Contents: Cuivre River Electric

Section 1: Introduction

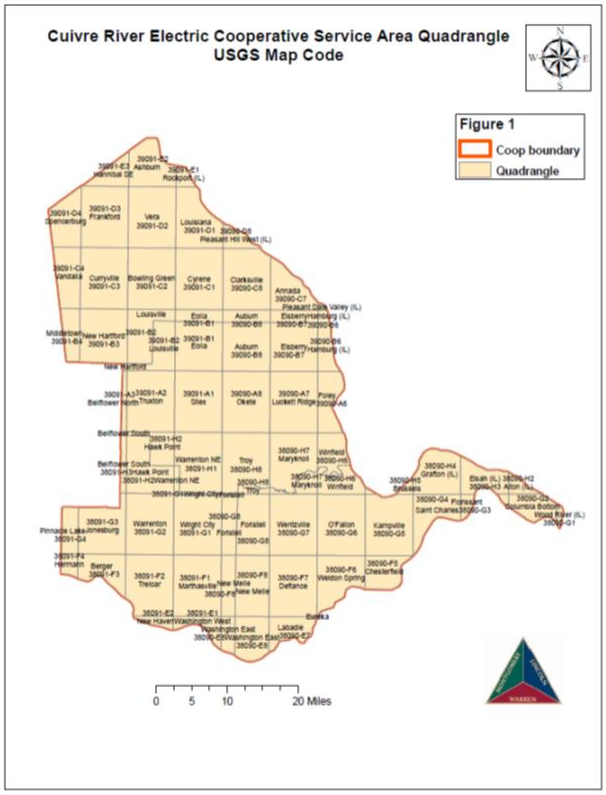
Cuivre River Electric Cooperative (CREC) was established in 1941 to provide electric service to the rural areas of northeast Missouri. A Touchstone Energy Cooperative, CREC is headquartered in Troy, Missouri, and provides service to customers in Lincoln, Montgomery, Pike, St. Charles, and Warren counties. The cooperative is run by a board of twelve directors which approve the company's mission and internally developed business policy:

> *"Cuivre River Electric Cooperative will be a progressive leader in the energy industry, empowering employees to serve our members using innovative energy solutions, while safely providing reliable service at the lowest possible cost."*

> *"Cuivre River Electric aspires to be a trusted energy partner that is prepared to embrace opportunities in a changing utility industry while providing our members with maximum value and improving our communities."*

Cuivre River Electric borders the Mississippi River with the Missouri River flowing through the service area, serving four major counties in the St. Louis metropolitarian area. With over 68,000 members, Cuivre River is the largest of Missouri's consumer-owned electric distribution cooperatives and owns 5,655 miles of service line within these counties. Figure 1 depicts the geographic boundaries of the cooperative in relation to USGS local quadrangles within the state of Missouri. *(Map sources: www.usgs.gov, Association of Missouri Electric Cooperatives, Cuivre Electric Cooperative.)*

Figure 1 *Cuivre River Electric Cooperative Boundaries*



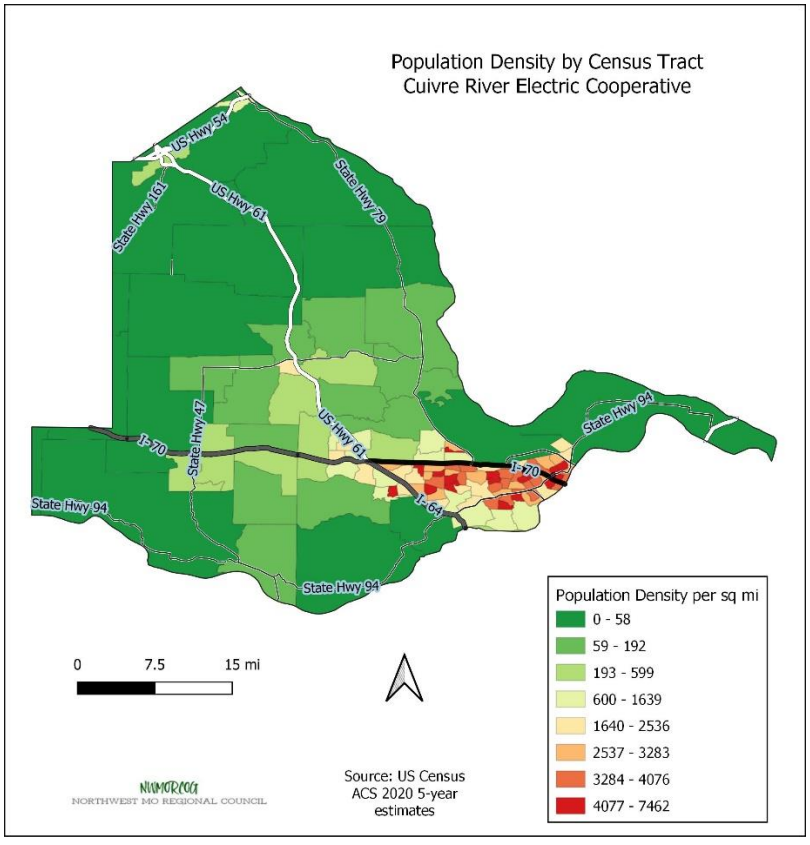
The customer base of CREC currently consists of 59,572 members in the four counties of service in the Western portion of the state. Residential customers account for 98% of memberships (58,381 members), while non-residential customers make up the remaining 2% (1,191 members). Many commercial enterprises, public schools, nursing homes, medical clinics, and other critical and vulnerable facilities in the CREC service area rely on the cooperative for electrical service. Table 1 provides the summary of metered customers by county.

Table 1 *Meters by County*

County	Number of Meters
Lincoln	17,659
Montgomery	76
Pike	1,317
St. Charles	41,374
Warren	9,872
Total	70,298

The average daily customer usage for CREC is 54 kilowatt-hours (kWh). Annual total usage of CREC customers in 2021 was 1,382,098,461 kWh of service. Population density for the cooperative service area is depicted in Figure 2 (*Map source: U.S. Census 2020*).

Figure 2 *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. CREC provides service to:

St. Joes West Hospital and Medical Buildings, St. Joe Surgery Center, Lutheran Living Senior Center, Old Monroe Senior Center, Elsberry Senior Housing, Lake St. Louis Lake Ridge Senior, Cottages of Lake St. Louis, Twin Oaks Seniors, Caregivers Retirement Home, Boulevard at Wentzville Seniors. Multiple Schools, Cellular towers, ambulance districts and fire houses.

Future Development

Cuivre River Electric has provided three future development plans that are as follows: American Food Group, potential 33 MW load, several underground subdivisions. Table 2 below illustrates the population trend for the counties served by CREC.

