State-and-Transition Model Development

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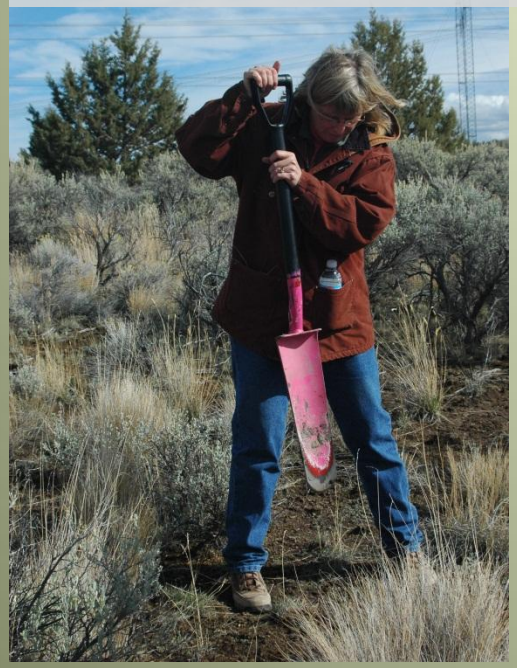
Multiple Approaches

Dig lots of holes - I will figure this out!



Hang out with the right people!

Check with the dog!

STM Fundamentals
Know the Subject Matter

- Briske, D.D., B.T. Bestelmeyer, T.K. Stringham and P.L. Shaver. 2008. Recommendations for development of resilience-based state-and-transition models. *Rangeland Ecology and Management* 61:359-367.

- Stringham, T.K., W.C. Krueger and P.L. Shaver. 2003. State and transition modeling: A process based approach. J. Range Management 56:106-113. Featured Article.

- Stringham, T. K. and J.P. Repp. 2010. Ecological Site Descriptions: Considerations for Riparian Systems. Invited Paper. *Rangelands* 32(6):43-48.

State-and-Transition Models

(Stringham et al.2003)

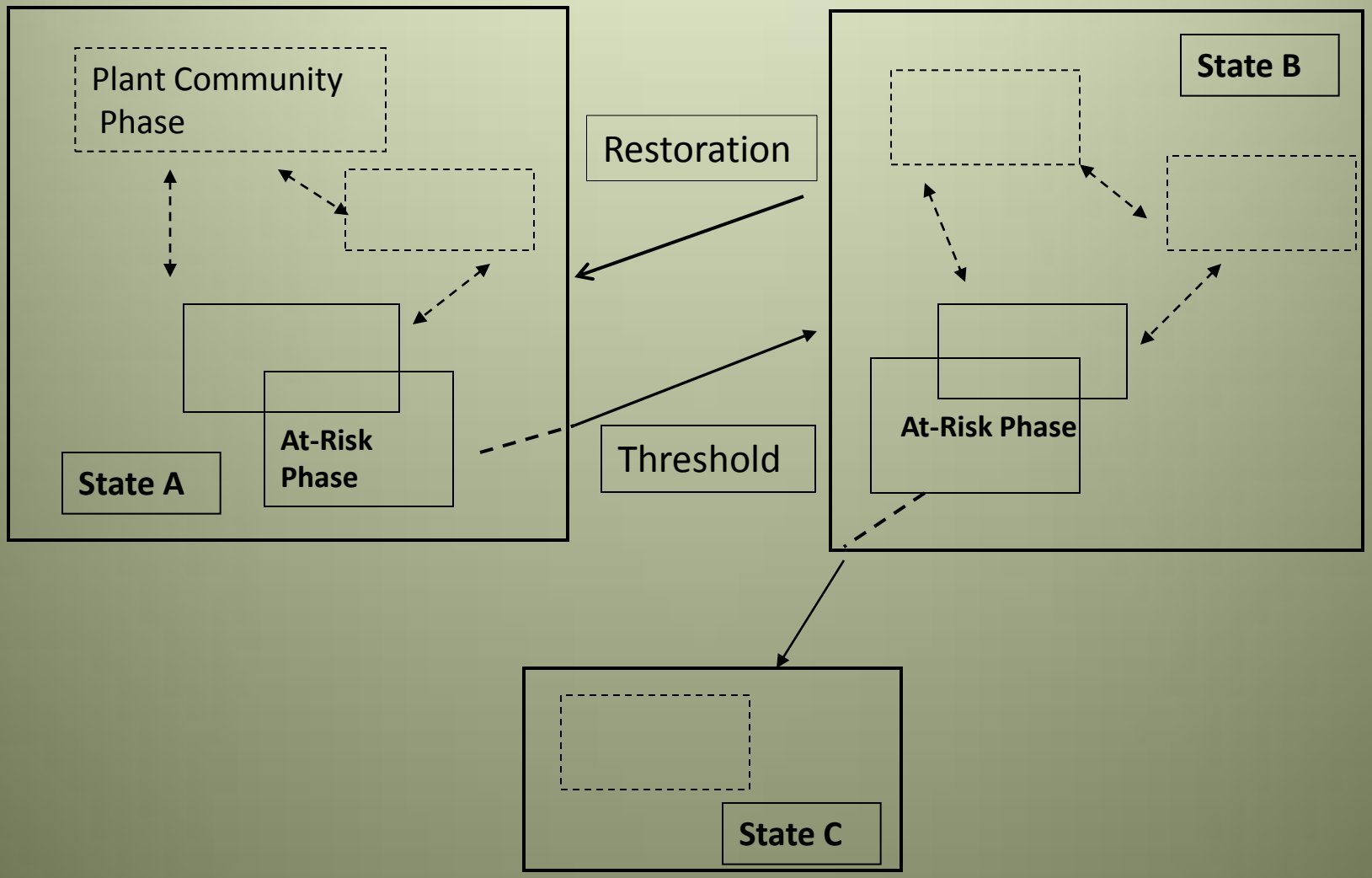
(Briske et al. 2008)

