Stacks

Reconstructing the history and demise of the red wolf in Alabama: Insights from examining historical records and cultural perspectives

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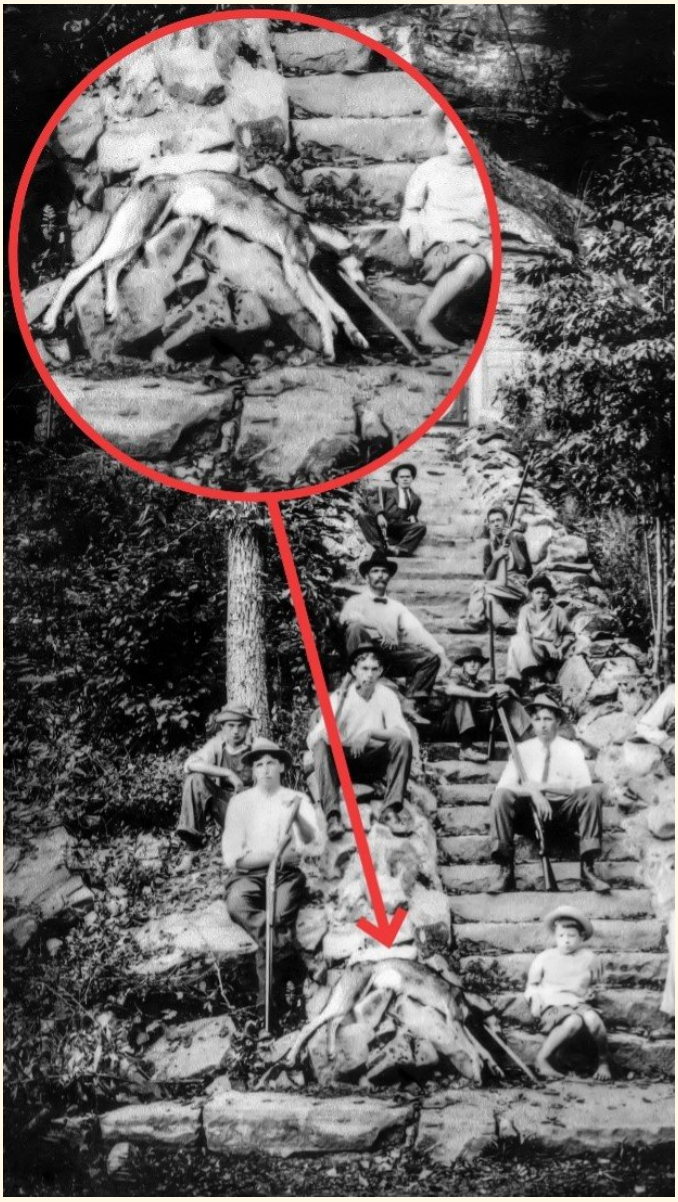
Abstract

What we did: We collected approximately 400 archival newspaper publications, management documents, articles, and books, along with photos, to assess and recontextualize the historical ecology of the red wolf (*Canis rufus*) in Alabama using a social-ecological lens.

Why we did it: There is a growing movement to decolonize ecological research and wildlife conservation using social-ecological dimensions. Under this context, this paper fills a critical knowledge gap concerning culture, values, attitudes, and behaviors toward the red wolf.



Abstract photo. *Photo of a young red wolf (left of child at bottom) killed on Rufus O'Rear's property along Blackwater Creek in Jasper, Walker County, Alabama during 1911. Photo by J. H. Reeves (The Mountain Eagle 1912).*

What we found: European colonization of the southeastern United States (US) resulted in a significant social-ecological shift that replaced Indigenous positive value orientations for the red wolf with European negative value orientations, contributing to the wolf's extirpation as an ultimate cause, alongside proximate causes such as deforestation.

Why it matters: The US Fish and Wildlife Service (USFWS) Red Wolf Recovery Program aims to better incorporate human dimensions into its efforts to restore red wolf populations to the eastern US. Understanding historical and cultural conflict, as well as social-ecological dynamics can assist USFWS in its current stakeholder engagement to achieve more equitable stakeholder involvement in red wolf recovery.

What is next: By implementing social-ecological frameworks to reform stakeholder engagement as it is currently practiced, the USFWS Red Wolf Recovery Program could increase engagement with non-European American communities and pursue broader ideological diversity among European American constituents for more equitable community involvement in its management of red wolves.

Keywords: *Canis rufus,* decolonization, extinction, extirpation, historical ecology, human-wildlife conflict, social-ecology, stakeholder conflict

Introduction

There is a growing movement in the ecological and environmental sciences to acknowledge the entangled histories of institutionalized knowledge systems and the erasure or marginalization of non-European traditional epistemologies and lifeways due to colonization (Black, 2011; Tuhiwai Smith, 2021; Blanc, 2022; Ferdinand, 2022; Sène-Harper et al., 2022). For

example, the United States of America (US) expelled approximately 80,000 Indigenous people from the eastern US to territories west of the Mississippi River to expand territorial claims and the institution of slavery following the passage of the Indian Removal Act of 1830 (hereafter, "Indian Removal Act"; Saunt, 2020). Today, the Indigenous peoples displaced by the Indian Removal Act largely reside in Oklahoma, Kansas, Nebraska, and other states in the Great Plains. Consequently, these historical events have lasting impacts on the social-ecological dynamics of wildlife conservation in the US (Blossey & Hare, 2022).

The traditional framing of the causes of extinction, such as nondescript government eradication campaigns (Laliberte & Ripple, 2004; Bergstrom et al., 2013), consistently ignore or downplay the role of historical events like the Indian Removal Act in facilitating the long-term degradation of social-ecological systems to support a diversity of life. The shortage of in-depth assessments of the underlying human dimensions leading to the loss of species in the wild, such as the red wolf (*Canis rufus*), hinders our ability to mitigate key threats to wildlife and establish higher standards of conservation.

The red wolf

The red wolf emerged during the late Pleistocene following the disappearance of the smaller coyote (*Canis latrans*) and larger dire wolf (*Aenocyon dirus*) from the eastern US (Nowak, 2002). During the Pleistocene-Holocene transition, characterized by deglaciation and warming temperatures (Seersholm et al., 2020), floral and faunal communities changed rapidly, marked by the eastern US losing most of its megafauna (Ebersole & Ebersole, 2011). The red wolf appeared when the large mammal fauna was depauperated, leaving behind mostly smaller species in the region that survived into the modern era such as white-tailed deer (*Odocoileus virginianus*), elk (*Cervus canadensis*), American bison (*Bison bison*), American black bear (*Ursus americanus*), and eastern cougar (*Puma concolor couguar*) (Ebersole & Ebersole, 2011). From the late Pleistocene to European colonization of North America, the red wolf was the only wild *Canis* species to occupy most of the eastern United States (Nowak, 2002; Figure 1).

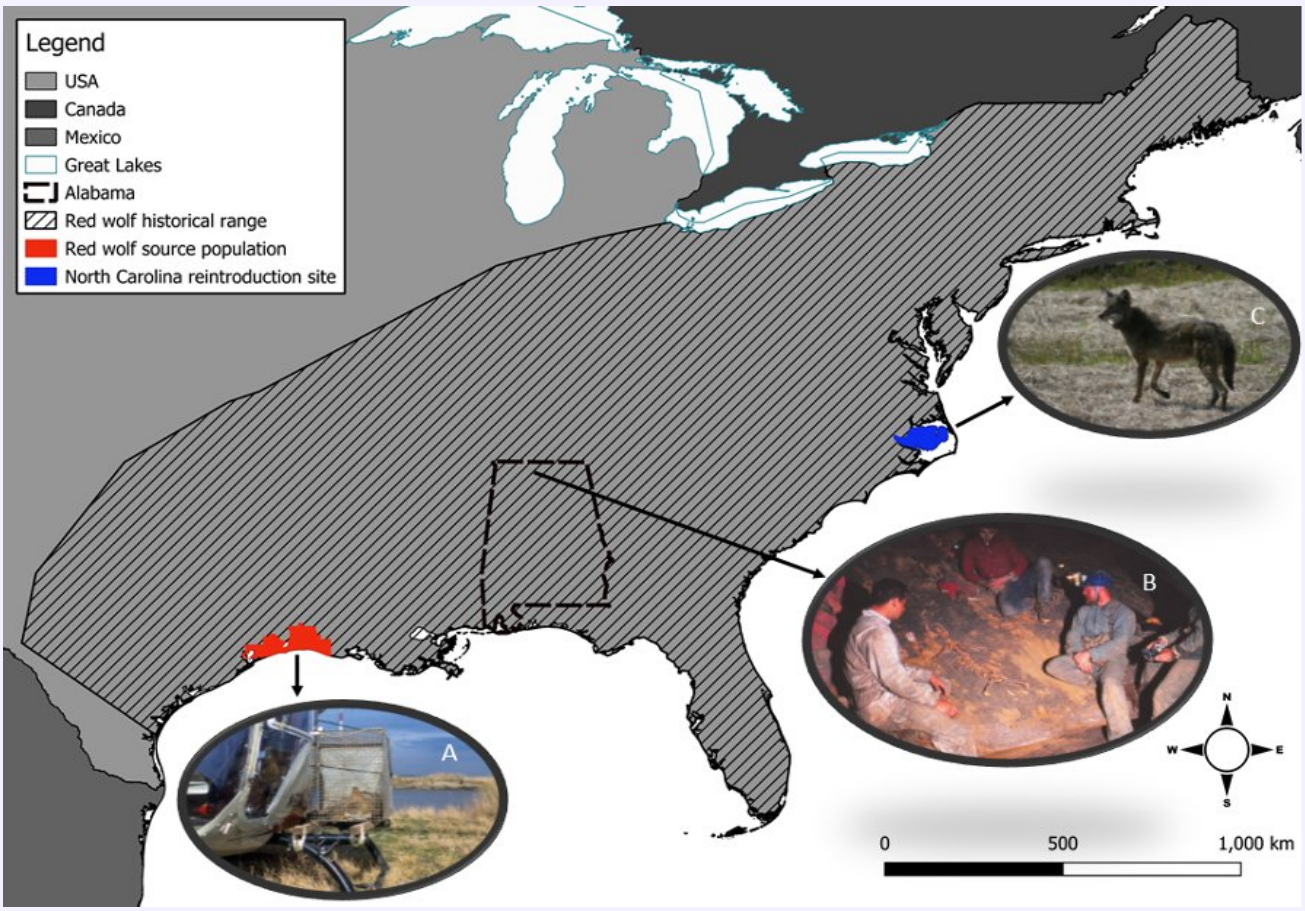


Figure 1. *Historical range of the red wolf prior to European colonization, which includes the entirety of what is now Alabama, USA (Nowak, 2002). The red wolf was extirpated throughout all its native range, but some red wolves were captured in the 1970s from a small, declining population along the coastal border of Texas and Louisiana (A) to initiate a captive-breeding program. In the northernmost region of Alabama, a nearly complete specimen of a male red wolf was discovered at Fern Cave National Wildlife Refuge during 1969 (B; Paradiso & Nowak, 1973). Today, a small, reintroduced population is present in northeastern North Carolina since 1987 (C).*

During the period following the Pleistocene until European colonization, Indigenous peoples of the region coexisted with red wolves. Artifacts found in the eastern United States indicate that the red wolf's historical range was intensively occupied by Indigenous peoples (Anderson et al., 2010, 2015; Lapham, 2011; Scarry, 2008; Walker, 1998). Consequently, Indigenous people were likely a dominant ecological force influencing the distribution and abundance of red wolves throughout the wolf's historical range. For example, land use and agricultural practices, such as controlled fires and the planting of mast and fruit trees, significantly influenced eastern landscapes (Kay, 2007; Abrams & Nowacki, 2008).

