

Back from Extinction: The Dire Wolf's Second Chance

Introduction

Scientists at Colossal Biosciences have brought back the Dire Wolf by using advanced cloning and gene-editing technology ([Colossal, 2025](#); [Gaj et. al, 2016](#)). The scientific name of the Dire Wolf is *Aenocyon Dirus* ([Britannica, 2025](#)). This project represents [Value-Based Innovation](#) by using science to restore biodiversity in alignment with ethical and ecological values, and [Strong Sustainability](#) and [Science-Based Target](#) by emphasising the irreplaceability of lost species and grounding the de-extinction effort in rigorous scientific methods.

The Dire Wolf went [extinct](#) thousands of years ago. Scientists studied ancient Dire Wolf DNA and altered the genes of a [Gray Wolf](#) to make them close to that of a Dire Wolf. Researchers placed these engineered cells in dogs, who then gave birth to three healthy pups named Romulus, Remus, and Khaleesi ([Biotech Company, 2025](#)). While the pups look like Dire Wolves, scientists say they might not act exactly like the true beast. This breakthrough is exciting but also raises questions about how these animals might affect today's [ecosystems](#).

ROMULUS

SPECIES

Dire Wolf

AGE / SEX

6 months

Male



CLUB DIRE WOLF / AGE: 1 MONTH

REMUS

SPECIES

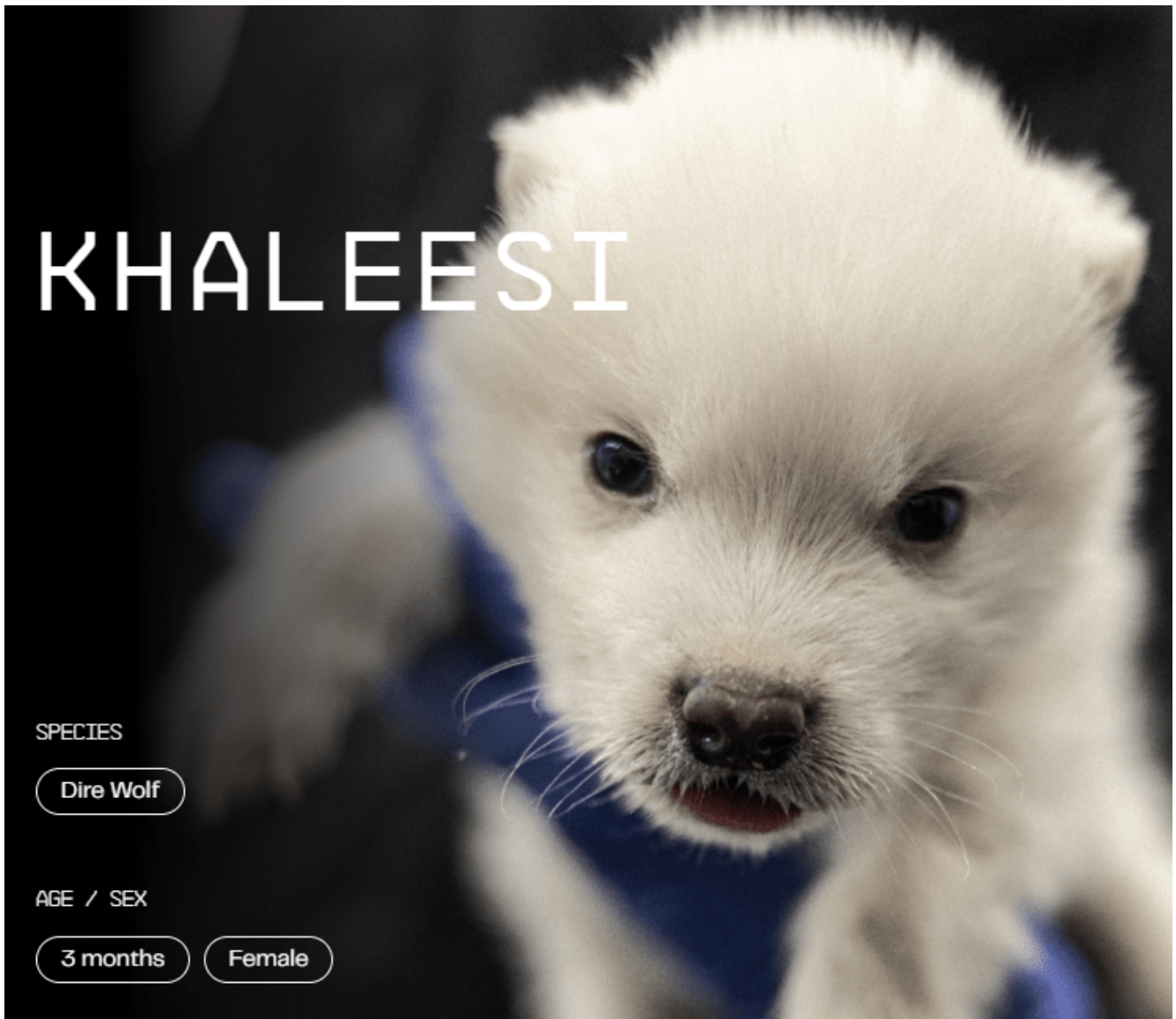
Dire Wolf

AGE / SEX

6 months

Male





Romulus, Remus, and Khaleesi.

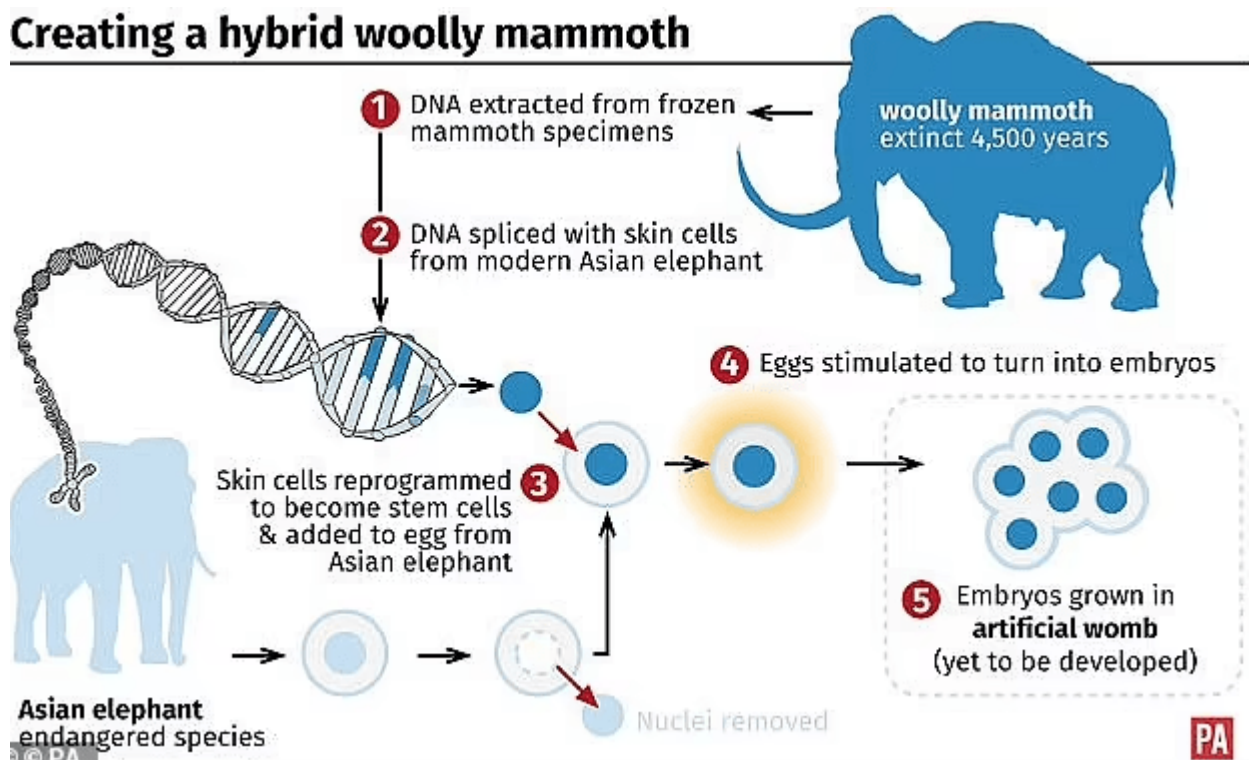
Source: [Colossal](#)

