

COST SHARING PARTNERSHIPS FOR MUNICIPAL INTERBASIN TRANSFER AND AGRICULTURAL WATER CONSERVATION

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ABSTRACT

The House Bill 1437 (HB 1437) Agriculture Water Conservation Program is an innovative way to meet rising municipal demands in a county adjacent to the Lower Colorado River Authority (LCRA)'s service area in central Texas, conserve river water used for irrigation, and maintain agriculture productivity. A cooperative program between municipal and agricultural water users, and the Natural Resource Conservation Service's Environmental Quality Incentive Program (EQIP) provides grants to irrigation divisions and agriculture producers in Matagorda, Wharton, and Colorado counties to implement agricultural water conservation projects.

Responding to requests for an interbasin transfer mechanism from utilities in Williamson County pressured with high population growth rates and limited water supplies, in 1999, the Texas Legislature passed HB 1437. HB 1437 authorized LCRA to transfer up to 25,000 acre-feet of water per year to Williamson County under certain conditions including "no net loss" of water to the lower Colorado River basin, and a conservation surcharge on the transferred water collected from customers in Williamson County dedicated to a specific fund to help pay for agricultural conservation projects.

The grant program began in 2006 and from 2006-2008 has funded a 30% cost share to precision level 12,161 acres of farm land already participating in the 50% cost share federal EQIP program. A 3-year average of 3,597 acre-feet of water has been conserved as a result of these precision land leveling grants. LCRA has partnered with the Lyndon Baines Johnson School of Public Affairs at the University of Texas to develop a sound statistical methodology for determining water savings from precision leveled fields. Preliminary results of this analysis indicate that there is a statistically significant difference in water use between leveled and non-leveled fields. More in-depth statistical analyses are to be completed by Spring 2010. The 5-yr program plan goal is to conserve 10,000 acre feet per year by 2014, using a combination of conservation projects including precision land leveling grants, on-farm volumetric measurement and billing, and automating existing canal check structures.

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INTRODUCTION

HB 1437 Enabling Legislation

Due to high population growth rates and limited water supplies, water utilities within Williamson County have had to look outside of their river basin to meet projected demands for water. Williamson County lies within the Brazos River Basin, which is adjacent to the Lower Colorado River Basin in Texas (Figure 1). House Bill (HB) 1437, passed by the Texas Legislature in 1999, authorizes the Lower Colorado River Authority (LCRA) to provide up to 25,000 acre-feet of surface water per year for use in specific areas of Williamson County. The LCRA is a conservation and reclamation district created by the Texas Legislature in 1934. LCRA supplies electricity for Central Texas, manages water supplies and floods in the lower Colorado River basin through the operation of six dams, manages three irrigation divisions, develops water and wastewater utilities, provides public parks, and supports community and economic development in 58 Texas counties.

According to HB 1437, this water would be transferred under four major conditions:

1. Water is transferred in a manner that assures “no net loss” of surface water to the Colorado River Basin.
2. A conservation charge for transferred water is added to the base water rate, with proceeds from the conservation charge to be deposited into the Agricultural Water Conservation Fund (Ag Fund). The legislation set a minimum 10 percent conservation charge and authorized the LCRA Board to adjust the conservation charge as necessary to mitigate any adverse effects of the transfer.
3. The Board may use money from the fund only for the development of water resources or other water use strategies to replace or offset the amount of surface water to be transferred to Williamson County.
4. LCRA consults with an advisory committee, comprised of representatives from Colorado, Wharton and Matagorda counties, prior to using funds from the Agricultural Water Conservation Fund.

Interbasin Permit and Water Contract

In October 2000, LCRA and Brazos River Authority (BRA) signed a 50-year water sales agreement for the 25,000 acre-feet of water. In addition to the standard contract provisions, the agreement included a 25 percent conservation charge for transferred and reserved water and a clause that allows BRA to terminate the agreement not earlier than February 15, 2012.

In August 2001, the Texas Natural Resource Conservation Commission issued the interbasin transfer permit to BRA to transfer up to 25,000 acre-feet of water per year to

Williamson County under the conditions authorized in HB 1437. As of October 2009, no water transfers have occurred.

