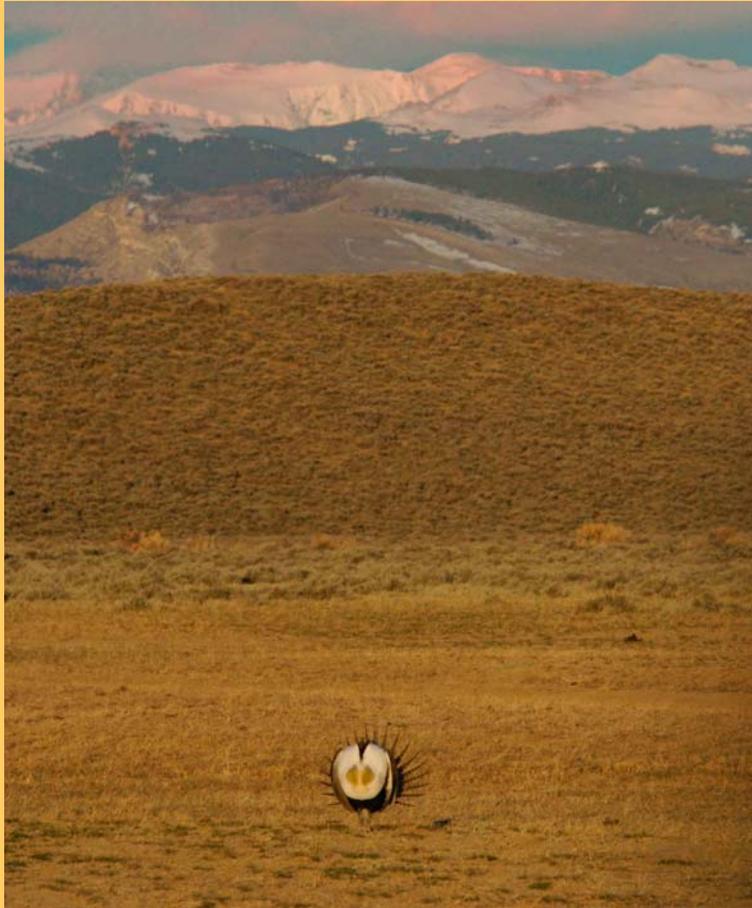
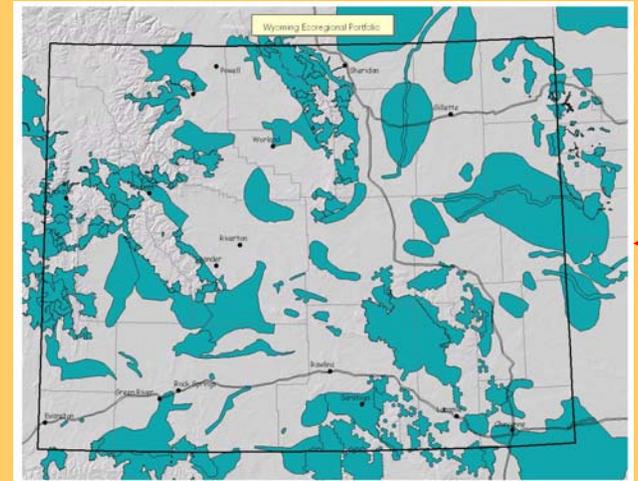
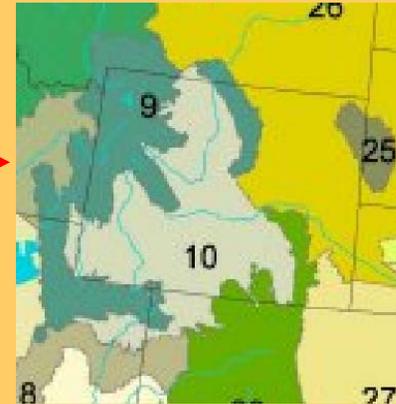


