BARRICK

Barrick Nevada Sage Grouse Bank Enabling Agreement

Gail Ross, Manager Biological & Ecological Sciences

Sagebrush Ecosystem Council, July 17th 2018

Barrick Bank Enabling Agreement

BARRICK

BARRICK NEVADA SAGE-GROUSE BANK ENABLING AGREEMENT

DEPARTMENT OF THE INTERIOR,

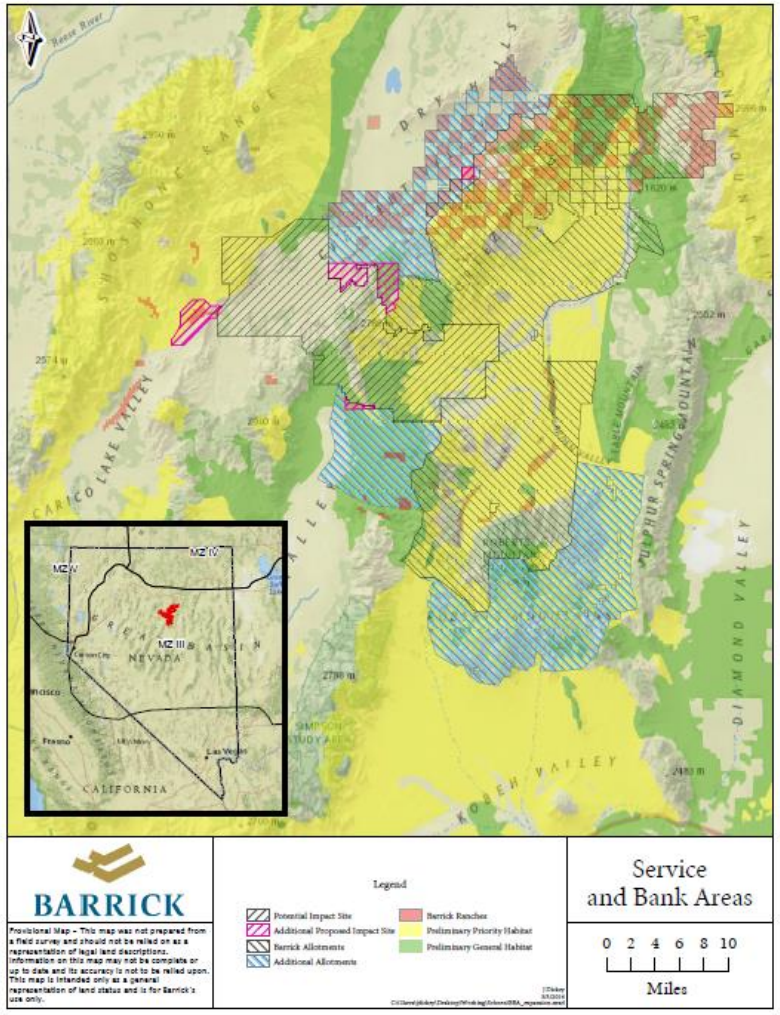
BUREAU OF LAND MANAGEMENT,

U.S. FISH AND WILDLIFE SERVICE,

AND

BARRICK GOLD OF NORTH AMERICA

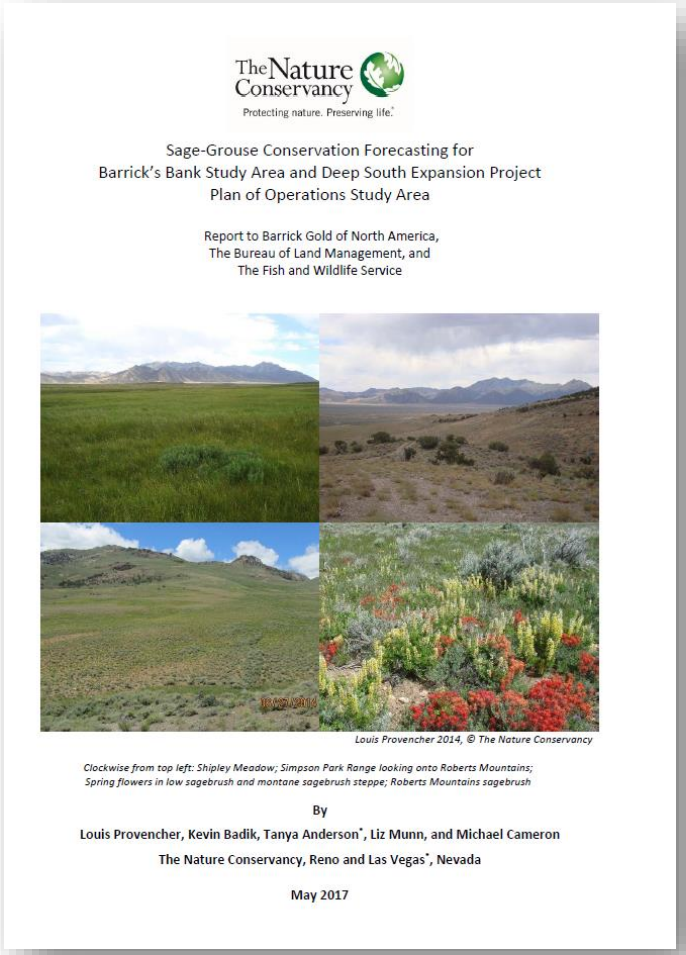
MARCH 25, 2015



Sage-grouse Conservation Forecasting

The Bank Enabling Agreement is a voluntary agreement reached by Barrick and the DoI to mitigate for loss of sage-grouse habitat within the Barrick Nevada Sage-Grouse Bank.

- Signed in March 2015
- Requires a "Net Conservation Gain"
- TNC LCF Method is used to calculate mitigation "credits" and impact "debits"
- Net Conservation Gain is defined as Credits ≥ 1.1 x Debits
- Barrick implements "project plans" approved by FWS and BLM to generate "credits" measured in "functional acres" gained
- "Debits" calculated from Plan of Operations impacts measure in "functional acres" lost



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Sage-Grouse Conservation Forecasting for
Barrick's Bank Study Area and Deep South Expansion Project
Plan of Operations Study Area

Report to Barrick Gold of North America,
The Bureau of Land Management, and
The Fish and Wildlife Service

Louis Provencher 2014, © The Nature Conservancy

Clockwise from top left: Shipley Meadow; Simpson Park Range looking onto Roberts Mountains; Spring flowers in low sagebrush and montane sagebrush steppe; Roberts Mountains sagebrush