The red wolf's ecosystem changed as a consequence of European colonization. These wolves were some of the first North American carnivores to interact with European colonizers, such as the Spanish, French, and British, when Europeans began to colonize parts of the eastern US during the 16th century (Hinton et al., 2013; Smalley, 2017). In the late 18th century, the US initiated its Westward Expansion beyond the original 13 colonies, and, by 1860, all the red wolf's historical range occurred within US boundaries (Figure 1; Frymer, 2017; Saunt, 2020). By the early 20th century, the red wolf's geographical range was reduced to the Mississippi River Basin and Gulf Coast of the southeastern US (Nowak, 2002). Significant losses of red wolves during the early- and mid-20th century led the United States Fish and Wildlife Service (USFWS) to declare the species extinct in the wild by 1980 (USFWS, 1989). Some red wolves captured during 1974–1980 by the USFWS along the coastal region of the Texas and Louisiana border were used to establish a captive-breeding program and the reintroduced Eastern North Carolina Red Wolf Population (ENC RWP; USFWS, 1989; Hinton et al., 2013). Today, the red wolf exists as one of the most imperiled species in the world for which we lack substantial ecological knowledge due to their extirpation (Hinton et al., 2013). There are only less than 20 wolves persisting in the ENC RWP and approximately 270 animals in the captive-breeding program (USFWS, 2024). Although the ENC RWP peaked at an estimated 151 red wolves in 2006 (Hinton et al., 2017a), the population rapidly declined to its current state due primarily to anthropogenic mortality, namely poaching and vehicle collisions, and political opposition to recovery efforts (USFWS, 2023; Hinton et al., 2017a; Agan, Treves, & Willey, 2021b). Because a key action of

the USFWS Red Wolf Recovery Plan (RWRP) is to engage with the public to cultivate support for red wolf recovery (USFWS, 2023), we believe it is important to contextualize the red wolf's natural history through a social-ecological lens. This will help identify what aspects of human dimensions can be changed or resolved regarding wildlife value orientations and attitudes (Manfredo et al., 2016), and what underlying historical factors drive perpetual inter-stakeholder conflict vis-á-vis wolves (Madden & McQuinn, 2014; Colvin, Witt, & Lacey, 2015).

The red wolf in Alabama

Alabama has a unique and informative role in the red wolf's extirpation. The state is home to the oldest known specimen of the red wolf in North America (Paradiso & Nowak, 1973). It was also one of the initial areas of the western frontier beyond the Appalachian Mountains that European Americans colonized (Frymer, 2017; Saunt, 2020) and central to the passage of The Indian Removal Act, offering valuable insights into the region's historical social-ecological dynamics during a pivotal period. Records and observations of red wolves were documented in the area prior to European colonization and until the wolf's extirpation during the 20th century (Howell, 1921; Nowak, 1979). For example, one of the most detailed accounts on red wolves in Alabama comes from Howell's (1921) report of fauna in the state in which he observed that wolves in Alabama were near extinction and only occupied the 'rough, hilly country' extending from Walker County northwestward to Colbert County. During that period, Alabama's forest cover was characterized as comprising longleaf (*Pinus palustris*), shortleaf (*Pinus echinata*), loblolly (*Pinus taeda*), and slash (*Pinus elliottii*) pines, along with hardwoods and prairie (Demmon & Southern Forest Experiment Station, 1927). Today, these land cover types roughly align with the Environmental Protection Agency's (EPA) Level 3 classifications Piedmont and Ridge and Valley (longleaf pine), Interior Plateau and Southwestern Appalachians (shortleaf pine and hardwoods), Southeastern Plains (mixed pine and hardwood forests and prairie), and Southern Coastal Plains (longleaf and slash pine) (US EPA, 2015a, b). By 1930, the red wolf was already near extirpation and was finally assumed extinct in Alabama by the 1940s (Young & Goldman, 1944; McCarley, 1962).

To build on this work and understand causal relationships and dynamics between anthropogenic and non-anthropogenic environments during the mid-18th and early 20th centuries in Alabama, we apply three primary theoretical frameworks to our study: i) social-ecology (Ortega-Rubio, 2020; Bookchin, 1990; Clark, 1988; Stokols et al., 2013), ii) the cognitive-behavioral concepts of the cognitive hierarchy and the theory of planned behavior (Vaske & Manfredo, 2012; Azjen, 1985), and iii) stakeholder theory (Decker et al., 1996; Colvin, Witt, & Lacey, 2015; Flora & Thiboumery, 2009; Freeman, 1984).

Social-ecology posits that anthropogenic and non-anthropogenic subsystems are inherently connected and interact via constant, dynamic inter- and intra-system feedbacks, the latter driven by each subsystem's unique elements (Ortega-Rubio, 2020; Stokols et al., 2013). The anthropogenic subsystem is driven by two elements: "human resources," consisting of social, ethical, and political capital, or influence and power, and "material resources," meaning economic and technological means (Stokols et al., 2013; Figure 2). It is primarily by material resources that the anthropogenic subsystem engages directly with the biotic and abiotic elements of the non-anthropogenic subsystem (e.g., resource extraction land use; Figure 2). Historical conflicts resulting from the allocation of material resources continue to inform present-day conflict and governance (Madden & McQuinn, 2014; Colvin, Witt, & Lacey, 2015; Bookchin, 1990).

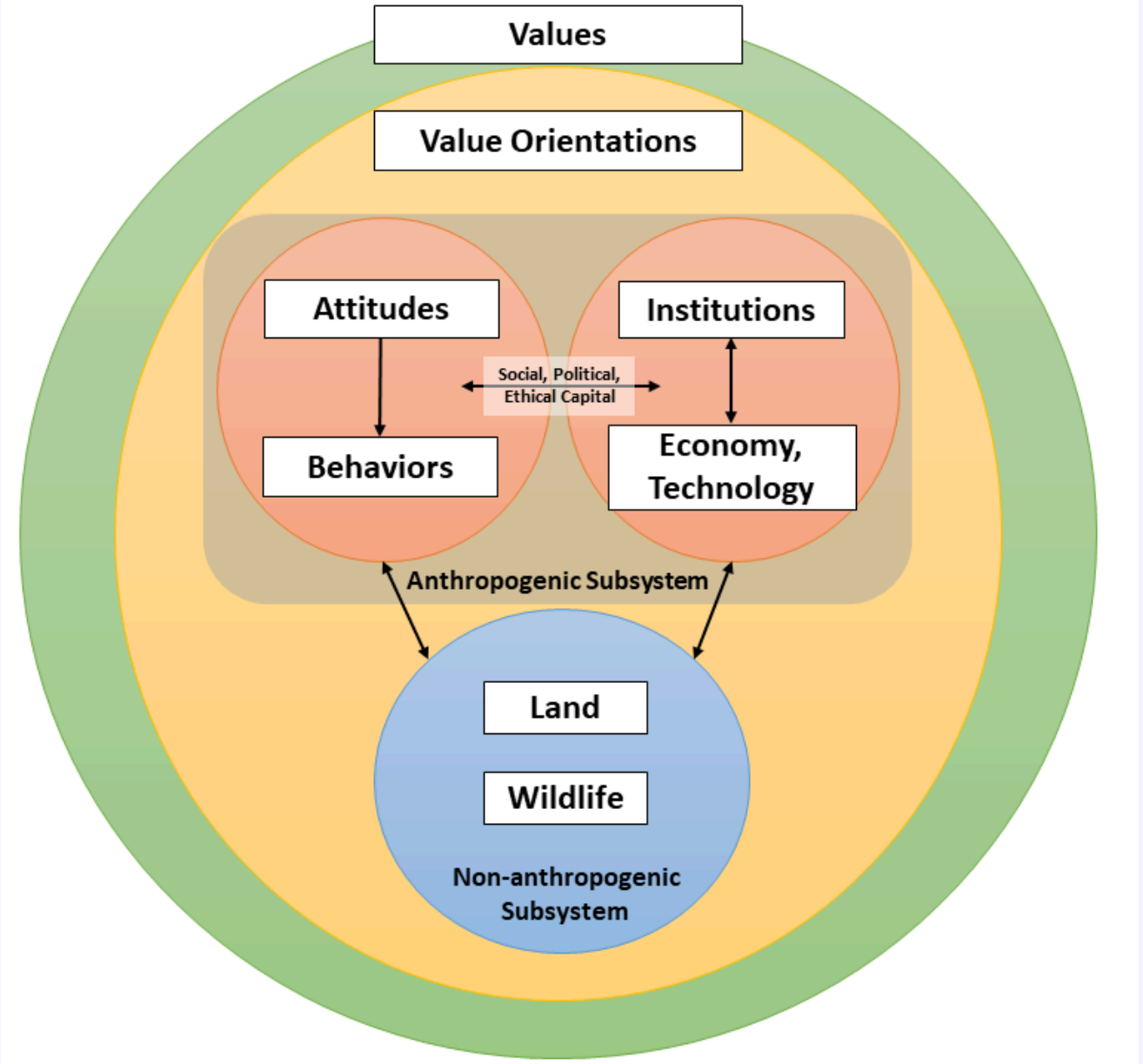


Figure 2. *A conceptual model combining social ecology and cognitive hierarchy to describe the dynamic relationships within and between the anthropogenic (human) subsystem and non-anthropogenic subsystem of the social-ecological system. Values and value orientations shape social norms, as well as public institutions and laws (Manfredo et al., 2016). Those norms and the formal and informal mechanisms which enforce them (Nkrumah, 2009; Vaske & Manfredo, 2012), dictate norms, attitudes, and behaviors within institutions (Berl et al., 2021) and between the public and institutions (Colvin, Witt, & Lacey, 2015; Bondy & Charles, 2020; Phillips, 2003). These human dynamics consequently dictate our interactions with the natural environment by allocation of resources and power (Ortega-Rubio, 2020; Bookchin, 1990; Clark, 1988; Stokols et al., 2013).*

This body of theory is further informed by the concept of the cognitive hierarchy and the theory of planned behavior (Azjen, 1985; Agan, Treves, & Willey, 2021a), the former of which states that values are "general mental constructs" (Vaske & Manfredo, 2012, p. 44) shaped by one's culture early in life, that determine one's fundamental goals, desires, and priorities. Values, like culture, are resistant to change (Vaske & Manfredo, 2012). Value orientations are expressions of values concerning specific objects or circumstances in the form of beliefs (e.g., wolves are a threat to humans). These give rise to attitudes, which are positive or negative evaluations of an object or circumstance (e.g., lethal management of wolves is good). Attitudes directly inform behaviors (e.g., shoot wolves or solicit authorities for their removal) along with norms, which are behavioral expectations enforced within social groups via formal (e.g., legal recourse) or informal (e.g., social ostracization) sanctions (Vaske & Manfredo, 2012; Nkrumah, 2009). Values, attitudes, and norms all shape and reinforce stakeholder identities and the institutions that empower stakeholder-government governance, or "hybrid governance" (Colvin, Witt, & Lacey, 2015).

"Stakeholders" are "any group or individual who can affect or is affected by the achievement of the organization's objectives" (Freeman, 1984, p. 46). Stakeholder theory, originally a business concept (Colvin, Witt, & Lacey, 2015; Schroeder et al., 2021; Decker et al., 1996), asserts that an organization must consider the concerns and interests of its stakeholders for the sake of its own adaptability (Freeman, 1984). However, in practice, organizations govern with primarily "legitimate" or "client" stakeholders in mind, meaning those to whom the organization perceives itself to be obligated to support (Freeman, 1984; Phillips, 2003; Decker et al., 1996).