- Accommodates: Range Succession Model (Quantitative Climax Model)
- Accounts for transitions, thresholds, and multiple steady states
- Process based NOT vegetation

ECOLOGICAL PROCESS MODEL

THE BASICS

MINIMUM SCALE FOR *STATE* = ECOLOGICAL SITE



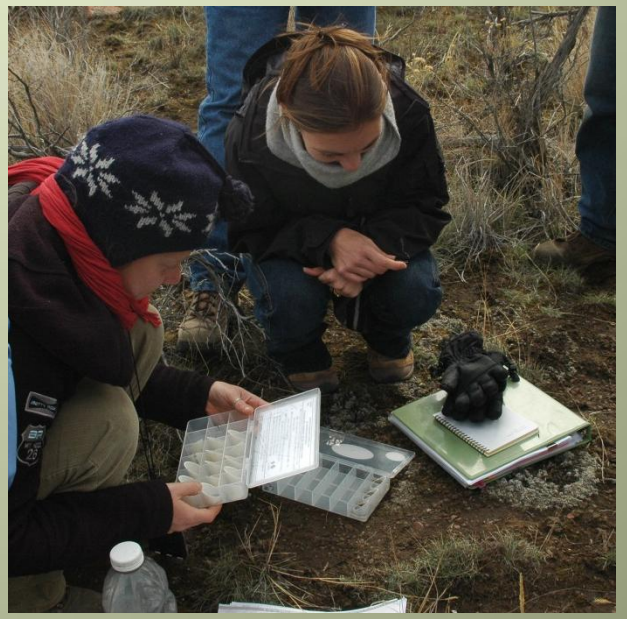
STM Components

- What is a STATE?
- Threshold or Transition?
- Community Phase?
- Community Pathway?
- At-Risk Community Phase?
- Restoration Pathway

What is “process-based thinking?

- Ecological Processes ?
  - Range people think plants
  - Soil people think landscapes and soils
  - Hydrologist think flow patterns
  - Wildlife biologists think habitat
  - Administrators think $$$$$

Ecological Processes



What is “process-based thinking?

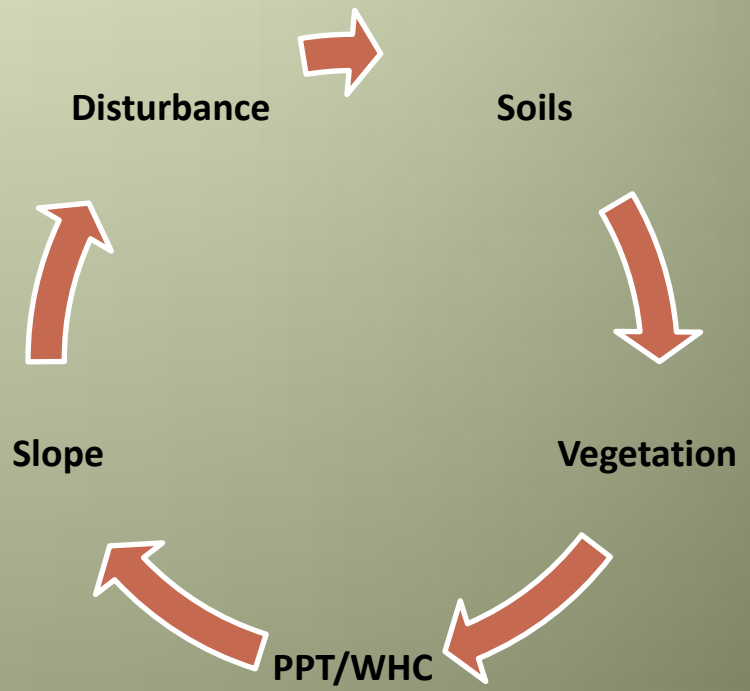
- What is driving the creation and maintenance of what I see?
- Process = amount per time (rate)
  - Infiltration rate
  - Nutrient cycling
  - Energy capture
  - Soil erosion
  - Etc.

