

## **Timber Damage Assessment for the Northeast Texas Tornadoes of November 4, 2022**

### **Texas A&M Forest Service December 2022**

Seven tornadoes touched down in Texas during the storms of November 4, 2022. Five of them impacted timberland in northeast counties including Bowie, Cass, Henderson, Morris, and Red River. For Bowie County, an EF-2 tornado was confirmed by the National Weather Service, with peak winds around 125 MPH. In Cass County, the high-end EF-1 rating tornado had an estimated wind speed of 110 MPH. The damage in Henderson County was linked to an EF-2 tornado, with estimated peak winds around 115 MPH. The Red River County tornado was EF-3 and traveled on into Oklahoma.

Forest Inventory and Analysis (FIA) data from 2021 was used to estimate the volume of timber present in the region before the tornadoes. To assess the damage, satellite imagery from before and after the storms was compared. Tornado tracks were obtained from the National Weather Service. The change in vegetation greenness calculated from Sentinel-2 Level 2A satellite imagery collected before (October 18, 2022) and after the events (November 12, 2022) was used to estimate damage severity. All maps with tornado tracks are given in the appendix.

The results of the image analysis were combined with FIA data to produce tables 1-5. The value of damaged timber was estimated based on the most current Texas Timber Price Trends report. Timber damage was estimated for sawtimber and poletimber. Sawtimber-size trees are at least 9.0 inches in diameter at breast height (dbh; 4.5 feet above the ground) for pine and at least 11.0 inches dbh for hardwood. Poletimber-size trees are at least 5.0 inches dbh, but smaller than sawtimber size. Damaged trees were uprooted, snapped off below the crown, or leaning significantly. Throughout the path of the tornados, the severity of timber damage ranged from light to heavy based on the percent of trees damaged:

- Light: 0-20 percent
- Moderate: 20-60 percent, and
- Heavy: 60-100 percent.

For Bowie County, the total mapped area containing damaged timber was 2,279 acres of which 624 acres were damaged pine forest, 1,327 acres were damaged hardwood forest, and 328 acres were damaged mixed forest. The total volume of timber damaged is estimated to be 3.2 million cubic feet worth a total stumpage value of \$2.7 million and total delivered value of \$4.5 million. In particular, the total sawtimber damaged by the tornado was 2.3 million cubic feet worth a total stumpage value of \$2.5 million. Total poletimber damaged by the tornado was 10,270 cords with a total stumpage value of \$0.2 million (Table 1).

Table 1. Bowie County Tornado Timber Damage Acres, Volume, and Value

Damage	Pine	Hardwood	Mixed	All
Acres	624	1,327	328	2,279
Volume				
Sawtimber (Cubic Feet)	944,102	1,148,988	270,155	2,363,245
Poletimber (Cords)	2,046	7,123	1,102	10,270
Total (Cubic Feet)	1,109,805	1,718,814	358,838	3,187,457
Value				
Sawtimber (\$)	682,346	1,531,706	272,459	2,486,511
Poletimber (\$)	33,243	157,245	21,033	211,521
Total (\$)	715,589	1,688,952	293,492	2,698,033

For Cass County, the total mapped area containing damaged timber was 3,250 acres of which 1,626 acres were damaged pine forest, 1,149 acres were damaged hardwood forest, and 476 acres were damaged mixed forest. Total volume of timber damaged is estimated to be 5.5 million cubic feet worth a total stumpage value of \$4.1 million and total delivered value of \$7.2 million. In particular, the total sawtimber damaged by the tornado was 4.1 million cubic feet worth a total stumpage value of \$3.7 million. Total poletimber damaged by the tornado was 17,658 cords with a total stumpage value of \$0.3 million (Table 2).

