

Texas Environmental Flows Initiative

Final Report - March 2019



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Acknowledgements

Recognizing the need to demonstrate environmental water transactions as an effective tool for achieving conservation outcomes in bays and estuaries, the Texas Environmental Flows Initiative (TEFI) was created in 2014. The three-year pilot — a collaborative effort of Ducks Unlimited, Harte Research Institute at Texas A&M Corpus Christi, The Meadows Center for Water and the Environment, National Wildlife Federation and The Nature Conservancy — received generous support from numerous funders, including the Harte Charitable Foundation, the Cynthia and George Mitchell Foundation, The Meadows Foundation, Water Funders Initiative, Lyda Hill Holdings, Inc., The Houston Endowment and the National Fish and Wildlife Foundation. An additional pledge of transaction matching funds was made by The Campbell Foundation. The pilot brought more than \$3 million in funding toward the development of the legal and scientific frameworks necessary to implement water transactions for the benefit of three priority bays in the Gulf of Mexico: Galveston Bay, Matagorda Bay and San Antonio Bay.

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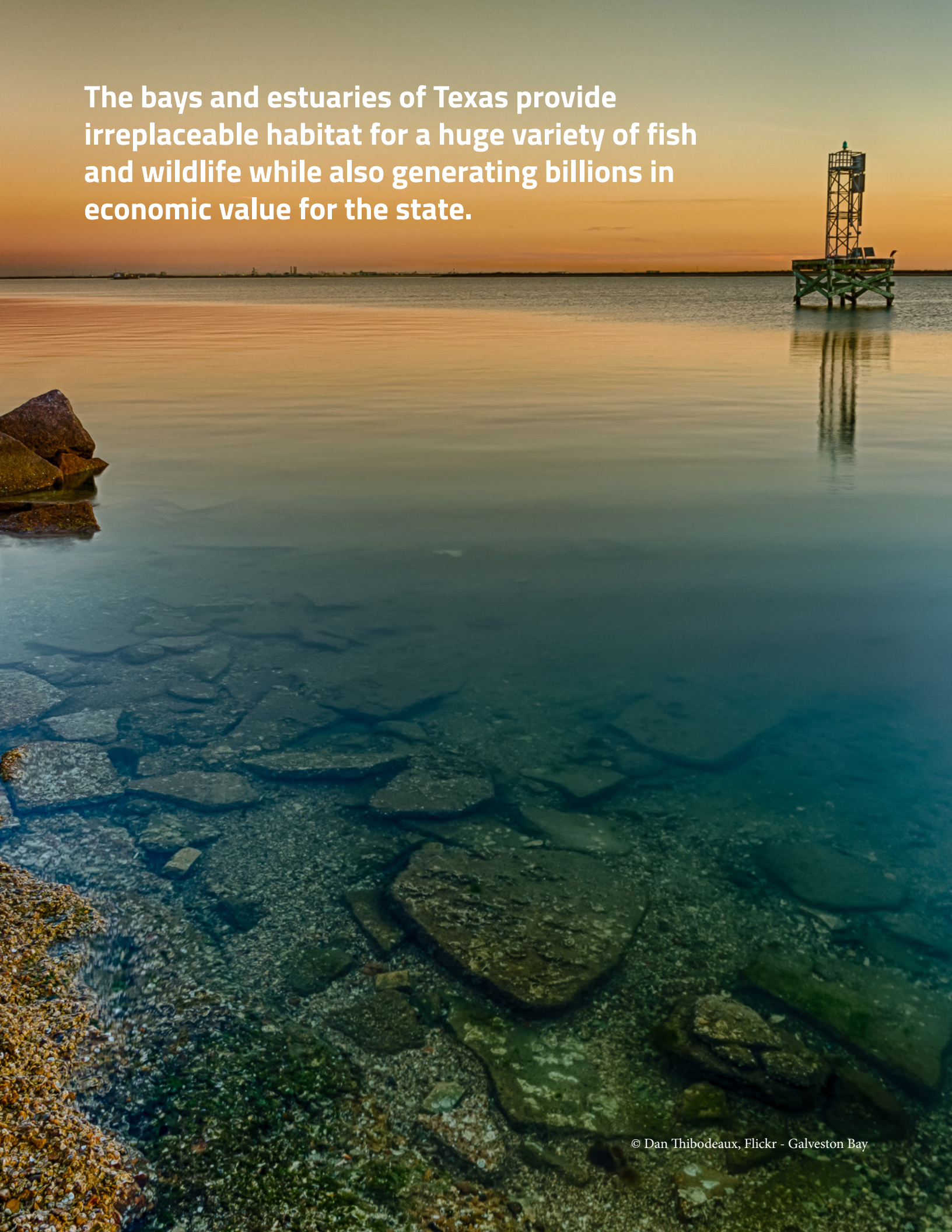
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The bays and estuaries of Texas provide irreplaceable habitat for a huge variety of fish and wildlife while also generating billions in economic value for the state.



Background

Water transactions have been used in the U.S. for more than a quarter century to secure and restore fresh water for important western streams, rivers, lakes and estuaries. Beginning in Oregon in 1993, the use of water transactions spread throughout the four Pacific Northwest states in an effort to improve flows for anadromous and resident fish populations. Since 2001, groups have increasingly used water transactions in California, Nevada and the Colorado and Rio Grande River Basins to achieve a variety of environmental and water-management objectives. These objectives include increasing delivery of water to Sacramento Valley wetlands for migratory birds, increasing freshwater inflows into Walker Lake to decrease salinity, providing water for riparian habitat restoration in the Colorado River Delta, and conserving water for the Colorado Basin system as a whole.

Interest in water transactions as a flow protection and restoration tool has been growing in Texas since Senate Bill 3 was enacted in 2007¹, but the Texas Environmental Flows Initiative, which focused on securing fresh water for coastal ecosystems, was the first organized effort to actually deploy this market mechanism for conservation purposes.

