Modeling

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GEM3
Genes by Environment
Modeling · Mechanisms · Mapping

Team

- ***Leads:*** Robison (UI), Heath (BSU), Wichman (UI)
- ***Participating Faculty:*** Abatzoglou (UI), Brandt (BSU), Burnham (ISU), Caudill (UI), Caughlin (BSU), Hillis (BSU), Hohenlohe (UI), Kliskey (UI), Rachlow (UI), Running (ISU), Waits (UI)
- ***New Hires:*** Ecological Genomics Modeler (BSU), Environmental Network Systems Scientist (BSU), Data Scientist (BSU)
- ***Postdocs (4)***: Agent Based Modeling, Evolutionary Computation , Mathematical Modeling, Geospatial Modeling, Landscape level processes (trout), Landscape level processes (sage)
- ***Graduate students:*** 2

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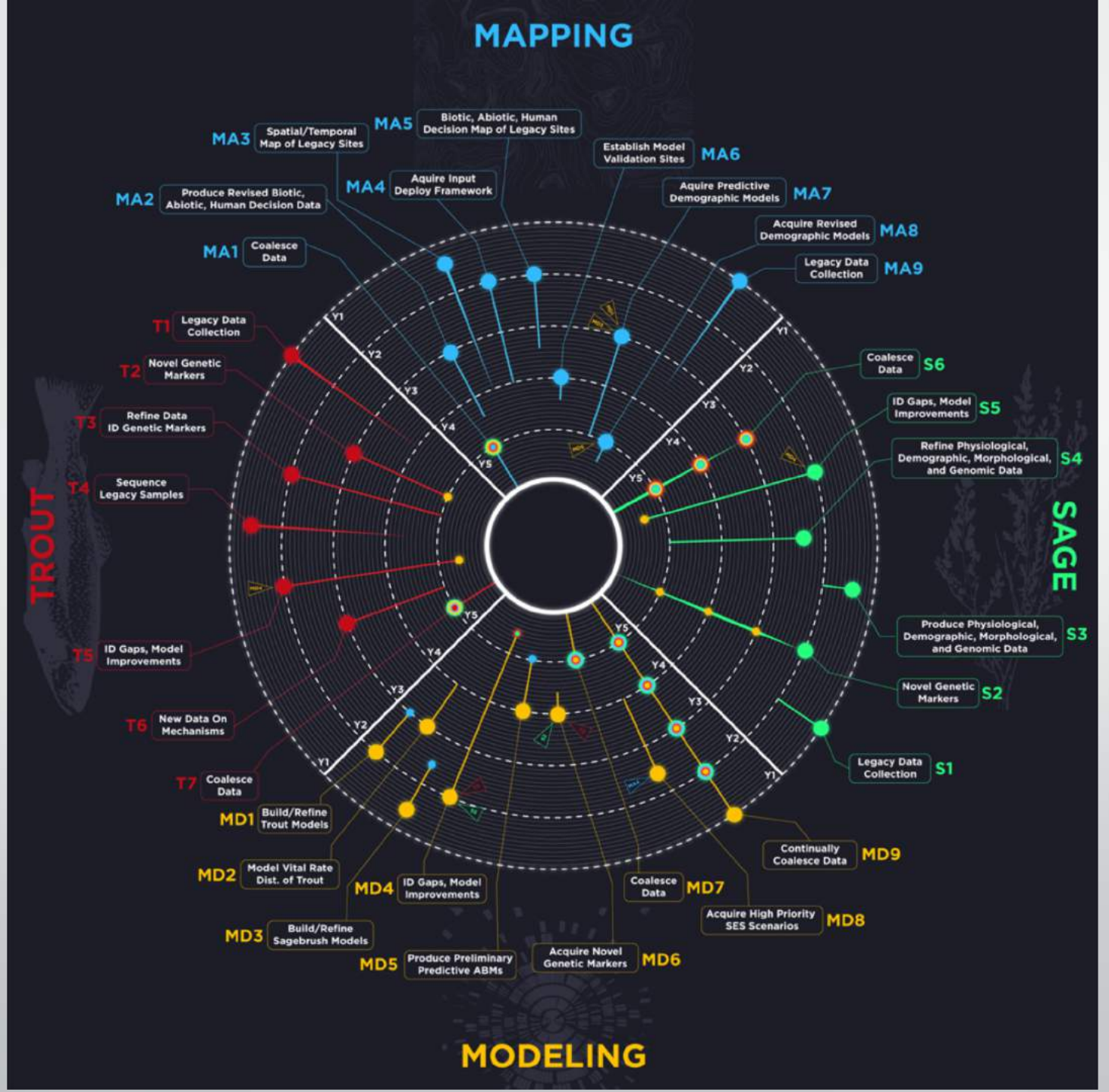

