Targeted Education to Decrease Nonpoint Source Loadings

Texas Water Resources Institute TR-533
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Texas Water Resources Institute
make every drop count

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Texas Water Resources Institute

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Acronyms

BMP	Best Management Practice
NRCS	Natural Resources Conservation Service
QPR	Quarterly Progress Report
SWCD	Soil and Water Conservation District
TSSWCB	Texas State Soil and Water Conservation Board
TWRI	Texas Water Resources Institute
USDA	U.S. Department of Agriculture
WQMP	Water Quality Management Plan
WPP	Watershed Protection Plan

Executive Summary

Segments of the Lavaca River have been identified as impaired due to excessive indicator bacteria. In response, a watershed protection plan was developed for the Lavaca River watershed to identify management measures that would reduce bacterial loads. One management measure identified in the watershed protection plan is the development of water quality management plans and conservation plans. The Texas State Soil and Water Conservation Board, local soil and water conservation districts, and the U.S. Department of Agriculture Natural Resources Conservation Service work with landowners to develop and implement such plans specific to each operation. These conservation plans include the implementation of best management practices, which may include financial and technical assistance as needed, that both improve operations and help reduce the amount of indicator bacteria that enters nearby waterbodies. However, raising awareness amongst landowners about available sources of technical and financial assistance can be a challenge. In-person programs are traditionally the primary method of education, but the impact can be limited when only a small number of people are able to attend.

A different method of outreach, compared to traditional educational programs, was attempted in this project as a means of reaching more landowners in a cost-effective manner. Educational mailers were sent to all landowners within Lavaca County every other month for six months to inform residents on stocking rates for beef cattle operations and contact information for the local U.S. Department of Agriculture Natural Resources Conservation Service and soil and water conservation district offices. Texas Water Resources Institute worked with the Texas State Soil and Water Conservation Board, local soil and water conservation districts, and the U.S. Department of Agriculture Natural Resources Conservation Service to track the impact of the educational mailers.

There was a significant increase in developed conservation plans, planned practices, and implemented practices within Lavaca County in 2020 and 2021 during the mailing campaign. This result suggested educational mailers are an effective outreach method to inform landowners of the resources available and motivate landowners to implement conservation plans.

Background

Excessive indicator bacteria (*E. coli* or *Enterococcus*) remains the most frequent impairment issue for Texas water bodies. In rural watersheds, watershed protection plans (WPPs) are frequently developed and identify the improvement of grazing practices through implementation of U.S. Department of Agriculture Natural Resource Conservation Service (USDA NRCS) conservation plans or Texas State Soil and Water Conservation Board (TSSWCB) certified water quality management plans (WQMPs) as a management measure. Landowners work with local soil and water conservation districts (SWCDs), TSSWCB, and USDA NRCS to develop and implement these operation-specific plans that protect and improve water quality. However, making landowners aware that these programs are available to them is a challenge. A traditional educational approach is for watershed managers to deliver in-person education programs, but these programs only reach 15–75 landowners, and each program can be relatively expensive. Additionally, a major limitation of in-person education programs is that program attendees are only those who have time to attend, so the reach of the education programs is often limited.

Resources to implement WPPs are becoming increasingly limited and competitive, so watershed managers must be innovative in their approaches to educating and encouraging landowners to adopt best management practices (BMPs). Also, many landowners do not live in the same county as the property they own and lease it to someone else; however, it is often still the responsibility of the landowner to make decisions about certain practices and work with the local producer to ensure practices are implemented. To have a broader reach to both resident and absentee landowners in a cost-effective manner, new educational campaigns should be attempted.

A study conducted in a rural Central Texas watershed by Dewald, Leggette, Murphrey, Berthold, and Wagner (2018) showed that landowners preferred to be contacted quarterly through direct mailings from a trusted source, such as Texas A&M AgriLife Extension Service, about conservation practices to improve water quality when it comes to receiving water related information. Texas Water Resources Institute (TWRI) has worked in many watersheds that typify these conditions, including the Lavaca River watershed. Segments of the Lavaca River are currently impaired for excessive indicator bacteria, and the dominant land uses are used for livestock grazing, providing an excellent opportunity to widely reach producers and encourage them to adopt practices through TSSWCB and USDA NRCS programs. Reaching more landowners to encourage their participation is crucial to meeting the goals outlined in the Lavaca River WPP.

Purpose and Objectives

The goal of this project was to increase adoption of BMPs by landowners by reaching out to them through direct delivery of education and outreach materials. To accomplish this goal, TWRI worked with county appraisal districts to acquire landowner data. This data was sorted to remove parcels that fall within city limits, parcels that do not qualify for agricultural tax exemptions (parcels under 10 acres), and duplicates, providing a final contact list. TWRI utilized an in-house communications team that produces professional, high quality educational materials. The educational materials included information about rotational grazing, benefits to the landowner (e.g., improved heard health, increased forage availability, lower input costs), a call to

action, and local experts that can provide financial and technical assistance. Using the generated contact list, TWRI mailed the educational materials to each landowner every other month for six months in only Lavaca County.

To determine if the education campaign was effective, TWRI worked with local SWCDs and USDA NRCS in Lavaca and Goliad counties. Residents that own land within Lavaca County received the educational materials while Goliad County served as a control. TWRI provided the Lavaca SWCD and USDA NRCS with the contact list, and the Lavaca SWCD tracked the number of landowners who adopted plans and the number of practices implemented under these plans. Due to privacy rules, TSSWCB, SWCD, and USDA NRCS provided TWRI with a total number of plans developed and practices adopted during the project period as well as data for the 5 years prior to the project. Similarly, TWRI worked with the SWCD and USDA NRCS office in Goliad County where the educational campaign was not implemented. Using the difference in plans adopted and practices implemented between the two counties, TWRI determined that the mailing campaign was a successful approach to encourage the agricultural community to adopt practices.

TWRI also administered a pre- and post-evaluation within the two counties selected for the project. The purpose of the evaluation was to measure knowledge gained through the educational campaign as well as the intention to adopt. Prior to administering the evaluation, TWRI secured Institutional Review Board approval to protect the rights and welfare of research participants. Specific task activities and results are provided below.

Project Tasks

Task 1 – Project Management

Project management was conducted by TWRI and included coordinating meetings, reports, and budgeting. TWRI communicated with TSSWCB for updates on the project and collaboration on key project items, such as evaluations and educational mailers. Additionally, TWRI maintained records of all actions and engaged consumers.

Subtask 1.1

TWRI prepared electronic quarterly progress reports (QPRs) for submission to TSSWCB. The QPRs documented all activities performed within a quarter and were submitted to all project partners on the dates below:
QPR #1: 09/06/2019
QPR #2: 12/11/2019
QPR #3: 03/05/2020
QPR #4: 06/05/2020
QPR #5: 09/15/2020
QPR #6: 12/08/2020
QPR #7: 03/09/2021
QPR #8: 06/01/2021

Subtask 1.2

TWRI performed accounting functions for project funds and submitted appropriate reimbursement forms to TSSWCB in a timely manner.

Subtask 1.3

TWRI hosted conference calls quarterly with project partners to discuss project activities, project schedule, communication needs, deliverables, and other requirements. TWRI developed lists of action items needed following each project conference call and distributed them to project personnel. The scheduled conference calls took place on the following dates:
Quarterly Call #1: 09/04/2019
Quarterly Call #2: 12/12/2019
Quarterly Call #3: 03/09/2020
Quarterly Call #4: 06/11/2020
Quarterly Call #5: 09/24/2020
Quarterly Call #6: 12/10/2020
Quarterly Call #7: 03/10/2021
Quarterly Call #8: 06/02/2021

Subtask 1.4

TWRI developed a final report that summarizes activities completed and conclusions reached during the project and discusses the extent to which project goals and measures of success have been achieved.

