Emerging Technologies: De-Extinction

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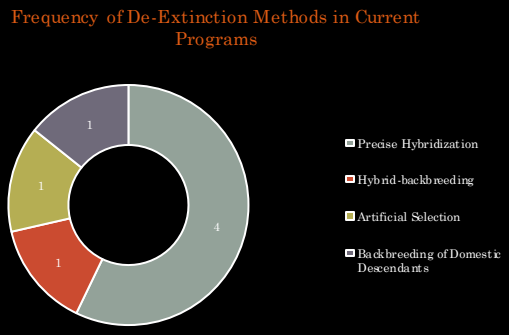
Plan and Implementation

What does De-Extinction really mean?

-Reviving an animal that serves the same ecological purpose as one in the original species

- This can be done in three main ways cloning, selective/artificial breeding, or genome editing.



The official definition of de-extinction given by the NCBI "...the ecological replacement of an extinct species by means of purposefully adapting a living organism to serve the ecological function of the extinct species

by altering phenotypes through means of various breeding techniques, including artificial selection, back-breeding and precise hybridization facilitated by genome editing."

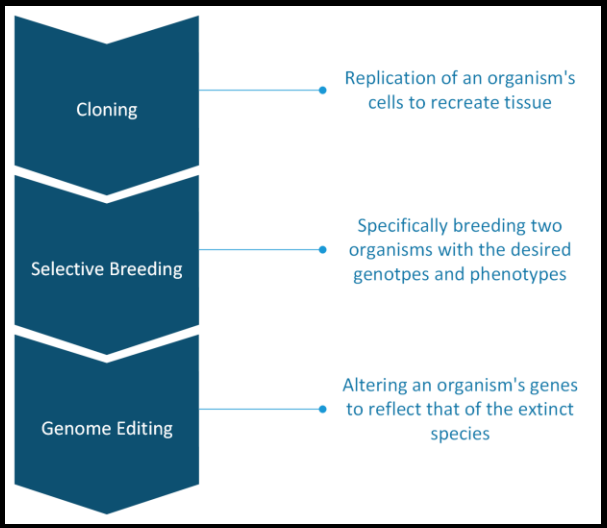
This means a revived animal must have the same environmental relationships that an animal in the original species had. This is factors in a revived animal's place on the food chain which impact predator vs. Prey relationships.

Hybridization is a form of genome editing when each strand of DNA is bound together.

Back breeding is a form of artificial selection where two (usually domestic) organisms are bred to produce a phenotype that is similar to that of wild populations.

Plan and Implementation Cont.

Basic Three Methods to Achieve De-Extinction



As a reminder Hybridization is a form of genome editing and back breeding is a form of selective breeding. These are the three main categories.
-Also, cloning is primarily used when a species has become fully extinct.

Plan and Implementation Cont.

Different Forms of De-Extinction

- Restoration of Local Populations
- Introduction of Domestic Species into the Wild
- Complete Regeneration of Species

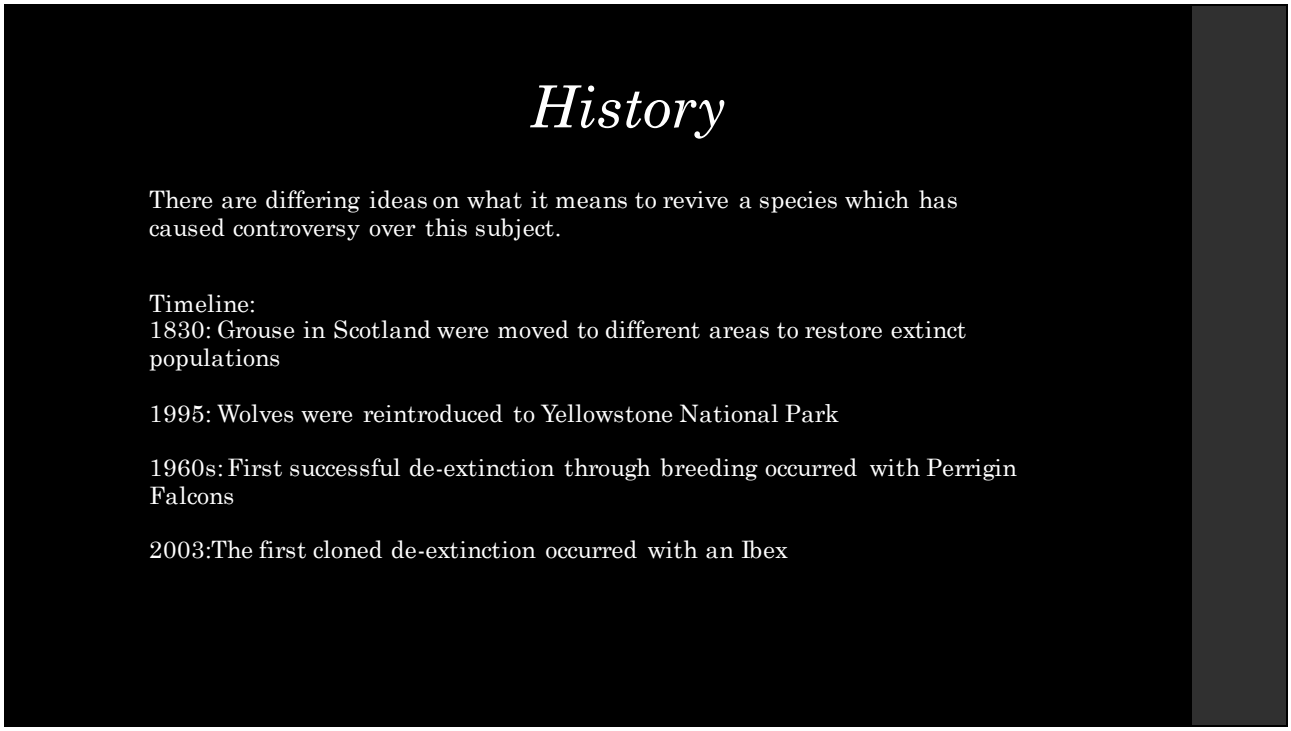
- This is the technology that is still emerging as it has not been successfully accomplished for long term periods

