Rum River Watershed Landscape Stewardship Plan

Appendix

Aitkin SWCD Crow Wing SWCD Isanti SWCD Mille Lacs SWCD Sherburne SWCD

Mille Lacs County Environmental Resources The Nature Conservancy

DEPARTMENT OF NATURAL RESOURCES BOARD OF WATER AND SOIL RESOURCES

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Project Partners

This section provides an overview of the people involved with the development of the Rum River Landscape Stewardship Plan.

Rum River LSP Planning Team

The Rum River Landscape Stewardship Plan development involved several people representing different interests. The following list includes planning tam members arraigned alphabetically by last name. In addition to those on this list, there were many others who supported the effort in various ways.

Team Member	Organization
Mitch Lundeen	Aitkin SWCD
Jamie Schurbon	Anoka SWCD
Sheila Boldt	Crow Wing SWCD
Tiffany Determan	Isanti SWCD
Dillon Hayes	Mille Lacs County Environmental Resources
Harmony Maslowski	Mille Lacs SWCD
Susan Shaw	Mille Lacs SWCD
Dan Cibulka	Sherburne SWCD
Francine Larson	Sherburne SWCD
Gina Hugo	Sherburne SWCD
Jeff Wilder	MN DNR Forestry
Tony Miller	MN DNR Forestry
Troy Holcomb	MN DNR Forestry
Barb Peichel	Board of Water and Soil Resources
Leah Hall	The Nature Conservancy

Staff Supporting the Rum River LSP Development

Board of Water and Soil Resources
- Lindberg Ekola, Forest Stewardship Planning Coordinator
- Dan Steward, Watershed/Private Forest Management Program Coordinator

Independent Contractors
- David Henkel-Johnson, plan writer
- Mitch Brinks, GIS support

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Bibliography

This section lists documents referenced in the Rum River Landscape Stewardship Plan or otherwise used in its development.

Arnold, C. L., & Gibbons, C. J. (1996). *Impervious Surface Coverage: The Emergence of a Key Environmental Indicator*. Journal of the American Planning Association, 62(2), 243–258. doi: 10.1080/01944369608975688

Brown, Terry; Meysembourg, Paul; Host, George E. (2013). *Geospatial Modeling of Native Plant Communities of Minnesota's Laurentian Mixed Forest*. Natural Resources Research Institute, University of Minnesota Duluth. Retrieved from https://data.nrri.umn.edu/data/dataset/nemn-pnpc.

Host, G. (2018). *Potential Native Plant Communities of Minnesota's Eastern Broadleaf Forest*. Natural Resources Research Institute, University of Minnesota Duluth. Retrieved from https://data.nrri.umn.edu/data/dataset/npc-ebf-lmf

Jacobson, Peter; Cross, Timothy; Dustin, Donna; Duval, Michael. (2017). *A Fish Habitat Conservation Framework for Minnesota Lakes*, Fisheries, 41:6, 302-317. Retrieved from https://www.researchgate.net/publication/303745823_A_Fish_Habitat_Conservation_Framework_for_Minnesota_Lakes.

Minnesota Department of Natural Resources. (2010). *Identification of Priority Forests for the Minnesota Forests for the Future Program*. St. Paul, MN.

Minnesota Forest Resource Council (2017). *North Central Landscape Forest Resources Plan*. Minnesota Forest Resource Council, St. Paul, Minnesota. Retrieved from https://mn.gov/frc/docs/NC_Landscape_Plan.pdf

Minnesota Pollution Control Agency. (2017). *Rum River Watershed Restoration and Protection Strategy Report.* Retrieved from https://www.pca.state.mn.us/water/watersheds/rum-river

USDA Forest Service, Northeastern Area State and Private Forestry. (2009). *Forest, Water and People: Drinking water supply and forest lands in Minnesota.*

Verry, E.S. (2016). *The Hydrology of Minor Watersheds*. Ellen River Partners, Inc. Grand Rapids, Minnesota.

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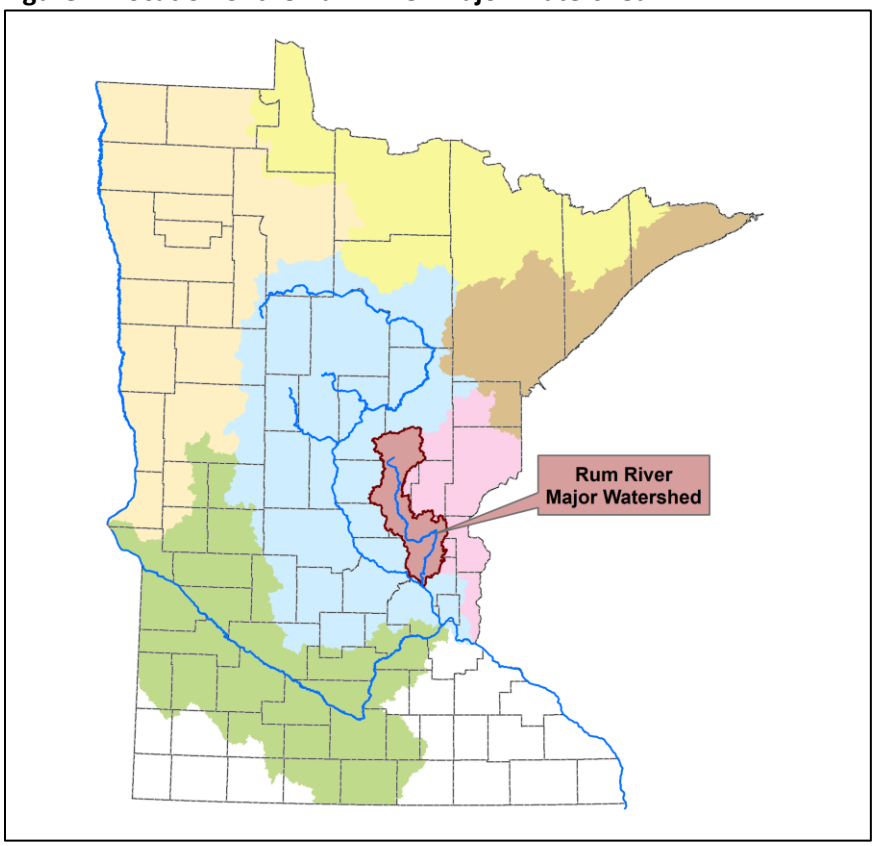
Rum River Resource Inventory (HUC 8)

The purpose of this section is to provide major watershed-scale (HUC 8) geographic data as a reference for the Rum River Landscape Stewardship Plan. Included in this section are maps regarding forest management topics for the Rum River Major Watershed.

Figure 1. Location of the Rum River Major Watershed.



Geography

Figure 2. Geomorphological landforms.

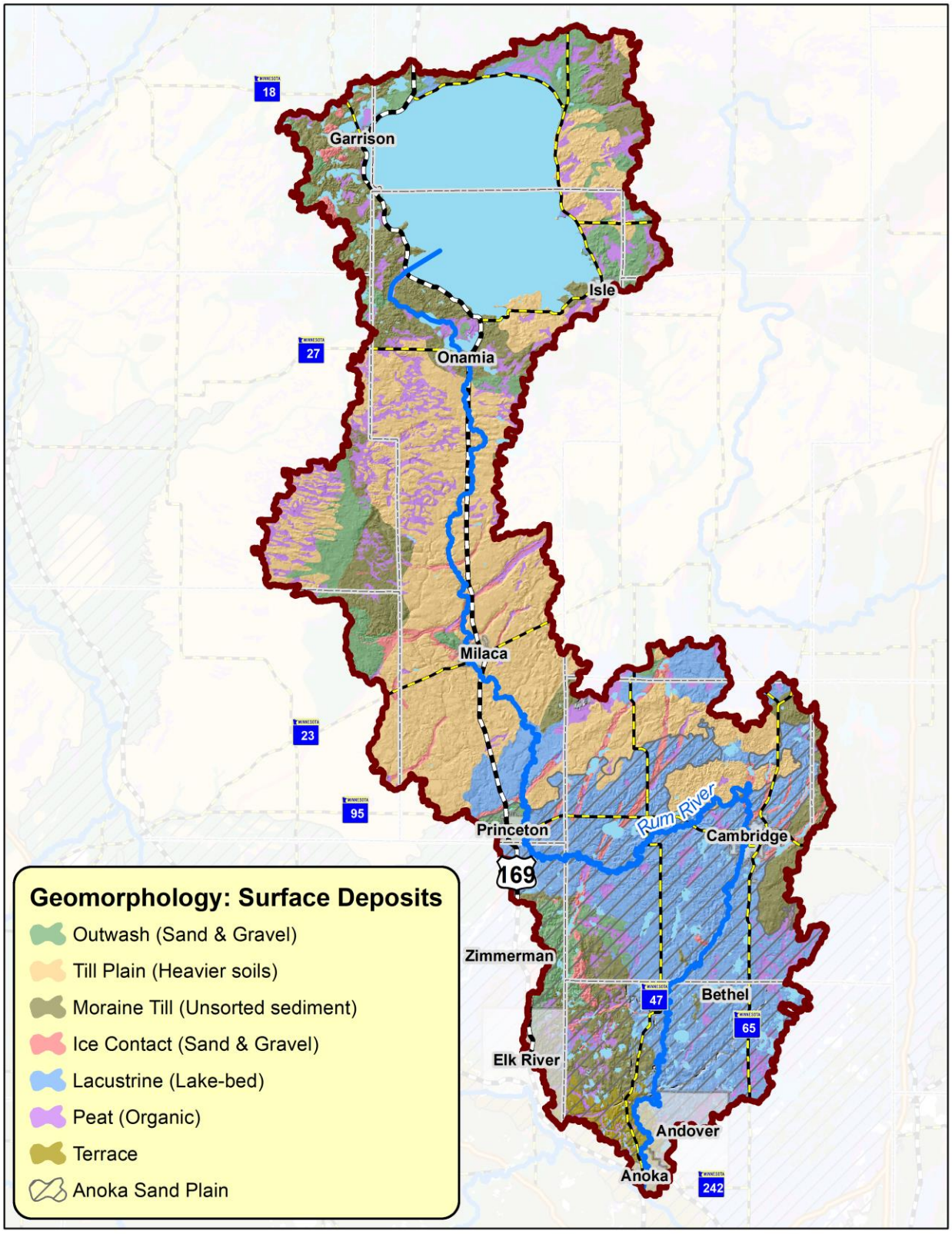


Figure 3. Elevation.

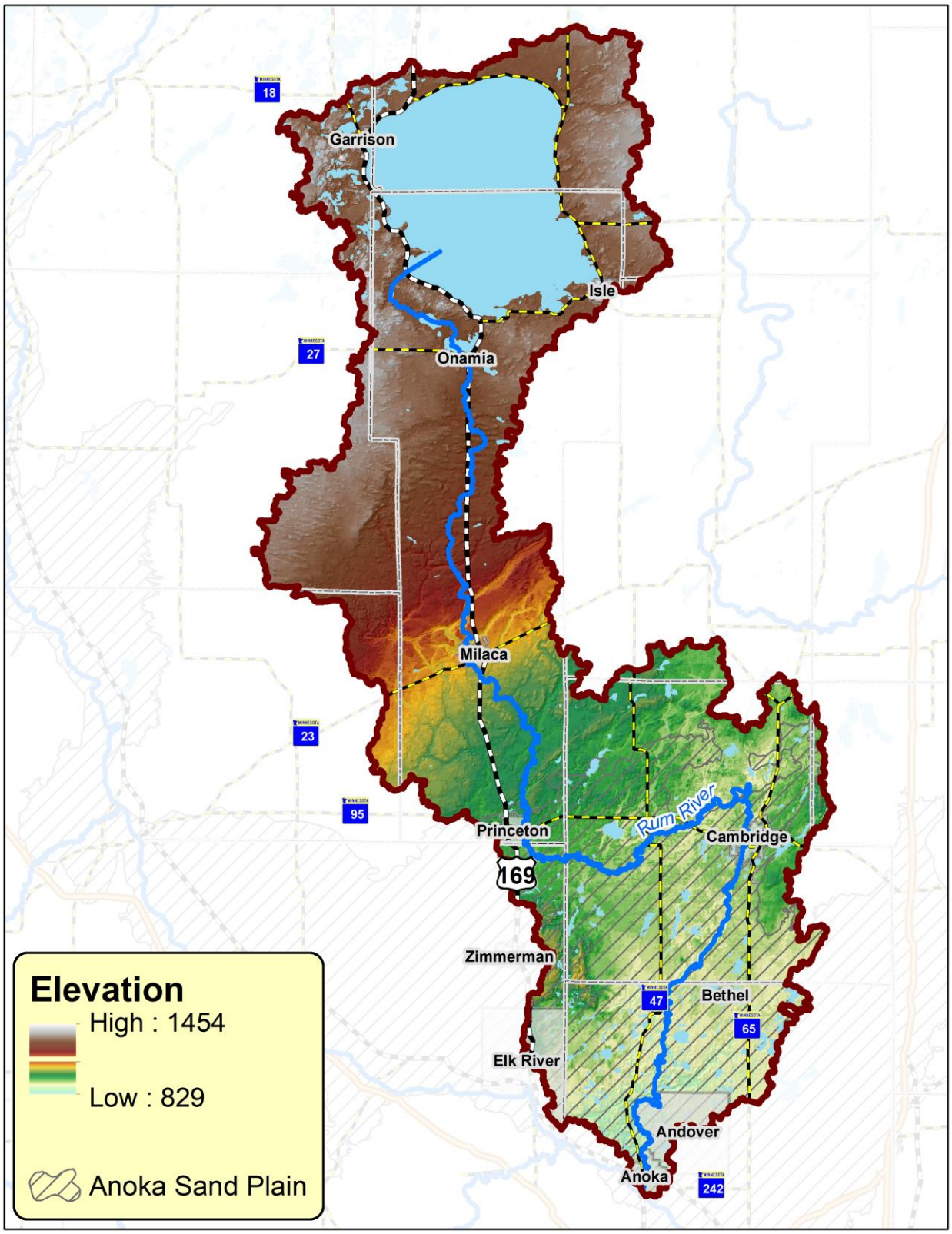


Figure 4. Ecological subsections.

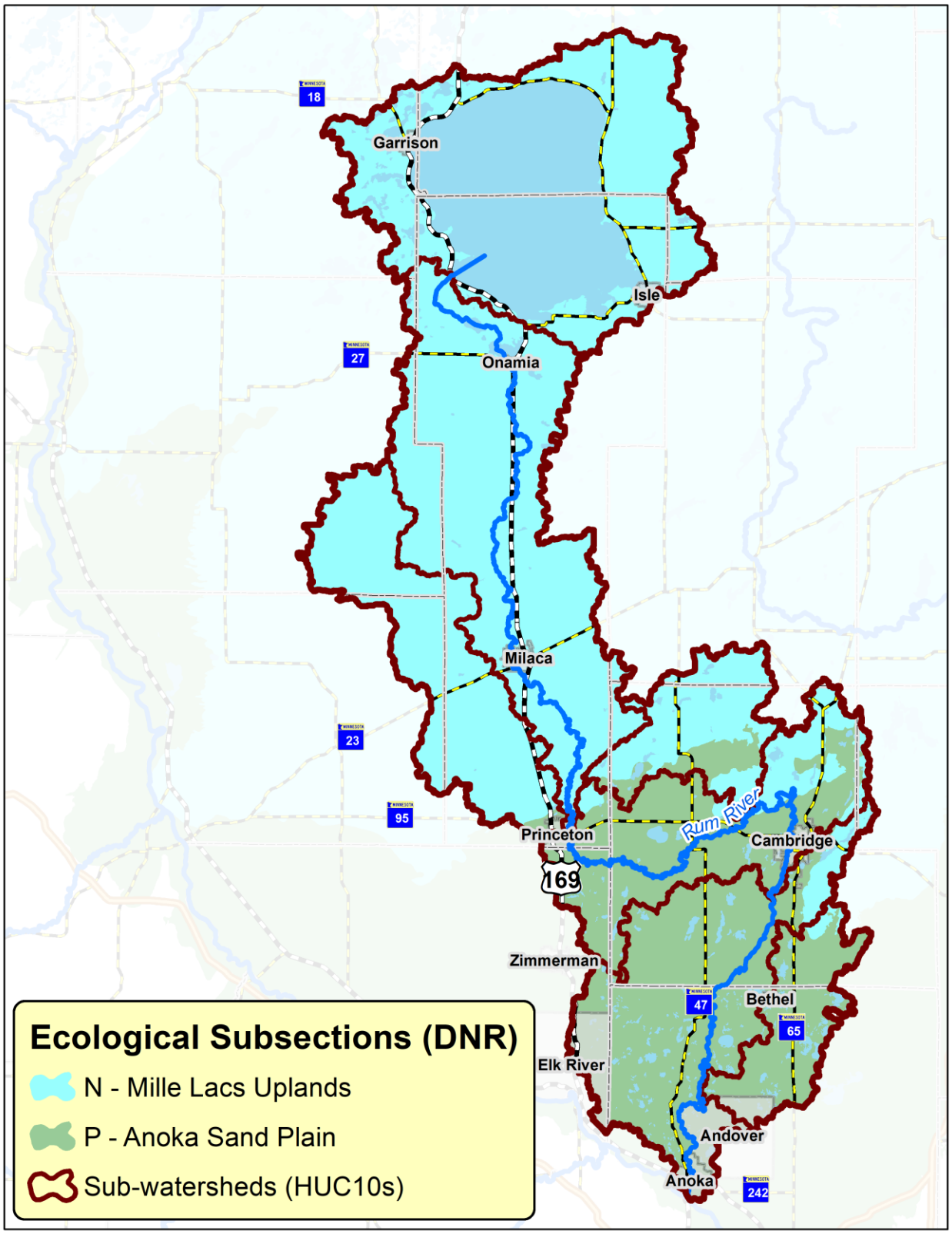


Figure 5. Land type associations.

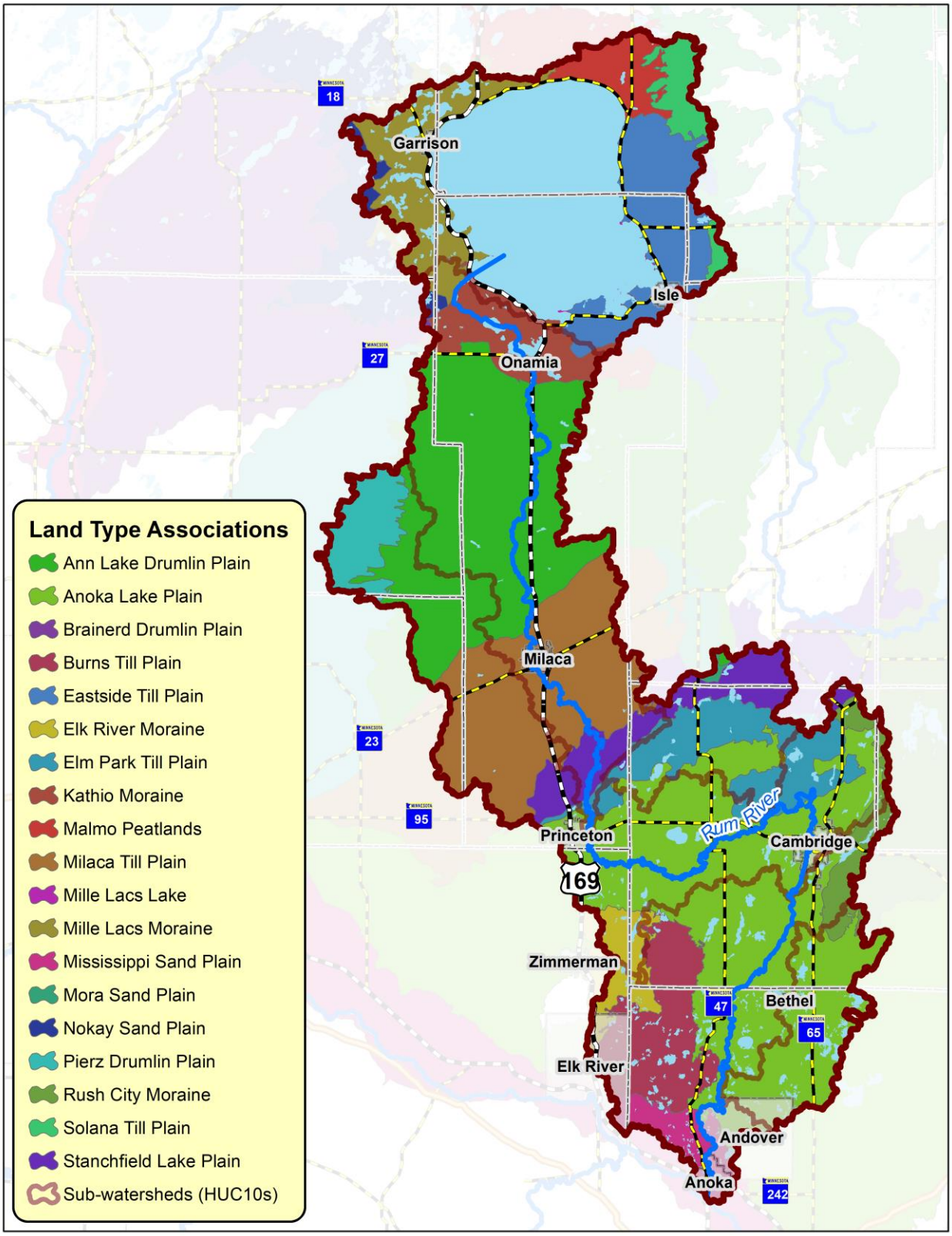


Figure 6. Anoka Sand Plain.

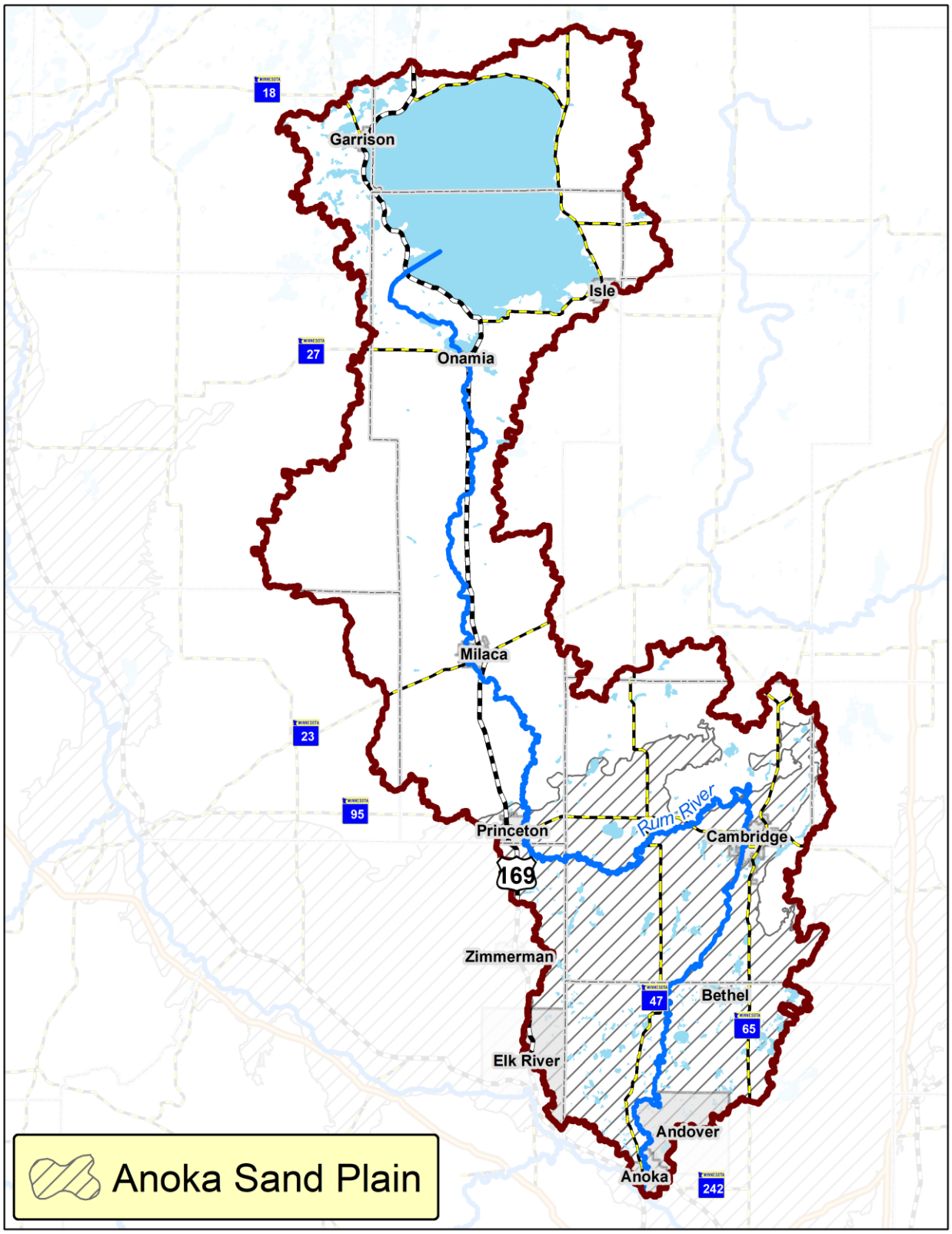


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Figure 7. Historic vegetation cover, Marschner.

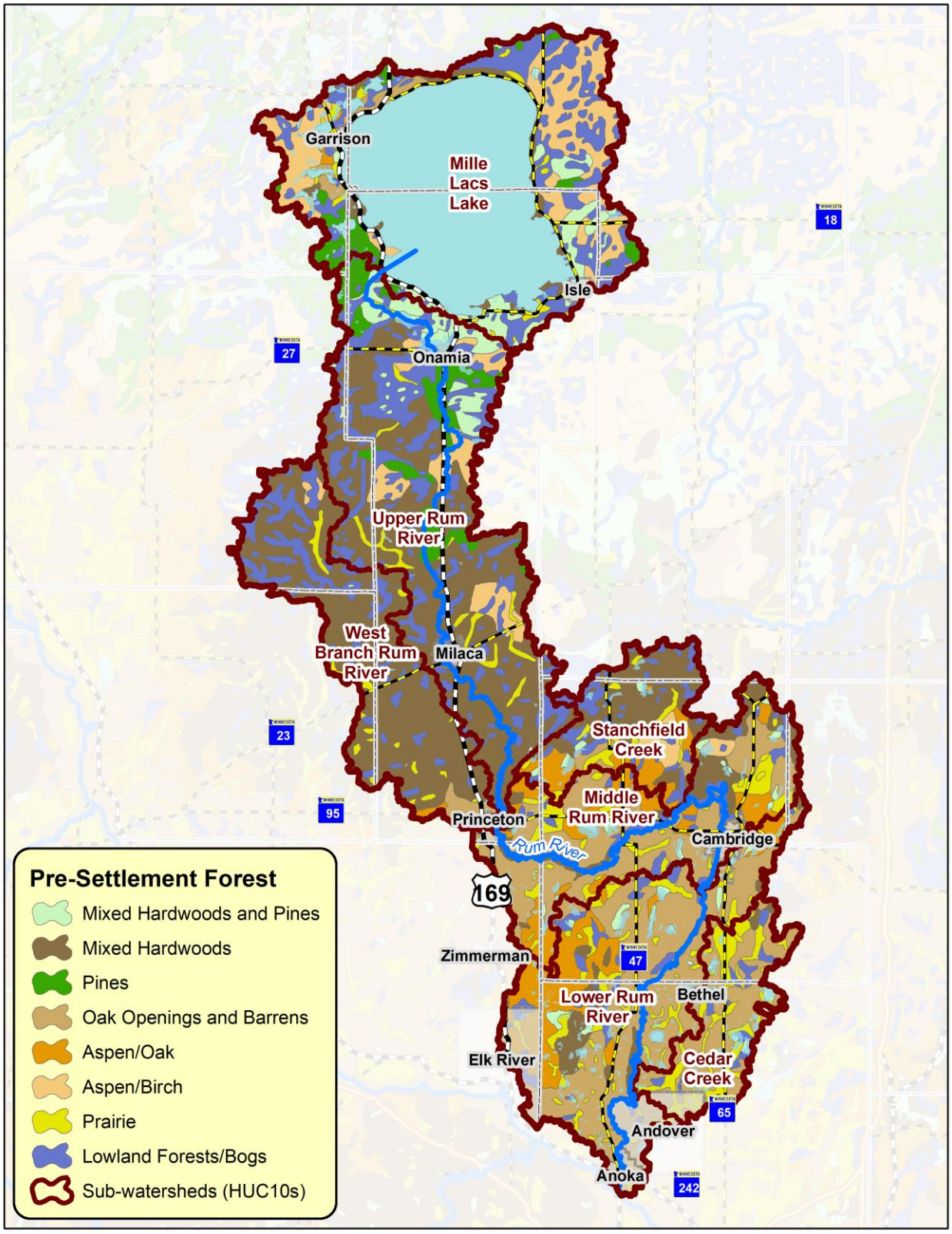


Figure 8. Historic vegetation class, MnDOT.

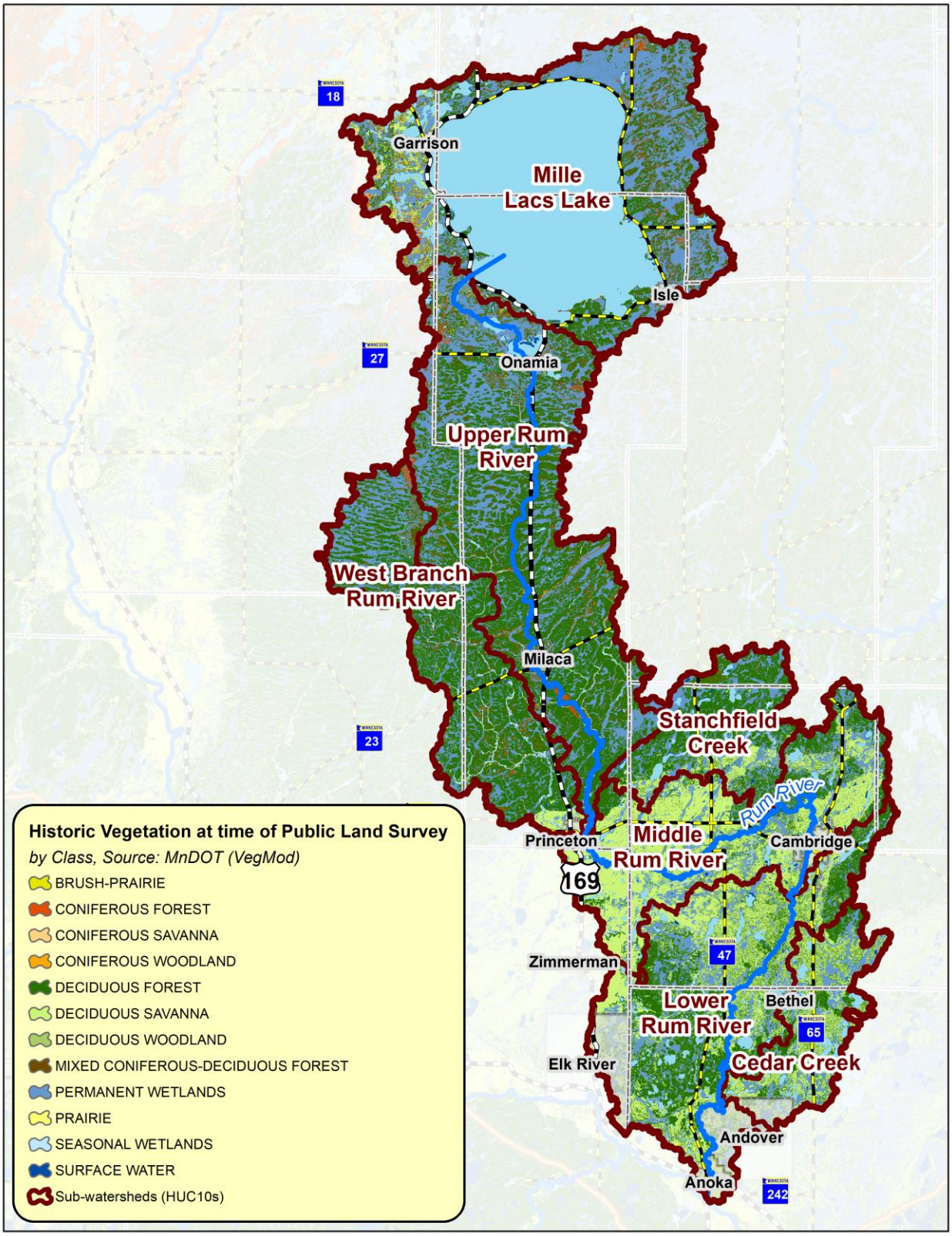


Figure 9. Land cover, 2013.

