Habitat Restoration in the Middle Trinity River Basin

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Trinity River Initiative

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When it comes to water, the Trinity River is the life blood of people in Dallas/Fort Worth (DFW) and Houston. Compromised flow, water quality impairments, and increasing water demands have forced municipalities within the Trinity River Basin to consider long-term solutions for clean water supply often from outside entities (e.g., purchase and transfer of water from other regions of the state).

Trinity River—Perspective of History

It must have been something to see the Trinity River prior to European settlement, when Native Americans traveled its bends. One's imagination can transport you to another time to see the river through the eyes of French explorer, René Robert La Salle, who stood on its banks in 1687 and was inspired to call it the River of Canoes.

Rivers were once the highways of frontiersmen, as these waterways afforded the easiest travel, linking land with sea and therefore becoming avenues of commerce. Over the years as commerce increased, the modest cow town of Fort Worth on the river's northern end combined with neighboring Dallas to become one of the top 10 fastest growing metropolitan areas in the nation. Population growth here and elsewhere in Texas forever changed the Trinity River. As Texas grew, much of the river basin's bottomland forests with deep, fertile soils were cleared for agricultural production, thus dramatically altering the ecosystems' function. There are still a few places where the old hardwoods stand and give a glimpse of times past. However, most people fail to recognize what they are seeing, or the river's vital importance to their water supply.

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Population Trends and Importance of the Trinity River

The population in Texas will expand significantly in the coming decades (Figure 1). Resulting pressures from urbanization, land use changes and increasing water demand will result in a long-term loss of ecosystem function. This term refers to items like the storage and retention of water, or the cycling and processing of nutrients which provide valuable ecosystem services. These services have both intrinsic and monetary value in the form of consumables such as food, clean air and water as well as recreational and cultural aspects that Texans enjoy.

The State of Texas has made water and natural resource conservation a priority. The Trinity River is a common tie among native grasslands and bottomland hardwood forests, (these ecosystems have been reduced significantly since the settlement of Texas). Land uses occurring throughout the basin include: urbanized residential and industrial areas, row-crop farming, livestock/hay production, mining, outdoor recreation, and timber production. Land uses have direct affects on the water quality and quantity. Responsible land stewardship (on public and private lands) is essential to improve and conserve natural resources for present and future generations. Landscape-level conservation planning is needed for restoration to improve the Trinity River Basin and its associated ecosystems. A major initiative to restore the ecological condition of the Trinity River Basin would result in the following:

1. Improved water quality and availability along the 512-mile river and its 1,983 miles of major tributaries,
2. Increased flood plain capacity for managing risks associated with flooding in low-lying areas, while improving wildlife habitats including wetlands, bottomland hardwoods and native grasslands, and
3. Increased watershed ecosystems leading to improved recreational business and resources for the 8 million people living in the region.

Landscape Conservation

Through partnerships with private landowners, sound science, effective outreach, and well-monitored ecological restoration, the Trinity River Basin can better support human needs, while maintaining important ecological resources. To assure successful implementation, conservation actions will require engagement with local stakeholders, scientific tools for planning and projection, technical support for implementation, and research and monitoring programs to assure reliable results.

Analysis of site potential for landscape conservation allows decision makers the ability to establish focus areas for restoration efforts and direct resources to priority areas that serve the greatest ecological benefit. The outcomes of this publication will aid decision makers by:

1. Developing usable maps of currently existing native grasslands, bottomland hardwood forests and wetlands,
2. Quantifying the distribution and size of grassland/pasture, cropland, shrub/scrub, and forest,
3. Identifying priority areas for habitat restoration on uplands and bottomlands, and
4. Providing a tool for conservation partners to use in the coordination of restoration efforts in the middle Trinity River Basin.