Energy by Design: Blending TNC's Methodology with the Mitigation Hierarchy



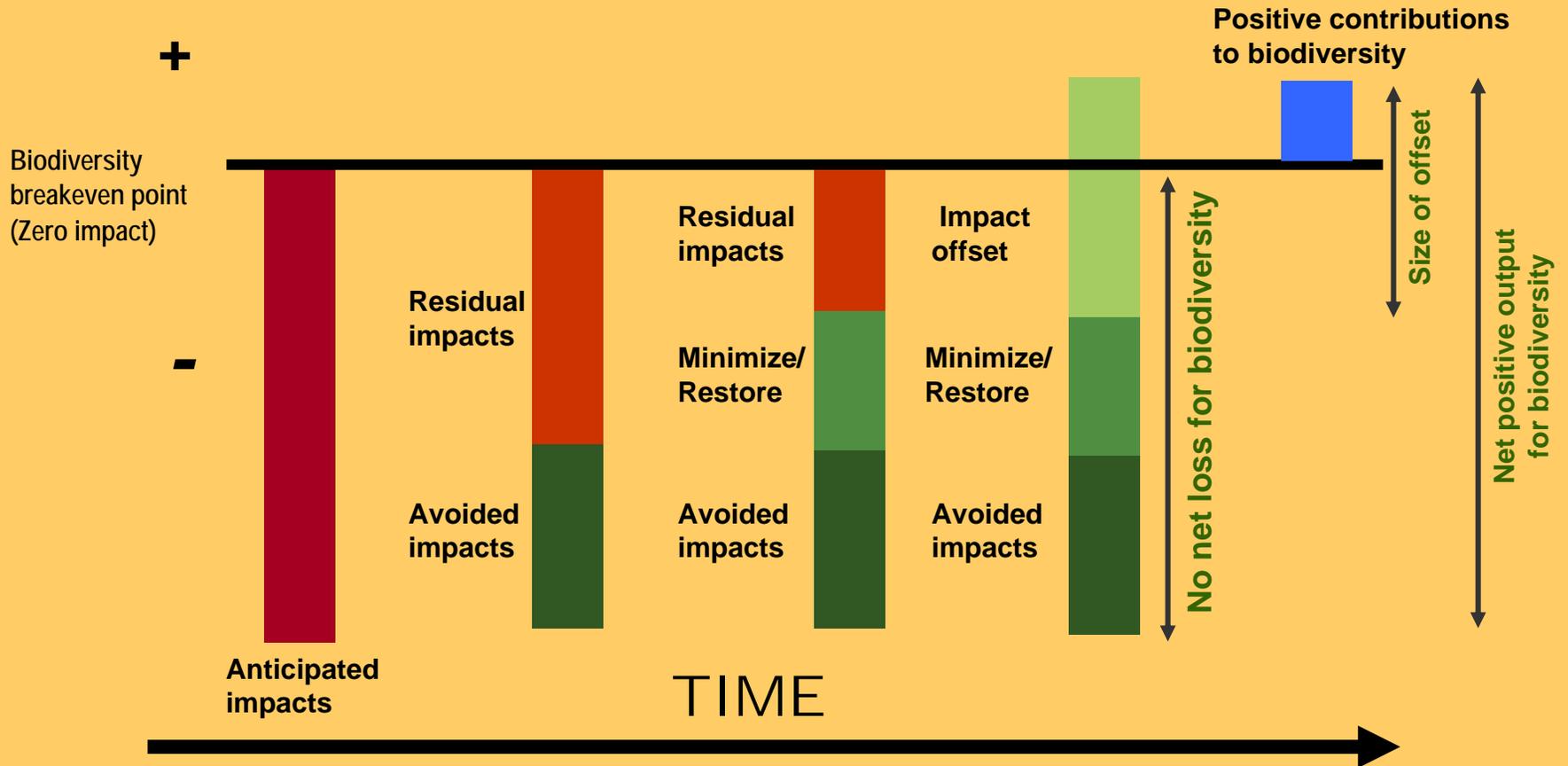
TNC SCIENCE

Ecoregional Planning



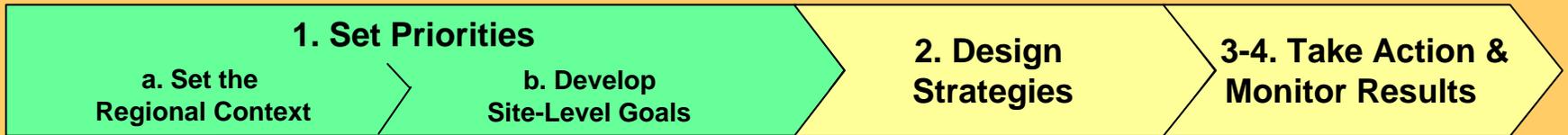
THE MITIGATION HIERARCHY

Avoid → **Minimize/Restore** → **Offset**



Modified from BBOP Bainbridge 2007 Rio Tinto

Energy by Design

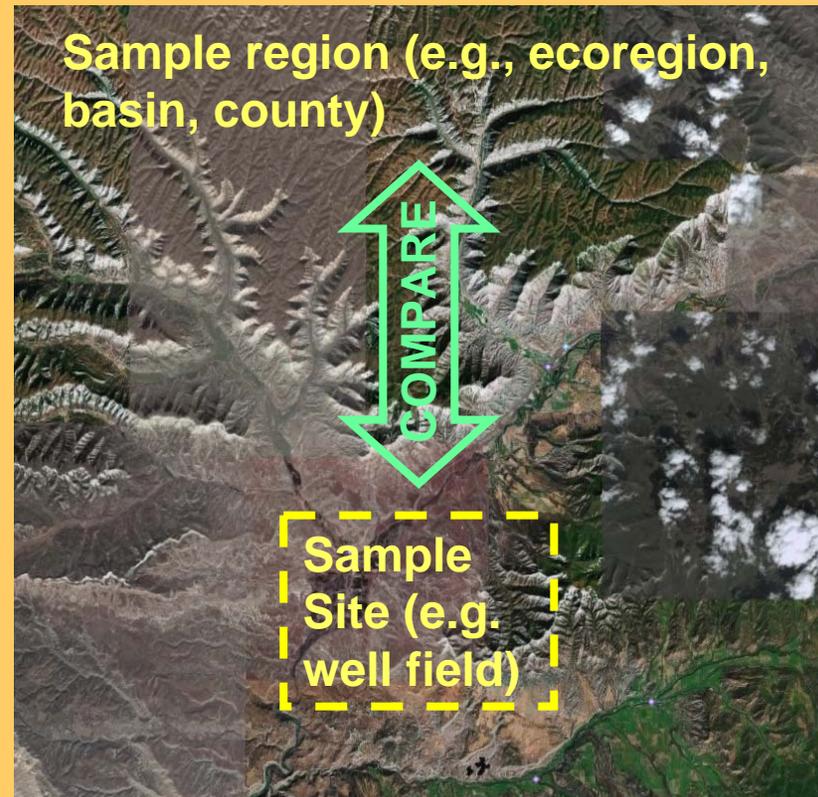


Where are the biodiversity values in the **site**?

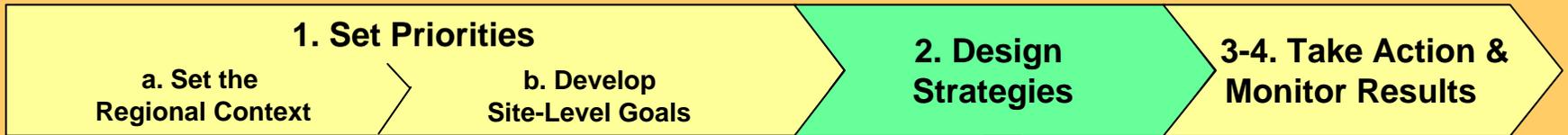
Where are these values throughout the **region**?

What are the **regional goals** for these values and to what extent are they being achieved?

How much do the values in the site contribute to regional goals, and which values in the site are of **highest priority**?



Energy by Design



For which areas is it most important to **avoid** impacts?

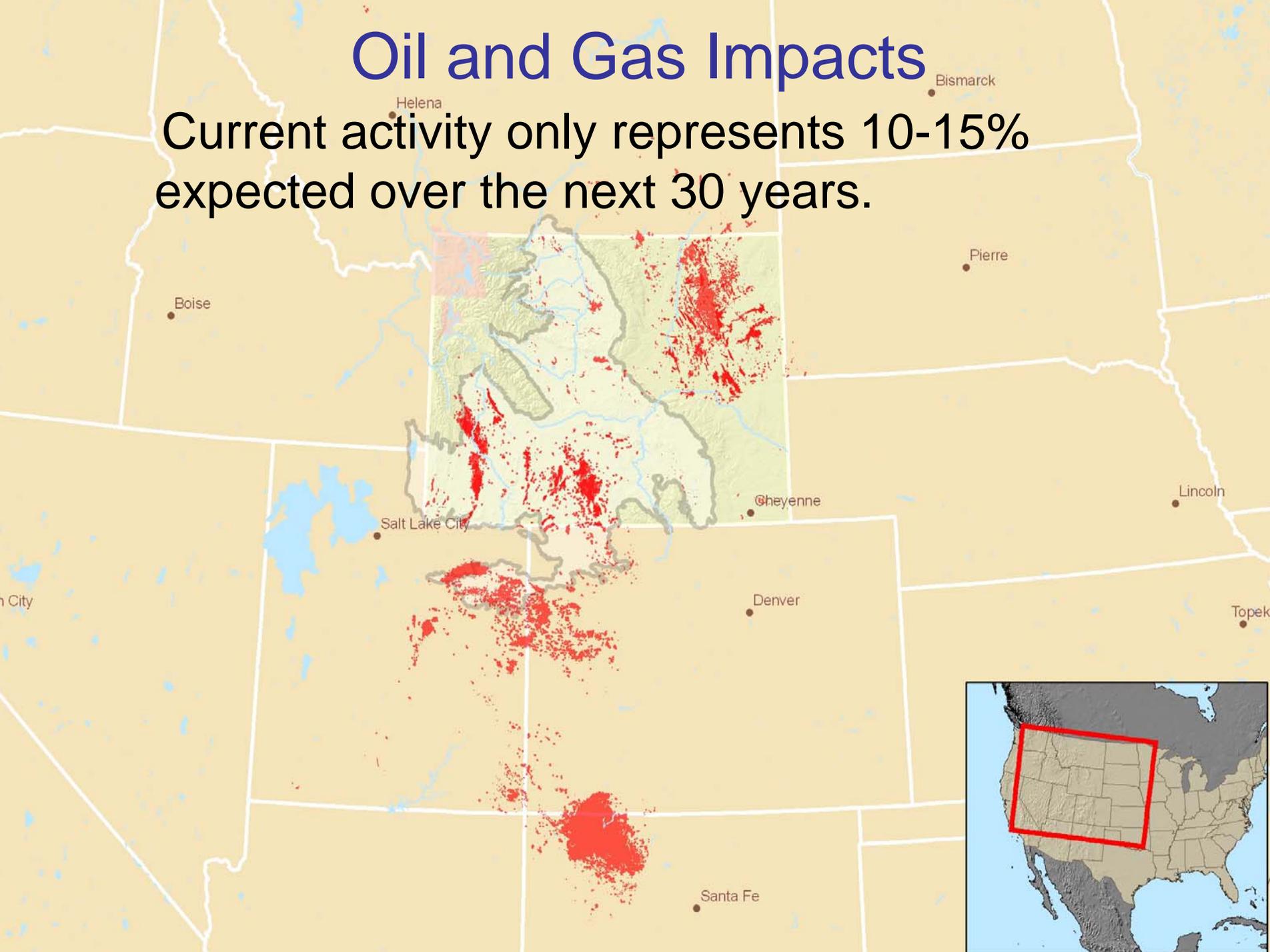
How can impacts best be **minimized**?

