# Land use planning and early warning systems for limiting drought impacts and promoting recovery

UN Commission on Sustainable Development,
Intergovernmental Planning Session for the 17th Session
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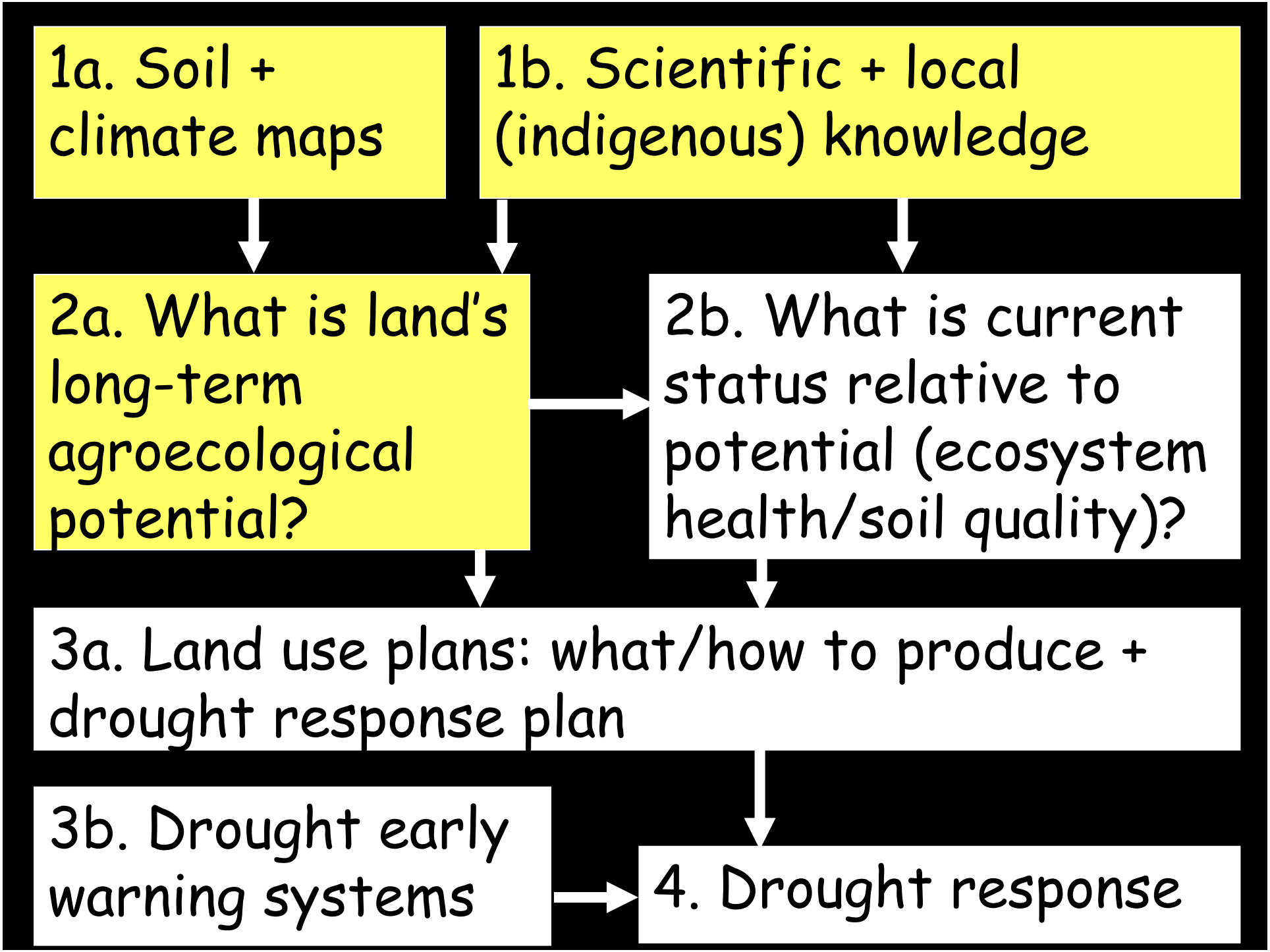
ARIDnet
Meteorological Dimensions
Human Dimensions
Ecological Dimensions

