Ecological Influences of Free-roaming Horses on Rangelands

Wild Horse & Burro Advisory Board Meeting
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Principles of Rangeland Ecology

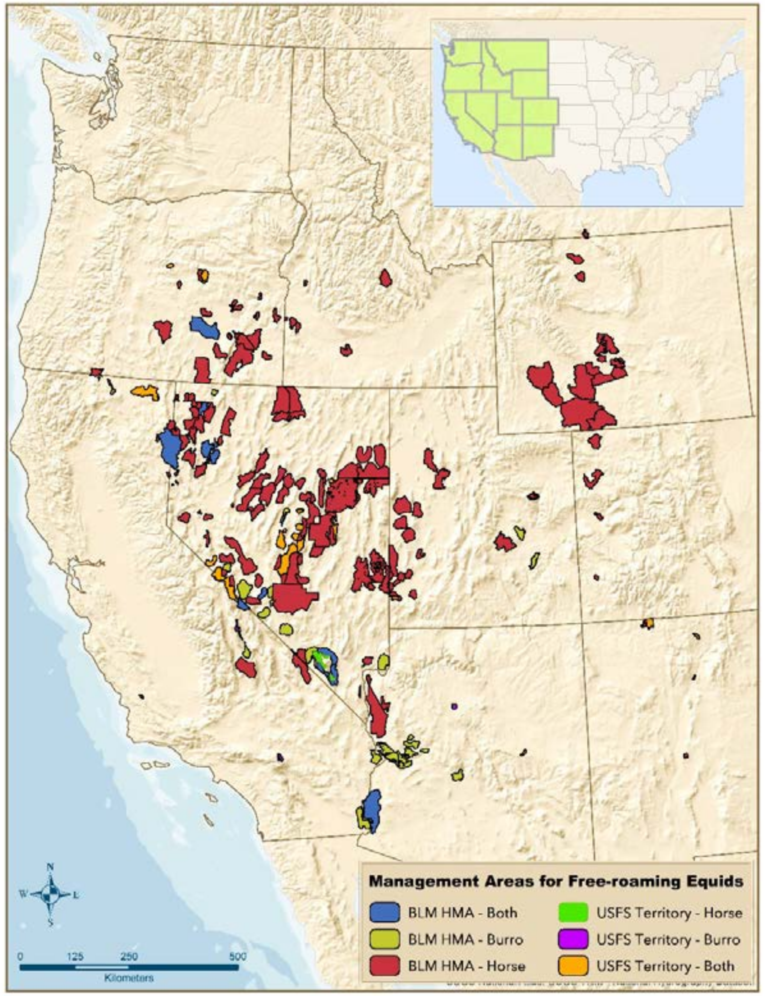
1. Protect rangelands as renewable resources
2. Maintain green plants to capture solar energy and sustain grazing animals
3. Provide protection to soil, water, vegetation, and climate
4. Sustain multiple uses of rangelands (food, water, wildlife habitat, recreation, ecosystem dynamics)