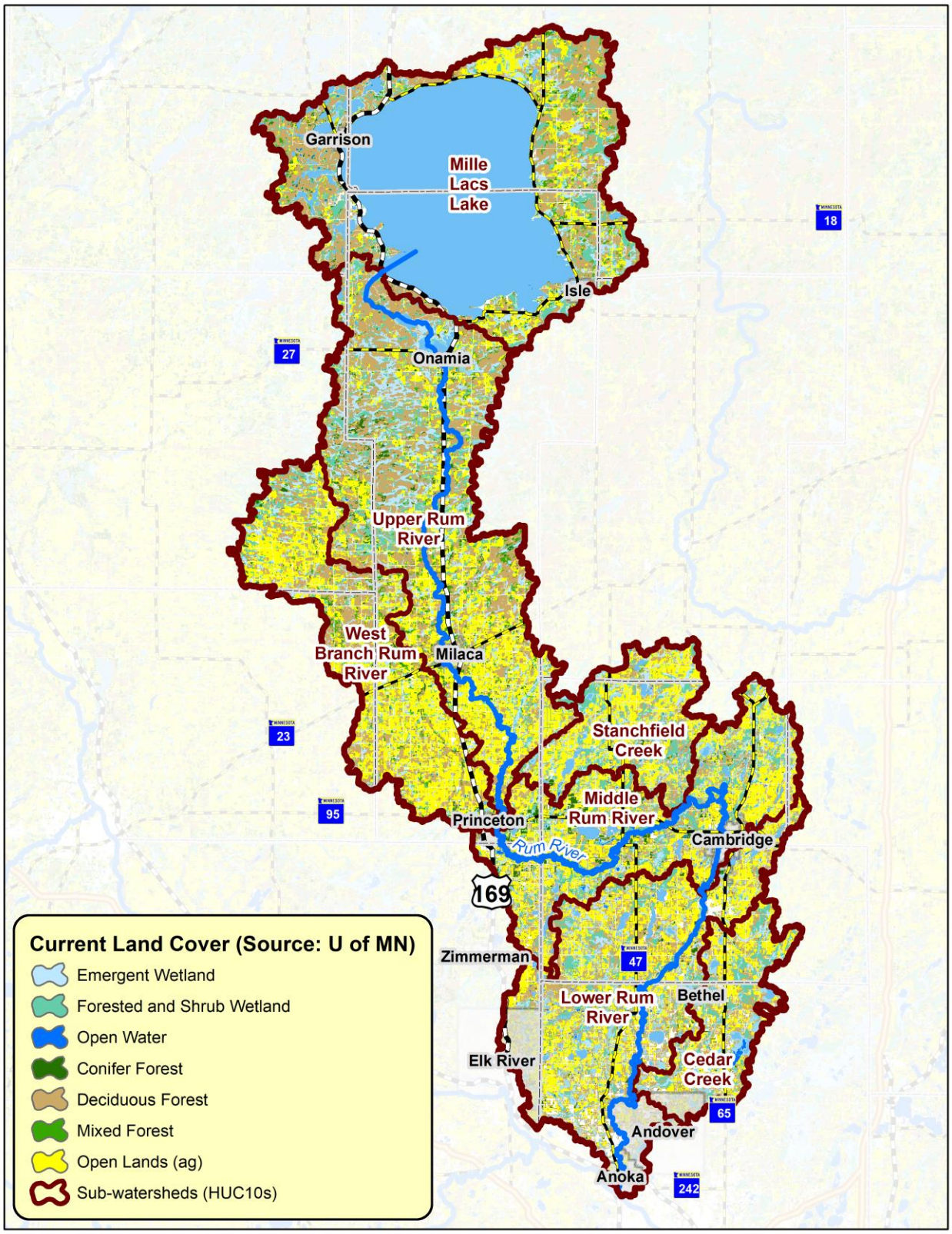


Figure 10. Historic forest loss.

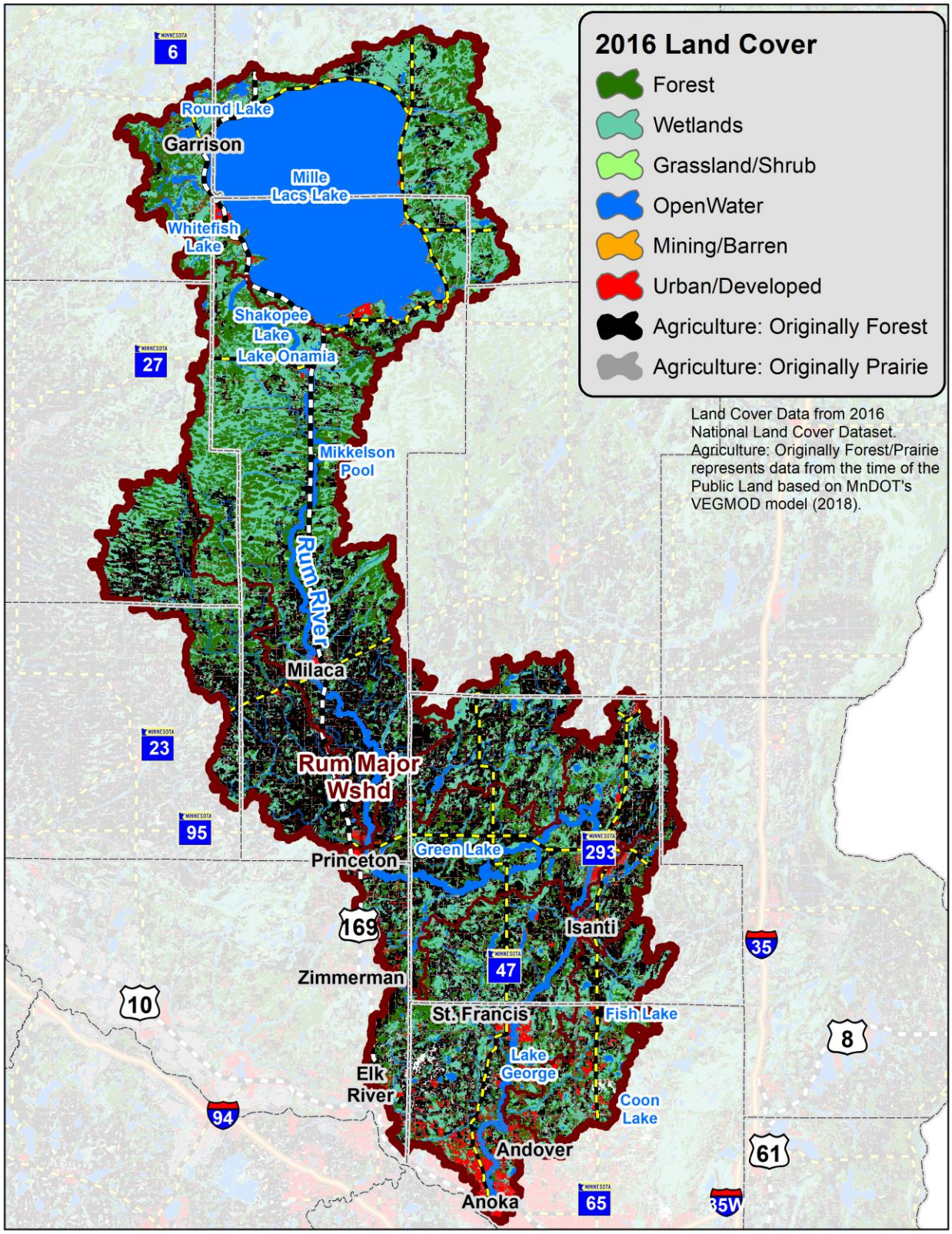


Figure 11. Potential native plant communities.

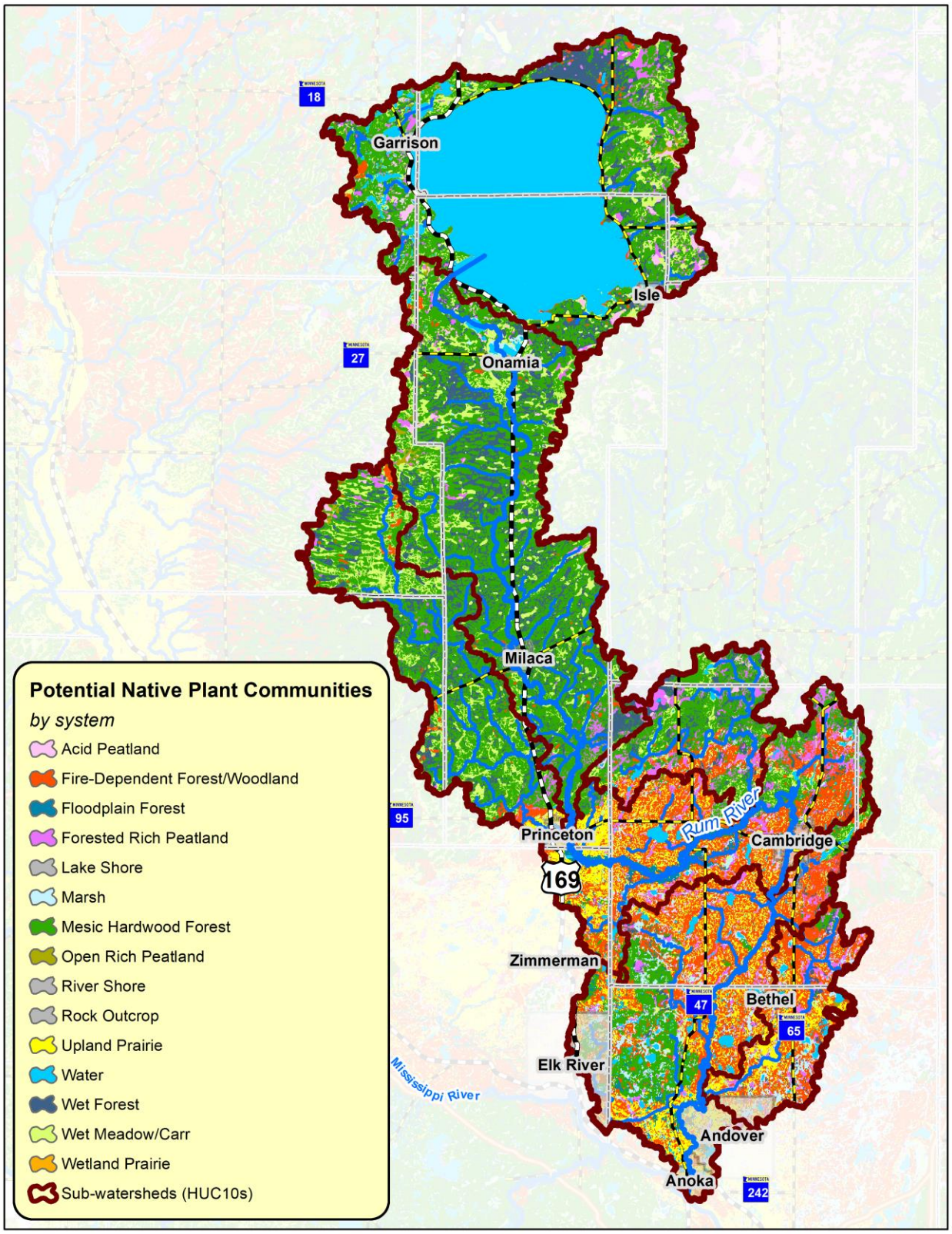
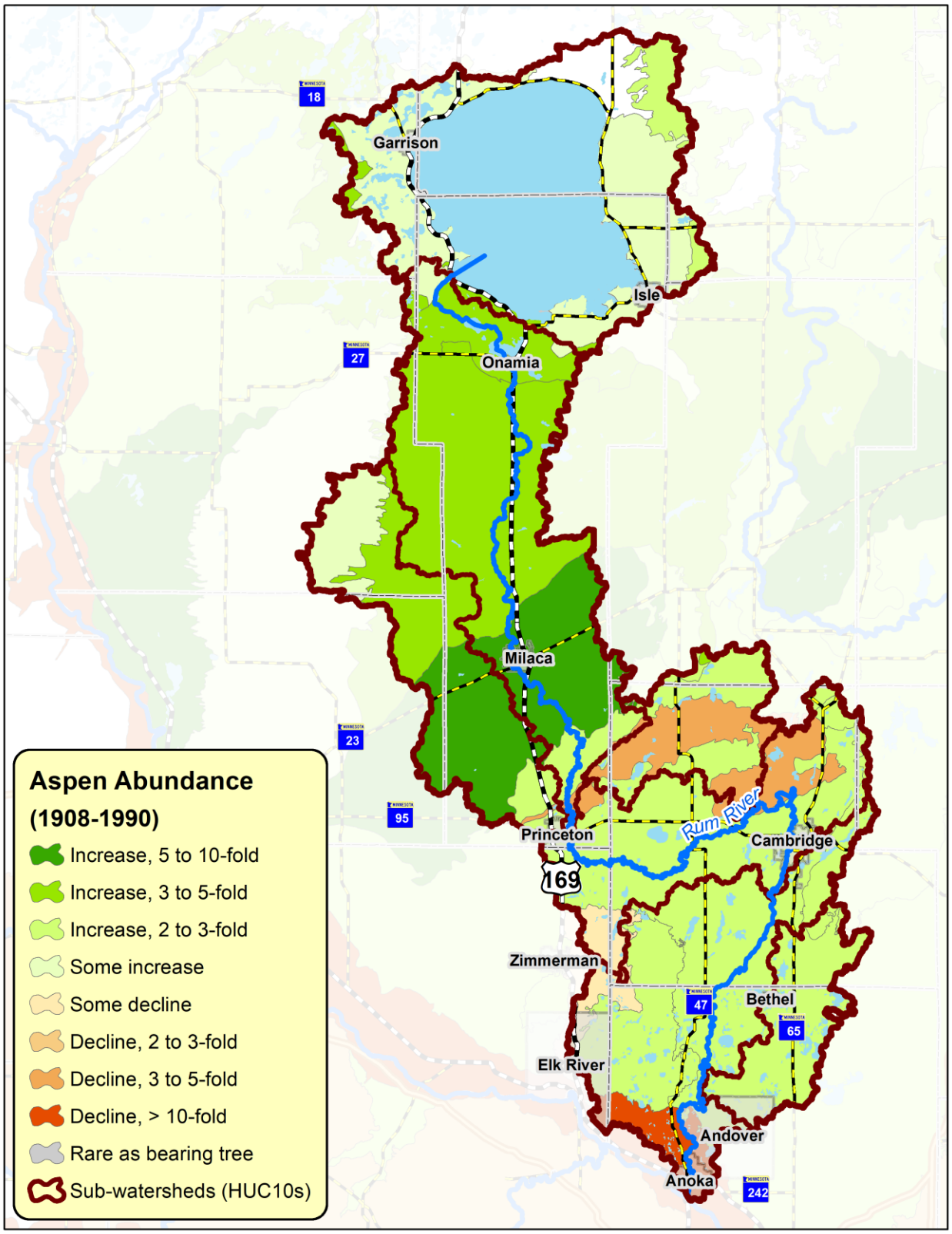


Figure 12. Change in aspen abundance.



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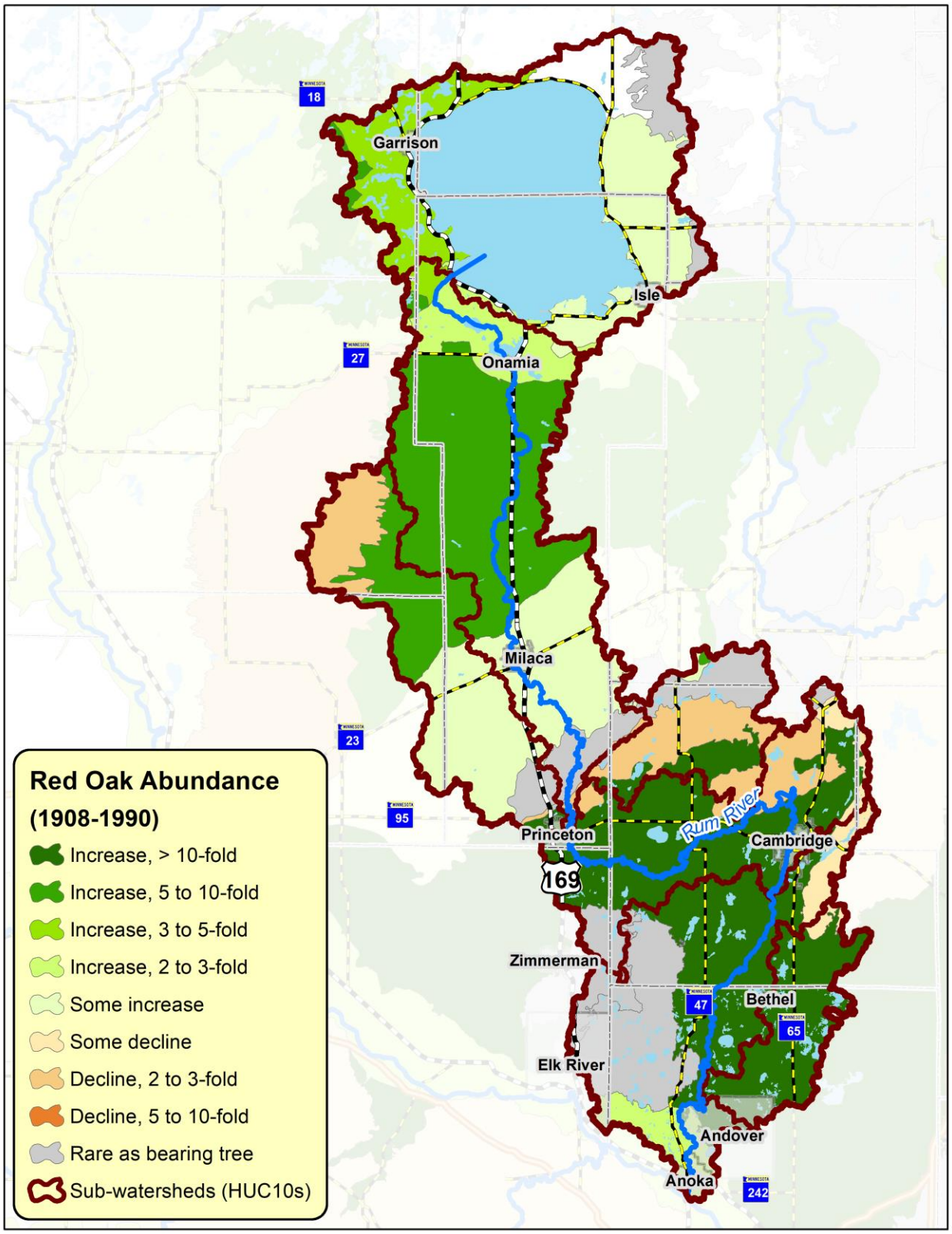

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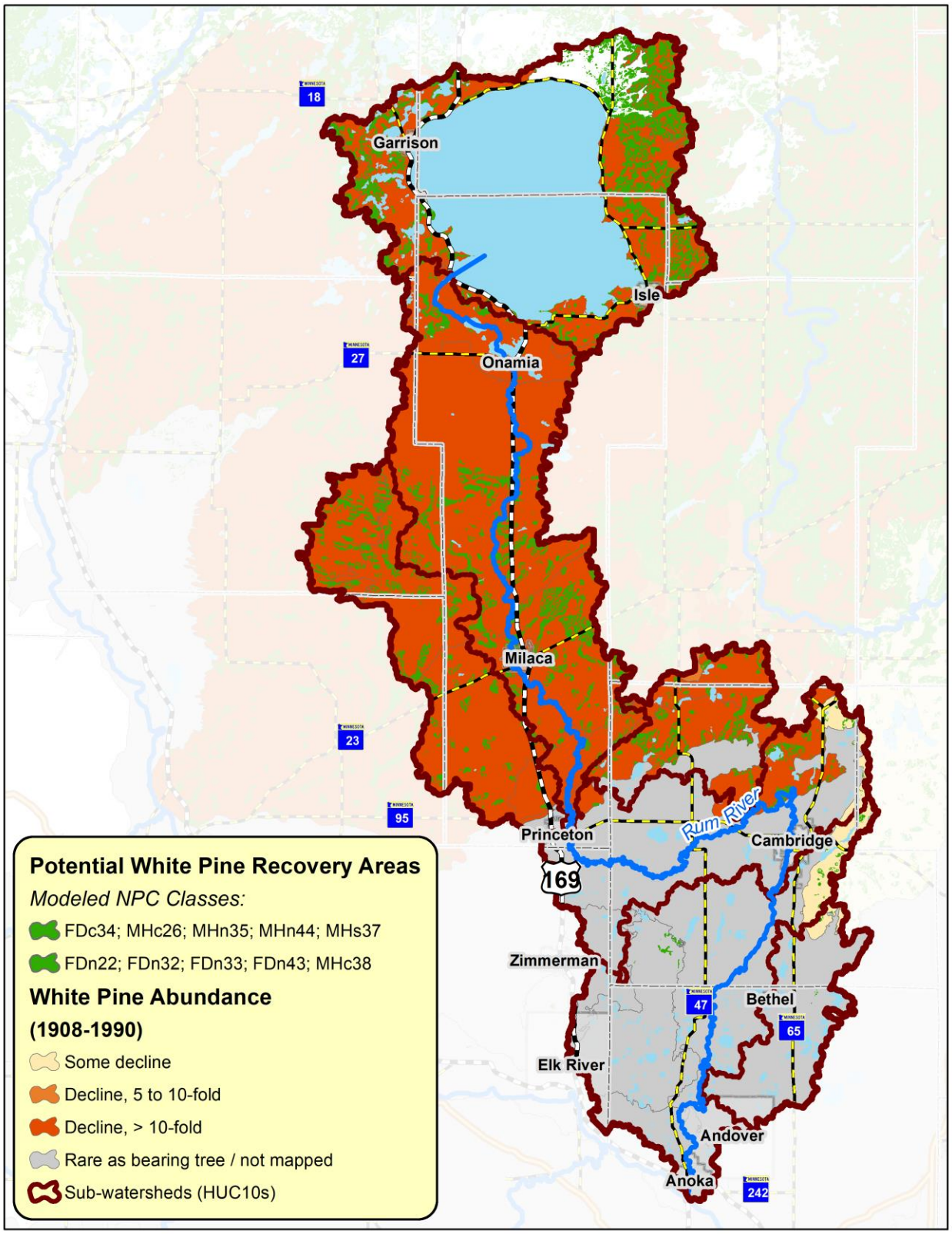

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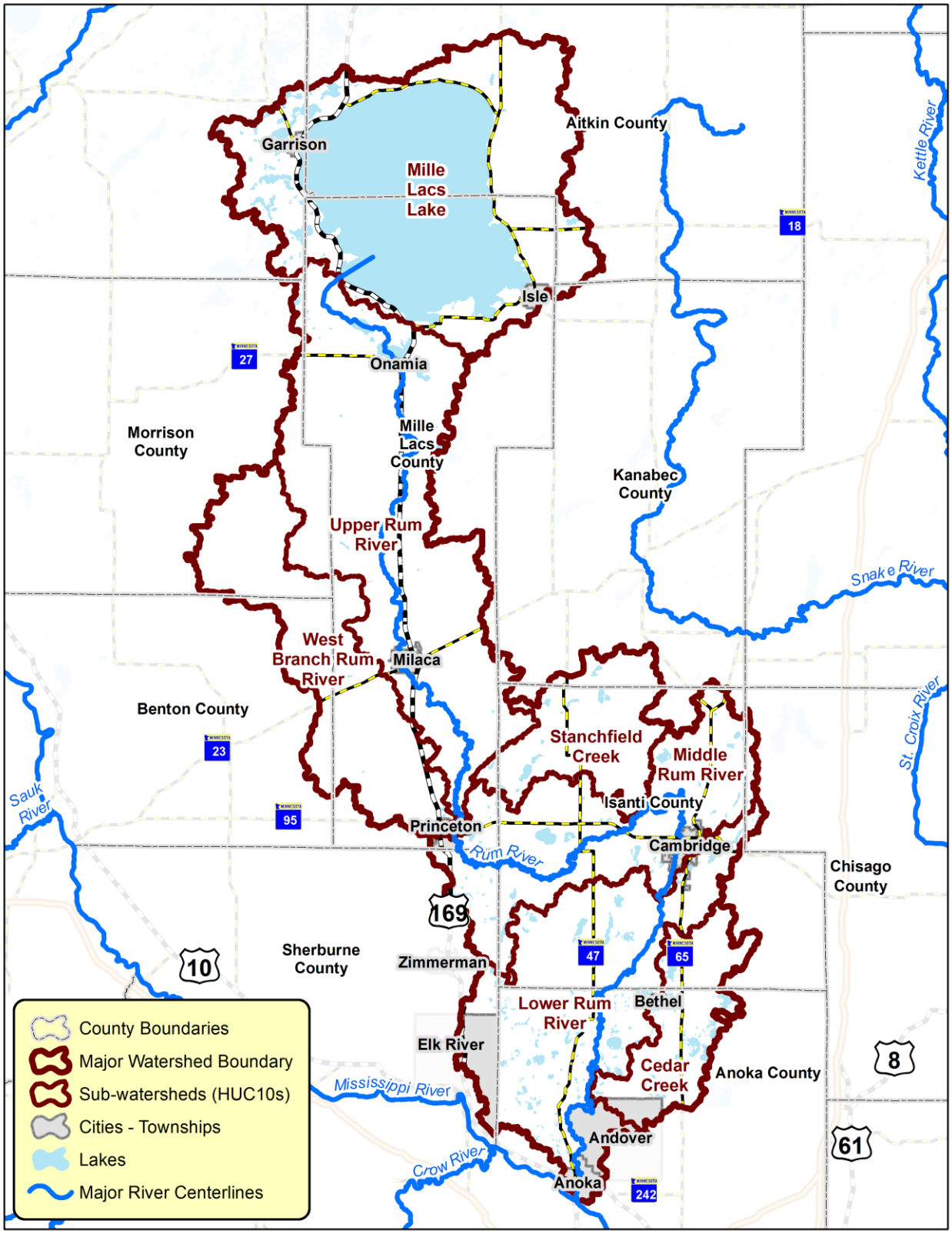
Figure 15. Lakes.



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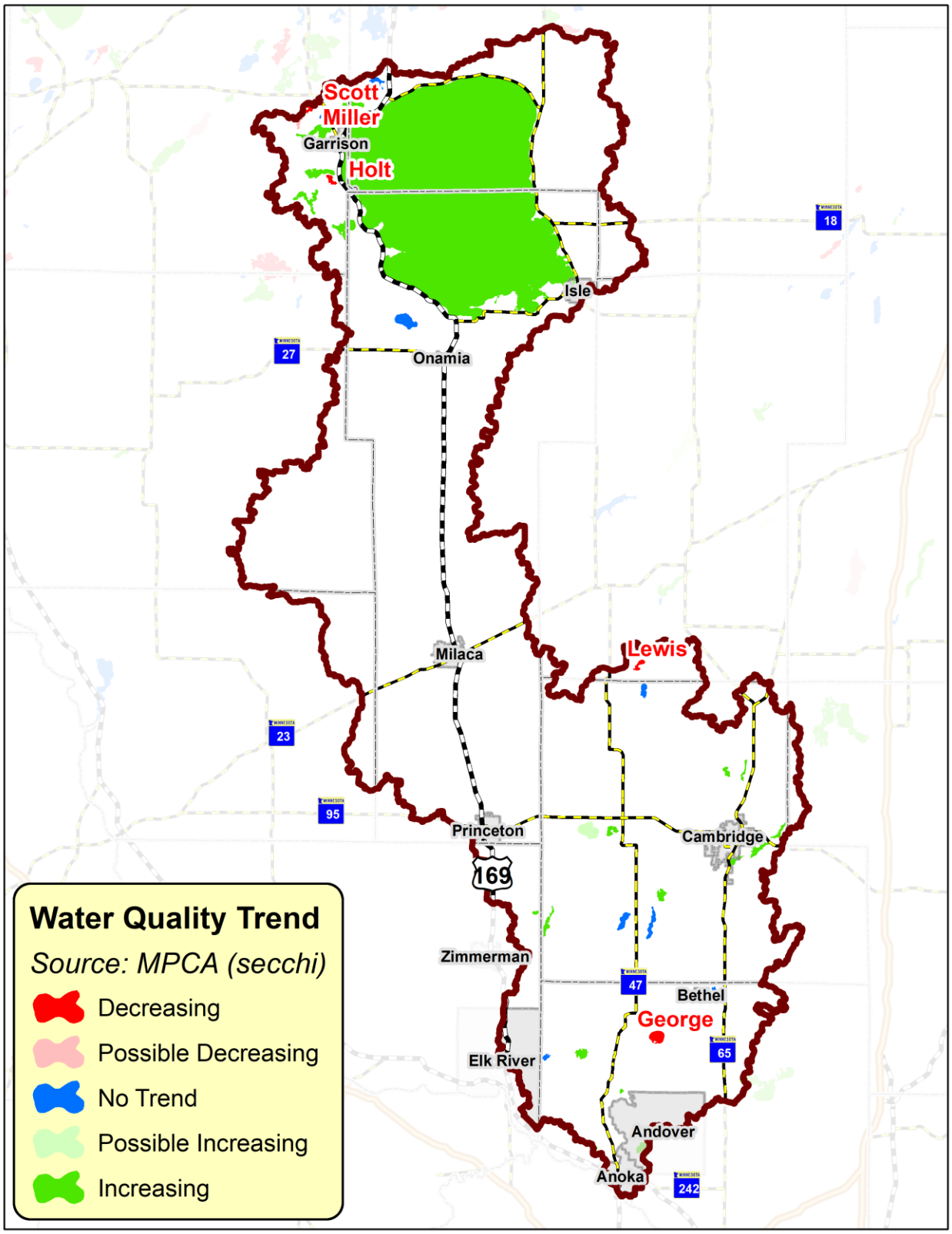

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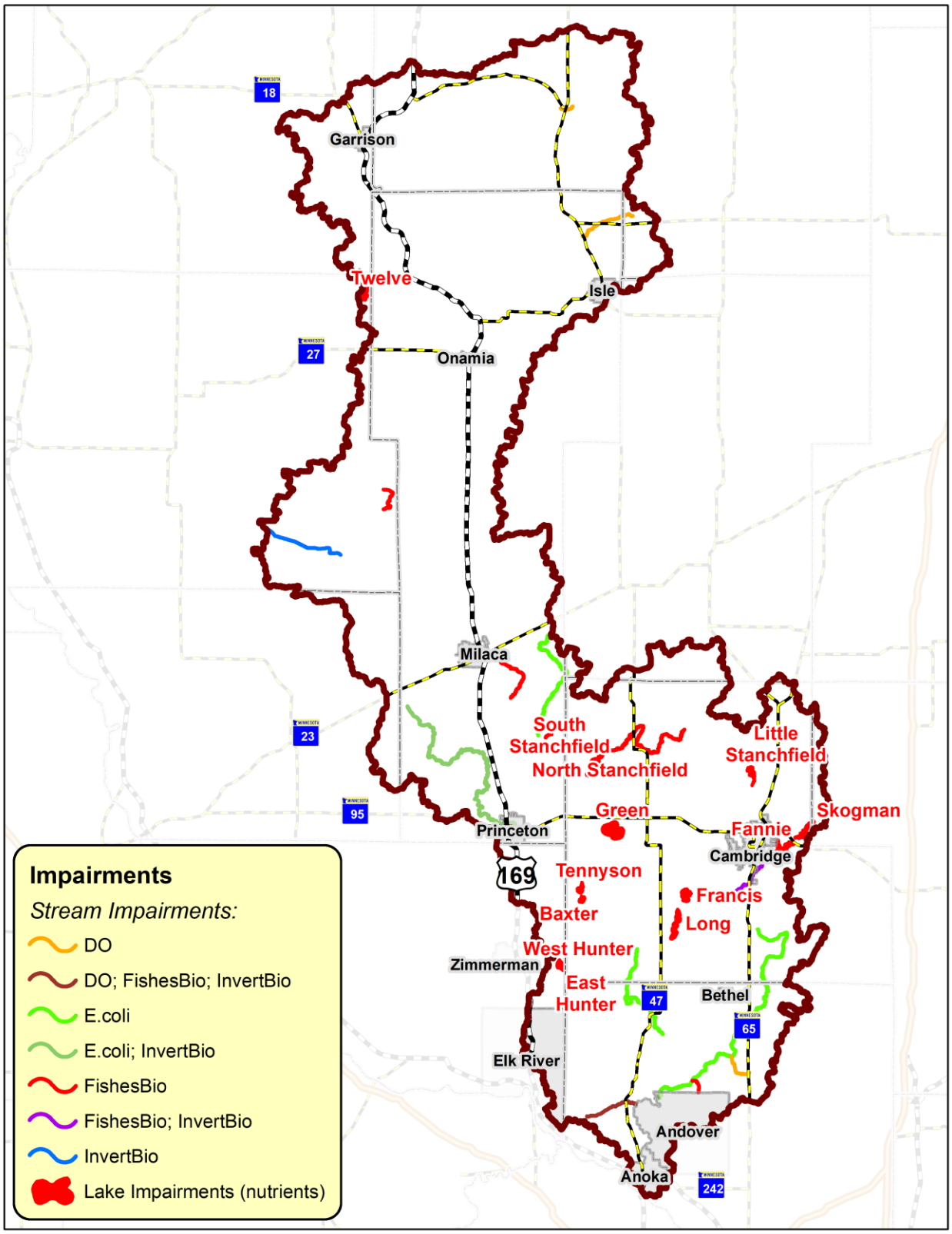

