Weedy Relations: Narratives of invasion and intimacy with tamarisk in the Chihuahuan Desert

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WEEDY RELATIONS: NARRATIVES OF INVASION AND INTIMACY WITH TAMARISK IN THE CHIHUAHUAN DESERT

by

SHANNON SLOANE PEPPER

THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in Geography

The University of New Mexico

Albuquerque, New Mexico

July 2021
ACKNOWLEDGEMENTS

A deep thank you to Dr. Maria Lane for giving feedback on nearly every iteration of this thesis and offering me the perfect balance of guiding support and freedom to take this project in the direction I chose. Thank you, also, Drs. Mindy Morgan and Marygold Walsh-Dilley for your continued support, edits, and excellent questions. Thank you to my peers in Dr. Lane’s advising group—Javier, Ramona, Desiree, Joe, Aly, Lauren, Laura— who patiently read multiple iterations of this thesis. And to the professors in and outside Geography who guided, encouraged, and catalyzed key aspects of my research: particularly Drs. joni palmer and Marcy Litvak. Thank you to those I interviewed and am happy to know through this project. Particular gratitude to Olivia, for your careful reading and help with word-smithing, to Cameron for taking me to the tamarisk, and to Michelle, for inspiring this project with a good conversation. And to my parents and grandparents, who supported my desire to come back to school. A final thank you to the Rio Grande/Río Bravo Bosque, who was a subject, a medium, and an inspiration in this project.
WEEDY RELATIONS: NARRATIVES OF INVASION AND INTIMACY WITH TAMARISK IN THE CHIHUAHUAN DESERT

by

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ABSTRACT

*Tamarix spp.*, also known as salt cedar or tamarisk, has garnered a notorious reputation in North America as an invasive plant, with widespread policy and research advocating for its eradication in the Southwest U.S. and Northern Mexico. This study examines both governmental conservation documents and news articles to investigate narrative trends on tamarisk in the Southwestern U.S. and Northern Mexico as a contiguous region (the Chihuahuan Desert), expanding on current research to include transborder effects on the perception and management of introduced species. This paper asks: In the last 25 years, how has the movement, management and biocontrol of tamarisk plants interacted with broader discourses of invasion in the Southwestern U.S. and Northern Mexico? The study finds that quotidian intimacy with and use of tamarisk defines Mexican news narratives. In U.S. publications, militaristic narratives pose human relationships to tamarisk as combative and hierarchical. The paper argues that the discursive division between the two countries has damaged relationships and economies in Northern Mexico and blinded perspectives in the U.S. to other ways of knowing and relating to tamarisk. This narrative intervention seeks to help to form new paths forward in thinking about introduced species.
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Chapter 1:
Detailed Research Overview

I. Introduction

“Father Joseph had come to love the tamarisk above all trees. It had been the companion of his wanderings. […] out of the sun-baked earth, against the baked adobe walls, the tamarisk waved its feathery plumes of bluish green. The family burro was tied to its trunk, the chickens scratched under it, the dogs slept in its shade, the washing hung on its branches. […] he loved it merely because it was the tree of the people, and was like one of the family in every Mexican household.”

Willa Cather, Death Comes for the Archbishop (1927)

“Tamarisk is one of the lessons in American West 101: About the time newcomers learn that the striking black-and-white bird on their porch is a common magpie, they find out that the feathery green riverside shrub with the pretty pink sprays of flowers is actually a nasty weed.”


In the last century, Tamarix spp., also known as salt cedar or tamarisk, has garnered a notorious reputation in North America as an invasive plant, with widespread policy and research advocating for its eradication in the U.S. intermountain west and Northern Mexico. Support for tamarisk control measures, however, is not universal throughout the region. Tamarisk has a cultural presence in Mexico, as illustrated by the quote from Willa Cather’s novel; its significance and relationship to humans in the region predates the line drawn between the now-U.S. and Old Mexico and divided ideologies with it. Recently, Mexican news and press releases have indicated that U.S. initiatives to control the spread of tamarisk in the Southwestern U.S. have affected communities in Mexico, indicating there is some variation
in attitudes toward tamarisk depending on location. Using a political ecological lens, this study examines both governmental conservation documents and news articles to investigate narrative trends on tamarisk in the Southwestern U.S. and Northern Mexico as a contiguous region, expanding on current research to include transborder effects on the perception and management of introduced species.

II. Statement of Problem and Purpose of Study

This study seeks to fill several key gaps in scholarship on tamarisk, and introduced species more broadly. In research to date, scholars have addressed in detail the history and ecology of tamarisk and its spread in the U.S. Many ecology and restoration-focused articles address the spread of tamarisk exclusively from a biological perspective, using empirical methods to study the plant and its spread. While several studies bring in the human and historical aspects of tamarisk conservation (notably, Chew’s 2009 “Monstering of the Tamarisk”), there are few studies on human perceptions and management that also address the full extent of the tamarisk’s spread. Northern Mexico’s reaction to and management of tamarisk remains largely underreported and unstudied in the academic and popular literature. This disconnect parallels the literature on invasive species more broadly, which calls for increased communication and exchange of information between scientists, land managers, and researchers, but offers very few examples of research that actively involves the work of all three of these groups. In addition, literature on tamarisk ecology and geography has tended to follow national boundaries, though the plants themselves do not. With climate change and global traffic driving in the migration of new species in increasing numbers, there is a need for deeper readings of the foundations and trends at work in how we think about, talk about, and interact with introduced species.

The purpose of this study is to better understand how the movement, management and biocontrol of tamarisk interacts with broader discourses on invasion in the Southwest U.S. and Northern Mexico. This study, by using cross-disciplinary and cross-border work ground-
ed in political ecology, yields new insights into the origins, trajectories and roles of narrative discourse on tamarisk. This study also contributes to the growing scholarship on multi-species relationships, exploring the interdependencies and conflicts between humans, tamarisks and the beetles released as biocontrol. In exploring this dynamic assemblage through recent narratives and focusing on the Chihuahuan desert as a contiguous ecoregion, I illuminate the interactions between tamarisk management and discourses of invasion.

III. Background

A. Study Area

The Chihuahuan Desert ecoregion extends from southern Arizona, New Mexico, and West Texas to the state of Hidalgo. It includes the large valley separating Sierra Madre Occidental and Sierra Madre Oriental mountain ranges through the interior of Mexico (Figure 1). An “ecoregion” refers to a geographically distinct area with similar species assemblages, climate patterns, and ecosystem dynamics (Atchley et al. 2001). Given the recent research regarding the southern extent of tamarisk in Northern Mexico (Glenn and Nagler, 2005), this project is concerned primarily with the northern half of the ecoregion, where the Rio Grande/Rio Bravo river basin—including Río Conchos and Río Salado—intersects with the Chihuahuan Desert.
ecoregion. Although GIS researchers are currently developing reliable methods for mapping tamarisk using satellite imagery (Natale et al. 2018; Ji and Wang 2015; Evangelista et al. 2009), there are currently no detailed distribution maps for tamarisk in Mexico. The most recent reports on the plant have indicated that it currently exists in the states of Coahuila, Sonora and Chihuahua, and throughout the course of the Rio Bravo/Grande (CONABIO 2016).

B. Early introduction to North America

The Eurasian tamarisk (Tamarix spp.) has been a common shrub or small tree across Southern Russia, the Middle East, and Northern Africa for centuries. In North America, there are five common species of tamarisk in the genus Tamarix, though most of these species have now hybridized (usda.gov, 2021). For the purpose of this research, I do not generally make a distinction between each species, but am referring to the whole genus Tamarix (except where specified). The date of the tamarisk’s introduction in North America is unknown, but is believed to have come to New England before 1818 on trade ships (Chew 2009). Settlers originally planted tamarisks as ornamentals, then as shade trees and windbreaks for farmers, and the plants quickly gained a reputation as hardy and vigorous in arid climates and disturbed soils (Chew 2009). Tamarisk was especially suitable for stabilizing eroded riverbanks, where their deep-reaching root systems held onto sandy, quick-draining, and salty soil where other plants could not survive (Stromberg, 2009). In 1927, Kirk Bryan, a geologist for United States Geological Survey (USGS), reported plantings of tamarisk along stretches of the Rio Puerco by the Middle Rio Grande Conservancy District (Bryan and Post 1927).

During the Great Depression, the nationwide call for more jobs fell on federal agencies, who scrambled to create new forms of work in the fields of land restoration and infrastructure (Chew 2009). Tamarisk’s ability to grow in poor and degraded soil was utilized by government agencies for restoration of land cleared for industry. A 1933 Science article suggested “utilizing labor in planting Tamarisk or similar plants at the inflow of large reser-
voirs, such as Elephant Butte or Roosevelt Lakes” (Freudenthal 1933: 448). This era of tamarisk promotion did not last long, however. With World War II (1939-1942) came demand for metals, especially copper—an industry which pulls on large amounts of ground- and surface water (Chew 2009). Phelps Dodge mining company, looking to expand its Morenci, Arizona, copper mine in the late 1930s, were stymied by unavailability of additional stream water, and extensive research efforts ensued to find out who—or what—was competing with the mining company for water (Stromberg et al. 2009).

Figure 2. Before and after photos of a tamarisk eradication project in Albuquerque’s Bosque Open Space from the “New Mexico Non-Native Phreatophyte/Watershed Management Plan.” (NMDA 2005)

C. Turns in discourse and management responses
Much of the early research funded by mining companies suggested that tamarisk had high rates of evapotranspiration. The studies relied, however, on techniques that scientists now recognize as having significantly overestimated the plants’ water use (Shafroth et al. 2005), leaving the impression that water could be significantly conserved by clearing any plants that tap into groundwater (Robinson 1952). One study extrapolated from “all available data” that 15 million acres of phreatophytes—plants with roots in direct contact with the water table—were wasting up to 25 million acre-feet of water annually in 17 states (Robinson 1952, Shafroth et al. 2005). These studies spelled trouble for the tamarisk, and the discourse on the shrub took a turn in the late 1930s. The new decade had brought a drought that settled on Texas, Arizona and central New Mexico, and popular media penned tamarisks as “water thieves” and “alien invaders” (Chew 2009).

Beginning in the 1980s, new methods arose for measuring stand-level evapotranspiration rates (Goodrich et al. 2000), complicating the question of tamarisk water use. Recent science indicates that evapotranspiration by tamarisks varies greatly depending on a myriad of factors, but overall, they use water at a rate comparable to their native counterparts in most cases (Goodrich et al. 2000.). A 2006 study revealed that removing tamarisk stands along stream banks reduces evapotranspiration but results in more bare-soil evaporation, leading to net neutral water savings (Hu et al. 2006). Another group of scientists found that removal of tamarisk and Russian olive from below cottonwoods on riverbanks may result in short-term water saving but projected the evapotranspiration reduction to be short-lived as the bare soil rapidly gives way to understory regrowth (Cleverly et al. 2006).

Despite recent studies debunking the theory that tamarisks use more water than their native counterparts, most agencies have been slow to adapt their eradication plans. Published in 2005 and lead by the New Mexico Department of Agriculture (NMDA), the “New Mexico Non-Native Phreatophyte/Watershed Management Plan” prominently displays the results of a
tamarisk eradication project in Albuquerque’s Bosque Open Space: the “Before” photo shows a mixed stand of cottonwood and tamarisk, and the “After” photo shows bare soil beneath a homogenous stand of cottonwoods (Figure 2). The report repeatedly asserts that non-native phreatophytes have uniformly negative impacts (NMDA 2005), but gives no citations or scientific reasoning for this assumption nor the agency’s subsequent recommendations.

The issue of tamarisk eradication became even more complicated by the discovery of the plant’s importance to the endangered Southwestern willow flycatcher (*Empidonax traillii extimus*). Initially, when the US Fish and Wildlife Service listed the Southwestern willow flycatcher as endangered in 1995, its decline was in part attributed to the presence of tamarisk in its primary nesting areas (USFWS 1995). Scientific discourse on the relationship between the tamarisk and the SW willow flycatcher took a turn in the early 2000s in response to studies revealing that the tamarisk in fact provided integral nesting habitat for the flycatchers (Sogge et al. 2003). One study estimated that throughout the flycatchers’ whole range, they built around 25% of their nests in tamarisk-dominated habitat (Sogge et al. 2003). In 2005, the USFWS denied permission to introduce tamarisk biocontrol insects in the bird’s range, citing concern over loss of habitat should the habitat take more than several years to spring back with native plants (USDA 2005).

**D. U.S. Introduction of Diorhabda spp. as biocontrol**

To control tamarisk, the USDA was interested in using *Diorhabda spp.* (including *elongata/carinulata* and *sublineata*), a species of beetle native to China and Kazakhstan (McLeod 2018). Biological control, or “biocontrol,” refers to the process of introducing a new species into the habitat range of a target species (often viewed as invasive and problematic) with the explicit expectation that the introduced biocontrol species will target the problem species and reduce or eliminate it from an ecosystem over time (Davis 2011). Though concern over SW willow flycatcher habitat thwarted some sections of the USDA biocontrol
project, some local governmental groups had already taken matters into their own hands. In 2004 the weed management department of Grand County, Utah, captured around 100 beetles from nearby study areas in Delta, Utah and released them along the Colorado River in Moab (McLeod 2018). Several other rogue and official beetle releases in those few years established the beetles in the upper Colorado River and Rio Grande, after which the beetles spread with astonishing rapidity. In 2006, Grand County recorded around 990 acres of tamarisk defoliation along the Colorado River. By late 2007, the beetles defoliated nearly 10,000 acres along a 70-mile stretch of the Colorado River, and the beetles had spread into several major tributaries (Tamarisk Coalition, n.d.). Currently, the extent of *Diorhabda* beetle range stretches as far south as Chihuahua, Sonora, and Coahuila in Northern Mexico (Figure 3).
U.S. introduction of tamarisk beetles into the socio-ecological fold with humans and tamarisks has created a complex and tangled web of relations, with cascading effects on countless other members of the ecosystems containing tamarisks. From the research that pegged tamarisk as an egregious water-user, to the pushback against its eradication on behalf of the SW willow flycatchers, to the decision to release beetles as biocontrol, management discourses and decisions about tamarisk have been laden with intricate layers of power and persuasion. In the following section, I pull on academic literature from political ecology and invasion biology to build a theoretical framework for an in-depth investigation of the socio-ecological web comprising humans, tamarisks, and tamarisk beetles and how it interacts with broader discourses of invasion.

IV. Literature Review

A. Political ecology

Political ecologists are concerned with the structures and institutions of power that drive environmentally impactful decisions and actions. In this section, I will highlight current trends and their roots in political ecological literature, touching on foundational and current perspectives on power in the context of environmental management, decolonial turns, and an increased awareness of emotion and bias in conservation decision-making.

