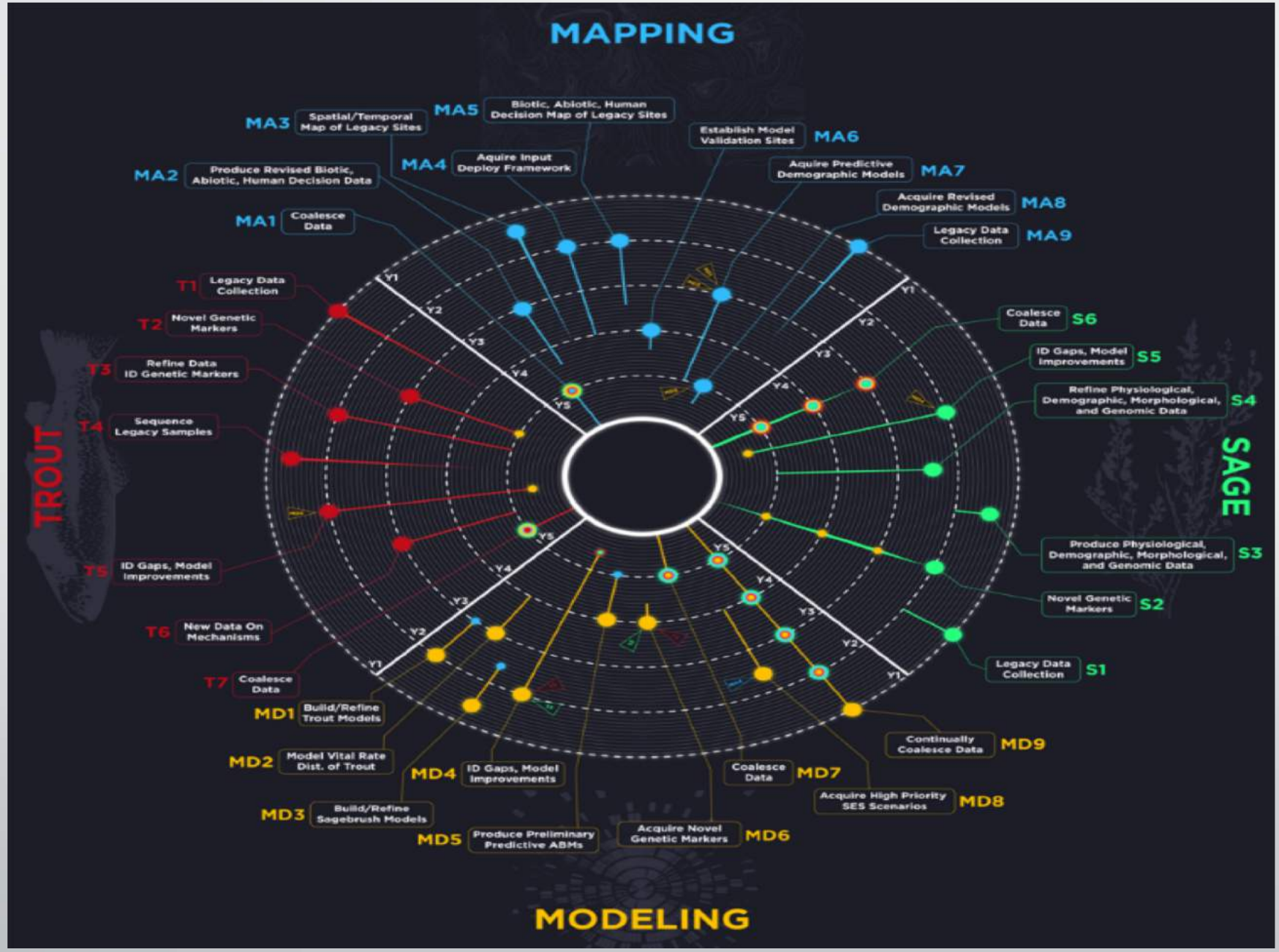
Objective 3: Mapping

Map genotype by environment outcomes across social-ecological systems to inform management decisions

Leads: Donna Delparte and Morey Burnham


MAPPING
MA1 Coalesce Data
MA2 Produce Revised Biotic, Abiotic, Human Decision Data
MA3 Spatial/Temporal Map of Legacy Sites
MA4 Aquire Input Deploy Framework
MA5 Biotic, Abiotic, Human Decision Map of Legacy Sites
MA6 Establish Model Validation Sites
MA7 Aquire Predictive Demographic Models
MA8 Acquire Revised Demographic Models
MA9 Legacy Data Collection
TROUT
T1 Legacy Data Collection
T2 Novel Genetic Markers
T3 Refine Data ID Genetic Markers
T4 Sequence Legacy Samples
T5 ID Gaps, Model Improvements
T6 New Data On Mechanisms
T7 Coalesce Data
SAGE
S6 Coalesce Data
S5 ID Gaps, Model Improvements
S4 Refine Physiological, Demographic, Morphological, and Genomic Data
S3 Produce Physiological, Demographic, Morphological, and Genomic Data
S2 Novel Genetic Markers
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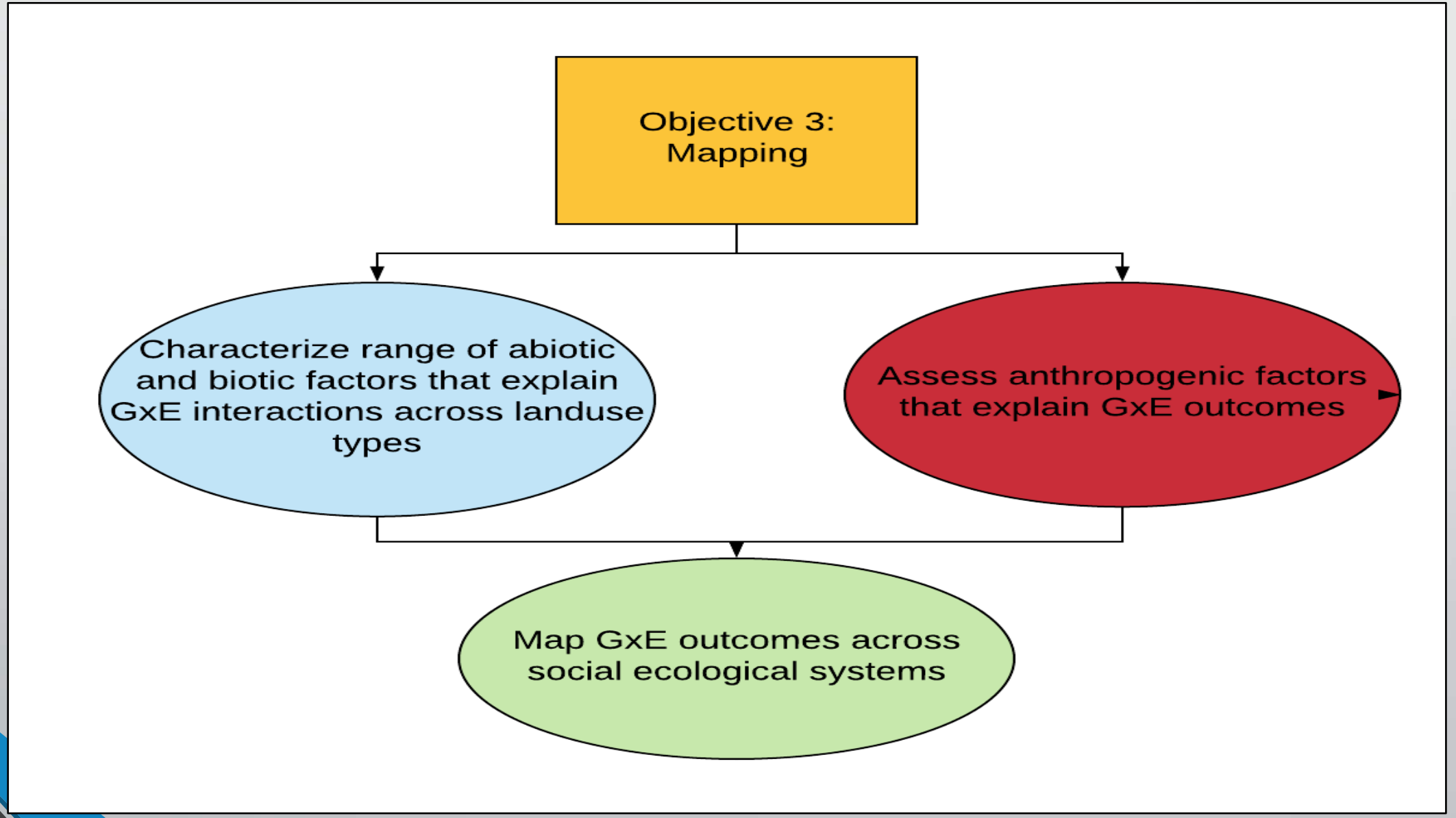
MD1 Build/Refine Trout Models
MD2 Model Vital Rate Dist. of Trout
MD3 Build/Refine Sagebrush Models
MD4 ID Gaps, Model Improvements
MD5 Produce Preliminary Predictive ABMs
MD6 Acquire Novel Genetic Markers
MD7 Coalesce Data
MD8 Acquire High Priority SES Scenarios
MD9 Continually Coalesce Data
MODELING