USDA ARS Agricultural Research Service

"Several proposals from the meetings in Africa and Asia referred to the need to take the potential of land and soil into account" – H.E. Mrs. Gerda Verburg, CSD17 IPM opening statement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2a. What is land's long-term agroecological potential?
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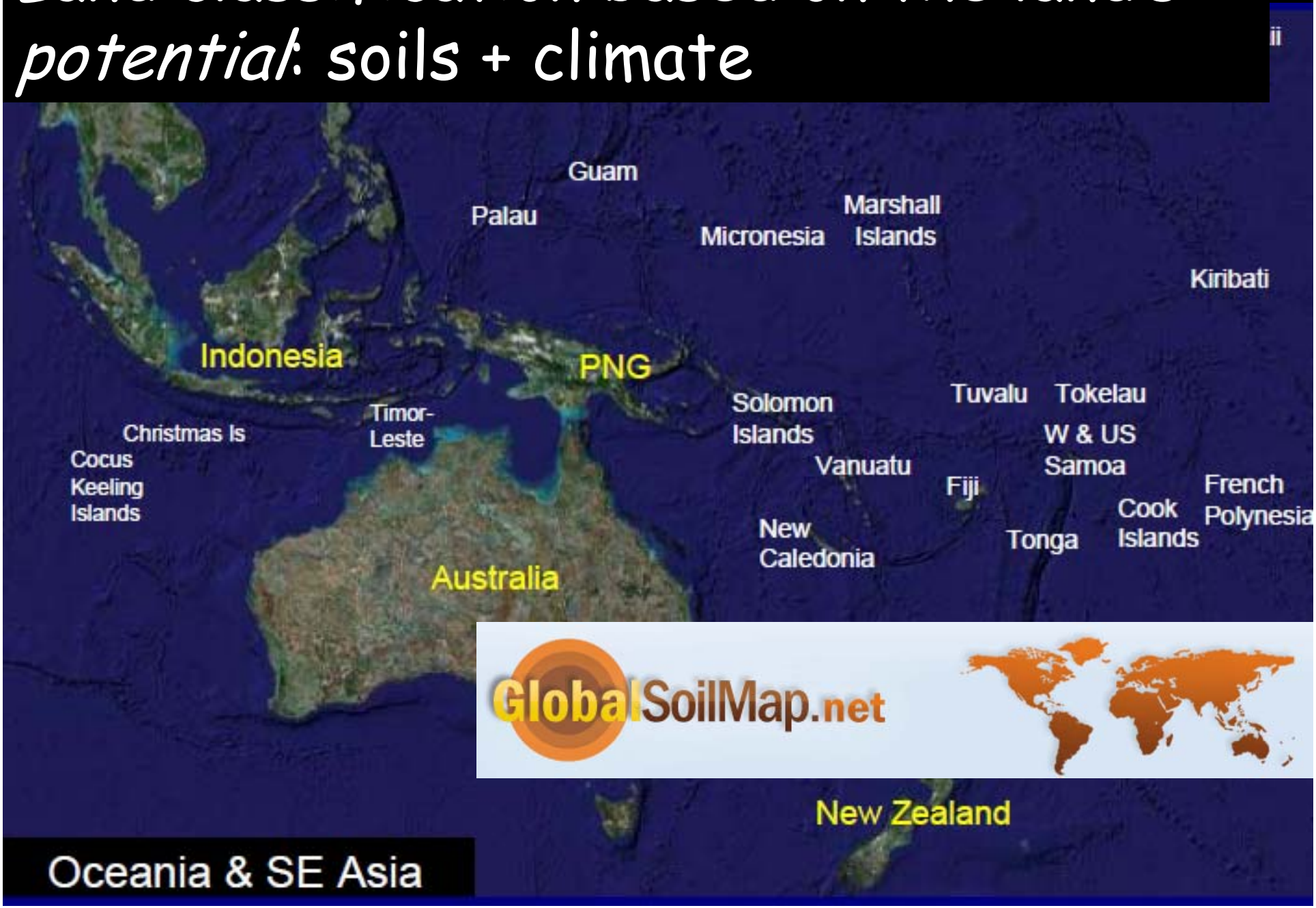
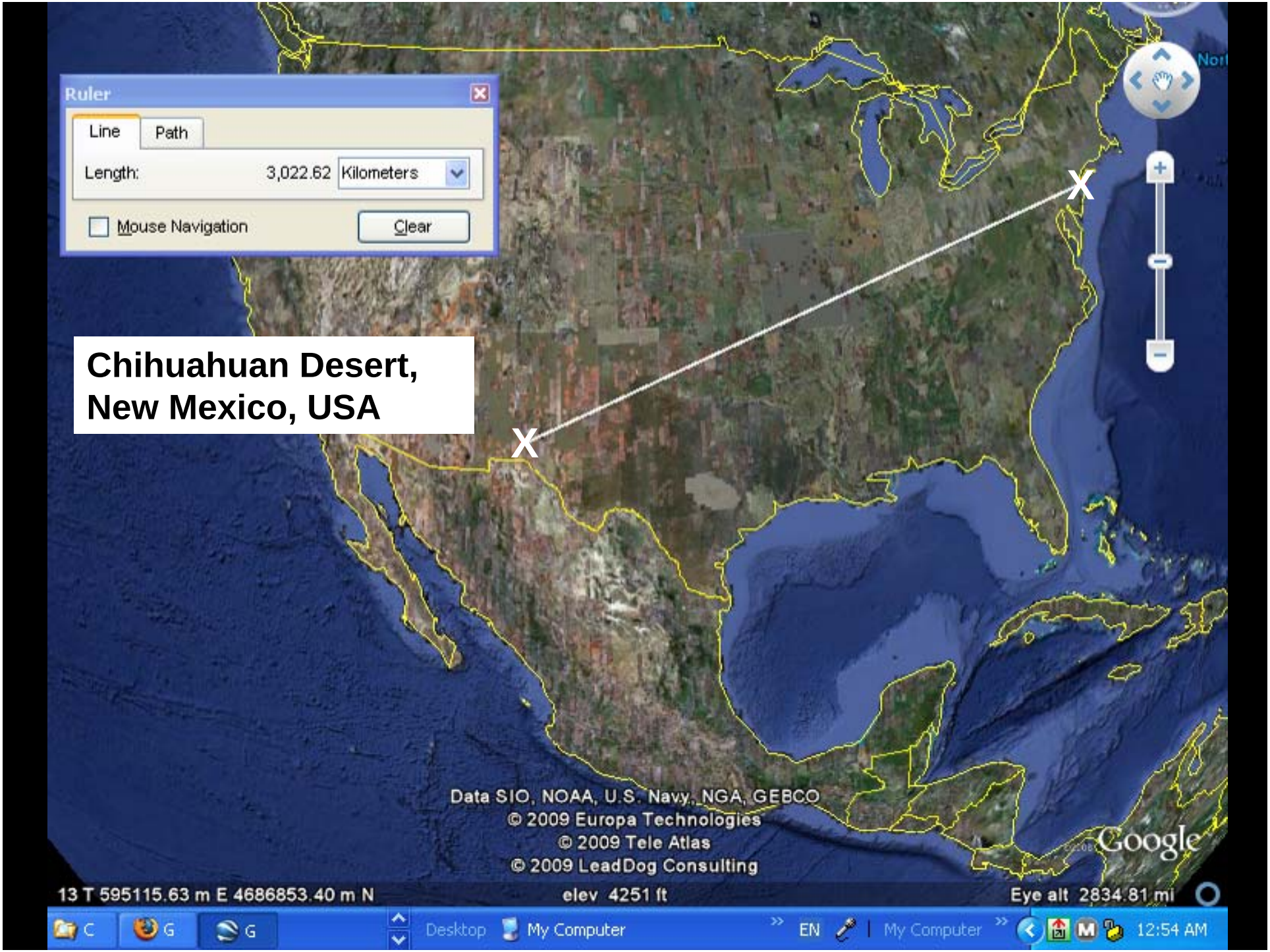
3b. Drought early warning systems
4. Drought response

