The Chesapeake Bay Watershed and Knowledge Systems for Sustainability

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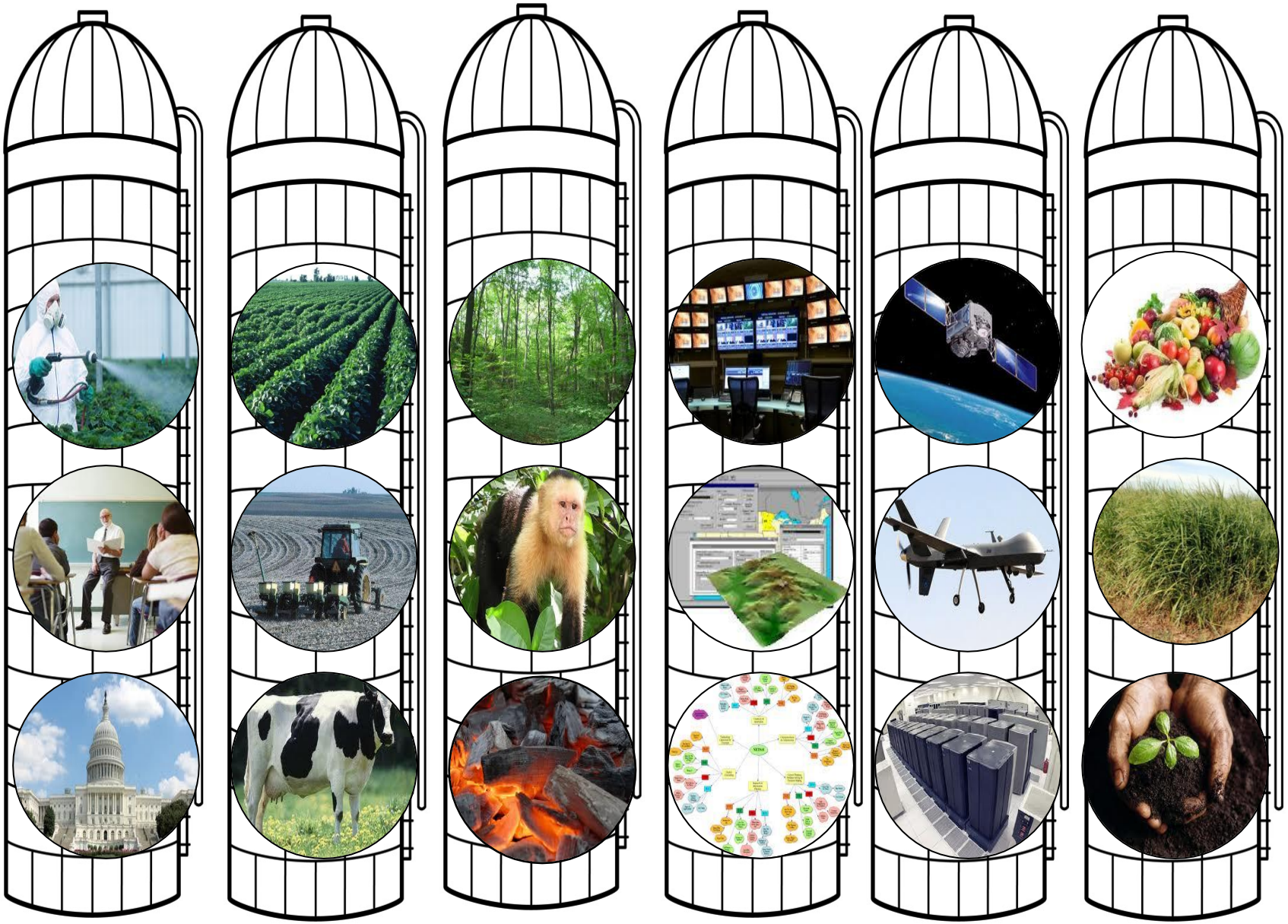
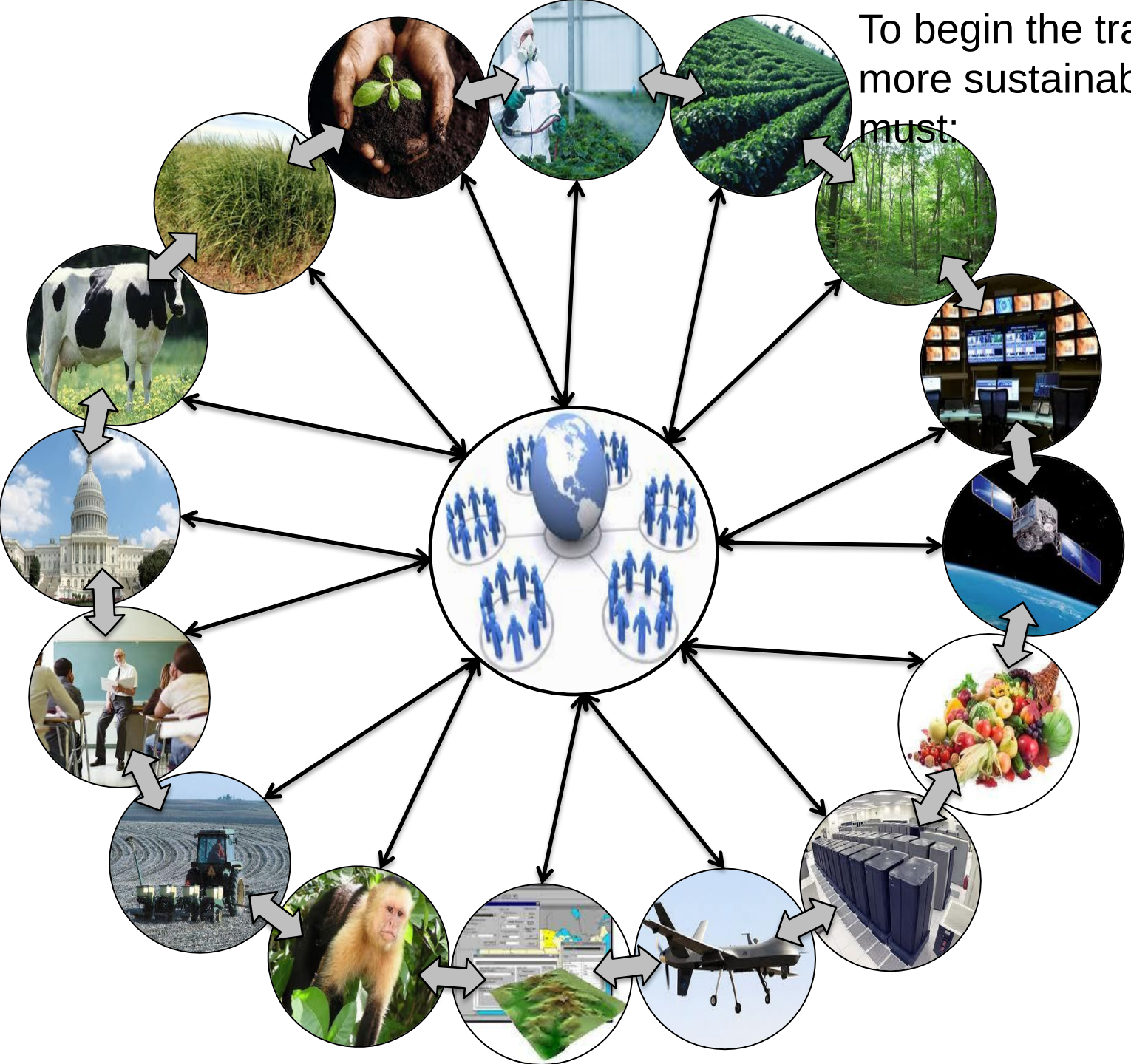
Our socio-ecological systems are highly silo





To begin the transition to a more sustainable system, we must:

-Connect and align current investments

-Create an active learning ecosystem

-Represent non-traditional disciplines

-Focus on the need of decision makers and

We propose to synthesize a **knowledge system** for sustainable landscape management to support and enhance **holistic, wise, and effective decision making** that provides for production of and access to a sufficient supply of **valued services** of food, energy, and materials from a landscape to **meet immediate needs**, while maintaining adequate levels over the **long term** of other valued or necessary services and uses.