How can impacts best be **rectified** through restoration or reclamation?

For which areas is it most important that impacts be **compensated** through off-site mitigation and where are the best opportunities located?

Oil and Gas Impacts

Current activity only represents 10-15% expected over the next 30 years.



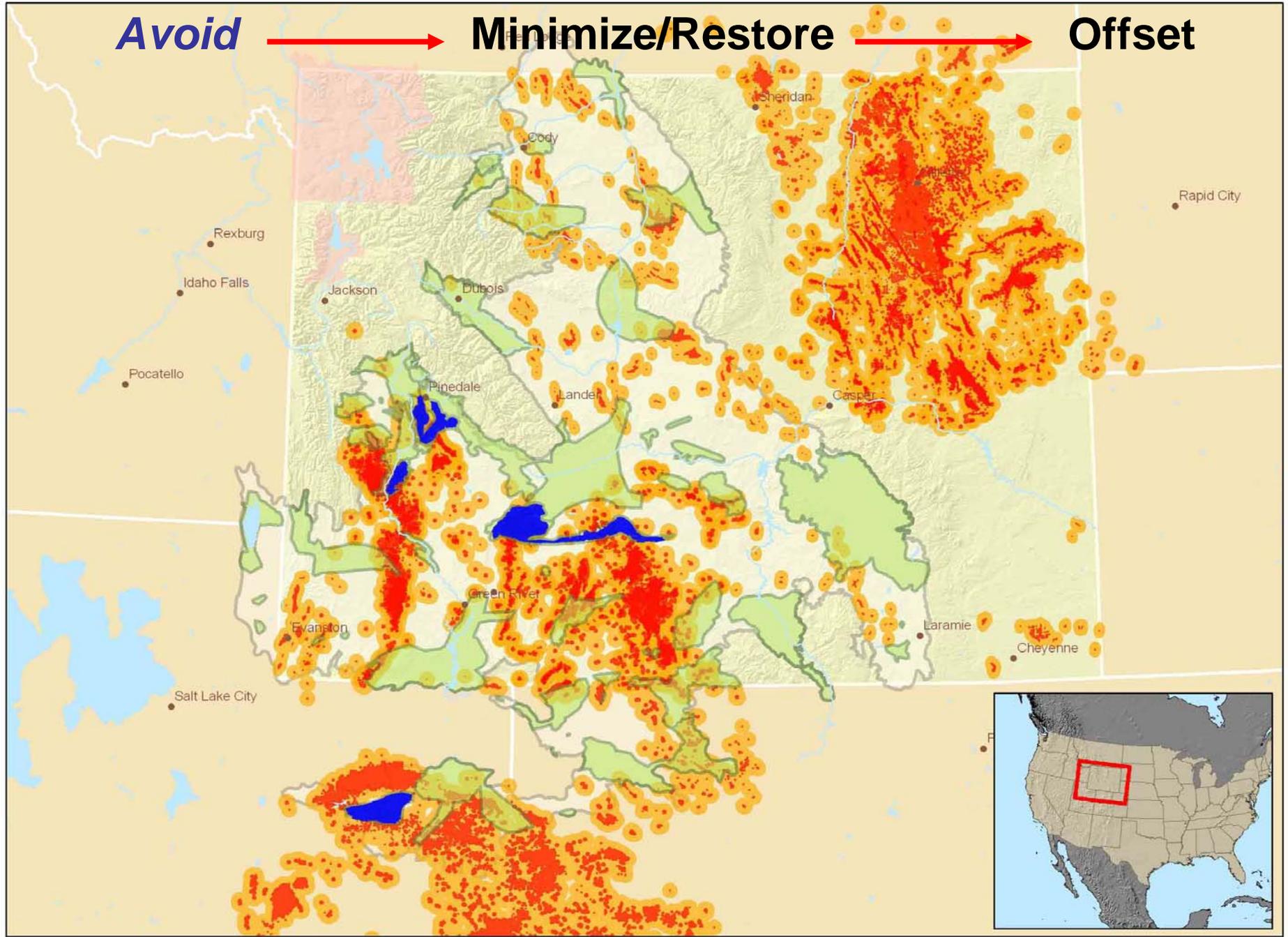
Avoid



Minimize/Restore



Offset



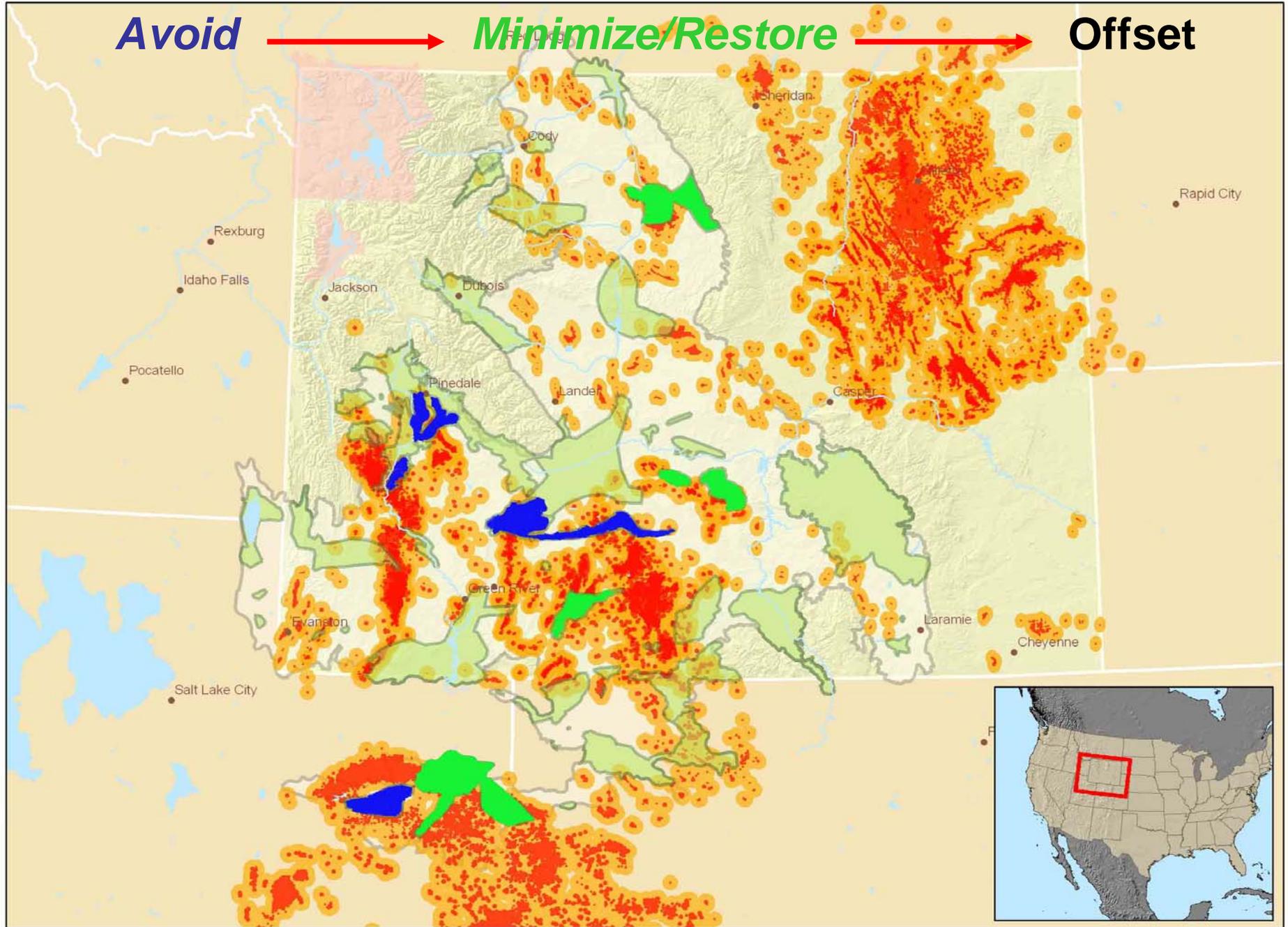
Avoid



Minimize/Restore



Offset



