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


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

State A
- Plant Community Phase
- At-Risk Phase

State B
- At-Risk Phase

State C
- Restoration
- Threshold
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

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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
Experience

Range Ecologist / STM

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

Range / Plant  GIS  Soils  Range / Plant

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
Draft STM Development – Tier 2

• Site verified
• Plant list
• Range Health Assessment
• Photos
• DISCUSSION
• DISCUSSION
• DISCUSSION
Tier 2 – Field Validation

Document 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

Document
Location: GPS
Map Unit
Soils
Elevation
Landform
Range Health
Production
Fire History
Disturbance: farming, ground water pumping, herbivory etc.
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