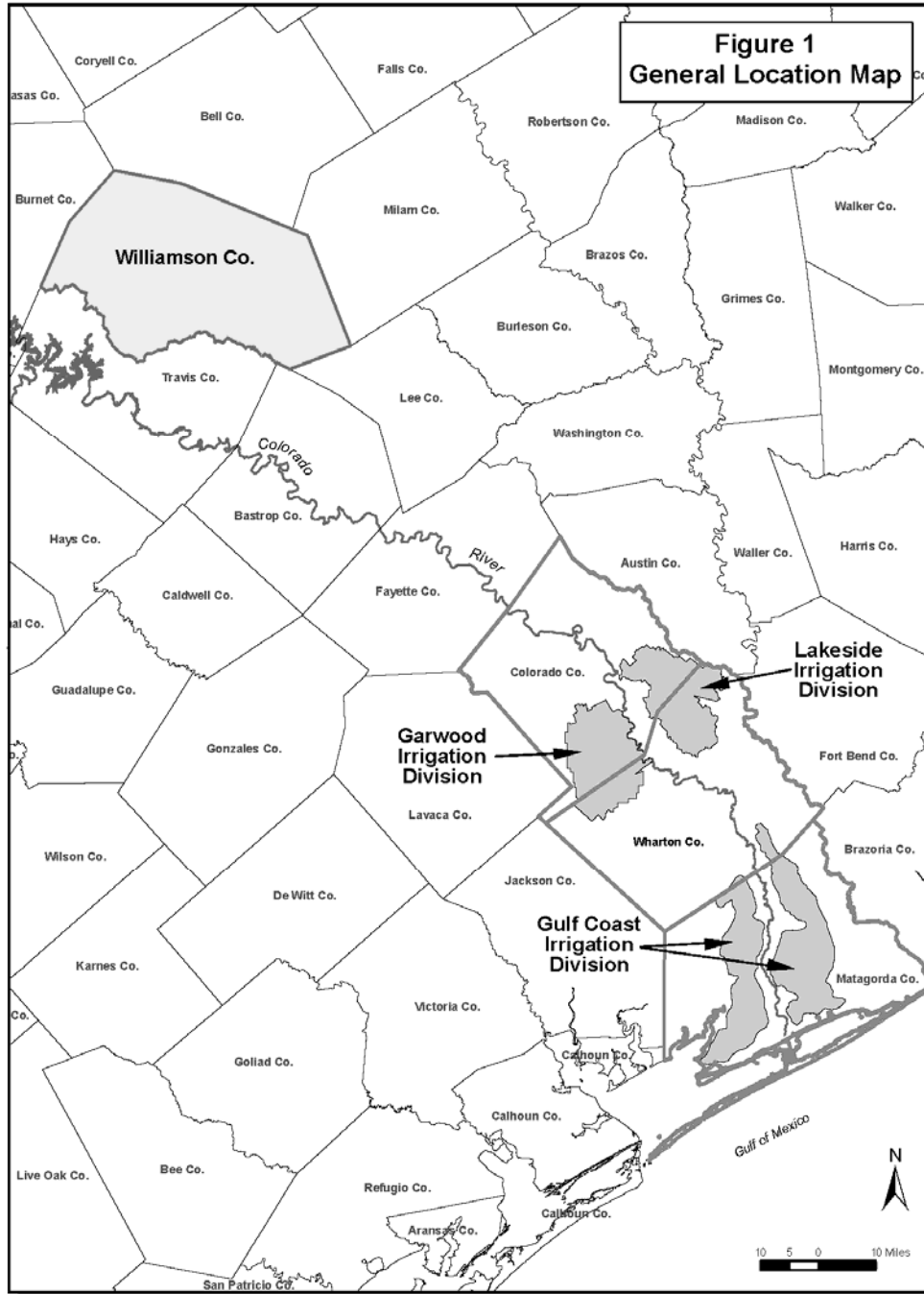


Figure 1. General Location Map

HB 1437 Implementation Study

In 2004, the LCRA Board authorized an engineering study and public meetings to develop a plan for implementing the HB 1437 program. Major goals of the study were to define the term “no net loss,” evaluate potential conservation projects and develop an

implementation plan to allow the water transfer to occur under the provisions of the HB 1437 legislation. The plan, developed after review and comment by the Brazos River Authority, municipal customers, local farmers and members of the public, developed a definition for “no net loss,” developed a seven-year plan to meet projected water demands through on farm and in-district conservation projects, established a 25 percent conservation surcharge on the water transferred to Williamson County customers, and presented additional recommendations for program implementation.

The development of this plan followed an extensive public input process. A total of 18 water replacement strategies were evaluated in two rounds of public meetings conducted in three locations throughout the basin. Stakeholders who participated in the process included people who live close to the Highland Lakes, people who farm and use irrigation water, LCRA and BRA water customers, environmental group representatives, and the City of Austin. The primary screening criteria used to create a refined set of viable strategies were: cost to the customer, phased implementation, accelerated implementation, sustainable yield, permits, meets definition of “no net loss” and mitigates adverse impacts. Secondary screening criteria were applied to identify and prioritize impacts and benefits of strategies, balance subjective project impacts against implementation costs and score total project impacts and costs equitably. The five final strategies selected as a result of this process included: precision leveling, automated check structures and SCADA control system, balancing reservoirs, conjunctive use of groundwater, and reduced irrigation for 2nd crop. More details on this process are contained in the study document, which is available at www.hb1437.com.

This study also determined a definition for “no net loss” which resulted in the adoption of LCRA Board Policy 501, “Water Resources,” that incorporated the demands of HB 1437 Agricultural Water Conservation Program. This revised policy was adopted by the LCRA Board in March 2005.