Table 2. Cass County Tornado Timber Damage Acres, Volume, and Value

Damage	Pine	Hardwood	Mixed	All
Acres	1,626	1,149	476	3,250
Volume				
Sawtimber (Cubic Feet)	2,665,402	1,075,834	379,857	4,121,094
Poletimber (Cords)	10,090	5,689	1,879	17,658
Total (Cubic Feet)	3,482,707	1,530,975	531,079	5,544,760
Value				
Sawtimber (\$)	1,926,409	1,434,185	383,097	3,743,691
Poletimber (\$)	163,965	125,598	35,865	325,428
Total (\$)	2,090,374	1,559,783	418,962	4,069,119

For Henderson County, the total mapped area containing damaged timber was 194 acres of which 185 acres were damaged hardwood forest. Total volume of timber damaged is estimated to be 230,518 cubic feet worth a total stumpage value of \$235,120 and total delivered value of \$409,390. In particular, the total sawtimber damaged by the tornado was 164,428 cubic feet worth a total stumpage value of \$217,081. Total poletimber damaged by the tornado was 826 cords with a total stumpage value of \$18,039 (Table 3).

Table 3. Henderson County Tornado Timber Damage Acres, Volume, and Value

Damage	Pine	Hardwood	Mixed	All
Acres	2	185	7	194
Volume				
Sawtimber (Cubic Feet)	2,379	160,004	2,044	164,428
Poletimber (Cords)	9	771	46	826
Total (Cubic Feet)	3,115	221,661	5,741	230,518
Value				
Sawtimber (\$)	1,719	213,301	2,062	217,081
Poletimber (\$)	148	17,014	877	18,039
Total (\$)	1,867	230,315	2,938	235,120

For Morris County, the total mapped area containing damaged timber was 1,216 acres of which 384 acres were damaged pine forest, 645 acres were damaged hardwood forest, and 187 acres were damaged mixed forest. Total volume of timber damaged is estimated to be 2.4 million cubic feet worth a total stumpage value of \$2.1 million and total delivered value of \$3.3 million. In particular, the total sawtimber damaged by the tornado was 2.0 million cubic feet worth a total stumpage value of \$2.0 million. Total poletimber damaged by the tornado was 4,507 cords with a total stumpage value of \$90,445 (Table 4).

Table 4. Morris County Tornado Timber Damage Acres, Volume, and Value

Damage	Pine	Hardwood	Mixed	All
Acres	384	645	187	1,216
Volume				
Sawtimber (Cubic Feet)	988,157	726,064	305,357	2,019,578
Poletimber (Cords)	1,456	2,859	192	4,507
Total (Cubic Feet)	1,106,126	954,782	320,802	2,381,711
Value				
Sawtimber (\$)	714,186	967,910	307,961	1,990,058
Poletimber (\$)	23,667	63,115	3,663	90,445
Total (\$)	737,853	1,031,026	311,625	2,080,503

For Red River County, the total mapped area containing damaged timber was 3,606 acres of which 816 acres were damaged pine forest, 2,217 acres were damaged hardwood forest, and 573 acres were damaged mixed forest. Total volume of timber damaged is estimated to be 5.0 million cubic feet worth a total stumpage value of \$3.9 million and total delivered value of \$6.8 million. In particular, the total sawtimber damaged by the tornado was 3.2 million cubic feet worth a total stumpage value of \$3.4 million. Total poletimber damaged by the tornado was 22,149 cords with a total stumpage value of \$0.5 million (Table 5).