By

Louis Provencher, Kevin Badik, Tanya Anderson*, Liz Munn, and Michael Cameron

The Nature Conservancy, Reno and Las Vegas*, Nevada

May 2017

SAGE-GROUSE CONSERVATION FORECASTING

LIZ MUNN – SAGEBRUSH ECOSYSTEM PROGRAM MANAGER, TNC NEVADA

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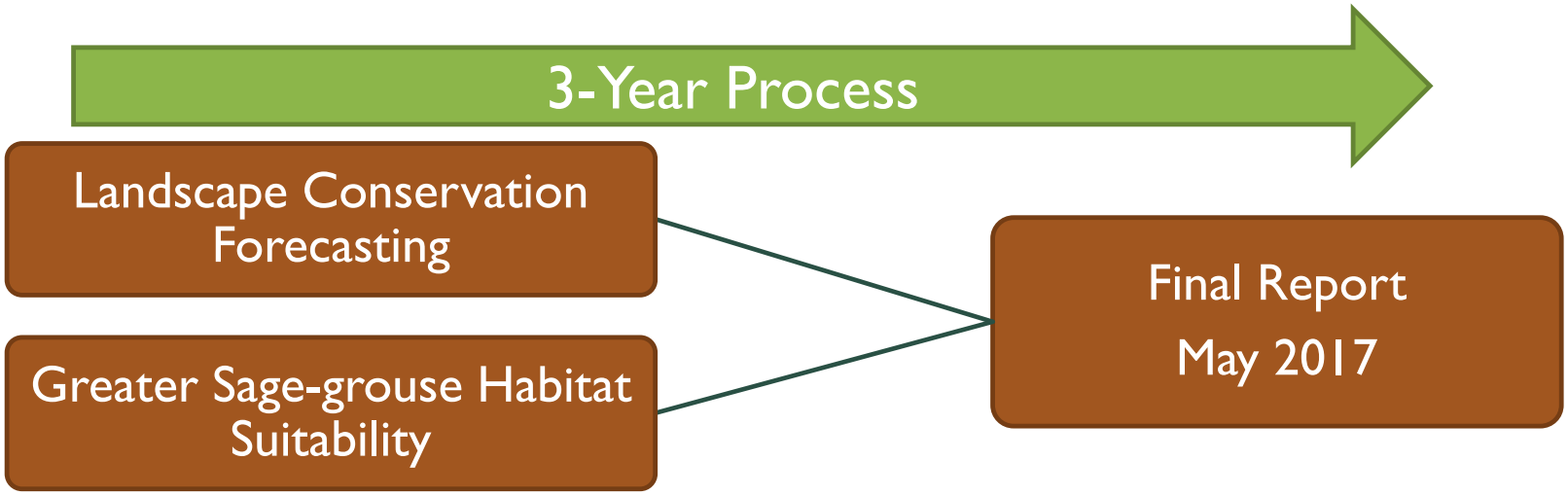
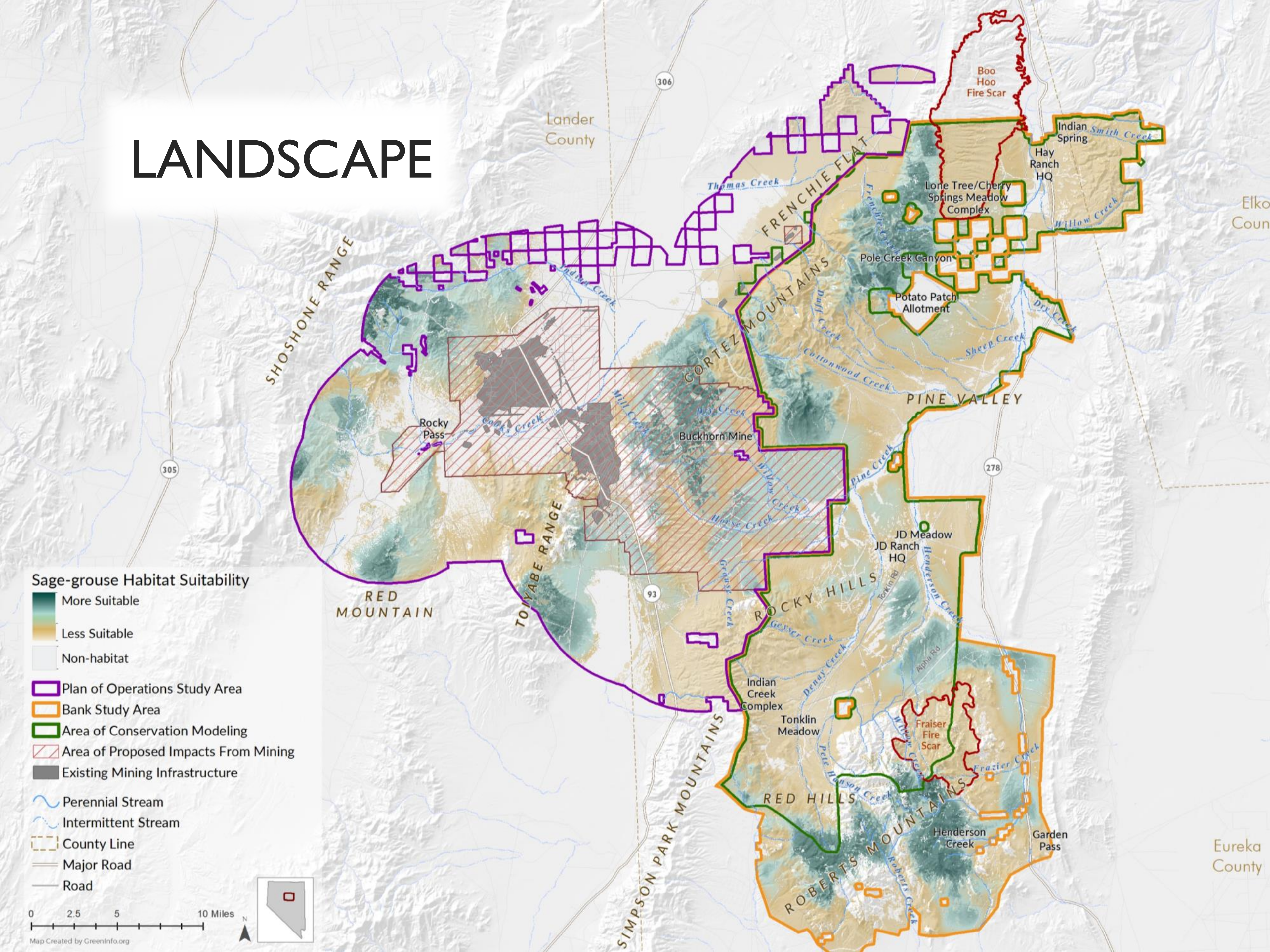
KEY QUESTIONS, METHODS, TIMELINE

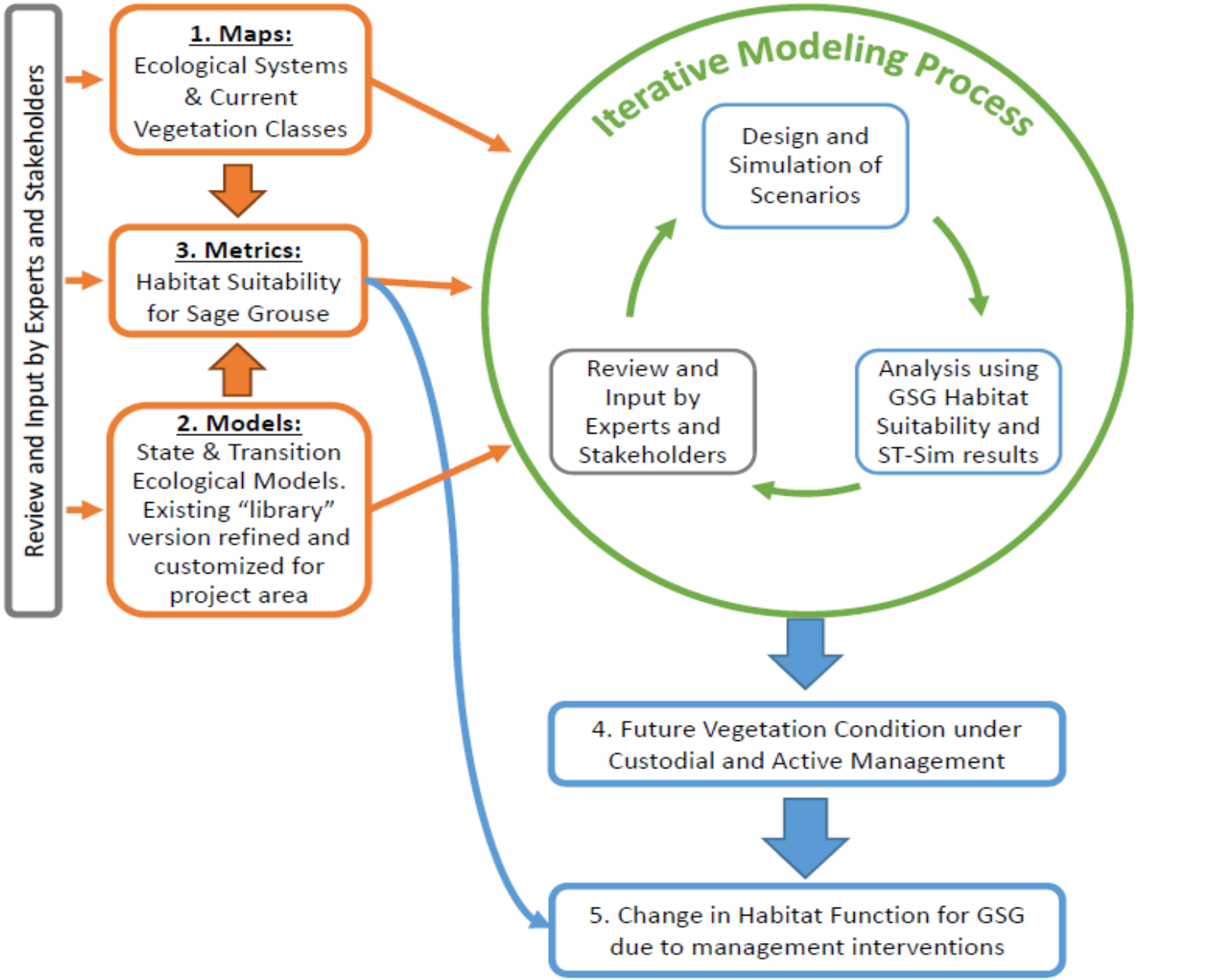
- Where on this landscape can we improve habitat for greater sage grouse? What is the value of those gains?
- What are the impacts to habitat from new mining infrastructure? What is the value of those losses?



