

- a) **Case Study: North American Bison/Wood Buffalo**
- b) **Species Diversity/Richness**

a) **CASE STUDY: North American Bison**

The Demise of the Bison. *Bison antiqua* appear in the fossil record of North America as early as 71,000 YA, giving rise to the American or Plains Bison (*Bison bison*) approximately 30,000 YA. Prior to the 1800s roughly 30 million bison roamed the North American Plains, and for many native cultures, the bison was a sacred animal critical to their survival. However, conservation measures were not practiced, probably as their numbers appeared limitless (*Buffalo Jumps were used for millennia to kill scores of animals at a time*). Bison numbers began to decline rapidly with the arrival of European settlers dropping to as few as several hundred by the late 1800s. This was due to combination of factors, including competition with large wild horse herds introduced by native peoples (obtained from Spanish colonialists), prairies droughts, and especially overhunting by both natives and Europeans.

Hunting pressure increased with European demand for meat and hides, and the increased efficiency of killing associated with the introduction of the horse and the carbine (a lightweight, repeating rifle). Railroads, which provided a means of transportation for rapidly expanding European-American populations, also gave ready access to the prairie herds, and 4-5 million bison were killed in three years alone. By the fall of 1883, the commercial hunt was finished.

Another element to their demise was the U.S. government sanctioned extermination of some herds to subdue native peoples in some regions forcing them onto reservations and opening up space for settlement by white settlers.

Wood Bison (Wood Buffalo): A subspecies of the Plains Bison, the Wood Bison (*B. b. athabasca*) ranged across the northwest U.S. and Canada from Montana to northern Alberta. In the early 1800s, their population was estimated at 168,000 animals, but by 1893 their numbers declined to 250 animals.

Wood Buffalo National Park (WBNP) was established in the early 1900s as an attempt to save Wood Bison from extinction and to protect its habitat. Their numbers slowly increased and by 1922 had reached 1500 to 2000. Between 1925 and 1928, 6,673 plains bison were transferred from Wainwright Buffalo Park in central Alberta to WBNP to boost herd vigor. Unfortunately the introduced bison were infected with bovine brucellosis and tuberculosis. By 1940, it was feared that wood bison had disappeared as a subspecies as a result of interbreeding with plains bison. However, in 1957 federal wildlife

officials discovered a herd of pure wood bison in the Nyarling River area of the park, and in 1963, 18 animals were captured and released in the Mackenzie Bison Sanctuary. These animals founded the Mackenzie herd, which grew to about 2,400 by 1989 and stabilized at 1900 animals by 1998. The Mackenzie herd is now the world's largest free-ranging herd of disease-free wood bison. Another 21 were captured in 1965 and released in Elk Island National Park. The total bison population in Wood Buffalo National Park is now estimated at about 4000 animals (2002).

Limiting Factors

Tuberculosis and brucellosis introduced into WBNP with the plains bison in the 1920s, along with anthrax, are common in the herds in Wood Buffalo National Park and the Slave River lowlands. Recent studies by the University of Saskatchewan suggest that disease levels in the park bison have not declined in the last 40 years for either brucellosis or tuberculosis. In the most recent survey, 29 per cent of bison tested positive for brucellosis while 51 per cent tested positive for tuberculosis. Both brucellosis and tuberculosis may make bison more vulnerable to predation. Eliminating these diseases would remove the greatest obstacle to recovery and reduce conflicts with the Alberta ranchers association, who fear transmission into their cattle herds.

Drowning in spring floods is also a problem faced by all herds in the NWT. As many as 1000 animals can die in a short time when the spring ice cracks.

Protection

The first legislation to protect bison in Canada passed in 1877, although it wasn't until 1964 that wood bison were declared a "protected species" under the Northwest Territories Act, and in 1977 COSEWIC designated wood bison as an Endangered Species.

There is an annual harvest quota of 47 animals from the Mackenzie herd and two from the Nahanni herd. No harvesting is allowed in Wood Buffalo National Park.

Recovery

A National Recovery Plan to protect and recover the wood bison was completed in 2001. Since 1987, a bison control area has been set up and actively monitored to minimize the risk of contact and prevent the spread of disease between the healthy Mackenzie and Nahanni herds and the diseased Slave River Lowlands and WBNP herds. The GNWT is also working co-operatively with the Fort Resolution Aboriginal Wildlife Harvesters Committee on the Hook Lake Recovery Project. The purpose of the project is to capture and salvage bison from the diseased Hook Lake herd and to create a healthy, captive-breeding herd. The long-term objective is to restore healthy wood bison to the wild. The Hook Lake captive herd consists of 111 animals and is considered a new and valuable source of wood bison genetics. By 2005, the Hook Lake bison herd should achieve a disease-free status.

Management and conservation of wood bison in the NWT will require the continued support and input of local communities and resource management boards. Efforts to keep existing herds disease-free will continue as will research into bison habitat and ecology. The GNWT will also continue to work towards developing options for resolving the issue of diseased herds as well as developing long term objectives for re-introducing healthy bison to their former range.

Additional Information Site: www.wildlife.alaska.gov/.../game/wood_bison1.cfm

QUESTIONS:

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| <ol style="list-style-type: none">1. Do you think that the current conservation management strategy is sufficient to protect the Wood Bison from extinction?2. If you could go back in time to the mid-1800s, would you be able to create an effective species protection plan for the bison?3. Are there other endangered species that have been used as political tools? How?4. What ecological/biological factors played a role in the bison's decline? i.e., why were they so vulnerable? |
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b) Species Richness and Species Diversity

Species Richness = # of different species in a community. Distribution is not considered
Species Diversity = # of species and spatial distribution patterns i.e., What proportion of the total number of individuals is represented by a particular species? (relative abundance)

Community 1: Five Species - Even distribution	
Species	# Individuals
A	10
B	10
C	10
D	10
E	10

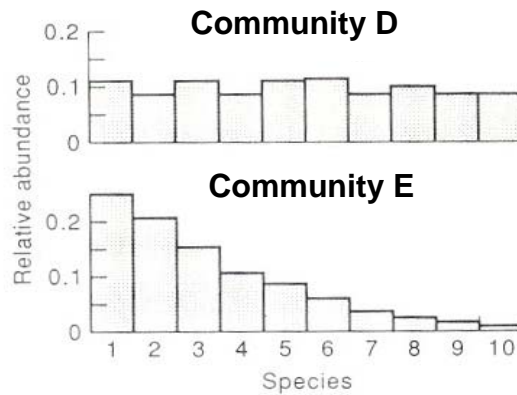
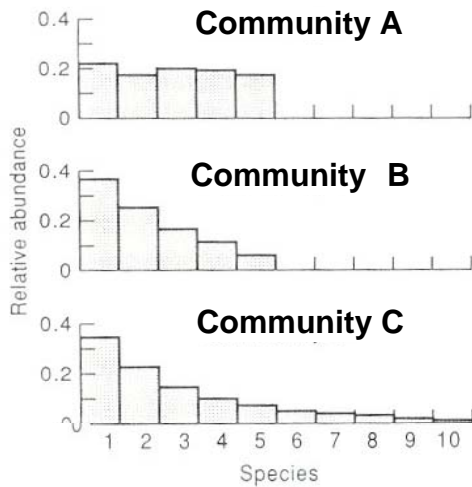
Community 2: Five Species -Uneven distribution	
Species	# Individuals
A	1
B	2
C	1
D	10
E	36

QUESTION:

1. When is species richness a useful measure for conservation purposes?
2. What does species “evenness” tell us about communities?
3. How might species diversity indices be used for conservation?

Consider the following data for 5 different sites randomly sampled until 100 individuals are tallied.

	A	B	C	D	E
Species 1	24	36	30	11	25
Species 2	18	26	22	9	22
Species 3	21	16	15	11	16
Species 4	19	12	10	9	11
Species 5	18	6	8	11	8
Species 6			5	12	6
Species 7			4	9	5
Species 8			3	10	4
Species 9			2	9	2
Species 10			1	9	1
TOTAL	100	100	100	100	100



QUESTIONS:

1. What might the variance among the different communities tell you?
2. How does this information compare with species richness calculations?
3. If you had the resources to protect only one of these sites, which would it be? Why?
4. Let's assume that species 1 through 10 are not necessarily the same for each community. Does this change your answer from #3? Why?
5. List other information that would be very useful in making your determination?

OTHER CATEGORIES OF SPECIES DIVERSITY/RICHNESS

1. Alpha richness (diversity)
 - Number of species in a community
 - Used to compare different communities
2. Gamma richness (diversity)
 - Number of species in a large region/continent
3. Beta richness (diversity): gamma/alpha
 - Rate of change in species composition across a region

