

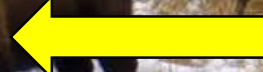
A photograph of a herd of bison in a snowy, mountainous landscape. In the foreground, a stream flows over rocks. The bison are scattered throughout the scene, some near the water and others in the snow-covered areas. Evergreen trees are visible in the background.

Ecological Sustainability in the Gardiner Basin

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Maintaining Dynamic Equilibrium

Climate + Geology + Landscape

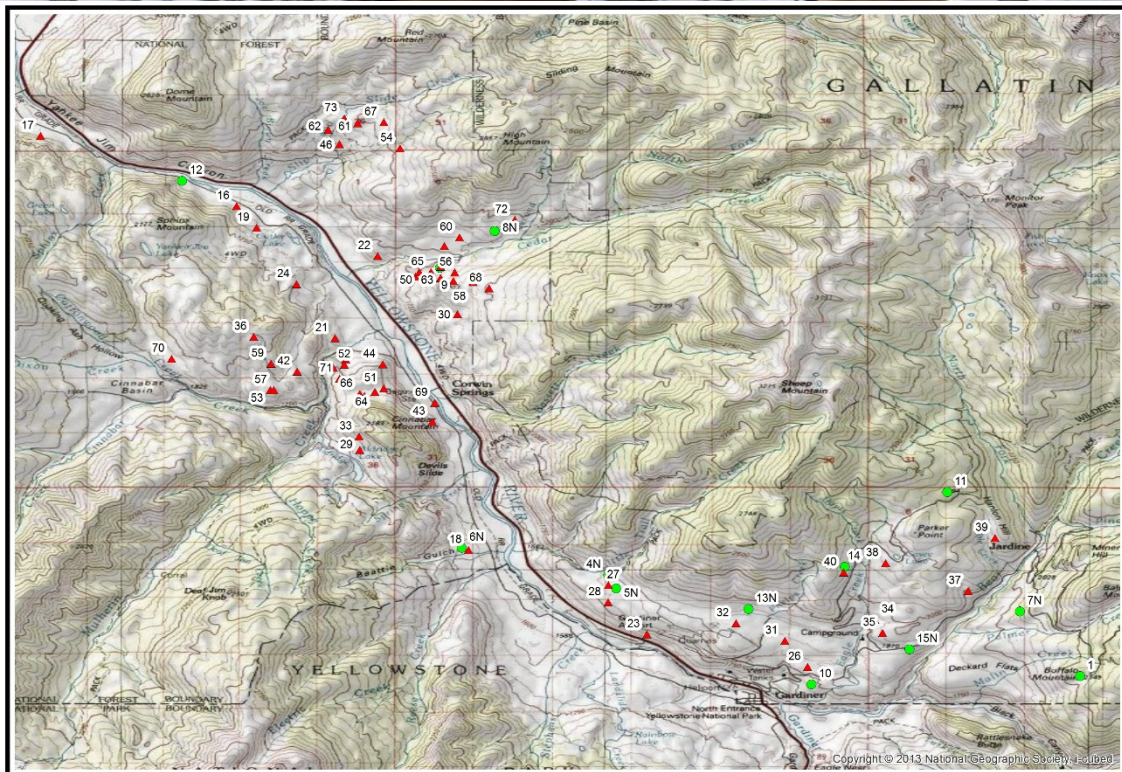


Project Goal

- Develop a series of ecological site descriptions that would serve as the foundation for future assessment of extended bison presence on US Forest Service lands outside of the Park
 - Soil and vegetation inventory sites within the Gardiner Basin
 - This was amended to include the Horse Butte and Red Canyon areas near West Yellowstone
 - Plant community production measures at inventory sites
 - Establish ecological reference metrics for the non-forested communities inventoried in this effort