Definitions

Throughout this paper, "diasporic Africans" refers to Africans who were forcefully displaced to North America from sub-Saharan Africa, primarily, through the Transatlantic Slave Trade (Manning, 2009) and subsequently developed unique regional cultures and place-based lifeways (e.g., Hazzard-Donald, 2012; Lee, 2014; Cowan, 2004) and oral traditions (Gates & Tatar, 2018; Bascom, 1992; Hurston, 1935; Talley, 1922), and in doing so, became African Americans. "European Americans" refers to those of the

European diaspora, primarily descending from Western Europe, who traveled to North America during the period of European global conquest (Horne, 2018). “Indigenous North Americans” or “Indigenous” refers to those cultural groups who have inhabited the North American landscape for thousands of years, and from such belonging, developed lifeways and ways of knowing that are uniquely tied to the landscape into which they are patterned (Black, 2011). “Settlers” refers to the Europeans who settled lands in North America as part of the settler colonial project whereby Indigenous peoples were expelled to establish a new nation (Wolfe, 2006). “Settler colonialism” refers to systems which occur as part of the settlement process that structurally impose a racist, hierarchical relationship (material and ideological) between the Indigenous person and the European settler and introduce extractive relations to the land and resources (Youé, 2018). Finally, we refer to Black (2011, p. 15) to define “cosmology;” as “a people’s cosmological Creation story and events define their principles, ideals, values and philosophies, which, in turn, inform the legal regime.”

Objectives

Our overarching aims were to understand the historical and social-ecological context of the red wolf’s extirpation in Alabama and to address the knowledge gap left by previous work regarding non-European American perspectives on and history with the red wolf (e.g., Agan, Treves, & Willey, 2021a; Serenari & Lute, 2020; Responsive Management, 2016; USFWS, 2023). Toward these goals, we provide a case study for the application of social-ecology in conjunction with, or instead of, stakeholder theory for managing the human dimension of imperiled species conservation. Such a case study offers a basis by which wildlife managers and researchers can address recurring issues underlying conflicts or barriers that inhibit conservation efforts, given that adaptive management programs have been found to be lacking in awareness of specific human dimensions affecting study systems, a critical part of any successful management program (Westgate, Likens & Lindenmayer, 2013; Colvin, Witt, & Lacey, 2015; Williams et al., 2009).

Methods and Materials

Our search of literature and archival materials consisted of two stages: exploratory, to assess the potential of finding historical accounts of red wolves, and systematic. The former consisted of using the search terms “wolf killed,” “wolf trapped,” “wolf hunt,” “wolf,” “wolves,” “coyotes,” and “coyote” on Internet Archive and Newspapers Archive. Following the discovery of archived material that we believed relevant for our study (Tables S1 & S3), we conducted a reproducible, systematic search (Table 1), followed by snowball sampling, in our case, meaning the acquisition of literature through citations in acquired materials, such as in the collection of Presnall (1943a, b) and Mooney (1900), the latter of which was cited in the former. We searched coyotes along with wolves to account for the colonization of Alabama by coyotes following wolf extirpation, and because coyotes were historically considered to be a type of wolf (the “prairie wolf;” Coues, 1873). Despite several reported observations of individual coyotes in Alabama between 1927–1948 (Young & Jackson, 1951), the expanding coyote population was not known to have crossed the Mississippi River and into Alabama prior to the 1960s (Nowak 1979, 2002). Lastly, we did not use the term “red wolf” because the species was not commonly referred to as the red wolf outside of Texas until after the 1940s (Goldman, 1937; Nowak, 1967).

Table 1. *Counties in brackets in row one were searched one at a time, as Newspapers[.]com returned an error anytime there were more than two search items in parentheses. Collection of newspapers was capped at 60 results per search due to a noticeable decline in the quality of search results at that threshold and time limitations. The search term "wolves" was chosen as opposed to "wolf" to avoid having to filter through results featuring individuals named "Wolf." Additionally, red wolves were not commonly referred to as red wolves outside of Texas until after the 1940s (Nowak, 1967). We searched coyotes along with wolves to account for the colonization of Alabama by coyotes following wolf extirpation, and because coyotes were historically considered to be a type of wolf (the "prairie wolf;" Coues, 1873).*

Database	Search terms	Filter(s)	Total results	Filtered and retained results
Newspapers[.]com	wolves w/10 counties[a] AND (trap* OR kill*) NOT (West* OR Canad*)	*Date*: 1819-1920; Location: Alabama; *Sort*: Best Match; *Filters*: Exclude: Hide Enslavements; Hide Marriages; Hide Obituaries	3957 (cumulative)	299 (cumulative)
	biological survey AND (trap* OR kill*) AND wol*	*Date*: 1819-1920; Location: Alabama; *Sort*: Best Match; *Filters*: Exclude: Hide Enslavements; Hide Marriages; Hide Obituaries	159	25
	("government trapper" OR "government hunter") AND wol*	Date: 1819-1920; Location: Alabama; Sort: Best Match; Filters: Exclude: Hide Enslavements; Hide Marriages; Hide Obituaries	93	15
	wolves	*Sort*: Best Match; *Newspapers*: Tahlequah Arrow; Indian Arrow; The Sequoyah Memorial; Cherokee Telephone; The Daily Telephone; Cherokee Phoenix, and Indian's Advocate; Cherokee Advocate	74	29
	wolves	*Sort*: Best Match; *Newspapers*: The Negro Leader; The Press Forum Weekly; The Colored Citizen; The Colored Alabamian; The Voice of the Negro; The Emancipator	11	2
Alabama Department of Archives and History	wolves	NA	1	1
USDA National Wildlife Research Center	Bureau of Biological Survey	Subjects: "coyotes AND wolves"	3	1[b]

[a] Lauderdale, Madison, Limestone, Jackson, Franklin, Morgan, Lawrence, Marion, Jefferson, St. Clair, Tuscaloosa, Shelby, Bibb, Greene, Perry, Autauga, Dallas, Marengo, Montgomery, Washington, Clarke, Wilcox, Monroe, Butler, Pike, Conecuh, Covington, Henry, Mobile, and Baldwin

[b] 50 annual reports in collection

We prioritized newspapers in our search because we reasoned that this would be the best source for firsthand accounts of wolves in Alabama. All other materials were acquired to support the information we found in the newspaper publications, with additional, local information sought for wolves specifically in the state archives, and information specific to the Bureau of Biological Survey (BBS), from the USDA archives. For official management reports, we searched the United States Department of Agriculture (USDA) National Wildlife Research Center Archives. Our search yielded three results: the collections titled, "Bureau of Biological Survey Field Reports and Maps," "Animal Damage Control Annual Reports," and "Donald Hawthorne Animal Damage Control History Collection." We ultimately decided to include only the BBS reports due to limited scope and lesser relevance of the other two collections. Lastly, we attempted to acquire records from the Alabama Cooperative Extension Service (ACES) and Auburn University for state-level government actions. However, the total scanning cost was prohibitive, and we were informed by ACES that it would not contain any relevant information on wolves. Additionally, Auburn University staff conducted a search for wolf-related information in their online catalog and databases which yielded no meaningful results.

To quantify the extent of the impact of land use practices introduced by the European American settlers, we consulted decennial and quinquennial USDA Agricultural Census reports beginning in 1840, the first year on record, until 1925, the earliest decade in which the local red wolf population was in notable decline (Howell, 1921). Therefore, reported acreage of "improved land" was recorded by year, and the median by county was calculated for 1850–1925. "Improved land" is defined in the 1870 USDA census as land which has been cleared for "grazing, grass, or tillage, or lying fallow" (Walker, 1870, p. 71).

To address European American cultural perspectives on the red wolf, we relied on the use of language in reference to wolves found in archived newspaper articles classified under the "General Newspaper Search" category (S3) primarily, as well as Bureau of Biological Survey reports (Table 1; S3). Qualitative assessment of said language aimed to categorize cultural perspectives of wolves as "positive," "negative," or "neutral" using the definitions and "fittingness" of identified terms, specifically evaluative adjectives (Brandt, 1946; Little, 2015; D'Arms & Jacobson, 2000), to the

exclusion of nouns like “depredations,” non-evaluative adjectives, such as “large,” and non-evaluative verbs, such as “howling” or “killing.” Brandt (1946) defines evaluative adjectives as terms (which can include subjectively moral-value-laden nouns, such as “beast,” “brat,” or “buffoon”) people use to express their moral approval or disapproval of a subject or actions. These terms are based on the presence or occurrence of certain traits in the subject or characteristics of the action. “Fittingness” means that “‘X is Y-able,’ is a fitting object of Y attitude (or emotion),” X being a subject or action described by Y evaluative adjective (Brandt, 1946, p. 113). However, we apply this only in consideration of attitudes directed at wolves as contextualized by respective cultures’ cognitive hierarchies, and not as an analysis of the morality or appropriateness of the attitudes and emotions themselves (D’Arms & Jacobson, 2000). Metaphorical references to wolves were not considered for this portion, as this was covered by the discussion of cosmologies below. For non-European American cultural perspectives, we used newspaper publications produced by and for Cherokee (Tsalagi) and African American audiences. We chose to assess Tsalagi perspectives due to accessibility for direct consultation, and because they have a pre-colonization history in both Alabama and North Carolina (Figure 3), the latter being the only place where red wolves currently persist in the wild. The USFWS also engaged with the Cherokee Nation, or Tsalagi Ayeli, among other Indigenous nations, to revise the RWRP (USFWS, 2023). We chose to assess diasporic African perspectives given the significance of this community in the story of colonization in the eastern US, and in consideration of the fact that a significant proportion (approximately 30%) of the population within the 5-county ENC RWP area is African American (US Census Bureau, 2023; Responsive Management, 2016).