What is “process-based” thinking?

- Understanding that what we see is created by the functional capacity of ecological processes
- STMs describe ecological dynamics

Ecological Dynamics
Response to Disturbance

- Response to different disturbances
  - Fire
  - Grazing
  - Flooding
  - Drought
  - Insects
  - Invasive species, Etc.
  - Any combo of the above
- Resilience of Sites



Ecological Dynamics
Response to Disturbance

- Response to disturbances
  - Specie specific?
    - Know individual plant response
  - Dynamic soil properties
    - Vary by soil texture?
- Resilience
  - Climate
  - Soils
  - Plants

Ecological Dynamics
Response to Disturbance

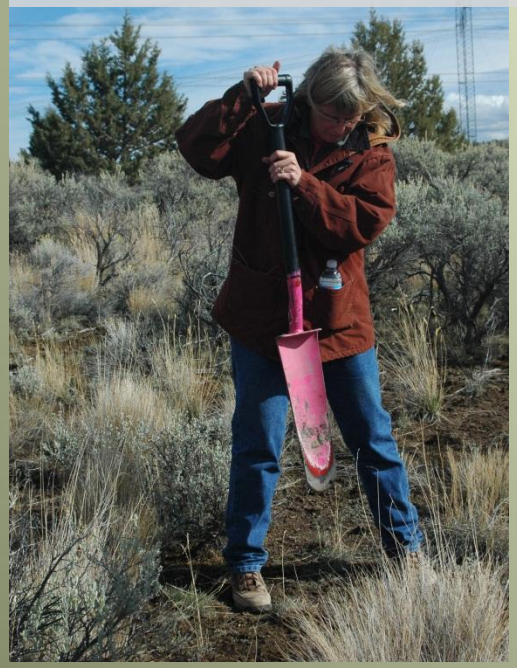
Fire #1: injures or kills plants; may cause soil damage

Fire #2: eliminates residual plants; conversion to weed dominated

Fire #3: plant cover significantly reduced; wind erosion

STM Development ≠ Simple

Dig lots of holes - I will figure this out!



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STM Development ≠ Simple

- Build a team of experts on the area
- Members
  - STM developer = team lead
  - Range ecologist = senior level (more than one)
  - Soil scientist = senior level
  - GIS specialist = field worthy
  - Wildlife biologist
  - Land Managers