Overarching Research Question

What abiotic, biotic, and anthropogenic factors explain deviations in predicted adaptive capacity of populations determined from Objectives One and Two across social-ecological systems

Mapping Overview



Strategic Planning

Objective 3.1 Map complex social ecological systems

- Create Mapping Tools
- Map SES Conditions

Objective 3.2 Assess and characterize the range of biotic and abiotic factors that explain GxE outcomes across SES gradients

- Assess and characterize phenomic factors that explain GxE outcomes
- Assess abiotic and biotic mechanism of deviation, including human decisions, from demographic distribution models

Objective 3.3 Assess anthropogenic factors that explain GxE outcomes

- David L. Griffith, Kelly Hopping

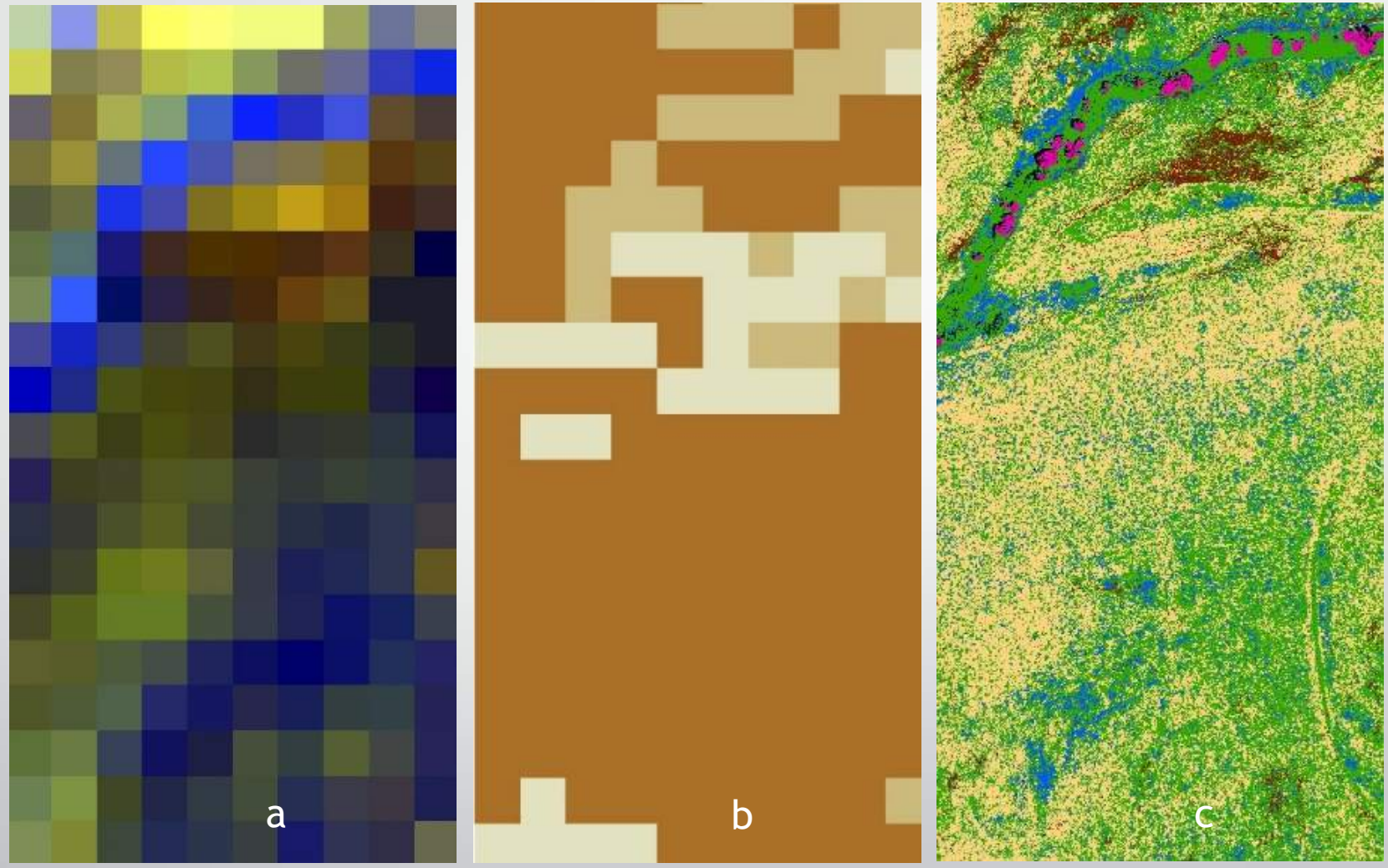
Create Mapping Tools

DJI Matrice 600 Pro, fitted with Rikola hyperspectral sensor (a) and Ricoh II digital camera (b).