Task 2 – Development and Delivery of Targeted Educational Materials

Subtask 2.1

TWRI contacted both the Lavaca and Goliad County appraisal districts in September 2019 to acquire contact lists for landowners in the counties. A contact list was received from Lavaca County in September 2019 through email and Goliad County in December 2019 via an in-person visit. The lists were further developed by eliminating duplicate addresses and landowners with acreages below 10, who are ineligible for agricultural exemptions. After finalizing the contact lists, a total of 4,921 landowners remained on the Lavaca County list and 1,959 on the Goliad County list. Of the 4,921 landowners on the Lavaca County mailing list, 4,819 had valid mailing addresses.

Subtask 2.2

TWRI developed an educational mailer for landowners in Lavaca County as a call to action for improving their beef cattle operations (see Appendix A). The mailer included information on stocking rates, including advantages of using proper stocking rates, indicators of overstocking, results of overstocking, and best management practices to help implement proper stocking rates.

Also incorporated into the mailer was contact information for Lavaca SWCD and the Lavaca USDA NRCS offices.

Subtask 2.3

TWRI administered the delivery of the same educational mailer to Lavaca County landowners four times. Dewald et al.'s (2018) study reported landowners preferred to be contacted on a quarterly basis. Therefore, the original project schedule included mailings on a quarterly basis. However, the COVID-19 pandemic delayed several items on the project's timeline, and mailers were sent every other month for six months. After each mailing, the contact list was updated to account for non-deliverable addresses. As described in Table 1, the first mailer was sent on July 15, 2020, to 4,819 landowners, the second on September 9, 2020, to 4,734 landowners, the third on November 4, 2020, to 4,692 landowners, and the fourth on January 6, 2021, to 4,684 landowners. Additionally, Table 1 breaks down the number of contacts by local (mailing addresses within Lavaca County) and non-local (mailing addresses outside Lavaca County) landowners.

Table 1. Educational mailers delivered by date

	Mailer #1 July 15, 2020	Mailer #2 September 9, 2020	Mailer #3 November 4, 2020	Mailer #4 January 6, 2021	Total contacts:
Local	2,274	2,242	2,222	2,219	8,957
Non-local	2,545	2,492	2,470	2,465	9,972
Total	4,819	4,734	4,692	4,684	18,929

Task 3 – Effectiveness Evaluation

Subtask 3.1

TWRI remained in contact with the Lavaca SWCD and USDA NRCS throughout the project. In January 2020, TWRI traveled to Hallettsville, in Lavaca County, to meet with USDA NRCS representatives. During this meeting, USDA NRCS provided feedback and suggested changes made on the pre-evaluation. Following this meeting, TWRI communicated with the Lavaca SWCD and USDA NRCS about the occurrence and order of the mailings: pre-evaluation, educational mailers, and post-evaluation. At the conclusion of the mailing campaign, TWRI worked with the Lavaca SWCD, TSSWCB, and USDA NRCS to collect the number of WQMPs and conservation plans developed both for Lavaca and Goliad counties. In Table 2 and Figure 1, conservation plans adopted by county are reported by year. Lavaca County averaged approximately 24 plans developed per year from 2016 to 2019 and then increased to about 40 per year in 2020 and 2021. Goliad County averaged 14 plans developed per year from 2016 to 2019, increased to 20 in 2019, and fell to 10 in 2021. In Table 3 and Figure 2, the number of USDA NRCS practices adopted by year was reported for Lavaca and Goliad counties. Practices adopted from 2016 to 2018 in Lavaca County averaged 90, fell to 59 in 2019, and increased dramatically

from 2020 to 2021. Goliad County averaged approximately 52 practices implemented 2016–2019, increased to 141 in 2020, and fell to 53 implemented and planned in 2021.

Table 2. Conservation plans developed by county

Year	Lavaca County conservation plans (treatment group)	Goliad County conservation plans (control group)
2016	25	15
2017	23	15
2018	25	13
2019	22	12
2020	39	20
2021	40	10

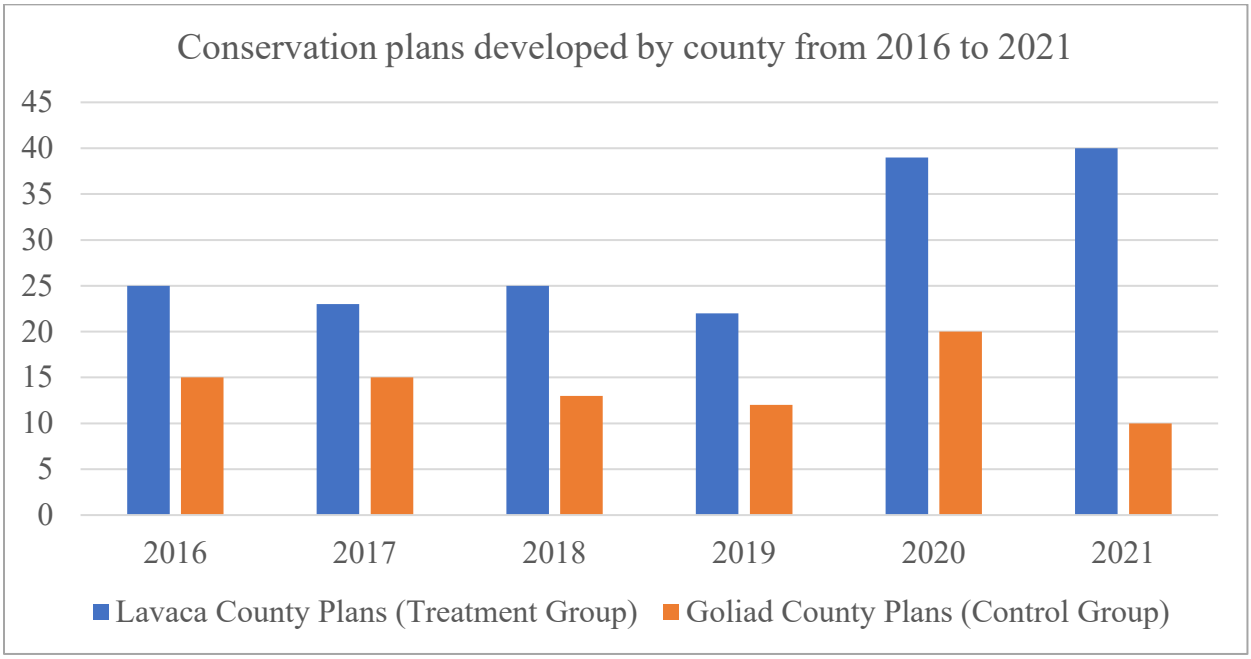


Figure 1. Conservation plans developed by county from 2016 to 2021

Table 3. Number of U.S. Department of Agriculture Natural Resources Conservation Service practices adopted by year and county

Year	*Practice status*	Lavaca County practices (treatment group)	Goliad County practices (control group)
2016	*Implemented*	92	52
2017	*Implemented*	95	34
2018	*Implemented*	82	60
2019	*Implemented*	59	61
2020	*Implemented*	136	141
2021	*Implemented + planned*	321	53