# Land classification based on the land's *potential*: soils + climate

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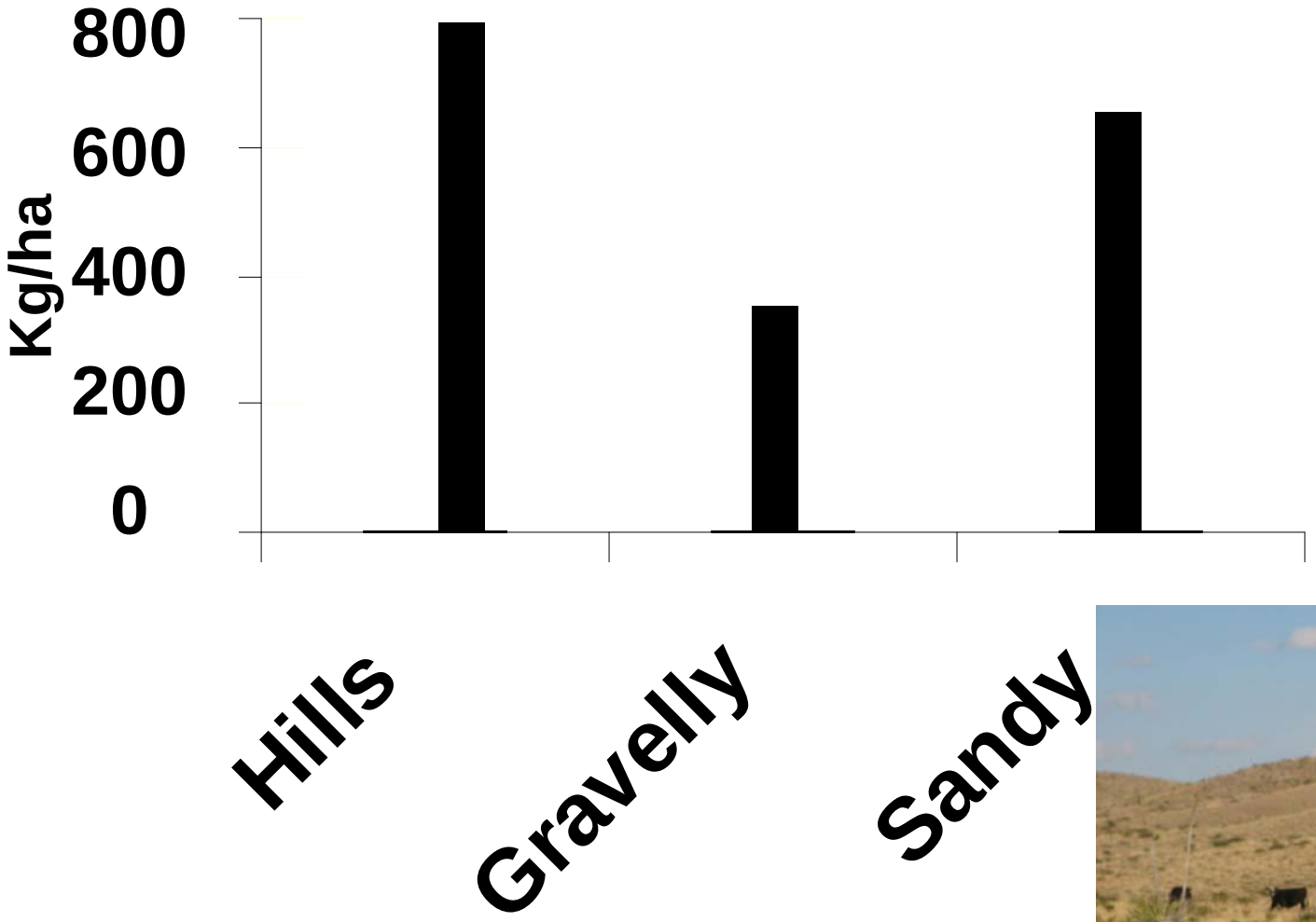
# Land classification based on the land's *potential*: soils + climate