No Net Loss No Net Loss is defined in the LCRA Board Policy 501 as a hydrologic condition where the average annual volume of Transferred Water is equivalent to, or less than, the combined average annual volume of Conserved Water, Developed Water, and Returned Water resulting in a reduced reliance on surface water for agricultural irrigation. This is expressed below in equation form.

$$\text{Transferred Water} < \text{Conserved Water} + \text{Developed Water} + \text{Returned Water}$$

Transferred Water is the average annual volume of surface water exported from the lower Colorado River basin to Williamson County under the Texas Water Code (which reflects the original legislation). Conserved Water is the average annual volume of water developed under HB 1437 from conservation projects and demand reduction projects within the water service areas of LCRA’s irrigation divisions. Developed Water is the average annual volume of additional water made available for use within the water service areas of LCRA’s irrigation divisions and may include any groundwater or surface water resources that are not presently under the control of LCRA. Returned Water is the average annual volume of water that is imported to the lower Colorado River basin with the specific intent to meet the conditions of the Texas Water Code. Average annual

volume is defined as the arithmetical average volume of water over a contiguous 3-year period. This averaging provision was included in the policy and allows for flexibility in adding groundwater and reuse water from outside the Lower Colorado River watershed to balance any unexpected diversions within the averaging period. Conserved Water that is not transferred is lost but as more conservation practices are implemented, the average yearly volume of transferrable water increases.

NRCS Memorandum of Understanding

In March 2007, the LCRA and the Natural Resources Conservation Service (NRCS) entered into an agreement to share technical information related to the NRCS's Environmental Quality Incentives Program (EQIP). This federal grant reimburses producers 50 percent of the cost of specific on-farm conservation projects such as precision land leveling. In 2006, LCRA Board adopted the application guidelines, eligibility rules and contract provisions for awarding cost sharing conservation grants from the Ag Fund. These guidelines integrated the NRCS technical specifications and payment certification processes into the requirements for the HB 1437 grant program. This agreement is an important mechanism for reducing administrative costs as well as the actual cost-share burden for LCRA by adopting NRCS' existing certification program for EQIP funded water conservation projects.

PROGRAM OVERVIEW

The HB 1437 Agricultural Water Conservation Program is a major part of the LCRA's water conservation program for agricultural uses. The program joins individual producers, local soil and water conservation districts, and the NRCS in a collaborative effort to conserve water. The following are the goals of the HB 1437 program:

1. Reduce agricultural use of surface water;
2. Plan and implement conservation projects to fulfill obligations of the LCRA/BRA contract for HB 1437 water;
3. Provide grants from the Agricultural Water Conservation Fund to implement water conservation projects; and
4. Provide program performance information to the LCRA Board, BRA water customers, and the public in accordance with LCRA Board Policy 501.

Demand Projections for HB 1437 Water

The water demand projections were developed by the Brazos River Authority and its customers, and are reviewed and updated annually. Figure 2 compares the HB 1437 water demands used to develop the current HB 1437 implementation plan with the updated demand projections recently provided by BRA and their customers. The updated projections indicate an initial delay in demand, relative to the previous projections, followed by a more uniform growth in demand.

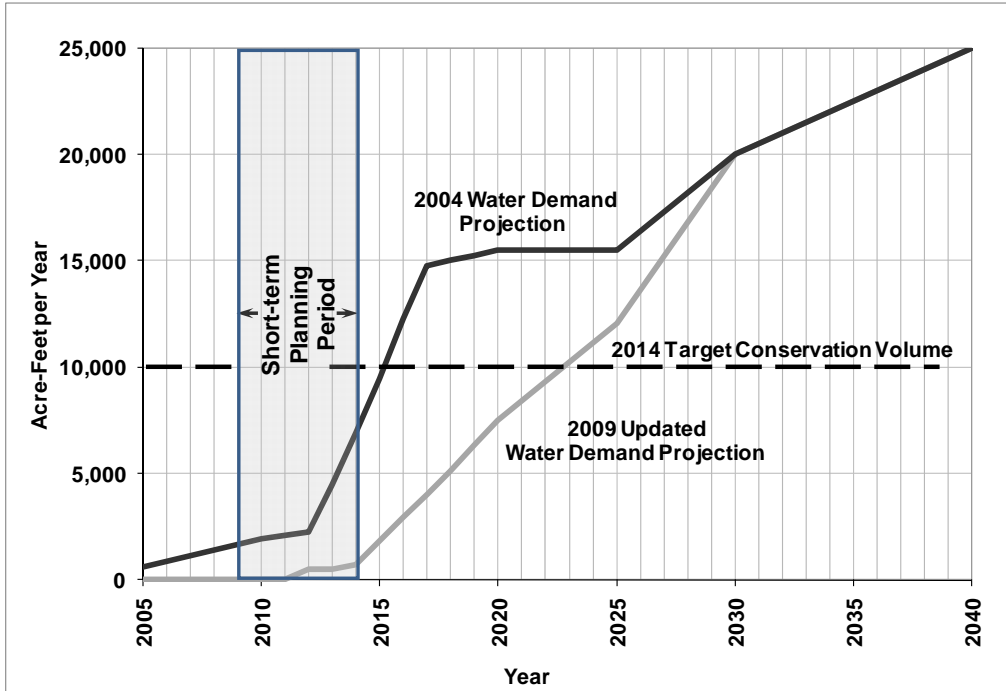


Figure 2. Water Demand Projections for HB 1437 Water

Updated Program Plan

The initial HB 1437 program plan was developed during the 2005 implementation study and includes a combination of on-farm and in-division conservation improvements to meet the projected water demands of BRA water customers in Williamson County. This plan developed 3,500 acre-feet of conservation, primarily through providing supplemental grant funds to precision grade 6,000 acres by the year 2012.