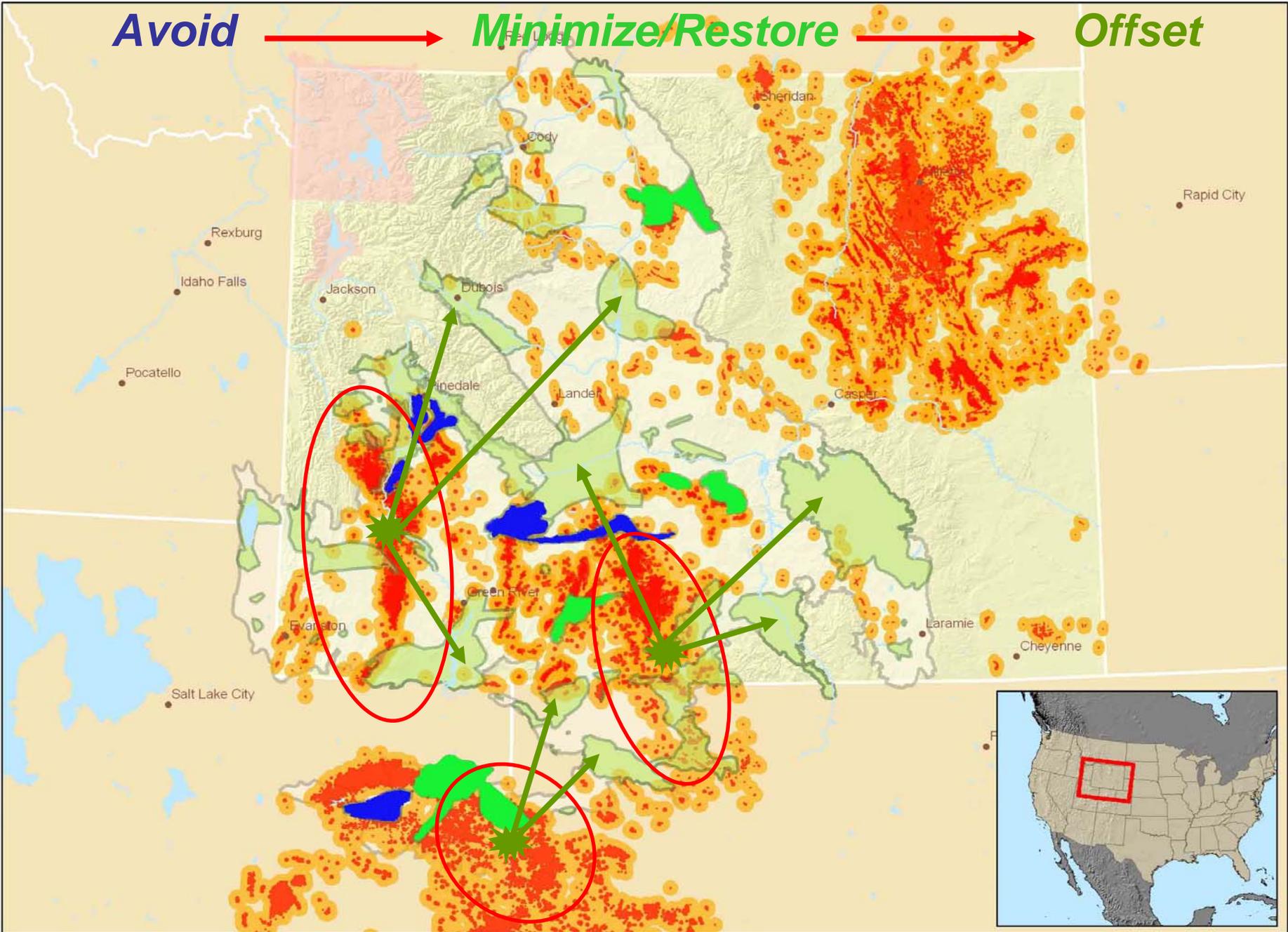
Avoid



Minimize/Restore

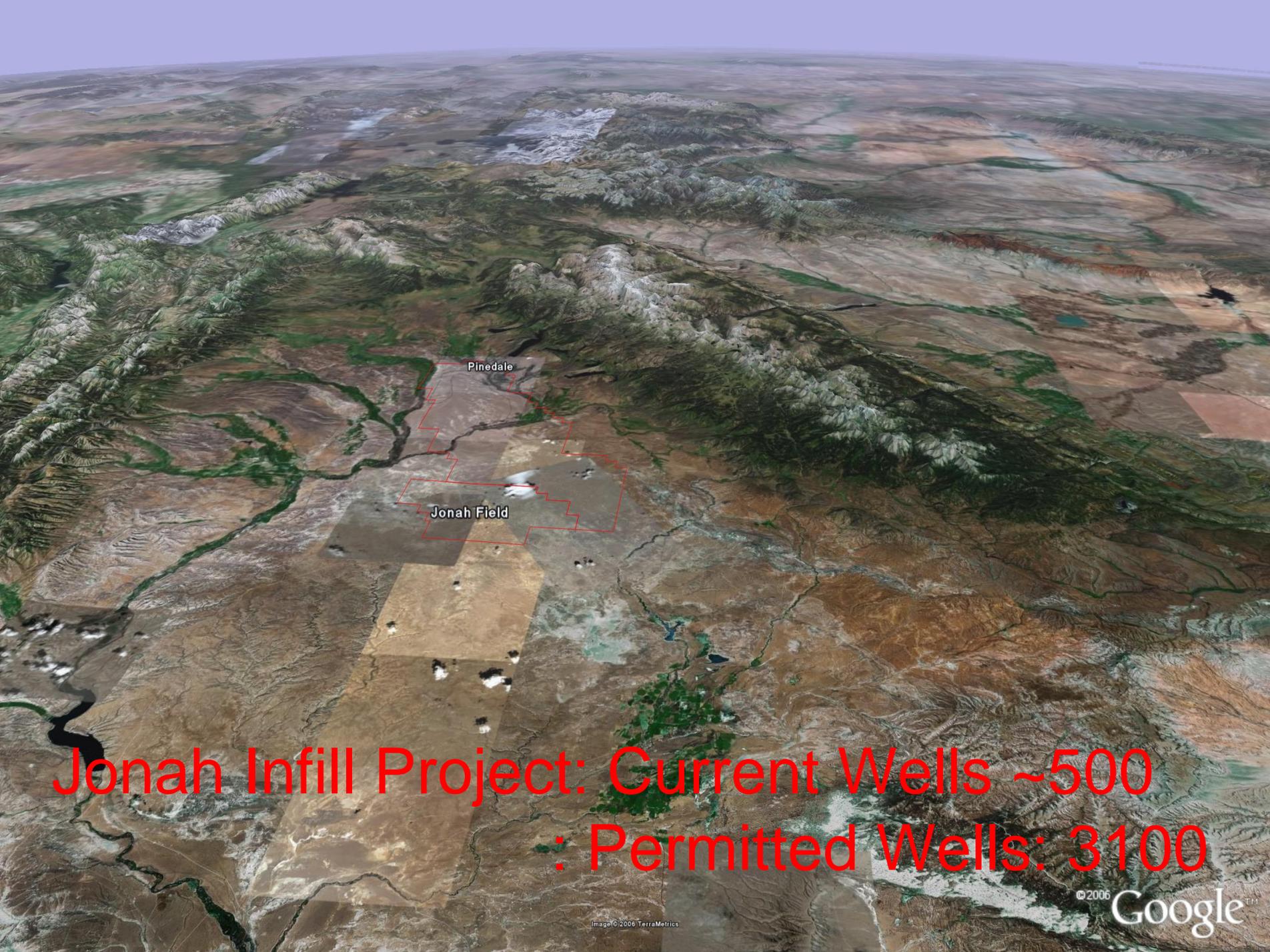


Offset



Offsite Mitigation Questions

1. How do you identify suitable offset sites?
2. How do you ensure offsite mitigation, compensates for onsite impacts?
3. How do you confirm offsets are ecologically equivalent?
4. Once offset sites are located how do you identify appropriate mitigation actions?
5. How do you ensure offsite mitigation conforms to the mitigation hierarchy ?