Political ecology, since its beginnings, has been linked to geographical study. After a foundation in qualitative method, exemplified by Alexander von Humboldt’s early 19th century field journals (Humboldt 1808), the discipline of geography was unsettled and broadened by the expansion of quantitative methodology in geographic research in the mid-1900s. David Harvey’s Marxist geographical framework was a direct response to the mid-1900s positivist turn in academia and geography in particular. In geography, positivism is the notion that humans, environments, and social structures ought to be studied using scientific methodology, pulling from the concrete, data-driven research of the natural sciences. Harvey was trained in schools of positivism but ultimately felt that this mode of study failed to capture
the depth and complexity of human-environment relationships (Neumann 2005). Harvey, in his article “Revolutionary Theory,” discusses the formation and adoption of new paradigms through the use and control of knowledge. Harvey directly addresses logical positivism in relation to Marxist theory: “They both have a materialist base and both resort to an analytic method. The essential difference of course is that positivism simply seeks to understand the world whereas Marxism seeks to change it.” (Harvey, 7) Our immediate task, according to Harvey, is to create a new paradigm through deep critique of current analytical thought—an inherently uncomfortable proposition.

Although power is central to political ecological studies, there is no singular approach to understanding how power influences environmental decision-making in political ecology. A recent study by Svarstad, Benjaminsen, and Overå (2018) looks at the origins of political ecology to reveal three main power theories used in current political ecological studies, especially as they pertain to environmental decision-making. The authors define the three approaches as actor-oriented (“Weberian”), neo-Marxist and Foucauldian, after the theorists who contributed to the foundations of each theory (Svarstad et al. 2018). Consistent with Weber’s concept of individual agency in relation to power, “actor-oriented” refers to power as exercised by conscious and accountable individuals (Svarstad et al. 2018.). Though this framework highlights individual agency, it does not assume that actors are making decisions in a vacuum—the power that they exercise is still constrained and enabled by governmental, economical, and social structures (Svarstad et al. 2018.). Somewhat similarly, the neo-Marxist understanding sees power as exercised through domination and exploitation of markets and capital—here, the emphasis is less on the individual and more on the structures created and upheld by those in positions of power (Svarstad et al. 2018).

Svarstad et al.’s Foucauldian perspective on power in political ecology is more closely associated with poststructuralism, and stems from Foucault’s theories on discursive influence as a form of power. They define “discourse,” broadly, as “a socially shared perspective on a topic,” and discourse analysis in the context of environmental decision-making as a fo-
cus on narratives and storylines to analyze specific conflicts (Svarstad et al. 2018). They refer to Emery Roe’s (1991, 1995, 1999) framing of discourse analysis, stating that “discursive power is exercised when actors such as corporations, government agencies or NGOs produce discourses and manage to get other groups to adopt and contribute to the reproduction of their discourses.” (Svarstad et al. 2018) Discourse analysis is also central to Edward Said’s (1978) seminal work *Orientalism*, in which he argues that the West exercised enormous discursive power to control perceptions of the East as fundamentally foreign and “other.” Related and also central to the Foucauldian approach to power is “governmentality,” or the ways in which a government exercises discursive power over its citizens (Svarstad et al. 2018). According to Svarstad et al., this is done in one of four ways: disciplining to discourage certain lines of discourse, promotion of a particular “truth,” presenting a neoliberal rationality, or exercising sovereign power. These four control tactics, the authors argue, can be concurrent within a governmental system, associated with different scales of governance and possibly simultaneously contradicting one another (Svarstad et al. 2018). The authors stress that political ecology as a framework for understanding environmental governance is strengthened by its openness to plurality of scale and perspective. All three approaches to power as they relate to environmental decision-making are valid and potentially coexistent, and the authors urge researchers to be aware of and use whichever best supports their particular topic or region.

Political ecological research that ties in decoloniality and queer theory also illuminates the role that emotions play in the discursive creation of the abject. Scholars of queer theory generally understand the “abject” as that which is imbued with negativity and cannot be assimilated, and is thus open to subversion and change (Kristeva 1982; Sandberg 2008). Gonzalez-Hidalgo and Zografos (2019) address sentiment and decoloniality in what they call “the emotional turn in political ecology.” The authors describe environmental conflict as being based in unequal distribution of environmental benefits and costs, as well as in differing and often unintentional “languages of valuation” toward human and nonhuman relationships.
The authors, also pulling on Foucault’s (1991) writings on political subjectification and power argue that the values embedded in language are emotional, highly subjective (Gonzalez-Hidalgo & Zografos 2019) and frequently dominated by Euro-centric ways of knowing (Escobar 2014). Queer theory is an important but relatively unexplored tool for research on the role of emotion in discourse on invasive species—a concept that involves “othering” a particular species. Harcourt and Nelson (2015) describe ecology through a queer lens as the refusal of violence and ecological destruction without also refusing “the polluted, the abject, the hybrid seed infiltrated with GMO genes, and the exposed bodies and beings that we must learn not only to live with, but to love” (Harcourt and Nelson 2015). Haraway’s (1991; 2016) notion of a “polluted” cyborg ecology and Bennet’s (2010) vital materialism both advocate a more inclusionary ecology that counters the ecological purism that currently dominates the field. These philosophies within political ecology respect rather than dismiss the abject, illuminating deeper complexities in academic discourse on ecology and conservation. When elevating species understood as “native” and damning species understood as “invasive,” we risk dismissing the nuance and complexity of ecological webs of relation—of both human and more-than-human.

In another sector of political ecology, researchers have recently investigated the drivers of conservation decision-making through exploration of the relationships between policy-makers, researchers and the general public; arguing that within conservation, there are systemic and self-reinforcing biases that must be addressed in order to meet biodiversity conservation goals (Male and Bean 2005; Wilson et al. 2007; Martín-Lopez et al. 2009; Ressureção et al. 2012). A 2009 study by Martín-Lopez et al. calls attention to the taxonomic and, ultimately, anthropocentric biases in biological research through analysis of the uneven funding support for specific birds and mammals above all other taxa. Central to the authors’ claims is the the often-cited article by Wilson et al. (2007), “The (bio)diversity of science reflects the interests of society,” a study which begins to flesh out the emotionality and biases implicit in conservation research and, subsequently, decision-making. Taking this claim a step further,
Martín-Lopez et al. argue that analyzing connections between and interrelated interests of science, public opinion and conservation policies is key to understanding where conservation funds are allocated (Martín-Lopez et al. 2009). The authors also call attention to how differences in scale affect conservation funding decisions in Europe, finding that plants received approximately twice as much funding on a national scale than regionally (Martín-Lopez et al. 2009).

A study by Ressureção et al. (2012), published a few years later, also uses quantitative funding analysis to assess the public’s “willingness to pay” for various conservation initiatives, aiming to determine if there are socio-economic and/or regional differences in how people value a variety of marine species in the European Atlantic. While assessing value as synonymous with spending can be problematic, the authors do acknowledge the limitations of this approach and manage to shed a bit more light on a complex question. The authors found that the public valuation of certain species varied widely between geographic regions, and that previous studies that asserted that mainly “charismatic” species received a bias in public attention did not catch smaller-scale nuance. In this study, species not normally viewed as “charismatic” (such as small fish and various types of seaweed) are highly valued on a smaller and more regional scale, possibly due to peoples’ involvement and dependence upon them for their livelihoods (Ressureção et al. 2012). This study begins to fill a gap that has been overlooked in studies that attempt to address conservation biases on a global or nationwide scale, revealing a need for more research that tackles preferences, narratives and biases on a smaller, region-specific scale.

In this paper, the ideas discussed above are situated in the historical and geographical contexts of a particular place: the U.S./Mexico borderlands. Many scholars have focused on this place from outside political ecology. Binational conversation about the U.S./Mexico Borderlands’ shared ecologies, whether explicitly political ecology or not, is needed for effective consideration of conservation and ecological sciences in this region. A cross-border collection of essays (ed. Cantú-Ayala et al. 2007), though not political ecology in the discl-
plined sense, discusses ecological sciences within the specific political context of the U.S./Mexico border. The authors call out the U.S.’s hyper-focus on national security at the price of ecological health, pointing out that this thinking presents a “false dichotomy”—concerns for national security and concerns about habitat fragmentation and species decline at the border are not essentially in conflict with one another (Cantú-Ayala et al. 2007). Sundberg’s (2006, 2007) attention to U.S./Mexico border materialisms and their relationship to conservation discourse also refuses the political/ecological dichotomy in favor of a kind of co-constitution (Gorman and Gaynor 2020), and argues for the attentiveness to multi-species entanglements required to do environmental research within historical contexts.

Overall, it is clear that political ecology contains several important focal lenses for considering human-tamarisk interactions. The use of discursive analysis to address conservation conflicts gets to political ecology’s main aim of addressing underlying power structures in social-ecological research. Queer theory describes the complex interrelatedness of tamarisks, humans and tamarisk beetles, and draw in research that strives to bridge the political (in this case, the border region and its geopolitics) with the ecological sciences. In the section that follows, scientific and social concepts intertwine in a discourse-focused review of invasion biology.

B. Invasion biology

Invasion biology, though a relatively new field of study, receives frequent and passionate attention in academia, perhaps in part because of its cross-disciplinary following. The field is concerned, broadly, with the changing ecology and species interactions brought on through the introduction of a species that does not historically occur in a given area. What actually makes a species “invasive,” and what terms—and discourses—people should use to clarify the persistent murk around defining “invasive” species, however, has been hotly contested by scholars in the last 20 years.
Until relatively recently, there was no concept of a plant being “native” or “nonnative” to a region. In 1835, English botanist John Henslow first outlined the concept of “natives” in plants, distinguishing “true” British flora from those brought from elsewhere (Henslow 1835). Alexander von Humboldt, explorer and naturalist (now viewed as a founder of geographic thought) made specific notes of the global distribution of plants and animals and how it changed during his lifetime, such as the spread of American Opuntia cactus across Eurasia and northern Africa (Humboldt 1850, Davis 2009).

More than a hundred years later, Charles Elton published what is now considered a tome in the field of invasion biology: The ecology of invasions by animals and plants (1958). A 2008 study (described below in greater detail) found that Elton’s book was still the most cited source in invasion ecology, with more than 1500 academic citations according to the Web of Science database (Richardson & Pysek 2008). In the book’s first chapter, titled “The Invaders,” Elton describes what he calls “ecological explosions,” meaning “enormous increases in numbers in some kind of living organism”—anything from a virus to a cactus to a squirrel (Elton 1958). Elton is also referring to living things (“forces”) which “burst out from control”; “forces that were previously held in restraint by other forces” (Elton 1958). Elton, unlike his successors many years later, directly included in his study of invasions not only plants and animals, but also the spread of disease and viruses. Elton also managed to consider a range of topics of interest in current research, such as the particularities of island geography and their vulnerability to biological invasions, and the introduction of what he called “counterpests” (now called “biocontrols”) and—paramount to Elton—the preservation of “variety,” now referred to as biodiversity (Elton 1958).

During the fiftieth anniversary year of the publication of Elton’s The ecology of invasions by plants and animals, two landmark studies were released assessing the current state of the field of invasion ecology. In 2008 David Richardson and Petr Pysek, two prominent researchers in the field from South Africa and the Czech Republic respectively, published a study on the use of Elton’s book through analysis of citations on the Web of Science data-
base (Richardson and Pysek 2008). The authors found that some of the topics that Elton introduced were still of concern in 2008, such as invasive species impacts of biodiversity, the role of ecological disturbance, and geographical dispersion of nonnative organisms (Richardson and Pysek 2008). Emerging technologies, including geographic information systems, molecular methods, and modeling techniques, are now shaping what is possible in invasion ecology research and supporting growing attention toward risk analysis, especially regarding future climate scenarios (Richardson and Pysek 2008).

Biologist Mark Davis published *Invasion Biology* the following year in 2009. The book offers a more in-depth analysis of the state of the field, covering the history of invasion biology research, the science of invasions, the impacts on human health, economy and ecology, and the paradigms within the field that shape the way that scientists think about biological invasions. Also a highly-cited work within the field, *Invasion Biology* reads like a torch being passed on to a new generation of researchers and thinkers, and Davis explicitly notes this in the book’s introduction. Davis quotes heavily from Elton, and the two biologists clearly share
a multidimensional, conservation-focused language in their writings about biological invasions.

All three of the aforementioned authors assert that the field of invasion ecology has grown exponentially in the last fifty years (Figure 4), and awareness of biological invasions has spread quickly both within academic communities and outside of them (Richardson and Pysek 2008, Davis 2009). These authors also note a prominent geographical research bias for North America. I would add that recent studies are bringing Australia into the fold as one of the most-researched countries with regards to invasion ecology, especially concerning terminology and discourse within the field (Head & Muir 2004, Ram 2019). Both publications also note a need for research which bridges invasion ecology with the fields of conservation biogeography, human geography and policy studies, as well as the need for more effective communication from academic research to the scale of land management (Hulme 2003, Richardson & Pysek 2008, Davis 2009). Current research begins to address this communication breakdown.

There is an abundance of literature published on why a disconnect between researchers, land managers and the public may be happening. Keulartz (2009) calls for ecological “boundary work”—efforts by various stakeholders to communicate across divides to reach a common goal. Keulartz offers a philosophical argument for thinking in “degrees rather than dualisms” about what he describes as the main points of disagreement within ecological restoration literature: 1) “(re)introduction” of species that were, for whatever reason, pushed out of a particular ecosystem, and 2) eradication of “exotic” or “alien” species (Keulartz 2009). The idea that a gray area exists on the scale of management is now widely supported in the field if invasion ecology, which seems to be one of the only things most researchers agree on. Many have indicated, and continue to argue, that the field has a fundamental problem with terminology and classification.

The poet Anne Carson (1995) described “dirt” as “matter out of place” in the context of understanding how women are thought about in Ancient Greek society—as uncontrollable
forces, dangerous leaky, and bound to mess up the dry, orderly world of men. A weed, similarly, is simply a plant out of place, bound to mess with whatever order humans are enforcing, whether in a home garden or large-scale farming. According to the United States Department of Agriculture (USDA), the term “noxious weed” indicates a plant that is dangerous to industrial agriculture, and a “toxic” plant is dangerous to livestock. In the context of the U.S., “invasive” refers to a plant which arrived in North America after Lewis and Clark’s expedition west and are now harmful to human activity and/or ecosystems in some way, whereas “native” plants were here before that botanical project (USDA 2020, Davis 2009). Other words for nonnative plants—even less clearly defined—include “exotic”, “introduced”, “alien”, “nonindigenous”, “adventive”, “neophyte”, “pest”, and “weedy”.

The ambiguity of these terms and methods of classification have been called into question by numerous studies (Webb 1985, Pysek 1995, Head & Muir 2004, Colautti & MacIsaac 2004, Larson 2005, Davis et al. 2011). Research by Robert Colautti and Hugh MacIsaac attempts to clarify the procedural naming structure of nonnative plants based on “stages of invasion” (Colautti and MacIsaac 2004). The authors call for an understanding of “invasions” as “biogeographical rather than taxonomic”—in other words, classification is not about the essence of the plants themselves, but rather the context in which they are encountered (Colautti and MacIsaac 2004). Robbins (2004) makes a similar argument in his paper “Comparing invasive networks: cultural and political biographies of invasive species.” Through evaluation of histories of Mimosaceae (plant family including Acacia, Prosopis, and Mimosa) Robbins discusses the need for social and political context in the discussion of invasive species, arguing that humans have long been agents and vectors of global plant movement (Robbins 2004). People have moved plants for all sorts of reasons—as food and material resources, as ornamentals, or as spiritual reminders of home, wherever home was. These “sociobiological networks”, as Robbins calls them, are the true “invasives” (Robbins 2004).