Table 2 *County Population Trend, 1990-2030*

County	1990	2000	2010	2020	2030 Projected
Lincoln	28,892	38,944	52,566	60,119	91,294
Montgomery	11,355	12,136	11,236	11,294	11,513
Pike	15,969	18,351	18,516	17,552	18,728
St. Charles	212,907	283,883	360,485	406,204	499,126
Warren	19,534	24,525	32,513	36,594	46,241
	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 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

Cuivre River Electric Cooperative has a wide variety of assets. Real estate owned by the company includes office buildings, warehouses, garages, and other outbuildings throughout the service area. Ninety vehicles provide access to customers and infrastructure. CREC does not own any electric generation or transmission infrastructure. Table 3 provides information concerning total asset valuation. CREC owns and maintains 5,655 miles of service lines, overhead and underground. Table 2 provides information concerning total asset valuation.

Table 3 *Cuivre River Electric Cooperative Asset Inventory Valuation Summary*

Asset	Total Replacement Cost	Cost Breakdown
Total CREC Assets	$320,101,293.79	Buildings and vehicles - $39,063,209.81 Overhead assets - $147,009,637.59 Underground assets - $134,028,446.39 Substation Assets - $134,028,446.39
Distribution Lines	$42,152,727.92 OH $51,931,110.68 UG	OH Conductors/Equip - $42,152,727.92 UG Conductors/Equip - $51,931,110.68
Supporting Infrastructure	$186,954,245.40	Meters - $17,857,435.21 Services – 48,182,336.78 Poles - $50,876,396.82 Conduit - $21,262,299.43 IT, SCADA, GIS Equip - $1808,468.65 OH Transformers - $35,470,225.58 Stores Equipment - $442,605.71 Tool Equipment - $442,605.71 Comm/Misc equip - $524,791.43
Office Buildings/Warehouses	$30,388,782.57	
Office Furn	$843,080.61	
Vehicles	$7,831,346.63	
Source: Internal Cuivre River Electric Accounting and Insurance records, 2021		

CREC maintains not only distribution lines, but also the supporting infrastructure as well Table 3 includes a list of asset types, emergency replacement cost per unit or mile, the asset inventory by county of service, and total infrastructure numbers.

Table 4 *CREC Asset Inventory by Service County*

Asset	Replacement Cost per unit or mile	Number of units or miles: LINCOLN	Number of units or miles: MONTGOMERY	Number of units or miles: PIKE	Number of units or miles: ST. CHARLES	Number of units or miles: WARREN	Total number of units or miles
Meter	$315	17,659	76	1317	41,374	9872	70,298
Pole	$2600	28202	197	5152	17818	18456	69,825
SP* Distribution Line	OH $103,600 UG $180,000	OH -833 UG - 273	OH - 4 UG - 1	OH - 179 UG - 12	OH - 385 UG - 701	OH - 577 UG - 221	OH - 1980 UG - 1214
TP**** Distribution Line	OH $233,000 UG $360,000	OH - 1125 UG - 25	OH - 14 UG - 0	OH - 179 UG - 5	OH - 912 UG - 220	OH - 591 UG - 36	OH - 2821 UG - 286
Transformers OH	$2200	8301	41	1076	4972	5278	19668
Transformers UG	$4500	2995	12	96	7911	1921	12935
Cross-arms	$225	13088	91	2391	8269	8565	32405
Guys/anchors	$525	22329	156	4079	14107	14613	55284
Regulators	$30,000	3			1	3	1980
Oil Circuit Reclosures	SP $8,500 TP $25,000	SP - 159 TP	SP - 0 TP	SP - 20 TP	SP - 138 TP	SP - 81 TP	SP - 398 TP
Capacitors	$1,250	32	0	4	61	13	110
Total Replacement Value by county	Overhead Underground	$457,829,000 $76,409,809	$4,388,357 $254,358	$79,075,678 $4,628,228	$326,225,055 $249,869,205	$269,025,940 $63,515,640	$1,136,544,030 $394,677,263
*OH = overhead **UG = underground ***SP = Single phase ****TP = Three phase ^ =Cost not included in pole cost							
Source: Internal Cuivre River Electric Cooperative Accounting 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. Any differentiation from the process below is explained in the individual cooperative's chapter as necessary.

For the purpose of this risk assessment, the identified hazards for the CREC 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 CREC, hazards with historical data include tornadoes, severe thunderstorms/high wind/hail, flood, 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 CREC, hazards without historical data include wildfire, sinkholes, earthquakes, and dam failure.

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 $186,072,847
- Overhead infrastructure assets only
  - Used for:
    - Severe Thunderstorm / High Wind / Hail
    - Flood
    - Severe Winter Weather
  - Valued at $147,009,638

