

# DIXON WATER FOUNDATION

## 2020 – ANNUAL REPORT



### **HEALTHY LAND. HEALTHY WATER. HEALTHY LIVING FOR ALL.**

The Dixon Water Foundation’s mission is to promote healthy watersheds and sequestration of carbon through regenerative land management, to ensure that present and future generations have the water resources they need.

Through our ranches, grants, education programs, and research partnerships, we hope to help people protect the great environmental resources of our country.

This report summarizes the efforts taken by Dixon Water Foundation to achieve the goals of their mission in the year 2020.

## **2020 Staff and Board of Directors**

### Staff:

- Robert Potts – President and CEO
- Casey Wade – Vice President of Ranching Operations
- Melissa Bookhout – North Texas Education Coordinator/Secretary/Treasurer
- Philip Boyd – Director of Science and Communications
- Rachel Vasquez – Program Director

### Ranch Managers:

- Robby Tuggle – North Texas Ranch Manager
- Lee Young – West Texas Ranch Manager

### Board of Directors:

- Clinton W. Josey, Jr.
- Kathy Smyth
- Jerry Addison
- Hugh Aljoe
- Walt Davis
- Leslie C. Rauscher
- Laura Whiting
- Robert Potts

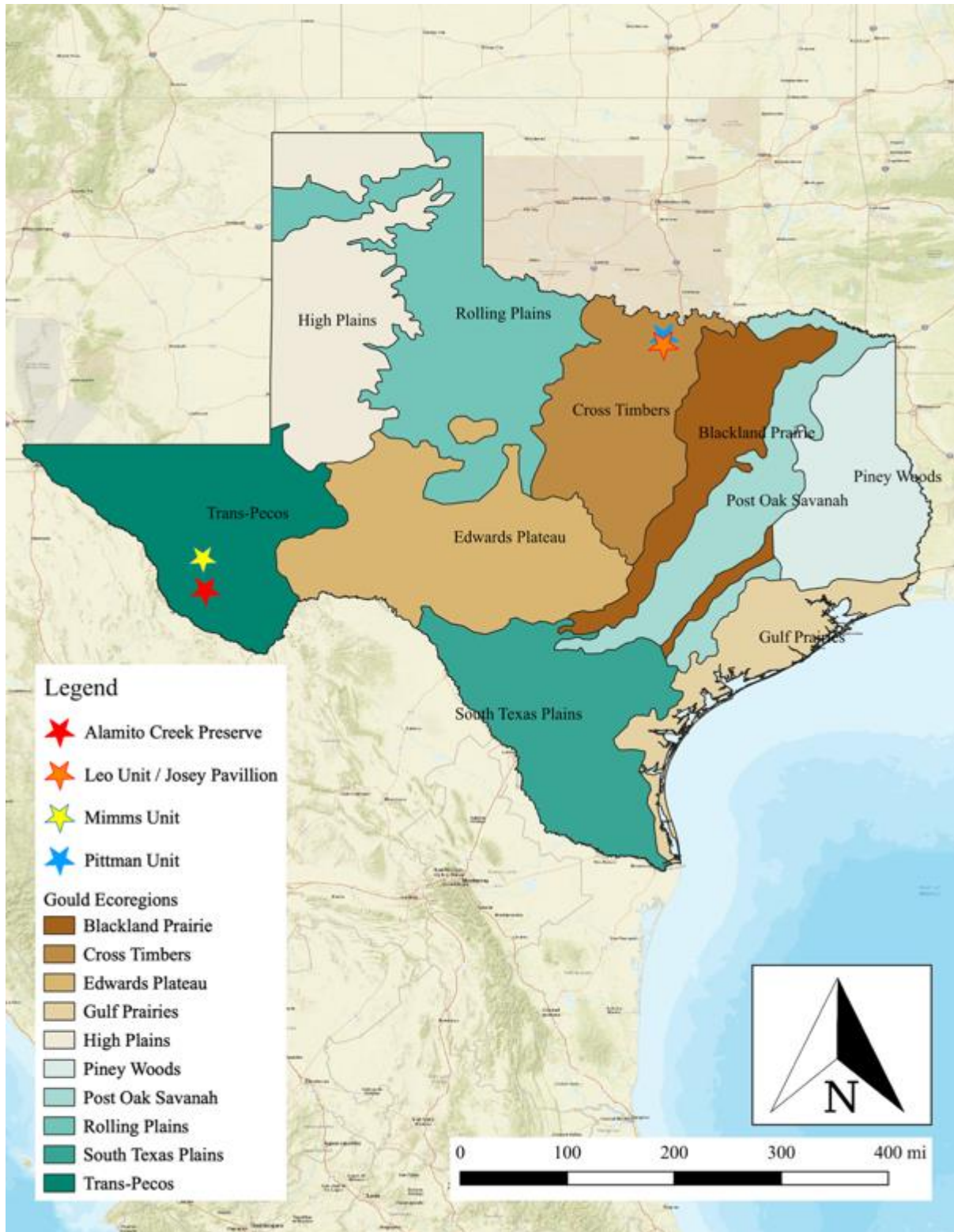
### Science Advisory Board:

- Dr. Bonnie Warnock
- Dr. Richard Teague

### 2020 changes in Board of Directors and Staff:

The Foundation hired Lee Young to manage the Mimms Unit in Marfa, Texas, in June, 2020. Mr. Young's family were long-time ranchers near Balmorhea, Texas, in the Trans-Pecos before relocating to Junction, Texas. Mr. Young still has ties to West Texas.

Rachel Vasquez began working for the Foundation on December 1, 2020 as Program Director. Ms. Vasquez previously worked for The Nature Conservancy in multiple capacities. Ms. Vasquez will be working with the Foundation's granting program, as well as developing the Foundation's internship program.



*Figure 1. Dixon Water Foundation Ranch locations and Texas Ecoregions created from map in Gould, F. W. 1975, updated by Texas Parks and Wildlife Department (TPWD) GIS Lab 1/09/2004 and downloaded from the TPWD GIS Website.*

## **Letter from the President and CEO**

Dear Reader,

By just about any measure, 2020 was a difficult year. Covid reduced the number of educational events we could host at our ranches, and as I write this, we are suffering a crippling drought at our Presidio County ranch in West Texas. In spite of these obstacles, the Foundation accomplished some important work in 2020. This annual report details these accomplishments - as well as the setbacks of the past year. I hope you find this report informative and interesting.

In the coming year we will build on the foundation of past years' work to advance our mission of improving watershed health. We look forward to working with you to achieve this goal.

Sincerely,

Robert J. Potts

President & CEO

# **2020 Ranching Operations**

## *North Texas*

Dixon Water Foundation owns and manages roughly 4,500 acres in Wise and Cooke Counties. The ranches are in the Cross Timbers and Prairies Ecoregion (*Figure 1*) in North-Central Texas, 22 miles north east of Decatur, Texas, and 32 miles north west of Denton, Texas. The Foundation ranches sheep and cattle in North Texas.



*Figure 2. Dixon Water Foundation's North Texas Block property with a view facing the Leo Unit and the Josey Pavilion (Photo by Melissa Bookhout)*



# **North Texas Ranching Update**

## ***Casey Wade – Vice President of Ranching Operations***

Our Leo Ranch in North Central Texas had an exceptionally good year in 2020. It's a little strange that two ranches in the very same state could have such different years. I guess it goes to show how far apart they are as well as how different the ecoregions are. The Leo Unit did not have overly abundant rainfall in 2020. It was an average rainfall year, between 30 and 40 inches, but the rain fell in a timely way. The rain also came all the way through July and August which is typically the brutally hot and dry time of the year. All in all, we had a great growing season.

We are continuing to make good progress on infrastructure development in North Texas. With all of the added land there has been an enormous amount of fence to build as well as water development and clean up. We are now able to graze our sheep herd on some of the newly acquired land and keep the neighbor's bulls out.

A long-awaited goal has almost been reached, in that we are almost completely stocked at our Leo Ranch. We have been retaining heifers in order to build our cattle numbers for years but with the addition of fifty-plus corriente cows as well as our droughted cattle from Marfa, we are finally very near our ideal stock numbers in North Texas. Hopefully between good rainfall and good management we can keep it that way.

Finally, I guess the biggest change for my family and me is a recent move to the Leo Ranch. After living at the Mimms Unit for the past ten years, my family and I moved to the Leo Unit in November. This move will allow me to become more closely acquainted with our North Texas operation and learn from our Leo Ranch manager, Robby Tuggle who has been on the ranch for over 25 years. I look forward to spending more time at our Leo Unit and I look forward to the joys and challenges of 2021.

## **Property Updates**

With the addition of several properties around the Foundation's Leo Unit in 2019, staff continued to improve infrastructure at the North Texas ranches in 2020. These improvements included updating interior and exterior fencing, as well as adding wells and water points.

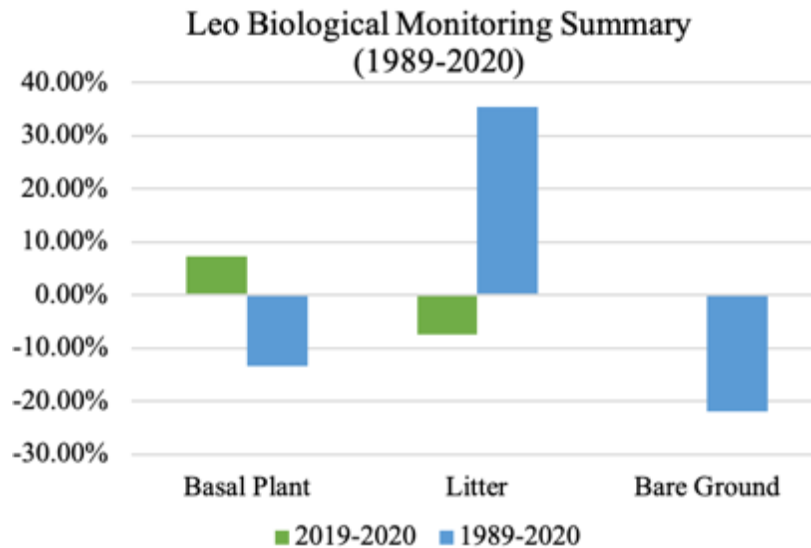
## Biological Monitoring update

Foundation staff conducted annual biological monitoring at the North Texas ranches in November 2020. The biological monitoring process employs a method developed by Holistic Management International. The process involves traveling to fixed monitoring points each year where staff throw 100 darts into the air around each point. As the darts hit the ground, staff document what type of ground cover the dart landed on: bare ground, litter, or basal plant cover. The staff member also documents the type of plant closest to the dart, based on 10 categories: Prairie complex, Johnson Grass, High Seral Forb, Mid Seral Grass, Mid Seral Forb, Introduced Grass, Sedges, Bermuda Grass, Low Seral Grass, and Low Seral Forbs.

**Leo Unit-** On the Leo Unit, this type of monitoring has been conducted since 1989. A primary goal of the grazing plan the Foundation has in place is to reduce the amount of bare ground on the landscape. Through annual monitoring, the Foundation is able to track any changes in conditions. On the Leo Unit, there are 5 fixed monitoring points. When the percentages are averaged for all 5 monitoring points, the 2020 biological monitoring efforts reported an average of 23.20% basal plant cover, 76.60% litter, and 0.20% bare ground across surveyed points on the Leo Unit (*Table 1*). There was no change in bare ground cover percentage from the 2019 monitoring effort, and a reduction of 22.00% in bare ground since 1989 (*Figure 3*).

