Student Materials—Lesson 4

Introductory Activity

Passage 1 is adapted from Stewart Brand, "The Case for Reviving Extinct Species." ©2013 by the National Geographic Society. Passage 2 is adapted from the editors at *Scientific American*, "Why Efforts to Bring Extinct Species Back from the Dead Miss the Point" ©2013 by Nature America, Inc.

Passage 1

Many extinct species—from the passenger pigeon to the woolly mammoth—might now be reclassified as "bodily, but not genetically, extinct." They're dead, Line but their DNA is recoverable from museum specimens and fossils, even those up to 200,000 years old.

Thanks to new developments in genetic technology, that DNA may eventually bring the animals back to life. Only species whose DNA is too old to be recovered, such as dinosaurs, are the ones to consider totally extinct, bodily and genetically.

But why bring vanished creatures back to life? It will be expensive and difficult. It will take decades. It won't always succeed. Why even try?

Why do we take enormous trouble to protect endangered species? The same reasons will apply to species brought back from extinction: to preserve biodiversity, to restore diminished ecosystems, to advance the science of preventing extinctions, and to undo harm that humans have caused in the past.

Furthermore, the prospect of de-extinction is profound news. That something as irreversible and final as extinction might be reversed is a stunning realization. The imagination soars. Just the thought of mammoths and passenger pigeons alive again invokes the awe and wonder that drives all conservation at its deepest level.

Passage 2

The idea of bringing back extinct species holds obvious gee-whiz appeal and a respite from a steady stream of grim news. Yet with limited intellectual bandwidth and financial resources to go around, de-extinction threatens to divert attention from the modern biodiversity crisis. According to a 2012 report from the International Union for Conservation of Nature, some 20,000 species arc currently in grave danger of going extinct Species today are vanishing in such great numbers—many from hunting and habitat destruction—that the trend has been called a sixth mass extinction, an event on par with such die-offs as the one that befell the dinosaurs 65 million years ago. A program to restore extinct species poses a risk of selling the public on a false promise that technology alone can solve our ongoing environmental woes—an implicit assurance that if a species goes away, we can snap our fingers and bring it back.

Already conservationists face difficult choices about which species and ecosystems to try to save, since they cannot hope to rescue them all. Many so countries where poaching and trade in threatened species are rampant either do not want to give up the revenue or lack the wherewithal to enforce their own regulations.

Against that backdrop, a costly and flamboyant project to resuscitate extinct flora and fauna in the name of conservation looks irresponsible: Should we resurrect the mammoth only to let elephants go under? Of course not. That is not to say that the de-extinction enterprise lacks merit altogether. Aspects of it could conceivably help save endangered species. For example, extinct versions of genes could be reintroduced into species and subspecies that have lost a dangerous amount of genetic diversity, such as the black-footed ferret and the northern white rhino. Such investigations, however, should be conducted under the mantle of preserving modern biodiversity rather than conjuring extinct species from the grave.

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Which choice best states the relationship between the two passages?

A) Passage 2 attacks a political decision that Passage 1 strongly advocates.

B) Passage 2 urges caution regarding a technology that Passage 1 describes in favorable terms.

C) Passage 2 expands on the results of a research study mentioned in Passage 1.

D) Passage 2 considers practical applications that could arise from a theory discussed in Passage 1.

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How would the authors of Passage 2 most likely respond to the "prospect" referred to in line 21, Passage 1?

A) With approval, because it illustrates how useful de-extinction could be in addressing widespread environmental concerns.

B) With resignation, because the gradual extinction of many living species is inevitable.

C) With concern, because it implies an easy solution to a difficult problem.

D) With disdain, because it shows that people have little understanding of the importance of genetic diversity.

Group/Pair Activity

Passage 1 is adapted from Susan Milius, "A Different Kind of Smart." ©2013 by Science News. Passage 2 is adapted from Bernd Heinrich, *Mind of the Raven: Investigations and Adventures with Wolf-Birds*. ©2007 by Bernd Heinrich.

Passage 1

In 1894, British psychologist C. Lloyd Morgan published what's called Morgan's canon, the principle that suggestions of humanlike mental processes behind an animal's behavior should be rejected if a simpler explanation will do.