Pinedale

Jonah Field

Jonah Infill Project: Current Wells ~500
: Permitted Wells: 3100

A window of opportunity...

- Off-site mitigation has been agreed to by the BLM, State of Wyoming and operators (Encana, BP) on the Jonah Field
- No standard criteria or methodology has been identified to inform project selection
- BP, a long standing partner with TNC and co-signer of the Energy and Biodiversity Initiative (EBI), has invited TNC to design a methodology
- TNC has both methodology and technical capacity for **large landscape analysis of biodiversity**. This is one of the key ways for TNC to engage

OFF-SITE MITIGATION DESIGN PROJECT PROCESS

Assemble Team of Experts



Compile Key Species List for Jonah



Gather Spatial Data & Develop Species Models



Set Species & Vegetation Goals



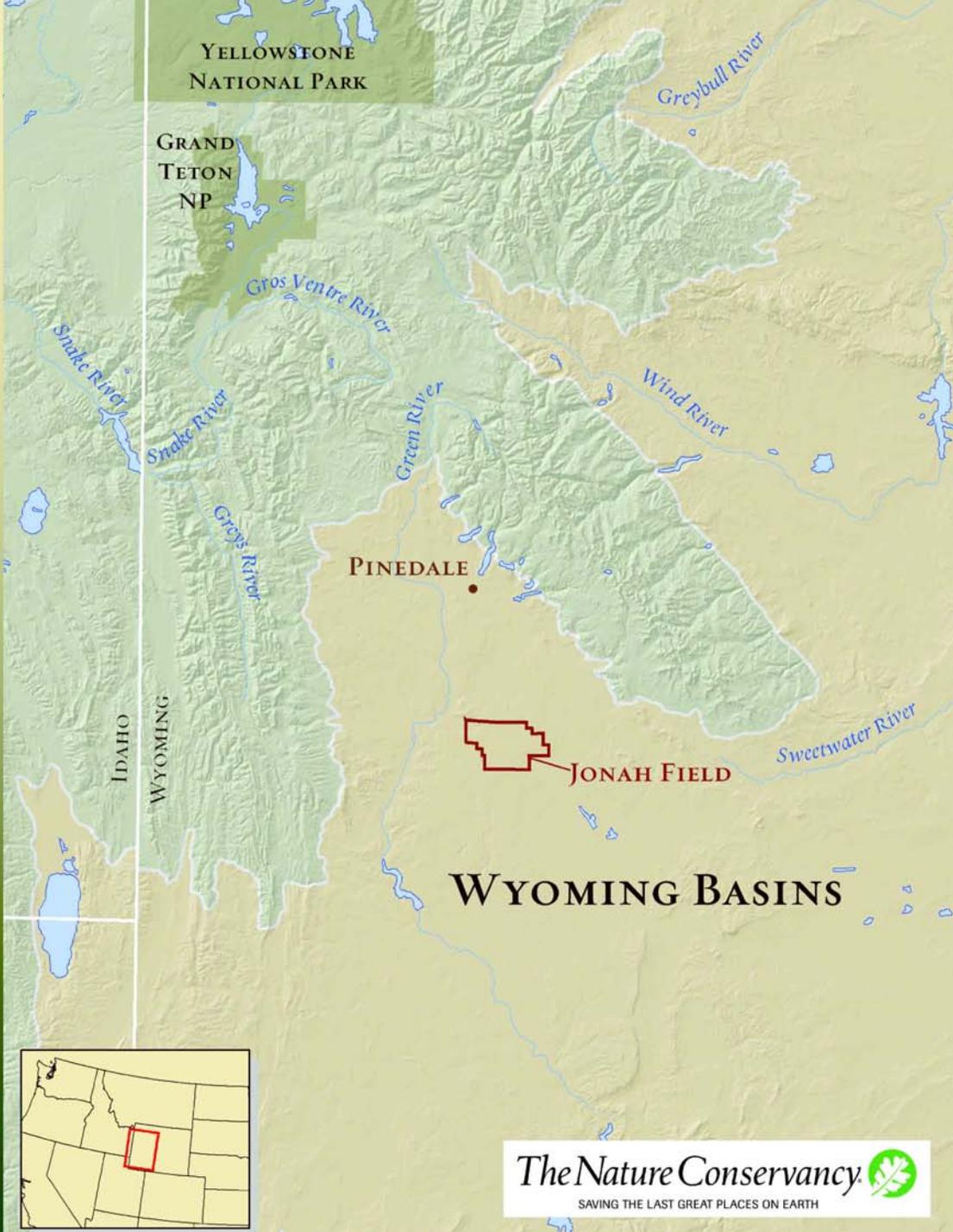
Run Marxan Model



Validate Model Results



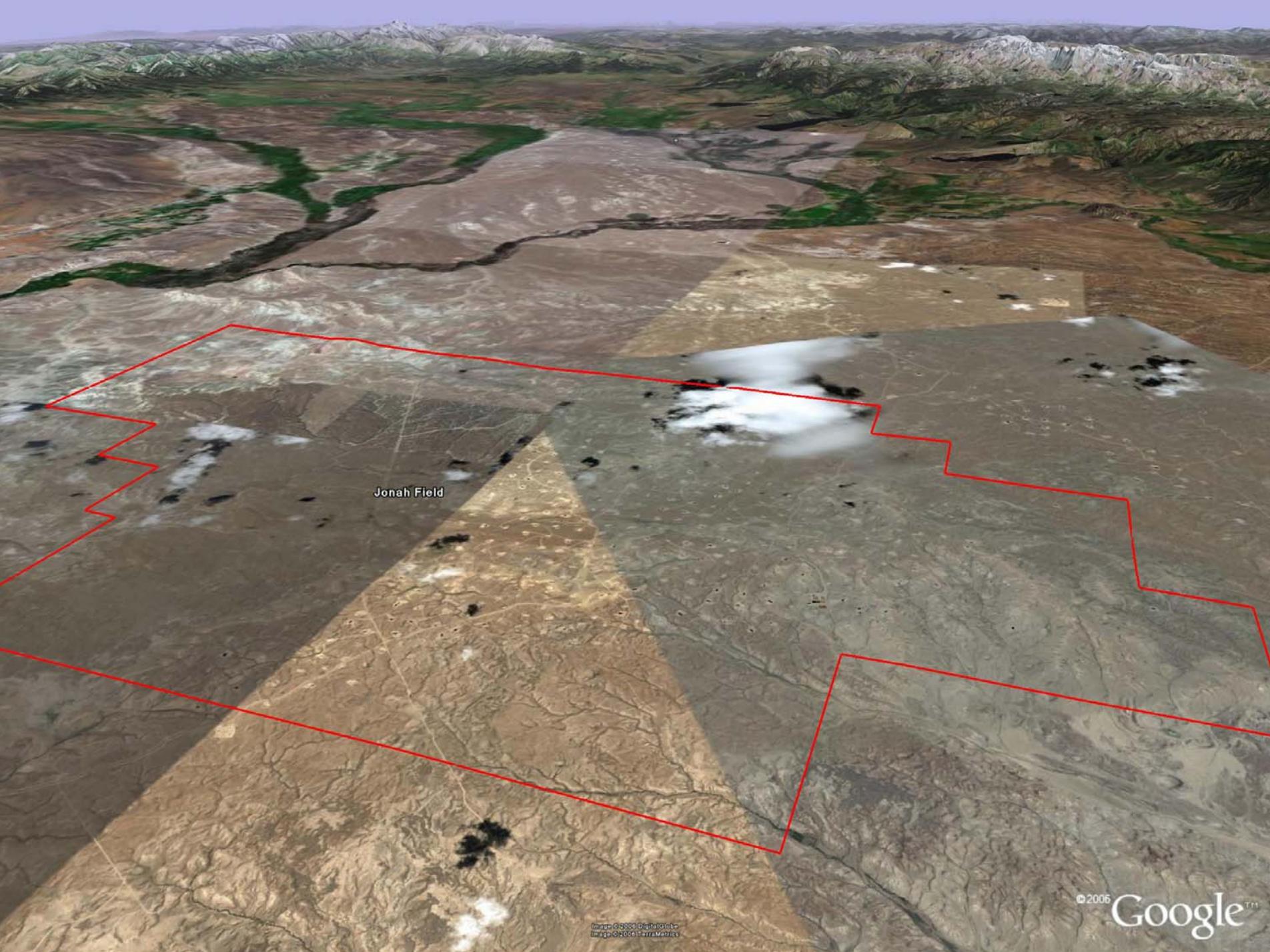
Report Results & Track Progress



**Each step includes expert review*

Jonah Mitigation Goals

Target Name	Goal (Ha)	Goal (Acres)	Goal (Number)	Minimum Viable Size
<i>Burrowing owl</i>	13,690	33,828		220 ha
<i>Cedar Rim thistle</i>	3,433	8,483		n/a
<i>Mountain plover</i>	1,390	3,435		1000 ha
<i>Pronghorn migration</i>	7,738	19,121		n/a
<i>Pygmy rabbit</i>	20,804	51,407		1100 ha
<i>Sage grouse (occupied leks)</i>			6	n/a
<i>Sage grouse (winter/nesting/early brood-rearing habitat)</i>	20,955	51,780		700 ha
<i>Sage sparrow</i>	8,813	21,777		100 ha
<i>White-tailed prairie dog</i>	1,705	4,213		2024 ha
<i>Wyoming big sagebrush</i>	22,573	55,778		6880 ha