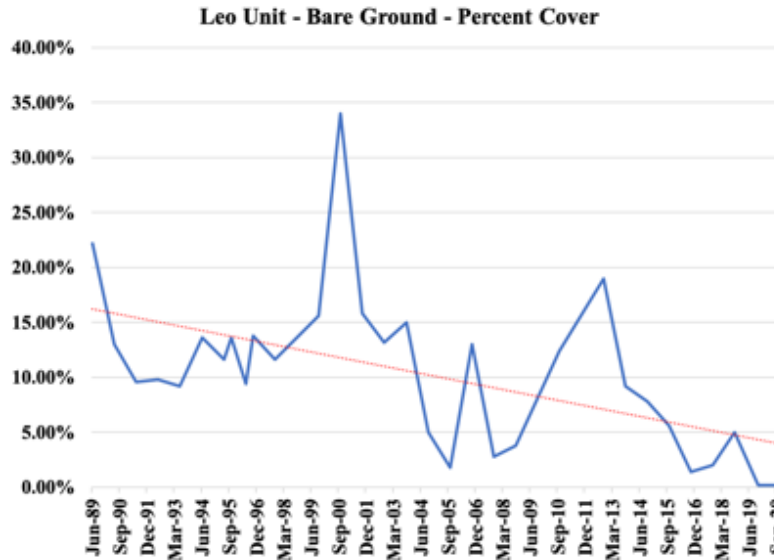
<b>Table 1 - Leo Unit Ground Cover Averages</b>			
	<b>Basal Plant</b>	<b>Litter</b>	<b>Bare Ground</b>
<b>1989</b>	36.60%	41.20%	22.20%
<b>2019</b>	15.80%	84.00%	0.20%
<b>2020</b>	23.20%	76.60%	0.20%

*Table 1. Percent cover for each cover type on the Leo Unit between 2019-2020 and 1989-2020.*



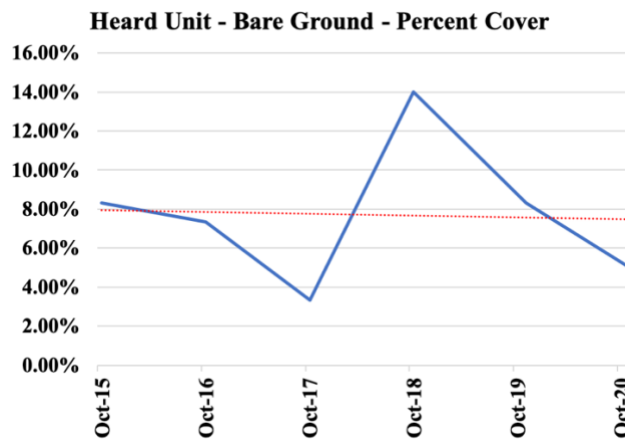
*Figure 3. Percent change in ground cover types on the Leo Unit between 2019-2020 (green) and 1989-2020 (blue).*

Each individual year and monitoring point may show some variation. When all monitoring point results are averaged and plotted on a chart for each year that has been surveyed, an overall trend in ground cover change can be seen (*Figure 4*). Through consistent monitoring efforts, staff has recorded a decreasing bare ground trend at the Foundation’s Leo Unit.



*Figure 4. Leo Unit- Percent bare ground recorded 1989-2020 (blue line) and trend of change in bare ground 1989-2020 (red line)*

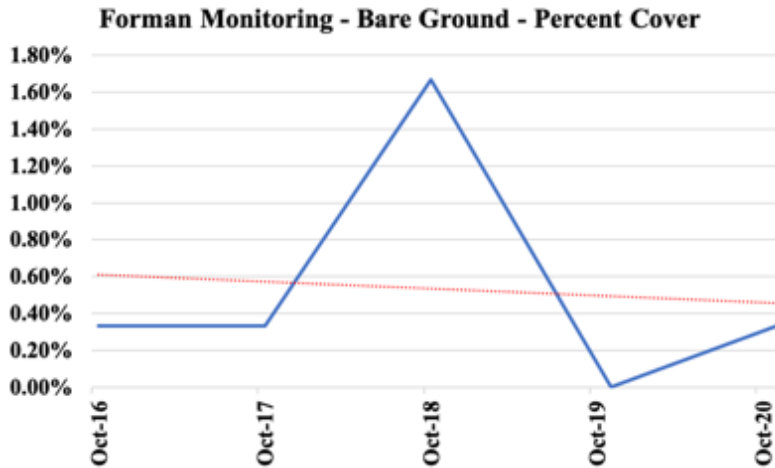
**Heard Unit-** The Heard Unit is a property connected to the Leo Unit. The Heard Unit has been surveyed utilizing the same biological monitoring method as the Leo Unit since 2015, when the Foundation bought the land. The property is still undergoing infrastructure and management transitions. There are 3 fixed monitoring points on the Heard Unit. One of these points was not surveyed in 2018. A slight decreasing trend in bare ground was documented from 2015-2020.(*Figure 5*).



*Figure 5. Heard Unit - Percent bare ground recorded 2015-2020 (blue line) and trend of change in bare ground 2015-2020 (red line)*

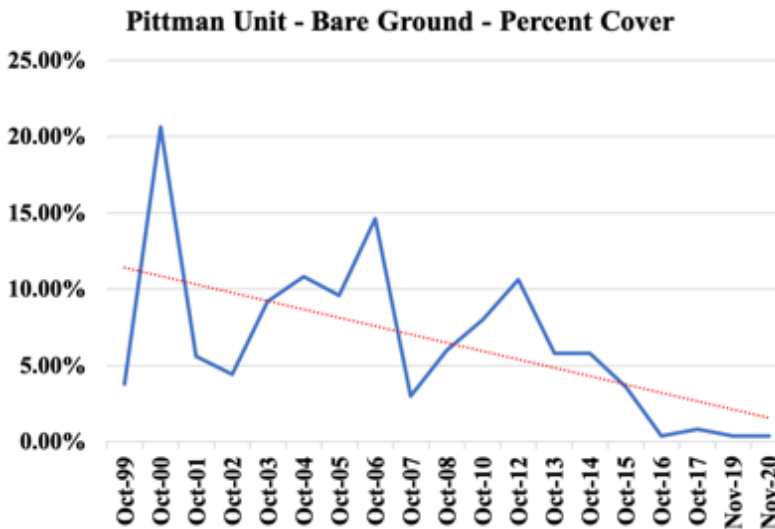


**Forman Unit-** The Forman Unit is a property connected to the Leo Unit. The Forman Unit has been surveyed utilizing the same biological monitoring method used on the Leo and Heard Units since 2016. There are 3 monitoring points on the Forman and 2020 marked the 5<sup>th</sup> year of monitoring. The property is still undergoing infrastructure and management transitions. The average amount of bare ground surveyed has been minimal (0.53%) with a decreasing trend throughout the monitoring data (*Figure 6*).



*Figure 6. Forman Unit - Percent bare ground recorded 2016-2020 (blue line) and trend of change in bare ground 2016-2020 (red line)*

**Pittman Unit-** The Pittman Unit is a property roughly 7 miles north of the Leo Unit. The Pittman Unit has been surveyed utilizing the same biological monitoring method used on the Leo Unit since 1999. There are 5 monitoring points on the Pittman Unit. The unit was not monitored in 2018 due to wet conditions. The average amount of bare ground surveyed in 2020 was the same as the previous year (0.40%) with an overall decreasing trend throughout the monitoring dataset (*Figure 7*).



*Figure 7. Pittman Unit - Percent bare ground recorded 1999-2020 (blue line) and trend of change in bare ground 1999-2020 (red line)*

## ***West Texas***

Dixon Water Foundation owns and manages roughly 30,500 acres in Presidio County. The ranches are in the Trans-Pecos Ecoregion (*Figure 1*). The Foundation's ranches are located near the town of Marfa, Texas, and along Alamito Creek, roughly 30 miles south of Marfa, Texas. The Foundation grazes cattle on the Mimms Unit ranch and grazes on Alamito Creek Preserve on a seasonal basis.



***Figure 8. Young steers on the George property, now part of the Mimms Unit, Marfa, Texas.  
(photo credit – Philip Boyd, March 2020)***

## **West Texas Ranching Update**

### ***Casey Wade – Vice President of Ranching Operations***

There is no doubt that 2020 has been a difficult year and our Mimms Ranch in Far West Texas is no exception. Much of West Texas has been in exceptional drought for most of 2020. The Mimms ranch typically receives around 15 inches of rain per year. This past year we received approximately 4.5 inches of rain. These drought conditions resulted in lighter grass fed steers shipped in October, increased feed cost and a lack of forage to make it through the dormant season. In an effort to not damage the range ecology we chose to de-stock by roughly 75% in October. I think this decision was timely and actually was a bit of an unexpected benefit. The drought in West Texas did not extend to our North Texas ranch location. The Leo Unit in North Texas was still under-stocked as of October 2020. Because of this we were able to ship a large portion of the cattle in West Texas to North Texas.

We also had the opportunity to bring on a new Ranch Manager at our Mimms Unit. Lee Young started in June of 2020. We are excited to have him and his family on the ranch and look forward to working with him in the years to come.

Our partnership with Sul Ross University and the Sustainable Ranch Management program continues to move forward. We were able to share our love for the land and livestock with two new interns during the spring semester of 2020.

2020 certainly offered up some difficult challenges, but all in all, I think we came through them in good shape and we are all looking forward to seeing what 2021 has in store for the Mimms Ranch.

### **Property Updates**

With the purchase of the George Ranch in 2019, the Foundation spent 2020 working on several infrastructure updates. These updates included staking out new fence-lines, updating water, and adding an updated set of working pens.

## Precipitation

Precipitation on the Mimms Unit is measured by 3 methods:

1. A weather station at the nearby Marfa Municipal Airport, which borders the north eastern portion of ranch 3 miles north on Highway 17 from the town of Marfa, Texas.
2. Analog rain gauges at ranch headquarters at the northern edge of the town of Marfa, Texas.
3. Data collected at 6 weather stations installed in January 2018 by the University of Texas Bureau of Economic Geology (UT BEG) across the northern portion of the ranch.

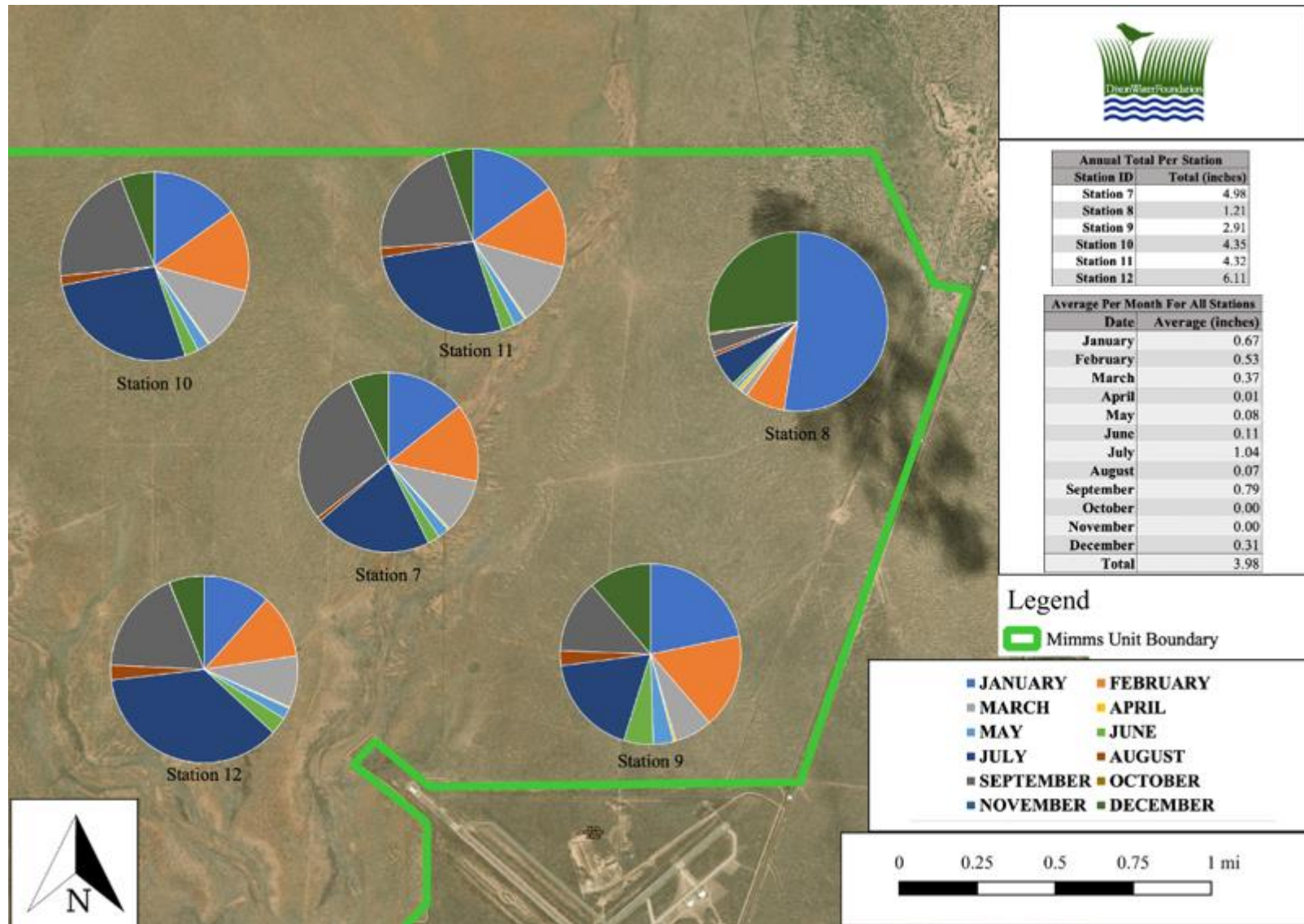
Weather station data from the Marfa Municipal airport was obtained through the Weather Underground website reported 4.72 in of precipitation in 2020.