Many of the debates around terminology occur within the scientific community, with authors such as D.A. Webb (1985) addressing the general ambiguity of terms used to classify
nonnative species in Britain and Ireland. Webb criticizes the subjectivity of the classification systems, derisively citing “irrelevant emotions such as local patriotism” as one of the subjective and inappropriate criteria used to decide native/alien status (Webb 1985). Several more recent studies (Colautti & MacIsaac 2004, Head & Muir 2004, Davis et al. 2011) have cited this particular paper in an attempt to solidify, once and for all, the slipperiness of language with regards to nonnative species, with still no clear consensus at this time (2020). Other researchers, such as Matthew Chew in his 2009 paper “The Monstering of the Tamarisk,” have chosen to instead engage in a political ecological approach to discourse research, considering the interrelation of science and popular media and subtly rejecting the notion that science is inherently free of human subjectivity or emotion.

The recent rise in nationalism and xenophobia across America (North and South) and Europe coincides temporally with an increased awareness of and fervor for eradication of nonnative plant species. A growing number of researchers are calling for consideration of discourse and how it may be perpetuating xenophobic and/or militaristic ideologies (Gröning and Wolschke-Bulmahn 2003, Larson, 2005).

Looking back to Charles Elton’s The ecology of invasions by plants, militaristic language and metaphor abound, which Elton openly acknowledges. In Chapter 6, he writes:

In the first part of this book I have described some of the successful invaders establishing themselves in a new land or sea, as a war correspondent might write a series of dispatches recounting the quiet infiltration of commando forces, the surprise attacks, the successive waves of later reinforcements after the first spearhead fails to get a foothold, attack and counterattack, and the eventual expansion and occupation of territory from which they are unlikely to be ousted again … almost illimitable reservoirs of species moving out to bombard other parts of the world for thousands of years to come. (p. 109)
On the page that follows, Elton goes on to describe the three steps required to successfully repel invaders, using the terms “quarantine”, “eradication”, and “control” in conjunction with more military metaphors (Elton 1958). Elton, whose book began as a series of radio broadcasts, was striving to appeal to a broad audience (Davis 2009)—the majority of which, at the time of the book’s publication, had lived through two World Wars. Thus, the use of militaristic metaphor makes some sense considering the social climate of the book’s era. As time goes on, however, and more researchers—restoration ecologists in particular—continue to use this book as the foundation for which to build a conservation ethos as well as to inform their own research, what legacies might Elton's language (and that of many other researchers of his time) carry forward?

The militaristic metaphors have recently taken on more concrete meaning. Meyerson and Reaser (2003) published a paper in *Frontiers in Ecology* titled “Bioinvasions, bioterrorism, and biosecurity.” The article called for collaboration between scientists and the U.S. government to control both deliberate acts of bioterrorism—post-911 anthrax attacks, for instance—and “bioinvasions, the routine importations (both accidental and deliberate) of harmful non-native organisms” (Meyerson & Reaser 2003). The solution to both of these threats to national security, the authors say, is heightened “biosecurity”. The continued references to acts of terrorism pull the many themes of this paper together, including the suggestion that an act of bioterrorism might look like a disease deliberately introduced to one of the U.S.’s most charismatic megafauna, thereby impacting “national psyche” (Meyerson & Reaser 2003).

Two years later in the same publication, Brendon Larson issued a call for biologists to critically consider the language they are using to talk about invasive species, particularly in the use of militaristic metaphors (Larson 2005). Larson noted that researchers’ focus on terminology had thus far been focused on the scientific usefulness of the terms in question, but did not address the broader ramifications of the language in question outside their academic circles. The us-versus-enemy model, Larson argues, encourages the misleading thought that we (humans) can pit ourselves against invasive species: “we are inextricably entangled with
these species since their invasions originate from our consumptive activities and global movement patterns,” an argument similar to Robbins’ (2004) theory of “invasive networks.” Scientists using militaristic language may also be eroding the public’s trust in their objectivity due to resonance within a particular political climate, Larson argues, citing the possible influences of the September 11th attacks on scientists’ language regarding invasive species. Larson directly quotes Meyerson and Reaser’s paper, arguing that the use of militaristic metaphors brings moralistic ideas of good and evil into play, but doing “good” as a means of returning an ecosystem to some prior state of truth or purity is impossible considering the degree to which species have hybridized and mingled to form new assemblages and recombinant ecosystems (Soule 1990; Larson 2005).

C. Applications to tamarisk

How do theories of power and discourse, then, come into conversation with ecological sciences? Scholars of Science and Technology Studies (STS) can offer a productive path for political ecology to engage with science through identification of interrelated groups known as assemblages and looking for hybrid multinatural geographies; two practices that do not ignore either systems of power or of science, but imagine the two as co-created and co-constituted (Haraway 1991; Whatmore 2002; Gorman and Gaynor 2020). Deleuze and Guattari introduce A Thousand Plateus (1987) as an “assemblage”: “neither object or subject; it is made of variously formed matters, and very different dates and speeds.” I propose a framing of tamarisk, humans and tamarisk beetles as a multi-species assemblage (Deleuze & Guittari 1987; Haraway 2016), given the components’ complex interactions and wildly varying temporal scales and velocities. This multi-species assemblage is a conglomeration of moving bodies that do not share the concept of geopolitical borders. Here, a hybrid “multinatural” geographical approach to nature and society that also accounts for structural inequalities is useful (Haraway 1991; Whatmore 2002). An understanding of the grouping of tamarisk, bee-
As research continues to reveal the impacts of introduced species on development and livelihoods as well as ecological processes, new categories emerge for classifying these plants, and thus new ways of thinking about them and relating to them. What makes the human-tamarisk beetle assemblage political is really a question of what systems of power are at play through attempts to control (or not) the tamarisk’s existence, and how language influences the telling of their story in North America. There is a tendency in apolitical thinking to use economics and the theory of rational actors as reasoning for why humans do what they do — separate and sovereign from the influence of non-human actors and outside of historical context. Apolitical thinking simply means “the view that decisions and behaviors are free from coercion, suggestion, power, and exploitation” (Robbins 2007: 4). To assume that any study or management decision regarding a problematic species is “apolitical,” especially in the U.S./Mexico Borderlands, would be to ignore the long history of exploitation and political tension that already charges this region. A political ecological lens shares with new materialism and queer ecologies a challenge to the notion of nonhuman impotence. Through an acknowledgement of humans, tamarisk and tamarisk beetles as a multi-species assemblage, a more complex relationship than the duality of conquerer/conquered or manager/managed reveals itself. This combination of theoretical approaches is lacking in current literature on invasive species, and this project is founded in an effort to address this gap.

The spread and management of of tamarisk and tamarisk beetles provides a perfect case study to examine these concepts. This paper responds with the following research question: In the last 25 years, how has the movement, management and biocontrol of tamarisk
plants interacted with broader discourses on invasion in the Southwestern U.S. and Northern Mexico?

V. Conducting the study

A. Data

Table 1. Search terms for Tamarix spp.

<table>
<thead>
<tr>
<th>English</th>
<th>Tamarix</th>
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<tr>
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<td>tamarisk</td>
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<tr>
<td></td>
<td>saltcedar</td>
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<td></td>
<td>salt cedar</td>
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<table>
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<tr>
<th>Spanish</th>
<th>Tamarix</th>
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<tr>
<td></td>
<td>tamarisco</td>
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<tr>
<td></td>
<td>pino salado</td>
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<tr>
<td></td>
<td>cedro salado</td>
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<tr>
<td></td>
<td>pinavete/pinabete</td>
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</tbody>
</table>

The data I collected to answer the above questions came from two main sources: existing conservation policy documents from U.S. and Mexican governmental agencies published between 1995-2020, news and media—both U.S. and Mexican—covering tamarisk between the years 1995-2020. The range of data allowed me to assess both wider and mainstream portrayal and understanding of tamarisk as well as official discourse, and allowed me to track trends and discrepancies between diverse sources.

I screened policy documents based on the agencies that published them, focusing on four Mexican agencies and four U.S. agencies (see Table 2 below). I trimmed down the pool of existing conservation documents first based on keyword searches for mentions of tamarisk
Preliminary searches indicated that while U.S. documents on tamarisk date back to the 1970s, conservation documents from Mexico that mention tamarisk were not published until the early 2000s. To flesh out policy history and potential influences, I searched both U.S. and Mexican government documents from 1980-2020. I focused particularly on the last couple decades in order to highlight the most recent turns in discourse. Official documents published by each agency (Table 2) were free and openly accessible via the agencies’ respective governmental websites.

I sourced the second pool of data, news and media coverage of tamarisk, using online media databases of Southwestern U.S.-focused news publications and Northern Mexico-focused news publications (Table 2). Since media coverage of tamarisk is not widespread, I selected these news journals to represent a wide range of localities and interests in readership. I located the particular journals cited in this study in both the U.S. and Mexico using online news journal databases Prensa Escrita\(^1\) and United States Newspaper Listing\(^2\). Using a set of search terms (see Table 1) that encompassed tamarisk’s colloquial names in Spanish and English, I identified news articles to reference by mentions of tamarisk. Some publication companies did not contain any articles mentioning tamarisk, and those are not included in this study.

I used six interviews with U.S. and Mexican government employees, scientists and nonprofit land managers to help corroborate findings and salient points from document analysis, but did not code these interviews for analysis. I found interview contacts through university-based connections with land managers in the U.S. and Mexico, and also made several cold calls to government offices and conservation nonprofits.

**Interview script (basic template):**

\(^1\) [https://www.prensaescrita.com](https://www.prensaescrita.com)

\(^2\) [https://usnpl.com](https://usnpl.com)
1. I understand that you work for [agency] as a [position]. Can you describe the work you do for [agency]?

1. Entiendo que usted trabaja para [agencia] como un/a [posición]. Describa por favor el trabajo que hace para (agencia).

2. How long have you been in this position?

25
2. ¿Por cuanto tiempo ha tenido esta posición?

3. Where do you work, and what geographic regions do you manage?

3. ¿Dónde trabaja, y cuáles regiones geográficas maneja?

4. Is this your first job with (agency)? Have you worked as a land manager previously for a different business or organization?

4. ¿Esta es el trabajo primero con (agencia), o ha tenido otras posiciones con (agencia)?

5. In general, what kinds of decisions are you responsible for making within the organization?

5. En general, de cuáles decisiones es responsable en la organización?

When you make those decisions, what resources do you usually use?

5. ¿Cuando haces estas decisiones, cuales recursos use normalmente? (como el aviso de otros, papeles científicos, información producida por el gobierno, etc.)

6. Are you familiar with the tamarisk plant (it’s also called salt cedar, pino salado, cedro salado, and pinabete)?

6. ¿Está familiar con la planta tamarisco (también es conocida como pinabete, cedro salado, y pino salado)?

7. How would you describe tamarisk to someone who has never heard of it before?

7. ¿Como describiría el tamarisco a alguien que no ha escuchada de él?

8. When did you first become aware of tamarisk in your conservation work?

8. ¿En su trabajo con el medio ambiente, cuándo se dio cuenta del tamarisco?

Had you read or heard anything about it prior to that?

8. ¿Había oído hablar del tamarisco antes?

9. When tamarisk was first brought up as an issue to you, how was it presented?

What were cited as the main ecological impacts that tamarisk might have on an ecosystem?

9. Cuando el tamarisco estuvo mencionada a usted como un problema, ¿cómo estuvo presentada?

¿Qué fueron citados como los impactos ecologías más grandes del tamarisco?
10. Has your understanding of tamarisk and its ecological impacts shifted since you first became aware of it?

10. ¿Ha cambiado su perspectiva sobre tamarisco y sus impactos ecológicas desde sus ideas primeros? Y sí, ¿cómo?

11. Do you have an opinion on the US’s introduction of the tamarisk beetles and their effects in Mexico? What do you think are the problems with the introduction of tamarisk beetles? What are the benefits?

11. ¿Usted tiene opinión sobre la introducción de los escarabajos y sus efectos en México?

B. Coding methods

Using the aforementioned data categories, I qualitatively coded each article and document to highlight patterns and to find thematic connections and disparities between data sources. A total of 139 documents and articles were gathered from the sources listed in Table 2 for coding in this study. I used the software NVivo as a data organization and coding tool. After collecting data, I did an initial read-through of all the data I had collected, then sorted the data by source category (policy document, news article), and publishing company/agency. After identifying several key narrative trends in the initial read-through of the data, I developed a set of codes that captured these major trends. The codes I started with were: “water use,” “land use changes,” “ecological restoration” (with subcategories “use in restoration” and “effects on biodiversity”), “aesthetics,” militarism,” “tamarisk beetles as tool,” and “tamarisk beetles as plague.” As I progressed in coding the documents, I identified several other common themes, which I added as additional codes: “fire,” “urban/rural location,” and “decision to release beetles.” I then did a second round of thematic coding to make sure that articles I had read earlier on incorporated the newer codes.
C. Challenges to this approach

The onset of the COVID-19 virus and its implications for summer travel derailed my original plan to travel to Chihuahua and conduct interviews in person. This factor, combined with a concern that I would be excluding voices of people without reliable phone or internet access, led me to the decision to focus on government and media archives as the sole sources of data for this project, while using interviews to corroborate salient trends from document and article coding.

Additionally, while I do speak Spanish fluently, my experience and learning of the language was in Mexico City. Northern Mexico differs in accent and colloquialisms, and I often asked interviewees to repeat themselves or clarify their responses. Because the interviews were recorded, I was also able to listen back to anything that I missed initially.

D. Format of Results

The goal of the project is to produce new knowledge on how invasion discourse is conducted on a binational scale, using tamarisk as a case study and thinking object for the complex web of relationships at play. The results of this research illuminate key aspects of narratives of tamarisk invasion—where ecological knowledge and narratives are coming from, their trajectories, and their consequences and implications for invasion-related conservation discourse.