Still, people seem to maintain certain expectations, especially when it comes to birds and mammals. "We somehow want to prove they are as 'smart' as people," zoologist Sara Shettleworth says. We want a bird that masters a vexing problem to be employing human- style insight.

New Caledonian crows face the high end of these expectations, as possibly the second-best toolmakers on the planet.

Their tools are hooked sticks or strips made from spike-edged leaves, and they use them in the wild to winkle grubs out of crevices. Researcher Russell Gray first saw the process on a cold morning in a mountain forest in New Caledonia, an island chain east of Australia. Over the course of days, he and crow researcher Gavin Hunt had gotten wild crows used to finding meat tidbits in holes in a log. Once the birds were checking the log reliably, the researchers placed a spiky tropical pandanus plant beside the log and hid behind a blind.

A crow arrived. It hopped onto the pandanus plant, grabbed the spiked edge of one of the long straplike leaves and began a series of ripping motions. Instead of just tearing away one long strip, the bird ripped and nipped in a sequence to create a slanting stair-step edge on a leaf segment with a narrow point and a wide base. The process took only seconds. Then the bird dipped the narrow end of its leaf strip into a hole in the log, fished up the meat with the leaf-edge spikes, swallowed its prize and flew off.

"That was my 'oh wow' moment," Gray says. After the crow had vanished, he picked up the tool the bird had left behind. "I had a go, and I couldn't do it," he recalls. Fishing the meat out was tricky. It turned out that Gray was moving the leaf shard too forcefully instead of gently stroking the spines against the treat.

The crow's deft physical manipulation was what inspired Gray and Auckland colleague Alex Taylor to test other wild crows to see if they employed the seemingly insightful string-pulling solutions that some ravens, kea parrots and other brainiac birds are known to employ. Three of four crows passed that test on the first try.

Passage 2

For one month after they left the nest, I led my four young ravens at least once and sometimes several times a day on thirty-minute walks. During these walks, I wrote down everything in their environment they pecked at. In the first sessions, I tried to be teacher. I touched specific objects—sticks, moss, rocks—and nothing that I touched remained untouched by them. They came to investigate what I had investigated, leading me to assume that young birds are aided in learning to identify food from the parents' example. They also, however, contacted almost everything else that lay directly in their own paths. They soon became more independent by taking their own routes near mine. Even while walking along on their own, they pulled at leaves, grass stems, flowers, bark, pine needles, seeds, cones, clods of earth, and other objects they encountered. I wrote all this down, converting it to numbers. After they were thoroughly familiar with the background objects in these woods and started to ignore them, I seeded the path we would later walk together with objects they had never before encountered. Some of these were conspicuous food items: raspberries, dead meal worm beetles, and cooked corn kernels. Others were conspicuous and inedible: pebbles, glass chips, red winterberries. Still others were such highly cryptic foods as encased caddisfly larvae and moth cocoons. The results were dramatic.

The four young birds on our daily walks contacted all new objects preferentially. They picked them out at a rate of up to tens of thousands of times greater than background or previously contacted objects. The main initial criterion for pecking or picking anything up was its novelty. In subsequent trials, when the previously novel items were edible, they became preferred and the inedible objects became "background" items, just like the leaves, grass, and pebbles, even if they were highly conspicuous. These experiments showed that ravens' curiosity ensures exposure to all or almost all items in the environment.

Independent Activity

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The crows in Passage 1 and the ravens in Passage 2 shared which trait?

A) They modified their behavior in response to changes in their environment.

B) They formed a strong bond with the humans who were observing them.

C) They manufactured useful tools for finding and accessing food.

D) They mimicked the actions they saw performed around them.

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One difference between the experiments described in the two passages is that unlike the researchers discussed in Passage 1, the author of Passage 2

A) presented the birds with a problem to solve.

B) intentionally made the birds aware of his presence.

C) consciously manipulated the birds' surroundings.

D) tested the birds' tool-using abilities.

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Is the main conclusion presented by the author of Passage 2 consistent with Morgan's canon, as described in Passage 1?

A) Yes, because the conclusion proposes that the ravens' behavior is a product of environmental factors.

B) Yes, because the conclusion offers a satisfyingly simple explanation of the ravens' behavior.

C) No, because the conclusion suggests that the ravens exhibit complex behavior patterns.

D) No, because the conclusion implies that a humanlike quality motivates the ravens' behavior.