LANDSCAPE


Sage-grouse Habitat Suitability
More Suitable
Less Suitable
Non-habitat
Plan of Operations Study Area
Bank Study Area
Area of Conservation Modeling
Area of Proposed Impacts From Mining
Existing Mining Infrastructure
Perennial Stream
Intermittent Stream
County Line
Major Road
Road
0 2.5 5 10 Miles
Map Created by GreenInfo.org
Lander County
Elko County
Eureka County
Boo Hoo Fire Scar
Indian Spring
Smith Creek
Hay Ranch HQ
Lone Tree/Cherry Springs Meadow Complex
Willow Creek
Pole Creek Canyon
Potato Patch Allotment
FRENCHIE FLAT
Thomas Creek
SHOSHONE RANGE
CORTEZ MOUNTAINS
PINE VALLEY
Sheep Creek
Dry Creek
Cottonwood Creek
Rocky Pass
Buckhorn Mine
Mill Creek
Pine Creek
JD Meadow
JD Ranch HQ
ROCKY HILLS
TOIYABE RANGE
RED MOUNTAIN
Indian Creek Complex
Tonklin Meadow
Fraiser Fire Scar
Frazier Creek
RED HILLS
Henderson Creek
Garden Pass
ROBERTS MOUNTAINS
SIMPSON PARK MOUNTAINS
306
305
278
93

Landscape Conservation Forecasting™

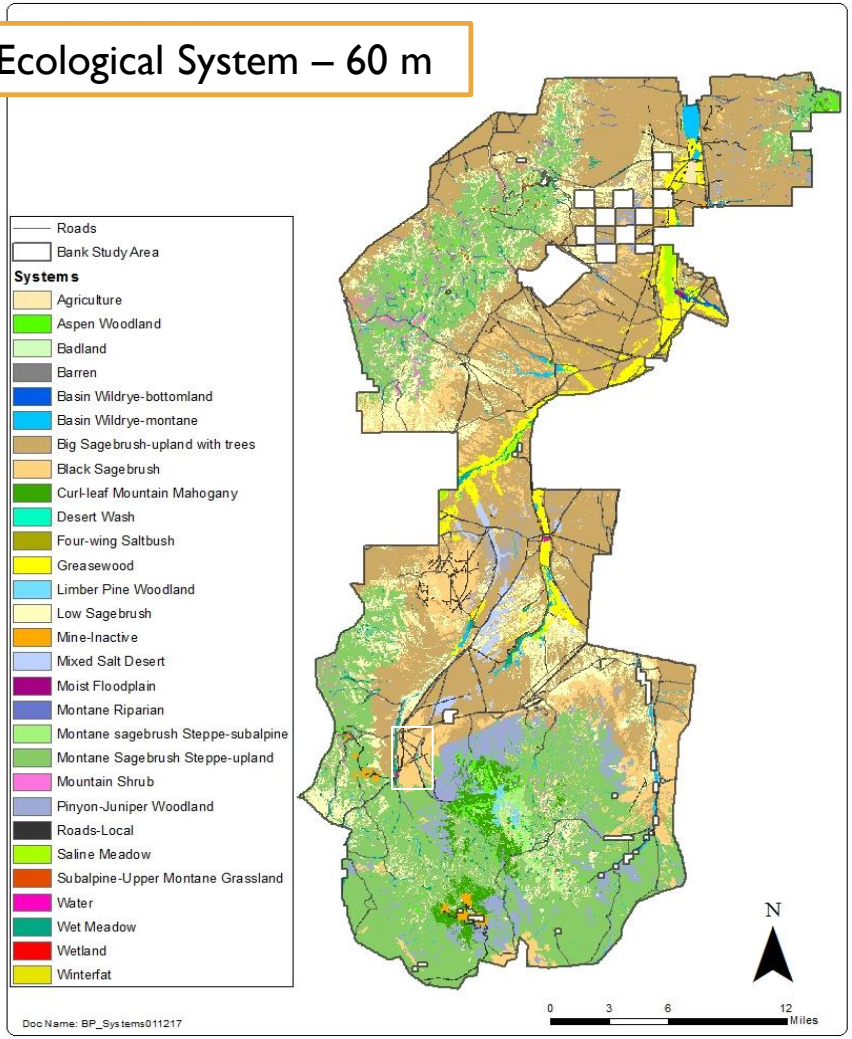


1. MAPS

- Satellite imagery: SPOT 6/7, resolution = 1.5 m
- Field verification/ground-truth = high-volume rapid assessments
  - ~10,000 over both study areas;
- Each pixel is assigned 2 vegetation values
  - Ecological system
  - Vegetation class
- Reviewed by local stakeholders in a workshop setting.

1. MAPS

Ecological System – 60 m



- Dominant Potential Vegetation
- Examples:
  - Wyoming Big Sagebrush Uplands with Trees
  - Montane Sagebrush Steppe – Uplands
  - Pinyon-Juniper Woodland
  - Greasewood

2. MODELS: Overview

ST-Sim – state-and-transition simulation model

- Developed by ApexRMS as freeware
- Adopted by NPS, USFS, USGS, BLM, etc. for projects, 20+ scientific publications using ST-Sim

Models include:

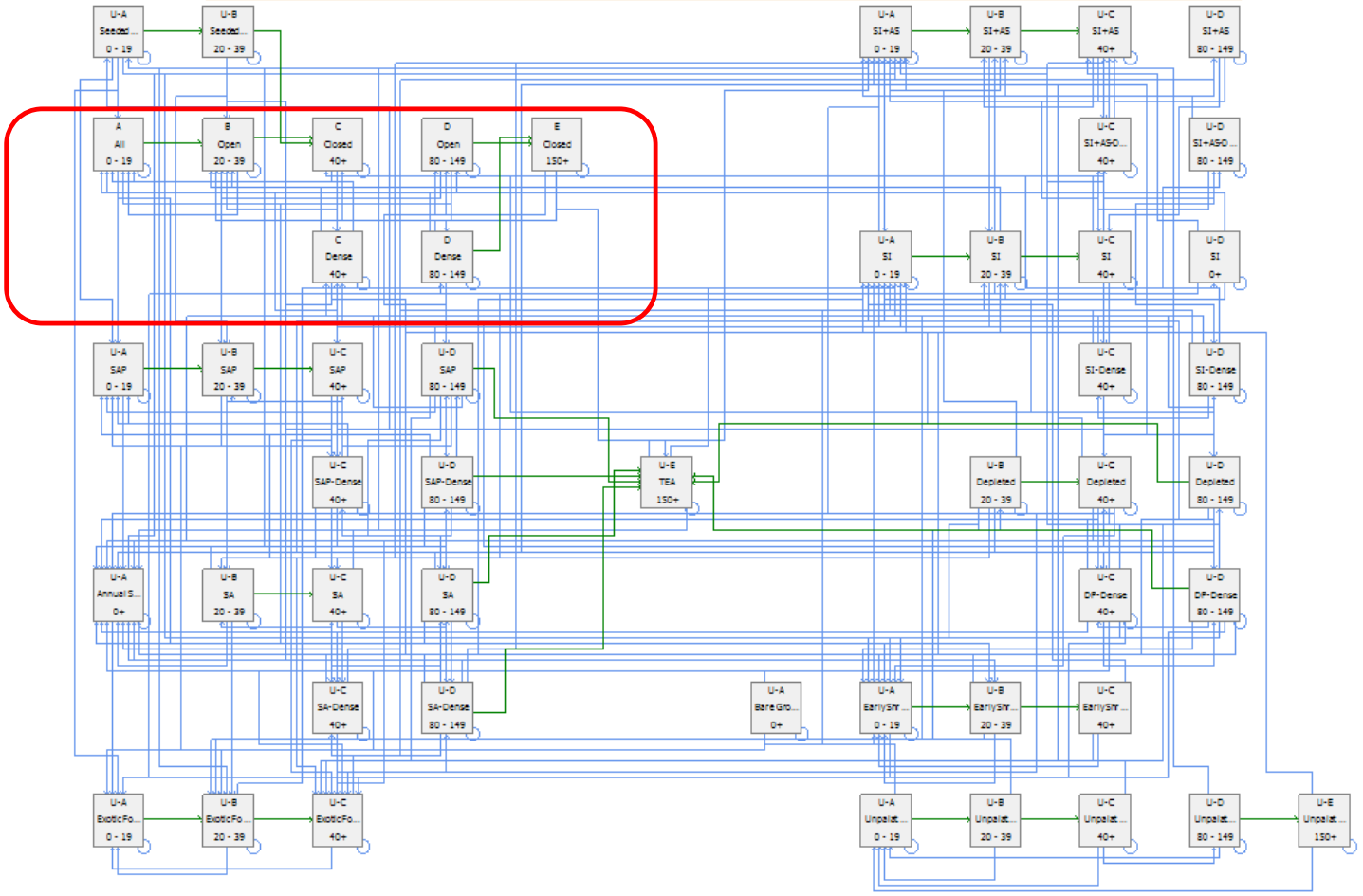
- Box & Arrow models of ecological systems
- Disturbances (drought, fire, wet years, Aroga moth)
- Spatial controls for certain activities

