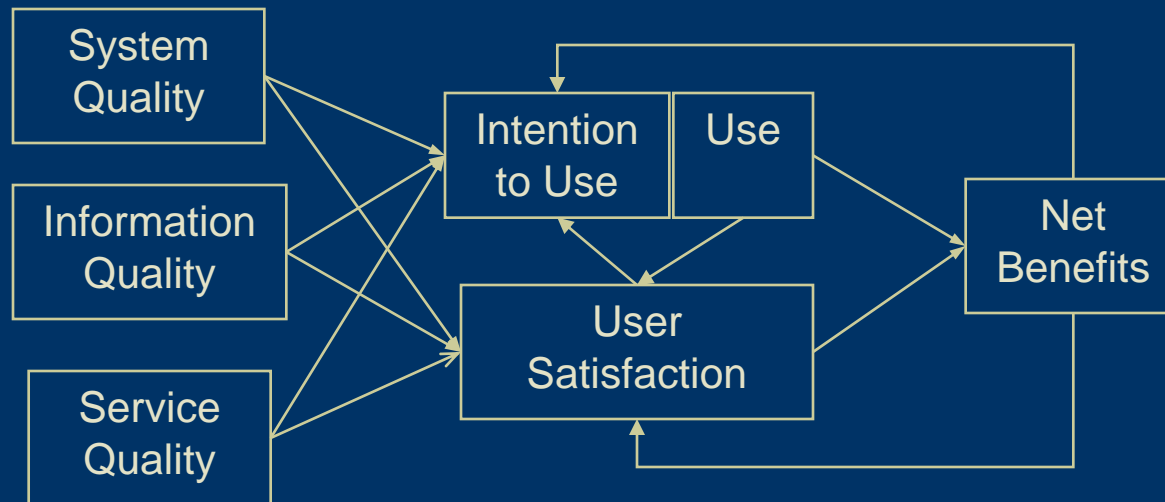
Literature: DSS Use and Success

- ◆ DSS and analysis in forest planning
 - Complexity, wickedness, and public forests (Allen and Gould 1986)
 - FORPLAN: The marvelous toy (Barber and Rodman 1990)
- ◆ Information systems
 - Information systems success model (DeLone and McLean 1992, 2003)
- ◆ Environmental & risk assessment
 - From science to policy: Assessing the assessment process (Cash and Clark 2002)
 - Understanding risk: Informing decisions in a democratic society (NRC 1996)