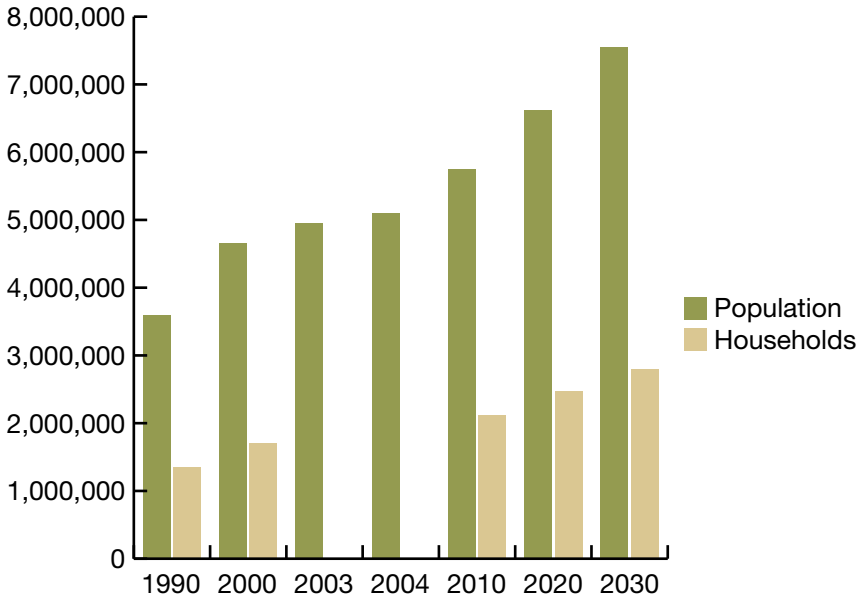

Figure 1. Human population growth has been on a rapid rise in the Dallas-Fort Worth metroplex, just like other urban centers in Texas. The number of households has a similar growth pattern, which indicates greater demand for clean water. Household for 2003-2004 were not available.

Many urban communities are experiencing overabundant deer populations, urban sprawl, and limited natural resources.

Site Potential Assessment

Building from the foundation of information in the Trinity River Information Management System (TRIMS; http://trims.tamu.edu), site potential maps of native grasslands, and bottomland hardwood forests were developed to gain perspective on sites that will yield the greatest ecological gain for conservation funds invested. A site potential map can be defined as a map that represents the vegetation that could be supported at a given location based on the biophysical environment (i.e., soil, climate, current vegetation). These map/data layers were developed separately and incorporated into TRIMS. The step-wise process involved development of 1) a layer indicating sites conducive to existence of bottomland hardwoods and 2) a layer indicating uplands with ease of conversion back to native grasslands.

The site potential map for upland grasslands was developed by selecting all landcover types that did not intersect with the flooded soil layer. These areas were considered upland. This layer was reclassified into grassland/pasture, cropland, shrub, and forest. Each class was ranked by ease of conversion back to native grassland; ranking of 1 for grassland/pasture, 2 for cropland, 3 for shrub, and 4 for forest. The resulting layer ranks upland areas within the Trinity River Basin based on their economical effectiveness for restoring native grasslands. Mapped areas with a ranking of 1 are considered the most practical and economical to convert back to native grasslands, while areas with a ranking of 4 represent areas that are the most difficult, expensive, or impractical to convert.

Site potential map for bottomland hardwoods was developed from the 2009 USDA-NASS cropland layer and USDA-NRCS Soil Survey Geographic Database (SSURGO). Soils that flood rarely, occasionally, or frequently, were then selected from the SSURGO soil data layer. Flooded soils and forested layers from the USDA-NASS cropland layer data were overlaid. Areas where flooded soils intersected forested landcover are sites of existing bottomland hardwoods. The remaining flooded soils that did not intersect existing forested areas indicated sites for potential bottomland forest restoration. The resulting data layer shows existing bottomland hardwoods and areas where there is potential for restoration.

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Landscape Potential Results

Native Grasslands

Non-native grasslands occupy the vast majority of the grassland/pastureland cover type. True native grasslands in this region are believed to occupy less than 1% of the land-cover type mapped. Much of the historical native grasslands have been converted to exotic grasses for hay production, row crop production, or through time grasslands have changed to shrubland or forestland due to the lack of fire. Native grasslands are far more valuable in maintaining diverse, healthy ecosystems that are essential for wildlife and humans in Texas. This examination indicated that among the 12 counties representing the middle Trinity River Basin approximately 3 million acres are available for restoration. Within this acreage, 1.7 million acres are considered sensible for restoration; Grassland/pasture lands (Rank 1) are the most practical and economical to convert back to native grasslands.

County Ranking	Grassland/Pasture 1	Cropland 2	Shrub/Scrub 3	Forest 4	Total Acres
Anderson	133,155	18,227	161	109,725	261,268
Freestone	193,474	28,589	1,192	123,134	346,389
Grimes	50,743	2,999	23	17,397	71,163
Henderson	158,398	8,990	687	83,539	251,614
Hill	98,388	43	57,880	10,230	166,540
Houston	220,378	36,562	1,679	148,622	407,241
Leon	207,070	26,030	351	159,880	393,331
Limestone	43,621	563	2,479	3,474	50,137
Madison	153,184	3,397	348	34,025	190,954
Navarro	358,107	9,287	48,605	55,144	471,143
Trinity	49,182	18,879	32	113,752	181,844
Walker	60,468	19,810	147	108,229	188,654
Total	1,726,167	173,378	113,582	967,151	2,980,278

Table 1. Acreage of upland classes (grassland/pasture, cropland, shrub/scrub, and forest) by county in the middle Trinity River Basin, as determined using GIS.