A global community of practice anchored in the research community: Knowledge systems for sustainability

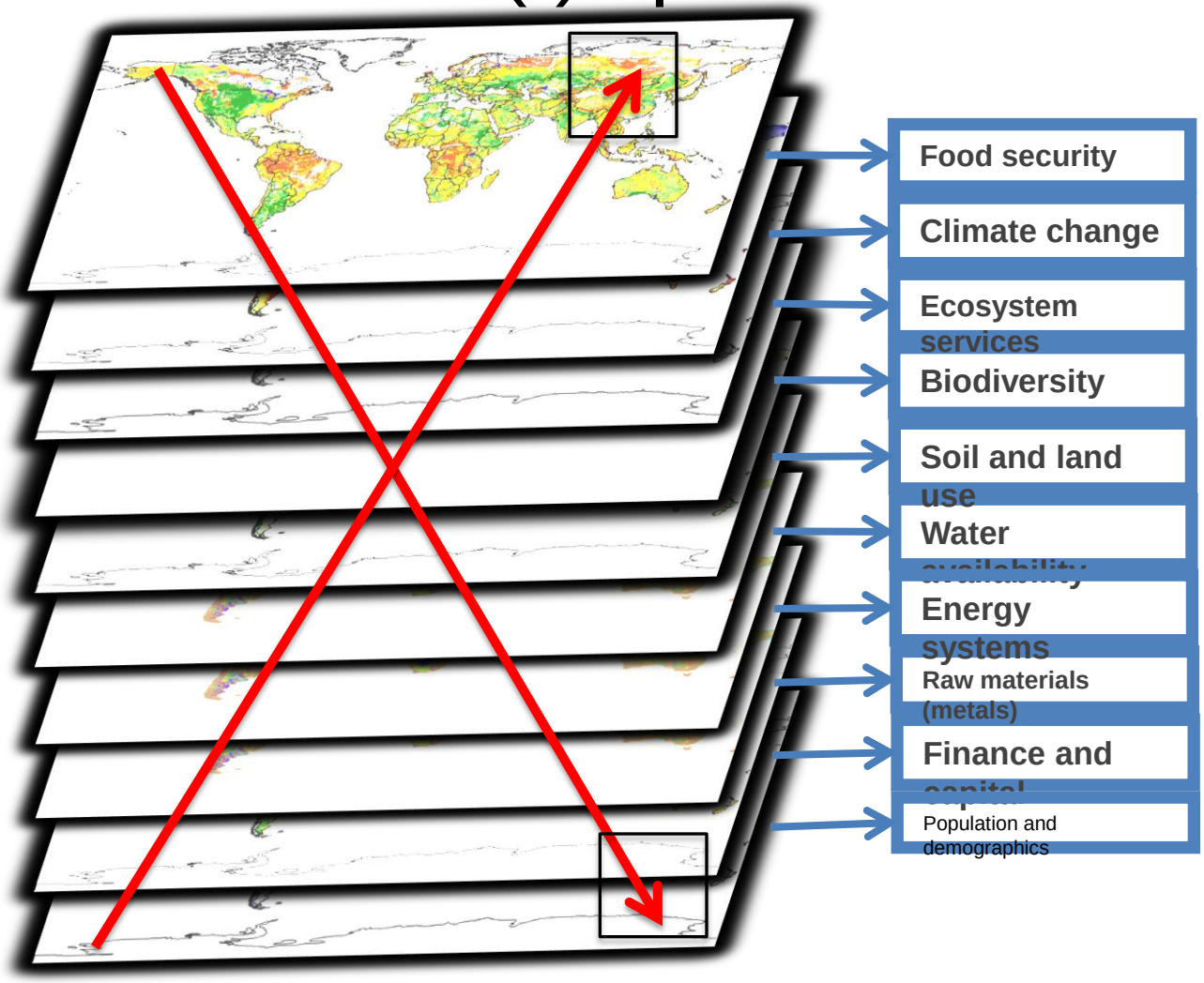
THE UNIVERSITY of WISCONSIN MADISON

Global Sustainability Institute

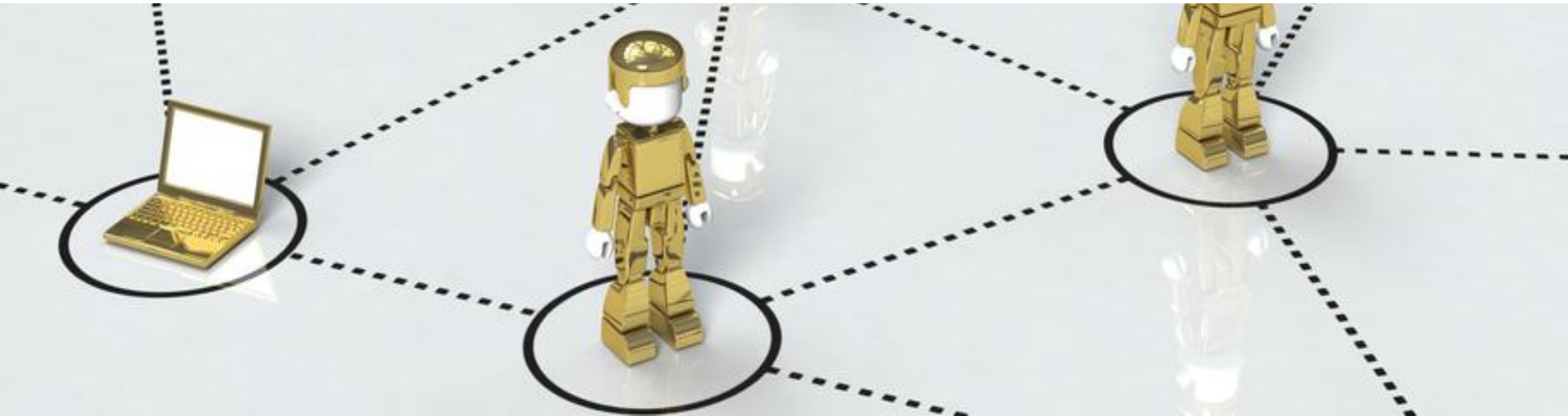
Environmental Virtual Observatory — Pilot