The bays and estuaries of Texas provide irreplaceable habitat for a huge variety of fish and wildlife while also generating billions in economic value for the state. The ecological health of these coastal systems depends in large part on adequate freshwater inflows from contributing streams and rivers. However, Texas bays and estuaries are increasingly at risk as the state's population grows and upstream water demands increase.² Passage of Senate Bill 3 (with significant involvement and support from environmental interests) represented a major step forward in addressing the challenge of environmental flows in Texas. Implementation of the legislation, one of the most comprehensive environmental-flow-protection statutes in the country, generated significant science on the environmental-flow needs of Texas' seven major bay systems. And, by explicitly authorizing the conversion of consumptive water rights to rights intended for environmental-flow purposes, the new law also paved the way for the use of market mechanisms as a strategy to help meet environmental-flow needs.

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- 1 Senate Bill 3 directed the state, for the first time, to develop and adopt comprehensive environmental-flows standards for the state's major river and bay systems, using a science-advised stakeholder process to help define each system's flow needs. These Basin and Bay Stakeholder Committees and Expert Science Teams are also charged with recommending strategies to meet the basin's defined environmental-flow needs to the extent they will not be met by restrictions on new permits.
 - 2 A number of examples illustrate this trend. In late 2011, scientists charged with helping the state develop environmental-flow standards for the Nueces River and Corpus Christi and Baffin Bays determined that Nueces Bay and Delta does not constitute "a sound ecological environment", due largely to a lack of freshwater inflows. In a July 2014 ruling on a lawsuit related to the deaths of 23 endangered whooping cranes in 2008-2009, the U.S. Fifth Circuit Court of Appeals left standing a lower court finding that a lack of sufficient freshwater inflows contributed to the cranes' high mortality rate. And high salinity levels in Galveston Bay, caused by drought-related low inflows in 2011 and 2012, were widely understood to have created conditions harmful to the oyster harvest in that estuary. Oysters in this system have since been further damaged by the extremely high inflows produced by Hurricane Harvey in 2017. A ground-breaking 2004 study, *Bays in Peril*, by the National Wildlife Federation identified significant concerns for five of the state's seven major bay systems based on levels of authorized diversions.

The Texas Environmental Flows Initiative (TEFI) came together in late 2014 for the express purpose of developing and executing one or more environmental water transactions to benefit coastal estuaries. The primary catalyst for this initiative was the emerging availability of significant revenue for Texas in the wake of settlements from the 2010 Deepwater Horizon Gulf oil spill. The TEFI partners saw the oil-spill funds as a tremendous opportunity to launch a market for environmental water transactions in Texas and were fortunate to receive enthusiastic and sustained support from forward-thinking funders—the Harte Charitable Foundation, the National Fish and Wildlife Foundation, the Houston Endowment, the Meadows Foundation, the Cynthia and George Mitchell Foundation, Lyda Hill Holdings, the Water Funders Initiative, and the Campbell Foundation—to carry out this ground-breaking work.

Because the Deepwater Horizon-related revenue sources that prompted the initiative were intended for coastal and marine recovery, TEFI necessarily focused on transactions that would benefit coastal systems. This focus presented a specific and significant challenge, namely that it takes a large amount of freshwater inflow to influence estuarine systems to a quantifiable extent. Thus the size of the transactions would need to be fairly large, particularly compared to those executed to benefit instream habitats, which are typically the target of environmental water transactions elsewhere in the country. The focus on coastal systems also raised a number of technical issues related to the adequacy of current modeling tools for assessing and demonstrating ecological benefits, as well as legal issues around whether water rights with an upstream historic diversion point could, if acquired, be guaranteed to reach the target bay. TEFI partners addressed these and other relevant issues — such as the identification of candidate water rights and the standards for project evaluation used by those administering the oil-spill funds — rigorously and systematically over the course of the project.

As described below in more detail, TEFI made significant progress on two potential transactions. The Anahuac transaction would acquire water from a water right holder with a delivery system and transport it to the Anahuac National Wildlife Refuge to sustain and restore wetland habitat, with secondary benefits of increasing inflows to the upper eastern reaches of Galveston Bay. This project is on hold, pending the resolution of an unrelated lawsuit between the water right holder and the state, but is fairly advanced in its design, its quantification of ecological benefits, and even in the terms of the transaction.

The Tres Palacios transaction is still under negotiation with the water-right holder, who is a self-declared willing seller. The reliability of this right and the potential ecological benefits of the transaction for Tres Palacios Bay (a sub-bay of Matagorda Bay) have been defined and documented, and state decision-makers in charge of one of the oil-spill funds have expressed strong interest in the project. Assuming it is finalized as envisioned, Tres Palacios will be the largest permanent environmental water transaction executed in the country to date.

In addition to the progress on these two transactions, and preliminary work on two more potential transactions in the Guadalupe River/San Antonio Bay system, the TEFI made significant headway with key state decision-makers in

// The Texas Environmental Flows Initiative came together in late 2014 for the express purpose of developing and executing one or more environmental water transactions to benefit coastal estuaries.



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normalizing the idea of environmental water transactions as a sound strategy for addressing environmental-flow needs. Project partners held numerous meetings with both state decision-makers and administrators of the various oil-spill funds to promote water transactions as a tool for restoration. In related work, the NGO members of the initiative prevailed in their efforts to persuade the RESTORE Council³ to add an explicit reference in its 2016 Gulf-wide Comprehensive Plan to the protection of the water quantity needs of Gulf estuarine and marine waters as a priority for project funding. This means that freshwater-inflow projects, including market transactions, are eligible for the \$1.56 billion in oil-spill penalties the RESTORE Council is administering. The next opportunity to propose projects for this funding source will likely take place in 2019. In addition, TEFI partners helped persuade the Texas Water Development Board to acknowledge environmental water transactions as an eligible expenditure under the State Revolving Fund program, a state-federal loan program that supports infrastructure investments to improve water quality.

Though the three-year TEFI project has drawn to a close, the work of building out a market for environmental water transactions in Texas, despite having been advanced dramatically, remains a work in progress. Individual project partners are committed, as resources allow, to contributing to this work in a variety of ways.