The program plan was recently updated to include a series of projects and studies to be completed during the period 2009 to 2014. The goal of this short-term plan is to develop 10,000 acre-feet of HB 1437 water per year for transfer to Williamson County by 2014. This target provides for development of conservation improvements 4 to 6 years ahead of their need while accounting for other uncertainties, such as reliability of conservation during drought. It also allows for leverage of the HB 1437 funds through acquisition of other grants that may not be available in the future. A summary of the HB 1437 program plan is presented in Table 1.

Table 1. 2010-2014 Conservation Projects and Program Costs

On-Farm Projects	In-Division Projects	Studies and Management
Precision level 12,500 acres of farmland (2,500 acres per year)	Implement volumetric measurement in the Garwood Irrigation division Retrofit to automate eleven canal check structures in LCRA’s irrigation divisions	Conservation measurement and monitoring
Construction Cost - \$1.203 million	Construction Cost - \$1.519 million	Oversight and customer communication
		Program administration
<p>Total cost: \$8.008 million</p> <p>Funding sources: Ag Fund - \$3.097 million, EQIP & TWDB Grant – \$2.833 million, Farmer - \$2.077 million</p> <p>HB 1437 Water Available for Transfer: 10,000 acre-feet per year</p>		

Program Funding

The program is funded through the income stream generated from the conservation surcharge applied to the water sales contract. The conservation surcharge is applied to both reserved water and transferred water. The conservation surcharge rate must be sufficient to maintain a positive balance in the Ag Fund. Income to the Ag Fund is based on the following rates:

• Conservation Surcharge 25%	• Max Available Water: 25,000 ac-ft/yr
• Normal Raw Water Cost: \$138/ac-ft	• Reserved Water Cost: \$69/ac-ft

Schedule

The current implementation plan projects that at least 10,000 acre-feet of HB 1437 water would be conserved and be available for transfer to Williamson County by the year 2014.

Precision leveling will continue to be funded at a level of 2,500 acres per year, the Garwood volumetric measurement project will begin in 2010 and will be completed in 2012. In-division canal check structure retrofits will begin in 2012 and continue until 2014.

PROGRAM RESULTS

Program and Policy

In December 2008, the HB 1437 Application Guidelines and the HB 1437 Cost Sharing Agreement were amended so that conservation funds for precision leveling are distributed pro rata among qualified applicants rather than limiting the award of grant funds based on a lottery selection system.

Under the previous lottery method, if the dollar amount of highest priority qualified applications exceeded the grant budget for that year, payments from the Ag Fund would be awarded based on a lottery ranking of qualified applications. Under this lottery method with a fixed 30 percentage cost share, a highly ranked, and large acreage application could effectively use up all of the available funds, eliminating other worthy projects.

While LCRA staff has received favorable comments regarding the prioritization of conservation projects (these prioritizations take into account whether the applicant has completed the steps necessary to obtain an EQIP agreement as well as the status of the leveling project) the lottery ranking component has been the subject of farmers' concerns. Therefore, beginning in 2009, an annual grant budget was set for expenditures from the Ag Fund and those expenditures, subject to NRCS guidelines for leveling costs, was spread across all qualifying applicants with the same priority ranking within a budget year on a pro rata basis. This Board action also limited expenditures to any single applicant to a maximum of 30 percent of the cost of the applicant's precision leveling project, and the total grant amount (EQIP plus HB 1437 Ag Fund) to an applicant to an amount that could not exceed 100 percent of the applicant's project costs. Even though applications far exceeded budgeted funds in 2009, resulting in a payout of only 12%, LCRA customers accepted this method as an equitable way to distribute grant funds.

On-Farm Conservation Projects

The total on-farm conservation projects completed from the program inception in 2006 to 2008 is presented in Table 2. The grant program shared the cost of precision leveling of 159 fields totaling 12,161 acres. The largest acreage was in the Lakeside Irrigation Division (50 percent), followed by Garwood (45 percent) and Gulf Coast (5 percent). All program projects were funded by a combination of funds: 50 percent cost share from the Natural Resource Conservation Service (NRCS)'s Environmental Quality Incentive Program (EQIP); 30 percent funding from the Ag Fund; and the remaining 20 percent from producers. The average area of a leveled field was 77 acres.

Since inception, the HB 1437 Ag Fund has contributed \$967,299 out of a total cost of \$3,247,302. The average area of a leveled field was approximately 77 acres. The average cost to precision level was approximately \$267 per acre.

All of the applications submitted in 2006-2008 that met the first priority criteria were funded. The priority criteria can be found in the HB 1437 Application Guidelines on <http://www.hb1437.com>.