Output

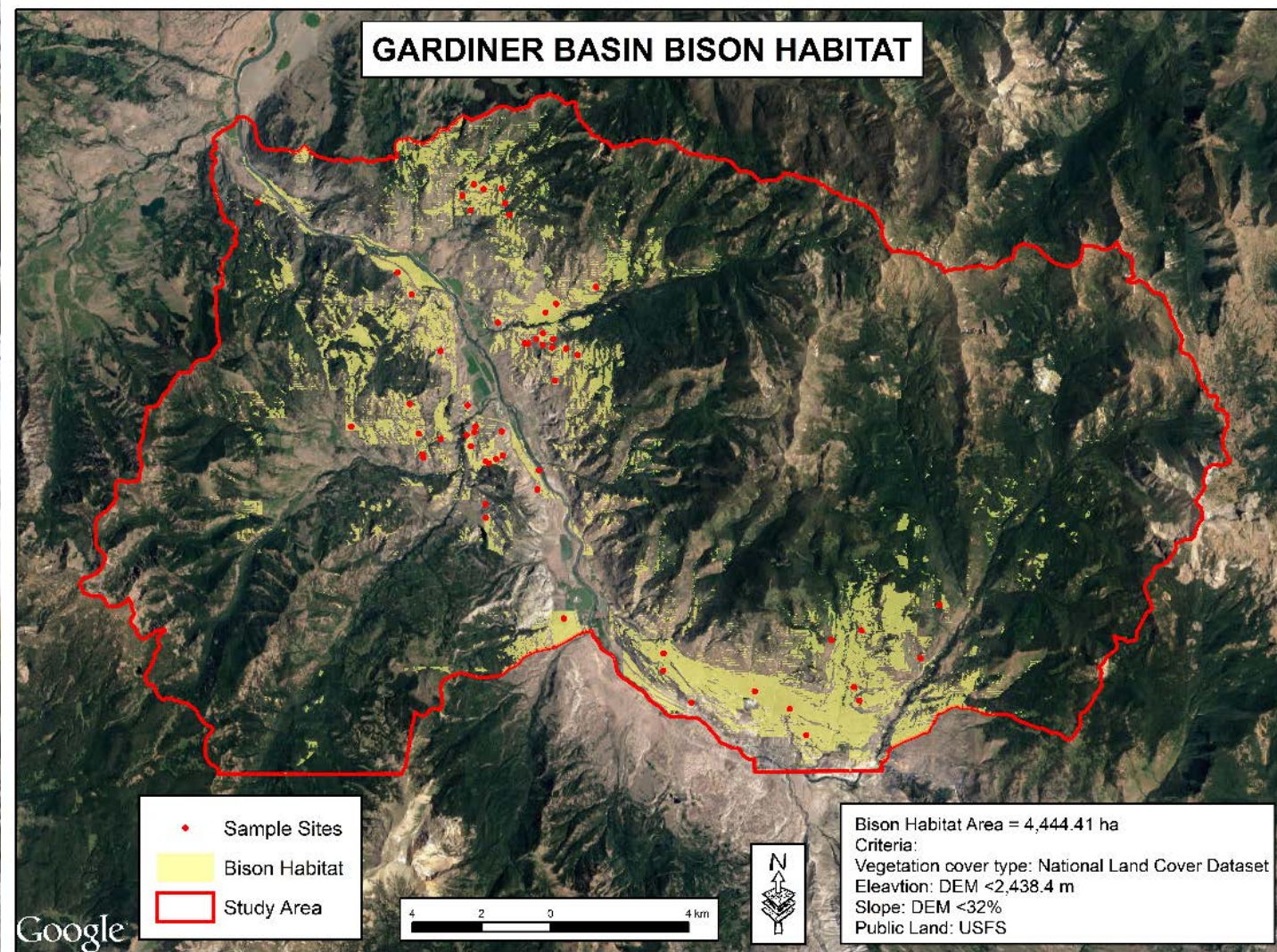
Data Collection Sites



Products

- Five major community types
 - Abandoned Agricultural Lands
 - Basin Big Sagebrush
 - Black Sagebrush (2 phases)
 - Grasslands (2 phases)
 - Mountain Big Sagebrush (5 phases)
- Community Production Metrics
 - Clipping data from 58 sites

Primary Foraging Area – Gardiner Basin



Ecological Site Descriptions

- Abandoned Agricultural Fields (6 sites)
 - Dominate vegetation species – smooth brome and Kentucky bluegrass
 - Native grasses < 5%
 - Sagebrush < 3%
- Productivity Potential
 - Level to moderately steep
 - Soil Organic matter - 5%
 - Soil Depth – up to 30”
- Biomass Production
 - 329lbs/ac to 942lbs/ac

Ecological Site Descriptions

- Basin Big Sagebrush (4 sites)
 - Dominate vegetation species – needleandthread grass, Idaho fescue, bluebunch wheatgrass
 - Native grasses 14%
 - Sagebrush 12%
- Productivity Potential
 - Level to slightly steep
 - Soil Organic matter - 2%
 - Soil Depth – 12 to 22”
- Biomass Production
 - 79lbs/ac to 489lbs/ac

