9.0 CITY OF EDEN PRAIRIE

The City of Eden Prairie is located north of the Minnesota River in Hennepin County, between the cities of Chanhassen and Bloomington. The southern edge of the city, between the bluffs and the Minnesota River, is within the LMRWD boundary.

The 2008 Inventory identified 42 features within the City of Eden Prairie. Through the desktop analysis of the 2008 Inventory, one site was removed because it fell outside the LMRWD boundary and eight were determined to lie outside the District (**Figure 90**).

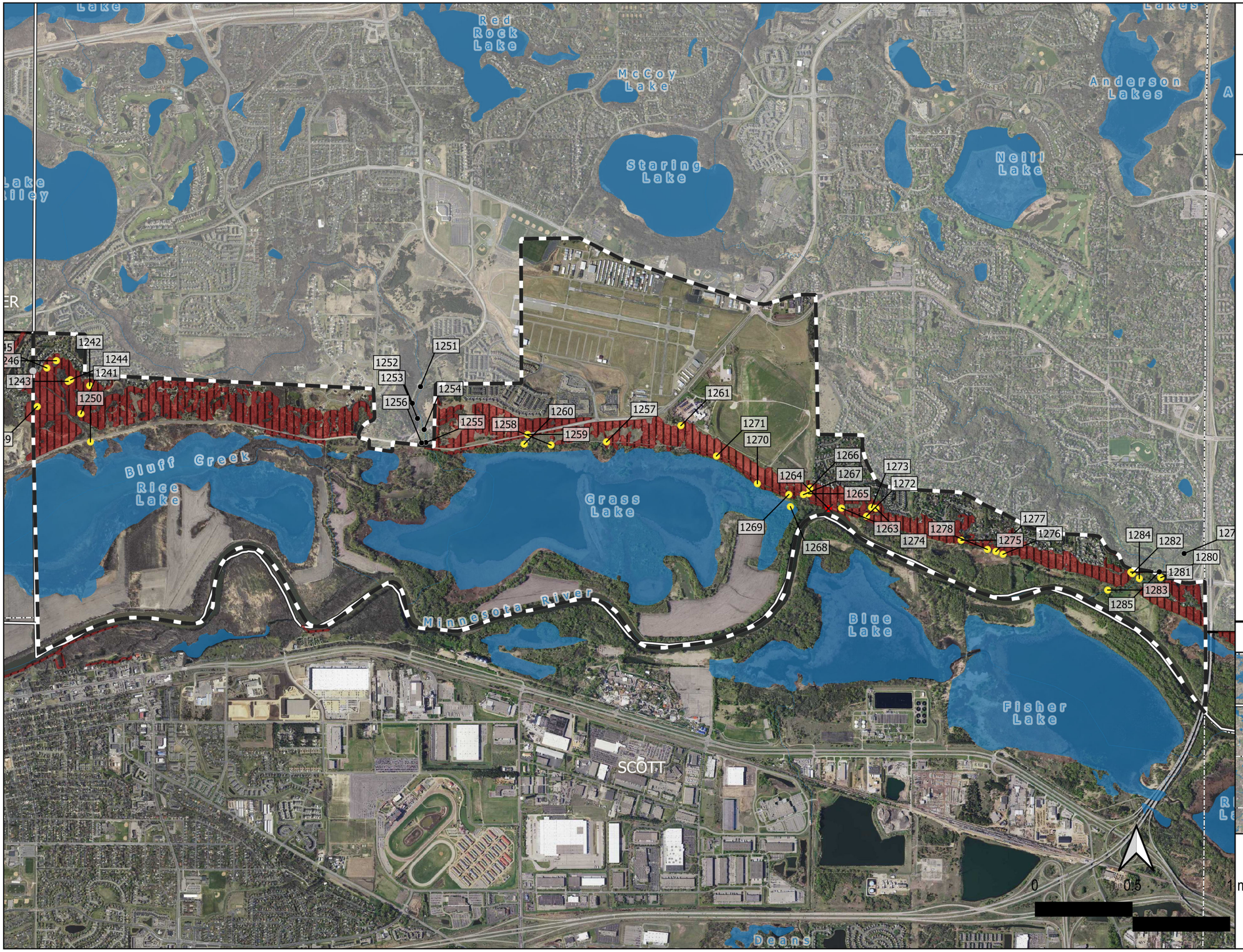
During the 2020 field season, the field team collected data at 53 locations. At four locations, the field team could not locate the indicated pipe outfall or road culvert. Some features may have been removed. Two locations were determined not to be applicable to the project because they consisted of generalized erosion that could not be characterized as a true gully. One location was found to be a duplicate point and was removed in the field. The remaining 44 points were all confirmed as either a gully, pipe outfall, or both (**Figure 91**).

9.1 Previous Restoration Efforts

The City of Eden Prairie has been an active LMRWD partner in collaborating on the Area 3 Bluff Stabilization project since 2008. The following are brief synopses of the gully work completed to date:

- Riley Creek Stabilization (2018): The LMRWD stabilized a portion of Riley Creek immediately south of Flying Cloud Drive/CSAH 61 in the City of Eden Prairie.
- Lower Riley Creek Ecological Restoration (2019): The LMRWD is partnering with the Riley-Purgatory-Bluff Creek Watershed District to stabilize and enhance Lower Riley Creek.
- Area 3 Bluff Stabilization (2021): In partnership with the City of Eden Prairie, the LMRWD is in the process of finalizing the design for construction of a large slump and bank erosion along the Minnesota River near Riverview Terrace.

