

The Nature Conservancy

Sage-grouse Conservation Forecasting

Presentation to:

Sagebrush Ecosystem Council

May 31, 2013

Summary

1. Rigorous metrics for estimating change in habitat condition over time.
2. Suitable for landscape-scale assessments of 50,000 to 2 million acres (data and time intensive).
3. First application on 1.25 million acres with Newmont.
4. Not a comprehensive banking system or process for facilitating and documenting transactions. Can be integrated into such a system.

Integrate Two Methodologies

1. State-and-Transition Computer Models forecast future conditions due to:

- Background disturbances, weather cycles, and trends
- Adverse impacts from development activity
- Positive impacts from conservation actions

2. Habitat Suitability or Population Viability (GIS) Models

Forecasting State & Transition Models

- Account for:
 - Resilience of baseline vegetation conditions
 - Dynamic, successional nature of desirable vegetation (sagebrush and wet meadows) and undesirable vegetation (wooded classes, annual grasslands)
 - Effectiveness of alternative conservation measures (i.e. success and failure rates)
 - Return on Investment (ROI) analysis based on costs of conservation measures
- Multiple applications of TNC State and Transition models by BLM and USFS in Nevada to develop restoration plans and support NEPA decisions

Example Application

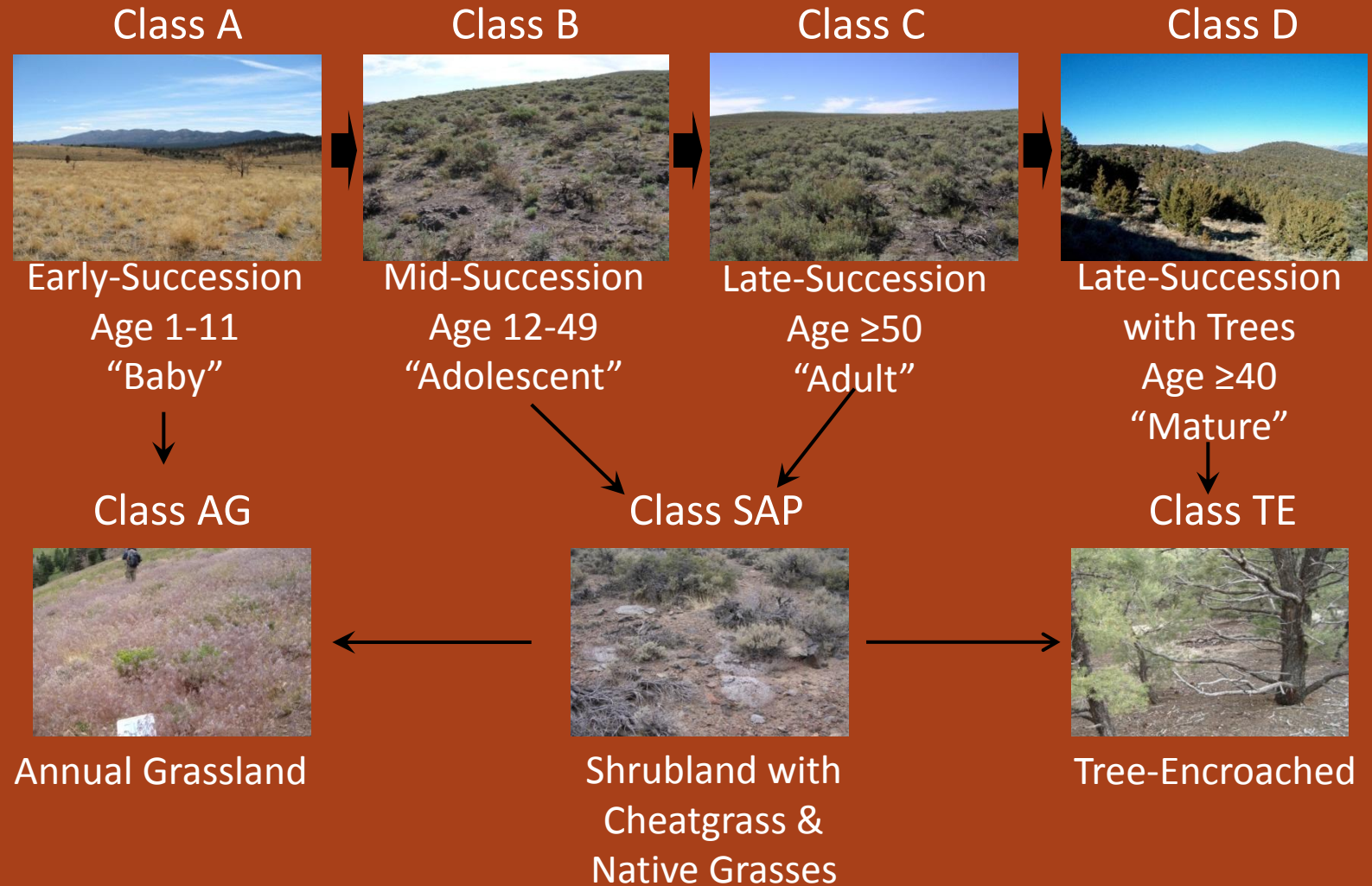
Achieving Mitigation Objectives

Mitigation Objective: Increase Habitat Suitability by 50%

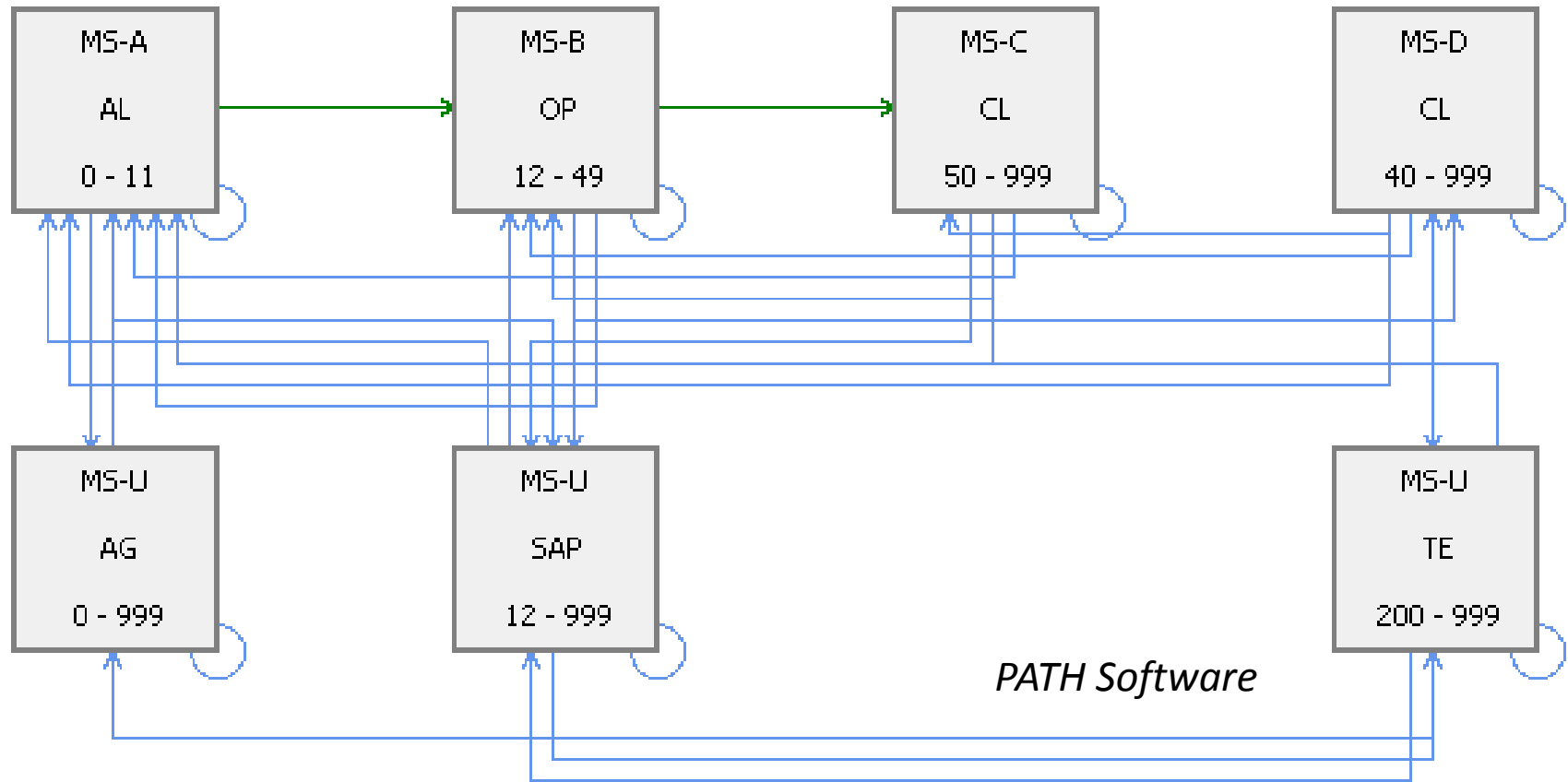
- Area consists of 100,000 acres
- Seek to maximize ROI
- What restoration strategies do you use?
- How many acres/year of each strategy?