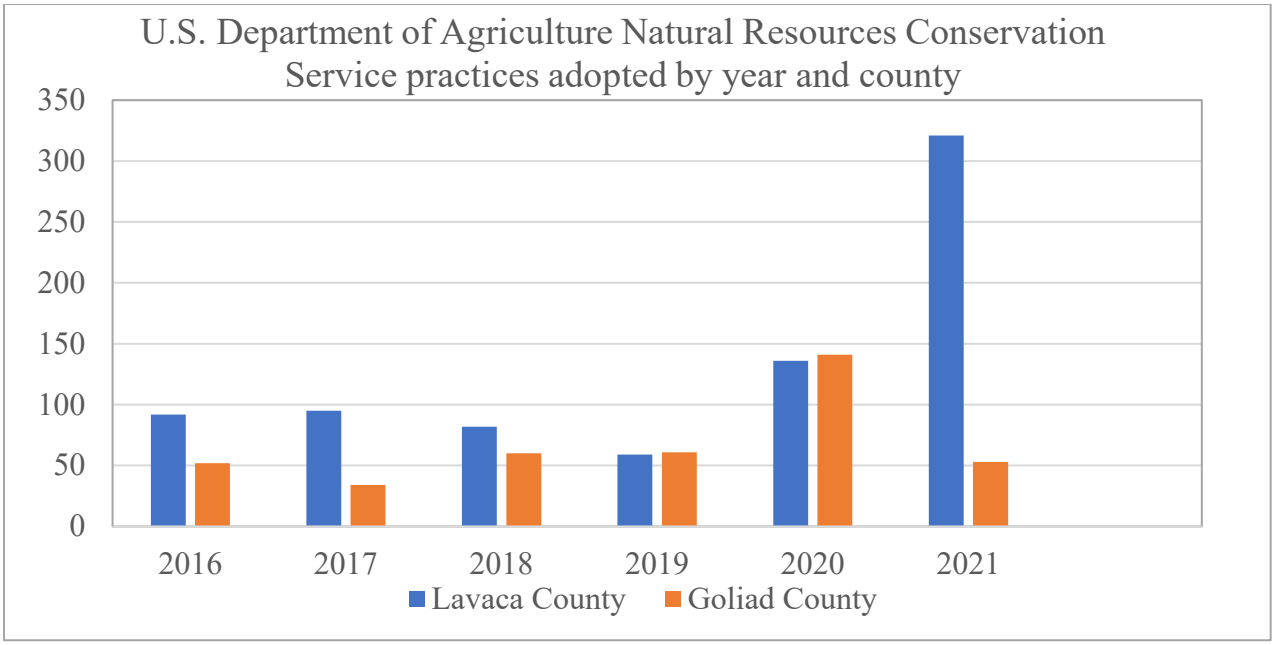


Figure 2. U.S. Department of Agriculture Natural Resources Conservation Service practices adopted by year and county

In Table 3 and Figure 2, the number of USDA NRCS practices adopted by year was reported for Lavaca and Goliad counties. Practices adopted from 2016 to 2018 in Lavaca County averaged 90, fell to 59 in 2019, and increased dramatically from 2020 to 2021. Goliad County averaged approximately 52 practices implemented from 2016 to 2019, increased to 141 in 2020, and fell to 53 implemented and planned in 2021.

Subtask 3.2

During the pre-evaluation, a simple random sample was selected from the county mailing lists, where Lavaca County had a sample size of 1,200, and Goliad County had a sample size of 500. Samples were also drawn for the post-evaluation by removing the pre-evaluation sample from the county mailing list and selecting a new simple random sample from those that remained on the list. Similarly, Lavaca County had a sample size of 1,200, and Goliad County had a sample size of 500.

TWRI administered pre- and post-evaluations to assess knowledge gained and response to messaging (see Appendix B and C). Pre-evaluation mailings included four items: a pre-notice postcard mailed May 26, 2020, a pre-evaluation package a week after, a thank you postcard another week later, and finally a second pre-evaluation package two weeks later. The evaluation package consists of a cover letter, an information sheet, and an evaluation. The information sheet advised landowners that their answers and contact information were confidential and included contact information for TWRI for questions and concerns. COVID-19 delayed return mail, leading to an extended data collection period into late July 2020. Post-evaluations were mailed following the same methodology starting March 9, 2021. The final combined response rate for the pre-evaluation was 37%, with a total of 271 usable responses and 64 undeliverable. The final

response rate for the post-evaluation was 35%, with a total of 235 usable responses and 67 undeliverable.

Pre-Evaluation Results:

Respondents' personal characteristics were reported in Table 4. The majority of both Lavaca and Goliad County respondents from the pre-evaluations were male (*f*(Lavaca) = 135, 75%, *f*(Goliad) = 59, 79%), 51–70 years old (*f*(Lavaca) = 88, 48%, *f*(Goliad) = 41, 54%) and white (*f*(Lavaca) = 167, 94%, *f*(Goliad) = 69, 96%) with either a bachelor's degree or graduate degree, and receive 1–20% of their income from beef production (*f*(Lavaca) = 119, 68%, *f*(Goliad) = 43, 57%). Additionally, most Lavaca and Goliad respondents reported an operation type of commercial cow/calf (*f*(Lavaca) = 145, 83%, *f*(Goliad) = 57, 81%). However, respondents from both counties indicated wide ranging differences in years in production agriculture.

Table 4. Descriptive statistics for respondents' personal characteristics

	Lavaca		*Goliad*	
	f	*%*	*f*	*%*
Gender				
Male	135	75	59	79
Female	44	25	16	21
Age				
51–70	88	48	41	54
71 and over	69	38	25	33
31–50	26	14	8	10
18–30	1	1	2	3
Ethnicity				
White	167	94	69	96
Spanish, Hispanic, or Latino	6	3	3	4
American Indian or Alaskan Native	3	2	0	0
Black or African American	1	1	0	0
Education level				
Bachelor's degree	55	29	23	31
Graduate degree	39	21	16	21
High school graduate	38	20	11	15
Some college	31	16	18	24
Associate degree	21	11	6	8
Less than high school	6	3	1	1
Percentage of income from beef production				
1–20%	119	68	43	57
0%	26	15	22	29
21–40%	20	11	2	3
41–60%	8	5	3	4
61–80%	1	1	4	5
81–100%	2	1	1	1
Operation type				
Commercial cow/calf	145	83	57	81

Other	15	9	9	13
Backgrounder/stocker	6	3	1	1
Feedlot/finishing operation	5	3	1	1
Seedstock	3	2	2	3
Years in production				
11–25 years	52	29	16	21
26–40 years	45	25	19	25
41–60 years	37	21	18	24
0–10 years	23	13	13	17
None – I lease my property for ag production.	15	8	5	7
61+ years	8	4	5	7

As reported in Table 5, Lavaca and Goliad respondents indicated high knowledge levels in strategies to determine stocking rates. An independent samples t-test was used to determine the difference between Lavaca and Goliad respondents' knowledge in this category. Only one significant difference was found between the two counties as it relates to their knowledge of determining stocking rates based on current or anticipated market prices. While respondents in Lavaca County somewhat disagreed with determining stocking rates based on market prices (M = 3.25, SD = 1.50), Goliad County respondents indicated they somewhat agree with the strategy (M = 3.50, SD = 1.26).

Table 5. Respondents' knowledge of strategies to determine stocking rate by county

	Lavaca			Goliad			
Knowledge items	*n*	*M*	*SD*	*n*	*M*	*SD*	*p*
Based on forage availability	175	5.00	1.06	71	5.11	1.06	0.82
Based on calculated grazeable acres for my pastures	175	4.62	1.23	69	4.67	1.21	0.62
Based on preparation for change in season	173	4.48	1.26	70	4.61	1.07	0.07
Based on current or anticipated market prices	173	3.28	1.50	68	3.50	1.26	0.02*
Based on the county appraisal district's recommendations	162	3.18	1.48	68	2.88	1.46	0.83

Note. * $p < .05$. Scale: 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Somewhat disagree*, 4 = *Somewhat agree*, 5 = *Agree*, 6 = *Strongly agree*.

As reported in Table 6, Lavaca and Goliad respondents indicated high knowledge levels for indicators of overstocking. An independent samples t-test was used to determine the difference between Lavaca and Goliad respondents' knowledge in this category. No significant differences were found.

Table 6. Respondents' knowledge of indicators of overstocking by county

	Lavaca			Goliad			
Knowledge items	*n*	*M*	*SD*	*n*	*M*	*SD*	*p*
Bare patches on the land	181	4.86	1.08	73	4.95	0.91	0.06

Weed/brush encroachment	179	4.63	1.23	72	4.57	1.28	0.65
Visible hooves from a distance	173	4.49	1.26	70	4.66	1.26	0.46
Noticeable manure visible from a distance	177	4.40	1.23	71	4.54	1.36	0.69
Less desirable body scores	171	4.85	1.04	71	4.93	1.09	0.76

Note. Scale: 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Somewhat disagree*, 4 = *Somewhat agree*, 5 = *Agree*, 6 = *Strongly agree*.

As reported in Table 7, Lavaca and Goliad respondents indicated high knowledge levels for results of overstocking. An independent samples t-test was used to determine the difference between Lavaca and Goliad respondents' knowledge in this category. No significant differences were found.

Table 7. Respondents' knowledge of results of overstocking by county

	Lavaca			Goliad			
Knowledge items	*n*	*M*	*SD*	*n*	*M*	*SD*	*p*
Susceptibility to drought	179	5.09	0.96	73	5.07	0.86	0.45
Increased soil erosion and rainfall runoff	179	5.08	0.96	70	5.09	0.90	0.24
Increased external parasites	174	4.73	0.94	71	4.69	1.05	0.71
Increased feeding period	179	5.00	0.91	72	5.15	0.69	0.75
Increase in supplemental feeding needs	180	5.12	0.84	71	5.25	0.65	0.49
Decrease in forage production	180	5.11	0.89	70	5.19	0.69	0.36
Decrease in herd performance	180	5.11	0.75	71	5.23	0.66	0.97
Reduced land carrying capacity	177	5.12	0.74	72	5.19	0.62	0.74

Note. Scale: 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Somewhat disagree*, 4 = *Somewhat agree*, 5 = *Agree*, 6 = *Strongly agree*.

As reported in Table 8, Lavaca and Goliad respondents indicated high knowledge levels for advantages of properly stocking. An independent samples t-test was used to determine the difference between Lavaca and Goliad respondents' knowledge in this category. No significant differences were found.

Table 8. Respondents' knowledge of advantages of properly stocking by county

	Lavaca			Goliad			
Knowledge items	*n*	*M*	*SD*	*n*	*M*	*SD*	*p*
Drought resilience	180	4.99	0.85	72	4.96	0.86	0.78
Protection of soil and water resources	180	5.19	0.82	72	5.25	0.58	0.15

Decreased feeding period	179	5.08	0.79	72	5.13	0.60	0.42
Decrease in supplemental feeding needs	180	5.04	0.88	71	5.18	0.54	0.07
Higher body scores	175	5.09	0.78	72	5.10	0.59	0.12
Increased forage production	179	5.21	0.72	72	5.22	0.59	0.28
Increased plant resiliency	173	5.12	0.74	71	5.27	0.58	0.81

Note. Scale: 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Somewhat disagree*, 4 = *Somewhat agree*, 5 = *Agree*, 6 = *Strongly agree*.

Lavaca and Goliad respondents' intention to adopt is reported in Table 9. An independent samples t-test was used to determine the difference between Lavaca and Goliad respondents' intention to adopt grazing management practices. There was a significant difference between Lavaca and Goliad respondents' intention to adopt as it relates to implementing cross fencing and alternative feed/salt/mineral locations. While Lavaca respondents indicated having adopted cross fencing and alternative feed/salt/mineral locations ($M = 3.60$, $SD = 0.92$; $M = 3.53$, $SD = 0.92$), Goliad respondents plan to adopt the practices ($M = 3.38$, $SD = 1.10$; $M = 3.04$, $SD = 1.06$). Additionally, the independent samples t-test results indicated a difference between the counties' intention to adopt alternative shade structures, but both counties reported they plan to adopt the practice.

Table 9. Respondents' intention to adopt grazing management practices by county

	Lavaca			Goliad			
Grazing management practices	*n*	*M*	*SD*	*n*	*M*	*SD*	*p*
Calculating grazable acres for stocking rates	175	3.29	1.01	71	3.08	1.08	0.13
Grazing plan/prescribed grazing	171	3.30	0.96	69	3.26	1.12	0.09
Cross fencing	178	3.60	0.92	71	3.38	1.10	0.01*
Alternative water sources	179	3.60	1.00	70	3.31	1.07	0.11
Alternative feed/salt/mineral Locations	178	3.53	0.92	70	3.40	1.06	0.02*
Alternative shade structures	180	3.34	1.22	70	3.04	1.48	0.00*

Note. * $p < .05$. Scale: 1 = *Will not adopt*, 2 = *Undecided*, 3 = *Plan to adopt*, 4 = *Already adopted*, 5 = *Not applicable*.

Respondents' awareness of USDA NRCS and local SWCDs are reported in Table 10. Lavaca County respondents indicated having awareness of Lavaca SWCD and USDA NRCS, the agencies' purpose, and technical assistance. However, roughly half of participants ($f = 88$, 49%) from Lavaca County reported awareness of financial assistance, and less than the majority ($f = 64$, 36%) were aware that services from the agencies were confidential.

Goliad County respondents did not indicate that they were aware of Goliad SWCD. However, measurement error occurred due to the use of "Lavaca" rather than "Goliad" in the survey during data collection from the sample. Participants from this county indicated awareness of USDA NRCS, the SWCD's and USDA NRCS's purpose, and technical assistance opportunity. However, only 50% ($f = 37$) of Goliad County respondents reported awareness of financial

assistance, and less than half reported awareness of confidential services (*f* = 30, 41%) and the SWCD's and USDA NRCS's work to help respondents develop a conservation plan (*f* = 36, 49%).

Table 10. Respondents' awareness of the U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS) and soil and water conservation district (SWCD) by county

	Lavaca				Goliad			
	Yes		No		Yes		No	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Are you aware of Lavaca SWCD?	149	82	32	18	18	25	54	75
Are you aware of USDA NRCS?	135	75	44	25	58	78	16	22
Did you know that the agencies mentioned above work to protect and enhance your working lands and natural resources?	144	80	36	20	52	70	22	30
Did you know that the agencies mentioned above offer free technical assistance?	118	66	62	34	45	61	29	29
Did you know that the agencies mentioned above offer financial assistance?	88	49	92	51	37	50	37	50
Did you know that any technical and financial assistance that you receive is confidential?	64	36	114	64	30	41	44	60
Did you know that the agencies mentioned above work with you to develop a conservation plan that will help attain your goals?	104	59	73	41	36	49	39	51

Post-Evaluation Results:

Respondents' personal characteristics were reported in Table 11. The majority of Lavaca and Goliad County respondents from the post-evaluations were male (*f*(Lavaca) = 128, 80%, *f*(Goliad) = 61, 81%), 51–70 years old (*f*(Lavaca) = 89, 54%, *f*(Goliad) = 47, 59%), and white (*f*(Lavaca) = 153, 96%, *f*(Goliad) = 72, 94%), with either a bachelor's degree or graduate degree and receive 1–20% of their income from beef production (*f*(Lavaca) = 94, 59%, *f*(Goliad) = 47, 61%). Additionally, most Lavaca and Goliad respondents reported an operation type, commercial cow/calf (*f*(Lavaca) = 136, 85%, *f*(Goliad) = 68, 86%). Again, respondents from both counties indicated wide ranging differences in years in production agriculture starting with none to 41–60 years of experience.

