Contents: Black River Electric

Section 1: Introduction

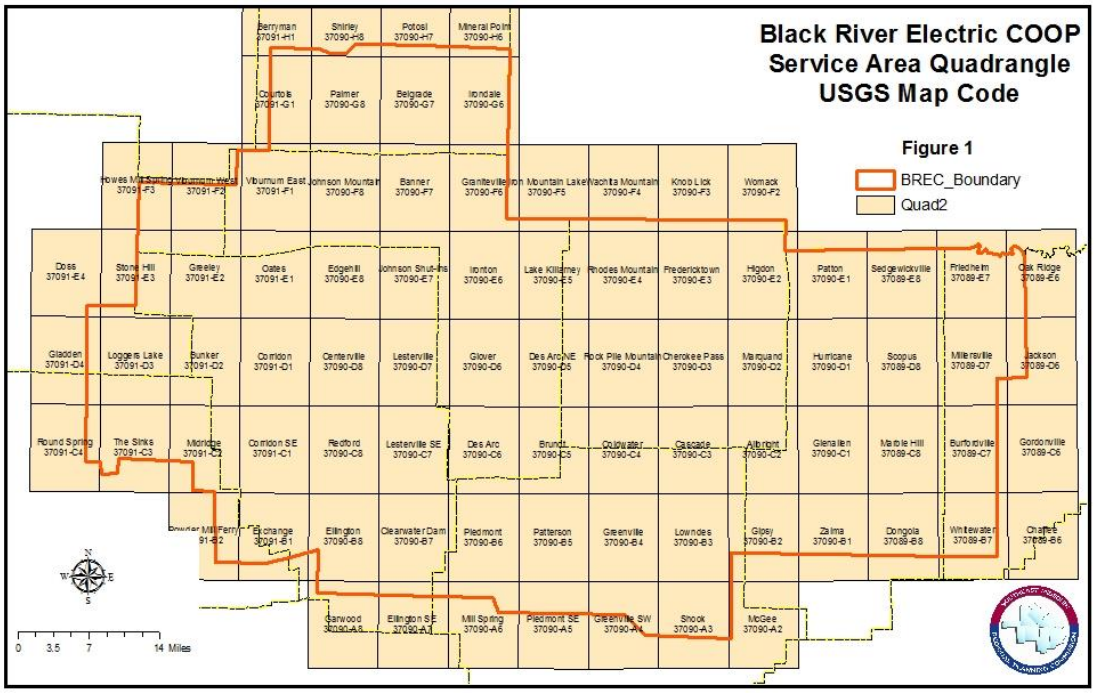
Black River Electric Cooperative (BREC) was established in 1938 to provide electric service to the rural areas of southeast Missouri on a non-profit cooperative basis. A Touchstone Energy Cooperative, BREC is headquartered in Fredericktown, Missouri, and provides electric service to customers in Bollinger, Cape Girardeau, Dent, Iron, Madison, Reynolds, Shannon, and Wayne Counties in Missouri. It also provides electric service to residents of the cities of Annapolis, Bunker, Sedgewickville, Piedmont, Mill Springs, Marble Hill, Marquand, Greenville, Glen Allen, Ellington, Centerville, Cobalt Village, Des Arc. BREC is governed by a board of nine directors who approves the Corporation's mission statement and business policies. BREC's mission is:

> *"The mission of Black River Electric Cooperative remains, as it has since its inception in 1938, to provide electrical service to its member-owners, as a not-for-profit organization. We, the elected board of directors and employees, are committed to providing the best, most economic, electric service possible to our member owners and contributing to the welfare of the community through growth and progress."*

BREC's service territory includes all or nearly all of Bollinger, Iron, Madison, and Reynolds Counties and portions of Cape Girardeau, Dent, Shannon, Washington, and Wayne Counties. BREC owns 4,418 miles of distribution lines within these counties, of which 4,113 miles are overhead distribution lines, and 52 miles are underground distribution lines.

Figure 1 depicts the geographic boundaries of the cooperative in relation to USGS local quadrangles within the state of Missouri. *(Map sources: USGS, BREC)*

Figure 1 *Black River Service Area Map*



The customer base of BREC is currently 25,751 members; residential customers account for 83.4% of memberships (21,528 members) while non-residential customers account for the remaining 16.4% of memberships (4,223 members). Table 1 shows Black River Electric Meters by County.

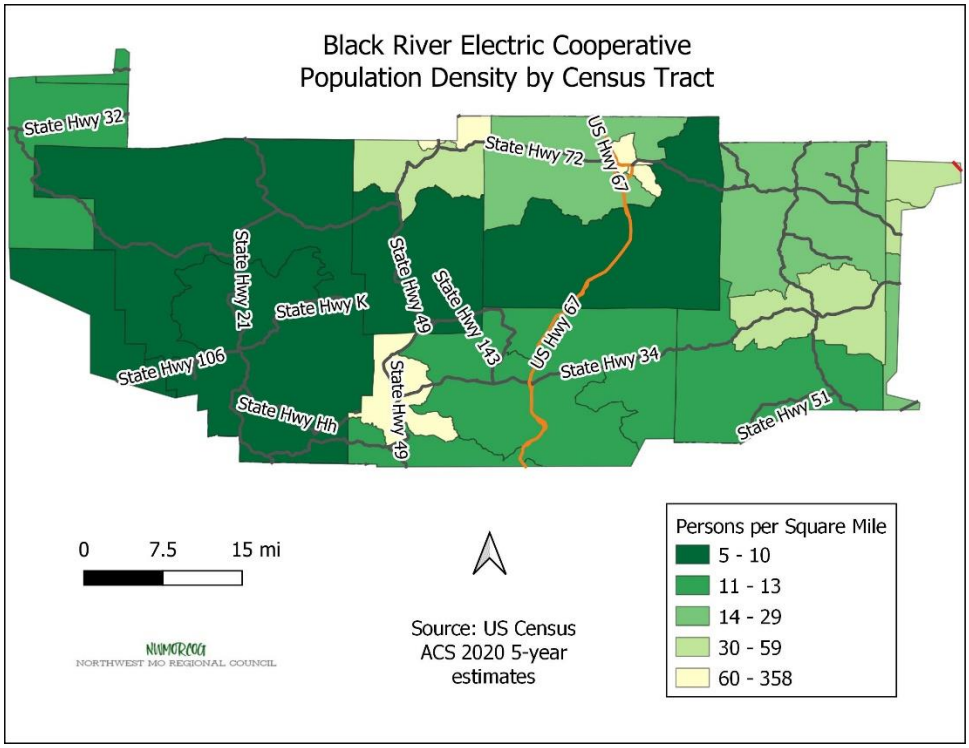
Table 1 *Meters by County*

County	Number of Meters
Bollinger	6,266
Cape Girardeau	1,711
Dent	413
Iron	1,951
Madison	5,145
Reynolds	4,309
Shannon	186
Wayne	5,770
Total	25,751

The average daily residential customer usage for BREC is 39 kilowatt-hours (kWh). Annual total usage of BREC customers in 2021 was 469,829,539 kWhs.

Population density for the cooperative service area is depicted in Figure 2. *(Map source: U.S. Census 2020)*

Figure 2 *BREC Population Density Map*



Critical Facilities

It is important in mitigation planning for the electric cooperatives to identify the critical facilities in each area and to be able to prioritize reconnection and back-up power needs. Black River provides service to approximately school districts, various medical clinics, pharmacies and nursing homes concentrated in Marble Hill, Piedmont, Greenville, Ellington and Bunker.

Future Development

Black River Electric Cooperative is currently in discussions for future load growth within various industries including: manufacturing, retail, resource recycling, new and existing mining, natural resource processing and others. Given the nature of the discussions, the cooperative chose to hold the exact nature, timing and size of future loads in confidence. However, they believe load growth is imminent and likely to be significant. Table 2 illustrates the population trend for the counties served by BREC.

Table 2 *Black River Service Area County Population Trend, 1990-2030*

County	1990	2000	2010	2010	2030 Projected
Bollinger	10,619	12,029	12,363	12,363	12,805
Cape Girardeau	61,633	68,693	75,674	75,674	84,612
Dent	13,702	14,927	15,657	15,657	15,694
Iron	10,726	10,697	10,630	10,630	7,494
Madison	11,127	11,800	12,226	12,226	13,304
Reynolds	6,661	6,689	6,696	6,696	6,285
Shannon	7,613	8,324	8,441	8,441	9,693
Wayne	11,543	13,259	13,521	12,769	11,200
	Source: U.S. Census Data				

Planning Process

Since the planning process is the same for each of the electric cooperative plans, the details of the planning process are presented in the Statewide Summary section of the plan.

Appendices

Three appendices are included at the end of the each plan:

Appendix A contains the Adoption Resolution; a document signed by the Cooperative's governing official showing that the Board of Directors has adopted the mitigation plan.

Appendix B contains the Documentation of Participation; copies of press releases, website postings and other public outreach that was made to request public comment.

Appendix C contains the Surveys; the Data Survey that is the source of data for the 2023 plan update; the Goals and Actions Survey is the updated review of the mitigation strategies.

Section 2: Asset Inventory

Black River Electric Corporation has a wide variety of assets by type. Real estate owned by the Corporation includes office buildings, warehouses, vehicle storage, and other outbuildings throughout its service territory. Seventy-four vehicles provide access to customers and infrastructure. BREC does not own any electric generation or transmission facilities. BREC owns approximately 4,200 miles of distribution lines. Table 3 provides information concerning total Utility Plant valuation.