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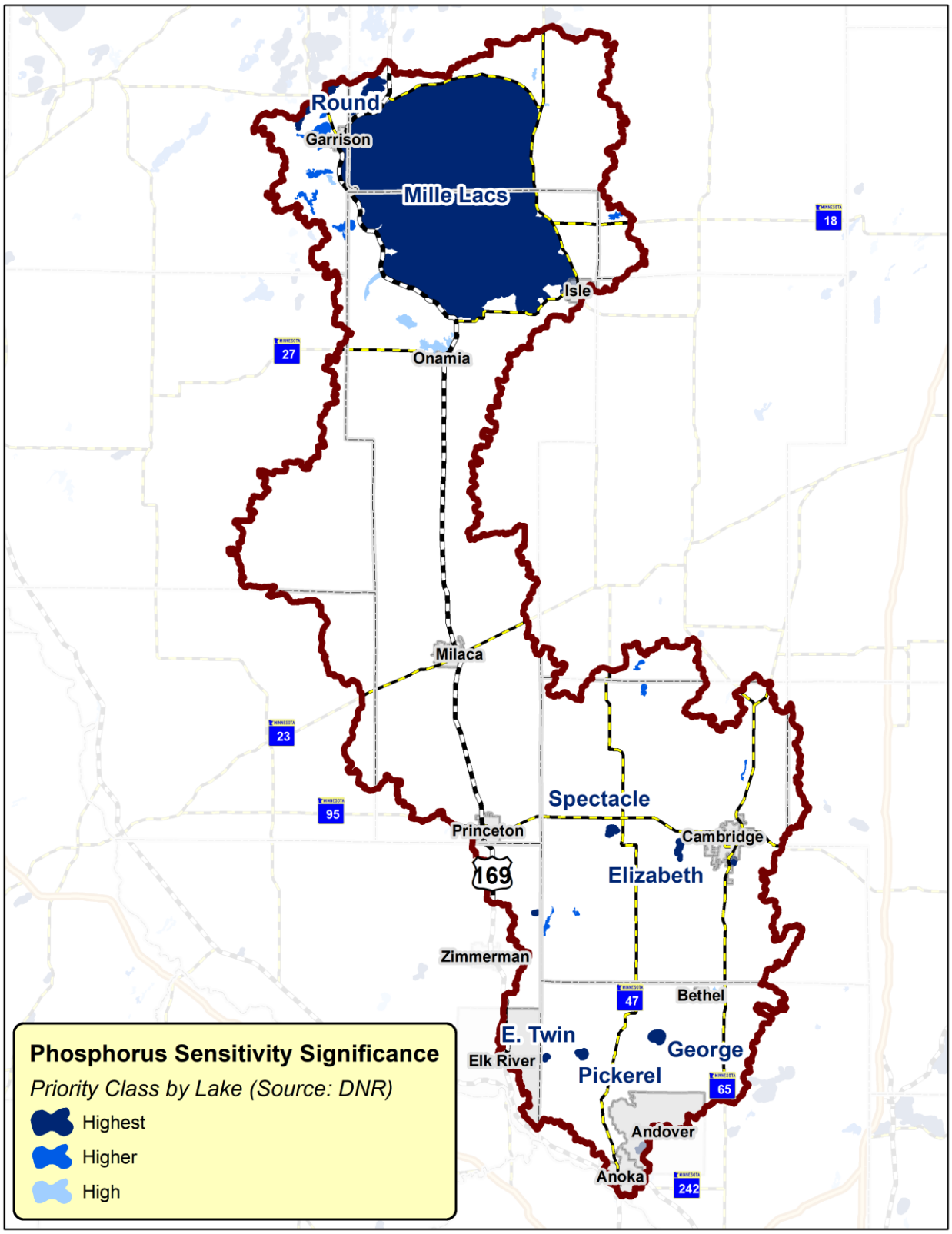

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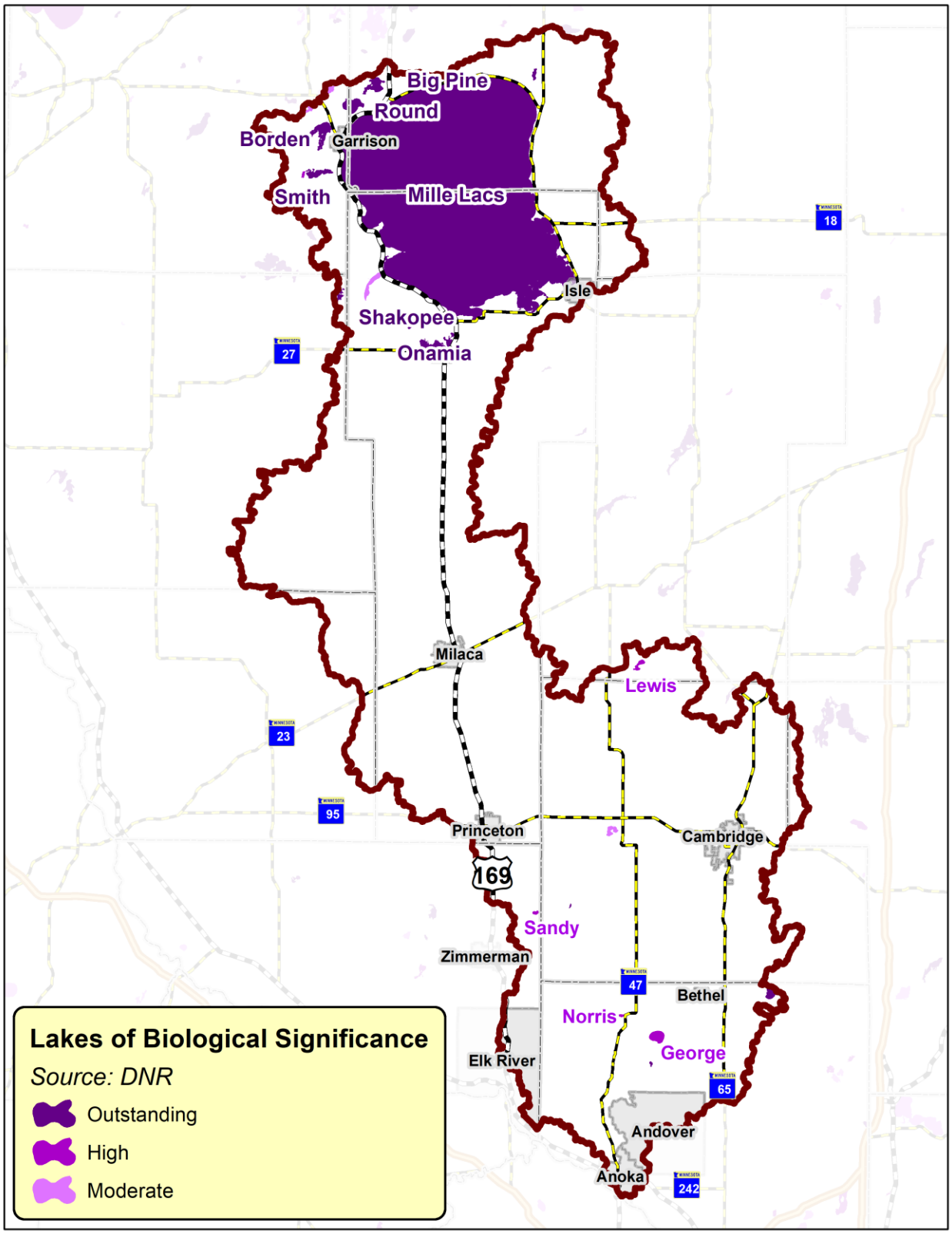

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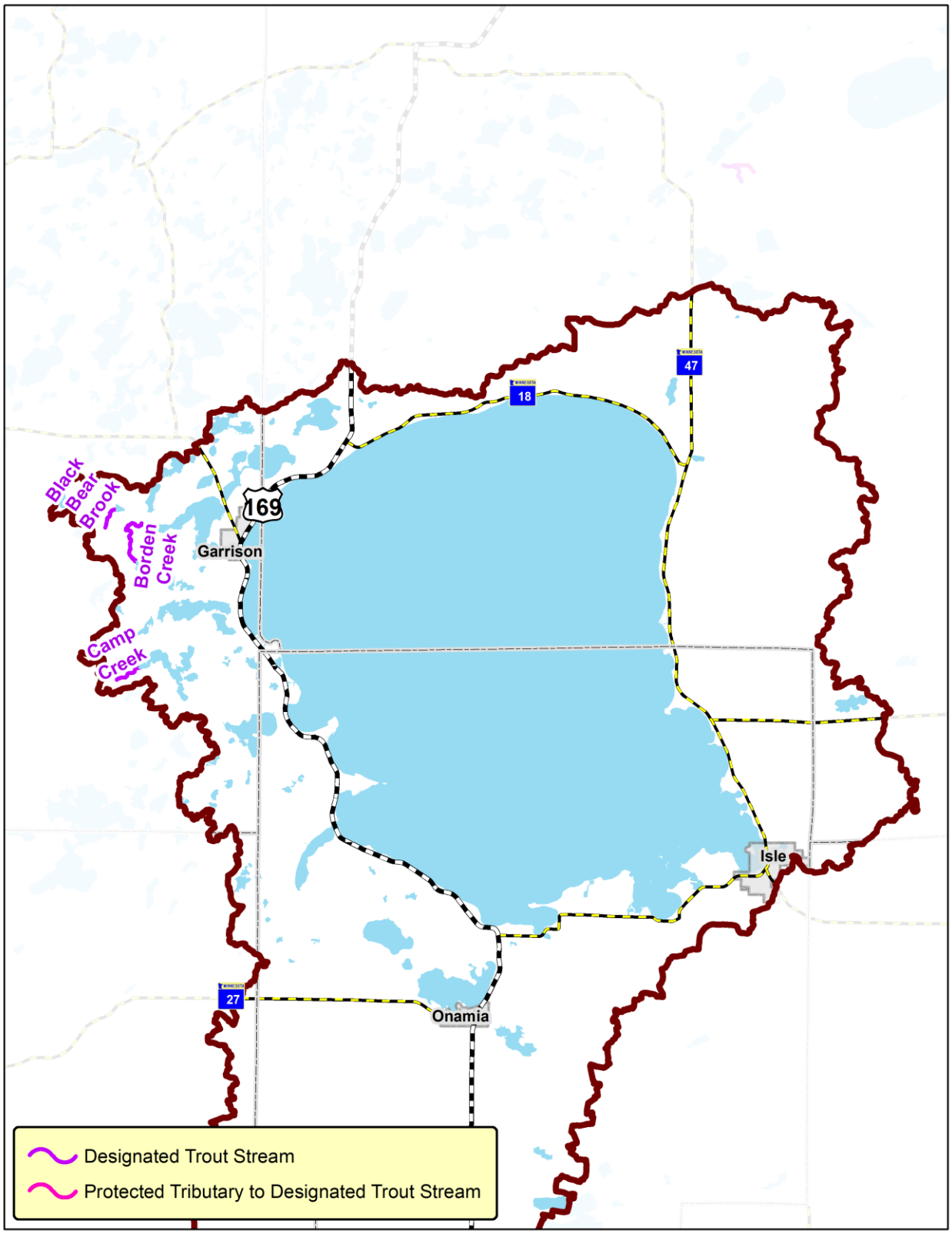

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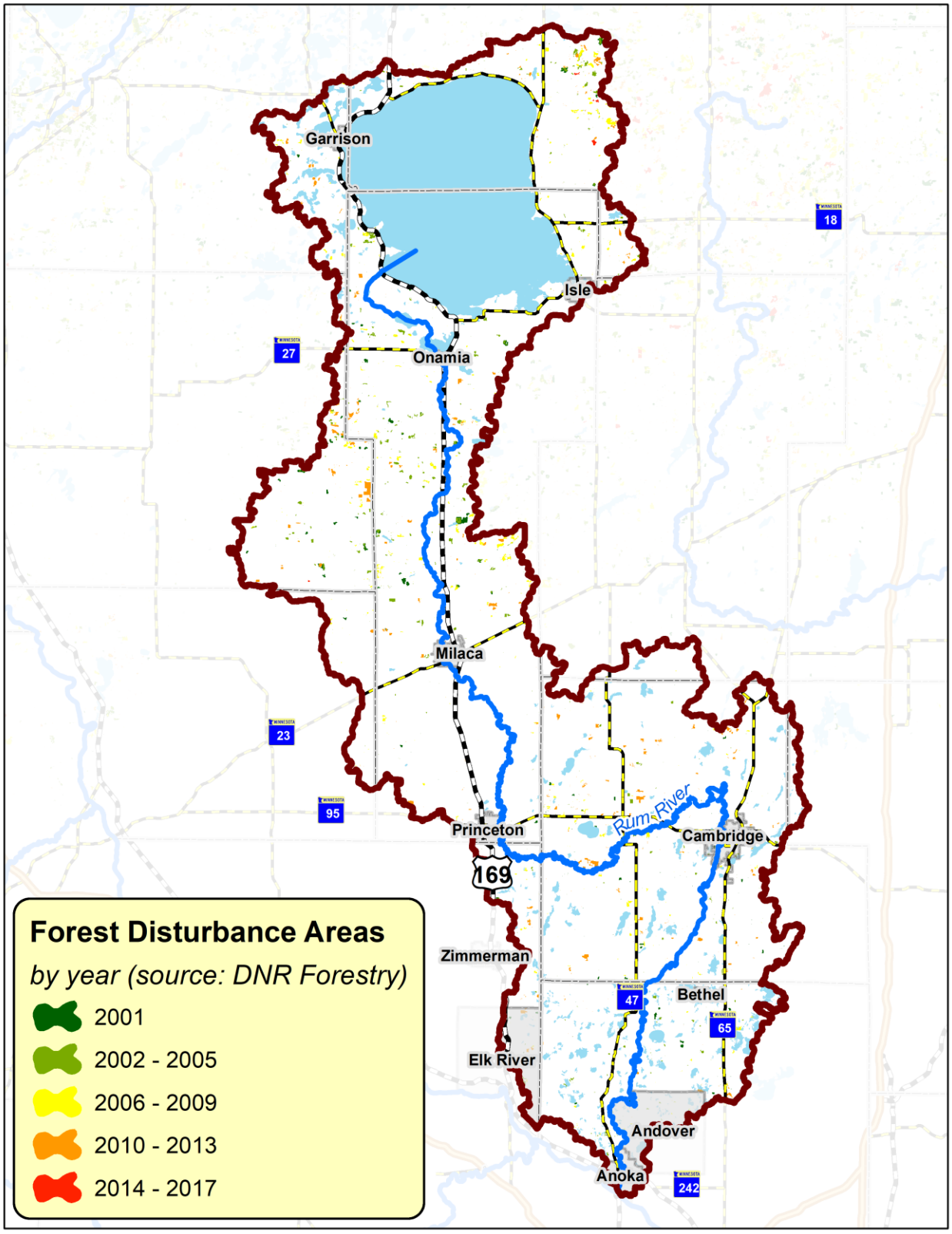

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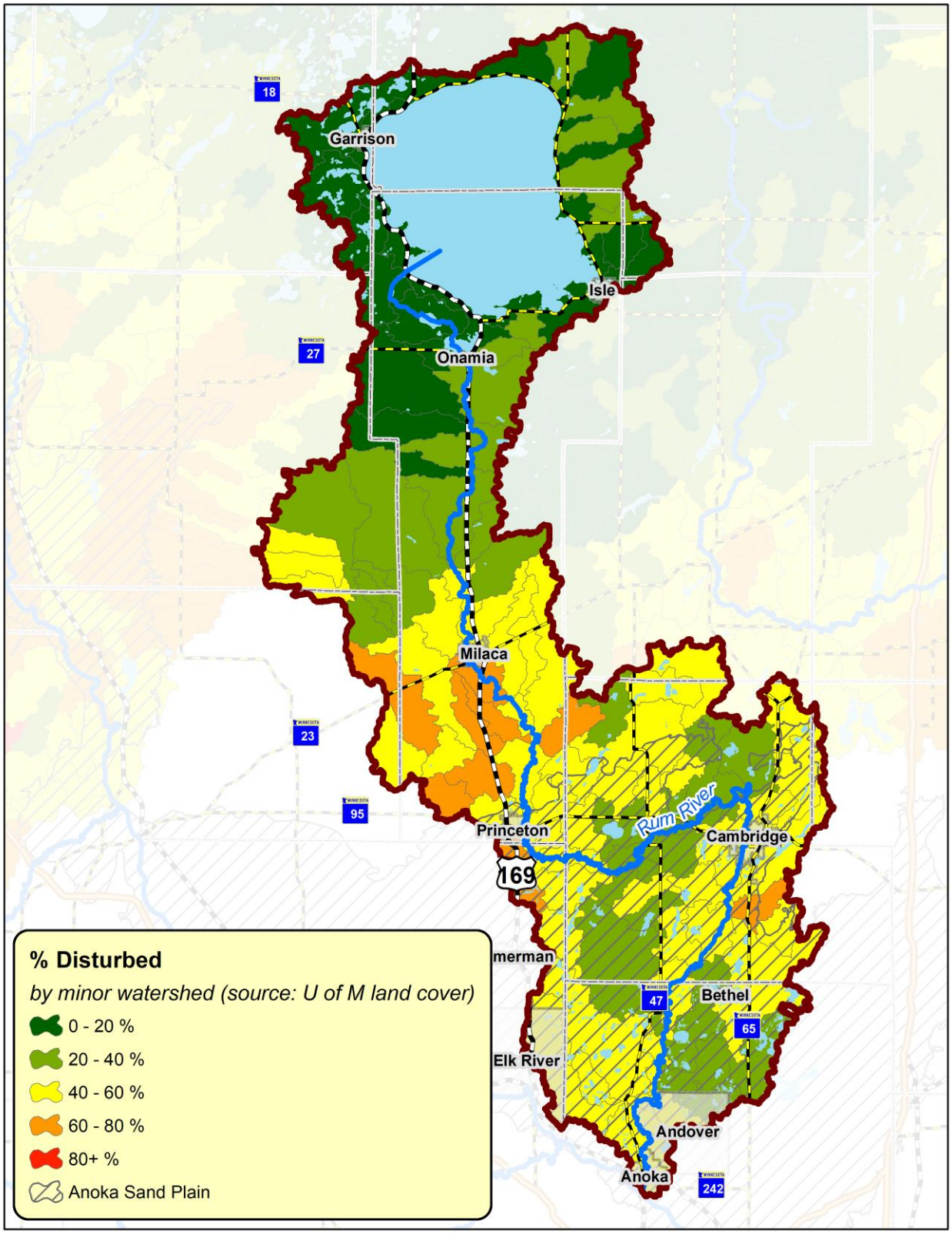

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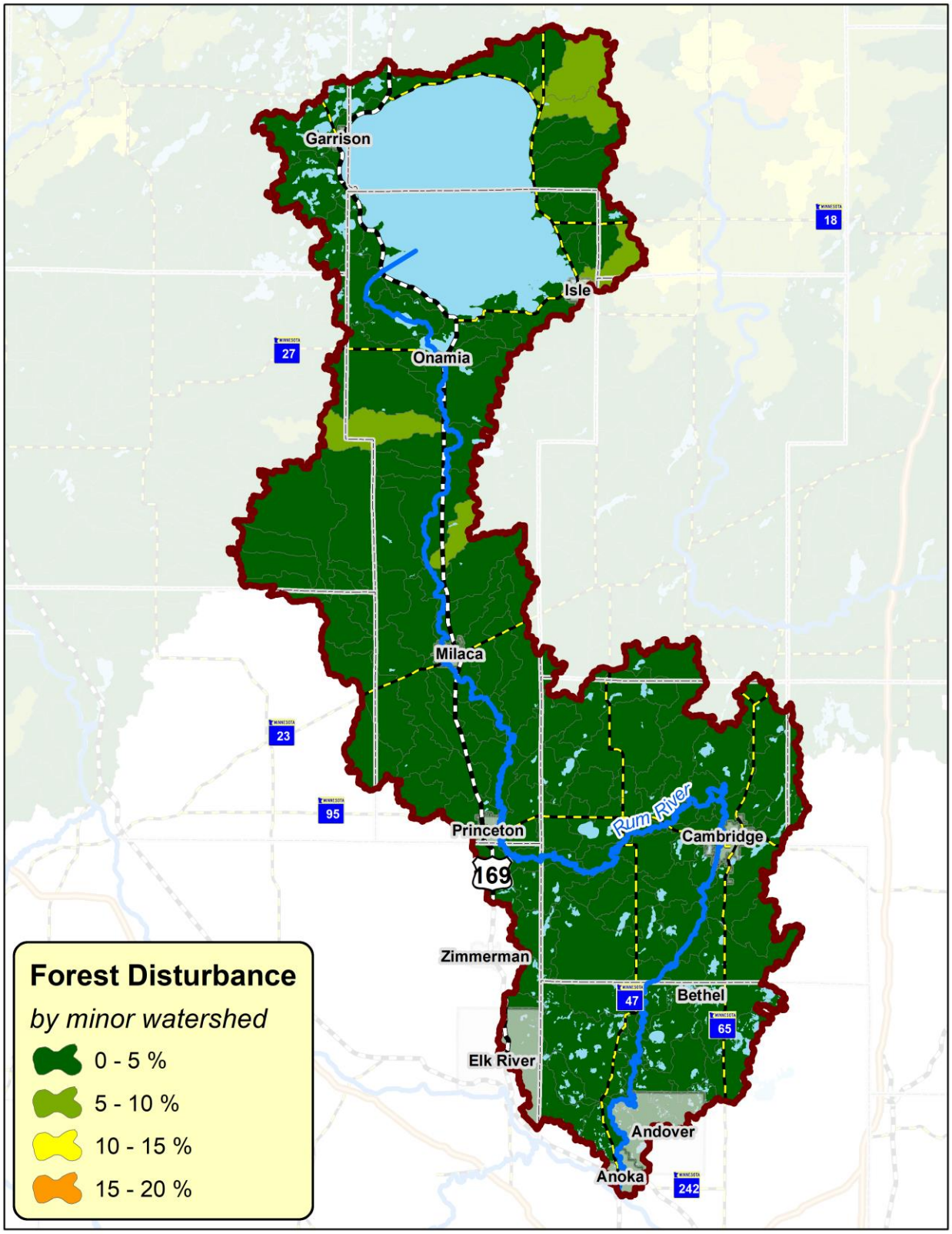

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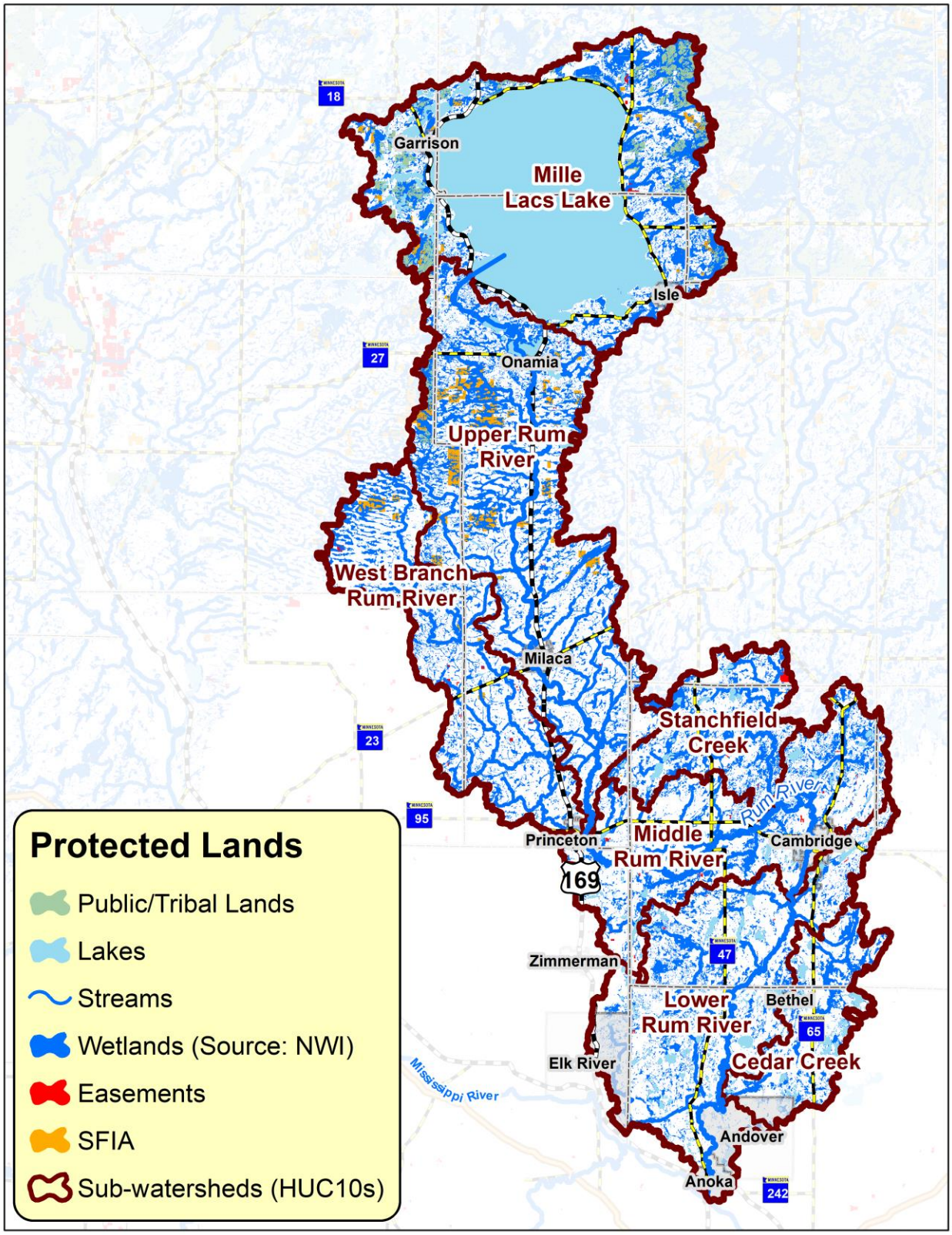

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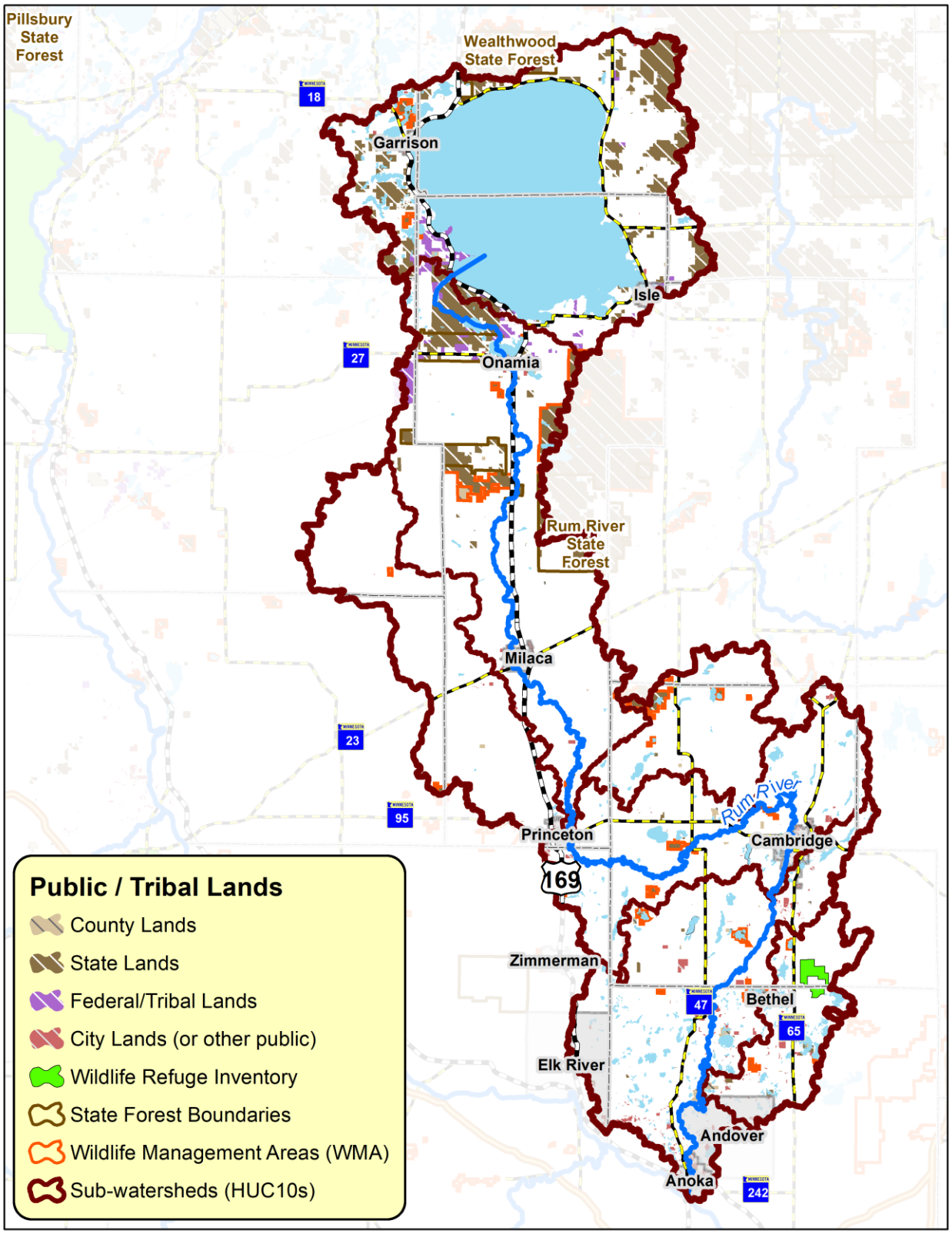

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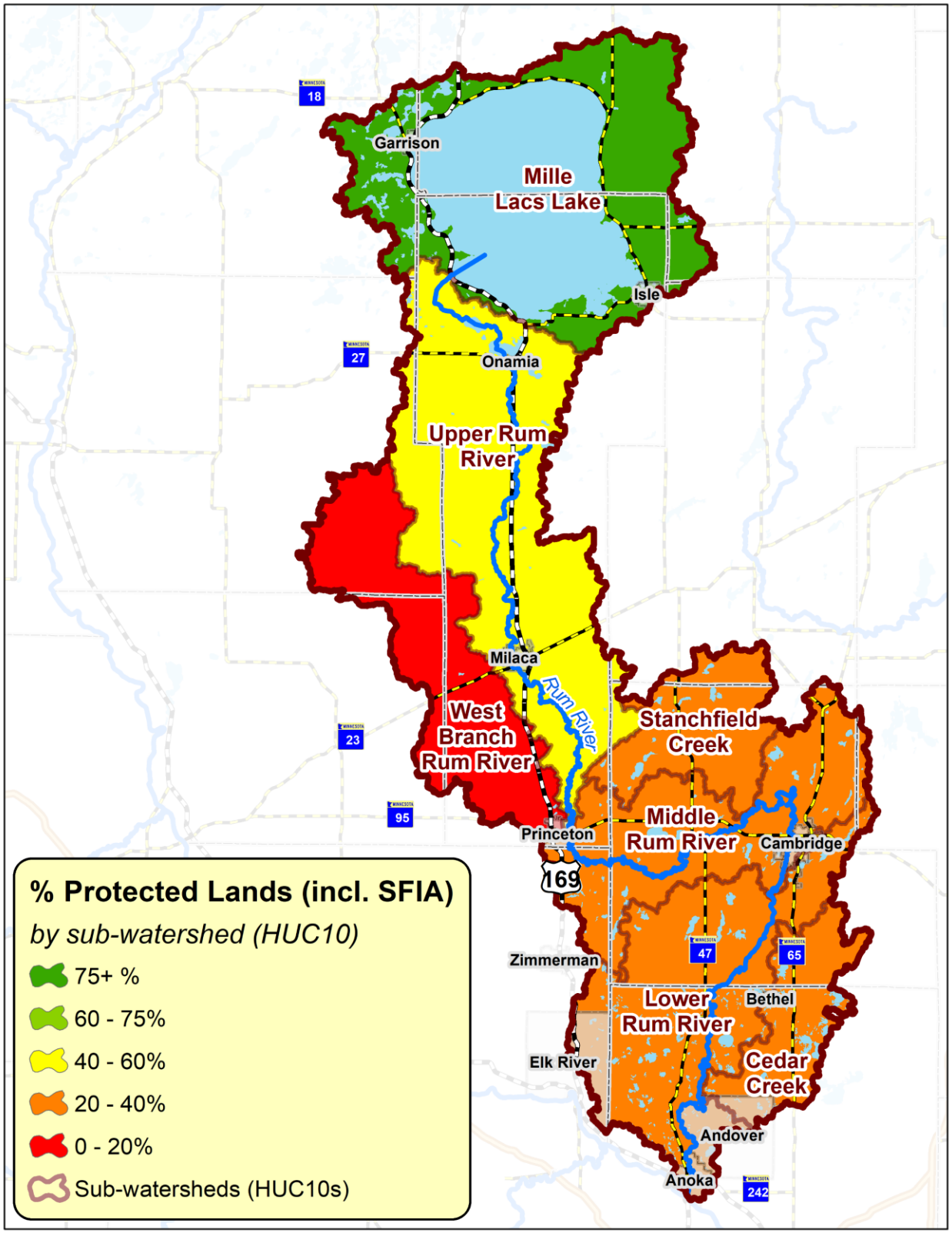
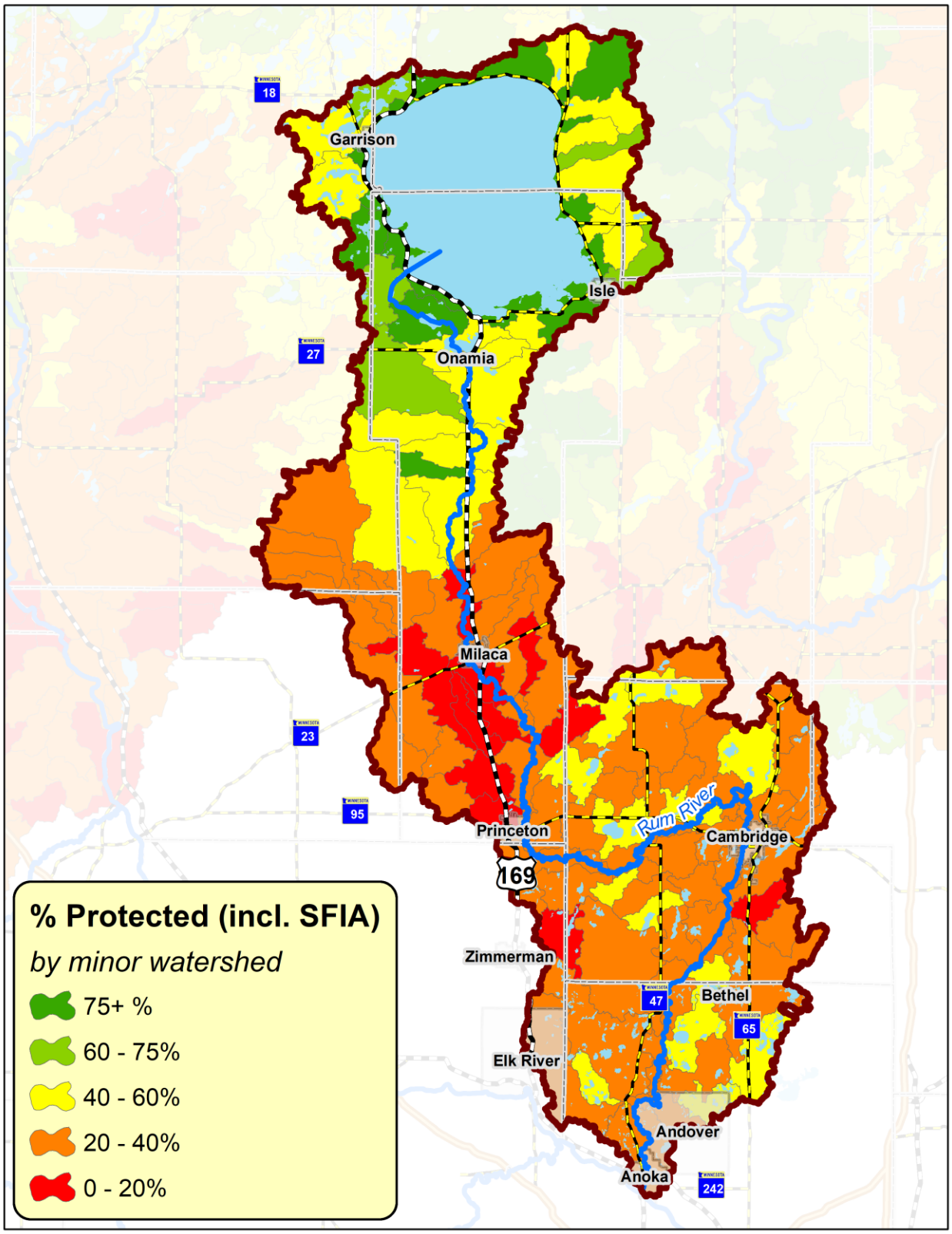


Figure 27. Minor watershed protection levels.