Table 5. Red River County Tornado Timber Damage Acres, Volume, and Value

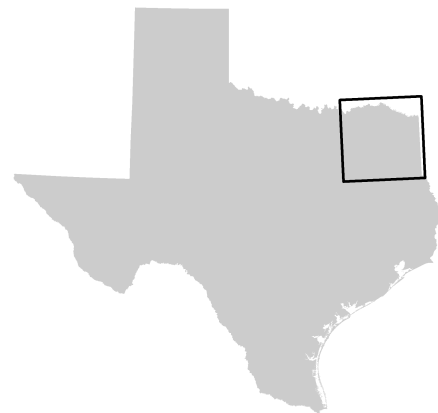
Damage	Pine	Hardwood	Mixed	All
Acres	816	2,217	573	3,606
Volume				
Sawtimber (Cubic Feet)	1,159,317	1,773,968	244,693	3,177,978
Poletimber (Cords)	3,251	14,825	4,073	22,149
Total (Cubic Feet)	1,422,672	2,959,930	572,592	4,955,193
Value				
Sawtimber (\$)	837,892	2,364,861	246,781	3,449,534
Poletimber (\$)	52,833	327,270	77,767	457,871
Total (\$)	890,725	2,692,132	324,548	3,907,405

Questions about the Timber Damage Assessment should be directed to Dr. Xufang Zhang, Forest Resource Analyst, Texas A&M Forest Service Forest Analytics Department, [xufang.zhang@tfs.tamu.edu](mailto:xufang.zhang@tfs.tamu.edu).