Table 3 *Black River Electric Asset Inventory Valuation Summary*

Asset	Total Replacement Cost	Cost breakdown
Total BREC Assets	$608,379,114	Buildings and vehicles - $17,666,271 Overhead assets - $578,124,699 Underground assets - $12,588,144
Distribution Lines	Overhead (OH) $319,206,158 Underground (UG) $9,825,327	OH Single-phase lines - $308,795,990 UG Single-phase lines - $9,825,327 OH Three-phase lines - $10,419,168 UG Three-phase lines - $0
Supporting Infrastructure	$258,918,540OH $2,762,816 UG	Meters - $3,641,219 Poles - $192,635,868 OH Transformers - $35,802,776 UG Transformers - $2,762,816 Guys/Anchors - $13,261,687 Cross-arms - $6,124,811 Regulators - $3,059,888 SP Oil-Circuit Reclosures - $2,403,558 3phase Oil-Circuit Reclosures - $1,295,181 Capacitors - $693,552
Office Buildings	$13,033,779	
Warehouses	$0	
Vehicles	$4,632,492	
Source: Internal BREC Accounting and Insurance records		

Ensuring quality distribution to its customers, Black River maintains not only distribution lines, but also the supporting infrastructure as well. Table 4 on the next page includes a list of asset types, emergency replacement cost per unit or mile, the asset inventory by Service County, and total infrastructure numbers.

Table 4 *Black River Electric Asset Inventory by Service County*

Asset	Emergency Replacement Cost per unit or mile	Number of units or miles: BOLLINGER	Number of units or miles: CAPE GIRARDEAU	Number of units or miles: DENT	Number of units or miles: IRON
Meter	$148/unit	6,266	1,711	413	1,951
Pole	$2,095/unit	19,688	5,050	1,990	6,794
SP*** distribution line	$64,236/mile OH $12/foot OH $101,182/mile UG $19/foot UG	970 OH 6 UG	198 OH 3 UG	122 OH 2 UG	326 OH 7 UG
TP**** distribution line	$103,945/mile $20/foot UG/OH	160 OH 0 UG	42 OH 1 UG	11 OH 0 UG	80 OH 1 UG
Transformers	$1,460 OH	5,248 OH	1,418 OH	362 OH	1,707 OH
	$6,605 UG	109 UG	9 UG	3 UG	22 UG
Guys/ anchors	$220/unit	11,688	2,454	1,228	3,882
Cross-arms	$325	4,331	914	474	1,358
Regulators	$14,689	60	11	4	38
Oil Circuit Reclosures	$5,386 SP $5,386 TP	95 SP 123 TP	19 SP 9 TP	10 SP 3 TP	27 SP 18 TP
Capacitors	$2,385/unit	66	8	3	12
Total Replacement Value by county		$134,967,761 OH	$31,156,073 OH	$14,299,020 OH	$48,395,496 OH
		$1,327,037 UG	$472,936 UG	$222,179 UG	$957,529 UG

Black River Electric Asset Inventory by Service County continued

Asset	Number of units or miles:	Number of units or miles:	Number of units or miles:	Number of units or miles:	Total number of units or miles:
	MADISON	REYNOLDS	SHANNON	WAYNE	
Meter	5,145	4,309	186	5,770	25751
Pole	15,100	13,790	1,254	14,337	78,003
SP* distribution line	650 OH 11 UG	697 OH 7 UG	81 OH 1 UG	622 OH 7 UG	3,666 OH 44 UG
TP** distribution line	132 OH 0 UG	124 OH 2 UG	2 OH 0 UG	149 OH 4 UG	700 OH 8 UG
Transformers	4,215 OH	3,394 OH	184 OH	4073 OH	20,601 OH
	43 UG	61 UG	0 UG	131 UG	378 UG
Guys/ anchors	6,493	5916	729	6,165	38,555
Cross-arms	3,277	3,026	275	2,867	16,522
Regulators	44	31	4	28	220
Oil Circuit Reclosures	77 SP 30 TP	67 SP 31 TP	8 SP 4 TP	51 SP 40TP	354 SP 258 TP
Capacitors	42	47	3	43	224
Total Replacement Value by county	$97,840,273 OH	$95,524,946 OH	$8,714,602 OH	$95,571,200 OH	$526,469,371 OH
	$1,397,017 UG	$1,319,069 UG	$101,182 UG	$1,989,309 UG	$7,786,258 UG
*SP = Single phase **TP – Three phase Source: Internal Black River Accounting and Maintenance records					

Section 3: Risk Assessment

Risk Assessment Methodology

The risk assessment methodology used in the following section was utilized for both the statewide aggregation as well as for each individual cooperative chapter. Section 4 of the Statewide Summary details this methodology. Some variation in the availability of data exists between the electric cooperatives as each utilizes a different system of recording the impact of natural disasters.

For the purpose of this risk assessment, the identified hazards for the Black River service area have been divided into two categories: **historical and non-historical hazards.** Based on the data collected for the update, the hazards have been reclassified to reflect the actual data available and those hazards with no data available have been reclassified as non-historical. This does not mean that a non-historical hazard will never cause damage; it just means there have been no impacts prior to this report. The potential still exists, but the probability of the occurrence is numerically near zero. For the analysis in this plan non-historical hazard probability is stated as less than one.

> **Historical Hazards** are those hazards with a measurable previous impact upon the service area. Damage costs per event and a chronology of occurrences are available. The associated vulnerability assessments utilize the number of events and cost of each event to establish an average cost per incident. For BREC, hazards with historical data include tornadoes, severe thunderstorms/high wind/hail, flood/levee failure and severe winter weather.
>
> **Non-historical Hazards** are hazards with no previous record of impact upon the local service area. As such, the associated vulnerability assessments for each of these hazards will have an occurrence probability of less than 1% in any given year, but the extent of damage will vary considerably. For BREC, hazards without historical data include wildfire, earthquakes, dam failure and land subsidence.

Each hazard has a unique impact upon the service area, requiring each hazard to utilize a different valuation amount depending upon the level of impact. Non-historical hazards assume damage to all general assets. For Historical Hazards, assets were divided into two groups based upon historical impact which were utilized in the hazard damage analysis:

- Overhead infrastructure assets and buildings
    - Used for Tornado damage assessments
        - Valued at $595,790,970

- Overhead infrastructure assets only
    - Used for:
        - Severe Thunderstorm / High Wind / Hail
        - Flood
        - Severe Winter Weather
            - Valued at $578,124,699

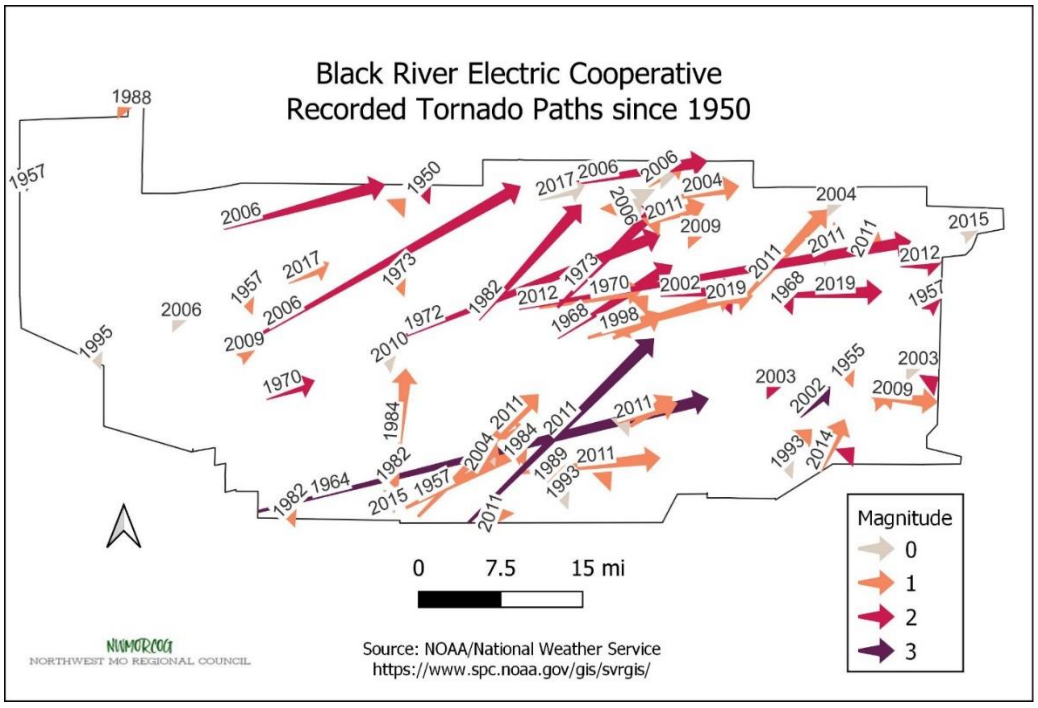
A. Historical Hazards

Tornadoes

Previous Occurrences

From 1950 to 2020, 83 tornadoes have been reported within the service area of Black River Cooperative. Figure 3 provides a pictorial representation of all recorded tornado touchdown sites and recorded paths during this time period *(Data for map collected from National Oceanic and Atmospheric Administration, NOAA.)*

Figure 3 *BREC Tornado Map*



A data insufficiency exists, however, between 1968 and 1991 in both historical hazard records and cooperative records concerning damage estimates. For the purpose of this assessment, the years for which records exist for both data sets have been used. From 1992-2016, Black River's service area within the state of Missouri has experienced a total of 74 tornadic events.