Ecological Site Descriptions

- Black Sagebrush – Level Phase (5 sites)
 - Dominate vegetation species – Idaho fescue, bluebunch wheatgrass, prairie junegrass
 - Native grasses 17%
 - Sagebrush 15%
- Productivity Potential
 - Level to slightly steep
 - Soil Organic matter - 2%
 - Soil Depth – 4 to 15”
- Biomass Production
 - 107lbs/ac to 224lbs/ac

Ecological Site Descriptions

- Black Sagebrush – Steep Phase (5 sites)
 - Dominate vegetation species – Idaho fescue, bluebunch wheatgrass, prairie junegrass
 - Native grasses 17%
 - Sagebrush 15%
- Productivity Potential
 - Moderately steep to steep (35 – 60%)
 - Soil Organic matter - 2%
 - Soil Depth – 9 to 22”
- Biomass Production
 - 174lbs/ac to 354lbs/ac

Ecological Site Descriptions

- Grassland – Level Phase (10 sites)
 - Dominate vegetation species – Idaho fescue, bluebunch wheatgrass, prairie junegrass; rich forb component
 - Native grasses – 20%
 - Sagebrush < 4%
 - Forbs \leq 9%
- Productivity Potential
 - Gently rolling (4 – 15%) to steep (35 – 60%);
 - Soil Organic matter - 5%
 - Soil Depth – 8 to 33”
- Biomass Production
 - 82lbs/ac to 315lbs/ac