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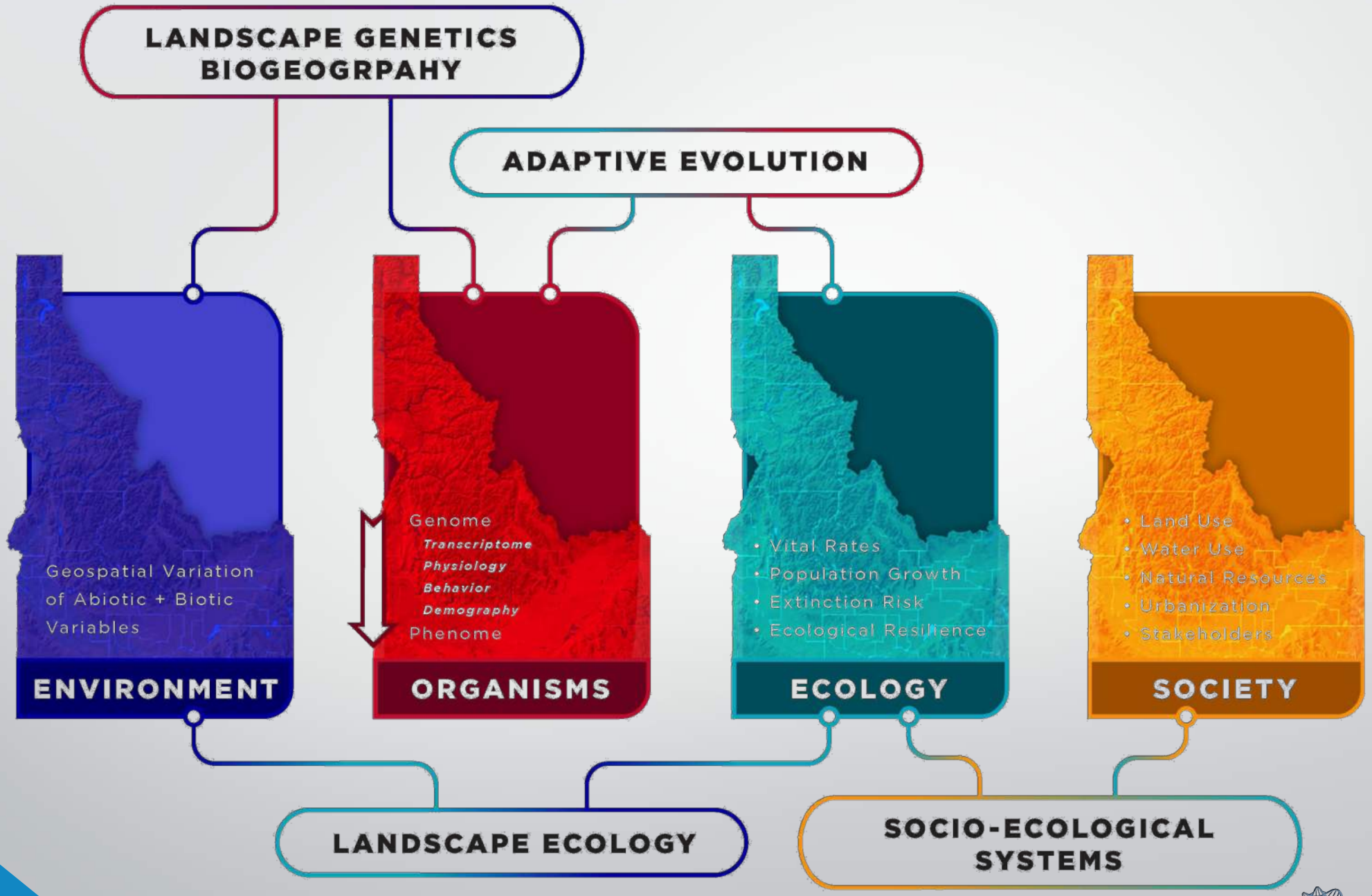