Table 11. Descriptive statistics for respondents' personal characteristics

	Lavaca		*Goliad*	
	f	*%*	*f*	*%*

Gender				
Male	128	80	61	81
Female	32	20	14	19
Age				
51–70	89	54	47	59
71 and over	61	37	27	34
31–50	15	9	5	6
18–30	1	1	1	1
Ethnicity				
White	153	96	72	94
Spanish, Hispanic, or Latino	4	0	4	5
American Indian or Alaskan Native	2	1	0	0
Asian	1	1	0	0
Black or African American	0	0	1	1
Education Level				
Bachelor's degree	53	32	26	32
Graduate degree	26	16	16	20
High school graduate	42	26	17	21
Some college	30	18	18	22
Associate degree	12	7	5	6
Less than high school	1	1	0	0
Percentage of income from beef production				
1–20%	94	59	47	61
0%	38	24	13	17
21–40%	19	12	8	10
41–60%	6	4	7	9
61–80%	1	1	2	3
Operation type				
Commercial cow/calf	136	85	68	86
Other	15	9	8	10
Backgrounder/stocker	6	4	0	0
Feedlot/finishing operation	1	1	0	0
Seedstock	2	1	3	4
Years in production				
11–25 years	47	28	15	19
26–40 years	42	25	22	28
41–60 years	40	24	20	25
0–10 years	21	13	8	10
None – I lease my property for ag production.	8	5	7	9
61+ years	8	5	8	10

As reported in Table 12, Lavaca and Goliad respondents indicated high knowledge levels in strategies to determine stocking rates. An independent samples t-test was used to determine the

difference between Lavaca and Goliad respondents' knowledge in this category. No significant differences were found.

Table 12. Respondents' knowledge of strategies to determine stocking rate by county

	Lavaca			Goliad			
Knowledge items	*n*	*M*	*SD*	*n*	*M*	*SD*	*p*
Based on forage availability	156	5.04	0.98	76	5.18	1.07	0.23
I have calculated my stocking rate based on my grazeable acres	156	4.62	1.24	76	4.79	1.27	0.84
Based on preparation for change in season	154	4.41	1.22	77	4.52	1.19	0.88
Based on current or anticipated market prices	152	3.30	1.49	75	3.33	1.51	0.93
Based on county appraisal district recommendations	146	3.11	1.55	71	3.06	1.53	0.63

Note. Scale: 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Somewhat disagree*, 4 = *Somewhat agree*, 5 = *Agree*, 6 = *Strongly agree*.

As reported in Table 13, Lavaca and Goliad respondents indicated high knowledge levels for indicators of overstocking. An independent samples t-test was used to determine the difference between Lavaca and Goliad respondents' knowledge in this category. No significant differences were found.

Table 13. Respondents' knowledge of indicators of overstocking by county

	Lavaca			Goliad			
Knowledge items	*n*	*M*	*SD*	*n*	*M*	*SD*	*p*
Bare patches on the land	160	4.94	1.08	78	5.09	0.87	0.41
Less desirable body scores	155	4.82	1.06	76	4.93	0.93	0.30
Weed/brush encroachment	158	4.73	1.14	80	4.88	0.97	0.17
Visible hooves from a distance	156	4.54	1.25	76	4.45	1.20	0.85
Noticeable manure visible from a distance	159	4.53	1.20	76	4.63	1.13	0.63

Note. Scale: 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Somewhat disagree*, 4 = *Somewhat agree*, 5 = *Agree*, 6 = *Strongly agree*.

As reported in Table 14, Lavaca and Goliad respondents indicated high knowledge levels for results of overstocking. An independent samples t-test was used to determine the difference between Lavaca and Goliad respondents' knowledge in this category. One significant difference was found between Lavaca and Goliad County respondents as it relates to their knowledge of the result of overstocking, decrease in forage production. However, both Lavaca and Goliad County respondents reported to agree that a decrease in forage production can result from overstocking the pastureland.

Table 14. Respondents' knowledge of results of overstocking by county

	Lavaca	Goliad

Knowledge items	*n*	*M*	*SD*	*n*	*M*	*SD*	*p*
Increase in supplemental feeding needs	163	5.20	0.77	78	5.37	0.76	0.39
Increased feeding period	162	5.11	0.85	78	5.21	0.87	0.27
Decrease in forage production	162	5.07	0.85	78	5.24	0.94	0.03*
Reduced land carrying capacity	160	5.01	0.83	77	5.27	0.79	0.22
Decrease in herd performance	159	4.99	0.85	78	5.15	0.84	0.42
Increased soil erosion and rainfall runoff	160	4.96	1.08	76	5.01	0.92	0.49
Susceptibility to drought.	160	4.92	1.06	78	5.06	0.93	0.95
Increased external parasites	159	4.64	1.07	75	4.68	1.04	0.85

Note. * $p < .05$. Scale: 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Somewhat disagree*, 4 = *Somewhat agree*, 5 = *Agree*, 6 = *Strongly agree*.

As reported in Table 15, Lavaca and Goliad respondents indicated high knowledge levels for advantages of properly stocking. An independent samples t-test was used to determine the difference between Lavaca and Goliad respondents' knowledge in this category. No significant differences were found.

Table 15. Respondents' knowledge of advantages of properly stocking by county

	Lavaca			Goliad			
Knowledge items	*n*	*M*	*SD*	*n*	*M*	*SD*	*p*
Protection of soil and water resources	162	5.16	0.71	77	5.19	0.61	0.67
Increased forage production.	163	5.13	0.70	79	5.29	0.66	0.18
Higher body scores	162	5.12	0.65	77	5.21	0.73	0.15
Decrease in supplemental feeding needs	164	5.09	0.80	78	5.04	0.96	0.30
Decreased feeding period	163	5.07	0.76	78	5.13	0.87	0.27
Increased plant resiliency	162	5.04	0.72	77	5.26	0.70	0.07
Drought resilience	160	4.93	0.77	77	5.00	0.83	0.55

Note. Scale: 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Somewhat disagree*, 4 = *Somewhat agree*, 5 = *Agree*, 6 = *Strongly agree*.

Lavaca and Goliad respondents' intention to adopt is reported in Table 16. An independent samples t-test was used to determine the difference between Lavaca and Goliad respondents' intention to adopt grazing management practices. No significant differences were found.

Table 16. Respondents' intention to adopt by county

	Lavaca			Goliad			
Grazing management practices	*n*	*M*	*SD*	*n*	*M*	*SD*	*p*
Alternative feed/salt/mineral locations	138	4.28	1.39	60	4.23	1.60	0.16

Cross fencing	139	4.22	1.52	60	4.08	1.68	0.34
Alternative water sources	138	4.17	1.63	59	4.25	1.64	0.73
Grazing plan/prescribed grazing	137	4.09	1.54	59	3.88	1.68	0.24
Alternative shade structures	134	4.09	1.85	59	4.17	1.86	0.95
Calculating grazeable acres for stocking rates	134	3.96	1.59	60	4.18	1.56	0.37

Note. Scale: 1 = *Will not adopt*, 2 = *Undecided*, 3 = *Plan to adopt*, 4 = *Adopted since July 2020*, 5 = *Adopted prior to July 2020*, 6 = *Not applicable*.

Awareness of USDA NRCS and local SWCDs for both Lavaca and Goliad counties is reported in Table 17. Lavaca County respondents indicated awareness of the local SWCD and USDA NRCS, the agencies' purpose, financial and technical assistance available, and work to develop conservation plans. Most participants reported to have not contacted the local USDA NRCS or SWCD since July 2020 (*f* = 121, 74%), and approximately half of Lavaca County respondents indicated they were unaware services from these agencies is confidential (*f* = 85, 52%).

The measurement error, which occurred during the pre-evaluation when asking the Goliad County sample about Lavaca SWCD, was corrected in the post-evaluation. Goliad County respondents indicated they were not aware of their local SWCD (*f* = 61, 25%) and have not contacted their local USDA NRCS or SWCD since July 2020 (*f* = 20, 26%). Participants from this county reported awareness of USDA NRCS, the SWCD's and USDA NRCS's purpose, free financial and technical assistance opportunities, and the work the agencies do to help landowners develop and implement conservation plans. Approximately half of Goliad County participants indicated they were unaware services from the agencies are confidential (*f* = 36, 47%).