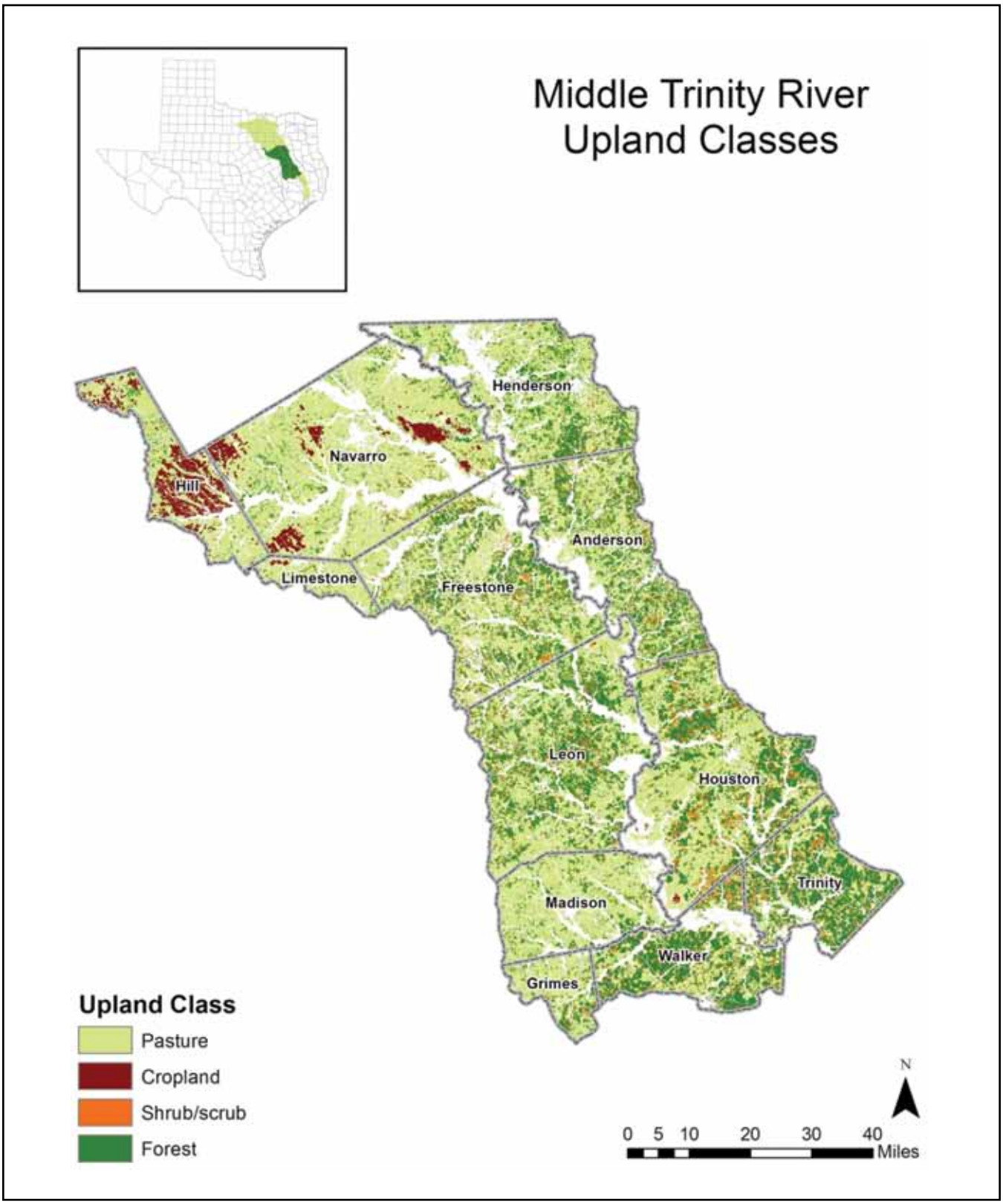
Figure 2. Geographic Information Systems were used to identify existing grassland/pasture, cropland, shrub/scrub and forest lands in the middle Trinity River Basin, Texas. Keep in mind that little native grassland exists. The vast majority of land shown for grassland/pasture consists of exotic grasses.