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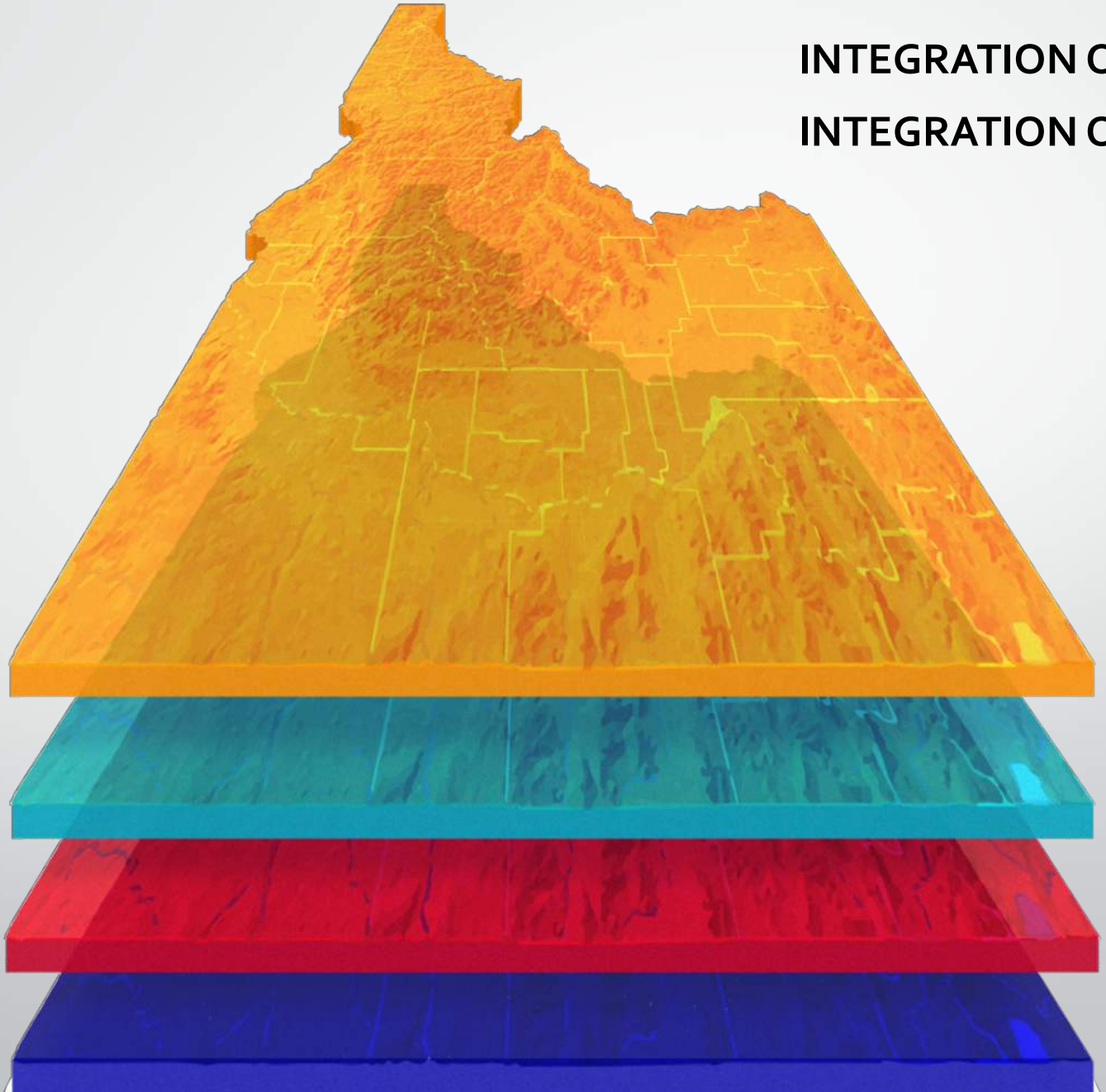
INTEGRATION

INTEGRATION OF DATA

INTEGRATION OF PROCESSES



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Goal:

Develop, validate, and test integrative models that predict the adaptive capacity of populations across space and time.