State & Transition

Mountain Big Sagebrush - Simplified Example



Computer-Based Predictive Models



Example of Application - Increase Habitat Suitability

Overall suitability increases if all habitat needs are met in the same landscape: as seasonal needs are more evenly met.



Good

Nesting: older, higher cover of shrubs near leks

Early-brood rearing: younger sagebrush, but not too much

Late-brood rearing: young and middle-aged sagebrush

Wintering: increases with older, taller, higher cover of shrubs

Bad

Decreases with trees and cheatgrass

State & Transition

Mountain Big Sagebrush - Simplified Example

Class A



Early-Succession
Age 1-11
"Baby"

Class B



Mid-Succession
Age 12-49
"Adolescent"

Class C



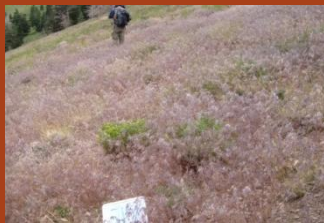
Late-Succession
Age ≥ 50
"Adult"

Class D



Late-Succession
with Trees
Age ≥ 40
"Mature"

Class AG



Annual Grassland

Class SAP



Shrubland with
Cheatgrass &
Native Grasses

Class TE



Tree-Encroached

From Maps & Models

Vegetation Classes & Percentages

Montane Sagebrush - 100,000 acres	Current %	NRV	No Action 20 Years	Mgmt Scenario 1	Mgmt Scenario 2
A-Early succession	5%	20%	1%		→
B-Mid succession	5%	45%	8%		→
C-Late succession	45%	20%	36%		→
D-Late w trees	5%	15%	8%		→
Annual Grassland	0%	0%	1%		→
Shrubs w cheatgrass	20%	0%	25%		→
Tree encroached	20%	0%	21%		→
	100%	100%	100%		

From Grouse Field Data

Habitat Suitability Scores

	Nesting	Early Brood Rearing	Late Brood Rearing	Winter
	n/a	100	50	0
	10	25	100	25
	100	0	25	100
	-100	-100	-100	-100
	-25	0	0	-25
	25	0	10	25
	-100	-100	-100	-100

Scorecard

Life Stage	Current Condition (Overall Habitat Suitability scores 0-1)	Forecasted Future 20 yrs		
		No Action	Mgmt Scenario #1	Mgmt Scenario #2
Nesting	0.90	0.76		
Early Brood Rearing	0.14	0.09		
Late Brood Rearing	0.03	0.03		
Wintering	0.91	0.80		
Overall Score	0.51	0.42		
Management Cost/Year				
Return on Investment (% change of overall score)				