Government Office for Science

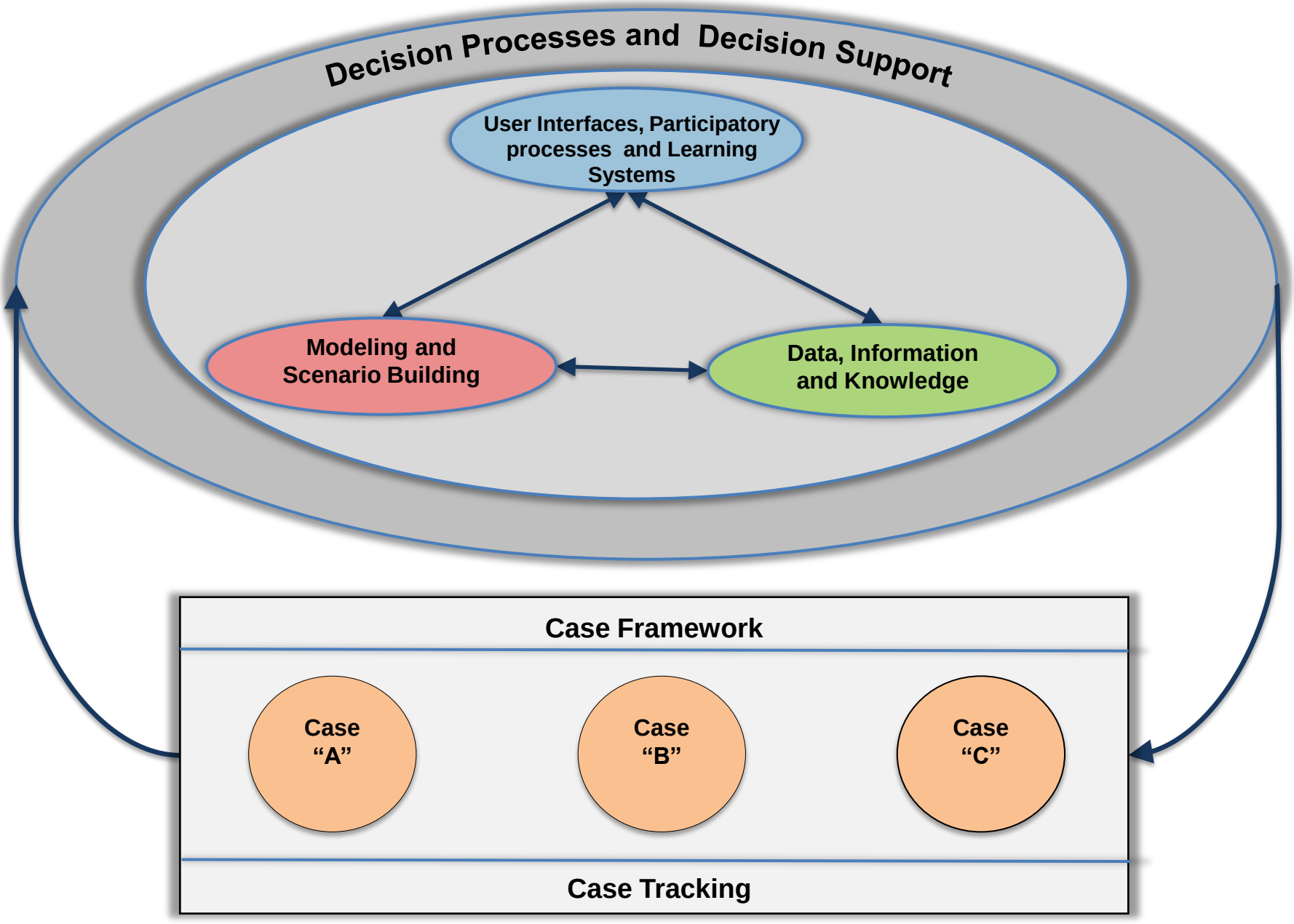
Knowledge systems for sustainability toward safe(r) space?



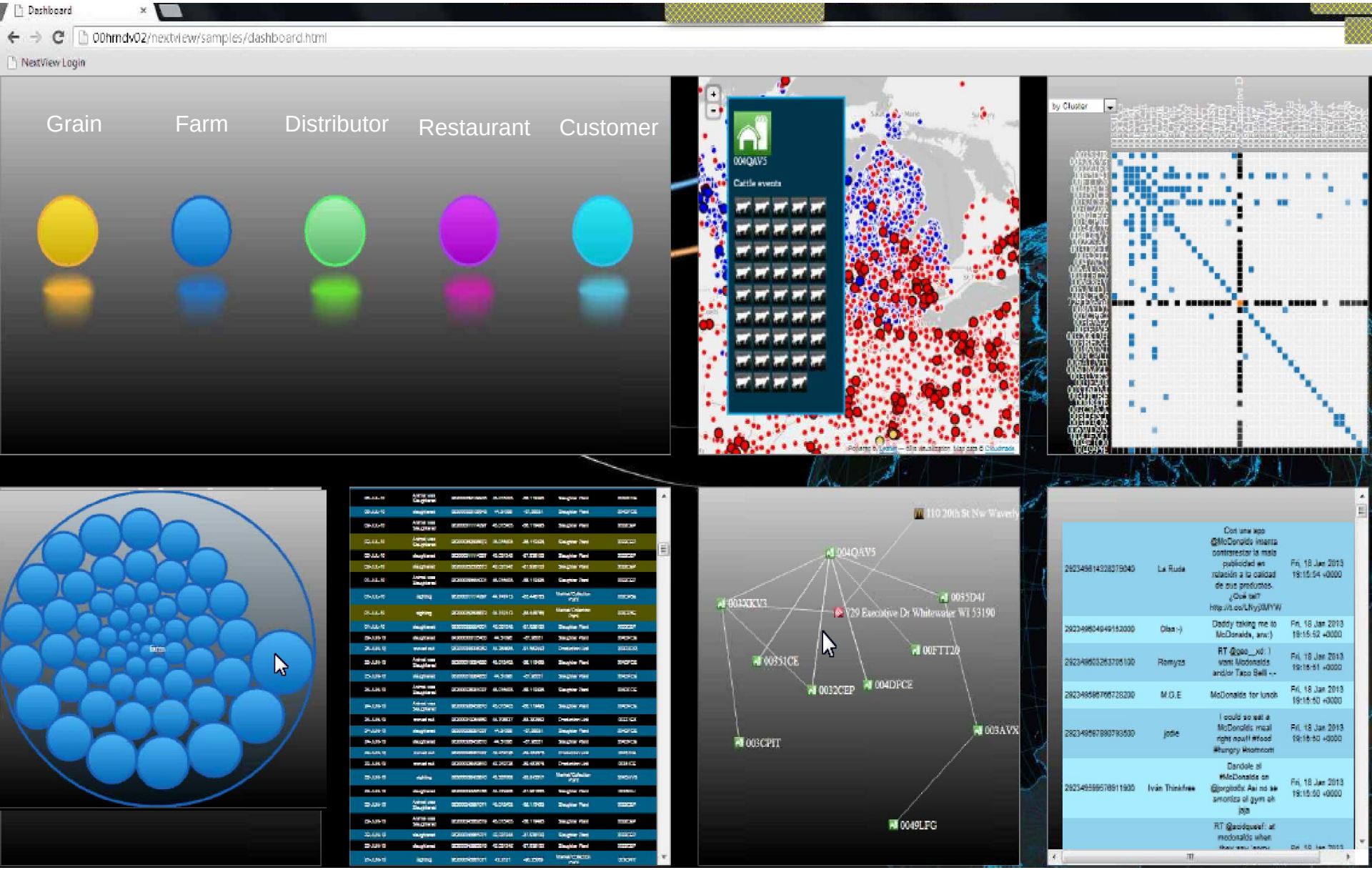
A vision for the future?
Working to create trusted information sharing environments in a pre-competitive space, across sectors, for collective benefit



