

## H O N O R A B L E   M E N T I O N

# Going the Way of the Dodo: De-Extinction, Dualisms, and Reframing Conservation

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### I. Introduction

De-extinction, an emerging suite of selective breeding or biotechnological processes for reviving and releasing into the environment members or facsimiles of an extinct species, has been the subject of a recent surge of analysis in popular, scientific, and legal literature. Yet de-extinction raises more fundamental questions about the relationship between humans and nature and about the more and less useful ways that the law serves to navigate that relationship. In this sense, de-extinction may make the Dodo, until now a symbol of eternal obsolescence, the ultimate example of the inevitably dynamic character of ecological phenomena and the inextricable relationship of humans with nature.

Unfortunately, conservation laws likely to govern the revival and introduction of de-extinct species like the Dodo largely remain premised on outdated assumptions of nature as static and firmly divisible from human activity. Endangered species, invasive species, and public land management laws habitually privilege and even actively promote what they identify as natural and native over the unnatural and exotic. An analysis of the effect these laws might have on de-extinction efforts illustrates the limitations of the law's reliance on these crude dualisms. Currently, de-extinct species will often be obstructed as non-native and introduced (even if they might promote ecological function in a particular area) and may be allowed or promoted in locations they used to exist (even if likely to cause ecological damage). Accordingly, this Article argues that policymakers need to reformulate legal frameworks to be less dependent on simplistic dualisms in favor of cautious risk

assessment and adaptive management that recognizes the dynamism of nature and humanity's indivisibility from it.

### II. The Ecological Risks and Benefits of De-Extinction

Proponents raise a range of possible benefits from engaging in de-extinction to conserve existing ecological resources. The introduction of a de-extinct species could improve the integrity and function for ecosystems that have declined due to the loss of the constituent species. In addition, technologies developed in the pursuit of de-extinction may have considerable co-benefits for efforts to recover critically endangered populations. Finally, the successful de-extinction of a species may serve to awaken interest in ecological conservation by providing a concrete illustration of the capacity of humans to shape and repair past and ongoing anthropogenic damage to ecosystems.

On the other hand, de-extinction efforts have several costs, and potentially significant risks, for conservation management. The most obvious costs are the direct economic expenses of carefully managing the laboratory revival and subsequent introduction effort. The introduction of de-extinct organisms to existing ecological systems also carries risks of harm, such as eroding biodiversity, disrupting ecosystems, and contributing to extinctions at receiving sites. Uncertainties for any such introduction will typically be greater than those for extant species, especially for long-extinct species. Finally, some raise concerns that de-extinction activities will divert already limited resources from more urgent conservation strategies.

One might think that legal rules governing whether a species can or should be revived and introduced would be based on an analysis that carefully considered these potential ecological benefits and risks. However, the laws governing wildlife management primarily seek to divide biological phenomena between those deemed natural and those deemed man-made, and/or between those labeled

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native and others labeled exotic. These dichotomies largely fail to integrate a coherent methodology for evaluating the risks and benefits of relying on biotechnologies, like de-extinction, to advance ecological conservation.

### III. Dualism in Endangered Species Laws

The existing Endangered Species Act (ESA) and its analogues are largely designed to preserve existing species in their historical and existing habitat, while minimizing those resources deemed to be artificial or artifactual. As such, they are ill-fitted for providing a comprehensive framework for both revival and introduction of de-extinct species. These laws are premised on simplistic dichotomies between humans and nature, and between native and non-native, that lead to incongruous results when humans inevitably affect ecological processes or when ecological conditions necessarily shift. Since the effect of being categorized under these laws as exotic is to be treated as tainted and provided less legal protection, the introduction of many revived species might be difficult or impossible, even in cases where significant ecological benefits are expected.

#### A. “Species” and a Focus on Natural

Under the existing ESA, a species could potentially be listed as endangered shortly after revival, if the revived organism qualified as a “species” and as “endangered.” A number of factors strongly suggest that a de-extinct population would be considered a “species” under the ESA. Then again, the fact that a de-extinct species would be, at least in part, an artifact of human action raises questions about the ESA’s applicability.

#### B. “Endangered” and a Focus on Native Range

Similarly, most (but not all) of the factors required for consideration of listing as “endangered” suggest listing a de-extinct species could be appropriate. On the other hand, the ESA defines “endangered” by reference to the species’ historical and existing native range, making its applicability to a de-extinct species confounding. As such, it is fairly clear that the ESA’s listing regime does not contemplate the revival of an extinct species, and the tethering of endangerment to existing range inextricably links value under the ESA to historical conditions and purported naturalness.