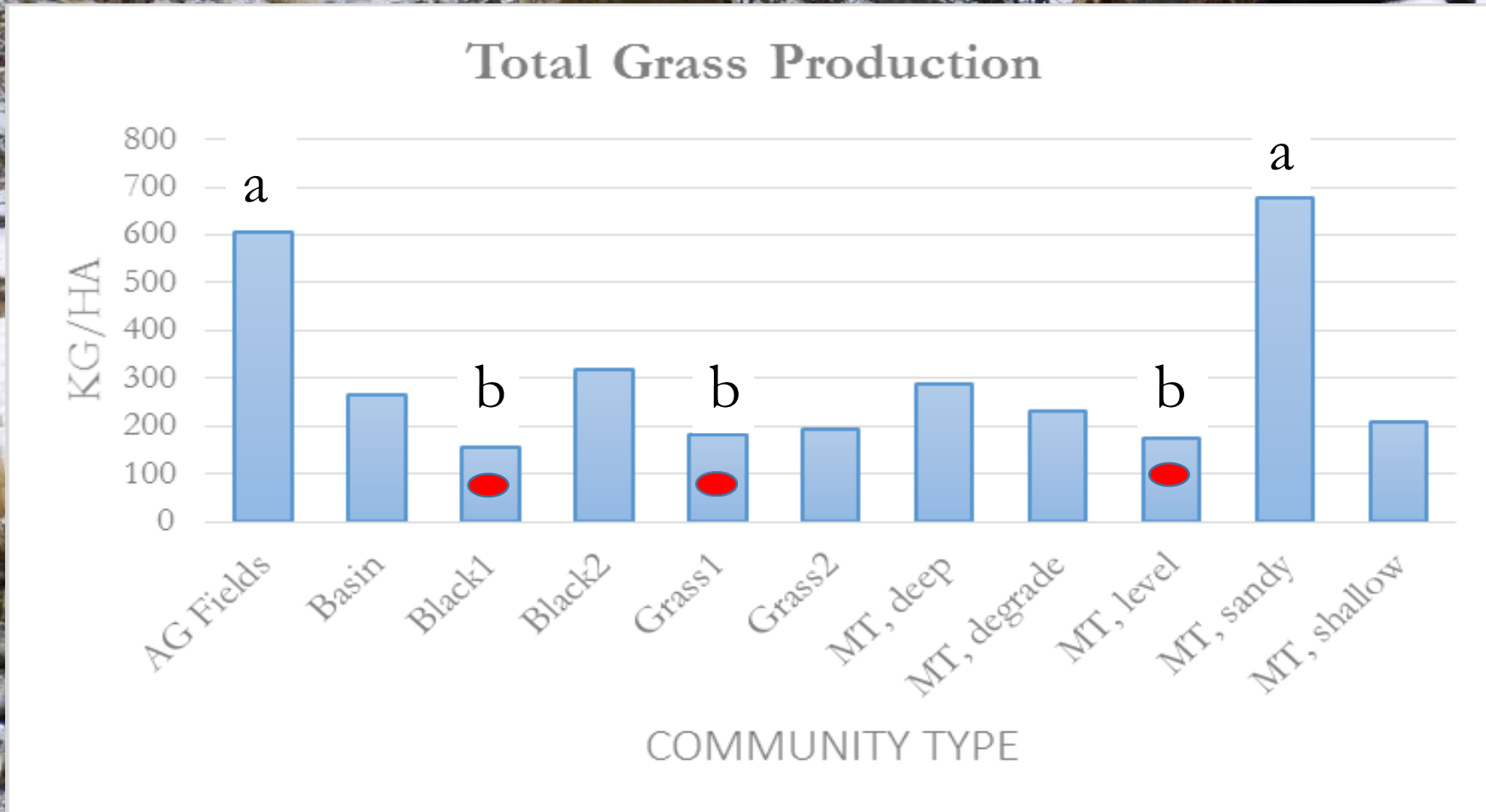
Ecological Site Descriptions

- Grassland – Steep Phase (6 sites)
 - Dominate vegetation species – Idaho fescue, bluebunch wheatgrass, prairie junegrass
 - Native grasses - 7%
 - Sagebrush <1%
- Productivity Potential
 - Steep (35 – 60%);
 - Soil Organic matter - 4%
 - Soil Depth – 9 to 27”
- Biomass Production
 - 61lbs/ac to 242lbs/ac

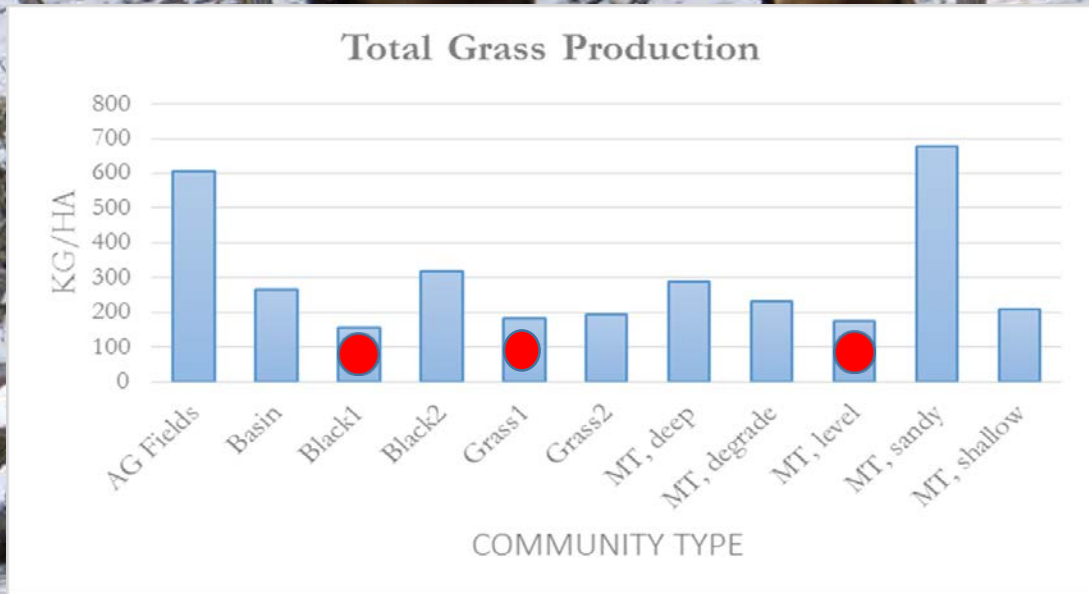
Ecological Site Descriptions

- Mountain Big Sagebrush (22 sites)
 - Shallow Phase, steep: 35 to 60% slope; 8 to 10”
 - 86lbs/ac to 287.5lbs/ac
 - Silty Loam, level: 0 – 4% slope; > 12”
 - 131lbs/ac to 182lbs/ac
 - Sandy Clay loam, deep: 15 – 35% slope; 11 to 23”
 - 329lbs/ac to 1096lbs/ac
 - Deep loamy: variable; 18 to 24”
 - 151lbs/ac to 377lbs/ac
 - Degraded loamy: variable; 14 to 25”
 - 117lbs/ac to 308lbs/ac

