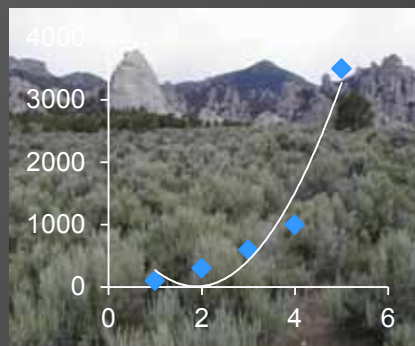
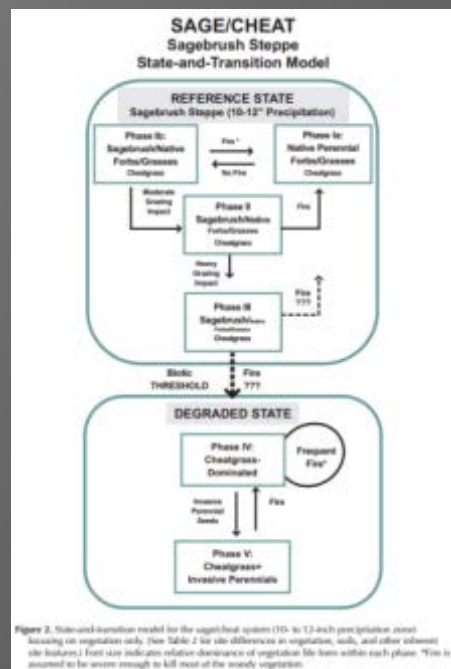


Simulation Modeling and Emerging Technologies for Understanding and Prioritizing Management Actions



The Next Steppe: Sage-grouse and
rangeland wildfire in the Great Basin
Boise,
November 6, 2014

Dr. Matt Reeves (USFS, RMRS, Research Ecologist)
Leonardo Frid (Apex RMS)



Simulation Modeling

Not going to discuss model theory

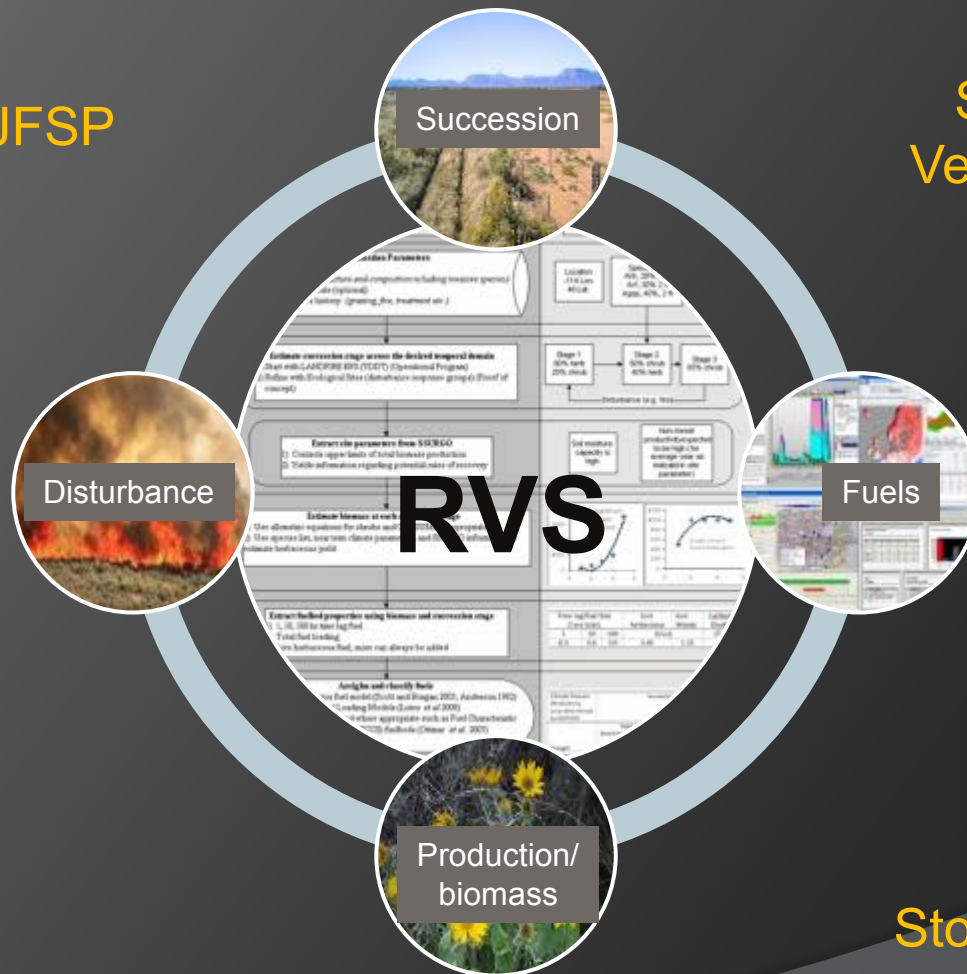
Explain our efforts to develop a quantitative model platform for rangelands:

- *Potential uses*
- *Limitations*
- *Development stage*
- *Policy, fire operations and science implications*

