The trophic cascade effect

An original idea by Éric Guittet

Watercolours by Olivier Loir

Funded by the MICHELIN factory in Cholet

ADNature presents this fresco to help you better understand biodiversity, its importance and contribute to its protection.

Biodiversity includes living beings of both fauna and flora with their genetic variability, in their different ecosystems.

This effect of a trophic cascade (food chain disturbance) can readily be seen in Yellowstone, a national park in the United States created in 1872.

Wolves were hunted there until they disappeared from the park in 1930. This left coyotes as the top predator at the apex of the food pyramid, but they do not predate large herbivores such as elk. Elk reproduces in large numbers despite being hunted by bears and pumas.

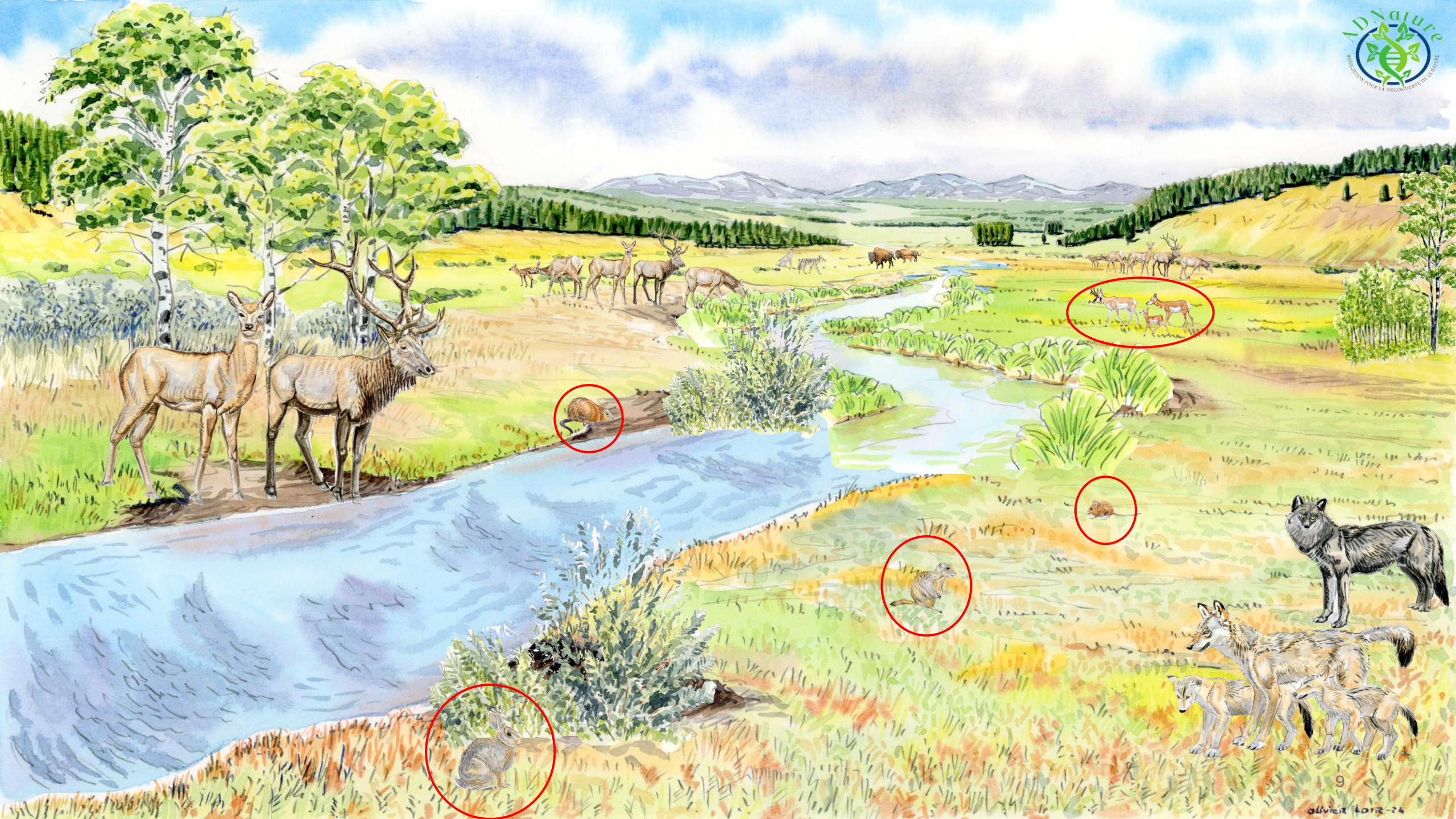
They over-consume meadows, aspens and willows. Herds erode riverbanks and transform the landscape.