Success Models: Information Systems

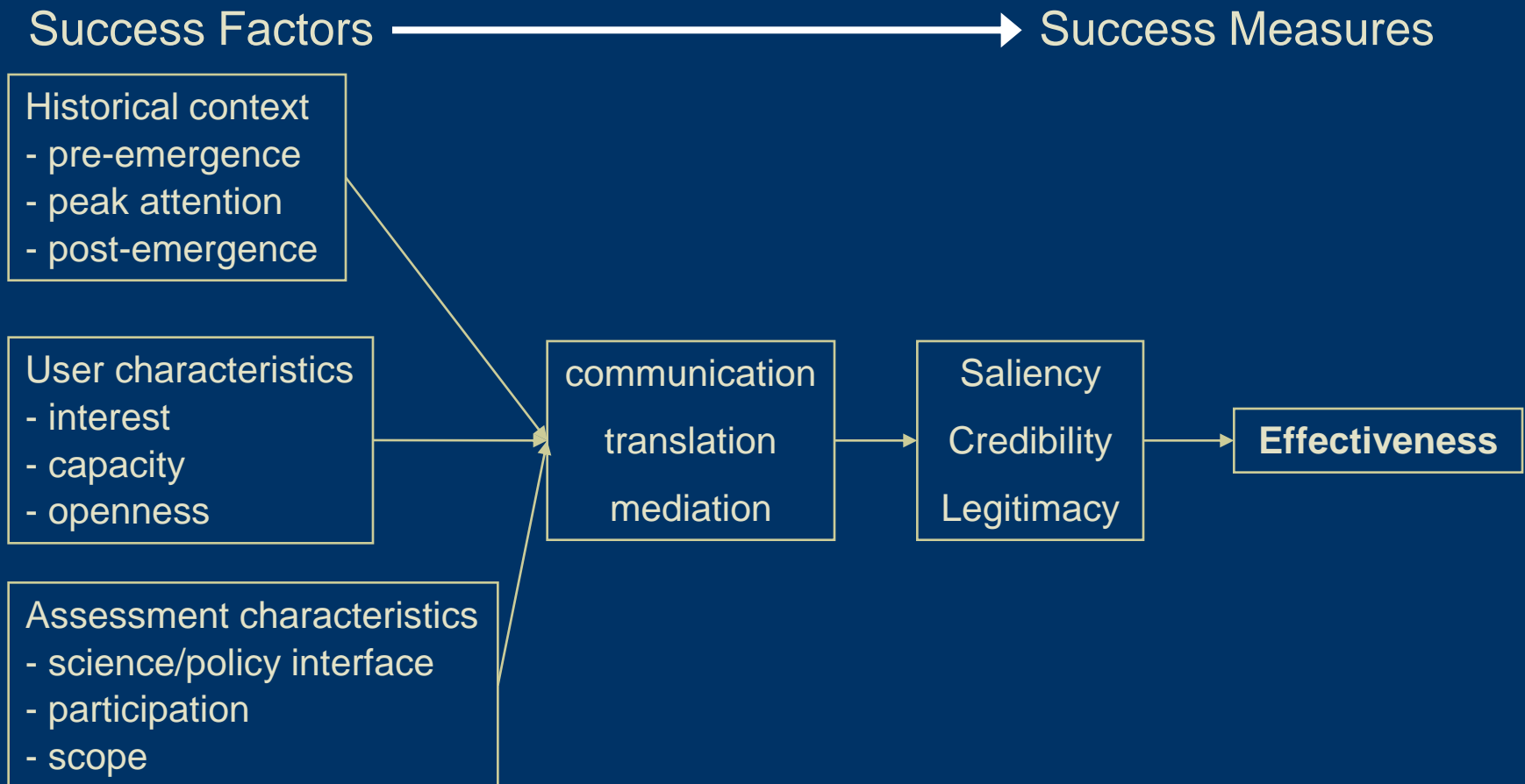
Information systems success model (DeLone and McLean 1992, 2003)

Success Factors \longrightarrow Success Measures



Success Models: Environmental Assessment

From science to policy: Assessing the assessment process
(Cash and Clark 2002)



Success Models: Risk Assessment

Understanding risk: Informing decisions in a democratic society (NRC 1996)

Analysis and social deliberation should be mutual and recursive



Analytical Framework

1. Success measures from participants
2. Success factors from literature
 - Analytical: system quality, information quality, service quality
 - Social: participation, communication, translation, mediation
 - Social – analytical interaction: “mutual and recursive”

DSS Case Selection

Decision sector

federal
state
local
private industry
small landowners

Perspective

Land management
vs.
Regulatory

X

- ◆ within US
- ◆ active in last 5 years
- ◆ geographic distribution
- ◆ access to information

Cases

#	Sector	Case Name	Type of Decision
1	mixed	Willamette Basin Futures (WBF)*	regional futures assessment
2	mixed	Sandy Basin Anchor Habitats	aquatic habitat restoration
3	federal-mgt	NWFP Watersheds (NWA)*	regional assessment
4	federal-mgt	Boise-Payette National Forest Plan	national forest mgt plan
5	federal-reg	FWS red-cockaded woodpecker	species recovery planning
6	fed-state-mgt	FSP Spatial Analysis Project	landowner assistance plan
7	state-mgt	Chesapeake Forest	state forest mgt plan
8	state-mgt	Oregon Harvest & Habitat Model	state forest mgt plan
9	state-reg	WA state water typing (WWT)*	state forest practice rules
10	state-reg	TNC WA state ecoregional planning	conservation priorities
11	local gov-mgt	Baltimore watershed plan	city watershed mgt plan
12	local gov-reg	Summit County (CO) master plan	local zoning regulations
13	industry-mgt	Intl Paper habitat modeling (IFP)*	industrial forest mgt planning
14	industry-reg	SFI/FSC certifiers	industry self-regulation
15	nipf-mgt	Consulting foresters	small landowner mgt plans