Simulation Modeling: *Rangeland Vegetation Simulator (RVS)*

Began in 2012; JFSP

Similar to Forest
Vegetation Simulator



4 modules

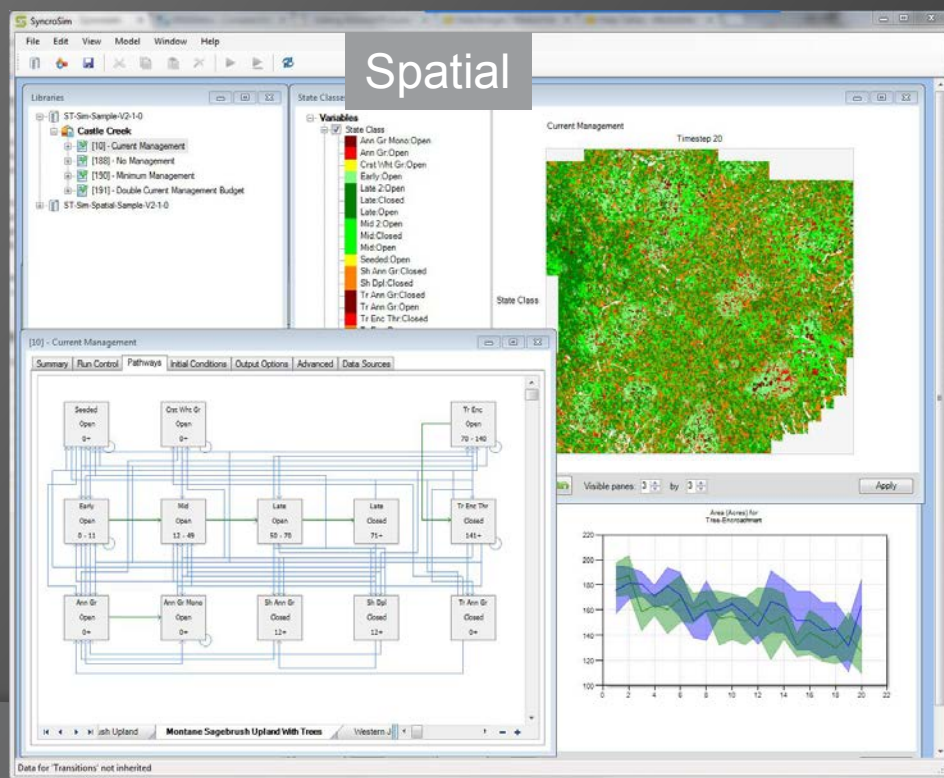
Deterministic and
Stochastic components

Simulation Modeling: *Rangeland Vegetation Simulator (RVS)*

Input	Output		
X, Y	Fuels	Production	Succession
Composition	1, 10, 100 hr	Herbaceous biomass	State / stage
Structure	Fuel Loading Model	Shrub biomass	Structure / assemblages
Rainfall	Surface Fire Behavior Fuel Model (FBFM)	Annual production	
Design criteria (herbivory, herbicide, fire)	XML for FCCS	Stem density	

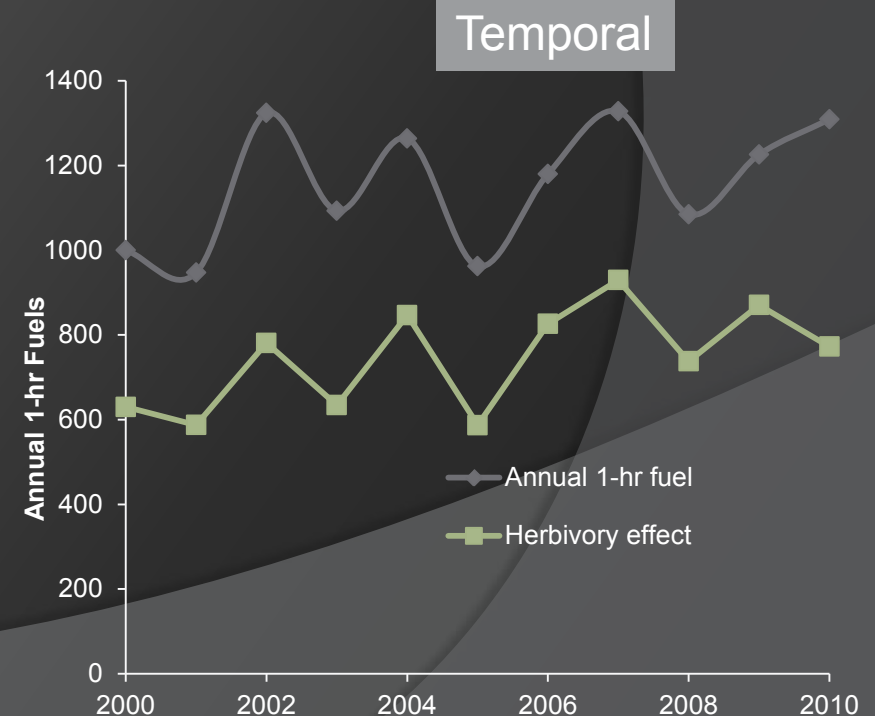
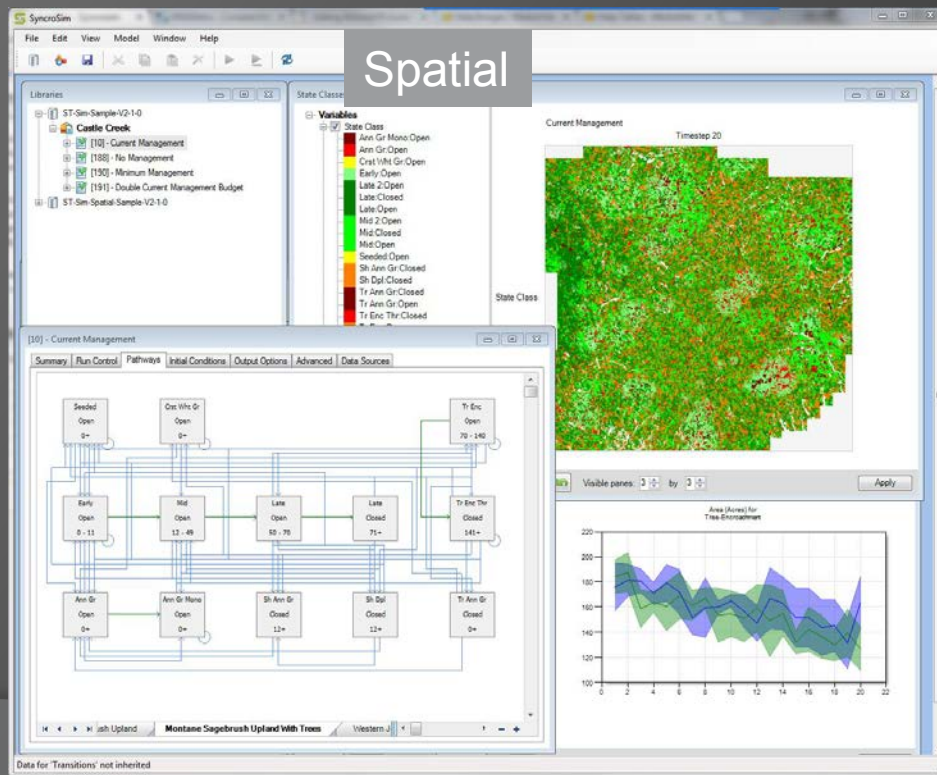
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Simulation Modeling: *Rangeland Vegetation Simulator (RVS)*