Replicates create ranges of probable outcomes

- 10 replicates, each run for 35 years
- Fundamental Output = Future Vegetation Maps

2. MODELS: Box-and-Arrow

Example: Wyoming Big Sagebrush Upland with Trees



2. MODELS Disturbances

Use Multipliers to create variability in a number of disturbances, including:

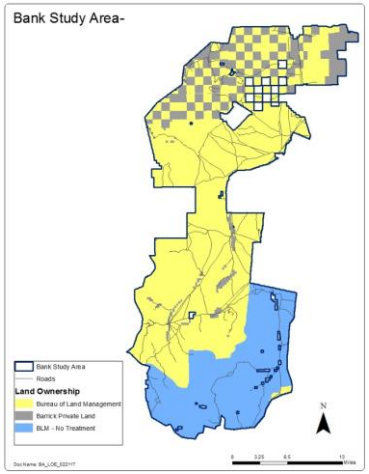
- Drought
- Wet Years
- Fire
- Aroga Moth

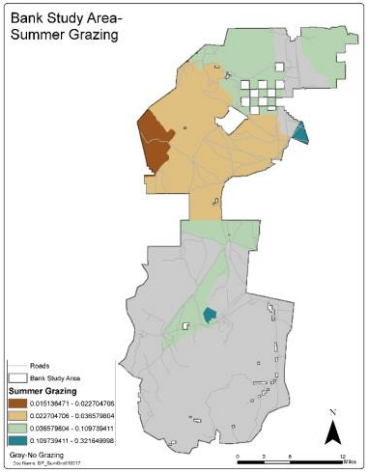
https://inciweb.nwcg.gov/incident/photographs/5899/

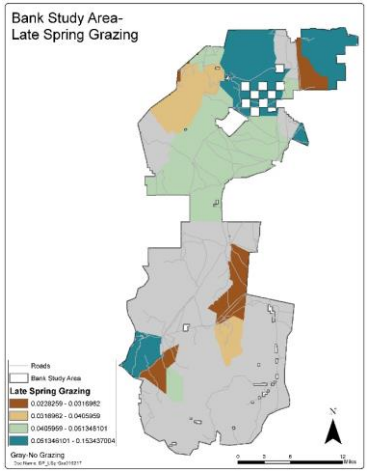
2. MODELS Spatial Control Layers

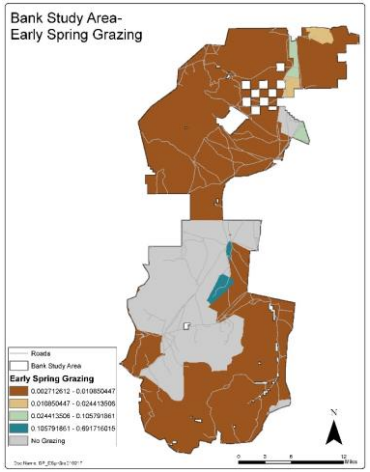
Spatial layer	Purpose
Permitted Cattle Grazing	Identifies the relativized AUMs of cattle on the ranches for a current (baseline or custodial) system.
Horse Management Areas	Identifies the wild horse management areas overlapping project area and relativized by AUMs
Grazing Behavior	To approximate seasonal grazing behavior based on distance to water and slope.
Fuel Breaks	Location of existing fuel breaks and roads that may act as fuel breaks. Identifies potential fuel breaks that could be implemented.
Slopes >15%; >30%	Identifies areas of slopes of greater than 15% or 30% which restricts certain mechanical restoration treatments.
Land Ownership / Mgmt	Defines land management in model to allow for differential treatment plans.

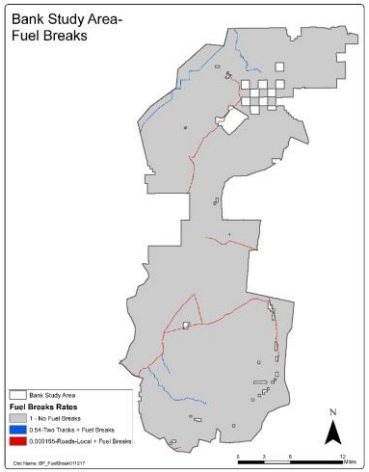
2. MODELS Spatial Control Layers

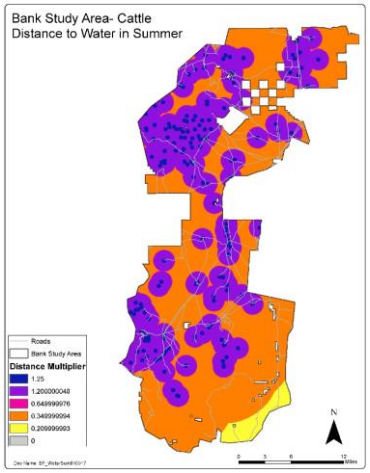


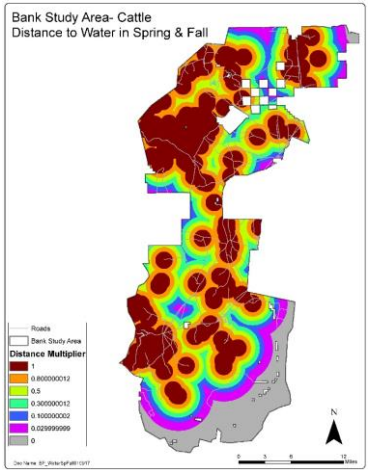


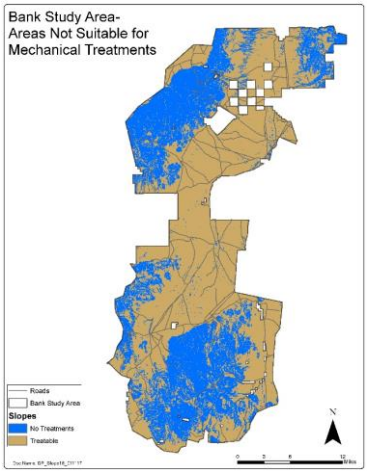


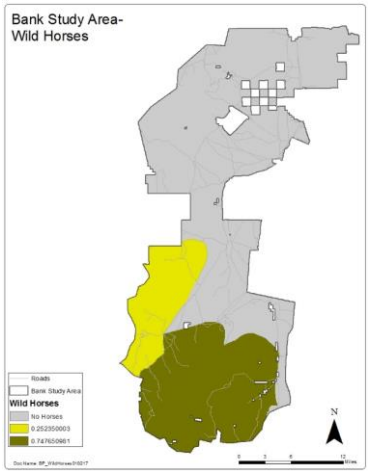










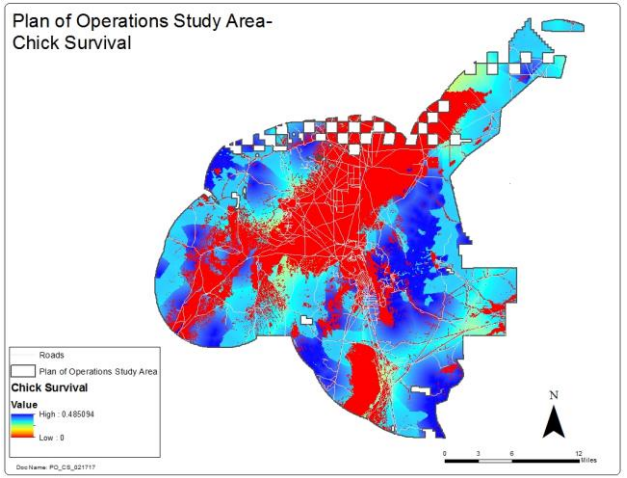


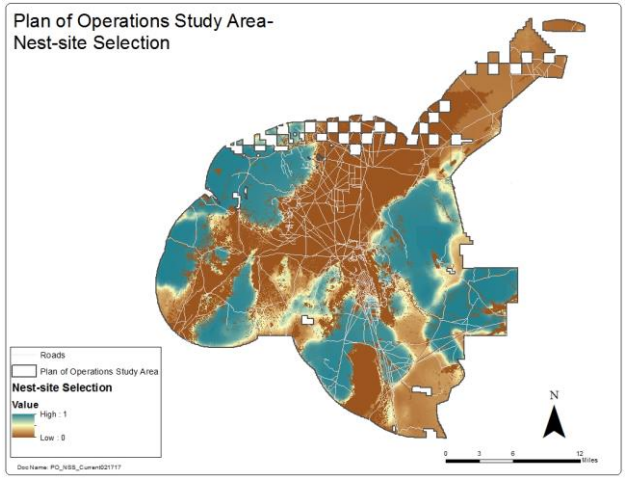
3. METRICS: Greater Sage-grouse Habitat Suitability Model