I visually represent major themes in policy discourse and trends in media representation of tamarisk in maps and tables alongside a comparative discussion of the themes drawn out of the two sources of data. I plan to submit an article on this project for publication shortly after defending my thesis on March 25, 2021. The knowledge that I produce through this project will likely be useful to both scholars and land managers interested in working toward more creative, inclusive, and cooperative management of introduced species in the Chihuahuan Desert and other transborder ecoregions.
VI. Timeline

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
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<tbody>
<tr>
<td>May 29, 2020</td>
<td>Proposal Defense</td>
</tr>
<tr>
<td>Early June</td>
<td>Began collecting relevant policy documents and news articles</td>
</tr>
<tr>
<td>June 17, 2020</td>
<td>Submitted IRB packet</td>
</tr>
<tr>
<td>August 8, 2020</td>
<td>Project approved by IRB</td>
</tr>
<tr>
<td>Mid-August - November</td>
<td>Conducted interviews</td>
</tr>
<tr>
<td>September - December 2020</td>
<td>Coded policy documents and news articles</td>
</tr>
<tr>
<td>January 2021 - February 2021</td>
<td>Data analysis and discussion of results</td>
</tr>
<tr>
<td>February 8, 2021</td>
<td>Full article draft complete</td>
</tr>
<tr>
<td>February 2021</td>
<td>Article revisions</td>
</tr>
<tr>
<td>March 8, 2021</td>
<td>Full thesis draft complete</td>
</tr>
<tr>
<td>March 8 - 18, 2021</td>
<td>Thesis revisions</td>
</tr>
<tr>
<td>March 11, 2021</td>
<td>Send full thesis to committee</td>
</tr>
<tr>
<td>March 25, 2021</td>
<td>Thesis defense</td>
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</tbody>
</table>
Chapter 2:

Research Article

Abstract

*Tamarix spp.*, also known as salt cedar or tamarisk, has garnered a notorious reputation in North America as an invasive plant, with widespread policy and research advocating for its eradication in the Southwest U.S. and Northern Mexico. Using a political ecological lens, this study examines both governmental conservation documents and news articles to investigate narrative trends on tamarisk in the Southwestern U.S. and Northern Mexico as a contiguous region (the Chihuahuan Desert), expanding on current research to include transborder effects on the perception and management of introduced species. This paper asks: In the last 25 years, how has the movement, management and biocontrol of tamarisk plants interacted with broader discourses of invasion in the Southwestern U.S. and Northern Mexico? The study finds that quotidian intimacy with and use of tamarisk defines Mexican news narratives. In U.S. publications, militaristic narratives pose human relationships to tamarisk as combative and hierarchical. The paper argues that the discursive division between the two countries has damaged relationships and economies in Northern Mexico and blinded perspectives in the U.S. to other ways of knowing and relating to tamarisk. This narrative intervention seeks to help to form new paths forward in thinking about introduced species.
I. Introduction

“Father Joseph had come to love the tamarisk above all trees. It had been the companion of his wanderings. […] out of the sun-baked earth, against the baked adobe walls, the tamarisk waved its feathery plumes of bluish green. The family burro was tied to its trunk, the chickens scratched under it, the dogs slept in its shade, the washing hung on its branches. […] he loved it merely because it was the tree of the people, and was like one of the family in every Mexican household.”

Willa Cather, *Death Comes for the Archbishop* (1927)

“Tamarisk is one of the lessons in American West 101: About the time newcomers learn that the striking black-and-white bird on their porch is a common magpie, they find out that the feathery green riverside shrub with the pretty pink sprays of flowers is actually a nasty weed.”


In the last century, *Tamarix spp.*, also known as salt cedar or tamarisk, has garnered a notorious reputation in North America as an invasive plant, with widespread policy and research advocating for its eradication in the U.S. intermountain west and Northern Mexico. Support for tamarisk control measures is not universal throughout the region, however. Tamarisk has a cultural presence in Mexico, as illustrated by the quote from Willa Cather’s novel; its significance and relationship to humans in the region predates the line drawn between the now-U.S. and Old Mexico. Recently, Mexican news and press releases have indicated that U.S. initiatives to control the spread of tamarisk in the Southwestern U.S. have affected communities in Mexico, indicating there is some variation in attitudes toward tamarisk depending on location. Using a political ecological lens, this study examines both governmental conservation documents and news articles to investigate narrative trends on tamarisk in the Southwestern U.S. and Northern Mexico as a contiguous region, expanding on current
research to include transborder effects on the perception and management of introduced species.

A. Significance

Scholars have addressed in detail the history and ecology of tamarisk and its spread in the U.S. While several studies address the political and historical aspects of tamarisk conservation (notably, Chew 2009, Davis et al. 2011), most current scholarship on tamarisk remains squarely in ecological sciences, with very little crossover in the humanities to investigate the messages and meanings carried in tamarisk politics. This disconnect parallels the literature on invasive species more broadly, which calls for increased communication and exchange of information between land managers, researchers, and the public (Colautti and MacIsaac 2004, Stromberg et al. 2009), but offers very few examples of research that actively involves the work of all three groups.

In addition to the lack of integrative social-scientific analysis on invasive species discourse, literature on tamarisk ecology and geography has tended to follow national boundaries, though the plants themselves do not. There are few studies on human perceptions and management of tamarisk that also address the full extent of the tamarisk’s spread in North America, from the Western U.S. to the Northern Mexico. The reaction to and management of tamarisk in Northern Mexico appears to be largely underreported and unstudied in academic and popular literature, both in the U.S. and in Mexico.
B. Background

1. Early introduction to North America

The Eurasian tamarisk (Tamarix spp.) is a shrub or small tree that has been common across Southern Russia, the Middle East, and Northern Africa for centuries.\(^3\) The date of its introduction in North America is unknown, but it is believed to have come to New England before 1818 on trade ships (Chew 2009). Settlers originally planted tamarisks as ornamentals, then as shade trees and windbreaks for farmers, and the plants quickly gained a reputation as hardy and vigorous in arid climates and disturbed soils (Chew 2009). Tamarisk was especially suitable for stabilizing eroded riverbanks, where their deep-reaching root systems held

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\(^3\) In North America, there are five common species of tamarisk in the genus Tamarix, though most of these species have now hybridized (usda.gov, 2021). For the purpose of this paper, I do not make a distinction between each species, but refer to the whole genus Tamarix, except where specified.
onto sandy, quick-draining, and salty soil where other plants could not survive (Stromberg 2009). In 1927, Kirk Bryan, a geologist for United States Geological Survey (USGS), reported plantings of tamarisk along stretches of the Rio Puerco by the Middle Rio Grande Conservancy District (Bryan and Post 1927).

During the Great Depression, the nationwide call for more jobs fell on federal agencies, who scrambled to create new forms of work in the fields of land restoration and infrastructure (Chew 2009). Tamarisk’s ability to grow in poor and degraded soil was utilized by government agencies for restoration of land cleared for industry. A 1933 Science article suggested “utilizing labor in planting Tamarisk or similar plants at the inflow of large reservoirs, such as Elephant Butte or Roosevelt Lakes” (Freudenthal 1933: 448). This era of tamarisk promotion did not last long, however. With World War II (1939-1942) came demand for metals, especially copper—an industry which pulls on large amounts of ground- and surface water (Chew 2009). Phelps Dodge mining company, looking to expand its Morenci, Arizona, copper mine in the late 1930s, were stymied by unavailability of additional stream water, and extensive research efforts ensued to find out who—or what—was competing with the mining company for water (Stromberg et al. 2009).

2. **Turns in discourse and management responses**

   Much of the early research funded by mining companies suggested that tamarisk had high rates of evapotranspiration. The studies relied, however, on techniques that scientists now recognize as having significantly overestimated the plants’ water use (Shafroth et al. 2005), leaving the impression that water could be significantly conserved by clearing any plants that tap into groundwater (Robinson 1952). One study extrapolated from “all available data” that 15 million acres of phreatophytes—plants with roots in direct contact with the water table—were wasting up to 25 million acre-feet of water annually in 17 states (Robinson
1952, Shafroth et al. 2005). These studies spelled trouble for the tamarisk, and the political and scientific discourse on the shrub took a turn in the late 1930s. The new decade had brought a drought that settled on Texas, Arizona and central New Mexico, and popular media penned tamarisks as “water thieves” and “alien invaders” (Chew 2009).

Beginning in the 1980s, new methods arose for measuring stand-level evapotranspiration rates (Goodrich et al. 2000), complicating the question of tamarisk water use. Recent science indicates that evapotranspiration by tamarisks varies greatly depending on a myriad of factors, but overall, they use water at a rate comparable to their native counterparts in most cases (Goodrich et al. 2000). A 2006 study revealed that removing tamarisk stands along

Figure 2. Before and after photos of a tamarisk eradication project in Albuquerque’s Bosque Open Space from the “New Mexico Non-Native Phreatophyte/Watershed Management Plan.” (NMDA 2005)
stream banks reduces evapotranspiration but results in more bare-soil evaporation, leading to net neutral water savings (Hu et al. 2006). Another group of scientists found that removal of tamarisk and Russian olive from below cottonwoods on riverbanks may result in short-term water saving but projected the evapotranspiration reduction to be short-lived as the bare soil rapidly gives way to understory regrowth (Cleverly et al. 2006).

Despite recent studies debunking the theory that tamarisks use more water than their native counterparts, most agencies have been slow to adapt their eradication plans. Published in 2005 and lead by the New Mexico Department of Agriculture (NMDA), the “New Mexico Non-Native Phreatophyte/Watershed Management Plan” prominently displays the results of a tamarisk eradication project in Albuquerque’s Bosque Open Space: the “Before” photo shows a mixed stand of cottonwood and salt cedar, and the “After” photo shows bare soil beneath a homogenous stand of cottonwoods (Figure 2). The report repeatedly asserts that non-native phreatophytes have uniformly negative impacts (NMDA 2005), but gives no citations or scientific reasoning for this assumption nor the agency’s subsequent recommendations.

The issue of tamarisk eradication became even more complicated by the discovery of the plant’s importance to the endangered Southwestern willow flycatcher (Empidonax traillii extimus). Initially, when the US Fish and Wildlife Service listed the Southwestern willow flycatcher as endangered in 1995, its decline was in part attributed to the presence of tamarisk in its primary nesting areas (USFWS 1995). Scientific discourse on the relationship between the tamarisk and the SW willow flycatcher took a turn in the early 2000s in response to studies revealing that the tamarisk in fact provided integral nesting habitat for the flycatchers (Sogge et al. 2003). One study estimated that throughout the flycatchers’ whole range, they built around 25% of their nests in tamarisk-dominated habitat (Sogge et al. 2003). In 2005, the USFWS denied permission to introduce tamarisk biocontrol insects in the bird’s...
range, citing concern over loss of habitat should the habitat take more than several years to spring back with native plants (USDA 2005).


To control tamarisk, the USDA was interested in using *Diorabha* spp. (*including* *elongata/carinulata* and *sublineata*), a species of beetle native to China and Kazakhstan (McLeod 2018). Biological control, or “biocontrol,” refers to the process of introducing a new species into the habitat range of a target species (often viewed as invasive and problematic) with the explicit expectation that the introduced biocontrol species will target the problem species and reduce or eliminate it from an ecosystem over time (Davis 2011). Though concern over SW willow flycatcher habitat thwarted some sections of the USDA biocontrol [Figure 3. (From Sanchez-Peña et al. 2016) Surveys of tamarisk beetle in Northern Mexico from 2013-2015. Original releases of the beetle occurred in the U.S. along the Río Bravo/Grande near Ojinaga and Boquillas del Carmen.]

To control tamarisk, the USDA was interested in using *Diorahbda* spp. (*including* *elongata/carinulata* and *sublineata*), a species of beetle native to China and Kazakhstan (McLeod 2018). Biological control, or “biocontrol,” refers to the process of introducing a new species into the habitat range of a target species (often viewed as invasive and problematic) with the explicit expectation that the introduced biocontrol species will target the problem species and reduce or eliminate it from an ecosystem over time (Davis 2011). Though concern over SW willow flycatcher habitat thwarted some sections of the USDA biocontrol...
project, some local governmental groups had already taken matters into their own hands. In
2004 the weed management department of Grand County, Utah, captured around 100 beetles
from nearby study areas in Delta, Utah and released them along the Colorado River in Moab
(McLeod 2018). Several other rogue and official beetle releases in those few years estab-
lished the beetles in the upper Colorado River and Rio Grande, after which the beetles spread
with astonishing rapidity. In 2006, Grand County recorded around 990 acres of tamarisk de-
foliation along the Colorado River. By late 2007, the beetles defoliated nearly 10,000 acres
along a 70-mile stretch of the Colorado River, and the beetles had spread into several major
tributaries (Tamarisk Coalition, n.d.). Currently, the extent of Diorhabda beetle range
stretches as far south as Chihuahua, Sonora, and Coahuila in Northern Mexico (Figure 3).

U.S. introduction of tamarisk beetles into the socio-ecological fold with humans and
tamarisks has created a complex and tangled web of relations, with cascading effects on
countless other members of the ecosystems containing tamarisks. From the research that
pegged tamarisk as an egregious water-user, to the pushback against its eradication on behalf
of the SW willow flycatchers, to the decision to release beetles as biocontrol, management
discourses and decisions about tamarisk have been laden with intricate layers of power and
persuasion. In the following section, I pull on academic literature from political ecology and
invasion biology to build a theoretical framework for an in-depth investigation of the socio-
ecological web comprising humans, tamarisks, and tamarisk beetles and how it interacts with
broader discourses of invasion.

C. Literature review

1. Political ecology

Political ecologists are concerned with the structures and institutions of power that
drive environmentally impactful decisions and actions (Cox et al. 2007, Robbins 2011). Al-
though power is central to political ecological studies, there is no singular approach to under-
standing the role power plays in environmental discourse (Neumann 2014). A recent study used discourse analysis in the context of environmental decision-making as a focus on narratives and storylines to analyze specific conflicts. According to the authors, state and non-state actors typically convince others to adopt their promoted discourses in one of four ways: disciplining and discouraging certain lines of discourse, promoting a particular “truth,” presenting a neoliberal rationality, or exercising sovereign power (Svarstad et al. 2018). Citizens, too, perform discursive power by internalizing and reproducing discipline (Foucault 1991; Svarstad et al. 2018). In accounting for these myriad assertions of power through discourse, political ecology can be a strong framework for understanding the role of narrative creation and perpetuation in environmental governance.

Political ecological research that ties in anticoloniality and queer theory also illuminates the role that emotions play in the discursive creation of the abject. Scholars of queer theory generally understand the “abject” as that which is imbued with negativity and cannot be assimilated, and is thus open to subversion and change (Kristeva 1982; Sandberg 2008). Gonzalez-Hidalgo and Zografos (2019) address sentiment and anticoloniality in what they call “the emotional turn in political ecology.” The authors describe environmental conflict as being based in unequal distribution of environmental benefits and costs, as well as in differing and often unintentional “languages of valuation” toward human and nonhuman relationships. The authors, also pulling on Foucault’s (1991) writings on political subjectification and power argue that the values embedded in language are emotional, highly subjective (Gonzalez-Hidalgo & Zografos 2019) and frequently dominated by Euro-centric ways of knowing (Escobar 2014). Queer theory is an important but relatively unexplored tool for research on the role of emotion in discourse on invasive species—a concept that involves “othering” a particular species. Harcourt and Nelson (2015) describe ecology through a queer lens as the refusal of violence and ecological destruction without also refusing “the polluted, the abject.