Bottomland Hardwood Forest

Like native grasslands, most bottomland hardwood forests have been severely reduced in acreage through various land uses that have either eliminated the forest altogether or have compromised the quality of tree species that remain. Most hardwood forests were logged (high graded) in the early 1900s. The timber that was harvested consisted primarily of the higher values trees, particularly oaks and hickories. The residual forest resulting from these timber harvests consisted of the less desirable species (honey locust, hackberry, cedar elm, and green ash) that make up a majority of the bottomland forests in the Trinity River Basin today and do not offer the same ecological benefits as the original forest. Further, potential

County	Existing Bottomland Forest	Potential Restoration Areas	Total
Anderson	42,332	43,295	85,627
Freestone	56,251	47,514	103,766
Grimes	6,215	6,540	12,756
Henderson	28,011	30,658	58,669
Hill	6,881	15,661	22,542
Houston	31,968	58,951	90,919
Leon	44,218	51,457	95,675
Limestone	1,655	6,044	7,699
Madison	23,374	29,840	53,214
Navarro	43,092	88,138	131,230
Trinity	19,429	8,883	28,312
Walker	20,969	29,346	50,316
Total	324,396	416,328	740,725

Table 2. Acreage of existing bottomland forest and potential restoration area for bottomland forest within the middle Trinity River Basin.



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regeneration of the more desirable species like the oaks and pecans is extremely low or non-existent for many stretches of the Trinity River. Analysis showed about 324,396 acres of forested land (through habitat quality and species diversity has largely been compromised on these areas) remained and approximately 416,328 acres were previously occupied by native bottomland forests and have the potential for restoration (Figure 5).

How to Use This Guide

Information in the publication is also available to individual landowners and regional conservation planners via the internet. The first step is to access TRIMS (http://trims.tamu.edu). Turn on the site potential layers. Identify and zoom to your area of interest (e.g., region, county, or ranch). The current land use types can then be assessed. In the following segments, we take you through two scenarios that shed light on how to more effectively use this information.

Scenario 1 – Private Landowner

Private landowners interested in restoring portions of their property can use TRIMS to determine areas to focus their restoration projects and dollars. For example, a landowner can zoom to their ranch and determine locations that might be the most cost effective areas to restore. They may decide, based on the data layers, to restore native grasses to improve wildlife habitat. Using TRIMS, they can delineate the area of interest, calculate acreage and print maps. Once the area of interested has been defined, it is now time to implement a conservation plan. We recommend contacting natural resource professionals (TPWD, USDA-NRCS, Texas AgriLife Extension Service, soil and water conservation district, Texas State Soil and Water Conservation Board) that can assist in the planning and implementation phases. We also encourage landowners to take advantage of financial assistance programs available through state and federal agencies (Appendix A). Restoration projects can be costly depending on the current condition of the area of interest, and many of the state and federal programs will provide financial, as well as technical assistance for the duration of the project and beyond.

Additionally, wildlife management associations are often helpful, as neighbors can learn from one another and increase wildlife habitat by managing lands in a like-minded way. These associations (http://www.tpwd.state.tx.us/landwater/land/associations/)