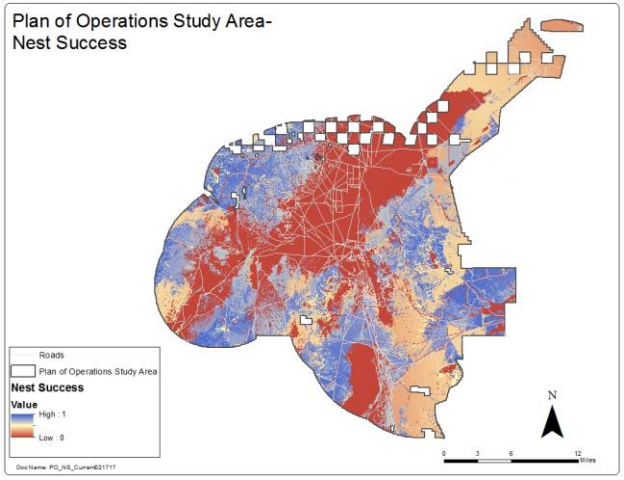
- Developed by Dr. Jim Sedinger et al at UNR from Falcon-to-Gondor Transmission Line study in Central Nevada
  - 1.25 million acres of occupied sage-grouse habitat
  - ~ 9 years of field data
- Overlaps with Study Areas

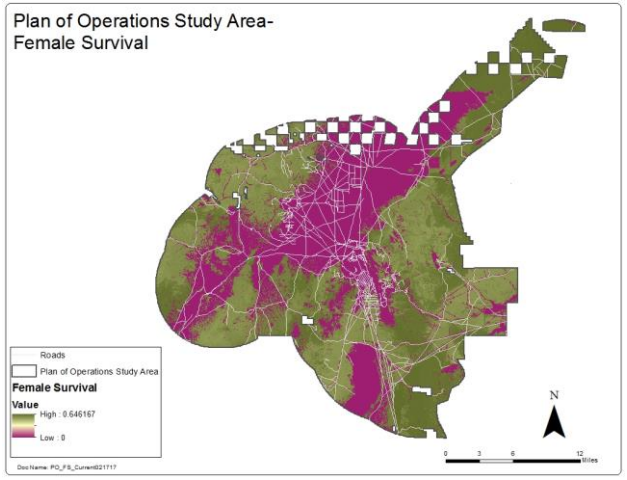
3. METRICS: Greater Sage-grouse Demographic Parameters

- Nest Site Selection: The probability a hen will nest in a particular location.
- Nest Success: The probability a nest will produce at least one hatchling.
- Chick Survival: The probability that at least one juvenile will survive through brood-rearing
- Female Survival: The annual probability that a female will survive









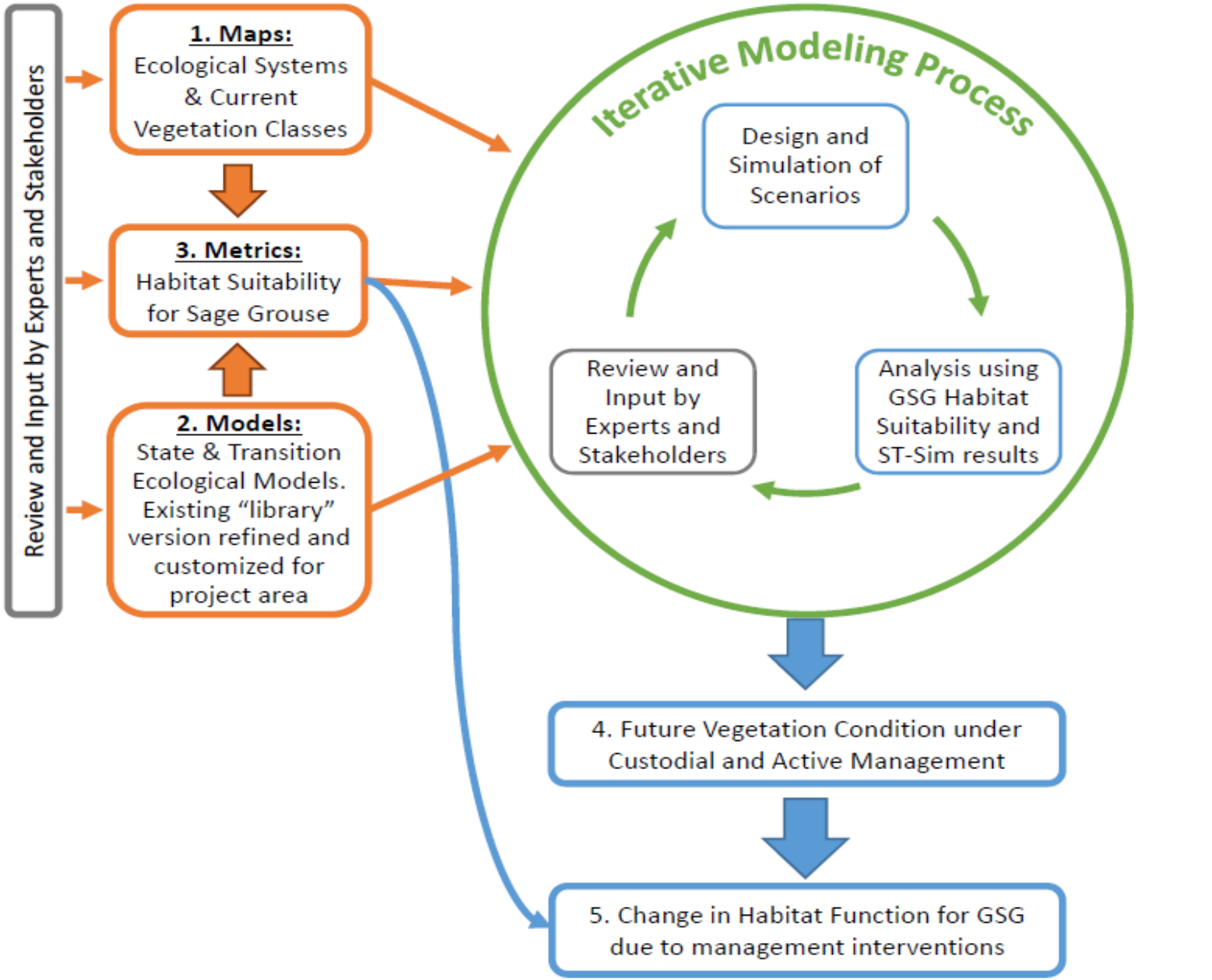
3. METRICS: Lambda and Functional Acres

- Lambda – combines demographic parameters, weighted to lowest,.
  - < 1 = pixel has a negative contribution to population growth
  - = 1 = pixel is has a neutral contribution to population growth
  - > 1 = pixel is has a positive contribution to population growth

- Functional Acre = Lambda * Area of Pixel / 2

- Net change in Functional Acres used to determine Credits and Debits in mitigation bank

Landscape Conservation Forecasting™



KEY QUESTIONS (REVIEW)

- Where on this landscape can we improve habitat for greater sage grouse? What is the value of those gains?
- What are the impacts to habitat from new mining infrastructure? What is the value of those losses?