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4 Foucault (1969) describes “discourse” as a socially shared perspective on a topic that operates through structures of power.
the hybrid seed infiltrated with GMO genes, and the exposed bodies and beings that we must learn not only to live with, but to love” (Harcourt and Nelson 2015: 5). Haraway’s (1991, 2016) notion of a “polluted” cyborg ecology and Bennet’s (2010) vital materialism both advocate a more inclusionary ecology that counters the ecological purism that currently dominates the field. These philosophies within political ecology respect rather than dismiss the abject, illuminating deeper complexities in academic discourse on ecology and conservation. When elevating species understood as “native” and damning species understood as “invasive,” we risk dismissing the nuance and complexity of ecological webs of relation—of both human and more-than-human.

In this paper, the ideas I discussed above are situated in the historical and geographical contexts of a particular place: the US/Mexico borderlands. Many scholars have focused on this place from outside political ecology. Binational conversation about the U.S./Mexico Borderlands’ shared ecologies, whether explicitly political ecology or not, is needed for effective consideration of conservation and ecological sciences in this region. A cross-border collection of essays (ed. Cantú-Ayala et al. 2007), though not political ecology in the disciplined sense, discusses ecological sciences within the specific political context of the U.S./Mexico border. The authors call out the U.S.’s hyper-focus on national security at the price of ecological health, pointing out that this thinking presents a “false dichotomy”—concerns for national security and concerns about habitat fragmentation and species decline at the border are not essentially in conflict with one another (Cantú-Ayala et al. 2007). Sundberg’s (2006, 2007) attention to US/Mexico border materialisms and their relationship to conservation discourse also refuses the political/ecological dichotomy in favor of a kind of co-constitution (Gorman and Gaynor 2020), and argues that attentiveness to multi-species entanglements is required to do environmental research within historical contexts.

Overall, it is clear that the field of political ecology contains several important focal lenses for considering human-tamarisk interactions. The use of discursive analysis to address conservation conflicts gets to political ecology’s main aim of addressing underlying power
structures in social-ecological research. Queer and anticolonial ecological theory can assist in understanding the complex interrelatedness of tamarisks, humans and tamarisk beetles, by drawing in research that bridges the political (in this case, the border region and its geopolitics) and emotional with ecological sciences. In the section that follows, I continue to review intertwining scientific and social concepts in a discourse-focused review of invasion biology.

2. Invasion biology

Invasion biology, though a relatively new field of study, receives frequent and passionate attention in academia, perhaps in part because of its cross-disciplinary following. The field is concerned, broadly, with the changing ecology and species interactions brought on through the introduction of a species that does not historically occur in a given area. What actually makes a species “invasive,” and what terms—and discourses—people should use to clarify the persistent murk around defining “invasive” species, however, has been hotly contested by scholars in the last 20 years.

Until relatively recently, there was no concept of a plant being “native” or “nonnative” to a region. Henslow (1835) first outlined the concept of “nativeness” in plants, distinguishing “true” British flora from those brought from elsewhere. More than a hundred years later, Charles Elton published the field’s founding document: *The Ecology of Invasions by Animals and Plants* (1958). A half-century later, Elton’s book was still the most cited source in invasion biology, with more than 1500 academic citations in the Web of Science database (Richardson & Pysek 2008). In the book’s first chapter, titled “The Invaders,” Elton describes “ecological explosions,” meaning “enormous increases in numbers in some kind of living organism”—anything from a virus to a cactus to a squirrel (Elton 1958: 7). Elton refers to invasive organisms as “forces” which “burst out from control”; “forces that were previously held in restraint by other forces” (Elton 1958: 7). Elton managed to consider a range of topics of interest in current research, such as introducing what he called “counterpests” (now called “biocontrol”) and preserving “variety,” now known as “biodiversity” (Elton 1958).
The field of invasion ecology has grown exponentially in the last fifty years (Figure 4), and awareness of biological invasions has spread quickly both within academic communities and outside of them (Richardson and Pysek 2008; Davis 2009). Researchers have also noted a prominent geographical research bias for North America (Richardson and Pysek 2008; Davis 2009), though recent studies are bringing Australia into the fold as one of the most-researched countries with regards to invasion ecology, especially concerning terminology and discourse within the field (Head & Muir 2004; Ram 2019). Both publications also note a need for research that bridges invasion ecology with the fields of conservation biogeography, human geography and policy studies, as well as the need for more effective communication from academic research to the scale of land management (Hulme 2003; Richardson & Pysek 2008; Davis 2009). Current research begins to address this communication breakdown.

Anne Carson (1995) described “dirt” as “matter out of place” in a poem on how women are thought about in Ancient Greek society: as uncontrollable forces, dangerously leaky, and bound to mess up the dry, orderly world of men. Similarly, and in line with queer ecological theory, a “weed” is simply a plant out of place, bound to mess with whatever order
humans are enforcing, whether in a home garden or large-scale farming. According to the USDA, the term “noxious weed” indicates a plant that is dangerous to industrial agriculture, and a “toxic” plant is dangerous to livestock (USDA 2020). In the context of the Western U.S., “invasive” refers to a plant that arrived in North America after Lewis and Clark’s expedition west and is now harmful to human activity and/or ecosystems in some way, whereas “native” plants were here before that botanical project (Davis 2009; USDA 2020). This is a somewhat slippery definition that loses traction in other parts of the world where colonization did not occur with a particular expedition or at all, and can be further complicated by decolonial ways of thinking about ecology. Other words for nonnative plants—even less clearly defined—include “exotic”, “introduced”, “alien”, “nonindigenous”, “adventive”, “neophyte”, “pest”, and “weedy”.

The ambiguity of these terms and methods of classification have been called into question by numerous studies (Webb 1985; Pysek 1995; Head & Muir 2004; Colautti & MacIsaac 2004; Larson 2005; Davis et al. 2011). Colautti and MacIsaac (2004) attempt to clarify the procedural naming structure of nonnative plants based on “stages of invasion.” The authors call for an understanding of invasions as “biogeographical rather than taxonomic”—in other words, classification is not about the essence of the plants themselves, but rather the context in which they are encountered (Colautti and MacIssac 2004), a concept illustrated by the problematic demarcation of Lewis and Clark’s arrival in the West as the point of origin at which a species becomes “non-native.” Robbins (2004) makes a similar argument, bridging his work in political ecology with the field of invasion biology. Through evaluation of histories of the plant family *Mimosaceae*, Robbins discusses the need for social and political context in the discussion of invasive species, arguing that humans have long been agents and vectors of global plant movement (Robbins 2004). People, Robbins asserts, have moved plants for all sorts of reasons: as food and material resources, as ornamentals, or as spiritual reminders of home, wherever home was. These “sociobiological networks,” as Robbins calls them, are the true “invasives” (Robbins 2004).
Many critiques of invasion biology’s terminology occur within the ecological sciences. Webb (1985) criticizes the subjectivity of introduced species classification systems, citing “irrelevant emotions such as local patriotism” as one of the subjective and inappropriate criteria used to decide native/alien status (Webb 1985: 231). Several more recent studies (Colautti & MacIsaac 2004; Head & Muir 2004; Davis et al. 2011) have cited Webb’s paper in an attempt to categorize and contain the slipperiness of language regarding introduced species. Other researchers instead engage in a political ecological approach to discourse research, considering the interrelation of science and popular media and subtly rejecting the notion that science is inherently free of human subjectivity or emotion.

A growing number of researchers are calling for consideration of how conservation discourse may be perpetuating xenophobic and/or militaristic ideologies (Gröning and Wolschke-Bulmahn 2003; Larson 2005). In Elton’s Ecology of Invasions, militaristic language and metaphor are central to his arguments. For example, Elton names the three steps required to successfully repel invaders “quarantine”, “eradication”, and “control” in conjunction with more military metaphors (Elton 1958). Elton, whose book began as a series of radio broadcasts, was striving to appeal to a broad audience (Davis 2009)—the majority of which (in 1958) had lived through two World Wars. As restoration ecologists continue to use this book as the foundation on which to build a conservation ethos as well as to inform their own research, what legacies might Elton’s language (and that of many other researchers of his time) carry forward?

Militaristic metaphors have recently taken on more concrete implications. Meyerson and Reaser (2003) called for collaboration between scientists and the U.S. government to control both deliberate acts of bioterrorism—post-911 anthrax attacks, for instance—and “bioinvasions, the routine importations (both accidental and deliberate) of harmful non-native organisms” (Meyerson & Reaser 2003: 307). The solution to both of these threats to national security, the authors say, is heightened “biosecurity”. The continued references to acts of terrorism pull the many themes of this paper together, including the suggestion that an act
of bioterrorism might look like a disease deliberately introduced to one of the U.S.’s most charismatic megafauna, thereby impacting “national psyche” (Meyerson & Reaser 2003).

Two years later in the same publication, Brendon Larson issued a call for biologists to critically consider the language they are using to talk about invasive species, particularly in the use of militaristic metaphors (Larson 2005). Larson noted that researchers’ focus on terminology had thus far been focused on the scientific usefulness of the terms in question, but did not address the broader ramifications of the language in question outside their academic circles. The us-versus-enemy model, Larson argues, encourages the misleading thought that we (humans) can pit ourselves against invasive species: “we are inextricably entangled with these species since their invasions originate from our consumptive activities and global movement patterns,” an argument similar to Robbins’ (2004) theory of “invasive networks.” Scientists using militaristic language may also be eroding the public’s trust in their objectivity due to resonance within a particular political climate, Larson argues, citing the possible influences of the September 11th attacks on scientists’ language regarding invasive species. Larson directly quotes Meyerson and Reaser’s paper, arguing that the use of militaristic metaphors brings moralistic ideas of good and evil into play, but doing “good” as a means of returning an ecosystem to some prior state of truth or purity is impossible considering the degree to which species have hybridized and mingled to form new assemblages and recombinant ecosystems (Soule 1990; Larson 2005).

3. Applications to tamarisk

A critical gap in both tamarisk scholarship and invasion biology more broadly is the tendency of research to follow national boundaries. To attempt to view the region as contiguous, co-created, and mutually influential, rather than inherently separate, is a risky proposition in the tumultuous social and political climate of the border region. It is, however, an important reach. As discussed above, the prevalence of militaristic and xenophobic language in
invasion discourse bears the evidence of nationally segregated research, and becomes (perhaps unknowingly) entangled with this kind of discourse. Additionally, while current academic literature on tamarisk is bursting with an array of perspectives from U.S. citizens, land managers and researchers, knowledge of how Mexico has been managing and discussing tamarisk remains obscure in comparison. This gap in literature is significant given the proximity and interconnectedness of the Southwestern U.S. and Northern Mexico.

How do theories of power and discourse, then, come into conversation with ecological sciences? Scholars of Science and Technology Studies (STS) can offer a productive path for political ecology to engage with science through identification of interrelated groups known as assemblages and looking for hybrid multinatural geographies; two practices that do not ignore either systems of power or of science, but imagine the two as co-created and co-constituted (Haraway 1991; Whatmore 2002; Gorman and Gaynor 2020). Deleuze and Guittari introduce *A Thousand Plateaus* (1987) as an “assemblage”: “neither object or subject; it is made of variously formed matters, and very different dates and speeds.” I propose a framing of tamarisk, humans and tamarisk beetles as a multi-species assemblage (Deleuze & Guittari 1987; Haraway 2016), given the components’ complex interactions and wildly varying temporal scales and velocities. This multi-species assemblage is a conglomeration of moving bodies that do not share the concept of geopolitical borders. Here, a hybrid “multinatural” geographical approach to nature and society that also accounts for structural inequalities is useful (Haraway 1991; Whatmore 2002). An understanding of the grouping of tamarisk, beetles, and humans as an assemblage allows for attention to a multiplicity of movements, stories, and ways of relating. Holding each of these groups in opposition to one another would not serve the messy conversation about how humans conceive of and control introduced species, nor would it fully acknowledge the agency that the nonhumans of this assemblage possess or their co-constituted relationships with humans (Gorman & Gaynor 2020).

As research continues to reveal the impacts of introduced species on development and livelihoods as well as ecological processes, new categories emerge for classifying these
plants, and thus new ways of thinking about them and relating to them. What makes the human-tamarisk beetle assemblage political is really a question of what systems of power are at play through attempts to control (or not) the tamarisk’s existence, and how language influences the telling of their story in North America. There is a tendency in apolitical thinking to use economics and the theory of rational actors as reasoning for why humans do what they do —separate and sovereign from the influence of non-human actors and outside of historical context. Apolitical thinking simply means “the view that decisions and behaviors are free from coercion, suggestion, power, and exploitation” (Robbins 2007: 4). To assume that any study or management decision regarding a problematic species is “apolitical,” especially in the U.S./Mexico Borderlands, would be to ignore the long history of exploitation and political tension that already charges this region. A political ecological lens shares with new materialism and queer ecologies a challenge to the notion of nonhuman impotence. Through an acknowledgement of humans, tamarisk and tamarisk beetles as a multi-species assemblage, a more complex relationship than the duality of conquerer/conquered or manager/managed reveals itself. This combination of theoretical approaches is lacking in current literature on invasive species, and this project is founded in an effort to address this gap.

The spread and management of of tamarisk and tamarisk beetles provides a perfect case study to examine these concepts. This paper responds with the following research question: In the last 25 years, how has the movement, management and biocontrol of tamarisk plants interacted with broader discourses on invasion in the Southwestern U.S. and Northern Mexico?

II. Methods

A. Framework

This study analyzed conservation discourse on tamarisk within the Chihuahuan Desert ecoregion (Figure 5, Atchley et al. 2001). The data I collected for this study include news articles and government documents from both the United States and Mexico from 1995 to 2020, at-
tempting to highlight what these two countries share in how they tell the story of the tamarisk-beetle-human assemblage, and also what they do not share. What and who is moving across the geopolitical line? What and who is reaching across a conceptual border—one whose limits include language, lived everyday experience, political alliances, and ideas about nature?

B. Study Area

The Chihuahuan Desert ecoregion extends from southern Arizona, New Mexico, and West Texas to the state of Hidalgo. It includes the large valley separating Sierra Madre Occidental and Sierra Madre Oriental mountain ranges through the interior of Mexico (Figure 5). Given the recent research regarding the southern extent of tamarisk in Northern Mexico (Glenn and Nagler 2005), this project is concerned primarily with the northern half of the ecoregion, where the Rio Grande/Rio Bravo river basin—including Rio Conchos and Rio Salado—intersects with the Chihuahuan Desert ecoregion. Although GIS researchers are currently developing reliable methods for mapping Tamarix using satellite imagery (Natale et al. 2018; Ji and Wang 2015; Evangelista et al. 2009), there are currently no detailed distribution maps for tamarisk in Mexico. The
most recent reports on the plant have indicated that it currently exists in the states of Coahuila, Sonora and Chihuahua, and throughout the course of the Río Bravo/Grande (CONABIO 2016).