- ***Objective 1.*** Build statistical models to explain distribution and demography of study organisms using ***legacy and empirical data***.
- ***Objective 2.*** Simulate ***adaptive capacity and population vulnerability*** using Agent Based Models (ABM).

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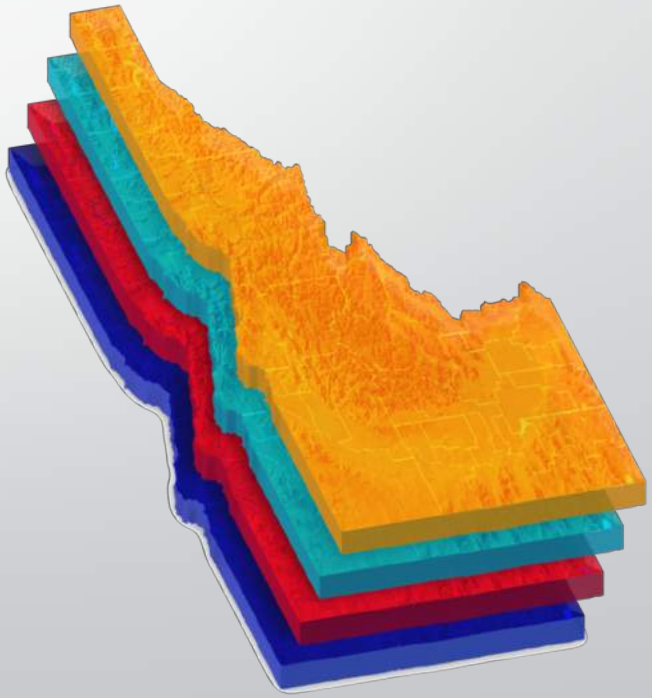
Approach

Objective 1. Build statistical models to explain distribution and demography of study organisms using ***legacy and empirical data***.

Trout: Lots of genetic data, published genome sequence.
Need more vital rate data in focal populations.

Sage: Lots of ecological data on focal populations.
Genomic tools need development.



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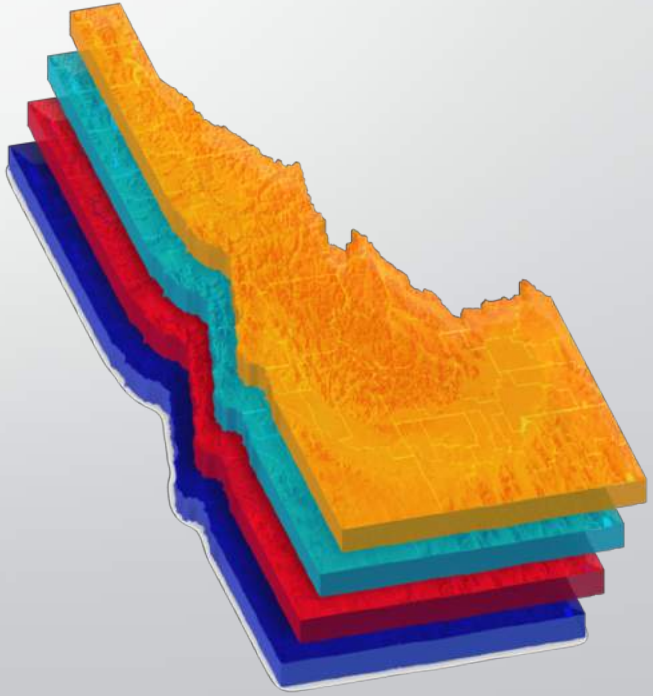
Approach

Objective 2. Simulate ***adaptive capacity and population vulnerability*** using Agent Based Models (ABM).

Trout: Priority to recruit postdoctoral expertise in agent based modeling to work with trout system (underway at UI).

Sage: Agent Based modeling expertise in sagebrush already thriving at BSU (Trevor Caughlin).