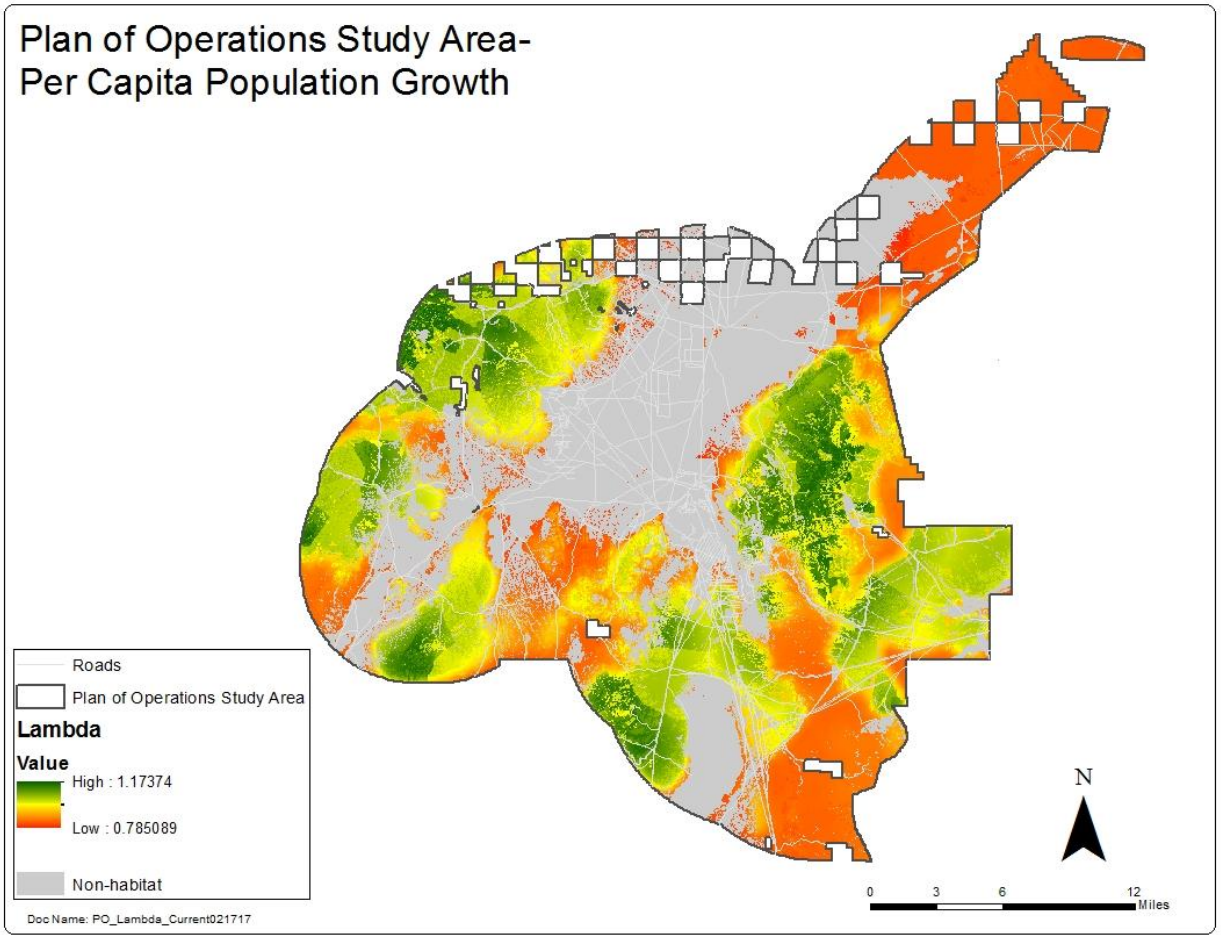
SCENARIOS

Habitat Gains and Losses: the difference in *Functional Acres* between *Custodial* and *Active* Scenarios at any given *Timestep*.

	Scenarios*	
	Custodial	Active
Bank Study Area (BSA)	CUSTODIAL+FIRE	FINAL+FIRE
Plan of Operations Study Area (PoOSA)	CUSTODIAL+FIRE	PROPOSED MINE DEVELOPMENT+FIRE

* All scenarios were also run without fire.

SCENARIOS Plan of Operations Study Area



SCENARIOS Plan of Operations Study Area

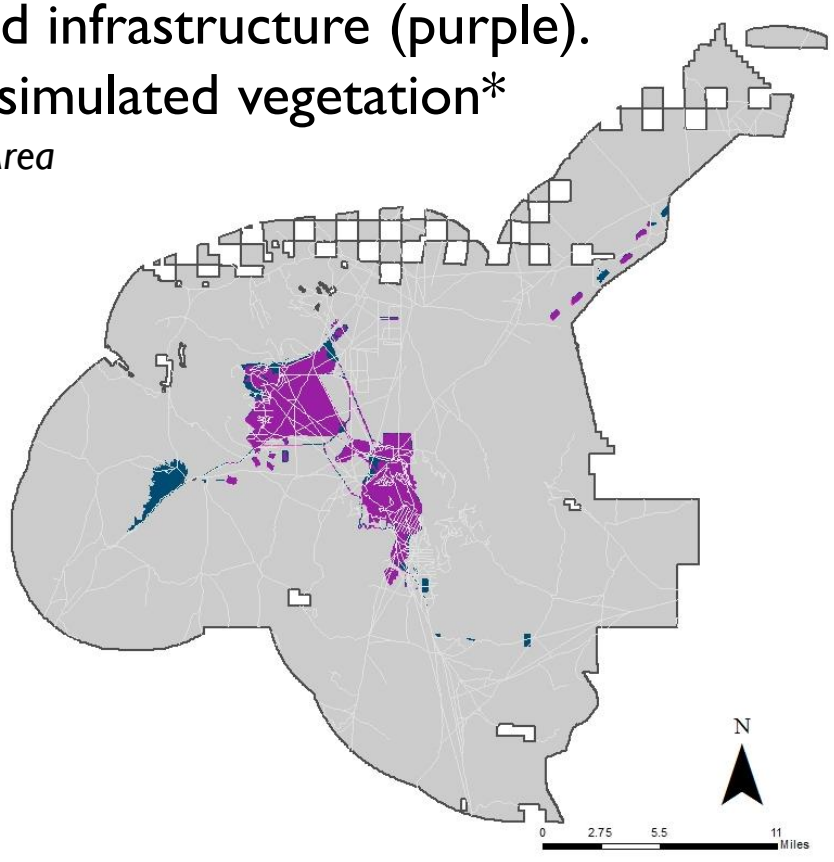
Process

- Vegetation is simulated into the future.
- Baseline includes all existing & permitted infrastructure (purple).
- New mine (blue) is "stamped" into the simulated vegetation*

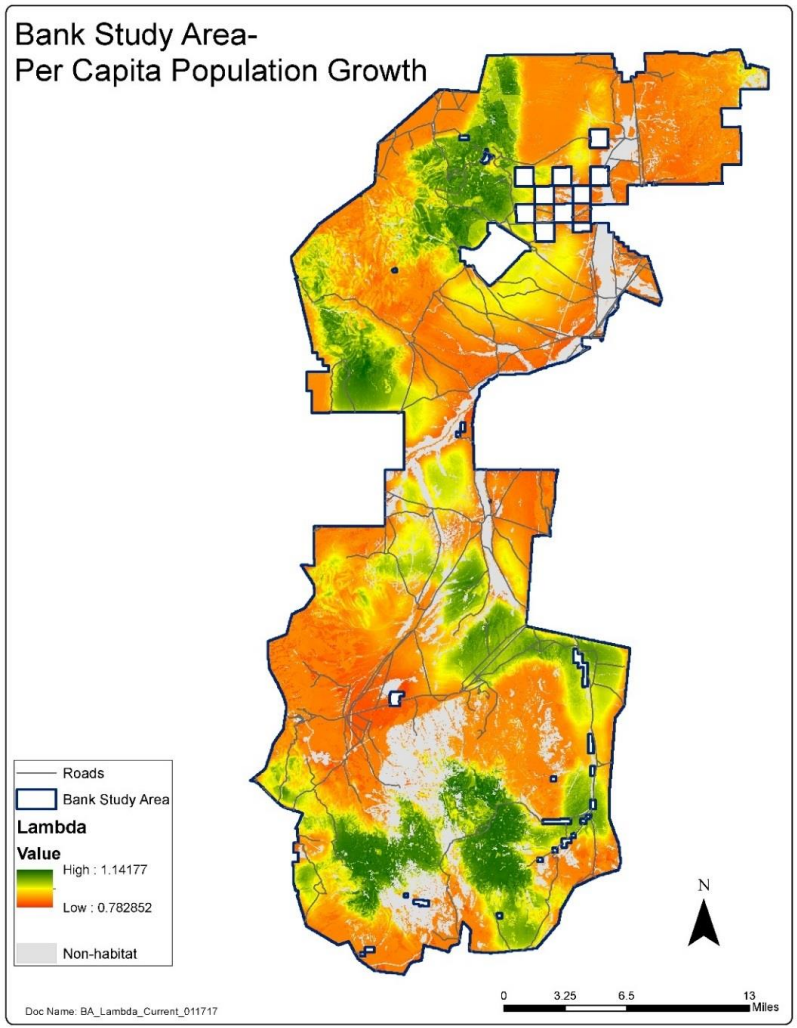
**Separate Analysis for Rapid Infiltration Basins in Bank Study Area*

Types of impacts accounted for

- Direct impacts: vegetation loss due to new infrastructure
- Indirect impacts: tall structures & roads



