St. Louis River Watershed Landscape Stewardship Plan

Appendix

Carlton SWCD *Lake SWCD* *North St. Louis SWCD*

South St. Louis SWCD *St. Louis County Land Department*

Cloquet Forestry Center *Minnesota Land Trust* *Sappi*

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 St. Louis River Landscape Stewardship Plan.

St. Louis River LSP Planning Team

The St. Louis 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
Melanie Bomier	Carlton SWCD
Mackenzie Hogfeldt	Lake SWCD
Tara Solem	Lake SWCD
Anita Provinzino	North St. Louis SWCD
Becca Reis	North St. Louis SWCD
Beth Kleinke	North St. Louis SWCD
Lauren Soergel	North St. Louis SWCD
RC Boheim	South St. Louis SWCD
Jason Meyer	St. Louis County Land Department
Kyle Gill	Cloquet Forestry Center
Daryl Peterson	MN Land Trust
Jan Bernu	Consulting Forester
Chris Martland	Sappi
Bruce Schoenberg	MN DNR Forestry
Christine Ostern	MN DNR Forestry
Thor Pakosz	MN DNR Forestry
Erin Loeffler	Board of Water and Soil Resources
Jeff Hrubes	Board of Water and Soil Resources

Staff Supporting the St. Louis River LSP Development

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

MN Department of Natural Resources
- John Carlson, Private Forest Management Coordinator
- Andy McGuire, Forestry Incentives Coordinator

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

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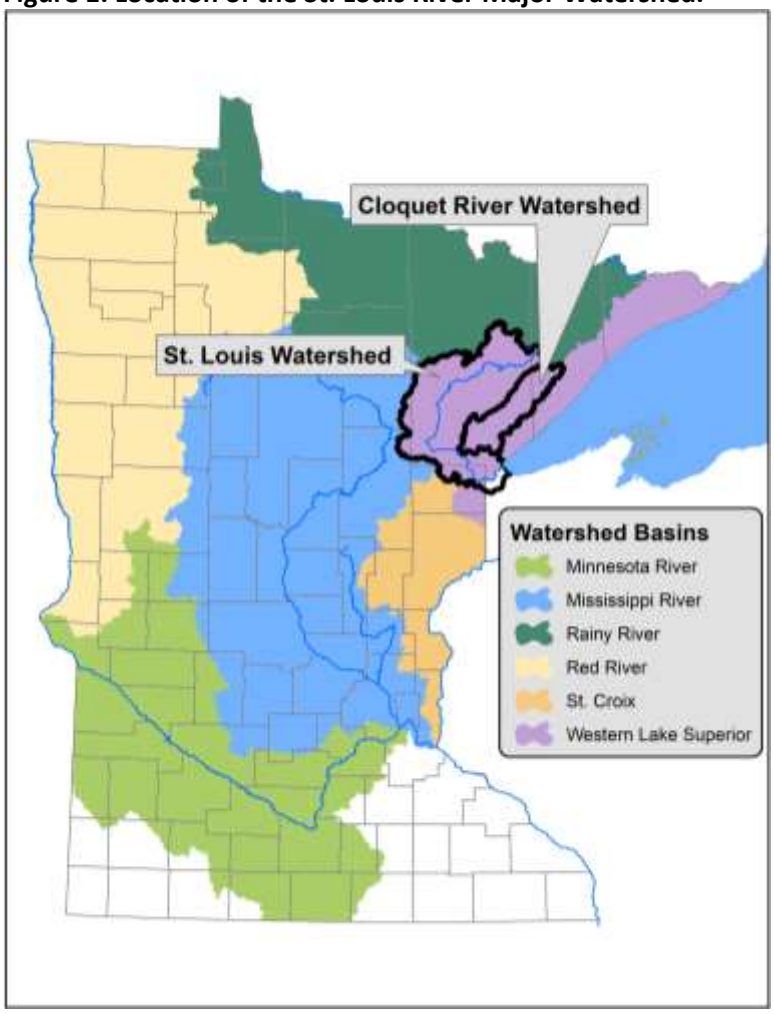
St. Louis River Resource Inventory (HUC 8)

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

Figure 1. Location of the St. Louis River Major Watershed.