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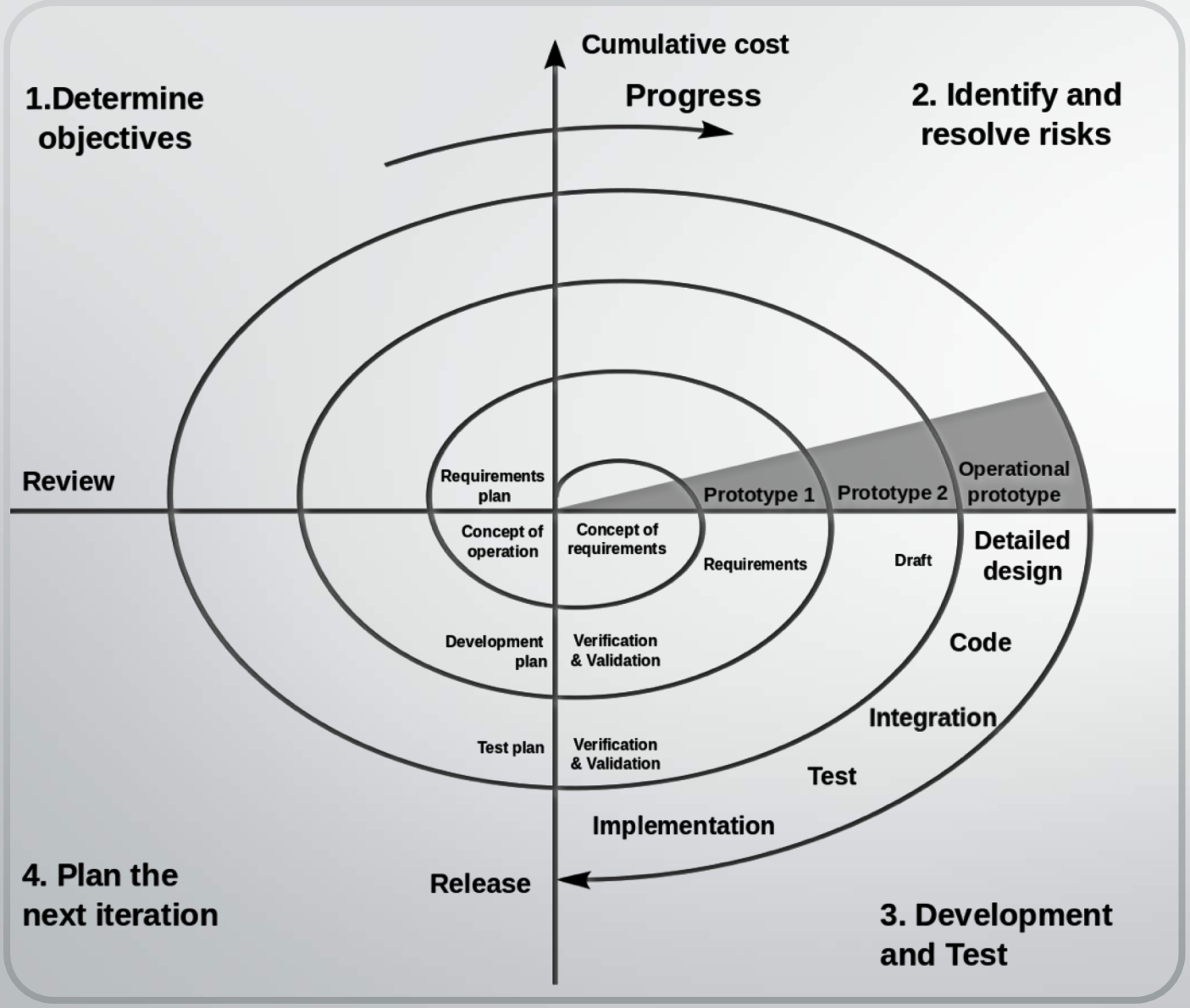
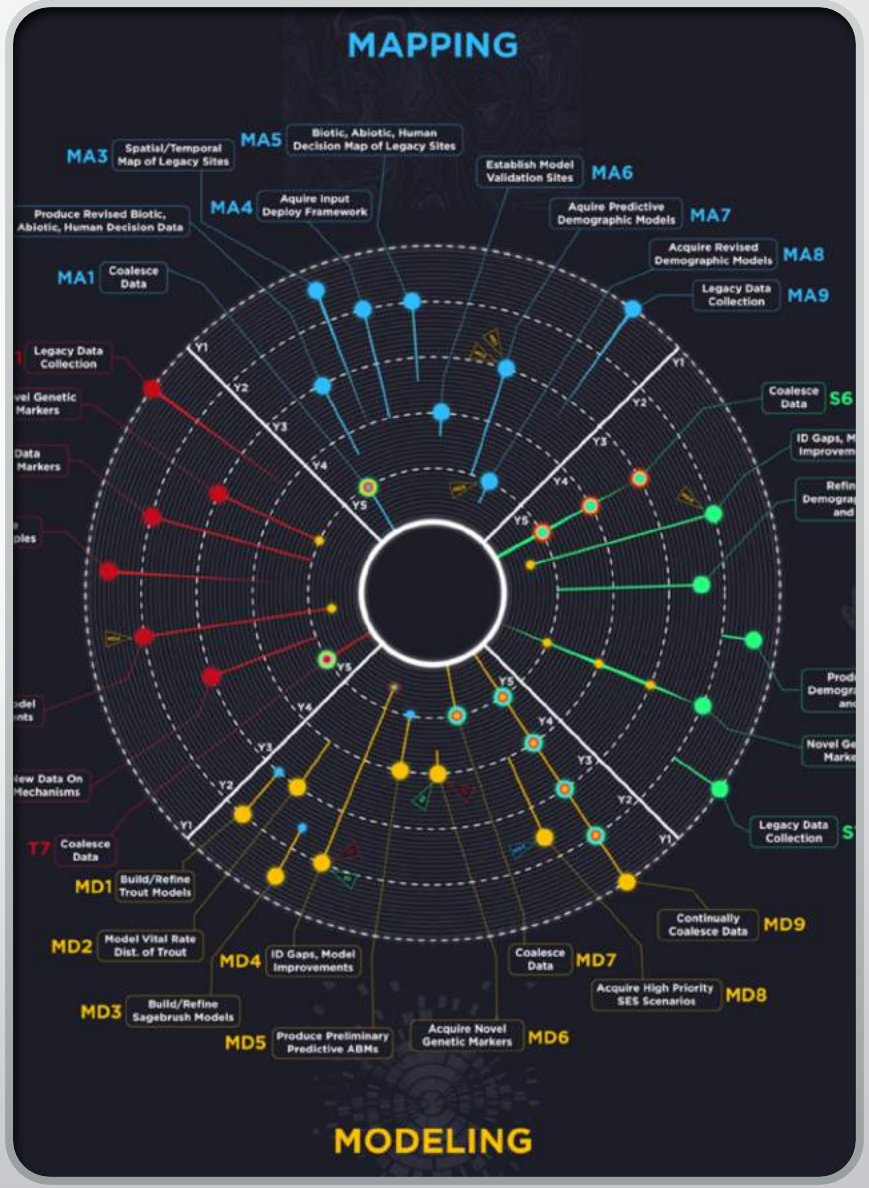
ITERATION IS CENTRAL TO OUR APPROACH





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Outcome:
INTEGRATED DATA NEXUS

- Stores, manages, catalogues, and makes available legacy and new data from GEM3.
- Houses geospatial and other data for Idaho that are suitable for new modeling projects.
- Provides high-speed data transfer mechanisms to efficiently move data across working groups and computational resources.
- Provides comprehensive GEM3 data catalog to research teams and beyond in an interactive web interface.
- Connects with external national data sharing initiatives (e.g. NSF DataONE).

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Outcome:
INTEGRATED AND PREDICTIVE AGENT BASED MODEL

- Informed and parameterized by legacy data.
- Integrates data and processes from GEM3 mechanisms and mapping teams.
- Iteratively guides data collection of mechanisms and mapping teams.
- Is spatially explicit across landscapes and regions.

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(Aspirational) Outcome:
CONCEPTUAL FRAMEWORK AND PLATFORM FOR AGENT-BASED MODELING

This framework will:

- be generalizable beyond sagebrush and trout.
- integrate data from organismal, population, and environmental, and social science sources.
- make predictions that can inform policy.

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