Bringing Back the Past: The Return of the Dire Wolf

A snow-white wolf graces the cover of [Time Magazine](#), accompanied by a headline announcing the return of the extinct Dire Wolf ([BBC News, 2025](#); [Kluger, 2025](#)). Famous for its role in A Game of Thrones ([Britannica, 2025](#)), the Dire Wolf once roamed the Americas over 10,000 years ago. In the 19th century, westward expansion led to conflict. Settlers, native predator species, and livestock owners clashed. Measures like poisoning were used for predator control. As a result, gray wolves, once present in Yellowstone, were exterminated. By the mid-20th century, they were nearly extinct in the 48 states ([Living With Wolves, 2023](#)).

The researchers created the creatures as 'genetically modified gray [wolves]', not genuine Dire Wolves. Colossal has also promoted similar efforts to resurrect other extinct species, such as the [woolly mammoth](#) and the Tasmanian tiger ([Whitefield, 2024](#)). Yet, experts highlight the stark biological differences between the wolves in Time Magazine and the real Dire Wolf that lived during the last ice age ([Britannica, 2025](#)).

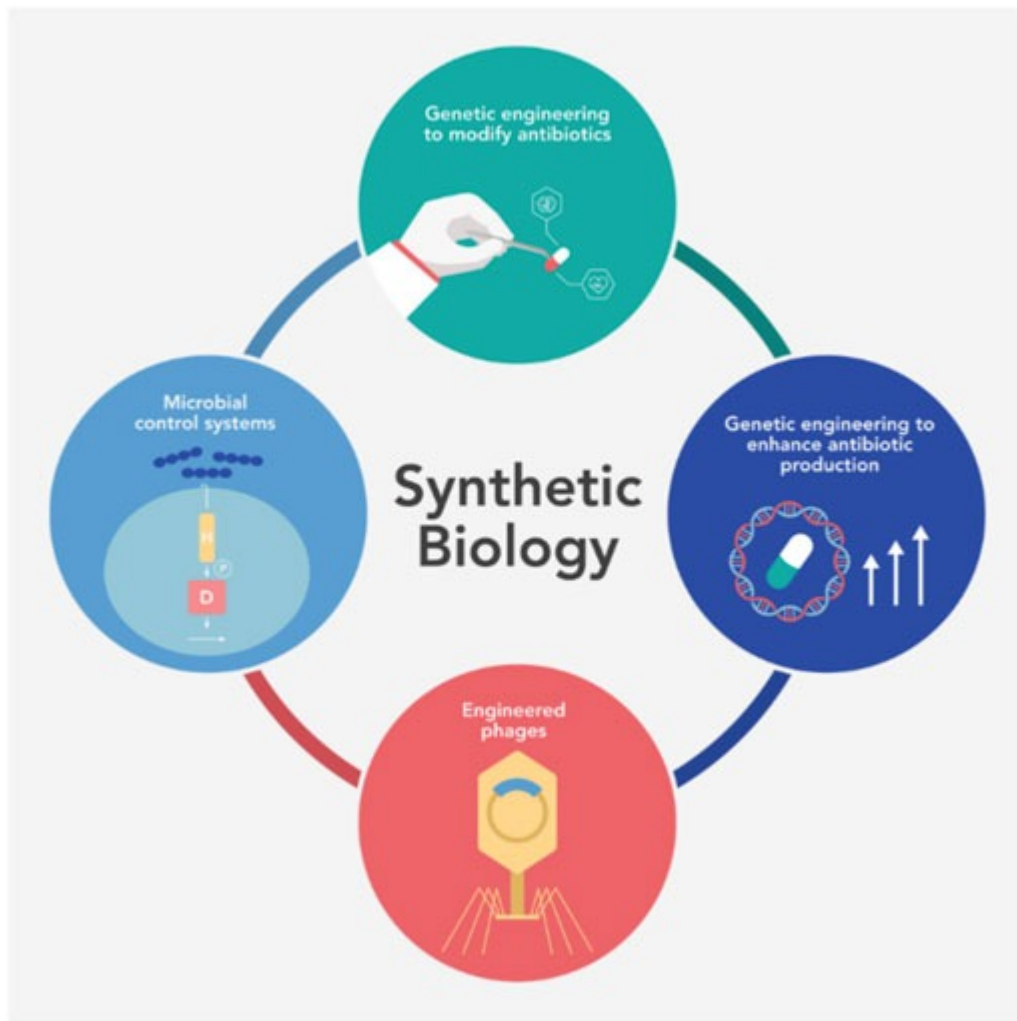
Creating a hybrid woolly mammoth



Creating a hybrid woolly mammoth.

Source: [Daily Mail](#)

Scientists cannot clone ancient Dire Wolf DNA because it is too degraded. They compare it to [fresh DNA](#) being baked in a 500-degree oven, where the resulting fragments cannot replicate. Instead, Colossal used [synthetic biology](#) techniques to identify key DNA segments from ancient remains and inserted them into the cells of a gray wolf, creating a hybrid with some Dire Wolf-like traits, such as a larger skull and white fur ([Gill, 2025](#)).