Analog rain gauge levels were recorded by ranch managers and entered on paper charts used to track grazing details at the Mimms headquarters at the south end of the ranch. These rain gauge data reported an annual precipitation level of 6.9 in of rain for 2020, plus about 4 in of snow in December. There was 3.1 in of precipitation during the growing season (July – September). The first frost occurred October 26<sup>th</sup>, 2020.

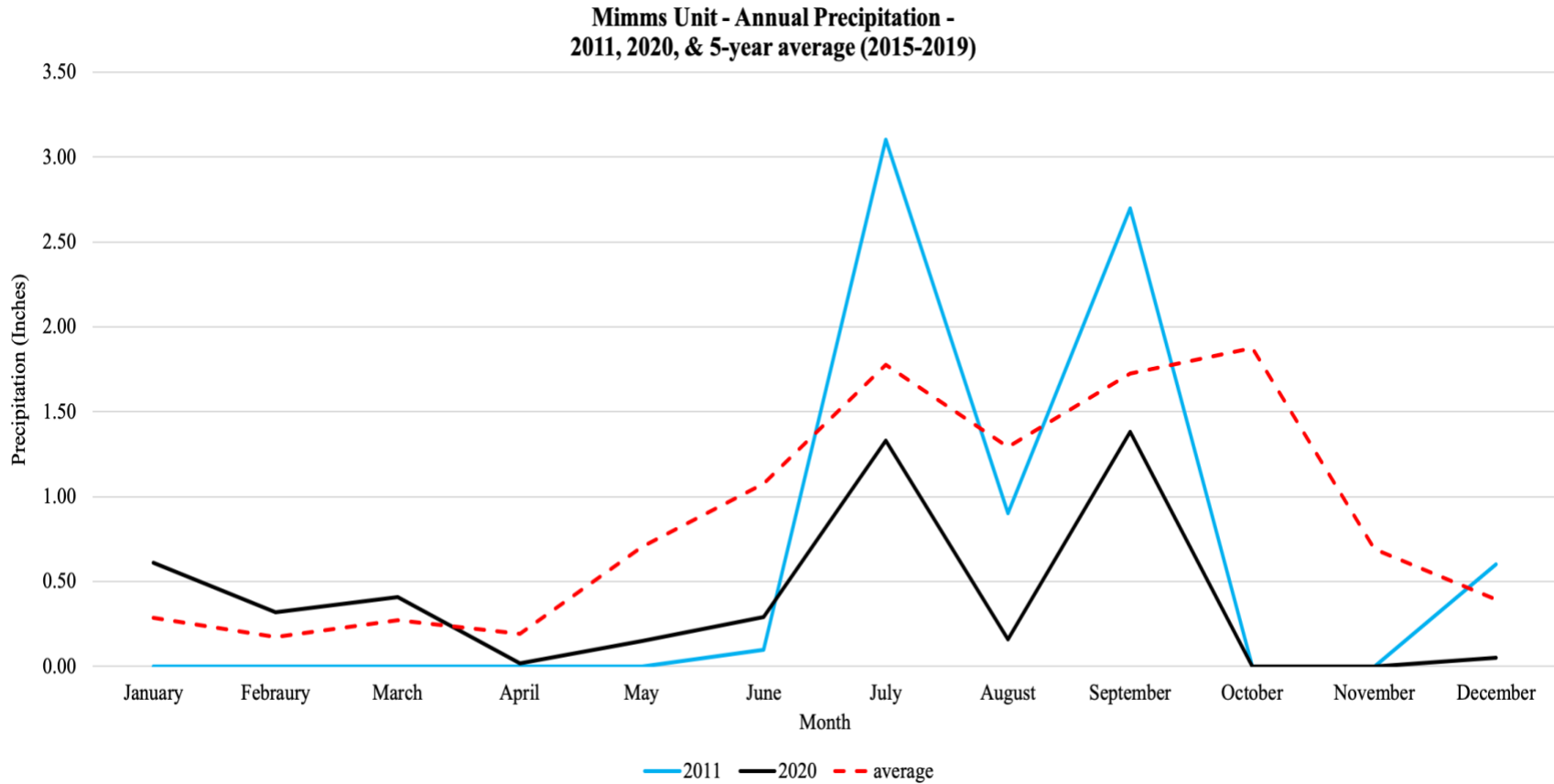
The UT BEG station data reported an average of 3.98 in of precipitation across all 6 weather stations for the year 2020. The months with the highest levels of recorded precipitation were June, September, and October (*Figure 12*).

During 2019 and 2020 the south side of the ranch received more precipitation than the north side.

The Mimms Unit experienced a severe drought which impacted the Trans-Pecos region in 2011. The 2011 drought is often referred to as a local benchmark for poor conditions. When comparing 2011 and 2020, the 2020 drought conditions are worse than average and worse than the 2011 precipitation totals (*Figure 13*).



**Figure 12. Monthly precipitation measurements (inches) collected by 6 University of Texas Bureau of Economic Geology weather stations on the Mimms Unit ranch and averaged per month for the year 2020.**



***Figure 13. Monthly precipitation measurements (inches) recorded by a weather station at the Marfa Municipal Airport (documented by Weather Underground) for the years 2011 (blue) and 2020 (black) as compared to a 5-year average for the years 2015-2019 (dashed red).***



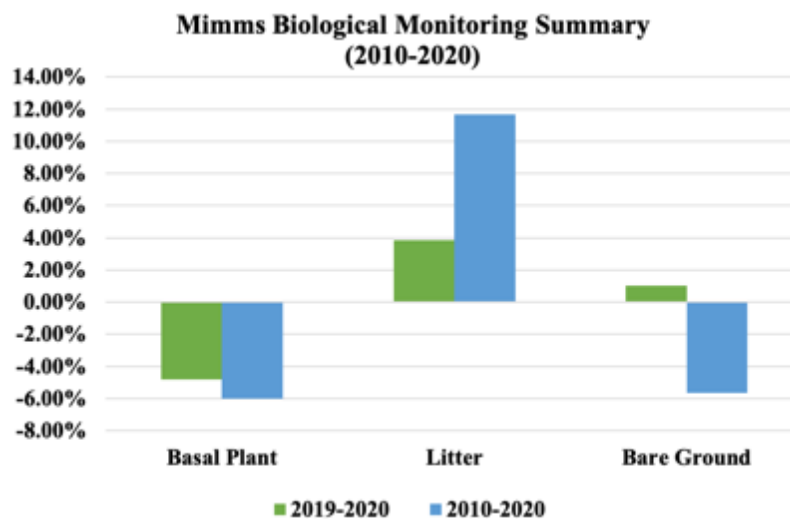


*Figure 14. Mimms Unit Middle Windmill Photo Point photographed in May 2020 before the typical monsoon season (top) and in early October, after the monsoon season and before the first frost (bottom). The lack of growing season precipitation brought about little change in the vegetation. (Photo Credit – Philip Boyd)*

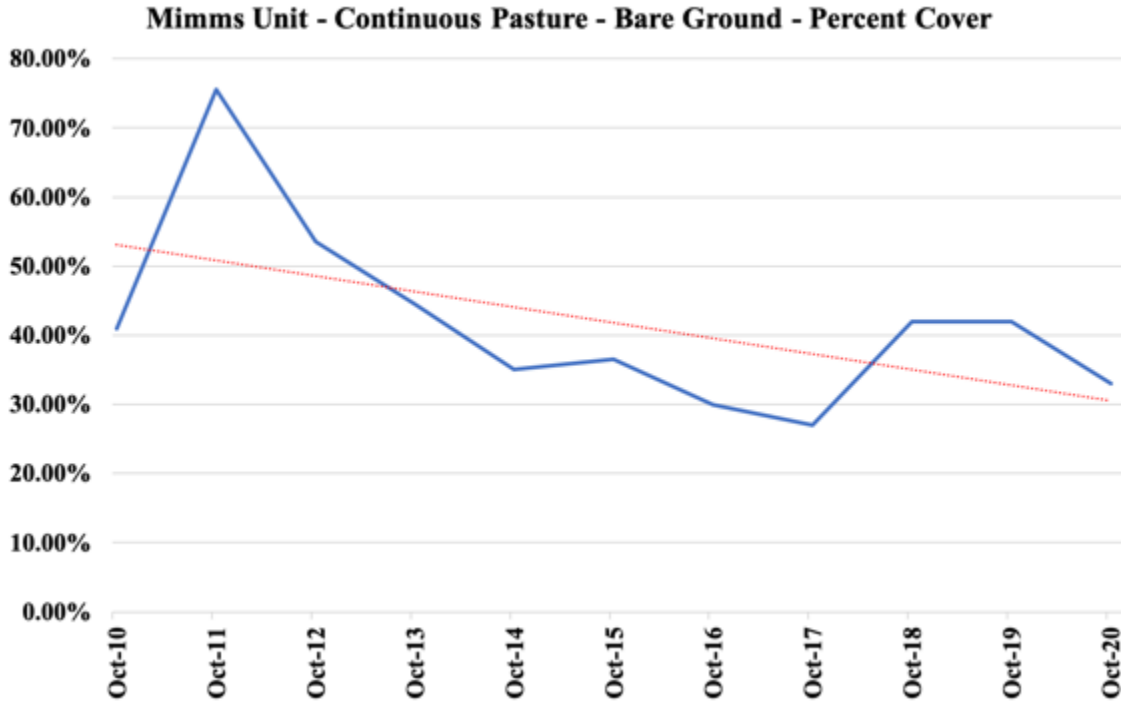
## Biological Monitoring update

Foundation staff conducted annual biological monitoring at the West Texas ranches in October 2020. Staff monitored the Mimms Unit, the George Property, and Hip-O East, which shares the Mimms Unit’s western boundary and is leased by the Dixon Water Foundation and under the Foundation’s grazing management. The biological monitoring process employs a method developed by Holistic Management International and is the same as the methodology used at the Foundation’s North Texas ranches. The process involves traveling to fixed monitoring points each year where staff throw 100 darts into the air around each point. As the darts hit the ground, staff document what type of ground cover the dart landed on: bare ground, litter, or basal plant cover. The staff member also documents the type of plant closest to the dart, based on 10 categories specific to the West Texas ecoregion: Prairie complex, High Seral Grass, High Seral Forb, Blue & Black Grama, Mid Seral Grass, Mid Seral Forb, Introduced Grass, Sedges, Low Seral Grass, and Low Seral Forbs.

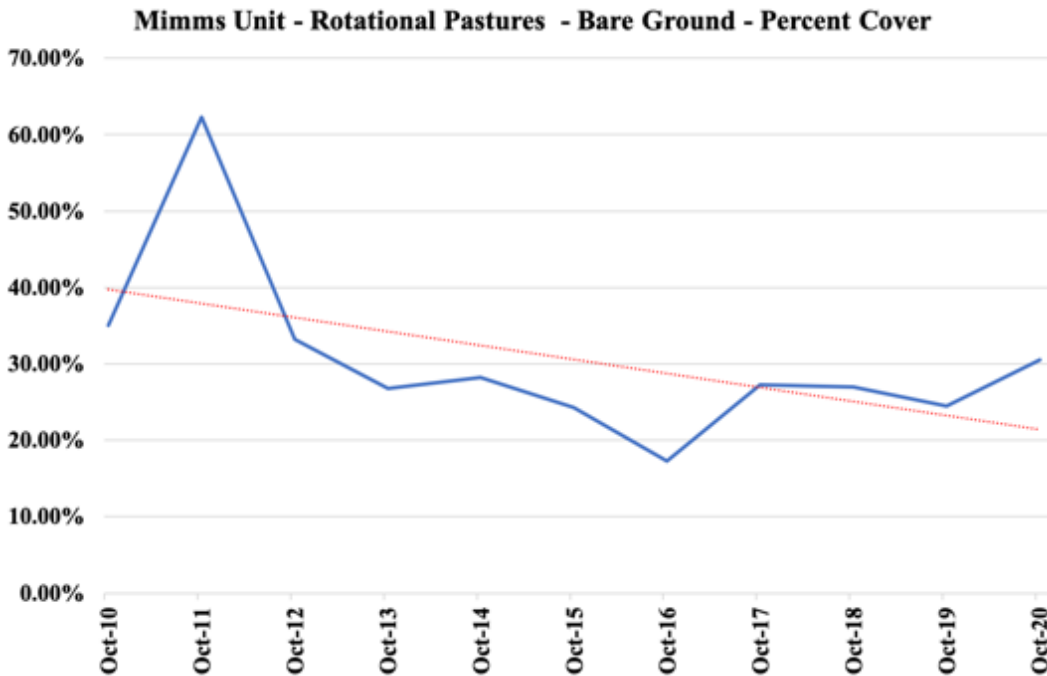
**Mimms Unit-** Dixon Water Foundation purchased the Mimms Unit in 2008 and began grazing it in 2009. The Mimms Unit has been monitored since 2010. The ranch succumbed to a large fire (“The Rockhouse Fire”) in April 2011, and most of the ranch burned. A shared goal across all Dixon Ranches is to utilize the grazing plan to reduce the amount of bare ground on the landscape. Another goal of the Mimms Unit is to be able to compare pastures grazed in a low stock density/continuous setting to pastures grazed in a high stock density rest/rotational setting. The Foundation has 4 monitoring points across the larger portion of the ranch which employs the rotational grazing practices, and 2 monitoring points in the continuously-grazed pasture. Across the entirety of the ranch, bare ground has decreased while litter has increased (*Figure 15*). Data averaged for all stations in each grazing regime shows a declining trend in bare ground for each management technique (*Figure 16*, *Figure 17*). The 2020 monitoring efforts recorded that the rotationally-grazed pasture showed an average of 2% less bare ground than the continuously-grazed pasture. When all pastures are averaged, the Mimms Unit, as a whole, is showing a reduction in bare ground (*Figure 18*).