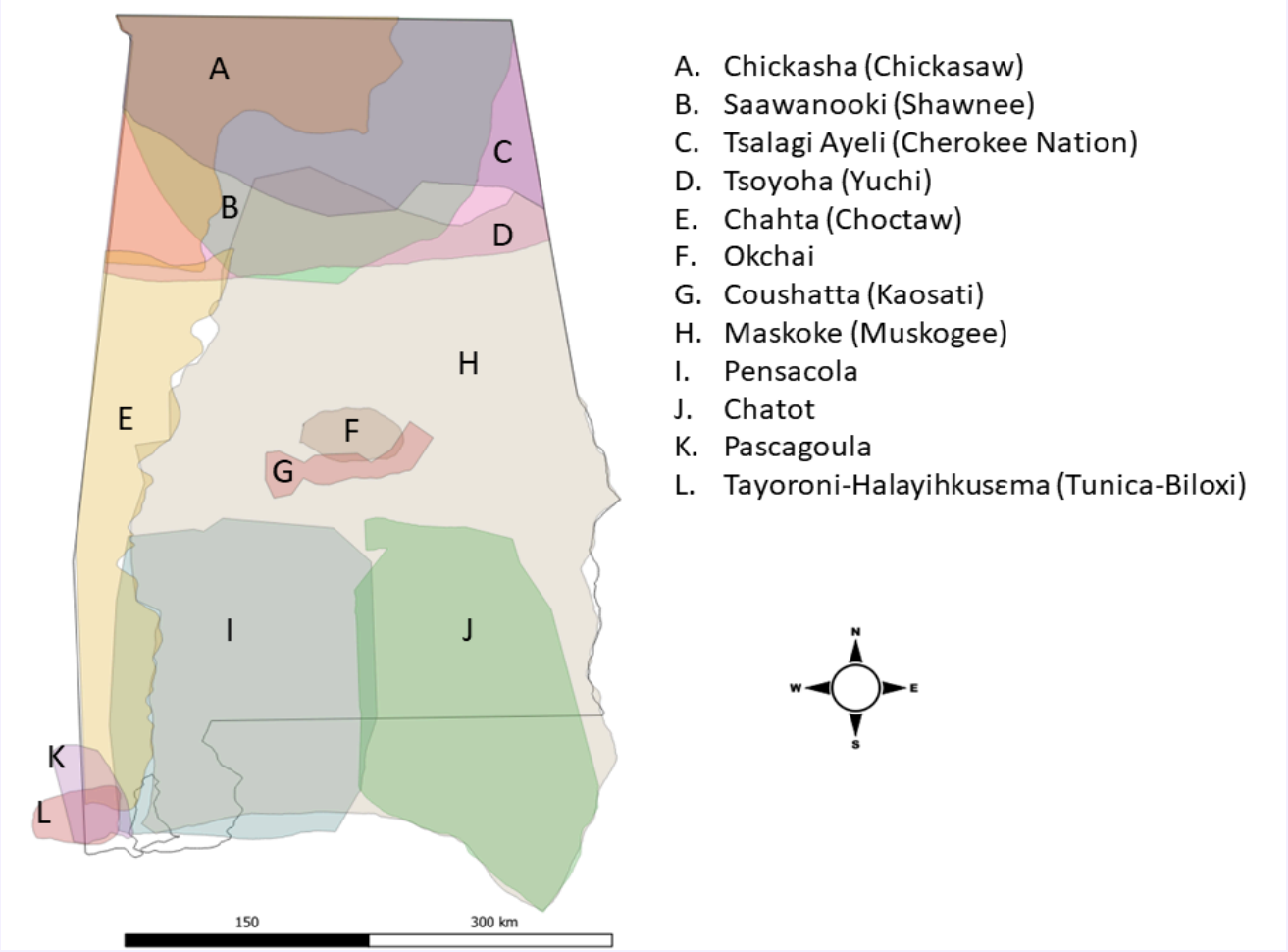


Figure 3. *The late-18th–early-19th century distribution of Indigenous peoples' territories in what is now known as Alabama. Historical Tsalagi Ayeli territory spanned the northernmost portion of Alabama, overlapping with Chickasha (Chickasaw), Saawanooki (Shawnee), and Tsoyoha (Yuchi) territory. All Indigenous tribal names are written in their Native language according to their respective government websites, direct consultation, or native-land.ca. Parenthesized are the Anglicized names corresponding to their Indigenous names.*

We used Tsalagi newspapers from Georgia and Oklahoma to assess Tsalagi viewpoints, because they were the primary, publicly available written materials representative of some Tsalagi perspectives from the period. Though the newspapers themselves were not based in Alabama, they were still representative of mass communications by and for the Tsalagi, given the history of their territory extending from Georgia, Alabama, South Carolina, North Carolina, Tennessee, Kentucky, Virginia, and West Virginia at the time of European contact (French & Hornbuckle, 1981), having been sold to settlers in Alabama in the 1830s and '40s (Young, 1955; Saunt,

2020). New Echota (now Calhoun), Georgia was the capital of Tsalagi territory and the location from which the selected newspapers were based during the time in which the Tsalagi people still claimed territory extending into Alabama (French & Hornbuckle, 1981). This was before the population was forced into Oklahoma beginning in 1802 with the Georgia Compact and advancing in 1829 with direct orders from Andrew Jackson and the 1835 Treaty of New Echota which made forced removal an official mandate (Boudinott, 1829; French & Hornbuckle, 1981). Because there were significantly fewer newspaper reports available in a search specific to newspapers written by and for Tsalagi people, and in consideration of the Indian Removal Act, we removed our time period and geographic location constraints to maximize the results. We did the same for documents written by and for African Americans, in consideration of potential barriers to access of mass communication due to enslavement, and racial terror by the Ku Klux Klan and others immediately following Emancipation (see Federal Writers Project, 1937), and "Jim Crow" apartheid, which legally lasted from Emancipation to 1964 (Civil Rights Act, 1964). For these same reasons, we used the simplest search term, "wolves," so as not to constrain the potential quantity of search results.

Finally, a brief review of general cosmologies of the aforementioned cultural groups is included to further inform their respective cognitive hierarchies. We chose to investigate these cosmologies, in part, via cultural tales, as folktales have been shown to influence how people perceive the featured animals (e.g., Prokopf, Usak, & Erdogan, 2011). A comprehensive investigation of differences in bodies of knowledge concerning the whole of ecology between Indigenous, diasporic African, and European American peoples was beyond the scope of this paper. To support our investigation of non-European conceptions of wolves, we consulted Mooney (1900) based on a USFWS investigation of Indigenous versus European worldviews and their influence on conservation (Presnall, 1943a). To control for potential bias in Mooney (1900), we referred to French & Hornbuckle (1981), and Muse Isaacs (2019) for Tsalagi perspectives for potential gaps in Mooney's work. We also conducted one interview with a Tsalagi-identifying individual. This individual was Pat Gwin, an enrolled tribal citizen of the Cherokee Nation, retired Senior Director of Cherokee Nation's Environmental Resources, and current member of the Red Wolf Recovery Team (USFWS, 2023). We then compare this with a Muskogee

(Maskoke) perspective to demonstrate the need to substantively engage and collaborate with Indigenous peoples beyond the Tsalagi in developing initiatives for red wolf recovery. This Maskoke perspective was that of Marcus Briggs-Cloud, co-director of the Ekvn-Yefolecv Maskoke ecovillage in Coosa County, Alabama. Finally, we interviewed Bill Bruce, general manager of the Moore-Odom Wildlife Foundation, including the FR Ranch, located in Cameron Parish, Louisiana. The FR Ranch and surrounding areas were assessed and/or trapped by the USFWS Red Wolf Recovery Team during 1974–1980, resulting in the capture of several founders for the red wolf captive-breeding program (Hinton et al., 2013; vonHoldt et al., 2022). Bruce is the third in this role since the land was purchased by the Odom family in 1918, to offer a direct perspective of a European American alongside those found in the acquired newspapers. For diasporic African perspectives, we consulted Hazzard-Donald (2013), Bascom (1992), Gates & Tatar (2018), Cowan (2004), Talley (1922), Hurston (1935, 2022), Harris (1908), and Proctor (2002) for cosmology and oral traditions. These materials were chosen due to their pre-existing availability to the authors. Additionally, two of the authors are diasporic Africans (JM and AH).

Results

Known natural history of the red wolf in Alabama

Catesby (1754) and Bartram (1791) provided some of the earliest empirical descriptions of red wolves in European and European American literature in which Bartram referred to the animal as *Lupus niger*, owing to the predominance of melanistic individuals observed during his travels in Florida. However, it is not clear if *Lupus niger* was identified by Bartram as a species distinct from gray wolves (*Canis lupus*). Bartram (1791) also reported the occurrence of wolves in Alabama along the lower Tombigbee and Tallapoosa Rivers. By the early 1800s, European Americans began to distinguish between the gray wolf, coyote, and red wolf. For example, Edwin et al. (1823, p. 169) compared the morphology of the gray wolf to that of the “common red wolf,” likely in reference to central and eastern Texas animals, while Gregg (1849) noted that gray wolves inhabiting US territories west of the Mississippi River were a “little larger than the wolf of the United States.” It is reasonable to infer that the “wolf of the United States” refers to the red wolf, because it was the only wolf living east of the

Mississippi River in the country at the time (Figure 1; Nowak, 1979, 2002), and the first states west of the Mississippi had only recently been established. Later, Audubon and Bachman (1851) described the "red Texan wolf" as a slender and long-legged subspecies of the more robust gray wolf. They assigned it the scientific name *Canis lupus rufus* while using an old name *Canis lupus ater* for the Florida black wolf that was established prior to Bartram (1791). Ultimately, Bailey (1905) was the first to use *Canis rufus* for the red wolf's species name.

The occurrence of melanistic red wolves in Alabama is notable, with the variant, referred to as the "Black Wolf of America" being described as the "largest and fiercest of wolves" (The Anniston Star, 1919 in Table S3). Many of the red wolves reportedly killed by Alabama settlers were described as melanistic (Table S1). In total, 2, 9, and 7 hunting or sighting reports explicitly involved red wolves displaying brown, black, and gray pelage, respectively. Reports indicated that the body mass of red wolves ranged from 21.8–43.1 kg, and wolves were 1.5–2.1 m long. Reported pack sizes reached up to 12 individuals, although one report claimed that wolves "seldom go in packs," perhaps referring to solitary dispersers (The Andalusia Times, 1906 in Table S3). Finally, red wolves in Alabama were reported to inhabit woodland, riparian, and wetland habitats, and were often found in or near mountain ranges or using rivers and creeks as corridors. Newspaper reports placed red wolves in all Level 3 ecoregions of Alabama, with all but two 1900-1950 sightings in or near the Interior Plateau (Figures 4 and 5).

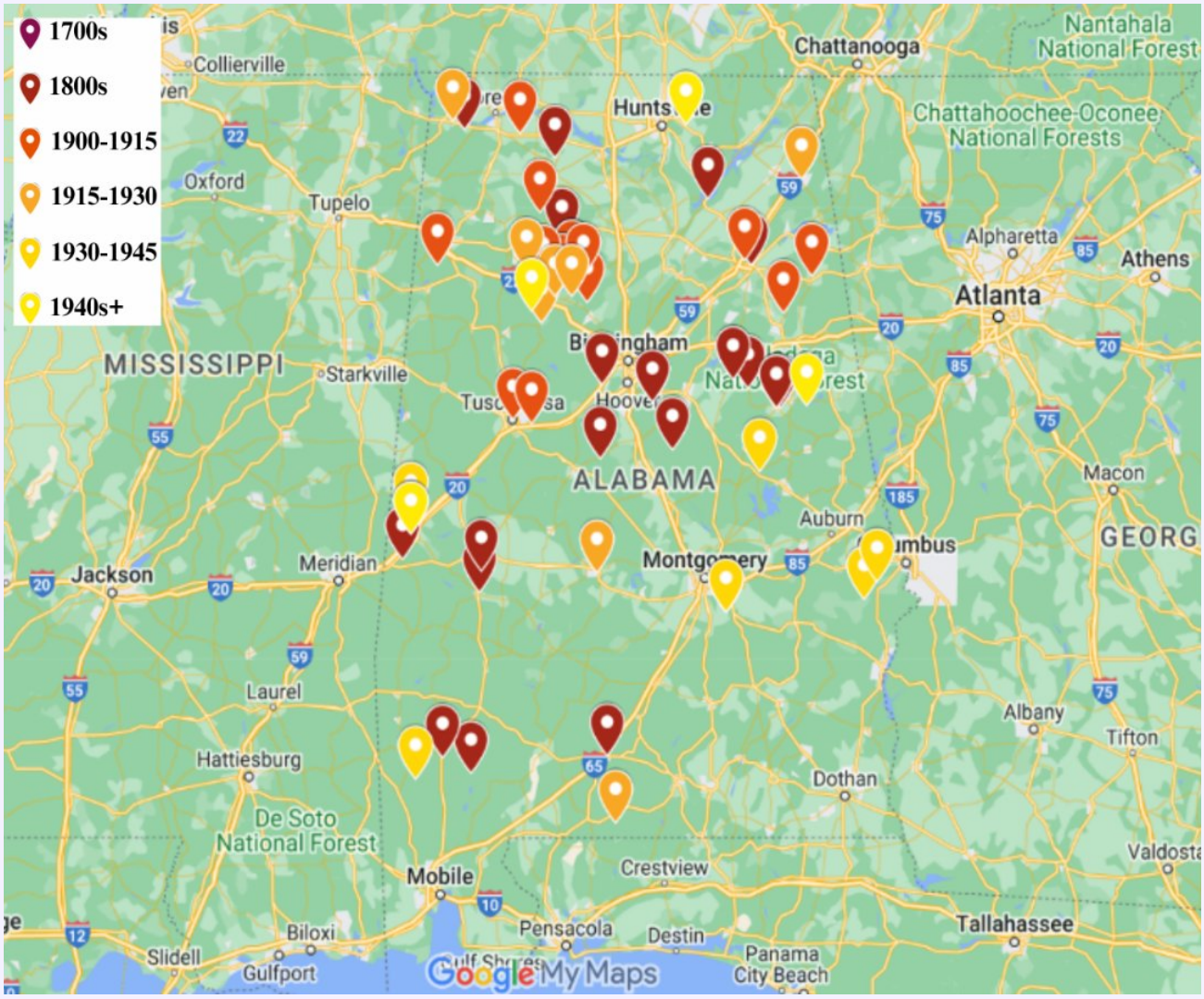


Figure 4. *An interactive digital map displaying the last sightings of red wolves in Alabama, USA during 1750–1950. This map represents all reports collected during our search (Table S1). Clicking on a location pin reveals a newspaper report describing the sighting or hunt that occurred at that site.*