Relative Ranking of Threats to Sage-Grouse in Idaho
(Idaho Sage-grouse Advisory Committee 2006)

1) Wildfire

- | |
|---------------------------------|
| 2) Infrastructure |
| 3) Annual Grassland |
| 4) Livestock Impacts |
| 5) Human Disturbance |
| 6) West Nile Virus |
| 7) Prescribed Fire |
| 8) Seeded Perennial Grassland |
| 9) Climate Change |
| 10) Conifer Encroachment |
| 11) Isolated Populations |
| 12) Predation |
| 13) Urban/Exurban Development |
| 14) Sagebrush Control |
| 15) Insecticides |
| 16) Agricultural Expansion |
| 17) Sport Hunting |
| 18) Mines/Landfills/Gravel Pits |
| 19) Falconry |

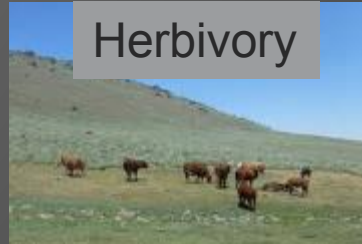
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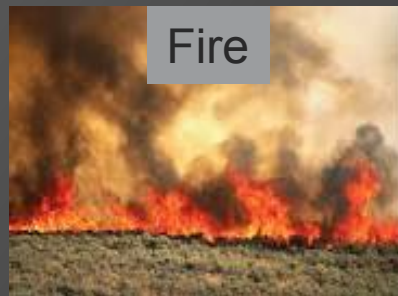
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Herbivory



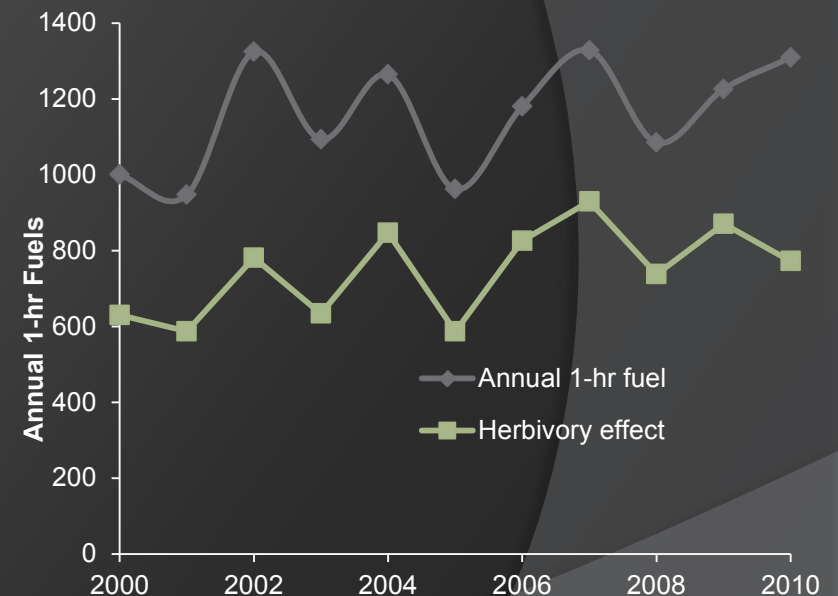
Fire



Herbicide

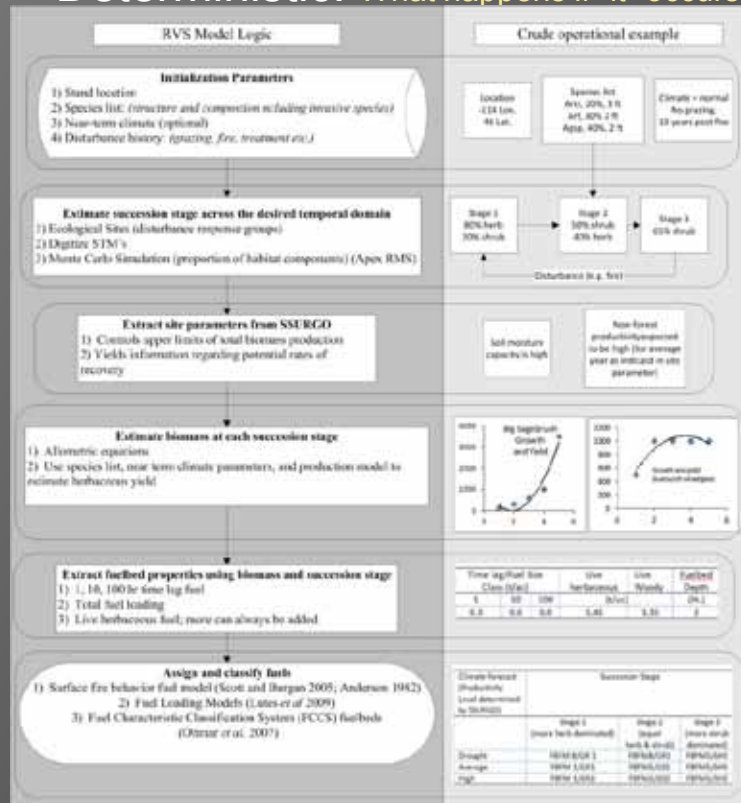


Greatest emphasis is on
Inter-annual evaluation of
fuelbeds in response
to disturbance