Geography

Figure 2. Geomorphological landforms.

Figure 3. Elevation.

Ecological Classification System/Native Plant Communities

Figure 4. Ecological sections.

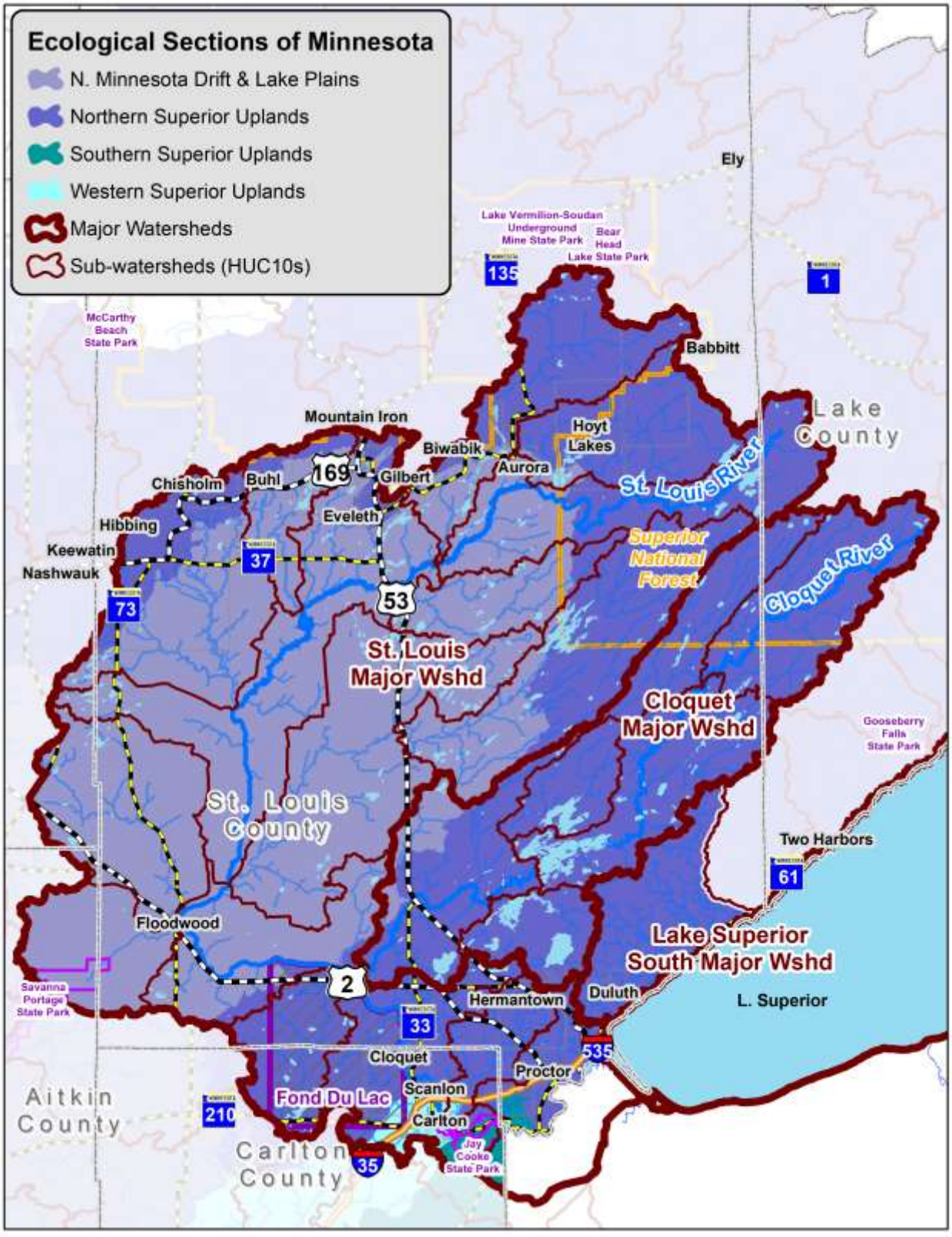


Figure 5. Ecological subsections.