Dimensions of a KSS Platform

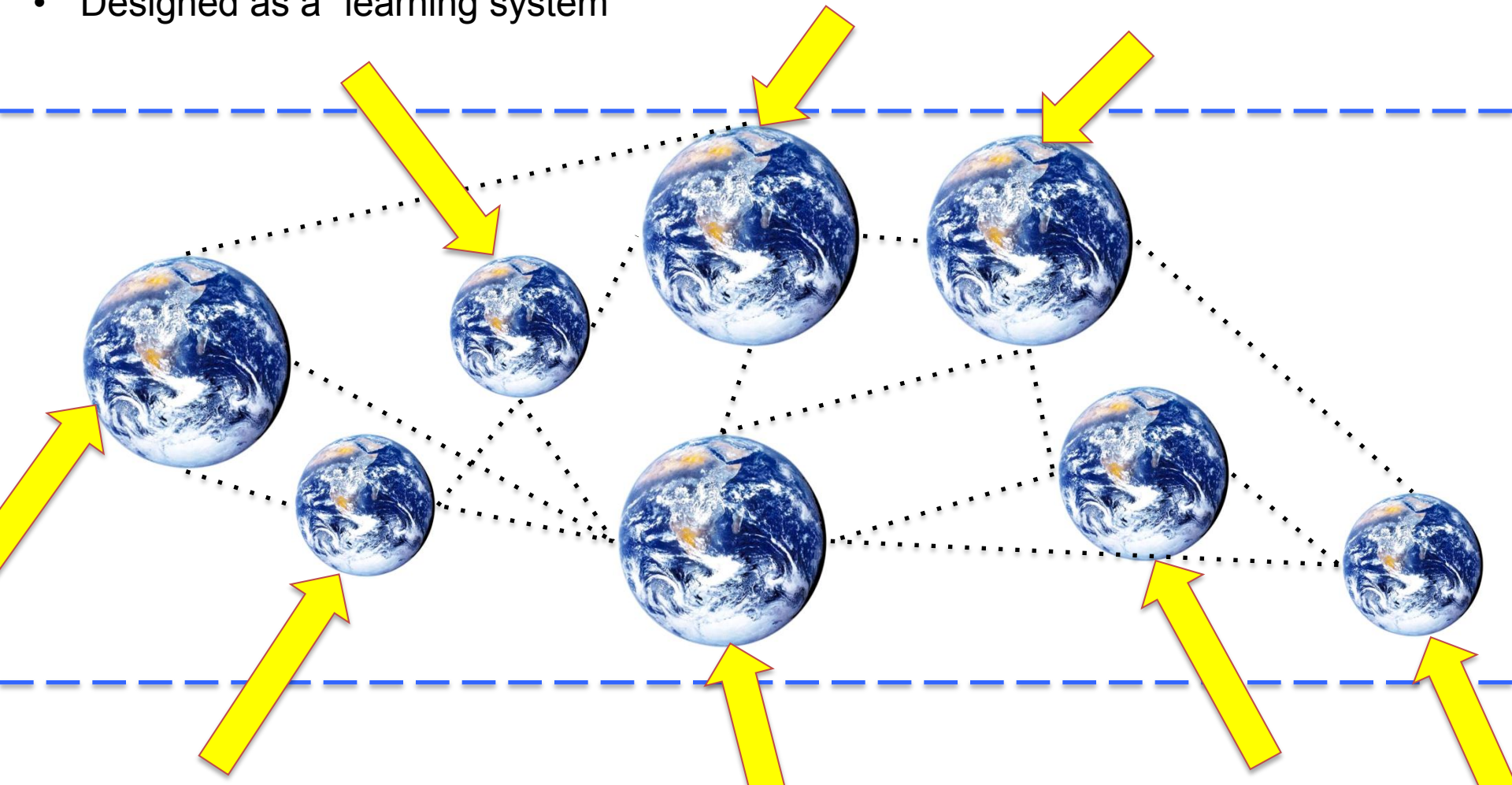


An exemplar pilot--Livestock traceability in the US: cross-sector partners, farmers, States, contributed info assets, on-the-shelf apps

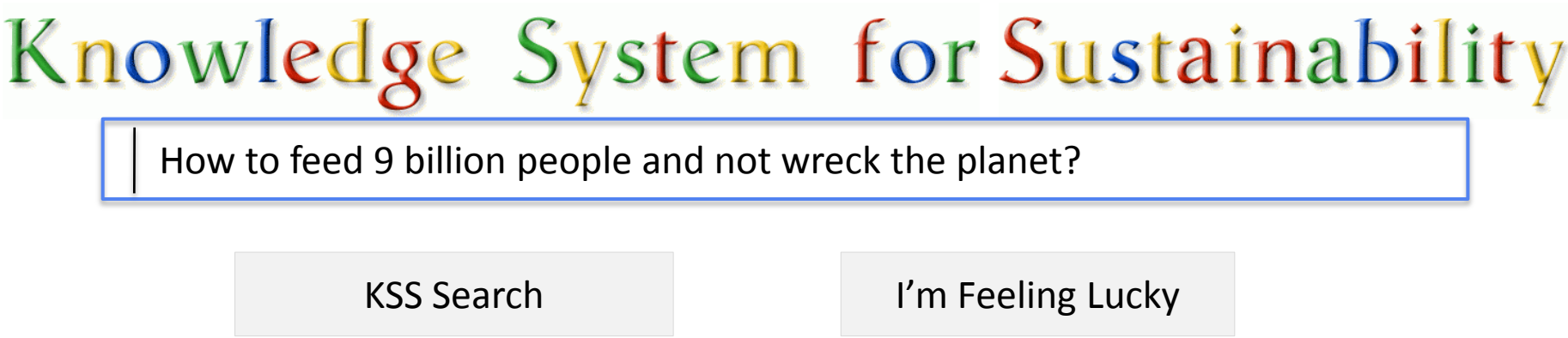


Developing KSS Prototypes

- Identify stand-alone “projects” with specified, unmet needs that can become KSS “Cas
- “Cases” gains access to the interconnected KSS System
- KSS network aligns previously unconnected elements across dimensions
- Foundational cyberinfrastructure components and connections
- Designed as a “learning system”