Forage Productivity



Indication of Depressed Ecological Condition



- Level sites should be the most productive
 - Stable sites with deep soils
 - Level site production no better than production on more harsh sites (steep)
- Grazing animal preference depressing site potential
 - Level sites accessible to larger numbers of grazers = heavier grazing use

Length of Grazing Period Based on Regular Monitoring of Baseline Inventory Sites

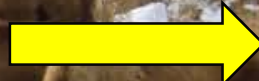
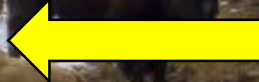
Mountain Big Sagebrush Reference

Return to Inventory Sites

Species	% cover	Range %
<i>Artemisia nova</i>	< 1	0 - 2
<i>Artemisia trid. vaseyana</i>	7	5 - 10
<i>Festuca idahoensis</i>	4	
<i>Hesperostipa comata</i>	< 1	0 - 1
<i>Koeleria macrantha</i>	2	1 - 5
<i>Poa secunda</i>	1	1 - 2
<i>Pseudoroegneria spicata</i>	4	2 - 6
Forbs	4	1 - 8



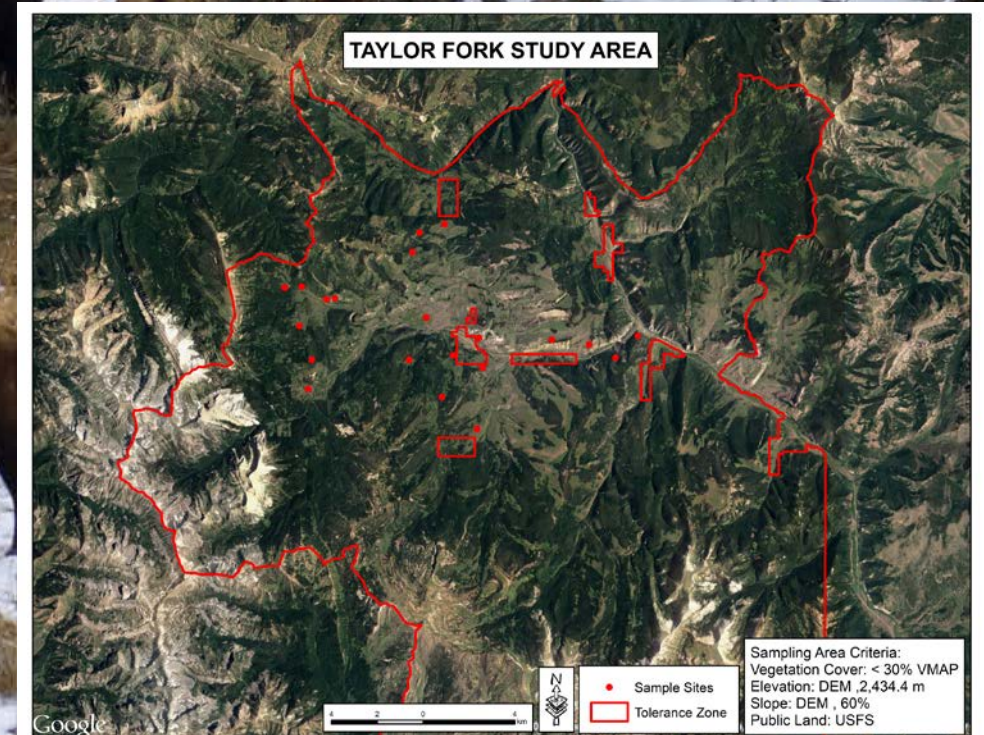
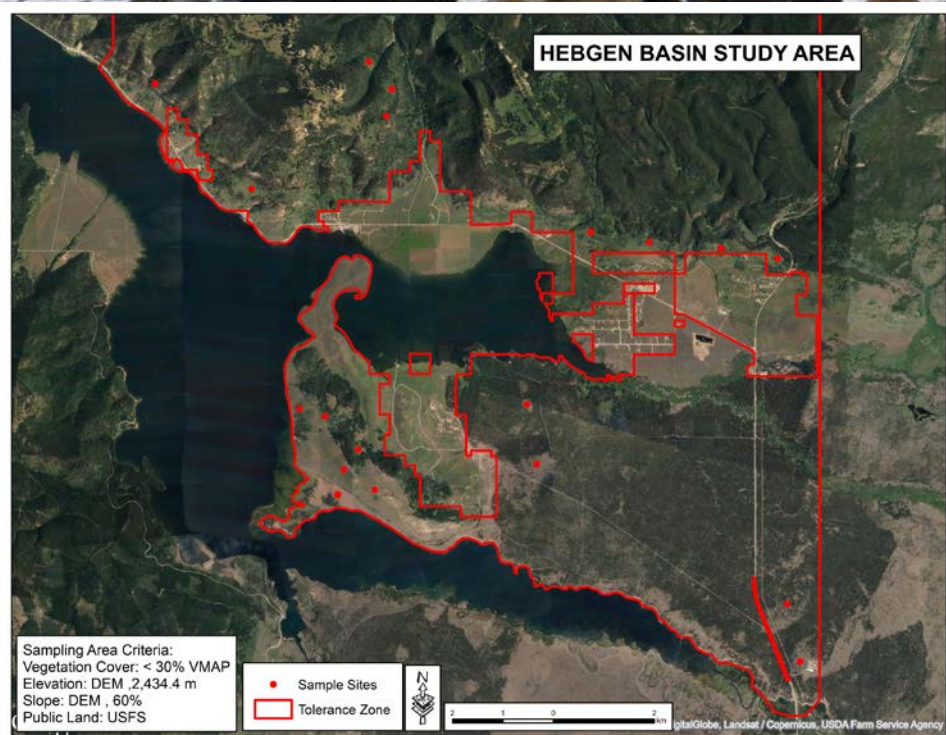
Regular monitoring reveals degree or level of equilibrium between grazers and plant community