SCENARIOS Bank Study Area



SCENARIOS Bank Study Area – Conservation Strategy

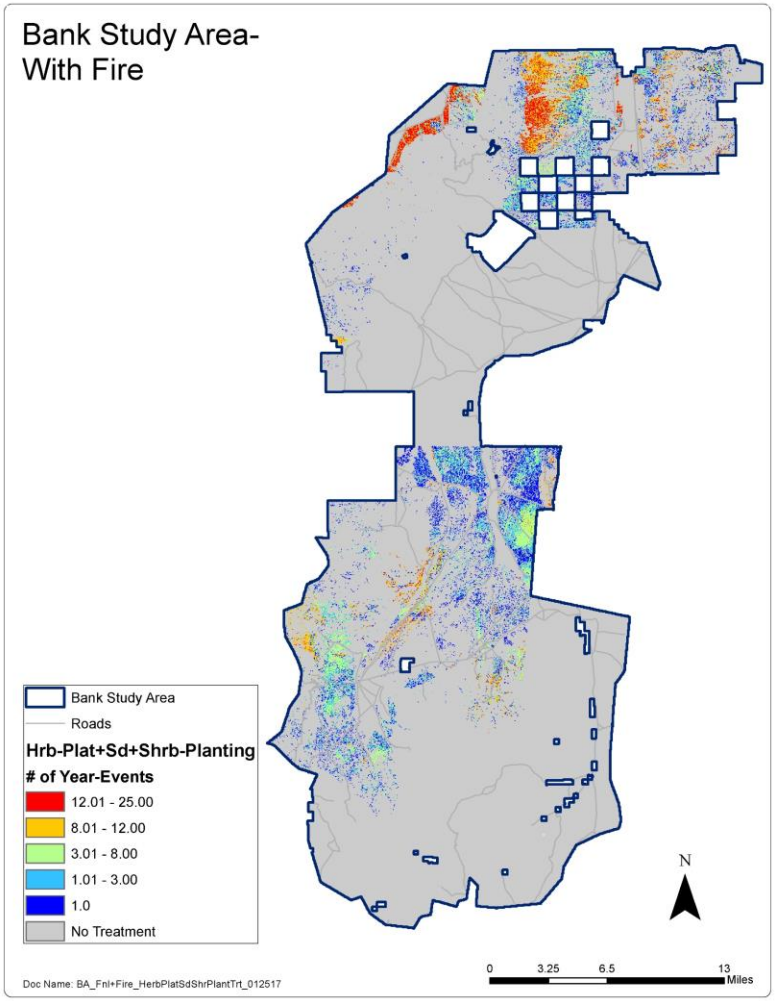
Objectives and Conservation Actions –
Developed in Workshops

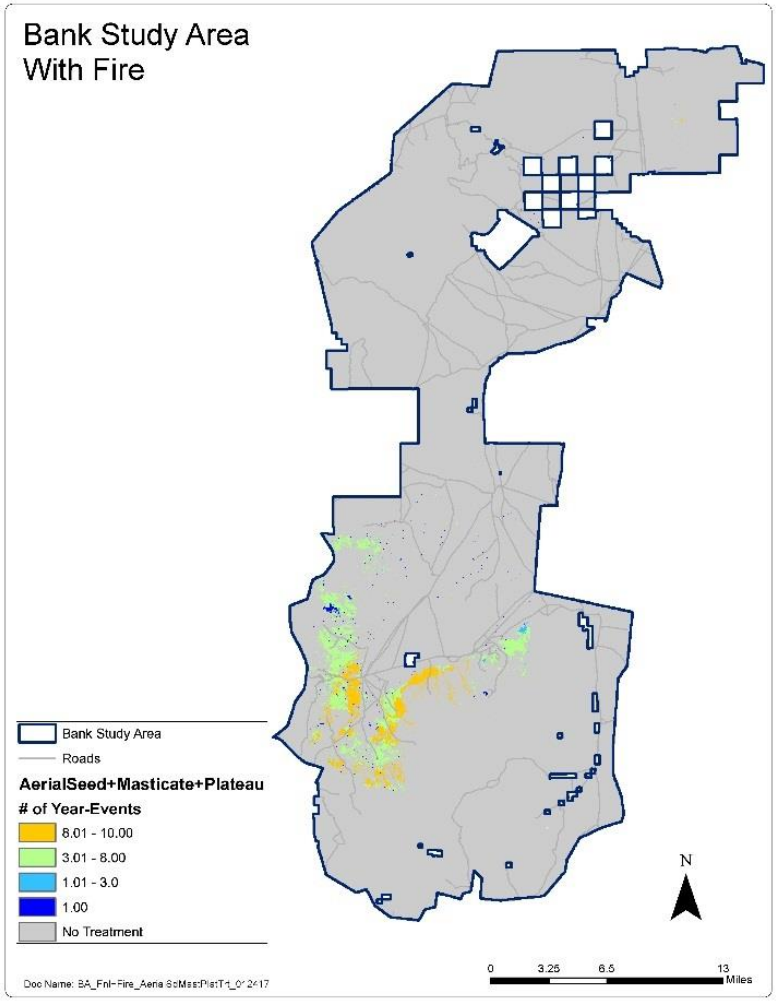
- Objective 1: Protect critical SG habitat from wildfire.
  - Implement fuel breaks to protect critical areas.
  - Treat annual grasslands
- Objective 2: Increase habitat suitability for Greater Sage-grouse.
  - Treat late brood-rearing habitat
  - Prevent loss ("do no harm") to higher-value nesting areas.
  - Increase nesting habitat (remove PJ, treat annual grasslands)

SCENARIOS Bank Study Area – Conservation Strategy

- Target: Annual Species ~ *24,000 average acres of modeled treatments over 10+ years*
  - Herbicide, Seeding, Planting of Shrubs
- Target: Tree-Encroached Shrublands ~ *15,000 ave. acres of modeled trmts./ 10+ years*
  - Aerial Seed, Mastication, Planting of Shrubs
  - Small-Tree Lopping
  - Chainsaw Thinning of Bigger Trees
- Target: Late Brood Rearing Habitat
  - Wet Meadow Restoration
  - Wet Meadow Preservation*

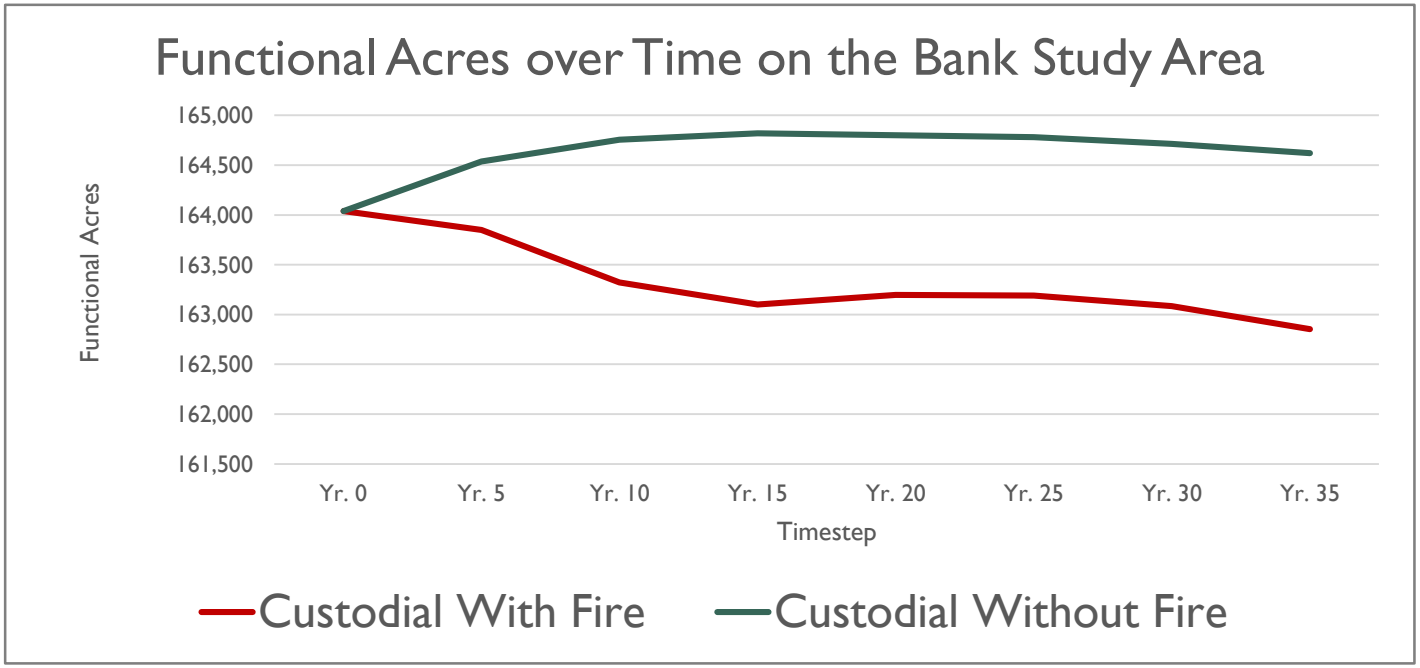
SCENARIOS Bank Study Area – Conservation Strategy





