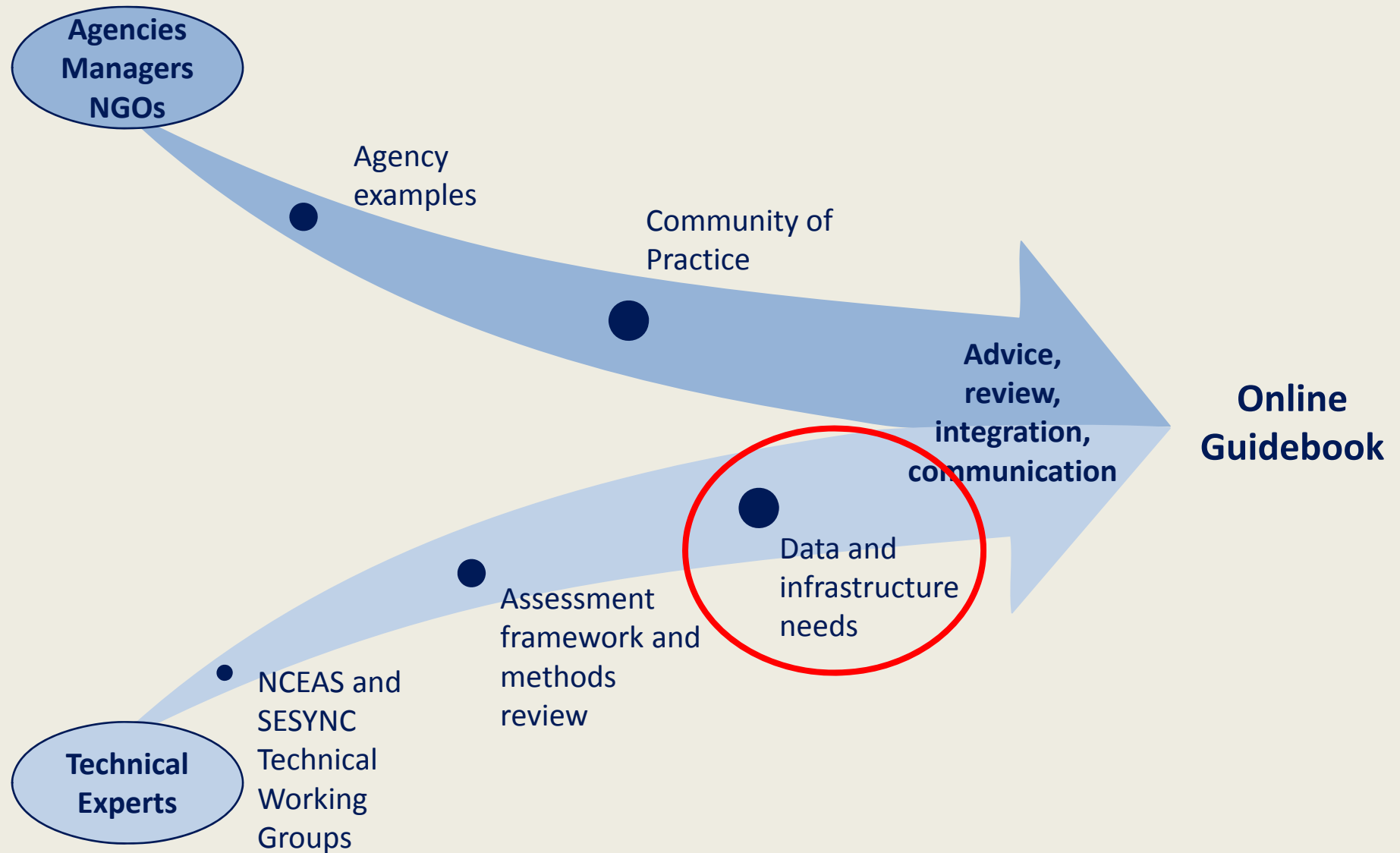




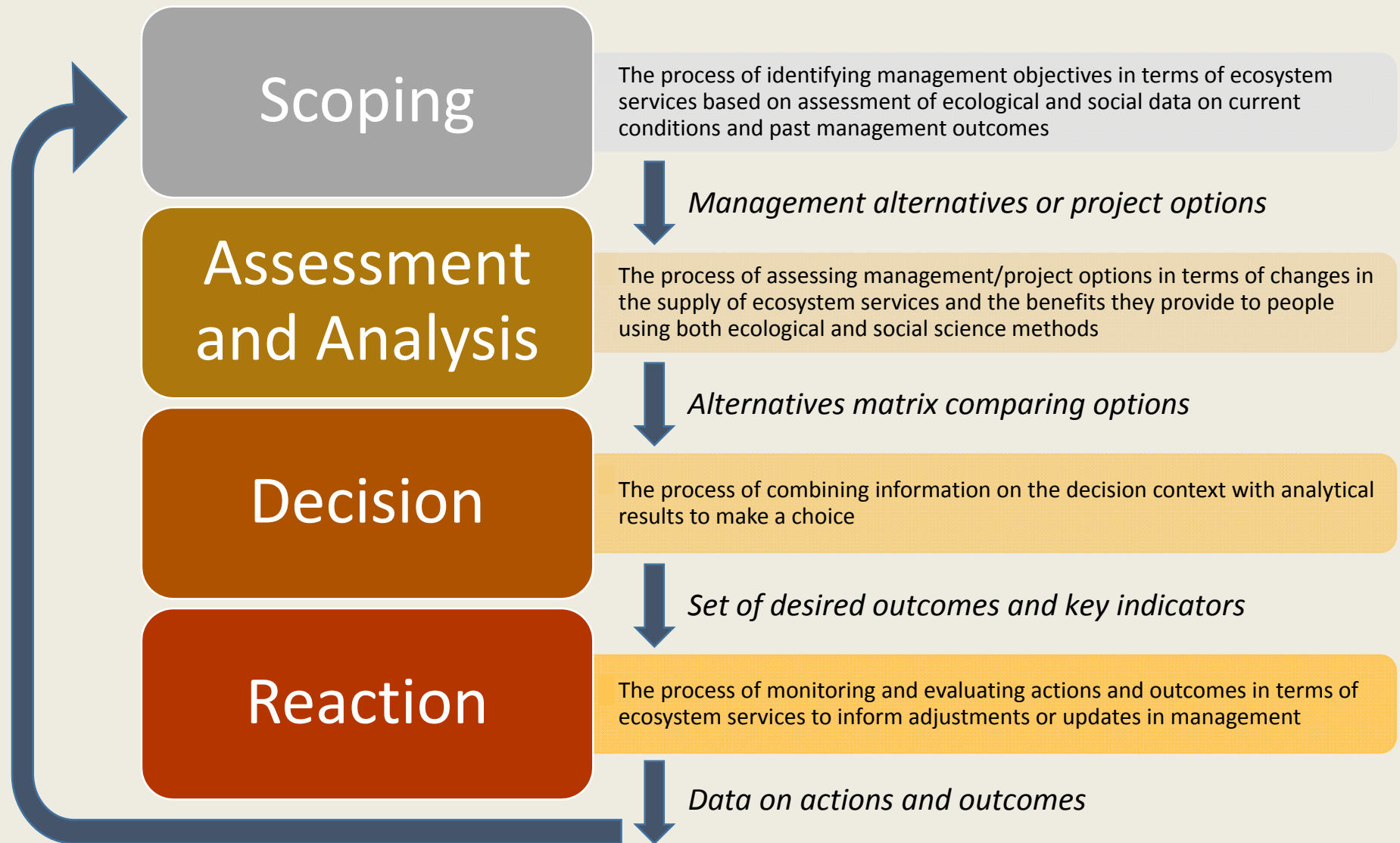
The Federal Resource Management and Ecosystem Services Project