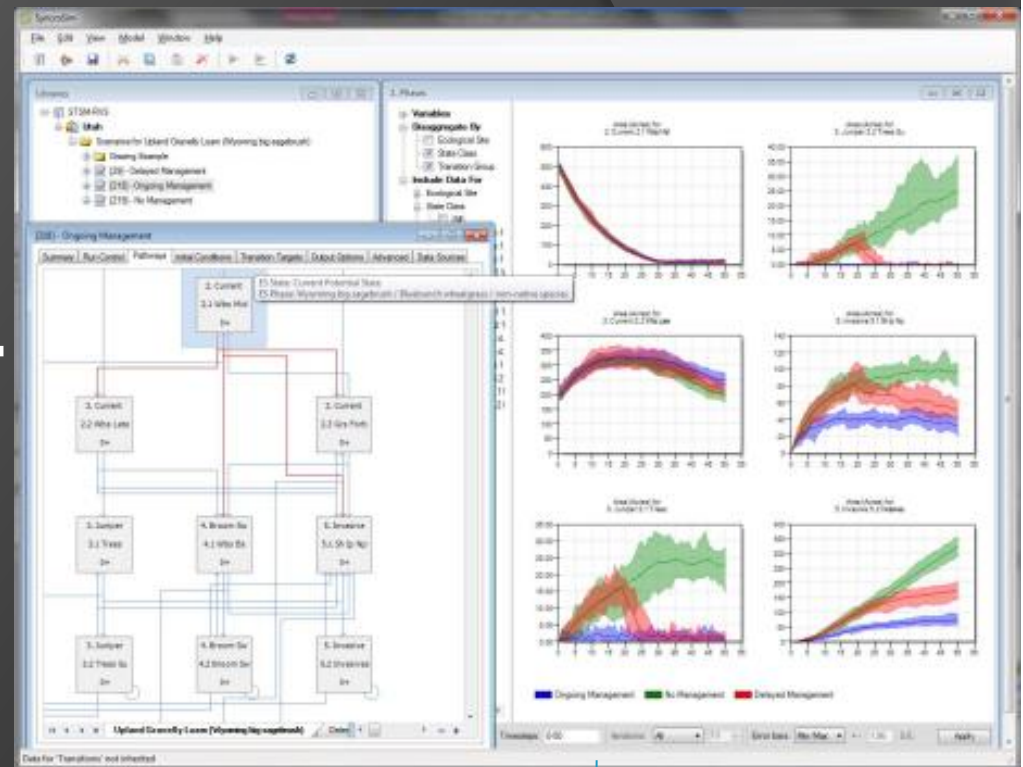


Rangeland Vegetation Simulator (RVS)

Deterministic: What happens if “it” occurs?



Stochastic: Will it occur? When where?



Research Direction:
Merge deterministic and stochastic modeling via
State-Transition Simulation

Simulation Modeling: *Rangeland Vegetation Simulator (RVS)*

Many State-Transition modelling efforts now taking shape, especially in GB

Differing resolution; Differing knowledge base; Disparate goals

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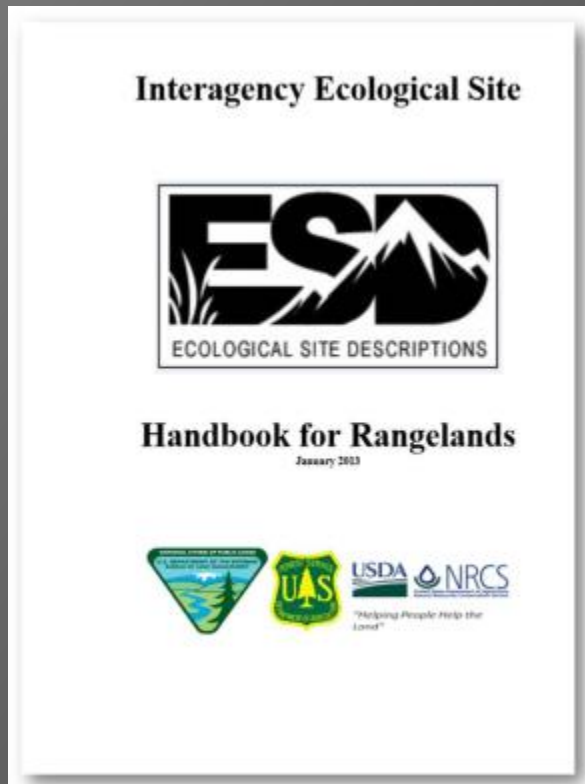
RVS Design