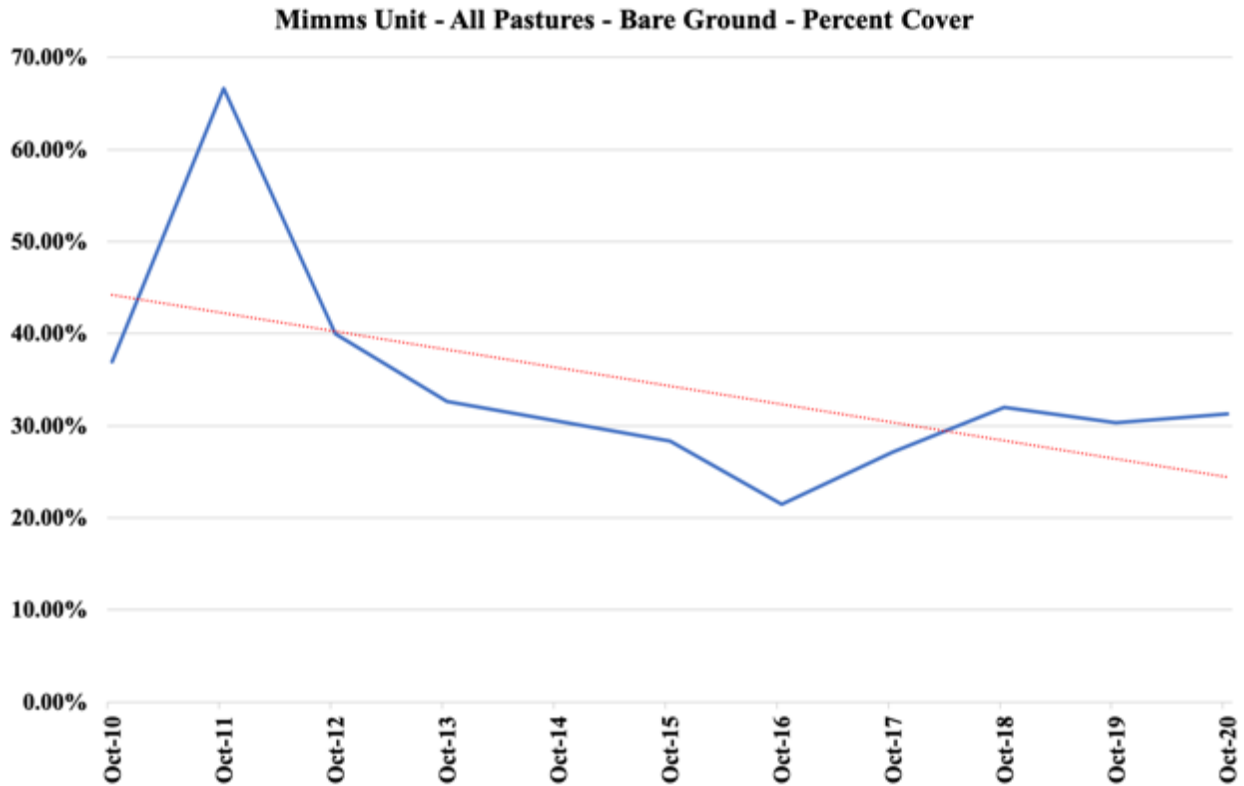
*Figure 15. Percent change in ground cover types between 2018-2020 (green) and 2010-2020 (blue).*



*Figure 16. Mimms Unit (Low Stock Density/Continuously Grazed Pasture) - Percent bare ground 2010-2020 (blue line) and trend of change in bare ground 2010-2020 (red line)*



*Figure 17. Mimms Unit (Rotationally Grazed Pasture) - Percent bare ground 2010-2020 (blue line) and trend of change in bare ground 2010-2020 (red line)*



**Figure 18. Mimms Unit (Average across all pastures) - Percent bare ground 2010-2020 (blue line) and trend of change in bare ground 2010-2020 (red line)**

**George Property** – Three monitoring points were evaluated on the George property within the Mimms Unit in 2020. This was the second year of biological monitoring on the property. Two points (monitoring points G1 and G3) were monitored in 2019 and a third was included in 2020 (monitoring point G2). There was an average of 7% less bare ground recorded between G1 and G3 from 2019-2020. Across all 3 George monitoring points, there was an average of 34.5% basal plant cover, 45.5% litter, and 20% bare ground cover in 2020. The results from the initial monitoring effort for point G2 will serve as benchmarks against which future monitoring efforts will be measured (*Table 2*).

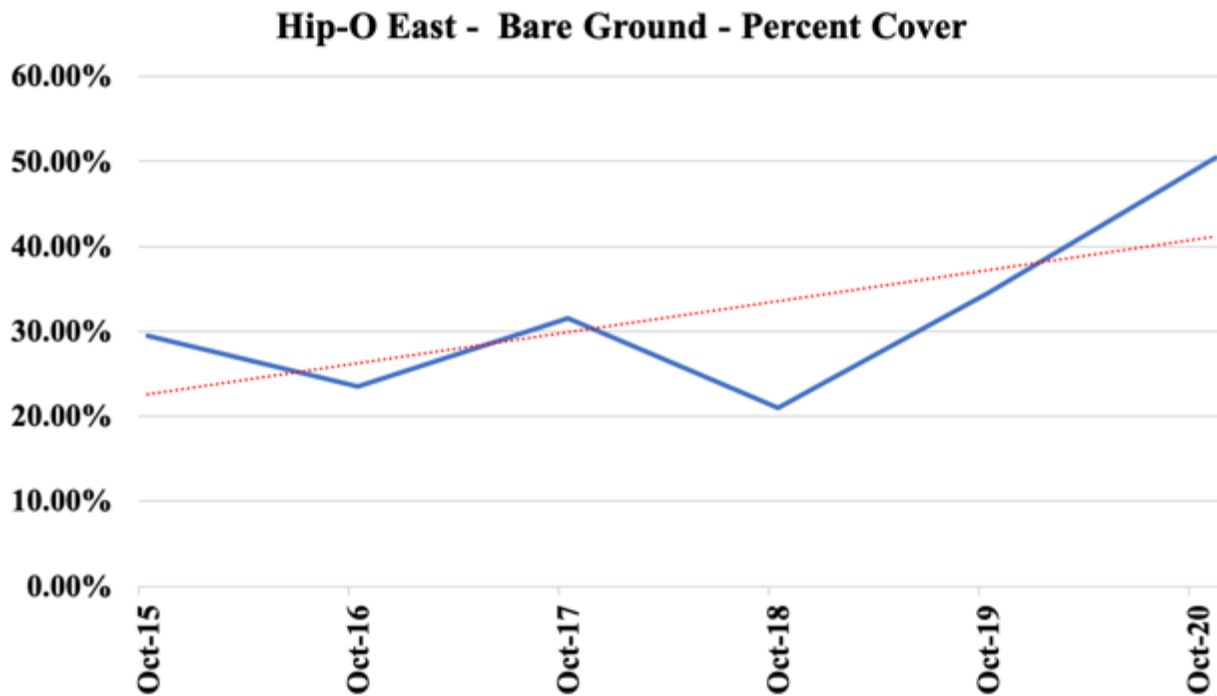
\*amended 11/17/21 – after evaluating the monitoring process, we reduced the number of monitoring sites on the George Unit back to the original 2 points. This change was made to reduce the sampling time for all Marfa points to 1 full day.

Litter	16%
Basal Plant	61%
Bare Ground	23%

**Table 2. Percent of each cover type for monitoring point G2 on the George Property for the initial monitoring effort, 2020.**

**Hip-O East-** The Hip-O East is directly west of the Mimms Unit. The ranch is 8,000 acres and is leased by the Dixon Water Foundation. It is primarily grazed during the summer months and serves as grounds for calving season for the Foundation’s West Texas herd. Calving season begins August 1 in an attempt to allow calves to be born after the typical Trans-Pecos monsoon (July- September) season has begun, allowing for the summer precipitation to increase the nutritional production of the grasslands.

Staff conduct biological monitoring at 2 fixed points on the Hip-O East property. The methodology is the same as that which is conducted on the Mimms Unit. Biological Monitoring of the Hip-O East began in 2015. On average, there has been a slight increasing trend in bare ground across the 2 monitoring points over the 5-year period (*Figure 19*).



*Figure 19. Hip-O East - Percent bare ground 2015-2020 (blue line) and trend of change in bare ground 2015-2020 (red line)*

As stated in the 2019 report, the Hip-O East unit is not owned by the Foundation and does not contain the infrastructure required to graze in the same fashion as the Mimms Unit. The Hip-O East is grazed seasonally, immediately before the monitoring period and this may reflect negatively in the data that is collected. Anecdotally, the Hip-O East is transitioning successionaly under the grazing pressure towards a more grass-dominated community and away from dense tumbleweed cover seen in the earlier stages of monitoring.

## Additional Monitoring Efforts

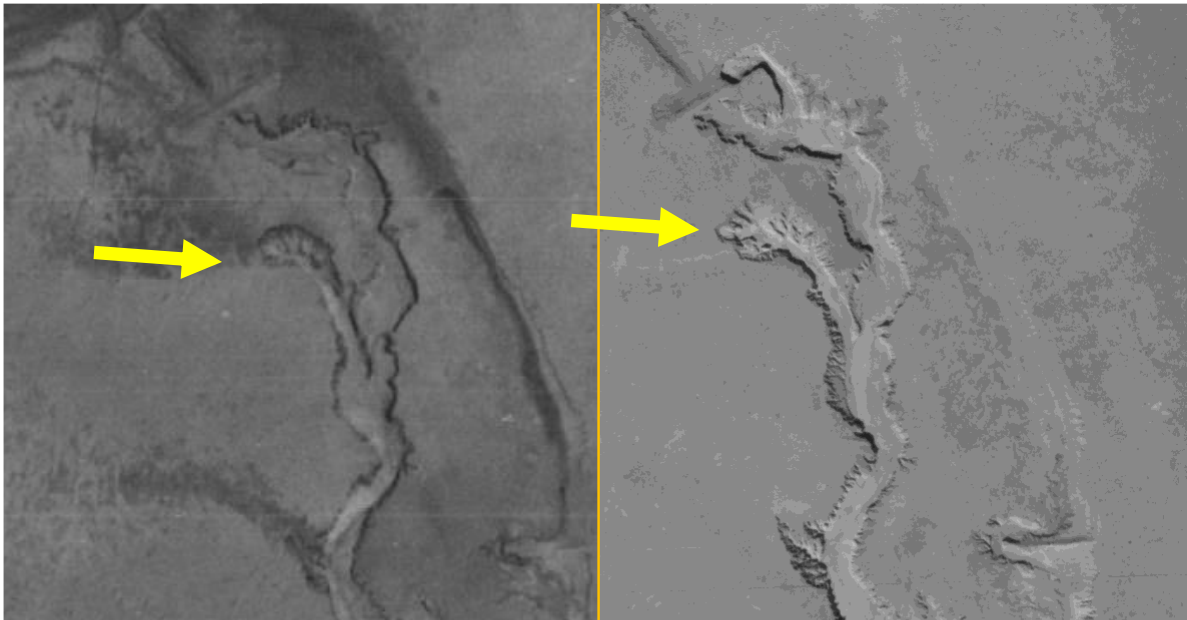
**George Gully Bank Erosion Monitoring-** Alamito Creek (*Figure 20*) starts on the northern end of the Mimms Unit, on the George Ranch. There are several small channels that work their way down-slope, eventually joining into a single channel that passes through two historic dirt tanks. Just below the tanks is a large earthen dam which a ranch road passes over. Below the dam the channel has deepened and features steep cut banks. As water sheds off of surrounding land and into these deep channels, several arroyos, or steep-sided gullies, have formed. One of these arroyos is located next to George Ranch monitoring point 3 (G3). This monitoring point sits atop soil categorized as Marfa soil, which is a high-quality soil for native mixed prairie grasses.