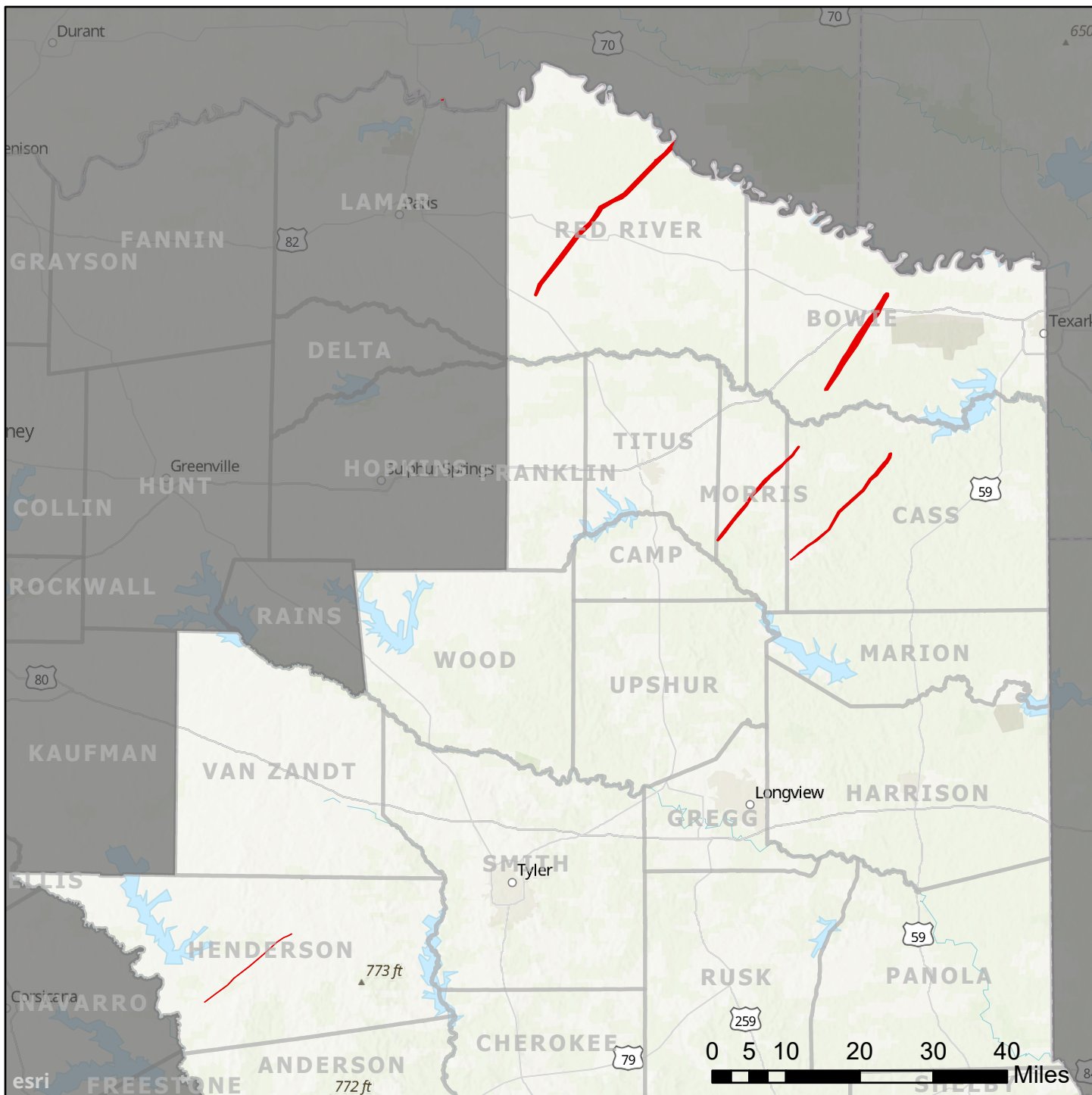
# Northeast Texas Tornadoes

November 4, 2022

A number of tornadoes touched down in northeast Texas during the storms of November 4, 2022, impacting timberland in Bowie, Cass, Henderson, Morris, and Red River counties. To roughly estimate the extent of the damage, satellite imagery from before and after the storms was compared. Tornado tracks were obtained from the National Weather Service.



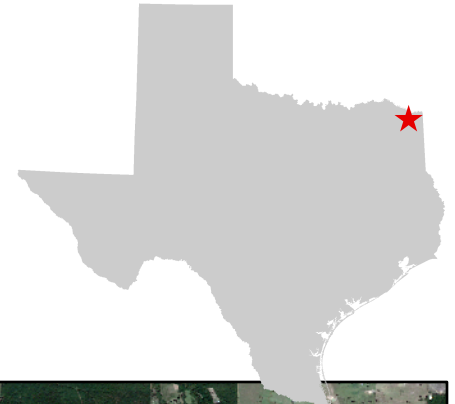
Maps prepared by Rebekah Zehnder, Texas A&M Forest Service, 11/29/2022.