Delparte, Forbey,Caughlin, Keeley,Reinhardt

(a) sUAS imagery captured by digital camera at 75 m AGL. (b) False color image of NIR and red bands, showing higher NIR values in red. (c) Classification of hyperspectral image.

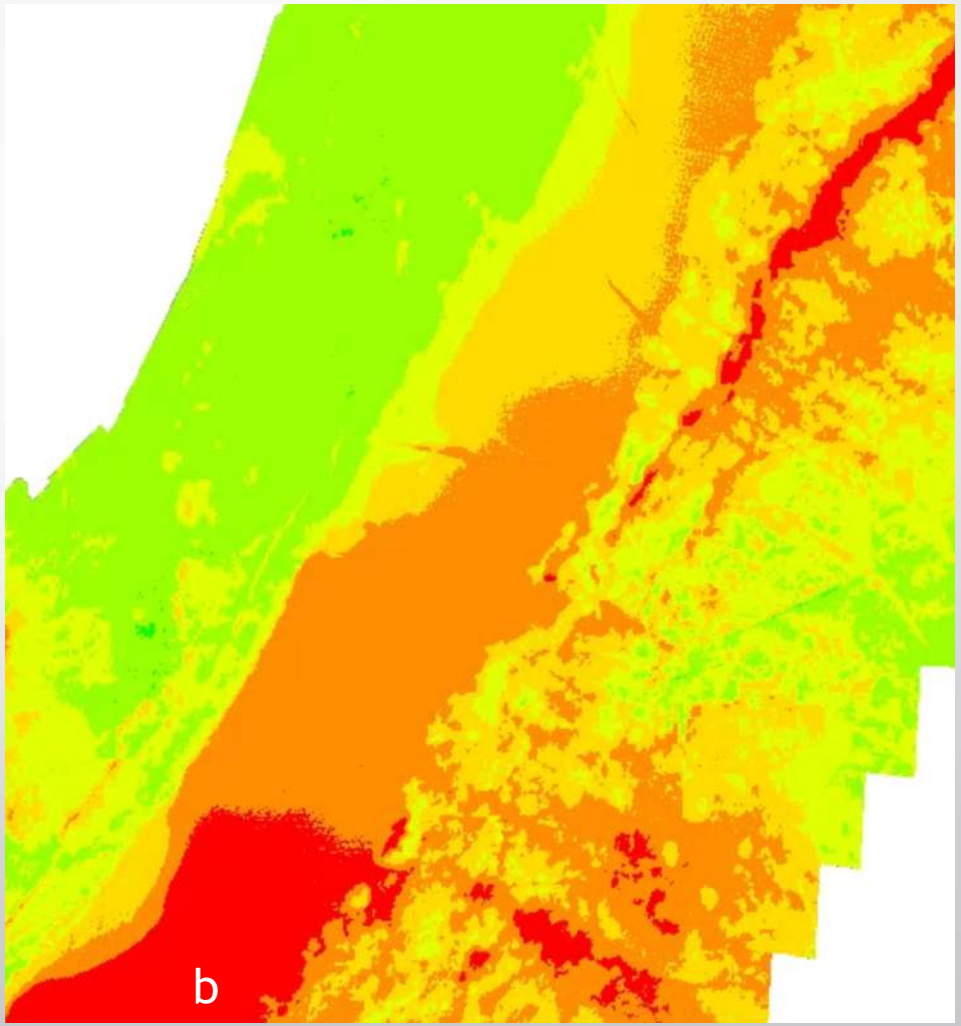
Map SES conditions – landuse and land cover change over time



(a) Landsat false color image. (b) NLCD classification image. (c) Classification of sUAS hyperspectral image.

Brandt, Delparte

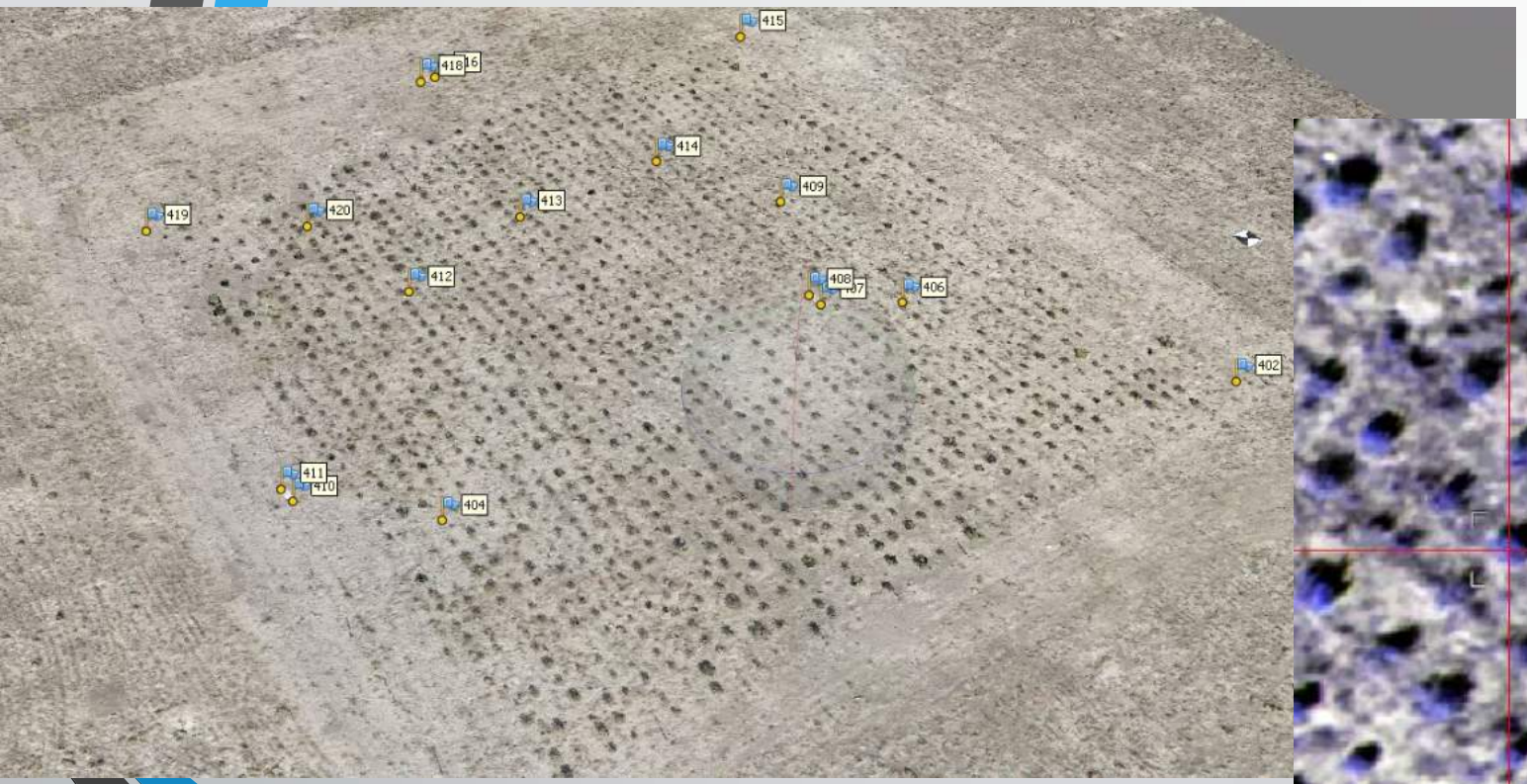
Assess and characterize phenomic factors that explain GxE outcomes