Reliability

Transparency

Consistency

Simulation Modeling: *Rangeland Vegetation Simulator (RVS)*

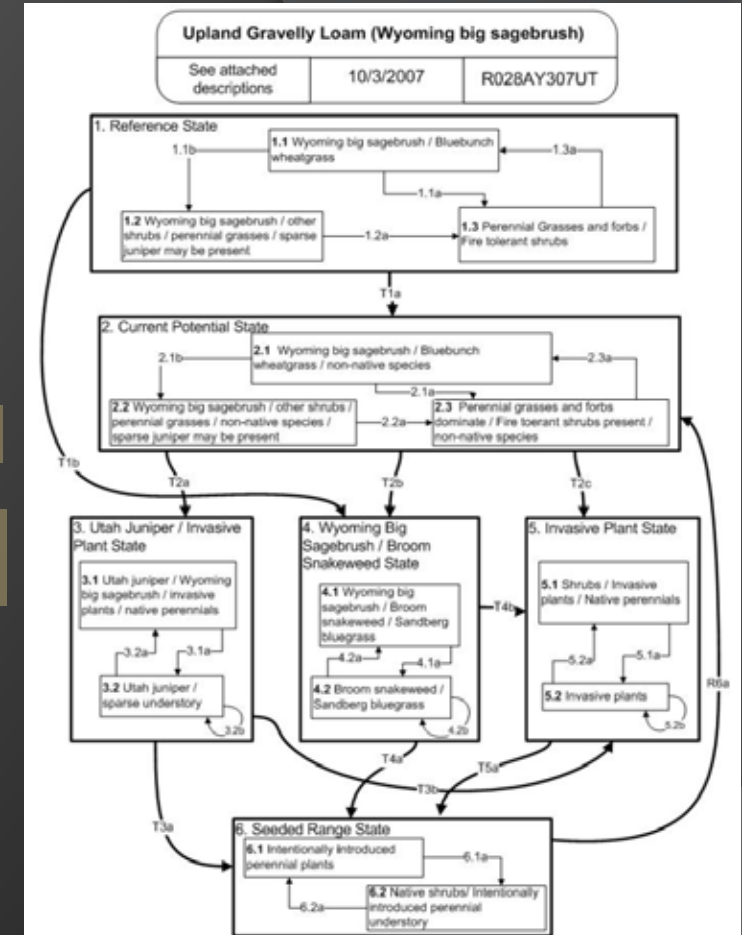


Interagency framework

Managers getting used to them

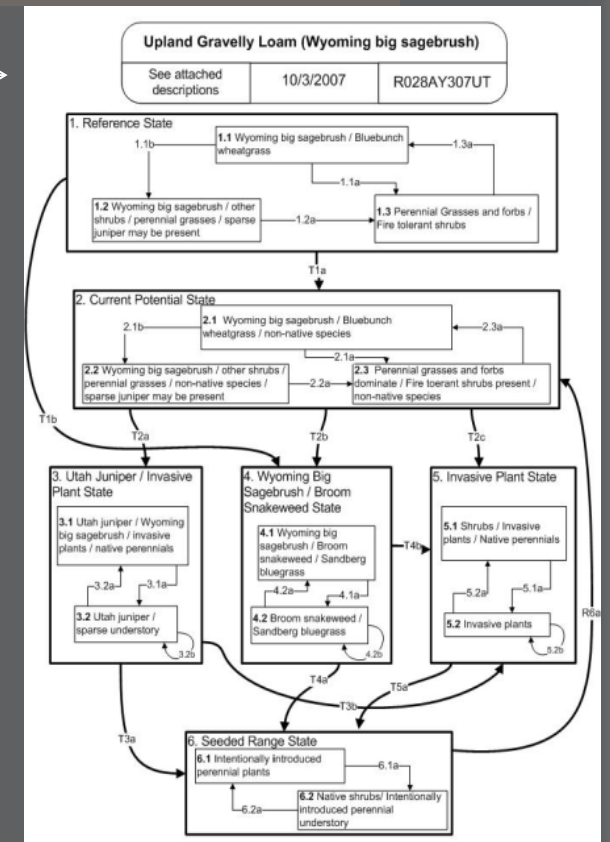
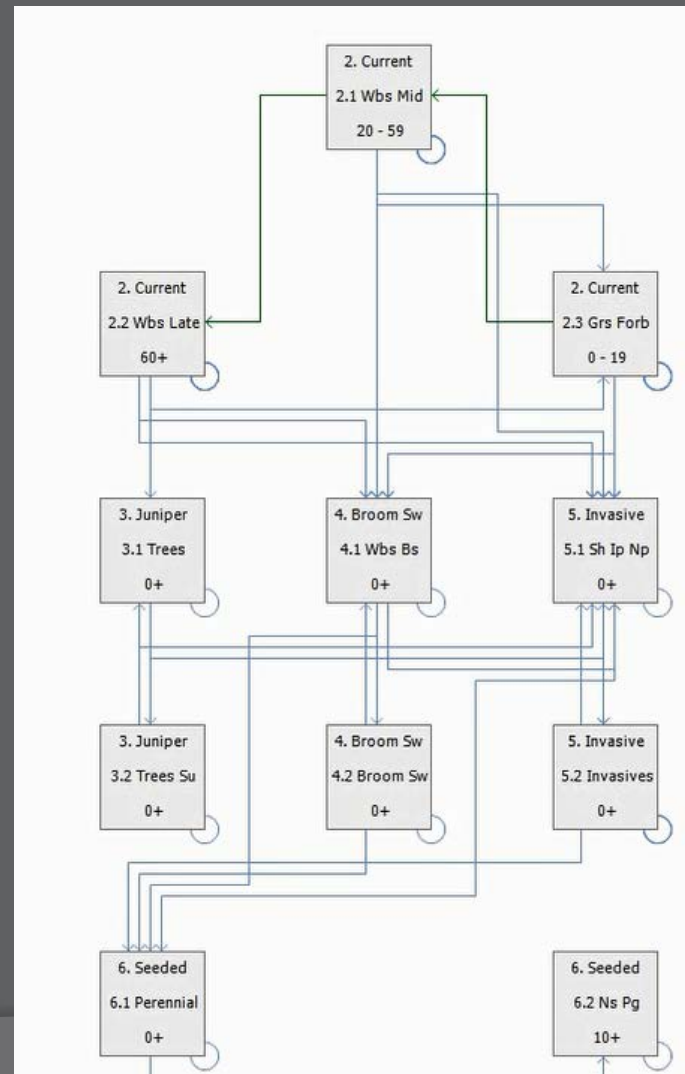
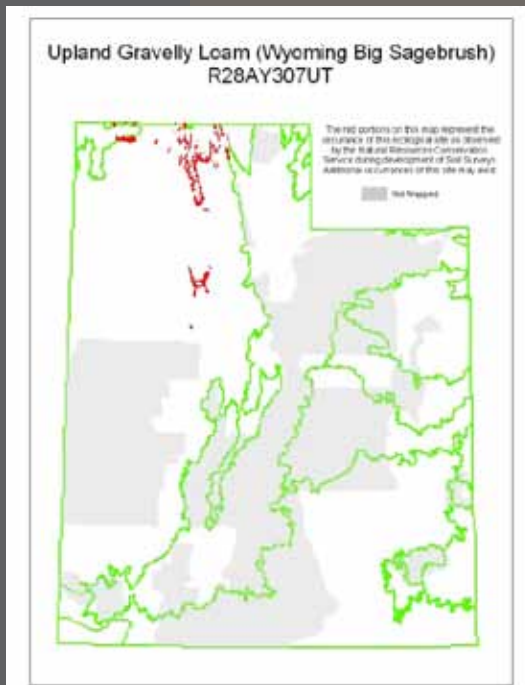
Consistent process for information