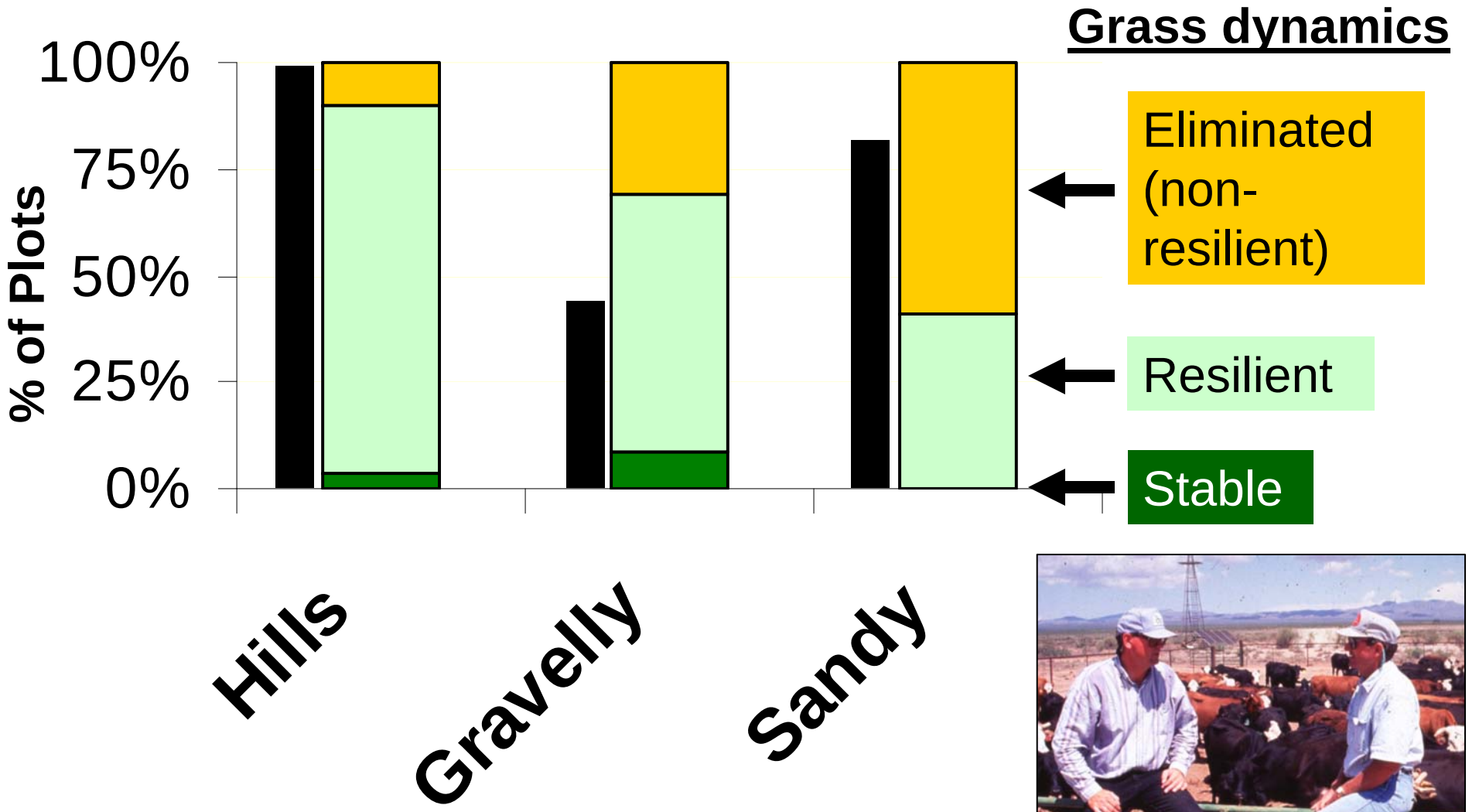

New Mexico, USA
(Chihuahuan Desert)

# Soils affect potential grass (forage) production




B. Bestelmeyer/BLM data, 123 plots (1970-2003)

# Soils affect grass (forage) resilience



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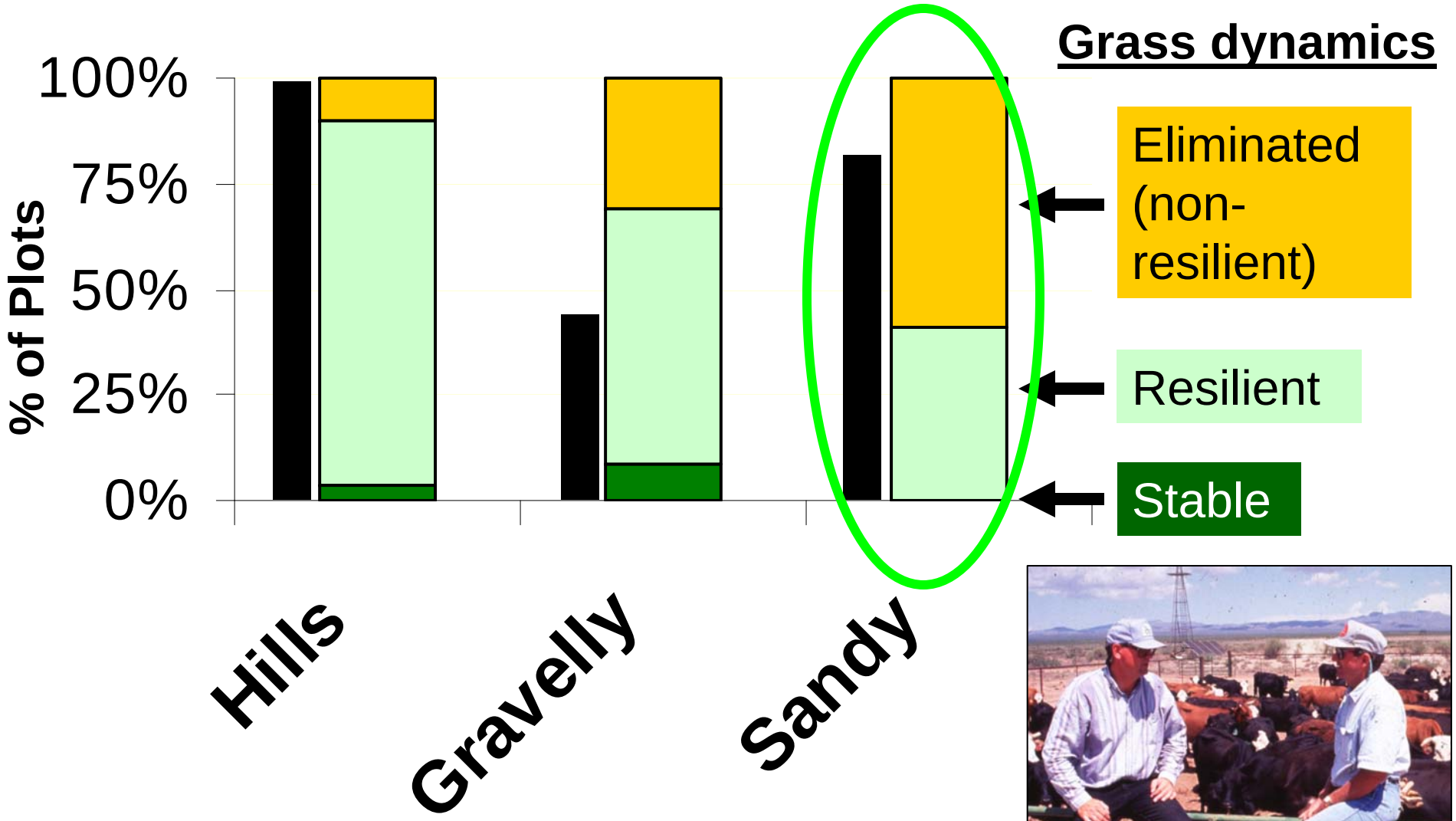
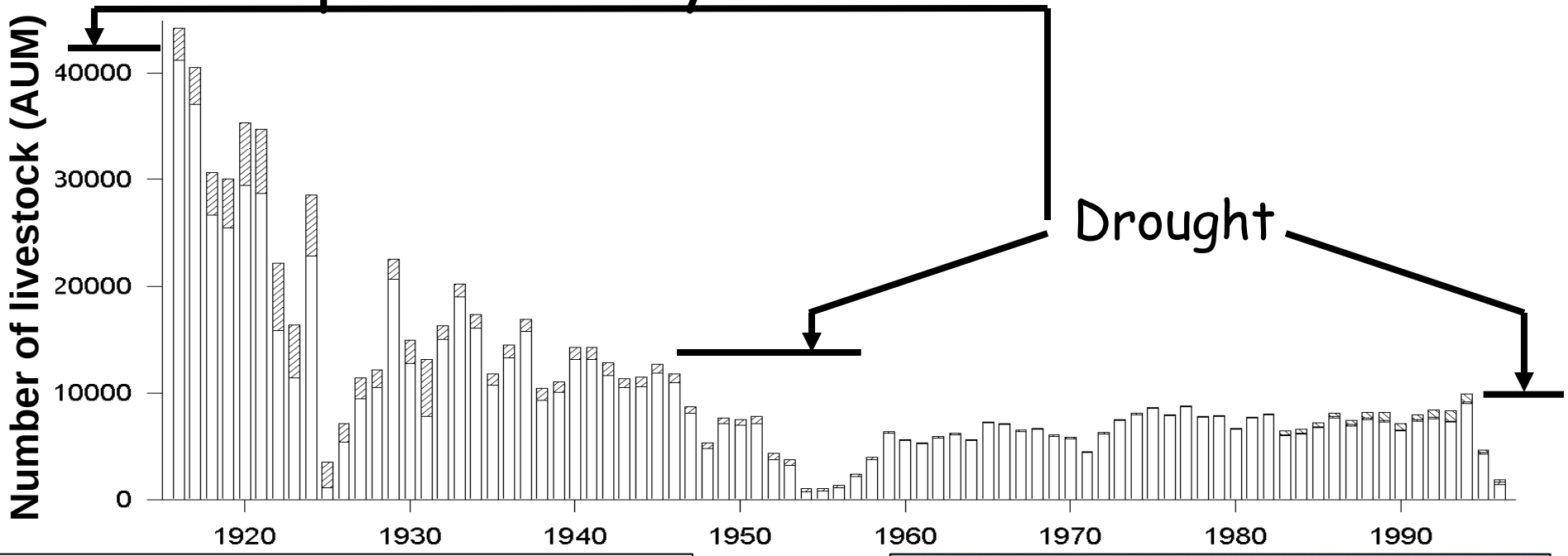
# Soils affect grass (forage) resilience