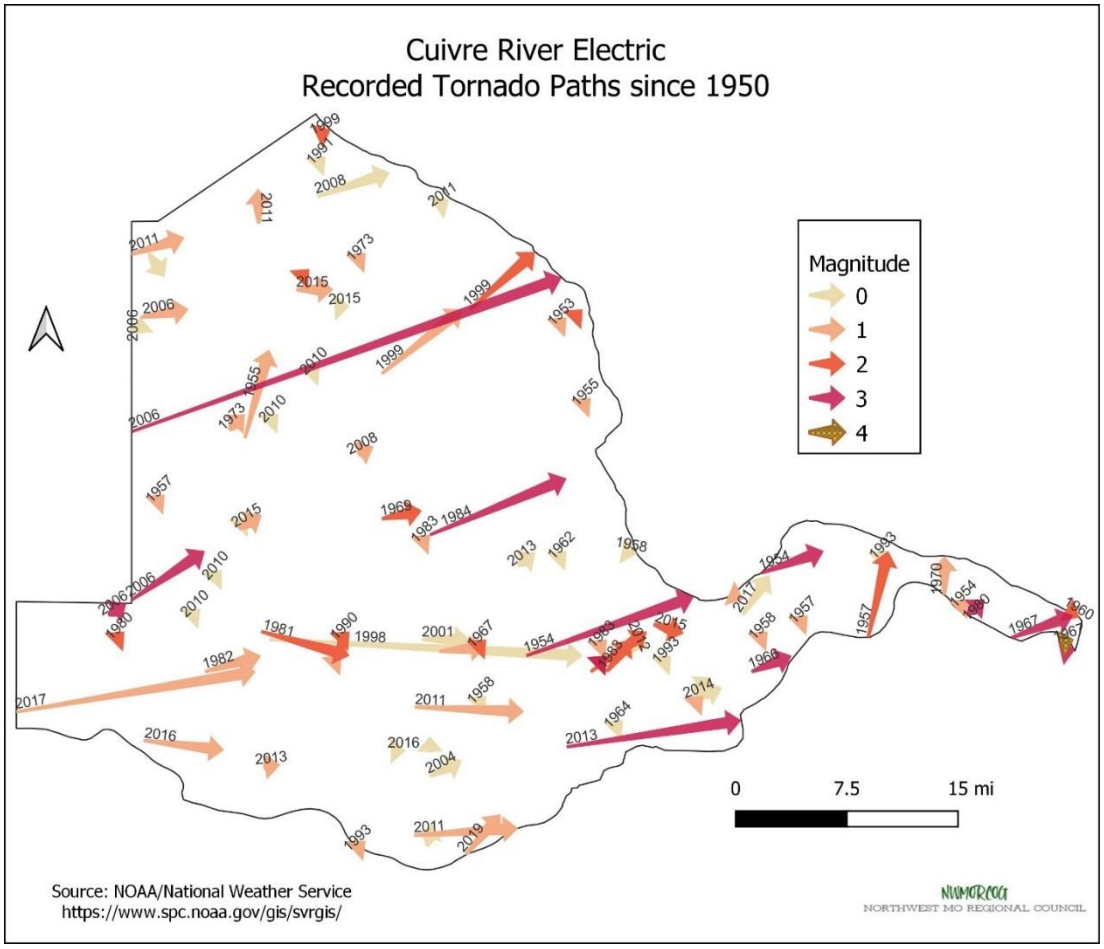
A. Historical Hazards

Tornadoes

Previous Occurrences

From 1955-2020, 87 tornadoes have been reported within the Cuivre River Electric cooperative boundaries. Figure 3 provides a pictorial representation of all recorded tornado touchdown sites and recorded path. *(Data for map collected from NOAA.)*

Figure 3 *Tornado Map*



A data insufficiency exists between historical hazard records and cooperative records concerning damage estimates and outages. Although historical hazard records include events that extend as far back as 1950, CREC has not participated in the AMEC plan update in previous years. Therefore, limited records concerning damage estimates are available. For the purpose of this assessment, the years for which records exist have been used. From 2012-2021, one tornado caused damage to CREC assets.

Probability of Future Occurrence and Vulnerability

The probability of a tornado in the CREC service area in any given year is 100% (87 events / 71 years). Estimated cooperative material damages associated with each of these events were compiled by CREC

staff. One occurrence caused damage to cooperative assets during the years existing in cooperative records. The probability that CREC will sustain damage from a tornado in any given year is 8.3%. Table 5 provides a summary of event dates, EF-scale ratings, damage cost estimates and outages reported.

Table 5 *CREC Tornado Event Summary*

Date of Event	EF Scale Rating	Damage Estimates	Outages Reported
05/31/2013	F3	$97,359	N/A
	Totals	$97,359	N/A
Data provided based on internal CREC records which reflect cost from the referenced event year.			

Based upon the last 10 years of historical event records, tornado events have caused average annual damages of $9,736. This averaged amount accounts for less than 0.01% of CREC's total overhead assets and building valuation of $166,436,410.

Due to a lack of data for customers reporting outages during recorded during tornadic events, the probability of customers reporting outages in any given year was put at less than 1%.

Problem Statement

CREC should continue to strengthen their infrastructure using manufactured poles and underground placement of lines.

Severe Thunderstorms, High Wind, and Hail

Previous Occurrences

From 1955-2020, Cuivre River Electric's service area within the state of Missouri has experienced 557 hail events and 720 thunderstorm/high wind events. NECI reported two hailstorms in 2011 with 4.5 inch hail storms and a $4 million property damaging hail storm with 4 inch hail in 2016. NCEI also reported damages from high winds in the cooperative service area on June 28th, 2018.

A data insufficiency exists between historical hazard records and cooperative records concerning damage estimates and outages. Although historical hazard records include events that extend as far back as 1955, CREC has not participated in the AMEC plan update in previous years. Therefore, limited records concerning damage estimates are available.

Probability of Future Occurrence and Vulnerability

The average annual number of hail events in the Cuivre River Electric service area is 8.4. The average annual is 10.9 thunderstorm/high wind events. CREC staff analyzed material damages associated with each of these events and determined no damage or outages occurred due to severe winter weather events, resulting in a less than 1% probability that any given severe winter weather event will result in damage to cooperative assets.

No customers reported outages during recorded severe winter weather events. Due to a lack of data for customers reporting outages during recorded severe winter weather events since 2012, the probability of customers reporting outages in any given year was assumed to be less than 1%.

Problem Statement

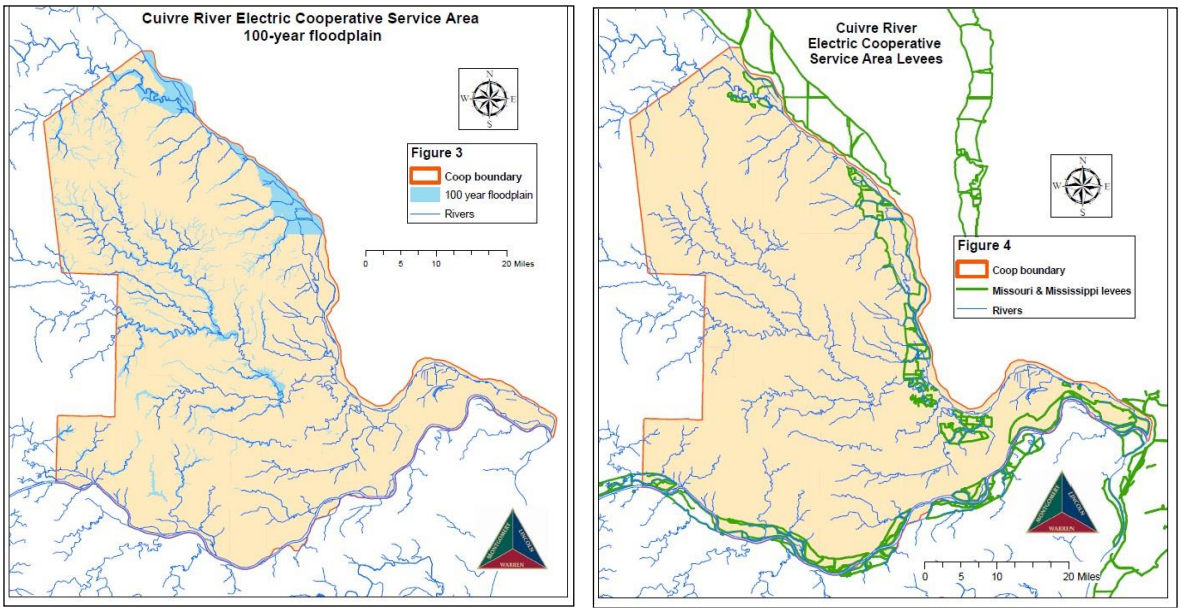
Although there is strong chance of a potentially damaging thunderstorm with high winds in any given year, no damages have been recorded by CREC for this hazard. Continued monitoring of infrastructure is recommended to maintain uninterrupted service to its customers.