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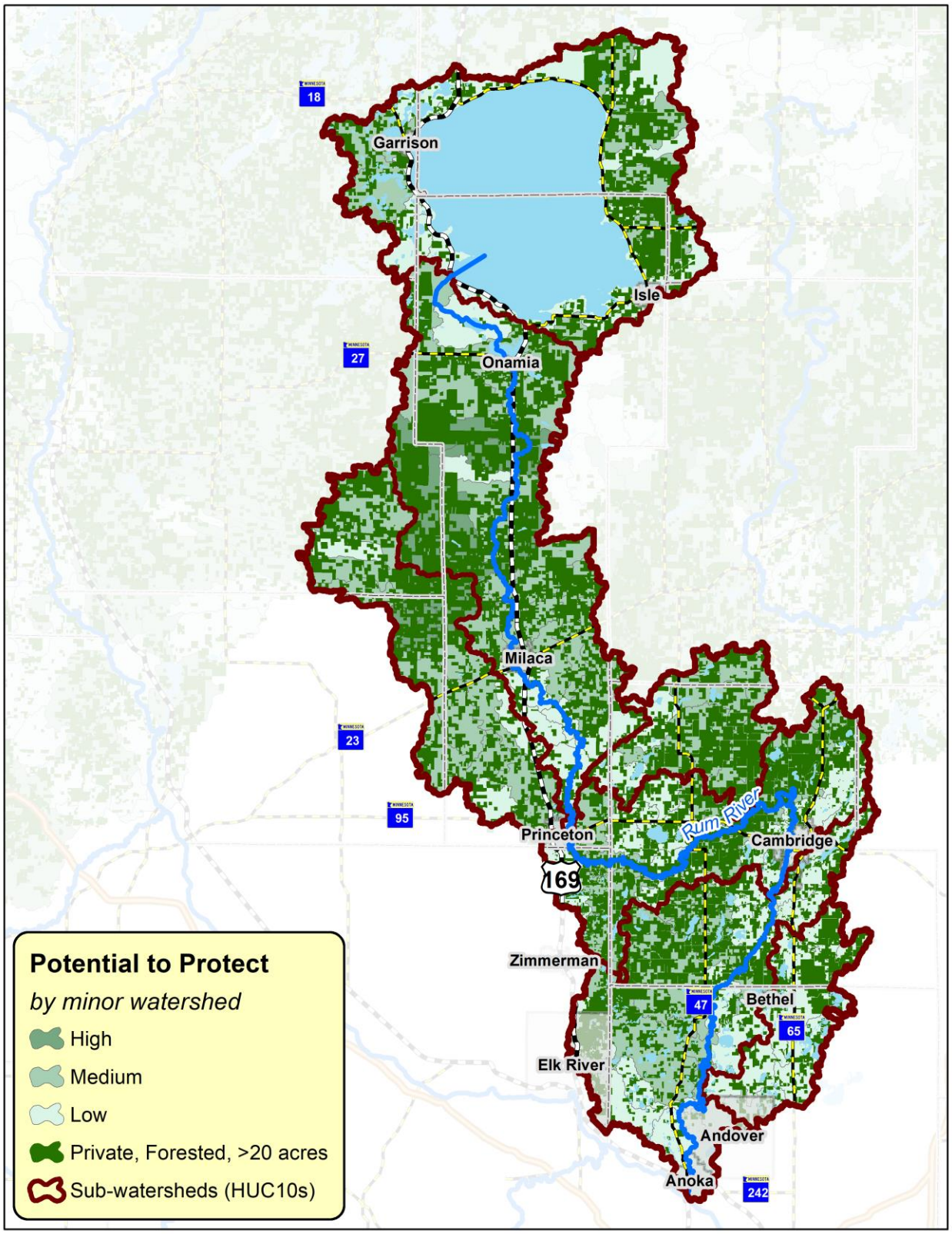

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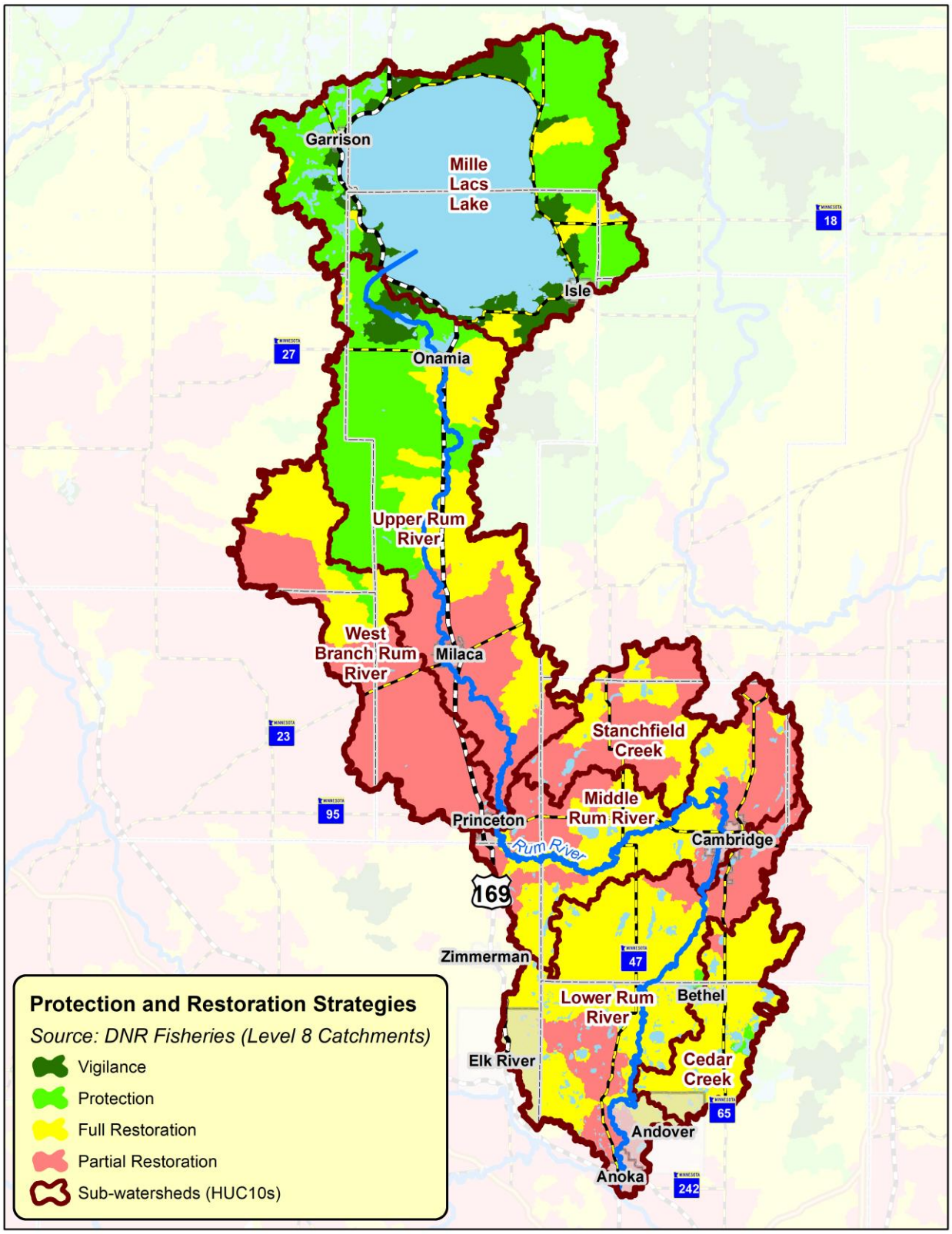

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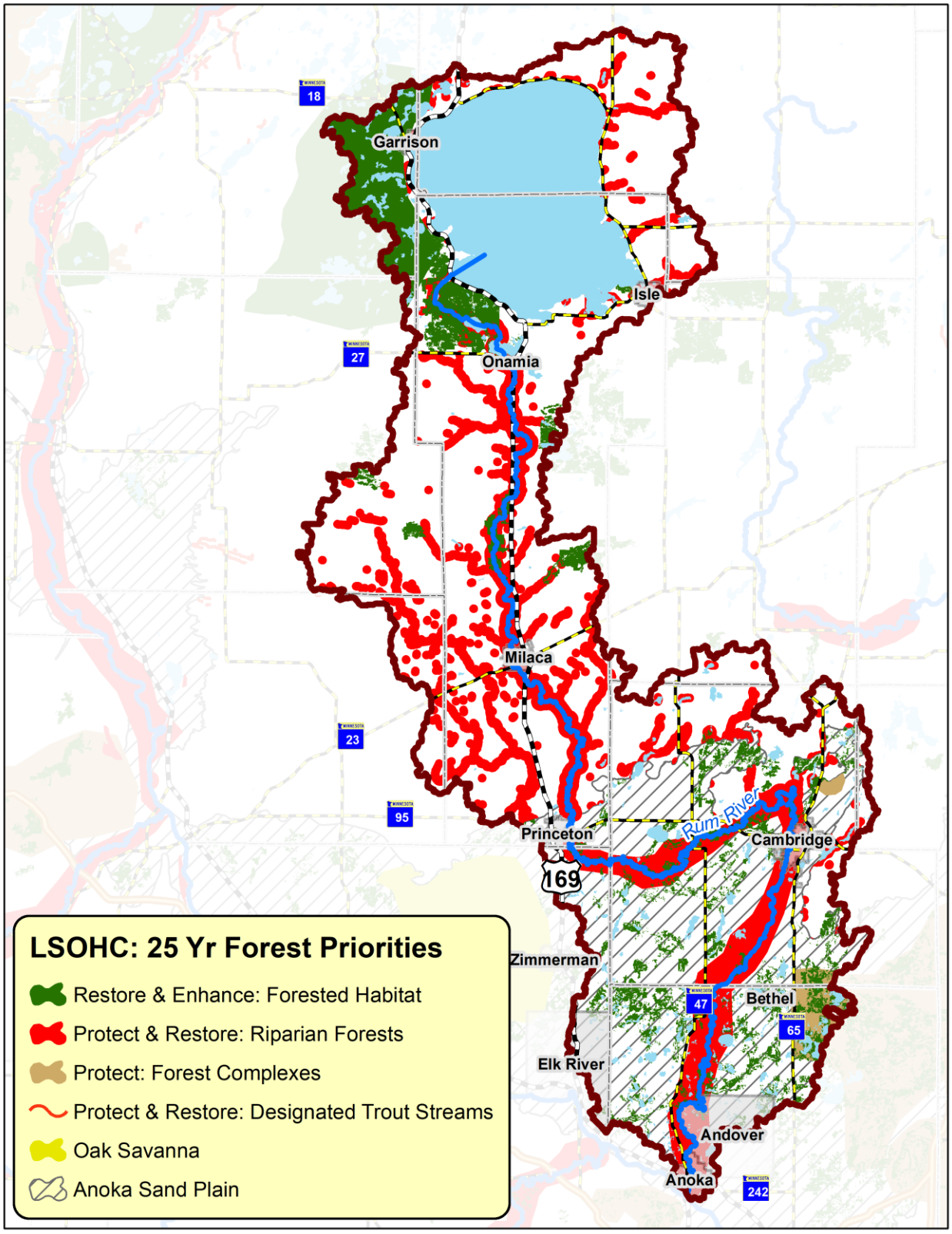
Figure 30. Lessard-Sams Outdoor Heritage Council priorities.



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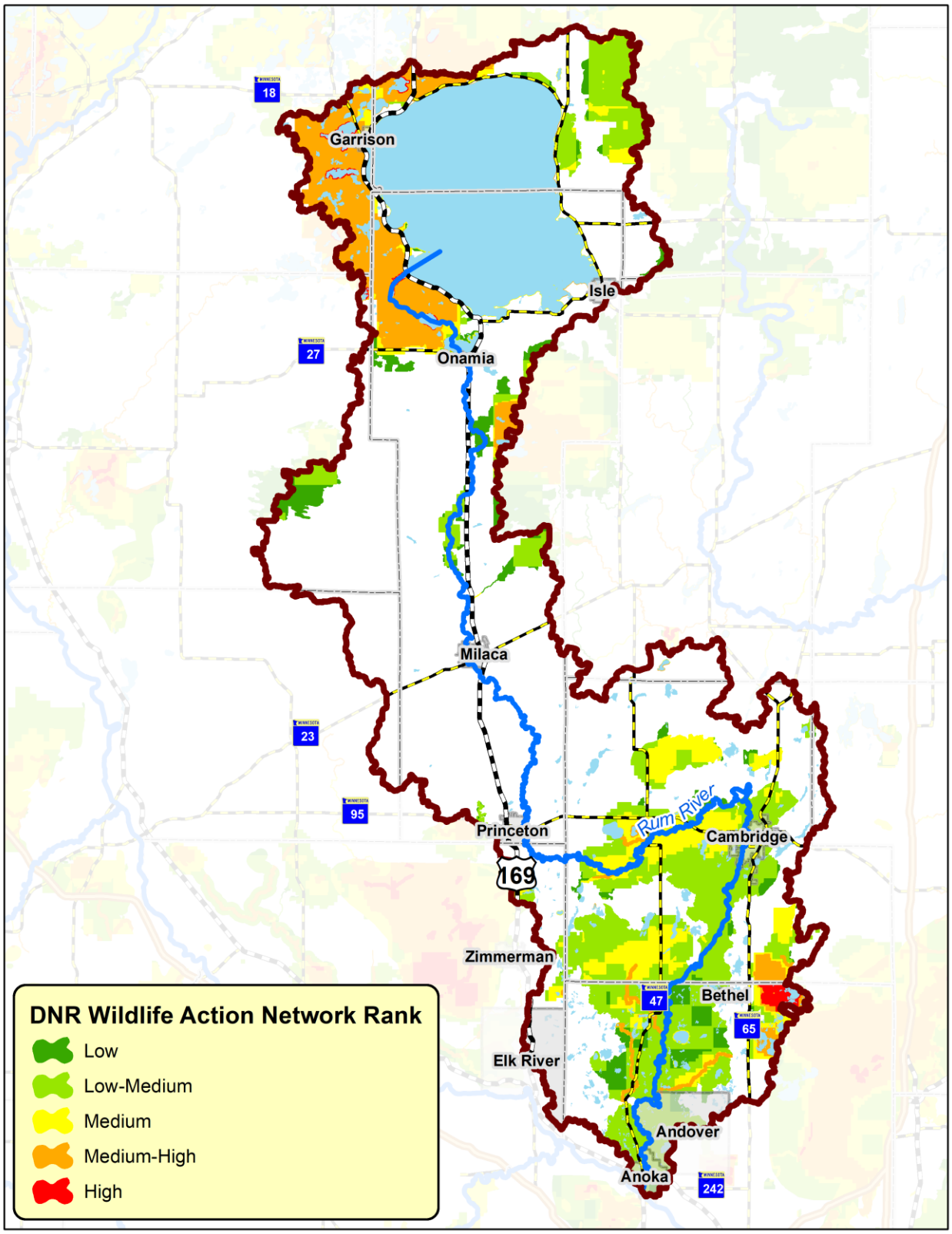

Figure 32. DNR Forests for the Future composite scores.

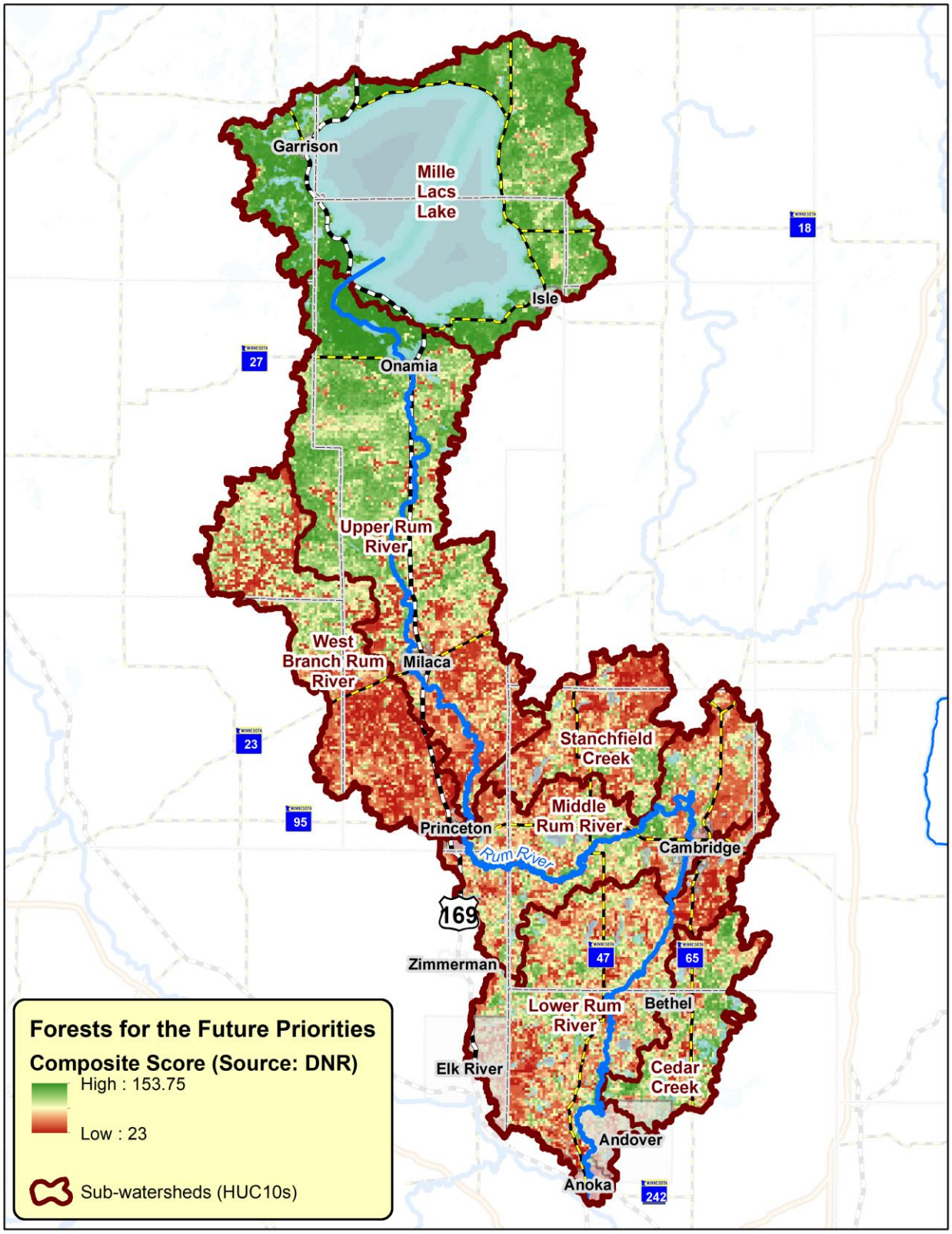

Figure 33. DNR Forests for the Future composite scores by minor watershed (HUC 14).

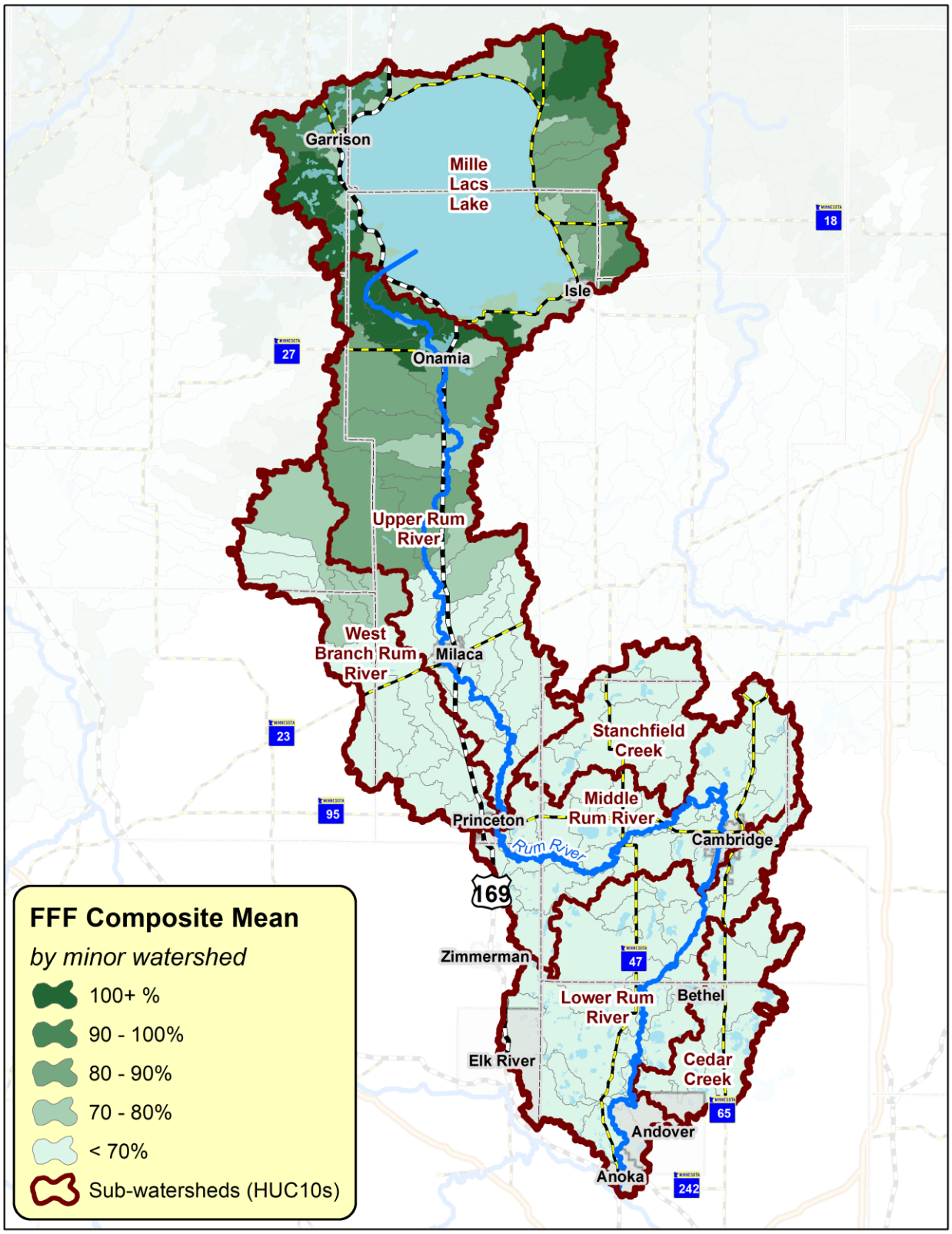

Figure 34. Minnesota Biological Survey (DNR) sites of biological significance.

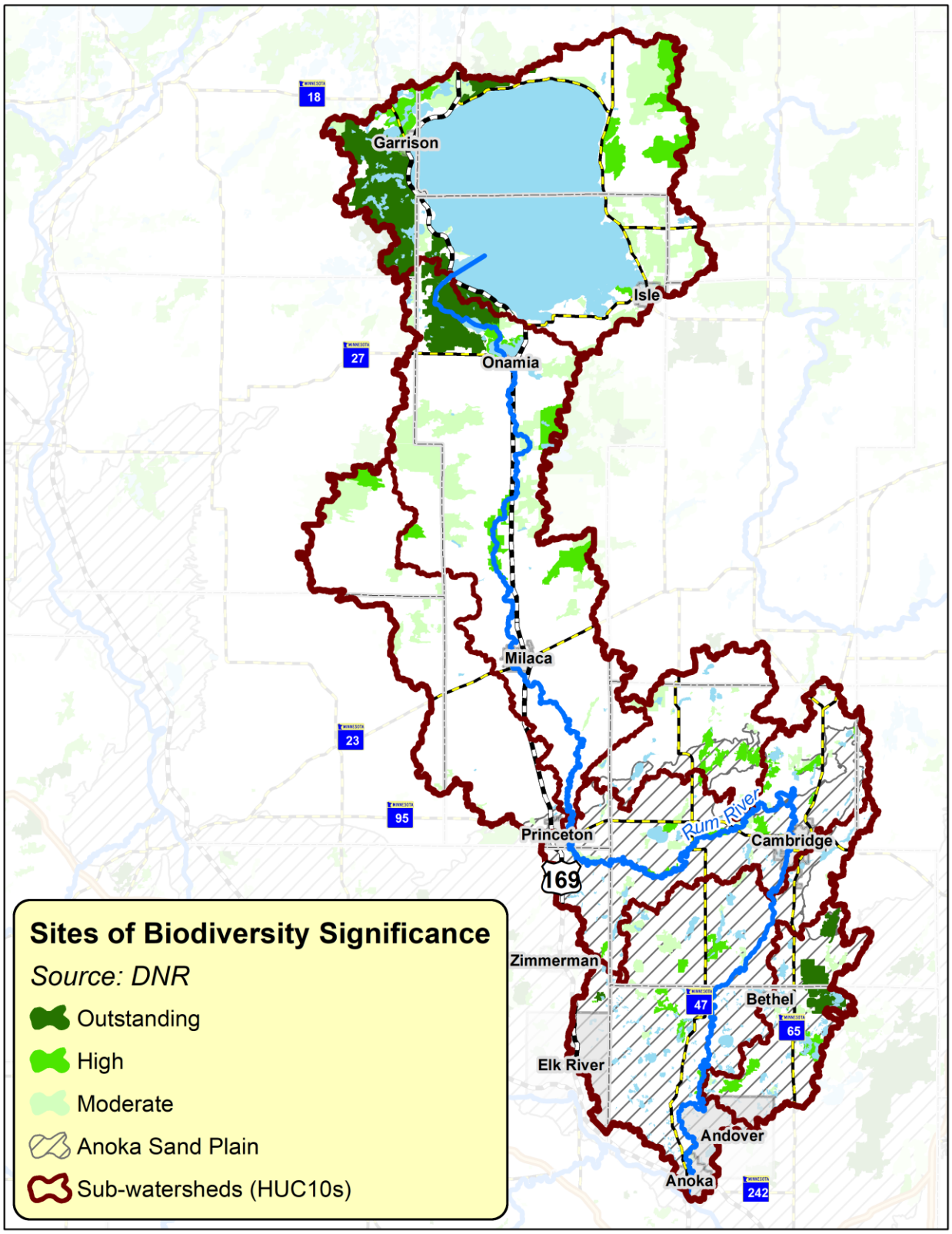

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Figure 35. Priority PFM focus areas.

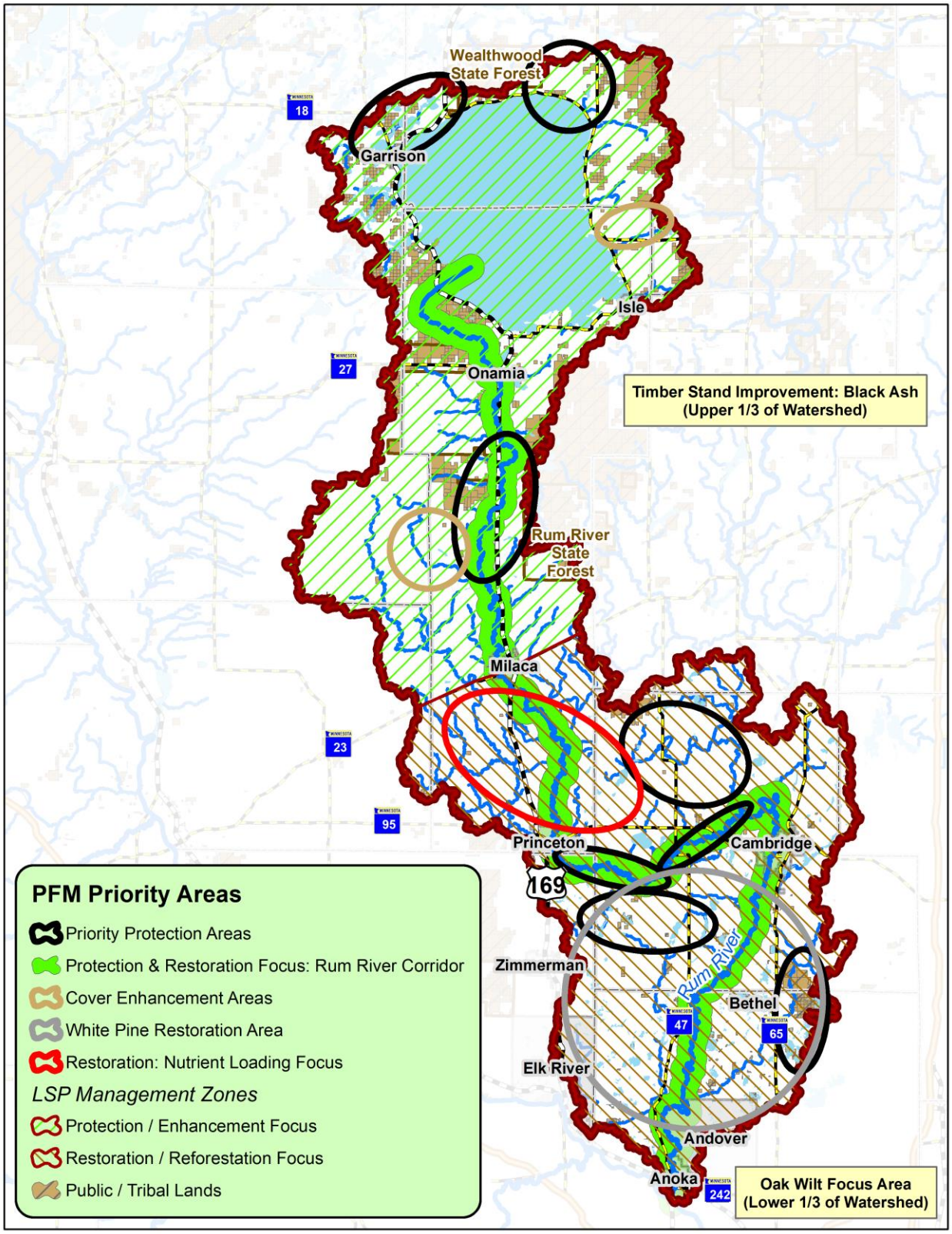


Figure 36. Forest stewardship plan areas.