Probability of Future Occurrence and Vulnerability

Using the previously described methodology, the probability of a tornadic event in the Black River service area in any given year is 100% (83 events / 71 years). Estimated cooperative material damages associated with each of these events were compiled by AHEC staff. Five tornadoes caused damage to cooperative assets over the years existing in the cooperative records (1992-2021). The probability that BREC will sustain damage from a tornado in any given year is 32%. Table 5 provides a summary of event dates, EF-scale ratings, damage cost estimates and outages reported.

Table 5 *Black River Electric Tornado Event Summary*

Date of Event	EF Rating	Damage Estimates	Outages Reported
Nov. 14, 1993	F0	$14,300	58
April 24, 2002	F2	$31,246	63
May 8, 2009	F0	$832,167	360
April 19, 2011	F0	$130,833	497
Feb. 29, 2012	EF2	$150,000	71
Oct. 31, 2013	EF1	$70,000	48
Oct. 13, 2014	EF1	$20,000	15
Dec. 23, 2015	EF1	$50,000	63
October 24, 2021	EF3	$500,000	68
Dec. 10, 2021	EF2	125,000	42
	Totals	$1,923,546	1,285
Data provided based on internal BREC records which reflect cost from the referenced event year.			

Based upon the last 30 years of historical event records, tornado events will cause an average annual damage of $64,118. This averaged amount accounts for 0.01% of BREC's total overhead assets and building valuation of $578,124.699.

An average annual of 43 outages were recorded during tornadoes since 1992. When compared with the total number of meters (25,751) served by BREC, it can be projected that 0.2% of all meters may experience outages during any given year due to a tornadic event.

Problem Statement

Tornadoes are potentially such violent events that it is cost prohibitive to build an infrastructure that can withstand such powerful winds. Strategies could be developed or improved, if already in place, to ensure that employees are warned of approaching storms when in the field. Procedures to restore power after outages should be reviewed regularly to ensure that power is restored to critical facilities as quickly as possible.

Severe Thunderstorms, High Wind, Hail

Previous Occurrences

Data for the remaining hazards was available by county basis only. For the rest of the historical hazards, the Counties of Bollinger, Iron, Madison, Reynolds and Wayne will be used to determine an estimate of the events that occurred in the BREC area. According to NOAA, 247 days with thunderstorm/high wind/ hail events have been reported within these counties from 1992 through 2016.

For this update, it was possible to look at the bounds of the Black River Electric Cooperative using GPS, finding 291 hail events and 322 high wind/thunderstorm events from 1955-2020.

Probability of Future Occurrence and Vulnerability

The average annual number of severe thunderstorms in the BREC area is 4.9 events. Estimated material damages associated with these events were reported by BREC staff. Hail and the other effects of severe thunderstorms were not distinguished from each other in the records and were included as one total damage amount. There were 25 thunderstorms that resulted in damages for BREC during the 30 year period when data was available. The probability of a severe thunderstorm affecting damage on the service area is 83% in any given year. Table 6 details the events that resulted in damage to BREC assets.

Table 6 *BREC Thunderstorm Event Summary*

Date of Event	Damage Estimates	Outages
May 17, 1995	$10,100	69
May 5, 1996	$6,800	55
June 20, 1998	$9,500	63
Oct. 24, 2001	$15,430	72
March 9, 2002	$2,900	36
May 15, 2003	$2,580	27
May 31, 2004	$18,710	82
July 6, 2004	$18,775	83
March 12, 2006	$3,400	39
April 2, 2006	$3,850	41
April 17, 2006	$21,686	92
Sept. 23, 2006	$20,950	90
Oct. 18, 2007	$7,400	59
March 20, 2008	$12,250	75
Sept. 11, 2008	$56,092	144
Sep. 14, 2008	$2,000,000	87
Feb. 11, 2009	$10,000	24
May 1, 2010	$4,900	48
Feb. 20, 2014	$1,000	11
August 19, 2014	$2,000	14
April 9, 2015	$17,000	19
Dec. 23, 2015	$20,000	28
July 6, 2016	$30,000	23
July 15, 2016	$25,000	41
Oct 19, 2016	$2,500	10
Feb 28, 2017	$150,000	115
March 6, 2017	$45,000	42
July 14, 2017	$25,000	31
June 26-28, 2018	$150,000	123
June 21-23, 2019	$75,000	206
July 17, 2019	$42,000	29
June 9, 2020	$25,000	27
Nov 14, 2020	$15,000	35

Date of Event	Damage Estimates	Outages
April 9, 2021	$11,000	28
Totals	$2,860,823	1,968
Data provided based on internal BREC records		

Based upon historical records, thunderstorm hail/high wind events will cause an average annual damage of $95,361. This averaged amount accounts for 0.02% of BREC's overhead asset valuation of $578,124,699.

An average annual of 65.6 outages were recorded during hail, thunderstorm, and high wind events since 1992. When compared with the total number of meters served by BREC, it can be projected that 0.2% of all meters may experience outages during any given year due to a hail, thunderstorm, or high wind event.

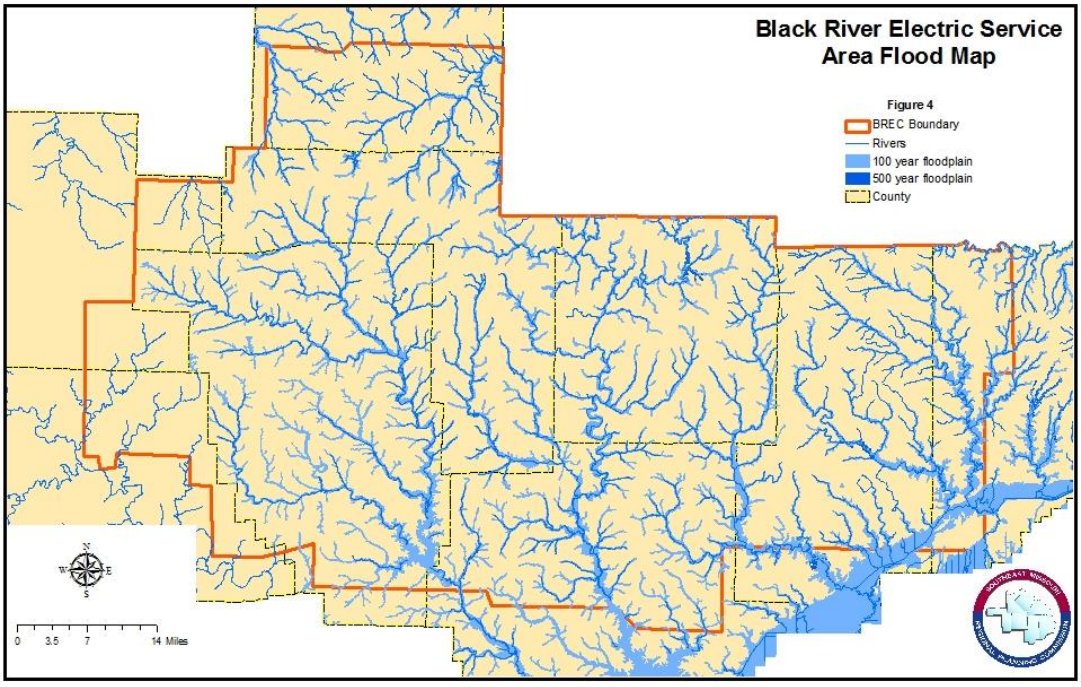
Problem Statement

Thunderstorms producing hail and high winds are events that occur several times each year in the service area. Since the trend has been towards more intense storms over the last decade, replacing wooden poles with manufactured ones whenever possible is recommended.

Flood and Levee Failure

Approximately 10% of BREC's service territory is located directly within the 100 or 500 year floodplain. Figure 4 below depicts the 100 year floodplain in relation to the cooperative's boundaries. *(Map source: FEMA)* Currently, inundation data for levee failure is lacking due to issues surrounding mapping, appropriate models, and its close association with flooding events.

Figure 4 *BREC Flood Map*



Previous Occurrences

From 1993-2016, Black River Electric's service territory has experienced 117 days of flooding events. This includes both flash flood and riverine flooding reports. Estimates from NOAA's Storm Events Database put property damage totals from the five counties at over $52 million from these events. To update this data, NCEI reported 39 flood events occurring during the past five years in the area. BREC did not report any additional damages or outages since the last update.

Probability of Future Occurrence and Vulnerability

The average annual number of days of flood events is 7.8. BREC has experienced damage to its assets during 10 flood events There is a 33% probability of a damaging flood occurrence in any given year. Estimated material damages associated with each of these events were compiled by BREC staff. Table 7 summarizes flood event dates by month and year, damage cost estimates, and reported outages.

Table 7 *Black River Electric Flood Event Summary*

Date of Event	Damage Estimates	Outages
November 1993	$12,000	45
April 1999	$9,500	30
March 2008	$5,085	15
March 2010	$1,000	2
May 2011	$2,800	9
August 14, 2015	$4,000	26
August 15, 2016	$6,000	18
September 15, 2016	$5,000	22
April 28, 2017	$100,000	105
Nov. 24, 2018	$10,000	32
Nov. 26-27	$13,000	48
Total	$168,385	352
Data provided based on internal BREC records which reflect cost from the referenced event year.		