Calibration possible with BLM data:
AIM

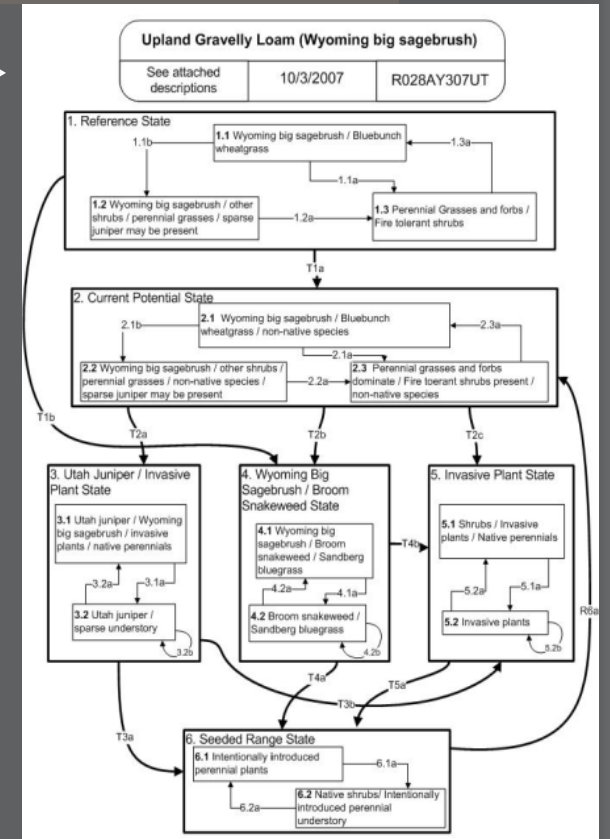
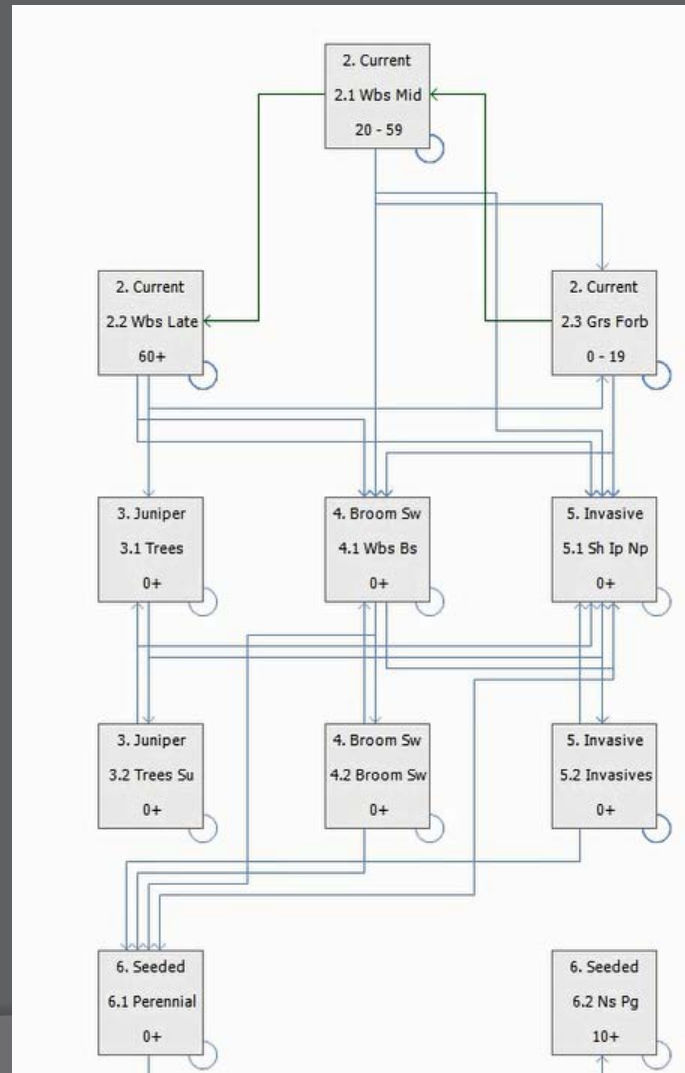
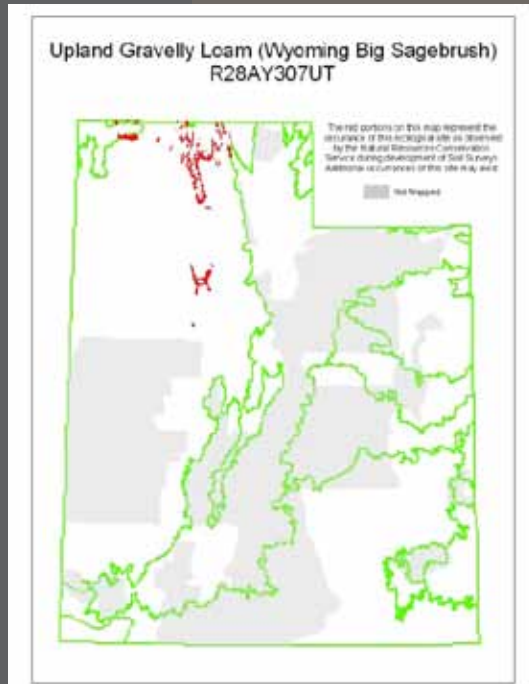