// NGO members of the initiative prevailed in their efforts to persuade the RESTORE Council to add an explicit reference in its 2016 Gulf-wide Comprehensive Plan to the protection of the water quantity needs of Gulf estuarine and marine waters as a priority for project funding.

³ The RESTORE Council is a federal-state body created under the 2012 RESTORE Act, which directed that 80 percent of administrative and civil penalties owed by responsible parties under the Clean Water Act be returned to the Gulf states for restoration and recovery efforts. The RESTORE Council itself administers 30 percent of this Gulf Coast Restoration Trust Fund; the Gulf states administer the rest.



© NOAA, Flickr - Deepwater Horizon oil spill

Structure of the Initiative

The Texas Environmental Flows Initiative was established to undertake a large and unprecedented environmental water transaction in a relatively short period of time. The participating organizations recognized that it would take a strong partnership to assemble the requisite capacity and expertise to define, evaluate, and execute a major freshwater-inflow transaction within the three-year pilot period. Accordingly, TEFI was created as a temporary partnership of five organizations (Ducks Unlimited, Harte Research Institute, Meadows Center for Water and the Environment, National Wildlife Federation, and The Nature Conservancy) with extensive technical support and advice from the Western Water Program of the National Fish and Wildlife Foundation (NFWF). The partnership provided essential expertise in biology, hydrology, wetlands ecology, water law and policy, and economics as well as practical experience with transactions and management of real property assets. TEFI also relied on contractors to provide additional expertise in more specialized areas, particularly related to quantification of potential ecological benefit and the valuation of water rights.

The goal of moving a pilot transaction forward in a three-year period grew out of the desire to tap into funds available to Texas as a result of the Deepwater Horizon oil spill. Specifically, we targeted the Gulf Environmental Benefit Fund (GEBF), created by NFWF as a separate program, independent from other undertakings such as the Western Water Program, to implement the settlement of criminal liability by British Petroleum and Transocean, as the most appropriate source for this type of restoration project. Because of the scope of the spill and a shared commitment to address the severe threat that declining freshwater inflows pose to fisheries, habitats, and wildlife along the Texas coast, the partnership was formed to pursue a large environmental-flow transaction in at least one critical location along the Texas coast. At the time the project was launched, the GEBF timeline only ensured a three-year period to submit a project for funding. That timeline has now been extended somewhat, giving partners the opportunity to continue pursuit of one or more of the transactions identified, even though the formal TEFI partnership has ended.

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Project Challenges

The process of developing and executing an environmental water transaction at the scale contemplated by the Texas Environmental Flows Initiative is complex. It required TEFI to address a series of questions. Where along the Texas coast should we attempt a transaction? How do we identify water rights that might be for sale? Can we guarantee that purchased fresh water will actually get to the coast? Can we demonstrate that it will actually benefit coastal ecosystems? What is the right price for water, in the absence of an active market for these types of transactions, and how can environmental water transactions be funded? Can we define economic benefits along with ecological benefits? And finally, once a transaction is completed, how must the purchased water be managed to ensure its ecological benefits over time? Our approach to addressing those questions is set out below.

In which bays and estuaries are increased inflows a priority?

The TEFI partners quickly acknowledged that inflow protection is needed for all Texas bays, particularly from Corpus Christi Bay eastward to Sabine Lake. Considering the amount of water the state has authorized, via perpetual water rights, to be diverted out of Texas rivers and consumed, no major Texas bay is assured of sufficient freshwater inflows during dry years. The long-term picture is quite dire for many bay systems. Because rainfall volume declines from east to west across the state, the overall threat is more immediate for the bays farther south and west along the coast. However, even for the Sabine Lake and Galveston Bay systems in the east, specific sub-bays and substantial marsh habitats are at serious risk, or have already suffered serious degradation, as a result of a periodic shortages of freshwater flows. Based on a range of considerations, including near-term transaction opportunities, value of the habitat that would benefit from enhanced flows, the ability to deliver acquired water to the habitat, and the geographic priorities of key funders, we focused our efforts on potential inflow transactions in the Galveston, Matagorda, and San Antonio bay systems.

What water might be available for acquisition?

Because we set out to move a significant freshwater inflow transaction forward within a three-year period, identifying water rights that might realistically be available for acquisition in the near-term was an immediate priority for TEFI. Voluntary water transactions are, by their very nature, opportunity-driven. For the most part, we focused our initial search on large rights authorized for irrigation use, as these are the rights most likely to be available for acquisition. We also considered industrial water rights when circumstances suggested that the demand for the water might decline. Since rights authorized for municipal use are typically held for the long term, to support both current needs and future growth, they were not candidates for permanent acquisition—although TEFI did preliminary work on the potential for a water exchange with a municipal entity.



We then examined the extent to which the right was currently being used, since a right not being put to full use is more likely to be available for near-term acquisition. Although TEFI prioritized pursuing permanent acquisition of a water right, we also considered long-term leases, recognizing that some owners may not be willing, particularly before there is a track record of water transactions in Texas, to sell the underlying right.

Similarly, although we set out to implement a large transaction, in recognition of the challenge inherent in that lofty goal, we also assessed the potential for implementing a combination of smaller transactions that might collectively achieve significant inflow benefits. In order to help us compare the pros and cons of different combinations of smaller rights that might be available and of different approaches for managing the water that might be acquired, we developed an Evaluation Matrix.

Can the available water be reliably delivered where it is needed to maximize benefits?

Several major factors came into play for us in answering this question. First, we had to determine how likely it was that the water we might acquire would actually be available during dry periods, when it is most needed for bay inflows. TEFI used the State of Texas Water Availability Models (WAMs) to gauge the reliability of various water rights. In the course of the project, we developed a more user-friendly tool—the WAMs are far from user-friendly—referred to as the Geospatial Water Rights Tool, to help simplify efforts to identify water rights for further evaluation. The Texas Parks and Wildlife Department is now developing a comprehensive, user-friendly tool, building on the WAMs and on lessons learned in developing the Geospatial Water Rights Tool, to help prioritize areas of the state for future flow-restoration efforts.