Flood and levee failure events vary widely based upon numerous factors including, but not limited to, annual precipitation and extent of levee damage. Based upon historical records, flood/levee failure events affecting BREC will cause average annual damages of $5,613. This averaged amount accounts for less than 0.01% of BREC's overhead asset valuation.

An average annual of 11.7 outages were recorded during flooding events since 1992. When compared with the total number of meters served by BREC, it can be projected that less than .01% of all meters may experience outages during any given year due to a flooding event.

Problem Statement

With numerous flood-prone rivers crossing its area, Black River Electric needs to waterproof assets when possible.

Severe Winter Weather

Previous Occurrences

From 1992-2016, BREC's five main counties have been impacted by 54 days of severe winter weather events, including heavy snows, winter storms and significant ice storms. Over $4.6 million in property damage has occurred due to these events according to NOAA. To update this data, NCEI reported 7 winter weather events occurring during the past five years in the area. BREC did not report any additional damages or outages since the last update.

Probability of Future Occurrence and Vulnerability

The average annual number of days with a severe winter weather event in any given year is 1.4. To date, 25 of these severe weather events caused damage to cooperative assets, resulting in an 83.3% probability that a severe weather event will produce damage in any given year. There is an 89% probability that a damaging storm will occur in any given year. Table 8 shows damage and outage estimates from previous storms.

Table 8 *Black River Electric Severe Winter Weather Event Summary*

Date of Event	Damage Estimates	Outages
Nov. 1993	$11,000	79
March 1994	$775	4
Jan. 1995	$600	3
Jan. 1996	$1,200	9
Nov. 1996	$1,600	12
Jan. 1999	$12,600	88
Dec. 2002	$2,200	18
Feb. 2003	$5,400	39
Jan. 2004	$5,100	35
Dec. 2006	$6,309	65
Dec. 2007	$900	5
Jan 2008	$400	2
Feb. 2008	$975	5
Feb. 2008	$45,318	140
March 2008	$1,700	11
Jan. 2009	$800	5
Feb. 2009	$750	4
Feb. 2011	$855	5
Mar. 4, 2015	$4,000	31
Jan. 19, 2016	$1,000	53
Feb. 14, 2016	$50,000	101
Feb. 24, 2016	$50,000	124
Dec. 17, 2016	$2,500	23
Jan. 13, 2017	$62,000	45
Jan. 18, 2019	$20,000	22

Totals	$287,982	928
Data provided based on internal BREC records		

Based upon historical records, severe winter weather events will cause an average annual damage of $9,599. This averaged amount accounts for less than 0.01% of BREC's total overhead asset valuation.

An average annual of 31 outages were recorded during severe winter weather events since 1992. When compared with the total number of meters served by BREC, it can be projected that 0.1% of all meters may report outages during any given year due to a severe winter weather event.

Problem Statement

Underground placement of assets remains the best protection against damage from ice storms.

B. Non-Historical Hazards

Wildfire

Previous Occurrences

The incidence of wildfire in the BREC service area presents a unique risk assessment. Wildfire events have occurred in each of the seven counties from 2004-2016. Cape Girardeau, Dent and Shannon County have been eliminated from this assessment due to the low number of meters and small areas included in the cooperative's service area. Table 9 summarizes the incidences of wildfire within the remaining five counties.

Table 9 *Wildfire Summary by County*

County	# of Wildfires, 2004-16	Average Annual # of Wildfires	Acres Burned	Average Annual Acres Burned
Bollinger	399	31	2,814	216
Iron	141	11	7,064	543
Madison	233	18	1,316	101
Reynolds	599	43	21,737	1,672
Wayne	244	19	5,921	455
Total	1,616	122	38,852	2,987
Source: Missouri State Hazard Mitigation Plan, 2018				

Probability of Future Occurrence and Vulnerability

Based upon this information, the probability of a wildfire event in the Intercounty service area in any given year is near 100%, with an average annual number of 1,616 wildfires during the 13 year period. Although BREC does not have records of any significant damage from wildfires, for the purposes of this assessment, wildfire and its associated impacts cannot be eliminated from the realm of possibility.

The potential extent of damage caused by wildfire is difficult to determine. Like earthquakes and dam failure, wildfires have had no measurable impact upon the service area. With an average annual of 38,852 acres burned in the area and a five-county total area of 2,074,240 acres, it is unlikely that infrastructure damage would exceed one percent based upon asset location and the unlikeliness of an uncontrollable wildfire.

No customers have reported outages during recorded wildfires. When compared with the total number of meters served by BREC, it can be projected that less than 1 percent of all meters may report outages during any given year due to a wildfire event.

Problem Statement

Further study will be required to create a model for damage assessments related to wildfire.

Earthquakes

The closest source of earthquake risk in southeast Missouri is the New Madrid Fault, which runs from northern Arkansas through southeast Missouri and western Tennessee and Kentucky to the Illinois side of the Ohio River Valley. The South Central Illinois Seismic Zone and the Wabash Valley Seismic Zone are also in close proximity to BREC's territory.

Previous Occurrences

Numerous earthquakes occur throughout each year in this area. On April 1, 2015, a magnitude 3.6 event happened near Steele, Missouri. More recently on October 16, 2015, an earthquake near Doniphan, Missouri registered 3.5 on the Richter scale.

Probability of Future Occurrence and Vulnerability

The New Madrid Fault has, according to many experts, the potential to produce the largest earthquakes in North America. The New Madrid fault has the potential to cause damage throughout the state of Missouri, including the BREC service area. Scientists from the U.S. Geological Survey (USGS) and the Center for Earthquake Research and Information (CERI) at the University of Memphis have estimated the probability of a magnitude 6.0 or greater earthquake from the New Madrid Fault is 25-40 percent through the year 2053.

The projected earthquake intensity ratings for the cooperative region changes based upon the Modified Mercalli Scale. Given a New Madrid earthquake with a 6.7 magnitude, the region would experience Level VI-VII intensity characteristics. In the event of an earthquake with a 7.6 magnitude, the region would experience Level VII-VIII intensity characteristics while an earthquake with an 8.6 magnitude would most likely cause Level VIII-IX intensity characteristics.

In the event of an earthquake with a 7.6 magnitude, the BREC service area would most likely experience severe building damage as well as substantial damage to the electrical distribution system. Both overhead and underground lines could become disconnected or severed, and transformers, substations, and buildings would likely be damaged.

Based upon information from CERI, FEMA, and SEMA and using the standardized scale for Missouri electric cooperatives, it may be estimated that up to 30%, or 7,295 meters, could experience outages related to an earthquake event of 7.6 magnitude.

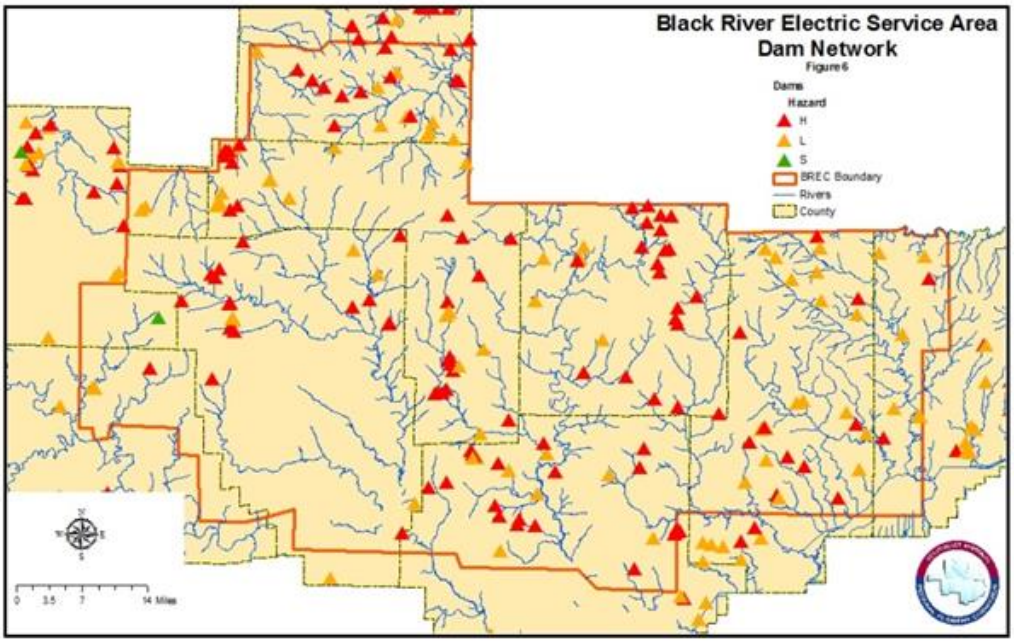
Problem Statement

Black River Electric should strive to meet seismic design standards for electrical substation equipment and other overhead assets susceptible to damage from earthquake events

Dam Failure

Like earthquakes, dam failures have had no measurable impact upon BREC's service territory to date. According to Missouri DNR's Dam Safety Division, 228 dams currently exist within the counties at least partially covered by the cooperative boundaries: 35 in Bollinger County, 32 in Cape Girardeau County, 36 in Dent County, 41 in Iron County, 26 in Madison County, 22 in Reynolds County, and 36 in Wayne County. Of these dams, 1 in Bollinger County, 6 in Cape Girardeau County, 4 in Dent County, 12 in Iron County, 5 in Madison County, 11 in Reynolds County, and 6 in Wayne County 45 are regulated by the state due to the fact that they are non-agricultural, non-federal dams which exceed 35 feet in height. Figure 5 shows the locations of all known DNR regulated dams located within BREC's service territory. *(Map sources: www.msdis.missouri.edu; www.dnr.mo.gov/env/wrc.)*

Figure 5 *Dam Map*



Previous Occurrences

The 2018 Missouri State Hazard Mitigation plan states "For the 42-year period from 1975 to 2016 for which dam failure statistics are available, 19 dam failures and 68 incidents are recorded. According to this data, annual probability calculates to a 45 percent annual probability of a dam failure somewhere in the

state and a 100 percent annual probability of dam incidents. In should be noted that historical dam failures and incidents include events from all hazard classes and all dams (whether regulated or un-regulated). Failures and incidents for regulated dams that have higher inspection frequencies should be less probable. The probability of future events is 45%." The most significant Dam Failure in the BREC service area was the Taum Sauk Upper Reservoir failure in December 2005 in Reynolds County. The reservoir breech drained over one billion US gallons of water in approximately thirty minutes. No damages or outages were reported from this event.