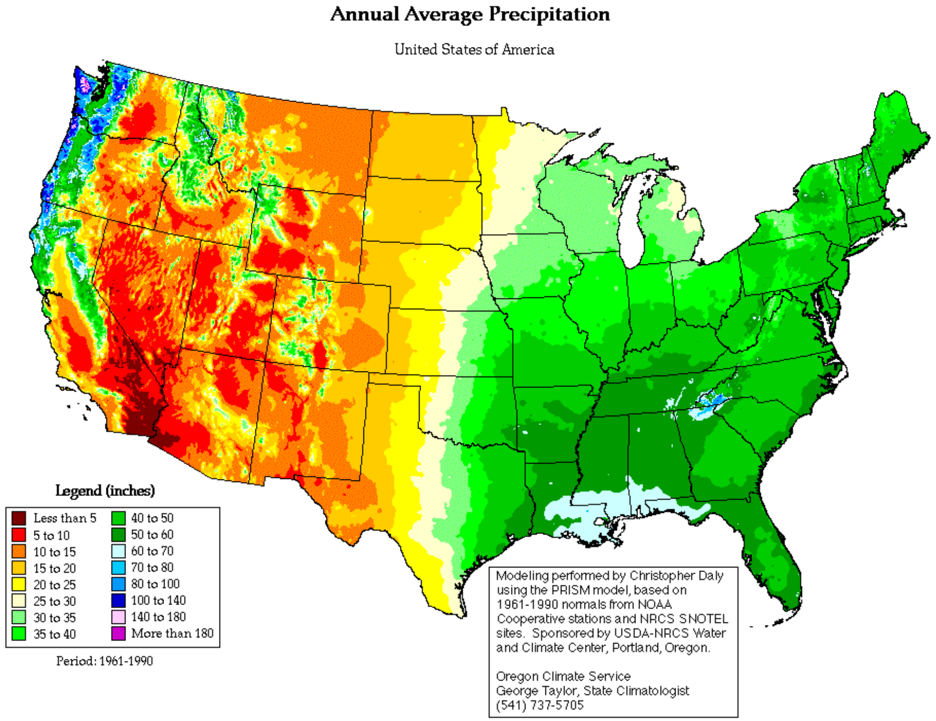
Principles of Rangeland Ecology

1. **Precipitation** is the single most important factor determining type and productivity of vegetation
   - Drought
   - Wind
   - Temperature

2. **Soil** influences forage production
   - Texture
   - Structure
   - Depth
   - Organic matter

Distribution of Free-roaming Horses





Management of Horses Today

- Appropriate Management Levels (AML) – BLM multiple use mandate to balance grazing of free-roaming horses and burros with wildlife, livestock, wilderness, and recreation

- BLM directed to manage for a thriving natural ecological balance (TNEB)
  - Accomplished by setting AML (stocking rates) and managing lands to prevent rangeland deterioration

Herbivory and Ecosystem Sustainability

- Animal density (stocking rate) is the most important of all grazing management decisions
  - Frequency, intensity and duration of grazing
- Carrying (grazing) capacity
  - Maximum stocking rate year and year without causing damage to vegetation or related resources (conservation of water, soil, plants)
- Emphasis on community level interactions
  - Important to understand individual plant species responses

State	Horses	Burros	Total	Max. AML	% Change From 2017
Arizona	418	6,642	7,060	1,676	**+7**
California	6,654	4,317	10,971	2,200	**+20**
Colorado	1,702	0	1,702	812	**+1**
Idaho	580	0	580	617	**+3**
Montana	155	0	155	120	**-7**
Nevada	40,394	3,623	44,017	12,811	**+14**
New Mexico	205	0	205	83	**+2**
Oregon	4,682	49	4,731	2,690	**+9**
Utah	4,848	344	5,192	1,956	**-6**
Wyoming	7,338	0	7,338	3,725	**+3**
Total	**66,976**	**14,975**	**81,951**	**26,690**	**+11**

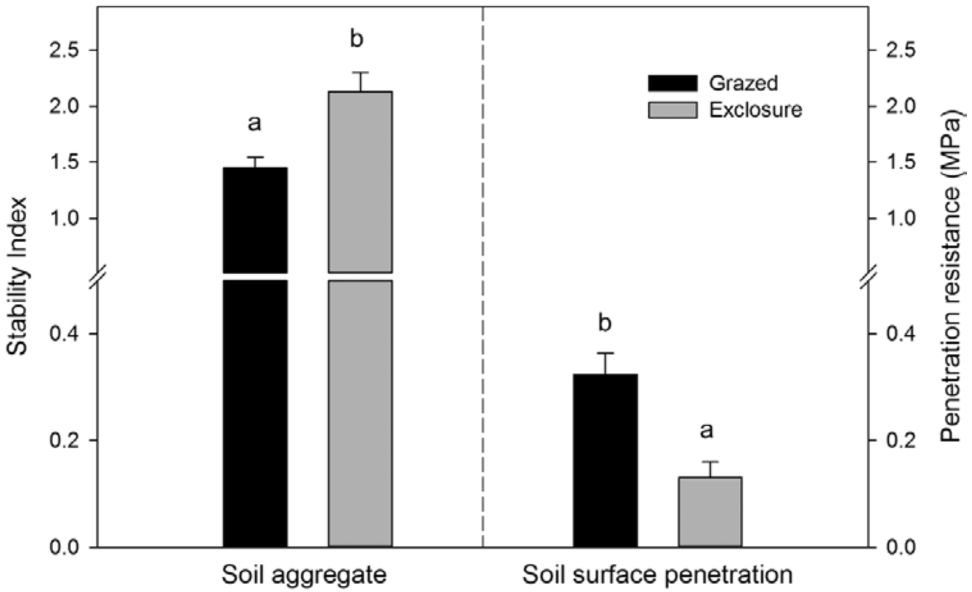
Report for March 2018

State	Horses	Burros	Total	Max. AML	% Above AML
Arizona	418	6,642	7,060	1,676	**321**
California	6,654	4,317	10,971	2,200	**399**
Colorado	1,702	0	1,702	812	**109**
Idaho	580	0	580	617	**-6**
Montana	155	0	155	120	**30**
Nevada	40,394	3,623	44,017	12,811	**244**
New Mexico	205	0	205	83	**147**
Oregon	4,682	49	4,731	2,690	**76**
Utah	4,848	344	5,192	1,956	**165**
Wyoming	7,338	0	7,338	3,725	**97**
Total	**66,976**	**14,975**	**81,951**	**26,690**	**207**