On annual time-step populate states
with productivity, fuels,
biomass, ecology

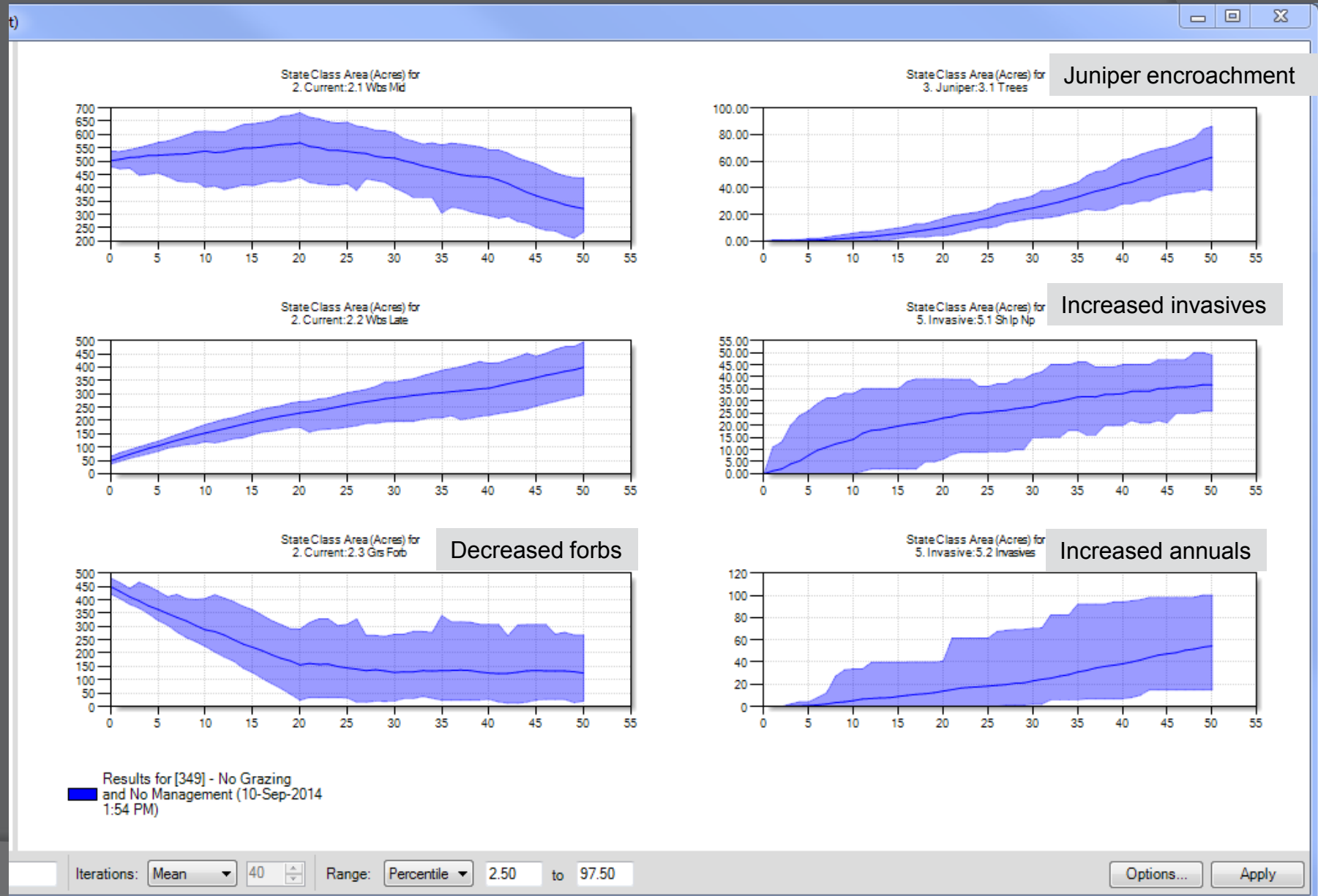
RVS: *Case Study*



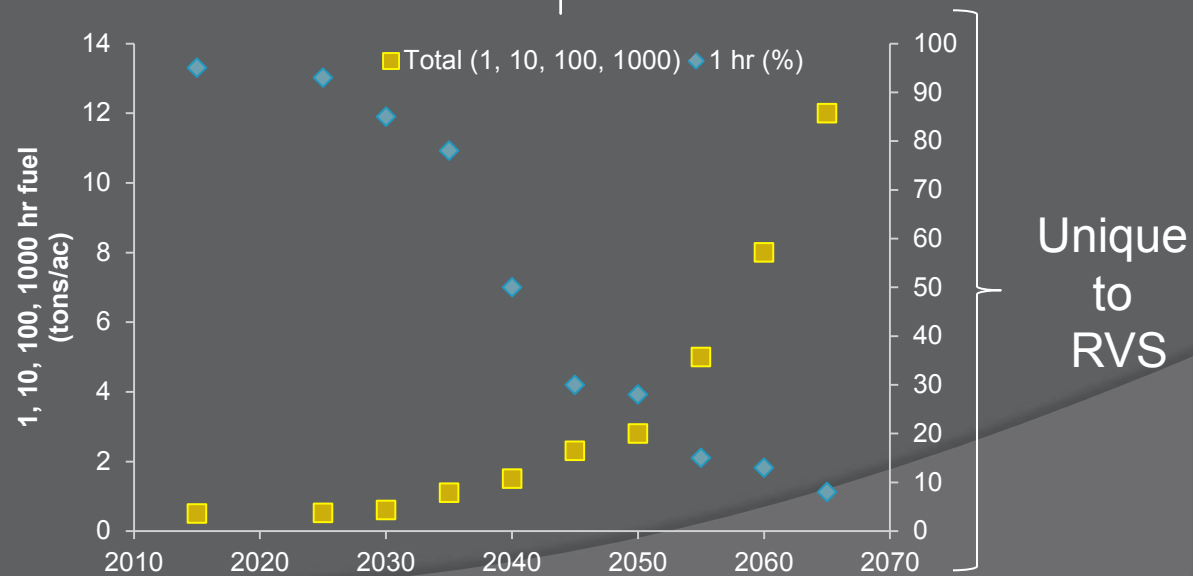
RVS: *Case Study*



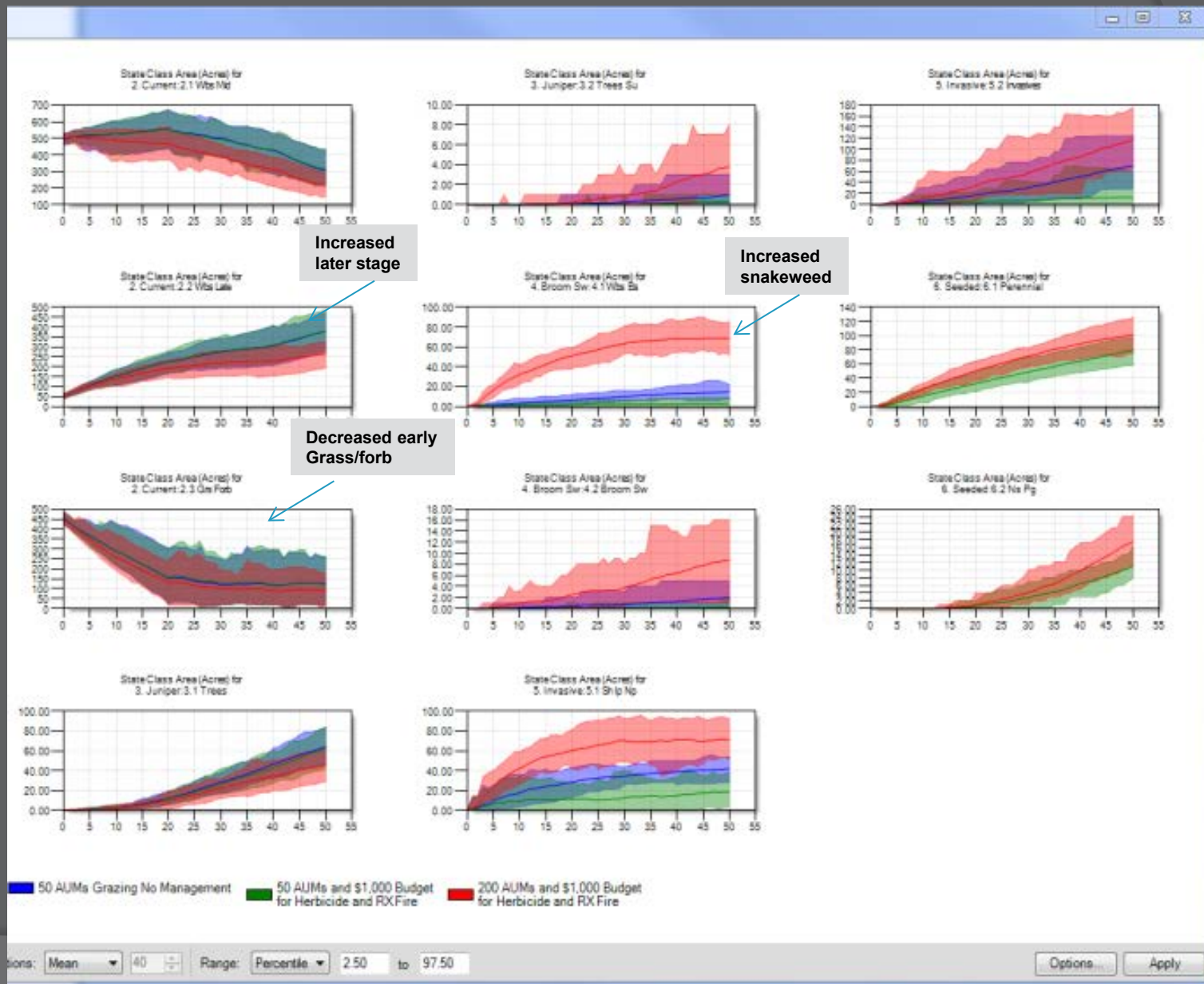
RVS: *Case Study* (No management)