Table 2. 2006-2008 Acres Leveled and Grants Awarded

Division	Fields Leveled	Acres Leveled	Total Cost	HB 1437 Share
Garwood	67	5,402	\$1,326,418	\$395,504
Lakeside	84	6,186	\$1,784,960	\$531,018
Gulf Coast	8	572	\$135,924	\$40,777
Total	159	12,161	\$3,247,302	\$967,299

Figure 3 shows the locations of the leveled fields in the Garwood, Lakeside divisions. There are very and Gulf Coast irrigation divisions.

In-Division Conservation Projects

There were no HB 1437 funded in-division conservation projects during the period 2006-2008. Preliminary design work was completed for the Garwood measurement project in early 2009 and construction work was started in the fall of 2009. This work is funded by a combination of HB1437 funds and a 2009 grant from the Texas Water Development Board.

Conservation Monitoring and Measurement

Accurate water conservation estimates are critical to water availability estimates necessary to comply with the “no net loss” requirement for water transfers. A major goal of the HB 1437 program is to continue to refine a technically sound water conservation monitoring plan that could be integrated and implemented within the normal business practices of the LCRA irrigation divisions. Studies by others have examined the role of precision leveled fields in agricultural water conservation (Goel et al. 1981, Anderson et al. 1999, Bjornlund et al. 2009, Smith et al. 2007) and have identified several factors that affect the utilization of conservation technologies and water savings, such as a farmer’s age, education, dependence on off-farm work, size of farm operation, a field’s ownership, quality of land leveling work and water costs.

The methodology to estimate the water conservation factors for the HB 1437 program is based upon a statistical comparison of water use in fields leveled to EQIP standards versus water use in other non-leveled fields. This concept will be verified by analyzing water use data from the Lakeside Irrigation Division for the 4-year period 2006 through 2009. Preliminary results from an analysis of 2006-2007 data show that the difference in water use between the HB 1437 fields and other fields is consistent with the 0.75 acre-foot of water saved per acre leveled conservation factor currently used to estimate water

conserved under the HB 1437 program. The conservation monitoring plan calls for the development of separate conservation factors for each irrigation division.

A major challenge in implementing a HB 1437 conservation monitoring program is that only two of the three LCRA irrigation divisions currently volumetrically measure water delivered to fields. Historically, the Garwood division did not measure water at individual fields, yet nearly half of the acreage in the HB 1437 grant program is in this division.

To address this condition, staff has implemented a limited water measurement program in several sections of the Garwood Irrigation Division that will be expanded to complete measurement of the division by 2012.

LCRA staff develops accurate field maps for LCRA contracted acreage yearly. The process digitizes into a GIS layer representation of the fields in production each year in an irrigation division and identifies the fields that have been precision leveled through the grant program, their production status, and other water use information.

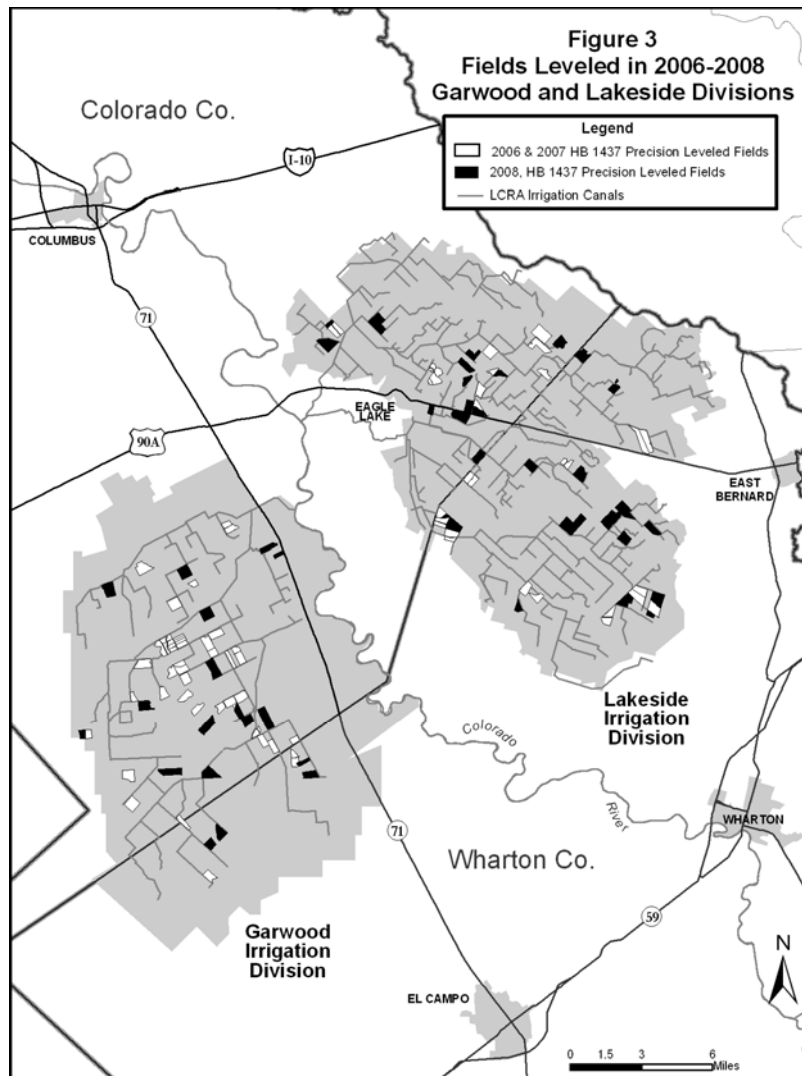


Figure 3. Fields leveled from 2006-2008 in 2 of the 3 irrigation divisions

Water Conserved and No Net Loss

The volume of conserved water produced is calculated by multiplying the number of acres leveled times the conservation factor for precision leveling. Results from field studies at the Texas A&M’s Texas Agricultural Experiment Station (TAES) in Eagle Lake support a conservation factor of 0.75 acre-ft of water conserved per acre leveled. A conservation savings verification program is now in progress to refine this conservation factor and the conserved water calculations. To be counted, a leveled field must be in production to receive conservation credit; conservation credit for a fallowed field is not allowed.

In 2008, an estimated 7,947 acres of HB 1437 fields were in production, conserving an estimated 5,960 acre-feet of agricultural water. This estimate includes current fields and fields previously leveled under the HB1437 program.

No Net Loss Status Table 3 summarizes the 2005-2008 no net loss volume statistics. It shows compliance with the definition of “no net loss” and that a 3-year rolling average of 3,597 acre-feet of HB 1437 water was available for transfer at the end of 2008. To date, no HB 1437 water has been transferred. The entity that was forecasted to need HB 1437 water first canceled its contract with BRA, but there is some indication that negotiations have restarted and another contract could be put into place in the near future.

Table 3. No Net Loss Summary, acre-feet

Year	Vol. Conserved	Vol. Developed	Vol. Returned	Vol. of HB 1437 Water			
				Total Vol. Available	Forecasted Demand	Actual Transferred	Net Loss
2005	0	0	0	0	600	0	0
2006	2,077	0	0	2,077	860	0	0
2007	2,753	0	0	2,753	1,120	0	0
2008	5,960	0*	0*	3,597*	1,380	0	0

* 3-year rolling average

AGRICULTURAL WATER CONSERVATION FUND

The HB 1437 Agricultural Water Conservation Fund (Ag Fund) was established by the HB 1437 legislation and funds LCRA's portion of current water conservation projects. It is an interest bearing, reserve fund recorded in a separate account titled HB 1437 Agricultural Water Conservation Fund. The fund was started in February 2002.

Income to the fund is derived from the annual conservation charge provision incorporated into the HB 1437 water sales contract with BRA. The current charge is 25 percent and is applied to both reserved water and delivered water. Conservation charge income is deposited into the Ag Fund in February of each year. The fund is reduced by HB 1437 program expenditures approved by the LCRA Board and replenished each year with the annual surcharge. Total program expenditures authorized by the LCRA Board through 2008 are \$2.025 Million. Figure 4 presents the yearly expenditures, income and balance for the HB 1437 Ag Fund.

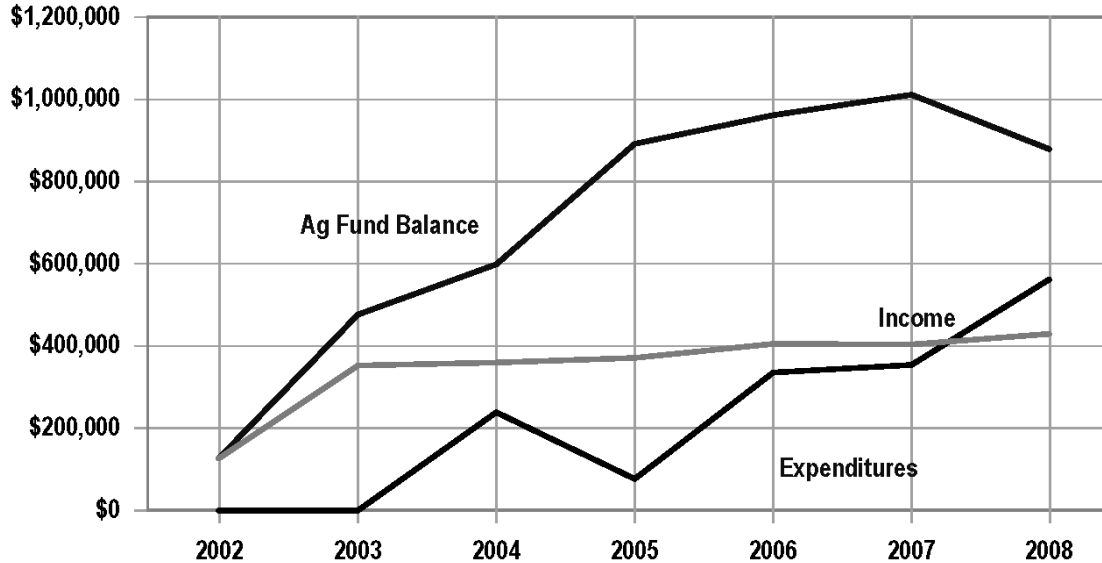


Figure 4. Agricultural Fund Income and Expenditures through December 2008

PROGRAM OUTLOOK

The 2009 program consists of four areas of effort: continue the grant program and cost-share on-farm conservation projects; review and update the HB 1437 implementation plan to account for new demand projections for HB 1437 water; implement and refine the conservation verification program, begin implementation of complete volumetric measurement in the Garwood Division, and meet with the Agricultural Water Conservation Fund Advisory Committee.