Figure 90: Eden Prairie 2008 Inventory Locations



LEGEND

2008 Gully Inventory Waypoints
- Inside LMRWD
- Outside LMRWD Boundary
- Non-Applicable Points
- Outside Eden Prairie
- MnDNR Spring Inventory
- Calcareous Fens
- Public Waters
- Public Waterbodies

LMRWD Overlay Districts
- High Value Resource Area Overlay District
- Steep Slopes Overlay District [SSOD]

Political Boundaries
- Eden Prairie
- LMRWD Boundary
- Cities, Townships, Unincorporated Areas
- County Boundaries

LMRWD Watershed Location Map

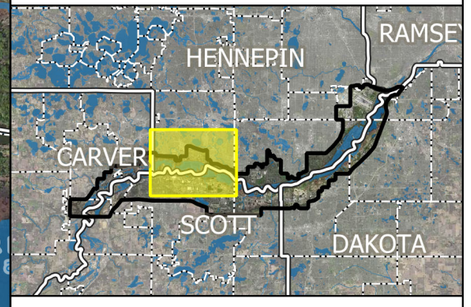


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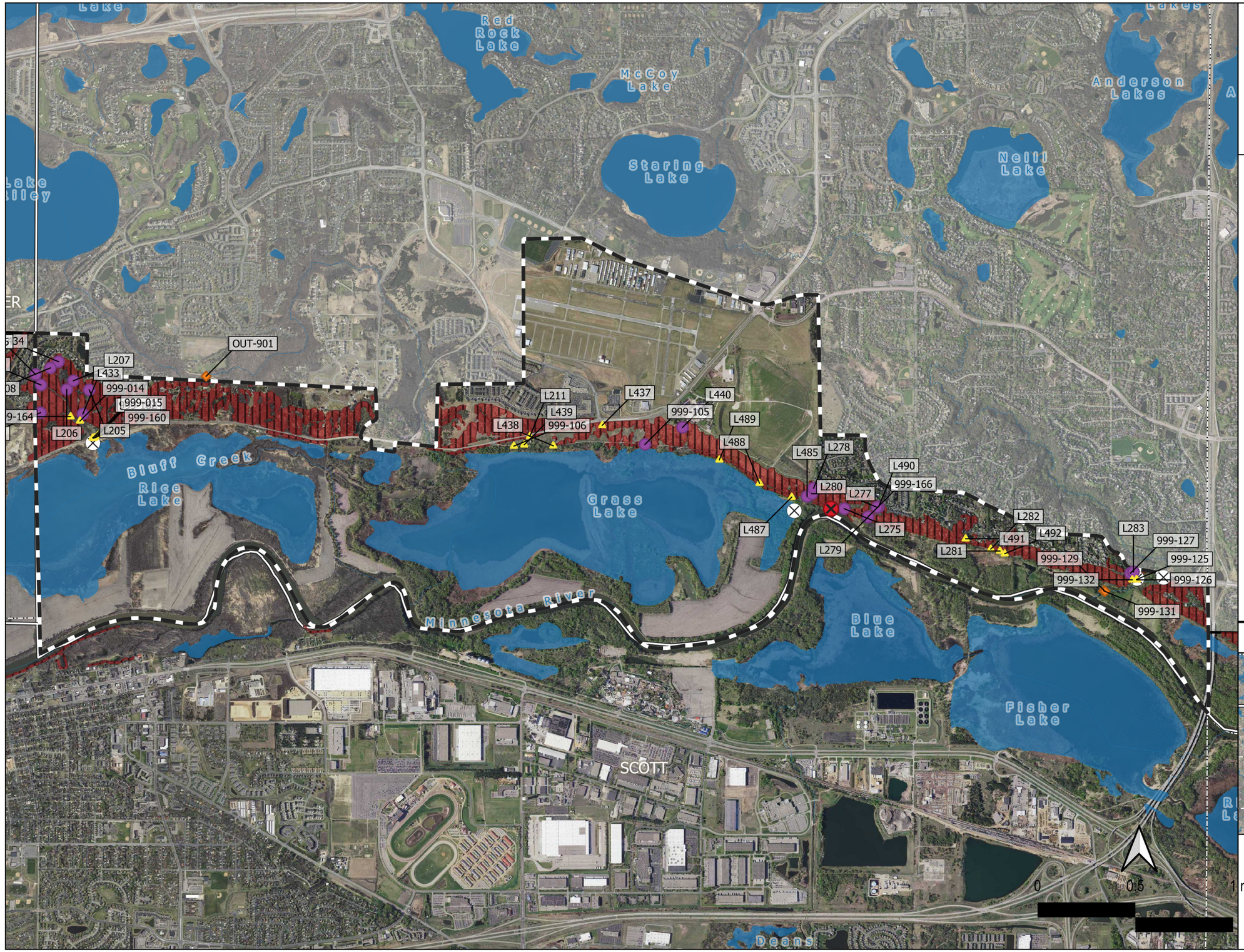
Figure 91: Eden Prairie 2020 Gully Locations



LEGEND

- 2020 Pipe Outfall Surveys
- 2020 Combination Surveys
- 2020 Gully Surveys
- 2020 Inaccessible Waypoints
- 2020 Non-Applicable Waypoints
- MnDNR Spring Inventory
- Calcareous Fens
- Public Waters
- Public Waterbodies