Advances in Synthetic Biology.

Source: [León-Buitimea et al., 2022](#)

What is the Dire Wolf and Why Did It Go Extinct?

The Dire Wolf was a large, extinct canine that lived in the Americas during the [Late Pleistocene](#) and [Early Holocene](#) epochs, approximately [10,000 to 125,000 years ago](#). [Notably larger than today's gray wolf, Dire Wolves were apex predators that primarily hunted megaherbivores such as horses, bison, and camels. In the 1920s, the wolves in the Yellowstone National Park were hunted to extinction, causing the biodiversity to be affected \(Yellowstone National Park Trips, 2020\).](#)

With no predators to keep their numbers in check, deer and elk populations exploded. They [overgrazed](#) the once lush aspen and willow [forests](#), transforming the park into a dry, barren landscape. Despite efforts to control the ruminant

populations, desiccation of habitats forced out other species, such as birds and beavers. The [food chain](#) and predator-prey relationship were dangerously imbalanced. By the 1990s, scientists agreed that there was a glaring need for restoration.



Mounted Wolf Skeleton.

Source: [Sternberg Museum of Natural History](#)

Dire Wolves weighed up to 90.7 kilograms; these relatives of the gray wolf (*Canis Lupus*) were about 25% larger than the biggest modern wolf species and had bigger teeth. In fact, they measured up to 39 inches at the shoulder and 69 inches in length. Paleontologists have consistently unearthed their remains in North and South America, and they're the most common mammal to appear in the La Brea Tar Pits of California ([Bassi, 2025](#)).