2009 Program Activities

The program plan for 2009 consists of grant funded On-Farm Conservation Projects, update of the HB 1437 Implementation Plan, initiation of the in-division Garwood Volumetric Measurement Project, and the LCRA/UT-LBJ Conservation Verification Study.

On-farm Conservation Project In Spring 2009, 6,845 acres were precision leveled through the HB 1437 program. Due to the program popularity and rule changes implemented in late 2008 that established a pro-rated allotment system for the grant money based on a funding cap set by the LCRA board for the current grant funding cycle, LCRA was only able to offer a cost share of 12.5% of the total project costs instead of the 30% cost share offered in previous years.

Results from the first three years of the grant program indicate that the additional cost-share contribution from HB 1437 encourages producers with existing EQIP contracts to complete the contracted work. The lower cost share in 2009 suggests that producers are willing to accept less than a 30 percent cost share.

EQIP remains a popular program for producers due to the availability of funds and its flexible contract terms. Producers holding EQIP contracts are allowed up to 10 years to complete the work. In 2005, NRCS reported that only 10 percent of the awarded EQIP contracts had been completed. This backlog of funded, but uncompleted, projects provided a reservoir of low-cost conservation projects. However, as shown in Table 4, this is changing.

The NRCS reported that, as of March 2009, 78 percent of the awarded EQIP contracts have been completed (up from 50 percent in 2007), and since April 2005, just over 38,000 acres of EQIP contracts have been added. These changes indicate strong support for EQIP and the positive effect HB 1437 is having on the implementation of water conservation projects.

Table 4. Contracted and Applied EQIP Precision Leveling Acreage, as of March 2009

County	Contracted	Installed	Remaining
Colorado	22,648	15,808	6,840
Wharton	14,283	13,021	1,262
Matagorda	1,173	956	217
Total	38,104	29,785	8,319

Implementation Plan Update An engineering study has been completed to update the short term (2010- 2014) implementation plan and reassess the types and timing of new conservation projects. The findings indicate that sufficient funds are available to continue grants for precision land leveling, fund the on-farm volumetric measurement project in Garwood and retrofit 11 check structures in the irrigation divisions. A long-

term plan will also need to be developed to meet BRA water demands for the full 25,000 acre-feet/year.

Garwood Volumetric Measurement The Garwood Volumetric Measurement program will implement water measurement structures within the Garwood Irrigation Division. The implementation of volumetric measurement in the Garwood Division is similar to implementation of volumetric measurement in the other LCRA irrigation divisions during the early 1990s.

Not only will the farmers be charged for the amount of water used, which has been shown to result in conservation compared to flat-rate systems, but the Garwood Irrigation Division staff will control the water delivery structures, improving water distribution, improving information for management of flows in the system, and increasing accountability for improved water management by individual farmers. This strategy will improve control of flow in the outer reaches of the Garwood division, particularly in areas where there may be long field laterals, and it includes installation of additional check structures that will provide for improved management and control of water through the canal system.

Conservation Monitoring and Measurement Study In August 2009, LCRA contracted with the LBJ School of Public Affairs at the University of Texas in Austin to conduct a robust statistical analysis of the HB 1437 water conservation program.

Verification of the water savings from HB 1437 program is essential to comply with the “no net loss” provision and accurately judge the efficacy of numerous policies and resources invested in water-conserving programs. An initial look at comparing water use between leveled and non-leveled fields within one crop season indicates that the data is normally distributed, and that there is a statistically significant difference in the water use between leveled versus non-leveled fields. Findings from that analysis also identified the need for future study to: (1) consider multiple years in the analysis; (2) incorporate parameters to extend the statistical analysis to a complete model, reducing or eliminating the effects of confounding factors measured along with the variable of interest (precision laser-land leveling); and (3) account for the lack of independence between observations, which is an assumption required when using the t-test, by specifying a model that incorporates clusters of fields at the farmer/ownership level.

Differences in farmers’ skills and practices are one of the many factors that affect on-farm water use. Because initial differences in farmers’ management may partially account for later variation in water use, it is critical to disentangle the effects of farm management from the effects of precision laser-land leveling. Only then, can conservation programs be credited with reliable water savings by policy makers and researchers. For instance, farmers who have implemented precision laser-land leveling may use other best management practices or have above average management skills. In sum, it is likely that management skills alone partially explain on-farm water use.