#### C. Captive-Breeding: Preferencing Exotic

The ESA’s captive-bred wildlife regulations, which permit specified activities for certain populations held or bred in captivity, require species to be either not native to the United States or determined to be well protected in the wild. As such, these regulations serve to authenticate the disparate treatment of captive-bred organisms that are considered a human artifact (and thus for which human manipulation is acceptable) from those wild popu-

lations that are deemed natural. These regulations might in theory provide a potential pathway for certain genetic-engineering activities related to the continued propagation of a listed de-extinct species. However, as any newly de-extinct species is not going to be well protected in the wild, a revival program for native extinct species would be very difficult under the ESA’s existing framework for captive-bred wildlife.

#### D. Introductions: Preferencing “Natural” and “Native”

Likewise, the ESA’s provisions likely to govern the introduction of revived species rely on dualisms that make little sense in light of de-extinction. These regulations create distinctions that disfavor introduced populations over “natural” ones. Moreover, regulations on introductions heavily favor the introduction of species in historically native areas—regardless of the species’ compatibility with existing conditions.

As de-extinct species may have no natural habitat and their ranges will often be at most unclear under the statute, their introduction raises a number of fundamental problems in the application of these native/exotic dualities. De-extinction thus again demonstrates the limitations of existing endangered species law’s myopic focus on advancing “natural” populations and preserving native, rather than assessing the potential benefits and risks in light of current ecological conditions.

### IV. Dualism in Other Wildlife and Public Land Laws

As with endangered species laws, invasive species and public land laws treat species’ movement—in particular, any human-aided movement—with skepticism, to be resisted. In contrast, previously present biota and ecological inertia are treated as almost undeniable virtues. Many of these legal provisions are premised on a static, preservationist model of ecology that seeks to preserve species only where they exist or existed. These provisions draw from the prominent approach in natural resources law largely focused on a goal of historical preservation: preserving fidelity to historical conditions and preexisting biota, thus setting up a dualism between native and alien resources.

Alternatively, legal regimes seeking to manage wildlife focus on keeping humans separate from, and largely passive in their management of, these resources. The goal of such legal provisions is to avoid or minimize human involvement in species movement or the progression of reserved ecological areas. Such reserved lands and biota are considered valuable in large part because they are deemed wild or natural, separate from humans, and not artificial or an artifact of human activity.

However, reliance on native/exotic and human/nature dichotomies for invasive species and public lands law and management conflicts with current scientific understand-

ing, disregards the pervasive effects of humans on natural systems, and ultimately fails to foster the effective protection of ecological resources and their services. By cordoning off areas to be reserved for certain pre-existing resources (while keeping out all others), wildlife laws may impair the ecological function of reserved areas if conditions change and make the area inhospitable to those resources. Similarly, tying the value of a species' movement to the degree of human involvement systematically disadvantages human-aided species movement and bars introduction of ecological resources that may improve ecosystem function.

De-extinction brings these various incompatibilities into sharp focus. For legal provisions that emphasize historical preservation and the native/non-native divide, the introduction of a de-extinct species might be deemed permissible if initiated in a geographic area in which its previously extinct brethren historically existed, regardless of the harm it might create or its compatibility with the area's conditions. For legal provisions that promote wilderness preservation and human/nature dualism, any introduced de-extinct species would be deemed exotic because humans instigated its presence. Though a subset of jurisdictions only bar an introduced de-extinct species if the species would be harmful to current resources, another subset deems non-native species invasive regardless of harm and bars any introduction of de-extinct species regardless of its benefits. Continued reliance on these incongruous distinctions is unlikely to promote long-term health of ecological resources.

### A. *De-Extinction and the Problem of "Native"*

#### 1. Promoting "Native"

In most jurisdictions, native species benefit from a range of proactive measures seeking to protect, promote, and restore native ecosystems and processes. Many federal land agencies, for instance, aim to sustain and enhance native ecological systems and species. The conservation focus of these federal land provisions is thus not on dividing humans from nature, but on promoting or restoring native or pre-existing conditions.

Even those legal provisions that fortify a dualism between avowed natural conditions and human activity nevertheless tolerate some human intervention on behalf of native resources. Some agency regulations governing federal Wilderness areas, for example, specifically allow the restoration of native populations and natural processes to reverse human manipulation.

### 2. De-Extinction With "Native" as Pre-Existing

Applying the existing definitions of "native" and "exotic" to de-extinct species, however, fails to track the potential risks and benefits of introduction. A historical preservationist definition of native could raise significant problems for the introduction of a de-extinct species. Under such a

classification, a de-extinct organism could only be considered native if it previously existed in the area. Thus, a de-extinct species might not be native to any area, even if well suited to a particular location's ecological conditions. Even if deemed to be the same as its extinct brethren, the de-extinct species could at most be considered native to areas in which such extinct brethren previously existed, regardless of its compatibility with the current biotic communities or physical conditions in those or other areas.