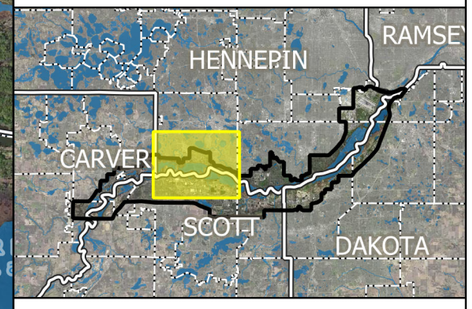
LMRWD Overlay Districts

- High Value Resource Area Overlay District
- Steep Slopes Overlay District [SSOD]

Political Boundaries

- Eden Prairie
- LMRWD Boundary
- Cities, Townships, Unincorporated Areas
- County Boundaries

LMRWD Watershed Location Map



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9.2 Field Survey Discussion

Access conditions in the city were not found to be challenging except for sporadic sections of heavy vegetation, especially along Riverview Road. Additionally, access conditions were difficult along the Minnesota River near the Area 3 Slope Stability Study. In this area, severe erosion and unstable slopes prevented access to pipe outfalls. One of the locations in this area, L275, is part of the upcoming Area 3 Slope Stability Study and was determined by the field team to be a candidate for a future drone survey if additional detail is needed.

Notably, the field team filled out an N/A survey for two sites that showed signs of erosion but were not gullies. Sites L493 and L284 documented sections of erosion along a stream bank. These sites were not classified as gullies because they lacked discernable gully features such as a head cut. A different classifying method from the one used for gullies would likely provide more relevant information on these stream sections. The areas may be of interest to Eden Prairie for future restoration efforts.

No landowner issues arose in Eden Prairie. Those few gullies that backed up to private property were accessed through public land; in general, most sites were not near private residences.

9.3 Findings

The field team observed a variety of pipe outfalls throughout Eden Prairie. A wide distribution of pipe materials and outlet conditions were observed. Commonly, the pipe outfalls drained into the surrounding wetlands of the Minnesota River. Of the pipe outfalls, two caused downstream gullies, both of which were short gullies feeding directly into Purgatory Creek.

Steep hillslopes and groundwater springs throughout Eden Prairie resulted in the team ranking a large proportion of sites as having high erosion potential. The team found sections of Riverview Road and Purgatory Creek heavily eroded. However, the most extensive erosion in the city occurred within the Richard T. Anderson Conservation Area.

Evidence of past erosion was observed at Pipe Outfall L437 along Flying Cloud Drive; sections of eroded soil dotted the grassland downstream from a large road culvert and underground pipe. The cause of the eroded patches was unclear, but it is possible that L437 once served as a pipe draining directly onto the grassy hillside. The team also noted a stable area along Flying Cloud Drive with no signs of historic erosion. Site L440 is representative of much of the terrain along the highway, where the sloping landscape forms wide, heavily vegetated channels that lead to the Minnesota River.

The field team noted four pipe outfalls in need of repair in Eden Prairie (**Figure 92**) and assessed the current gully conditions in terms of erosion potential (**Figure 93**).

9.4 Eden Prairie Gully Progression

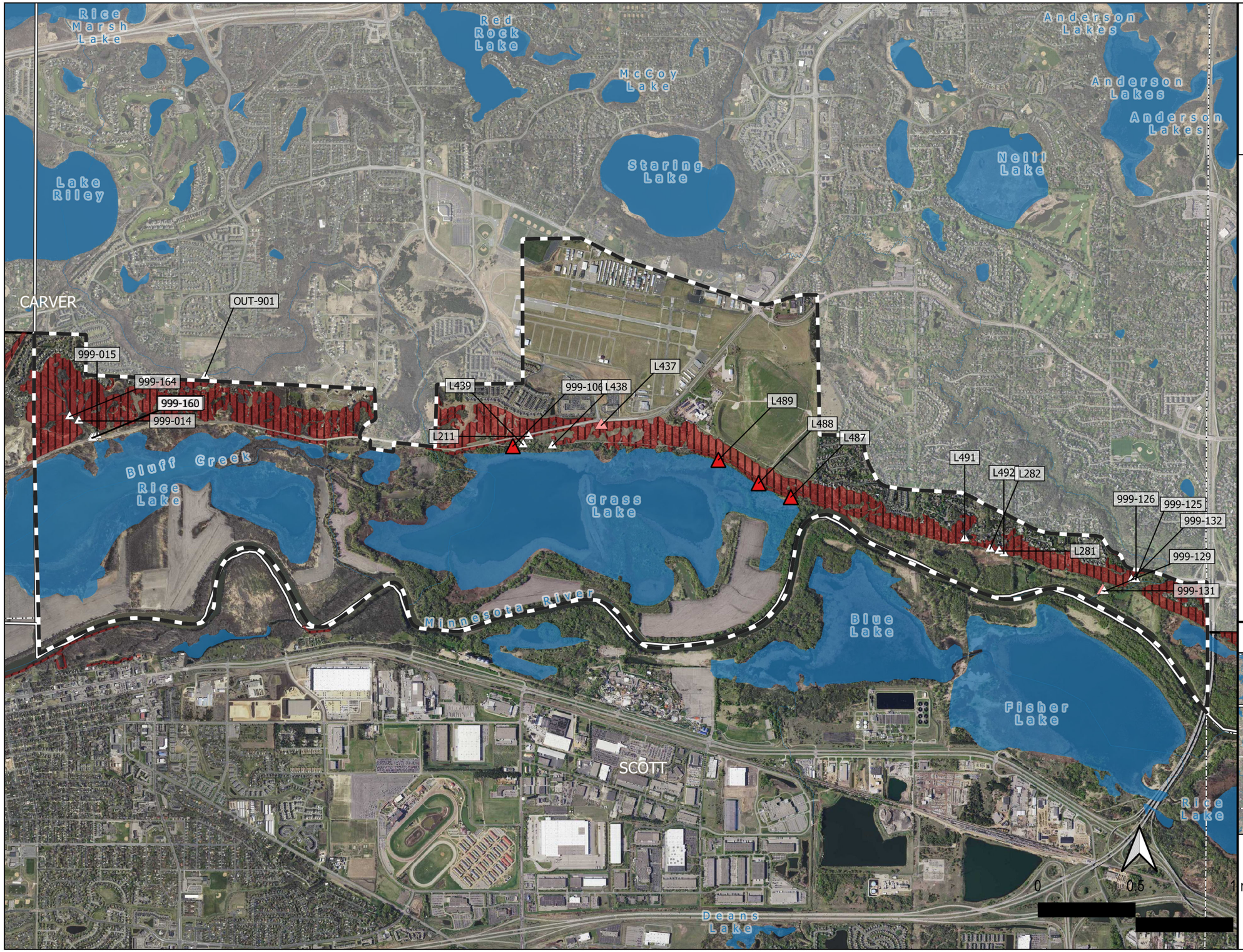
Compared to the 2008 benchmark data, the total number of gullies and the severity of the erosion in Eden Prairie have generally increased based on the 2020 assessments. **Table 9-1** provides an overall summary of the erosion potential within the City of Eden Prairie in both 2008 and 2020.