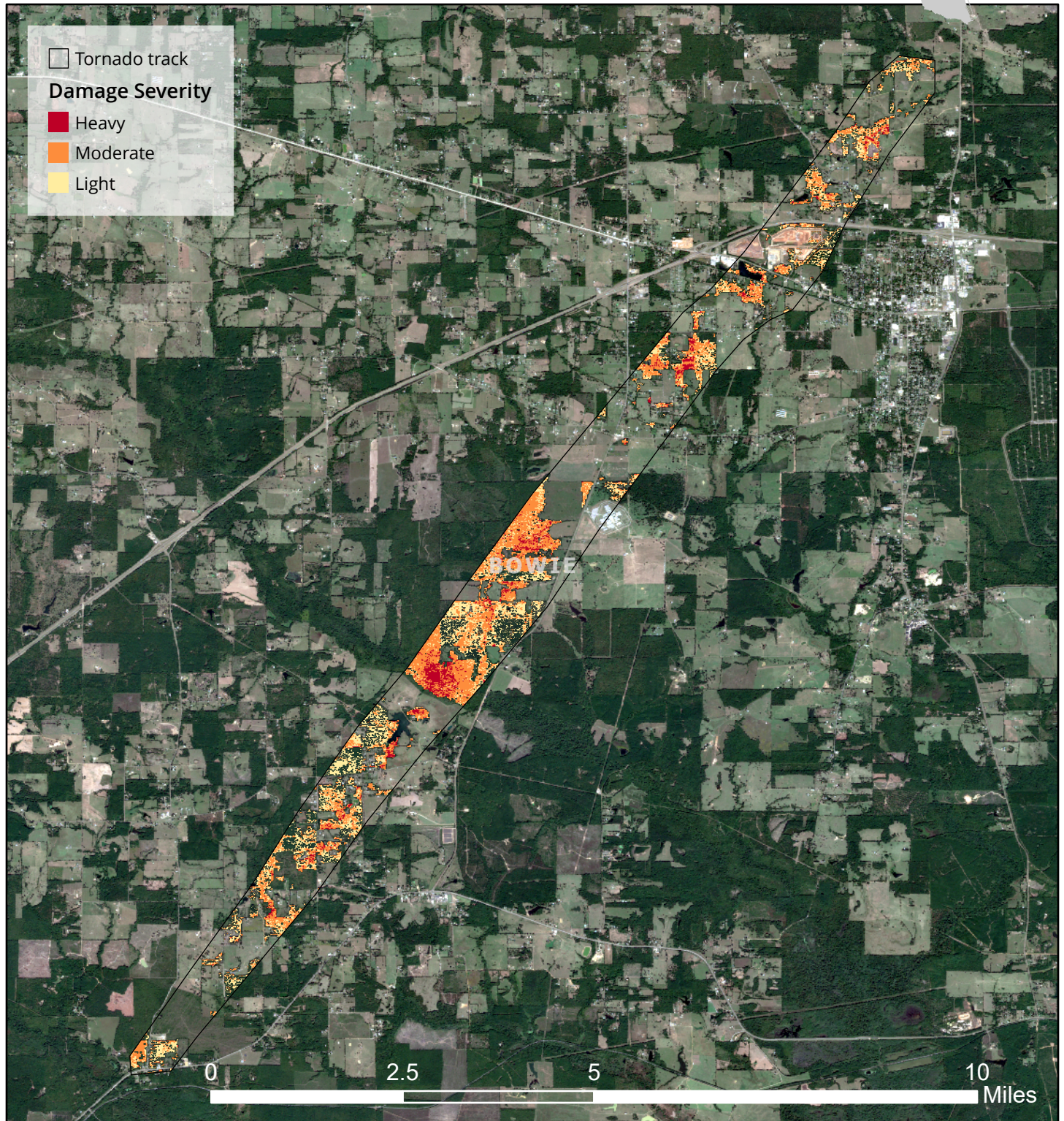
# Northeast Texas Tornadoes: Bowie

November 4, 2022

Tornado track was obtained from the National Weather Service. Severity is estimated from the change in NDVI from October 18 to November 12 in Sentinel-2 Level 2A satellite imagery. The October 18 image is shown.



Maps prepared by Rebekah Zehnder, Texas A&M Forest Service, 11/29/2022.