C. Data source selection

To trace narratives and look for discursive themes, this study examined data from two main categories: 1) existing conservation policy documents from U.S. and Mexican governmental agencies published between 1995-2020, and 2) news and media—both U.S. and Mexican—covering tamarisk between the years 1995-2020. The temporal range and diverse pools of data has allowed me to assess official discourse as well as popular portrayal and understanding of tamarisk. I screened policy documents based on the agencies that published them, focusing on four Mexican agencies and four U.S. agencies (see Table 2 below). I screened the pool of existing conservation documents first based on keyword searches for mentions of tamarisk (Table 1). The official conservation documents I used in this study are free and openly accessible via governmental agencies’ online document archives.

I sourced the second pool of data, news and media coverage of tamarisk, using online media databases of Southwestern U.S.-focused news publications and Northern Mexico-focused news publications (Table 2). Since media coverage of tamarisk is not widespread, I have selected these news journals to represent a wide range of localities and interests in readership. I located the particular journals cited in this study in both the U.S. and Mexico using online news journal databases Prensa Escrita and United States Newspaper Listing. Using a set of search terms that encompassed tamarisk’s colloquial names in Spanish and English (Table 1), I identified news articles by mentions of tamarisk. Some publication companies did not contain any articles mentioning tamarisk, and those are not referenced in this study. I used six interviews with U.S. and Mexican government employees, scientists and nonprofit
land managers to help corroborate findings and salient points from document analysis, but did not code these interviews for analysis.

D. Coding methods

Using the data categories outlined in Table 2, I qualitatively coded each article and document to highlight patterns and to find thematic connections and disparities between data sources. I gathered a total of 139 documents and articles from the sources listed in Table 2 for coding in this study. I used the software NVivo as a data organization and coding tool. During and after data collection, I did an initial read-through of all the data, then sorted the documents by source category (policy document, news article), and publishing company/agency. After identifying several key narrative trends in the initial read-through, I developed a set of codes that captured salient patterns in discourse. The codes I started with were: “water use,” “land use changes,” “ecological restoration” (with subcategories “use in restoration” and “effects on biodiversity”), “aesthetics,” militarism,” “tamarisk beetles as tool,” and “tamarisk beetles as plague.” As I progressed in coding the documents, I identified several other common themes, which I added as additional codes: “fire,” “urban/rural location,” and “decision to release beetles.” I then did a second round of thematic coding to make sure that articles I had analyzed earlier on incorporated the newer codes.

### III. Results

<table>
<thead>
<tr>
<th>Table 1. Search terms for <em>Tamarix spp.</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>English</strong></td>
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<tr>
<td>Tamarix</td>
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<tr>
<td>tamarisk</td>
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<tr>
<td>saltcedar</td>
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<tr>
<td>salt cedar</td>
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<tr>
<td>athel</td>
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<tr>
<td><strong>Spanish</strong></td>
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<tr>
<td>Tamarix</td>
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<tr>
<td>tamarisco</td>
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<tr>
<td>pino salado</td>
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<tr>
<td>cedro salado</td>
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<tr>
<td>pinavete/pinabete</td>
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</tbody>
</table>
Table 2. Data sources for policy documents and news/media archives.

<table>
<thead>
<tr>
<th>Source agency</th>
<th>Country (state/region)</th>
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</thead>
<tbody>
<tr>
<td>Comisión Nacional del Agua (CONAGUA)</td>
<td>Mexico</td>
</tr>
<tr>
<td>Comisión Internacional de Limites y Aguas</td>
<td>Mexico</td>
</tr>
<tr>
<td>Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO)</td>
<td>Mexico</td>
</tr>
<tr>
<td>Comisión Nacional de Areas Naturales Protegidas (CONANP)</td>
<td>Mexico</td>
</tr>
<tr>
<td>US Department of Agriculture (USDA)</td>
<td>United States</td>
</tr>
<tr>
<td>US Fish and Wildlife Service (USFWS)</td>
<td>United States</td>
</tr>
<tr>
<td>US Forest Service (USFS)</td>
<td>United States</td>
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<tr>
<td>US Bureau of Reclamation (USBR)</td>
<td>United States</td>
</tr>
<tr>
<td>Albuquerque Journal</td>
<td>United States (NM)</td>
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<tr>
<td>El Defensor Chieftain</td>
<td>United States (NM)</td>
</tr>
<tr>
<td>El Diario de Juárez</td>
<td>Mexico (Chih.)</td>
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<tr>
<td>El Heraldo de Chihuahua</td>
<td>Mexico (Chih.)</td>
</tr>
<tr>
<td>High Country News</td>
<td>United States (Intermountain West)</td>
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<tr>
<td>La Voz</td>
<td>Mexico (Coah.)</td>
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<tr>
<td>La Jornada</td>
<td>Mexico (national)</td>
</tr>
<tr>
<td>Texas Monthly</td>
<td>United States (TX)</td>
</tr>
<tr>
<td>El Zócalo</td>
<td>Mexico (Coah.)</td>
</tr>
</tbody>
</table>

A. Border Crossing: A Framework

1. The border I am discussing

The U.S.-Mexico border is (in some stretches) a tangible place, demarcated by physical things such as water, roads, fences, signs, and mountains. The border comes from, and is
maintained by, human imagination, inscribed and re-inscribed through political and civilian acts. Through these acts of creation, borders work to separate nations and the things and beings within them. Anzaldúa (1987) and Sundberg (2007, 2008) remind us that the U.S./Mexico borderlands also include zones of mixing where material things, beings, ideas, languages, and narratives intermingle both in spite of and because of the existence of the border. While a geopolitical border (whether agreed upon or disputed) is defined by a set of coordinates, “A borderland is a vague and undetermined place created by the emotional residue of an unnatural boundary” (Anzaldúa 1987: 25). Through the tension of an enforced separation, new narratives take shape. In the following analyses of (nonmaterial) narratives on tamarisk, tamarisk beetles, and humans, I will often refer to the “border,” and will be talking about a conceptual border or borderland. First, though, I will address material crossings/transgressions of the demarcated geopolitical U.S./Mexico border.

2. Material crossings

Tamarisks, humans, and tamarisk beetles (*Diorhabda* spp.) have all been material bodies in motion across the geopolitical boundary between the U.S. and Mexico since first arriving in Chihuahuan Desert. Each group in the assemblage has crossed the border at some point, both with assistance and of their own volition. All transgressed the expectation that the geopolitical line would keep things in predictable geographic separation.

Tamarisk, believed to be first introduced in the U.S. around 200 years ago, crossed into Mexico soon after (Di Tomaso 1998). Humans have been crossing this line outside state jurisdiction since it was created in 1848, sometimes with facilitation from tamarisk, which creates dense stands that form protective cover for those wanting to avoid being seen. The news journal *Texas Monthly* notes, “Looking around at the thick, twelve-foot-tall salt cedar that provided cover for almost 150 miles upstream and 90 miles downstream, it was clear to me that a conga line could cross through the water anywhere and avoid unwanted
attention” (Vine, 2008). I will elaborate on the political implications of this relationship in the “Militarism” section below.

This study’s discourse analysis reveals that the beetles’ crossing was met with a mixture of trepidation from civilians and especially farmers, and relief from environmental government agencies, whose conservation goals aligned with those of the U.S. government, and represented a lift of the workload of eradicating tamarisk. Tamarisk beetles (*Diorhabda spp.*), were introduced first by county officials in Utah in 2004, and at that time USDA researchers were assured and assuring that the beetles would not survive south of the 38th parallel—not south of Colorado/Utah (Lewis et al. 2003). The beetles, however, adapted quickly in their new territory, and adjusted their diapause requirements to suite reproduction at increasingly southern latitudes (Bean et al. 2012). In 2010, USDA researchers released a group of beetles near El Paso along the Río Bravo/Grande, and the beetles crossed into Mexico to a mixture of open arms and great alarm.

To examine how narratives of tamarisk control or protection interact with invasion discourse, the results of this study are organized in two parts. The first examines narratives about tamarisk conservation that cross the U.S./Mexico border, looking specifically at government-sponsored conservation goals and narratives that construct the tamarisk beetle as an agent of the human project to control tamarisk. I will be mostly referring to the conceptual U.S./Mexico border. The second section names and unpacks which narratives are not crossing the conceptual U.S./Mexico border, focusing on contrasts between militaristic language in U.S. conservation discourse and the intimacy of Mexican vernacular relationships with tamarisk.

**B. What Crosses: The U.S. and Mexico’s shared governmental conservation narratives**

Several conservation-motivated narratives on tamarisk run concurrently within governmental agencies on both sides of the border. The Department of the Interior and SE-
MARNAT share strivings to improve the functionality of ecosystems through control of tamarisk, and both embrace the idea that ecosystem “health” can be improved through tamarisk removal. Both governments also tend to discursively frame the tamarisk beetle as a tool in service of human goals.

1. Concepts of ecosystem “health”

The idea that biodiversity is an important determinant of the beauty and functionality (often referred to as “health”) of ecosystems became a central concept in restoration ecology following the work of Elton (1958). The ecological concept of competition, wherein one species consumes or makes unavailable essential resources for another species, is essential to this concept. In 17 out of the 30 government documents analyzed for this study, both U.S. and Mexican agencies depicted tamarisk as in competition with—and outcompeting—native species as rationale for eradication or control measures. This assertion was based on two main ideas related to ecological competition. First, tamarisks are noted to increase soil salinity, making the soil surrounding tamarisk plants uninhabitable for other plant species.

The second and most popular shared narrative regarding ecosystem health is that tamarisk uses an egregious amount of water compared with native species sharing its ecosystem niche (ie; cottonwood and willow). Although the theory that tamarisks use more water than native species was debunked by a series of studies in the early 2000s (see “Background” section above), this narrative retains its strength and ubiquity in governmental documents from both sides of the border.

Human alarm about lack of water in the Chihuahuan Desert is not misplaced. There is increasing human demand for water while the amount of water in this ecoregion is, overall, declining and projected to continue to decline in future climate change scenarios (Gonzalez et al. 2018). The concerns about tamarisk water use seemed to have peaked among government agencies around the time that new studies emerged showing average-low comparative
use. A variety of water-use values were in circulation: from “between three and seven acre-feet of water per year,” (US Bureau of Reclamation 2005) to “more than twice as much water annually as all the cities in southern California,” (Invasive Species Advisory Council 2006) to “annual water loss estimated to be as great as 2.5 million acre-feet per year” (USBR 2004). These values are commonly associated with monetary losses. In 2016 CONABIO estimated annual losses of $133 to 285 million due to tamarisk water use. Concern about tamarisk water use echoes across government agencies in the region, with epicenters in the USDA, U.S. Bureau of Reclamation (USBR), the Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO), and the Comisión Nacional de Areas Naturales Protegidas (CONANP), as well as U.S. news media publications.

The water use narrative originated in the U.S. with geologist Oscar Meinzer’s development of the term “phreatophyte” to describe plants whose root systems are in contact with groundwater, and thus likely to use more water than other plants (Meinzer 1927). U.S. governmental agencies—in particular the USDA and USBR—appear to form a coalition of defense of the water use narrative and their justification of tamarisk removal projects of the past 25 years. The most common tamarisk water use metric of 200 gallons/day appears to have originated in a now-unavailable paper published by the USDA. The metric spread like wildfire and was present in 17.2% of all government and news publications coded in “water use.” A CONANP educational pamphlet on tamarisk management reads: “Other impacts of tamarisk is its high water consumption. A single tree consumes 200 gallons, the equivalent of 770 liters of water per day (Hoddenbach, 1987), a quantity that depends on the amount of evaportranspiration and is dependent on the availability of water, stem dimensions and climatic conditions (Davenport et al. 1982)”5 (CONANP 2015, translation by author). Doody et al.

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5 Original text: “Otro de los impactos del Pinabete es su alto consumo de agua ya que un solo árbol consume 200 galones, lo que equivale a 770 litros de agua por día (Hoddenbach, 1987), dicha cantidad depende de la cantidad de evaportranspiración y esto depende de la disponibilidad de agua, dimensiones del tallo y condiciones climáticas (Davenport et al. 1982).”
(2011) note, however, that the 200 gallons/day metric does not appear to be supported by the research in the publication that many articles cite for this metric, and its original source remains unknown.

CONANP’s use of U.S. studies referenced in U.S. governmental documents is part of a larger trend suggesting a narrative trajectory flowing from the U.S. to Mexico. Many of the mentions of tamarisk water use include references from the same studies that U.S. governmental agencies cite as proving tamarisk’s high water use. More recent governmental documents from Mexican agencies (2016-2020) skirt the issue of reconciliation with new science and opt to simply not mention water use in their rationale for tamarisk eradication objectives.

This narrative, though, has begun to lose ground in the U.S., especially in the USFS and USFWS. A 2020 publication from USFS on tamarisk reads: “Findings indicate that the species complex is a stress-adapted group with a low to moderate water consumption that primarily replaces native vegetation when conditions within watersheds that have become unsuitable for native species colonization (Nagler and Glenn 2013; Nagler et al. 2012)” (Carothers et al. 2020). U.S. news sources, too, have largely turned away from the high water use narrative since around 2010 and have started acknowledging academic studies released in the early 2000s that disproved the water use theory. U.S. journalists now often include a note about the most recent science regarding water use, often citing a failed water-savings project along the Pecos River. “The effort failed to generate the promised water,” a reporter for the Albuquerque Journal wrote in 2014. “Texas sued because New Mexico failed to deliver its legally required share down the Pecos at the New Mexico-Texas border, and New Mexico ended up spending $100 million buying up and retiring agricultural water rights instead” (Fleck 2014).
2. Tamarisk beetle as tool

As narratives about the tamarisk’s water use shifted in the past decade, the introduction of the tamarisk beetle (*Diorhabda* spp.) into the human-tamarisk dynamic has also sparked a wide range of reactions and narratives in news and government publications. The narrative arc traces transformation of perception of the beetle from human-controlled agent to autonomous new addition to the Chihuahuan Desert (“for better or for worse,” noted the Albuquerque Journal in 2014).

The first *Diorhabda* narrative in circulation was that of the beetle-as-tool; an agent and arm of governmental conservation goals. The biocontrol project was first championed by USDA researchers, who advocated the tamarisk beetle’s suitability as biocontrol in the US. The main financial rationale for beetle introduction rested on the idea that tamarisks use “large quantities of scarce groundwater” and the money that would be saved through beetle defoliation (DeLoach et al. 2007). Their view is optimistic—the language outlining preliminary research on beetle host specificity is persuasive and reassuring: “Classical biological control offers good potential for permanent, inexpensive control that does not harm any plants outside the genus *Tamarix* using an introduced leaf beetle, *Diorhabda* spp. from China and Kazakhstan (for northern areas) and from Greece (Texas, New Mexico).” (DeLoach et al. 2007) Following a series of roadblocks to the biocontrol project posed by environmentalists concerned with the loss of Southwest willow flycatcher habitat, a 2005 USDA publication published just before the agency fully launched its biocontrol program chides the “tendency in some agencies toward a ‘zero risk approach to weed management,’” calling for “better coordination and communication of information […] so that we can address misunderstandings and fears before they interfere with the management of invasive species in wildland ecosystems” (Dudley 2005). The USDA researcher’s critique of the “zero risk approach” clarifies
their pro-biocontrol position in the debate about whether the potential benefits of biocontrol outweigh the risks involved with the decision to deliberately introduce a new species.

