

# Killing Cane: Learning From Large-Scale Conservation on the Nueces River

*The Nueces River Authority has engaged nearly 200 landowners in removing an invasive species from some 60 miles of the Nueces River. The author discusses the process for bringing landowners onboard and bridging the landowner-government divide.*

By J. DANIEL OPPENHEIMER

With three times more privately owned land than in any other state, Texans can—and occasionally do—boast that 95% of our state is private property. Less frequently mentioned is that all the land under navigable streams in Texas, approximately one million acres, is legally open to the public. This public access to navigable waters persists even when there is no water. As drought is an all-too-common occurrence, and with several rivers that flow through karst limestone formations and under gravel beds, some channels run dry.

Whether dry or flowing, many of these publicly accessible riverbeds are modestly supervised. An assortment of state, federal, county, and regional bodies have limited authority over freshwater riverbeds, but no single state agency holds plenary responsibility for their management. Given the private nature of land ownership, much of river management is left to landowners.

The Nueces River Basin encompasses all or parts of 22 counties in south Texas. Over 17,500 square miles of hill country, brush country, and coastal plains, the Basin extends from the Edwards Plateau to the Gulf of Mexico. Within this expansive basin, springs, creeks, seeps, and rivers have shaped the very narrative of the state. Historically, these waters sustained Comanche, Apache, and other native peoples, provided the underpinnings for Spanish missions and U.S. Army posts, waterholes for mustangs and longhorns, refuges for wildlife, and critical drinking sources for thirsty crops and people.

In the upper stretch of the Nueces, these waters remain the life blood of a parched landscape located on the eastern edge of the Chihuahuan Desert. Today, the coveted headwaters of the Nueces—clear and, at times, emerald green rivulets, often few and far between—support cattle, goats, and sheep, recreational activities like fishing, hunting, camping, and water sports, domestic wells, and real estate activity. The Nueces River Basin

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*The views expressed in this article are the author's and do not necessarily represent the views of the Nueces River Authority.*

provides 60% of the total water entering the Edwards Aquifer via the recharge zone. The Edwards Aquifer, in turn, serves the agricultural, industrial, and domestic needs of nearly two million users in south-central Texas.

In a state singularly held in private hands, the upper stretches of the Nueces River Basin are no exception. Large ranches, farms, and several subdivisions encompass the headwaters. As such, private landowners' understanding of and attitudes toward riparian systems matter dearly. Riparian systems may be wholly preserved or manicured for an enhanced scenic view from the homestead; deadwood along the bank may be untouched for wildlife habitat or removed for an accessible swimming hole; and stream banks may be avoided or destabilized by recreational vehicles. With regular droughts, south Texans know the value of a good rain and the importance of water conservation. Yet, until recently, words like "wetlands" and "riparian" hardly ever passed across the center console. In short, knowledge of wetlands and riparian function was lacking.

That changed in 2008, when the Nueces River Authority (NRA) initiated the Nueces River Riparian Landowners' Network. Under the leadership of Sky Jones-Lewey, Resource Protection and Education Director of the NRA (and a previous National Wetlands Award recipient who was instrumental in passing state legislation to restrict motor vehicles in protected freshwater areas), the Network has educated private landowners and agency decisionmakers about the functions of riparian zones and their benefits to creeks, streams, and rivers. Working with members of the National Riparian Service Team (NRST), the Network has advanced the NRST's national goal "to develop a new critical mass of people who interact with and manage riparian-wetland resources based on shared knowledge of the attributes and processes that constitute sustainability" (NRST 2011). This knowledge occurs through complimentary riparian plant field guides, place-based problem solving, and interactive workshops.

Land stewards along riparian zones host these one-half-day workshops. In addition to taking a biophysical focus, NRST

trainers also discuss social factors that influence the health of riparian systems. Important social dimensions, such as commonly held views about rivers, are openly discussed and contextualized during workshops. Untangling misunderstandings about woody debris and river morphology, for example, has opened the door to new attitudes and management actions, whereby participants began to think about woody debris in terms of deposition of sediments. In just four years, the NRA has organized 35 such riparian workshops and reached 700 people who collectively manage about 1.6 million acres of land. A number of collaborations have taken root from these interactions, including the Arundo Control and Riparian Restoration Project.

#### THE ARUNDO PROJECT: PULL. KILL. PLANT.

In the spring of 2010, several landowners from the Riparian Network began to notice an explosive expansion of *Arundo donax* along the Nueces and Sabinal Rivers. Known locally as Carrizo cane and sometimes confused with bamboo and other grasses, this particular genotype of *A. donax* was first introduced by Spanish colonizers. While introduced several hundred years ago, *A. donax* has only recently found its way into the stream beds, riparian lands, and floodplains throughout south Texas. In part, this may be explained by recent land disturbances, e.g., years of heavy all-terrain vehicle use and development, along the vast alluvial floodplain, as well as flood events on the Nueces that have spread propagules. A perennial reed that grows vegetatively through root shoots or resprouting of stems and rhizomes, *A. donax* spreads quickly when sprouting nodes are gnawed or mechanically cut down and then washed downstream. In the Nueces River Basin, its spread and impact have been unmistakable.