KEY FINDINGS: Trends and Drivers

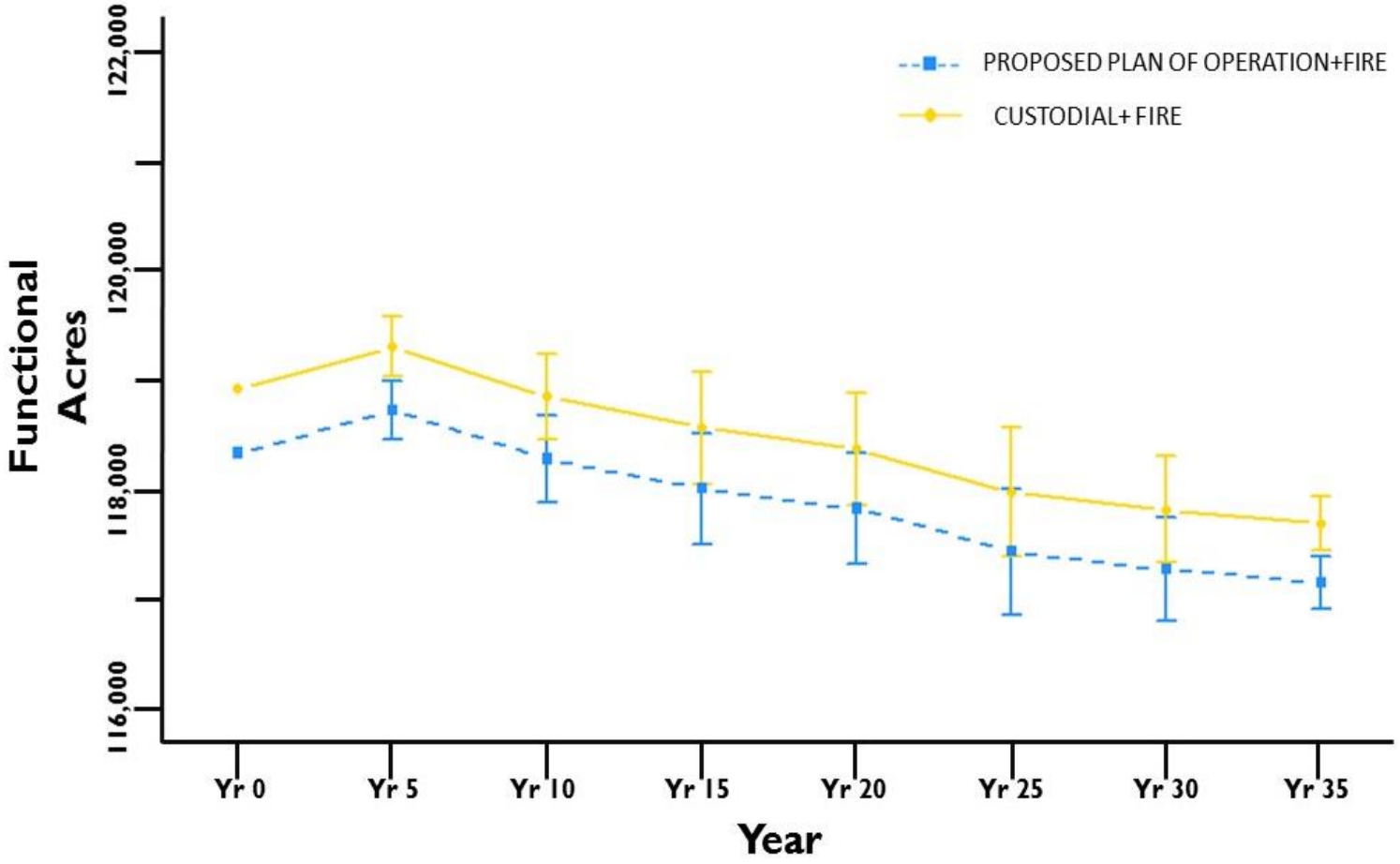
- Without intervention, the value of the landscape for sage-grouse will continue to decline.
- The fire-annual species cycle is primarily responsible for the continued decline in sage-grouse habitat.



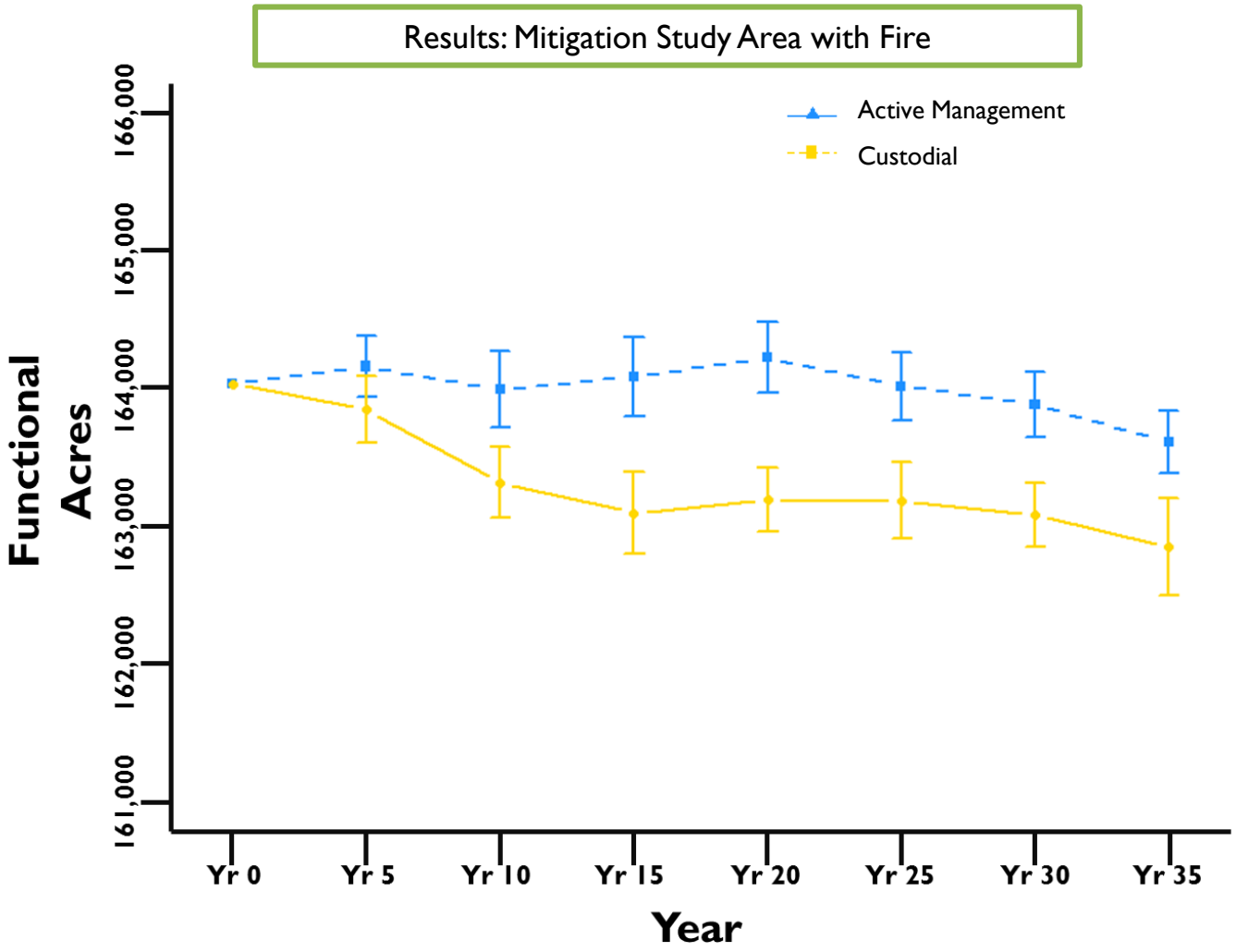
KEY FINDINGS: Landscape-scale Impacts and Offsets

- The mine expansion modeled for this report will cause the loss of sage-grouse habitat both directly and indirectly.
  - Functional Acre loss = 644
- Restoration actions can more than offset the loss of habitat from this mine on this landscape.
  - Restoration Functional Acre Gain = 1,034
- Preserving or enhancing late-brood rearing habitats can avoid significant losses and/or significantly improve habitat suitability.
  - Preservation Functional Acre Gain = 272

Results: Proposed Plan of Ops. Study Area with Fire



Time series of functional acres for the Impact Area comparing the CUSTODIAL+FIRE and PROPOSED MINE DEVELOPMENT+FIRE scenarios. These results are with fire occurring on the landscape. N = 10.



Time series of functional Area (acres) for the Bank Study Area comparing the CUSTODIAL+FIRE and FINAL+FIRE scenarios and Plotted are the means and standard errors across the 10 replicates for each scenario. Note, these results do not include the proposed RIBs in the Frenchie Flat area.

KEY FINDINGS: Spatial Context and Scale

- Landscape-scale restoration efforts are most effective when including uplands and public land.
- The value of restoration actions is spatially-dependent and often incremental.

BEA Project Plans

- Outline where, when and how conservation actions will be implemented across the landscape
- Target treating more than 47,000 acres over 35 years (37,006 public land & 9,923 private land)
- Focus on restoration actions
- Require financial and real estate assurances to ensure durability
- Include annual monitoring, adaptive management provisions and reporting requirements
- Risk is managed through TNC modeling dynamics targeting 10% conservation gain