Building the Data Infrastructure to Support Nation-Wide Ecosystem Services Assessments ACES 2014

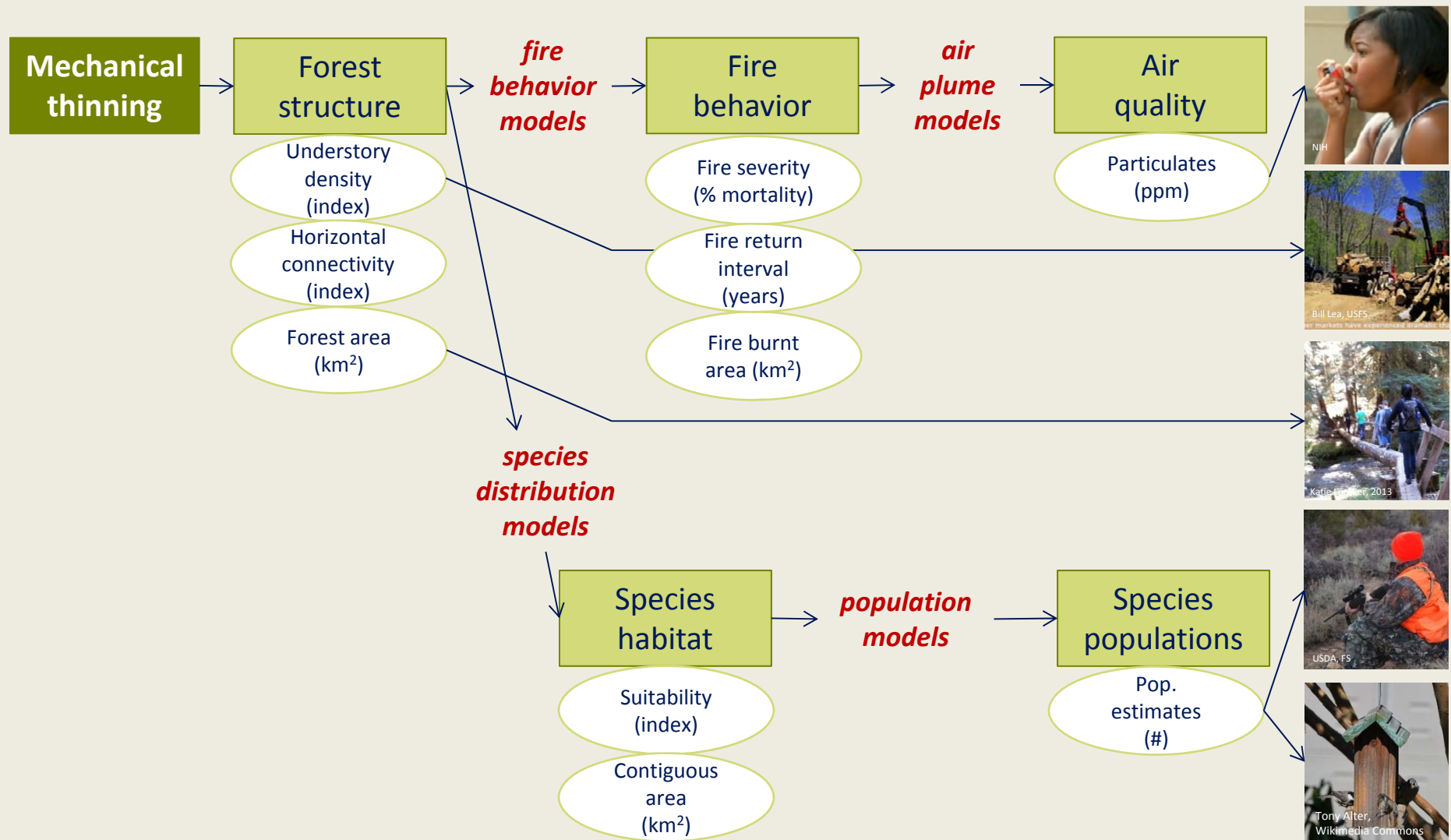
How Was the Guidebook Created?