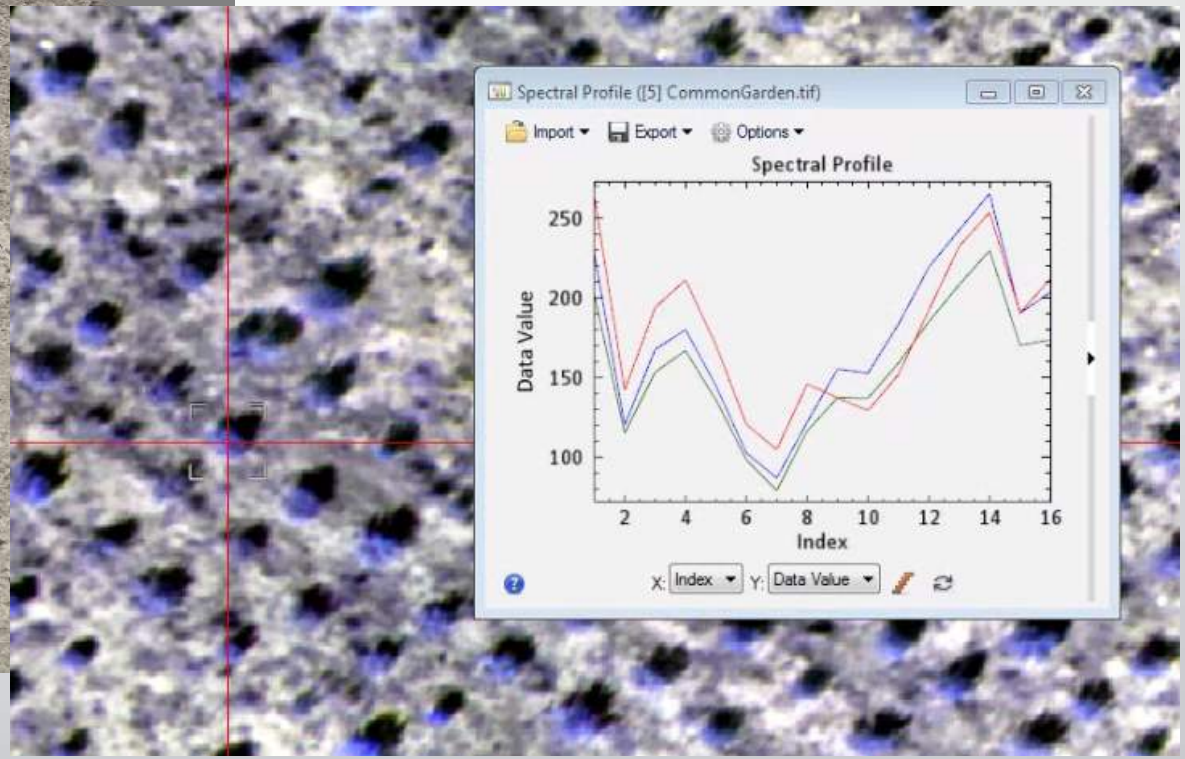


(a) River bathymetry. (b) Thermal gradient

Caughlin/Reinhardt, (Sagebrush), Keeley/Caudill (Trout); Burnham,Hopping, Kliskey

Assess abiotic and biotic mechanism of deviation, including human decisions, from demographic distribution models





Orchard Common Garden. (a) RGB point cloud. (b) UAS Hyperspectral signatures

Caughlin, Keeley, Reinhardt, Forbey, Buerki, Hardy, Delparte

Social-Ecological Science (SES) Approaches for GEM3

Morey Burnham[1], David L. Griffith[2], Kelly Hopping[3], Andrew Kliskey[2], & Garry Sotnik[1]

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[3] Human-Environment Systems, Boise State University