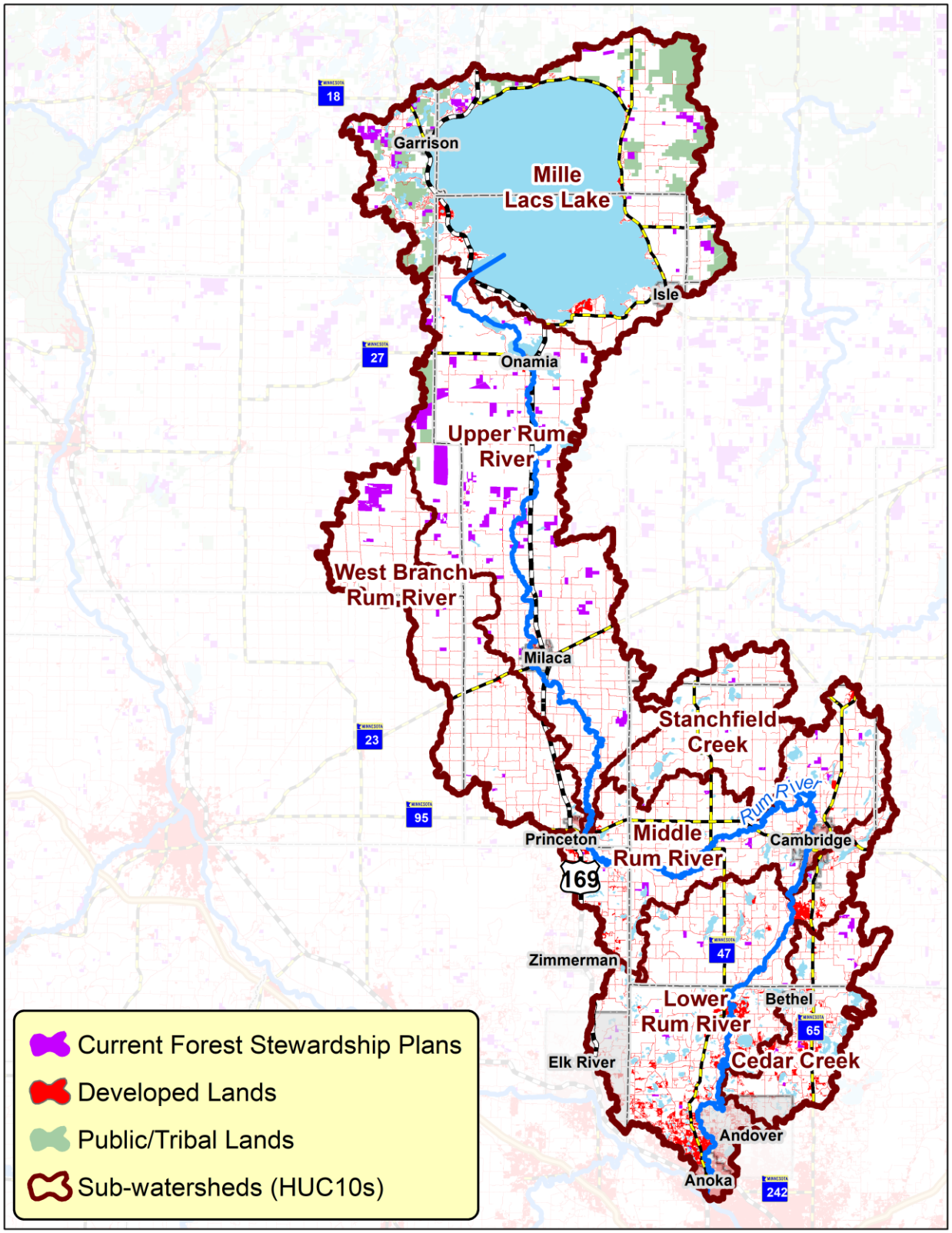


Figure 37. Population change, 2000-2010.

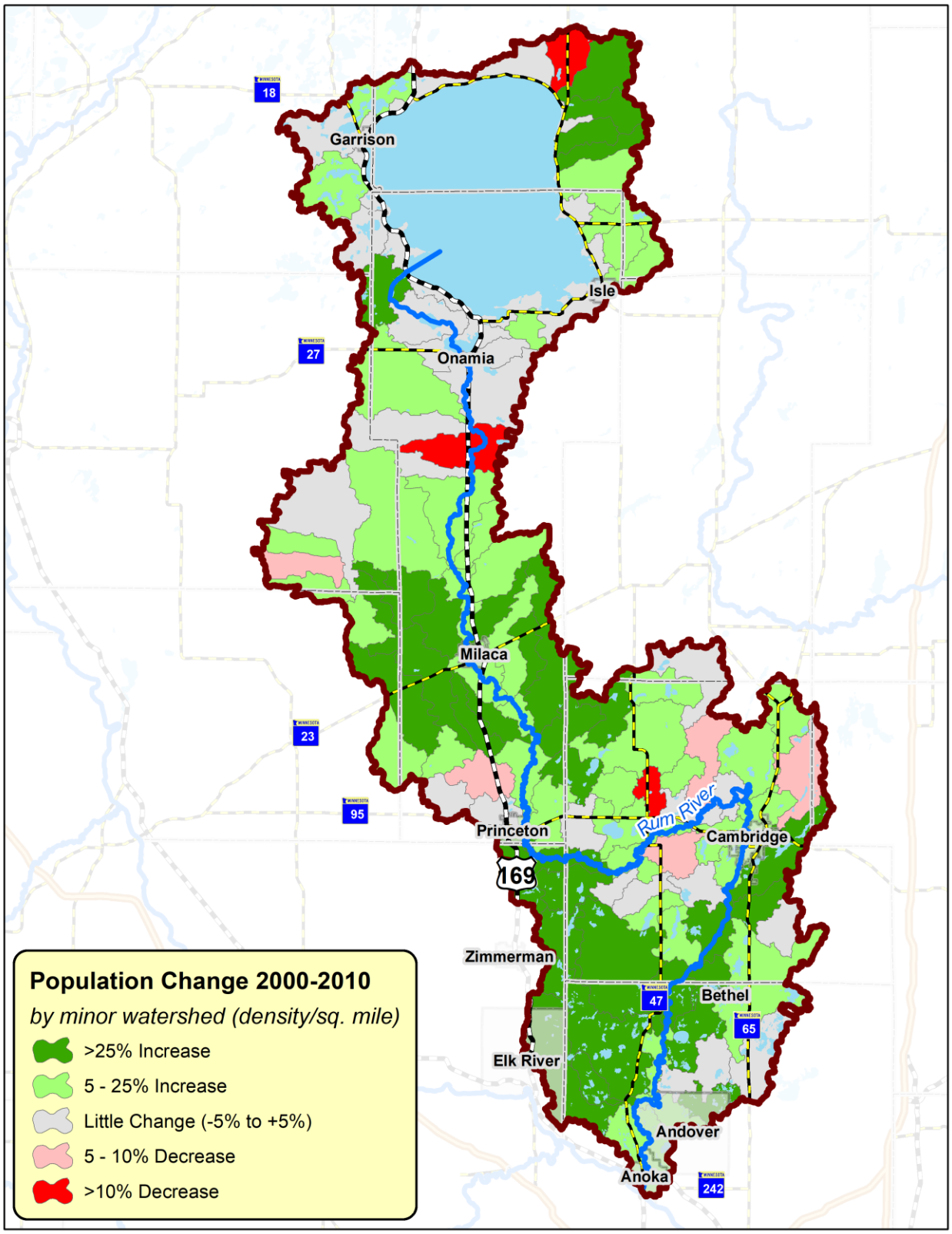
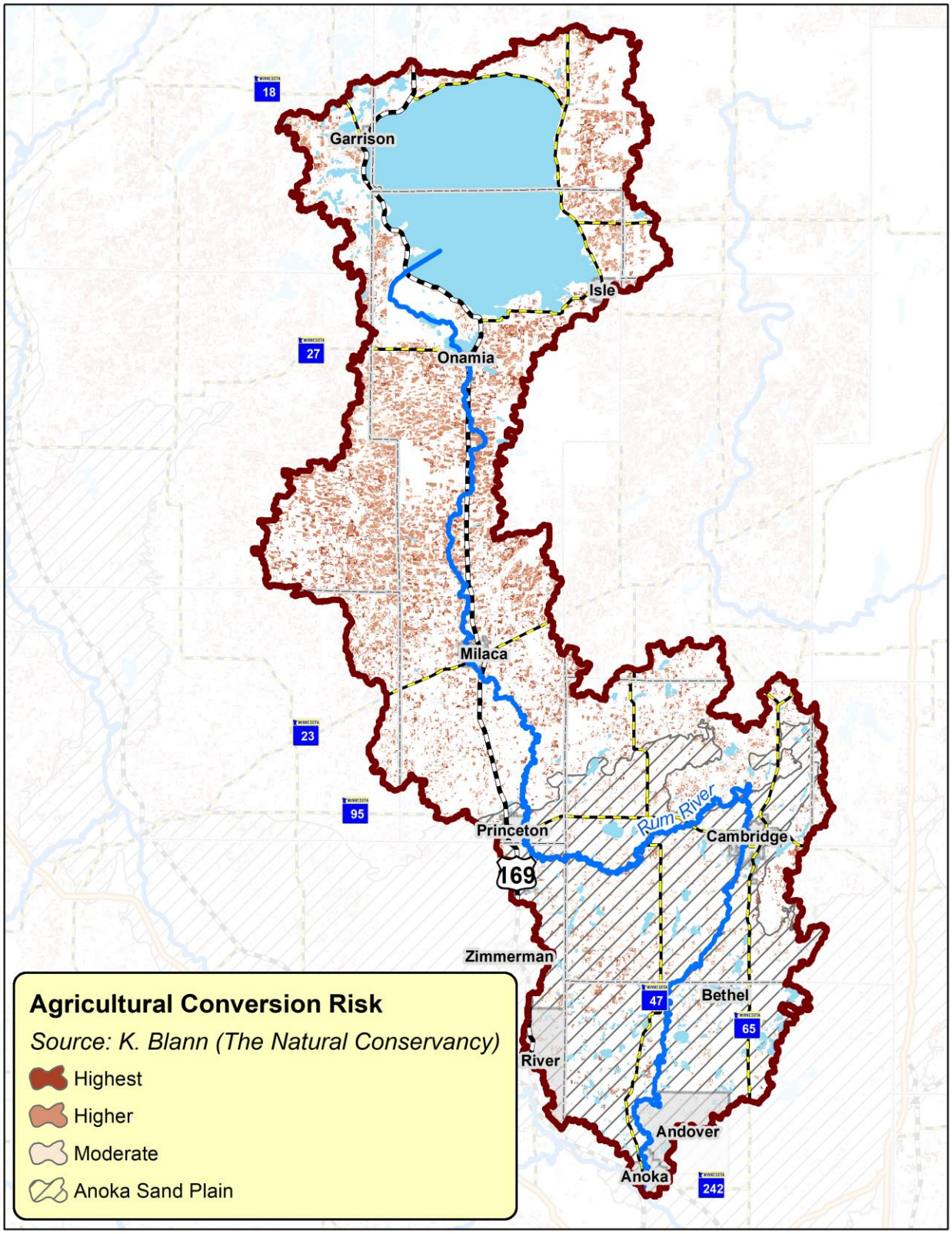
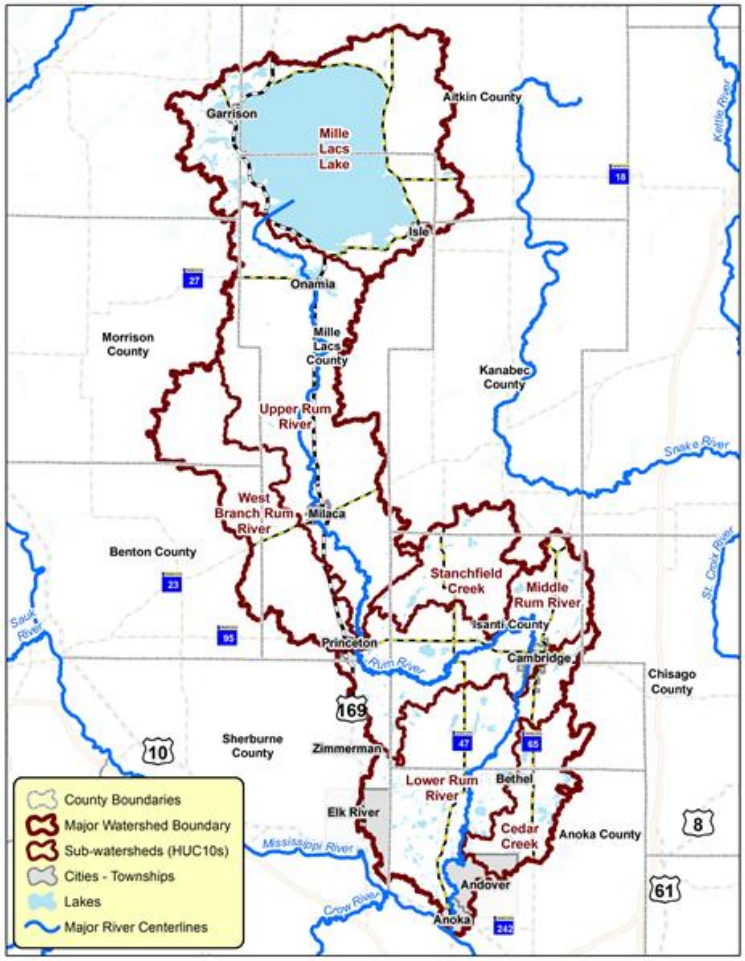


Figure 38. Agricultural conversion risk areas.



Subwatershed Analyses (HUC 10)

Developing water resource protection strategies within a watershed context is a logical, scientific approach because it acknowledges what landowners have known for years: that upstream activities affect those downstream. The question becomes at what scale is appropriate? Watersheds are classified at many scales, from region and basin scales down to smaller watershed and sub-watersheds, including minor watersheds and catchments. The Rum River Major Watershed is divided into 7 smaller or "sub" watershed units (HUC10 scale) as shown in the map below. Within each of these HUC10 sub-watersheds, are 5 to 23 minor watersheds, which are on average are 10,038 acres (15.7 sq. miles). Although major watersheds can be analyzed and modeled, it is difficult to implement since they typically cross municipal, county, and/or state boundaries.



The minor watershed is a sub-watershed unit of the HUC12 unit, which is a sub-watershed of the HUC10 unit. "The character of the minor watersheds drives the character of larger watersheds" (Sandy Verry, 2016). Implementation is also easier since many minor watersheds are within a single jurisdiction, focused on one or two primary surface water resources, and strategies can be better targeted and designed for optimal success and cost efficiencies. Each of the 75 minor watersheds are unique in their amount of protection, quality forest and water resources, and risk factors. These minor watersheds are highlighted in the following sections, which are organized by the HUC10 subwatershed unit. These HUC10 subwatersheds are summarized in the table below and on the following pages:

Subwatershed Characteristics

Below is a summary of the subwatershed and forest characteristics of the Mississippi Headwaters Major Watershed by subwatershed (HUC10):

Table 1. Subwatershed characteristics and indices of quality and risk.

	Mille Lacs Lake	Upper Rum River	West Branch Rum River	Middle Rum River	Stanchfield Creek	Lower Rum River	Cedar Creek
# of minor wshds	**15**	**23**	**15**	**19**	**7**	**17**	**5**
% upland forest cover	25%	41%	32%	25%	19%	27%	27%
% protected	77%	43%	25%	33%	39%	33%	33%
Potential to protect	10%	22%	25%	6%	4%	6%	5%
Land use disturbance	11%	31%	50%	45%	44%	46%	46%
# of lakes	51	23	5	60	15	206	90
Avg. lake size	2666	167	27	73	117	45	46
Geomorphology	Moraine (w), till plain (e)	Till plain	Till plain	Lacustrin (lake bed)	Till plain	Lacustrin (lake bed)	Lacustrin (lake bed)
Primary land cover	Lakes & deciduous woodlands	Open lands / deciduous woodlands / wetlands	Open lands	Open lands / deciduous woodlands	Open lands / deciduous woodlands / wetlands	Open lands / deciduous woodlands / urban development	Open lands / deciduous woodlands / wetlands
Lake or stream based	Lake	Stream	Stream	Lake & stream	Lake & stream	Lake & stream	Lake & stream
Quality	High quality lakes, forest habitat	Forest habitat	Streams, forest habitat	Surface water, forest habitat	Surface water, forest habitat	Surface water, forest habitat	Surface water, forest habitat
Risks	Ag: animals & crops, development, water quality impairments/ declining trends	Ag: animals & crops, development, water quality impairments	Ag: animals & crops, development, water quality impairments	Ag: animals & crops, development, water quality impairments	Ag: animals & crops, development, water quality impairments	Ag: animals & crops, development, water quality impairments/ declining trends	Ag: animals & crops, development, water quality impairments/ declining trends
Acres to achieve protection goal	10,811	42,508	24,420	7,656	3,375	10,392	2,978
Cost to achieve protection goal	$12,280,603	$46,411,778	$26,115,203	$11,721,592	$4,243,980	$18,454,476	$5,732,308
Avg. land value (20+ acre, private lands)	$1,513	$1,517	$1,493	$3,021	$2,316	$4,115	$3,983
Avg. RAQ score	3.4	2.2	1.3	1.8	1.6	2.0	2.8

Table 2. Composite Forests for the Future (FFF) scores and potential native plant communities.

Name	FFF score (composite mean)	Fire-Dependent		Mesic Hardwood		Acid & Forested Rich Peatland		Floodplain & Wet Forest		Open wetlands (Marsh, Open Peatland, Wet Meadow)	
Mille Lacs Lake	84.6	3,993	1%	74,783	28%	14,111	5%	22,081	8%	17,453	7%
Upper Rum River	79.3	2,093	1%	133,496	59%	7,796	3%	46,424	20%	35,608	16%
West Branch Rum River	60.9	4,270	4%	67,534	57%	3,124	3%	18,833	16%	22,753	19%
Middle Rum River	65.8	49,346	39%	16,681	13%	12,988	10%	11,138	9%	14,972	12%
Stanchfield Creek	60.5	7,093	12%	28,621	46%	10,479	17%	7,218	12%	6,443	10%
Lower Rum River	64.0	59,920	38%	25,103	16%	8,957	6%	8,554	5%	22,470	14%
Cedar Creek	73.8	23,875	44%	1,231	2%	4,480	8%	2,577	5%	10,132	19%
Total (or avg for FFF)	**73.0**	**150,589**	**15%**	**124,371**	**12%**	**61,934**	**6%**	**116,826**	**12%**	**129,831**	**13%**

Lake Characteristics

Below is a summary of the lake characteristics of the Rum River Major Watershed by subwatershed (HUC10). More information on the lakes will be detailed in the individual subwatershed sections to follow.

Figure 39. Lake size distribution.

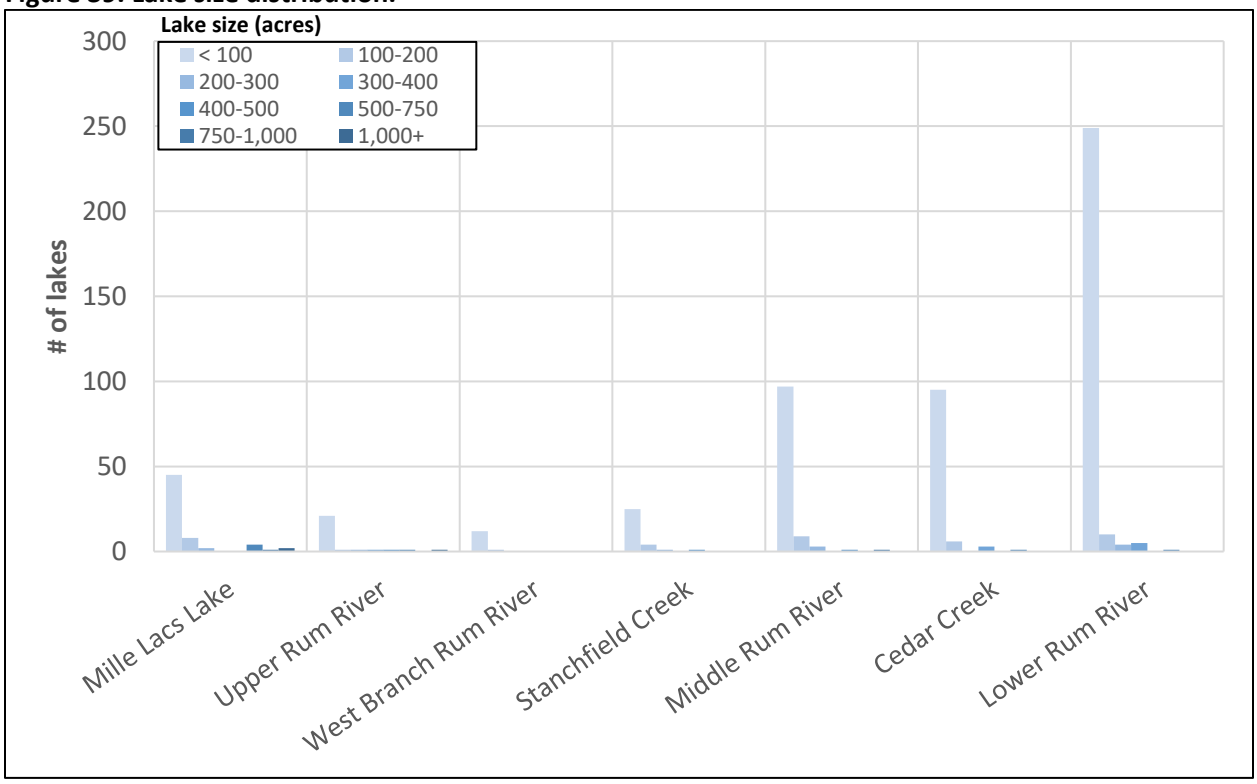


Table 3. Priority and at-risk lake estimates.

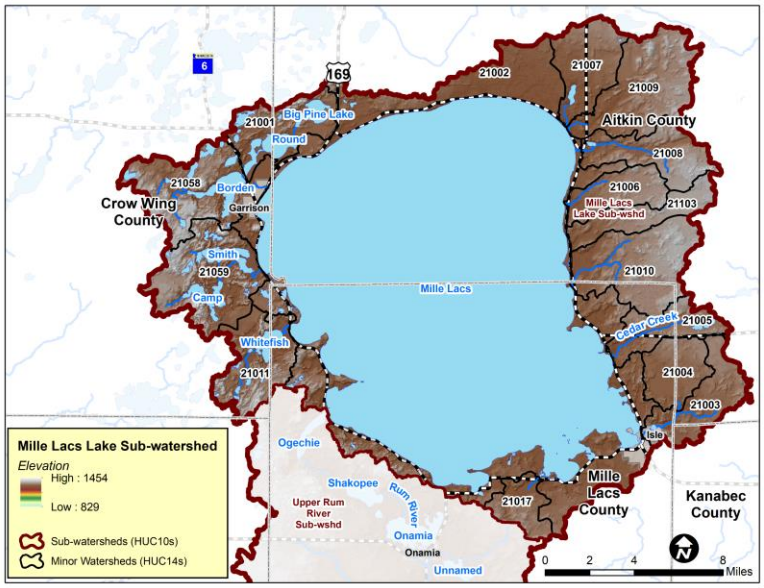
	Lakes of phosphorous sensitivity significance			Lake of biodiversity significance			Lake water quality trends			Outstanding water resources		
Name	**High**	**Higher**	**Highest**	**Moderate**	**High**	**Outstanding**	**Improving**	**Declining**	**Stable**	**Cisco/ tullibee**	**Priority wild rice**	**Priority shallow**
Mille Lacs Lake	3	6	6	2	1	6	6		5	3	11	4
Upper Rum River	3			1		3					5	5
West Branch Rum River												
Stanchfield Creek		1	1		1			1			4	4
Middle Rum River	2	1	3	1	1		4		1		5	3
Cedar Creek	1					1					1	4
Lower Rum River		4	3		2	2	7	1	5		6	14
Totals	**9**	**12**	**13**	**4**	**5**	**12**	**17**	**2**	**11**	**3**	**32**	**34**

Subwatershed No. 1
Mille Lacs Lake (HUC 701020701)

Description

The Mille Lacs Lake Subwatershed drains 416 square miles of Aitkin, Mille Lacs, Crow Wing, and Kanabec counties and it is the headwaters to the Rum River. It is also home to Mille Lacs Lake, which is one of the most important recreation lakes in Minnesota. The outlet to Mille Lacs Lake, and the beginning of the Rum River, is located on the southwestern side of the lake by Mille Lacs Kathio State Park. Land use in the Mille Lacs Lake Subwatershed is mainly forests and wetlands and a moderate amount of agriculture (13%).

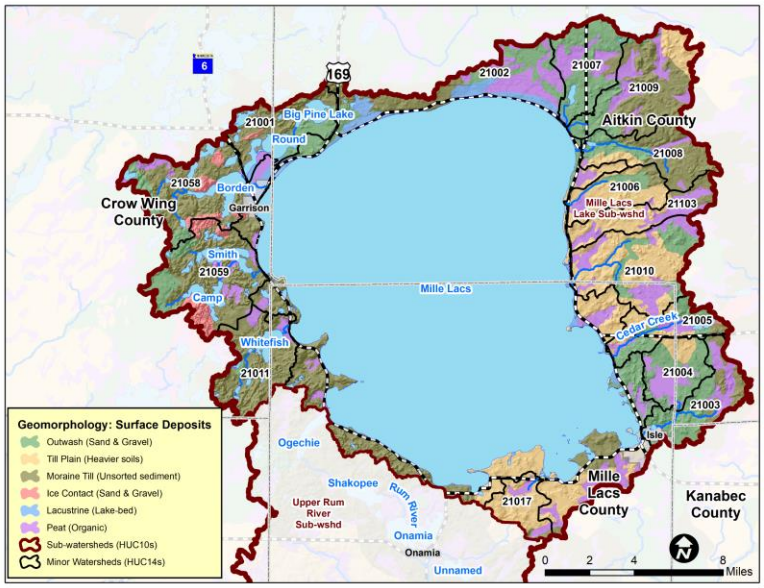
Figure 40. Elevation.



Geography

The west side and the east side of the Mille Lacs Lake Subwatershed have noticeably different landforms. The west side is dominated by a hummocky end moraine formed by the Superior Lobe glacier. In contrast, the east side has a rolling to hilly terrain (till plains) separated by areas of level to gently rolling terrain (outwash plains). The northeastern end of the subwatershed intersects with the Malmo Peatlands LTA, which is composed of large peatlands interspersed with level to gently rolling uplands.

Figure 41. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Mille Lacs Lake Subwatershed was mainly conifer swamps and northern hardwoods forests. Some oak savanna may also have been present along the western side of the subwatershed. Today the forest remains partially intact, although some conversion to pasture occurred on the east side of the lake, as well as to development in the several communities that surround Mille Lacs Lake. The current forest composition is mostly a mix of aspen/birch and maple/beech/birch forest type groups. Some oak/hickory forests may be found around the lakes on the western side of the subwatershed, and on the eastern side are a few patches of spruce/fir and elm/ash/cottonwood forests.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas have the potential to support mesic hardwood NPCs. Wet forests NPCs may also have significant potential within the Malmo Peatlands LTA to the northeast of the lake.

Figure 42. Historic vegetation cover, Marschner.

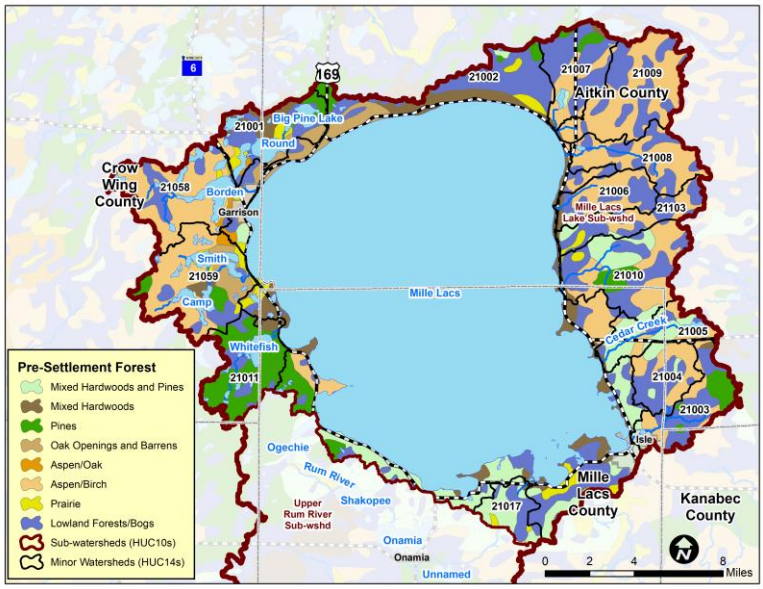


Figure 43. Land cover, 2013.

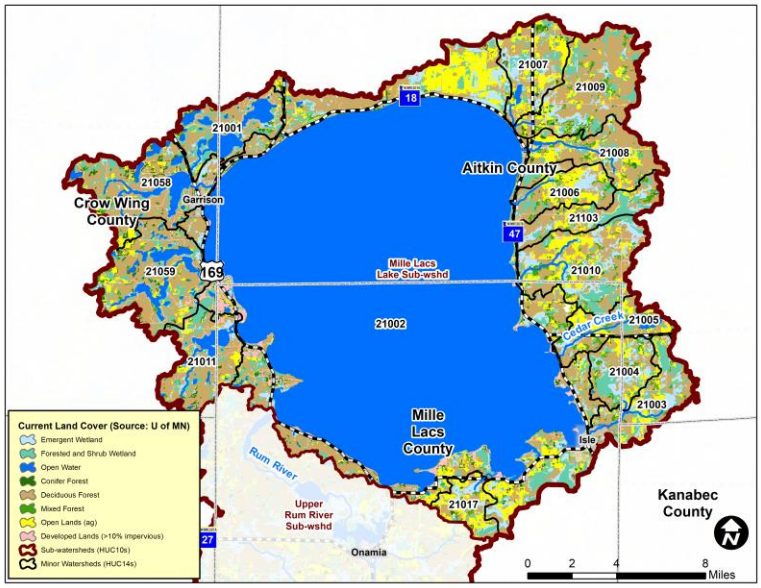
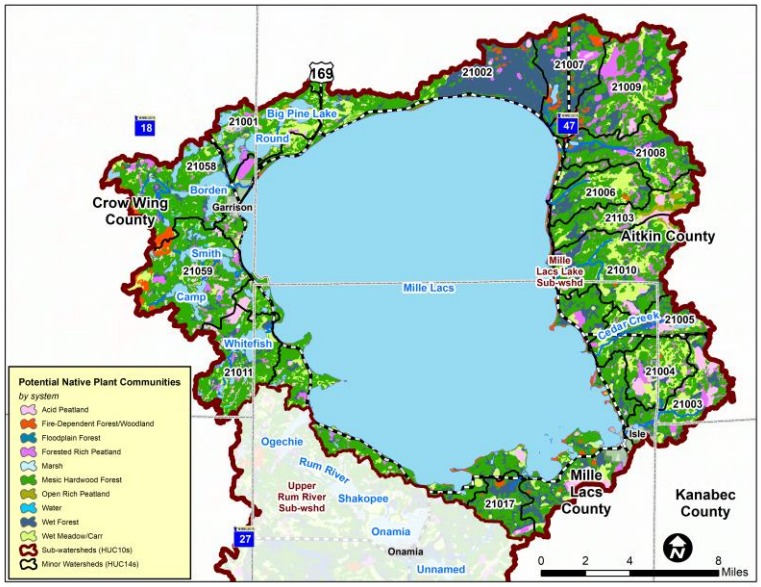


Figure 44. Potential native plant communities.

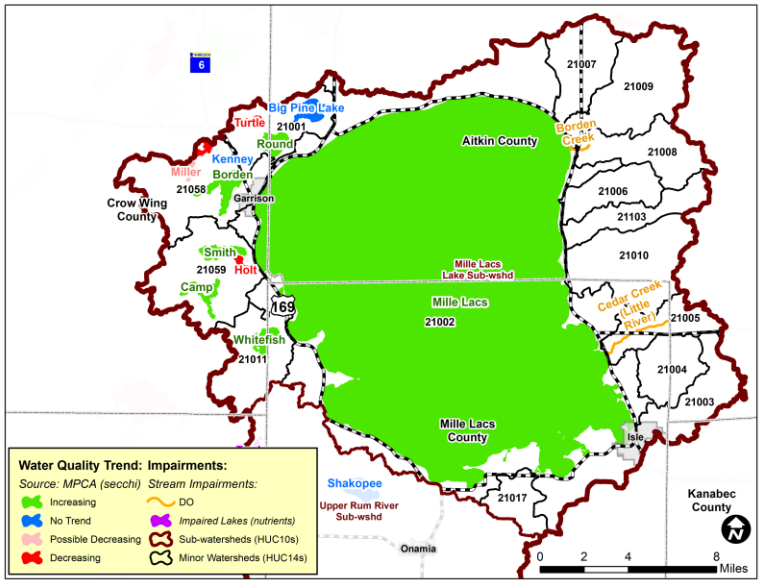


Water Resources Summary

The Mille Lacs Lake Subwatershed contains about 90% of the open water in the entire Rum River Major Watershed. As its name implies, it is also home to Mille Lacs Lake, which is among the most famous fisheries in the country. Many small and medium lakes are also present, and they are concentrated on the western side of the subwatershed. Of the lakes that have available water quality data, six are improving in clarity (including Mille Lacs), three are declining, and two are stable. It should be noted that the improving water quality trend in Mille Lacs may be related to the presence of invasive zebra mussels (*Dreissena polymorpha*). Zebra mussels are filter feeders and since their arrival in Mille Lacs the water clarity has substantially increased, which unfortunately has a negative impact on the light-sensitive walleye population that the lake is known for.

The Mille Lacs Lake Subwatershed also has seven lakes of high or outstanding biodiversity significance, as well as three cisco refuge lakes, 11 priority wild rice lakes, and four priority shallow lakes. Additionally, this subwatershed contains 45 miles of streams, 5.8 miles of which are impaired by dissolved oxygen.

Figure 45. Water quality trends.



Protection Status

78% of the Mille Lacs Lake Subwatershed is currently protected, mostly by public waters as well as county land. This exceeds the subwatershed protection goal of 75%, and therefore the Mille Lacs Lake Subwatershed is a low priority for forest land protection.

Figure 46. Protected lands.