Range Ecologist / STM

Experience

Range / Plant

GIS

Soils

Range / Plant

Pitt Falls

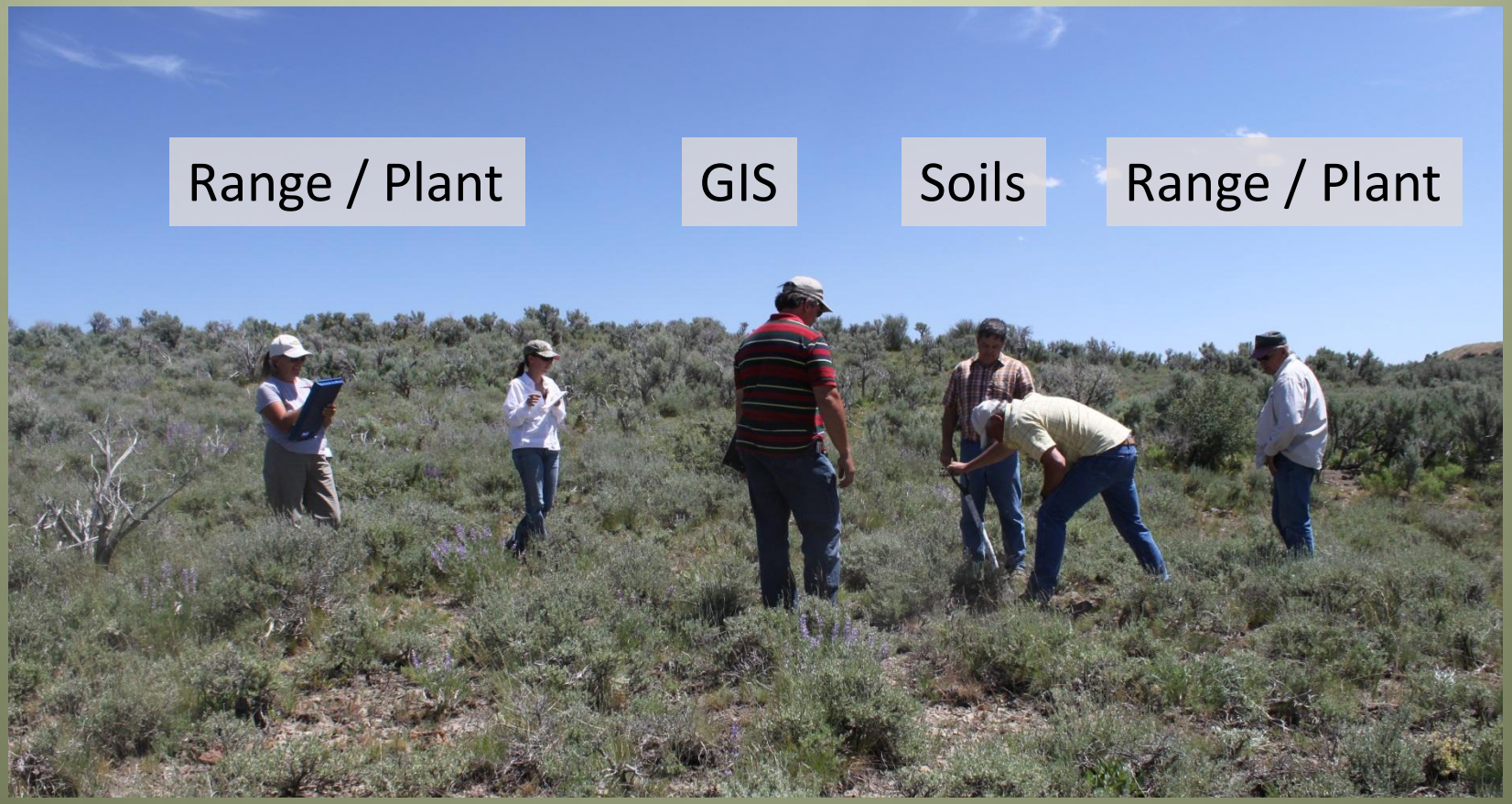
- Assuming STM knowledge
- Lack of diversity of knowledge in team
- Inadequate literature review
- Limited field visits
- No peer review
- Unwillingness to consider new ideas
- EGOs

Experience is critical

Plant / soil relationships

Disturbance response

≠ STM Knowledge



STM Development Process
Disturbance Response Groups

- Assemble the core TEAM
- Invite others to participate in office / field events
- Teach the STM concepts to the core TEAM
  - Multiple times; office & field

STM Development Process
Disturbance Response Groups

- MLRA or LRU scale
  - Build understanding of the climate, soils, plants
    - Soil scientist teach geology, soils, etc
    - GIS specialist create data layers of soil map units; fire events; roads; public / private land; etc.

STM Development Process

- Range sites
  - Describe Reference Condition = State 1
  - Describes landscape, climate, soils, plants, production
  - Describes response to disturbance
- Team analyzes each site & determines how it responds to disturbance
- Group sites