Flood and Levee Failure

Flood and levee failure carry, perhaps, the greatest ongoing potential threat to the existing infrastructure of the Cuivre River Electric Cooperative. Figure 4 (left) depicts the 100-year floodplain in relation to the cooperative's boundaries. *(Map sources: FEMA HAZUS-MH; DFIRM).*

Currently, inundation data for levee failure is lacking due to issues surrounding mapping, appropriate models, and its close association with flooding events. Figure 4 (right) provides the location of known state and federal levees within the cooperative's boundaries. *(Map sources: MSDIS, County Emergency Management Agency)*.

Figure 4 *100 Year Floodplain Map*



Previous Occurrences

From 2017-2021, Cuivre River Electric's service area has experienced 24 flooding events. These included both flash and riverine floods. NCEI reported a flash flood in 2019 that cause $100,000 in property damage, a levee breech in May of 2019, and a storm that dropped 7 inches of rain in 4 hours all in the CREC service area.

A data insufficiency exists between historical hazard records and cooperative records concerning damage estimates and outages. Although historical hazard records include events that extend as far back as 1955, CREC has not participated in the AMEC plan update in previous years. Therefore, limited records concerning damage estimates are available.

Probability of Future Occurrence and Vulnerability

The average annual number of flood events affecting the cooperative's service area is 4.8 days. However, CREC did not report any damages or outages due to flood events for the cooperative. If a one percent loss is projected, this would be $1,470,096 in overhead losses for the cooperative.

With the most current number of meters reported as 70,298, a one percent outage rate would result in 703 meters experiencing outages.

Problem Statement

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

Severe Winter Weather

Previous Occurrences

From 2017-2021, Cuivre River Electric's service area has experienced 18 severe winter weather events, including a blizzard, heavy snowfall periods and ice storms. NCEI reported a significant ice storm in 2017 that occurred in the cooperative boundaries.

A data insufficiency exists between historical hazard records and cooperative records concerning damage estimates and outages. Although historical hazard records include events that extend as far back as 1955, CREC has not participated in the AMEC plan update in previous years. Therefore, limited records concerning damage estimates are available.

Probability of Future Occurrence and Vulnerability

For the 5-year period the average annual number of severe winter weather events is 3.6. CREC staff analyzed material damages associated with each of these events and determined no damage or outages occurred due to severe winter weather events, resulting in a less than 1% probability that any given severe winter weather event will result in damage to cooperative assets.

No customers reported outages during recorded severe winter weather events. Due to a lack of data for customers reporting outages during recorded severe winter weather events since 2012, the probability of customers reporting outages in any given year was assumed to be less than 1%.

Problem Statement

Ice storms typically play havoc on electric cooperative's overhead assets. With the historical record showing that numerous ice storms have occurred in the service area, CREC should considerate underground placement of assets when feasible.

B. Non-historical Hazards

Wildfire

Previous Occurrences

Wildfire events have occurred in each of the five counties. According to the Missouri Department of Conservation, Lincoln, Montgomery, Pike, St. Charles, and Warren counties have experienced wildfires between 2004 and 2016. Table 6 summarizes the incidences of wildfire within the five counties.

Table 6 *Wildfire Summary by County*

County	# of Wildfires, 2004-2016	Average Annual # of Wildfires	Acres Burned	Average Annual Acres Burned
Lincoln	423	33	2,198	169
Montgomery	205	16	1,227	94
Pike	172	13	2,323	179
St. Charles	161	12	933	72
Warren	124	10	405	31
Totals	1,085	84	7,086	545

Source: Missouri State Hazard Mitigation Plan, 2018

Probability of Future Occurrence and Vulnerability

The probability of a wildfire event in the CREC service area in any given year is 100% with an average annual of 84 wildfires throughout the five-county area. Although CREC 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 CREC service area. With an average annual of 1,085 acres burned in the area, 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 customers served by CREC, it can be projected that less than 1 percent of all customers may report outages during any given wildfire event.

Problem Statement

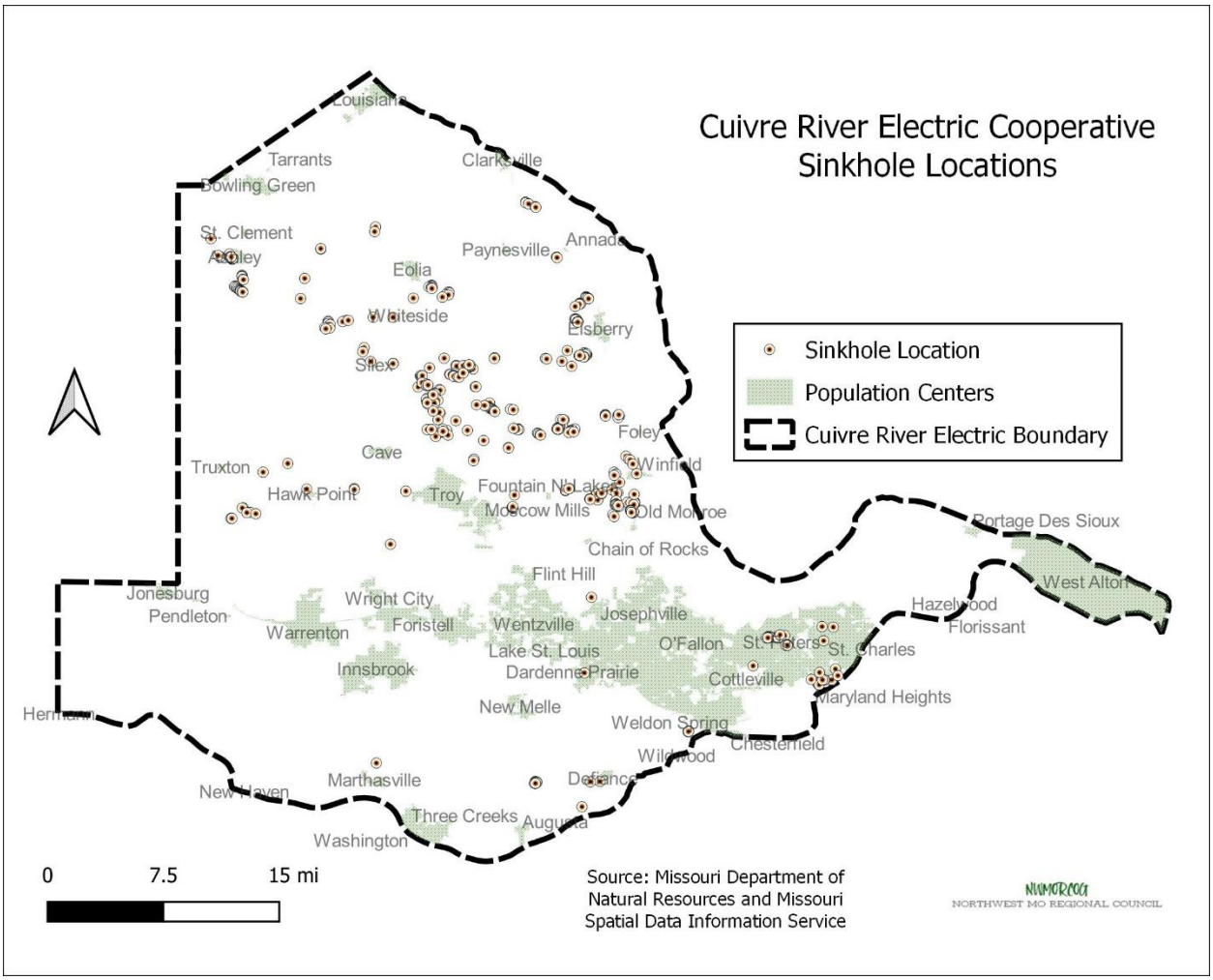
Further study will be required to create a model for damage assessments related to wildfire.