RVS: *Case Study* (No management)



RVS: *Case Study* (management)



RVS: *Potential Uses*

- 1) Justification of stocking rates. Litigation (R3 USFS example)

RVS: *Potential Uses*

1) Justification of stocking rates. Litigation (R3 USFS example)

Mogollon chaparral



Annual production?

Fuel loading?

Stocking rates justified?

RVS: *Potential Uses*

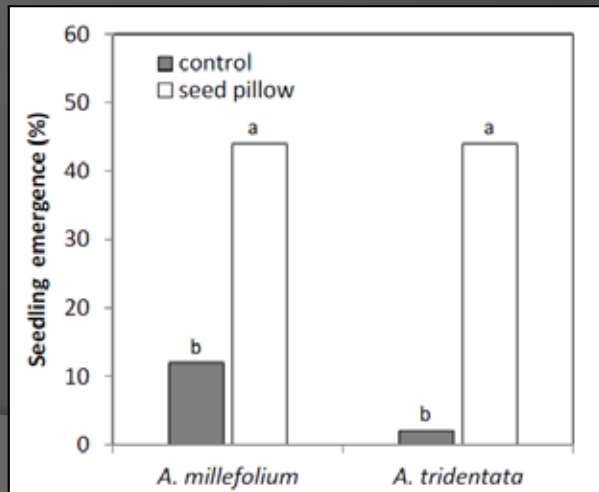
- 1) Justification of stocking rates. Litigation (R3 USFS example)
- 2) Prioritizing treatments in space and time
- 3) Estimating effectiveness of planned treatments
- 4) Quantifying fuels from inventory data
- 5) Interagency planning (*Reliability, Transparency, Consistency*)

RVS: *Potential Uses*

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Example Questions

a) What is the probability of seeding success across the landscape? Based on this, where and when should we treat? How will seed pillow change this?



RVS: *Potential Uses*

- 1) Justification of stocking rates. Litigation (R3 USFS example)
- 2) Prioritizing treatments in space and time
- 3) Estimating effectiveness of planned treatments
- 4) Quantifying fuels from inventory data
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Example Questions

- a) What is the probability of seeding success across the landscape? Based on this, where and when should we treat?
- b) Is it better to invest \$100,000 up front to increase forb richness or \$10,000 for 10 years?

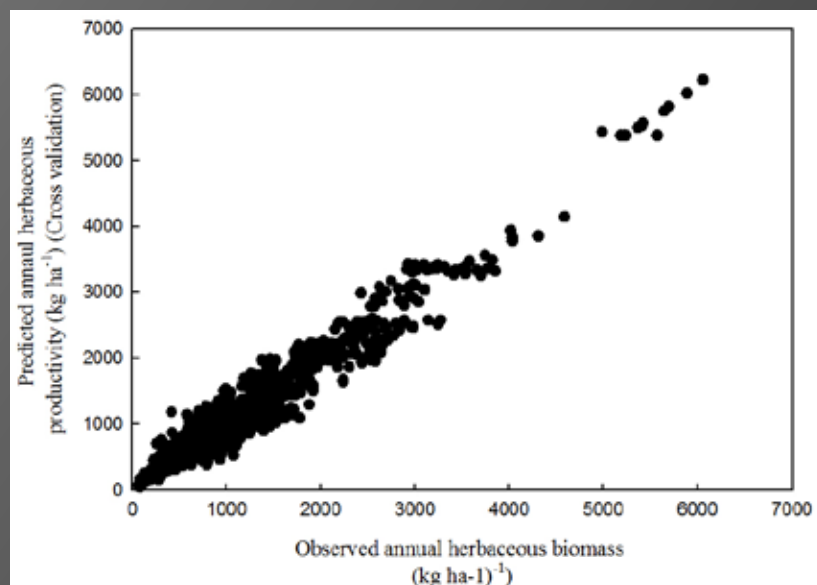


RVS: *Limitations*

- 1) Many species have incomplete information
- 2) Lack of plot inventory
- 3) Ecological Sites are prototypical
- 4) Little or no calibration of ecological dynamics
- 5) Merging with Forest Vegetation Simulator

RVS: *Development Stage*

Calibration/Validation stage



Funding
available

Beta
Release

RVS

RVS: *Policy, Fire Ops., Science*

Policy	Fire Mgt
Consistent framework for justifying Management	Comprehensive fuels data set
Prioritize budgets (where, when how)	Identify “tipping” points
Support policies for increasing quality of sage grouse habitat	Optimize burn plans (achieve multiple objectives)
Enable evaluation of wild horse & burro impacts	Positive feedback between BLM inventory and implications for fire and fuel management
	More precise estimates of fire severity and behavior

Concluding Remarks

- Simulation modelling mature enough to enable appropriate decisions
- RVS is consistent, transparent, reliable
- Provides feedback between BLM monitoring and fire management (TerraDat)
- Novel framework for bridging management and science gap
- Bureau decisions often litigated; seek support of simulation; rich rangeland information