

Birgit Pruess, Ph.D.

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Dear Superintendent,
Theodore Roosevelt National Park
Medora ND

My name is Dr. Birgit Pruess and I am a resident of North Dakota. My Ph.D. is in Biology, which I mention to make the point that I am knowledgeable of biological concepts. I have lived in Fargo since 2004 and have photographed and watched the horses and other wildlife since 2014. Many of my observations have recently been summarized in a book. I know the horses, their names, their lineages, whose bands they in just about every day of the year. I also paid attention to horse behavior and ecology of the park. This is all because I love just about everything that is alive.

I am seeing with concern that the three options we are asked to comment on are not targeted to maintain a genetically viable herd of horses in the park. I have below summarized what I found out about some of the claims that were made at the January 12 meeting regarding ecology, the livestock designation, and legal aspects of the situation.

ECOLOGY

Theodore Roosevelt National Park (TRNP) claims that horses impact the ecosystem in a negative way. However, no evidence was presented. In fact, park personnel was unable to point towards a single species that was negatively impacted. Furthermore, the claim omits much research. I have below summarized some of the positive impacts horses have on grassland ecology.

1) On the website of the American Wild Horse campaign (AWHC; <https://americanwildhorsecampaign.org/wild-horses-and-ecosystem>), I found the following information: Horses have upper and lower incisors and can consequently clip the grass above the soil line. This leaves the plant alive and it can grow back. In contrast, cattle and bison are lacking the front teeth. Instead, they wrap their long and flexibler tongues around the grass and can pull the entire plant out of the soil (at least when the grass is wet). The grass can then not grow back.

Seeing as I am a scientist, I don't trust any kind of information without references. I went to Google Scholar, where I found this paper: Larson *et al.*, eScholarship, 2015. (<https://doi.org/10.3733/ucanr.8524>). The reference supports the above claim #1 by AWHC. This same reference also says that multi species grazing is best because of different dietary requirements for different animals.

2) Going back to the AWHC website, there are differences in the digestive system between horses and cattle/bison. Cattle and bison are ruminants with four stomachs, horses are considered semi-ruminants. Horses don't degrade the vegetation, including seeds, completely. As a consequence, seeds pass through the system in a viable form. This helps the spread of plants, species diversification, and also aids the building of a nutrient rich soil. Cattle and bison degrade vegetation much more effectively. While this is an advantage for the animal and permits feeding on nutrient low vegetation, the feces does not contain viable seeds and is less nutrient rich.

Further investigation by means of peer-reviewed research articles revealed that the germination of seeds from horse feces has been reported in the scientific literature for decades. For a first example of a reference, please see Quinn *et al.*, Natural Areas Journal, 2008.

([https://DOI:10.3375/0885-8608\(2008\)28\[356:GOIPSA\]2.0.CO;2](https://DOI:10.3375/0885-8608(2008)28[356:GOIPSA]2.0.CO;2)).

A second example of a peer-reviewed research article reports that horse dung has a positive effect on plant diversity. Valdez-Correcher *et al.*, Scientific Reports, 2019.

(<https://www.nature.com/articles/s41598-019-42249-z>).

3) An additional example of a positive impact of horses on grassland ecology, feral equids (horses and donkeys) dig holes up to 2 m (or 6 foot) to groundwater (in the deserts of North America). These are used by other species and decrease distance between water sources and increase germination of key riparian trees (riparian: situated by banks of river). The reference for this is Lundgren *et al.*, Science, 2021. (<https://www.science.org/doi/10.1126/science.abd6775>). The term ‘ecosystem engineer’ has been used in this context.

4) My final example of positive impacts of horses on grasslands is the reduction of fire by horses. This has to do with reducing the amount of combustible plant vegetation. There are again many research articles out there that document this phenomenon world wide. It applies to other grazers as well, though each grazing species has preferred grasses and consequently reduces these preferred grasses the most. Equine in particular reduce gorse, but that only grows in Europe and Africa, not here. An NPR article describes a fire that spread right to the area where feral horses had been foraging. The saving of the community was attributed to the Wild Horse Fire Brigade. (<https://www.npr.org/2022/10/30/1131042723/preventing-wildfire-with-the-wild-horse-fire-brigade>). The Fence Post describes a ‘common’, a ring of grazers around their community to reduce the spread of fire (<https://www.thefencepost.com/news/livestock-grazing-can-be-fire-mitigation-tool-during-the-season/>). I did not find a really good peer reviewed article for North America. I found one paper where the author attributes the increase in fires to the extinction of previous much larger species of grazers (mammoth).