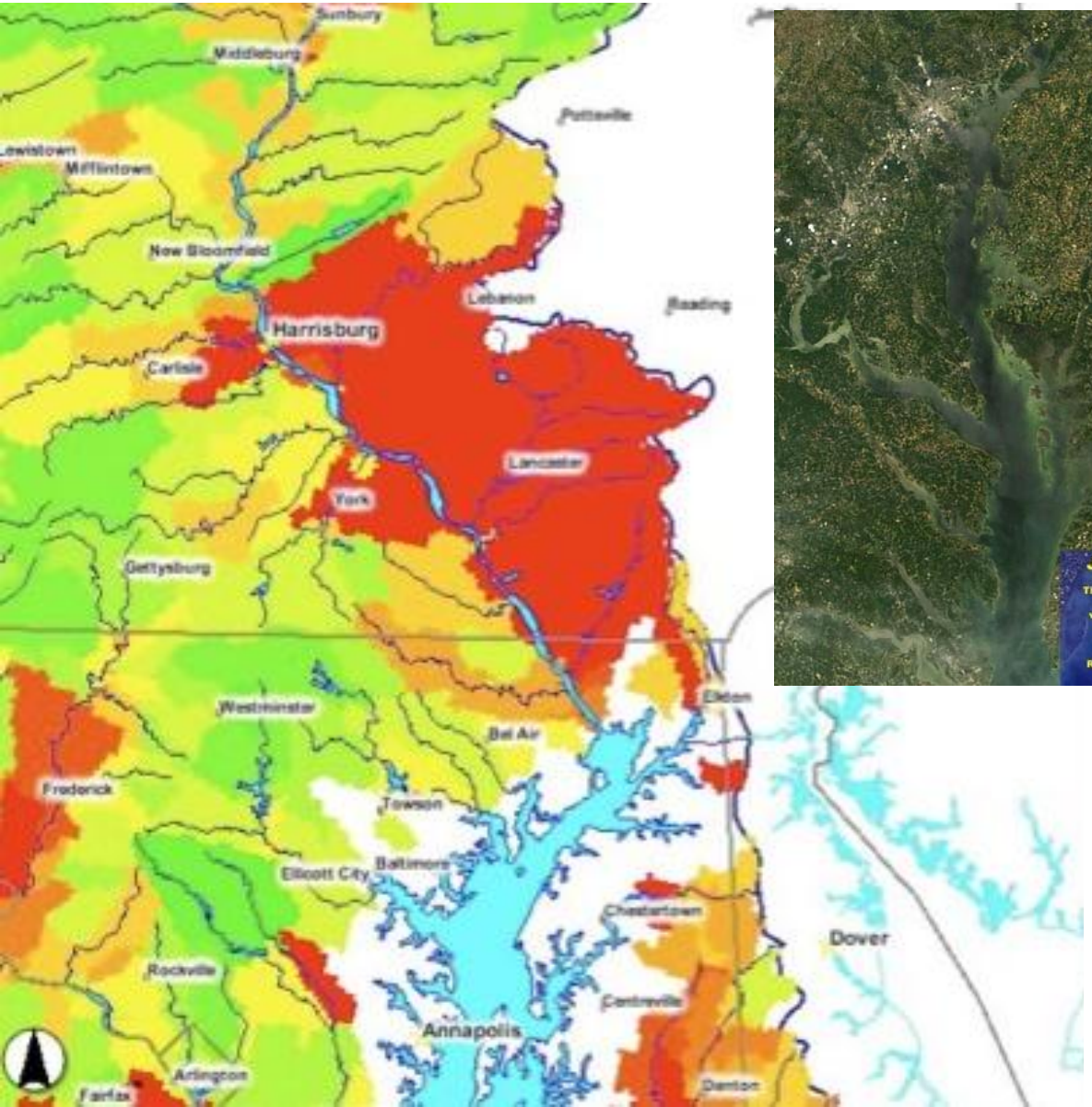


KSS Portal – Starting the experiment



- Constructing the knowledge-to-action and action-to-knowledge pathways
- Begin tracking the impacts of each intervention
- Compare the structural and functional similarities and differences of Cases
- Adaptively manage for the needs of the decision maker