Report for March 2018

Upland Plant Community Response to Free-roaming Horses

- Compared vegetation and soil surface characteristics in grazed areas and ungrazed
- Horse grazed areas had lower sagebrush density and plant diversity, greater soil penetration resistance, and lower soil aggregate stability
- Herbaceous cover and density generally did not differ between grazed and ungrazed treatments
- Horses may have an affect the ecological function of semi-arid rangelands (risk of soil erosion and lower water availability)



Davies, K. W., G. Collins, and C. S. Boyd. 2014. Effects of feral free-roaming horses on semi-arid rangeland ecosystems: an example from the sagebrush steppe. Ecosphere 5(10):127.

Riparian Plant Community Response to Free-roaming Horses

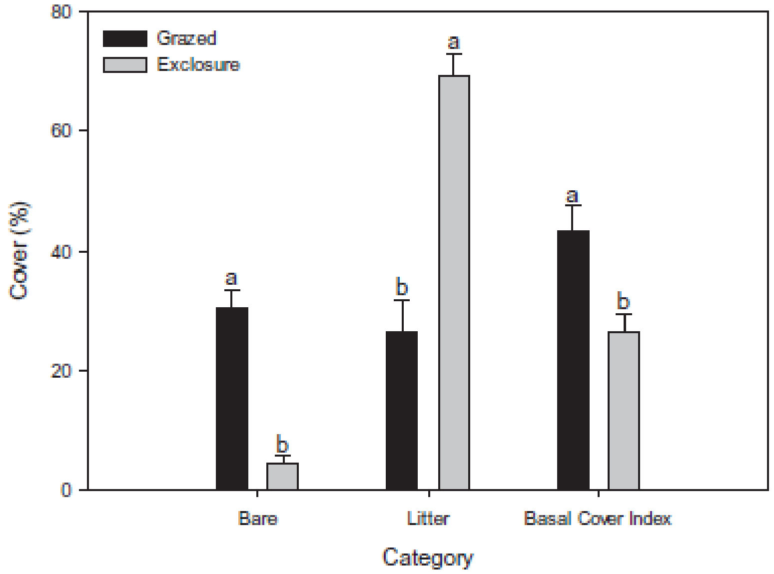


Figure 3. Ground cover for riparian study plots in northern Nevada. Data are means for 2012–2013 with associated standard errors. Plots were excluded from horse grazing from 2009–2013 or were accessible to grazing during that time period. Within a category, bars without a common letter are different at α = 0.05.

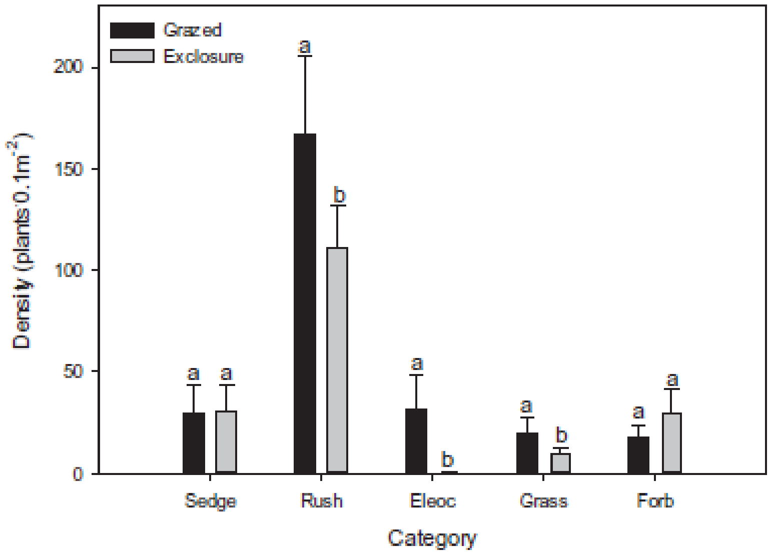


Figure 4. Herbaceous plant density for riparian study plots in northern Nevada. Data are means for 2012–2013 with associated standard errors. Plots were excluded from horse grazing from 2009 to 2013 or were accessible to grazing during that time period. Bars represent treatment means with associated standard errors. Within a category, bars without a common letter are different at α = 0.05.