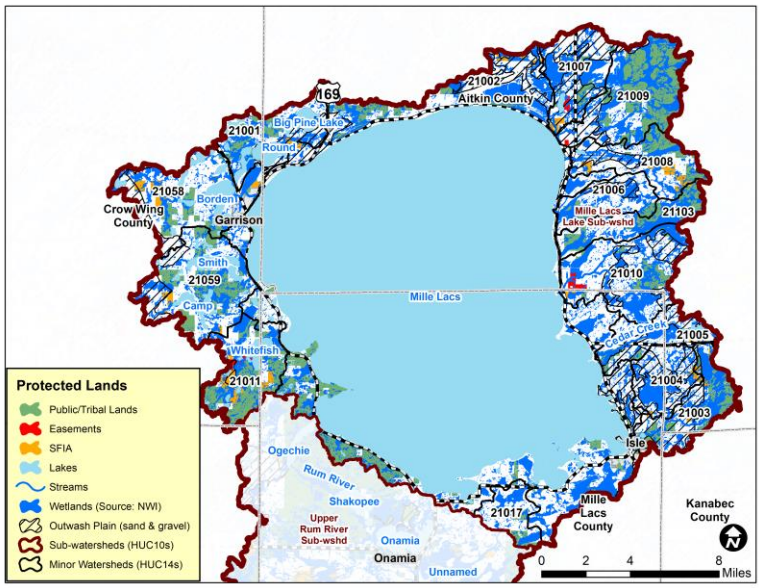
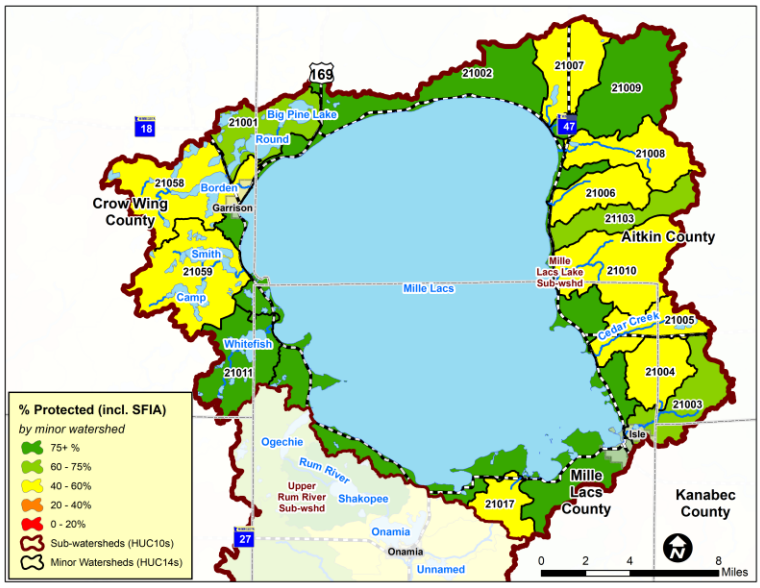


Figure 47. Minor watershed protection levels.



Subwatershed No. 2
Upper Rum River (HUC 701020702)

Description

The Upper Rum River Subwatershed drains 356 square miles of Mille Lacs, Morrison, Kanabec, and Isanti counties and receives water from the Mille Lacs Lake Subwatershed. On a map the subwatershed appears tall and narrow with the Rum River running through the middle of it from north to south. Towards the northern part of the Upper Rum River Subwatershed the Rum River flows through a heavily forested landscape and past popular recreation destinations such as Mille Lacs Kathio State Park and parts of the Rum River State Forest. Near the lower half of the subwatershed the landscape transitions from forests to farmland, and the Rum River eventually exits the subwatershed by the City of Princeton.

Geography

The Upper Rum River Subwatershed has a few different geographical regions that are arrayed from north to south. The area just to the south of Mille Lacs Lake and around Onamia is an end moraine with rolling terrain. South of that but north of Milaca and Highway 23 is the Ann Lake Drumlin Plain LTA. This LTA is characterized by rolling hills formed by the Superior Lobe glacier. Drumlins are common and oriented in either an east-west or southwest-northeast direction. In this area wetlands are common, are long and narrow, and often occur in the low areas between drumlins. Near Milaca and Highway 23 there is a noticeable drop in elevation and the terrain transitions into a rolling loess covered till plain. Lastly, at the very southern end of the subwatershed is a gently rolling to level lake plain that had been occupied by Glacial Lake Hugo.

Figure 48. Elevation.

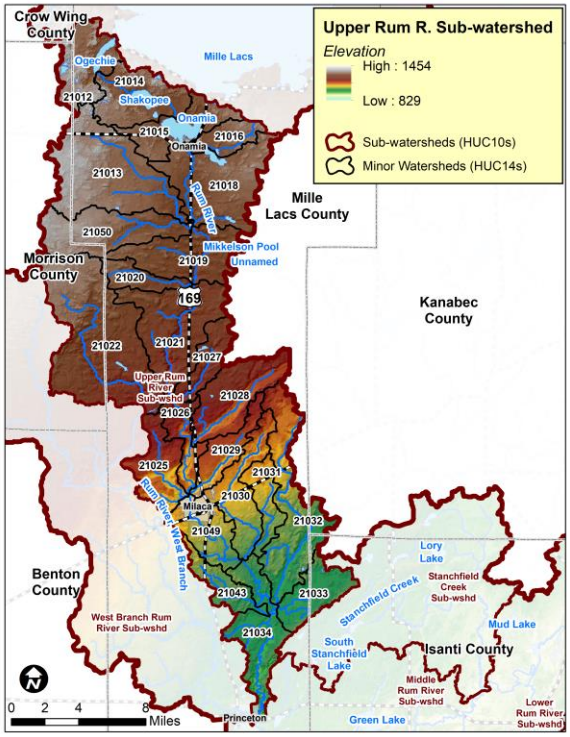
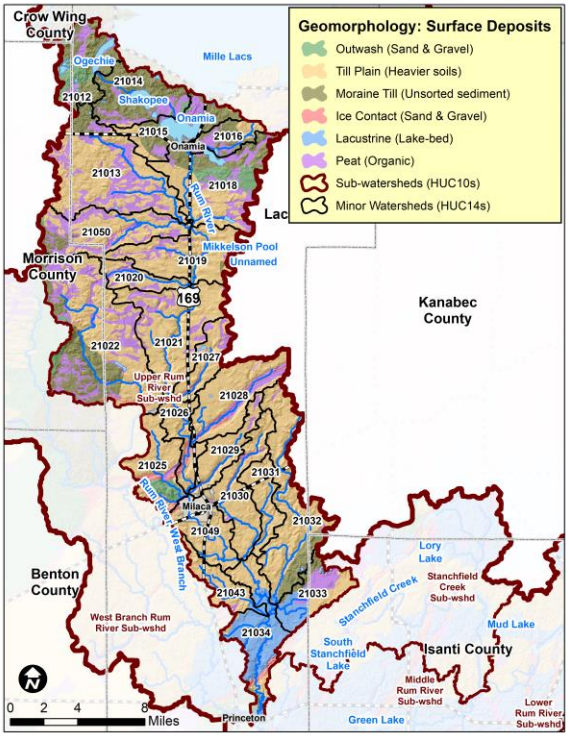


Figure 49. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Upper Rum River Subwatershed was mainly conifer swamps in the lowlands, and northern hardwoods or maple-basswood forests in the uplands. Today the forest remains somewhat intact in the northern half of the subwatershed, but in the southern half most of the forest has been converted to agriculture and only unconnected stands remain. The composition of the remaining forest is a diverse mix of elm/ash/cottonwood, aspen/birch, maple/beech/birch, and oak/hickory forest type groups.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas have the potential to support mesic hardwood NPCs. The lowland areas may support wet forest or wet meadow/carr NPCs.

Figure 48. Historic vegetation cover, Marschner.

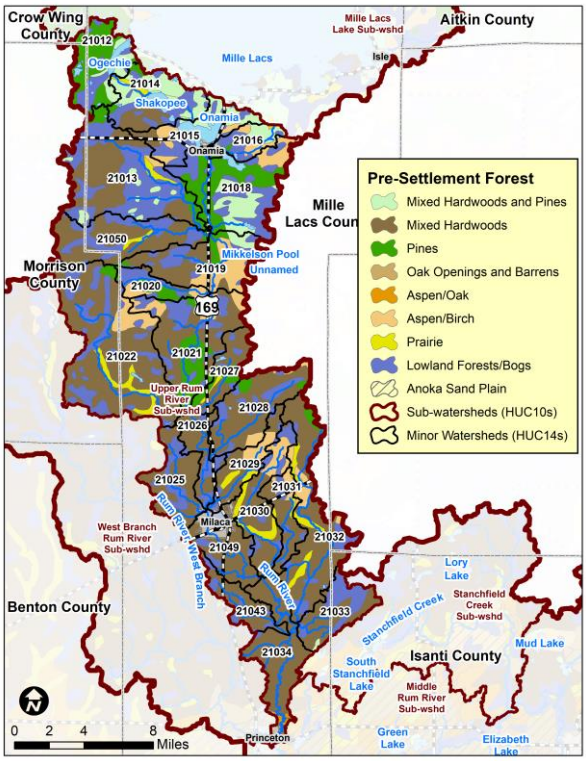


Figure 49. Land cover, 2013.

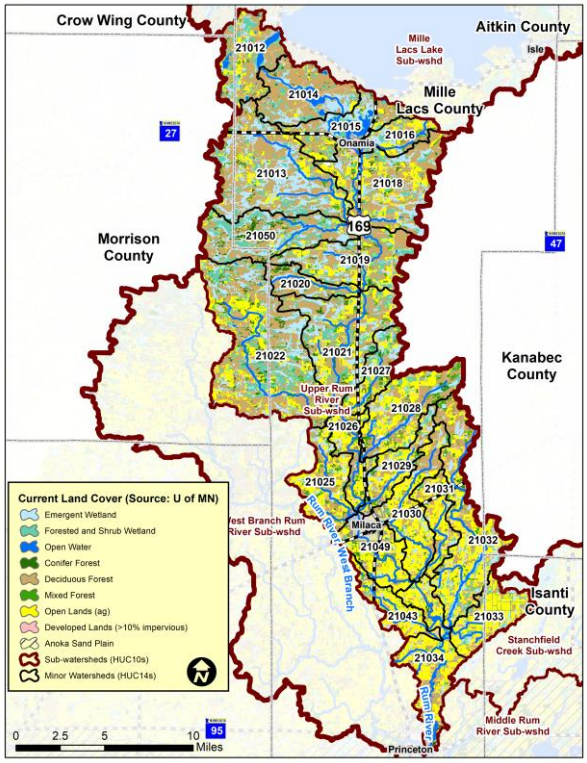
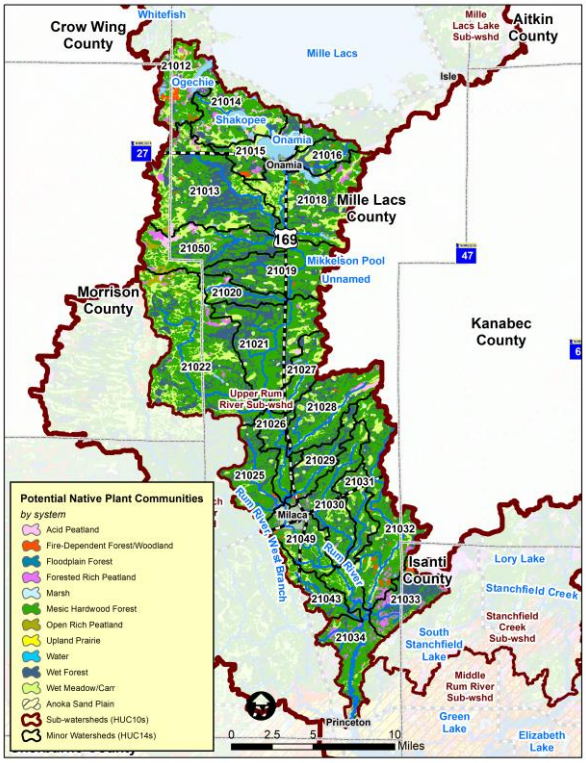


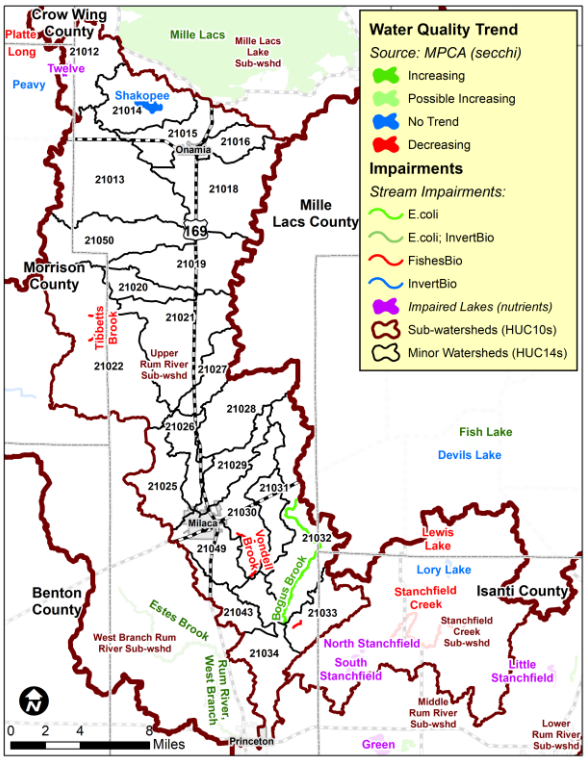
Figure 50. Potential native plant communities.



Water Resources Summary

The Upper Rum River Subwatershed is largely a stream-based watershed with relatively few lakes. As its name implies, it is home to the upper reaches of the Rum River. Shakopee Lake is the only lake in the Upper Rum River Subwatershed with available water quality data, and the trend is stable. This subwatershed also has four lakes of outstanding biodiversity significance, as well as five priority wild rice lakes and six priority shallow lakes. Additionally, this subwatershed contains 189 miles of streams, 21.1 miles of which are impaired by E-coli or fish bioassessments.

Figure 51. Water quality trends.



Protection Status

43% of the Upper Rum River Subwatershed is currently protected, mostly by wetlands as well as state-owned land. Generally, there is less protection in the southern half portion of the subwatershed than in the northern half. To reach the subwatershed protection goal of 53% an additional 22,402 acres need to be protected at an estimated cost of $24,353,241. Fortunately, over 89,000 acres have the potential to protect, although the Rum River Landscape Stewardship Committee recommends prioritizing protection efforts on the Rum River corridor and minor watershed #'s 21019, 21021, and 21027.

Figure 52. Protected lands.

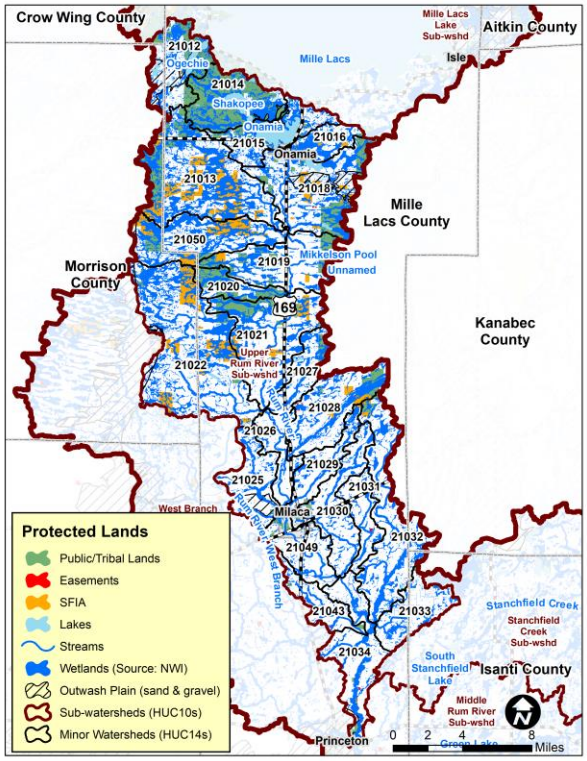
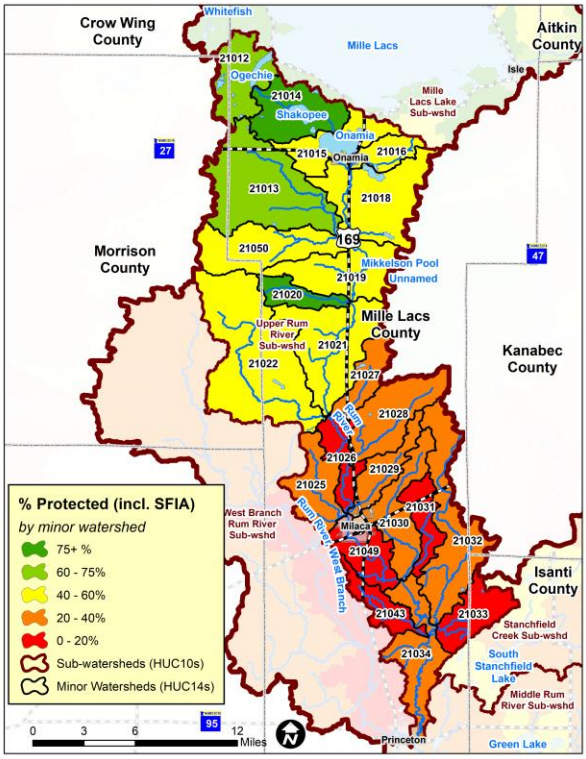


Figure 53. Minor watershed protection levels.



Subwatershed No. 3
West Branch Rum River (HUC 701020703)

Description

The West Branch Rum River Subwatershed is a tributary watershed to the Rum River and drains 185 square miles of Mille Lacs, Benton, and Morrison counties. The subwatershed is long and narrow with the West Branch Rum River running through the middle of it in a northwest-southeast direction. The dominant land use is agriculture, although a couple larger patches of intact forests and wetlands are present in the northern half of the subwatershed. The outlet of the West Branch Rum River is by the City of Princeton, which is located at the confluence of the West Branch Rum River and the main branch of the Rum River.

Geography

The West Branch Rum River Subwatershed, like the Upper Rum River Subwatershed to its east, has a few different geographical regions. The headwaters to the West Branch Rum River are in the northwestern portion of the subwatershed and the terrain is a rolling plain with abundant drumlins and wetlands orientated in an east-west direction. South of that area but north of Foreston and Highway 23 is the Ann Lake Drumlin Plain LTA, which is characterized by rolling hills and drumlins. The southern half of the West Branch Rum River Subwatershed is mostly in the Milaca Till Plain LTA and is largely covered by a rolling loess covered till plain. Lastly, at the southeastern end of the subwatershed is a gently rolling to level lake plain that had been occupied by Glacial Lake Hugo.

Figure 54. Elevation.

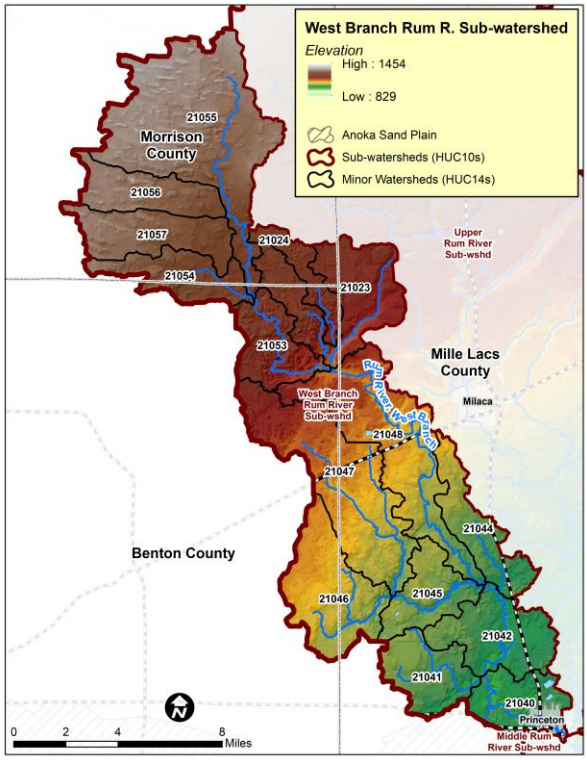
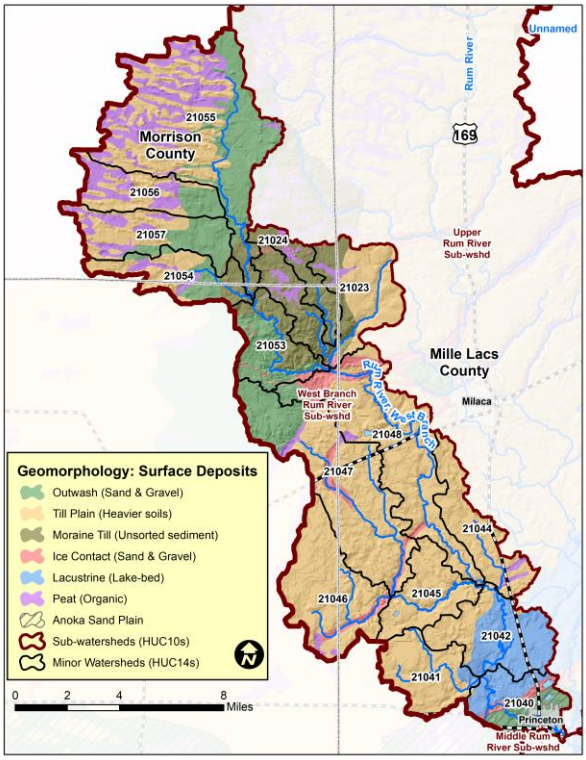


Figure 55. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the West Branch Rum River Subwatershed was mainly conifer swamps or lowland hardwood forests in the lowlands, and maple-basswood or northern hardwoods forests in the uplands. Today most of the forest has been converted to agriculture, although a few patches remain in the northern half of the subwatershed. The composition of the remaining forest is largely aspen/birch and maple/beech/birch, although some elm/ash/cottonwood and oak/hickory forest type groups are present as well.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas have the potential to support mesic hardwood NPCs. The lowland areas may support wet forest or wet meadow/carr NPCs.

Figure 56. Historic vegetation cover, Marschner.

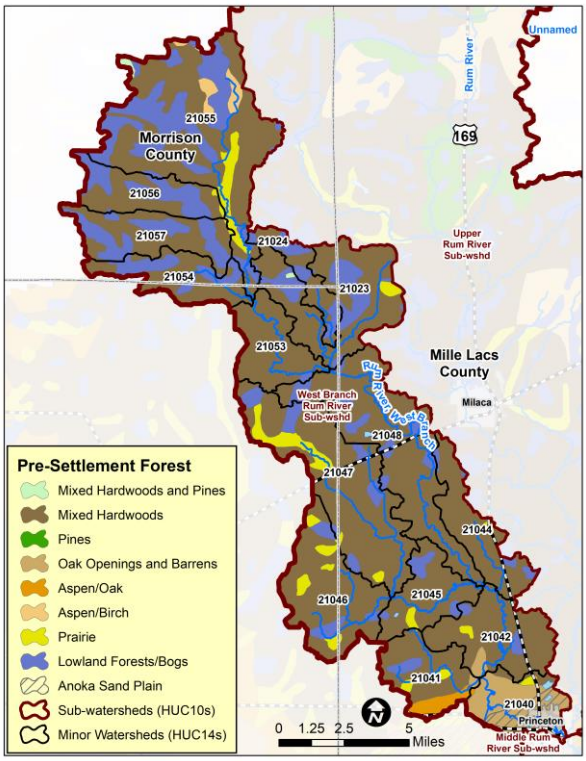


Figure 57. Land cover, 2013.

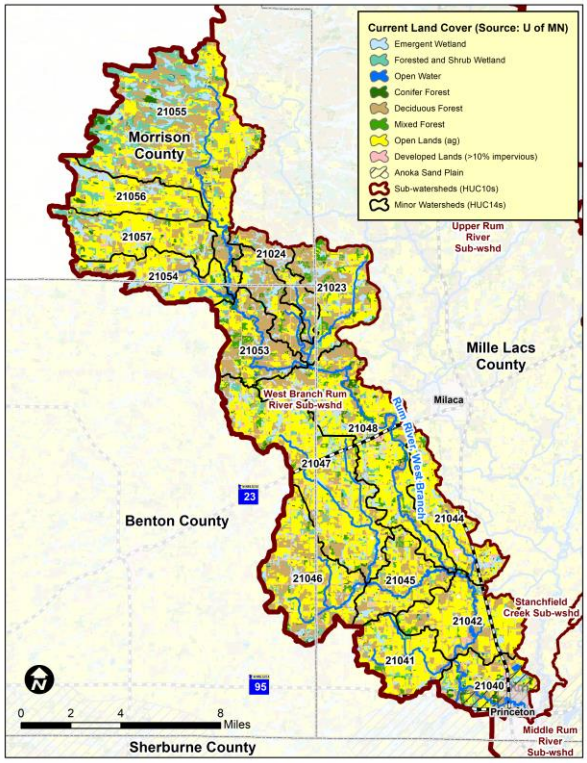
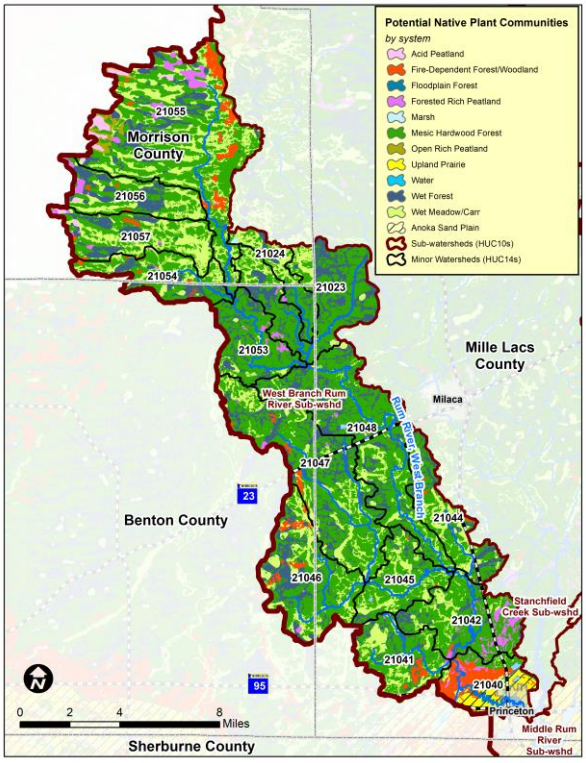


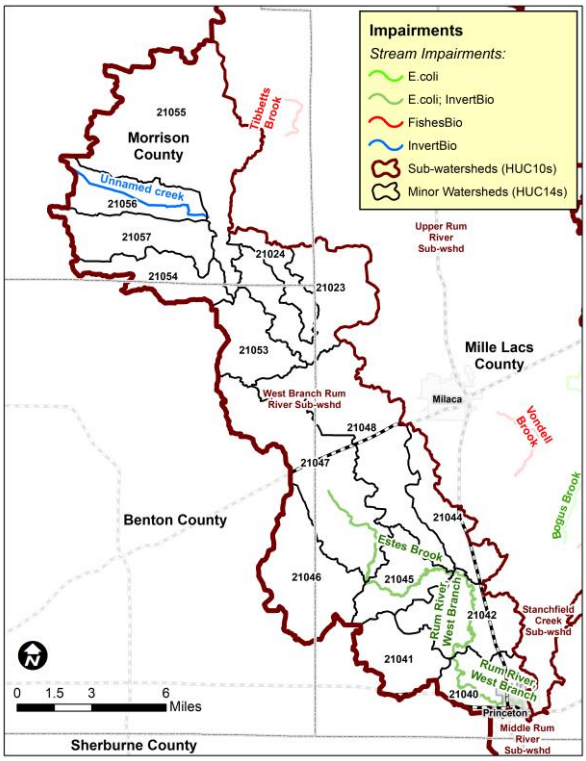
Figure 58. Potential native plant communities.



Water Resources Summary

The West Rum River Subwatershed is largely a stream-based watershed with relatively few lakes. As its name implies, it is home to the West Branch Rum River. This subwatershed has no lakes with water quality data nor any lakes with quality indicators (e.g. lakes of biodiversity significance, wild rice lakes, priority shallow lakes, etc.). The West Rum River Subwatershed does have 109 miles of streams, 35.9 of which are impaired by E-coli or invertebrate bioassessments.

Figure 59. Water quality trends.



Protection Status

19% of the West Branch Rum River Subwatershed is currently protected, mostly by wetlands. To reach the subwatershed protection goal of 29% an additional 11,465 acres need to be protected at an estimated cost of $12,380,873. Fortunately, over 58,000 acres have the potential to protect, although the Rum River Landscape Stewardship Committee recommends prioritizing protection efforts on minor watershed #'s 7050, 7052, 7053, 7061, 7062, 7083, and 7084.

Figure 60. Protected lands.

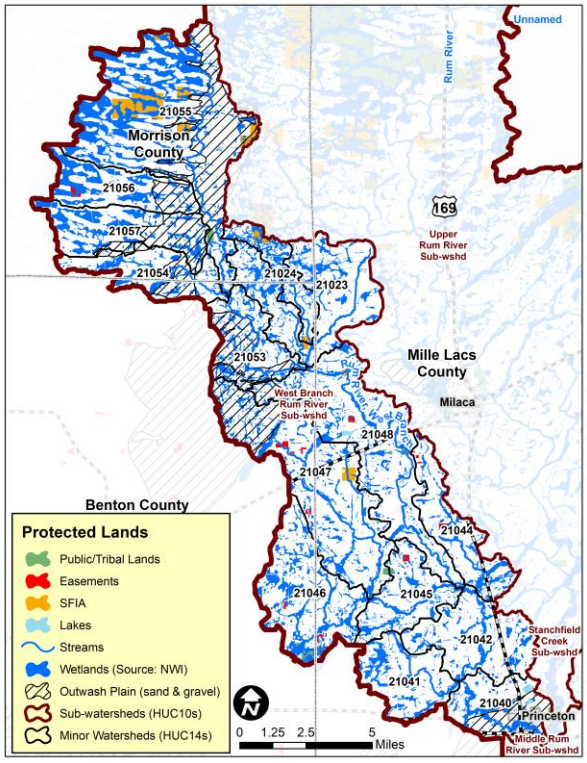
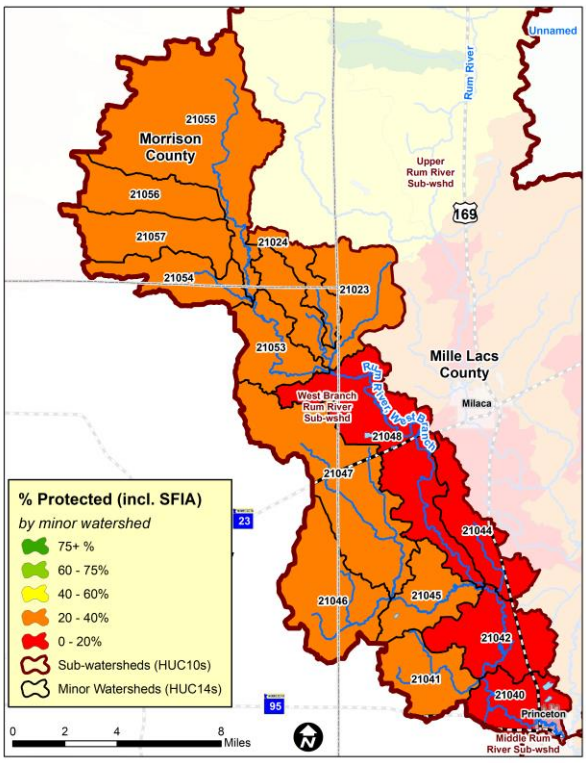


Figure 61. Minor watershed protection levels.

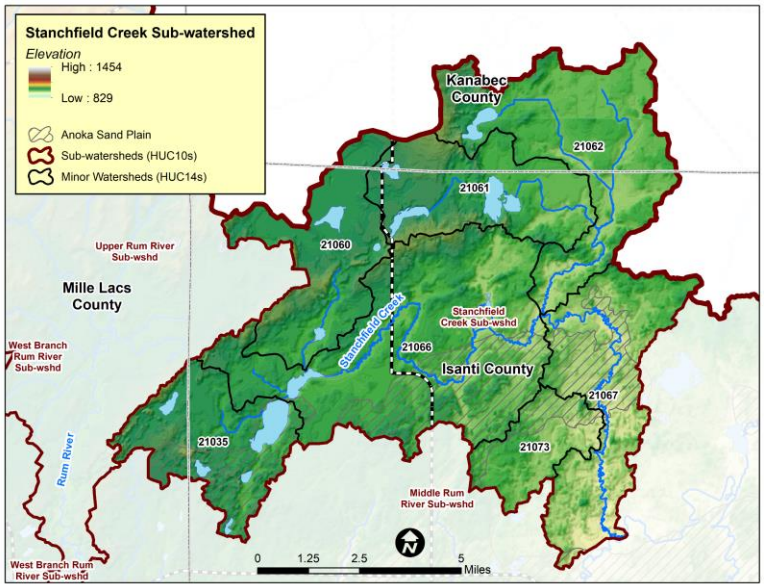


Subwatershed No. 4
Stanchfield Creek (HUC 701020704)

Description

The Stanchfield Creek Subwatershed is a tributary watershed to the Rum River and drains 96 square miles of Isanti, Kanabec, and Mille Lacs counties. The subwatershed is roughly triangular-shaped and the headwaters to Stanchfield Creek and its tributaries are located near the western and northern corners. The dominant land use is agriculture, although some relatively larger patches of forest and wetland cover are present near the lower reaches of Stanchfield Creek. The outlet to Stanchfield Creek and its merging with the Rum River is located near the southern corner of the subwatershed.