In the first 2 years after the first official non-test release of the beetles in 2005, some U.S. journalists seemed to embrace the beetles-as-tool narrative, noting the ease with which they defoliated and knocked back monotypic tamarisk stands. *High Country News* quoted a volunteer coordinator for public lands in Arizona, “I consider them my newest volunteer corps,” she says of the beetles. ‘Their job is to eat and have lots of sex’” (Nijhuis 2007).

When it became clear that the beetles were moving outside the bounds predicted by the USDA’s extensive testing, journalists began to write with more trepidation. A 2010 *High Country News* article reads, “Originally, the beetles couldn't survive so far south—the short summer days cued them to hibernate too early—but they quickly adapted and began to thrive. [...] In 2008, the beetles crossed the invisible line into active flycatcher nesting territory, just a couple miles from the release area, and an unplanned, high-stakes experiment began” (Zurer 2010). The journalist is referring to the concern that environmentalists raised that the tamarisk beetle would destroy precarious SW willow flycatcher habitat—a concern that had initially delayed the USDA beetle release.

The framing of beetles crossing an “invisible line” or boundary marks a new branch of the beetle-as-tool narrative: that of the cyborg Frankenstein being. The classic cyborg arc illustrates a being with agency that is first viewed as an extension of the human arm that wields its power, then turns on its human master and benefactor by demonstrating that it is not a simple tool, but an autonomous being. The USDA researchers’ assurance and confidence that the beetles would behave in predictable ways once released was based on extensive lab testing and assurance from experts in biological control. No tests, however, could fully account for the ways in which the beetles would act with agency in favor of their own goal: to survive in their increasingly hot and arid new territory.
C. What does not cross: intimacy and militarism

1. Quotidian relationships to tamarisk in Mexico

In much of the Chihuahuan Desert in Mexico, the arid climate and salinity of the soil creates a harsh environment for plants any larger than a creosote bush to eke out a living. News journals from Chihuahua and Coahuila reveal the roles tamarisk has played, and continues to play, in agricultural Northern Mexico. A journalist with *La Jornada* mentions that the tamarisk’s bursts of pink flowers are an important resource for bees and their farmers (Villalpando 2010), and the tamarisk’s sap is used to roast chipotle chiles: “Le imparta un sabor único” (Gallegos 2013). Many articles published in Mexico mention that tamarisks serve as windbreaks along the edges of agricultural fields and stabilize eroded ditch- and river-banks where native trees cannot survive (*El Heraldo de Chihuahua* 2019; Cruz 2017; Gallegos 2013; Villalpando 2010). Some farmers, however, are fed up with the ubiquity of tamarisks’ presence in their fields. Sergio Sanchez-Peña, an entymologist from Chihuahua studying tamarisk beetles, has received several requests for beetles from farmers further south in Nuevo León, hoping to reduce labor costs involved in clearing tamarisk from their fields (interview, June 2020).

In Northern Mexico’s urban and residential areas, tamarisks are one of the hardiest and longest-living shade trees. A species of *Tamarix* not often found further north, called *Tamarix aphylla* (also known as athel) is taller and more treelike in stature than its shrubbier northern cousins, and can live to well over 100 years (Tesky 1992). In news articles, “pina-bete” is not always referred to as an athel. Photos can be indicative, though, as athels are easily distinguished from shrubbier tamarisks by their larger trunk diameter (Tesky 1992). The athel is often cultivated as a shade tree, and it shares the tamarisk trait of drought hardiness and tolerance of salty soils.

News articles indicate that the athel is a beloved tree found along residential blocks and ringing plazas (*El Diario de Juárez* 2008, Flores 2018). The mayor of the town of Deli-
cias, Chihuahua, was the target of local outrage in September 2019 when he ordered a stand of athels to be cut down and burned on an ejido outside of town. *El Heraldo de Chihuahua* released a series of scathing articles and social media posts on the event, calling it a devastating “ecocidio” (ecocide) of trees as old as 60 or 70 years (Ponce 2019). A city official interviewed for another *Heraldo* article lamented the lack of recourse for those responsible for the *ecocidio*: “The councilor said she did not know how this crime against the environment could be punished, mentioning that lately there has been more citizen concern for conserving green spaces.” (El Heraldo 2019, translation by author) The townspeople also argued that they should have been informed of the plan to remove the trees so that they could have used the materials—that the burning of the trees was a waste of resources. Others mourned the athels, noting again their age (“centenarios”) in recounting their anger at the “crime against the environment” (*El Heraldo de Chihuahua* 2019). The public outrage in response to the removal of the stand of athels in Delicias indicates that the trees are beloved there, and deemed worthy of protection.

In 2010, the USDA released tamarisk beetles in Presidio, Texas, just over the border from the Mexican town of Ojinaga. The beetles quickly moved along the Río Bravo/Grande and its tributaries. According to USDA documents, a group of Mexican scientists and officials had “agreed to not oppose the release” (DeLoach et al. 2007), but the USDA and the officials they refer to did not appear to have consulted in or communicated to affected regions near the release site (Zamorano 2012). Over the following five years, a wave of articles on the beetles’ arrival flowed from Chihuahuan news journals. Unlike U.S. news media coverage of the introduction of beetles, Mexican media reflected a sense first of alarm, then mourning. The first article to come out about the tamarisk beetles in Mexico was titled “A

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6 Original passage: “La regidora dijo desconocer de qué manera podría castigarse este crimen contra el medio ambiente, mencionando que a últimas fechas existe más preocupación de los ciudadanos por conservar las áreas verdes.”
plague attacks the tamarisks.” (“Plaga ataca los pinabetes” *El Diario de Juárez* 2013) “The infestation of a plague” was the most common framing in subsequent news articles on the arrival of tamarisk beetles in Mexico. The town of Delicias released an urban reforestation plan, worried that their town would lose its green spaces when the beetles fully defoliated the parks’ tamarisks (*El Diario de Delicias* 2014).

The USDA beetle release also had economic consequences for farmers. *La Jornada* reported (as of September 2010, the same year that the beetles crossed the border into Ojinaga and surrounding areas) that beetles had destroyed 1500 hectares of tamarisk around Ojinaga, depressing the income of many of the area’s apiculturists. The farmers reported “swarms of beetles,” and local officials promised to “present the neighboring nation [U.S.] with an analysis of harms with a request for economic support” (Villalpando 2010, author translation). A 2013 article in *El Diario de Juarez* frames the conflict as a result of negligence on the U.S.’s part:

“‘While in the United States they consider the salt cedar a threat to their environment, on this side of the border it is given special value because it is used as shade for livestock, as a control for wind erosion, that is, wearing away of rocks or the removal of soil by wind,’ said Lucio López, of the local plant health board in the Juárez Valley. ‘They sought to solve a problem on the other side of the border, but unleashed one on this side.’”* (El Diario 2013, translation by author)

Some Mexican government documents also express trepidation in response the beetle release. A 2010 press release from the International Commission of Boundaries and Waters

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7 Original passage: “Mientras en Estados Unidos se considera al pino o cedro salado una amenaza para su medio ambiente, de este lado de la frontera se le da un valor especial porque se utiliza para sombra de ganado, así como un controlador de la erosión eólica, es decir, desgaste de las rocas o la remoción del suelo por los vientos, dijo a su vez Lucio López, de la junta local de Sanidad Vegetal en el Valle de Juárez. Se buscó solucionar un problema del otro lado de la frontera, pero se desató uno de este lado.”
between Mexico and the United States (CILA) immediately following the release called the U.S.’s move “unilateral,” suggesting that CILA was not aware of the agreement from Mexican officials cited by the USDA. The document, while stating that the tamarisk is known for high water use, also stresses the importance of tamarisk to farmers in the rural areas surrounding Ojinaga. A researcher in Mexico has made several public calls for monetary settlement and support from the U.S. government considering the economic and social repercussions of the release, as well as stressing the importance of binational communication and collaboration to monitor the beetles (Zamorano 2012, 2016). There are, to date, no formal legal challenges to the USDA’s decision to release beetles near the border.

López’s quote in El Diario, CILA’s press release, and Zamorano’s criticism of the USDA decision to release beetles at the border illustrate a common theme: the U.S. treatment of the problem of tamarisk and lack of consideration of collateral damage in Mexico has been met with alarm and frustration from environmental officials and civilians both rural and urban. This trend is wrapped up in a larger context of U.S. border militarism that situates U.S. interests before, and with little consideration of, the interests of Mexicans.

2. Militarism in U.S. tamarisk discourse

In U.S. journal articles about tamarisk, military metaphors abound. Article titles can be especially indicative: “A War on a Weed” (Albuquerque Journal 2003), “Alien Invasions” (High Country News 1997), “Taking Up Arms Against Trees,” (Soussan 2003), “Beetle Warfare” (Nihjuis 2007), and “It’s ’bombs away’ on New Mexico saltcedar” (Krza 2003). All articles with the code “militarism” (29 news articles and 1 government document) came from U.S. documents, and 29.25% of news articles coded with at least one reference to militaristic language. In analyzing the documents, I defined “militarism” as mentions of weapons, war, or battle in reference to tamarisk. The “militarism” code often shared space or
overlapped with the “aesthetics” and “ecosystem health” codes; an association that I explore in this section.

When many U.S. journalists write about tamarisk, they use it to make an aesthetic distinction between a healthy, vibrant ecosystem and one that has been neglected or degraded. The general attitude toward the plant is negative, and its positive uses by humans or wildlife largely left out. A main focus is on the obstruction the tamarisks pose on riverbanks where people want to recreate: “Carved out of a nearly impenetrable forest of water-robbing salt cedar and thorny Russian olive trees, the state Game & Fish Department has turned its Hammond Tract into what should become a very popular recreational area” (Moffatt 2013). El Defensor Chieftan (2018) interviews the coordinator of a project to clear out tamarisk, who says, “That's why we spent all this money with all the picnic areas, and clean up all the salt cedar so you can see the river while you're walking the trail.” The phrase “cleaning up” when referring to tamarisk is a decision to frame the plant as something dirty, or out of place (Sundberg 2007)—that, when removed, beautifies a space and appeals to people wanting to recreate in clear view of the river.

The adjective “invasive,” while common in referring to nonnative species, is not without militaristic connotation. Merriam-Webster’s first definition of “invade” is “to enter for conquest or plunder” (Merriam-Webster 2021). Use of the word “invader” is territorial, representing a geographic transgression, as in “alien invader,” or an “invasion of territory.” Further, there is a tendency in U.S. news articles and government documents on tamarisk to nounify the adjective in “invasive species” and shorten it to “invasives” (USBR 2005; Setziol 2011; Keller 2013; Goldfarb 2014). This nounification resembles another popular linguistic move in the U.S. to refer to “people who cross the U.S./Mexico border illegally” as, simply, “illegals” (Flores & Schachter 2018). In contrast, language in Mexican news and government documents tend to keep the original phrase, using “las especies invasoras” rather
than shortening to “las invasoras” (Comité Asesor Nacional sobre Especies Invasoras 2010; 
*La Voz* 2010; Martínez 2017). The presence of “especies”, or “people illegally crossing” 
dramatically changes the tone of the phrase and reveals a sentiment toward perceived out-
siders that acknowledges their human-ness, planty-ness, or—at least—the fact that they are 
alive.

The “cleaning up the invaders” narrative is also used by journalists to refer to 
tamarisk removal projects aimed at rooting out people illegally crossing the border, or other 
forms of crime. Tamarisk form dense stands “thick enough to hide a meth lab—which they 
have, in fact, been known to do,” noted Cally Carswell for *High Country News* (2015). An-
other article from the same journal writes with surprise on the involvement of the U.S. Bor-
der Patrol in tamarisk eradication. “Twenty-foot-high walls of tangled branches mask people 
standing 10 feet away, says Dominguez, making bandits virtually invisible. ‘I wouldn't send 
my worst enemy down there to hunt or fish,’ agrees lead restoration planner Fred Phillips. 
‘Hunters Hole is rampant with crime.’ […] It became a forgotten place, where bandits and 
illegal immigrants hid amid the brush” (Heim 2007). In Mexican news articles, by contrast, 
the only reference to tamarisk posing an access problem is a report of an effort to clear out a 
stand in an Allende (Coah.) cemetery so that families can have easier access to their deceased 
(*El Zócalo* 2019).

**VI. Conclusion**

There appear to be two key contrasting ideas in narrative trends regarding tamarisk. 
Quotidian intimacy defines Mexican journalistic narratives, with specific attention to how 
eradication of tamarisk—whether mechanically, chemically, or through beetle predation— 
impacts the public’s relationship to the plant and, in the case of some farmers, economic 
livelihoods. These narratives are mainly circulating through news journalism, though some 
government agencies (such as CILA) are also concerned with how the USDA’s beetle release
is affecting the livelihoods of Mexican citizens. In U.S. publications, however, there appears to be little to no concern regarding peoples’ relationships to tamarisk. It seems that the general assumption in news media and government publications is that most people consider the tamarisk an adversary, including (perhaps especially) the ecosystems themselves, and are thus justified in narratives that pose human relationships to tamarisk as combative and hierarchical. Here, consideration of the human-beetle-tamarisk assemblage becomes important to understanding narrative differences. The grouping relates differently to each other in different geographic locations; with humans, their borders and their stories as the key differential.

The language we use to tell stories matters. Language shapes perceptions; the speaker might use it to define a relationship it but it also defines the speaker’s relationships (Foucault 1969). The militaristic metaphors that appear in story-telling and the on-the-ground practices of researchers and journalists in the U.S.—and the involvement of the U.S. border patrol in tamarisk eradication—indicates a combative, militarized relationship to tamarisk and tamarisk beetles. This language and framework correlates temporally with a rise in xenophobia in the U.S. (particularly toward Latin America), though it is certainly not unique to our current era. Narratives of military combat to talk about ecological newcomers echo Elton’s (1958) influential introduction of militarized language to talk and think about introduced species.

The strong contrasts in tamarisk discourse (and the underlying relationships this contrast points to) raises the question of why other aspects of tamarisk management are largely similar on both sides of the border. The shared understandings of introduced species as bad for biodiversity, generally, and tamarisk’s high water use are part of a shared governmental discourse. The sharing of scientific knowledge and the tendency of researchers on both sides of the border to reproduce the same set of faulty citations could partly explain why an incorrect metric for tamarisk water use was able to spread unchecked for over 20 years (Stromberg...
2009). Most governmental papers cited the same sources as rationale for tamarisk eradication, and came to similar conclusions about how to manage tamarisk.