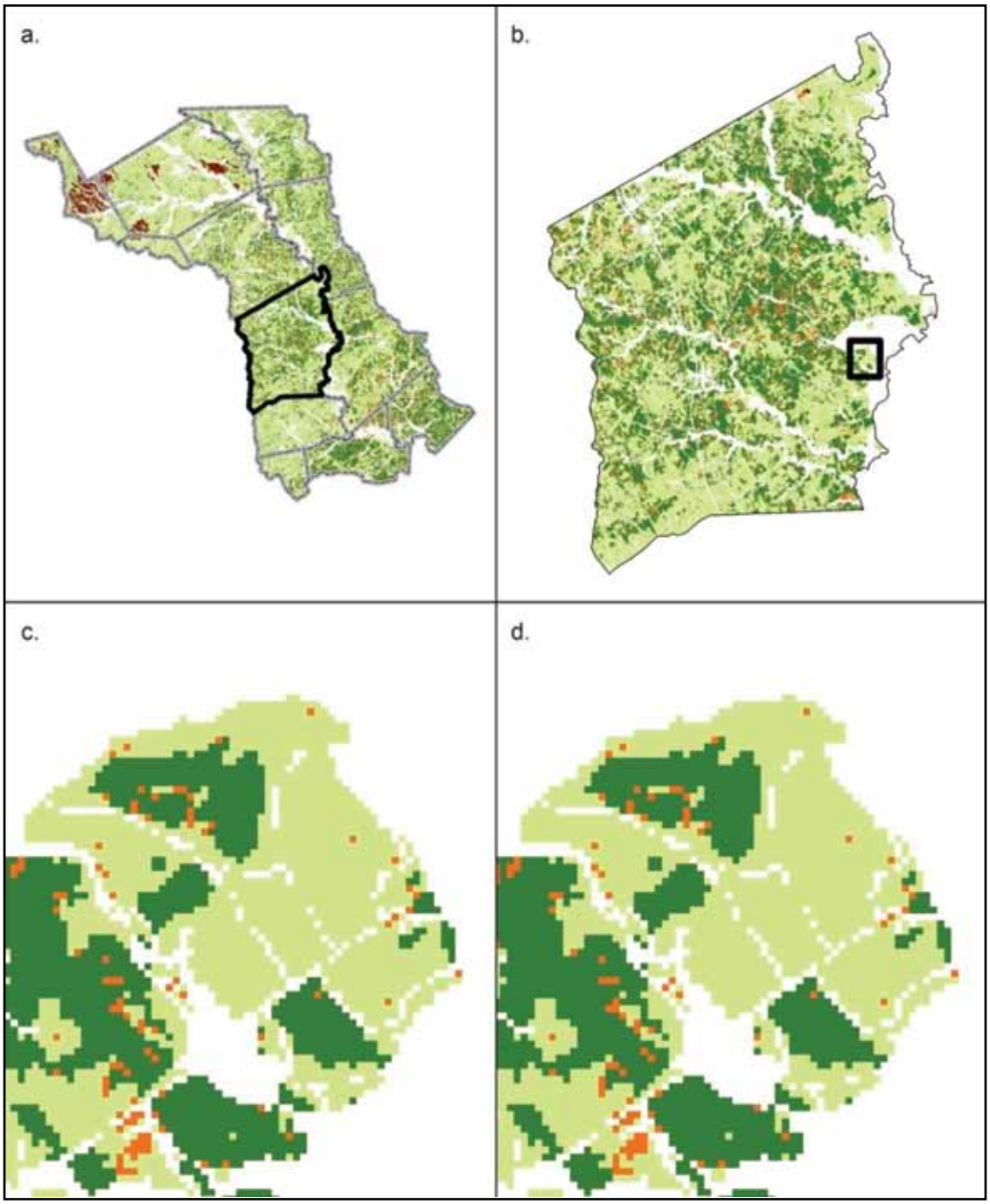

Figure 4. Landowners using TRIMS, an on-line mapping and planning tool, can identify their county (A), a specific area or parcel within the county (B) and identify soil and habitat types suitable for restoration to grasslands and forestlands (C) on their specific property (D).

consist of landowners in the same region/area that work cooperatively toward similar goals. Management associations typically purchase and/or share equipment (e.g., tractors, implements, seed drill, prescribed burn trailer), specifically for members of the association and assist each other to reduce outside costs. Conservation organizations such as the Trinity Basin Conservation Foundation (TBCF; http://www.trinitybasin.org/) can also assist with restoration projects and landowner peer-to-peer networking.

The TBCF was awarded $60,000 in a competitive grant process administered by the U.S. Fish and Wildlife Service (USFWS) through a Recovery Act grant. The TBCF invested these funds for conservation projects on private land and used the GIS techniques described here and incorporated

Figure 3. Leaders with Trinity Basin Conservation Foundation sign a conservation cost-share agreement with the Laura Johnston Family Properties, Ltd. Wetland construction will increase flood water capacity and provide habitat to a variety of wildlife, including winter waterfowl and shorebirds, and prairie restoration will provide increased habitat quality for a variety of upland wildlife including quail and turkeys while providing diversity to the grazing management program at the ranch.

into TRIMS to identify potential project sites. This method considered soils and habitat characteristics for project planning to increase the ecological return of funds invested for the selected property. Specifically, wetland units were created that increased water storage capacity during flooding and served as habitat for many animals including wintering populations of waterfowl. Soon additional efforts will be made to re-establish bottomland hardwoods like water, willow, overcup and burr oaks. The long term effect of this reforestation project will increase the amount of food and cover for wildlife and improve water quality by filtering sediment, nutrients, and bacteria during flood events. Yet another phase of this project will incorporate current cropland fields for restoration to native prairie species that will later be incorporated into the grazing rotation for the livestock operation on-site. This will increase on-site upland species diversity for ground nesting bird species like quail and turkeys while also providing an additional source of revenue in terms of grazing.

Coupled with matching funds from the Laura Johnston Family Properties, Ltd., over 200 acres of wetland habitat and bottomland hardwood forest will be enhanced; and 400 acres of cropland fields reseeded to native prairie. This type of capacity building among private landowners, TBCF, the USFWS works to achieve goals set into motion by Governor Perry's Trinity Basin Environmental Restoration Imitative. Leaders in the USFWS and the State of Texas see this as a winning solution for the ecosystem and local businesses that are involved in natural resource restoration.