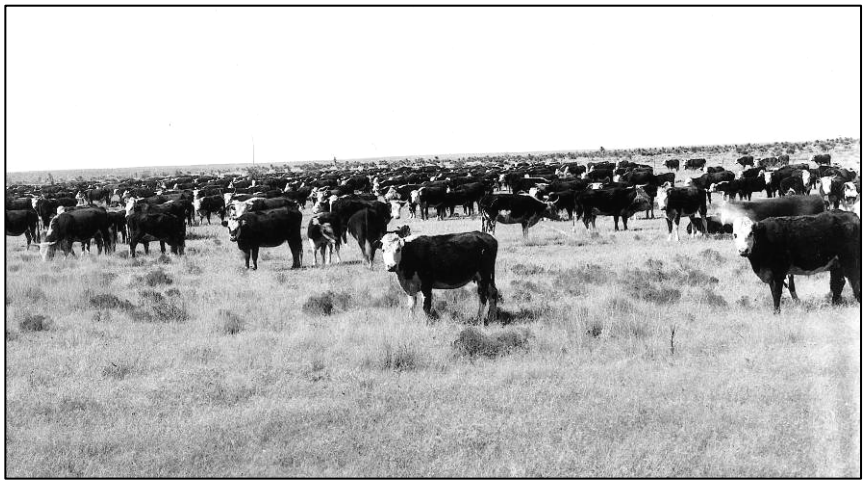


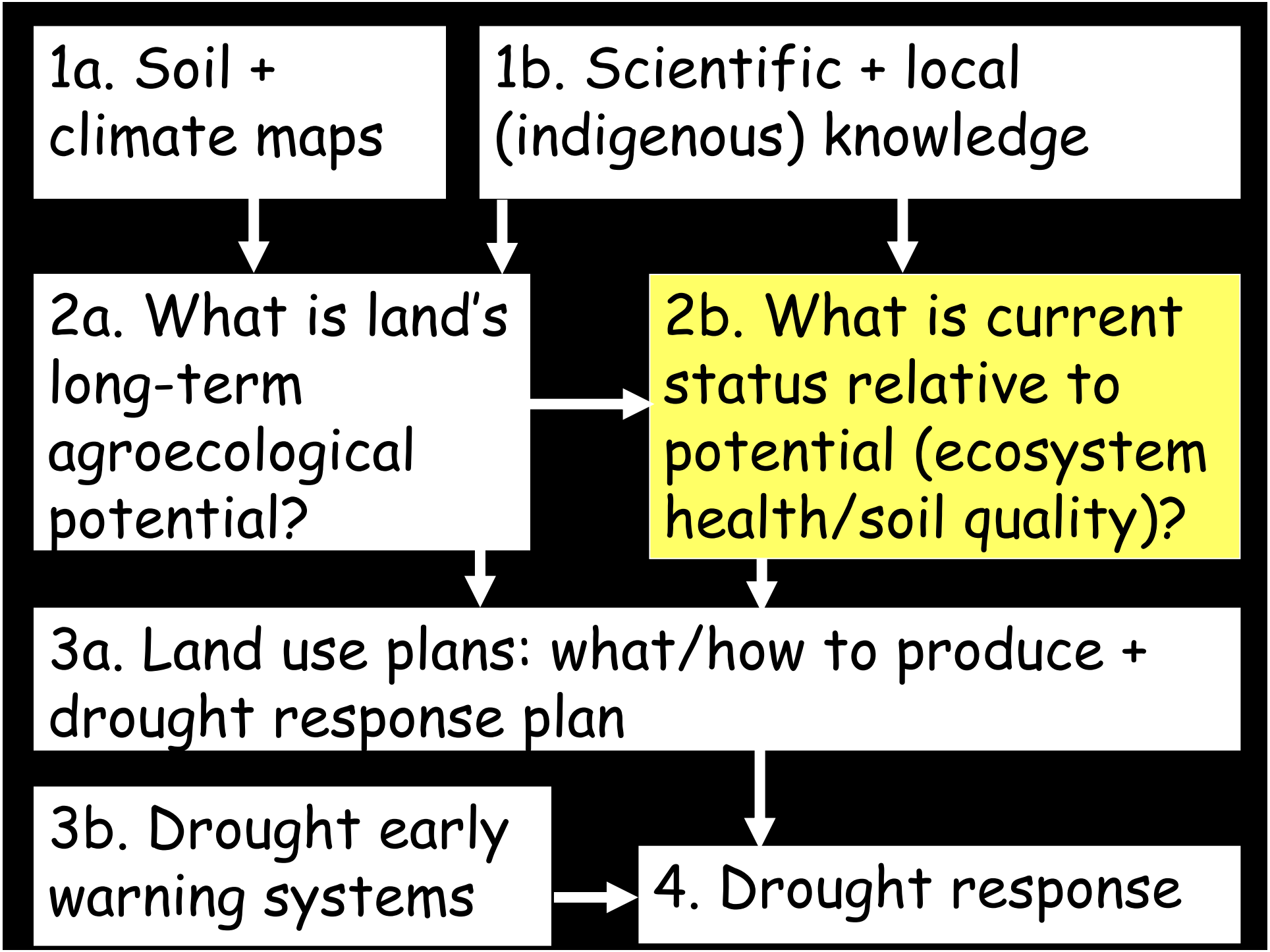



B. Bestelmeyer/BLM data, 123 plots (1970-2003)

# Drought + landscape scale overgrazing + native shrub invasion on sandy soils → reduced productivity + increased soil erosion

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Grassland

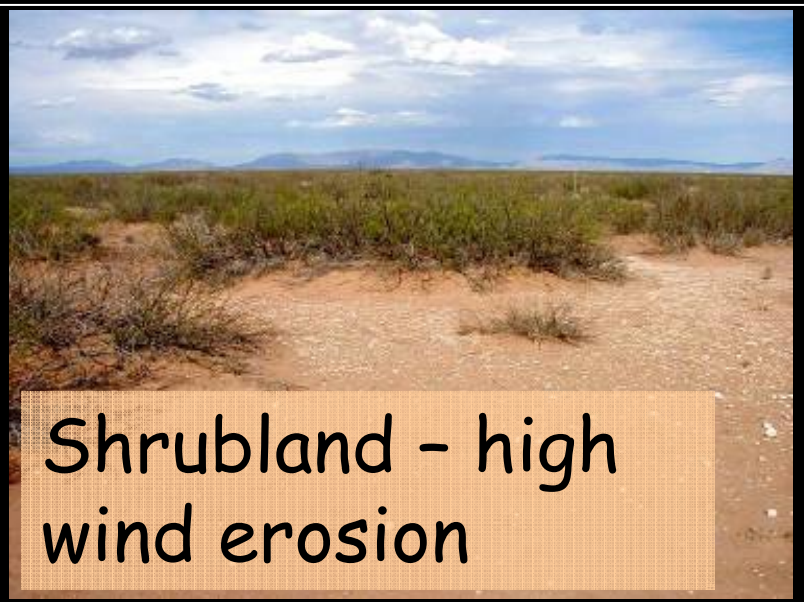