STM Development Process
Disturbance Response Groups

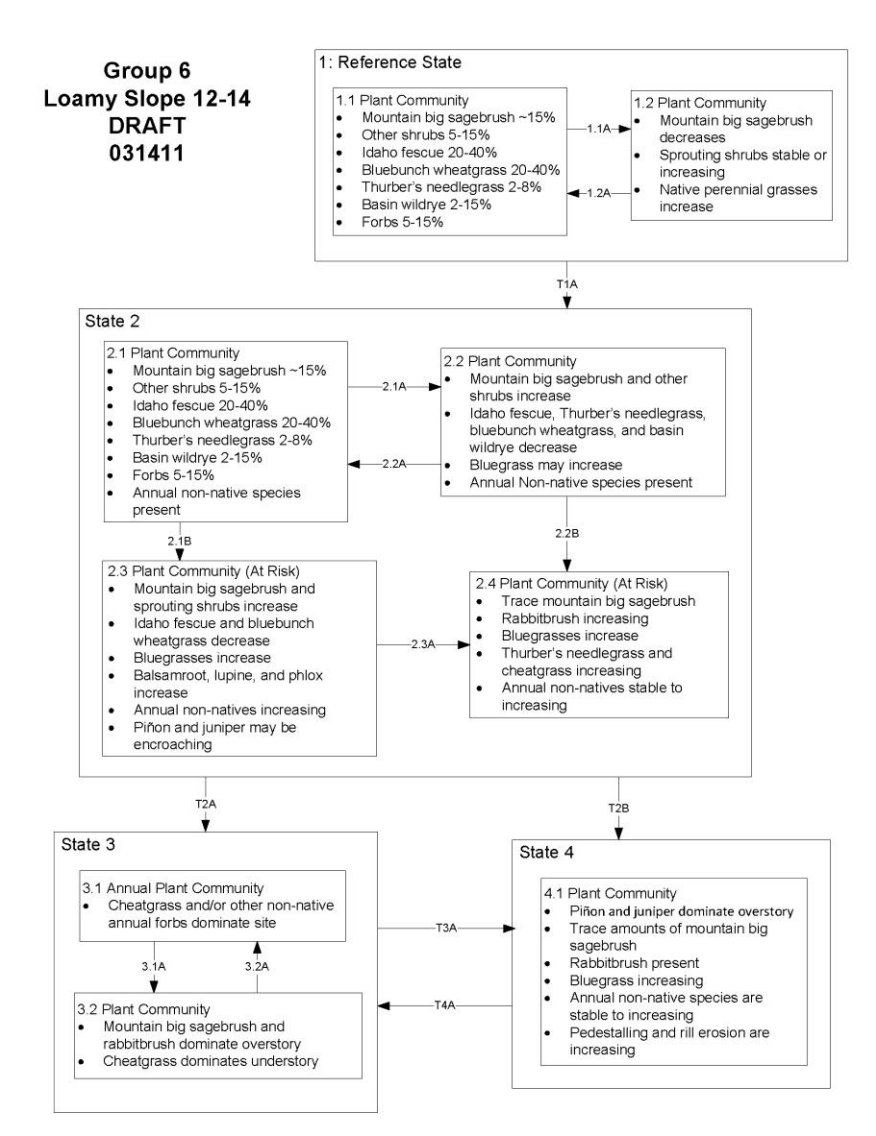
- Grouping process leads to building blocks for STM
  - Discussion involves
    - Soils and soil differences within groups
      - resilience
    - Plant species response to numerous disturbances
    - Response to repeated disturbance
- Modal site
  - greatest amount of acres mapped or
  - typical disturbance response of the group

STM Development Process

- NO range site
  - Soil survey / ESD team
    - Include a team member who specializes in STM development
  - Beyond Soil Survey / Site Development
    - STM Team will need to visit multiple locations of the same site to understand the potential states, transitions, community phases etc.