Dire Wolf

Aenocyon dirus



POPULATION

zero



LOCATION

Asia, Central America,
South America, North
America



CONSERVATION STATUS

Extinct



WEIGHT

200 lbs



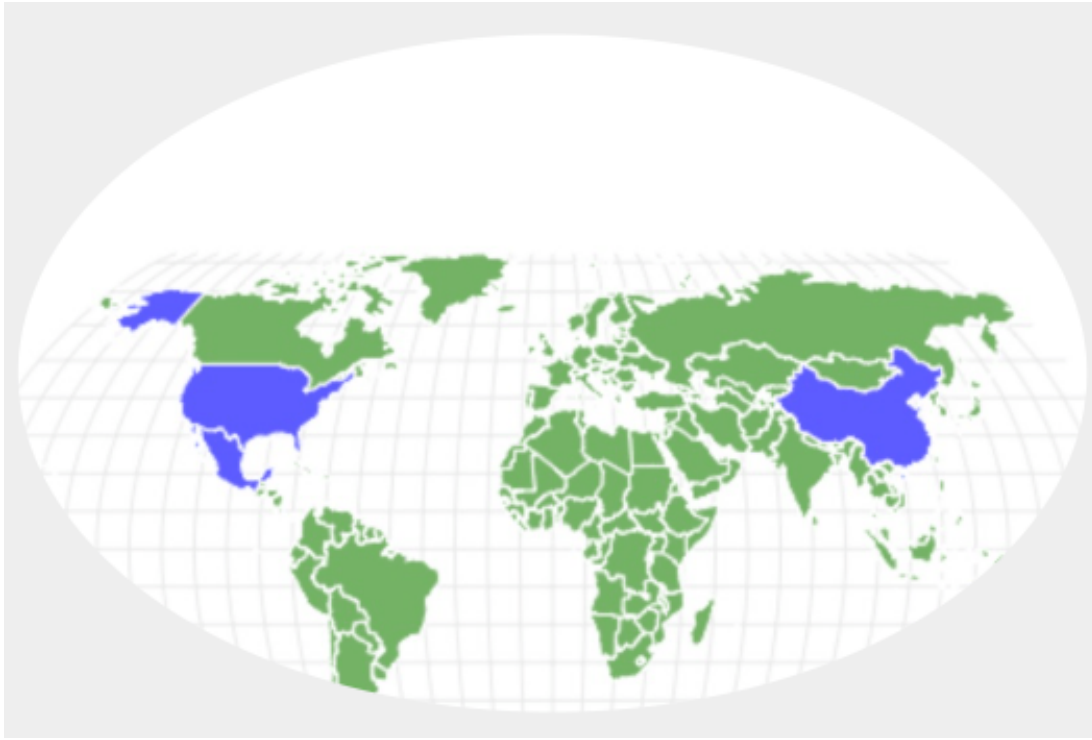
HABITAT Plains and grasslands

Huge prehistoric wolf that competed for prey with saber-tooth cats and hunted mastodon.

The Dire Wolf.

[A-Z Animals, 2024](#)

Scientists found evidence of Dire Wolves in various regions, including Asia, Central America, North America, and South America ([A-Z Animals, 2024](#)).



The Former Distribution of the Dire Wolf.

Source: [A-Z Animals, 2024](#)