### 3. De-Extinction With "Native" as Natural

A more common approach to defining a "native" species on federal and state lands ties nativeness to the absence of human assistance or influence in a species' migration to an area. These provisions allow for the possibility that a species may be native even if it was never present historically, but only if it arrived without human assistance. Accordingly, this type of definition makes human intervention the key factor, establishing a dichotomy between human activity and "natural" movement. Under such a definition, however, any de-extinct species proposed to be introduced would almost certainly be considered exotic.

### B. *De-Extinct Species as "Exotic" and "Invasive"*

#### 1. Suppressing "Exotic" and "Invasive"

Being labeled exotic not only places a de-extinct species outside the protection of laws that seek to promote native species, but it also makes them vulnerable to being labeled invasive and subject to control or eradication. Many state and federal laws prohibit or restrict human-induced movement of exotic or invasive species without a permit. Most public land laws and policies also actively seek to impede, contain, or eliminate invasive species. Though these measures vary, virtually all seek to limit or reduce the presence of invasive species.

#### 2. De-Extinction and Defining "Invasive"

Some jurisdictions require harmfulness for an exotic species to be subject to eradication or control by government authorities. However, other jurisdictions provide for the use of suppression management strategies for any species considered exotic. These jurisdictions assume a non-native species is by default harmful.

Importantly for de-extinction, though some federal agencies following Federal Executive Order 13,112 may not engage in active measures to control an exotic species unless harmful, many of these federal land agencies nonetheless make the deliberate introduction of an exotic species on public lands impermissible. These laws would thus inhibit the introduction of a de-extinct species anywhere it would be deemed exotic, regardless of its ecological benefits. De-extinction consequently shows how prevailing dichotomies in invasive species and public



lands laws can lead to perverse results for the management of ecological systems.

## V. Rejecting Strict Dualities: A Risk Assessment Approach

### A. *Native/Exotic and Nature/Human as False Dichotomies*

De-extinction illuminates the limitations of existing wildlife management laws and regulations premised on an erroneous assumption of ecological stasis. Because they are designed to keep communities as they were or used to be, historical preservation laws based on a strict native/non-native duality may not serve to promote ecological function or enhance biodiversity, but rather to inhibit it. Even if changing ecological conditions cause such preservation lands to be inhospitable to native resources, current legal native/non-native dualities will continue to direct managers to maintain native resources even at the expense of ecological function.

De-extinction exposes the limitations of a parallel dichotomy between nature and humanity. Laws proscribing active management strategies like introductions help institutionalize a dualism between humans and nature, treating untouched natural systems and undirected species migrations as intrinsically virtuous while resources subject to active human management are artifactual and thus *per se* of diminished value.

However, it is evident nature is increasingly indivisible from human activity, assuming it ever was separable. The substantial and widespread ecological effect of humanity has been discernible, and growing, for decades, most pervasively with anthropogenic climate change. With many scientists dubbing the current ecological era the “anthropocene,” ecology has come to view the natural and human worlds as substantially interrelated. So closely intertwined have these two spheres become that they resemble a synthesis more than a dualism.

Establishing a rigid legal dualism between the wild and artifactual can lead to perverse results, as it has in the Wilderness Act, and undermine sound conservation policy. As exemplified through the lens of de-extinction, making the fundamental ecological goal minimizing human influence on ecological resources necessarily obstructs active management measures (such as the introduction of a species) even if they were likely to improve ecological function. Likewise, ignoring the effects of unassisted wildlife migrations as seemingly natural, without inquiry into such a migration’s potential benefits and harms, raises significant risks of ecological degradation.

### B. *Risk-Based Adaptive Ecosystem Management*

Sound de-extinction policy, and wildlife management laws in general, should reflect the dynamic and human-influenced character of modern ecosystems. Laws managing

whether to encourage, allow, restrict, or prohibit the establishment or introduction of biota, de-extinct or otherwise, should focus the inquiry on whether the management strategy (as compared to alternative strategies) will promote ecological health in light of current and reasonably foreseeable ecological conditions.

### I. Risk Assessment and Adaptive Management

A sensible risk-based approach should incorporate into relevant wildlife management laws both (1) a provisional assessment of the risks and benefits for an introduction and (2) adaptive management that incorporates a framework for periodic monitoring and adjustment of such provisional decisions to account for new information and changes in conditions. Furthermore, any permitted introduction should be required to include concrete measures that seek to minimize the negative and maximize the positive consequences of the strategy, as determined by the initial risk assessment. Because of the considerable uncertainty involved in such a determination, such risk assessments always should be treated as provisional and accompanied by thorough adaptive management measures that mandate sustained and concrete monitoring, reexamination, and periodic adjustment procedures. Such a program should include sufficient resources and incentives for managers to reduce uncertainty and adjust decisions over time.