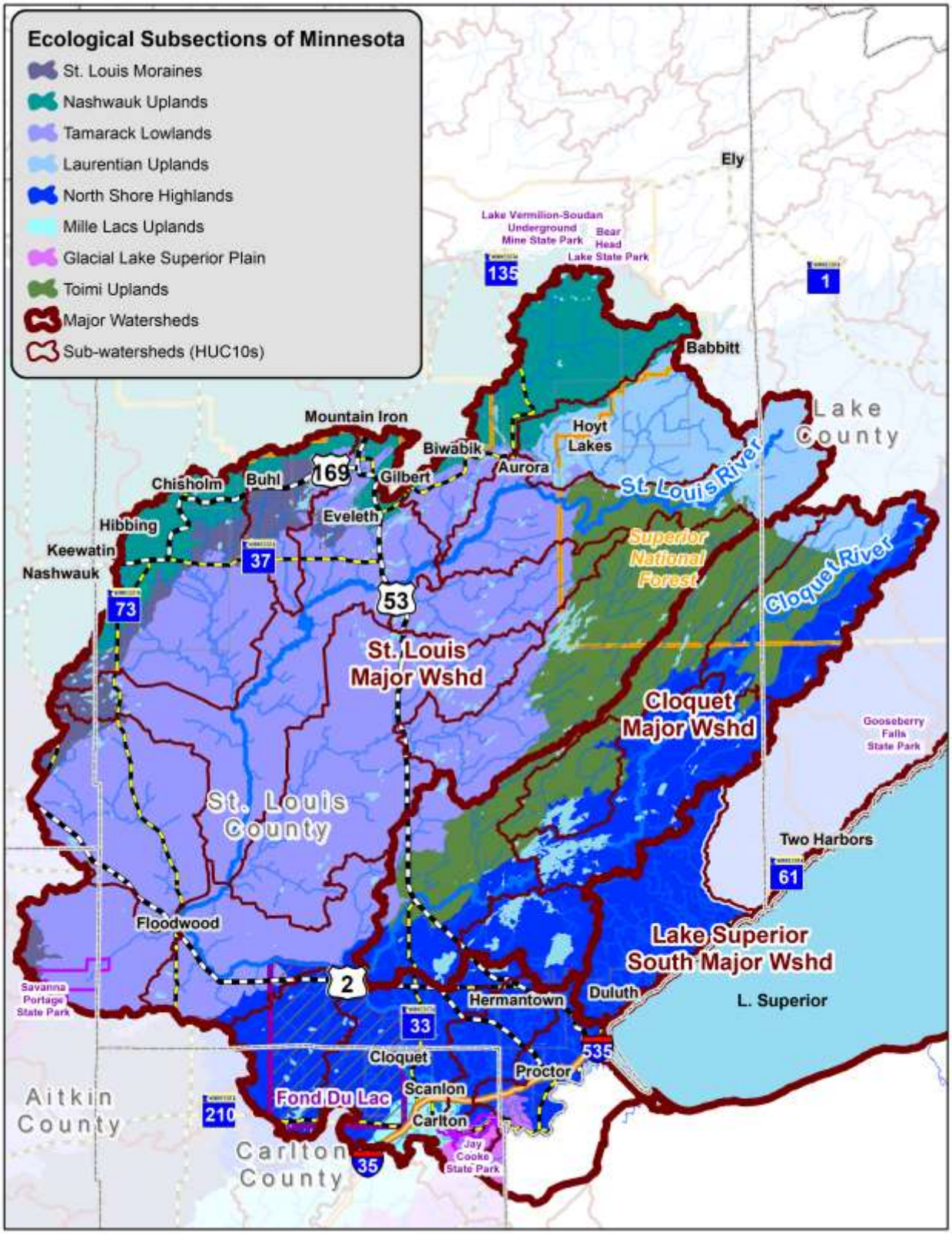


Figure 6. Land type associations.