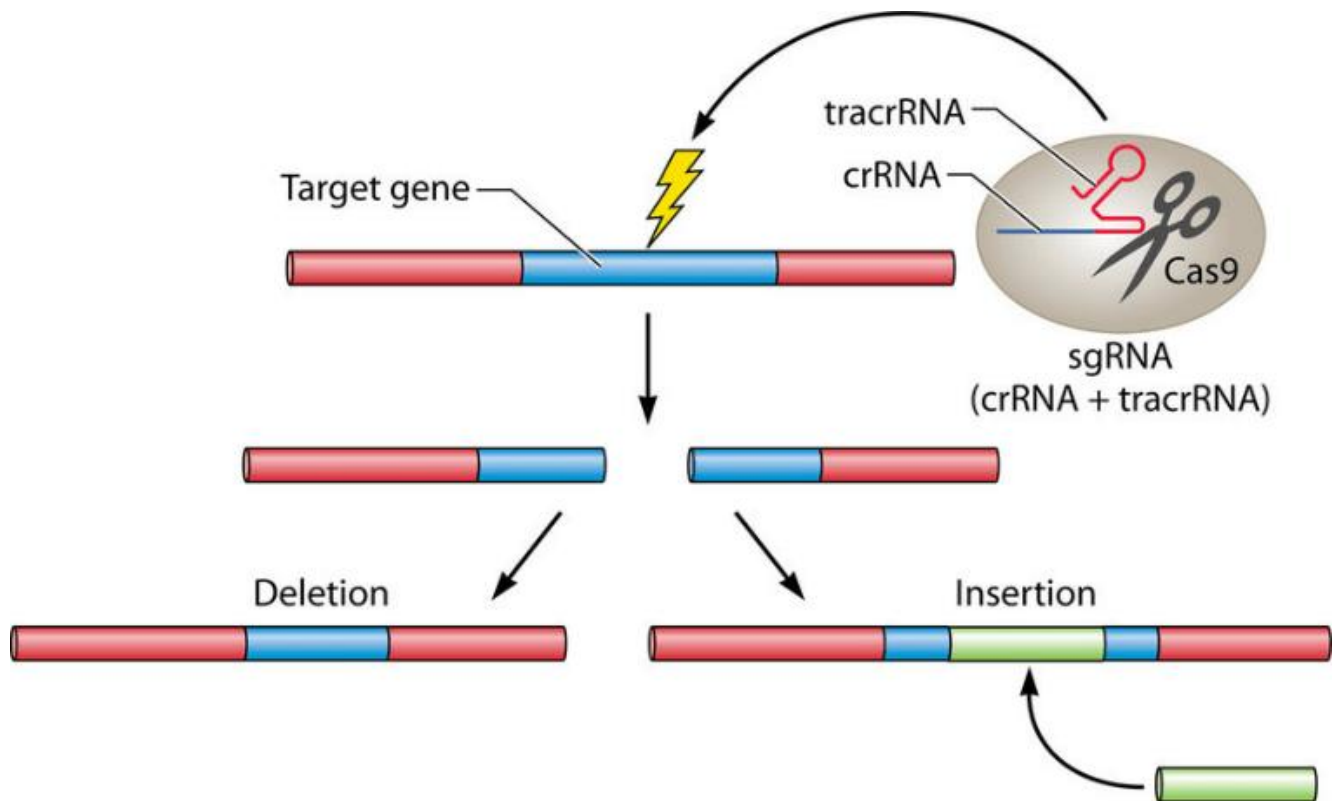
The Science Behind Cloning and Gene Editing: Creating the New Dire Wolf

Scientists are now using cutting-edge biotechnology to bring back the extinct Dire Wolf, or at least something very close to it ([Time, 2025](#)). Colossal researchers used advanced [CRISPR](#)-based multiplex gene editing to modify 20 specific genomic sites (loci) across 14 genes, achieving the most extensive extinct DNA restoration in a living canid and setting a new standard in de-extinction science ([Colossal, 2025](#)).

Gene editing

In 2012, researchers demonstrated that specially designed RNA molecules, known as guide RNAs, could direct a DNA-cutting protein called Cas nuclease (such as Cas9, the first one used) to any desired DNA sequence. These guide RNAs are engineered to match a specific DNA target, ensuring that the Cas protein cuts only at that exact location in the genome, reducing the risk of off-target effects. Further testing revealed that the system works quite well in all types of cells, including human cells ([The Jackson Laboratory, n.d.](#)). Gene editing is a scientific

method where scientists modify DNA, the genetic code that determines how an organism looks, grows, and behaves. Think of DNA like a biological instruction manual made up of letters (A, T, C, G). With gene editing, scientists can add, delete, or replace parts of the genome to change how an organism develops ([Rausias, 2025](#)).



DNA engineering.

Source: [De Extinction of Dire Wolf](#)

CRISPR:

[CRISPR](#) stands for Clustered Regularly Interspaced Short Palindromic Repeats. Repetitive DNA sequences, [called CRISPR](#), were observed in bacteria with “spacer” DNA sequences in between the repeats that exactly match viral sequences. It was subsequently discovered that bacteria transcribe these DNA elements to RNA upon viral infection. The RNA guides a nuclease (a protein that cleaves DNA) to the viral DNA to cut it, providing protection against the virus. Scientists named the nucleases “Cas,” for “CRISPR-associated” ([The Jackson Laboratory, n.d.](#)).

Genome Editing.

Source: [CRISPR](#)

Colossal scientists modified gray wolf genes and used them to create embryos, which they implanted into surrogate mothers that gave birth to pups. The modifications were based on an analysis of DNA extracted from two Dire Wolf fossils. A tooth found in Sheridan Pit, Ohio, and an inner-ear bone from American Falls, Idaho ([Maguire, 2025](#)).