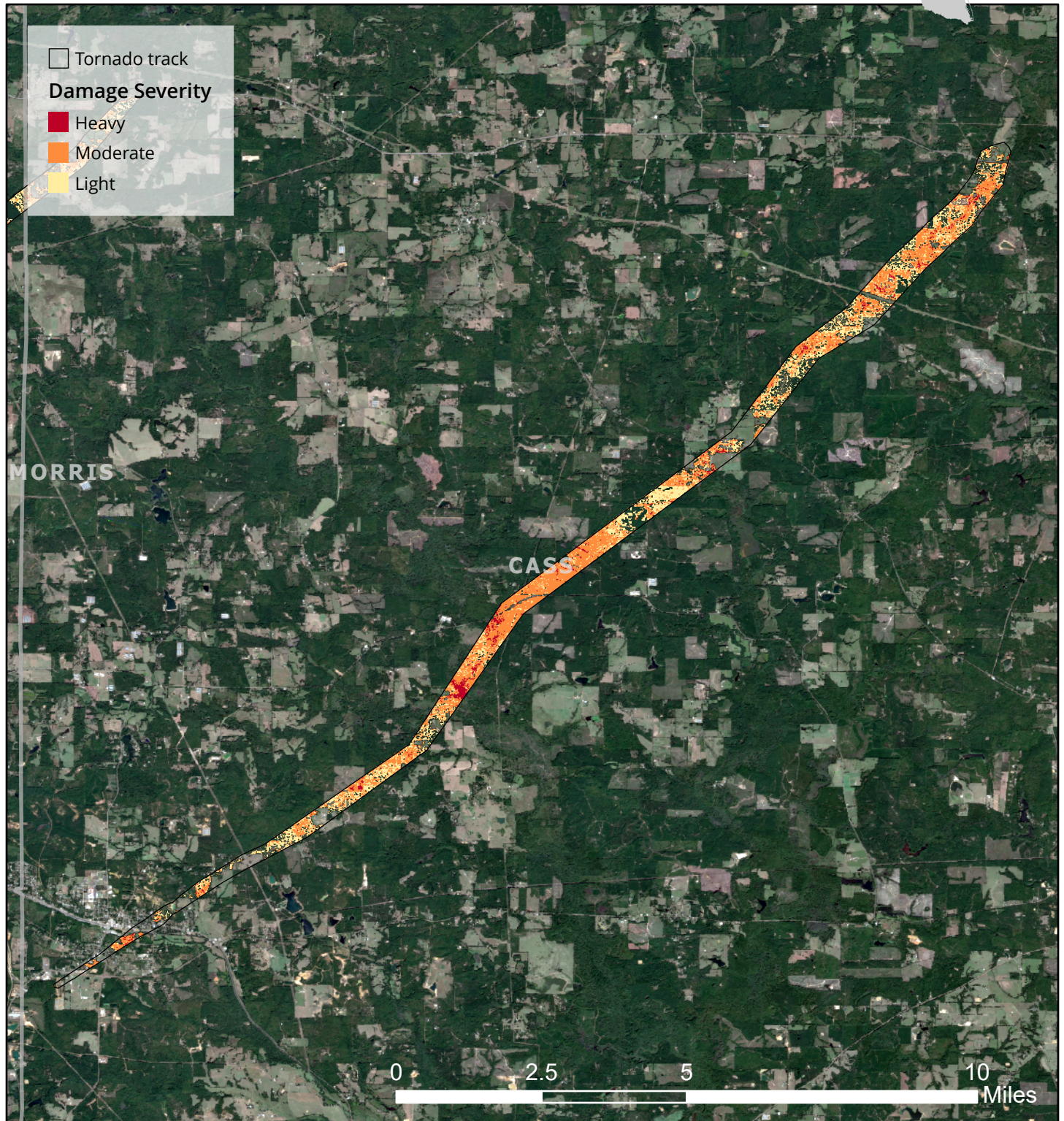
# Northeast Texas Tornadoes: Cass

November 4, 2022

Tornado track was obtained from the National Weather Service. Severity is estimated from the change in NDVI from October 18 to November 12 in Sentinel-2 Level 2A satellite imagery. The October 18 image is shown.



Maps prepared by Rebekah Zehnder, Texas A&M Forest Service, 11/29/2022.