In 1995, it was decided to reintroduce wolves in the park. When wolves arrived in the park with their predation and howls, the elks, their favorite preys, changed their behavior.

It became a landscape of fear.

The herds regrouped, moved more, experienced more stress, and preferred open areas where they could see approaching predators more easily. Their feeding became less selective, and their rate of reproduction declined.

Wolves do not like competitors in their territories. Coyotes were gradually driven out (now 40% fewer since the return of the wolf).

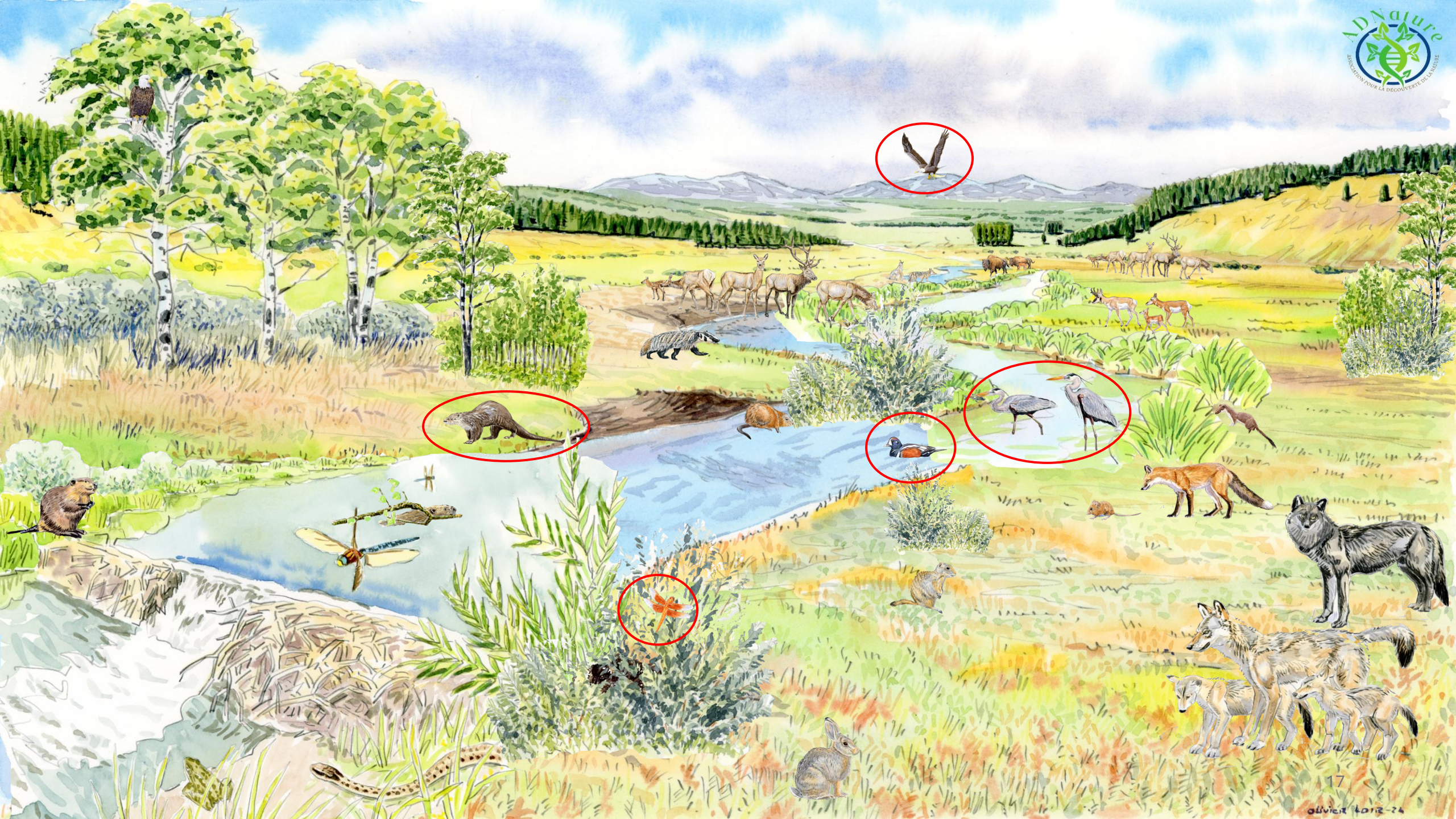


The coyote’s over-predated prey such as the pronghorn antelope, the Uinta ground squirrel, the muskrat, the Nuttall’s rabbit and the harvest mouse could multiply again.