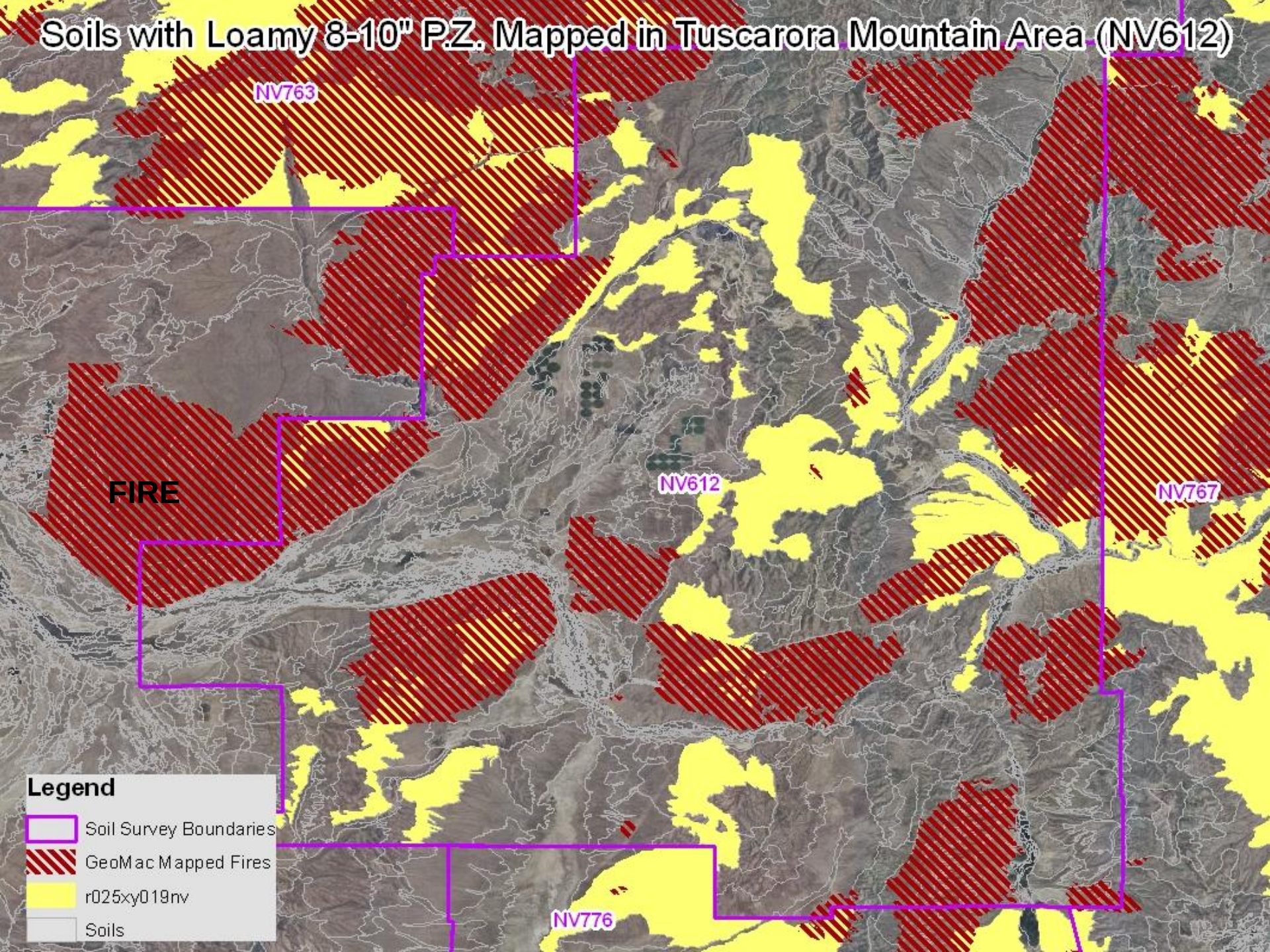
Draft STM Development – Tier 1

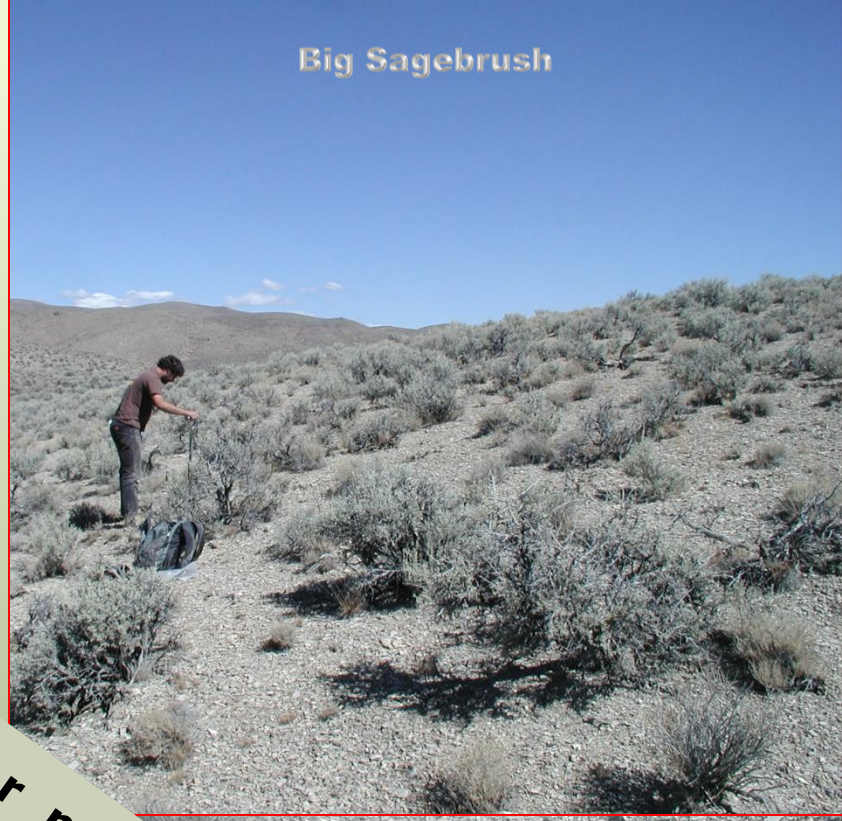
- STM expert develops the draft STM before field visits
- Team reviews