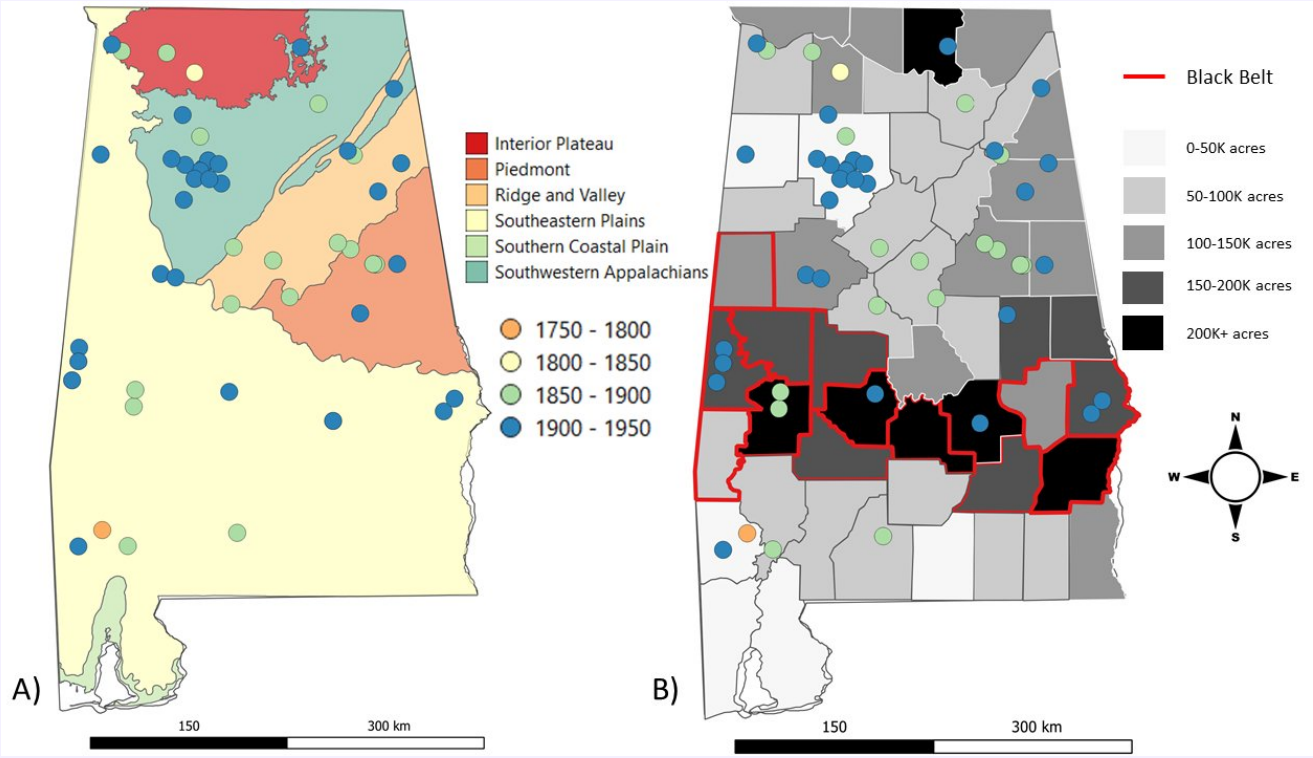


Figure 5. *A) Reported wolf sightings from mid-18th–20th centuries in Alabama by ecoregions. Though historical ecoregions described by Demmon & Southern Forest Experiment Station (1927) more closely align with Level 4 ecoregions, Level 3 ecoregions were used for simplicity. B) Median annual acres of deforestation and land clearing as reported by annual USDA agricultural census documents between 1840-1925 (1840 and 1890 did not report relevant data and 1920 did not report in acres of "improved land" by county). The latter uses the 1844 map, as it represents all major historical counties which were roughly consistent throughout the focal period. The majority of 19th and 20th century red wolf sightings in the state occurred North of the Black Belt, the portion of Alabama historically characterized by having the highest concentration of enslaved Africans (Phillips, 1906).*

European Americans and red wolf decline

The decline and eventual extirpation of the red wolf in Alabama appears to have been initiated directly and primarily by local European American settlers, as opposed to exclusively led by federal government eradication campaigns. The extent to which the federal government agencies, including BBS, contributed to the extirpation of the red wolf in Alabama appears to be relatively limited when compared to direct civilian actions that occurred prior to the state's establishment. Concerning state-level efforts, Alabama enacted a bounty law immediately upon gaining

statehood (Alabama Legislature, 1819; S2A). The bounties were so effective in spurring the civilian population to kill panthers and wolves that they threatened to bankrupt the state by forcing the use of state taxes to pay for red wolf and Florida panther scalps (DeLand & Smith, 1888). This bounty offered $3 for every ≤ 6-month-old wolf or panther killed and $5 for those > 6 months (Alabama Legislature, 1819; S2A). Another bounty was enacted in an unnamed "western county" around 1940 (The State Sun, 1940 in S3). However, during the early 20th century, federal biologists were used to exterminate predators such as BBS contracted hunters and trappers. Andy Ray, a prominent federal trapper and Predator Control Supervisor for USFWS in Alabama (Sumter County Journal, 1944 in S3; Figure 6), was identified in four unique reports as having lethally removed red wolves and coyotes from Sumter and Russell counties. Some communities solicited Ray's work (The Clarke County Democrat, 1944 in S3). Additionally, internal BBS documents show that federal agents killed 12 red wolves in Alabama during 1915–1939 (Young, 1937–1939).

In addition to government actions at the local, state, and federal levels, newspaper reports demonstrate that settlers continued to exterminate local wolf populations in response to conflict or sightings (Tables 2 and S1; Figure 6) using strychnine, pit traps, and guns. Of the 361 total newspaper reports collected that were not specific to the BBS, Indigenous North Americans, or African Americans, 93 publications reflecting 52 unique stories reported settler-initiated hunting actions that were followed through (Tables 2 and S1). There were 43 reports which explicitly resulted in red wolf killings; other publications mentioning hunting parties did not report an outcome. Another 139 reports were categorized as general communications of red wolf depredations, presence, management, or deterrence. All remaining newspaper publications collected constituted reports featuring social or religious metaphors of red wolves, individual recollections of wolf presence, and miscellaneous reports (those which did not fit in the preceding categories).

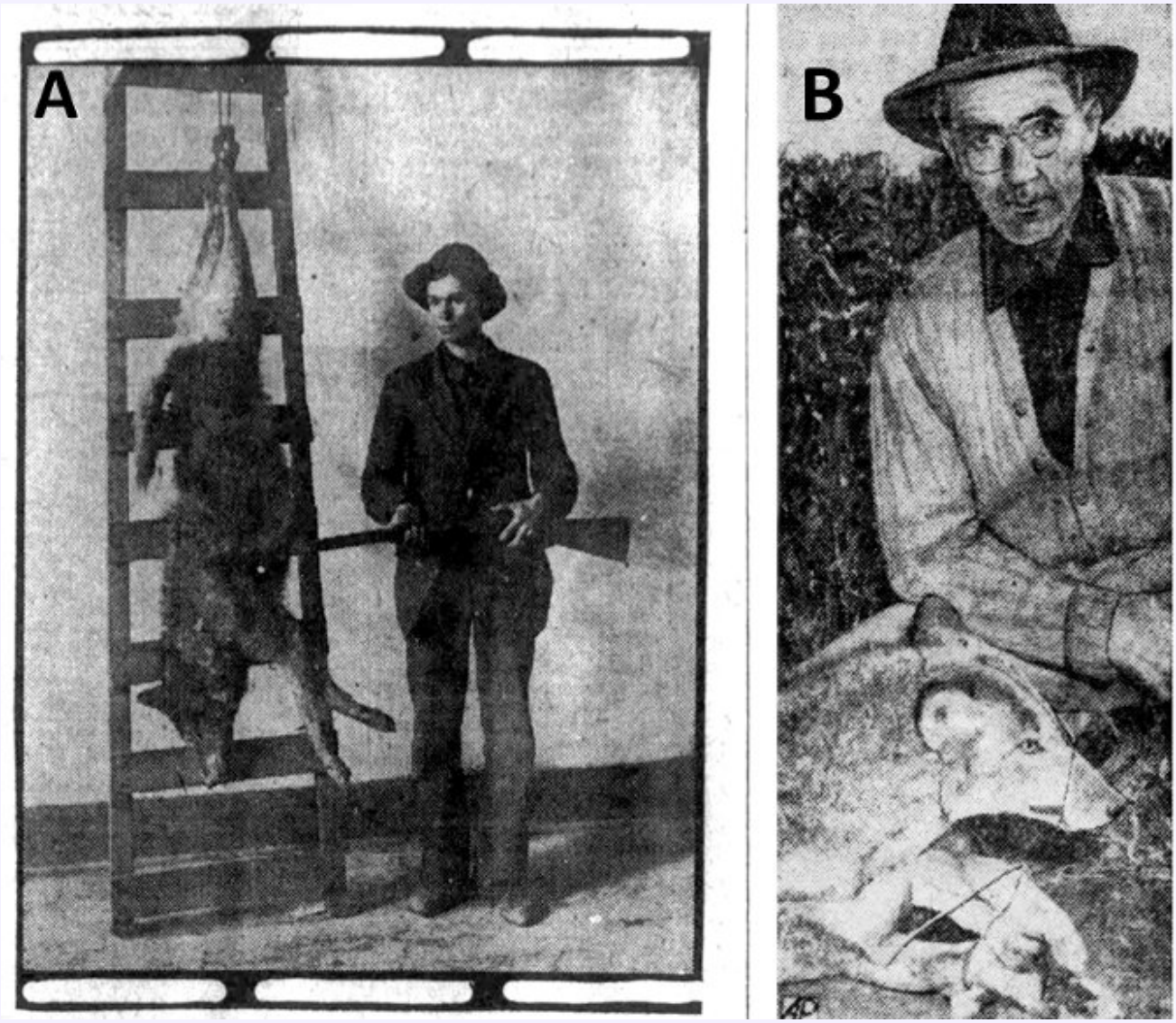


Figure 6. *A) Cicero Walden, a 17-year-old boy, stands next to the suspended body of a melanistic red wolf he shot in 1911. The red wolf was killed in Laney, a small village in the mountains of northeastern Alabama (The Montgomery Advertiser 1911 in S3). B) Andy Ray, federal trapper for the Biological Survey, sits next to a wolf he trapped (The Decatur Daily 1951 in S3).*

Table 2. *An account of Western European and European American values, value orientations or beliefs, and attitudes, and how these all coalesce as ultimate factors to result in the proximate factors of anti-wolf behaviors. Because values are products of culture which are embedded and resistant to change, attitudes and behaviors (highlighted cells) are considered more manageable for mitigating human-wildlife conflict (Manfredo et al., 2016).*