This contributed to the return of small mammal predators such as the red fox or the badger but also birds of prey.

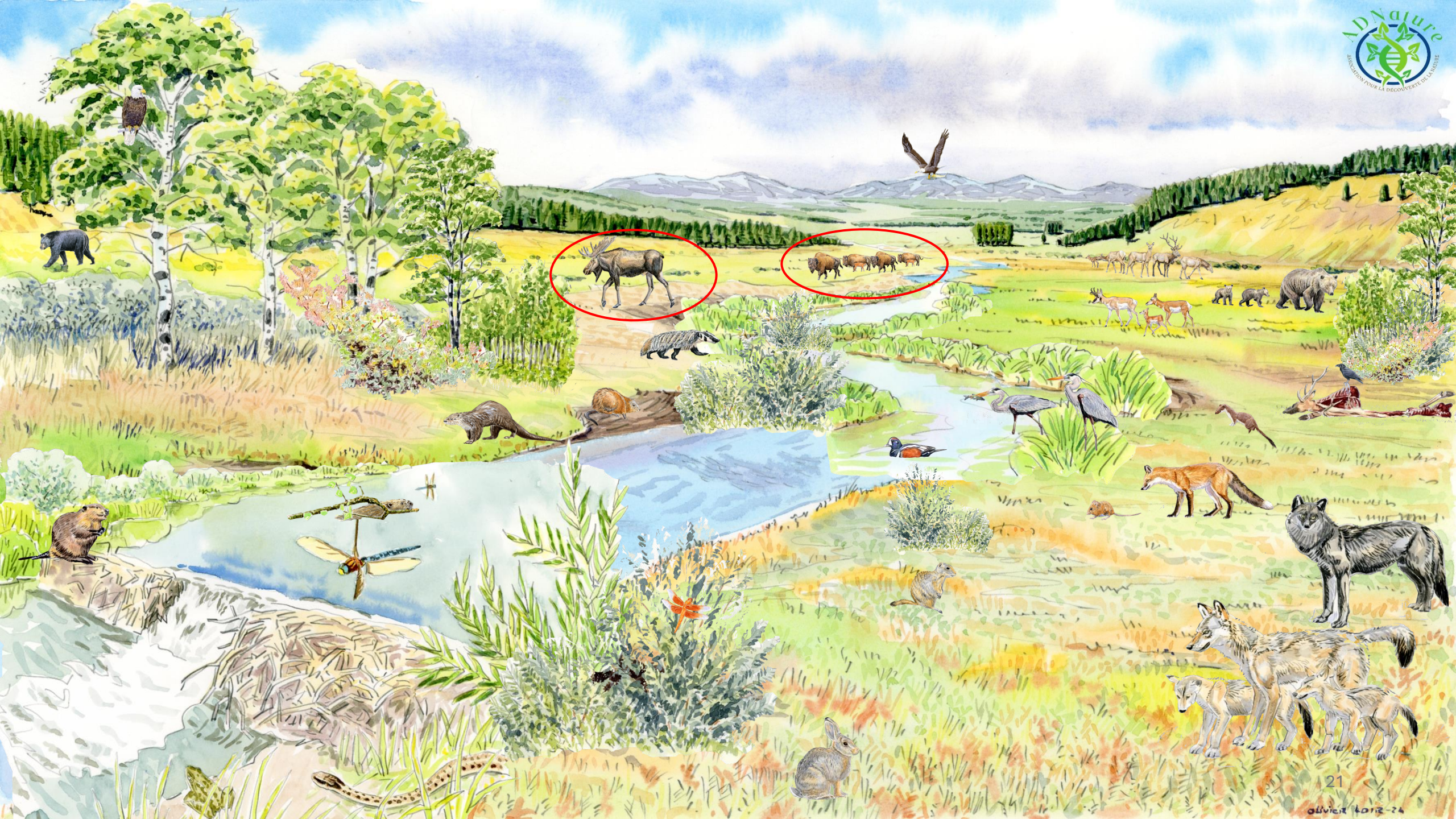
The decrease in the number of elks also allowed pioneer willows and aspens to grow and strengthen the banks of rivers and lakes. The return of these plants gave the opportunity for an ecosystem builder to come back in the form of the beaver.