Boyd, C.S., K.W. Davies, G.H. Collins. 2017. Impacts of feral horse use on herbaceous riparian vegetation within a sagebrush steppe ecosystem. Rangeland Ecology and Management 70:411-417.

Riparian Plant Community Response to Free-roaming Horses

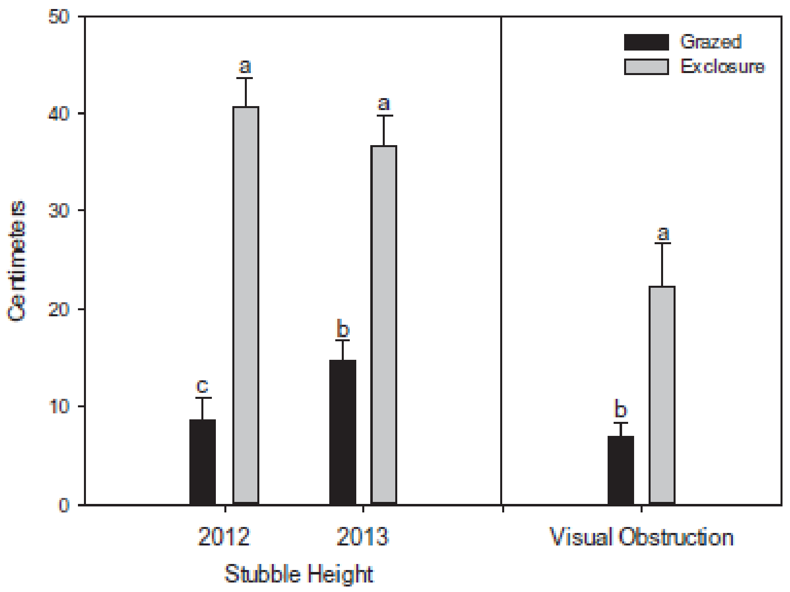


Figure 5. Herbaceous stubble height and visual obstruction for riparian study plots in northern Nevada. Stubble height is the average maximum height of herbaceous plants, and visual obstruction represents the highest (from ground) portion of a 2.5-cm diameter pole visible from a distance of 5 m and an observation height of 1 m. Data are means and associated standard errors for 2012–2013 (stubble height) and 2013 (visual obstruction). Plots were excluded from horse grazing from 2009 to 2013 or were accessible to grazing during that time period. Within a panel, bars without a common letter are different at $\alpha = 0.05$.9

Boyd, C.S., K.W. Davies, G.H. Collins. 2017. Impacts of feral horse use on herbaceous riparian vegetation within a sagebrush steppe ecosystem. Rangeland Ecology and Management 70:411-417.