Severe Land Subsidence (Sinkholes)

Previous Occurrences

Cuivre River Electric service area is underlain primarily by carbonate rocks containing mainly limestone and some dolomite bedrock. These types of bedrock are extremely sensitive to water dissolution along joints and fractures within the rock. Areas along natural drainage paths tend to be more susceptible to sinkhole formation as well, due to increased water flow into the subsurface. There are 413 identified sinkholes by the Missouri Department of Natural Resources. Figure 5 shows the location of the sinkholes within Cuivre River Electric's service area. *(Map sources: www.msdis.missouri.edu.)* CREC did not report any damage to their assets from land subsidence.

Figure 5 *Sinkhole Map*



Probability of Future Occurrence and Vulnerability

Formation of sinkholes can and will probably affect Cuivre River Electric. However, the impact of past sinkholes is statistically negligible. Since sinkhole formation occurs on a localized scale, property damage is negligible depending on structures immediately within or adjacent to the sinkhole area. However, for the purposes of this assessment, sinkholes and their associated impacts cannot be eliminated from the

realm of possibility. To allow for a risk assessment, the probability of this event has been included as less than 1%. Due to the localized nature of sinkhole impacts it is estimated that less than 1% damage will occur to the system due in the event of sinkhole formation.

Determining the potential extent of impact in terms of reported outages due to sinkhole formation is difficult to pinpoint; however, is very unlikely such an event would result in more than 1% of customers in the system reporting outages.

Problem Statement

The fact that CREC 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.

Earthquakes

Previous Occurrences

The closest source of earthquake risk in CREC service area include the New Madrid Fault Zone, the Wabash Valley Fault Zone, Big River Fault Zone, St. Genevieve Fault Zone and the Illinois Basin.

Between 1811 and 1812, four earthquakes, with magnitude estimates greater than 7.0, occurred during a three-month period. Hundreds of aftershocks followed over a period of several years. The largest earthquakes to have occurred since then were on January 4, 1843 and October 31, 1895 with magnitude estimates of 6.0 and 6.2 respectively. In addition to these events, seven events of magnitude 5.0 and greater have occurred in the area. Instruments were installed in and around this area in 1974 to closely monitor seismic activity. Since then, more than 4,000 earthquakes have been located, most of which are too small to be felt. The most recent earthquake event was on June 6, 2003.

Probability of Future Occurrence and Vulnerability

The New Madrid fault has the potential to cause damage throughout the state of Missouri, including the CREC 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% 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 V intensity characteristics. In the event of an earthquake with a 7.6 magnitude, the region would experience Level VI intensity characteristic while an earthquake with an 8.6 magnitude would most likely cause Level VII intensity characteristics.

In the event of an earthquake with a 7.6 magnitude, the LCREC service area would most likely experience minor building damage as well as damage to the electrical distribution system. This damage, however, would most likely be relatively minimal and localized when compared with the southeast corner of the state. Distribution lines overhead and underground could become disconnected or severed, and transformers could be damaged.

Based upon information from CERI, FEMA, and SEMA, it may be estimated that 705 customers could report outages related to an earthquake event. When compared with the total number of customers served by LCREC, it can be projected that up to 10% of all customers may report outages during any given seismic event.

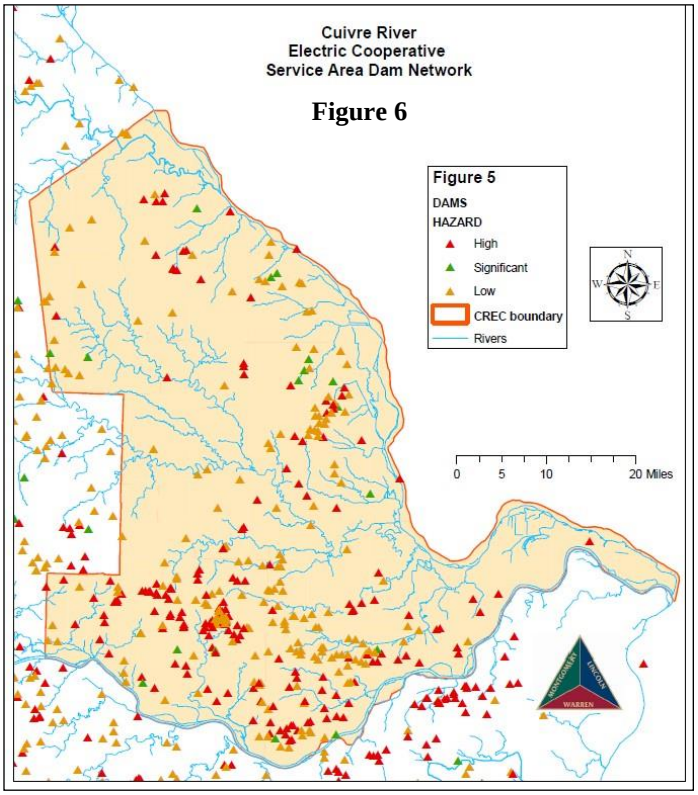
Problem Statement

Cuivre River Electric Cooperative 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 the CREC service area to date. According to Missouri DNR's Dam Safety Division, 367 dams currently exist within the cooperative boundaries: 68 in Lincoln County, 49 in Pike County, 119 in St. Charles County and 131 in Warren County. Of these dams, nine in Lincoln County, nine in Pike County, 27 in St. Charles County and 42 in Warren County are regulated by the state due to the fact that they are non-agricultural, non-federal dams which exceed 35 feet in height. Figure 6 shows the locations of all known dams located within Cuivre River's service area. *(Map sources: www.msdis.missouri.edu; www.dnr.mo.gov/env/wrc.)*

Figure 6 *Dam Network Map*



Previous Occurrences

The 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%”. However, no such event has occurred within or near the cooperative’s boundaries.

Probability of Future Occurrence and Vulnerability

For the purposes of this assessment, dam failure 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 dam failure is currently impossible due to a lack of data concerning inundation zones. This assessment assumes a limited impact upon downstream electric distribution infrastructure of less than 1% for both infrastructure damage and service interruption.

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 damage.

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 CREC. The table is ranked by the highest Average Annual Damages which is an indication of the vulnerability to each hazard.

Table 7 *CREC Hazard Risk Summary*

Hazard	Average Annual Damages
Tornadoes	$9,736
Severe Winter Weather	$0
Severe Thunderstorms, Hail and High Winds	$0
Flood and Levee Failure	$0
Dam Failure	$0
Earthquakes	$0
Land Subsidence	$0
Wildfire	$0

Each of the non-historical hazards Wildfire, Land Subsidence, Earthquakes 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 Cuivre River Electric Cooperative 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 CREC, 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. CREC is aggressively working at vegetation management by utilizing herbicides in rights of way. The cooperative is in the midst of a phased program of reinforcing guys and anchors in areas vulnerable to domino effects. In addition, CREC has researched air foils and anti-dampening measures to mitigated line galloping on long spans. 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 Line Superintendent and contracted engineers, identifies, and addresses foreseeable hazards and safety issues before any new service lines area 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.

Existing and Potential Resources

As stated above, mitigation is a key component of good business practices. Cuivre River Electric Cooperative includes mitigation strategies as part of 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 CREC 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, CREC 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 CREC 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.

The staff considered which type of actions will maximize benefits and minimizes costs, how mitigation strategies will be implemented, and how the plan will be maintained and updated. Table 8 lists the goals as reviewed in the 2023 plan update.

Table 8 *Cuivre 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 9, 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 9 *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 10 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 10 *Prioritized Mitigation Actions for Cuivre River Electric Cooperative – 2023*

Goal-Action #	Action	Status Update	Progress on Continued Actions	Hazards Addressed by This Action	Completion Date	Cost/ Benefit Score
1-1	Use vegetation management to prevent public safety hazard of downed lines.	NEW		Earthquakes Flooding Land Subsidence Levee Failure Thunderstorms Tornado Wildfire Winter Weather	Annually	8
1-2	Upgrade radio communications network to work both planned and unavoidable outages.	NEW		Dam Failure Earthquakes Flooding Land Subsidence Levee Failure Thunderstorms Tornado Wildfire Winter Weather	2027 or later	8
2-1	Overall System Hardening. Addition of lightning arresters, post type insulators, standardize in heavy construction anchor and guy wires.	NEW		Earthquakes Land Subsidence Thunderstorms Tornado Wildfire Winter Weather	Annually	8
2-2	upgrade overhead infrastructure by replacing poles with taller, and larger class poles, shorter spans, electronic reclosures, increase conductor size	NEW		Earthquakes Thunderstorms Tornado Winter Weather	Annually	7
2-3	convert OH feeders to UG	NEW		Thunderstorms Tornado Wildfire Winter Weather	2027 or later	4
3-1	Maintain mutual aid agreements with other rural electric cooperatives.	NEW		Dam Failure Earthquakes Flooding Land Subsidence Levee Failure	annually	8

Goal-Action #	Action	Status Update	Progress on Continued Actions	Hazards Addressed by This Action	Completion Date	Cost/ Benefit Score
				Thunderstorms Tornado Wildfire Winter Weather		
3-2	Partner with a contractor to upgrade system and help with storm restoration.	NEW		Flooding Thunderstorms Tornado Winter Weather	2025	8
3-3	Purchase additional outage software to identify and analyze problem areas.	NEW		Dam Failure Earthquakes Flooding Land Subsidence Levee Failure Thunderstorms Tornado Wildfire Winter Weather	2026	5
4-1	Provide safety and reporting information to the general public through varying methods: • Company website • Social media sites • Local newspapers • Publications	NEW		Dam Failure Earthquakes Flooding Land Subsidence Levee Failure Thunderstorms Tornado Wildfire Winter Weather	annually	8
4-2	Conduct school visits to promote safety and storm readiness. Demonstrations	NEW		Dam Failure Earthquakes Flooding Land Subsidence Levee Failure Thunderstorms Tornado Wildfire Winter Weather	annually	9

Since this is the first year that Cuivre River REC participated, there were no Actions completed and removed from the Action Items list for the 2023 plan update.

Section 5: 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 efforts. The updated plan has been reviewed and adopted by the Board of Directors as part of the company's operations policy. This mitigation plan necessitates involvement from every CREC employment level as the organization strives to ensure quality service to their customers.

Local Planning Capabilities

Some internal planning capabilities do exist at Cuivre 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 Cuivre 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 broaden the capabilities of the local cooperative.

Beyond the Cuivre River Electric Hazard Mitigation Plan, regional planning capabilities exist at the local level. The Missouri counties of Lincoln, Montgomery, Pike, St. Charles, and Warren 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 the Regional Transportation Plan (RTP) as well as a Comprehensive Economic Development Strategy (CEDS). CREC's plan can be easily incorporated into these local plans and allow for coordination across agencies in the event of an emergency.

CREC is located within both rural and urban portions of third-, second-, and first-class counties. Only first-class counties are allowed enforce building codes and zoning by the state of Missouri. Warrenton, Wentzville, Troy, St. Peters, and St. Charles have comprehensive plans in place with adopted building codes and capital improvements plans.

Plan Maintenance

Cuivre River Electric will follow the requirements established 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 co-op 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.

Cuivre River Electric will conform to the requirements established 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, the cooperative's website, and the physical office of CREC.

Appendix: A - Adoption Resolution

RESOLUTION

HAZARD MITIGATION PLAN

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 CREC which was used by NWMORCOG staff to update the Plan:

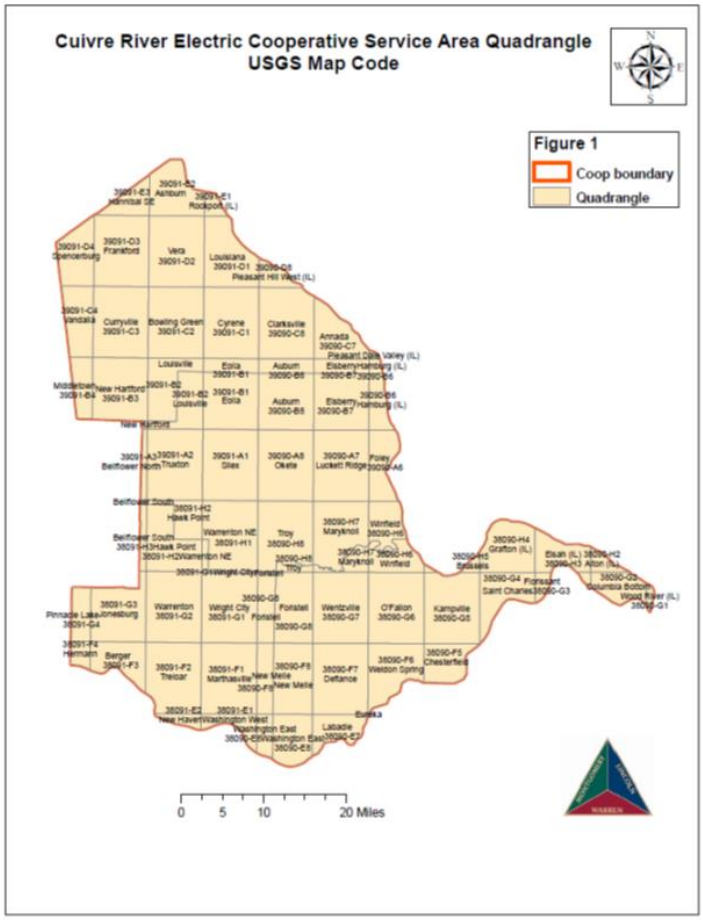
Section 1: Introduction

Cuivre River Electric Cooperative (CREC) was established in 1941 to provide electric service to the rural areas of northeast Missouri. A Touchstone Energy Cooperative, CREC is headquartered in Troy, Missouri, and provides service to customers in Lincoln, Montgomery, Pike, St. Charles, and Warren counties. The cooperative is run by a board of twelve directors which approve the company's mission and internally developed business policy:

"Cuivre River Electric Cooperative will be a progressive leader in the energy industry, empowering employees to serve our members using innovative energy solutions, while safely providing reliable service at the lowest possible cost."

"Cuivre River Electric aspires to be a trusted energy partner that is prepared to embrace opportunities in a changing utility industry while providing our members with maximum value and improving our communities.?

The cooperative owns 5,655 miles of service line within these counties. Figure 1 depicts the geographic boundaries of the cooperative in relation to USGS local quadrangles within the state of Missouri.



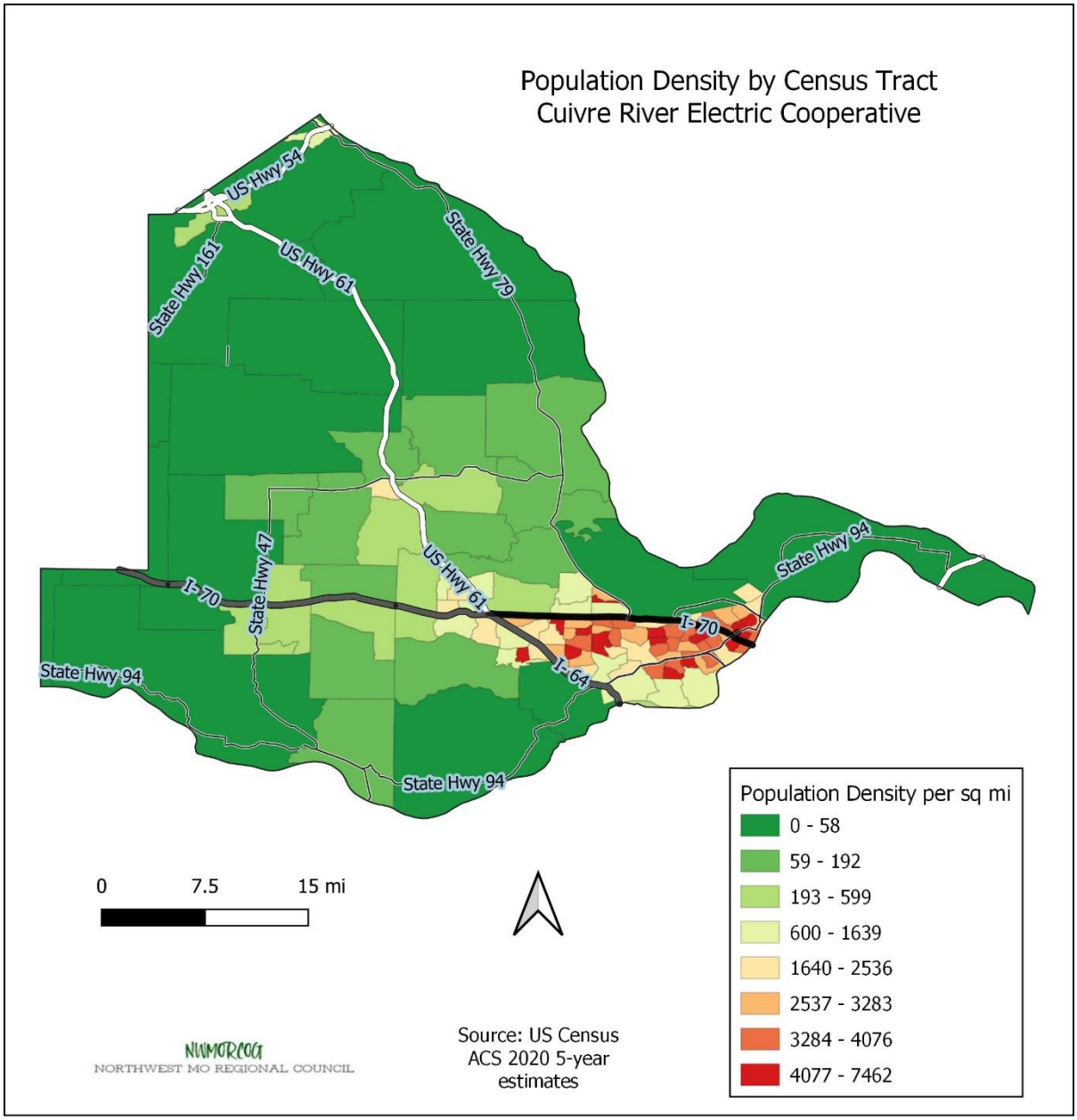
CREC is the largest of Missouri's electric cooperatives. There are 59,572 member-consumers; 98% are residential and 2% are commercial.

Table 1 *Meters by County*

County	Number of Meters
Lincoln	17,659
Montgomery	76
Pike	1317
St. Charles	41,374
Warren	9,872
Total	70,298

The average daily customer usage for CREC is 54 kilowatt-hours (kWh). Annual total usage of CREC customers in 2021 was 1,382,098,461 kWh of service. Population density for the cooperative service area is depicted in Figure 2 (*Map source: U.S. Census 2020*).

Population Density Map



Critical Facilities (please list those facilities whose lack of service would be most consequential)
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. CREC provides service to

St. Joes West Hospital and Medical Buildings, St. Joe Surgery Center, Luthern Living Senior Center, Old Monroe Senior Center, Elsberry Senior Housing, Lake St. Louis Lake Ridge Senior, Cottages of Lake St. Louis, Twin Oaks Seniors, Caregivers Retirement Home, Boulevard at Wentzville Seniors. Multiple Schools, Cellular towers, ambulance districts and fire houses.

Future Development – American Food Group, potential 33 MW load, several underground subdivisions.

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.

Asset Inventory

Cuivre River Electric Cooperative has a wide variety of assets by type. Real estate owned by the company includes office buildings, warehouses, garages, and other outbuildings throughout the service area. Ninety vehicles provide access to customers and infrastructure. CREC does not own any electric generation or transmission infrastructure. Table ? provides information concerning total asset valuation.

CREC Asset Inventory Valuation Summary

Asset	Total Replacement Cost	Cost Breakdown
Total CREC Assets	$320,101,293.79	Buildings and vehicles - $39,063,209.81 Overhead assets - $147,009,637.59 Underground assets - $134,028,446.39
Distribution Lines	Overhead(OH) $42,152,727.92 Underground (UG) $51,931,110.68	OH Conductors/Equip - $42,152,727.92 UG Conductors/Equip - $51,931,110.68
Supporting Infrastructure	$186,954,245.40	Meters - $17,857,435.21 Services - $48,182,336.78 Poles - $50,876,396.82 Conduit - $21,262,229.43 IT, SCADA, GIS Equip - $1,808,468.65 Street lighting - $10,578,889.08 OH Transformers - $35,470,225.58 Stores Equipment - $442,605.71 Tool Equipment - $338,152.10 Comm/Misc equip - $524,791.43
Office Buildings/Warehouses	$30,388,782.57	
Office Furn	$843,080.61	
Vehicles	$7,831,346.63	

Source: Internal Cuivre River Accounting and Insurance records, 2021

Asset	Replacement Cost per unit or mile	Number of units or miles: LINCOLN	Number of units or miles: MONTGOMERY	Number of units or miles: PIKE	Number of units or miles: ST. CHARLES	Number of units or miles: WARREN	Total number of units or miles
Meter	$315	17,659	76	1317	41,374	9872	70,298
Pole	$2600	28202	197	5152	17818	18456	69,825
SP* Distribution Line	OH $103,600 UG $180,000	OH -833 UG - 273	OH - 4 UG - 1	OH - 179 UG - 12	OH - 385 UG - 701	OH - 577 UG - 221	OH - 1980 UG - 1214
TP**** Distribution Line	OH $233,000 UG $360,000	OH - 1125 UG - 25	OH - 14 UG - 0	OH - 179 UG - 5	OH - 912 UG - 220	OH - 591 UG - 36	OH - 2821 UG - 286
Transformers OH	$2200	8301	41	1076	4972	5278	19668
Transformers UG	$4500	2995	12	96	7911	1921	12935
Cross-arms	$225	13088	91	2391	8269	8565	32405
Guys/anchors	$525	22329	156	4079	14107	14613	55284
Regulators	$30,000	3			1	3	1980
Oil Circuit Reclosures	SP $8,500 TP $25,000	SP - 159 TP	SP - 0 TP	SP - 20 TP	SP - 138 TP	SP - 81 TP	SP - 398 TP
Capacitors	$1,250	32	0	4	61	13	110
Total Replacement Value by county	Overhead Underground	$457,829,000 $76,409,809	$4,388,357 $254,358	$79,075,678 $4,628,228	$326,225,055 $249,869,205	$269,025,940 $63,515,640	$1,136,544,030 $394,677,263
*OH = overhead **UG = underground ***SP = Single phase ****TP = Three phase ^ =Cost not included in pole cost							
Source: Internal Cuivre River Electric Cooperative Accounting 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. Please tell the date range of the data provided. The other coops are updating for the last 5 years, but a ten year or longer period would give a better probability base. Please add additional lines as necessary.

Tornadic Event Summary

Event date	EF Scale rating	Damage estimates	Outages reported
05/31/2013	F3	$97,359	N/A
		$	
		$	
Totals		$	
Source: Internal records			

Thunderstorm/High Wind, Hail Event Summary

Cuivre River Electric Coopeative Hail Event Outage Summary

Event Date	Outages Reported	Damages
Total		
Cuivre River REC records		

Cuivre River Electric Cooperative Thunderstorm/High Wind Event Damage Summary

Event Date	Outages Reported	Damages
Total		
Cuivre River REC 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

Event date	Damage estimates	Outages reported

Levee failure,

Event date	Damage estimates	Outages reported

Severe Winter Weather Event Summary

Event date	Event type (ice storm, blizzard, heavy snow)	Damage estimates	Outages reported
	Totals		
Source: Internal CREC 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

Feel free to add any narratives about storm damage or other information you would add here:

Thank you!

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	E
Complete each row left to right. Click on each box to receive instructions for that box.	**Goals**	**Reassess the goal**	**Instructions**	**Justifications for modifying or removing a goal**
	**Goal 1:** Protect the health and safety of the community	accept, as is ☑ yes	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 ☑ yes	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 ☑ yes	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 ☑ yes	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**			

risk summary table

Hazard	Average Annual Damages
Tornadoes	$9,736
Severe Winter Weather	$0
Severe Thunderstorms, Hail and High Winds	$0
Flood and Levee Failure	$0
Dam Failure	$0
Earthquakes	$0
Land Subsidence	$0
Wildfire	$0

goals | actions | suggestions

Goal-Action#	Action Items Specify locations when able	Status Update	Explanation for completed/deleted action	Report progress on continued actions	Select Hazard(s) addressed by this action	Completion Date	COST/BENEFIT SCORE
1-1	Use vegetation management to prevent public safety hazard of downed lines.	NEW			Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	annually	8
1-2	Upgrade radio communications network to work both planned and unavoidable outages.	NEW			Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2027 or later	8
2-1	Overall System Hardening. Addition of lightning arresters, post type insulators, standardize in heavy construction anchor and guy wires.	NEW			Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	annually	8
2-2	upgrade overhead infrastructre by replacing poles with taller, and larger class poles, shorter spans, electronic reclosures, increase conductor size	NEW			Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	annually	7
2-3	convert OH feeders to UG	NEW			Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2027 or later	4
3-1	Maintain mutual aid agreements with other rural electric cooperatives.	NEW			Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	annually	8

3-2	Partner with a contractor to upgrade system and help with storm restoration.	NEW			Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2025	8
3-3	Purchase additional outage software to identify and analyze problem areas.	NEW			Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	2026	5
4-1	Provide safety and reporting information to the general public through varying methods: • Company website • Social media sites • Local newspapers • Publications	NEW			Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	annually	8
4-2	Conduct school visits to promote safety and storm readiness. Demonstrations	NEW			Dam Failure Earthquakes Flooding Land Subsidence Levee failure Thunderstorms Tornado Wildfire Winter Weather	annually	9