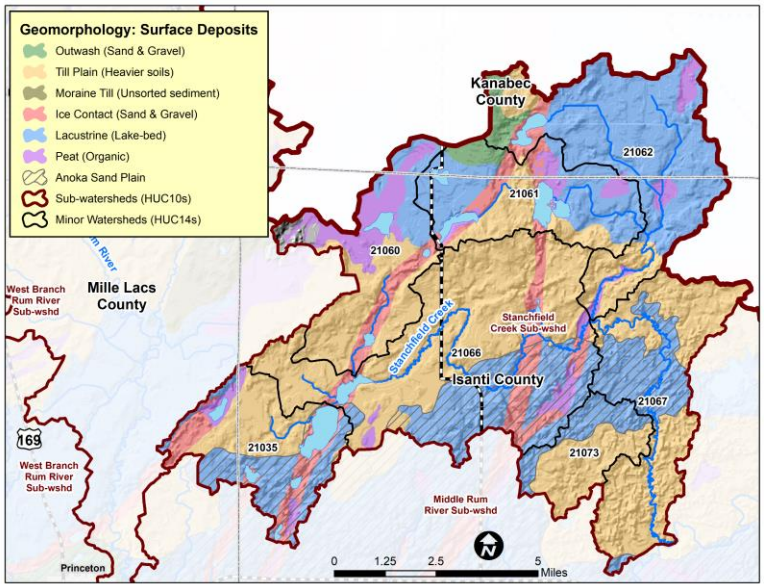
Figure 62. Elevation.



Geography

The Stanchfield Creek Subwatershed is largely split between till plain and lake plain landforms. The center of the subwatershed is part of the Elm Park Till Plain LTA, which is characterized by a rolling till plain formed by the Grantsburg Sublobe glacier. To the north and south of the Elm Park Till Plain LTA are level to gently rolling lake plains. Additionally, a few channels of ice contact deposits run across the Stanchfield Creek Subwatershed in a southwest-northeast direction.

Figure 63. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The boundary between the Laurentian Mixed Forest (LMF) and the Eastern Broadleaf Forest (EBF) provinces crosses the Stanchfield Creek Subwatershed, but the subwatershed is mainly on the LMF side. Historically, the uplands were maple-basswood, oak forest, or oak savanna while the lowlands were conifer swamps. Oak forest and oak savanna may have been more abundant on the EBF side while maple-basswood forests and conifer swamps were more abundant on the LMF side. Today most of the forest and savanna has been converted to agriculture, and the remaining forest exists as unconnected stands. The composition of the remaining forest is a mixture of elm/ash/cottonwood, maple/beech/birch, aspen/birch, and oak/hickory forest type groups.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas on the LMF side have the potential to support mesic hardwoods NPCs, while uplands on the EBF side may support fire-dependent NPCs. The lowland areas have the potential to support forested rich peatland, wet forest, or wet meadow/carr NPCs.

Figure 64. Historic vegetation cover, Marschner.

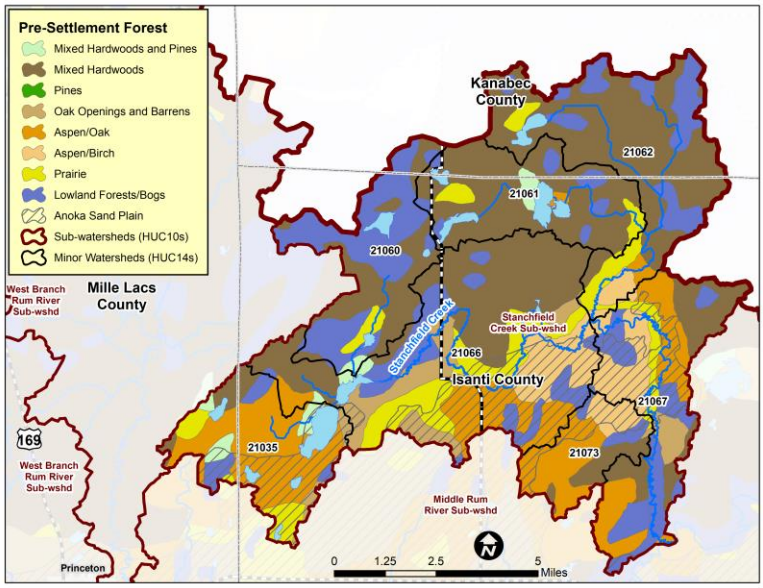


Figure 65. Land cover, 2013.

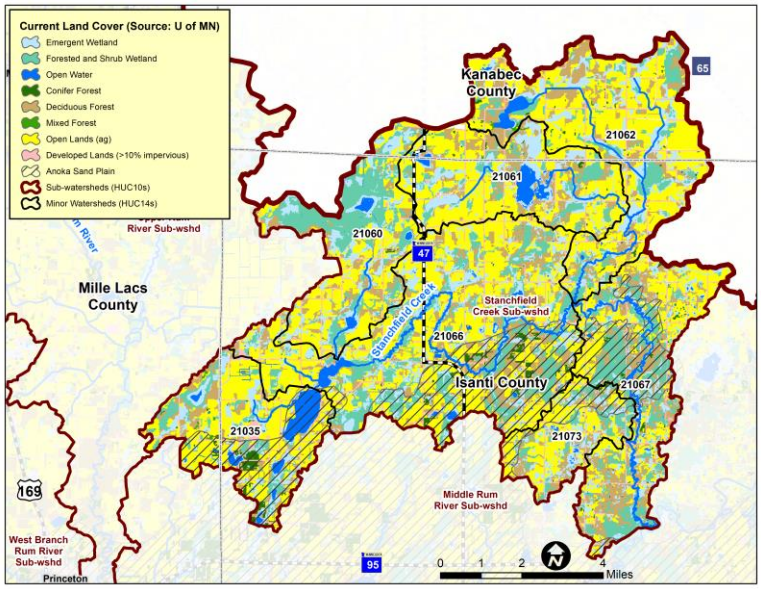
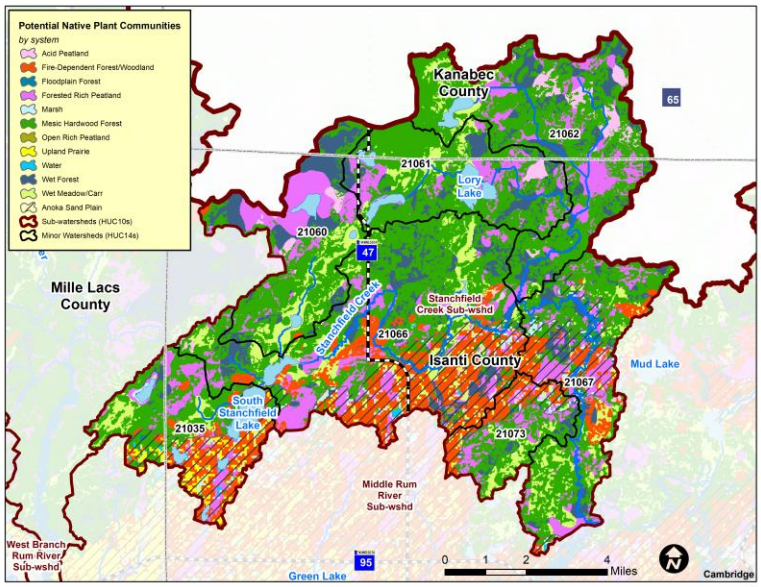


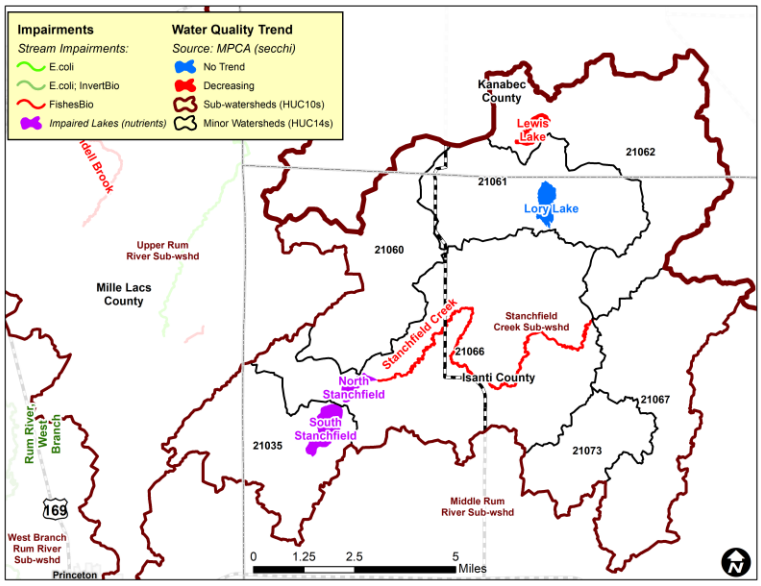
Figure 66. Potential native plant communities.



Water Resources Summary

The Stanchfield Creek Subwatershed is as its name implies, home to Stanchfield Creek, as well as several small and medium sized lakes near the subwatershed headwaters. Of the lakes with available water quality data, one is declining improving in water clarity, one is stable, and two are impaired by nutrients. This subwatershed also has one lake of high biodiversity significance, as well as four priority wild rice lakes and four priority shallow lakes. Additionally, the Stanchfield Creek Subwatershed contains 46 miles of streams, 14.9 miles of which are impaired by fish bioassessments.

Figure 67. Water quality trends.



Protection Status

33% of the Stanchfield Creek Subwatershed is currently protected, mostly by wetlands. To reach the subwatershed protection goal of 43% an additional 6,465 acres need to be protected at an estimated cost of $$8,577,251. Fortunately, over 16,000 acres have the potential to protect, although the Rum River Landscape Stewardship Committee recommends prioritizing protection efforts on minor watershed #'s 21060, 21062, 21066, 21067, and 21073.

Figure 68. Protected lands.

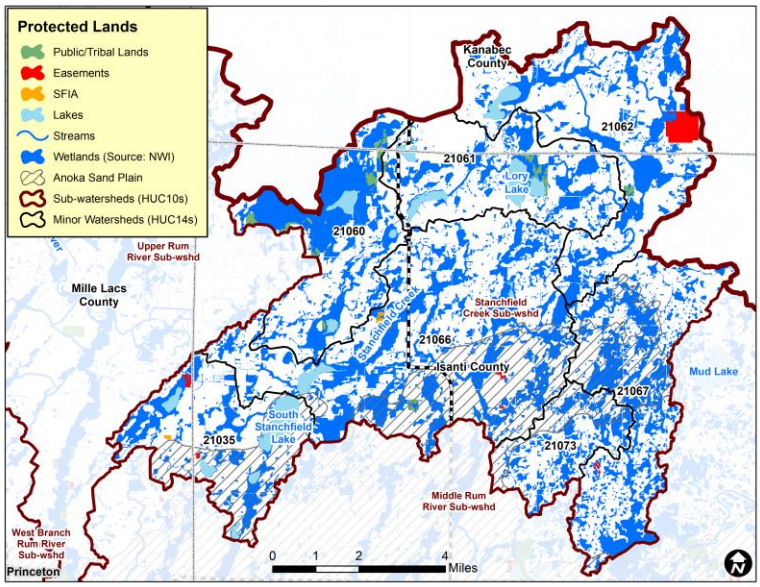
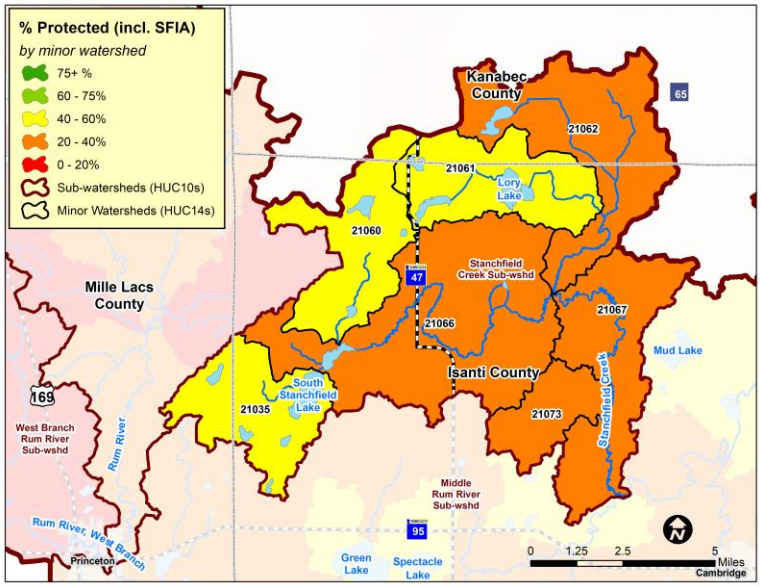


Figure 69. Minor watershed protection levels.

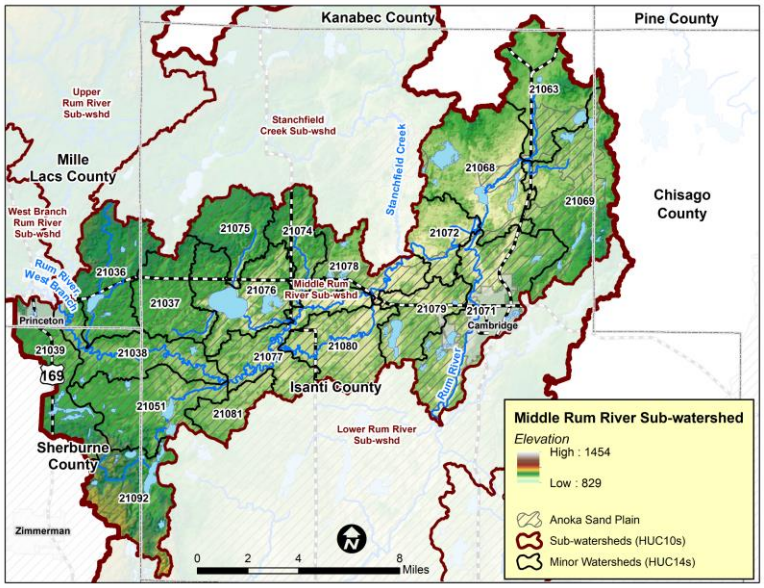


Subwatershed No. 5
Middle Rum River (HUC 701020705)

Description

The Middle Rum River Subwatershed drains 198 square miles of Isanti, Sherburne, Mille Lacs, Kanabec, and Chisago counties. It also receives water from the Upper Rum River, West Branch Rum River, and Stanchfield Creek subwatersheds. The subwatershed inlet is located at the City of Princeton, which is at the confluence of the West Branch Rum River and the main branch of the Rum River at the western end of the subwatershed. South of Princeton the Rum River turns east and meanders about 17 miles before turning south again where it flows past the city of Cambridge before exiting the subwatershed. Agriculture is the dominant land use in the Middle Rum River Subwatershed, although patches of forest and wetlands are present throughout the subwatershed, as well as along the Rum River corridor.

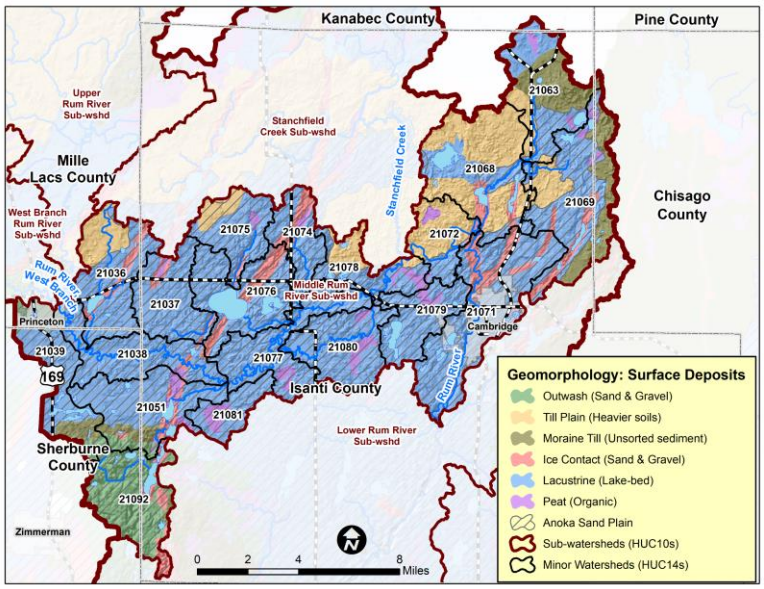
Figure 70. Elevation.



Geography

The Middle Rum River Subwatershed is mostly covered by a nearly level to gently rolling lake plain formed by melt water from the Grantsburg Sublobe. Some areas along the northern border to the subwatershed are covered by till plain, and the southwestern corner of the subwatershed is part of the Elk River Moraine. The Elk River Moraine is a rolling to steep pitted outwash plain formed by the Superior Lobe glacier

Figure 71. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The boundary between the Laurentian Mixed Forest (LMF) and the Eastern Broadleaf Forest (EBF) provinces crosses the Middle Rum River Subwatershed, but the subwatershed is mainly on the EBF side. Historically, the uplands on the LMF side were maple-basswood forest, but on the EBF side the uplands were oak savanna. Additionally, the uplands on both sides had some oak forests and the lowlands were conifers swamps and marsh. Today most of the forest and savanna has been converted to agriculture or development; and the remaining forest exists in unconnected stands and the riparian corridor along the Rum River. The composition of the remaining forest is a mixture of pine (usually as plantations), oak/hickory, elm/ash/cottonwood, and aspen/birch forest type groups.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas on the LMF side have the potential to support mesic hardwoods NPCs, while uplands on the EBF side may support fire-dependent or prairie (which includes oak savanna) NPCs. Additionally, the floodplain along the Rum River may support floodplain forest NPCs, while the lowlands elsewhere are more likely to support forested rich peatland, wet meadow, or marsh NPCs.

Figure 72. Historic vegetation cover, Marschner.

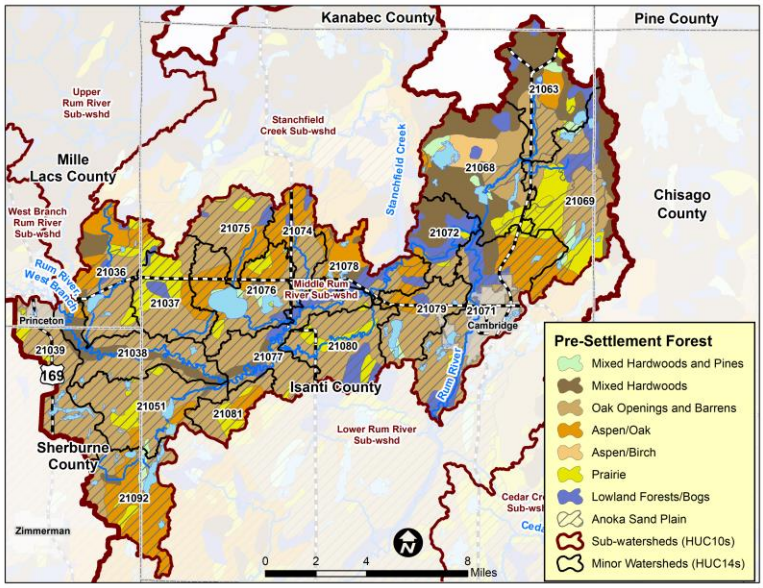


Figure 73. Land cover, 2013.

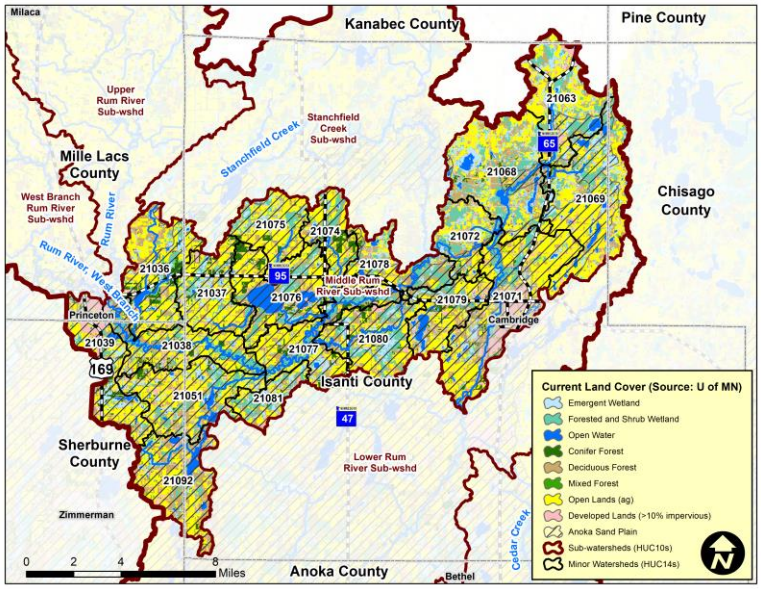
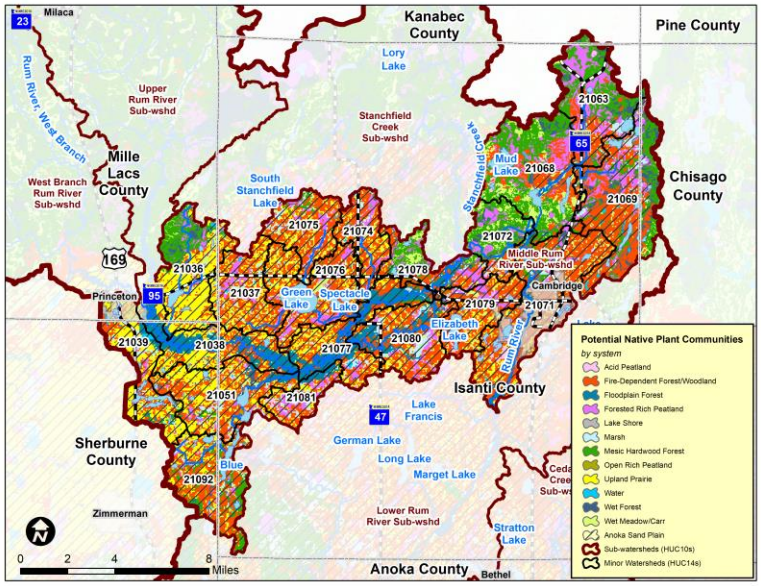


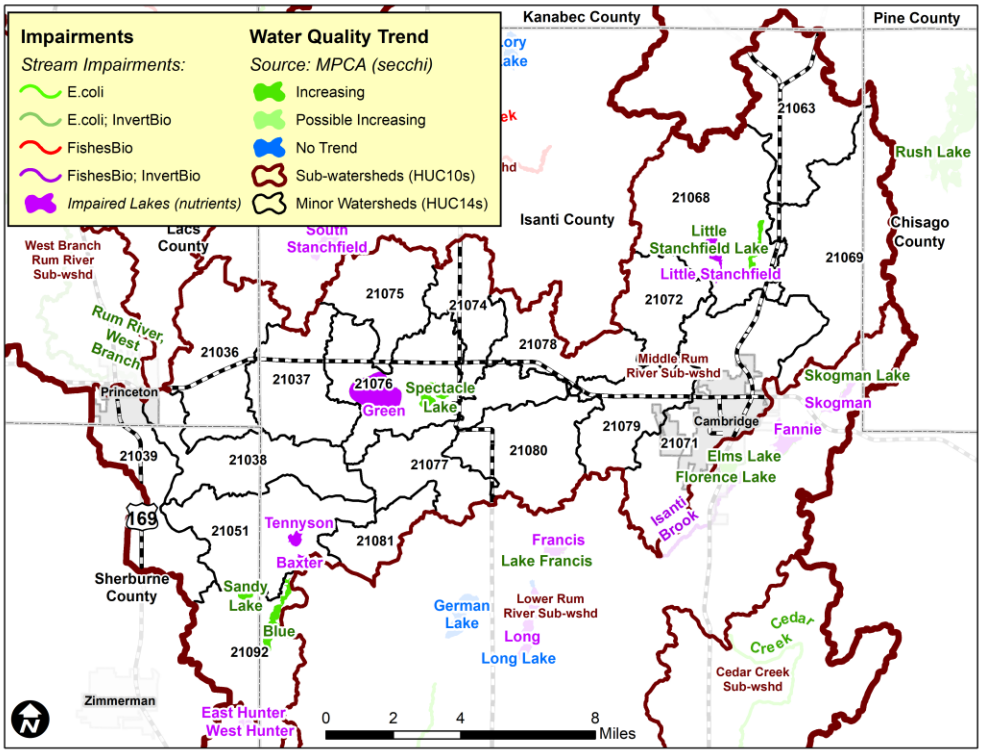
Figure 74. Potential native plant communities.



Water Resources Summary

The Middle Rum River Subwatershed is as its name implies, home to the middle reaches of the Rum River, as well as several small and medium sized lakes. Of the lakes with available water quality data, four are improving in water clarity, but four are impaired – mainly by nutrients. This subwatershed also has one lake of high biodiversity significance, as well as five priority wild rice lakes and three priority shallow lakes. Additionally, the Middle Rum River Subwatershed contains 91 miles of streams, none of which are impaired by anything other than mercury in fish tissue.

Figure 75. Water quality trends.



Protection Status

29% of the Middle Rum River Subwatershed is currently protected, mostly by wetlands. To reach the subwatershed protection goal of 39% an additional 13,007 acres need to be protected at an estimated cost of $20,009,261. Fortunately, over 32,000 acres have the potential to protect, although the Rum River Landscape Stewardship Committee recommends prioritizing protection efforts on the Rum River corridor and minor watershed #'s 21038, 21051, 21077, 21078, 21080, 21081, and 21092.

Figure 76. Protected lands.

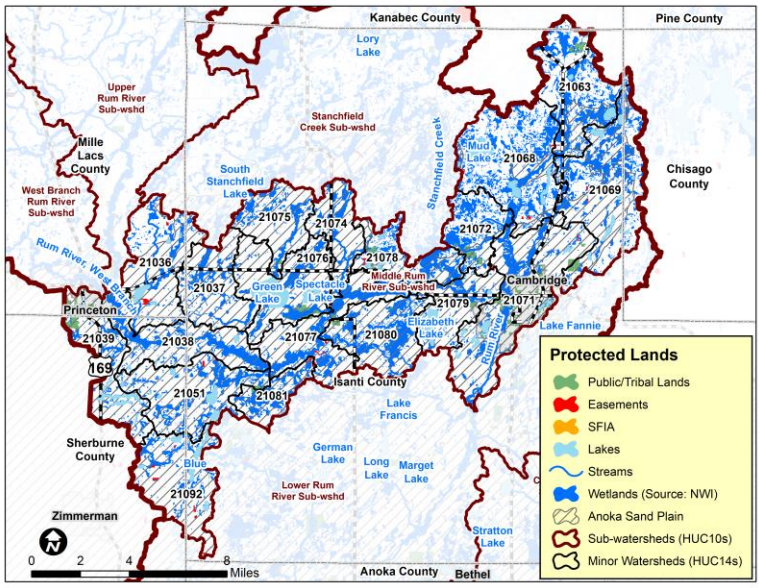
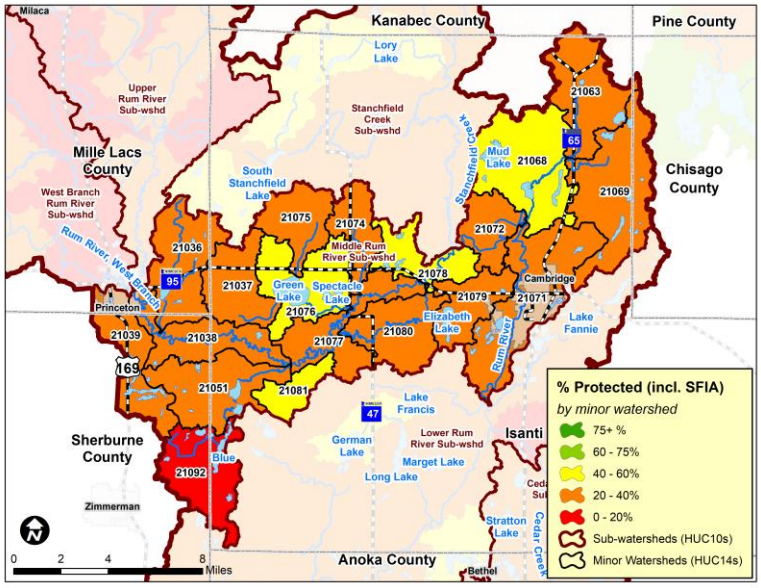


Figure 77. Minor watershed protection levels.



Subwatershed No. 6
Cedar Creek (HUC 701020706)

Description

The Cedar Creek Subwatershed is a tributary watershed to the Rum River and drains 84 square miles of Anoka and Isanti counties. The subwatershed is taller (north to south) than it is wide (east to west), with the headwaters to Cedar Creek located at its northern end. Cedar Creek runs south-southwest out of the headwaters and is joined by several smaller streams that flow out of the many lakes in the area before merging with the Rum River near the subwatershed's southwestern end. Land use in the Cedar Creek Subwatershed is a mixture of wetlands, forests, agriculture, and development. Given the subwatershed's location near the expanding metro area it is likely that development will continue to increase.

Geography

The majority of Cedar Creek Subwatershed is covered by the Anoka Lake Plain LTA, which is characterized by a nearly level to gently rolling lake plain formed by melt water from the Grantsburg Sublobe. The soil parent material is fine sand and some areas have been reworked by wind to form dunes. The headwaters to Cedar Creek are in the northern end of the subwatershed, and this area differs from the rest of the subwatershed in that it is within the rolling to steep terrain of the Rush City Moraine.

Figure 78. Elevation.

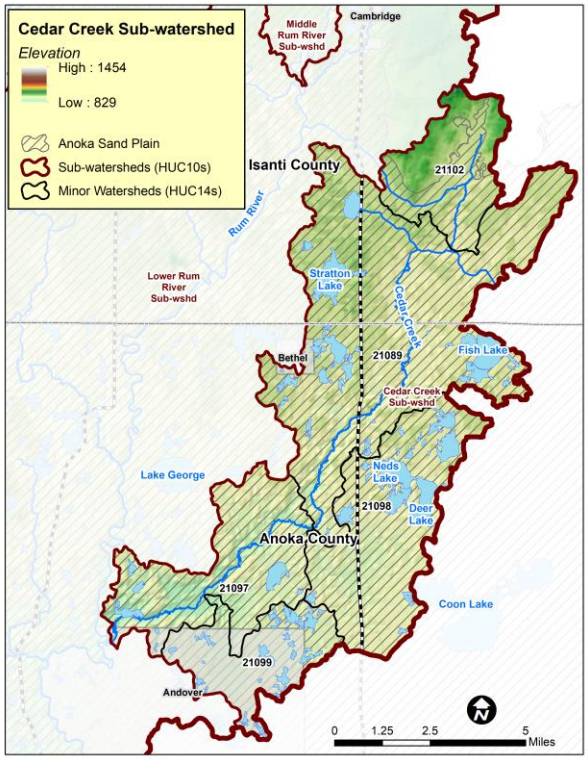
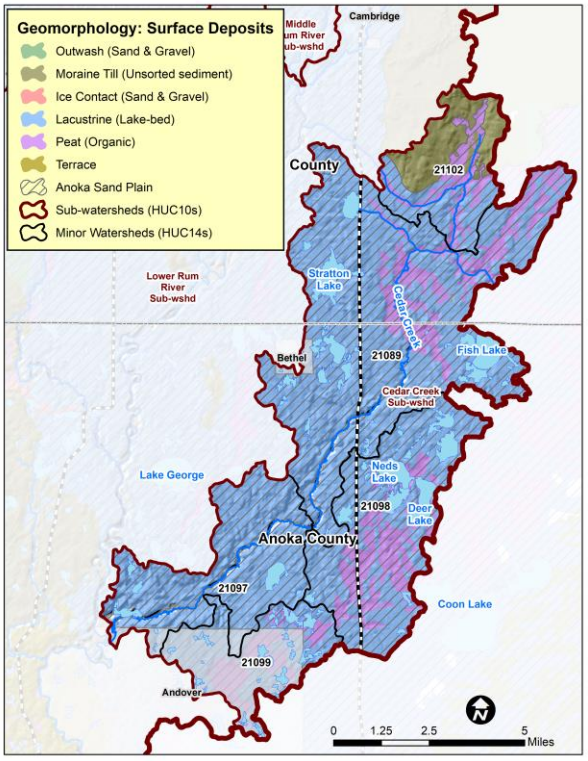


Figure 79. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Cedar Creek Subwatershed was mainly oak savanna or oak forest in the uplands, and marshes or conifer swamps in the lowlands. Today most of the forest has been converted to agriculture or development, and the remaining forest exists as unconnected stands. The composition of the remaining forest is a mixture of elm/ash/cottonwood, maple/beech/birch, and oak/hickory forest type groups.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas have the potential to support fire-dependent or prairie (which includes oak savanna) NPCs. The lowland areas may support marsh, forested rich peatland, wet meadow/carr, or wet forest NPCs.

Figure 80. Historic vegetation cover, Marschner.