Scenario 2 – Regional Planner

In addition to ranch-scale restoration projects by private landowners, regional planners have the opportunity to benefit from conservation planning using TRIMS at the landscape scale. For instance, some regional planners have recognized the importance of managing property in a way that benefits hydrological capacity of the land. This is known as the Watershed Approach which is based on the following principles: 1) geographic focus based on hydrology rather than political boundaries; 2) water quality objectives based on scientific data; 3) coordinated priorities and integrated solutions; and, 4) diverse, well-integrated partnerships (see AgriLife Extension publication B-6154 "The Watershed Management Approach"). For instance, within this type of approach, headwaters of basins may protected from development to reduce problems associated with runoff, erosion, and sedimentation that would otherwise compromise water quality in a reservoir serving as a municipal water supply.

Rather than zooming to a specific land parcel, regional planners should think of connecting restoration efforts among counties or subwatersheds. An assessment of existing and potential acreages for grassland and bottomland hardwood restoration must be undertaken (Tables 1 and 2). This will help gauge how investment dollars could be used and anticipate the greatest ecological benefit, resulting from restoration efforts.

A connection should be made between regional planners and private landowners to insure that cooperation among stakeholders is fostered to achieve common goals. The regional planner might look to the largest land holdings within their county to serve as the epicenter from which conservation plans expand into neighboring areas. For instance, Table 2 shows 44,332 and 56,251 acres of existing bottomland forests in Anderson and Freestone counties, respectively.

Not all of this land is contiguous. Regional planners can use TRIMS to visualize the largest parcels and then examine proximity of other parcels that show potential (ecologically suitable) for bottomland restoration. It is here that counties can work together, as these two counties share a common boundary – the Trinity River.

As part of a strategic planning process, leaders with the Texas Land Conservancy (TLC) used TRIMS to identify areas best suited for long-term protection of open space lands. The TLC specializes in developing conservation easements, which are agreements between landowners and a land trust, where the landowner voluntarily restricts the type and amount of development that takes place on the land in exchange for tax benefits. This practice ensures that landholdings are protected from large-scale development and remain as open space lands