The Potential Ecological and Scientific Impact of Reviving the Dire Wolf

Reviving the Dire Wolf through genetic engineering presents both ecological and scientific considerations:

Ecological Impact

The [ecological impact](#) of the [de-extinction](#) of the Dire Wolf could be profound and multifaceted, potentially restoring lost [ecological functions](#) once performed by this apex predator ([Ripple & Beschta, 2012](#)). In certain [Native American cultures](#), people regard wolves as sacred animals. They integrate into spiritual and cultural practices. These communities understand the [ecological](#) interdependence between wolves and other species. Moreover, they understand the importance of maintaining balanced predator-prey relationships.

Scientific Impact

Genetic Engineering Advances: The project exemplifies cutting-edge gene-editing techniques, offering insights into genetic modification and species revival ([Colossal, 2025](#) & [Nuwer, 2025](#)).

Species Authenticity: A debate exists regarding the authenticity of these animals as true Dire Wolves, given their genetic modifications and the lack of complete ancient DNA sequences ([Lewis, 2025](#)).

What Happens Next: Reintroducing the Dire Wolf and Protecting Ecosystems

Nowadays, the need for the continued restoration and [conservation](#) of wolves becomes more apparent ([Colossal, 2025](#)). Reintroducing the Dire Wolf, even in its

genetically engineered form, necessitates careful planning to [maintain sustainable ecosystems](#). Apex predators are critical to stabilising entire ecosystems, and their loss from the landscape can have profound impacts on biodiversity. This project uses sequences from the Dire Wolf to de-extinct this iconic apex predator.

This work underpins pioneering research that seeks to stabilise ecosystems to prevent further biodiversity losses and to create new methods to actually restore lost biodiversity ([Colossal, 2025](#)).

The wolves are thriving on an “8 square kilometre secure” expansive ecological preserve that is certified by the American Humane Society and registered with the [US Department of Agriculture](#). Colossal employs 10 full-time animal care staff to support the wolves’ physical and mental well-being. It says the property will provide “lifetime care” for the wolves ([Maguire, 2025](#)).

The wolves are “thriving” in their habitat.

Source: [Maguire, 2025](#)

Conservation or Just Greenwashing?

Critics have labelled the project as [greenwashing](#), where a company presents a [superficial environmental solution](#) while avoiding addressing the core problems. The company behind the Dire Wolf project has also been criticised for using the project to generate publicity and attract investment ([Contino, 2025](#)). Indeed, de-extinction has been talked about for decades ([Nuwer, 2025](#)).

In the wake of the Dire Wolf announcement, however, many scientists have [criticised](#) Colossal’s approach. They see efforts to bring back long-extinct species as [costly wastes](#) of resources and a distraction from the significant work that’s needed to save still living, but endangered, species ([Nuwer, 2025](#)). This [de-extinction project](#) has had millions of dollars poured into it, money that most conservation programs could only dream of.

The Colossal company announced its achievement alongside a statement from the Secretary of the [US Fish and Wildlife Service](#). Major media outlets have featured the story, sharing it as a positive news story in contrast to much of the bad news in the world.

Colossal claims Dire Wolf de-extinction while celebrating three births, widely covered by WIRED and The New Yorker. It was also the cover story in the latest issue of Time Magazine ([Maguire, 2025](#)). However, experts remain sceptical.

MAY 12, 2025

TIME

Extinct

This is Remus. He's a dire wolf.
The first to exist in over 10,000 years.
Endangered species could
be changed forever

by
JEFFREY KLUGER



time.com

Extinct no more.

Source: [Time Magazine](https://www.time.com)

De-extinction should consider the bigger picture of thrivability. Bringing back extinct species is not enough if their habitats no longer exist. Without addressing habitat loss and environmental changes, revived species may not survive ([Nguyen-Robertson, 2024](#)). Also, reintroducing them can disturb current ecosystems ([Jepson, 2025](#)). For de-extinction to be sustainable, it must go hand-in-

hand with habitat protection and ecosystem restoration. De-extinction claims risk [greenwashing](#) by implying extinction is reversible, undermining conservation and ignoring lasting ecological and environmental harm ([Maguire, 2025](#)).