Draft STM Development – Tier 2

- Field Tours
  - Core TEAM participation required
- GIS layers
  - Locate sites; fire history; roads etc.
  - Modal focus
    - Multiple locations visited
      - Validate states, community phases, thresholds
  - All other sites in group
    - At least one location – multiple preferred


Soils with Loamy 8-10" P.Z. Mapped in Tuscarora Mountain Area (NV612)
NV763
FIRE
NV612
NV767
NV776
Legend
Soil Survey Boundaries
GeoMac Mapped Fires
r025xy019nv
Soils

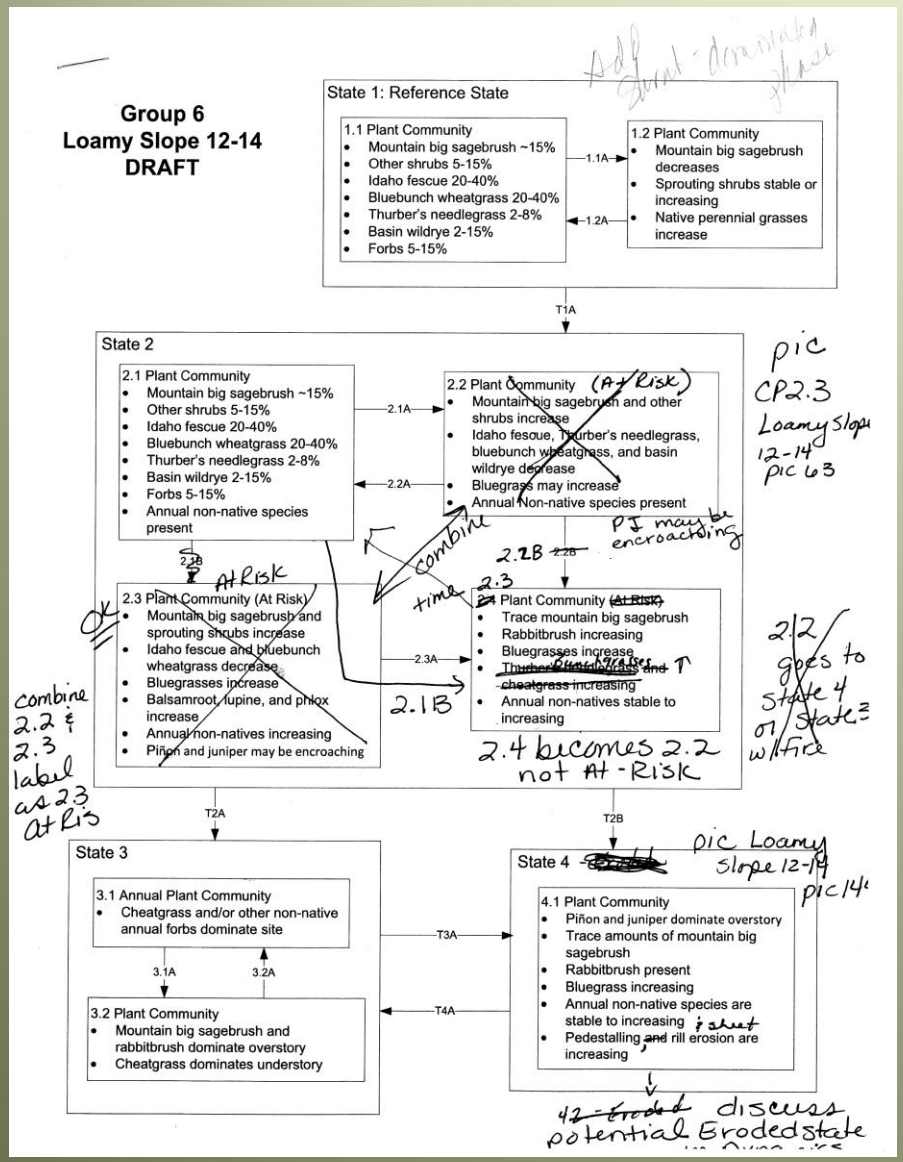


Site Confirmation

Draft STM Development – Tier 2

- Site verified
- Plant list
- Range Health Assessment
- Photos
- DISCUSSION
- DISCUSSION
- DISCUSSION