Drought + overgrazing

Rest

Degraded Grassland

Shrub invasion

Knowledge of rangeland resilience and relevant indicators is stored in "Ecological Site Descriptions"



Shrubland – high wind erosion

Modified from J. Range Mgmt. 2003 56:114-126.

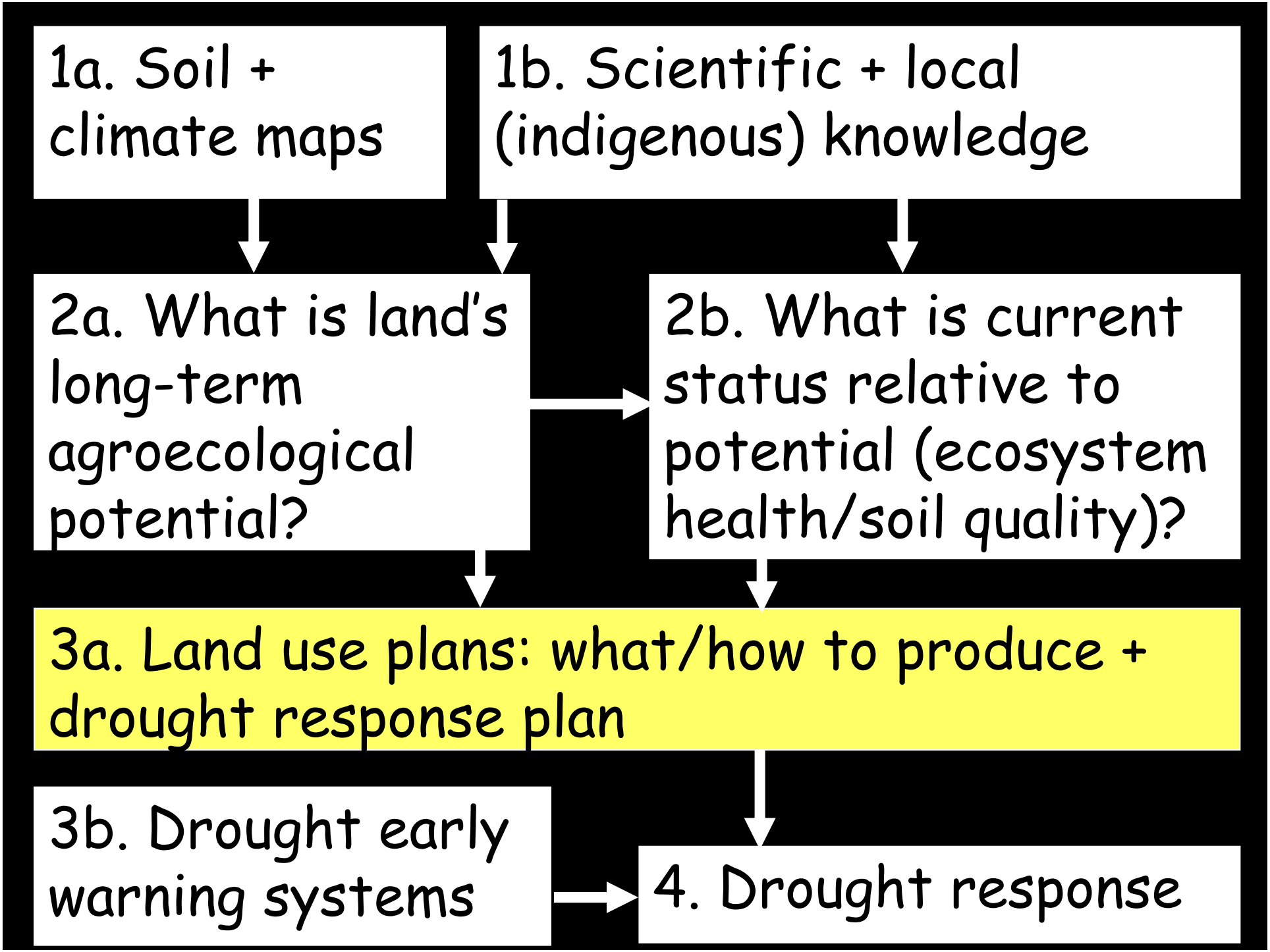
**Soil quality and ecosystem health indicators**

