## Briefing Statement

**Bureau: National Park Service**

**Issue: Cattle Introgression of the Yellowstone Bison Genome**

**Park: Yellowstone National Park**

**Date: November 8, 2022**

**Key Points:**

* In 2021, geneticists at Texas A&M published findings that all North American bison have some level of cattle introgression, including Yellowstone bison.
* While this finding is disappointing, it does not change the conservation value of Yellowstone bison, which remain the closest ancestral connection to the animals that once roamed North America.
* Yellowstone bison are valuable because they live in herds of several thousands of individuals, moving and grazing across migratory landscapes, competing with other herbivores, and coping with predators and disease.
* Letting nature regulate Yellowstone bison allows the fittest to survive, helping them adapt to the environment as it changes, which should remove any genes, including cattle-related genes, that reduce their fitness.

**Background:**

* The low level of cattle introgression in Yellowstone bison was only detected by complete genome sequencing, which provided a conclusive description of the genetic makeup of 25 bison that were descendants of five remnant privately owned historic herds (1800s), Yellowstone bison, and four cattle breeds in North America.
* The geneticists used a variety of statistical techniques to identify if cattle DNA occurred in bison. For every single nucleotide that makes up DNA, they evaluated if the same ones were found in the same locations between cattle and bison. Cattle and bison naturally share some overlap, but the statistical techniques attempted to differentiate overlap occurring from hybridization.
* The detection of a low-level of cattle genes in Yellowstone bison is not surprising given the introduction of bison from other remnant herds into the park during the early 1900s to facilitate restoration and enhance genetic diversity following their slaughter and near extirpation by colonists in the late 1800s.
* When bison numbers were at their fewest in the late 1800s, they included the last wild herd in Yellowstone and five privately owned herds across the country. Private buffalo managers often cross-bred bison and cattle.
* In the early 1900s, park managers brought 21 privately owned bison into Yellowstone to captively breed bison when they feared this last wild herd may go extinct. At least one of the males was hybridized with cattle genes.
* Previous research that evaluated smaller sections of DNA did not detect cattle introgression in Yellowstone bison, confirming the level is incredibly low.

**Current Status:**

* Allelic diversity, allele frequencies, and inbreeding levels have remained similar since the 1990s based on 44 microsatellites across the bison genome. Also, bison from both the native and introduced lineages remain in the population in approximate equal distribution based on mitochondrial DNA.
* The genetic health of the population has been maintained without genetic exchange from other populations, which is likely the result of managing for larger numbers and reducing the regularity of large culls.
* The NPS is collaborating with Dr. James Derr at Texas A&M University to develop a long-term monitoring tool to track genetic diversity in Yellowstone bison and then re-sample the genetic diversity to assess how various management strategies could affect its conservation over time.
* Yellowstone National Park will continue to manage bison as wildlife to reduce any adverse effects of the incredibly low-level of cattle introgression that has been detected.

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