Table 9-1: City of Eden Prairie Gully Erosion Potential Summary

	2008 Benchmark Condition	2020 Condition
High Erosion Potential	6	14
Moderate Erosion Potential	7	6
Low Erosion Potential	2	4
	15	**24**

To better assess the erosion progression of an individual site, the change in erosion potential is mapped in **Figure 94**. There were six sites in Eden Prairie that changed erosion potential from the 2008 Inventory to the 2020 Inventory. Four of the sites have increased in their erosion potential, moving from moderate or low erosion potential to high erosion potential; these are discussed in more detail within their respective HPRs. Two other gullies were observed to have a reduced erosion potential: one from high to low and one from moderate to low. High priority was placed on the sites that became more severe between the 2008 and 2020 studies. The ranking of sites in less-severe categories owes largely to the limited information available from the 2008 study for ranking determinations, with the more appropriate ranking of the sites in the 2020 study attributable in part to improved data collection rather than any significant progressive change in conditions.

Figure 92: Eden Prairie 2020 Pipe Outfall Conditions



LEGEND

2020 Pipe Outfalls

- Needs Immediate Attention
- Potential/Future Repair Needed
- Good Condition/No Repair Needed
- MnDNR Spring Inventory
- Calcareous Fens
- Public Waters
- Public Waterbodies

LMRWD Overlay Districts

- High Value Resource Area Overlay District
- Steep Slopes Overlay District [SSOD]

Political Boundaries

- Eden Prairie
- LMRWD Boundary
- Cities, Townships, Unincorporated Areas
- County Boundaries

LMRWD Watershed Location Map

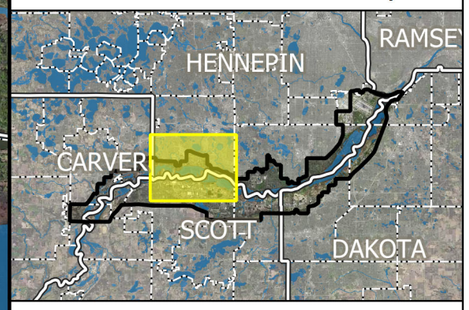


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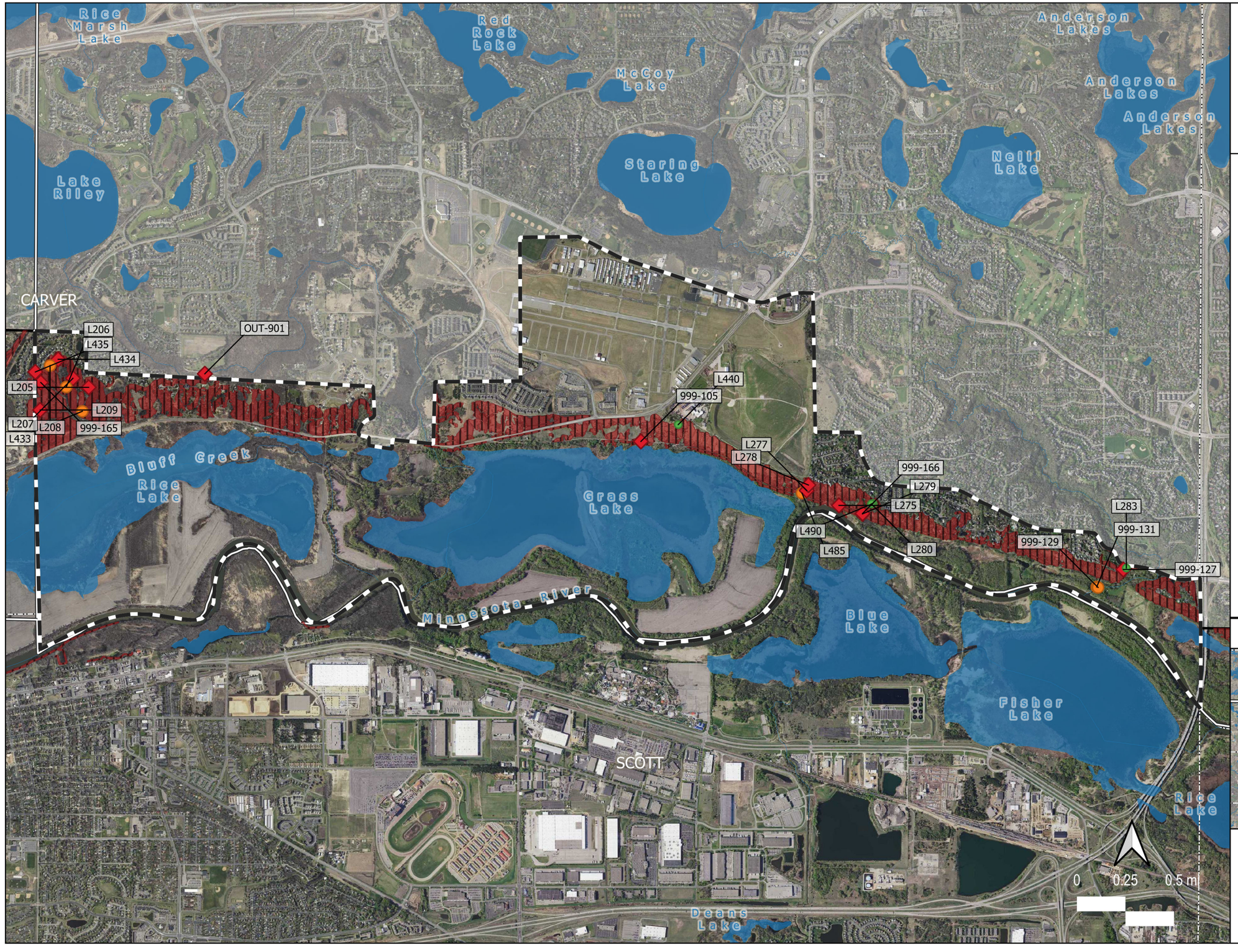
Figure 93: Eden Prairie 2020 Gully Conditions



LEGEND

2020 Gully Condition

- High Erosion Potential
- Moderate Erosion Potential
- Good Condition/No Repair Needed
- MnDNR Spring Inventory
- Calcareous Fens
- Public Waters
- Public Waterbodies

LMRWD Overlay Districts

- High Value Resource Area Overlay District
- Steep Slopes Overlay District [SSOD]

Political Boundaries

- Eden Prairie
- LMRWD Boundary
- Cities, Townships, Unincorporated Areas
- County Boundaries

LMRWD Watershed Location Map

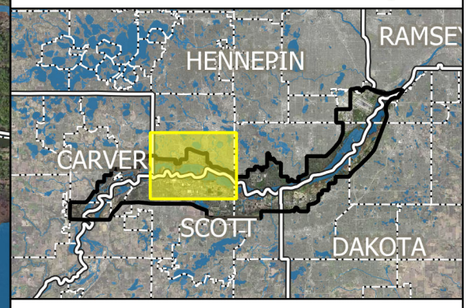


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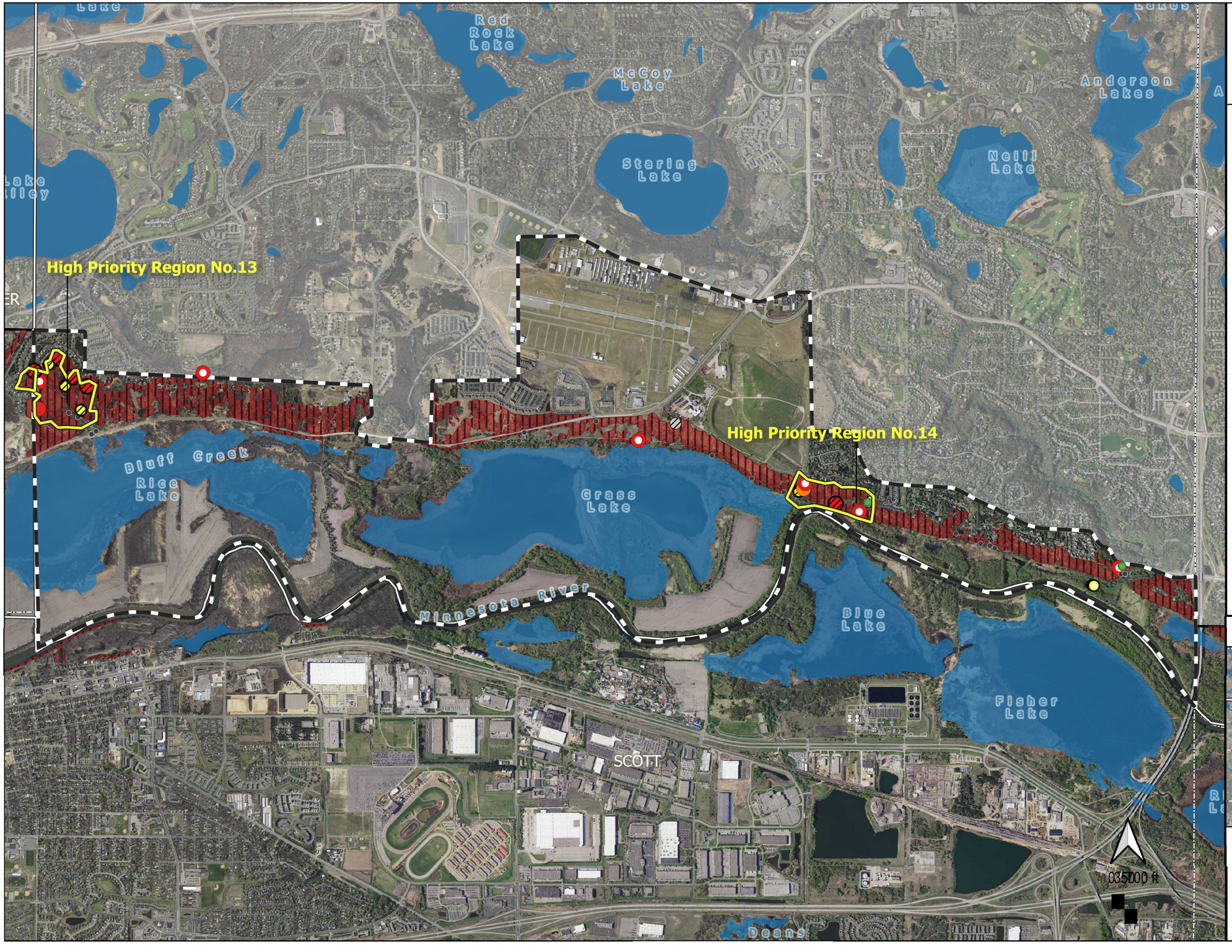
Figure 94: Eden Prairie Erosion Progression and HPRs



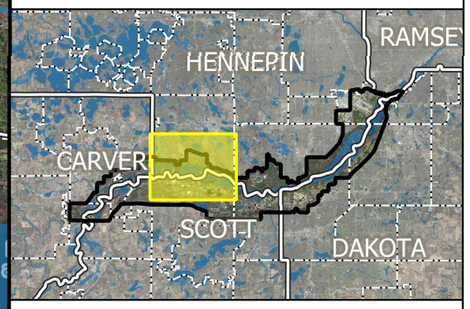
LEGEND

- High Priority Region

Erosion Progression (2008 --> 2020)

- Low --> High
- Moderate --> High
- High --> High
- New Site High
- Low --> Moderate
- Moderate --> Moderate
- New Site Moderate
- Low --> Low
- New Site Low
- Improved
- Non-Gully
- Public Waters
- Public Waterbodies
- High Value Resource Area Overlay District
- Steep Slopes Overlay District
- Eden Prairie
- LMRWD Boundary
- Cities, Townships, Unincorporated Areas
- County Boundaries

LMRWD Watershed Location Map



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9.5 Eden Prairie High-Priority Regions

Three HPRs have been identified within the City of Eden Prairie. All the high-priority sites are in the steep slopes district (**Figure 94).**

- **HPR 13:** This includes the area within the Richard T. Anderson Conservation Area near the border with the City of Chanhassen.
- **HPR 14:** This is also known as the Area 3 Slope Stability Area. Because Area 3 is a separate project, the information collected in that area may serve as supplementation for future construction, and the western cluster of points may serve as a future project.
- **HPR 15:** This includes the two outlying points 999-105 and 999-127.

9.5.1 HPR 13

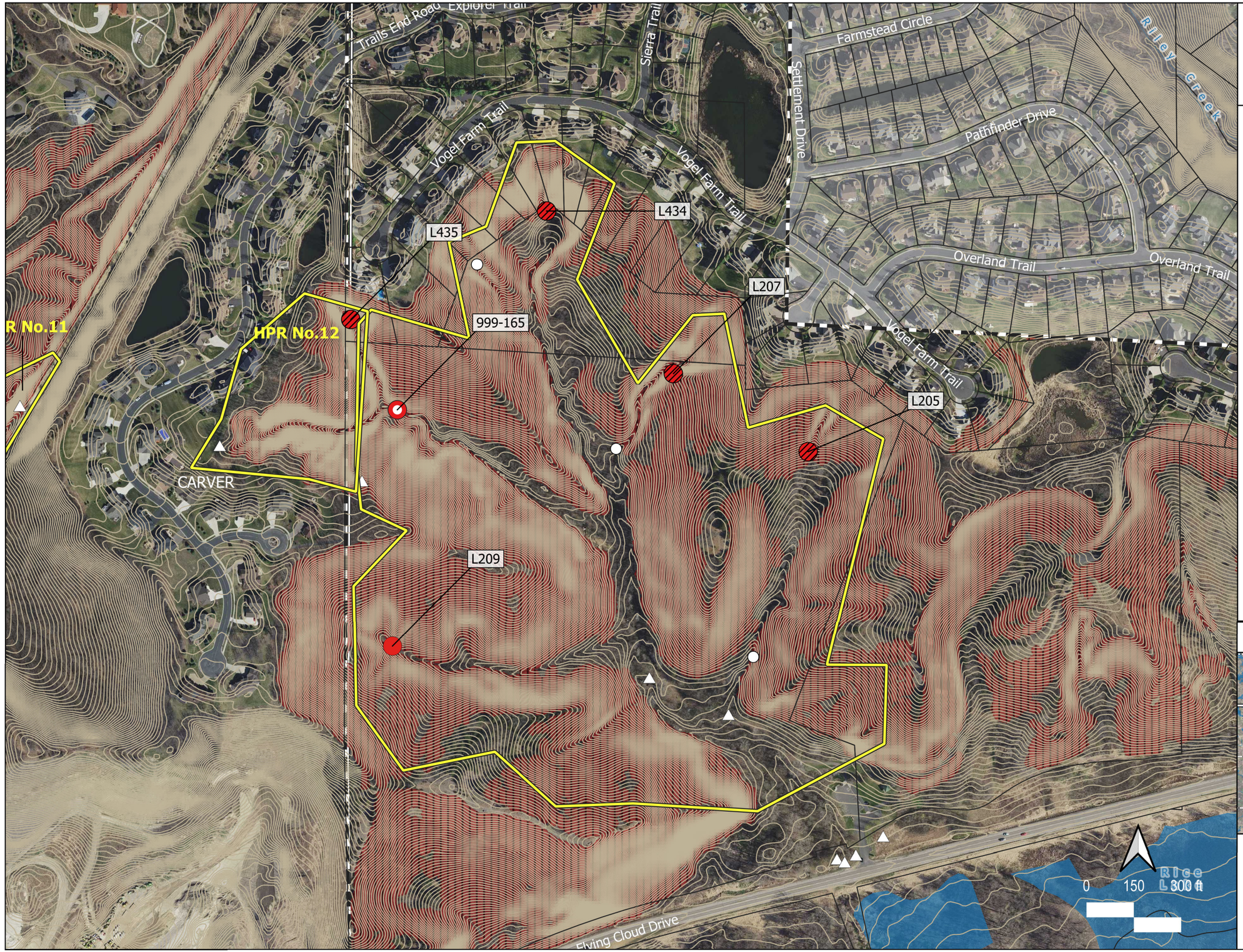
HPR 13 consists of Gullies L209, 999-165, L434, L207, and L205 (**Figure 95**). Each gully listed formed the head cut of a branch that connected downstream to a central stream flowing through the center of the Richard T. Anderson Conservation Area. The field team noted groundwater and V-shaped gullies with bare soil underneath overhanging banks as common characteristics in this region. Generally, groundwater seeps and steep slopes with dense canopies caused further erosion in the gullies at this site.

The 2008 Inventory described severe erosion, ferrous springs, and proximity of the gullies to residential homes at three of the sites in this HPR. Based on the comments and incision visible in the pictures, the desktop analysis ranked those three gullies as having high erosion potential in 2008. In 2020, the field team remained consistent with the 2008 Inventory and ranked the three gullies as still having high erosion potential. Site L205 in **Figure 96** shows the comparison of L205 between the two studies.

Based on the 2008 picture and note about "little erosion" at Site L209, the fourth gully in the HPR was ranked as having low erosion potential in 2008 during the desktop analysis. However, during the 2020 field visit, the team noted incision, groundwater, and unstable banks. These problem indicators, as well as the steep bank slopes near the more stabilized head cut, led to a high erosion potential rating. Between 2008 and 2020, the head cut banks appeared to have remained stable, while the channel eroded down. Additionally, a long section of incision was found further downstream from the head cut that showed the most severe signs of erosion in the gully. A comparison of the gully conditions over time appears in **Figure 97**; **Figure 97b** highlights the leaning trees and channel incision seen in 2020, signifying increased erosion in the gully between studies.

At the northern part of the Richard T. Anderson Conservation Area, L434 presented a unique gully case. It seems possible that between 2008 and 2020, stabilization efforts occurred along the slope behind a house. However, at the time of the 2020 field visit, large sections of vegetation were slumping off the hillslope towards the head cut of the stream, which occurred at an eroding area of ferrous groundwater seeps. Thus, the area was still ranked as having high erosion potential and appeared to have been the site of unsuccessful stabilization. **Figure 98** shows an upstream view of the gully taken in 2008 before the restoration was completed; **Figure 99** shows the gully in 2020. **Figure 99a** is a view of slumping and bare soil along the head cut. **Figure 99b** is a downstream view of bare soil and steep valley walls.

Figure 95: Eden Prairie High Priority Region No. 13



LEGEND

- High Priority Region

High Priority Sites

- Low --> High
- Moderate --> High
- High --> High
- New Site High

Other 2020 Locations

- Surveyed Gully
- Surveyed Pipe Outfall
- Hennepin Co. 2-ft Contours
- MnDNR Spring Inventory
- Public Waters
- Public Waterbodies
- High Value Resource Area Overlay District
- Steep Slopes Overlay District
- Eden Prairie
- LMRWD Boundary
- Cities, Townships, Unincorporated Areas
- County Boundaries

LMRWD Watershed Location Map

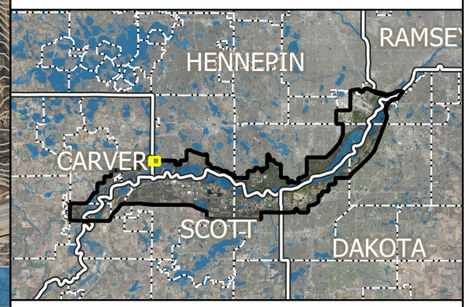


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Figure 96. View of Site L205 from 2008 ('a') to 2020 ('b').

Figure 97. Photo 'a' is a view of L209's head cut area taken in 2008. Photo 'b' is a downstream view of L209 taken in 2020.

Figure 98. Photo of Site L434 from 2008 Inventory.

Figure 99. Photos of Site L434 from 2020 Inventory.

9.5.2 HPR 14

HPR 14 is located along the banks of the Minnesota River. The region includes two channels consisting of two gully sites each, and one large slump along the Minnesota River (**Figure 100**).

L275 was noted as having high erosion potential in the 2008 study due to the bare soil noted around the pipe in the picture taken by the field team. At the time of the 2020 site visit, the field team could not safely reach the pipe outfall to clearly assess it because of unstable slopes, which indicates the amount of erosion that occurred along the bank since 2008. A comparison of the pipe outfall in 2008 and the bank erosion noted in the 2020 field work appears below in **Figure 101**.

The other gullies in this HPR were all noted as having moderate erosion potential in 2008 based on the pictures and descriptions from the time. The 2020 field team assessed these sites as having high erosion potential because of observed active erosion and unstable banks along the head cut. However, Site L277 had a medium depth and bottom width, Site L278 had a medium length, and Site L279 had a narrow depth and medium top width. Therefore, although the erosion within each gully was severe, the smaller size of the gullies makes this region a lower priority for restoration than the gullies in HPR 14.

Factors contributing to the formation and erosion of the high-priority gullies in the region included groundwater seepage, steep slopes throughout Eden Prairie, and a dense canopy and subsequent lack of vegetation. Common problem indicators within these gullies included slumping, overhanging banks, and leaning trees. Incision was noted at sites L277 and L279. **Figure 102** below illustrates incision caused by groundwater at Site L277.

Sites L279 and 999-166 shared similar characteristics to L277. They were both incised channels formed from groundwater seeps with unstable, overhanging banks and active head cuts where seeps emerged. **Figure 103** shows the active erosion seen at L279 and 999-166 during field visits in 2020. **Figure 103b** also illustrates a large knickpoint within the channel of 999-166.

Figure 100: Eden Prairie High Priority Region No. 14

LEGEND

- High Priority Region

High Priority Sites

- Low --> High
- Moderate --> High
- High --> High
- New Site High

Other 2020 Locations

- Surveyed Gully
- Surveyed Pipe Outfall
- Hennepin Co. 2-ft Contours
- MnDNR Spring Inventory
- Public Waters
- Public Waterbodies
- High Value Resource Area Overlay District
- Steep Slopes Overlay District
- Eden Prairie
- LMRWD Boundary
- Cities, Townships, Unincorporated Areas
- County Boundaries

LMRWD Watershed Location Map

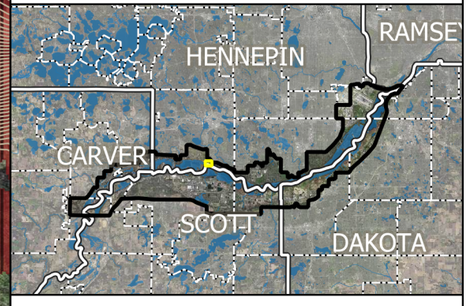

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Figure 101. Progression of erosion at Site L275 from 2008 (a) to 2020 (b).

Figure 102. Comparison of Site L277 in 2008 (a) and 2020 (b).

Figure 103. View of Sites L279 (a) and 999-166 (b) taken in 2020.

9.5.3 Gully 999-105

Gully 999-105 is an outlying point found along the Riverview Road trail. At this gully, advancing erosion is threatening an existing pedestrian walking trail, and bare sandy banks are exposed (**Figure 104**). Further slumping looks imminent; overhanging banks line the top perimeter of the gully. The field team was unable to determine the cause of the erosion, but the steep slopes along the hillslope may be exacerbating the speed at which this headward erosion and migration is occurring.

Figure 104. View of Gully 999-105 taken in 2020 looking upstream toward the pedestrian walking trail and gully head cut.

9.5.4 Gully 999-127

Gully 999-127 is located near the eastern boundary of Eden Prairie, to the west of Purgatory Creek and what appears to be a groundwater fed channel that flows into Purgatory Creek. The gully was severely eroded due to the channel incision and degradation below knickpoints.

At the time of the visit, the field team found that the gully has a medium depth and a bottom width. The gully was U-shaped, with a steep channel slope and bare soil along the gully bank and bottom.

Problem indicators included slumping, a loss of bank vegetation, overhanging trees, and degradation visible in the incised sections of the gully channel. **Figure 105** below details the erosion, with **Figure 105a** showing the actively eroding head cut and seep and **Figure 105b** showing the overhanging banks and bare soil along an incised channel.

The apparent causes for the development of the gully include several groundwater seeps ringing the gully head cut, which are saturating and destabilizing the soil. Slumping and erosion may continue as trees along the banks continue to hang over the gully channel.

Figure 105. Photos of Gully 999-127 in 2020.