Bird & Mammal Species Richness

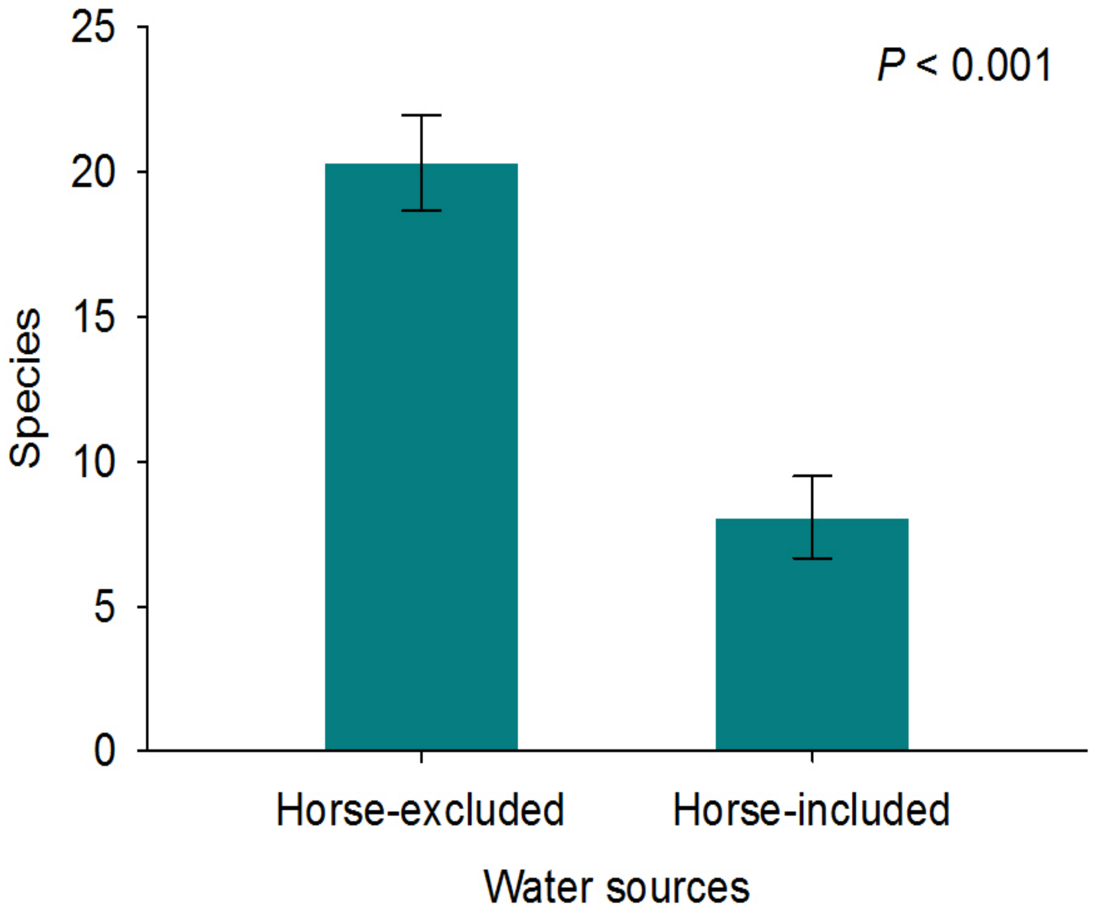
300 horses in Dugway, Utah

12 included, 13 excluded sites

75 total species

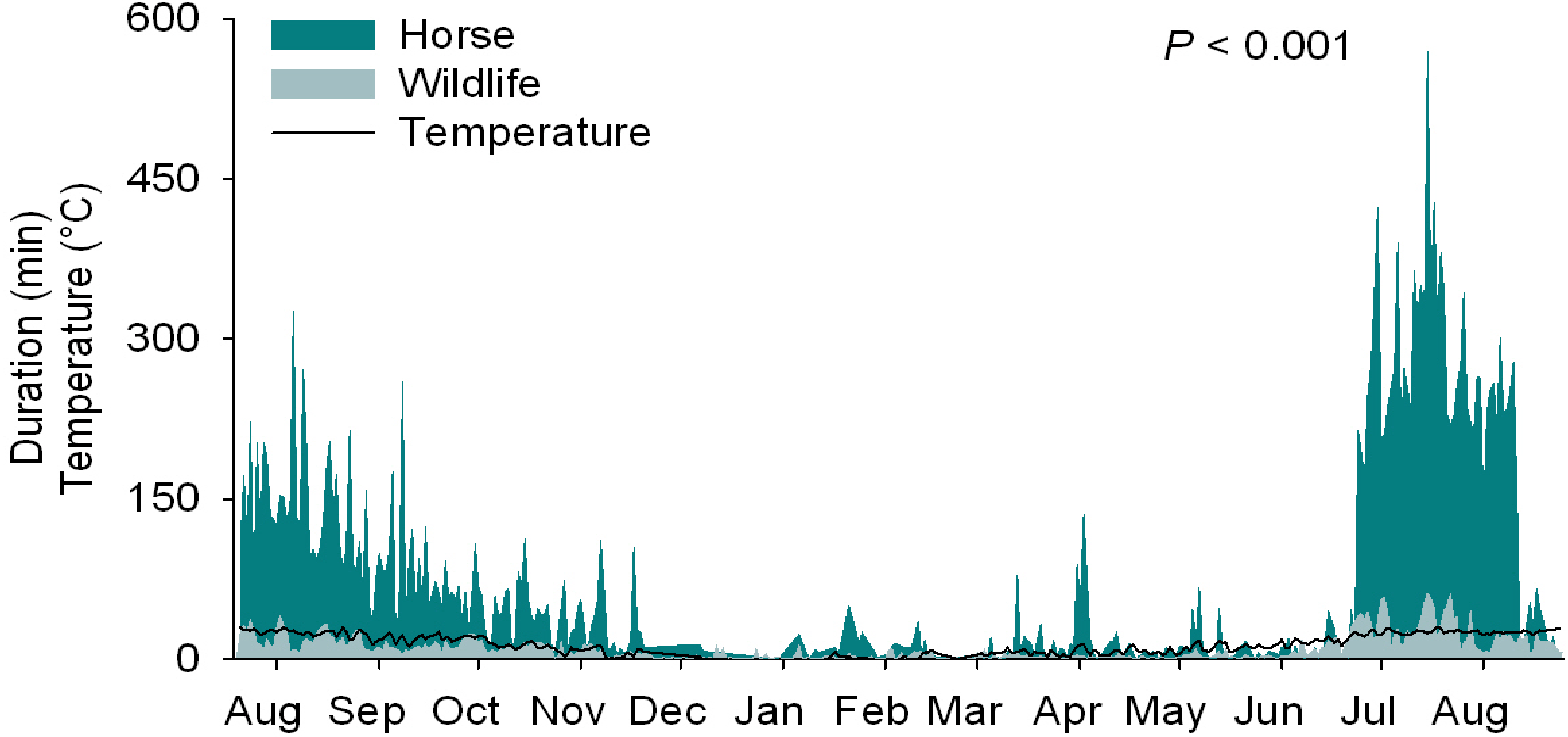
Species included:

- Mourning dove
- Pronghorn
- Mule deer
- Black-tailed jackrabbit
- House finch
- Black-billed magpie

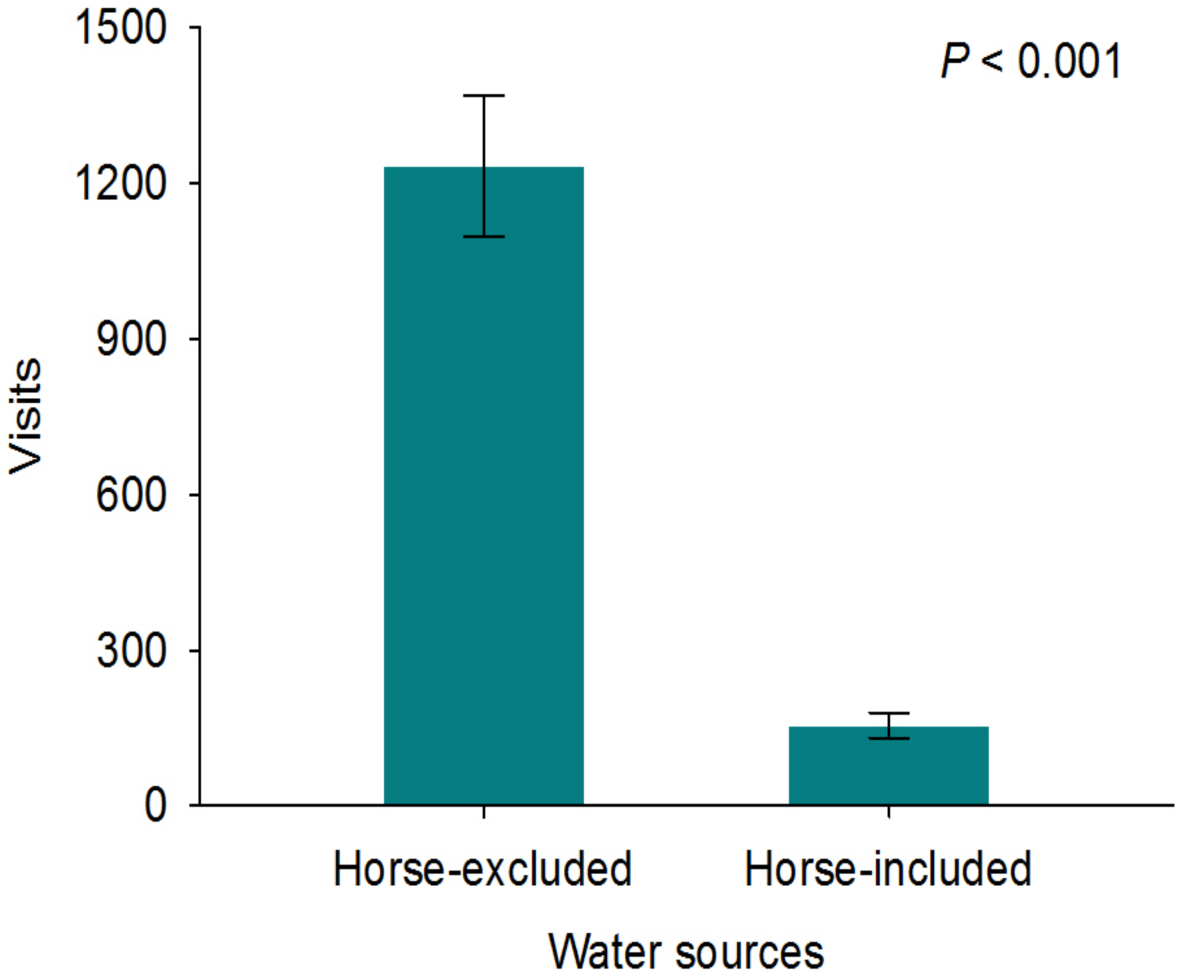


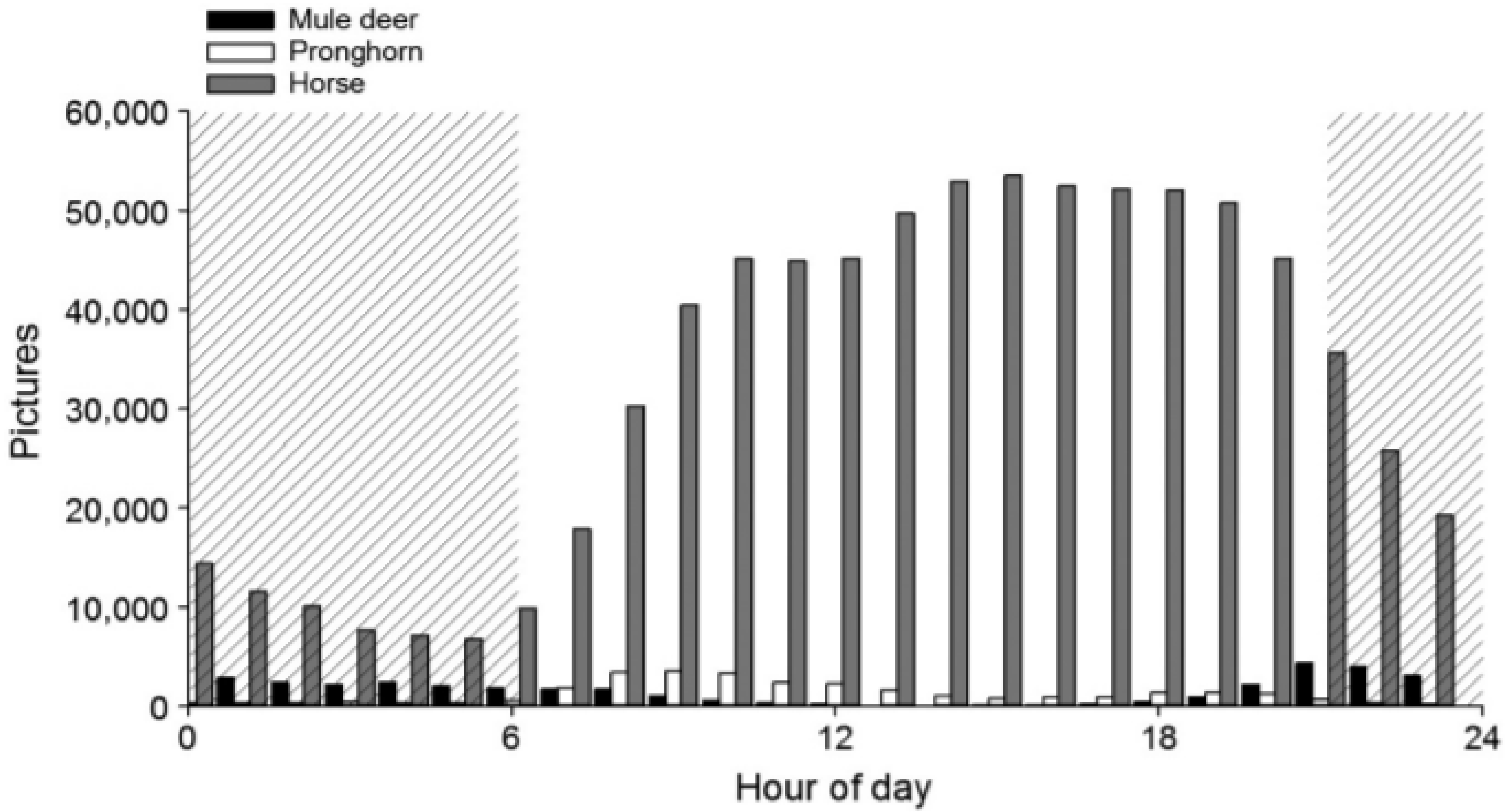
Hall, L. K., Larsen R. T., Westover M. D., Day C. C., Knight R. N., and McMillan B. R. 2016. Influence of exotic horses on the use of water by communities of native wildlife in a semi-arid environment. Journal of Arid Environments 127:100-105

Temporal Patterns Between Feral Horses and Wildlife



Wildlife Visits





Hall, L. K., Larsen R. T.,R. N. Knight, and McMillan B. R. 2018. Feral horses influence both spatial and temporal patters of water use by native ungulates in semi-arid environment. Ecosphere 9(1) e02096. 10.1002/esc2.2096.