General Assessment Steps



Ecological Analysis: Means-Ends Diagrams



Social Impact Analysis

Ecological
changes



Human interaction with and
preferences for changes

- # of beneficiaries
- Access to service
- Substitutes to service
- Reliability of service



3 focal approaches:

1. Monetary valuation
2. Non-monetary valuation (MCDA)
3. Benefit relevant indicators

Assessment and Analysis: Goal

To create an alternatives matrix that feeds into the decision process

Ecosystem Services	Alternative management actions		
	Status quo	Mechanical Thinning	Prescribed Burning
Fire Risk Reduction	<i>Each of these cells is populated with some measure of the expected change in service provided and where possible these are subsequently updated with measures indicating benefit to people.</i>		
Wildlife Related Recreation			
Water Yield			
Cost	<i>These cells are populated with the costs for each alternative</i>		

Data and Modeling Needs

- Ecological Production Functions
 - Models to estimate production of services
 - Data to parameterize the models
- Social Impact/Preferences
 - Data on social qualifiers
 - Access by stakeholders, substitutability/rarity, ...
 - Data on stakeholder populations
 - Who is benefiting and where are they?
 - What is their socio-economic status, cultural identity, ...?
 - Data and models on stakeholder preferences for alternatives

Agenda

- Dean Urban: *Data and Infrastructure Needs for Ecosystem Services Assessment (overview)*
- Annie Neale: *EPA's EnviroAtlas as a Resource for Nationwide Ecosystem Services Assessments*
- Jimmy Kagan: *Building Midscale Datasets to Support Ecosystem Services Assessments*
- Rob Johnston: *Enhancing the Geospatial Validity of Meta-Analysis to Support Ecosystem Service Benefit Transfer*
- Lynn Maguire: *Scale and Context Dependence in Multicriteria Analyses of Ecosystem Services*



The Federal Resource Management and Ecosystem Services Project

Data and Infrastructure Needs for Ecosystem Services Assessment

Dean Urban
Nicholas School of the Environment
Duke University

Aim: Distributed implementation

The FRMES project aims to scale up nationally:

- Across geographies
- Across agencies (and agency mandates)
- Across decision contexts

This implies:

- Robust, flexible, transferable models
- National-scale data of consistent quality

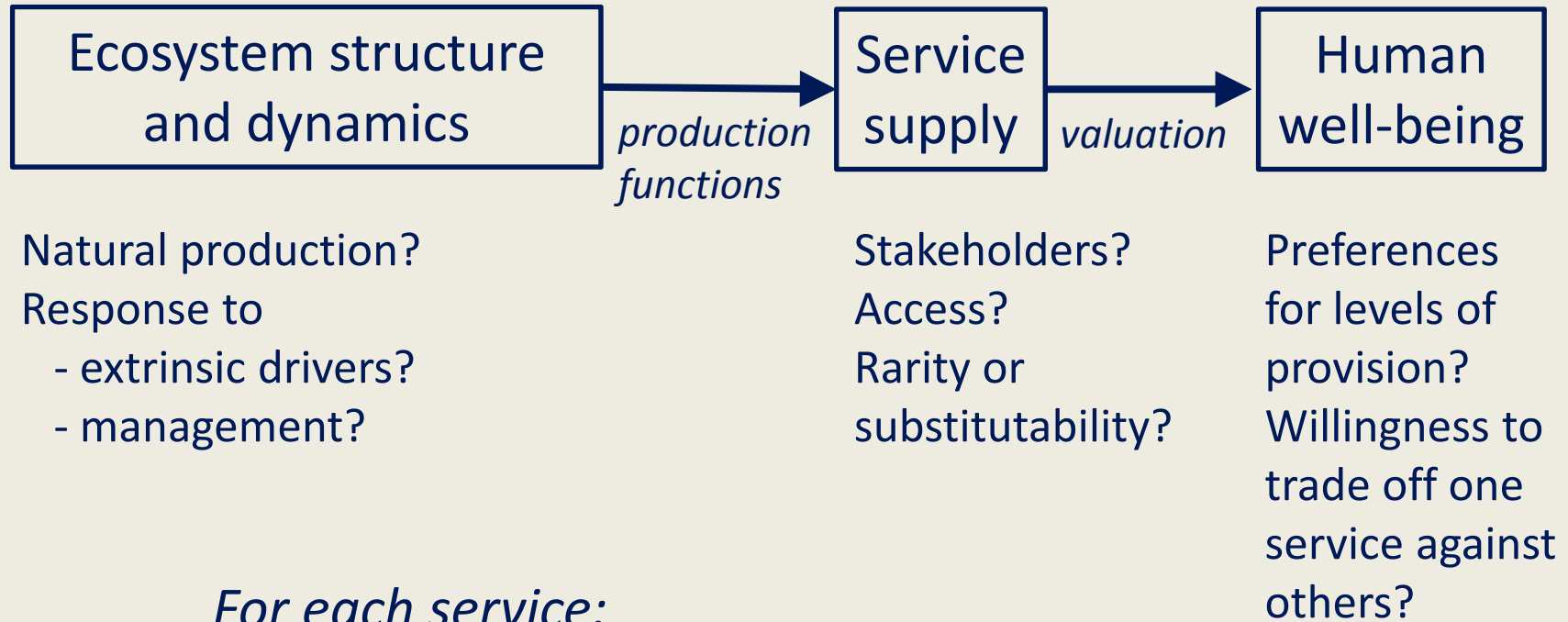


NATIONAL
SOCIO-ENVIRONMENTAL
SYNTHESIS CENTER



National Science Foundation
WHERE DISCOVERIES BEGIN

Chain-of-custody of information



For each service:

- How good are the models?
- Do we have data available?

Example: Western Forests & Fire



Mechanical
thinning

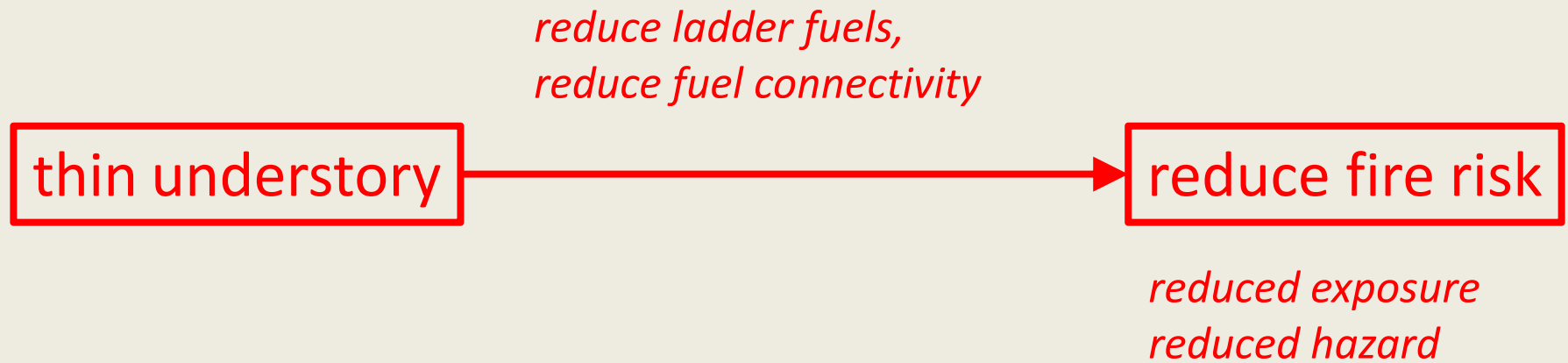
NPS (Bryce Canyon)

Prescribed fire

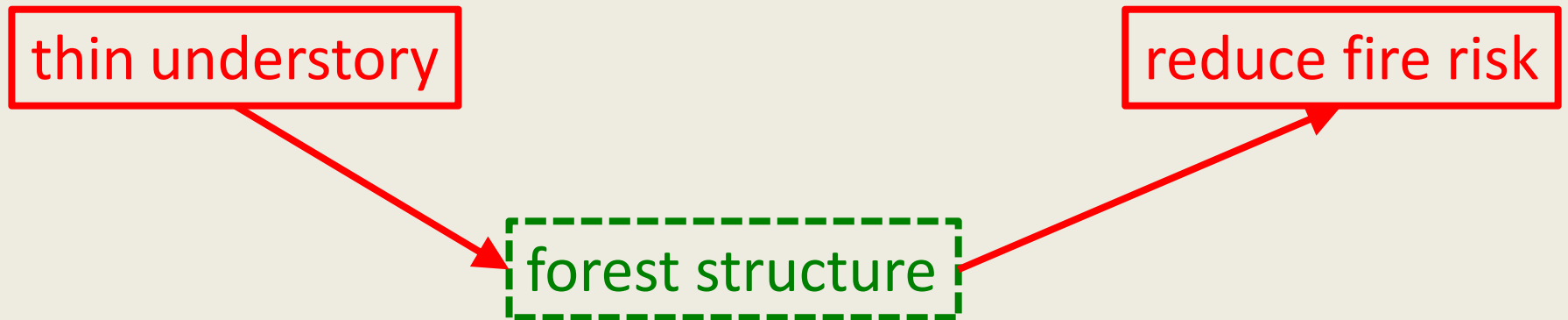
Northern Rockies Fire Science Network



Forests & Fire



Forests & Fire



Forests & Fire

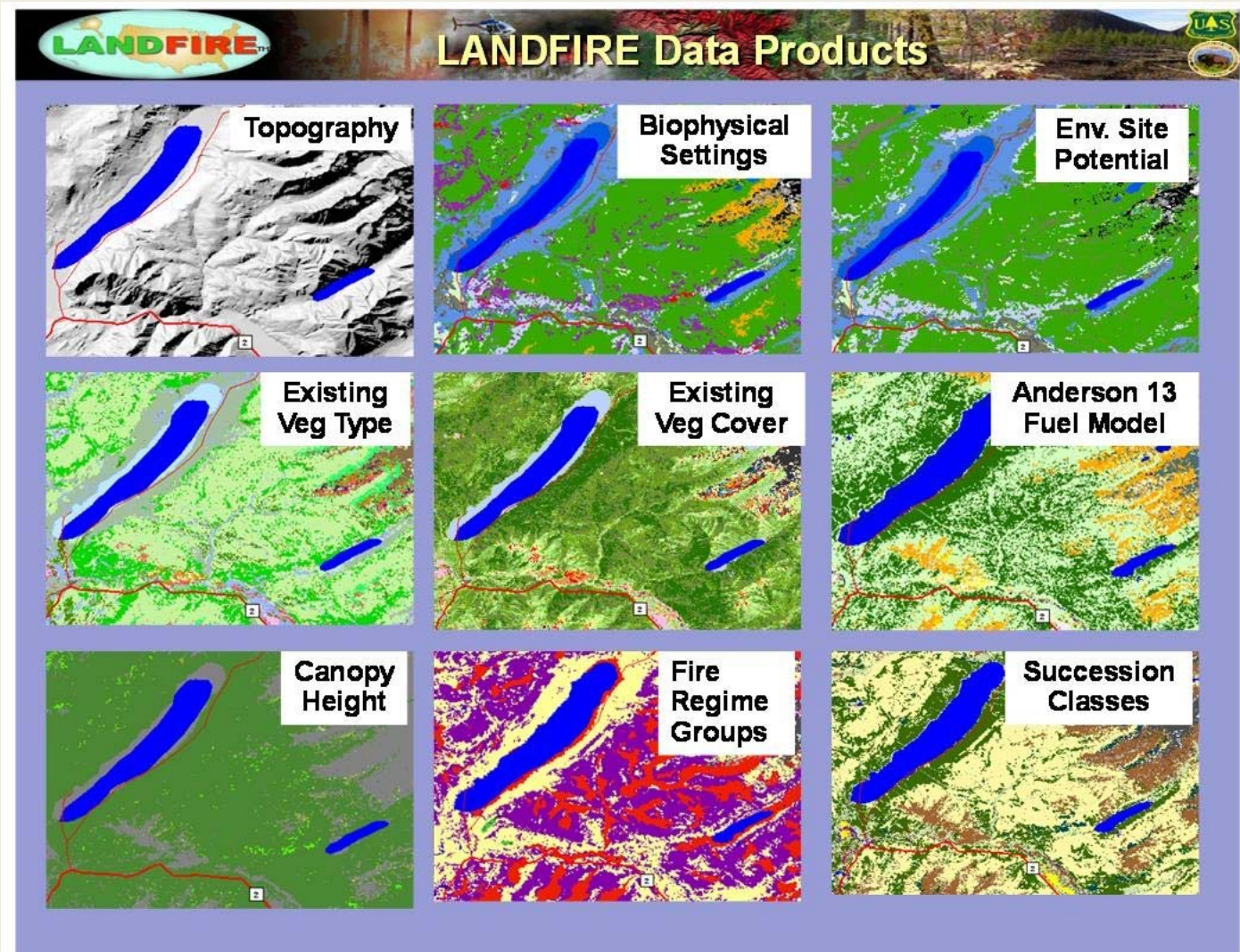
Forests (fuels)	Management	Fire potential	Fire behavior	Fire effects	Property risk, cost	Human health impacts	Human well-being
FVS-FFE	x	x	x	x			
FM 97.5	x	x					
FIRE-BGC	x	x	x	x			
FARSITE		x	x	x			
SIAM					x		
WIRHD					x		
RAVAR					x		
AERMOD						x	