*Figure 20. Alamito Creek channel on the George Ranch. The yellow arrow indicates the location of the arroyo east of monitoring point G3 (Google Earth 2015)*



According to historical aerial imagery (*Figure 21*), the arroyo has existed for decades, though the exact cause and date of formation are unknown.



***Figure 21. Aerial photograph of Alamito Creek on the George Ranch, 1954. The yellow arrow highlights the location of a large arroyo east of George Ranch biological monitoring point G3 (Photo credit – US Army Map service 1954 and US Geological Survey 1974)***

In an effort to monitor the rate of erosion of the cut banks along these arroyos, the Foundation set up bank erosion monitoring point east of biological monitoring point G3 (*Figure 22*).



***Figure 22. Facing east towards George Ranch monitoring point G3 (marked by white post in foreground) with arroyo (background). (photo credit – Philip Boyd)***

The bank erosion monitoring point is comprised of 8 rebar stakes. There are 4 stakes on the north side of the arroyo that are spaced 20 feet apart from one another, moving east to west. Directly south of each stake at a distance of 70 feet (840 inches) are 4 more rebar stakes along the southern edge of the arroyo. In order to monitor any bank erosion, a 100-foot tape measure is stretched south to north from the southern stakes. The distance from the rebar stakes to any bank edge is documented in a spreadsheet. Annual measurements will be taken to document any changes in the size of the gully and rate of bank erosion.

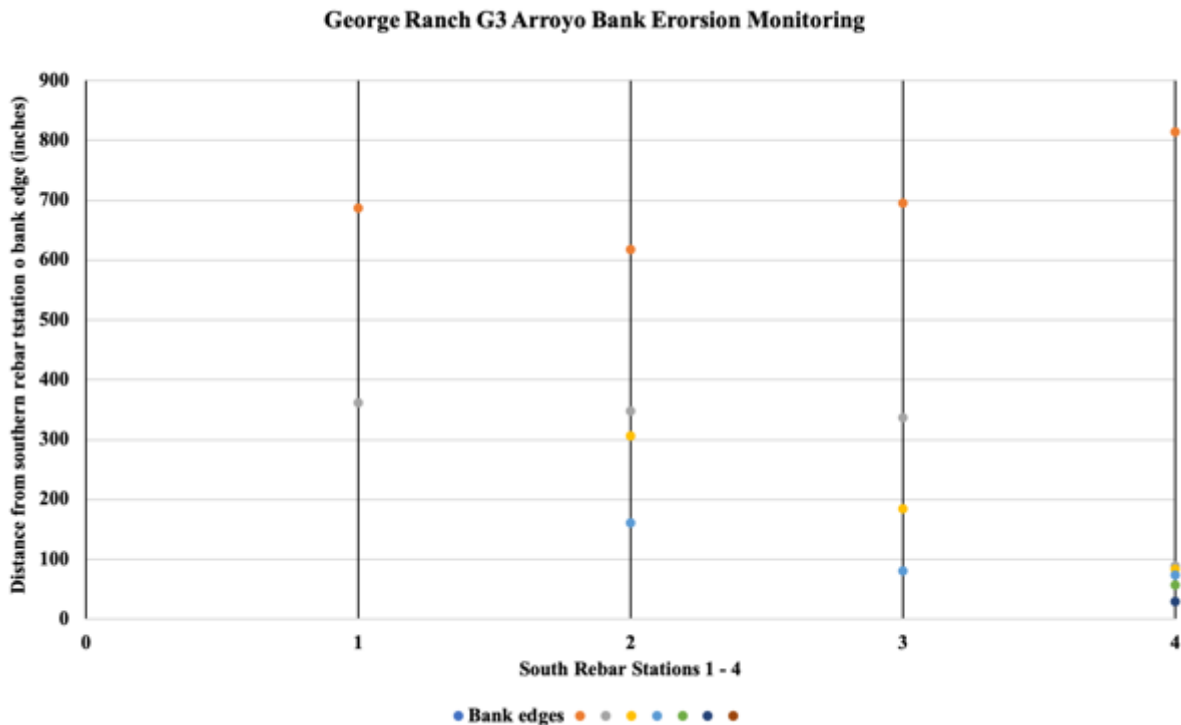


Figure 23. Chart showing plot of distance in inches (y-axis) from George Arroyo Bank Monitoring rebar stations (x-axis) to bank edges as measured from south to north March 2020.

	Arroyo Erosion Monitoring Points			
	Distance from rebar station 1S - 4S (inches)			
Stations	1North	2North	3North	4North
↑	686.75	617.5	695.5	813.75
	362	348	337	88.5
		306	185	84
		161	80.5	74
				57
				29
Stations	1South	2South	3South	4South

Table 3. Distances in inches from George Arroyo Bank Monitoring rebar stations (x-axis) to bank edges as measured from south to north March 2020.

## Alamito Creek Preserve Monitoring

### Trail Camera Photographs-

Trail camera was installed on the Alamito Creek Preserve property in December 2019 and remained there for the duration of the year. The camera was aimed a point in the creek bed where a pool of groundwater rises through the bedrock. This pool is accessed by wildlife year-round and water levels fluctuate throughout the year. These photographs can help inform an understanding of what wildlife species are utilizing the creek corridor and its water sources, as well as how both groundwater and surface water levels fluctuate in the creek throughout the year. Several wildlife species have been documented, including mule deer, elk, javelina, bobcat, gray fox, feral hog, badger, racoon, coyote, porcupine and numerous bird species.



*Figure 24. An elk cow drinks from a pool before a rain event brings water rushing through Alamito Creek a few hours later (Trail Camera Photo, May 2020)*





*Figure 25. Water rushes through Alamito Creek after a rain and reaches its highest levels for this event (Trail Camera Photo, May 2020)*



*Figure 26. A zone-tail hawk visits replenished pool along Alamito Creek after a flashing rain event brought water rushing through creek channel (Trail Camera Photo, May 2020)*

## Groundwater Monitoring

There are 3 steel pipes driven into the bedrock in the Alamito Creek channel. Their location was marked (29°54'44.49"N, 104° 0'25.30"W) in summer 2020 (*Figure 27*). Each pipe is topped with a cap. These caps can be removed so that a measuring tape can be dropped into the pipes until it hits a solid surface. The tape can be extracted and observed to identify how far the water surface is from the top of the well cap. Two measurements were taken in 2020 (*Table 4*). Sediment from heavy flow events occasionally covers the pipe tops, so measurements can only be taken when pipes are accessible. As access allows, water levels will be monitored quarterly from the initial date of record in order to document groundwater levels below the creek channel. This method may be unreliable due to the shifting and deposition of sediment. For documentation-sake, facing downstream, the pipes are assigned ID numbers 1-3, beginning counterclockwise at the 7 o'clock position (*Figure 27*).



*Figure 27. Wells in the Alamito Creek channel at the Alamito Creek Preserve. Pipe ID 1 is pointed to in this figure (Photo credit – Jeff Bennett, June 2020)*

Alamito Creek Preserve Capped Well		
Date	Depth to water (inches)	Pipe ID
6/16/20	47"	1
10/10/20	43"	3

\*from top of cap to top of water level

*Table 4. 2020 Measurements of depth to groundwater surface from top of well cap in Alamito Creek Channel.*

## **2020 Research Efforts**

### *North Texas*

#### **Soil Sampling**

##### *Noble Institute*

**Leo and Pittman Units-** The Noble Institute visited the Dixon Water Foundation's North Texas ranches in March 2019 to collect soil samples from ranches involved in their Land Stewardship Program. As of December, the raw data from the 2019 samples have been shared with the Foundation, but are still being interpreted for the final reporting.

##### *Texas Institute for Applied Environmental Research, Tarleton State University*

**Leo and Pittman Units-** Dr. Barbara Bellows sampled in August 2020 in support of her research into carbon sequestration and comparing soil characteristics between managed lands and native prairies.

#### **Surface Water Quality and Biodiversity**

##### *University of North Texas*

**Leo Unit** – The University of North Texas (UNT) was given a grant in 2019 to begin looking into how land management impacts vegetation, hydrology, and soil properties and how those may affect water quality and biodiversity in surface water. The 2019 grant funded the first phase of this research, involving surface water surveys, on-site water quality monitoring, and habitat and biodiversity surveys focused on the Leo Unit in order to establish baseline conditions and inventory. Preliminary results were presented as a poster at Texas Chapter American Fisheries Society (Texas AFS) annual meeting in Waco, Texas in January 2020. In 2020, this lab was awarded a grant for phase 2 of the research which will look at connectivity of land and water resources and how land management impacts the productivity of aquatic communities. This project is on-going.

Phase 1 of this project ended in August 2020. Phase 1 concluded with data generated from 18 sampling dates and 21 sites (multiple sites sampled during each event depending on surface water availability) and subsequent lab processing of samples. In total, 19 students (8 undergrad, 4 MS and 7 PhD; 13 from underrepresented groups) participated in field and lab research for the project. Sampling from ephemeral, intermittent and perennial waterbodies yielded 246 water samples analyzed for total nitrogen and total phosphorus, as well as other water chemistry parameters quantified in the field during each sampling event. Physical environmental parameters were quantified for more than 80 sampling events. Approximately 600 drone images



and videos capture extent of surface water and landscape conditions across sites and through time. Biological sampling yielded 6,484 fish representing 30 taxa/life stages and 24,404 invertebrates from 69 taxa/life stages. For the Phase 2 work, UNT researchers explored and identified site options to have combinations of ephemeral, intermittent and perennial sites for different land-use histories, deployed the first seasonal set of nutrient diffusing substrata, continued field monitoring of sites (including new sites) using protocols from Phase 1, and initiated collections of aquatic and terrestrial food web components for stable isotope analyses.



***Figure 28. University of North Texas researchers work in Clear Creek on the Leo Unit, January 2020 (Photo credit – Philip Boyd)***

## Terrestrial Biodiversity

### *University of North Texas*

**Leo and Pittman Units** – In 2020, the Foundation met several times with a new University of North Texas faculty member Dr. Elinor Litchenberg. Dr. Litchenberg is interested in plant-pollinator interactions and has ongoing research investigating pollinator responses to rangeland restoration and management. Dr. Litchenberg toured the Foundation’s North Texas ranches in preparation for potential future research.

### *Texas State University*

**Leo Unit** – As part of the Texas Statewide Bat Survey, Ph.D. candidate Carlos Garcia installed two acoustic bat detectors (*Figure 29*) and environmental data loggers on the Leo Unit. These tools will record for 3 years and will help inform recovery projects for impacted bat species in Texas.



*Figure 29. Researcher Carlos Garcia installs an acoustic bat detector on the Leo Unit (Photo by Melissa Bookhout)*



## *West Texas*

### **Range Inventory**

#### **Sul Ross State University**

Dr. Bonnie Warnock brought her range inventory class to the Mimms Unit to conduct vegetation surveys in fall 2020. These surveys were part of an annual inventory that takes place across 35 points that include all of the grazing regimes on the ranch.



*Figure 30. Students from Sul Ross State University conduct range inventory surveys on the Mimms Unit, fall 2020 (Photo by Philip Boyd)*

### **Grassland Bird Research**

#### **Bird Conservancy of the Rockies**

**Mimms Unit** - Technicians surveying over-wintering grassland birds in the Chihuahuan Desert stayed at the Mimms Unit headquarters in the winter of 2019/2020. The technicians conducted surveys in the area and utilized the Mimms Unit to practice their survey techniques.

## **Sul Ross State University - Borderlands Research Institute**

**Mimms Unit-** Alejandro Chávez Treviño conducted grassland bird field research on the Mimms Unit. He has plans to finish his thesis work and graduate in spring 2021. Chavez Treviño was the primary field research coordinator for 2019 and 2020, the fourth year in ongoing over-wintering grassland bird research with the Borderlands Research Institute. Alex's work focused on Grassland bird abundance and diet response to habitat management. His 2019 field season was from December 2019 – March 2020. He conducted surveys on the Mimms Unit and on ranches in the region that were treated for brush. His primary advisor was Dr. Mieke Titulaer. His technician stayed at the Mimms Unit house during this time. Occasionally, students from the Universidad Autónoma de Chihuahua stayed at the Mimms house as well to assist with field work. These students accompanied Dr. Titulaer on the trip as she works part time in Chihuahua and part time at Sul Ross State University in Alpine, Texas. During each visit, Foundation staff were given an opportunity to talk to the group to explain grazing practices on the Mimms Unit and to answer questions.



***Figure 31. Outgoing graduate researcher Alejandro Chavez Treviño (foreground) holds a Baird's Sparrow on the Mimms Unit while incoming researcher Emily Card (background) looks on (Photo by Philip Boyd)***

In 2020, new graduate student Emily Card joined the BRI grassland-bird team. Card plan to build upon Chávez Treviño's research and help add a community outreach component to the grassland-bird project that will help connect and educate landowners with birds and their role as ecosystem indicators.