Table 17. Respondents' awareness of the U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS) and local soil and water conservation district by county

	Lavaca				Goliad			
	Yes		No		Yes		No	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Are you aware of your local SWCD?	134	82	29	18	61	78	17	22
Are you aware of USDA NRCS?	123	75	40	25	64	83	13	17
Have you contacted your local USDA NRCS or SWCD since July 2020?	43	26	121	74	20	26	58	74
Did you know that the agencies mentioned above work to protect and enhance your working lands and natural resources?	121	74	43	26	57	75	19	25
Did you know that the agencies mentioned above offer free technical assistance?	110	67	54	33	55	71	23	29
Did you know the agencies mentioned above offer financial assistance?	101	62	63	38	44	57	33	43
Did you know that any technical and financial assistance that you receive is confidential?	79	48	85	52	40	53	36	47
Did you know that the agencies mentioned above work with you to develop a	99	61	64	39	43	56	34	44

conservation plan that will help attain your goals?	

Conclusions

Pre-Evaluation

One purpose of the pre-evaluation was to determine if Lavaca County and Goliad County populations were similar and results from the two counties could later be compared. Overall, results from the pre-evaluation suggested Lavaca County and Goliad County respondents were similar in their knowledge about stocking rates as well as their awareness of technical and financial resources available through local SWCD and USDA NRCS offices. There was, however, a difference between the two groups relating to their intention to adopt cross fencing and alternative feed/salt/mineral locations. This result suggests Lavaca County respondents may be more easily influenced into adopting practices through USDA NRCS or SWCDs than Goliad County respondents. However, the counties may be deemed similar enough to compare in this study following the treatment. Also in the results of the pre-evaluation, respondents reported awareness of USDA NRCS and the Lavaca SWCD; however, financial assistance and confidentiality are two characteristics of the agencies that respondents indicated they were unaware of. This result suggests a disconnect between respondents and locally available sources of technical and financial assistance and can explain a lack of interaction with local SWCDs, TSSWCB, and USDA NRCS.

Educational Mailers

As discussed in subtask 2.3, the educational mailing campaign made almost 19,000 contacts across all four mailings, and it is believed that these contacts influenced the number of practices adopted identified in subtask 3.1. Specifically, comparing date ranges of 2016–2019 to 2020–2021, the number of conservation plans adopted through USDA NRCS increased significantly in Lavaca County during the latter range. While both Lavaca and Goliad counties increased in 2020, compared to Goliad County, Lavaca County had a substantial increase in practices implemented and planned for 2021. There was roughly a 200% increase in plans adopted in Lavaca County from comparing the practices adopted between the two date ranges. Goliad County's increase in plans adopted in 2020 could be attributed to 29 Lavaca County landowners also owning property in Goliad County (identified by comparing the two mailing lists), and therefore, select Goliad County residents could have received the educational mailer. However, due to privacy rules, researchers could not acquire this information to confirm.

Through personal contact with USDA NRCS, it was communicated that no additional funding was provided to Lavaca County in 2020 or 2021. In fact, funding for the region decreased from $11 million to $7.5 million during this study. Also, there was no change in advertisement for USDA NRCS programs.

An unexpected variable in conducting this study was the COVID-19 pandemic. Therefore, it is important to note researchers are uncertain about the impact or effect of the pandemic on the outcome in practices adopted. With the changing aspects of the virus, landowners may not have wanted agency representatives to visit their property in fear of contracting the virus, inhibiting

the adoption of practices. Additionally, in-person educational programs delivered by Texas A&M AgriLife Extension decreased during this time while practices adopted increased.

Water quality change from implementation of practices has a slow response time. Improvement of water quality in the Lavaca River watershed cannot be determined yet, but data will continue to be collected and analyzed. Long-term improvements may take years to show through data collection and analysis.

Post-Evaluation

Results from the post-evaluation suggested no difference between the two counties relating to knowledge of stocking rates, indicating there was no gain in knowledge as a result of the mailing campaign. However, this result was anticipated due to the pre-evaluation results indicating respondents from both counties had significant knowledge of stocking rates. Additionally, there was no difference in responses regarding intention to adopt between respondents from the two counties. However, the results indicated the participants from both Lavaca and Goliad counties in this post-evaluation adopted practices since July 2020. This result is consistent with the reports received from USDA NRCS and local SWCDs.

In the post-evaluation, respondents overall reported they were aware of USDA NRCS and their local SWCD, with similar frequencies compared to the pre-evaluation. Responses indicated slightly more landowners (compared to the pre-evaluation) were aware thta the agencies work with landowners to develop conservation plans, the agencies offer financial assistance, and landowners' interaction with the agencies is kept confidential. During the six months in which educational mailers were sent, COVID-19 could have impacted and limited contact between landowners and the agencies due to reduced availability to contact the offices.

Recommendations and Implications

There are many recommendations following this study. Collaborating with local SWCDs and USDA NRCS to ensure funding is available prior to initiating a mailing campaign is important so as to not lose the interest of landowners who work with or would like to work with the agencies. Also, researchers must communicate with local SWCDs and USDA NRCS so that the mailing dates do not interfere with the end of the fiscal year, for example. As time passes over the course of the project, addresses change frequently. Therefore, it is important to maintain and update the mailing lists. This reduces the number of undeliverable mailers and maximizes the reach of the project to as many landowners as possible.

An evaluation prior to and following a mailing campaign can help measure barriers to adoption, ideal communication channels, distribution frequency for educational materials, and other information relative to the best way to reach landowners. An example of this is a characteristic identified in the Lavaca County pre-evaluation where most respondents indicated that 0–20% of their income comes from agricultural production. One assumption can be made that these respondents are not full-time agricultural producers, and that work off-farm makes up the bulk of their income, meaning that an in-person program that is during business hours would be difficult for many individuals to attend. Additionally, many landowners indicated they were unaware that working with USDA NRCS remained confidential, and researchers can determine the impact, if

any, that a confidentiality policy has on landowner adoption of practices and interaction with local SWCDs and USDA NRCS.

With an increase in practices implemented and planned, as well as conservation plans developed through USDA NRCS, SWCDs, and TSSWCB, this method of outreach has influenced more adoption of BMPs in six months than what many in-person educational programs are able to reach with one program. USDA NRCS, TSSWCB, and local SWCDs work to help landowners develop conservation plans and adopt BMPs. However, landowners need to be made aware of technical and financial assistance available. Outreach via educational mailers is cost-effective and reaches a wider array of landowners. This in turn could influence necessary changes in water quality management in Texas.

References

Dewald, S., Leggette, H. R., Murphrey, T. P., Berthold, A., Wagner, K. 2018. Communicating to landowners in the Texas Little River watershed: A descriptive analysis of their communication preferences for receiving water related information. Journal of Agricultural Education. 59 (2): 343-369. https://doi.org/10.5032/jae.2018.02343.

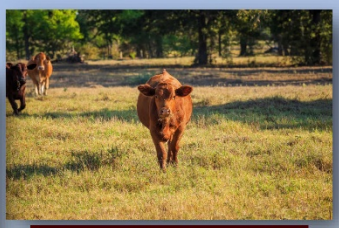
Appendix A - Mailer

AM I PROPERLY STOCKED?

OVERSTOCKING INDICATORS:

- Bare patches
- Visible hooves from a distance
- Noticeable manure from a distance
- Weed encroachment

Overgrazed: hooves and manure visible at a distance.



Appropriate stocking rates: adequate forage & root growth.

ADVANTAGES TO APPROPRIATELY STOCKING:

- Protection of soil & water resources
- Drought resilience
- Decrease in feeding costs
- Increase forage production
- Higher body scores

OVERSTOCKING CAN LEAD TO:

- Susceptibility to drought
- Increased feeding costs
- Increased soil erosion & rainfall runoff
- Decreased forage production
- Increased external parasites

Overgrazed vs. Not Overgrazed

ACHIEVE APPROPRIATE STOCKING RATES THROUGH:

- Developing a grazing plan
- Resting your pasture & allowing for recovery
- Cross fencing
- Adding shade structures & fresh water sources
- Stocking according to YOUR grazable acres

WHO CAN HELP?

*All photos taken in October 2019 on neighboring properties.