Its lifestyle, constructing dams, creates wetlands with still water ponds, lakes, and marshes.

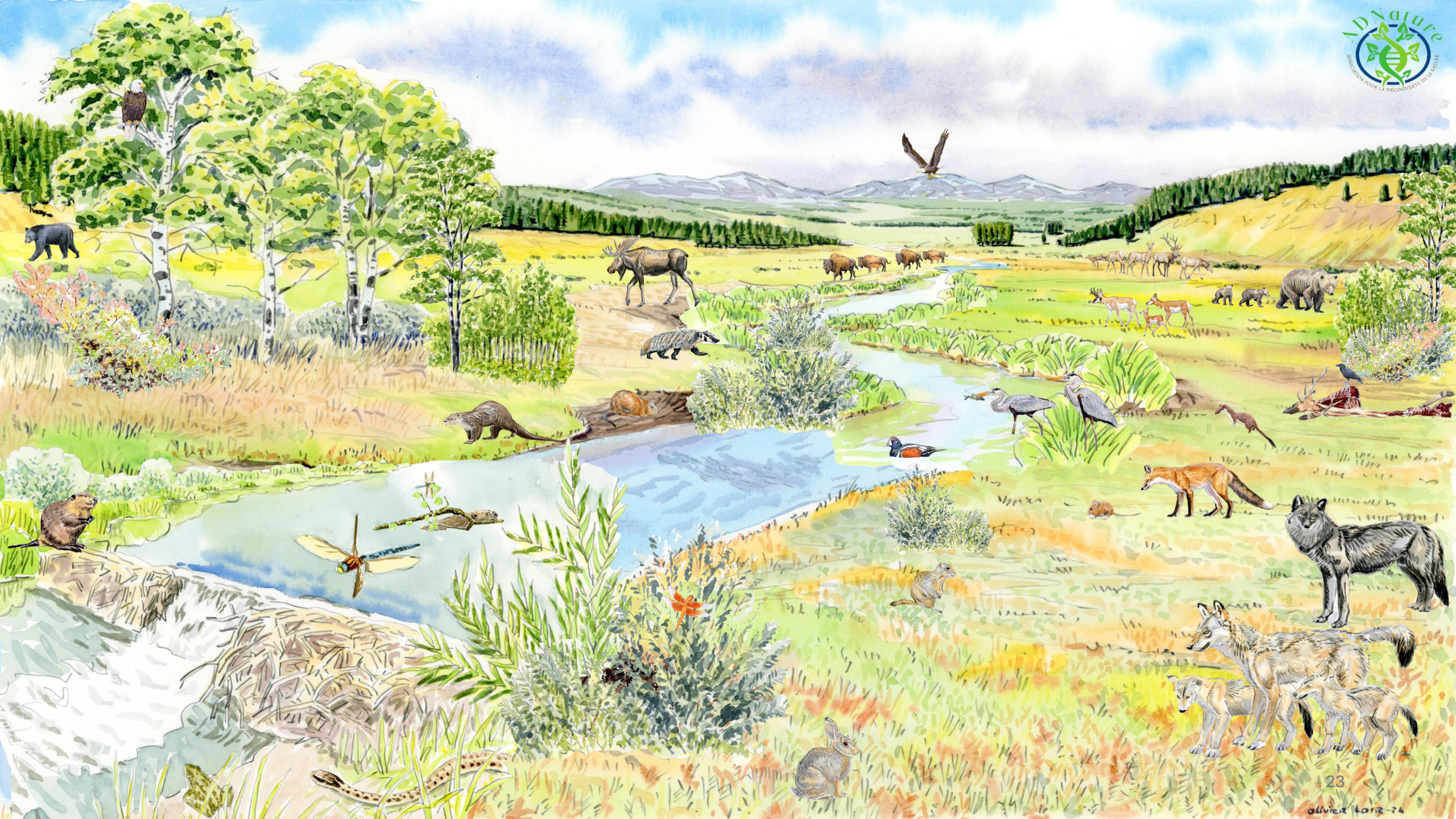


Birds, fish, reptiles, amphibians, insects came back to their ecosystems, together with their predators such as otters, herons, bald eagles ....

The predation of elks also favored the return of berry shrubs and of brown and black bears who find omnivorous conditions suitable to their needs, including the opportunity to scavenge corpses left by wolves.