Thanks to Keith Stockman (USFS)

Forests & Fire

Data:

- Local (high-resolution)
- National (moderate resolution)



Forests & Fire

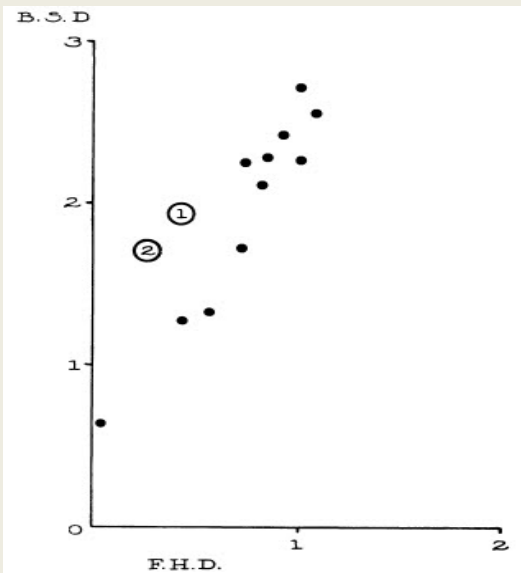
thin understory

reduce fire risk

forest structure

wildlife?

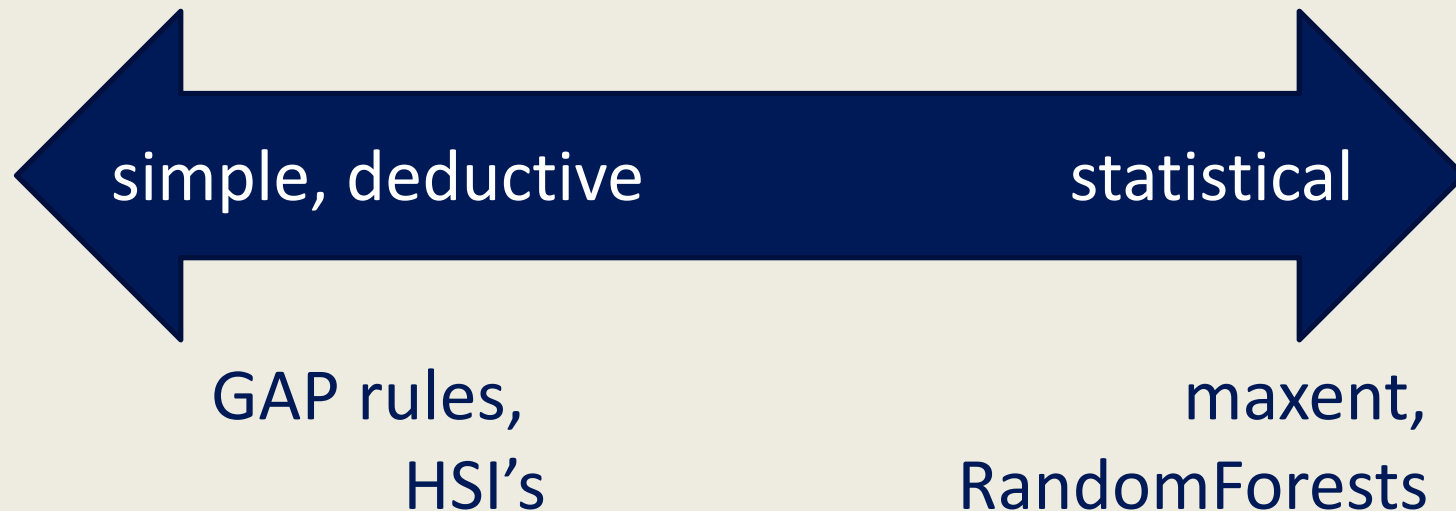
*habitat
variety*



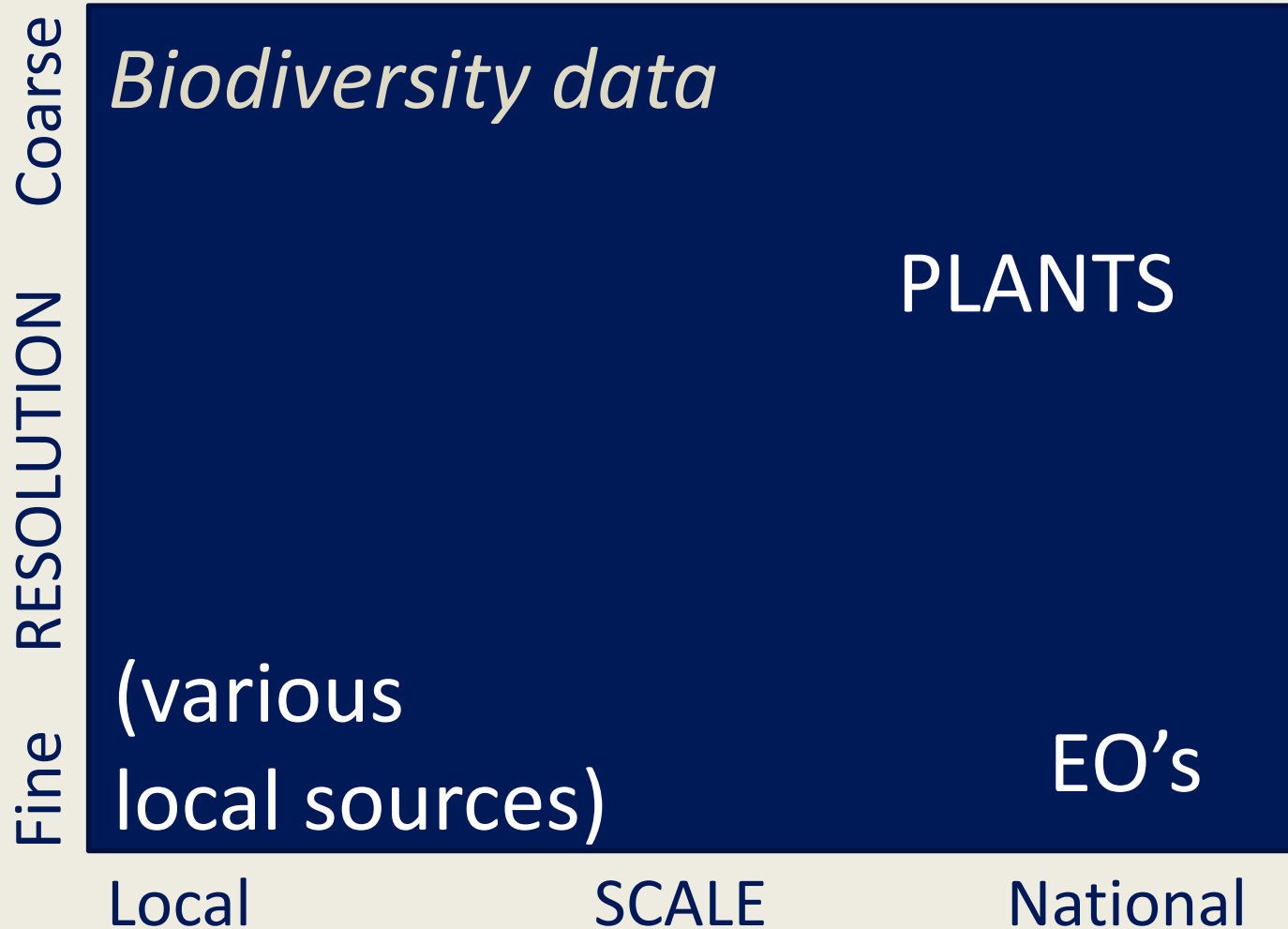
MacArthur:
bird species diversity vs foliage height diversity