		Euro-Americans	
Ultimate	Values	• Subdue the earth (Manfredo et al., 2016; Ferdinand, 2022; Nkrumah, 2009; King James Version, 1611) • Reproduce and make the land productive for capital gain (Manfredo et al., 2016; Ferdinand, 2022; Nkrumah, 2009; King James Version, 1611)	
	Value orientations, Beliefs	• Wolves kill people even when not hungry (The Roanoke Leader, 1907) • "Mission of man" is the "weed[ing] out inferiority" of human and nonhuman life (The Living Truth, 1910) • White people had the right to self-defense against "outrages worse than [t]hose that savage Indians, or wolves, or bear, or rattlesnakes could inflict" (Birmingham Post-Herald, 1899) • A dead wolf < 6 months old is worth $3; a dead wolf > 6 months is worth $5 (Alabama Legislature, 1819) • Land is "improved" only when it has been deforested and transformed for agriculture (Walker, 1870; Ferdinand, 2022)	
	Attitudes	• Black wolves "largest and fiercest of wolves" (The Anniston Star, 1919) • Wolves should be killed for the protection of livestock, communities (S2A) • Extermination of wolves and other predators is an "absolute necessity" (Union Springs Herald, 1901) • "The fierce destructiveness of large wolves…both to domestic animals and game, is so great that it becomes a necessity to eliminate them from certain areas." (Nelson, 1924, p. 2)	
		Citizen	Government
Proximate	Behaviors	• Creation of Wolf Hunters League (S2A) • Arrangement of hunting parties (S2A) • Use of poison, wolf pits, guns, etc. to kill wolves on private property (S2A) • Tree clearing	• Wolf bounties (Alabama Legislature, 1819; DeLand & Smith, 1888; The State Sun, 1940) • Establishment of Bureau of Biological Survey (Merriam, 1896) • Implementation of predator control information dissemination and official program (Merriam, 1907, 1908; Nelson, 1920) • Indian Removal Act of 1830, ethnic cleansing (Saunt, 2020; French & Hornbuckle, 1981)

Defense of agriculture and livestock was the primary motivation for settlers killing red wolves in the compiled reports, though myths of their inclination to attack humans and beliefs of the necessity of their extirpation persisted (S2A). Upon claiming new plots of land, settlers cleared vegetation to prepare land for subsistence and cash crops (Abernethy, 1922; Alabama Historical Commission, 2002; Figure 5). The median acres of "improved land" maintained by county varied but was greatest in the Black Belt region, the portion of Alabama historically characterized by having the highest concentration of enslaved Africans (Figure 5; Phillips, 1906). These forms of European American land use following the expulsion of Indigenous Peoples represent the much-cited "habitat loss" precipitating red wolf extirpation in the state and introduced sites of potential conflict given the presence of livestock (McCarley, 1962; NASEM, 2019; Mech & Nowak, 2023).

Federal and state policy, along with the shared values of natural resource management authorities and settlers, created the ultimate conditions which led to the proximate causes of the extirpation of the red wolf in Alabama (Table 2; Figure 7). Members of the BBS and some of the European American settler public of Alabama demonstrated shared value orientations and attitudes toward wolves. This was abundantly documented in official BBS management reports and civilian newspapers, primarily in agreeing that the red wolf constituted a threat to livestock and humans (e.g., S2A; Huntsville Weekly Democrat, 1912; The Birmingham News, 1907; The Union Banner, 1909 in S3). It is important to note, however, that this attitude is not ubiquitous across all European Americans, as there were landowners along the Gulf Coast in the early 20th century who were aware of the potential of red wolf depredation on cattle, and yet still chose not to lethally control the local population (Bill Bruce, pers. comm., 2024).

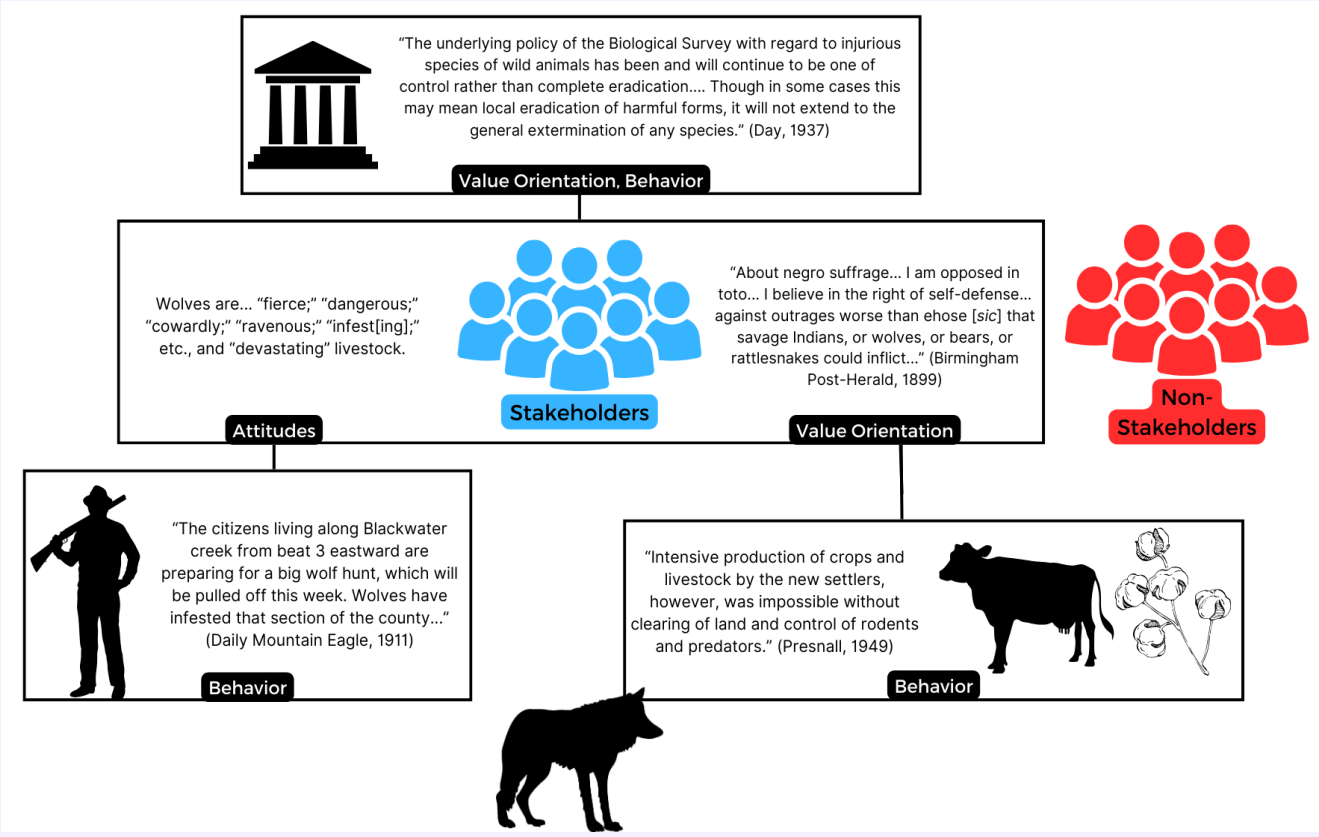


Figure 7. *An illustration of the social-ecological system that led to red wolf extirpation, as interpreted from our review of newspaper reports and BBS archival management documents. The shared value orientations and attitudes between the federal government, state government of Alabama, and European American settlers enabled the former two to perceive the latter as legitimate stakeholders, thus enacting legislation that supported their interests. Consequential behaviors created the proximate impact on the land and wildlife of deforestation and extirpation, respectively. Coercive or forced assimilation of Indigenous North Americans and diasporic Africans into the European American value system homogenized attitudes and value orientations, resulting in a hostile social-ecological system for red wolves.*

European American cosmology and attitudes toward the red wolf

The predominant cosmological context of Europeans during the 1800s and early 1900s was Christianity (Manfredo et al., 2016; Nelson, 2023). This cosmology asserted that God created man in his image, distinguishing man from all other living things, and granted man dominion over the Earth, with the specific task of subduing the earth and reproducing. After being cast

out of Eden for transgression, and thus out of God's direct presence, man was condemned to toil over the Earth (King James Version, 1611). This forms the basis of notions of subjugating wilderness and the dualism of man-nature or civilization-wilderness we observed (Table 2). Wolves, in particular, were portrayed as "ravenous" and "grievous" beasts or false prophets preying upon the lambs ("God's flock" or "God's children", at the time thought to be represented by European Americans).

European American language pertaining to red wolves was almost entirely negative, and often served as hostile metaphors against Indigenous peoples, diasporic Africans, and perceived social enemies (Tables 2 and 3). The most common language used to refer to red wolf presence and behavior included assertions of the wolves "infesting" natural lands or private property (e.g., The Leighton News, 1900; The Weekly Herald, 1914 in S3), and reported depredations were described as devastating (The Weekly Advertiser, 1893 in S3), ravenous (Birmingham Post-Herald, 1911 in S3), terrorizing (The Montgomery Advertiser, 1911 in S3), or marauding (The Montgomery Advertiser, 1943 in S3). Despite the prevalence of these negative evaluative adjectives, some who identify as European American and Christian still maintain positive views of red wolves (Bill Bruce, pers. comm., 2024).

Table 3. *An account of Tsalagi, Maskoke, and diasporic African values, value orientations or beliefs, and attitudes, and how these all coalesce as ultimate factors to potentially result in the proximate factors of behaviors that are neutral or positive toward wolves. Because values are products of culture which are embedded and resistant to change, attitudes and behaviors (highlighted cells) are considered more manageable for mitigating human-wildlife conflict (Manfredo et al., 2016). This table observes these cultural communities only in the context of their own cosmologies and resulting actions, not in the context of assimilation.*

		Tsalagi	Maskoke	Diasporic Africans
Ultimate	Values	• *Gadugi*, People coming together for mutual benefit and support (Muse Issacs, 2019) • Harmony, balance, mutual reciprocity between humans and nonhumans (Muse Issacs, 2019)	• The first Maskoke people took the names of the plants and animals for their powers and strengths, creating the names of their clans, including the Wolf Clan. All people are of the Earth, *ecuna.* (Fixico, 2017)	• The forces of nature are intertwined with, and observed and exercised through, spirituality (Cowan, 2005; Hazzard-Donald, 2013; Smith, 2007; Hurston, 1935; Talley, 1922; Nkrumah, 2009) • All living things have spirits (Hazzard-Donald, 2013)
	Value orientations, Beliefs	• The red wolf is as much Cherokee as are the Cherokee people, and vice versa (USFWS, 2023)	• The Maskoke are caretakers of the land they've resided in since time immemorial, and have a sacred relationship to the natural world (Marcus Brigs-Cloud, pers. comm., 2024) • The red wolf is the "foremost grandfather," a term of respect as opposed to relational, and a medicinal being (Marcus Briggs-Cloud, pers. comm., 2024)	• Wolves are messengers of the gods (Hazzard-Donald., 2013)
	Attitudes	• Wolves are revered beings, considered also as neighbors	• Wolves must be respected and honored. They have just as much of a right to the land as humans	• Wolves are powerful spiritual beings, deserving of respect (Hazzard-Donald., 2013)

		and peers (Pat Gwin, pers. Comm., 2023) • Killing wolves is unacceptable, except in extreme circumstances (Pat Gwin, pers. comm. 2023; The Eutaw Whig and Observer, 1800, Mooney, 1900)		do (Marcus Briggs-Cloud, pers. Comm., 2024) • Humans are obligated to maintain a right relationship with the earth (Marcus Briggs-Cloud, pers. comm., 2024)			
Proximate	Behaviors	<u>Citizens</u> • Avoid killing wolves whenever possible (does not preclude possibility of conflict)	<u>Conduct</u> • Considers both wolf and human interests and well-being in land use • Nonlethal conflict resolution prioritized	<u>Citizens</u> • Avoid killing wolves whenever possible (does not preclude possibility of conflict)	<u>Conduct</u> • Considers both wolf and human interests and well-being in land use • Nonlethal conflict resolution prioritized	<u>Citizens</u> • Show an inherent respect for wolves or neutrality	<u>Conduct</u> • Wolves considered potential, not inherent, threat

Tsalagi and red wolf decline

The Tsalagi did not report on red wolves or wolf depredation with the same frequency or volume as did European Americans. In fact, there appeared to be no written reports of local red wolf depredations in the Oklahoma Indian Territory from which the referenced newspapers were based (S2B). The only mention of red wolf depredations asserts that reported livestock losses were not, in fact, committed by wolves but dogs stating: "One dog will do more damage to stock than ten wolves when the blame is laid to the wolf" (Cherokee Advocate, 1887 in S3). It is notable that collected newspaper publications featuring explicit, demonstrable support for lethal removal of red wolves in defense of livestock and farms, and for sport, increased sharply after the turn of the 20th century, long after the forced removal of Indigenous peoples and American Civil War. Some of these publications included retellings of organized wolf hunts, including in Indian Territory (S3).