Jonah Field



Brewer's sparrow

Sage sparrow

Prairie Dog Town

NEULSON PHACELIA

Sage Grouse Lek

Sage Grouse Lek

Sage Grouse Lek

Prairie Dog Town

SICKLE SALT BUSH

Sage Grouse Lek

Burrowing owl

Sage Grouse Lek

Sage Grouse Lek

Pygmy rabbit

Jonah Field Burrowing owl

Prairie Dog Town

Sage Grouse Lek

Brewer's Sparrow

Sage sparrow

Brewer's Sparrow

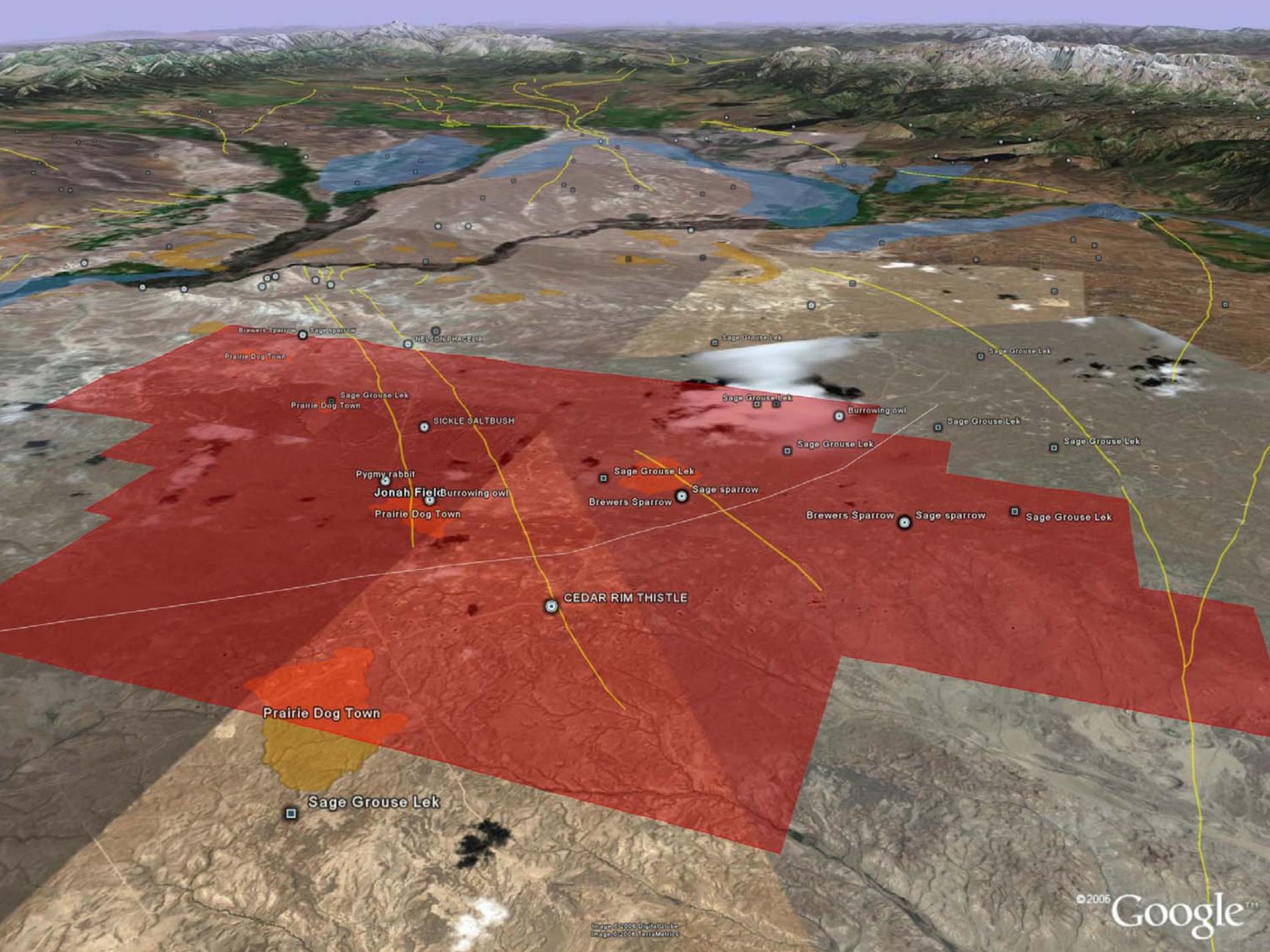
Sage sparrow

Sage Grouse Lek

CEDAR RIM THISTLE

Prairie Dog Town

Sage Grouse Lek