Many water rights, especially so-called “run of the river” rights that are not stored in any kind of reservoir or impoundment, are not fully reliable during dry periods. A key issue TEFI evaluated using the WAMs was how much of the water authorized for diversion under a given right would actually be available during drought periods, when it would provide the greatest benefit for bay or marsh health. We also assessed where the existing diversion point for the candidate right was located in relation to where we wanted the water delivered to achieve



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the desired ecological benefit. The ideal right would be a very senior right⁴ with a diversion point fairly close to the coast, so that there would be little risk that intervening water rights would divert the water before it reached the desired destination on the coast. We also considered potential conveyance pathways that could be used to deliver water to a specific location, and likely losses from evaporation and channel leakage as the water was being conveyed to the coast.

To maximize benefit from an inflow transaction, it can be helpful to deliver the available water in a very targeted way, in terms of both location and time. The ability to target delivery of inflows to a specific location, such as to a specific marsh habitat or a specific sub-bay or reef, can greatly magnify the benefits realized for a given increment of flow, compared to just allowing the water to flow down a major river or stream into a bay system. This “Focused Flows” approach was a major contribution to the project from the Harte Research Institute. TEFI used various tools, including aerial imagery and LIDAR analysis⁵ to assess the viability of delivery pathways that could direct water to specific locations to maximize benefits. Similarly, we used models to assess how targeting delivery to particular time periods can increase benefits from a given volume of water. An example of this targeting would be water delivered in months when inflows are in especially short supply—often summer months—or when it is most critical to meet life-cycle needs for key species. Controlling the timing of inflows often requires access to stored water. The availability of storage will affect both the ecological value and, as discussed below in the “How much should you pay” discussion, the monetary cost of the water being acquired.

How much difference would the acquired water make ecologically?

It is well understood that freshwater inflows play a critical function in maintaining the health and productivity of bay systems. Additionally, anyone familiar with water rights in Texas knows that freshwater inflows will continue to decline as existing permitted water rights are more fully exercised to meet

4 Texas’ system of allocating water rights is typical of most western states. This “first-in-time, first-in-right” system means that the oldest, or most senior, water rights have the first claim on the water in a river.

5 LIDAR stands for Light Detection and Ranging. It is a remote sensing method that uses light, in the form of a pulsed laser, to measure distances.

the needs of a growing population. As a result, while the basic benefit of environmental-flow transactions in protecting or restoring inflows is clear, rigorously quantifying that benefit remains a challenge.

For TEFI, the source of funds for the transactions drove the level of rigor needed for an assessment of the expected ecological benefits. Because the project sought to tap into the Gulf Environmental Benefit Fund, which was in turn bound by the terms of the plea agreement that created it, we worked to provide the robust quantification of ecological benefit we understood that funding source to require.

The challenge in quantifying benefit was heightened because water transactions to provide freshwater inflows to bays are a novel approach to ecological protection/restoration that has not been studied in any detail. Water transactions to restore and protect instream flows — flows that provide habitat within a stream or river — have been pursued to a greater degree, particularly in various western states, although they are still limited in number. Benefits from instream flow transactions, which often come in the form of maintaining flow in summer months, lend themselves to more straightforward quantification because the transition from a dry, or almost dry, stream to a flowing stream is visually obvious and the contrast in habitat value is similarly unambiguous.

Among the complexities to be addressed in quantifying benefits for a freshwater-inflow transaction is the reality that the amount of incremental benefit provided to coastal ecosystems will vary from year to year, with the bulk of the benefits occurring in dry years when inflows otherwise are low. In addition, few studies have been done to quantify the specific incremental benefit associated with a particular increase in inflows. It is notoriously difficult to count aquatic organisms, especially larval organisms, much less to predict how the numbers of organisms will be affected as a result of a particular increment of inflows. However, there are approaches under development to help answer these questions.

One of the basic approaches we used to help characterize benefit to bay habitats is prediction of changes in salinity. Salinity has long been understood as a key factor in determining habitat value in coastal environments. That is true in both marsh habitats and more open-water habitats. The State of Texas has a suite of bay salinity models designed to predict changes in overall bay salinity levels, including as a result of changes in freshwater inflows. We used these models extensively in our efforts. One key limitation of these models is their lack of sensitivity to the increment of change in inflows that a single, albeit large, transaction is likely to produce. These models are also not designed to predict salinity changes in marshes or small areas of a bay where the immediate impacts from an individual transaction are likely to be most pronounced.

Even with that limitation, by considering the relationship of benthic species—species that dwell on bay bottoms and have limited mobility — to salinity levels, we made substantial progress in predicting the relationship between potential freshwater inflow transactions and benthic-community response. For more freely moving species like fish, it is more difficult to predict a specific response to inflows in a particular area. However, inflow affects habitat quality which, in turn, affects population counts of fish and other organisms.

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To inform our assessment of the benefits of a potential transaction to deliver supplemental freshwater flows to marsh habitats — which are not suited to the modeling techniques developed by the State of Texas for instream flows — we partnered with the Louisiana-based Water Institute of the Gulf (TWIG) to develop a site-specific wetlands model for a national wildlife refuge.

The refuge's marsh tracts, which are important habitat for waterfowl, wading birds, and numerous aquatic species that move between the tracts and Galveston Bay, have been exposed to increasing salinity levels due to a combination of non-natural factors. Overland flow of runoff to the tracts following rain events has decreased because roads, canals, levees and other structures have permanently rerouted flow paths. In addition, a combination of subsidence, resulting primarily from historical oil and gas production, and of channelization of bayous connecting the tracts to Galveston Bay has raised salinity levels in the bayous. Because the bayous are hydrologically connected to the marshes, salinity levels on the tracts have also increased. Increased salinity levels have contributed to degraded marsh habitats on the refuge, resulting in both changes in vegetation and conversion of marsh to open-water habitat.

By using the wetlands model to characterize inundation and salinity levels on the tracts, we were able to predict vegetative response and corresponding wildlife values of the tracts under various inflow-delivery scenarios. The wetland salinity model developed by TEFI and TWIG is an important advancement in decision-support tools for focused flows.

What is an appropriate price to pay?