Tsalagi cosmology and attitudes toward the red wolf

Before the Tsalagi were subject to ethnic cleansing, which is the forced displacement of a group of people to achieve ethnic homogeneity (Michael, Smith, & Lowe, 2021), and genocide, defined as the targeted removal of an ethnic group via mass death (Michael, Smith, & Lowe, 2021; Saunt, 2020), their perspectives on wolves in the region were heterogeneous, though largely positive, particularly among those adhering to the general traditional worldview (pers. comm., Pat Gwin, 2023; French & Hornbuckle, 1981). Oral tradition being a standard for generational culture and information retention (Muse Isaacs, 2019) may be why there are relatively few newspaper accounts of Tsalagi perspectives and actions toward red wolves in the region. Tsalagi considered the red wolf to be sacred and equal and were explicitly opposed to hunting or otherwise killing wolves with few exceptions (Table 3; Pat Gwin, pers. comm., 2023; The Eutaw Whig and Observer, 1880 in S3; Mooney, 1900).

The Tsalagi creation story is one of cooperative action (*Gadugi*, meaning people coming together for mutual benefit and support) between human and nonhuman beings, the latter being primarily credited for the

formation of the land (Muse Isaacs, 2019; French & Hornbuckle, 1981). Muse Isaacs (2019) writes: “Each and every story describes and defines particular flora and fauna of the Cherokee homeland, including all the animals, birds, insects, and fish…” The story of Kana’ti and Selu which features the Wolf people (Wayah, or wolves) likely contains ecological information on the red wolf’s natural history. The story of the first Tsalagi features Kana’ti (the Lucky Hunter or the Great Hunter) and Selu (Corn, Corn Mother, or Spirit of the Corn), and their two sons, one their biological son, and the other adopted, the Wild Boy, or I’nage-utasun’hi, meaning ”He-who-grew-up-wild” (Muse Isaacs, 2019). Kana’ti regularly provided food to the family by hunting, at times assisted by wolves (Mooney, 1900), which Selu helped to prepare by butchering and cleaning the meat, as well as producing crops like corn and beans. The boys are said to have acted irresponsibly and destructively, having released all game into the wild, making it more difficult for Kana’ti to provide for them, and by killing Selu due to believing she was a “witch,” further depleting their sustenance. Their actions push Kana’ti to request help from the council of the Wolf people to bring them to heel. However, the boys ambushed and chased the Wolves down into a great swamp and ultimately killed all but three wolves. These three wolves are said to have given rise to all the wolves in the world (Mooney, 1900; Muse Isaacs, 2019). In the end, the two boys found their place as The Little Men, or Anisga’ya Tsunsdi, becoming Thunder and Lightning, reconciling with Kana’ti and Selu in spirit. Muse Isaacs (2019, p. 61) states, “Their new job as Anisgaya Tsunsdi’ suited their personalities in that Lightning and Thunder are life-giving and rejuvenating for the Earth but can also be deadly and destructive.”

This story represents the respect, responsibility, balance, and reciprocity between humans and nonhumans in the Tsalagi perspectives. Regarding wolves, it shows the possibilities of heterogeneity in relations, where there can be harmony as embodied with Kana’ti’s relationship with the Wayah, and imbalance, as represented by the boys’ irresponsibility and lethality. These origin stories inform Tsalagi culture to this day, especially in ideals of cooperation with the natural world, reciprocity, as well as clan structures and mechanisms of social and ecological balance (Muse Isaacs, 2019). The structure of these stories put wolves on a level with humans such that they are seen as a peer, neighbor, or an otherwise uniquely revered being,

illustrating belief systems that make Tsalagi traditionally opposed to the killing of wolves (Pat Gwin, pers. comm., 2023).

Multiple Tsalagi reports explicitly detailed the extent to which Tsalagi intentionally assimilated into European American Christian culture, largely as part of their defense against colonial encroachments preceding the Indian Removal Act (see Cherokee Phoenix, 1828a, b; Utaletah, 1828 in S3). Apart from deliberate assimilation, Tsalagi were also coerced into adopting European American family and household structures, agricultural traditions, and religious beliefs through processes such as marriage and schooling (Young, 1955; French & Hornbuckle, 1981). The extent to which this influenced Tsalagi perspectives on red wolves is unclear, but appears to be significant because of the stark contrast in language pertaining to wolves in the acquired newspapers in the late 1800s and early 1900s (S2B), as compared to traditional perspectives (Muse Isaacs, 2019; Pat Gwin, pers. comm., 2023).

Diasporic Africans and red wolf decline

There were a small number of reports (S3) originating from African American newspapers discussing red wolves. There were no reports of depredations apart from those considered to be caused by "useless dogs." Other reports on red wolf deterrence and lethal management only subtly communicated moral positions on employed tactics, such as the description of lethal "Esquimaux" (Eskimo) trapping methods as "infernal" (The Huntsville Gazette, 1882 in S3). The results also yielded one example of African American publications portraying political opposition as "wolves from perdition" (The Huntsville Gazette, 1884 in S3). However, it's important to note that multiple reports show African Americans killing red wolves on occasion, apparently in defense of livestock (The Selma Times, 1921; The State, 1924; The Sumter County Sun, 1899 in S3).

Diasporic African cosmology and attitudes toward the red wolf

Many diasporic Africans who were present in the South during enslavement held strongly to West and Central West African spiritual lifeways and knowledge systems until the Reconstruction Era (1865–1877),

despite adapting cultural practices to American society. This was a period characterized by the reintegration of the South after the American Civil War, during which time diasporic Africans were increasingly subject to social pressure to assimilate into European American paradigms (Cowan, 2004; Hazzard-Donald, 2012; Hurston, 2022). Traditional cosmology was predominantly Hoodoo, which is woven throughout traditional tales of Brer Wolf and Brer Rabbit (see Gates & Tatar, 2018; Harris, 1908). The Southwest Hoodoo region, which included Alabama, is said to have been characterized by paradigms and language inherited from the Bambara, Yoruba, Fon, and Ewe people, and generally Central West Africa, particularly the Kongo-Angola-Zaire area. This spiritual tradition was also informed by Indigenous North American and European traditions, including Christianity (Hazzard-Donald, 2012). Many West and Central West African cosmologies, along with Hoodoo, do not differentiate between a spiritual and secular realm, or material and immaterial (Nkrumah, 2009). Rather, humans occupy a universe in which there are intermediary forces connecting God (or the gods) and humankind, one type being that of deities. The wolf, along with the rabbit, was one of these deities, believed to be a messenger of the gods, though these deeper meanings and roles would likely change or fade over time with assimilation into European American culture (Hazzard-Donald, 2013; Talley, 1922). Additionally, the civilization-nature dualism that permeates European and European American cultures as earlier described was not standard in many African traditions (Nkrumah, 2009).

Beyond the few acquired reports, diasporic African folktales portray the wolf primarily as either an antagonistic or neutral figure. Brer Wolf is typically attempting to subdue Brer Rabbit but is ultimately defeated or evaded in every scenario due to his gullible and impulsive nature (Gates & Tatar, 2018). In addition to the traditional Brer Rabbit tales, Bascom (1992) details several story types originating from various regions of the African continent. These regularly feature the wolf being outsmarted by the trickster rabbit. For example, in a tale Bascom (1992) traced to Sierra Leone, Liberia, Mali, the Ivory Coast, Upper Volta, Ghana, Nigeria, Rio Muni, Gabon, and Mauritius, Rabbit—or another character, depending on the version—convinces Wolf to climb into a cow to eat, after which Wolf either becomes greedy or makes a mistake which kills the cow and leaves him trapped. In other stories, Rabbit steals Wolf's deer and gets Wolf killed by

tricking him into falsely admitting to killing goats, and even convincing Wolf to kill his own grandmother to sell her for food, ultimately leading to his own death (Bascom, 1992). These stories all originated in Mali, Nigeria, Zaire, Tanzania, Malawi, Zambia, Zimbabwe, Mozambique, South Africa, Senegal, Mali, Upper Volta, and were also documented in Haiti (Bascom, 1992). Despite the wolf's portrayal as either an antagonist or neutral character in African American heritage folktales, this community's language toward the red wolf did not display the same negativity shown in European American publications.

Discussion

Habitat loss and human persecution, primarily through government-sponsored programs, are routinely alluded to as the primary drivers of the red wolf's extirpation without substantial detail. Here, we considered the extirpation of the red wolf under the context of Alabama's colonial history from the early mid-18th to 20th centuries to identify events and anthropogenic dynamics that may have compounded as ultimate factors to create a nonviable, hostile environment for wolves, facilitating their extirpation via proximate factors like deforestation and direct killings caused by European colonization of the red wolf's historical range. We observed the elements of one major social-ecological mechanism, the Indian Removal Act, through which European colonization led to the institutionalization of European and European American epistemologies, value orientations, and attitudes relating to the wolf, manifest in lethal management methods and standards which marginalize non-European epistemologies, perspectives, and norms.

The red wolf's eastern form, *Canis rufus floridanus*, which carried the melanistic trait, is believed to have inhabited nearly all of Alabama prior to European colonization (Nowak, 1979, 2002). Ecological information provided by newspapers from the 1860s to the 1940s substantiates some current empirical knowledge of red wolves. For example, newspapers reported that red wolves were social and had packs consisting of up to 12 individuals which have been observed in extant red wolves (Hinton & Chamberlain, 2010; Sparkman et al., 2012). Reports involving melanistic red wolves are notable, as they accounted for several of the wolves shot for which pelage was described. Melanism, which had once been common

in historical red wolf populations, is now absent from the extant population and is only present in eastern coyote populations which hybridized with red wolves and colonized the region upon the wolf's extirpation, as well as red wolf-coyote hybrids located in the ENC RWP area (Hinton et al., 2022). Although we observed many similarities between characteristics of extant red wolves and those described in newspapers, some red wolves described in newspapers appeared to be larger than those in the ENC RWP (Hinton & Chamberlain, 2014). This was not surprising as the subspecies, *Canis rufus floridanus*, inhabiting Alabama was larger than the subspecies, *Canis rufus rufus*, that inhabited the coastal region of Texas and Louisiana and served as the source population for the extant population (USFWS, 1989; Nowak, 1979, 2002).

Alabama's red wolves were found in all Level 3 Ecoregions (Figure 5; US EPA, 2015b), but the majority of post-1900s reports were in Walker County, one of the few areas with a median of less than 50,000 acres of "improved land" maintained annually, and wolf sightings and depredations mostly occurred in the Southeastern Plains and Southwestern Appalachians. The persistent, intensive land-clearing for commercial crops and timber combined with targeted wolf extermination campaigns appears to have contributed significantly to the red wolf's extirpation in Alabama. These reports on the occurrence of 19th and early-20th century red wolves in Alabama are similar to recent findings on modern red wolf use of woodlands and wetlands juxtaposed with agriculture and commercial pine plantations (Hinton et al., 2016; Dellinger et al., 2013), and can provide insights on current observations of red wolf use of modern row-crop agriculture, commercial timber operations, and other anthropogenic landscapes.

