FOCUS QUESTIONS

- What role did American bison play in shaping the North American prairie ecosystem?
- How did the near-extinction of bison impact Indigenous communities and prairie biodiversity?
- How do keystone species influence ecosystem stability and biodiversity?
- What does it take to reintroduce a keystone species, and what are the benefits and challenges?
- How do traditional Indigenous land stewardship practices like prescribed fire support healthy ecosystems?
- How can collaboration between tribes, scientists, and conservation organizations help restore both nature and culture?

OVERVIEW

In ***Thunder & Fire,*** the Osage Nation, along with partners like The Nature Conservancy and the Bronx Zoo, work to restore American bison — a keystone species once numbering over 60 million — to their native prairie homeland. Through grazing, trampling, and wallowing, bison maintained plant diversity, soil fertility, and habitat heterogeneity.

By rebuilding the bison herd and using traditional land practices such as controlled burns, the Osage Nation is not only restoring balance to the grasslands but also reviving cultural and spiritual ties nearly lost after settlers nearly eradicated the buffalo. This episode shows how reconnecting people to ancestral lands and animals can revitalize ecosystems and communities alike.

KEY CONCEPTS

- **Biocultural Restoration:** The process of revitalizing both ecological systems and the cultural practices, knowledge, and values of the communities that are intrinsically connected to those ecosystems.
- **Cultural Revitalization:** The process of affirming and reclaiming cultural identity and practices.
- **Cultural Stewardship:** The practice of caring for land using Indigenous knowledge systems, values, and traditions that prioritize sustainability and interconnectedness.
- **Ecosystem Engineers:** Organisms that directly or indirectly create, modify, or maintain habitats (e.g., bison wallows)
- **Keystone Species:** A species that has a disproportionately large effect on its environment relative to its abundance.

- **Prairie Ecosystem:** A grassland community rich in biodiversity, shaped by grazing, fire, and weather.
- **Species Reintroduction:** The process of returning a species to parts of its native range where it has disappeared.
- **Traditional Ecological Knowledge (TEK):** The evolving knowledge acquired by Indigenous peoples over centuries through direct contact with the environment.

BACKGROUND

Once, bison herds "thundered" across the plains, shaping the land and supporting many Native Nations. By the late 1800s, government policies and overhunting nearly wiped them out, severing an important connection between the animals and the Indigenous communities who depended on them.

Today, the Osage Nation is bringing buffalo back to their prairie, with help from The Nature Conservancy and the Bronx Zoo's breeding program. They combine modern conservation science with traditional stewardship, such as controlled burning to maintain healthy prairies.

Together, the return of bison helps restore native grasses, supports diverse prairie species, and reconnects communities with cultural traditions, language, and identity.

BIODIVERSITY THREATS

The five biggest human-caused threats to biodiversity can be listed (in order of severity) using the easy to remember acronym **H.I.P.P.O**.: **H**abitat destruction and fragmentation, **I**ntroduced species, **P**ollution, **P**opulation growth, and **O**verharvesting.

In ***Thunder & Fire,*** we see how **overhunting** reduced bison populations from an estimated 60 million to fewer than a thousand by the late 1800s. This loss devastated prairie ecosystems, as bison are a keystone species and ecosystem engineers that maintain healthy grasslands through grazing, wallowing, and fertilizing soil.

Habitat loss due to settlement, agriculture, and the suppression of natural fires also contributed to the decline of prairie ecosystems and the species that depend on them. Without bison and natural fire, invasive species can outcompete native prairie plants, reducing biodiversity and weakening the land.

DISCUSSION QUESTIONS

- **[Before showing the film]** What do you know about bison and their importance to prairie ecosystems?
- **[Before showing the film]** Why might fire be an important tool for land management?
- **[Before showing the film]** How can reintroducing one species impact an entire ecosystem?

- **[After the film]** How do bison act as keystone species and ecosystem engineers?
- **[After the film]** What modern and traditional methods do the Osage use to care for the prairie?
- **[After the film]** How do grazing animals influence plant community composition?

POTENTIAL CLASSROOM ACTIVITIES

- **Map the Bison's Return:** Create a visual timeline showing bison population decline, conservation milestones, and current reintroduction projects.
- **Build a Bison Wallow Model:** Bison create shallow depressions called *wallows* that collect water and provide habitat for other species. Students can build a simple model using soil and water to see how wallows create mini wetlands and discuss how this affects prairie biodiversity.
- **Controlled Fire Experiment:** Use online resources or case studies to investigate how prescribed burns affect plant germination, soil nutrients, and invasive species.

CURRICULUM CONNECTIONS

NGSS

- HS-LS2: Ecosystems: Interactions, Energy, and Dynamics
    - LS2-6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
    - LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
    - LS2-8 Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
- HS-LS4 Biological Evolution: Unity & Diversity
    - LS4-6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
- HS-ESS3
    - ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

AP Biology

- Big Ideas
    - Systems Interactions (SYI)
        - 8.3 Population Ecology
        - 8.6 Biodiversity
        - 8.7 Disruptions to Ecosystems
    - Evolution (EVO)
        - 8.7 Disruptions to Ecosystems
    - Energetics (ENE)
        - 8.2. Energy Flow Through Ecosystems
        - 8.5. Community Ecology

IB Biology

- A. Unity and Diversity. Common ancestry has given living organisms many shared features while evolution has resulted in the rich biodiversity of life on Earth.
    - A4.2 Conservation of biodiversity
- C. Interaction and Interdependence. Systems are based on interactions, interdependence and integration of components. Systems result in emergence of new properties at each level of biological organization.
    - C4.1 Populations and communities

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