Brewer's sparrow Sage sparrow

Prairie Dog Town

Sage Grouse Lek
Prairie Dog Town

SICKLE SALTBUUSH

Pygmy rabbit

Jonah Field

Prairie Dog Town

Burrowing owl

Sage Grouse Lek

Brewers Sparrow

Sage sparrow

CEDAR RIM THISTLE

Brewers Sparrow

Sage sparrow

Sage Grouse Lek

Sage Grouse Lek

Sage Grouse Lek

Sage Grouse Lek

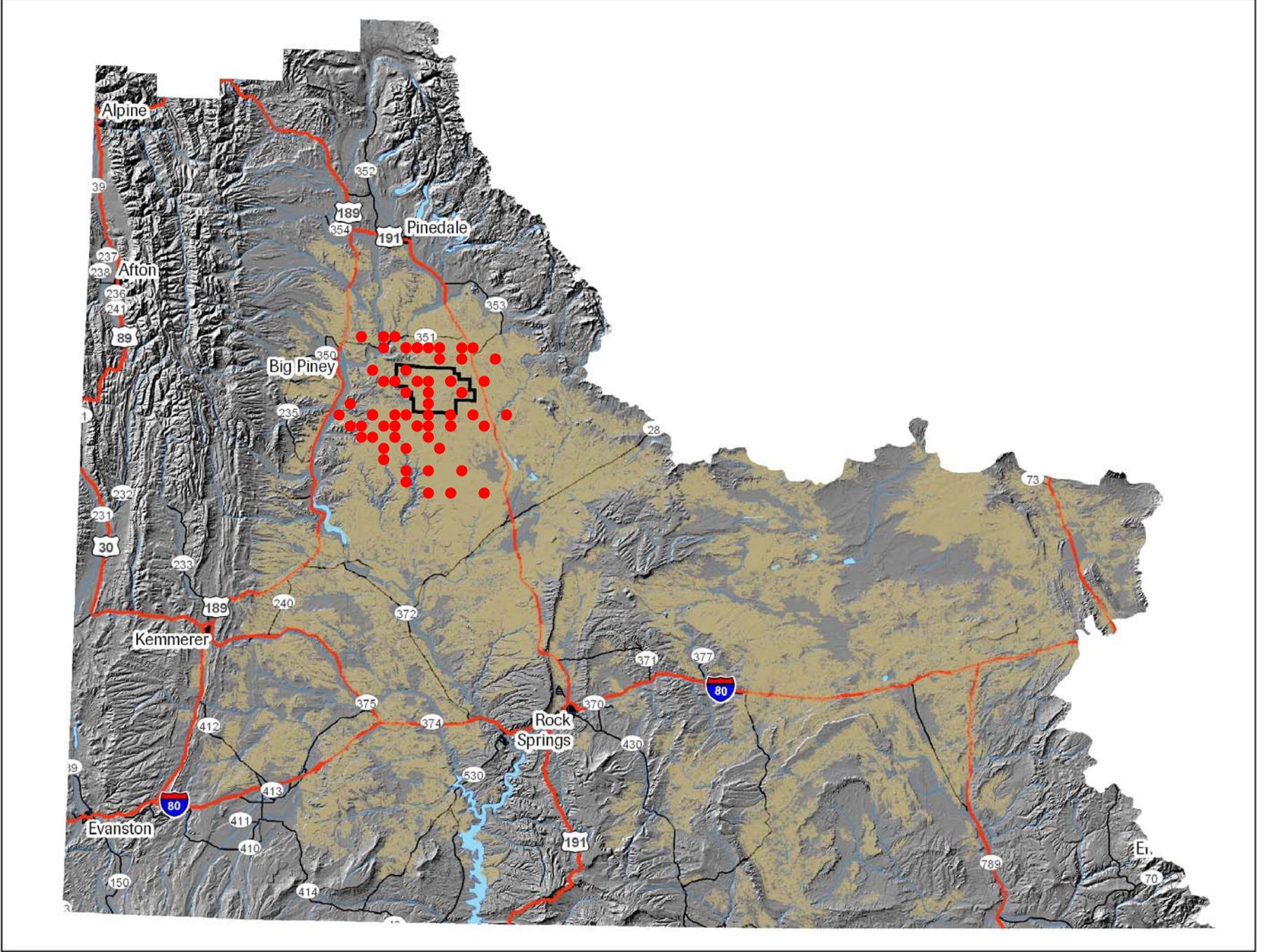
Burrowing owl

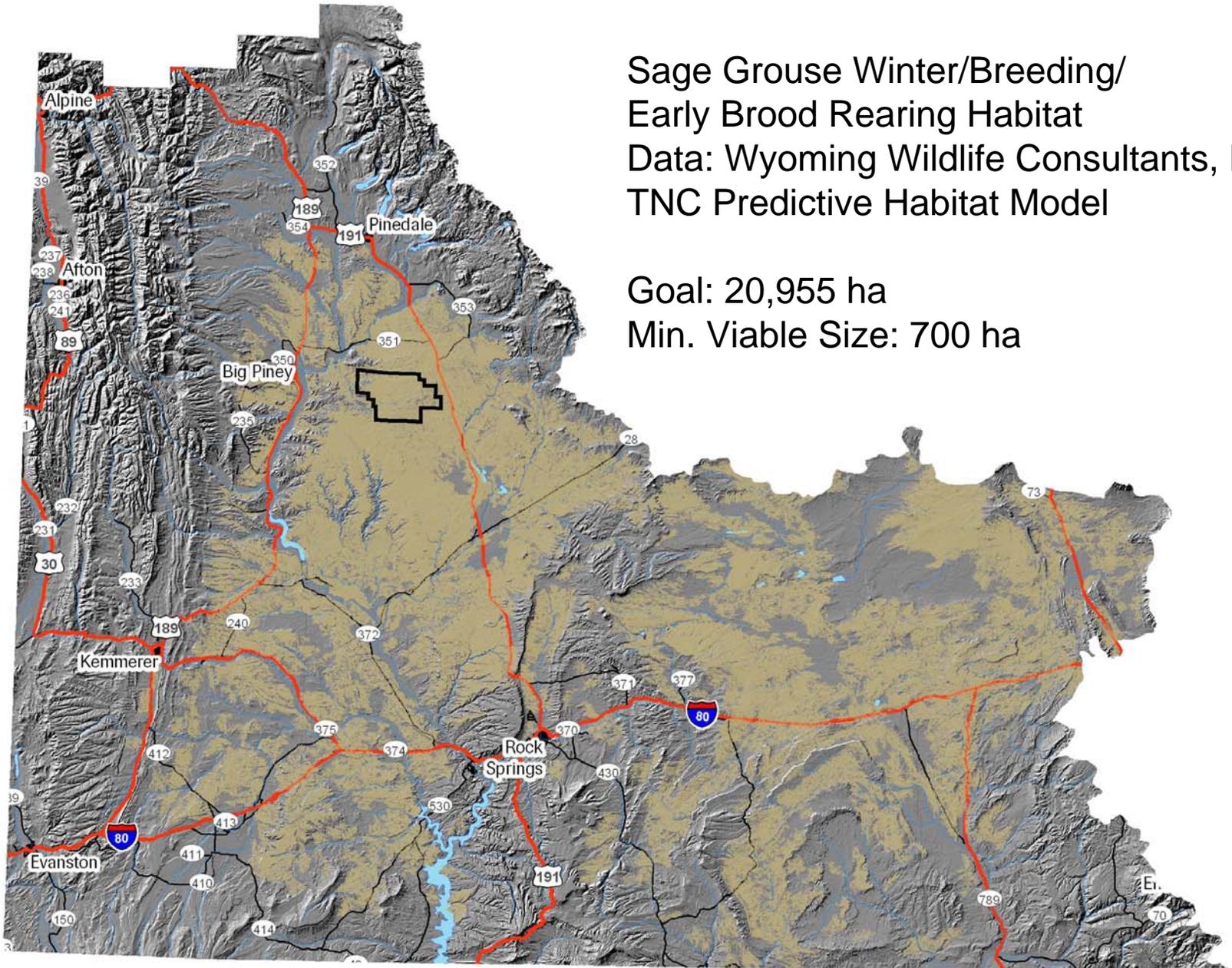
Sage Grouse Lek

Sage Grouse Lek

Prairie Dog Town

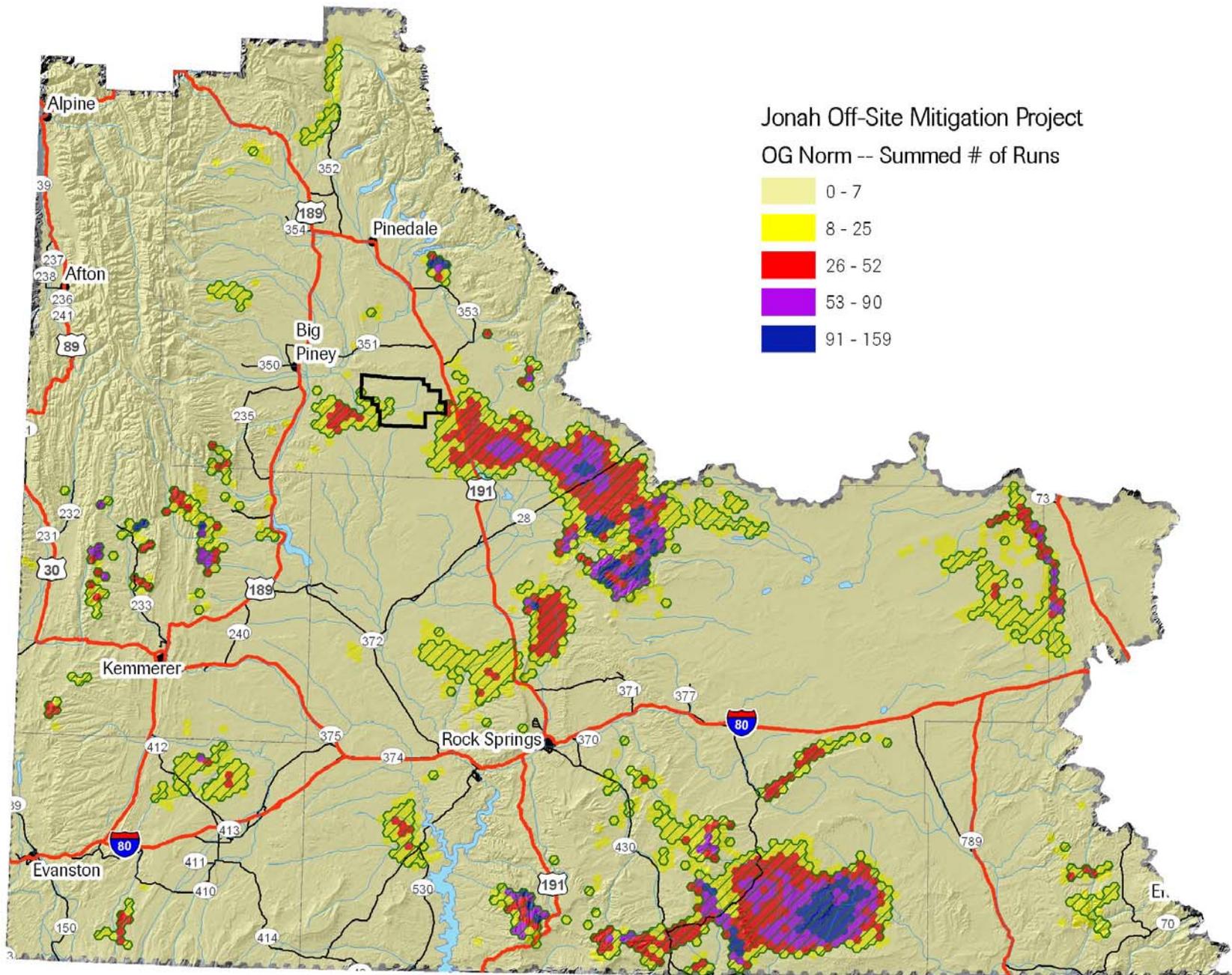