Thick colonies of *A. donax* have outcompeted native vegetation and formed impenetrable walls, some towering over 20 feet high. In a number of places, these tall, dense colonies have physically choked the flow of water and even blocked channels, creating eroded cut banks. As it changes physical processes, *A. donax* also captures the most precious resource in south Texas: water, lots of it. With high evapotranspiration rates, this phreatophytic plant mines shallow groundwater and can consume three times as much water as native plants (horticulturalists have estimated that one acre of *A. donax* uses about 5.62 acre-feet of water annually). When we first stood with landowners at the riverbanks, many shook their heads, forlornly recalling swimming holes of yesterday that were now dry.

As it captures water, *A. donax* also outcompetes native riparian vegetation that provides nesting habitat, shelter, and food for a host of native biota, periodically replacing the diverse composition of flora with a monoculture of cane. Not only does its spread lead to significant reductions in riparian bird species richness and abundance, but it also provides a favorable food supply for two other non-native organisms: feral hogs and nutria. These two organisms, in turn, will feed on, and consequently disperse, chewed stalks.

Alarmed by the recent explosion of *A. donax*, landowners from the Nueces River Riparian Landowners' Network contacted the NRA for assistance. Their concerns included water quantity, wildlife, aesthetics, and riparian function. One dismayed rancher noted that Carrizo cane is "only good for sheltering feral hogs and hiding junk cars." With the NRA at the center of communication, other agencies, including the U.S. Fish and Wildlife Service (FWS) and the Texas Parks and Wildlife Department (TPWD) Landowner Incentive Program, providing sizeable support, and 12 concerned riparian landowners working at the forefront, the group launched a prototypical demonstration. In 2010, large colonies of *A. donax* in the river channel and on the floodplain were sprayed with an aerial herbicide and little sprouts were hand-pulled along a five-mile stretch of the Nueces River headwaters.

Following the demonstration, participating landowners assessed the effectiveness of the prototype's methods. Most noteworthy was their observation that several *A. donax* plants, all situated with roots in water, responded to the aerial herbicide by sprouting propagules while they wilted; these dangling sprouts, in turn, provided an additional avenue for the dying plants to proliferate. In addition to assessing the methods and monitoring the site, the landowners did one more thing: they enlisted their neighbors.

Today, the project area stretches approximately 60 miles on the Nueces River and eight miles on the nearby Sabinal River in Bandera County. Nearly 200 landowners, several federal and state agencies, three contractors, and private foundations are involved in a multipronged effort to control *A. donax* and restore the rivers in the wake of the invasive plant's encroachment. Landowners and a contracted pulling crew, to date, have removed almost one million stalk nodes worth of cane; these smaller plants were fully pulled and placed on dry high ground to desiccate. The U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service and landowners continue to trap feral hogs and nutria. And, after



A Nueces River Authority intern observes *A. donax* sprouting from the node of another plant along the Sabinal River. Photo courtesy of Sky Jones-Lewey.

landowners' observations from the 2010 prototype, several herbicide treatments were tested and combinations applied on larger *A. donax* plants in the channels and floodplains. During the 2011 summer, 179 acres along the Nueces and 15 acres on the Sabinal were treated with herbicide. The short-term outcome has been convincing: large plants sprayed with the herbicide quickly yellowed.

Working with landowners and a consultant, the NRA project team identified two prioritized site classes for planting 60 riparian trees and several species of native grass. First, the team targeted large, dead clumps of *A. donax*, which not only offer rich organic sediment, but also a protective, dense nursery for planting native flora like eastern gamagrass, mulberry, and cypress. The second class of sites, brought to the NRA's attention by landowners' observations, is the eroded cut banks formed by water pushed aside by the dense walls of *A. donax*. Several native plants with deep root systems were planted to increase bank stability and mollify further erosion. Since planting, several landowners have worked with NRA staff, lending a golf cart, buckets, muscles, and good humor to water and monitor the saplings.

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#### **BRIDGING THE LANDOWNER-AGENCY DIVIDE**

Thick stands of Carrizo cane crisscross boundaries, reaching from the alluvial soils of the public river channel to dryer, private properties. Hence, controlling such a plant requires working across the public-private divide and with many individual stakeholders. When the NRA team built on the 2010 prototype, we disseminated to landowners in the expanded project area: information on the plant and its impact; risks associated with the herbicide; and specifics of the control strategy. Some landowners were familiar with the infestation of *A. donax* along the Rio Grande and were eager to prevent that level of encroachment in the Nueces River Basin. Others were unfamiliar with Carrizo cane and its impacts. After conversations on the phone, over coffee, or against pickup trucks, most landowners were eager to participate. Some, in fact, encouraged us to help take out chinaberry, mountain cedar, and other aggressive plants while we were at it.