Probability of Future Occurrence and Vulnerability

In order to allow for a risk assessment, the probability of this event has been included as less than 1%. Upstream dams do exist and complicate the analysis of a dam failure effects on service area assets. Determining the potential extent of dam failure is currently impossible due to a lack of data concerning past events in the service area. This assessment assumes a limited impact upon downstream electric distribution infrastructure of less than 1% for both infrastructure damage and service interruption due to the lack of data and past hazard occurrences.

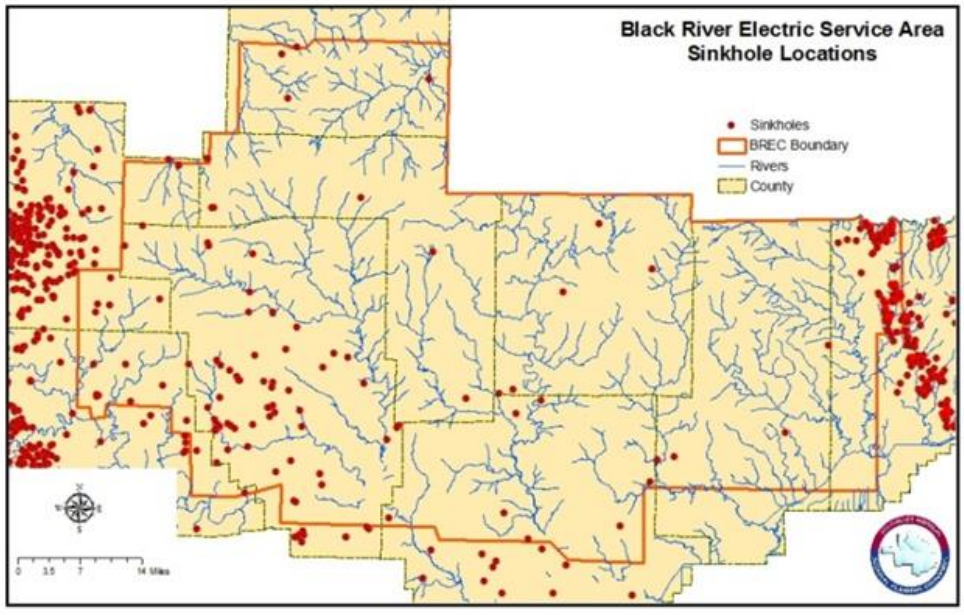
Problem Statement

Further study concerning existing dams and the impact of their failure is required to make a more comprehensive assessment of potential damages and mitigation strategies to address this potential hazard.

Land Subsidence (Sinkholes)

Through personal knowledge of BREC staff and the general public, it is well known that BREC's service territory contains areas of underground mining, surface mining and extensive cave systems. Figure 6 depicts the known locations of sinkholes within the BREC service area.

Figure 6 *Sinkhole Map*



Previous Occurrences

To date, there has been no measurable impact as a result of land subsidence to BREC's system; however, further investigation is required to detail the areas and/or number of sites within its service territory and within each county where these conditions occur.

Probability of Future Occurrence and Vulnerability

For purposes of this assessment, subsidence and its associated impacts cannot be eliminated from the realm of possibility. In order to allow for a risk assessment, the probability of this event has been included as less than 1%.

Determining the potential extent of subsidence is currently impossible due to a lack of data concerning the area. Further study concerning existing underground mining, surface mining and the extensive cave system and their potential impact is required to make a more comprehensive assessment of potential damages. This assessment assumes a limited impact on BREC's electric infrastructure of less than 1% for both infrastructure damage and service interruption.

Problem Statement

The fact that BREC does extensive engineering and environmental impact studies prior to construction of infrastructure reduces the potential threat of damage from land subsidence. If an incident of land subsidence occurred, it would be localized to a relatively small area which would further limit its impact on the cooperative.

C. Risk Assessment Summary

Most of the historical hazards have had an impact on the electric cooperatives. Table 10 below shows the annual damages associated with each hazard for Black River Electric. The table is ranked by the highest Average Annual Damages which is an indication of the vulnerability to each hazard.

Table 10 *BREC Hazard Risk Summary*

Hazard	Average Annual Damages
Severe Thunderstorms, Hail and High Winds	$95,361
Tornadoes	$64,118
Severe Winter Weather	$9,599
Flood and Levee Failure	$5,613
Dam Failure	$0
Earthquakes	$0
Land Subsidence	$0
Wildfire	$0

Each of the non-historical hazards Wildfire, Earthquakes, Land Subsidence and Dam Failure has the potential for causing catastrophic damages in any given year. To date there have been zero damages to the assets of the Black River Electric Cooperative Association from the non-historical events. Nonetheless, this set of hazards should be considered in mitigation strategies because of the damage potential.

Section 4: Mitigation Strategies

Previous Mitigation Efforts

For organizations like Black River Electric, mitigation is considered to be part of prudent business operations. In order to ensure the delivery of a quality product and minimize service interruptions, a number of mitigation strategies are continually utilized. Routine maintenance and upgrades to existing equipment are completed as part of daily tasks. Vegetation management is utilized to limit the cascading effects of natural hazards. Safety and reporting information are disseminated to the public through various types of media. Mutual aid agreements and partnerships create relationships which provide for future support in the event of a natural disaster.

Additionally, mitigation is considered prior to any expansion of service into special hazard areas. Before any service is built, it is first "staked out" in coordination with local builders and property owners. This process, completed by the Staking Engineers and approved by the respective Line Superintendent, identifies and addresses foreseeable hazards and safety issues before any new service lines are constructed. USDA-RUS specifications regarding operation and safety are utilized in every step of the process. Steps are taken to practically minimize the exposure of equipment to loss due to foreseeable hazards. Customers who reside in the floodplain are not charged for repairs or losses associated with flooding unless they purposefully destroy or restrict the Cooperative from protecting their transmission and/or distribution system assets.

Existing and Potential Resources

As stated above, mitigation is a key component of good business practices. Black River Electric Cooperative includes mitigation strategies as part of its regular work activities to ensure service with minimal interruptions. Funding for these activities is provided through the Cooperative's normal budgetary process for maintenance.

In order to expand mitigation efforts beyond normal maintenance, it is likely that BREC will need to seek outside funding sources. These may include private, state or federal programs which provide grant and loan funding. Upon passage of this plan, BREC will be eligible for funding through FEMA in the following categories:

- Hazard Mitigation Grant Program
- Flood Mitigation Assistance Program
- Pre-Disaster Mitigation Program
- 406 Stafford Act
- USDA Economic Development grants

Review of Goals and Actions

To focus on the mitigation actions for the 2023 update to this plan, it was decided to reach consensus on four goals that would address the needs of every cooperative member of AMEC and eliminate the objectives from previous updates. The BREC mitigation staff reviewed these goals and the actions from the previous update which addressed hazard mitigation issues. They evaluated each action to decide if it

was completed, will be continued, or should be deleted. There also was the opportunity to add new actions.

Table 11 *Black River Electric Cooperative Goals 2023*

Identified Goals	Reassessment of the Goal 2023
Goal 1: Protect the health and safety of the community.	**Accept, as is**
Goal 2: Reduce future losses due to natural hazard events.	**Accept, as is**
Goal 3: Improve emergency management capabilities and enhance local partnerships.	**Accept, as is**
Goal 4: Continue to promote public awareness and education.	**Accept, as is**

Traditionally, the STAPLEE (Social, Technical, Administrative, Political, Legal, Environmental, and Economic) method is used to prioritize mitigation actions. These categories, however, do not necessarily align with the private sector in the same way they are applicable to governmental agencies. Several action items could be included with multiple goals, for example. As a result, the cooperatives chose to use a different method to prioritize their mitigation strategy.

The chosen method of reviewing the proposed and existing mitigation strategies was to perform a cost-benefit analysis of all mitigation actions. The analysis was based on past experiences of performing certain actions and the potential number of beneficiaries. The following matrix, Table 12, was used to rate each mitigation action. Cooperative staff was asked in the Goals and Actions Survey to review the cost-benefit rating and change if necessary.

Table 12 *Cost Benefit Matrix*

COST	BENEFIT		
	High	Medium	Low
High	7	4	1
Medium	8	5	2
Low	9	6	3

The following tables represent the completed review of current and potential mitigation strategies. Each strategy has assigned a cost benefit score assigned by the cooperative staff based on prior experience and professional opinions. Table 14 shows review the actions and the results of the cost-benefit analysis. The table has been updated through the Goals and Actions Survey that was sent to facilitate the staff update review. The Survey can be found in Appendix C. Staff members reviewed each item on the original tables and determined the status of the item.