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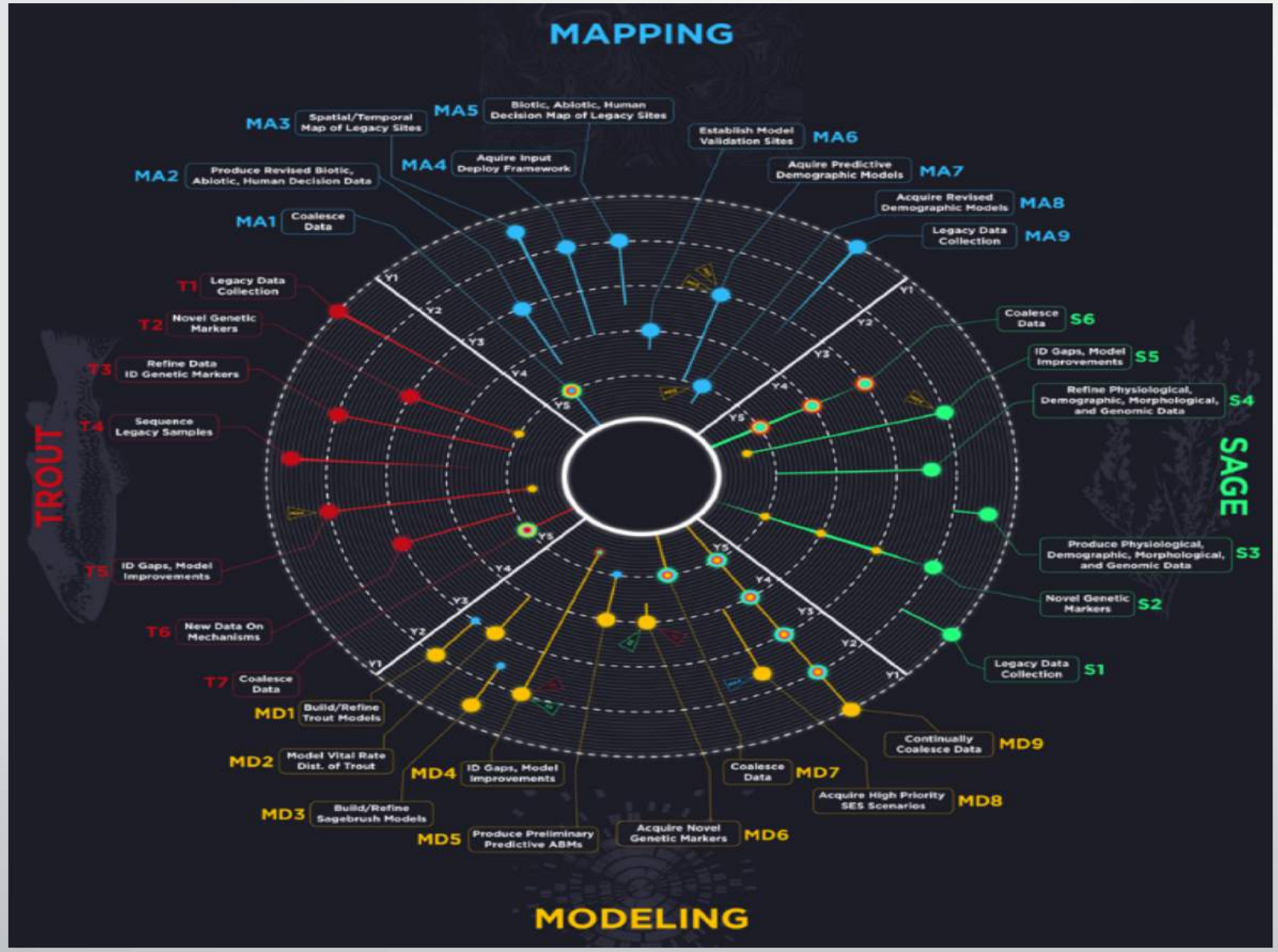
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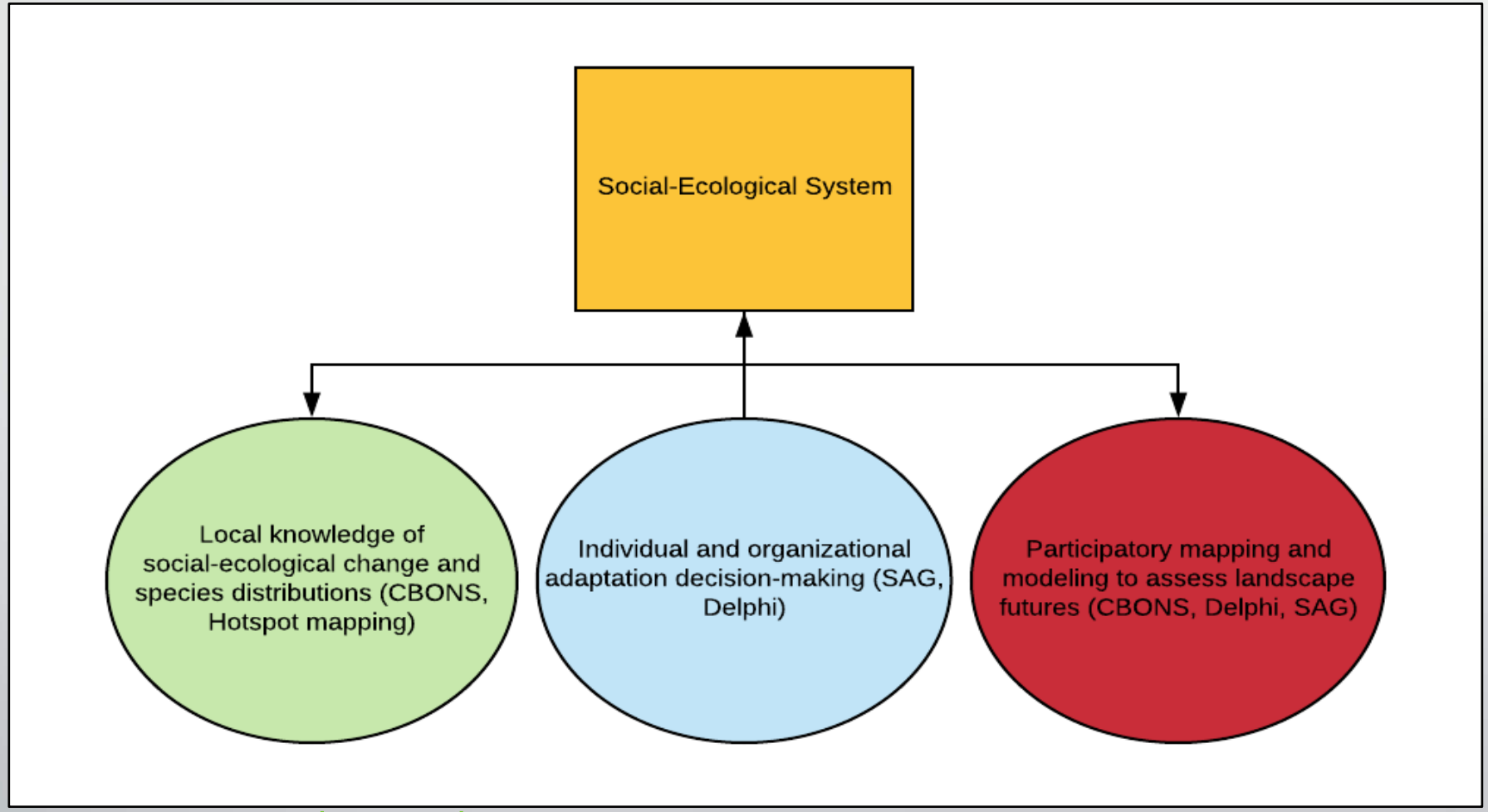
MODELING

Social-Ecological Systems Overview



System understanding Decision-making Future scenarios

Overarching research questions

Local knowledge of the system

1. How are social and environmental factors affecting species and their adaptive capacity, according to stakeholders?
2. How do different stakeholders value and use sagebrush and redband trout and their associated landscapes?

Decision-making

3. How do stakeholders make land and water management decisions, and what are the barriers and opportunities for implementing adaptation to social-ecological change?
4. How can local knowledge be incorporated into adaptation decision-making to ensure fair policy development that meets all stakeholders' needs?