Chesapeake Bay: Nutrients and Water Quality



STATE BORDER

WATER BODIES

Water

ATLANTIC

STREAMS

River

Large river

TOT NITROGEN-Delivered Yield g/m2-yr

0 - 0.2

0.2 - 0.4

0.4 - 0.6

0.6 - 0.8

0.8 - 1.0

1.0 - 1.2

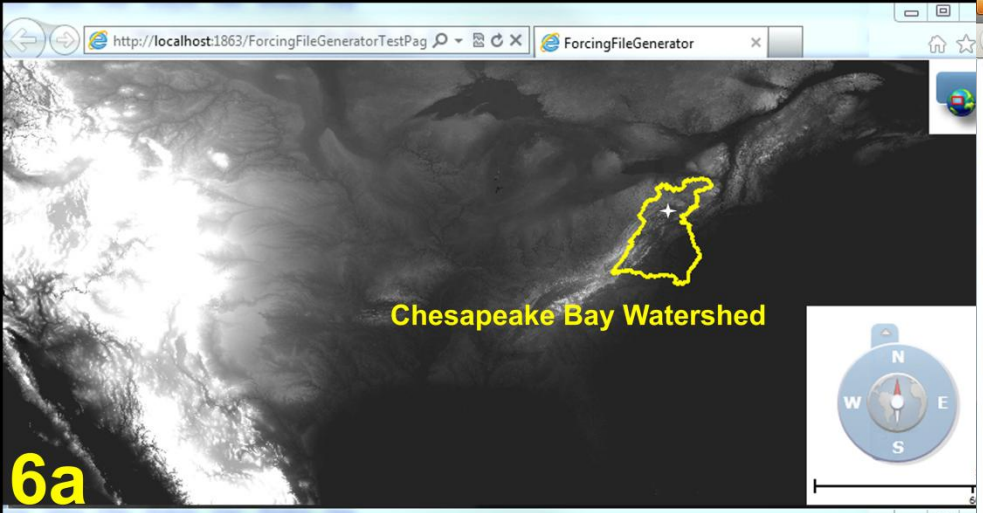
1.2 - 1.4

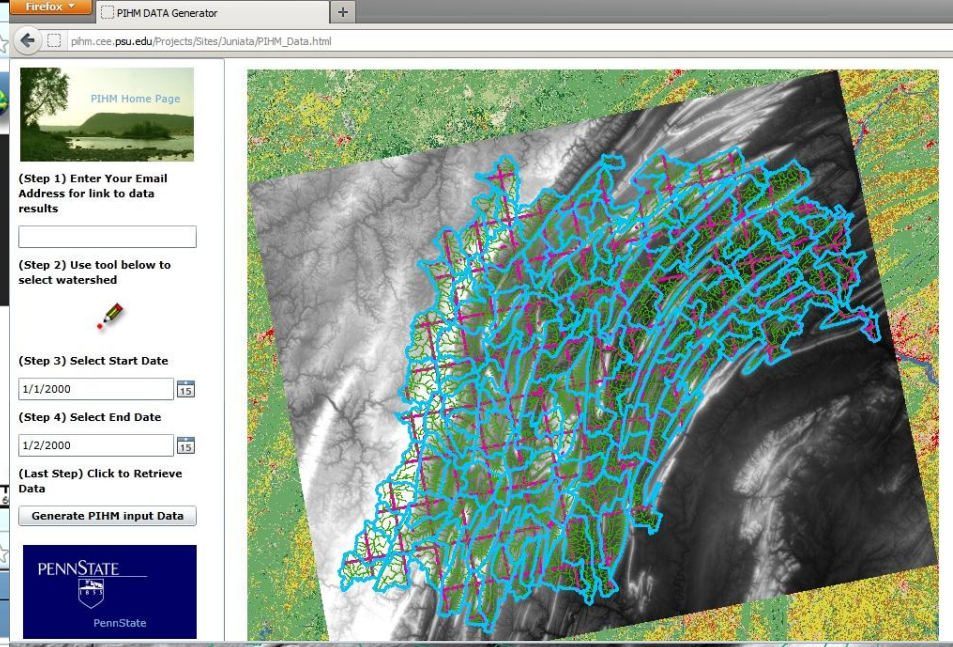
1.4 - 1.6

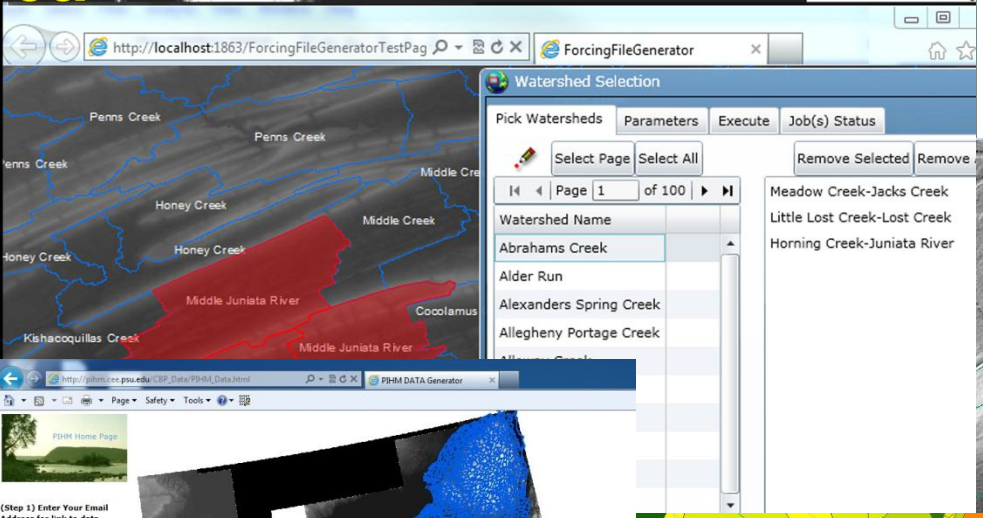
1.6 - 1.8

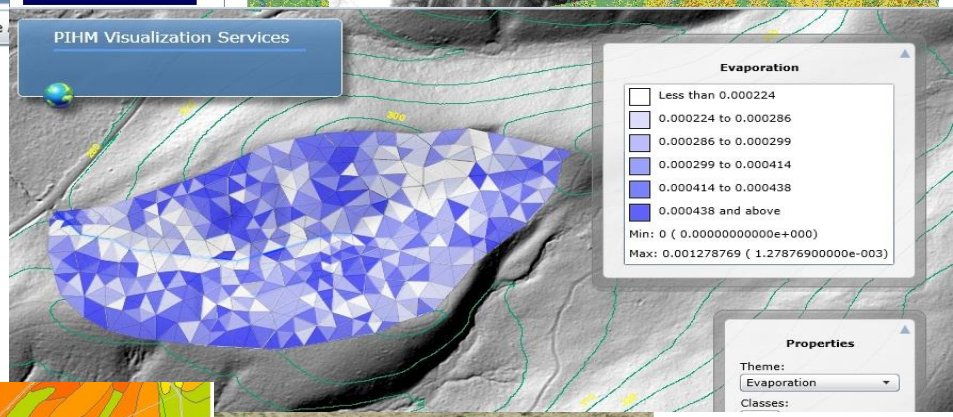
1.8 - 162.5

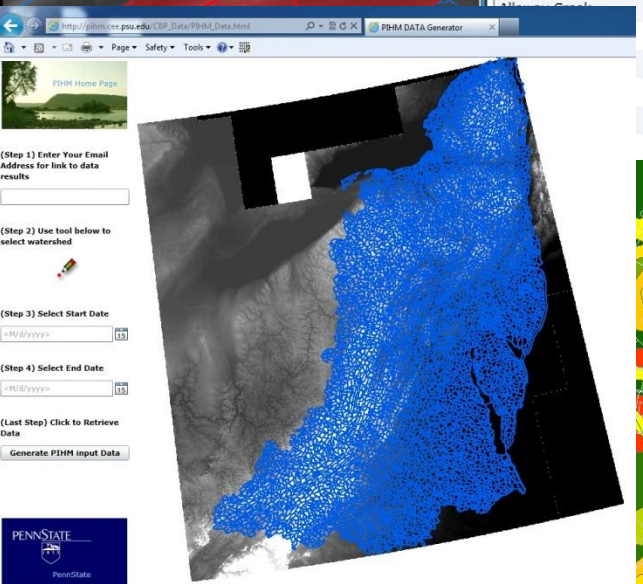
BAY WATERSHED

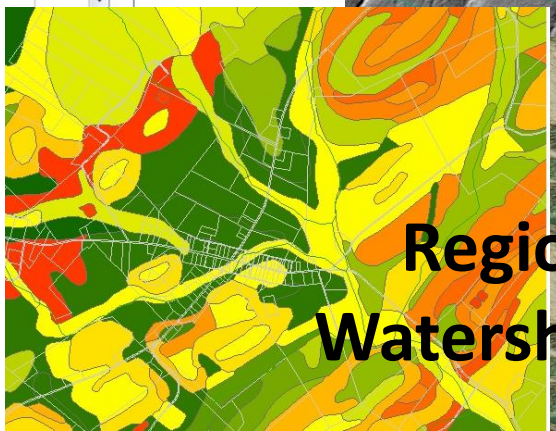




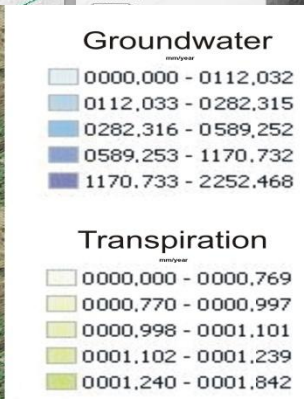


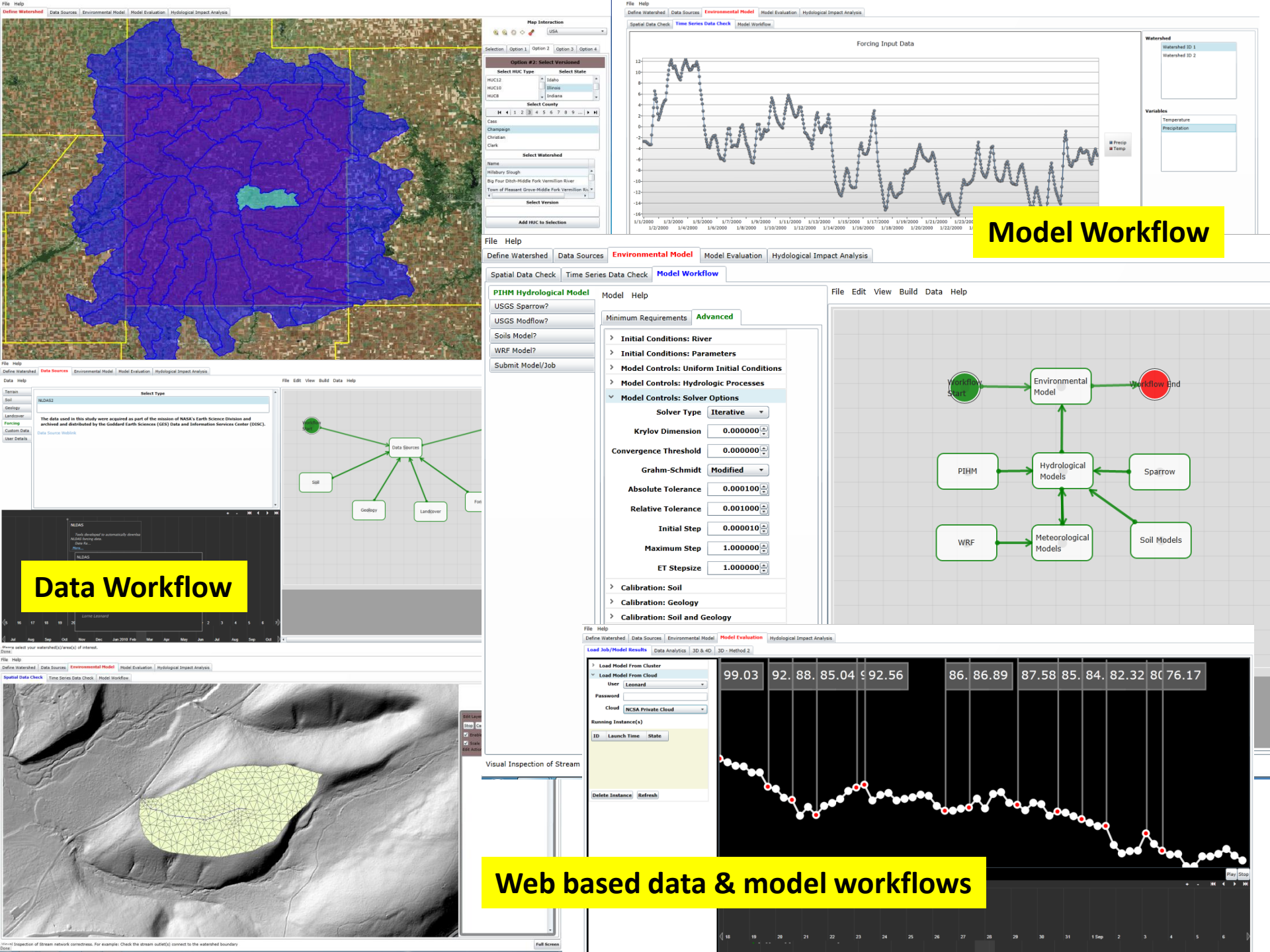


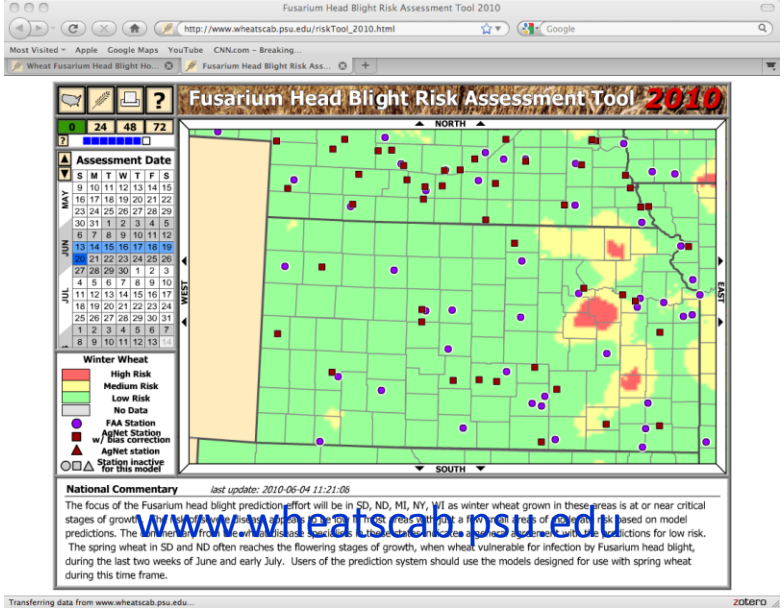




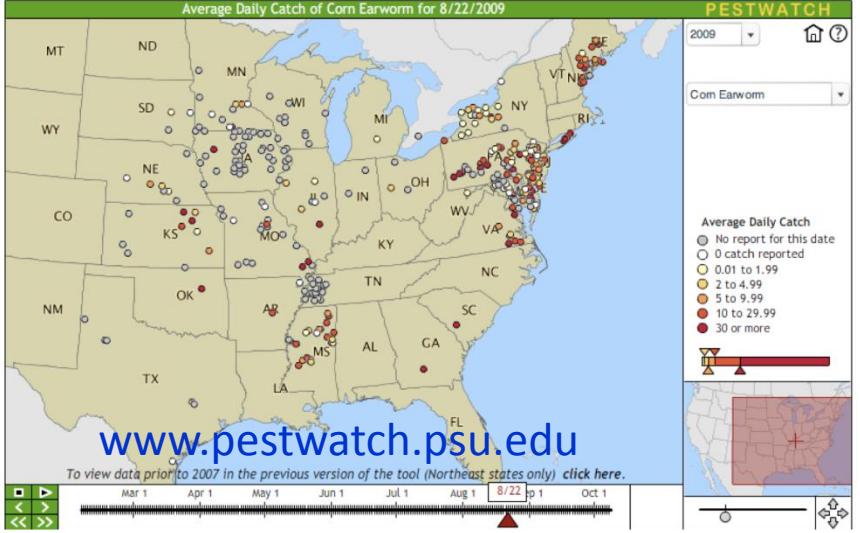
Regional & Site Watershed Data-sets



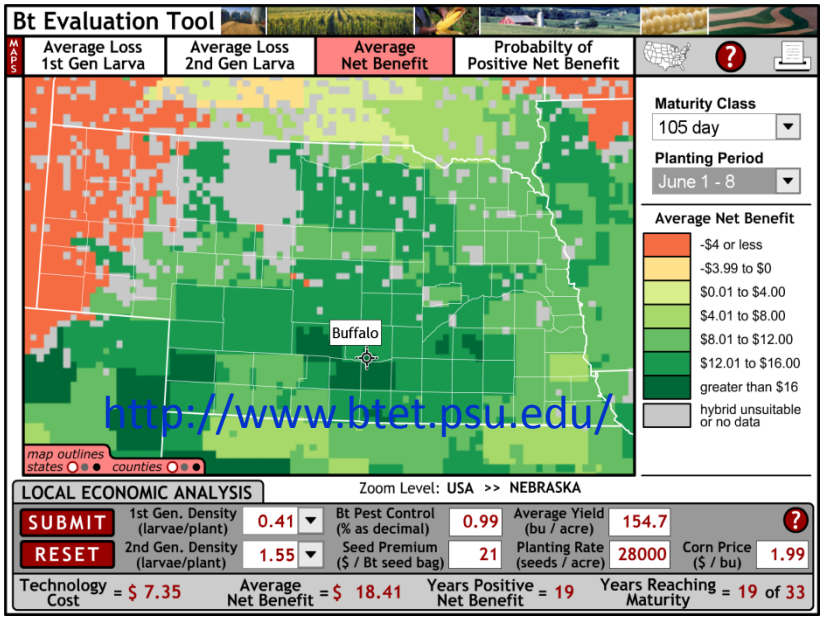

Model Workflow
Data Workflow
Web based data & model workflows
Forcing Input Data
PIHM Hydrological Model
USGS Sparrow?
USGS Modflow?
Soils Model?
WRF Model?
Submit Model/Job
Minimum Requirements
Advanced
Initial Conditions: River
Initial Conditions: Parameters
Model Controls: Uniform Initial Conditions
Model Controls: Hydrologic Processes
Model Controls: Solver Options
Solver Type
Iterative
Krylov Dimension
Convergence Threshold
Grahm-Schmidt
Modified
Absolute Tolerance
Relative Tolerance
Initial Step
Maximum Step
ET Stepsize
Calibration: Soil
Calibration: Geology
Calibration: Soil and Geology
Workflow Start
Environmental Model
Workflow End
PIHM
Hydrological Models
Sparrow
WRF
Meteorological Models
Soil Models
Visual Inspection of Stream