* in-depth analysis

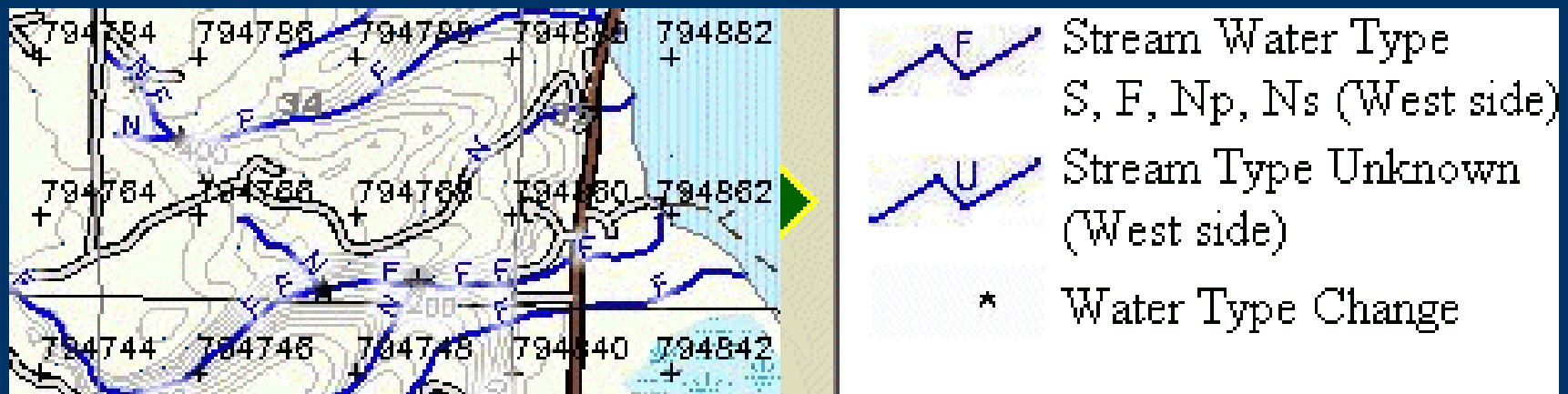
Data Collection

Data Collection

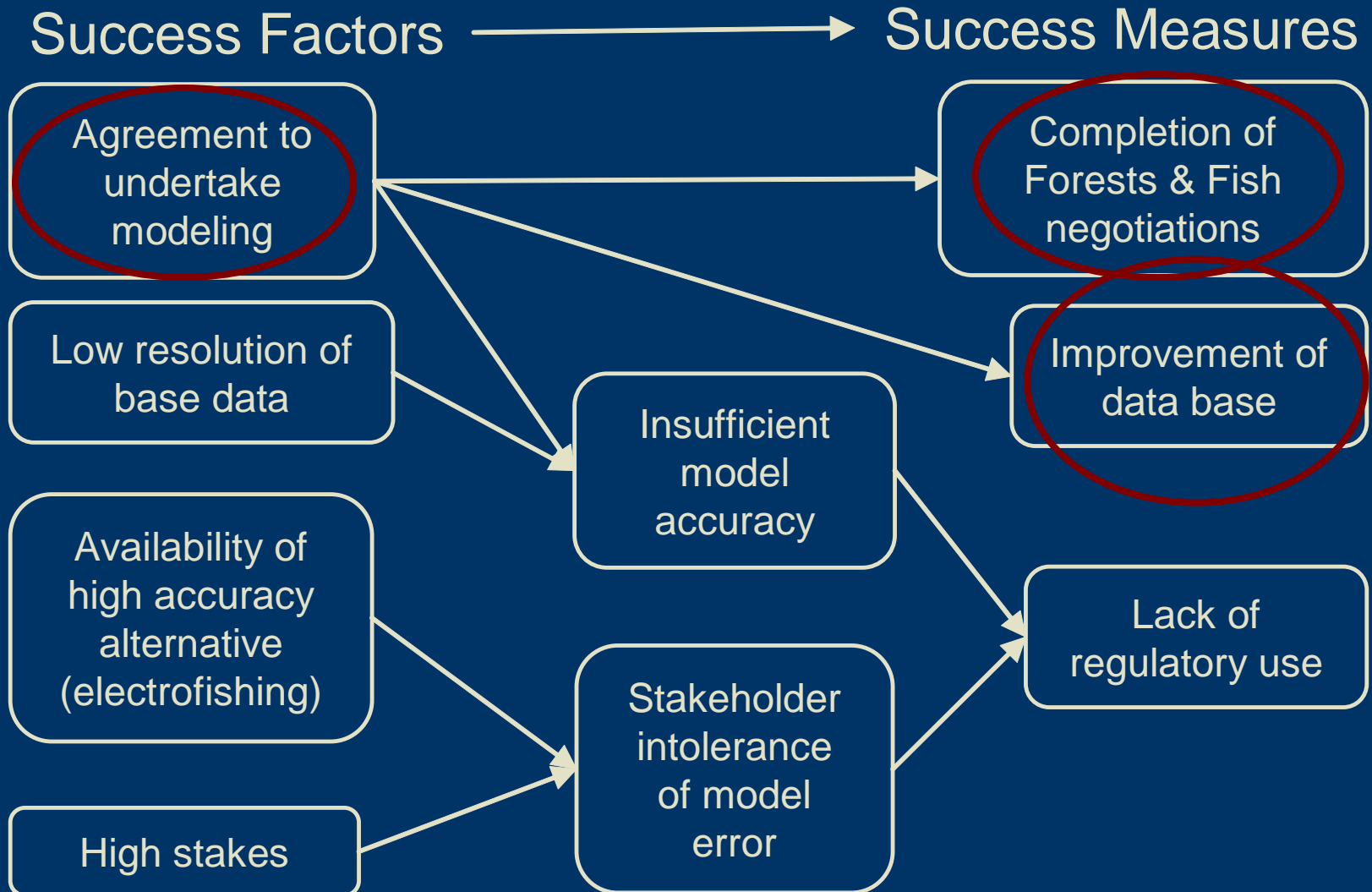
- ◆ documents
- ◆ semi-structured interviews (~ 1 hour, 3-4 ea. case)
- ◆ transcription and coding

Case: Washington State Water Typing

- ◆ forest practices rule changes (Forests and Fish negotiations)
- ◆ method to determine fish-bearing streams
- ◆ electrofishing expensive and potentially harmful
- ◆ model alternative based on geomorphic variables



Case: Washington State Water Typing



Success Measures

Measure

Cases

Reviews by Users / Stakeholders

4

Consensus Building

4

Use in Decision Making

3

Accuracy

2

Consistency with Expectations

2

Improvement of Data Base

2

Success Factors: Social

Participation

including all stakeholders and having numerous and varied opportunities for input

- ◆ Selective expansion
 - IFP: foresters → multiple specialists
 - NWA: monitoring group → local experts
 - WBF: modeling group → stakeholder groups
- ◆ Shift
 - WWT: policy group → science group

Success Factors: Analytical – Social Interaction

Mutual and recursive?