In summary of the above evidence, it is one sided to say that horses have a negative impact on grassland ecology. They clearly have both, negative and positive impacts. I found an interesting article about grazing not being a binomial (grazed or not grazed). The amount of grazing matters. This article by Davies and Boyd, BioScience, 2020 (<https://doi.org/10.1093/biosci/biz138>) attributes the ‘bad’ reputation of grazing to the equation with historical unrestricted grazing. Overgrazing really is ‘bad’. This gets us to number of grazing animals.

TRNP followed a model by Irby and coworkers (whose original reference I was unable to retrieve) that predicted an appropriate number of bison, elk, mule deer, and horses. In a study published in the J. of Environm. Management in 2002 ([http:// DOI: 10.1006/jema.2001.0514](http://DOI:10.1006/jema.2001.0514)), this model was re-evaluated. The group came to the conclusion that their earlier model “under-estimated the total number of ungulates that TRNP could support”. Specifically, the previous model might have led “to over protection of common plant communities and insufficient protection of rare plant communities”.

Clearly, number of animals is important and there is no evidence in the literature I reviewed that a complete elimination of the herd is in any ways beneficial for the ecology of TRNP. Note that as a biologist, I have no interest in harming the ecology of the park or any other environment.

I understand that the ecological impact study will happen after the scoping period to follow NEPA guidelines. I have below summarized my suggestions:

- Determine specific species of plants and/or animals that have been negatively impacted by the presence of the horses in the past. It should be possible to be specific about names of individual species, as well as percent reductions or percent increases. Personally, I like to know whether the species that was impacted is a native one or an invasive one.
- Develop a model like the revised one from the 2002 article by Irby and coworkers to determine appropriate numbers of horses, as well as other grazers. It seems like biodiversity of grazers is important; this means that removing one grazer (*e.g.* horse) may not be beneficial for the ecosystem. I hypothesize that replacing close to 200 horses by as many bison and/or elk would probably be counterproductive.
- Assuming the number of non-horse grazers stays what it is now, it would be of interest to know what the impact is of 50 horses, 100 horses, and 150 horses, all as compared to no horses.

THE LIVESTOCK DESIGNATION

The designation ‘LIVESTOCK’ is used by TRNP as a justification for the removal of the horses. However, I noticed a few inconsistencies regarding this designation.

1) TRNP personnel still publish horses as ‘FERAL’ in their research publications.

Title 1: Genetic diversity and origin of the **feral** horses in Theodore Roosevelt National Park. Ovchinnikov *et al.*, PLoS One, 2018. ([http://doi: 10.1371/journal.pone.0200795](http://doi:10.1371/journal.pone.0200795). eCollection 2018). In their other paper from 2018, also in PLoS One, TRNP refer to the horses as free-ranging.

Title 2: **Feral** Horses and bison at Theodore Roosevelt National Park (North Dakota, United States) exhibit shifts in behaviors during drone flights. Lenzi *et al.*, Drones, 2002. (<https://doi.org/10.3390/drones6060136>). Both, horses (*Equus caballus*) and bison (*Bison bison*) are being referred to as terrestrial charismatic species.

2) A lot of the discussion about the ‘wildness’ of the American mustang/horse centers around the presumed extinction of the original wild horse and the re-introduction of horses by Europeans just a few centuries ago. This would also mean that the original wild horse and the newer European horses should show clear genetic distinctions.

An article in Nature Communications describes DNA sampling in Canada’s permafrost that led to the reconstruction of ancient ecosystems (<https://www.eurekalert.org/news-releases/937153>). The authors determined that the North American horse persisted until at least 5,000 years ago, which is longer than the previously assumed 11,000 years. The paper concludes: “Although

mammoths are gone forever, horses are not” says Ross MacPhee of the American Museum of Natural History, another co-author. “The horse that lived in the Yukon 5,000 years ago is directly related to the horse species we have today, *Equus caballus*. Biologically, this makes the horse a native North American mammal, and it should be treated as such.”