Table 13 *Prioritized Mitigation Actions for Black River Electric Cooperative-2023*

Goal-Action #	Action Item	Status Update	Progress on Continued Actions	Hazards Addressed by This Action	Completion Date	Cost/ Benefit Score
1-1	Use vegetation management to prevent interference with delivery of power and protect public from downed lines.	Continue (In-progress)	vegetation management is ongoing	Thunderstorms Tornado Wildfire Winter weather	Annually	7
1-2	Work with emergency management partners to identify one strategic location in each county to provide a generator-set capable of operating county emergency operations or community shelter.	Continue (Not started)	Significant financial barriers exist	All Hazards	2027 or later	4
1-3	Automated voice response systems purchase/installation to improve outage reporting and two-way communication for public safety.	Continue (Not started)	Significant financial barriers exist	All Hazards	2027 or later	2
2-1	Upgrade to steel poles where possible. Transmission system	Continue (In-progress)	Steel pole installation is on an "as identified" basis.	Flooding Thunderstorms Tornado Winter Weather	Annually	7
2-2	Add tie lines to eliminate or reduce time of outages.	Continue (In-progress)	Tie lines are evaluated and constructed on a case-by-case basis	All hazards	Annually	7
2-3	Replace small copper conductor with large ACSR	Continue (In-progress)	Reconductoring, as identified by work plan and loading requirements.	Flooding Land subsidence Thunderstorms Tornado Winter Weather	Annually	5
2-4	Convert overhead lines to underground lines or vice versa in troubled areas based on vulnerability.	Continue (In-progress)	Ongoing as financial and work plan elements permit.	All Hazards	Annually	7
2-5	Harden operational facilities (offices) to withstand climate hazards such as: tornadic conditions, flooding & seismic activities.	Continue (Not started)	Financial and geographic barriers exist	Earthquakes Flooding Land Subsidence Levee Failure	2025	7
2-6	Research methods for waterproofing meters in flood-prone areas.	Continue (Not started)		Dam Failure Flooding Levee Failure	2027 or later	4

Goal-Action #	Action Item	Status Update	Progress on Continued Actions	Hazards Addressed by This Action	Completion Date	Cost/ Benefit Score
2-7	Monitor developments in data availability concerning the impact of dam failure, sinkholes/land subsidence, and wildfire upon the BREC service area through local, state, and federal agencies.	Continue (Not started)	Lack of substantive data	Dam Failure Land Subsidence Levee Failure	annually	1
2-8	Design & implement systems to improve two-way communications	Continue (Not started)	Additional tower sites need to be located and acquired to allow more effective and redundant digital communication across the BREC system.	Thunderstorms Tornado Wildfire Winter Weather	2026	7
3-1	Maintain mutual aid agreements with other rural electric cooperatives.	Continue (In-progress)	ongoing	All Hazards	Annually	9
3-2	Cooperate with local law enforcement and government officials to reduce the impact of power outages.	Continue (In-progress)	ongoing communication between the law enforcement, emergency management and local governments.	All Hazards	Annually	5
3-3	Purchase and implementation of automated vehicle location (AVL) to improve outage response time.	Continue (Not started)	Large areas of poor cellular coverage	All Hazards	2025	7
4-1	Provide safety and reporting information to the general public through varying methods: • Company website • Social media sites • Local newspapers • Presentations • Publications	Continue (In-progress)	Activities related to this section are ongoing	Flooding Thunderstorms Tornado Winter Weather	Annually	7

After review, there were two actions deleted and removed from the Action Items list for the 2023 plan update. These Actions are listed in the table below. There were zero Actions deleted. All other Actions are continued in the plan update. There was no new Actions added to the plan.

Table 14 *Prioritized Mitigation Completed and New Actions for Black River Electric Cooperative*

Actions Item	Status Update	Explanation for Completed/Deleted Action
Perform routine maintenance and utilize upgraded equipment where possible to ensure quality of system. Tasks may include part replacement and/or upgrades. Identified work includes but is not limited to: • Addition of lightning arresters, electronic reclosures, conductors, guidewires. • Replacement or repair on poles, cross-arms, lines. • Raising padmount transformers in flood prone areas.	delete	As a component of system hardening, these activities are incorporated into normal maintenance
Complete annual inspections of lines and poles.	delete	BREC performs as normal maintenance

Section 4: Plan Implementation and Maintenance

Plan Incorporation

The goals and actions of the previous section identify both ongoing efforts at mitigation and potential methods for expanding mitigation efforts. The updated plan has been reviewed and adopted by the Board of Directors as part of the Cooperative's operations policy. This mitigation plan necessitates involvement from every Black River Electric Cooperative employment level as the organization strives to ensure quality service to their customers.

Local Planning Capabilities

Some internal planning capabilities do exist at Black River Electric. The Hazard Mitigation Plan can be considered and/or incorporated into regular budgetary planning, the four-year work plan for capital improvements, and the maintenance planning policy. Planning capabilities per se for the electric cooperatives are limited. What is important is that the Action Items developed through the mitigation planning process are incorporated into the daily activities of the cooperative.

The four year work plans embrace the mitigation efforts that are in the mitigation plan. The electric cooperatives across Missouri are always working to strengthen their systems. This would include installing stronger/larger poles when smaller ones need to be changed out, installing stronger/larger conductors that can carry more weight and decreasing span lengths between poles, installing larger anchors, relocating structures out of flood plains, and installing structures to stop cascading during ice storms.

Other capabilities are unique to the electric cooperative's business of providing reliable electricity to their members. Many of the Action Items listed in the plan include tree trimming plans, use of GPS to locate outages, service upgrades to lines and poles, warning systems and use of weather radios, collection of GIS data and utility specific software for locating and rerouting outages to restore power, all contribute to local capabilities. Integration of Black River Electric's planning with local law enforcement, mutual aid agreements, and partnerships with local emergency management resources ensures power to critical facilities during a hazard event. This coordination and cooperation broadens the capabilities of the local cooperative.

Beyond the Black River Electric Hazard Mitigation Plan, regional planning capabilities exist at the local level. The counties each have a FEMA-approved Natural Hazard Mitigation Plan in place. County emergency management directors have Local Emergency Operations Plans which seek to mitigate the same hazards for residents. These same counties are also included in their respective Regional Transportation Plan (RTP) and Comprehensive Economic Development Strategy (CEDS). BREC's plan can be easily incorporated into these local plans and allow for coordination across agencies in the event of an emergency.

No counties in the service area have any zoning capabilities while the included municipalities generally have zoning ordinances and comprehensive plans in place.

Plan Maintenance

Black River Electric Cooperative will follow the requirements coordinated by the Association of Missouri Electric Cooperatives (AMEC) for monitoring, evaluating, and updating the plan.

Continued Public Involvement Opportunities

Public notice was given in the form a notice in the *Rural Missouri*, a publication of the Association of Missouri Electric Cooperatives, distributed to all cooperative members. The updated 2023 plans were posted on the website of the Northwest Missouri Regional Council of Governments for public review and comment. Comments were considered and addressed. Once all cooperative plans were completed, they were assembled into one plan and submitted to the State Emergency Management Agency and the Federal Emergency Management Agency for review and approval. The documentation for public involvement and comments can be found in Appendix B of each cooperative's section of the plan.

Black River Electric Cooperative will follow the requirements coordinated by the Association of Missouri Electric Cooperatives (AMEC) for continued public involvement. Opportunities for public comment will continue to be offered through various media outlets and the physical office of BREC.

Appendix: A - Adoption Resolution

RESOLUTION

HAZARD MITIGATION PLAN

(CORPORATE SEAL)

Appendix: B - Documentation of Participation

This ad was published in the *Rural Missouri*, a monthly publication of the Missouri Association of Missouri Electric Cooperatives, giving public notice to all subscribing members of AMEC.

Appendix: C - Surveys

Data Survey

The following is the returned survey from GEC which was used by NWMORCOG staff to update the Plan:

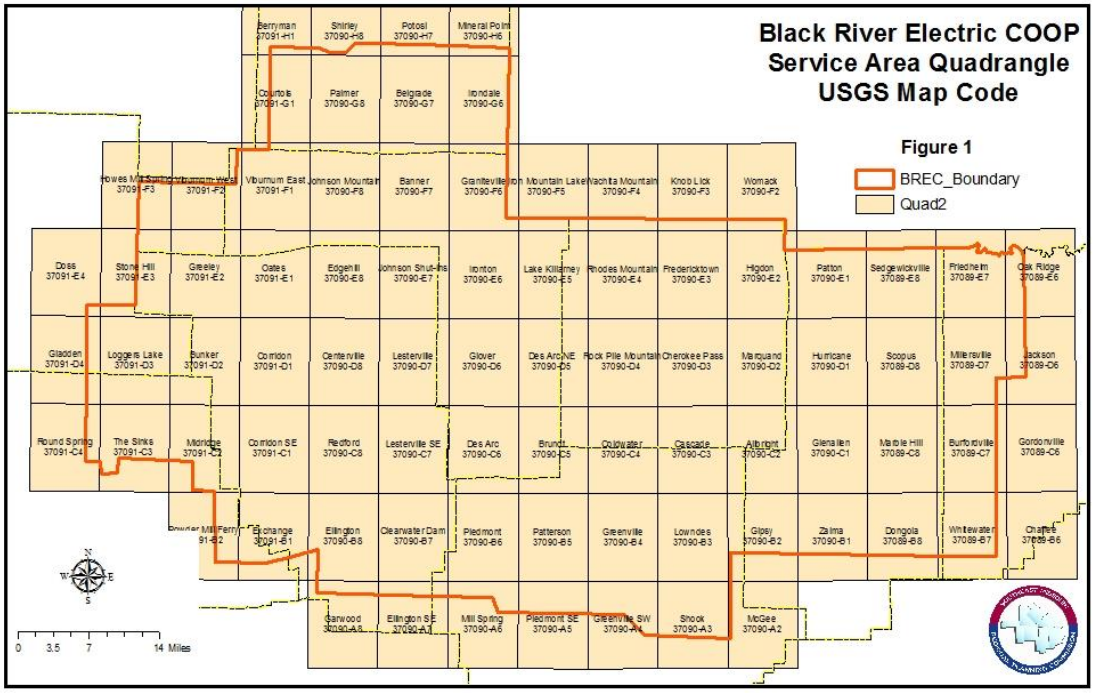
Please correct/update the following information from the previous plan.