TAMU IRB NUMBER: IRB2020-0058 IRB APPROVAL DATE: 04/20/2020

YOUR LOCAL SWCD & NRCS CAN PROVIDE…

FINANCIAL ASSISTANCE

Funding may be available to install practices that benefit your operation.

TECHNICAL ASSISTANCE

Your local district can help you form a FREE conservation plan to maximize efficiency.

Lavaca County Soil & Water Conservation District
801 West Fairwinds, Ste 1A
Hallettsville, TX 77964
361-798-3277
lavaca@swcd.texas.gov

This project was funded by the Texas State Soil & Water Conservation Board

TEXAS STATE Soil & Water CONSERVATION BOARD

TEXAS A&M AGRILIFE EXTENSION

Texas Water Resources Institute

NRCS

Texas A&M AgriLife Extension Service
Texas Water Resources Institute
2260 TAMU
College Station, TX 77845-2260

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Appendix B – Pre-Evaluation

Grazing Management Study

Please mark the answer(s) that best reflect your situation. Please note the marking instructions below. All information will be kept strictly confidential and will not be shared. Thank you for your participation and your time!

MARKING INSTRUCTIONS
CORRECT: ● INCORRECT: ⊘ ⊗ ◒ ◓

Please use a black or blue ink pen.

1. **Do you own or operate land that is used for beef production?**
   - O Yes (please continue filling out the survey)
   - O No (please return the incomplete survey)

Stocking Rates

2. **Which best defines your current stocking rate *(Mark one only)***
   - O I am definitely using proper stocking rates on my operation
   - O I am probably using proper stocking rates on my operation
   - O I am not sure
   - O I am probably not using proper stocking rates on my operation
   - O I am definitely not using proper stocking rates on my operation.

3. **Please indicate below the extent to which you agree or disagree with how you use each of the following to determine your stocking rate. Fill in ONE bubble for each strategy.**

Strategies	Strongly Disagree	Disagree	Somewhat Disgree	Somewhat Agree	Agree	Strongly Agree
Based on the county appraisal district's recommendations.	O	O	O	O	O	O
Based on forage availability.	O	O	O	O	O	O
Based on calculated grazeable acres for my pastures.	O	O	O	O	O	O
Based on preparation for change in season.	O	O	O	O	O	O
Based on current or anticipated market prices.	O	O	O	O	O	O
Other (please describe):	O	O	O	O	O	O

4. **Please indicate which of the following you believe can be indicators of overstocking. Fill in ONE bubble for each indicator.**

Indicators	Strongly Disagree	Disagree	Somewhat Disgree	Somewhat Agree	Agree	Strongly Agree
Bare patches on the land.	O	O	O	O	O	O
Weed/brush encroachment .	O	O	O	O	O	O
Visible hooves from a distance.	O	O	O	O	O	O
Noticeable manure visible from a distance.	O	O	O	O	O	O
Less desirable body scores .	O	O	O	O	O	O
Other (please describe):	O	O	O	O	O	O

Please continue to the next page.

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5. Please indicate which of the following you believe can result from overstocking. Fill in ONE bubble for each of the listed conditions.

Conditions	Strongly Disagree	Disagree	Somewhat Disgree	Somewhat Agree	Agree	Strongly Agree
Susceptibility to drought.	O	O	O	O	O	O
Increased soil erosion and rainfall runoff.	O	O	O	O	O	O
Increased external parasites.	O	O	O	O	O	O
Increased feeding period.	O	O	O	O	O	O
Increase in supplemental feeding needs.	O	O	O	O	O	O
Decrease in forage production.	O	O	O	O	O	O
Decrease in herd performance.	O	O	O	O	O	O
Reduced land carrying capacity.	O	O	O	O	O	O
Other (please describe):	O	O	O	O	O	O

6. Please indicate which of the following you believe to be advantages of using proper stocking rates. Fill in ONE bubble for each perceived advantage.

Advantages	Strongly Disagree	Disagree	Somewhat Disgree	Somewhat Agree	Agree	Strongly Agree
Drought resilience.	O	O	O	O	O	O
Protection of soil and water resources.	O	O	O	O	O	O
Decreased feeding period.	O	O	O	O	O	O
Decrease in supplemental feeding needs.	O	O	O	O	O	O
Higher body scores.	O	O	O	O	O	O
Increased forage production.	O	O	O	O	O	O
Increased plant resiliency.	O	O	O	O	O	O
Other (please describe):	O	O	O	O	O	O

7. Please indicate your intention to adopt the following practices. Fill in ONE bubble for each of the following practices.

Practices	Will Not Adopt	Undecided	Plan to Adopt	Already Adopted	Not Applicable
Calculating Grazable Acres for Stocking Rates.	O	O	O	O	O
Grazing Plan/Prescribed Grazing.	O	O	O	O	O
Cross Fencing.	O	O	O	O	O
Alternative Water Sources.	O	O	O	O	O
Alternative Feed/Salt/Mineral Locations.	O	O	O	O	O
Alternative Shade Structures.	O	O	O	O	O
Other (please describe):	O	O	O	O	O

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MARKING INSTRUCTIONS
CORRECT: ● INCORRECT: ⊘ ⊗ ◒ ◓

8. Please indicate <u>what</u> about each of the following practices <u>encouraged or could encourage</u> you to implement the practice.

   In each row, <u>please select ALL</u> that apply to your belief.

Practices	Is better than what I was doing	Fits my operation	Easy to implement	Was able to try before fully implementing	Observed it's benefits before implementing	None of These
Calculating Grazable Acres for Stocking Rates.	O	O	O	O	O	O
Grazing Plan/Prescribed Grazing.	O	O	O	O	O	O
Cross Fencing.	O	O	O	O	O	O
Alternative Water Sources.	O	O	O	O	O	O
Alternative Feed/Salt/Mineral Locations.	O	O	O	O	O	O
Alternative Shade Structures.	O	O	O	O	O	O
Other (please describe):	O	O	O	O	O	O

9. Please indicate your awareness of the following agencies and their capabilities by <u>filling in yes or no</u> for the following questions.

Awareness	Yes	No
Are you aware of Lavaca Soil and Water Conservation District (SWCD)?.	O	O
Are you aware of the USDA- Natural Resources Conservation Services (USDA-NRCS)?	O	O
Did you know that the agencies mentioned above work to protect and enhance your working lands and natural resources?.	O	O
Did you know that the agencies mentioned above offer free technical assistance?	O	O
Did you know that the agencies mentioned above offer financial assistance?.	O	O
Did you know that any technical and financial assistance that you receive is confidential?.	O	O
Did you know that the agencies mentioned above work with you to develop a water conservation plan that will help attain your goals?	O	O

10. What are some of your interests related to your operation or land? Please list as many as you'd like below.

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MARKING INSTRUCTIONS
CORRECT: ● INCORRECT: ⊘ ⊗ ◒ ◓

FARM CHARACTERISITCS

11. Which best describes your beef operation? *(Mark one only)*

- O Commercial Cow/Calf
- O Seedstock
- O Backgrounder/Stocker
- O Feedlot/Finishing Operation
- O Other (please describe): _____

12. Approximately how many years have you been in production agriculture?

- O 0-10 years
- O 11-25 years
- O 26-40 years
- O 41 to 60 years
- O 61+ years
- O None - I lease my property for ag production

13. Of the land that you operate or own, how many acres would fall under each of the following categories?

Self-owned: ☐☐☐☐☐☐

Owned by a local individual: ☐☐☐☐☐☐

Owned by an individual who is NOT local: ☐☐☐☐☐☐

Owned by a public or private entry: ☐☐☐☐☐☐

14. Please indicate the approximate number of acres you operate and number of acres per head for each of the following land types?