- ◆ IFP
 - cross-cutting teams, multiple rounds of review
- ◆ NWA
 - expert workshops, multiple rounds
- ◆ WBF
 - project design: no (lack of socio-economic indicators)
 - modeling: yes (stakeholder groups)
- ◆ WWT
 - technical team: yes
 - with policymakers: no

Conclusions

Success measures

- ◆ success defined as social and analytical
- ◆ equally important regardless of social complexity of context

Success factors

- ◆ social-analytical framework
- ◆ necessary participation
- ◆ mutual and recursive
- ◆ social complexity did not preclude analytical complexity

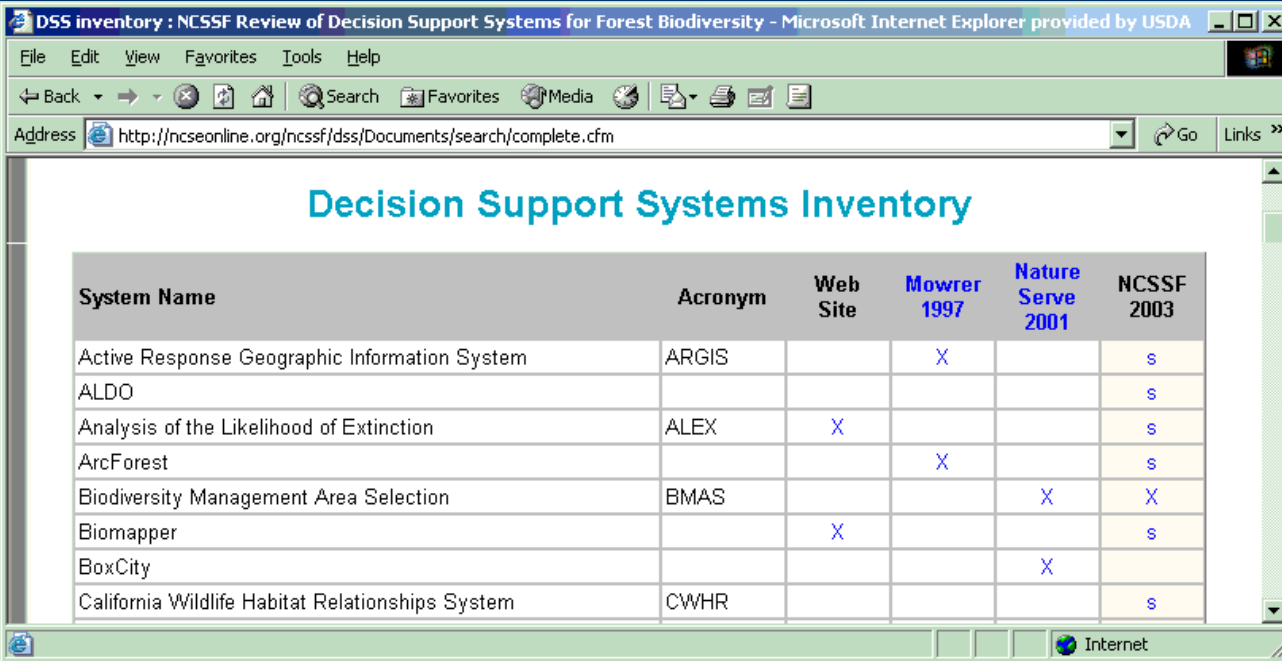
Conclusions

Using DSS

- ◆ understand the (relative) information credibility demands of decision makers
- ◆ solicit and incorporate local information
- ◆ limit and target participation to the extent the problem allows
- ◆ use to help structure group work and accumulate results

Moving Forward

- ◆ Canada & beyond
- ◆ Capturing experiences & lessons
- ◆ Cooperative website



System Name	Acronym	Web Site	Mowrer 1997	Nature Serve 2001	NCSsf 2003
Active Response Geographic Information System	ARGIS		X		s
ALDO					s
Analysis of the Likelihood of Extinction	ALEX	X			s
ArcForest			X		s
Biodiversity Management Area Selection	BMAS			X	X
Biomapper		X			s
BoxCity				X	
California Wildlife Habitat Relationships System	CWHR				s

Resources

Website

www.ncssf.org

www.ncseonline.org/ncssf/dss

NCSSF Guidebook

(coming to the website...)

Dissertation

library.oregonstate.edu

<http://hdl.handle.net/1957/2592>

Literature

Conserving Creatures of the Forest:

*A Guide to Decision Making
and Decision Models for
Forest Biodiversity*

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