Black River Electric Cooperative (BREC) was established in 1938 to provide electric service to the rural areas of southeast Missouri on a non-profit cooperative basis. A Touchstone Energy Cooperative, BREC is headquartered in Fredericktown, Missouri, and provides electric service to customers in Bollinger, Cape Girardeau, Dent, Iron, Madison, Reynolds, Shannon, and Wayne Counties in Missouri. It also provides electric service to residents of the cities of Annapolis, Bunker, Sedgewickville, Piedmont, Mill Springs, Marble Hill, Marquand, Greenville, Glen Allen, Ellington, Centerville, Cobalt Village, Des Arc. BREC is governed by a board of nine directors who approves the Corporation's mission statement and business policies. BREC's mission is:

> *"The mission of Black River Electric Cooperative remains, as it has since its inception in 1938, to provide electrical service to its member-owners, as a not-for-profit organization. We, the elected board of directors and employees, are committed to providing the best, most economic, electric service possible to our member owners and contributing to the welfare of the community through growth and progress."*

BREC's service territory includes all or nearly all of Bollinger, Iron, Madison, and Reynolds Counties and portions of Cape Girardeau, Dent, Shannon, Washington, and Wayne Counties. BREC owns approximately 4,418 miles of distribution lines within these counties, of which 4,366 miles are overhead distribution lines, and 52 miles are underground distribution lines.

Service Area Map if needed, please replace or attach a different map if available or provide info on changes so a new map can be made.



Population Density Map will be updated by staff at NWMORCOG

The customer base of BREC is currently 25,751 members: residential customers account for 83.6% of memberships (21,528 members) while non-residential customers account for the remaining 16.4% of memberships (4,223 members). Table ? shows Black River Electric Meters by County.

Meters by County

County	Number of Meters
Bollinger	6,266
Cape Girardeau	1,711
Dent	413
Iron	1,951
Madison	5,145
Reynolds	4,309
Shannon	186
Wayne	5,770
Total	25,751

The average daily residential customer usage for BREC is 39 kilowatt-hours (kWh). Annual total usage of BREC customers in 2021 was 469,829,539 kWhs.

Critical Facilities It is important in mitigation planning for the electric cooperatives to identify the critical facilities in each area and to be able to prioritize reconnection and back-up power needs. Black

River provides service to approximately school districts, various medical clinics, pharmacies and nursing homes concentrated in Marble Hill, Piedmont, Greenville, Ellington and Bunker.

Future Development Black River Electric Cooperative is currently in discussions for future load growth within various industries including: manufacturing, retail, resource recycling, new and existing mining, natural resource processing and others. Given the nature of the discussions, the cooperative chose to hold the exact nature, timing and size of future loads in confidence. However, they believe load growth is imminent and likely to be significant.

The FEMA reviewers that approved the previous update suggested including current operating budget information, any capital improvements, or strategic initiatives in this update. Please add or attach if possible. Please see "2022 BREC Budget-Mitigation" attachment.

Asset Inventory Please update the figures below to the most current information.

Black River Electric Corporation has a wide variety of assets by type. Real estate owned by the Corporation includes office buildings, warehouses, vehicle storage, and other outbuildings throughout its service territory. Seventy-four vehicles provide access to customers and infrastructure. BREC does not own any electric generation or transmission facilities. BREC owns approximately 4,200 miles of primary distribution lines. Table ? provides information concerning total Utility Plant valuation.

BLACK RIVER ELECTRIC COOPERATIVE

Asset	Total Replacement Cost	Cost Breakdown	
Total BREC Assets		Buildings & Vehicles	$ 17,666,271
	$ 608,379,114	Overhead Assets	$ 578,124,699
		Underground Assets	$ 12,588,144
Distribution Lines	Overhead (OH)	OH Single-Phase Lines	$ 308,795,990
	$ 319,206,158	UG Single-Phase Lines	$ 9,825,327
	Underground (UG)	OH Three-Phase Lines	$ 10,410,168
	$ 9,825,327	UG Three-Phase Lines	$ -
Supporting Infrastructure		Meters	$ 3,641,219
		Poles	$ 192,635,868
		OH Transformers	$ 35,802,776
		UG Transformers	$ 2,762,816
	$ 258,918,540	Guys/Anchors	$ 13,261,687
	$ 2,762,816	Cross-Arms	$ 6,124,811
		Regulators	$ 3,059,888
		SP Oil-Circuit Reclosures	$ 2,403,558
		Three-Phase Oil-Circuity Reclosures	$ 1,295,181
		Capacitors	$ 693,552
Office Buildings	$ 13,033,779		
Warehouses	$ -		
Vehicles	$ 4,632,492		
Source: Internal BREC Accounting/Insurance Records			

Asset	Emergency Replacement Cost per unit or mile	Number of units or miles: BOLLINGER	Number of units or miles: CAPE GIRARDEAU	Number of units or miles: DENT	Number of units or miles: IRON
Meter	$148/unit	6,266	1,711	413	1,951
Pole	$2,095/unit	19,688	5,050	1,990	6,794
SP*** distribution line	$64,236/mile OH $12/foot OH $101,182/mile UG $19/foot UG	970 OH 6 UG	198 OH 3 UG	122 OH 2 UG	326 OH 7 UG
TP**** distribution line	$103,945/mile $20/foot UG/OH	160 OH 0 UG	42 OH 1 UG	11 OH 0 UG	80 OH 1 UG
Transformers	$1,460 OH	5,248 OH	1,418 OH	362 OH	1,707 OH
	$6,605 UG	109 UG	9 UG	3 UG	22 UG
Guys/ anchors	$220/unit	11,688	2,454	1,228	3,882
Cross-arms	$325	4,331	914	474	1,358
Regulators	$14,689	60	11	4	38
Oil Circuit Reclosures	$5,386 SP $5,386 TP	95 SP 123 TP	19 SP 9 TP	10 SP 3 TP	27 SP 18 TP
Capacitors	$2,385/unit	66	8	3	12
Total Replacement Value by county		$134,967,761 OH	$31,156,073 OH	$14,299,020 OH	$48,395,496 OH
		$1,327,037 UG	$472,936 UG	$222,179 UG	$957,529 UG

Asset	Number of units or miles:	Number of units or miles:	Number of units or miles:	Number of units or miles:	Total number of units or miles:
	MADISON	REYNOLDS	SHANNON	WAYNE	
Meter	5,145	4,309	186	5,770	25751
Pole	15,100	13,790	1,254	14,337	78,003
SP* distribution line	650 OH 11 UG	697 OH 7 UG	81 OH 1 UG	622 OH 7 UG	3,666 OH 44 UG
TP** distribution line	132 OH 0 UG	124 OH 2 UG	2 OH 0 UG	149 OH 4 UG	700 OH 8 UG
Transformers	4,215 OH	3,394 OH	184 OH	4073 OH	20,601 OH
	43 UG	61 UG	0 UG	131 UG	378 UG
Guys/ anchors	6,493	5916	729	6,165	38,555
Cross-arms	3,277	3,026	275	2,867	16,522
Regulators	44	31	4	28	220
Oil Circuit Reclosures	77 SP 30 TP	67 SP 31 TP	8 SP 4 TP	51 SP 40TP	354 SP 258 TP
Capacitors	42	47	3	43	224
Total Replacement Value by county	$97,840,273 OH	$95,524,946 OH	$8,714,602 OH	$95,571,200 OH	$526,469,371 OH
	$1,397,017 UG	$1,319,069 UG	$101,182 UG	$1,989,309 UG	$7,786,258 UG
*SP = Single phase **TP – Three phase Source: Internal Black River Accounting and Maintenance records					

Risk Assessment

Please add any known information related to each of the natural hazards that follow: Flooding (Major and Flash), Levee Failure, Dam Failure, Earthquake, Land Subsidence/Sinkholes, Drought, Extreme Temperature, Severe Thunderstorms, Severe Winter Weather, Tornadoes, Wildfire

NWMORCOG will add information to the narrative from the National Weather Service that has occurred since 2016

Tornadic Event Summary

Date of Event	EF Rating	Damage Estimates	Outages Reported
Nov. 14, 1993	F0	$14,300	58
April 24, 2002	F2	$31,246	63
May 8, 2009	F0	$832,167	360
April 19, 2011	F0	$130,833	497
Feb. 29, 2012	EF2	$150,000	71
Oct. 31, 2013	EF1	$70,000	48
Oct. 13, 2014	EF1	$20,000	15
Dec. 23, 2015	EF1	$50,000	63
October 24, 2021	EF3	$500,000	68
Dec. 10, 2021	EF2	125,000	42
Data provided based on internal BREC records which reflect cost from the referenced event year.			