Tier 2 – Field Validation

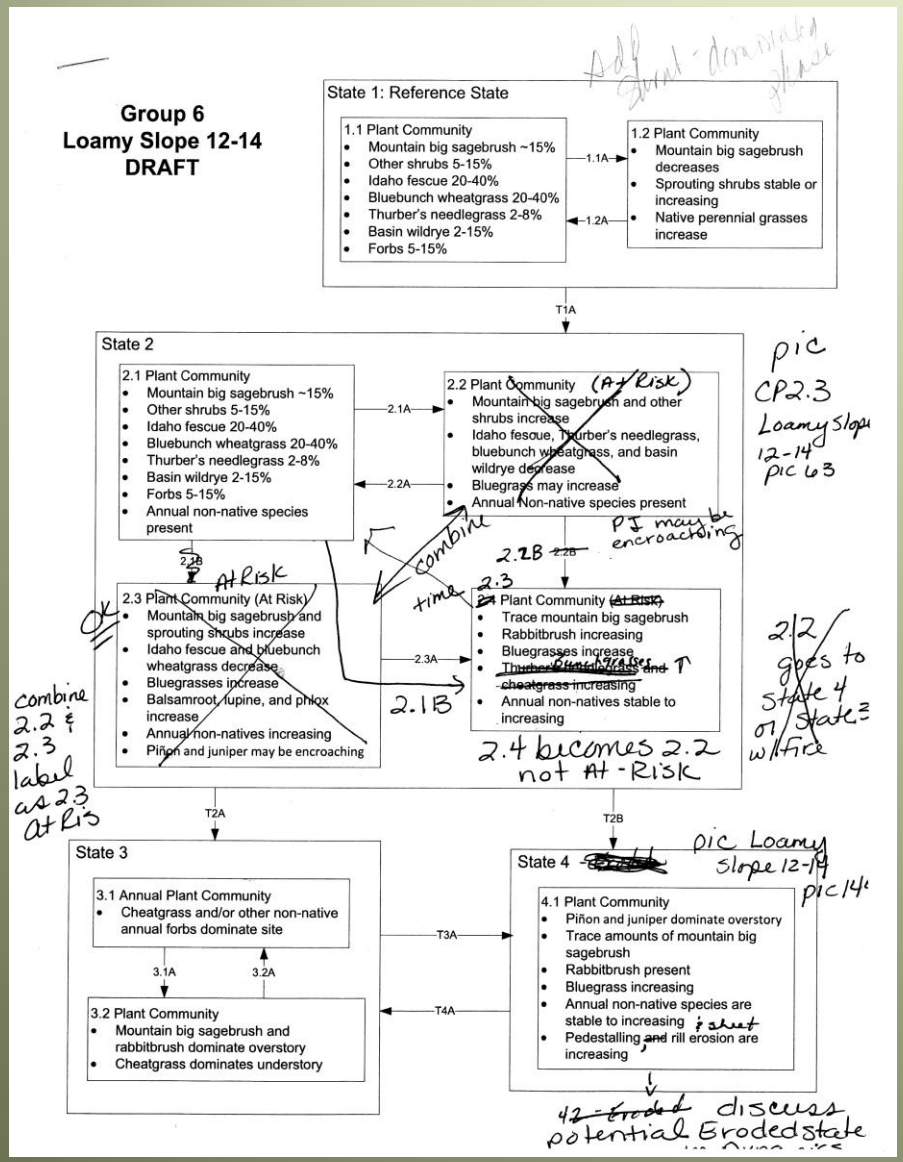


<u>Document</u>
Location: GPS
Map Unit
Soils
Elevation
Landform
Range Health
Production
Fire History
Disturbance: farming, ground water Pumping, herbivory etc.

Draft STM Development – Tier 2

- STM Expert modifies model per DISCUSSION
- Draft ecological dynamics section
  - States
  - Community Phases
  - Community Pathways
  - Thresholds or Transitions
- Model reviewed by core TEAM

Tier 2 – Field Validation



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Review

- Larger group
- Field
- Office
- Workshop

Conclusions

- STMs not simple
- Expert Team required
- STM concepts must be taught / reviewed
- Robust STMs require multiple site visits
- Develop draft STM in office
- Use to guide field discussions
- Revise
- Peer Review - Revise
- STMs ALWAYS DRAFT