Because of the simultaneous extirpation of the red wolf and the ethnic cleansing and assimilation of the Indigenous people in the southeastern US via the Indian Removal Act, concurrent with the destruction of epistemological and storytelling traditions of both Indigenous people and diasporic Africans – the former exacerbated by the absence of the wolf in traditional homelands and the lands into which they were forced (Pat Gwin, pers. comm., 2023; Marcus Briggs-Cloud, pers. comm., 2024) – current empirical knowledge of the red wolf is limited to European American recollections of history and perceptions of the wolf. Today, our

ecological knowledge of red wolves is largely based on zooarchaeological data (Nowak, 1979, 2002), the founders captured along the Gulf Coast, (Nowak, 1967; McCarely, 1962; USFWS, 1989) and the ENC RWP area (Sparkman et al., 2012; Hinton et al., 2016, 2017a, 2022; Dellinger et al., 2013).

Interdisciplinary engagement with Traditional Ecological Knowledge (TEK; Rinkevich et al., 2011; Hessami et al., 2021) and diasporic African epistemological traditions through storytelling (Gates & Tatar, 2018; Harris, 1908) can help to close knowledge gaps and reduce academic constraints on current red wolf natural history. For example, Maskoke language and oral traditions not only reflect the values and philosophy of Maskoke people regarding the wolf, but also contain extensive ecological information of interspecies interactions, such as that between the wolf and bison (*Bison bison*), and the impacts of those interactions on the landscape. Additionally, the African American tales of Brer Rabbit contain ecological observations of rabbit and wolf habitat selection and knowledge of botanicals used for cultural and medicinal purposes (Gates & Tatar, 2018; Harris, 1908). Though the Red Wolf Recovery Team currently includes members of the Tsalagi, Mattaponi, and Monacan Nations, the most recent recovery plan only substantively includes Tsalagi perspectives, which is also being featured in an upcoming documentary (USFWS, 2023; Pat Gwin, pers. comm., 2023). Expanding community engagement to others which retain historical ecological knowledge of the red wolf, especially Indigenous TEK, could be pivotal to future success of the recovery program. Further, the pursuit of cultural and intellectual diversity as guided by social-ecology (Bookchin, 1990; Ortega-Rubio, 2020; Clark, 1988), as opposed to racially diverse individuals assimilated into European American values and epistemologies (Nkrumah, 2009), could be beneficial to more accurately engaging public support and tolerance of red wolf reintroduction throughout its historical range. Supporting constituents in exercising their unique cultural identities and values in ecological contexts has been shown to support conservation and management programs (Sarkki et al., 2019; Shamon et al., 2022; Larson, Kipfulmueller, & Johnson, 2021; Johnson et al., 2022). Briggs-Cloud's comment on Maskoke culture as it relates to the extirpation of the red wolf highlights this point: "Maskoke cultural cognizance of wolves has suffered simply because of a lack of proximity to the species.... It calls into question the robustness of our medicinal efficacy

or the efficacy of our medicinal traditions based on not having [the medicinal] species."

However, here we offer a word of caution: wildlife managers and conservationists must be careful not to assume that all Indigenous perspectives will be the same. For example, though both Tsalagi and Maskoke cultures are characterized, in part, by the presence of Wolf Clans in family and societal structures (French & Hornbuckle, 1981; Muse Isaacs, 2019; Fixico, 2017), the wolf is seen as critical to the spiritual and ecological lifeways of the community, and they both linguistically refer to the red wolf as "grandfather" (*Wayah*, in Tsalagi, *Yvhv* in Maskoke; Marcus Briggs-Cloud, pers. comm., 2024), they do not share identical kinship relationships to the wolf. Where one traditional perspective might perceive the wolf as a relative (Tsalagi), the other may not (Maskoke), though they both position the wolf as a revered being deserving of respect. Such nuanced cultural differences could account for differences in motivation for hunting between the two communities. For example, the historical record suggests that traditional Tsalagi almost exclusively killed wolves in response to stock depredation with the development of atonement rites to allow such lethal action to retain positive relationships with the wolf (Mooney, 1900; Pat Gwin, pers. comm., 2023). On the other hand, some southeastern Indigenous peoples, including the Creek Confederacy, primarily composed of the Maskoke, were said to have harvested wolf parts, for uses such as archery gear or as decorative items (Swanton, 1946). These heterogeneous value structures still allow space for human-wolf conflict, as reflected in the interviewees' statements on predator control (S4). Further, no cultural community should be reduced to an "essentialist" identity, where one or a few traits are taken to represent the whole of an individual who fits a certain identity type (Bondy & Charles, 2020). In other words, no community is a monolith, and there must be space for heterogeneity in value orientations and attitudes toward wolves in any given community.

Ideals of coexistence are not exclusive to Indigenous or diasporic African people, even in a historical context. Bill Bruce shared similar sentiments that were passed onto him from the family which owned the Moore-Odom property since 1918: "Mr. Odom left [the land] for wildlife preservation and [to] bring the properties back to as close to nature with its vegetation, trees, shrubs… I don't have a problem living with [canids]—not to say that

we haven't lost calves, but we've seemed to cohabitate with them and made it work with our cattle operation…"

Still, it should be noted that even coexistence does not take the same form across cultures. For example, Bruce recalls the aim to return the lands under his management as "close to nature" as possible, whereas Briggs-Cloud clarifies that there is no equivalent concept of "nature" in Maskoke language: "Our ancient lexicon does not bear autonomous terms for the English equivalents," "nature, spirituality, religion, etcetera." Engagement with such perspectives is critical to improving nuanced cultural awareness concerning the red wolf's social-ecological system and prevents generalizing value orientations and attitudes across cultural identity groups, especially in light of historical observations such as ours. Generally, it appears that inherited values and attitudes related to wolves reinforce norms and historical dynamics of who constitutes a legitimate stakeholder in red wolf conservation (Figures 2 and 7; Phillips, 2003; Colvin, Witt, & Lacey, 2015). European colonization functionally homogenized (though not wholly, as complete cultural assimilation is not possible; Manfredo et al., 2016; Inglehart & Baker, 2000) and restricted the acceptable ranges of attitudes and behaviors toward wolves on social and institutional levels (Figure 7; Table 2; Tuhiwai Smith, 2021; Ferdinand, 2022), as institutions are manifestations of a society's values and ideologies (Nkrumah, 2009; Manfredo et al., 2016). These changes to the social and institutional landscapes were implemented by the Indian Removal Act, which ultimately removed a kaleidoscope of anthropogenic subsystems, many which held positive value orientations of the wolf, and replaced it with an anthropogenic subsystem that was largely negative. These changes in the human dimensions resulted in an SES hostile to wolves in Alabama.

With further study, it may be possible to trace some historical anthropogenic dynamics to the modern-day in the extant red wolf's social-ecological system. For example, red wolf recovery is still, at times, undermined by reactions to legislation intended to protect property rights (a core value) and other social-political interests, and incidental and illegal killings persist, neither of which had a notable precedent in the traditional Tsalagi or Maskoke worldview (USFWS, 2023; Serenari & Lute, 2020; Mercier & Halbrook, 2020; Agan, Treves, & Willey, 2021b; Pat Gwin, pers.

comm., 2023; Marcus Briggs-Cloud, pers. comm., 2024). For these reasons, community engagement must be predicated upon an awareness of identity-based, unresolved, historical conflict (Madden & McQuinn, 2014) resulting from historical ecocide and cultural assimilation. Conflict resolution such as this constitutes a non-negotiable element of governance, decision-making, and adaptive management, as widely acknowledged among federal wildlife and natural resource management researchers and practitioners (Colvin, Witt, & Lacey, 2015; Runge et al., 2020; Williams, Szaro, & Shapiro, 2009; Flora & Thiboumery, 2009; USFWS, 2023). Further, such engagement is critical to managers attaining a functional understanding of the drivers of anthropogenic mortality, namely poaching (Hinton et al., 2017a,b; Agan, Treves, & Willey, 2021b), and more indirect threats, such as active opposition to red wolf recovery efforts (Agan, Treves, & Willey, 2021a; USFWS, 2023).

Anthropogenic mortality in the forms of poaching and accidental shooting, accounted for approximately 70% of red wolf deaths for the majority of the ENC RWP's existence (Hinton et al., 2017a), yet there are no adequate mitigation or prevention measures in place despite ongoing recovery efforts (Agan, Treves, & Willey, 2021a; Santiago-Ávila et al., 2022). The federal government agencies overseeing wolf conservation nationwide have been repeatedly challenged for employing disproportionate lethal action to protect property and/or livestock and failing to adequately protect wolves and predators generally (Treves et al. 2017; Red Wolf Coal. et al. v. USFWS et al. 2018, 2021; Bergstrom et al., 2013). Further, specific social contexts of adaptive management programs have been severely understudied (Westgate, Likens, & Lindenmayer, 2013). Though the revised RWRP aims to better consider locals in the ENC RWP area regarding reintroduction efforts, failing to identify who constitutes the "community" and their distinct histories, cultures, epistemologies, values, and attitudes will continue this trend and cause the program to fall short of constituent expectations and needs. Programs like Prey for the Pack (North Carolina Wildlife Federation, 2022) are a step in the right direction, but ultimately inadequate alone, given that private landowners are not the only people in the ENC RWP area, and have in fact acted against the recovery program in the past by restricting red wolf biologists' access to private lands that were considered critical to the program (USFWS, 2023).

This paper was limited in the sense that we did not have access to official/empirical population estimates of the red wolf in Alabama. Additionally, we did not have spatial data to elucidate the spatially explicit consequences of civilian and governmental actions detailed in the newspaper reports. Lastly, we lacked specific or standardized attitudinal measurements of Alabama citizens and government officials, and federal government officials representing the BBS. Attitudes were instead inferred from newspaper reports from Alabama, as well as Georgia and Oklahoma for Tsalagi perspectives, and BBS management documents, primarily. However, as this project was intended to be qualitative, we believe our study provides opportunities for future quantitative investigation. For example, initiating investigations into the historical social-ecological system of the red wolf, how anthropogenic dynamics contributed to the species' extirpation throughout its historical range, and what elements of those dynamics persist in today's social-ecological system would be beneficial to further management and reintroduction efforts. This social-ecological framework (Figures 2 and 7; Tables 2 and 3) can account for value orientations, attitudes, and resulting behaviors in red wolf recovery to mitigate current anthropogenic threats (i.e., poaching), and would benefit from direct engagement with relevant cultural groups to capture nuances in values and attitudes relating to the species. Further, consultation with management authorities would be ideal to determine how management methods have changed over time. Regarding investigations of proximate causal factors of red wolf extirpation, a more in-depth study of how anthropogenic subsystems (Figure 2) can support coexistence with red wolves would be beneficial for red wolf recovery.

We suggest it may be more equitable to recognize communities and species not as "stakeholders," but as passive or active agents in the social-ecological system, deserving of democratic and ethical consideration in recovery planning. As the USFWS—partly responsible for the decimation of the red wolf as the agency under which the BBS was organized from 1940–1985 (Gabrielson, 1940; USDA, n.d.)—seeks to restore the red wolf to its historical range, it will need to continue to expand collaboration with governmental and nongovernmental organizations, communities, and individuals to establish a more holistic, historically and socially informed strategy for community engagement. Restoring the red wolf to areas of its historical range, including Alabama, will require thorough recognition of

historical contexts which led to the red wolf's extirpation from the wild and how we can change the ecological and social conditions into which we reintroduce red wolves. Without such efforts, we will likely see the red wolf become extinct in the wild for the second time.

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Amy C. Shutt: Conceptualization; Data curation; Investigation; Resources; Visualization; Writing - review & editing
Aby Sène-Harper: Writing - review & editing
Joseph W. Hinton: Conceptualization; Data curation; Investigation; Project administration; Resources; Writing - original draft; Writing - review & editing

Data Availability & Supplemental Information

The datasets analyzed are included here in the Supplemental Information files.

Transparent Peer Review

Results from the Transparent Peer Review can be found here.

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