	Acres	# Acres Per Head
Improved pasture / hay-land:	☐☐☐☐☐☐	☐☐☐☐☐☐
Unimproved pasture:	☐☐☐☐☐☐	☐☐☐☐☐☐

PERSONAL CHARACTERISITCS

15. Which age range do you fall into?

- O Under 18
- O 18 - 30
- O 31 - 50
- O 51 - 70
- O 71 and over

16. What is your gender?

- O Female
- O Male

17. What is your ethnicity?

- O American Indian or Alaskan Native
- O Asian
- O Black or African American
- O Native Hawaiian or Pacific Islander
- O Spanish, Hispanic, or Latino
- O White

18. What is the highest level of education you have completed?

- O Less than High School
- O High school graduate
- O Some college
- O Associate's Degree
- O Bachelor's Degree
- O Graduate Degree

19. Approximately what percentage of your household net income comes from your beef cattle operation?

- O 0%
- O 1- 20%
- O 21-40%
- O 41-60%
- O 61-80%
- O 81-100%

Thank you for participating!

IRB NUMBER: IRB2020-0058M IRB APPROVAL DATE: 05/11/2020

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Appendix C – Post-Evaluation

Grazing Management Study

Please mark the answer(s) that best reflect your situation. All information will be kept strictly confidential and will not be shared. Thank you for you participation and your time!

1. Do you own or operate land that is used for beef production?
   - ○ Yes- Please continue filling out the survey.
   - ○ No- Please return the incomplete survey.

STOCKING RATES

2. Which best defines your current stocking rate? Please select **ONE**.
   - ○ I am definitely using proper stocking rates on my operation.
   - ○ I am probably using proper stocking rates on my operation.
   - ○ I am not sure.
   - ○ I am probably not using proper stocking rates on my operation.
   - ○ I am definitely not using proper stocking rates on my operation.

3. Please indicate below your level of agreement with how you use each of the following to determine your stocking rate. Fill in **ONE** bubble for each strategy.

Strategies	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Based on the county appraisal district's recommendations	○	○	○	○	○	○
Based on forage availability	○	○	○	○	○	○
I have calculated my stocking rate based on my grazeable acres.	○	○	○	○	○	○
Based on preparation for change in season	○	○	○	○	○	○
Based on current or anticipated market prices	○	○	○	○	○	○
Other (please describe):	○	○	○	○	○	○

4. Please indicate which of the following you believe can be indicators of overstocking. Fill in **ONE** bubble for each indicator.

Indicators	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Bare patches on the land	○	○	○	○	○	○
Weed/brush encroachment	○	○	○	○	○	○
Visible hooves from a distance	○	○	○	○	○	○
Noticeable manure visible from a distance	○	○	○	○	○	○
Less desirable body scores	○	○	○	○	○	○
Other (please describe):	○	○	○	○	○	○

5. Please indicate which of the following you believe can result from overstocking. Fill in **ONE** bubble for each of the listed conditions.

Conditions	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Susceptibility to drought	○	○	○	○	○	○
Increased soil erosion and rainfall runoff	○	○	○	○	○	○
Increased external parasites	○	○	○	○	○	○
Increased feeding period	○	○	○	○	○	○
Increase in supplemental feeding needs	○	○	○	○	○	○
Decrease in forage production	○	○	○	○	○	○
Decrease in herd performance	○	○	○	○	○	○
Reduced land carrying capacity	○	○	○	○	○	○
Other (please describe):	○	○	○	○	○	○

6. Please indicate which of the following you believe to be advantages of using proper stocking rates. Fill in **ONE** bubble for each perceived advantage.

Advantages	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Drought resilience	○	○	○	○	○	○
Protection of soil and water resources	○	○	○	○	○	○
Decreased feeding period	○	○	○	○	○	○
Decrease in supplemental feeding needs	○	○	○	○	○	○
Higher body scores	○	○	○	○	○	○
Increased forage production	○	○	○	○	○	○
Increased plant resiliency	○	○	○	○	○	○
Other (please describe):	○	○	○	○	○	○

7. Beginning in July 2020, you should have received several educational flyers by mail about stocking rates. **As a result of these flyers**, have you adopted any of the following best management practices on your operation? Fill in **ONE** bubble for each of practice.

Practices	Will Not Adopt	Undecided	Plan to Adopt	Adopted Since July 2020	Adopted Prior to July 2020	Not Applicable
Calculating Grazeable Acres for Stocking Rates	○	○	○	○	○	○
Grazing Plan/Prescribed Grazing	○	○	○	○	○	○
Cross Fencing	○	○	○	○	○	○
Alternative Water Sources	○	○	○	○	○	○
Alternative Feed/Salt/Mineral Locations	○	○	○	○	○	○
Alternative Shade Structures	○	○	○	○	○	○
Other (please describe):	○	○	○	○	○	○

8. Were any of these practices adopted using assistance from the local Soil and Water Conservation District (SWCD) or USDA-Natural Resources Conservation Services (USDA-NRCS)?

Practices	Yes	No	Not Applicable
Calculating Grazeable Acres for Stocking Rates	○	○	○
Grazing Plan/Prescribed Grazing	○	○	○
Cross Fencing	○	○	○
Alternative Water Sources	○	○	○
Alternative Feed/Salt/Mineral Locations	○	○	○
Alternative Shade Structures	○	○	○
Other (please describe):	○	○	○

9. Please indicate your awareness of the following agencies and their capabilities by filling in yes or no for the following questions.

Awareness	Yes	No
Are you aware of your local Soil and Water Conservation District (SWCD)?	○	○
Are you aware of the USDA- Natural Resources Conservation Services (USDA-NRCS)?	○	○
Have you contacted your local NRCS or SWCD since July 2020?	○	○
Did you know that the agencies mentioned above work to protect and enhance your working lands and natural resources?	○	○
Did you know that the agencies mentioned above offer free technical assistance?	○	○
Did you know that the agencies mentioned above offer financial assistance?	○	○
Did you know that any technical and financial assistance that you receive is confidential?	○	○
Did you know that the agencies mentioned above work with you to develop a water conservation plan that will help attain your goals?	○	○

10. If Texas A&M AgriLife Extension or any of the agencies mentioned above were to distribute educational material, what topics would you be interested in? Please list as many as you would like below.

FARM CHARACTERISTICS

11. Which best describes your beef operation?

- ○ Commercial Cow/Calf
- ○ Seedstock
- ○ Backgrounder/Stocker
- ○ Feedlot/Finishing Operation
- ○ Other (please describe): _____

12. Approximately how many years have you been in production agriculture?

- ○ 0-10 years
- ○ 11-25 years
- ○ 26-40 years
- ○ 41-60 years
- ○ 61+ years
- ○ None- I lease my property for ag production

13. Of the land that you operate or own, how many acres would fall under each of the following categories?

Ownership Status	Acreage
Self-Owned	
Owned by a local individual	
Owned by an individual who is NOT local	
Owned by a public or private entry	

14. Please indicate the approximate number of acres you operate and number of acres per head for each of the following land types.

Pasture Type	Acres	# of Acres per Head
Improved pasture/ hay-land		
Unimproved pasture		

PERSONAL CHARACTERISTICS

15. Which age range do you fall into?

- ○ Under 18
- ○ 18-30
- ○ 31-50
- ○ 51-70
- ○ 71 and over

16. What is your gender?

- ○ Female
- ○ Male

17. What is your ethnicity?

- ○ American Indian or Alaskan Native
- ○ Asian
- ○ Black or African American
- ○ Native Hawaiian or Pacific Islander
- ○ Spanish, Hispanic, or Latino
- ○ White

18. What is the highest level of education you have completed?

- ○ Less than High School
- ○ High school graduate
- ○ Some college
- ○ Associate's Degree
- ○ Bachelor's Degree
- ○ Graduate Degree

19. Approximately what percentage of your household net income comes from your beef cattle operation?

- ○ 0%
- ○ 1-20%
- ○ 21-40%
- ○ 41-60%
- ○ 61-80%
- ○ 81-100%

THANK YOU FOR PARTICIPATING!!