Restoration

Scenarios	Mow+Hrbx+ Seed (acres/yr)	Tree Removal (acres/yr)	Thin-Shrub (acres/yr)
No Action	0	0	0
#1			
#2			
Cost/acre	\$300	\$800	\$100

From Maps & Models

Vegetation Classes & Percentages

Montane Sagebrush - 100,000 acres	Current %	NRV	No Action 20 Years	Mgmt Scenario 1	Mgmt Scenario 2
A-Early succession	5%	20%	1%		
B-Mid succession	5%	45%	8%		
C-Late succession	45%	20%	36%		
D-Late w trees	5%	15%	8%		
Annual Grassland	0%	0%	1%		
Shrubs w cheatgrass	20%	0%	25%		
Tree encroached	20%	0%	21%		
	100%	100%	100%		

From Grouse Field Data

Habitat Suitability Scores

	Nesting	Early Brood Rearing	Late Brood Rearing	Winter
	n/a	100	50	0
	10	25	100	25
	100	0	25	100
	-100	-100	-100	-100
	-25	0	0	-25
	25	0	10	25
	-100	-100	-100	-100

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Restoration

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No Action	0	0	0
#1			
#2			
Cost/acre	\$300	\$800	\$100

Management Objectives

- Increase Early and Mid-Succession Classes A & B
- Decrease Late Succession Class C
- Decrease Tree Encroached Shrubland
- Decrease Cheatgrass Encroached Shrubland

Management Strategies



\$100/acre
Thin Shrubs
C → A>B



\$800/acre
Tree Removal
TE → A
D → A, B, C



+



\$300/acre
Mow+
Herbicide+Seed
SAP → A & B

From Maps & Models

Vegetation Classes & Percentages

Montane Sagebrush - 100,000 acres	Current %	NRV	No Action 20 Years	Mgmt Scenario 1	Mgmt Scenario 2
A-Early succession	5%	20%	1%	5%	→
B-Mid succession	5%	45%	8%	23%	→
C-Late succession	45%	20%	36%	37%	→
D-Late w trees	5%	15%	8%	6%	→
Annual Grassland	0%	0%	1%	1%	→
Shrubs w cheatgrass	20%	0%	25%	13%	→
Tree encroached	20%	0%	21%	14%	→
	100%	100%	100%	100%	

From Grouse Field Data

Habitat Suitability Scores

	Nesting	Early Brood Rearing	Late Brood Rearing	Winter
	n/a	100	50	0
	10	25	100	25
	100	0	25	100
	-100	-100	-100	-100
	-25	0	0	-25
	25	0	10	25
	-100	-100	-100	-100

Scorecard

Life Stage	Current Condition (Overall Habitat Suitability scores 0-1)	Forecasted Future 20 yrs		
		No Action	Mgmt Scenario #1	Mgmt Scenario #2
Nesting	0.90	0.76	0.61	
Early Brood Rearing	0.14	0.09	0.28	
Late Brood Rearing	0.03	0.03	0.29	
Wintering	0.91	0.80	0.74	
Overall Score	0.51	0.42	0.66	
Management Cost/Year			\$500,000	
Return on Investment (% change of overall score)			2.35 (56%)	

Restoration

Scenarios	Mow+Hrbx+ Seed (acres/yr)	Tree Removal (acres/yr)	Thin-Shrub (acres/yr)
No Action	0	0	0
#1	600	400	0
#2			
Cost/acre	\$300	\$800	\$100

From Maps & Models

Vegetation Classes & Percentages

Montane Sagebrush - 100,000 acres	Current %	NRV	No Action 20 Years	Mgmt Scenario 1	Mgmt Scenario 2
A-Early succession	5%	20%	1%	5%	6%
B-Mid succession	5%	45%	8%	23%	23%
C-Late succession	45%	20%	36%	37%	32%
D-Late w trees	5%	15%	8%	6%	7%
Annual Grassland	0%	0%	1%	1%	8%
Shrubs w cheatgrass	20%	0%	25%	13%	12%
Tree encroached	20%	0%	21%	14%	19%
	100%	100%	100%	100%	100%