## **Grassland Mammal Research**

### **Sul Ross State University – Borderlands Research Institute**

**Mimms Unit-** Jacob Locke successfully defended his thesis and graduated from Sul Ross State University in 2020. The research for his thesis focused on pronghorn habitat carrying capacity. He conducted vegetation surveys, some of which occur on the Mimms, throughout several seasons. He sampled for nutritional value in available forbs, which are the primary component in pronghorn diet.

Portions of Locke’s work looked at the differences between pronghorn nutritional content among the various grazing management areas on the Mimms Unit. Pronghorn diet is primarily comprised of forbs. Among the three grazing areas: rotationally-grazed, continuously-grazed, and grazing exclusion, rotationally grazed pastures produced the highest nutritional forb content in wet years while areas that excluded grazing produced the highest nutritional content in dry years. This portion of his thesis was also written as a manuscript that was submitted for publication in a scientific journal and is awaiting review at this time of this report.

New graduate student Leanna “Lilly” Morin arrived in 2020 continue researching pronghorn nutrition on the Mimms Unit across all grazing regimes. Morin will look at what pronghorn are selecting for across the nutritional content available on the ranch.

## **Soil Research**

### **U.S. Department of Agriculture – Natural Resource Conservation Service – Soil Survey**

**Mimms Unit-** Employees at the Soil Survey office in Marfa, Texas, have made on-going visits to the Mimms Unit to study soil types across the ranch in an effort to accurately map soils in the region.

## **Archaeology**

### **Sul Ross State University – Center for Big Bend Studies**

**Mimms Unit** – An archaeologist visited the Mimms Unit to view some portions of the ranch that were not seen on their prior visit, while also revisiting some earlier sites. Primarily, the visit involved exploring cutbanks along Alamito Creek to look for cultural deposits. The trip report from the day stated:

*One of the significant gaps in archeological understanding of the Greater Big Bend region is the expansive Marfa Plain—a location that is likely key to grasping two major themes in prehistory: that of early human occupation of the region during the Late Pleistocene/Early Holocene and of the possible southwestward spread of bison postulated during mesic episodes of prehistory.*



***Figure 32. Earth oven heating element (pile of fire-cracked rock) along banks of Alamito Creek on the Mimms Unit. (Photo by Center for Big Bend Studies, July 2020)***

Archaeologists recommend continuing to monitor cutbank for further erosion and possible exposure cultural features. Additionally, dating sediments in the cutbanks could help researchers understand the temporal relation between artifacts, the cultural usage of the land, and the formation of the landscape.



***Figure 33. Cutbank of Alamito Creek on the Mimms Unit. (Photo by Center for Big Bend Studies, July 2020)***



## Stream Mechanics

### Chihuahuan Desert Habitat Partnership

**Mimms Unit and Alamito Creek Preserve** - Several reconnaissance trips were made to reaches of Alamito Creek on the Mimms Unit and at Alamito Creek Preserve throughout 2020. These trips included visits with Jeff Bennett, Conservation Delivery Specialist for Rio Grande Joint Venture, as well as a two-day group visit with the Chihuahuan Desert Habitat Partnership. The visits explored hydrology and erosion along the creek and surveyed potential sites for in-stream structures such as beaver dam analogs or pole-assisted log structures. These structures can help divert water, increase stream sinuosity, reconnect floodplains and potentially create habitat and refugia for aquatic wildlife species. Discussions and planning for these projects continue and involve further in-field visits as well as analysis using satellite imagery and modeling with geographic information systems to determine where structures may be placed to have the most beneficial impact.



*Figure 34. Conservation partners revisit the site of a previous restoration project at Alamito Creek Preserve. (Photo by Philip Boyd, September 2020)*

## Groundwater

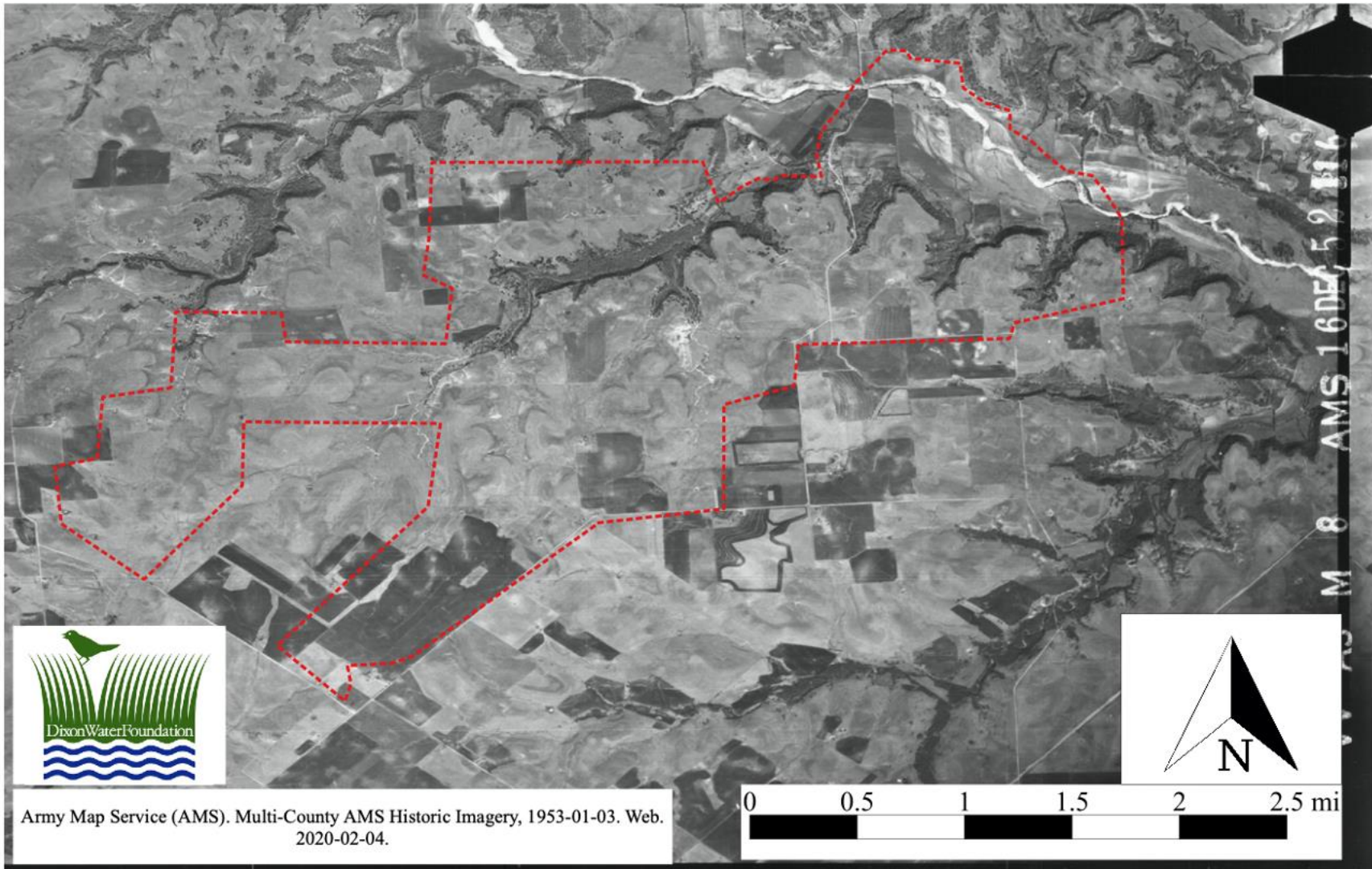
### Presidio County Underground Water Conservation District

**Alamito Creek Preserve** – The Foundation funded research that will explore connectivity of groundwater sources in and around the Alamito Creek Preserve property in southern Presidio County, Texas. The research was funded in 2020 and will be conducted in 2021.

## **All Ranches**

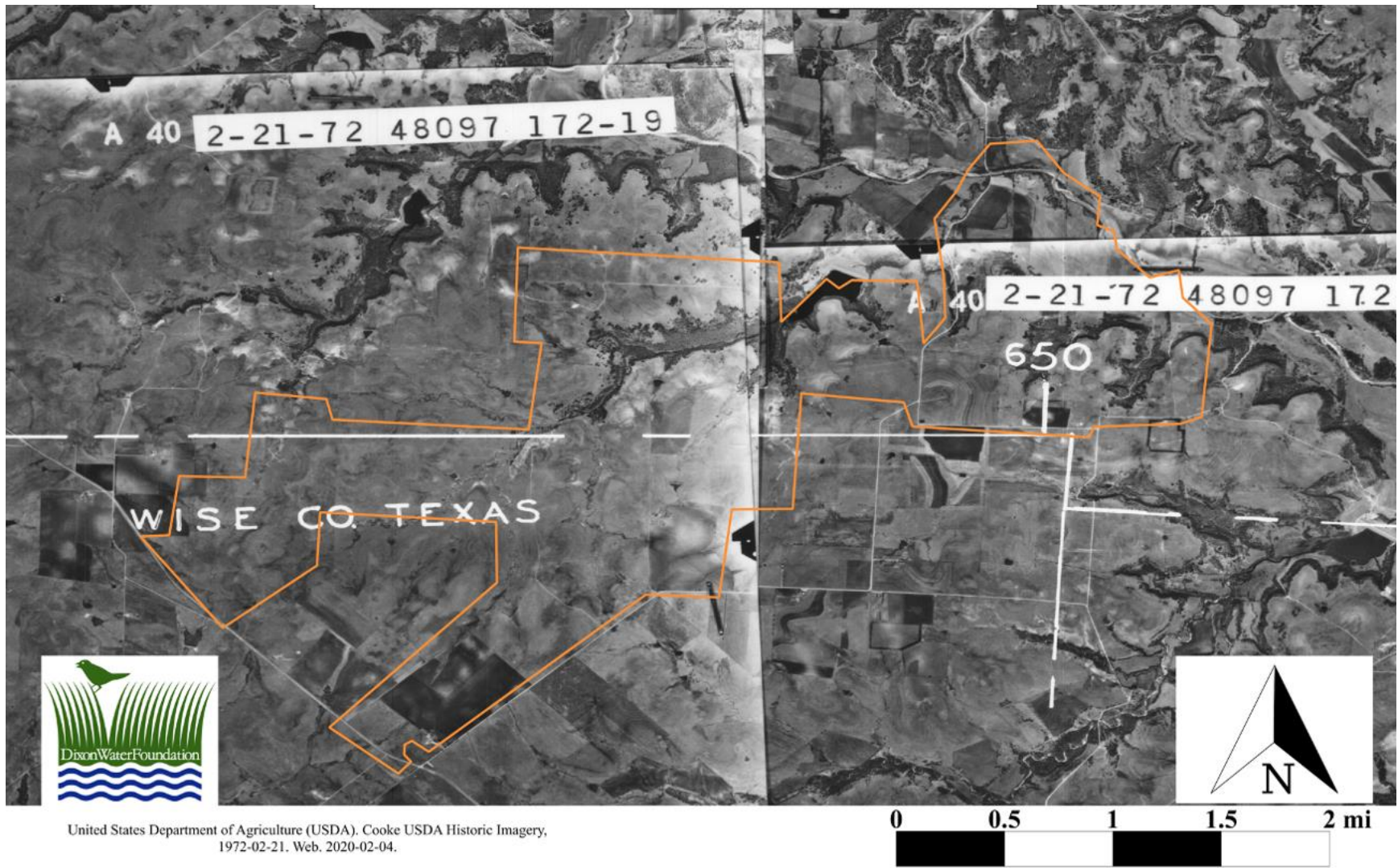
**Satellite Imagery** - Historical aerial imagery of all Dixon Water Foundation Ranches was acquired through the Texas Natural Resource Information Service (TNRIS) and the US Geological Survey (USGS) Earth Explorer website. These images can serve as references to current satellite imagery and can potentially answer questions about historical management and conditions. Not all imagery available for each ranch was taken in the same year, but there were two images acquired for multiple properties. Not all property boundaries are accurately represented due to distortion in the georeferencing process.