Higher resilience due to:

- -Water holding capacity
- -Nutrient reserves
- -Erosion resistance

Good structure
High Soil Organic Matter

Poor structure
Low Soil Organic Matter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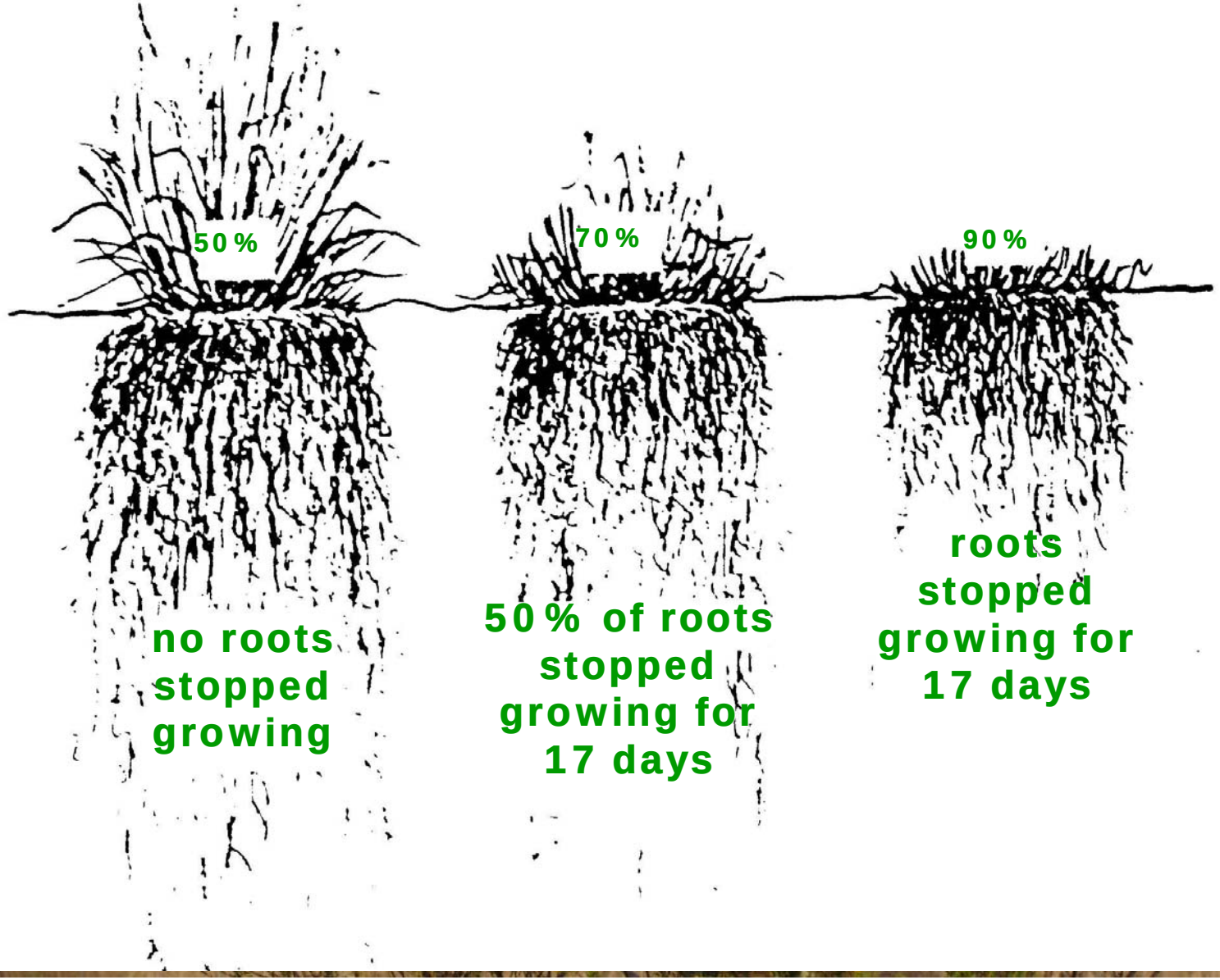
**Land use plan for Chihuahuan Desert grasslands: drought**