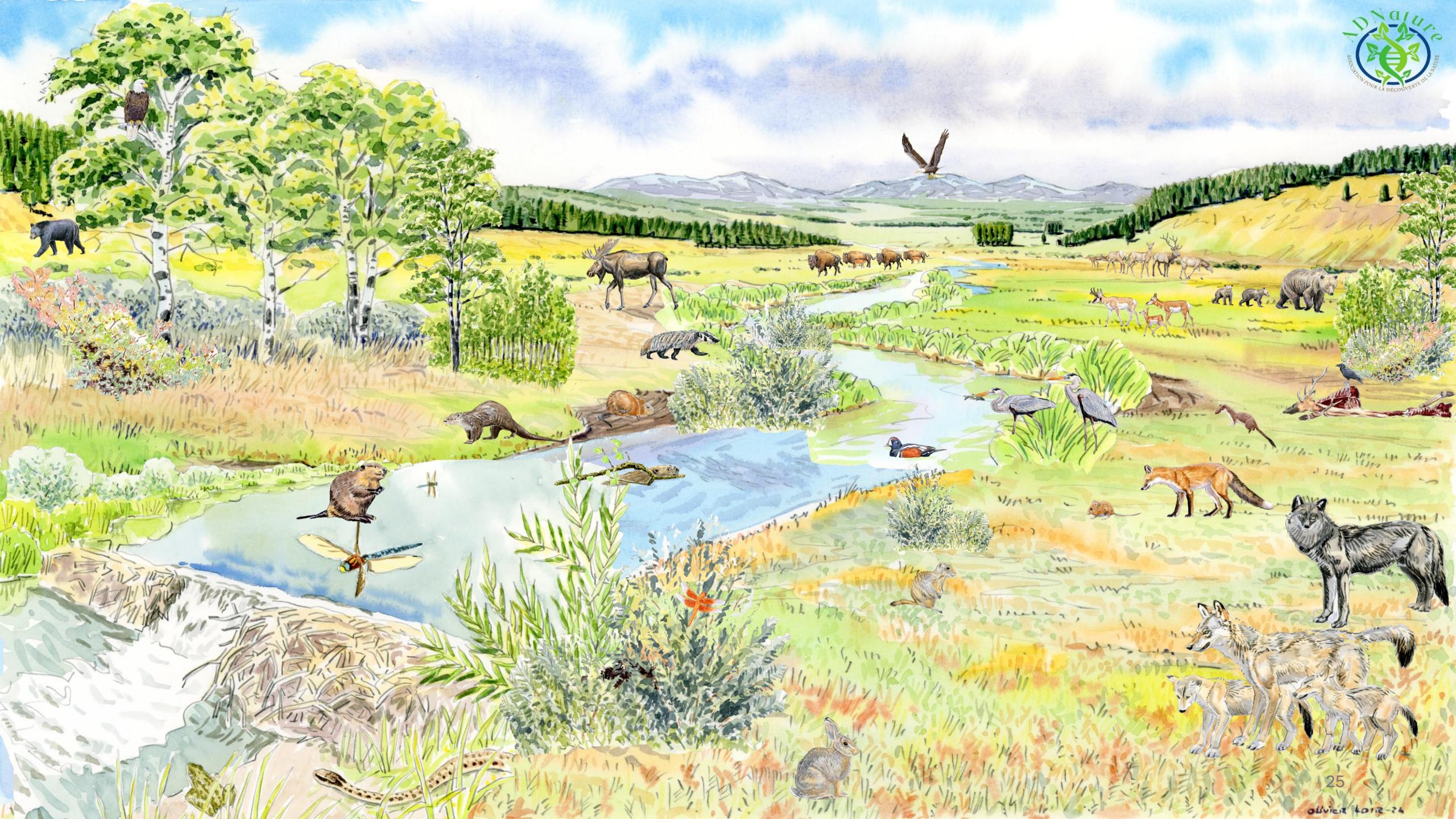
The vegetation of the prairies becoming more varied, bison could once again thrive on them.



As in all ecosystems on our planet, the predator/prey ratio is naturally balanced.

Predators have their place and are preponderant.

Wolf numbers have stabilized and their return acts in cascade on many environments and species allowing for abundant biodiversity.



This example of the trophic cascade effect in Yellowstone Park and its temporality (80 years without wolves, 30 with) is ideal for highlighting how the removal of a single element can unbalance a multitude of ecosystems.

Knowing and understanding biodiversity is the key to our survival in our one and only ecosystem, which is the Earth.

There are other examples of trophic cascades, such as:

- the dingo in Australia
- the beaver and wolf in France
- otters in kelp forests
- dogs barking at raccoons
- the same with wild dogs in the Kalahari on herbivores