Sage Grouse Lek

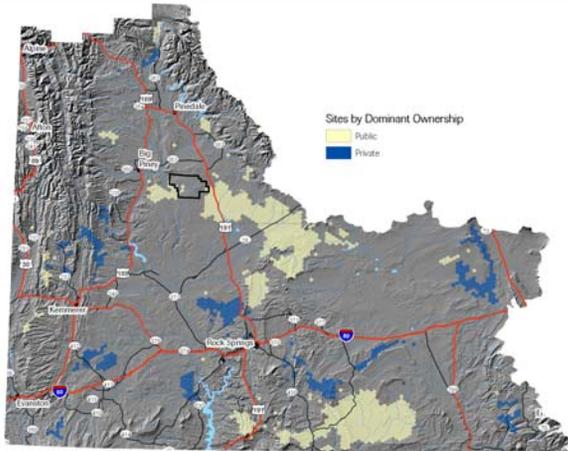




Sage Grouse Winter/Breeding/
Early Brood Rearing Habitat
Data: Wyoming Wildlife Consultants, LLC
TNC Predictive Habitat Model

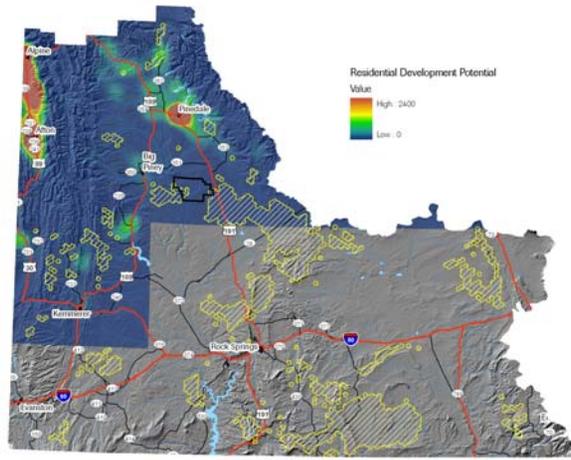
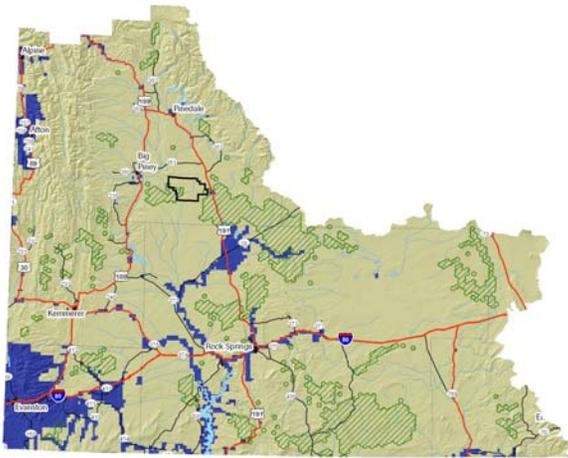
Goal: 20,955 ha
Min. Viable Size: 700 ha



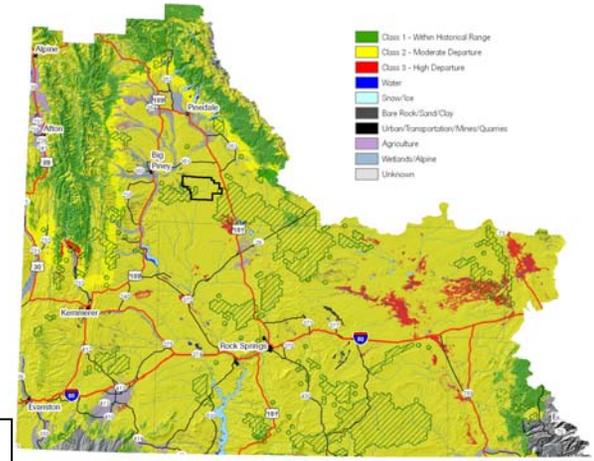


Dominant Land Ownership

Invasive Weeds



Residential Development



Fire Condition Class

Barriers to migration