From Grouse Field Data

Habitat Suitability Scores

	Nesting	Early Brood Rearing	Late Brood Rearing	Winter
	n/a	100	50	0
	10	25	100	25
	100	0	25	100
	-100	-100	-100	-100
	-25	0	0	-25
	25	0	10	25
	-100	-100	-100	-100

Scorecard

Life Stage	Current Condition (Overall Habitat Suitability scores 0-1)	Forecasted Future 20 yrs		
		No Action	Mgmt Scenario #1	Mgmt Scenario #2
Nesting	0.90	0.76	0.61	0.48
Early Brood Rearing	0.14	0.09	0.28	0.31
Late Brood Rearing	0.03	0.03	0.29	0.34
Wintering	0.91	0.80	0.74	0.65
Overall Score	0.51	0.42	0.66	0.63
Management Cost/Year			\$500,000	\$297,000
Return on Investment (% change of overall score)			2.35 (56%)	3.58 (50%)

Restoration

Scenarios	Mow+Hrbx+ Seed (acres/yr)	Tree Removal (acres/yr)	Thin-Shrub (acres/yr)
No Action	0	0	0
#1	600	400	0
#2	650	90	300
Cost/acre	\$300	\$800	\$100
\$ saved by scenario #2 =		\$4,060,000	

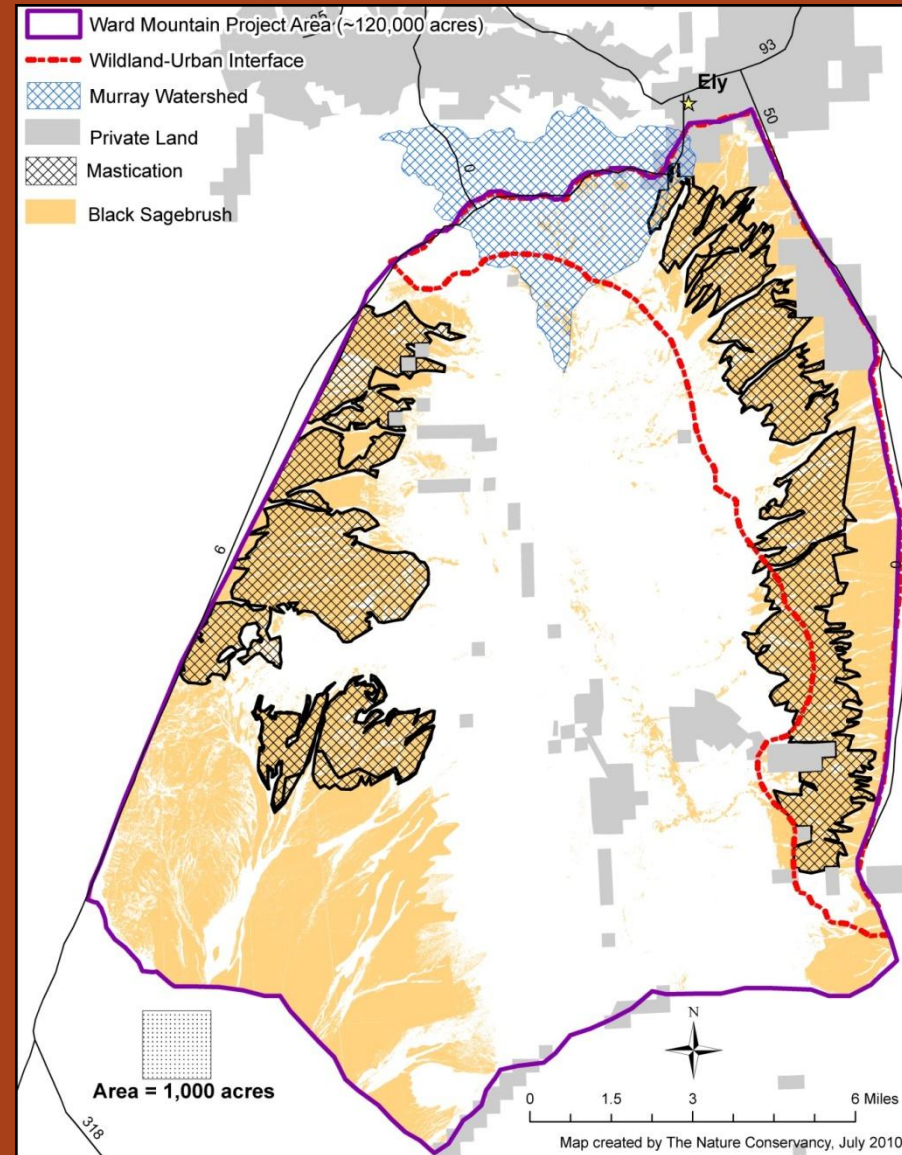
<u>From Maps & Models</u>						<u>From Grouse Field Data</u>				
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Montane Sagebrush - 100,000 acres	Current %	NRV	No Action 20 Years	Mgmt Scenario 1	Mgmt Scenario 2		Nesting	Early Brood Rearing	Late Brood Rearing	Winter
A-Early succession	5%	20%	1%	5%	6%	→	n/a	100	50	0
B-Mid succession	5%	45%	8%	23%	23%	→	10	25	100	25
C-Late succession	45%	20%	36%	37%	32%	→	100	0	25	100
D-Late w trees	5%	15%	8%	6%	7%	→	-100	-100	-100	-100
Annual Grassland	0%	0%	1%	1%	8%	→	-25	0	0	-25
Shrubs w cheatgrass	20%	0%	25%	13%	12%	→	25	0	10	25
Tree encroached	20%	0%	21%	14%	19%	→	-100	-100	-100	-100
	100%	100%	100%	100%	100%					