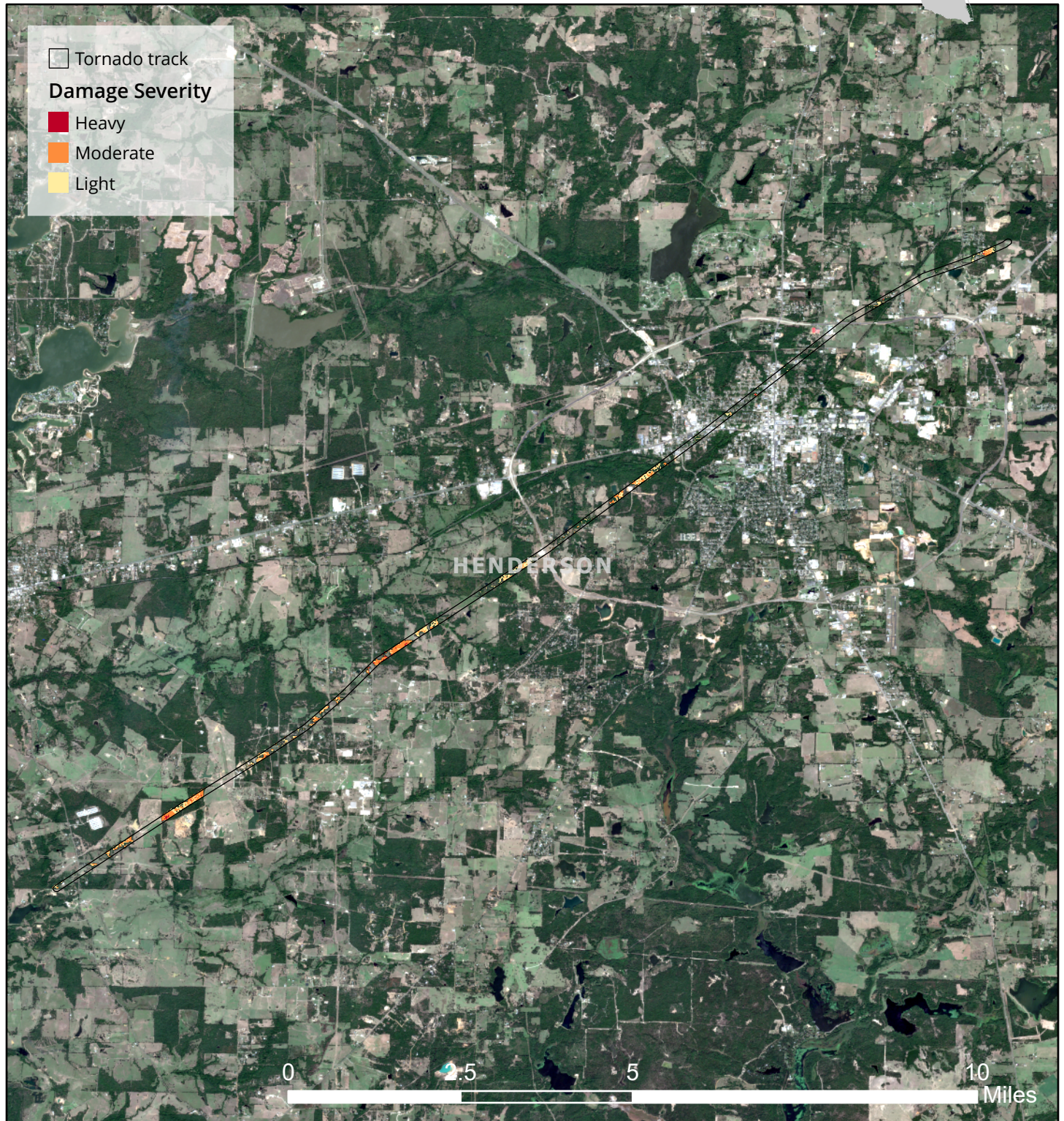
# Northeast Texas Tornadoes: Henderson

November 4, 2022

Tornado track was obtained from the National Weather Service. Severity is estimated from the change in NDVI from October 18 to November 12 in Sentinel-2 Level 2A satellite imagery. The October 18 image is shown.



Maps prepared by Rebekah Zehnder, Texas A&M Forest Service, 11/29/2022.