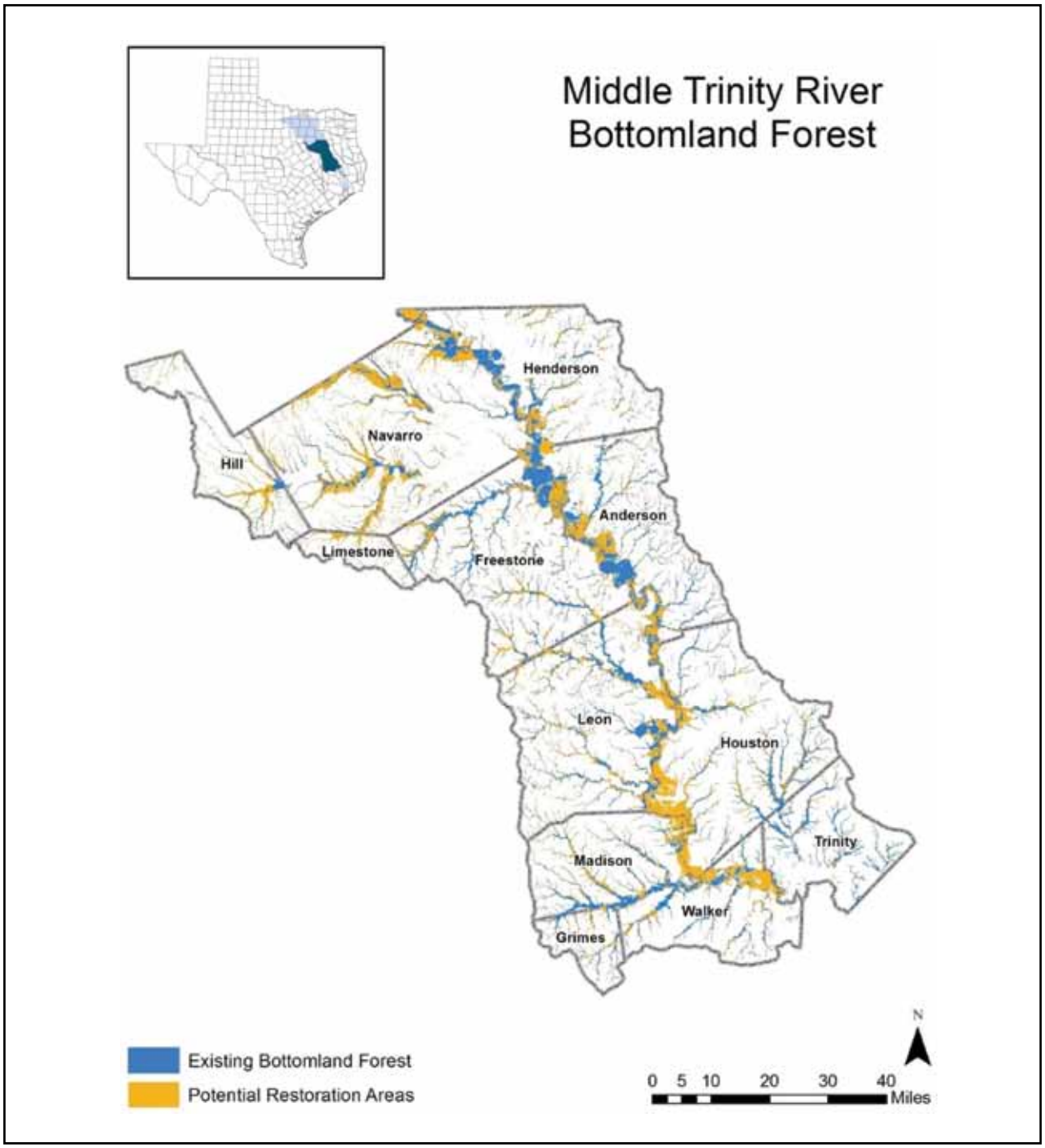

Figure 5. Geographic Information Systems were used to classify existing bottomland forests and locations for potential restoration among 12 counties in the middle Trinity River Basin.

associated with working farms or ranches which hold a greater ecological value.

For organizations like TLC, this type of planning has several advantages. Conservation easements concentrated in defined locations like a subwatershed should aid the ecological function within the area. In this example, landscape connectivity among parcels increases resulting in a more intact and functional ecosystem. By contrast, small parcels separated by distance do not function in the same manner and wildlife populations may not maintain a critical mass over time to support a population (e.g., bobwhite quail in eastern Texas). Concerted effort also has advantages for any company, as the logistics of managing parcels in proximity to each other is much easier and less costly than managing lands scattered throughout the state. Likewise, communication, commonalities, and understanding of conservation goals are likely to gain momentum among landowners, businesses, and agencies given focused effort.

Summary

Ecosystem restoration is a complex undertaking and often interested participants (landowners, business, and agencies) have difficulty agreeing where to start. By using GIS for habitat classification, information described in this document should hasten the process by showing locations and potential acreages for both upland and bottomland habitats in the middle Trinity River Basin. Land stewardship is no longer a foreign concept. Inspiring restoration efforts are occurring on private and public lands. When coupled with the expertise of professionals and financial assistance programs of private, state and federal programs, restoration becomes feasible. Connectivity among restoration projects should be a primary consideration at the individual landowner and regional conservation planning scales. There is opportunity for municipalities to become more proactive in restoration as the benefits of ecosystem function and services combine to save money, benefit business, and deliver clean water to their constituents, while enhancing wildlife habitat. It is recognized that restoration to the point of early Texas pre-settlement is neither practical nor feasible nor desirable, but land practices can be implemented to increase ecological value, which has monetary value for the landowner and all Texans.