The question of how much to pay a right holder is another tricky aspect of water transactions, particularly in the absence of an active water market for surface water in most of Texas, much less a market for water for environmental-flow protection. On a very basic level, because these are voluntary transactions, the key factor is the price the seller is willing to accept. However, it is important to assess what price makes sense, both in terms of establishing a precedent for future transactions and ensuring the value realized from the transaction is commensurate with the cost.

Determining the value of water rights is both a science and an art. Only a few entities around the country have developed the expertise to provide good valuation estimates. We contracted with one of those entities — WestWater Research — to assist us in our efforts. The science side of the valuation takes into account multiple factors, including: the reliability of the right (the portion of the right that is reliably available in the driest years is a major determinant of value), the location of the right (location affects both the likelihood that other buyers are interested in the right and the extent to which the right can provide a particular economic benefit), and the nature of the right (Texas law is pretty generous in allowing for amendment of consumptive water rights to change type of use and even place of use, but there are limits). Even with those scientific factors taken into consideration, there is an art to assigning a dollar value to a water right that only comes with experience.

A water right that has the benefit of storage generally will have increased value, since storage likely increases the reliability of the water — allowing water to be stored during wetter times and released during dry periods — and because it may allow for control of the timing for delivery of the water. Additionally, there are attendant complexities and costs that come with storage. The storage facility must be operated and maintained, which requires specific technical capacity and ongoing expenditures that must be factored into the transaction.

There is another unknown that can come into play for an environmental-flow transaction in Texas. The Texas Commission on Environmental Quality (TCEQ), the state agency that regulates surface water in Texas, may take the position that a physical diversion of water is required even for an in-channel use of water, such as flow protection. It does not appear that anything in state statute or current TCEQ rules mandates taking such a position, but key agency staff have suggested that outcome.

The significance of that issue will vary depending on the specifics of the environmental-flow transaction being considered. For a transaction in which water is released from storage into a conveyance system where there are not potential competing diverters, the absence of a downstream diversion point may not be a problem, since the requirement for a diversion likely was satisfied when the water was placed in storage or when it was released from storage or into the conveyance system. Similarly, if the water right being acquired has an existing diversion point that is downstream of all other water rights, the diversion requirement may not be a significant impediment. However, in other circumstances, such as when there are existing downstream diversion points

// Determining the value of water rights is both a science and an art.

associated with other water rights, the ability to ensure the water will reach the desired destination in a bay may be limited without the ability to establish an enforceable downstream diversion point or similar point of measurement. Additionally, establishing a new diversion or measurement point involves ongoing costs. This is also an important consideration in deciding how much to pay and how to approach identifying rights of interest.

What is the economic benefit of the transaction?

One possible approach to answering the question of how much to pay for a transaction is to assess the economic benefit expected from the transaction outcomes. However, in many ways, the assignment of specific monetary values to ecological functions is still a developing science. And, in order to assign a monetary value to various functions benefited by the transaction — such as water-quality improvement, commercial and recreational fishery benefit, and habitat enhancement — one must be able to quantify the incremental impact on those functions. As discussed in the section on ecological benefit, that can be challenging given the current state of the science.

Somewhat late in the pilot, TEFI evaluated the ability to quantify the economic benefit associated with the anticipated conservation outcomes of potential transactions. At least in theory, it is possible to calculate a value for the economic return that can be expected to accrue from the ecological benefits. However, just as the calculation of ecological benefit is challenging, assigning a specific economic value to an increment of such benefit adds an additional layer of complexity and challenge. Some benefits, such as reduction of storm surge resulting from the presence and extent of an oyster reef or the value of the oyster fishery, lend themselves fairly readily to the assignment of an economic value. On the other hand, it can be very difficult to calculate how much a specific increment of inflow contributes to the size of a reef, the likelihood of survival of the reef, or the rapidity of recovery of the oyster fishery after cessation of drought conditions. Other economic calculations, such as assigning a dollar amount to the extent of habitat an oyster reef provides for other species, are even more challenging. Ultimately, TEFI determined that we did not have sufficient information to make a good estimate of overall economic benefit for the specific transactions we were assessing.

How can environmental water transactions be paid for?

The Deepwater Horizon oil spill resulted in more than \$16 billion in fines and penalties that could be used for ecological restoration and recovery projects in the Gulf of Mexico. The initiative identified two oil-spill-related funds—the Gulf Environmental Benefit Fund and the RESTORE Act’s Gulf Coast Ecosystem Restoration Trust Fund—as potential sources for coastal-oriented environmental water transactions. As mentioned above, TEFI has focused primarily on the Gulf Environmental Benefit Fund, though RESTORE Act funds are also under consideration. In addition to the oil-spill funds, TEFI has also explored other potential funding sources for future water transactions. Each funding source is described on the next page.



Gulf Environmental Benefit Fund (GEBF): This fund — administered by the National Fish and Wildlife Foundation — was created pursuant to the settlement of both BP’s and Transocean’s criminal liabilities related to the Deepwater Horizon disaster. Of the \$2.544-billion settlement, half was allocated to Louisiana (which suffered the greatest damage) for specific project types. The remainder was allocated by formula to the other four Gulf states for purposes each state determines, consistent with the ecosystem-restoration requirements established in the BP/Transocean plea agreement. Texas’ portion of the GEBF is \$203.5 million. Since 2013, when the Fund was created, much of the GEBF money has been committed to various restoration and recovery projects. But roughly \$40 million of Texas’ share is still available to be administered in 2019 and possibly beyond.

Although each state has a defined allocation of GEBF funds, the states must still apply to NFWF for approval of funding for specific projects. The NFWF Board may decline projects advanced by the states but cannot unilaterally decide where the funds will flow. In Texas, the General Land Office (GLO), the Texas Commission on Environmental Quality (TCEQ), and the Texas Parks and Wildlife Department (TPWD) are responsible for jointly submitting projects to NFWF for the GEBF, with TPWD playing the role of the lead agency. Of all the pools of money related to the Deepwater Horizon spill, the GEBF is the one most clearly directed toward conservation projects such as freshwater inflow restoration.