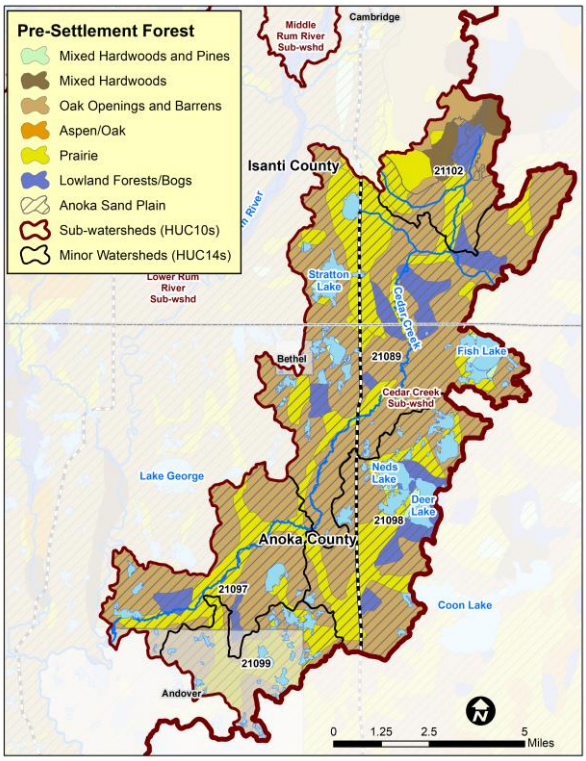


Figure 81. Land cover, 2013.

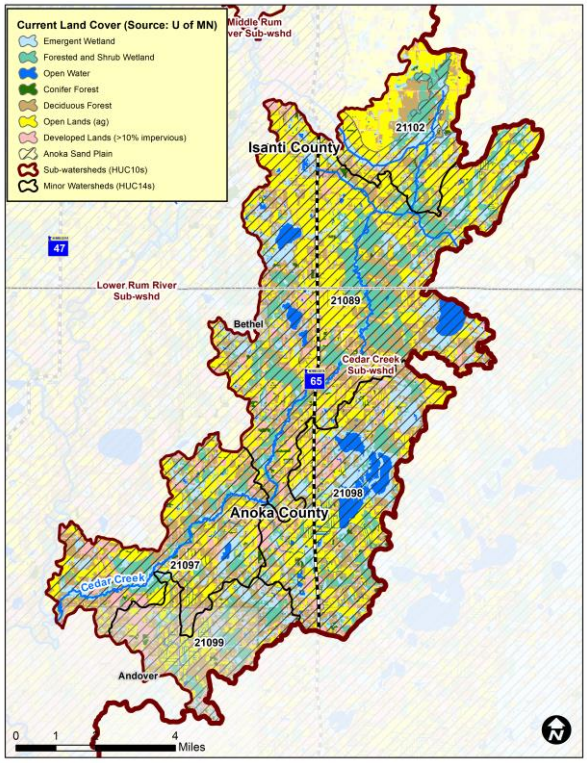
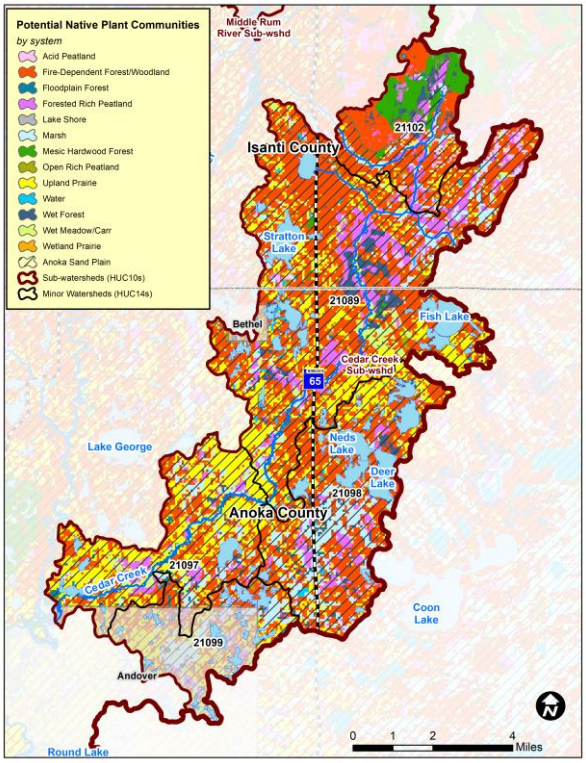


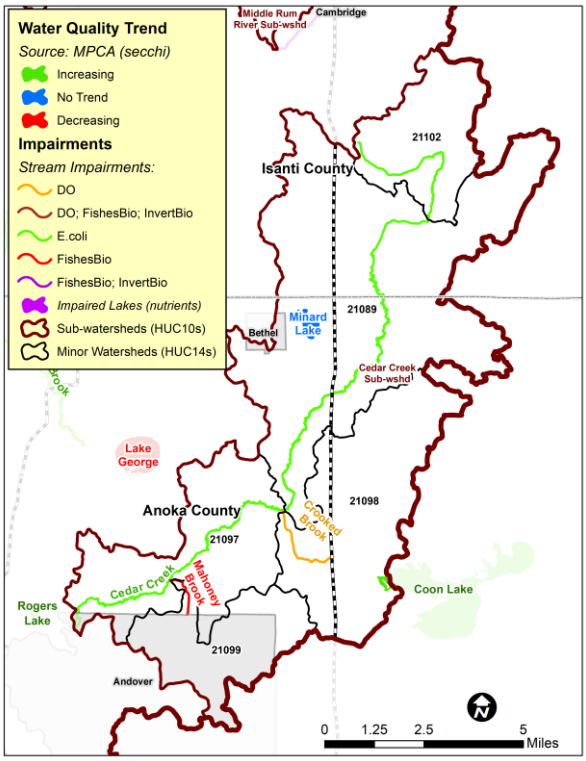
Figure 82. Potential native plant communities.



Water Resources Summary

The Cedar Creek Subwatershed is as its name implies, home to Cedar Creek, as well as many small lakes. Menard Lake is the only lake in this subwatershed with available water quality data, and the trend is stable. This subwatershed also has one lake of outstanding biodiversity significance, as well as two priority wild rice lakes and four priority shallow lakes. Additionally, the Cedar Creek Subwatershed contains 36 miles of streams, 32.1 miles of which are impaired by E-coli, dissolved oxygen, or fish bioassessments.

Figure 83. Water quality trends.



Protection Status

38% of the Cedar Creek Subwatershed is currently protected, mostly by wetlands and public land. To reach the subwatershed protection goal of 43% an additional 2,741 acres need to be protected at an estimated cost of $5,007,908. Fortunately, nearly 9,000 acres have the potential to protect, although the Rum River Landscape Stewardship Committee recommends prioritizing protection efforts on minor watershed #'s 21089, 21098, 21102.

Figure 84. Protected lands.

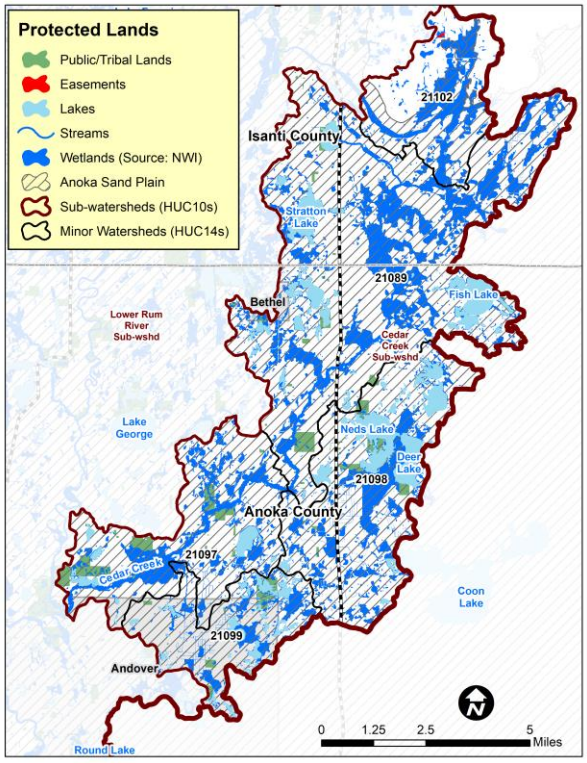
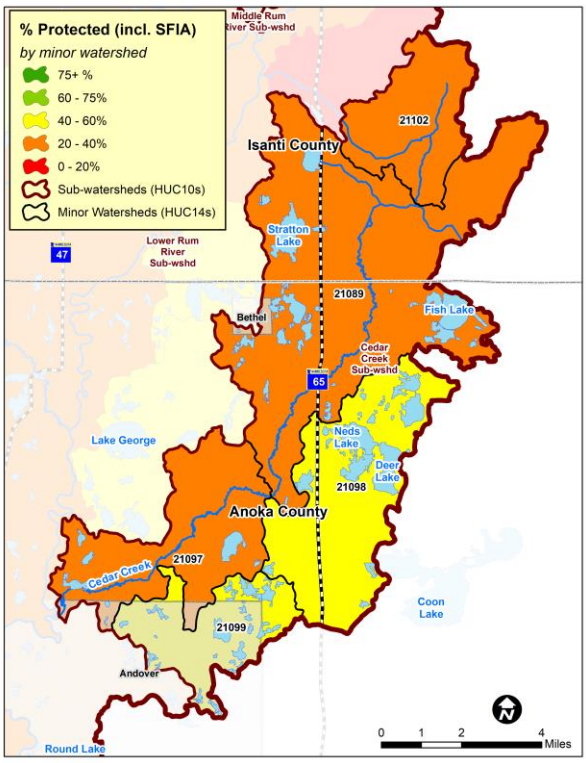


Figure 85. Minor watershed protection levels.



Subwatershed No. 7
Lower Rum River (HUC 701020707)

Description

The Lower Rum River Subwatershed drains 248 square miles of Anoka, Sherburne, Isanti, and Chisago counties. It also receives water from the Middle Rum River and Cedar Creek subwatersheds. The subwatershed inlet is located near the city of Isanti towards the subwatershed's northern end. From there the Rum River flows south and is joined by several smaller rivers and streams before merging with the Mississippi River by Anoka and Champlin. Land use in the Lower Rum River Subwatershed is a mixture of wetlands, forests, agriculture, and development. Given the subwatershed's location near the expanding metro area it is likely that development will continue to increase.

Geography

The Lower Rum River Subwatershed has a fairly diverse geomorphology. The northeast portion of the subwatershed (the area to the east of Highway 65) is a rolling to steep end moraine. The center of the Lower Rum River Subwatershed is a nearly level to gently rolling lake plain formed by melt water from the Grantsburg Sublobe. To the west of the lake plain is the Burns Till Plain LTA, which is characterized by a steep stagnation moraine formed by the Grantsburg Sublobe. Lastly, the southern end of the subwatershed intersects the Mississippi Sand Plain LTA, which has a nearly level to rolling terrain and is defined by outwash channels and post-glacial river terraces.

Figure 86. Elevation.

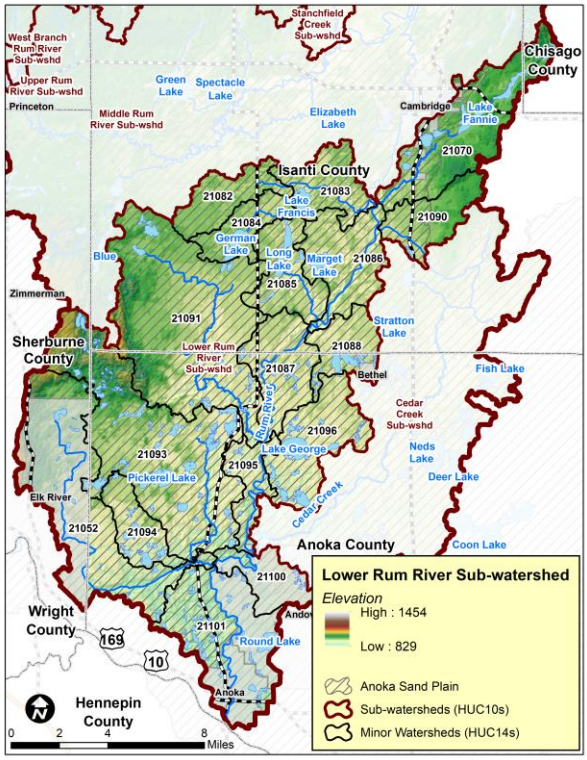
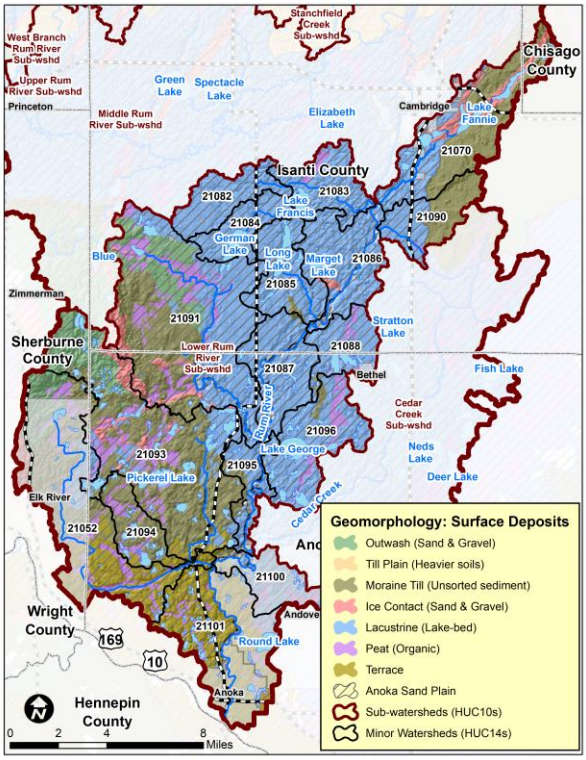


Figure 87. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Lower Rum River Subwatershed was mainly oak savanna or oak forest in the uplands, and marshes or conifer swamps in the lowlands. Today most of the forest has been converted to agriculture or development, and the remaining forest exists as unconnected stands. The composition of the remaining forest is a mixture of elm/ash/cottonwood, maple/beech/birch, aspen/birch, and oak/hickory forest type groups.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas outside of the Burns Till Plain LTA have the potential to support fire-dependent or prairie (which includes oak savanna) NPCs. Inside of the Burns Till Plain LTA the upland areas have the potential to support mesic hardwood NPCs. The lowland areas may support marsh, wet meadow/carr, forested rich peatland, or floodplain forest NPCs.

Figure 88. Historic vegetation cover, Marschner.

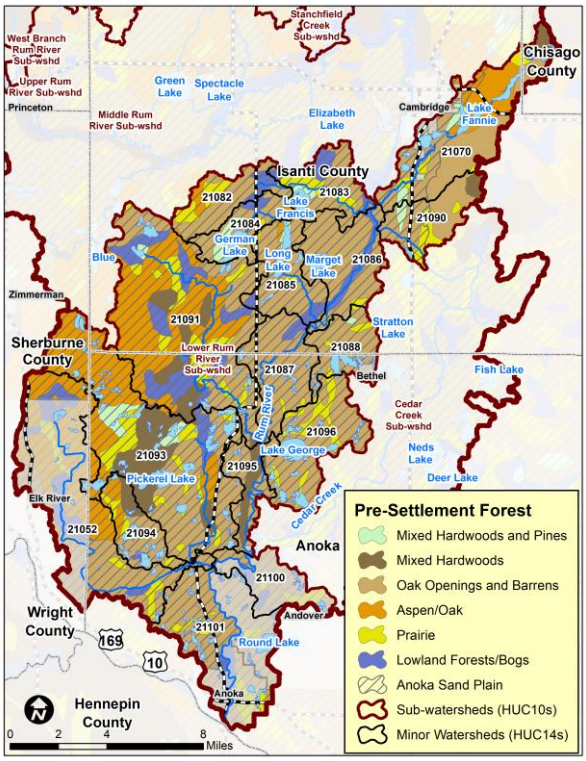


Figure 89. Land cover, 2013.

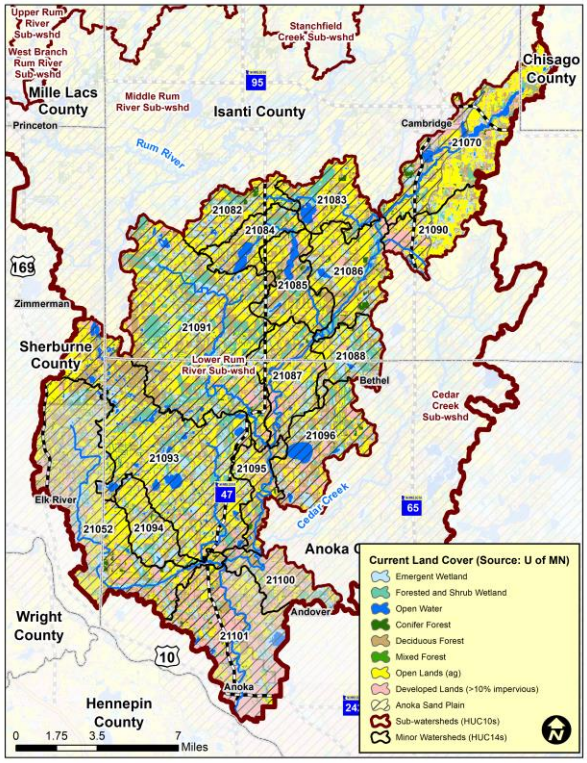
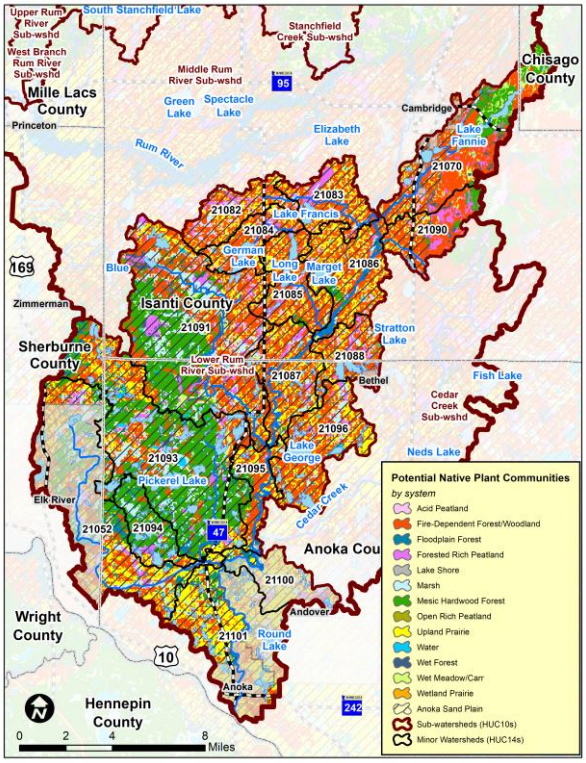


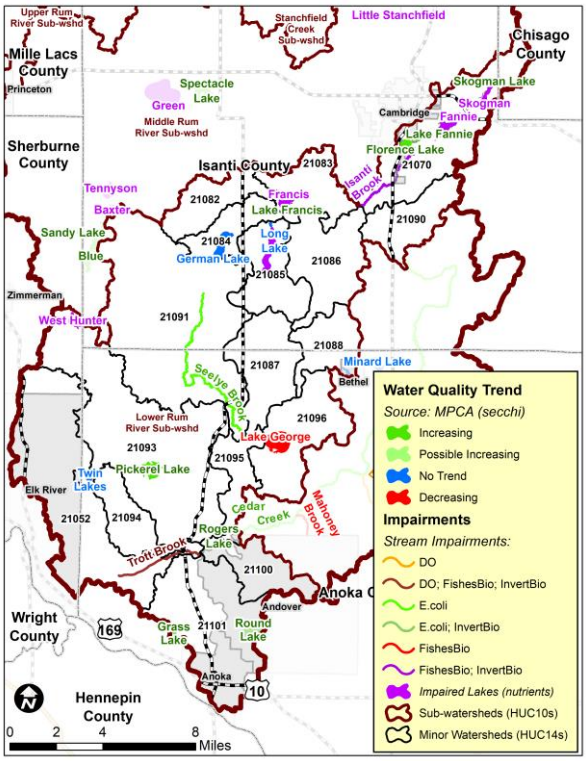
Figure 90. Potential native plant communities.



Water Resources Summary

The Lower Rum River Subwatershed is as its name implies, home to the lower reaches of the Rum River, as well as many small and medium sized lakes. Of the lakes with available water quality data, five are improving in water clarity, one is declining, two are stable, and five are impaired – mainly by nutrients. This subwatershed also has four lakes of high or outstanding biodiversity significance, as well as six priority wild rice lakes and fourteen priority shallow lakes. Additionally, the Lower Rum River Subwatershed contains 94 miles of streams, 21.8 miles of which are impaired by E-coli, fish bioassessments, invertebrate bioassessments, or dissolved oxygen.

Figure 91. Water quality trends.



Protection Status

27% of the Lower Rum River Subwatershed is currently protected, mostly by wetlands. To reach the subwatershed protection goal of 32% an additional 8,008 acres need to be protected at an estimated cost of $14,947,234. Fortunately, nearly 38,000 acres have the potential to protect, although the Rum River Landscape Stewardship Committee recommends prioritizing protection efforts on the Rum River corridor and minor watershed #'s 21084, 21085, and 21091.

Figure 92. Protected lands.

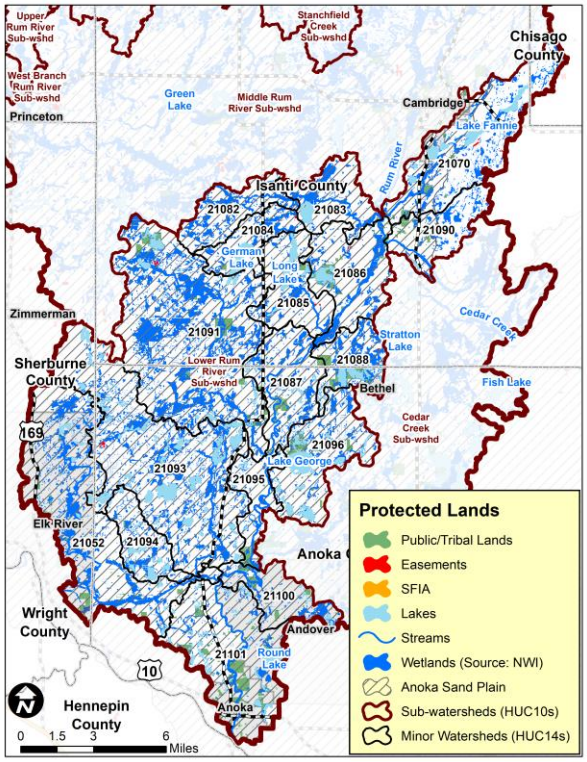
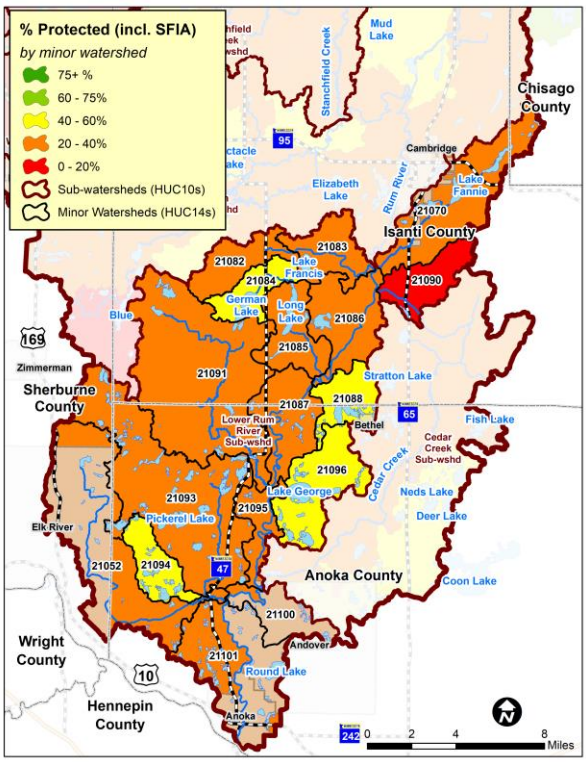


Figure 93. Minor watershed protection levels.



Ecological Pathway to Sustainable Forest Management

Below is the general sequence of concepts and products that will be developed for and/or integrated into the 2nd generation East Central Landscape Plan as a suggested ecological pathway to help land managers and owners work from the landscape scale down to the site level when planning specific forest management activities.

1. Ecological Classification System

a. Field Guide to the Native Plant Communities of Minnesota: The Laurentian Mixed Forest Province
b. Field Guide to the Native Plant Communities of Minnesota: The Eastern Broadleaf Forest Province
c. DNR ECS website (http://www.dnr.state.mn.us/ecs/index.html)
d. East Central Landscape Conditions and Trends Report (pp. 3.2-3.6)
e. East Central Landscape Resource Atlas (pp. 31-34)
f. East Central Landscape Plan (TBD)

2. Native Plant Communities

a. Field Guide to the Native Plant Communities of Minnesota: The Laurentian Mixed Forest Province
b. Field Guide to the Native Plant Communities of Minnesota: The Eastern Broadleaf Forest Province
c. DNR NPC website (http://www.dnr.state.mn.us/npc/index.html)
d. East Central Landscape Conditions and Trends Report (pp. 3.7-3.8)
e. East Central Landscape Resource Atlas (pp. 57-58)
f. East Central Landscape Plan - Appendix D (TBD)

3. Potential Native Plant Communities

a. Geospatial Modeling of Native Plant Communities of Minnesota's Laurentian Mixed Forest (http://mn.gov/frc/docs/NPC_Technical_Report_Final_Jan2013.pdf)
b. Mapping Potential Native Plant Communities of Minnesota's Laurentian Mixed Forest (http://mn.gov/frc/docs/Potential_Native_Plant_Communities_Summary_Final-Jan2014.pdf)
c. Potential Native Plant communities of Minnesota's Eastern Broadleaf Forest (https://data.nrri.umn.edu/data/dataset/cb6d64e5-fb67-4b05-b9cc-5bbebdb3568a/resource/43c8d895-709b-4b82-ae22-7dade35ac1df/download/nrri-tr-2019-01.pdf)
d. GIS data sources:
   - Laurentian Mixed Forest: http://data.nrri.umn.edu/data/dataset/nemn-pnpc
   - Laurentian Mixed Forest & Eastern Broadleaf Forest: https://data.nrri.umn.edu/data/dataset/npc-ebf-lmf
e. East Central Landscape Conditions and Trends Report (pp. 3.8-3.12)
f. East Central Landscape Resource Atlas (pp. 61-84)

4. Vegetation Management Framework Goals and Strategies

a. East Central Landscape Plan (TBD)

5. Climate Change Considerations and Strategies

a. Minnesota Forest Ecosystem Vulnerability Assessment and Synthesis: A Report from the Northwoods Climate Change Response Framework Project (http://www.fs.fed.us/nrs/pubs/gtr/gtr_nrs133.pdf)
b. Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers (https://www.fs.fed.us/nrs/pubs/gtr/gtr_nrs87-2.pdf)
c. Climate Change Field Guide for Northern Minnesota Forests: Site-level consideration and adaption (https://forestadaptation.org/sites/default/files/ClimateChangeFieldGuide_NMNForests_HiRes.pdf)
d. Minnesota Private Landowner Climate Scorecard (https://forestadaptation.org/sites/default/files/KeepYourWoodsHealthyforTomorrow_MN.pdf)
e. Climate Change Atlas (https://www.fs.fed.us/nrs/atlas/)
f. NPC silviculture strategies for forest stand prescriptions (https://www.dnr.state.mn.us/forestry/ecs_silv/npc/index.html)
g. East Central Landscape Conditions and Trends Report (pp. 3.20-3.25)
h. East Central Landscape Plan – Appendix D (TBD)
i. East Central Landscape Plan (TBD)

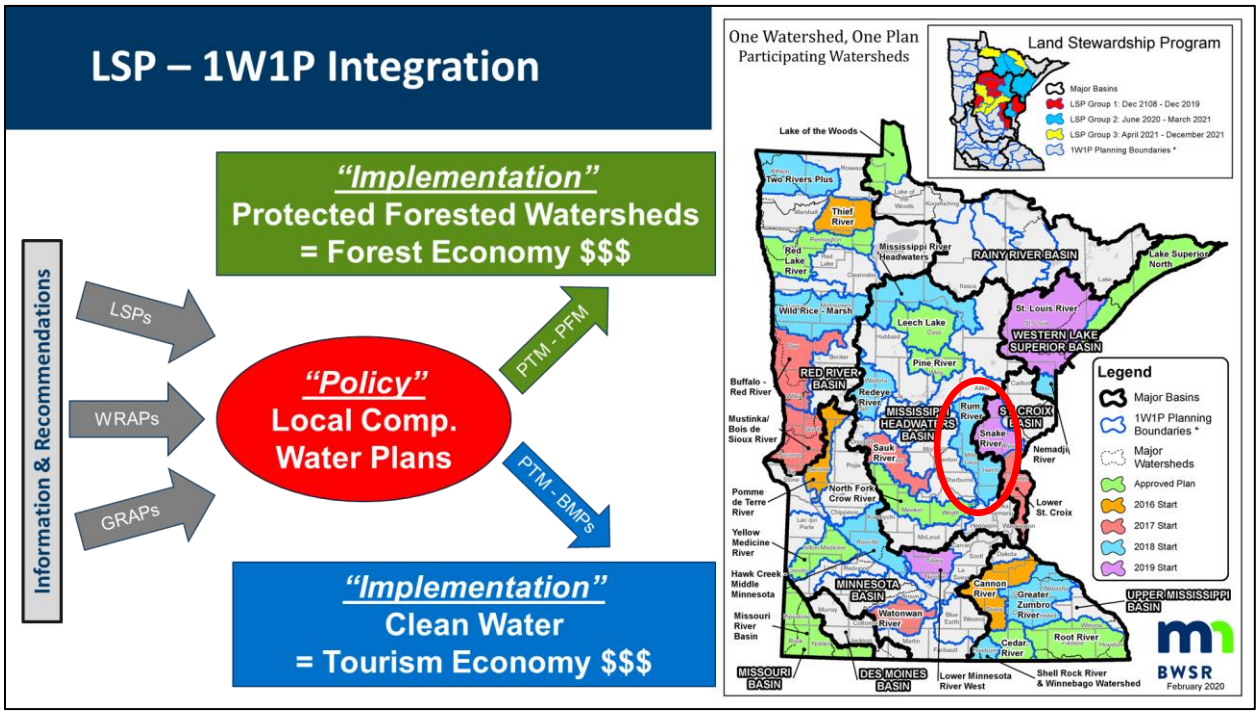
6. Silvicultural Considerations

a. MN DNR Tree Suitability Table (http://files.dnr.state.mn.us/forestry/ecssilviculture/treetables.pdf)
b. NPC silviculture strategies for forest stand prescriptions (https://www.dnr.state.mn.us/forestry/ecs_silv/npc/index.html)
c. Great Lakes Silvicultural Library (https://silvlib.cfans.umn.edu/)
d. East Central Landscape Plan - Appendix D (TBD)
e. East Central Landscape Plan - Appendix E (TBD)

8. Tatum Guides – in development

a. NPC silviculture strategies for forest stand prescriptions (https://www.dnr.state.mn.us/forestry/ecs_silv/npc/index.html)

Linking Forest & Water Planning and Implementation through LSPs and 1W1Ps

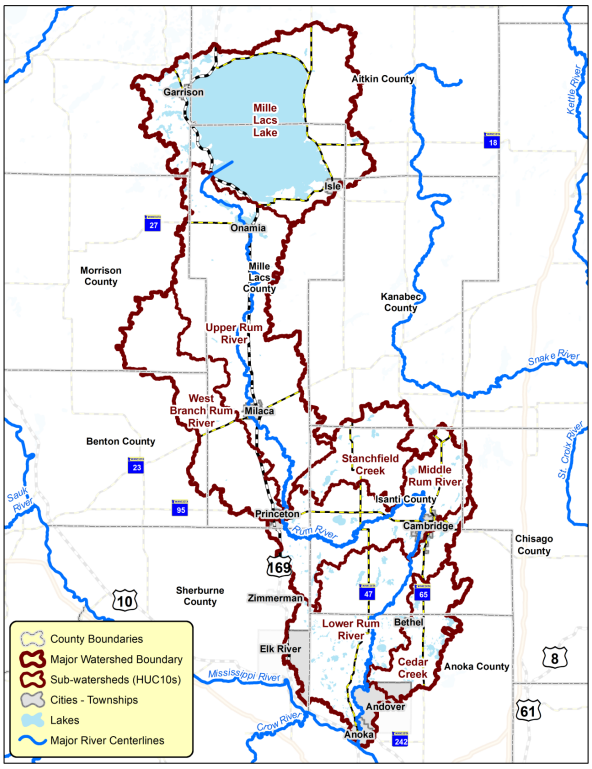


Note: Landscape stewardship plans (LSPs) like the MPCA Watershed Restoration and Protection Strategies (WRAPs) and the MDH Groundwater Restoration and Protection Strategies (GRAPs) provide an important information and relevant context from state water and forest resource programs to inform comprehensive local water management (1W1Ps) processes. Members of the 1W1P committees are encouraged to consider the recommendations in this document for incorporation into their plans. Through the integration of landscape stewardship plans and 1W1Ps, conservation professionals and landowners are working together to address the following national priorities from the USDA Forest Service:

- Conserve Working Forest Lands.
- Protect Forests from Harm.
- Enhance Public Benefits from Trees and Forests.

"A lake is the landscape's most beautiful and expressive feature.
It is Earth's eye;
looking into which the beholder measures the depth of his own nature."
- Henry David Thoreau

Index Information – Rum River Major Watershed



Subwd no.	Subwatershed name	HUC no.	Acres	No. of minors
1	Mille Lacs Lake	701020701	266,384	15
2	Upper Rum River	701020702	227,951	23
3	West Branch Rum River	701020703	118,277	15
4	Stanchfield Creek	701020704	61,671	7
5	Middle Rum River	701020705	126,743	19
6	Cedar Creek	701020706	53,827	5
7	Lower Rum River	701020707	158,942	17
	Totals		**1,013,794**	**101**