# Leo Unit



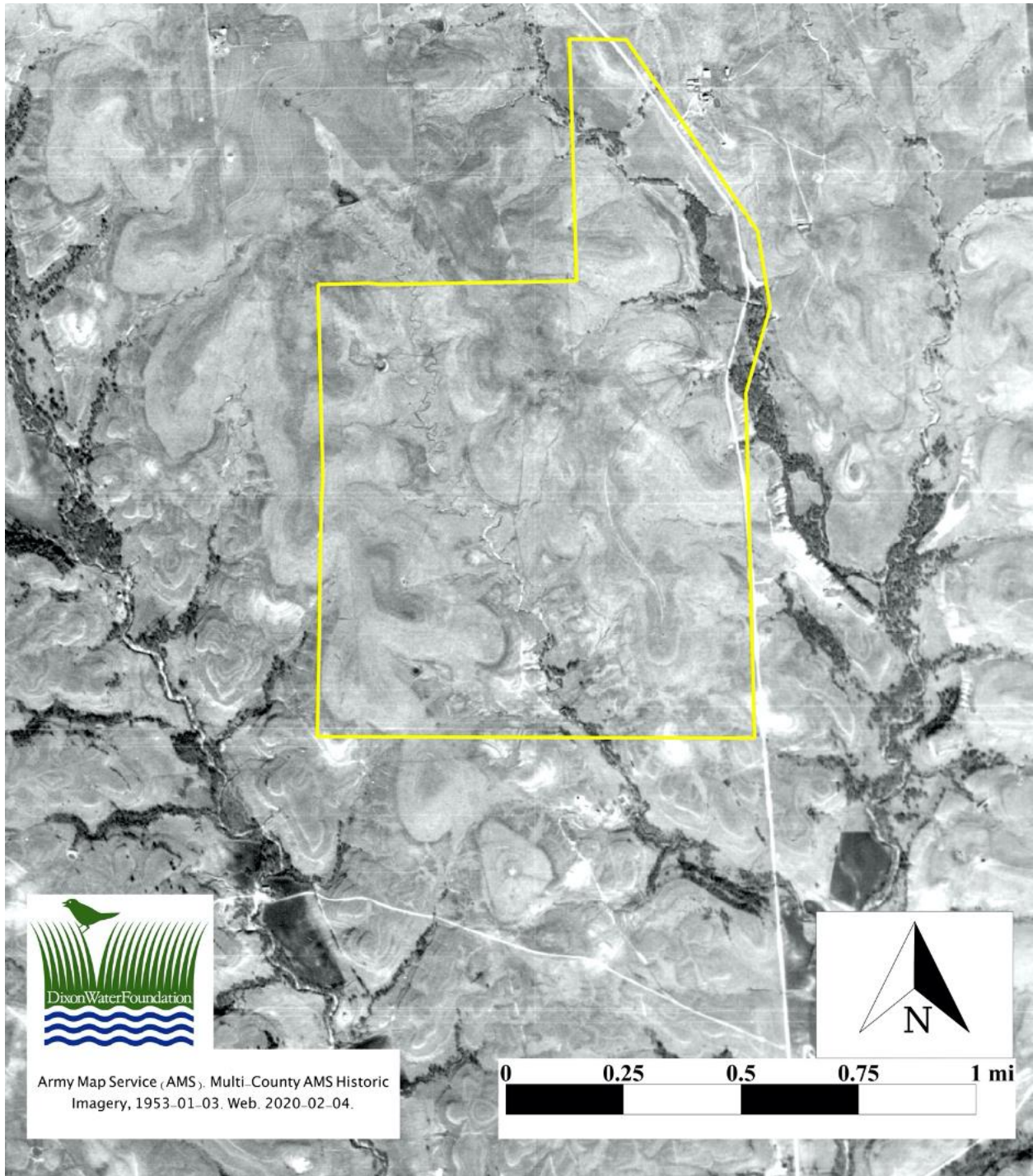
*Figure 35. Leo Unit Aerial Imagery 1952/1953 (Photo Credit – Army Map Service)*





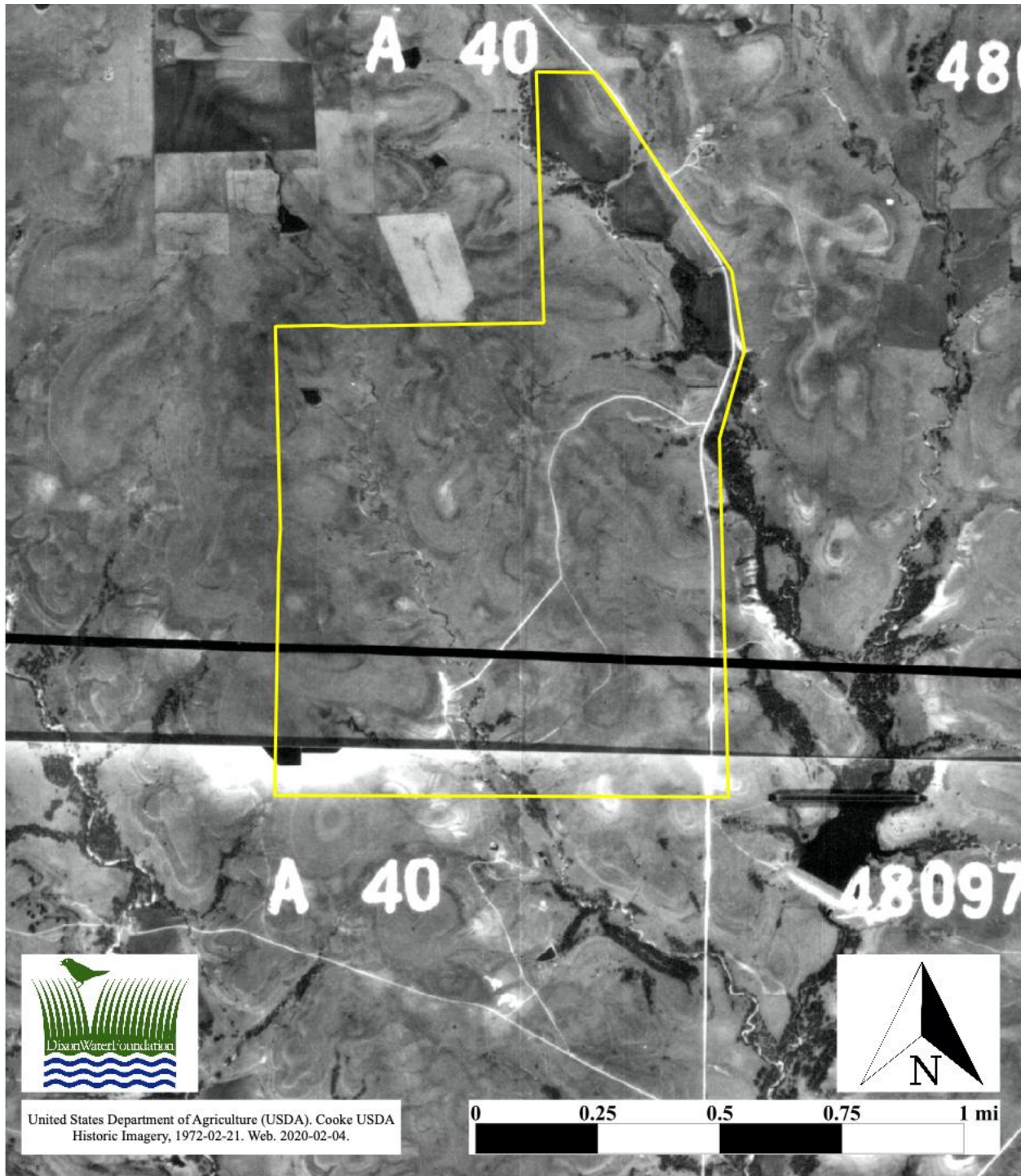
*Figure 36. Leo Unit Aerial Imagery 1972 (Photo Credit – United States Department of Agriculture)*