This project, and this deep investigation of discourse, has changed how I think about tamarisk, as well as invasive species more broadly. I now use “manage” with hesitancy, as this word does not come close to describing the many ways of knowing and relating to plants. As stories of apiculturalists who have lost a valued business partner and collective mourning of a town in the wake of an “ecocide” demonstrate, the possibilities for ways of knowing tamarisk are more abundant than what is presented in the U.S. news and government publications explored in this study would suggest. Therefore, I find the word “relate” more apt, as in, how do we relate with this plant? “Relate,” here, allows for multiple ways of interacting and shaping of behaviors, and it widens the one-way street of “management.” Humans are not simply acting upon their environment—the things around humans are acting on them, too.

This study contributes several key insights to the fields of political ecology and invasion biology. By examining the beings in question—humans, tamarisks, and tamarisk beetles—as a co-created and entangled assemblage, I have illuminated important connections between these three beings and the ways they influence one another. Tamarisk came to this continent with humans, flourished and hybridized in landscapes degraded by humans, became an important fixture in the Chihuahuan Desert landscape, and now is being subjected to a range of control measures. Included amongst these are the tamarisk beetle, framed as an agent of USDA goals (to control tamarisk), that has also adapted and hybridized in its new home in ways that the USDA tried, but ultimately failed, to predict. These are Harcourt and Nelson’s (2015) “hybrid seeds,” requiring a hybrid multinatural geographical analysis to fully grasp their interrelations (Whatmore 2002).

What of the humans? Our destinies remain inextricably connected with those of the other species in this tamarisk-human-beetle assemblage. The hatred sown in popular and of-
ficial conservation discourse toward “invasive” species is perhaps a displaced feeling stemming from shame or remorse at the changes wrought by humans on our home planet, or of colonial guilt. Easier, maybe, to target one plant family and pull it from the ground, and then feel like one has corrected some past wrong wrought by a complex soup of industrialization, globalization, and unchecked capitalism. Many researchers and environmental journalists, even those in governmental agencies that have fought tamarisk, have started addressing the role of dams and flood regimes on the influx of tamarisk (Stromberg 2007, 2009; Nijhuis 2007; Fonseca 2019), and the important roles of tamarisk in novel ecosystems (Carothers et al. 2020). This is a good start; until we (each person, and collectively) can confront or make peace with a multiplicity of structural change agents, we will continue displacing our hatred onto the other things with whom we are entangled on this planet. This is not, however, the only necessary framework for how to move forward in our changing landscape.

Finally, I argue that the imagined border and the way it divides ways of knowing must be addressed by land managers and those involved in conservation work. The surge of alarm in Mexico at the arrival of the tamarisk beetle points to a broken relationship and lack of two-way communication in cross-border conservation work. Not only did the division between the two countries cause damage to relationships and economies in Northern Mexico, it also has blinded perspectives in the U.S. to other ways of knowing and relating with tamarisk.

Without critical narrative intervention, discourse on introduced species will continue in the same ruts it has since the conception of the idea of “invasions” by plants, animals, and viruses: In combat, divided by an arbitrary line girdling North America. This intervention seeks to assist in forming a new route, based on collaborative, creative understanding of humans as part of many assemblages, including and especially with those beings we have brought with us.
Chapter 3:
Expansion, Discussion, and Future Directions

A note on the final chapter:

This study revealed several additional narrative threads and differences between particular government agencies on both sides of the border that I did not discuss in Chapter 2. I will explain these findings in more detail in the first section of this chapter. Next, I discuss the significance of the findings and how they contribute to the field of political ecology. Finally, I outline the limitations of this study and future directions for research.

I. Expansions

Of the four U.S. government agencies under examination for this study, the USDA and the USBR published the most documents with mentions of tamarisk. I have discussed USDA narratives in detail, especially regarding the agency’s role in tamarisk beetle releases. The USBR, however, also contributes significantly to U.S. narratives and understandings of tamarisk in relation to its alleged high water use.

The USBR focuses on water reclamation for human use, and the agency was one of the first to publish government documents on tamarisk and circulate some of the high water use metrics that I discussed in Section B.1. of Chapter 2. A 2005 USBR research proposal on effects of the newly-released tamarisk beetles asserts that “it is important to quantify how many defoliations occur to kill various sized and aged salt cedar in order for biocontrol to be widely accepted and used as a salt cedar control method to increase water salvage,” going
on to also state that the proposed research “will also quantify how quickly the remaining native grasses, forbs, and shrubs will recover once salt cedar is being controlled and will quantify the increase or decrease of other weedy groundcover species” (author’s emphasis) (Hosler 2005). These statements highlight two main assumptions assumed in all USBR documents in this study. One can gather from the first quote that the author assumes that biocontrol will increase water availability for humans. The author also immediately asserts a pro-biocontrol, beetle-as-tool position, implicated by the motivation to convince people to accept tamarisk beetles as a control method. The second main assumption here is that native plants will certainly return once the beetles repeatedly defoliate the tamarisks. Ecological studies on this assumption indicate that a return of native plants is not a guaranteed result of tamarisk removal by any method, and in some cases, the opposite is true—that ecosystems where tamarisk is present and mixed with other species of woody plants can actually contain more biodiversity than ecosystems where tamarisk has been removed (Sherry et al. 2016; Carothers et al. 2020), and that removal can cause declines in bird and reptile diversity in particular (Bateman 2008; Sogge et al. 2008). Still other studies indicate that the next wave of plants to come in after tamarisk removal is most often other introduced species that thrive in disturbed, exposed soils (González et al. 2017a; 2017b).

During document analysis, the codes “water use” and “money” were often part of the same sentence or phrase in USBR and USDA documents, demonstrating the agencies’ commercial concern with the presence of tamarisk. The tamarisk is thus framed as competing with human interests for decreasingly available water in the Southwest, with financial gains in more available water a base argument for the funding and use of tamarisk beetles as biocontrol. Another key connection here is the use of militaristic language (indicated by the “militarism” code) by these two agencies and U.S. news media where “water use” and “money” are present, with 16 documents sharing all three of these codes in a single paragraph. The correlation of these three ideas suggests the importance of each one justifying and supporting the others in the formation of combative narratives when discussing tamarisk in the U.S.
The distinct narratives within the USDA and USBR also demonstrate that governmental agencies are not monolithic—discourses and ideologies vary between (and within) particular agencies. Analysis of government documents from Mexico reveals another interesting variation between agencies focused on the environment and agencies managing infrastructure and transportation. In a government-organized reforestation project at the Nuevo Aeropuerto Internacional México, the Secretary of Communication and Transportation (Secretaría de Comunicaciones y Transportes, or SCT) and the National Forest Commission (Comisión Nacional Forestal, or CONAFOR) planted tamarisk as part of a reforestation project on degraded land at the airport. In a series of 2017 press releases from the SCT, the agency announced its reforestation project of over 500 hectares (1250 acres) of tamarisk, and its hope to plant another 500 hectares by the end of airport construction (SCT 2017a; 2017b). According to the articles, tamarisk is the “only species that can grow on the grounds at the new air terminal due to the nutrients in the soil” (SCT 2017a; translation by author). An article from CONAFOR on the reforestation clarifies that the city of Texcoco, where the new airport is located, is an old lakebed, so the soil is highly saline—ideal for tamarisk and inhospitable for most other tree species (CONAFOR 2017). The agencies were required by law to plant at least 240 hectares at the new airport grounds in order to mitigate air, water, and soil disturbance as a result of the airport’s construction, furthering the goal to have the airport LEED certified (SCT 2017a). There is no mention in this article of tamarisk being invasive or nonnative, which is a major narrative dissonance compared with the stance of CONANP, CONABIO, and CONAGUA.

The reforestation case at Nuevo Aeropuerto Internacional México falls outside the spatial bounds of the Chihuahuan Desert, but it is an important glimpse into the ambiguity of government agencies toward tamarisk in Mexico. This discrepancy could be geographical: the new airport is located far south of the Chihuahuan Desert in el Estado de México, where

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8 Original passage: “[…] realizaron la planta de árboles Tamarix (pino salado), única especie que puede crecer en los terrenos de la nueva terminal aérea debido a los nutrientes del suelo.”
conservation agencies have not recorded tamarisk as invasive. As the three articles mentioned above emphasized, the motivation to plant tamarisk was also one of necessity, as the soil surrounding the airport was too disturbed and salty to support other species. Tamarisk may have seemed like the obvious choice toward a goal of reforestation and land restoration.

The strong contrasts in tamarisk discourse (and the underlying relationships this contrast points to) raises the question of why other aspects of tamarisk management are largely similar on both sides of the border. The shared understandings of introduced species as bad for biodiversity, generally, and tamarisk’s high water use are part of a shared governmental discourse. The sharing of scientific knowledge and the tendency of researchers on both sides of the border to reproduce the same set of faulty citations could partly explain why an incorrect metric for tamarisk water use was able to spread unchecked for over 20 years (Stromberg 2009). Most governmental papers cited the same sources as rationale for tamarisk eradication, and came to similar conclusions about how to best manage (relate to) tamarisk.

II. Limitations and future directions

The many ways of knowing tamarisk are not all covered in this paper. Because the study was limited to news and governmental documents, I arrived at main narratives secondarily in some cases. For example, the study revealed a feeling of attachment and fondness in people for the athel tamarisks that the mayor of Delicias had removed, but was limited to interviews that journalists included in their news publications. In-depth interviews with people of Delicias would offer a deeper and more holistic look at the event and sentiment behind it. Direct interviews were not possible at the time of this study, but would likely give a more nuanced and detailed perspective of quotidian intimacy with tamarisk.

Another limitation to this study is its focus on mainstream perspectives. While this approach gives an overview of dominant narratives, it does not attend to less popular ways of knowing and relating to tamarisk. Scholarship on introduced species through a critical de-
colonial lens could give important insight on significant overlaps in language and ways of knowing. Indigenous theorists and political ecologists thinking about introduced species share a language of colonization and consider entwined histories of rapid land change in the wake of settler colonialism. Current scholarship in this framework is limited. Kimmerer (2013) sees two possible camps for introduced species: they can either be good—“wise and generous” and useful to people—or can be bad, interfering with native plants, using up the water (like tamarisk, she notes), and “growing with no regard to limits” (214). Other indigenous scholars mention the identification of Native people with native plants, drawing explicit connections between plant colonization and human colonization (Corntassel 2012; Snellgrove, Dahmoon & Corntassel 2014), but, “invasive species” in these papers get very cursory attention within the larger study of settler colonialism and decolonization. Specific attention to introduced species in decolonial scholarship is largely missing from the academic conversation about invasive species.

Finally, this study’s geographical focus on one region in North America does not tell a full story about the same plant in its many other new and historical ranges. The global tamarisk density map (Figure 1) shows that it has found a new home on three continents and remains abundant on three more. In particular, Australia, Argentina and Sub-Saharan Africa have been managing the arrival of tamarisk in those places. A similar comparative discursive study that looked at these different regions together would yield new understandings of how people perceive and interact with introduced species in different parts of the world. Further, what could a comparison of narratives from native ranges and introduced ranges reveal about how this difference and history influences narratives about this plant and others like it?

III. Summary and discussion of significance

There appear to be two key contrasting ideas in narrative trends regarding tamarisk. Quotidian intimacy defines Mexican journalistic narratives, with specific attention to how
eradication of tamarisk — whether mechanically, chemically, or through beetle predation — impacts the public’s relationship to the plant and, in the case of some farmers, economic livelihoods. These narratives are mainly circulating through news journalism, though some government agencies (such as CILA) are also concerned with how the USDA’s beetle release is affecting the livelihoods of Mexican citizens. In the U.S. publications, however, there appears to be little to no concern regarding peoples’ relationships to tamarisk. A common assumption in news media and government publications is that most people consider the tamarisk an adversary, including (perhaps especially) the ecosystems themselves, and are thus justified in narratives that pose human relationships to tamarisk as combative and hierarchical. Here, consideration of the human-beetle-tamarisk assemblage becomes important to understanding narrative differences. The grouping relates differently to each other in different geographic locations; with humans, their borders and their stories as the key differential.

The language we use to tell stories matters. Language shapes perceptions; the speaker might use it to define a relationship it but it also defines the speaker’s relationships (Foucault 1969). The militaristic metaphors that appear in story-telling and the on-the-ground practices of researchers and journalists in the U.S. — and the involvement of the U.S. border patrol in tamarisk eradication — indicates a combative, militarized relationship to tamarisk and tamarisk beetles. This language and framework correlates temporally with a rise in xenophobia in the U.S. (particularly toward Latin America), though it is certainly not unique to our current era. Narratives of military combat to talk about ecological newcomers echo Elton’s (1958) influential introduction of militarized language to talk and think about introduced species.

This study contributes several key insights to the fields of political ecology and invasion biology. By examining the beings in question — humans, tamarisks, and tamarisk beetles — as a co-created and entangled assemblage, I have illuminated important connections between these three beings and the ways they influence one another. Tamarisk came to this continent with humans, flourished and hybridized in landscapes degraded by humans, be-
came an important fixture in the Chihuahuan Desert landscape, and now is being subjected to a range of control measures. Included amongst these are the tamarisk beetle, conceived as an agent of USDA goals (to control tamarisk), that has also adapted and hybridized in its new home in ways that the USDA tried, but ultimately failed, to predict. These are Harcourt and Nelson’s (2015) “hybrid seeds,” requiring a hybrid multinatural geographical analysis to fully grasp their interrelations (Whatmore 2002).

What of the humans? Our destinies remain inextricably connected with those of the other species in this tamarisk-human-beetle assemblage. The hatred sown in popular and official conservation discourse toward “invasive” species is perhaps a displaced feeling stemming from shame or remorse at the changes wrought by humans on our home planet, or of colonial guilt. Easier, maybe, to target one plant family and pull it from the ground, and then feel like one has corrected some past wrong wrought by a complex soup of industrialization, globalization, and unchecked capitalism. Many researchers and environmental journalists, even those in governmental agencies that have fought tamarisk, have started addressing the role of dams and flood regimes on the influx of tamarisk (Stromberg 2007, 2009; Nijhuis 2007; Fonseca 2019), and the important roles of tamarisk in novel ecosystems (Carothers et al. 2020). This is a good start; until we (each person, and collectively) can confront or make peace with the true change agents, we will continue displacing our hatred onto the other things with whom we are entangled on this planet. This is not, however, the only necessary framework for how to move forward in our changing landscape.

Finally, I argue that the imagined border and the way it divides ways of knowing must be addressed by land managers and those involved in conservation work. The surge of alarm in Mexico at the arrival of the tamarisk beetle points to a broken relationship and lack of two-way communication in cross-border conservation work. Not only did the division between the two countries cause damage to relationships and economies in Northern Mexico, it also has blinded perspectives in the U.S. to other ways of knowing and relating to tamarisk.
Without critical narrative intervention, discourse on introduced species will continue in the same ruts it has since the conception of the idea of “invasions” by plants, animals, and viruses: In combat, divided by an arbitrary line girdling North America. This intervention seeks to assist in forming a new route based on collaborative, creative understanding of humans as part of many assemblages, including and especially with those beings we have brought with us.
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