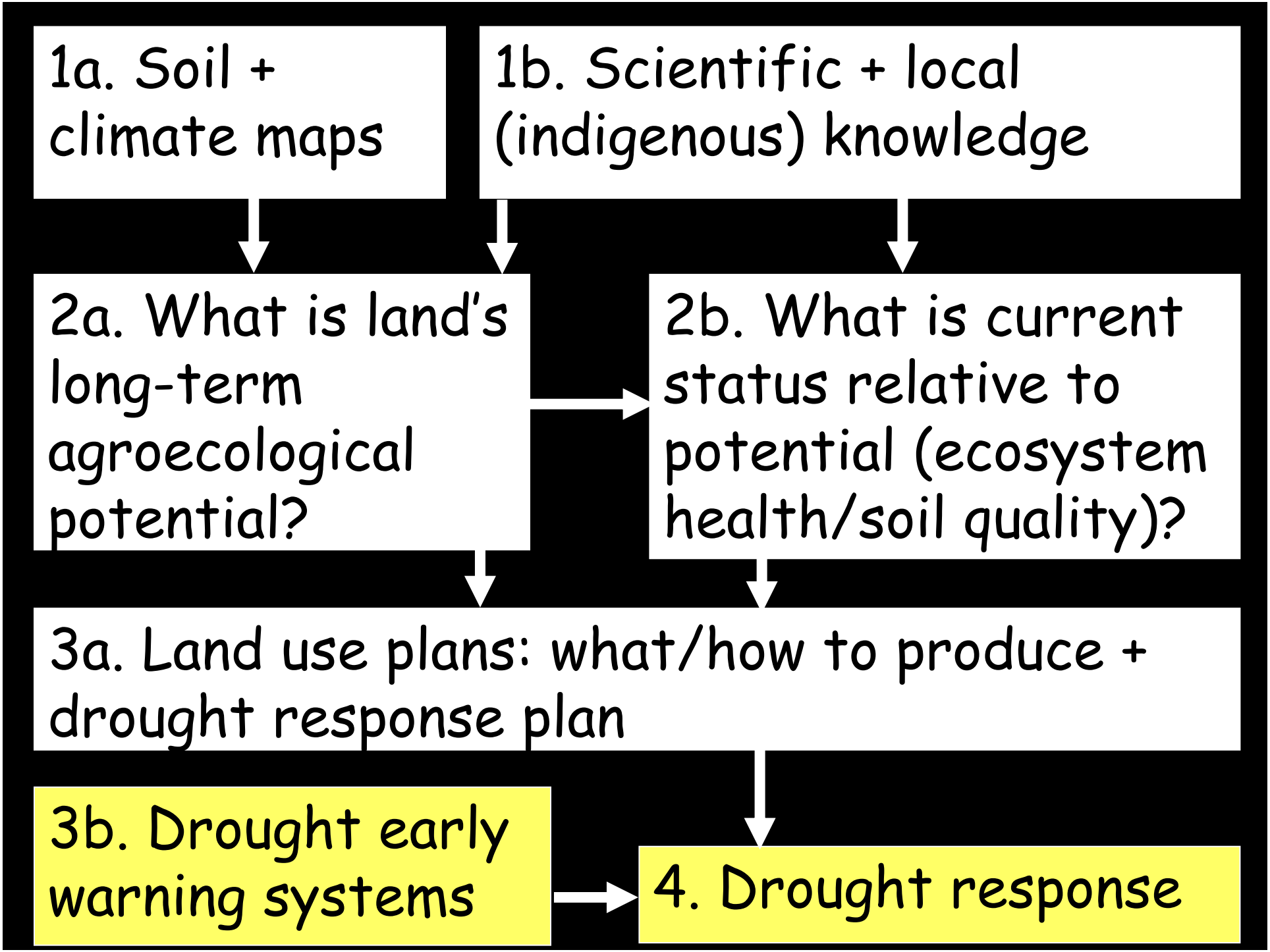
-Remove livestock early in drought

-Minimize pressure on highly erodible sandy soils, especially during early drought recovery period

-Control shrubs

# Proper Grazing During Non-Drought Periods is Also Important for Preparing for Drought

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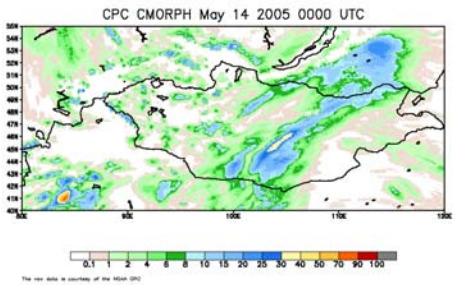
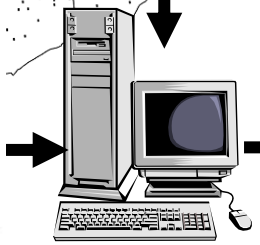
# *Livestock Early Warning Framework (LEWS) – One of Many Examples*

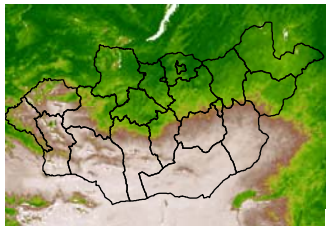

**Monitoring Sites**



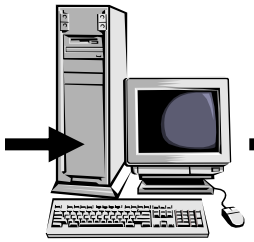

**Near Real Time Climate**

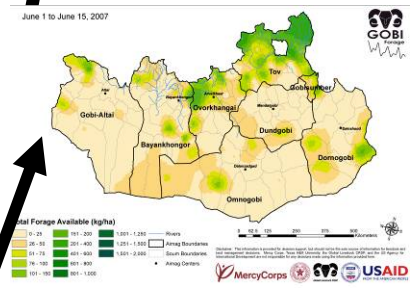


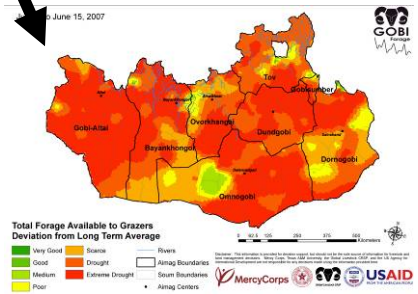
**Models**

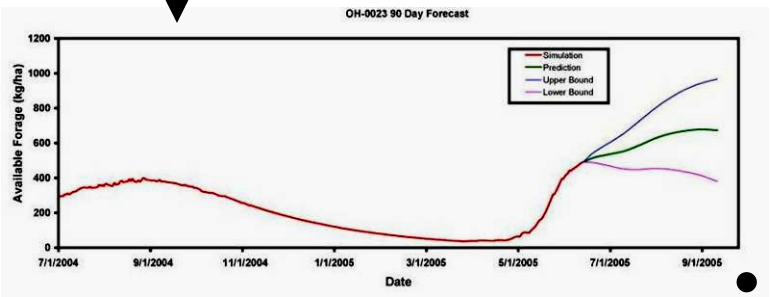


**Satellite Imagery (Greenness)**






Individual Site Analysis

<u>Regional Analysis</u>

- Forage Biomass
- Deviation from avg.
- 60-Day Forecasts

**Mongolia + East Africa. Supported by World Bank, USAID, MercyCorps, Texas A&M University**

The same tools can be used to plan restoration treatments

1975 2003

*18 years: contour dikes on loamy soil, 1% slope*

**Conclusion**: land use plans (based on land potential) can be used together with early warning systems to help **individuals, communities and nations** minimize drought impacts by helping to focus attention on the least resilient areas *before* the drought begins.

Info sources

globalsoilmap.net

usda-ars.nmsu.edu

drought.gov

Google Earth

Local knowledge