This analysis differs from preceding analyses in that most statistical inferences were made assuming similar management skills across all fields⁴. The LBJ school proposal will use Hierarchical Linear Models (HLM) to sort out the effects of a farmer's management skills across a cluster of fields; in essence to parse out differences in water use attributable to a cluster of fields managed by a single farmer. Using HLM, there are three primary goals: (a) to determine the extent to which precision laser-land leveling explains on-farm water use; (b) to identify other factors that affect water consumption such as temperature, rainfall, duration of crop season, and other water conservation measures in place; and (c) to examine how these factors operate at the field level as well as among groups of fields managed by the same farmer. For instance, different patterns of water use that exist between leveled and non-leveled fields managed by the same farmer can be distinguished. HLM analysis allows for both correlation between observations and correlation through time. These HLM models have several advantages. They will allow comparisons across multiple years, data from all fields are used for calculations (even when each rice field is not in production every year), and the data structure has many more records, making it suitable for small sample sizes.

The purpose of this analysis is to develop a model that tests hypotheses about factors that influence on-farm water use; a model that addresses statistical testing for precision graded verification. In the first model the main effect of precision graded laser leveling will be added (the effect that is of primary substantive interest), then a series of controls will be added (effects we want to remove) and mediating variables (effect we are interested in disentangling from the main effect) will be added last in a stepwise fashion. In this sequence of models, predictors that reflect changing characteristics will be included; for instance, correction for annual climate variation through rainfall and temperature. Length of the growing season will also be included as a variable as well as land ownership, the individual who is farming the land (representing management skills), the number of levees present in each field, and the presence of multiple inlets. The number of levees has been used in previous studies to determine the quality of precision land leveling. Multiple inlets is the practice of releasing water at multiple points along the side of a field utilizing a field lateral and multiple flow control structures instead of feeding all water through the highest section or cut of a rice field and cascading it down through each lower cut to the field outlet.

This analysis will be completed for the Lakeside Irrigation Division in the spring of 2010 with a goal of determining a field-verified conservation factor for that division. This research will be used to measure water savings and could be used to inform the development of guidelines for evaluating water conservation policies. Policy makers and water regulators, such as the LCRA and NRCS, may use the results of this research to evaluate alternative strategic investments in water conservation technologies by comparing water savings and investment costs. The results of this study have important implications to influence the direction of LCRA's future cost-share funds for water-conserving technology.

⁴ Water Savings Verification and Monitoring Program–2007

In the future, data from the other districts will be evaluated to determine if a similar analysis will work for those divisions given more data limitations in those areas. LCRA has been collecting measured water use from a limited subset of leveled and non leveled fields in the Garwood Irrigation Division for two years, but the sample size is not large enough to run the HLM model described above until more data is available as the Garwood volumetric measurement project progresses. In 2007, LCRA began a pilot project to measure water use of HB1437 fields in Garwood. For the first year, these daily flow measurements proved to be unreliable since adjacent farmers adjusted water flow to their fields between these measurements. In response to this issue, in 2008, LCRA started controlling and measuring a small subset of the irrigation division, requiring producers to contact LCRA to take water. This pilot program was continued in 2009 to accurately measure about 1,600 leveled and unleveled fields. This program will be rolled into the project to measure all on-farm water use by 2012 and will eventually enable LCRA to run this statistical model for the Garwood Division. This statistical model cannot be applied to the Gulf Coast Irrigation Division at this time either because of the low participation in the HB 1437 grant program and therefore the low sample size of leveled fields. In future years, LCRA will focus more efforts on investigating roadblocks to participation in that division such as different EQIP priorities than the other counties.

Program Oversight and Communication A large part of the HB 1437 implementation study was a public input process to involve various stakeholders in the framework and conservation strategies of the HB 1437 program. Since the grant program began in 2006, yearly updates have been provided about the program to farmers through annual farmer advisory meetings in each division and individual contact with division staff. The 2008 HB 1437 annual report is available on LCRA's website, and staff will continue to update the website as a part of on-going conservation communication efforts. The 2009 annual report will be available in April 2010.

In 2009, staff worked with key local producers to reappoint members of the Ag Advisory Committee members through county judges. This committee has reconvened, is providing guidance on the conservation verification study, and will be involved in the long term plan. In November 2009, this committee recommended that LCRA pursue a detailed survey of Lakeside contract holders to gather more information about additional factors that affect water use but are not currently collected by LCRA. These factors include additional conservation measures such as multiple inlets, conservation tillage, and permanent perimeter levees, details about the slope, type of levee and levee density to determine quality of land leveling, rice variety, and ownership stake. These variables will be included as part of the HLM model.

LCRA is in the process of developing an oversight committee composed of several academic and policy experts in statistics and agricultural conservation practices for this verification study. Feedback and endorsement of methodology from this committee will be important to obtaining widespread acceptance of the results of this study.

Future Challenges

While this program shows much promise, it is still relatively new and has not yet been completely tested since no water has been transferred. Participation in the grant program has exceeded LCRA's expectations and the relationship with NRCS has been beneficial for both parties by reducing costs for LCRA and increasing the pace of contract completion for NRCS.

Future challenges include the development of a long-term plan that addresses the one-to-one replacement policy and the issue of water availability during periods of drought. LCRA accounts for the water saved in this program as "interruptible" water meaning it can be cut off during times of drought, yet delivers the water to Williamson County as "firm" water, meaning it is water guaranteed during drought.

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