The inquiry proposed herein would thus seek to focus on promoting ecological health as the central goal, rather than an analysis that might emphasize broader consumptive, economic, aesthetic, or historical preservation considerations. This framework would be a significant departure from a reliance on strict dualist treatments of ecological resources that bifurcate management options according to whether or not a species is deemed native, or whether or not it is an artifact of human intervention.

The most prominent regulatory approach rejecting a strict duality between natural and human-engineered products is embedded in the Coordinated Framework for the Regulation of Biotechnology Products (Coordinated Framework), the principal policy framework for synchronizing federal oversight of commercial biotechnology processes and products in the U.S. Under the Coordinated Framework, determinations of whether to regulate are based on the product’s particular characteristics and expected environmental and health effects. The Coordinated Framework expressly states that such assessments (including decisions on whether to restrict a planned introduction of a product) should not be grounded in the methods used to produce them, but rather in the potential risks and advantages posed. In this sense, the Coordinated Framework similarly rejects a duality between human-engineered and conventional or natural products. It purports to subject commercial biotechnology processes and products to the same regulatory regime as more conventional commercial processes and products, ostensibly focusing on the potential advantages and disadvantages of regulation. The Coordinated Framework

undoubtedly has been the subject of various credible criticisms, including that it relies on a fragmented and inefficient regulatory patchwork, perpetuates yet another overly formalistic dualism between products and processes, and has resulted in regulatory passivity. It also is only limited to the regulation of commercial biotechnology processes and products, and fails to incorporate any of the essential adaptive management protocols proposed herein. Even so, in a limited way the Coordinated Framework serves as an important example of how the valuation of a potentially risky activity need not turn on a binary choice but can be based rather on a more detailed analysis of potential merits and risks.

## 2. Potential Default Rebuttable Presumptions

Of course, rejecting dependence on rigid categories such as native and exotic or natural and artificial for wildlife management leaves open the question of whether default presumptions in favor of unassisted or preexisting wildlife remain valuable. Though this Article's risk-based adaptive approach rejects a reliance on rigid native-exotic dualities, whether members of a species currently exist or previously existed in an area nonetheless will frequently be very relevant to an assessment of the potential risks and benefits of an introduction. Past and current conditions are likely to be invaluable in determinations of what might advance ecological health, and there is undoubtedly more uncertainty about ecological costs and benefits if an organism has never before been present in a particular location. Accordingly, such factors might give rise to rebuttable default presumptions in favor of native introductions. Conversely, an introduction of a species that is not native to an area might be barred unless assessed to be compatible with current conditions.

While most legal provisions regulating wildlife management in the United States are grounded in promoting a strict native/non-native duality, a few provisions do provide useful examples of how exotic species might be integrated into land management regimes under a rebuttable presumption in favor of native species. For instance, the FWS has adopted a default presumption against the introduction of non-native plants on Federal Wildlife Refuges unless it determines there is no feasible alternative. The BLM similarly is considering the adoption of a policy that establishes a default rebuttable presumption for the introduction of native plants and against non-native plant species.

A similar default rebuttable presumption could be developed that tracks the human/natural duality, though the

argument for such a presumption is appreciably weaker. A regulatory framework could presume that ecological shifts are valuable if not the direct consequence of human activity. Correspondingly, it could presume that alterations to an ecosystem are harmful if directly the result of human action, such as an introduction.

However, in light of the pervasive influence of humans in reserved lands and the biosphere more generally, the intrinsic benefit of minimizing additional human interaction with what are already disturbed or "unnatural" biotic communities is more suspect. Moreover, ecological harms in protected areas absent direct human intervention are expected to increase for the foreseeable future as a result of global climate change. As such, the costs of inaction are likely to increase and the benefits of active measures (whether barring or inducing the movement of species) are likely to increase. There often will be substantial reasons to minimize human-induced effects on ecological systems. However, a presumption against active strategies will frequently not be preferable to a detailed risk assessment that neither favors nor disfavors direct or indirect human interventions.

## VI. Conclusion

As an examination of their applicability to de-extinction makes clear, the dominant reliance in wildlife laws on dualist treatments of ecological resources distorts conservation management. Though nativity or human involvement may be relevant in assessing a resource's current ecological value or a management strategy's likely feasibility, neither should be the primary focus of conservation policy. De-extinction reinforces the need to reformulate legal frameworks for assessing new biotechnological and resource management strategies to make careful risk assessment and adaptive management their foundation.

Undoubtedly, making the promotion of ecological health the goal of such an assessment raises significant uncertainties, and the relative value of the various current and potential constituents of an ecological community is quite contestable. Reducing and managing these uncertainties, and developing processes and tools for assessing value, should be the primary focus of ecology, conservation management, and natural resources laws. By proposing a reorientation toward adaptive risk assessment and management, this Article seeks to push conservation laws to make assessments and deliberations about the relative value of ecological constituents the central enterprise.