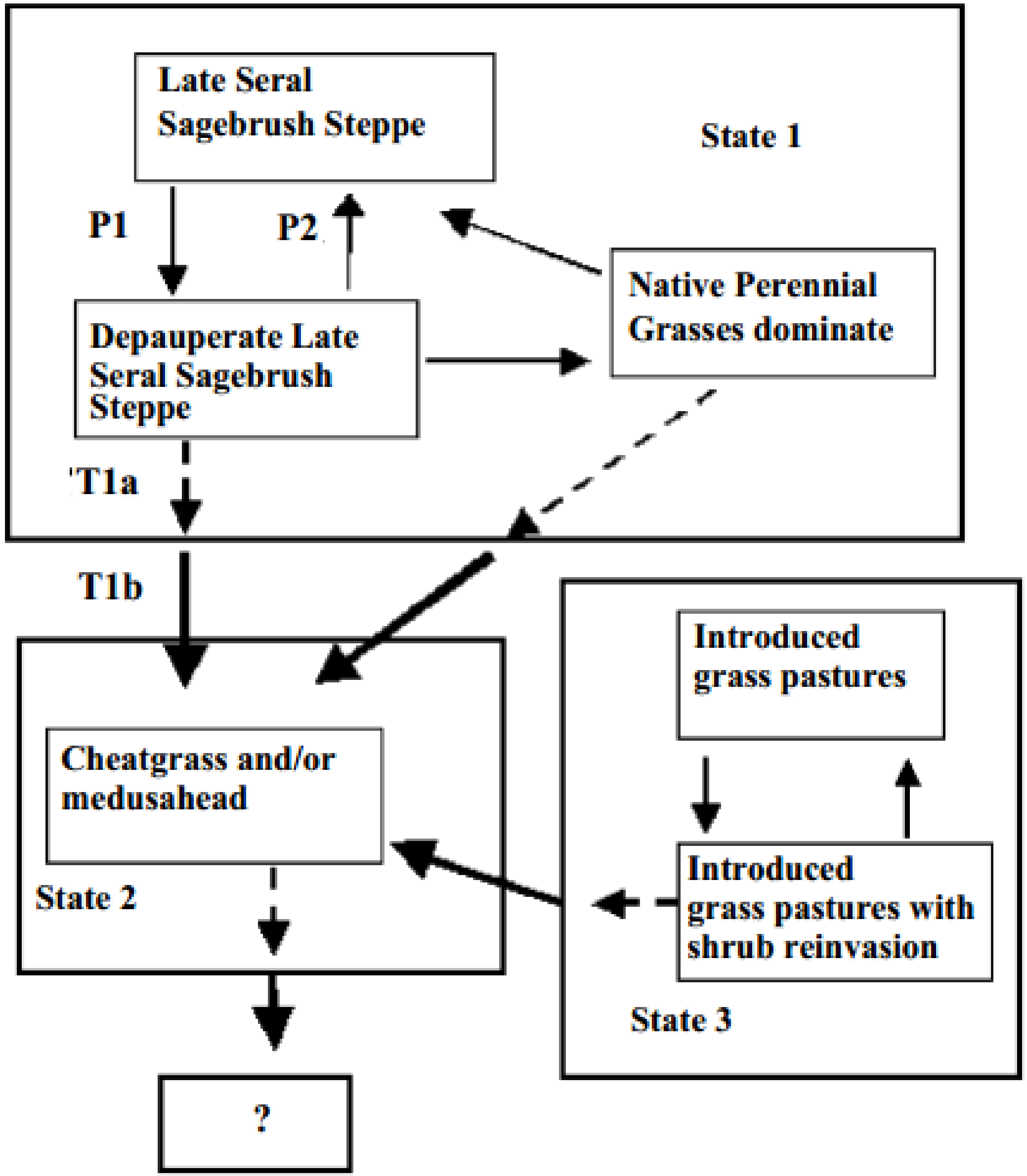
State-and-Transition Theory

State: resilient and resistant complex of soil and vegetation, connected through ecological processes

- Hydrology
- energy capture
- nutrient cycling

Threshold: boundary in space and time between all states

Transitions: trajectory of change that degrade primary ecological processes



Rangeland Management Success

- Increasingly dependent on a managers knowledge of range management, agronomy, animal husbandry, and wildlife management
  - Integrated (coordinated) resource planning
- Need skilled personnel who can evaluate rangeland condition and assess risk
- Implement technological advancements to improvement management strategies

Thank you