Forests & Biodiversity

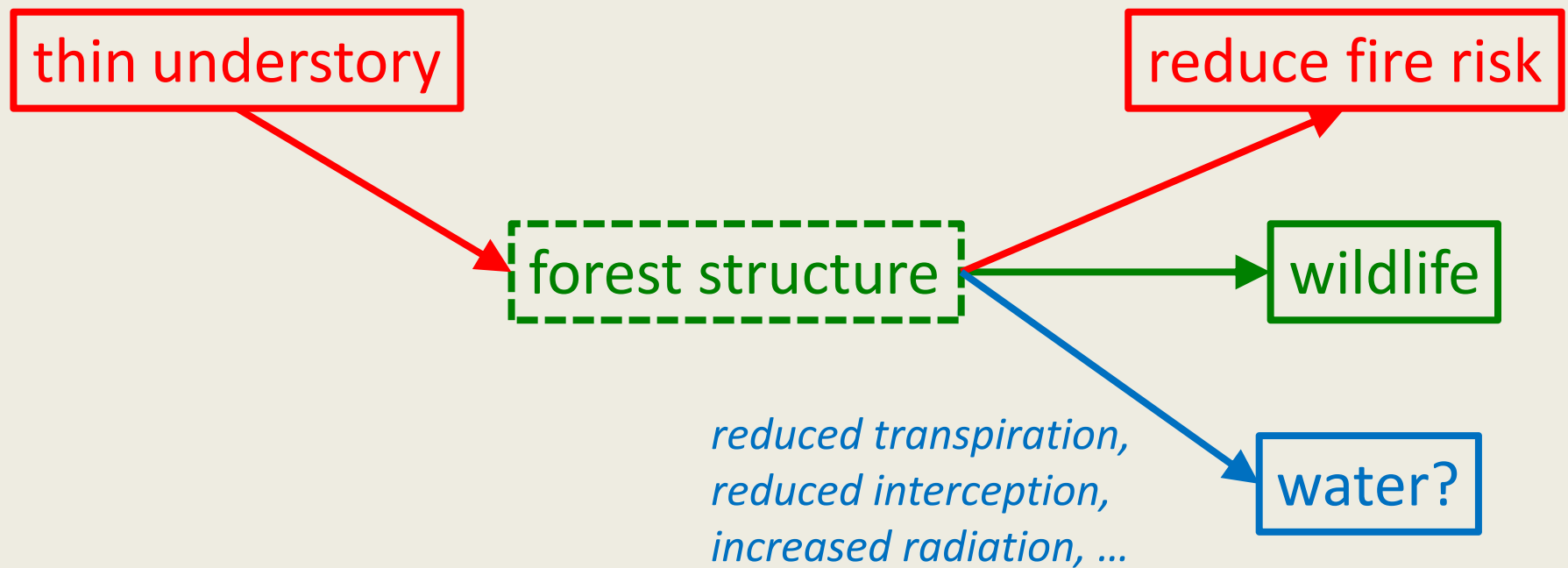
Habitat, species distribution models



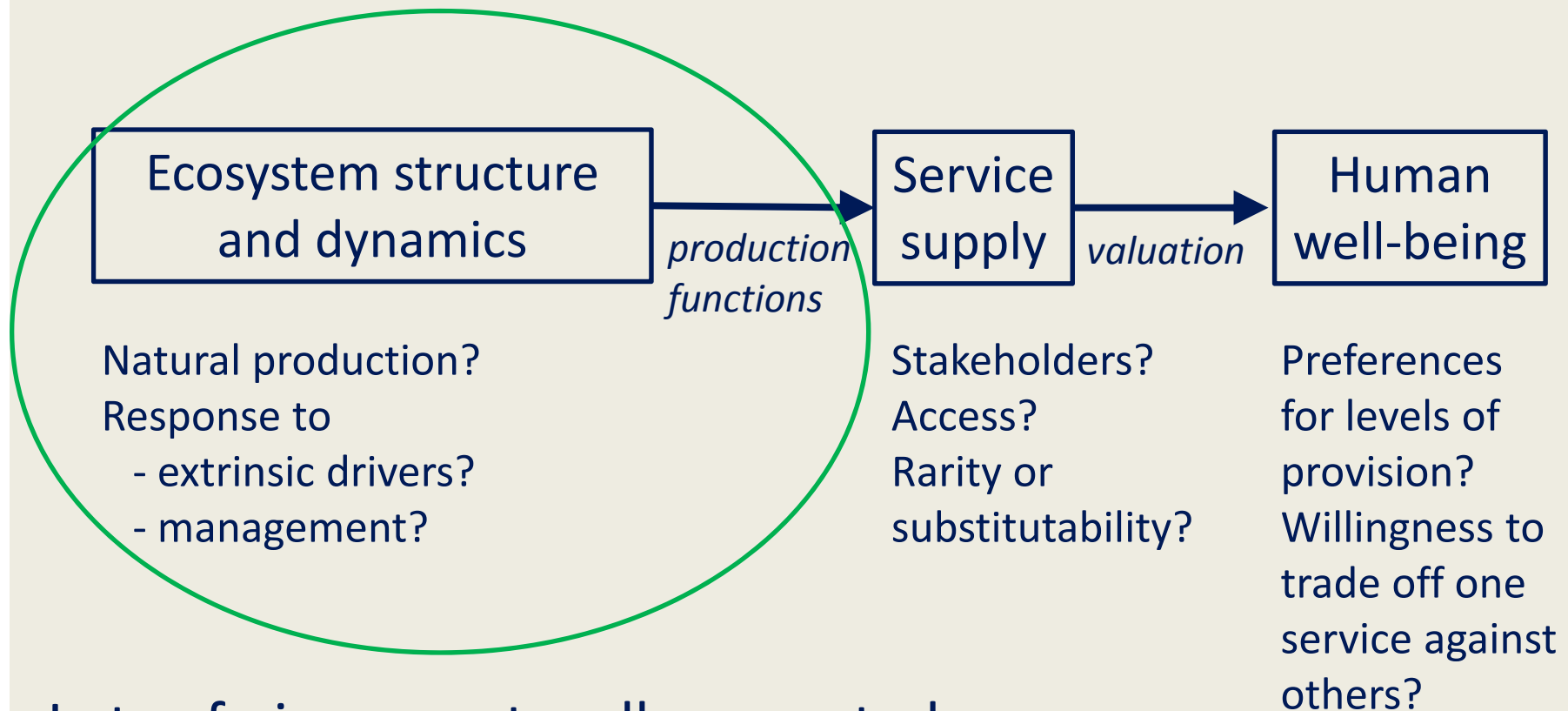
Forests & Biodiversity



Forests & Fire & Biodiversity



Chain-of-custody of information



Lots of pieces, not well connected:

- to other pieces
- to management actions

Using Socially Qualified Indicators

What is measured:

- Social factors that affect how a service is used or valued

Techniques:

- # of beneficiaries, access, etc.

Yields:

- Socially relevant ecological indicators modified by social information

Requires:

- Information on beneficiaries and how they interact with services

Caveats:

- No stakeholder preference information
- Biases are less transparent

Biophysical Indicator:

- Game habitat

+

Social Information:

- # of hunting permits
- # of access points for hunting
- # of other hunting sites



Monetary Valuation

What is measured:

- Willingness to pay (WTP)

Techniques:

- Revealed preference
(Travel cost, property values)
- Stated preference
(Surveys asking WTP)
- Production/profit function

Yields:

- Dollar value of ES provided (or change in ES)
- Allows BCA

Requires:

- Quantified ecological outcome to value

Caveats:

- Some services difficult or deemed unsuitable to monetize
- Difficult but possible to transfer values



Travel Costs



Medical expenses



Survey for WTP

Multi-Criteria Decision Analysis

What is expressed:

- Relative value for each service and overall value for each alternative

Techniques:

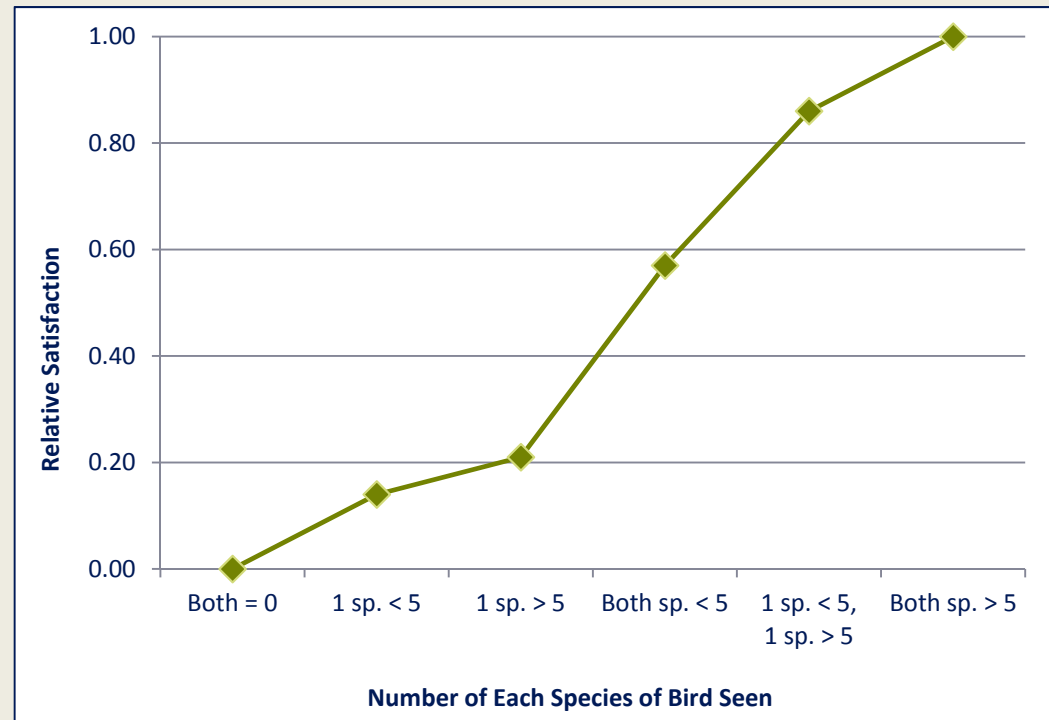
- In-person elicitation
- Surveys

Requires:

- Quantified ecological outcome and capacity to elicit stakeholder preferences

Caveats:

- Elicitation can be time-consuming
- Results not transferable to different decision contexts



George Gentry, FWS

State-of-the-Art?

Service	Ecology	Qualifiers	Social Impacts
Fire risk reduction	Data Models	Data Models	Data Models
Biodiversity support	Data Models	Data Models	Data Models
Recreation (non use)	Data Models	Data Models	Data Models
Watershed protection	Data Models	Data Models	Data Models

poor -> moderate -> good

Conclusions & Prospectus

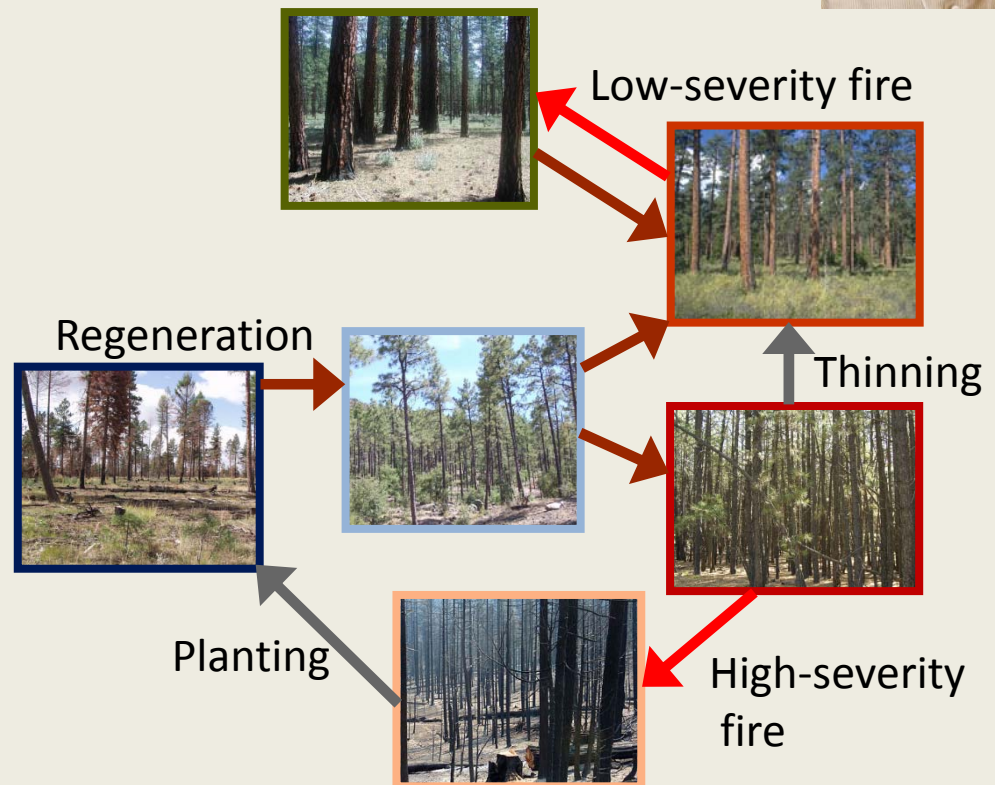
- We have a lot of data and quite a few models (not very well connected)
- We need more of each
- The chain-of-custody of info has lots of weak links, but this is a solvable problem (via collaboration)
- The data and models need to be built and curated over time if we want to do this well

National-scale data?



Regional Data and Models?

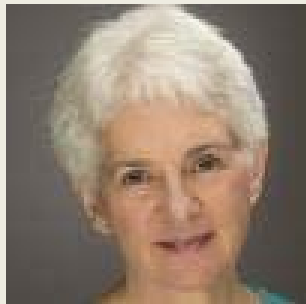
- Gradient nearest-neighbor imputation using NLCD x FIA data
- Produces maps of
 - Vegetation structure
 - Size distributions
 - Species composition (species of concern, invasives)



Scaling social analyses?



- Scaling up valuation: benefit transfer models with geospatial conditioners



- Transportability of non-monetary valuation (MCDA)