There are also different forms of de-extinction. While one may think it is simply reviving a male and a female of a completely extinct species, in reality de-extinction can be much more complicated.

-Restoring a local population. This means the population of a species has gone extinct in a single ecosystem or area. The species as a whole still exists, but has gone extinct in an area or multiple areas. In this case, de-extinction would be moving members of other populations into the area where the animal is extinct. An example of this could be moving a worm form location A to location B. Location A has a thriving worm population but the worm population in Location B is has gone extinct. By moving a few worms from Location A to Location B the worm population in location be can be restored.

-When all wild populations have gone extinct domestic populations are specially handled then reintroduced to the wild.

-The entire species has gone extinct and there is not a single animal left. The population must be revived completely.



The history of de-extinction is one that is complex to say the least. There has been debate as to whether reviving a completely extinct species is truly reviving a or only creating a proxy. The debate is mainly fueled by the differing definitions of what a species is in philosophy and science. Nonetheless, there have been some notable achievements in this field in which a rough timeline can be erected. In 1830 members capercaillie grouse populations were moved to new areas to restore locally extinct populations. This method of translocation can also be seen when wolves were introduced to Yellowstone National Park. This had great effects on the ecology of the area and restored the natural predator prey relationships. Another important event was the de-extinction of the Perrigin falcon. This falcon had become extinct in eastern U.S., but through randomly breeding different subspecies the bird was able to make a comeback. Then, in 2003 the first cloning de-extinction was achieved. An ibex or Bucardo, was successfully cloned. Sadly, the ibex was born with sever lung damages and died 7 minutes after birth. Because no extinct species has been successfully cloned to live past birth, I believe de-extinction is still an emerging technology.

Benefits

- May Restores the Natural Ecology of an Area
- New Access to Scientific Information
- Provides a Foundation for Technological Advancements
- Allows for the Preservation of New and Old Species

- Introduction of a new animal can restore a food chain that has been disrupted.
-There are new genes to study and new animal behaviors to monitor.
-If scientists are able revive an animal we have become technologically advanced enough to effectively study genes. This could potentially help with disease research.
- We would have an effective way to ensure species don't die out.

Downsides

- Morally Wrong
- New Diseases could Arise
- Ecosystems could be Negatively Affected
- Unaccounted for consequences

- If ancient species were to be revived they would be kept in captivity instead of roaming free. This is unfair to animals and poses a moral dilemma.
-With new genes and possible mutations new diseases could arise, even ones that are transmissible to humans.
-Reintroducing animals could not work in the way ecologists expected.

Summary

I gained a lot of insight into the complexity of De-Extinction throughout this project.

- Originally:
  -I completely supported De-Extinction
- After the Research:
  -I realized De-Extinction is not a straightforward "cure all"
  - There are many potential consequences (both positive and negative) that could arise because of De-Extinction

Summary Cont.

In the End...

I Fully Support:
- -Translocation
- -Introduction of Domestic Species into the Wild

I Do Not Support:
- -Complete Revival of an ancient species

Sources

- De-Extinction - Nov. 2018
- Planning and Implementing a Reintroduction of Wolves to Yellowstone National Park and Central Idaho-2008
- 13 Biggest Pros and Cons of De-Extinction- 2019
- Hybridization
- Breeding Back
  - Breeding Back