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Agency/Program	Cost-Share	Habitat Affected	Species of Interest	Length of Contract	Website
USDA-NRCS					
Wetland Reserve Program (WRP)					http://www.nrcs.usda.gov/programs/wrp/
Permanent Easement	100%	Wetlands	Fish & Wildlife	Permanent	
30-Year Easement	up to 75%	Wetlands	Fish & Wildlife	30-Years	
Restoration Cost-Share Agreement	up to 75%	Wetlands	Fish & Wildlife		
Wildlife Habitat Incentives Program (WHIP)	up to 75%	upland, wetland, aquatic, and other types of wildlife habitat	Fish & Wildlife	1 to 10 years	http://www.nrcs.usda.gov/programs/whip/
Environmental Quality Incentives Program (EQIP)	up to 75%	cropland, rangeland, pastureland, private non-industrial forestland, and other farm or ranch lands	Livestock	5 to 10 Years	http://www.nrcs.usda.gov/programs/eqip/
Healthy Forest Reserve Program					http://www.nrcs.usda.gov/programs/HFRP/ProgInfo/Index.html
Permanent Easement	100%	Forestland	Fish & Wildlife	Permanent	
30-Year Easement	up to 75%	Forestland	Fish & Wildlife	30-Years	
10-Year Restroration	up to 50%	Forestland	Fish & Wildlife	10-Year	
Grassland Reserve Program					http://www.nrcs.usda.gov/programs/GRP/
Permanent easement	100% of fair market value of land	Grassland		Permanent	
30-year easement	30% of fair-market value of land	Grassland		30-Year	
Rental Contracts(10, 15, 20, 30 year)	up to 75% of grazing value			(10,15,20, & 30 years)	
Farm and Ranch Land Protection Program (FRPP)	up to 50%	Productive farm and ranchland in agricultural uses		1 year to 5 years	http://www.nrcs.usda.gov/programs/frpp/
Emergency Watershed Protection Program (Floodplain Easements)	up to 100%	Floodplains		Permanent	http://www.nrcs.usda.gov/programs/ewp/Floodplain/index.html
Conservation Stewardship Program	paid based on conservation performance, not more than $40,000 per year	cropland, grassland, prairie land, improved pastureland, rangeland, and nonindustrial private forest land	Fish, Wildlife	5-year	http://www.nrcs.usda.gov/programs/new_csp/csp.html
Farmland Protection Policy Act					http://www.nrcs.usda.gov/programs/fppa/
USDA – Farm Service Agency					
Conservation Reserve Program	50% cost-share, rental pay cannot exceed $50,000	Farm and Ranch Land	Fish & Wildlife	10 to 15 years	http://www.nrcs.usda.gov/programs/crp/

Agency/Program	Cost-Share	Habitat Affected	Species of Interest	Length of Contract	Website
USFWS					
North American Wetlands Conservation Act of 1989	Funding is matched one to one	Wetlands	Mainly Migratory Waterfowl	no less than 10 years unless a 5 year demonstration project	http://www.fws.gov/birdhabitat/Grants/NAWCA/index.shtm
North American Waterfowl Management Plan (NAWMP)	Funding varies depending on Habitat Joint Ventures	Wetlands	Waterfowl		http://www.fws.gov/birdhabitat/NAWMP/index.shtm
Partners for Fish and Wildlife Program (PFW)	up to 100%	Wetlands	Wildlife	no less than 10 years unless a demonstration project	http://www.fws.gov/southeast/es/partners/
TPWD, DU, USFWS, NRCS					
Texas Prairie Wetland Project	up to 85%	Wetlands	Wetland Species	no less than 10 years	http://www.ducks.org/news-media/texas-prairie-wetlands-project
TPWD					
Landowner Incentive Program (LIP)	up to 75%	habitat of at least one rare or at-risk species	Rare or at-risk species	no set length	http://www.tpwd.state.tx.us/landwater/land/private/lip/
Texas Forest Service					
Southern Pine Beetle Prevention Program	up to $75/acre for thinning plus up to $10/acre for forestry	Forest areas susceptible to SPB outbreaks		no set length	http://txforestservice.tamu.edu/main/popup.aspx?id=1245
Texas General Land Office					
Texas Farm and Ranch Lands Conservation Program	None	all	Fish & Wildlife	Indefinite	http://www.glo.state.tx.us/res_mgmt/farmranch/
Texas Water Development Board					
Agricultural water conservation loans and grants	None	all	Not focused on wildlife		http://www.twdb.state.tx.us/assistance/conservation/grants.asp
Clean Water State Revolving Fund	None	all	Not focused on wildlife	30 years	http://www.twdb.state.tx.us/assistance/financial/fin_infrastructure/cwsrffund.asp
TSSWCB					
Water Quality Management Plan Program (funded with both state general revenue (AKA “503 program”) and federal Clean Water Act §319(h) nonpoint source grants)		all	Not focused on wildlife	5-10 years depending on specific BMPs	http://www.tsswcb.state.tx.us/en/wqmp

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Authors Contact Information:

James C. Cathey
Texas AgriLife Extension Service, Wildlife and Fisheries Sciences
Texas A&M University
College Station, TX 77843-2258, USA

Shawn L. Locke
Texas AgriLife Extension Service, Wildlife and Fisheries Sciences
Texas A&M University
College Station, TX 77843-2258, USA

Amy G. Snelgrove
Texas A&M Institute of Renewable Natural Resources,
Texas A&M University
College Station, TX 77843-2260, USA

Kevin Skow
Texas A&M Institute of Renewable Natural Resources
Texas A&M University
College Station, TX 77843-2260, USA

Todd Snelgrove
Texas A&M Institute of Renewable Natural Resources
Texas A&M University
College Station, TX 77843-2260, USA

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