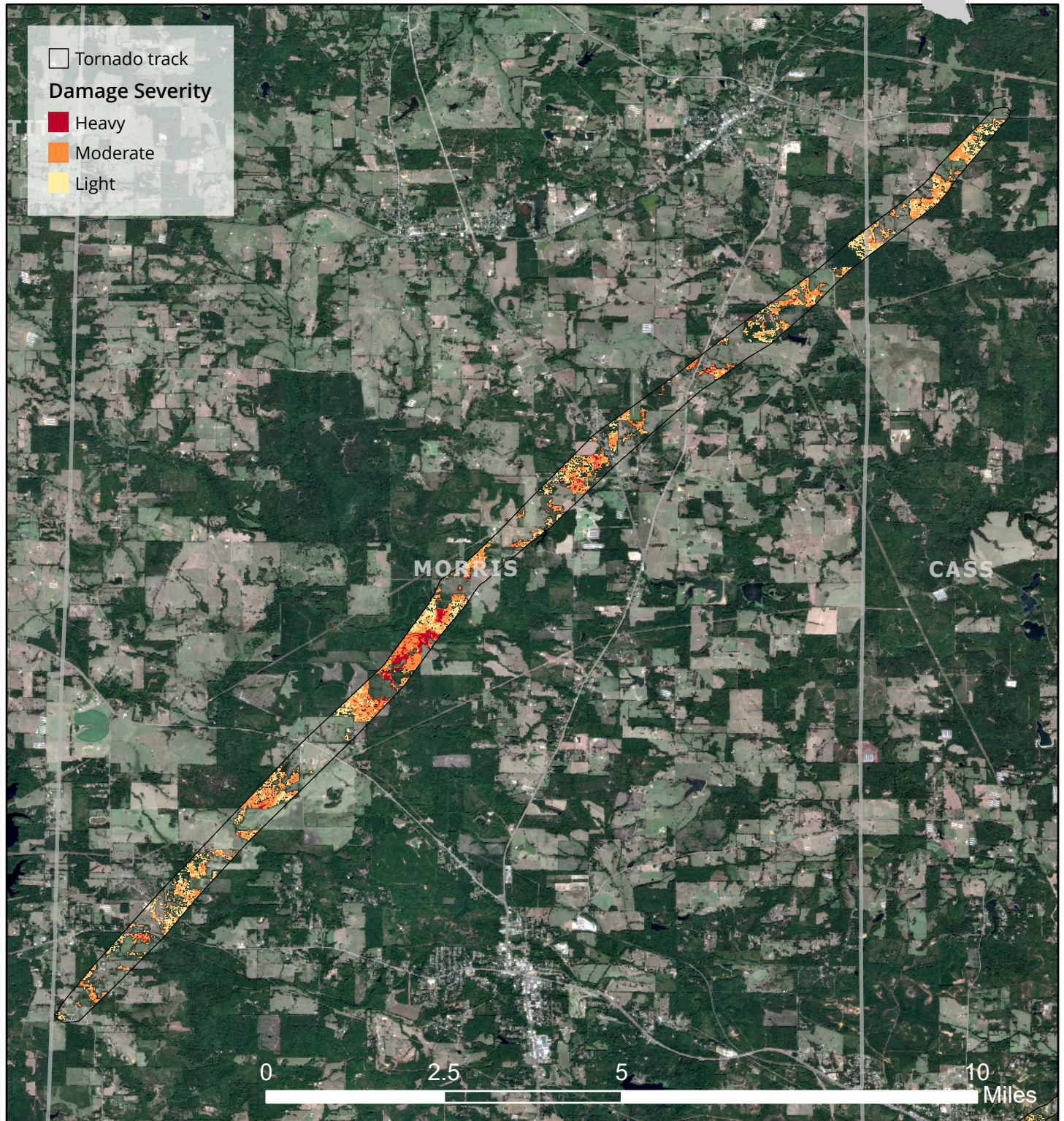
# Northeast Texas Tornadoes: Morris

November 4, 2022

Tornado track was obtained from the National Weather Service. Severity is estimated from the change in NDVI from October 18 to November 12 in Sentinel-2 Level 2A satellite imagery. The October 18 image is shown.



Maps prepared by Rebekah Zehnder, Texas A&M Forest Service, 11/29/2022.





# Northeast Texas Tornadoes: Red River

November 4, 2022

Tornado track was obtained from the National Weather Service. Severity is estimated from the change in NDVI from October 18 to November 12 in Sentinel-2 Level 2A satellite imagery. The October 18 image is shown.



Maps prepared by Rebekah Zehnder, Texas A&M Forest Service, 11/29/2022.