Conclusion and Call to Action (CTA): The Future of De-Extinction Dire Wolf

Proven [solutions to help reverse biodiversity loss](#) include habitat protection and restoration, controlling invasive species, and phasing out fossil fuels. However, no one markets these solutions as shiny, techno-fix packages like de-extinction. Instead, funders largely overlook and [underfund](#) them. The [future of de-extinction](#) presents both groundbreaking opportunities and significant ethical considerations. Advancements in genetic engineering have led to notable projects, such as Colossal Biosciences' efforts to revive species like the woolly mammoth and the Dire Wolf. These initiatives aim to restore lost biodiversity and potentially mitigate climate change impacts by reintroducing keystone species into their former habitats. However, the scientific community remains divided. Specifically, many raise concerns about ecological risks, animal welfare, and the diversion of resources from conserving currently endangered species ([University of Sydney, 2025](#)).

As we stand at this crossroads, it's imperative for scientists, policymakers, and the public to engage in transparent discussions about the goals and implications of de-extinction. Establishing robust ethical frameworks and prioritising ecological integrity is crucial ([Peine et al., 2009](#)). By balancing innovation with responsibility, we can ensure that de-extinction efforts contribute positively to [biodiversity conservation](#) and [ecosystem resilience](#).

The choices we make today will shape the legacy we leave for future generations.

Achieving THRIVE goals and SDGs

The effort to bring back the Dire Wolf fits well with the [THRIVE Framework](#). It particularly supports these three foundational focus factors:

Strong Sustainability (SSU):

It is about allowing nature to regenerate, thus enabling ecosystems to bounce back, and ultimately, flourish. It also means recognising that if we want [prosperity](#), it needs to fall within the boundaries of what is compatible with the earth's ecosystems. Restoration and regeneration are related to SSU in the [12 Foundational Focus Factors](#).

Values-Based Innovation (VBI):

Values-Based Innovation acts as a motivation to enable [effective change](#). According to the ISPIM, European companies see sustainability challenges and human values as drivers towards innovation. The innovation surrounding the de-extinction of the Dire Wolf exemplifies Values-Based Innovation by addressing deep-seated human values such as environmental stewardship, biodiversity restoration, and intergenerational responsibility. This project demonstrates the awesome potential for advances in [genetic engineering](#) and [reproductive technologies](#) to recreate lost diversity.

Science-Based Targets (SBT):

Science-Based Targets enable organisations to define goals based on scientific discoveries. The latest scientific research on ecosystems and species restoration guides the reintroduction of the Dire Wolf, aligning it with SBT.

Strong Sustainability (SSU), Values-Based Innovation (VBI), and Science-Based Targets (SBTs) are all connected to Climate Action (SDG13), with SSU also closely related to Life on Land (SDG15). The de-extinction of the Dire Wolf directly advances these SDGs:

SDG15: Life On Land

The goal of [SDG15](#) is to protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land [degradation](#) and [halt biodiversity loss](#). Consequently, de-extinction promotes biodiversity, reverses species loss, and restores habitats, supporting Life on Land (SDG15) and ecosystem resilience.

SDG13: climate Action

This initiative also contributes to [SDG13: Climate Action](#) by promoting resilient ecosystems that play a role in climate regulation, such as maintaining healthy forests and soil that store carbon.

A Thrivable Framework

The [THRIVE Framework](#) builds on 12 Foundational Focus Factors (FFFs). The Regenerative Holistic Innovative Value Entity ([THRIVE](#)) Project works for a future that goes beyond sustainability, into thriving. Thrivability refers to the future well-being of everything on Earth, going beyond sustaining the planet, to flourishing and prospering.

To learn more about THRIVE, visit the [website](#), explore the [YouTube](#) channel, or follow us on social media. You can dive into published [articles](#), [whitepapers](#), and [newsletters](#), and engage with [webinars](#) and [podcasts](#). [Subscribe to the free newsletter](#) to stay informed about thriving. Join THRIVE and be part of driving meaningful change today.