TEFI partners pursued GEBF funding through three funding rounds (2017, 2018 and 2019). The Anahuac Project, proposed in 2017, while compatible with the objectives of GEBF, was not invited beyond the pre-proposal phase due to ongoing litigation between the state of Texas and the entity that would be receiving payment from GEBF funds. The Tres Palacios Project was proposed for funding in 2018 and updated in 2019, with encouragement from both NFWF and TPWD. However, the project has not yet advanced because negotiations with the water-right owner are ongoing.

The Gulf Coast Ecosystem Restoration Trust Fund (RESTORE Act Fund): The RESTORE Act, passed by Congress in 2012, dedicates 80 percent of the civil and administrative penalties paid under the Clean Water Act by parties responsible for the Deepwater Horizon oil spill to a new Gulf Coast Ecosystem Restoration Trust Fund. The Fund is overseen by a new federal agency, the Gulf Coast



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Ecosystem Restoration Council (RESTORE Council), for ecosystem restoration, economic recovery, and tourism promotion in the Gulf Coast region. RESTORE funds will provide at least \$511 million to Texas for restoration and recovery activities.

Of the five sub-categories of the Trust Fund, the one most relevant for environmental-flows projects is the Gulf-wide Comprehensive Plan component. These funds, often called “Pot 2” of the RESTORE Trust Fund, represent 30% of the RESTORE Trust Fund and must be spent on ecosystem restoration across the Gulf. While Texas will get a portion of the \$1.56-billion Pot 2 Funds, there is no specific formula for distributing these dollars. Thus far, Texas has been allocated \$26 million for six projects, including one to restore hydrological connection in the Bahia Grande near Brownsville. Because TEFI partners prevailed upon the RESTORE Council to explicitly recognize meeting the water quantity needs of coastal and estuarine systems as an eligible activity in its 2016 Comprehensive Plan, and because of encouraging signals from key state decision-makers, we are confident that an environmental-flow transaction for Texas could qualify for RESTORE Act funding.

Clean Water State Revolving Fund: Thanks to the efforts of TEFI and our partners in the land conservation community, in 2018 the Texas Water Development Board (TWDB) clarified that water-rights transactions that keep water instream as a means of protecting or restoring water quality are eligible for funding under the Clean Water State Revolving Fund (SRF). This is an important, sustainable source of funding — TWDB is able to make available \$550 million of annual funding through the SRF. Unlike some of the other sources of money described here, the SRF is a loan program, meaning that some amount of the money provided through the SRF must be repaid. However, TWDB can make a portion of loans available at lower interest rates (including 0% interest) and/or through forgivable principal — meaning that the SRF funds potentially can function as a grant for at least a portion of the overall project cost. Since SRF loans are low-interest and long-term, eligible⁶ water rights transactors could use them as lower-cost bridge financing as they assemble the total funds

⁶ CWSRF funds are only available to certain qualified entities based on the type of activity being pursued. Although most funding is limited to governmental entities, for some categories, other entities may be eligible to receive loans. A key qualification criterion considered by TWDB is the identification of a revenue stream to cover repayment costs.

needed to cover the cost of a deal. Each year, TWDB announces opportunities to solicit SRF funds. In the coming years, TEFI partners will be working with TWDB and potential SRF borrowers to secure SRF funds for water-rights transactions to support instream flows.

The Gulf of Mexico Energy Security Act: The 2006 Gulf of Mexico Energy Security Act (GOMESA) directs a portion of revenue from offshore oil and gas leases to the four Gulf of Mexico oil-and-gas-producing states and their coastal political subdivisions.⁷ GOMESA funds are to be used for coastal conservation, restoration and hurricane protection. Beginning in 2017, up to \$500 million per year will be available to states and their political subdivisions, with 80 percent going to the states and 20 percent going to coastal counties. The actual amount of GOMESA revenue each year depends on the amount of leasing activity. In 2018, the Gulf states together received \$188 million. Of this, the state of Texas received \$40.5 million, with Texas coastal counties receiving \$10.1 million. In Texas, the General Land Office (GLO) decides how the state's portion of GOMESA funds are to be spent. While environmental-flows-restoration projects presumably fit within coastal conservation and restoration projects eligible for GOMESA funds, these sorts of projects will compete with more traditional infrastructure projects, including those aimed at coastal hurricane protection.

Corporate offsets: Many of the world's largest corporations have pledged to offset the water and carbon embedded in their operations and products. As Texas' economy grows, more of these companies are moving critical operations to Texas—creating an opportunity to help companies meet their water-offset commitments here in the state. Corporate offsets can be a significant source of project funding; depending on the size of the offset and total market share, a single company can pledge hundreds of thousands of dollars each year to water-offset projects. These projects are diverse, and could include purchases of water rights to be dedicated to instream flows, implementation of innovative urban water infrastructure to restore base flow in urban creeks, or funding of agricultural conservation projects that keep more water instream while improving agricultural producers' productivity. During the course of the TEFI project, partners explored the potential for a small instream flow transaction, working with the Bonneville Environmental Foundation, which specializes in matching large corporations with local conservation opportunities. That initial effort to identify a potential match was not successful, but other opportunities may emerge.

Private investment: Private investment represents another potential source of funding for flow protection and restoration projects. Private investment in flow projects may take a number of forms, including real estate, agricultural and private equity funds. For example, TEFI member The Nature Conservancy (TNC) has been exploring opportunities to partner with agricultural funds that could acquire lower-performing farms and invest in on-farm improvements into irrigation efficiencies, higher-value crop conversion and/or more reliable irrigation sources such as groundwater. This would allow TNC to shift the associated surface-water rights to instream flows without negatively affecting

⁷ <https://www.boem.gov/Revenue-Sharing/>

the productivity of farming operations. This sort of arrangement theoretically allows conservation actors to pursue larger agricultural-conservation projects than could be achieved through federal or state funding resources aimed at agricultural resilience and conservation, while also potentially leveraging these funding resources as needed. Beyond the agricultural sector, private investment could play a similar role in executing larger deals, especially where water rights or significant water features are associated with properties containing other marketable assets such as infrastructure, timber, or developable land.