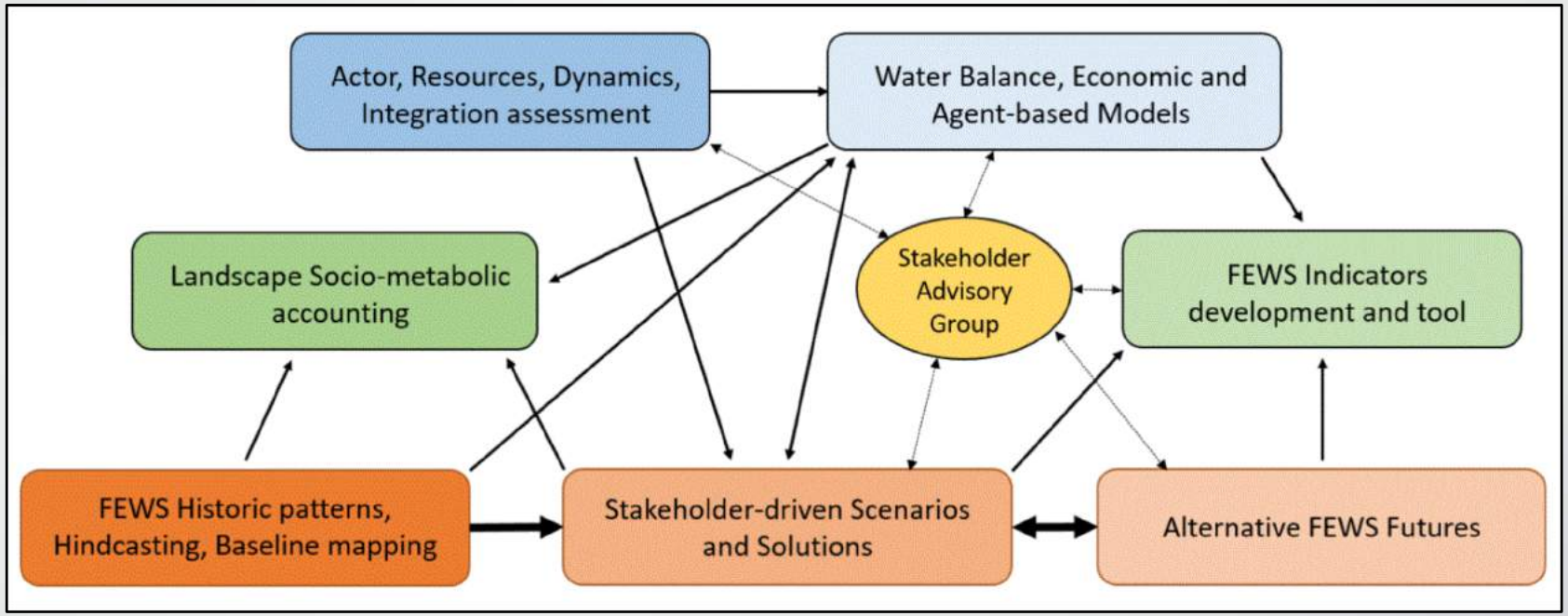
Future scenarios

5. What interventions do stakeholders consider appropriate, effective, and important for responding to potential consequences of SES change on species adaptive capacity?

Methods and Tools

Stakeholder Advisory Groups

INFEWS/T3: Social-ecological-technological solutions to waste reuse in Food, Energy, and Water Systems (NSF1639529)



Impacts:

1. Stakeholder partnerships generate viable and socially acceptable solutions.
2. Scenario process provides a space to explore integrated solutions as plausible futures and aggregated at the landscape scale.
3. Designing resilient FEWS landscapes requires more than technological solutions.

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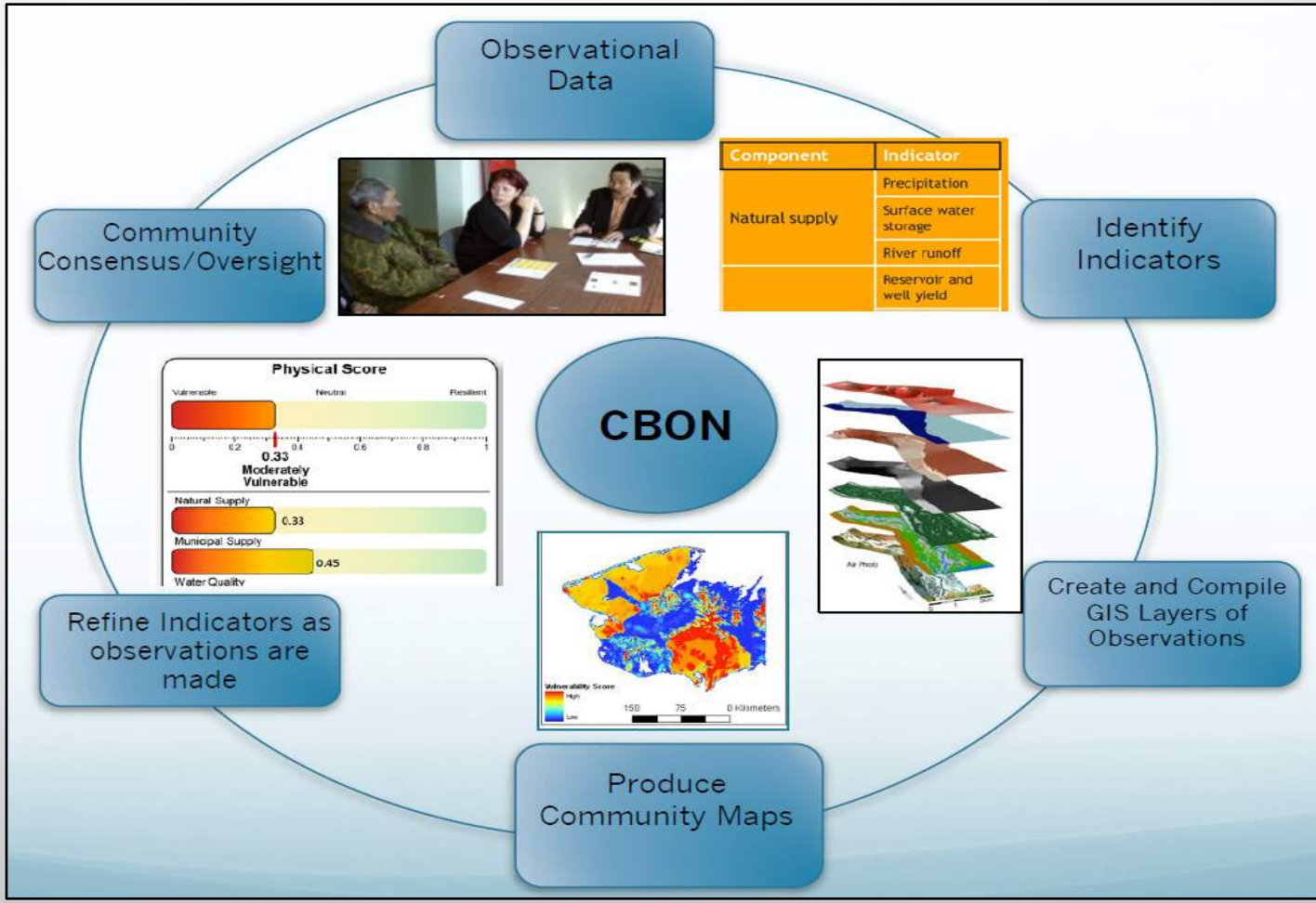
Community-Based Observation Networks (CBONS)

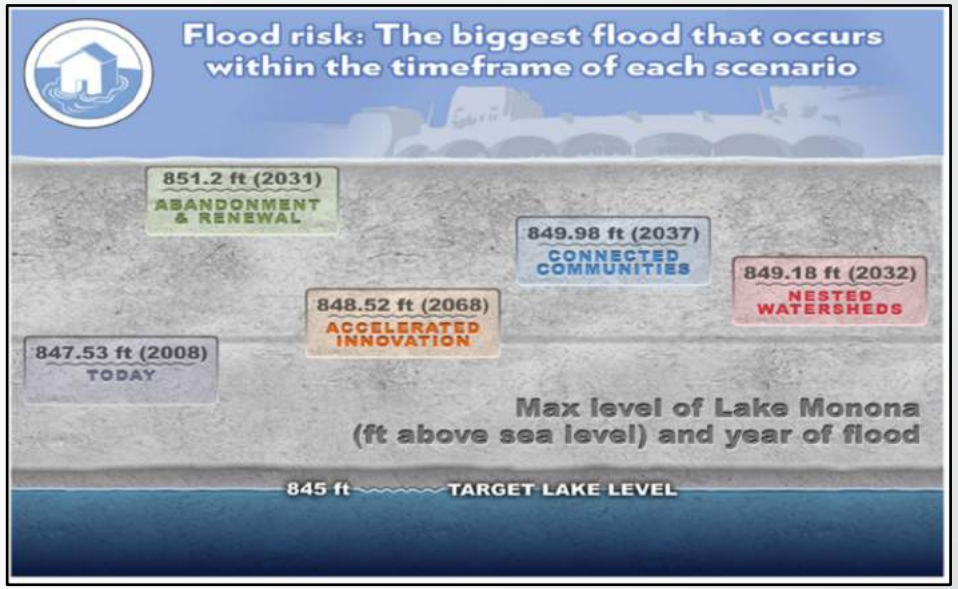
CBONs are long term, collaborative observatories focused on linked environmental and social change.

They are driven by the data needs of both communities and researchers.

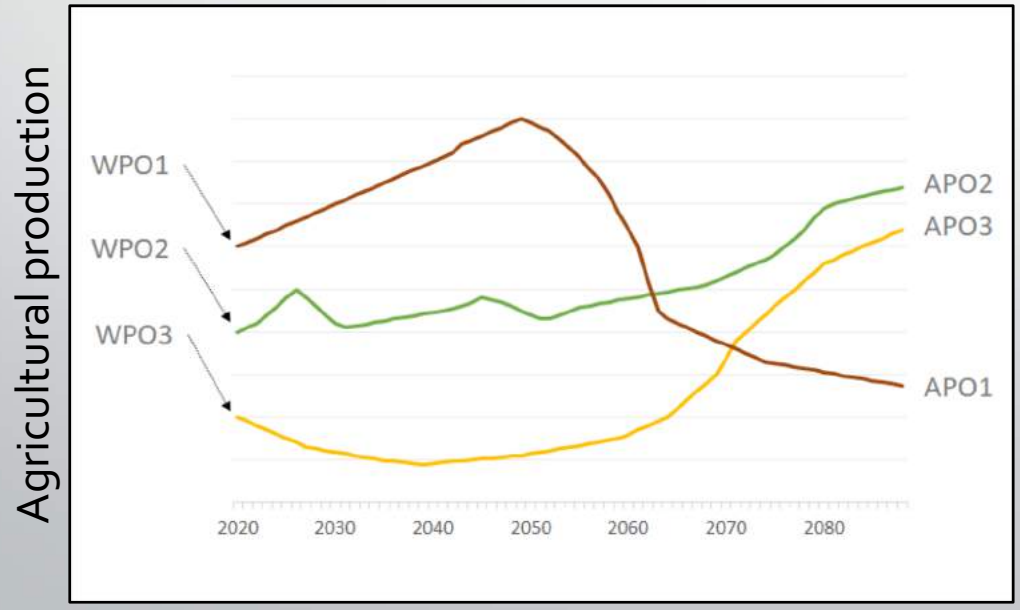


Scenario Analysis

Scenarios are plausible stories that detail future potential SES trajectories under status quo and alternative development patterns based on human choices. Scenario analysis is the comparison of alternative possible futures.