Another study from Canada’s permafrost determined the age of the last common ancestor of all members of the genus *Equus* to be 4 to 4.5 millions of years ago (Millar and Lambert, Nature, 2013) (<https://www.nature.com/articles/nature12263>). How different does this revelation make a domestic horse from a wild one?

The study by TRNP personnel I mentioned before (Ovchinnikov *et al.*, PLoS One, 2018) (<http://doi:10.1371/journal.pone.0200795>. eCollection 2018) was unable to determine the exact origin of the TRNP horses. However, phylogenetic testing yielded similarities with two horses from China, one from Yakutia, and one from Italy. The possibility of migration from Siberia or East Asia to North America was considered. The article concludes with the recommendation to introduce new genetic stock to increase genetic diversity. This article was co-authored by TRNP personnel and published just a few years ago. What on earth has changed since that time?

- 3) What about bison? I found this on the TRNP website “Livestock animals include bison, cattle and horses”. (<https://www.nps.gov/thro/learn/nature/wildlife-management.htm>). Are bison now wildlife or livestock?

An intriguing article in Biological Conservation by Freese and coworkers from 2007 (<https://doi.org/10.1016/j.biocon.2006.11.019>) calls for a “Second chance for the plains bison”. Given that few of the 500,000 plains bison are free of cattle gene introgression and 96% are subject to selective breeding practices, the authors came to the conclusion that the plains bison is practically extinct. Their paper is a call to conserve the wild bison genome.

A recent study by Stroupe *et al.*, Scient. Rep., 2022 (<https://www.nature.com/articles/s41598-022-09828-z>) used genome wide assessment of DNA from bison, includes those from herds that had previously been determined cattle gene free (*e.g.* Yellowstone, Wind Cave). Cattle gene introgression was found in every single one of the tested bison.

- 4) Let’s talk about humans for a moment. How many of us evolved here? I know I did not.

Altogether, the American mustang/horse is not that different from a wild horse as some people like us to believe. Likewise, the bison is not exactly genetically pure either. I am not proposing to reduce the number of bison in TRNP any more so than what has been done in the past. But I don’t see why horses need to be treated differently based on genetics that appears to be as one sidedly reported as the ecological impact of horses on grassland ecology.

Suggestion: drop the livestock designation. Replace by wild. Or feral, if you must. Though I have not come across a convincing genetic definition of feral, I have to say.

LEGAL ASPECTS

TRNP personnel refers to federal code (36 CFR § 2.60) as a justification to get rid of the horses. I looked this up and found the following:

(a) The running-at-large, herding, driving across, allowing on, pasturing or grazing of livestock of any kind in a park area or the use of a park area for agricultural purposes is prohibited, except:

(1) As specifically authorized by Federal statutory law; or

(2) As required under a reservation of use rights arising from acquisition of a tract of land; or

(3) As designated, when conducted as a **necessary and integral part of a recreational activity or required in order to maintain a historic scene.**

(b) Activities authorized pursuant to any of the exceptions provided for in paragraph (a) of this section shall be allowed only pursuant to the terms and conditions **of a license, permit or lease.** Violation of the terms and conditions of a license, permit or lease issued in accordance with this paragraph is prohibited and may result in the suspension or revocation of the license, permit, or lease.

The above cited federal code appears to be a poor justification for the removal of the horses. First of all, the horses could just be designated as wild or feral instead of livestock and the whole problem would be solved. This is if TRNP likes to keep the horses, which may or may not be the case. Even if the livestock designation sticks, there is the option for a license, permit or lease. I suggest to apply for that. It may be much easier than the amendment to federal law that was mentioned in the January 12 meeting. Admittedly, I am not a lawyer, but I am sure that legal advice could be consulted in this situation.

Overall, I am not convinced by many of the claims TRNP is making to justify the removal of all or most of the horses. I realize that some of them will have to be removed. But the number should be determined by the future ecological study. The genetic and legal claims are weak at best. My suggestion is to drop the livestock designation and include the points I made under Ecology in the ecological study. That should help determine an approximate number of horses the ecosystem can handle.

Sincerely and respectfully. I hope we can resolve this issue and everybody gets to keep enjoying TRNP.



Birgit Pruess, Ph.D.