# Pittman Unit



*Figure 37. Pittman Unit Aerial Imagery 1953 (Photo Credit – Army Map Service)*

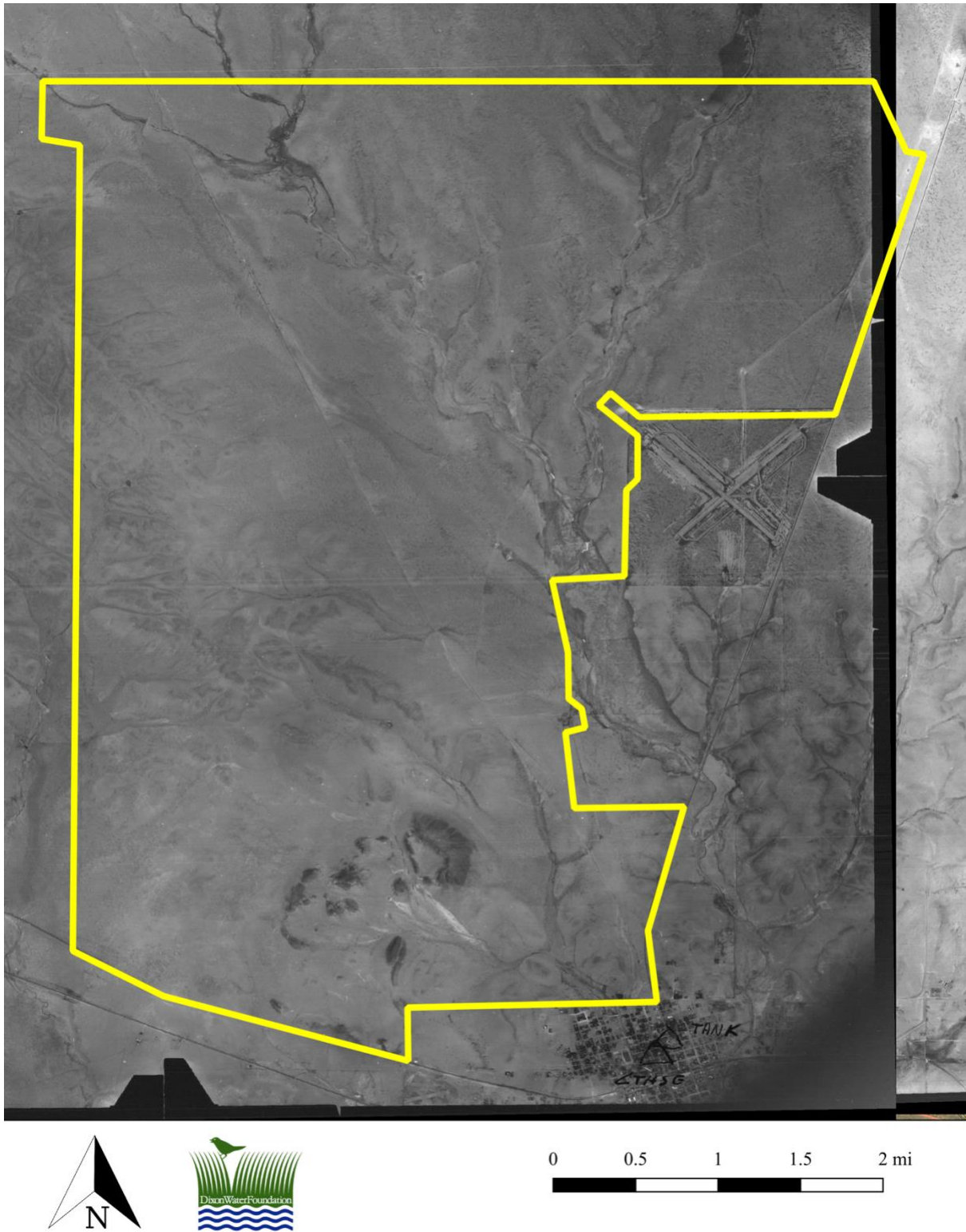




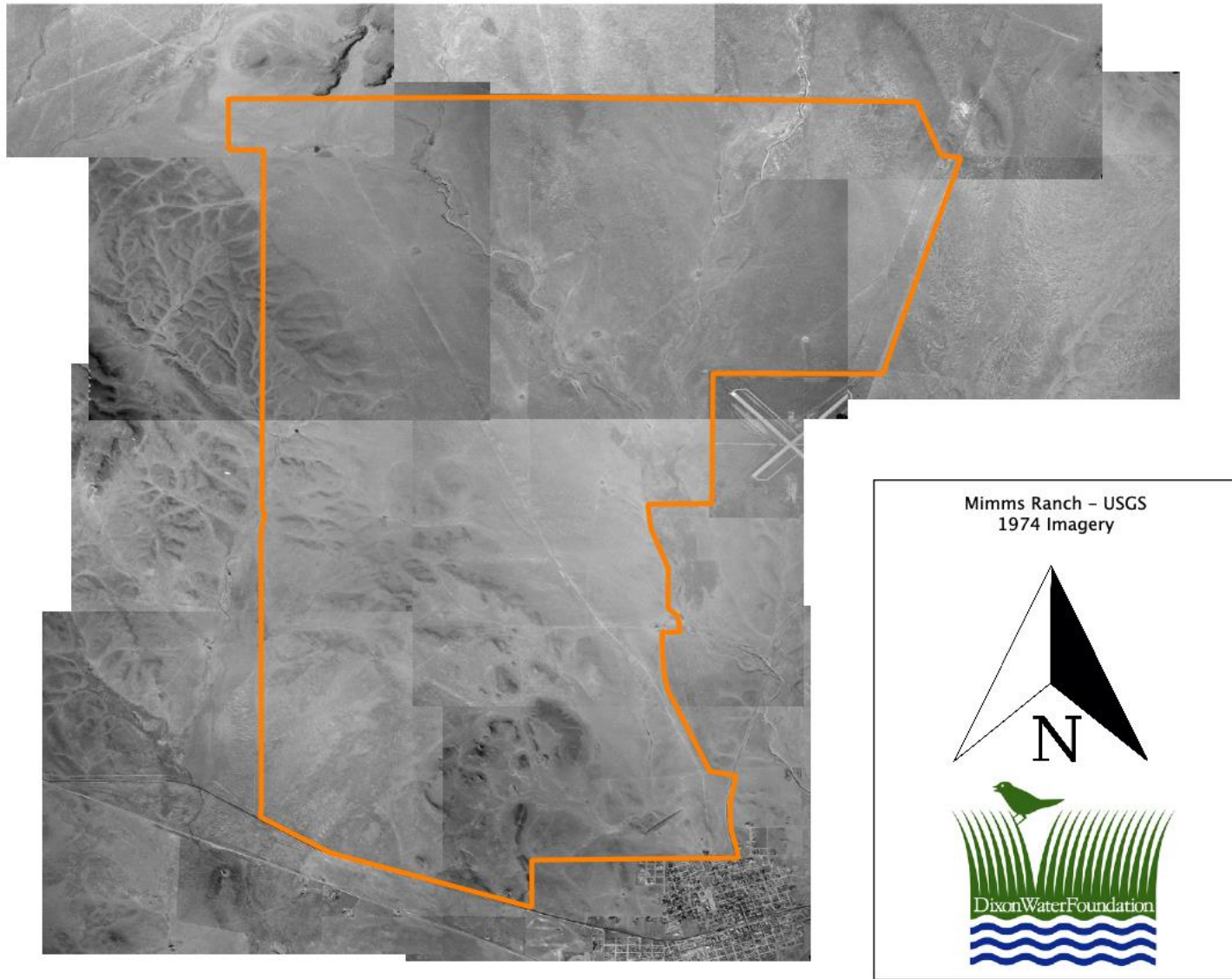
**Figure 38. Pittman Unit Aerial Imagery 1972 (Photo Credit – United States Department of Agriculture)**



# Mimms Unit

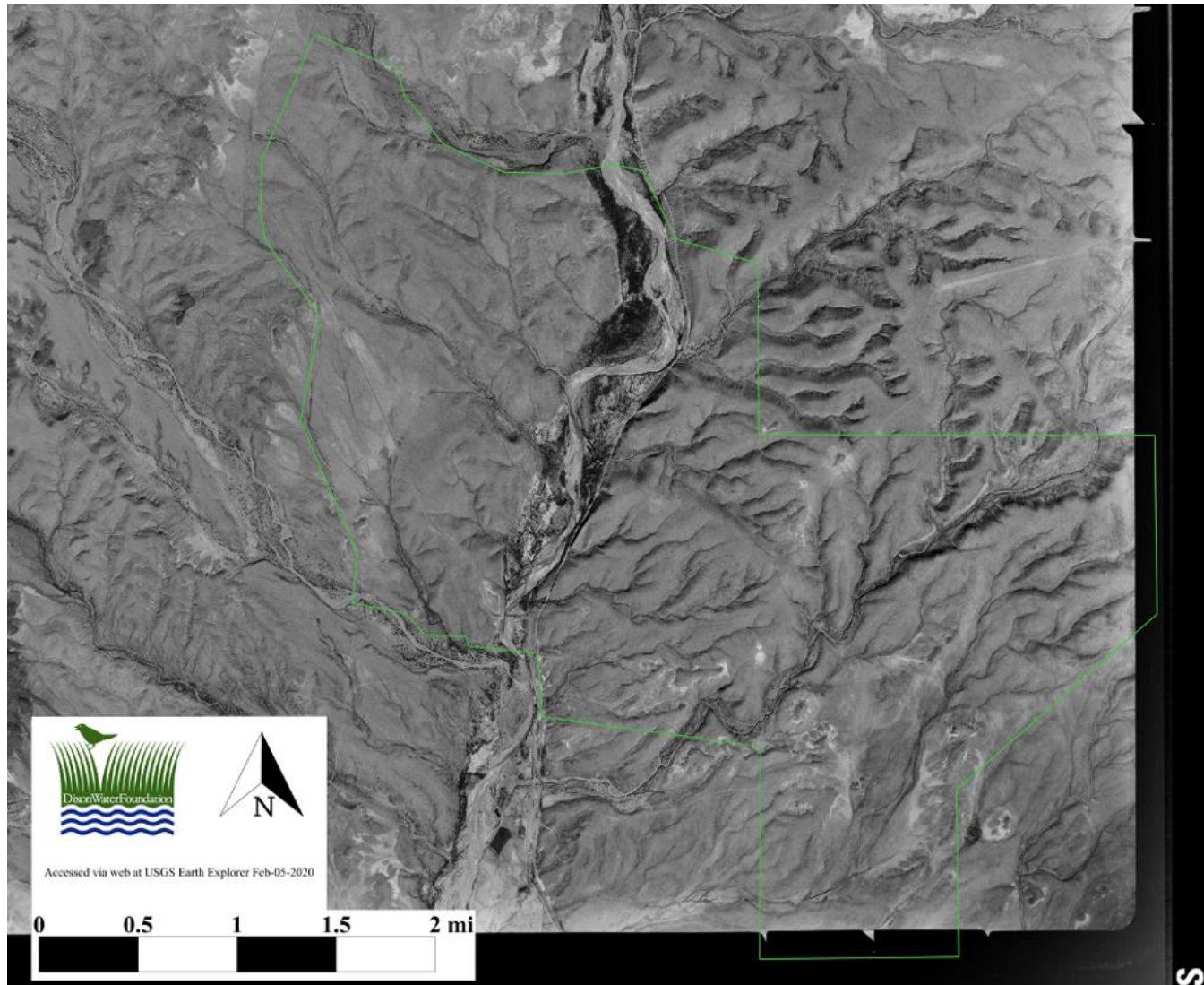


*Figure 39. Mimms Unit Aerial Imagery 1954 (Photo Credit –Army Map Service)*



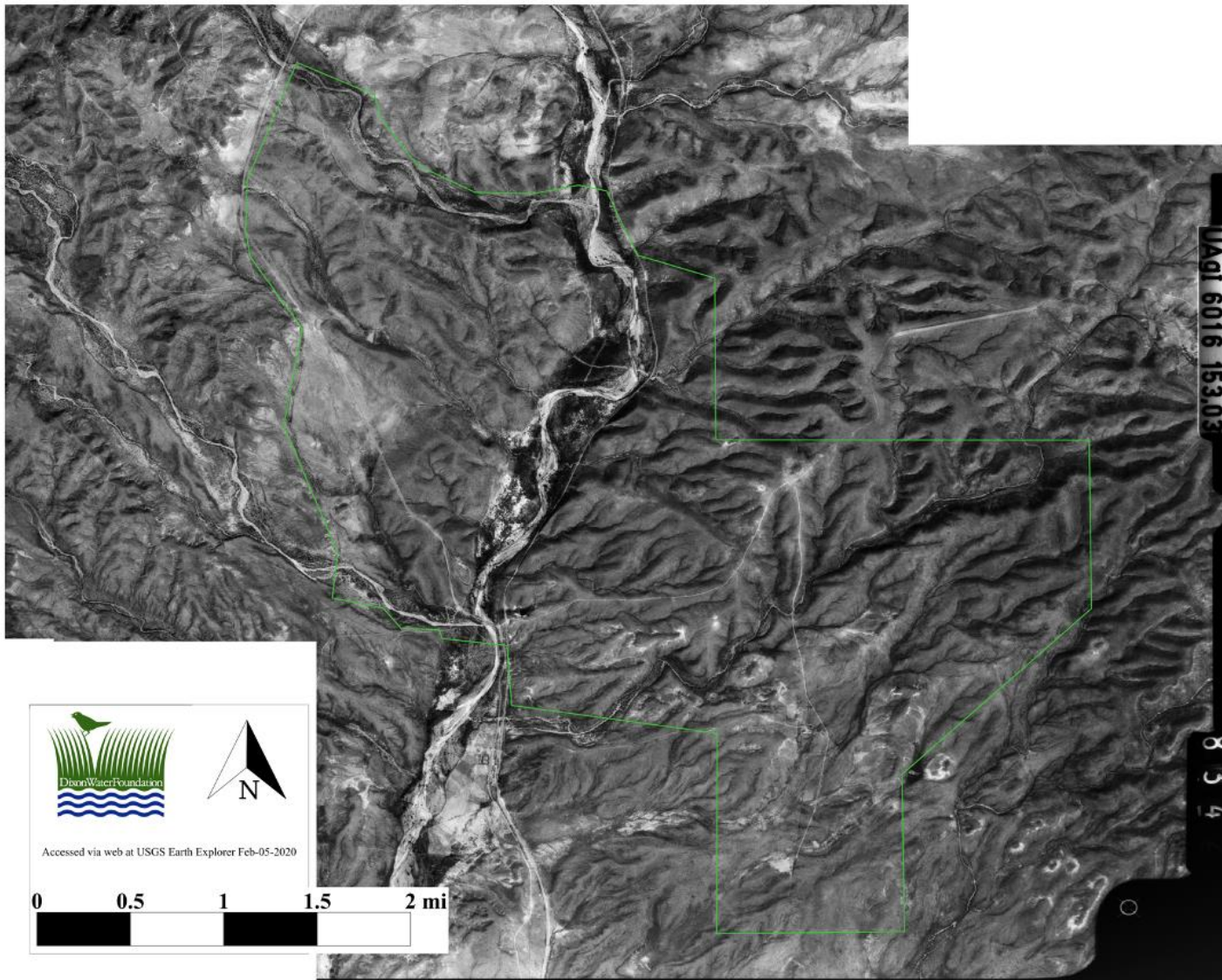
*Figure 40. Mimms Unit Aerial Imagery 1974 (Photo Credit –United States Geological Survey)*

## Alamito Creek Preserve



*Figure 41. Alamito Creek Preserve Aerial Imagery 1958 (Photo Credit –United States Geological Survey)*





*Figure 42. Almitoc Creek Preserve Aerial Imagery 1980 (Photo Credit –Army Mapping Service)*

## 2020 Outreach Efforts

### *North Texas*

**Leo and Pittman Units, Josey Pavilion-** Our North Texas ranches hosted 60 guests in 2020. These numbers were lower than previous years due to the COVID-19 pandemic.

### *West Texas*

**Mimms Unit** - Our Mimms Unit ranches hosted over 130 visitors through 20 events, field visits, workshops and meetings. There was a film crew that shot a pilot for PBS that featured different example of life in the Big Bend region and included example of the foundation's ranching. The Mimms Unit also hosted interns Garlyn Radford and Juan Rodriguez from Sul Ross State University's Sustainable Ranch Management Program from January 2020 – May 2020.



*Figure 43. Sul Ross State University Sustainable Ranch Management interns at the Mimms Unit headquarters. (Photo by Philip Boyd, Spring 2020)*

**Alamito Creek Preserve** – The Foundation's Alamito Creek Preserve hosted around 60 visitors through 8 field trips for birding, bird research, and stream restoration.

## ***All Dixon Ranches***

In the summer of 2019, the Foundation launched its first Instagram account. In 2020 there were 30 posts made to the account, covering various topics that included: grazing operations, research on Foundation ranches, grants, workshops, and wildlife. At the end of 2020, the account had 347 followers, an increase of 147 since the 2019 report, and most posts are shared to the Foundation's Facebook account as well.

## **2020 Grants**

In 2020, Dixon Water Foundation awarded \$ 580,200.00 in grants to 17 organizations. Recipients of 2020 Dixon Water Foundation grants were:

American Bird Conservancy - Rio Grande Joint Venture  
Devils River Conservancy  
Fred Provenza - Duke University  
Funders of Regenerative Agriculture  
Hill Country Alliance  
Holistic Management International  
Kids on the Land  
Native Prairie Association of Texas  
North Central Texas College  
Ogallala Commons  
People and Carnivores (Montana)  
Sand County Foundation  
Sul Ross State University  
Texan By Nature Film  
Texas Water Trade  
Texas Wildlife Association - Learning Across New Dimensions in Science (L.A.N.D.S)  
University of North Texas



## 2020 Sponsorships

In 2020, Dixon Water Foundation awarded \$18,750 in event sponsorships to 7 organizations. Recipients of 2020 Dixon Water Foundation event sponsorships were:

Big Bend Ranch Rodeo  
Bird Conservancy of the Rockies – Grasslands Summit  
Center for the Study of the American West – Water Conference  
River Network – River Rally Conference  
Soil Regen LLC - Regenerative Grazing for Restoration Conference  
Sul Ross State University – Plant ID Team  
Texas Agricultural Land Foundation – Ranch Stewardship



*Figure 44. Trail camera photograph of snow falling on Alamito Creek Preserve, New Year's Eve, 2020.*