https://wsc.limnology.wisc.edu/yahara2070



Social-Ecological Hotspot Mapping

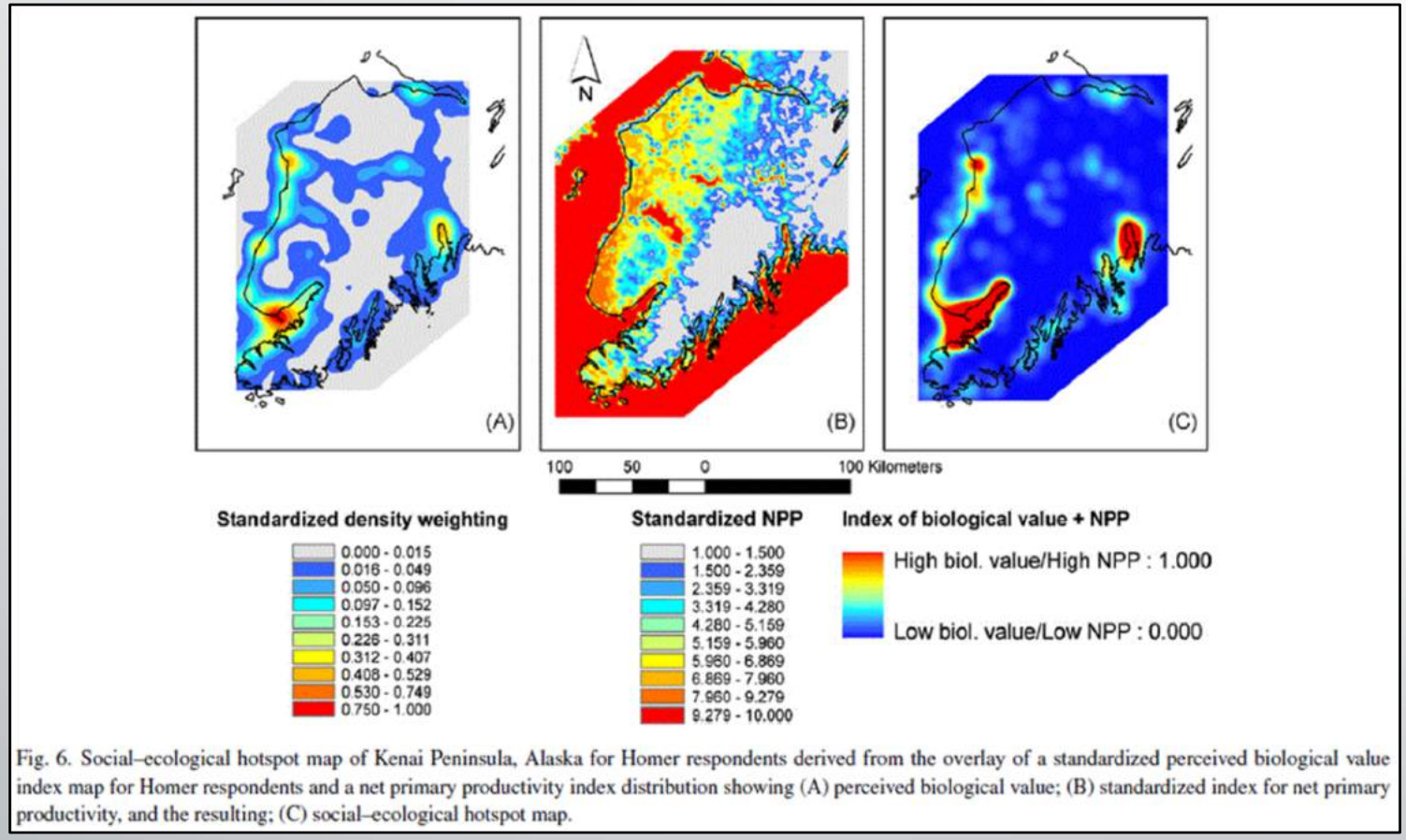


Fig. 6. Social–ecological hotspot map of Kenai Peninsula, Alaska for Homer respondents derived from the overlay of a standardized perceived biological value index map for Homer respondents and a net primary productivity index distribution showing (A) perceived biological value; (B) standardized index for net primary productivity, and the resulting; (C) social–ecological hotspot map.

- Collect spatially explicit sociocultural data (values) on resource utilization
- Combine with biophysical data using spatial analysis methods
- Alessa, Kliskey, & Brown 2008

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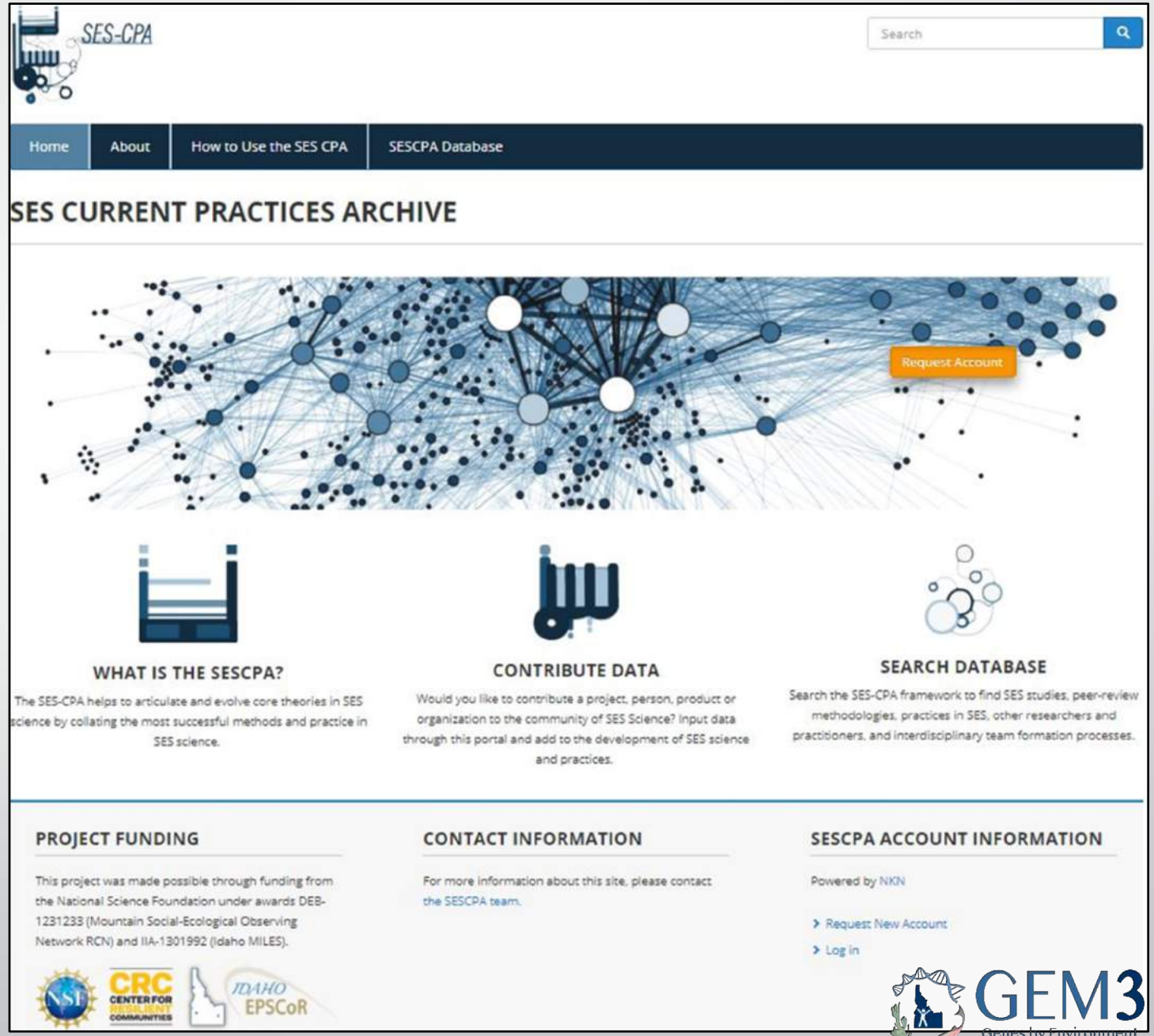
SES-CPA:

Social-ecological Systems Current Practices Archive

www.sescpa.net

- Legacy outcome for Idaho MILES
- Contributes to national and international best practices in SES science
- Tool for GEM3 SES neophytes and experts alike
- Repository for SES case-studies
  - Searchable SES meta-information
  - Evaluative information on successes and failures in SES
- Launched: Dec 6, 2018



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