There are several challenges to realizing the potential of private investment. One is finding flow protection or restoration opportunities that meet investment-return expectations, which are typically in the double digits. Very often, the conservation entity will need to find funding resources to “take out” the portion of the deal related to the conservation asset. For example, a conservation entity may need to secure funding from state, federal, or philanthropic sources to acquire the water right associated with a farm acquisition whose upfront cost is provided by the investor. In some situations, conservation entities have been able to repay private investors through revenues generated by ongoing operations from a conservation asset acquired, such as revenue from timber sales. In the case of a water-rights play, this revenue could theoretically be created through the leasing of water during years when it is not needed for environmental flows. During the course of the TEFI project, this type of arrangement was evaluated and remains under consideration as a potential transaction option.

How should transaction-generated environmental flows be managed and monitored?

A management and monitoring (M&M) plan is an essential and necessary element of a successful environmental water transaction. This framework must be in place to ensure that the water made available through the transaction is appropriately scheduled and delivered, as well as to gather information needed to demonstrate environmental-restoration benefits after delivery. As part of our due diligence in evaluating transactions, the TEFI partners developed key information that would be needed to help develop an M&M plan.

The exact elements of a management framework will depend upon the nature of the transaction, which can range from an outright purchase of an entire water right solely for flow protection, or a purchase of water for environmental-flow purposes where some of the original consumptive use is continued, to an intermittently exercised lease of water. Management-focused portions of the framework may include oversight of water utilization or delivery to make sure the contractual terms are being carried out as agreed; tracking streamflow and diversion(s) of other diverters to assure protection of the purchased and dedicated water; and, in the case of an intermittently exercised water lease, decision frameworks to guide the decision process, such that delivery is targeted to occur in dry or drought periods, when the environmental benefit is highest. Monitoring activities would not only quantify and document the resulting changes in water management, they would also provide site-specific information from the receiving stream, bay, or wetland to demonstrate ecological benefits.

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Many of the established environmental water transaction programs in the western states, including the Columbia Basin Water Transactions Program (CBWTP), have developed specific frameworks with water management and accounting elements and defined field metrics to measure progress based on their individual focal species and habitat. While individual projects may have different elements, monitoring and accounting frameworks, such as CBWTP's Flow Restoration Accounting Framework, seek to answer primary questions such as: Are the terms of the agreement for the transaction being met? Can the presumed increase in flow be accounted for instream? Are there flow-habitat changes that can be measured as a result of the transaction? What are the changes in the biological community as a result of the transaction? These questions can be evaluated and structured within an accounting framework. For example, the framework used in the CBWTP includes multiple tiers including contractual compliance, flow accounting, habitat response, and biological communities. TEFI partners anticipate crafting an analogous comprehensive framework for environmental flow transactions, which can be populated based upon the characteristics and objectives of each water transaction.

While TEFI has not yet had the opportunity to finalize a transaction and fully develop and implement an M&M plan to demonstrate accountability and environmental benefits of a specific transaction, the recognition of the critical importance of these elements was explicit throughout the project. The need to develop specific management and monitoring frameworks was acknowledged in funding proposals put forth by TEFI, and developing supporting information needed for such frameworks was considered as a part of due diligence for each of the proposed transactions.

Key Lessons Learned

As the Texas Environmental Flows Initiative concludes, project partners are eager to share with all interested parties—project funders, federal, state, and local decision-makers, conservation NGOs with an interest in water markets, and other interested parties—what we have learned and how we see this work advancing beyond this innovative pilot. In that spirit we share some lessons learned below, and express our collective commitment to continuing to build out and advance the market for environmental water transactions in Texas.

1 Depending on Funding Source, Burden of Proof for Ecological Benefits Can Be an Obstacle

TEFI spent considerable resources demonstrating and quantifying the anticipated ecological benefits of the transactions it was pursuing. This is primarily because we were making a case for using a new tool—environmental water transactions—to achieve tangible environmental restoration benefits to a funder who was bound by the terms of a plea agreement to ensure those benefits. There were many more traditional projects proposed to the Gulf Environmental Benefit Fund, such as land acquisition, for which there is a tried-and-true quantification methodology. Because water transactions, and specifically transactions for freshwater inflow protection, are new, we faced a relatively heavy burden of proof for calculating ecological benefit.

And, as mentioned earlier, we were working to demonstrate benefits to coastal ecosystems, where a significant amount of water can be required to make a quantifiable difference, particularly with the quantification tools currently available. As an environmental water market develops in Texas, providing this level of quantification—with site-specific modeling, species-sampling, and other methods—may not be sustainable. This could mean that standards and norms should be developed and adopted that allow ecological benefits to be assumed under a given set of circumstances, or that more desktop-oriented methods of quantifying benefits should be developed.

2 Environmental Water Market Must Address Patterns of Water-Right Ownership in Texas

The pattern of ownership (and management) of water in Texas will be challenging for the developing environmental water market. Although some irrigation rights are individually owned and some industrial water use may be changing—making water available for potential acquisition—much of the surface water in Texas is owned or controlled by river authorities, who are in the business of selling water to customers, often under long-term contracts, for consumptive uses. River authorities also own and manage water-delivery infrastructure that could be critical for delivering water for environmental purposes to particular locations at particular times. The evolving water market in Texas will need to find ways to constructively engage river authorities in transactions if the market is to get to scale.

3

Diverse Funding Sources will be Critical to the Development of an Environmental Water Market in Texas

TEFI's focus on coastal-related water transactions was driven by the requirements of funding sources related to the Deepwater Horizon oil spill. That focus also defined a relatively narrow window of time to find willing sellers, limiting the ability to respond when opportunities happen to arise. To have a fully functional environmental water market in Texas, one that addresses both instream needs and freshwater-inflow needs, a greater diversity of funding sources will be needed. Along with federal and state dollars, there will be a definite role for private funding sources, including corporate, investment, mitigation, and philanthropic dollars that provide more flexibility to seize opportunities when they arise.