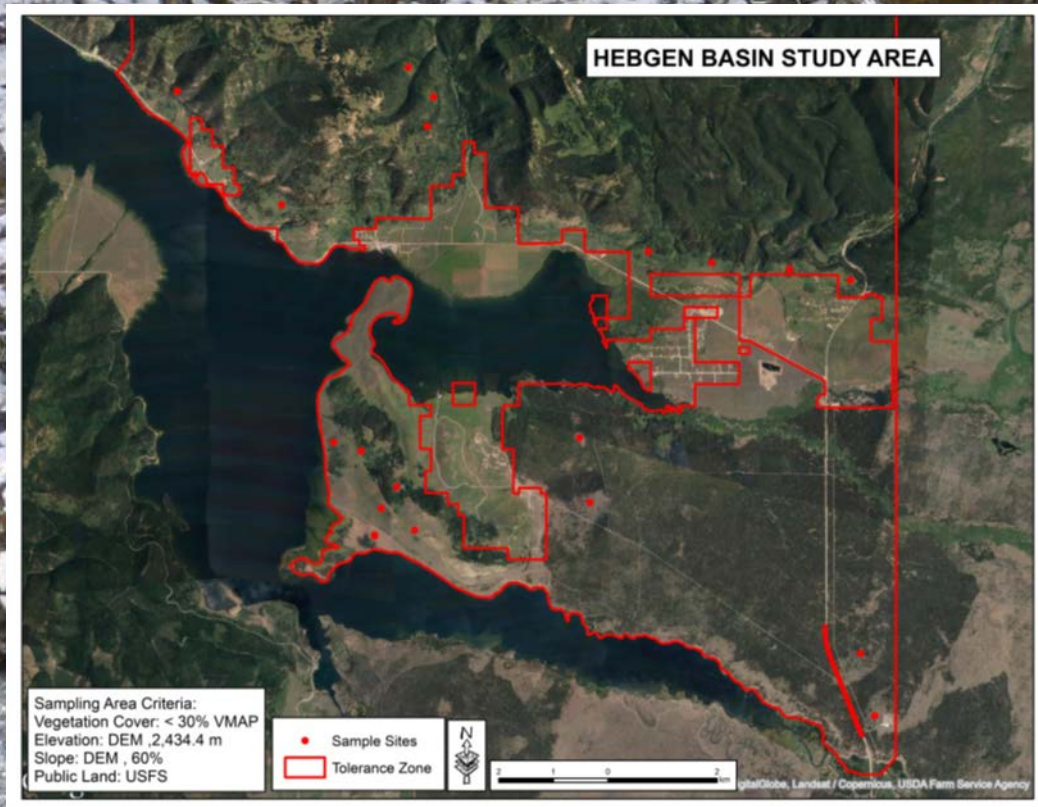
Extending Effort into other Districts

Horse Butte - Ongoing

Taylor Fork - Potential



Extending effort to the Hebgen - 2017



- Field data collected from 11 of 19 sites
- Field work completed during September
- Reference conditions and ecological carrying capacity available in March 2018

Questions?