Thunderstorm/High Wind, Hail Event Summary

Date of Event	Damage Estimates	Outages
May 17, 1995	$10,100	69
May 5, 1996	$6,800	55
June 20, 1998	$9,500	63
Oct. 24, 2001	$15,430	72
March 9, 2002	$2,900	36
May 15, 2003	$2,580	27
May 31, 2004	$18,710	82
July 6, 2004	$18,775	83
March 12, 2006	$3,400	39
April 2, 2006	$3,850	41
April 17, 2006	$21,686	92
Sept. 23, 2006	$20,950	90
Oct. 18, 2007	$7,400	59
March 20, 2008	$12,250	75
Sept. 11, 2008	$56,092	144
Sep. 14, 2008	$2,000,000	87
Feb. 11, 2009	$10,000	24
May 1, 2010	$4,900	48

Date of Event	Damage Estimates	Outages
Feb. 20, 2014	$1,000	11
August 19, 2014	$2,000	14
April 9, 2015	$17,000	19
Dec. 23, 2015	$20,000	28
July 6, 2016	$30,000	23
July 15, 2016	$25,000	41
Oct 19, 2016	$2,500	10
Feb 28, 2017	$150,000	115
March 6, 2017	45,000	42
July 14, 2017	25,000	31
June 26-28, 2018	150,000	123
June 21-23, 2019	75,000	206
July 17, 2019	42,000	29
June 9, 2020	25,000	27
Nov 14, 2020	15,000	35
April 9, 2021	11,000	28
Data provided based on internal BREC records		

The hazards of flood and levee failure have been separated in the Missouri State Hazard Mitigation Plan. If possible, separate any damage/outages data into the appropriate hazard's table.

Flood Event Summary

Date of Event	Damage Estimates	Outages
November 1993	$12,000	45
April 1999	$9,500	30
March 2008	$5,085	15
March 2010	$1,000	2
May 2011	$2,800	9
August 14, 2015	$4,000	26
August 15, 2016	$6,000	18
September 15, 2016	$5,000	22
April 28, 2017	$100,000	105
Nov. 24, 2018	10,000	32
Nov. 26-27	13,000	48
Data provided based on internal BREC records which reflect cost from the referenced event year.		

Levee failure,

Event date	Damage estimates	Outages reported

Severe Winter Weather Event Summary

Date of Event	Damage Estimates	Outages
Nov. 1993	$11,000	79
March 1994	$775	4
Jan. 1995	$600	3
Jan. 1996	$1,200	9
Nov. 1996	$1,600	12
Jan. 1999	$12,600	88
Dec. 2002	$2,200	18
Feb. 2003	$5,400	39
Jan. 2004	$5,100	35
Dec. 2006	$6,309	65
Dec. 2007	$900	5
Jan 2008	$400	2
Feb. 2008	$975	5
Feb. 2008	$45,318	140
March 2008	$1,700	11
Jan. 2009	$800	5
Feb. 2009	$750	4
Feb. 2011	$855	5
Mar. 4, 2015	$4,000	31
Jan. 19, 2016	$1,000	53
Feb. 14, 2016	$50,000	101
Feb. 24, 2016	$50,000	124
Dec. 17, 2016	$2,500	23
Jan. 13, 2017	$62,000	45
Jan. 18, 2019	20,000	22
Data provided based on internal BREC records		

Please add any dates, known damage, and outages since the last plan due to

dam failure,

Event date	Damage estimates	Outages reported

drought,

Event date	Damage estimates	Outages reported

earthquake,

Event date	Damage estimates	Outages reported

extreme temperatures (hot & cold)

Event Date	Event Type	Damage Estimates	Outages reported

land subsidence,

Event date	Damage estimates	Outages reported

or wildfire.

Event date	Damage estimates	Outages reported

Goals and Actions Survey

The original survey is an interactive Excel file that could not be inserted without stabilizing the formatting. All of the data submitted is included in the tables below.

	A	B	C	D	
	Complete each row left to right. Click on each box to receive instructions for that box.	**2017 Approved Goals**	**Reassess the goal**	**Instructions**	**Justifications**
	→	**Goal 1**: Protect the health and safety of the community	accept, as is	If you chose to remove or modify the goal, please give your reasons in the box to the right.	
	→	**Goal 2**: Reduce future losses due to natural hazard events.	accept, as is	If you chose to remove or modify the goal, please give your reasons in the box to the right.	
	→	**Goal 3**: Improve emergency management capabilities and enhance partnerships.	accept, as is	If you chose to remove or modify the goal, please give your reasons in the box to the right.	
	→	**Goal 4**: Continue to promote public awareness and education.	accept, as is	If you chose to remove or modify the goal, please give your reasons in the box to the right.	
	↓	**After completing this sheet, please click the "actions" tab at the bottom, left**			

Table 1 *BREC Hazard Risk Summary*

Hazard	Average Annual Damages
Severe Thunderstorms, Hail and High Winds	$95,361
Tornadoes	$64,118
Severe Winter Weather	$9,599
Flood and Levee Failure	$5,613
Dam Failure	$0
Earthquakes	$0
Land Subsidence	$0
Wildfire	$0

goals | actions

	Goal-Action#	Action Item	Status Update	Progress on Continued Actions	Hazards Addressed by This Action	Completion Date	Cost/ Benefit Score
→	2-1	Upgrade to steel poles where possible.	Continue (In-progress)	Steel pole installation is on an "as identified" basis.	Dam Failure Earthquakes **Flooding** Land Subsidence Levee failure **Thunderstorms** **Tornado** Wildfire **Winter Weather**	annually	5
→	1-1	Use vegetation management to prevent interference with delivery of power and protect public from downed lines	Continue (In-progress)	vegetation management is ongoing	Dam Failure Earthquakes Flooding Land Subsidence Levee failure **Thunderstorms** **Tornado** **Wildfire** **Winter Weather**	annually	7
→	2-2	Add tie lines to eliminate or reduce time of outages.	Continue (In-progress)	Tie lines are evaluated and constructed on a case by case basis	**Dam Failure** **Earthquakes** **Flooding** **Land Subsidence** **Levee failure** **Thunderstorms** **Tornado** **Wildfire** **Winter Weather**	annually	7
→	2-3	Replace small copper conductor with large ACSR	Continue (In-progress)	Reconductoring,as identified by work plan and loading requirements.	Dam Failure Earthquakes **Flooding** **Land Subsidence** Levee failure **Thunderstorms** **Tornado** Wildfire **Winter Weather**	annually	5
→	2-4	Convert overhead three phase lines to underground from each substation to the first set of protection devices on each feeder.	Continue (In-progress)	ongoing as financial and work plan elements permit.	**Dam Failure** **Earthquakes** **Flooding** **Land Subsidence** **Levee failure** **Thunderstorms** **Tornado** **Wildfire** **Winter Weather**	annually	7
→	2-5	Harden operational facilities (offices) to withstand climate hazards such as: tornadic conditions, flooding & seismic activities.	Continue (Not started)	financial and geopgraphic barriers exist	Dam Failure **Earthquakes** **Flooding** **Land Subsidence** **Levee failure** Thunderstorms Tornado Wildfire Winter Weather	annually	7
→	4-1	Provide safety and reporting information to the general public through varying methods: • Company website • Social media sites • Local newspapers • Presentations • Publications	Continue (In-progress)	activities related to this section are ongoing	Dam Failure Earthquakes **Flooding** Land Subsidence Levee failure **Thunderstorms** **Tornado** Wildfire **Winter Weather**	annually	7

	3-1	Maintain mutual aid agreements with other rural electric cooperatives.	Continue (In-progress)	ongoing	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	annually	9
	3-2	Cooperate with local law enforcement and government officials to reduce the impact of power outages.	Continue (In-progress)	ongoing communication between the law enforcement, emergency management and local governments.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	annually	5
	1-2	Work with emergency management partners to identify one strategic location in each county to provide a generator-set capable of operating county emergency operations or community shelter.	Continue (Not started)	Significant financial barriers exist	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2027 or later	4
	1-3	Automated voice response systems purchase/installation to improve outage reporting and two-way communication for public safety.	Continue (Not started)	Significant financial barriers exist	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2027 or later	4
	2-6	Research methods for waterproofing meters in flood-prone areas.	Continue (Not started)	Significant financial barriers exist	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2027 or later	4
	3--3	Purchase and implementation of automated vehicle location (AVL) to improve outage response time.	Continue (Not started)	Large areas of poor cellular coverage	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2025	7
	2-7	Monitor developments in data availability concerning the impact of dam failure, sinkholes/land subsidence, and wildfire upon the BREC service area through local, state, and federal agencies.	Continue (Not started)	Lack of substantive data	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	annually	1
	2-8	design & implement systems to improve two-way communications	Continue (Not started)	Additional tower sites need to be located and acquired to allow more effective and redundant digital communication across the BREC system.	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2026	7
NEW Action (optional)			NEW Not Started	NEW	Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather		