memo

Project Name |	PLOC Channel Inspections	**Date** |	12/10/2019
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Cc / Contact info |	Carl Almer		
From / Contact info |	Mike Majeski		
Regarding |	Channel and Vegetation Inspections – 2019 Summary		

Background

The Prior Lake Outlet Channel (PLOC) has been routinely inspected twice annually, typically in the spring and fall, to document the channel condition, survey debris and log jams, and inspect culverts and road crossings for obstructions of flow. Starting in the fall of 2017, a vegetation assessment was conducted concurrently with the channel inspection to assess previously managed areas for invasive plant species and document any satellite populations of invasive species growing within the PLOC easements. Following the assessment, recommendations have been provided to address certain populations of invasive species growing along the channel.

Methodology

The PLOC was assessed on foot from Segment 1 to Segment 7 on May 16, July 12, and September 24, 2019. Segment 8, which is under management by the United States Fish & Wildlife Service, was not assessed. For the spring and fall assessments, a series of photographs were taken in each segment to characterize the condition of the outlet channel, assess any new areas of bank erosion, and document any obstructions to flow such as down trees, debris piles, or culvert blockages. All images were collected working upstream to downstream in each segment to aid in channel reference. Due to the size and volume of images collected for this assessment, only the most relevant images pertaining to the channel condition were included in this memo. All other images collected for this effort were transferred to District staff (Jaime Rockney) via flash drive and were placed in an images folder titled "PLOC Channel Inspection_2019".

For the vegetation assessments, a handheld Trimble GeoXH GPS unit was used to survey the locations of satellite populations of terrestrial invasive species along the PLOC. A July vegetation inspection was conducted to help guide early detection and management of satellite populations of invasive species, particularly purple loosestrife (*Lythrum salicaria*) and wild parsnip (*Pastinaca sativa*), to prevent any plants from producing seed. The vegetation surveys targeted only problematic and early detection invasive species such as those found in the Minnesota Department of Transportation's list of noxious weeds and those included in the Minnesota Department of Natural Resources list of terrestrial invasive species. Common non-native species such as common dandelion (*Taraxacum officinale*), common burdock (*Arctium minus*), velvetleaf (*Abutilon theophrasti*), broadleaf plantain (*Plantago major*), white clover (*Trifolium repens*), and other naturalized weeds were not assessed. Appendix A includes a summary of vegetation management conducted in 2019 by Applied Ecological Services (AES) and Appendix B includes recommendations for continued channel and vegetation management in 2020.

Results

Segment 1 – Channel Condition

The boulder cross vane located immediately downstream of Jeffers Pass NW near Jeffers Pond Elementary School had been repaired with additional rock (Figure 1). Other FEMA-funded bank repairs completed in 2019 included repair of the walking bridge abutments and installation of boulder toe along previously eroded stream banks. No recent bank erosion was observed within this segment. Minor channel obstructions were located at the same areas identified in previous surveys including several large tree trunks and branches found lying across and within the channel in the wooded area just upstream of County Road 42, and a small beaver dam located just downstream of Fountain Hills Road (Figure 2). The bottom of the trash rack on the upstream end of the CR 42 culvert was partially obstructed with debris in September (Figure 3).

Segment 1 – Invasive Species

A few black locust (*Robinia pseudoacacia*) saplings were located along the paved walking path west of Jeffers Pond Elementary School. In addition, two new populations of wild parsnip were found in 2019, including a large patch in the grassy area southwest of the intersection of Jeffers Pass NW and Eagle Creek Avenue, and about 20 plants were located in a grassy opening northeast of Chickadee Landing on Jeffers Pond Elementary property. These satellite wild parsnip populations were treated by AES in July 2019 and should be closely monitored in the spring/early summer of 2020 to determine if any new plants exist in the area. Any basal rosettes located should be treated with herbicide with follow-up inspections and treatments conducted in early July to prevent the plants from maturing and producing seed. Figure 4 shows the locations and areal coverages of existing invasive species identified in this segment.

Figure 1. Repaired boulder cross vane near Jeffers Pond Elementary School

Figure 2. Small beaver dam located downstream of Fountain Hills Road

Figure 3. Debris jam in trash rack at upstream end of CR 42 culvert

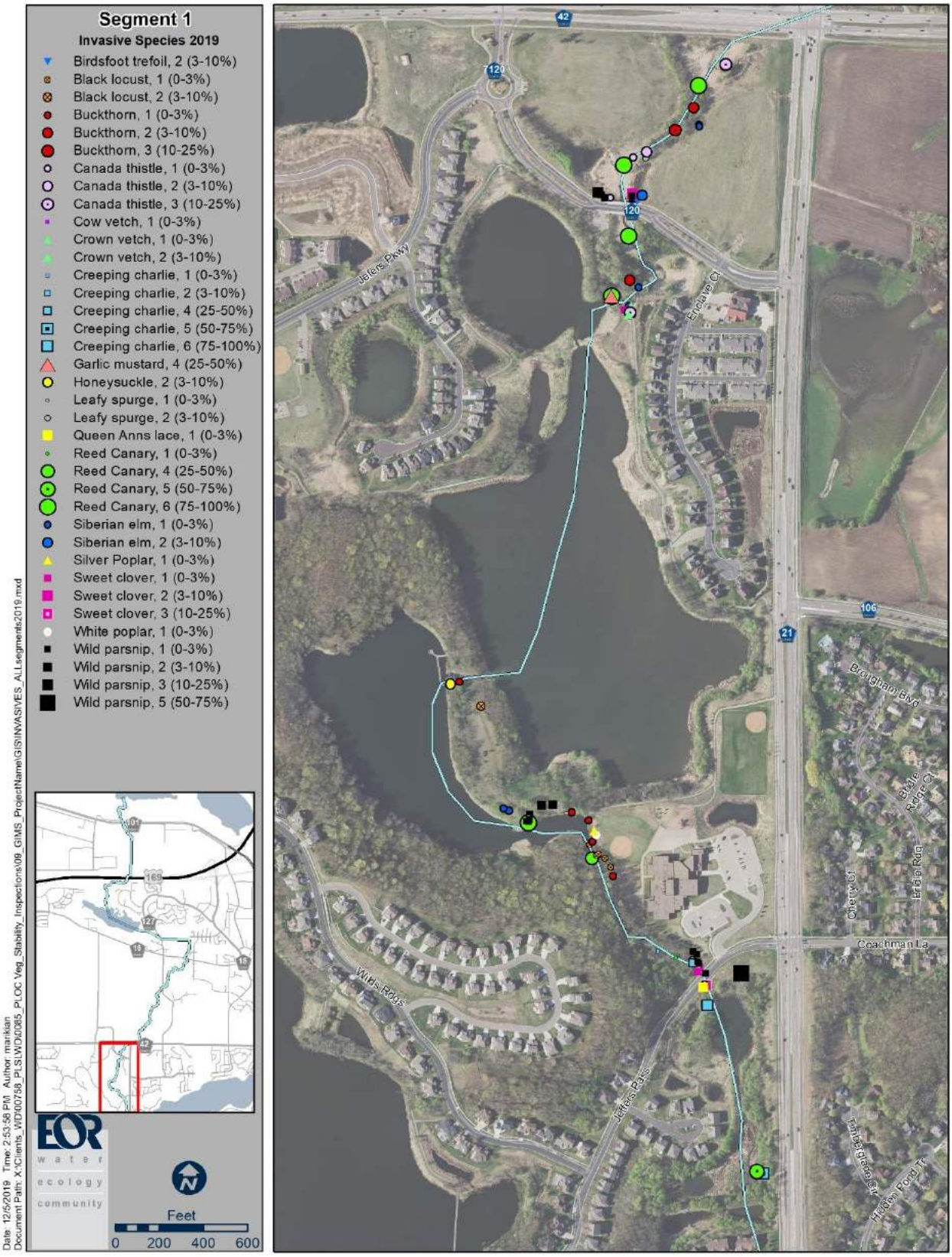

Figure 4. Invasive species and associated areal coverages (in parenthesis) along Segment 1

Segment 2 – Channel Condition

Numerous stream banks within this segment have been repaired since 2018 through the FEMA bank repair project (Figures 5-7). Nearly all previously documented down trees and channel obstructions have been removed as part of this effort; however, a few small woody debris obstructions remain in the channel. The primary bank stabilization practice implemented was the placement of boulder toe along the sides of the channel. Rootwads where also utilized along a few banks for toe stability and habitat improvements (Figure 8). The bank repairs have reduced toe erosion throughout the segment, but some banks continue to erode in areas where bank repair activities have not occurred. The large sediment delta previously identified at the inlet to Pike Lake was not visible during the site inspections due to high water.

Segment 2 – Invasive Species

No new invasive species were found. Figure 9 shows the locations and areal coverages of previously identified invasive species in this segment.

Figure 5. Boulder toe bank stabilization installed downstream of the 2nd crossing

Figure 6. Boulder toe bank stabilization installed downstream of the 3rd crossing

Figure 7. Boulder toe bank stabilization installed downstream of the 4th crossing (upstream of Pike Lake Park)

Figure 8. Rootwads installed along outside bank just upstream of Pike Lake

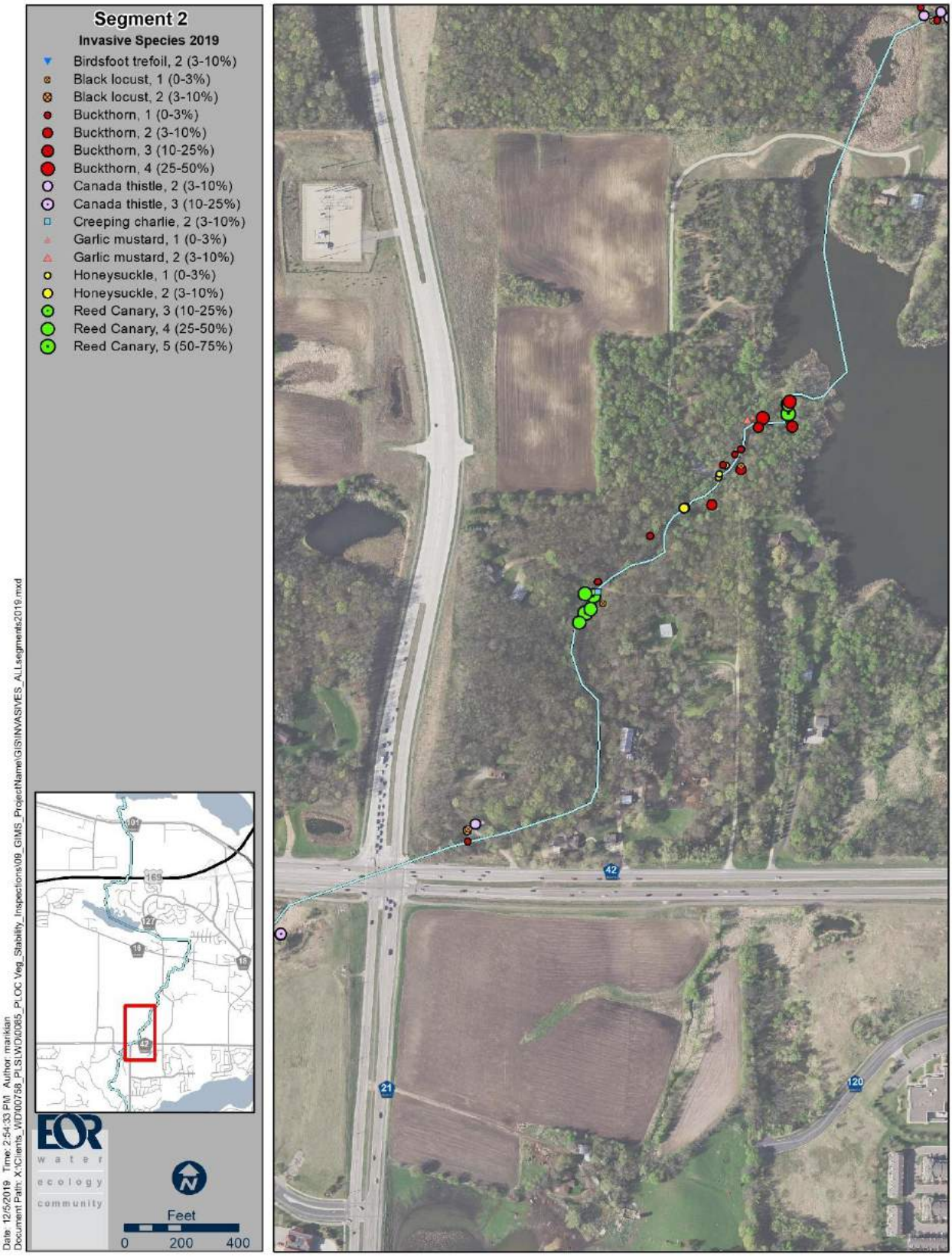

Figure 9. Invasive species and associated areal coverages (in parenthesis) along Segment 2

Segment 3 – Channel Condition

Following spring snowmelt and high flows in the outlet channel in 2019, two banks adjacent to the Kici Yapi gravel road began to rotationally slump, resulting in the formation of cracks (Figure 10) and subsequent bank failure (Figure 11) along the edge of the gravel road adjacent to the channel. Shakopee Mdewakaton Sioux Community staff repaired the failed banks with fieldstone boulders during the spring/summer of 2019 (Figure 12). Bank erosion continues to occur in areas previously affected by large flood events, particularly along the upstream half of the Kici Yapi property (Figure 13). Banks continue to self-heal in areas where toe stabilization practices were previously implemented (Figure 14).

Segment 3 – Invasive Species

No new invasive species were found in this segment. Common buckthorn (*Rhamnus cathartica*) and bush honeysuckle (*Lonicera spp.*) saplings were observed in areas previously managed. Continued foliar spray treatments will be needed to reduce the population of the saplings in this segment. Figure 15 shows the locations and areal coverages of previously identified invasive species in this segment.

Figure 10. Rotational slumping and formation of cracks along the gravel road of the Kici Yapi property

Figure 11. Rotational slumping and bank failure along the gravel road of the Kici Yapi property

Figure 12. Stream bank repair along the gravel road of the Kici Yapi property

Figure 13. Bank erosion within the middle reach of the Kici Yapi property

Figure 14. Channel condition near the downstream end of the Kici Yapi property

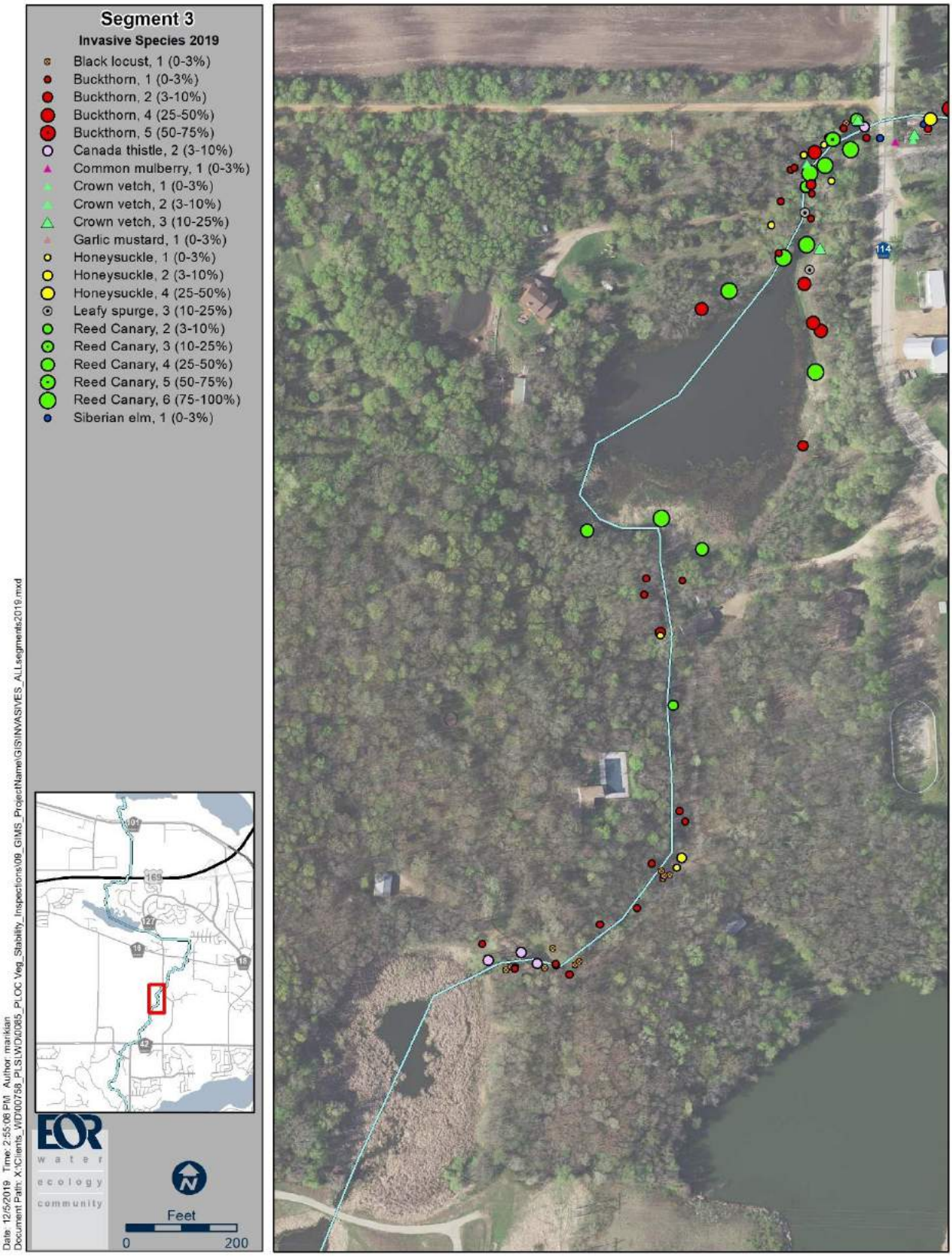

Figure 15. Invasive species and associated areal coverages (in parenthesis) along Segment 3

Segment 4 – Channel Condition

The restored channel in Segment 4A is stable but would benefit from re-positioning of the existing riprap in the channel. There appears to be a sufficient volume of riprap along the right side of the channel to address the minor toe erosion along the left bank (Figure 16). Immediately downstream of the Jackson Trail culvert, the riprap in the center of the channel continues to cause localized bank erosion and channel widening below the culvert (Figure 17). Bank erosion continues to advance within this segment, particularly at sites damaged by previous flood events. In the middle reach of Segment 4B, a recent bank slump was found in 2019 where the toe had been eroded away (Figure 18). In addition, several recently fallen trees were found lying across and within the channel of Segment 4A and were partially affecting flows at high stage (Figure 19, Figure 20). In Segment 4B, the large box elder tree that had fallen over the channel near the upstream end of the segment is still present within the channel. Grazing within the old pastured reach has ceased, resulting in strong regrowth of riparian vegetation along the channel (Figure 21). The removal of cattle from this reach has resulted in a significant improvement to the channel, and the previously trampled stream banks are beginning to self-heal. Bank erosion is now limited to the areas where vertical banks exist (Figure 22).

Segment 4 – Invasive Species

In May 2019, eight wild parsnip plants were found in the restored reach in Segment 4A. In addition, several patches of garlic mustard (*Alliaria petiolata*) containing over 50 plants were also found. Reconnaissance for purple loosestrife was conducted in July 2019 but no plants were found in the areas that were previously managed. Monitoring for wild parsnip and purple loosestrife should continue in 2020 to determine if any new plants exist in the area. Any basal rosettes found should be treated with herbicide, with follow-up inspections and treatments conducted in early July to prevent the plants from maturing and producing seed. Common buckthorn and bush honeysuckle saplings were found in areas previously managed. Continued foliar spray treatments will be needed to reduce the population of the saplings in this segment. Figure 23 and Figure 24 show the locations and areal coverages of previously identified invasive species in this segment.

Figure 16. Channel condition of Segment 4A downstream of Pike Lake Road

Figure 17. Riprap downstream of the Jackson Trail culvert causing bank erosion along the right bank

Figure 18. Recent rotational slump within the middle reach of Segment 4A

Figure 19. Down trees over the channel downstream of the Gonyea culvert in Segment 4A

Figure 20. Fallen box elder tree over the channel at the fence crossing at upstream end of the idle pasture

Figure 21. Self-healing stream banks and regrowth of riparian vegetation within the idle pasture of Segment 4B

Figure 22. Vertical bank erosion continues in areas previously documented in Segment 4B

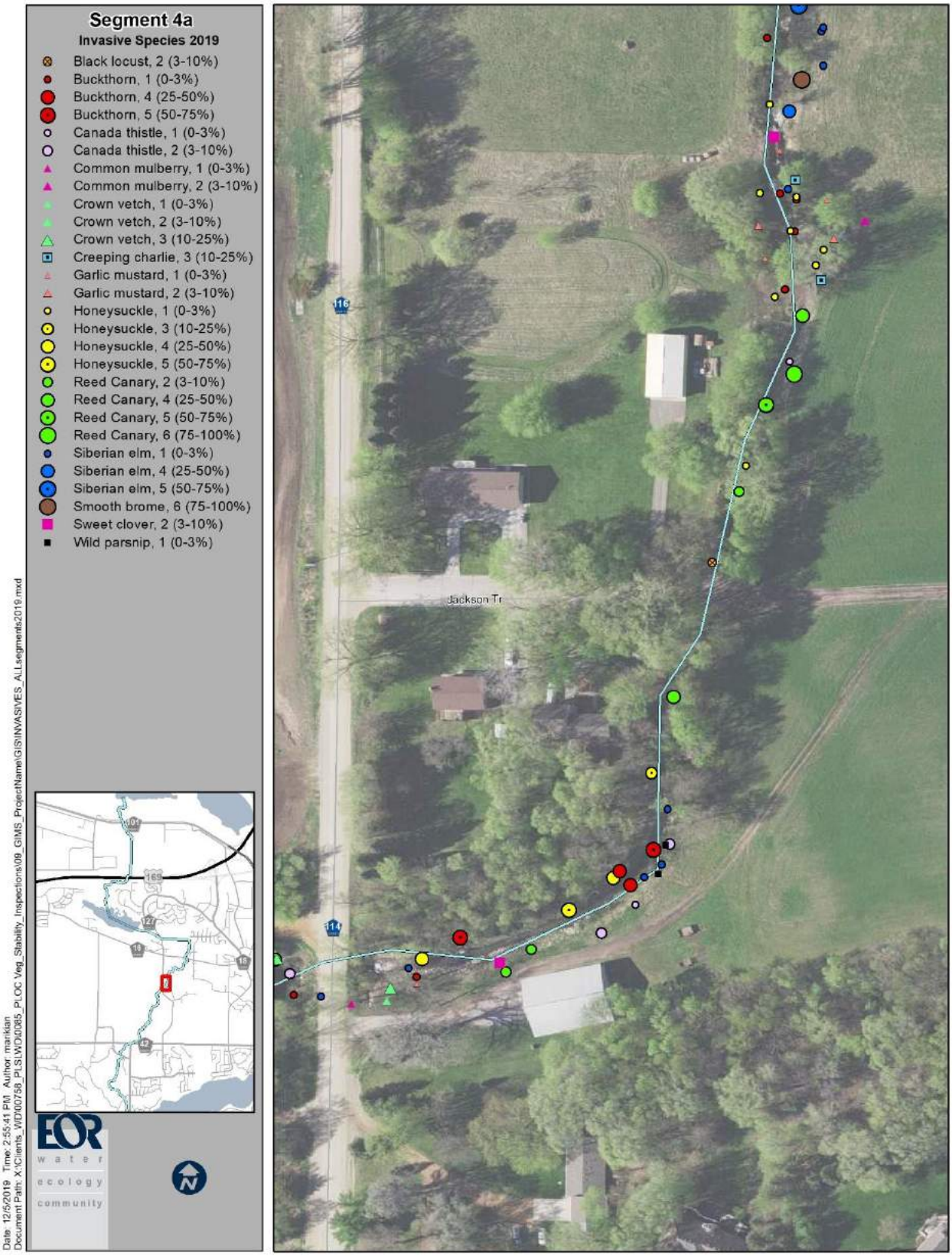

Figure 23. Invasive species and associated areal coverages (in parenthesis) along Segment 4A

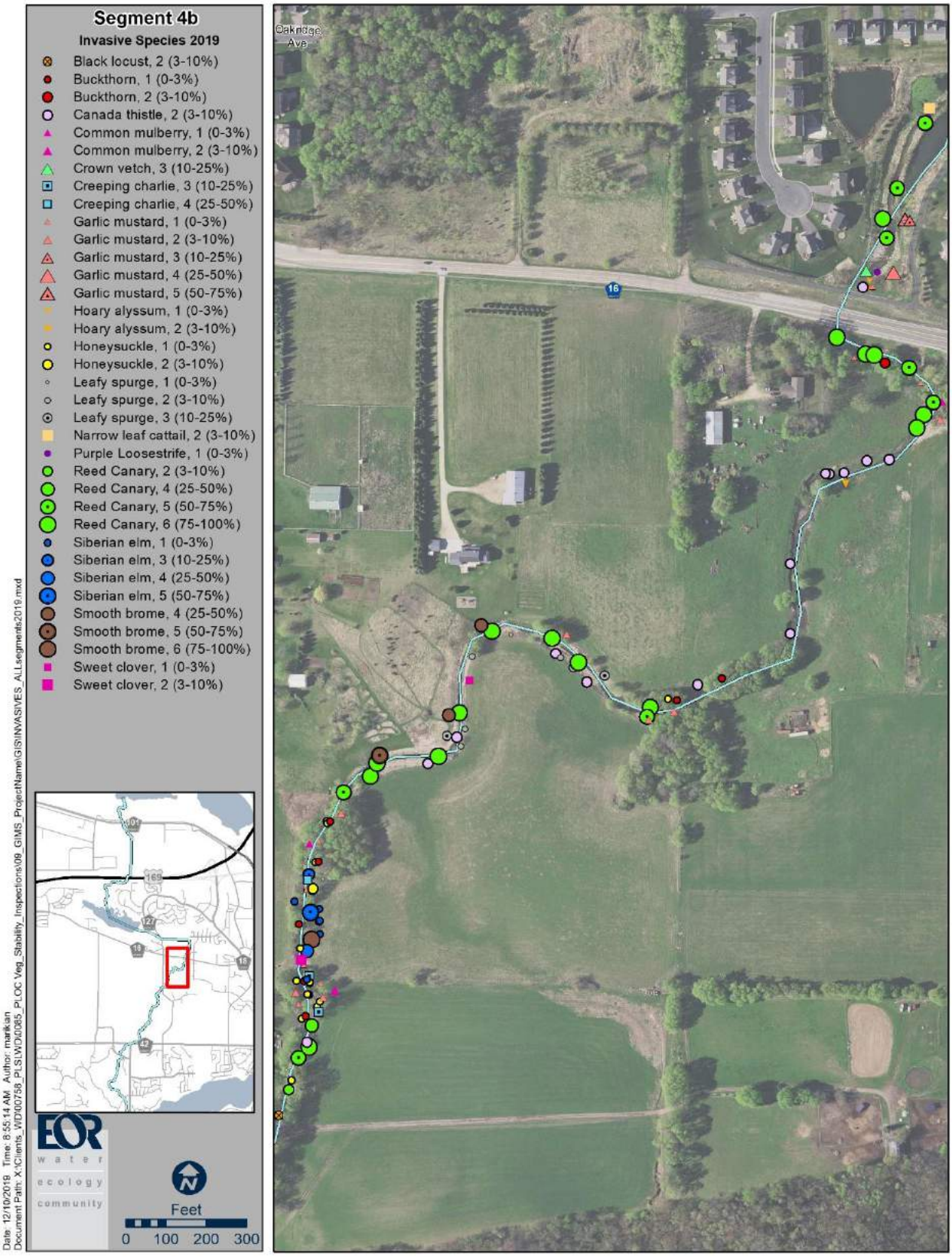

Figure 24. Invasive species and associated areal coverages (in parenthesis) along Segment 4B

Segment 5 – Channel Condition

A small debris obstruction was observed at the upstream end of the twin culverts where the channel bends 90-degrees to the west in Segment 5B (Figure 25). Several recently fallen trees were found lying across and within the channel in Segment 5B, some of which are partially affecting flow (Figure 26, Figure 27). In addition, a small beaver dam was found within the channel between the old field road crossings in Segment 5B (Figure 28). The channel banks throughout this segment are in fair condition with reed canary grass (*Phalaris arundinacea*) and tree roots providing ample surface protection in most areas. However, stream banks that were damaged by previous flood events continue to erode. A large sediment delta has re-developed within the pond located downstream of Pike Lake Road (Figure 29).

Segment 5 – Invasive Species

The management efforts to treat purple loosestrife located downstream of the CR 16 box culverts in Segment 5A were successful. Only one plant was found during the July inspection, and the plant was dug out by hand to remove the root system. This area should be monitored closely again in the summer of 2020 and any new plants should be promptly treated or removed before flowers develop. Purple loosestrife management in this area is particularly important since this site is located adjacent to three large wetland/pond areas and connects to other downstream wetlands, as well as Deans Lake. Figure 30-Figure 32 show the locations and areal coverages of previously identified invasive species in this segment.

Figure 25. Debris obstruction at the upstream end of twin culverts located at the 90-degree ditch bend

Figure 26. Fallen willow tree over the channel in Segment 5B

Figure 27. Several fallen trees over the channel in Segment 5B

Figure 28. Small beaver dam within Segment 5B

Figure 29. Sediment delta located downstream of Pike Lake Road (Segment 5C)

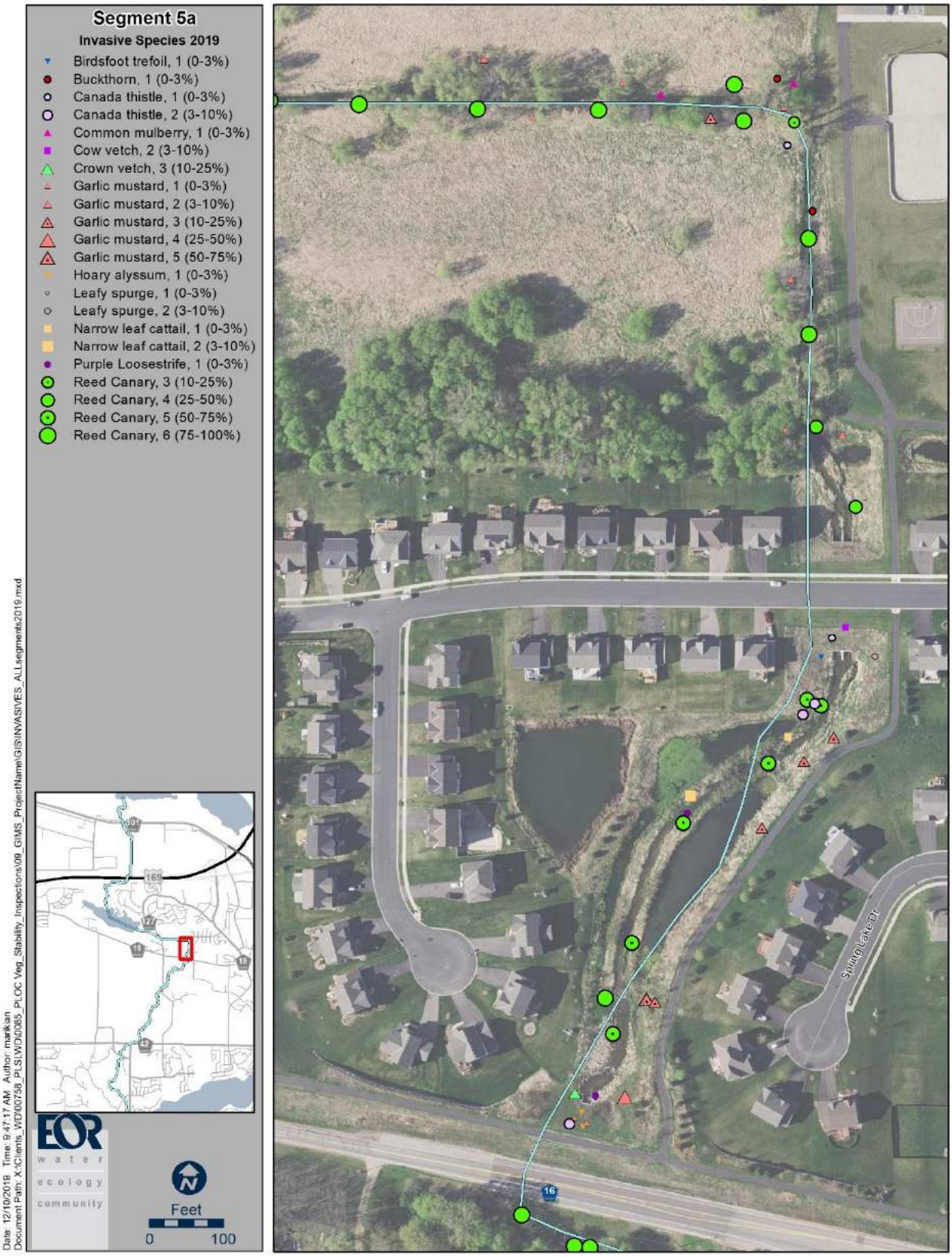

Figure 30. Invasive species and associated areal coverages (in parenthesis) along Segment 5A

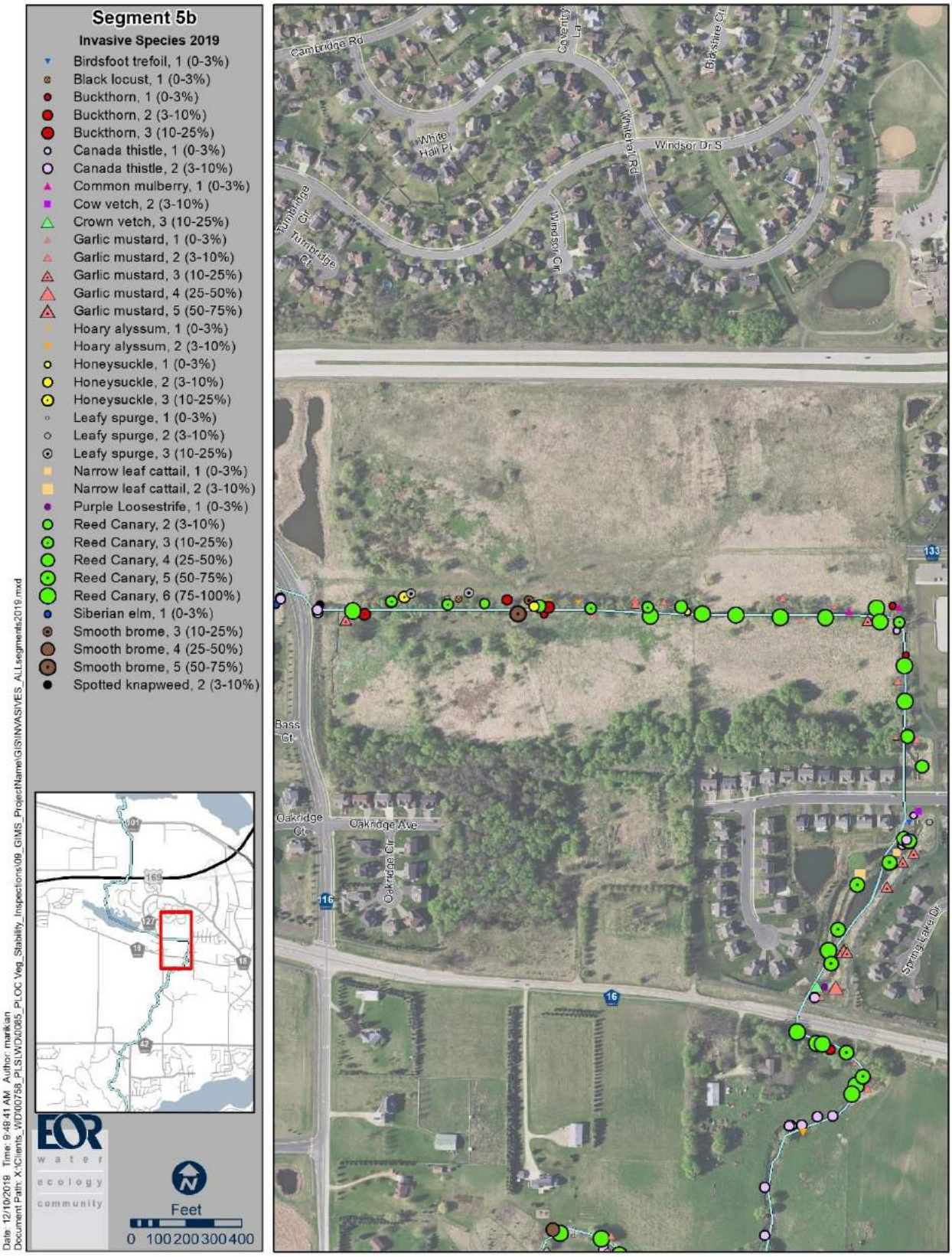

Figure 31. Invasive species and associated areal coverages (in parenthesis) along Segment 5B

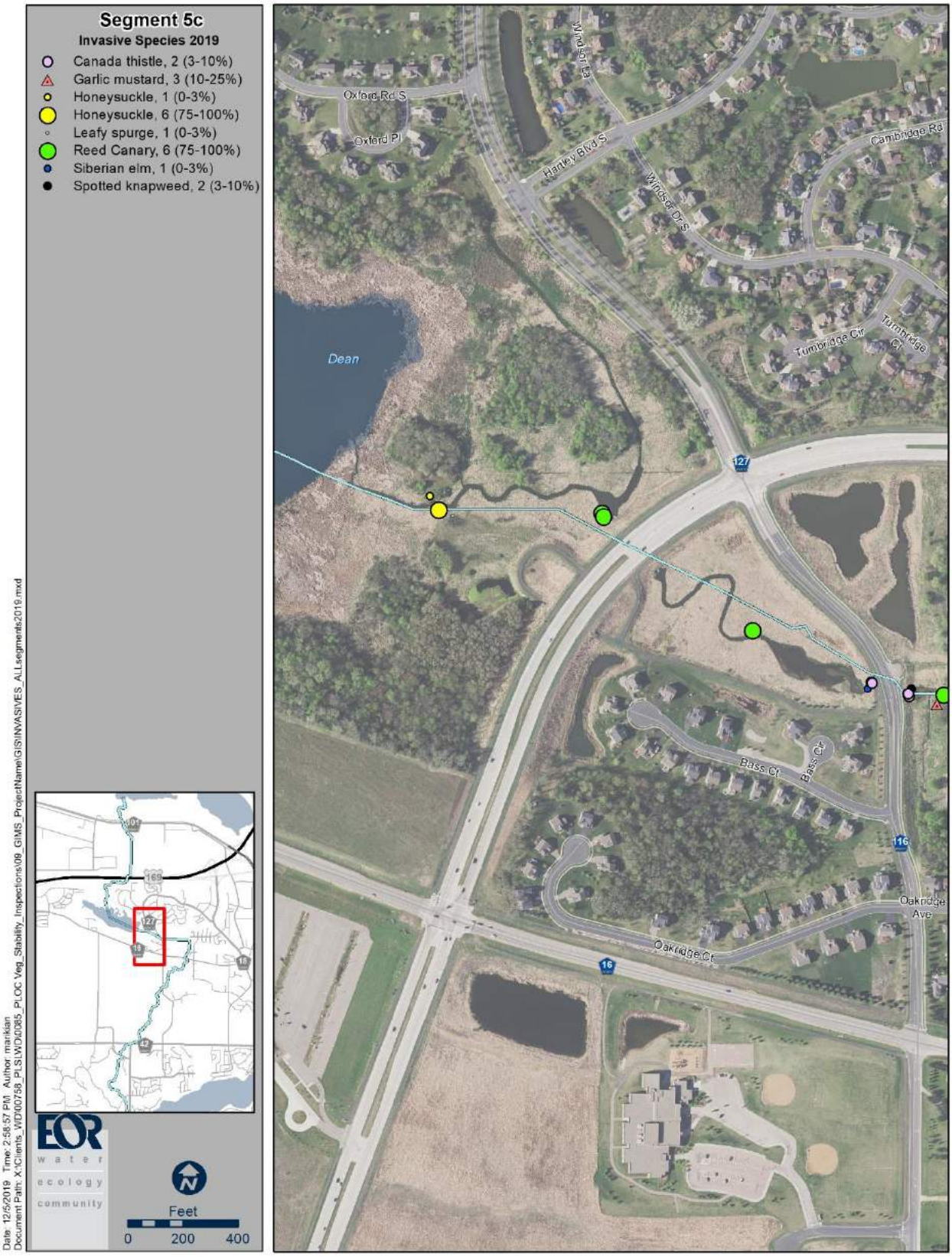

Figure 32. Invasive species and associated areal coverages (in parenthesis) along Segment 5C and Segment 6

Segment 6 – Channel Condition

The small sediment delta documented in 2018 was not visible during the 2019 assessments but likely still occurs at the upstream end of the bypass channel downstream of the County Road 21 box culverts (Figure 33). No other channel obstructions were found in this segment. The Deans Lake weir appears to be in good condition and was free of debris at the time of the surveys. The channel banks throughout this segment are well vegetated and show little evidence of bank erosion (Figure 34 and Figure 35).

Segment 6 – Invasive Species

No purple loosestrife plants were found downstream of the Dean's Lake weir where management was conducted in 2017. Although no plants were found in 2018 or 2019, it is recommended this area continue to be monitored in the summer of 2020 and any new plants should be promptly removed before flowers develop. Treatment and/or removal of purple loosestrife in this area is particularly important since the site is located near Deans Lake and connects to other downstream wetlands. Figure 36 shows the locations and areal coverages of previously identified invasive species in this segment.

Figure 33. Channel downstream of County Road 21

Figure 34. Vegetated stream banks downstream of the Deans Lake weir

Figure 35. Vegetated stream banks upstream of Highway 169

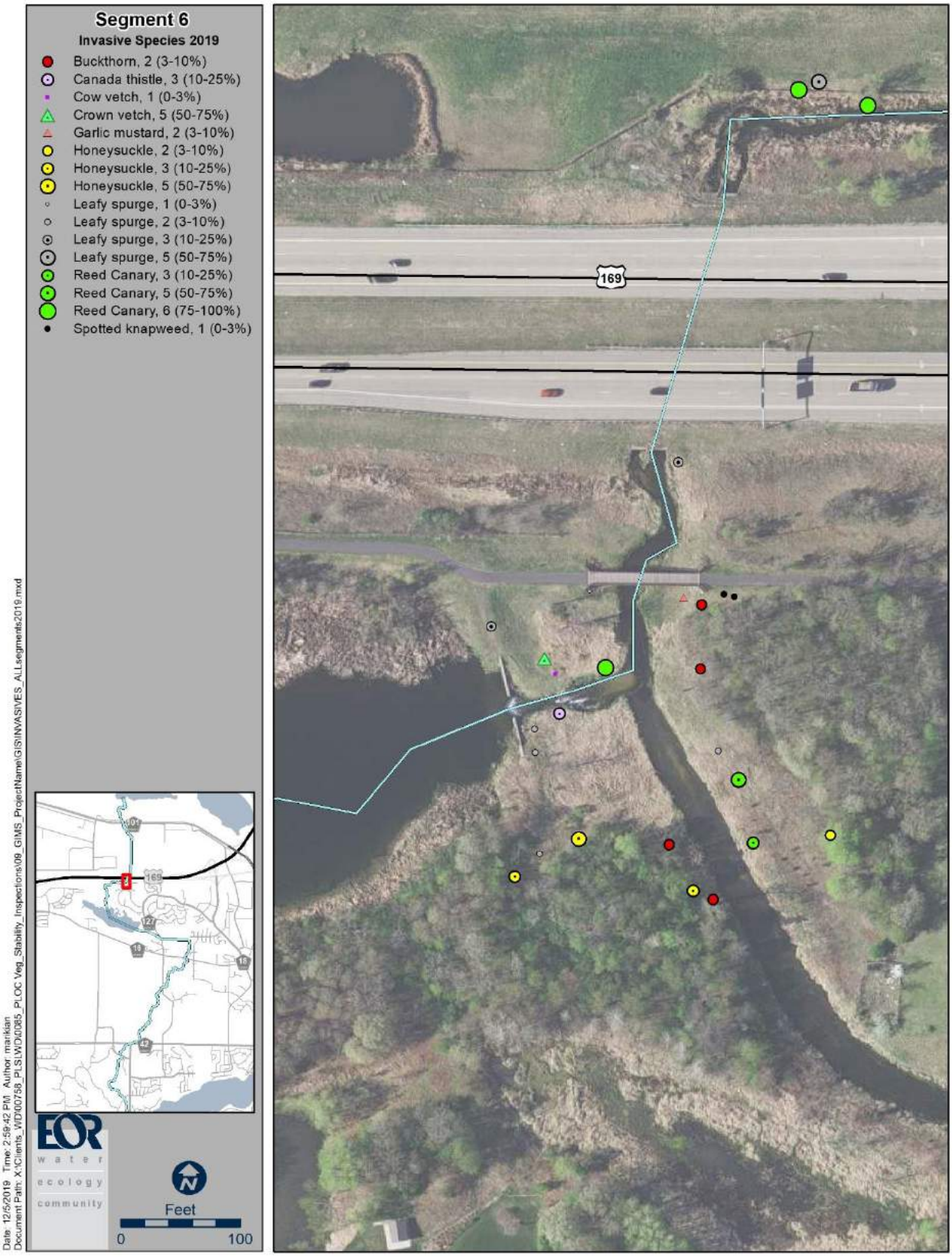

Figure 36. Invasive species and associated areal coverages (in parenthesis) along Segment 6

Segment 7 – Channel Condition

The channel banks downstream of Highway 169 are well vegetated and show little evidence of bank erosion (Figure 37). The sheet pile weirs located in this segment were mostly free of debris during the surveys. No channel obstructions were found within this segment; however, bank erosion continues to occur in areas damaged by previous flood events, particularly at the far downstream end of Segment 7A. A recent bank failure was found just upstream of Quarry Lake Park (Figure 38). The bank failure resulted in a large amount of sediment that entered the outlet channel, though it appears the sediment was transported downstream as there was little indication of localized flow deflection or channel aggradation from the sediment. In Segment 7A, a tree had recently fallen into the channel as a result of bank erosion (Figure 39). In Segment 7B, woody debris still occurs within the channel as previously documented, including the large oak tree that had fallen into the channel in 2016 that is still partially obstructing flow (Figure 40). Bank erosion in Segment 7B continues to occur in areas previously damaged by flood events. Several trees growing on the channel banks have undercut root boles and will likely fall into the channel if the banks are not restored. Vegetation has become well established in the reach where the Metropolitan Council Environmental Services interceptor work was completed in the summer of 2017 (Figure 41).

Segment 7 – Invasive Species

No purple loosestrife plants were found in the areas where management was conducted in 2017; however, it is recommended the area should be monitored again in the summer of 2020 and any new plants should be promptly removed before flowers develop. A significant decline in the population of purple loosestrife was observed in the wetland complex located immediately west of Segment 7A. Purple loosestrife beetles and weevils were released in this wetland by PLSLWD staff in July 2018, and it's possible the beetles have limited the growth and development of the plants in 2019. AES staff found only a few loosestrife plants during their reconnaissance work in July 2019. In addition, PLSLWD and EOR staff collected over a 1,000 leafy spurge flea beetles from a site just west of Deans Lake in late June 2019. Most of the flea beetles collected were *Aphthona lacertosa*, but some *Aphthona nigriscutis* beetles were also collected. The beetles were released in four separate locations to more widely distribute the beetles in areas with the densest populations of leafy spurge.

The proliferation of the invasive species crown vetch (*Coronilla varia*) that was documented in 2016 continues to spread along the segment. Extensive populations occur along Innovation Road and the Quarry Lake Park crossing. Common buckthorn and bush honeysuckle saplings were found in areas previously managed. Continued foliar spray treatments will be needed to reduce the population of the saplings in this segment. Figure 42 and Figure 43 show the locations and areal coverages of previously identified invasive species in this segment.

Figure 37. Vegetated stream banks in the upper reach of Segment 7A

Figure 38. Large bank collapse upstream of Quarry Lake Park in Segment 7A

Figure 39. Bank erosion and fallen tree in the wooded reach of Segment 7A

Figure 40. Fallen tree within the channel of Segment 7B

Figure 41. Channel condition of Segment 7B just upstream of Highway 101

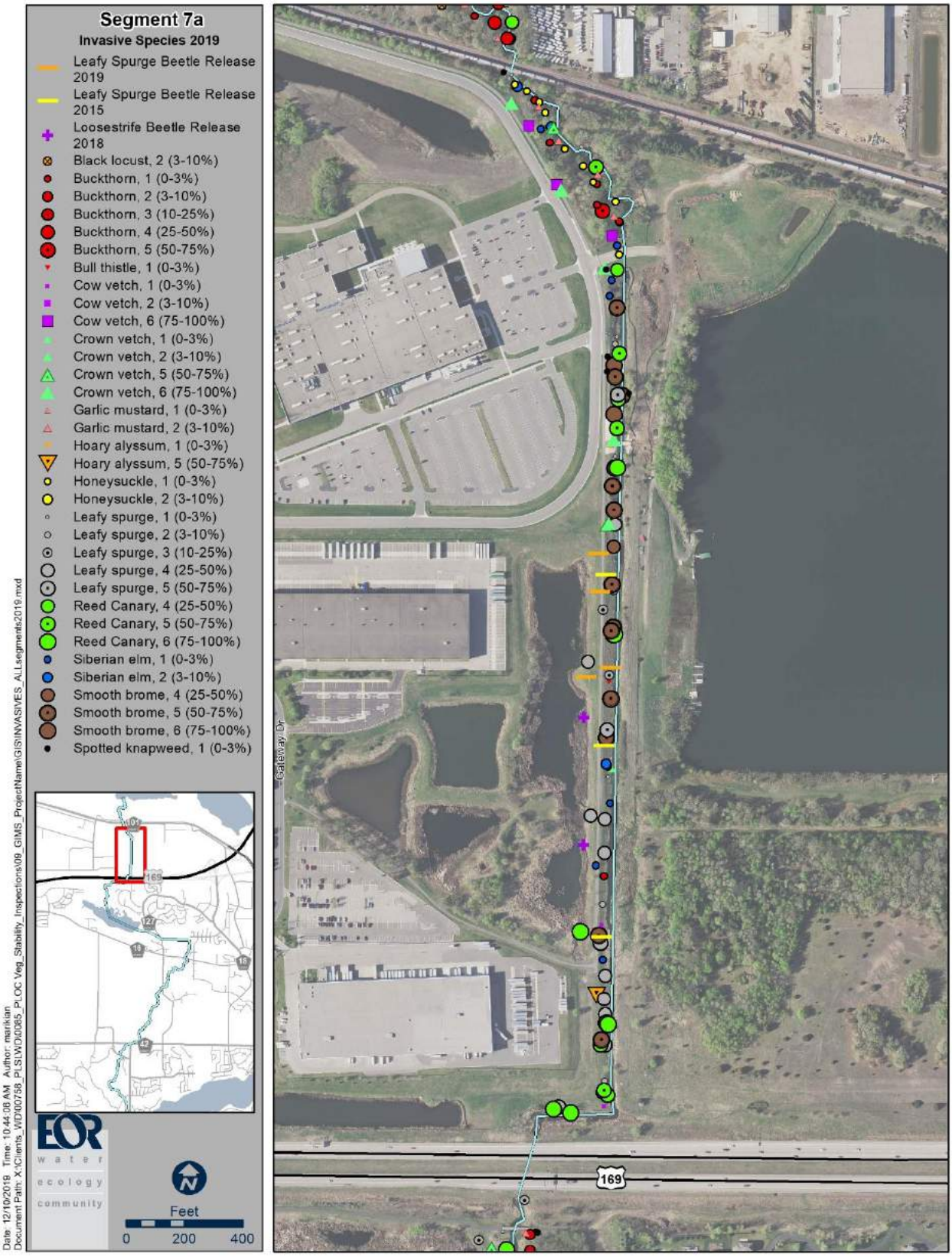

Figure 42. Invasive species and associated areal coverages (in parenthesis) along Segment 7A

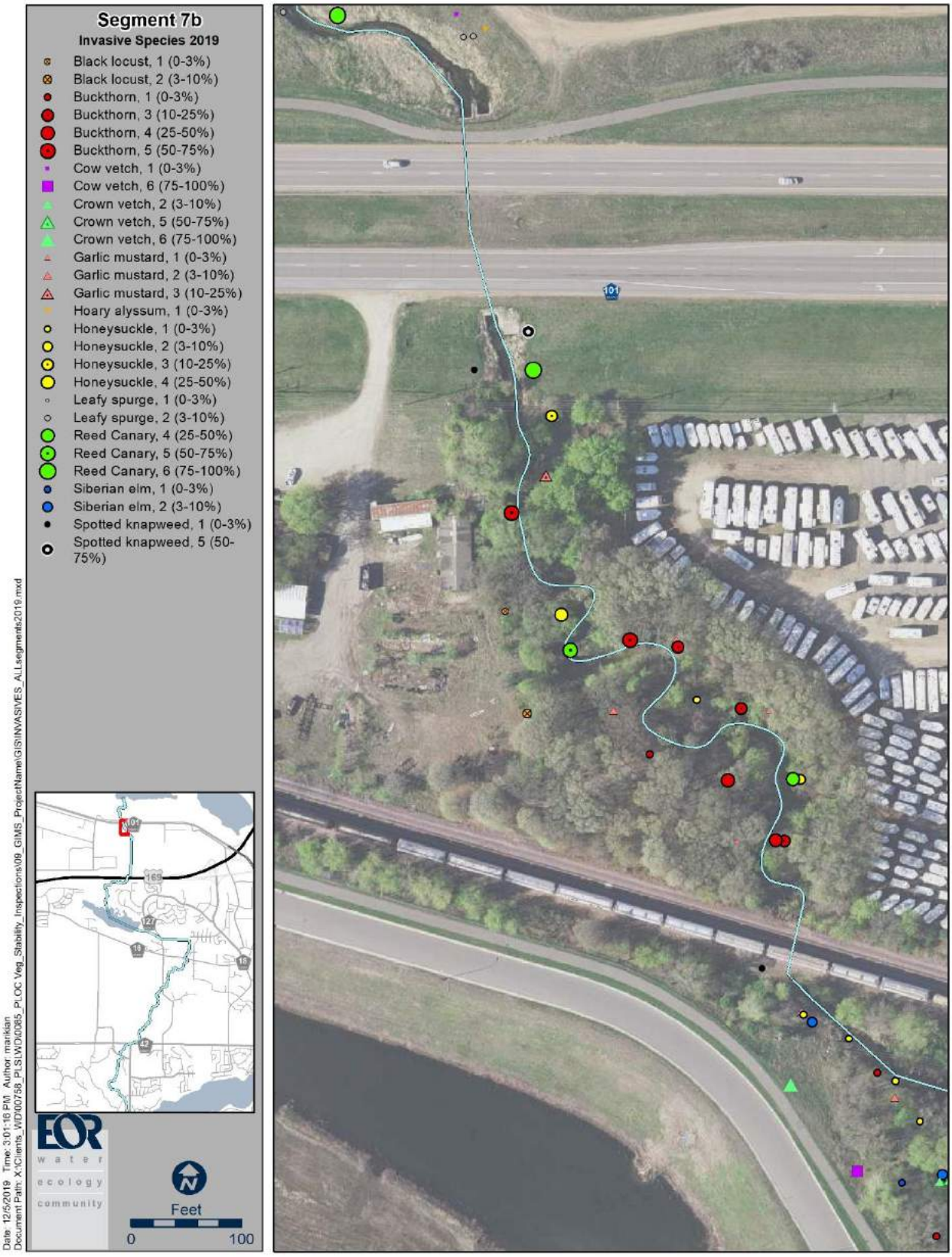

Figure 43. Invasive species and associated areal coverages (in parenthesis) along Segment 7B

Appendix A

Vegetation Management Conducted in 2019

Segment 1

- Three wild parsnip populations were treated by AES staff in June and July, including the area just north of Jeffers Pass NW, the area east of Chickadee Landing on Jeffers Pond Elementary property, and at the east and west sides of the channel just north of Fountain Hills Road. In addition, City of Prior Lake staff mowed the dense patch of wild parsnip located southwest of the intersection of Jeffers Pass NW and Eagle Creek Avenue in July
- Garlic mustard was treated by AES staff in June
- Foliar treatments for herbaceous invasive plants were conducted by AES staff on June 6 and August 5
- Foliar treatments for woody invasive species were conducted by AES staff on September 27

Segment 2

- No herbaceous management was conducted in 2019
- Foliar treatments for woody invasive species were conducted by AES staff on September 27

Segment 3

- EOR scouted for garlic mustard in the Kici Yapi area previously managed by hand-pulling efforts. No plants were found in 2019
- No herbaceous management was conducted in 2019
- Foliar treatments for woody invasive species were conducted by AES staff on September 27

Segment 4

- Foliar treatments for herbaceous invasive plants were conducted by AES staff on June 6 and August 5
- Two large patches of garlic mustard were treated in June and eight wild parsnip plants were treated in July by AES
- Foliar treatments for woody invasive species were conducted by AES staff on September 27

Segment 5

- Foliar treatments for herbaceous invasive plants were conducted by AES staff on June 6 and August 5
- One purple loosestrife plant was found and subsequently hand removed by EOR staff in July

Segment 6

- Foliar treatments for herbaceous invasive plants were conducted by AES staff on June 6 and August 5

Segment 7

- Foliar treatments for herbaceous invasive plants were conducted by AES staff on June 6 and August 5

- Foliar treatments for woody invasive species were conducted by AES staff on September 27
- Over 1,000 leafy spurge flea beetles were collected by EOR and PLSLWD staff from a known population west of Deans Lake and were released in four separate locations where dense patches of leafy spurge were found

Appendix B

Channel and Vegetation Management Recommendations for 2020

Segment 1

Channel

- Continue inspections in 2020 and monitor FEMA funded bank repair work completed in 2019

Vegetation

- Foliar spray or cut stump treatment of black locust saplings located along the paved walking path west of Jeffers Pond Elementary School
- Scout and treat wild parsnip, especially in the areas identified in 2019. Conduct the work in June to prevent plants from maturing and producing seed

Segment 2

Channel

- Continue inspections in 2020 and monitor FEMA funded bank repair work completed in 2019
- Remove the sediment delta at the outlet of Segment 2 in Pike Lake

Vegetation

- Scout and treat for woody invasive species in previously managed areas

Segment 3

Channel

- Continue inspections in 2020 and monitor FEMA funded bank repairs when completed

Vegetation

- Scout and treat for woody invasive species in areas not addressed by the proposed FEMA bank repair work

Segment 4

Channel

- Re-position existing riprap along restored channel in Segment 4A
- Continue inspections in 2020 and monitor FEMA funded bank repairs when completed
- Remove fallen trees within the channel between the Gonyea culvert and the idle pasture in Segment 4B

Vegetation

- Scout and treat for woody invasive species in areas not addressed by the proposed FEMA bank repair work
- Scout and treat for purple loosestrife and wild parsnip in areas previously managed. Conduct the work in June or early July to prevent plants from maturing and producing seed

Segment 5

Channel

- Remove fallen trees within the channel between the 90-degree ditch bend and Pike Lake Road, continue inspections in 2020

Vegetation

- Scout and treat for purple loosestrife in areas that were managed downstream of County Road 16 in Segment 5A. Conduct the work in early July to prevent plants from maturing and producing seed

Segment 6

Channel

- Remove the sediment delta at the upstream end of the Deans Lake bypass channel located downstream of County Road 21. Continue inspections in 2020

Vegetation

- Scout and treat for purple loosestrife immediately downstream of Deans Lake weir. Conduct the work in early July to prevent plants from maturing and producing seed

Segment 7

Channel

- Continue inspections in 2020 and monitor FEMA funded bank repairs when completed

Vegetation

- Scout and treat for purple loosestrife in areas previously managed. Conduct the work in early July to prevent plants from maturing and producing seed
- Scout and treat for woody invasive species in areas not addressed by the proposed FEMA bank repair work
- Collect and distribute additional leafy spurge flea beetles in areas containing dense populations of leafy spurge
- Hand-pull invasive species (primarily spotted knapweed, vetch, and hoary alyssum) in areas containing rare plants, especially where four-point evening primrose has been documented