Wheat Fusarium Forecast Tool

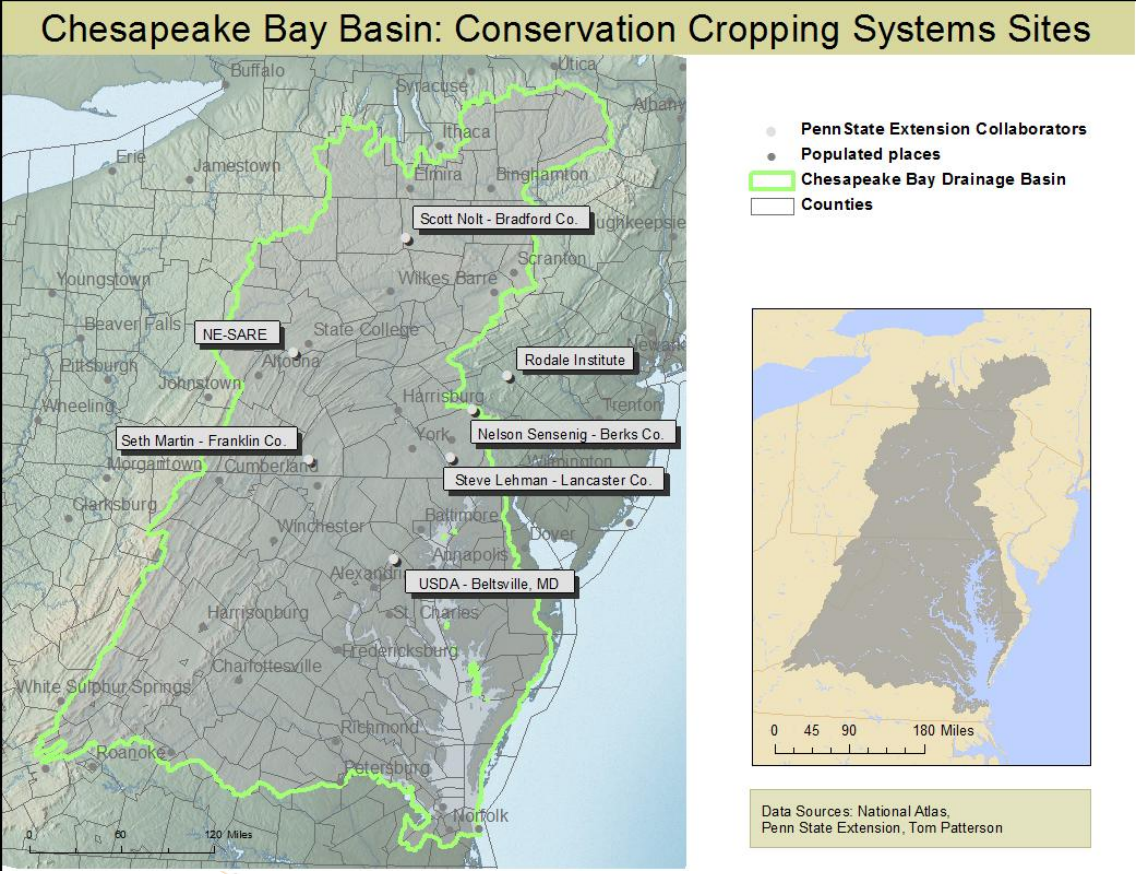


Pestwatch



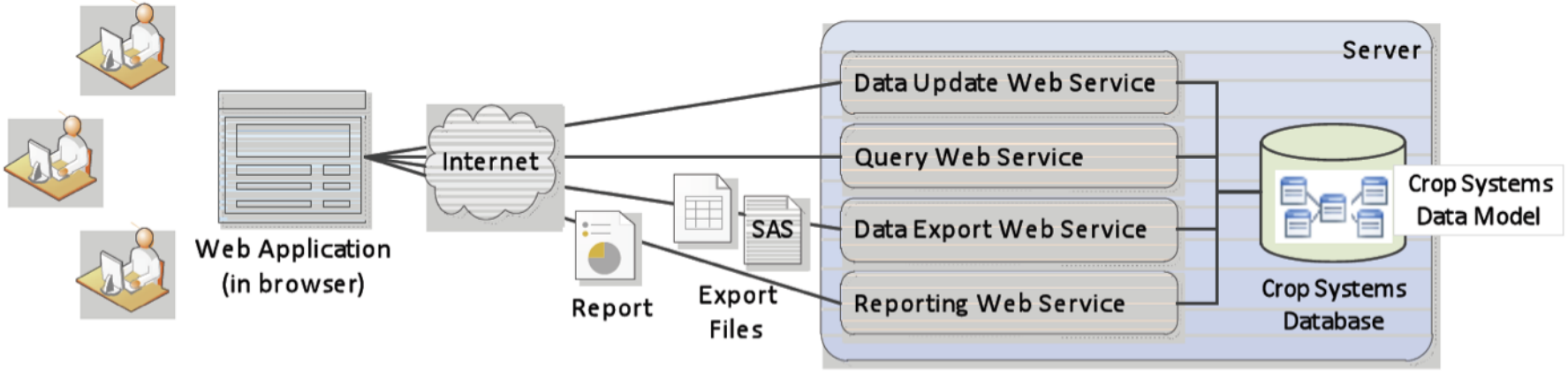
Economic Analysis for Bt Corn

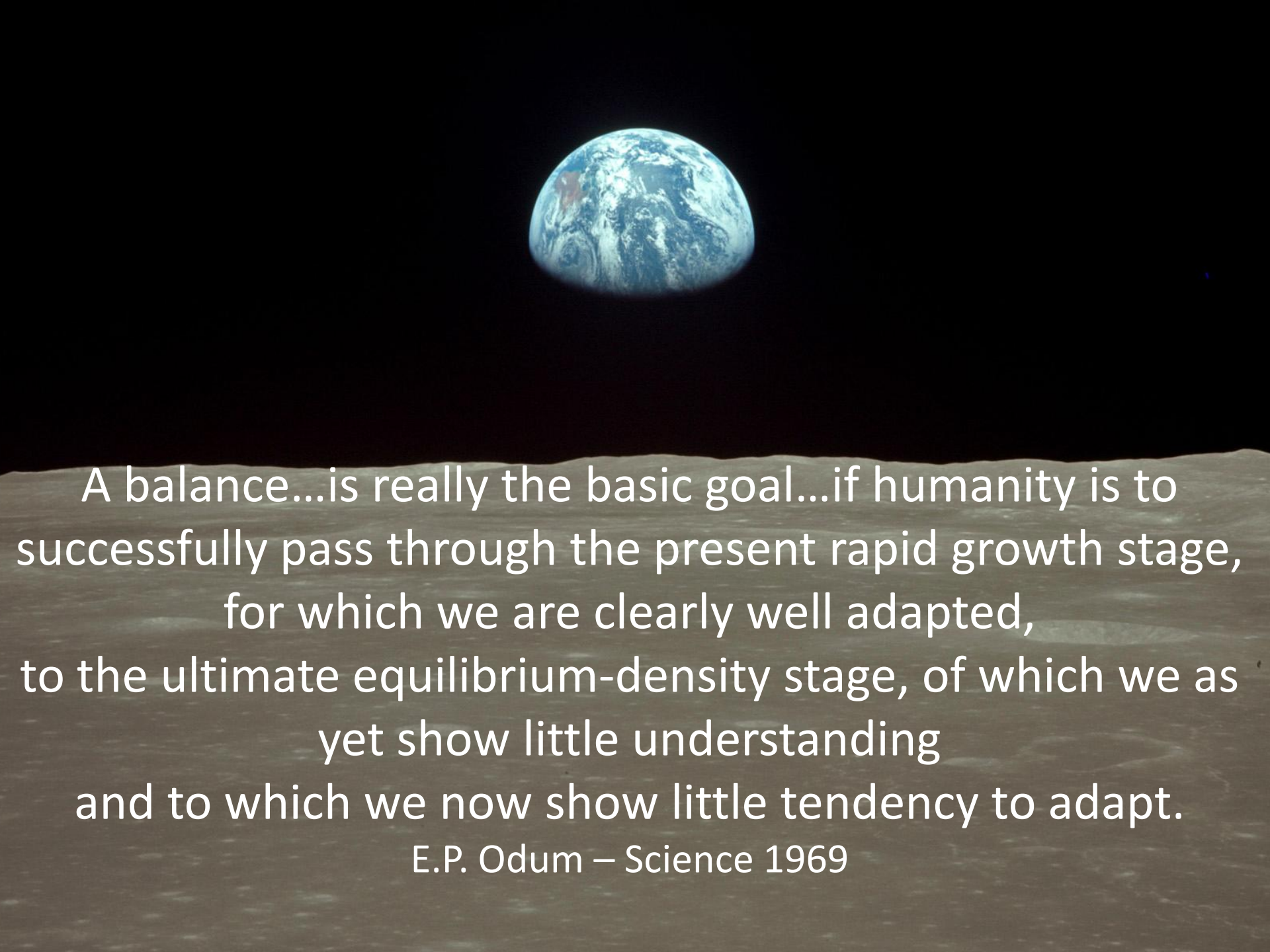
Nutrient Management



Chesapeake Bay Case

- Long-term agricultural and hydrologic research
- Extensive data collection
- Data management, sharing and archival challenges
- Modeling Laboratory plans
- Strong data management & modeling infrastructure supports policy & decision tools





A balance…is really the basic goal…if humanity is to successfully pass through the present rapid growth stage, for which we are clearly well adapted,
to the ultimate equilibrium-density stage, of which we as yet show little understanding
and to which we now show little tendency to adapt.

E.P. Odum – Science 1969