But a few chose not to participate. One landowner, for example, was highly concerned about non-target impacts of the herbicide. Eventually, we did gain his trust to access his land and use his property as a control for our research, while also ensuring a significant buffer between his property boundary and upstream herbicide application.

Taking on-the-ground actions to control *A. donax* requires a collaborative mix of funding, expertise, and knowledge from both the public and private sectors. Landowners are the gatekeepers, both

literally (they have the combination to the locked gates) and figuratively (they offer insights about hidden side channels sheltering *A. donax*, key access points to waterways, historical perspectives and baseline information, and environmentally sensitive areas). They also offer their own time and labor—assisting in assessments, monitoring, enlisting their neighbors in the project, and carrying cypress saplings in their tractors to restoration sites.

On the public side, the FWS, the TPWD, the Texas State Soil and Water Conservation Board, the NRCS, the Texas AgriLife Extension, and the Rio Grande-Nueces Resource Conservation and Development Council have provided the Nueces River Authority with support for outreach and education, scientific research and data collection, and the multi-pronged *A. donax* control strategy. The control strategy may soon have another component: bio-control. Scientists at the USDA Agricultural Research Service (ARS) have identified several insects, including a beetle and a wasp species, that enervate the plant in various ways. These and other public agencies, including the Department of Homeland Security, have looked elsewhere in Texas to control *A. donax*. South of the Nueces, stretches of the Rio Grande are so thickly infested with *A. donax* that the plant has become an effective refuge for drug smugglers and illegal immigrants, prompting a multiagency effort to control the plant. This control effort encountered problems with social process, including community concerns about aerial herbicides, concerns that suspended contract work for some time.

#### **EARLY LESSONS LEARNED**

When implementing a large-scale invasive species control or riparian restoration project, especially in a private landscape, it becomes very clear that the project is about people, not a plant. Understanding the biological nature of the invasive plant and the ecosystem in which it persists is paramount. But this is not enough. It is people that will ultimately make decisions impacting the plant, altering the ecosystem, and advancing or countering the control project. As such, managers must recognize how landowners relate to and perceive rivers. With this understanding of perspectives and values, managers can begin to build more effective dialogues.

When an herbicide-spraying machine broke down, a landowner was there to help clear the path and pull the device out from its resting place. After herbicide treatments were applied, and the small staff of the NRA needed extra eyes on the ground, landowners were there to seek out any green plants that needed additional herbicide. When a consultant who was visiting the project area required a place to land a small airplane, a participating riparian landowner offered his private landing strip. But recruiting stakeholder support, be it exceptional or routine, does not come easily. It means building social capital and trust. And building trust means meeting landowners on their turf, befriending sometimes-intimidating canines, and, above all, understanding the perspectives and values at play. For the Arundo Project, this might be a concern about herbicide use, non-target damage to sentimental cypress trees planted by a grandparent, or discomfort with having strangers and government employees on private property. Understanding these perspectives, clearly outlining expectations, and advancing social capital are fundamentally

important. Indeed, restoring a river is not simply a matter of restoring biophysical process and function. It is restoring a social process where people can interact together, share information over wide geographic spaces, and work together on an exigent problem.

This social process should be based on creating healthy, sustainable human relationships with rivers. And these human-nature relationships, in turn, must be realized on a local level in people's daily lives. This is easier said than done. It requires that resource managers be people managers, by understanding and incorporating local knowledge, perspectives, and skill. For some resource professionals with technical training and background, attuning to the social context and social problems, and not simply technological fixes, may be somewhat difficult.

Ultimately, resource managers in large-scale restoration efforts need to foster high-quality, inclusive, and respectful exchanges of information and learning. These exchanges should occur within an "adaptive knowledge system," or a method for continuously integrating and building upon divergent knowledge systems. Such integration requires a deliberate process, one in which there is space for a variety of voices, perspectives, methods of inquiry, and knowledge systems, and where all these are valued and used.

Fostering sustainable relationships with rivers may, in some circumstances, require transformational change. As technically trained resource managers may take time to attune to the social context, landowners too may need time to adopt new beliefs and practices for achieving properly functioning riparian systems. These behavioral changes may be spurred by exchanges that demonstrate the value, local consequence, and purpose for change. In our case, illustrating the significant amount of water sequestered by *A. donax* and the successes of the 2010 prototype especially hit home with landowners.

Large-scale conservation, whether across scales of governance or numerous private properties, is inherently complex. Managers work with many participants, e.g., contractors, ranchers and residents, university scientists, and agency personnel, who collectively represent different disciplines and worldviews. In such cases, river restoration demands that managers understand the different epistemologies and the strengths and blind spots of each—including their own. With this understanding, they can begin to restore not only biophysical process and function, but mutual learning and shared respect. ■

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Nueces River Riparian Landowner's Network members watching a chemical treatment applied to *A. donax* along the Nueces River. Photo courtesy of Sky Jones-Lewey.

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