4

Flexibility in Transaction Structure Can Increase Efficiency in Water Use and Ecological Resilience

Increasingly, Texas vacillates between periods of drought and over-abundance of water. Water secured for the environment is often most needed during periods of drought. Depending on how they are structured, water transactions can enable water-right holders to continue consumptive uses during normal-to-wet periods and provide water for the environment during dry periods. The income from a transaction may allow a water-right holder to invest in improved efficiency or in an alternate water-supply option or crop that allows some or all of the available surface water to benefit the environment in dry years. That combination can improve long-term viability for agricultural water users and for aquatic ecosystems.

5

To Maximize Benefits, Acquired Water Should be Managed for Timing and Location

TEFI advanced knowledge and understanding of the ecological impacts of increased inflows to bays and estuaries. This improved science demonstrates that well-timed flow increases can benefit coastal ecosystems. However, in the absence of infrastructure capable of managing the timing and location of delivery, relatively large quantities of water are needed to produce quantifiable benefits for coastal systems. Going forward, it will be important to structure transactions that can deliver available water efficiently, both in time and location.

6

Expanding Priority Geographies Beyond Bays and Estuaries will Increase Opportunity

The requirements of oil-spill-mitigation funding led TEFI to focus its efforts during the pilot on large, complicated, permanent (or at least long-term), often expensive transactions. Despite this challenge, significant progress was made in determining how to approach, develop, value and negotiate transactions, with two potentially viable deals being developed and preliminary work done on two other opportunities. Even beyond the potential realization of those transactions, this experience will benefit future transactions efforts along the Gulf Coast and in other priority areas of the state as the portfolio of transaction opportunities increases and the number of transacting groups grows and develops the requisite capacity.



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7 Some Aspects of Texas' Enabling Policy Conditions Remain Untested

Even as we advanced the science, the receptivity of regulators and potential funders, and the process for evaluating potential transactions, some aspects of the regulatory and policy structure in Texas can only be fully assessed through a completed transaction in a coastal setting. While the TEFI made significant progress on two transaction opportunities, which we still hope to see come to fruition, the lack of a completed transaction during the three-year pilot prevented the group from fully testing the existing regulatory framework and transfer process. It will be important to complete one or more transactions soon in order to fully understand the specific requirements that must be met to complete and successfully manage environmental water transfers in Texas. This improved understanding will enable more efficient completion of future transactions, including by informing the level of vigilance that will be required to enforce acquired rights.

8 Collaboration is Essential

TEFI's success was a direct result of collaboration among leading Texas academic and nonprofit organizations focused on improving flows into bays and estuaries along the Gulf Coast. TEFI effectively utilized the expertise and relationships of each participating group to make significant progress towards the use of environmental water transactions as a viable tool for restoring fresh water to rivers, streams and coastal waters in Texas. As the market for environmental water transactions develops, these types of cross-organizational partnerships will continue to be invaluable.

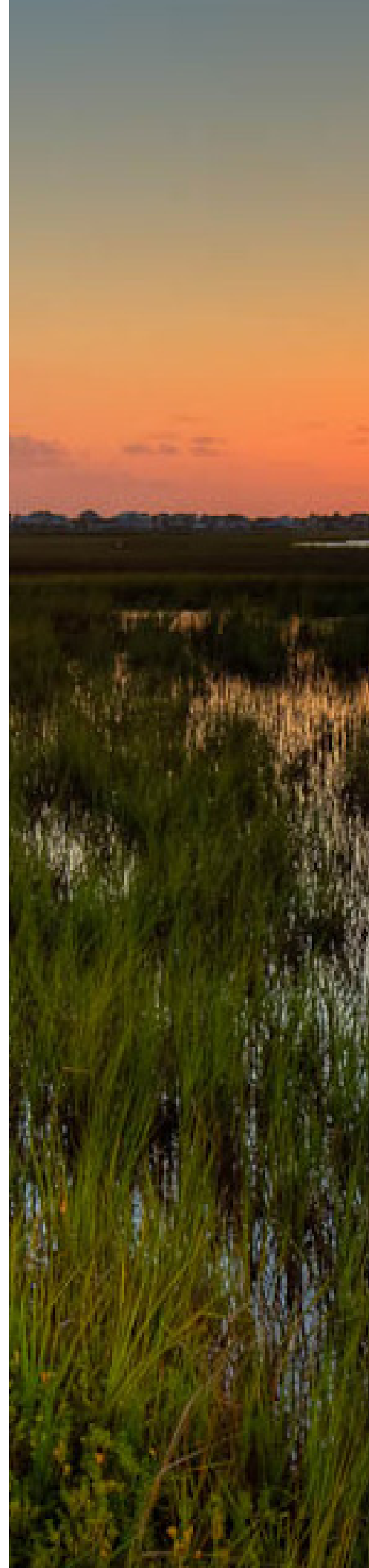
9 Knowledge and Tools will Benefit Future Efforts

The knowledge gained and tools created by TEFI will benefit future water-transaction efforts along the Gulf Coast of Texas. We will use these assets to encourage and facilitate transactions on the coast and throughout the state. TEFI representatives have conducted initial outreach to land trusts and other organizations in Texas to gauge their potential interest in future water-transaction work and to offer support.

Conclusion

TEFI was a successful collaboration of five leading academic and conservation organizations with a focus on coastal water issues. TEFI generated new knowledge and tools that were put to effective use in pursuit of a completed water transaction to benefit an important bay, estuary or wetland along the Texas Coast. Significant progress was made on two major water transactions that remain under development. TEFI's success also includes a better understanding of, and support for, water transactions as a tool for meeting identified flow objectives around the state.

Now it is critical to build upon TEFI's success to effectively utilize transactions along the Texas Coast as well as throughout other areas of the state. Sharing the knowledge gained and lessons learned under TEFI with agencies, funders, potential new transactors, and existing water users will be essential to expanding use of this voluntary approach to conservation. Ongoing engagement by the TEFI members, as well as the work of a newly established organization, Texas Water Trade, will provide the energy and expertise needed to expand the use of water transactions throughout priority bays, estuaries, rivers, streams and wetlands.



**The knowledge gained and tools created by TEFI
will benefit future water- transaction efforts
along the Gulf Coast of Texas.**