<u>Scorecard</u>					<u>Restoration</u>				
Life Stage	Current Condition (Overall Habitat Suitability scores 0-1)	Forecasted Future 20 yrs			Scenarios	Mow+Hrbx+ Seed (acres/yr)	Tree Removal (acres/yr)	Thin-Shrub (acres/yr)	
		No Action	Mgmt Scenario #1	Mgmt Scenario #2					
Nesting	0.90	0.76	0.61	0.48	No Action	0	0	0	
Early Brood Rearing	0.14	0.09	0.28	0.31	#1	600	400	0	
Late Brood Rearing	0.03	0.03	0.29	0.34	#2	650	90	300	
Wintering	0.91	0.80	0.74	0.65					
Overall Score	0.51	0.42	0.66	0.63	Cost/acre	\$300	\$800	\$100	
Management Cost/Year			\$500,000	\$297,000	\$ saved by scenario #2 =	\$4,060,000			
Return on Investment (% change of overall score)			2.35 (56%)	3.58 (50%)					

Example of Optimized Restoration Action

Ward Mountain

Mastication of pinyon and juniper in shrublands



Data Inputs Review

- Remote Sensing: High resolution ($\leq 5\text{-m}$), recent (≤ 3 years), and accurate.
- Sage-grouse habitat suitability or population viability (four applicable studies available in Nevada)
- Nature Conservancy library of state-and-transition models

Outputs and Deliverables

- Forecast changes (positive and/or negative) to habitat condition and population viability
- “Optimized” plans for restoration of sage-grouse habitat (and mitigation analysis)
- Report and documentation to support regulatory decision making
- Working models for ongoing evaluations and to support land-owner decision making
- Foundation and framework for long-term monitoring

Compatibility with Coates Model

- Coates model will show baseline, point-in-time habitat type and value at 30m resolution.
- TNC models will forecast changes to baseline that can be expected from background disturbances, development impacts, and conservation measures.
- TNC models work at higher resolution with more detailed vegetation maps, so a reconciliation step would be necessary as a re-estimation of habitat suitability for Coates model.

Questions & Discussion



Photo by Tim Torrell