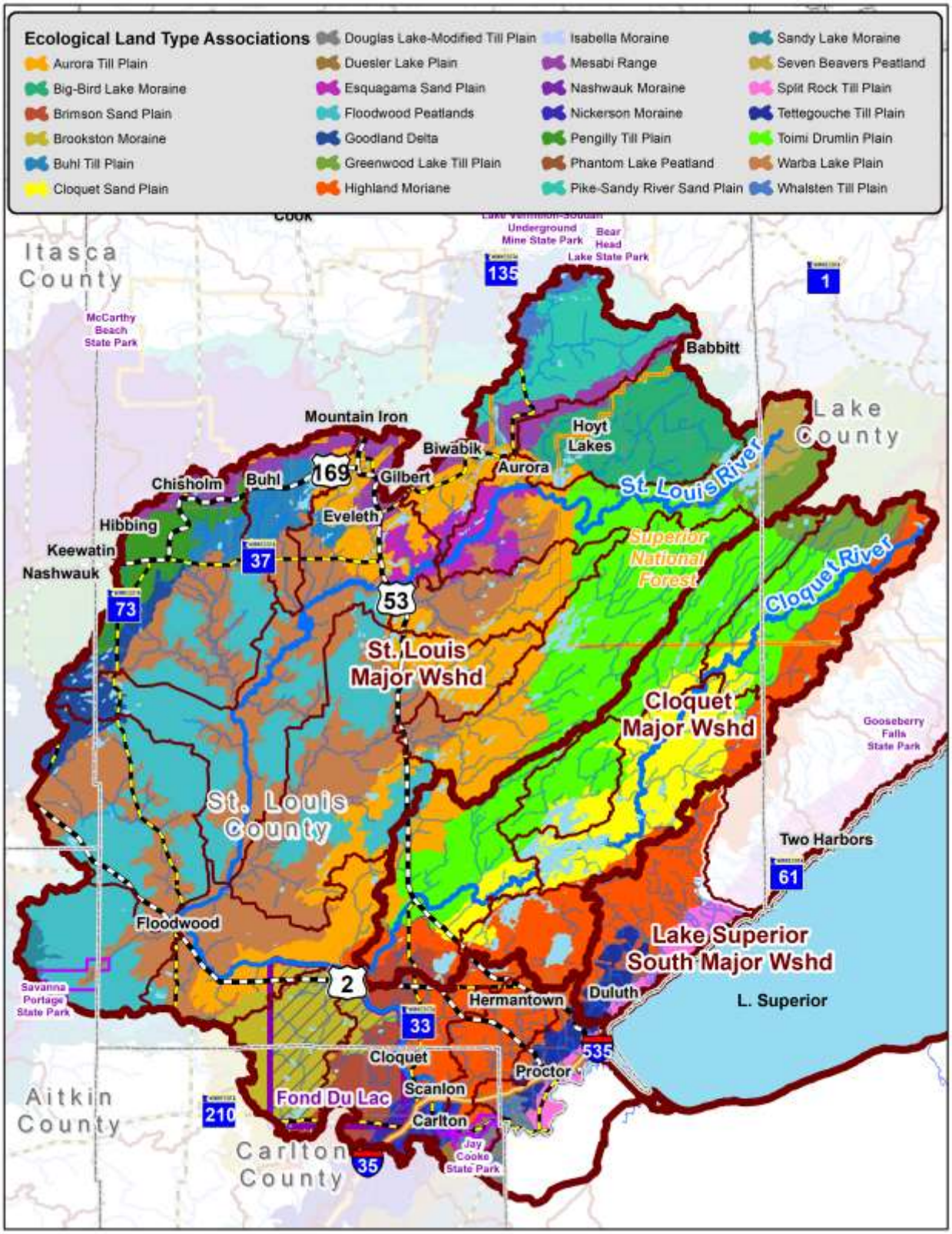
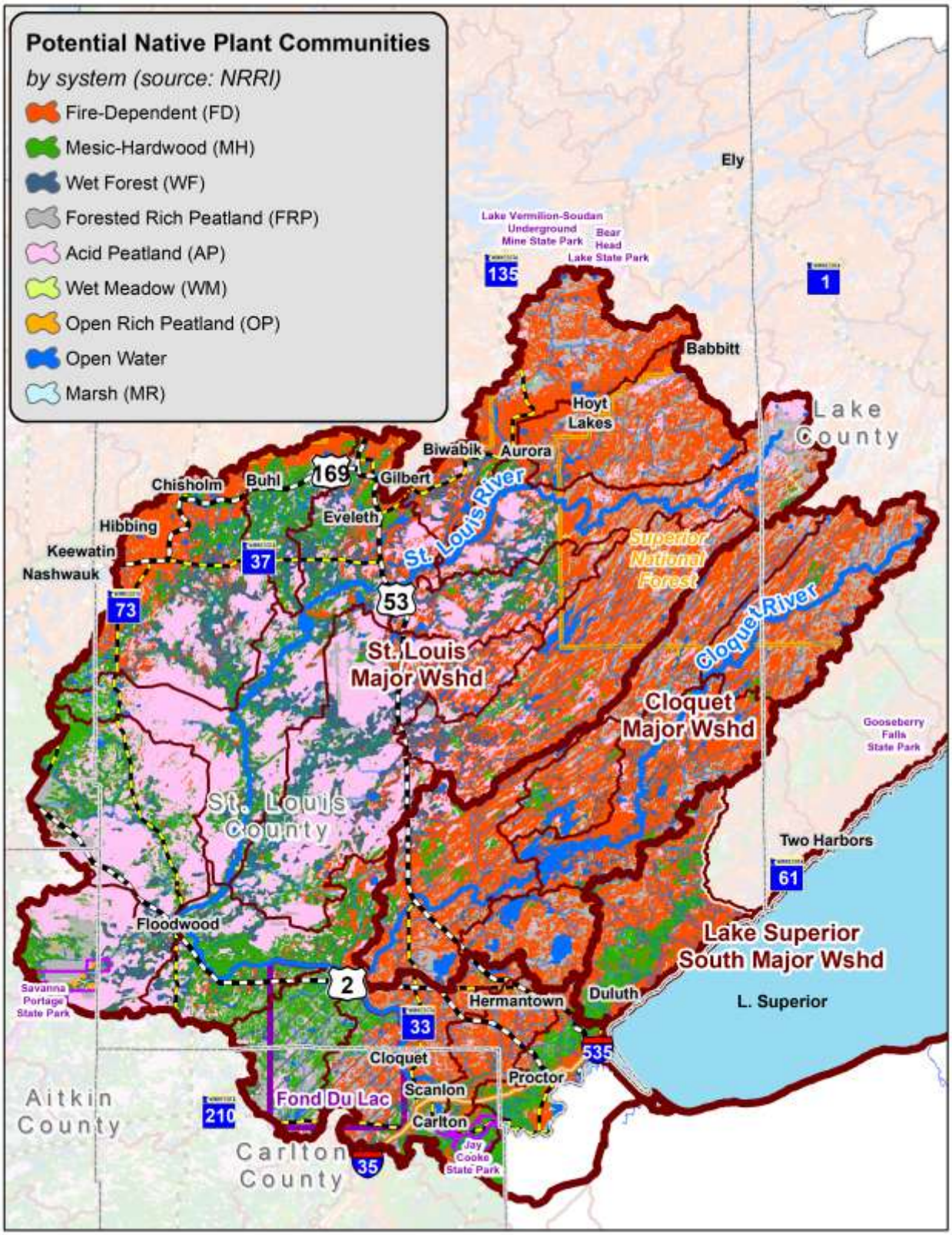


Figure 7. Potential native plant community systems.



Forest Cover and Composition

Figure 8. Historic vegetation class, MnDOT (VegMod).

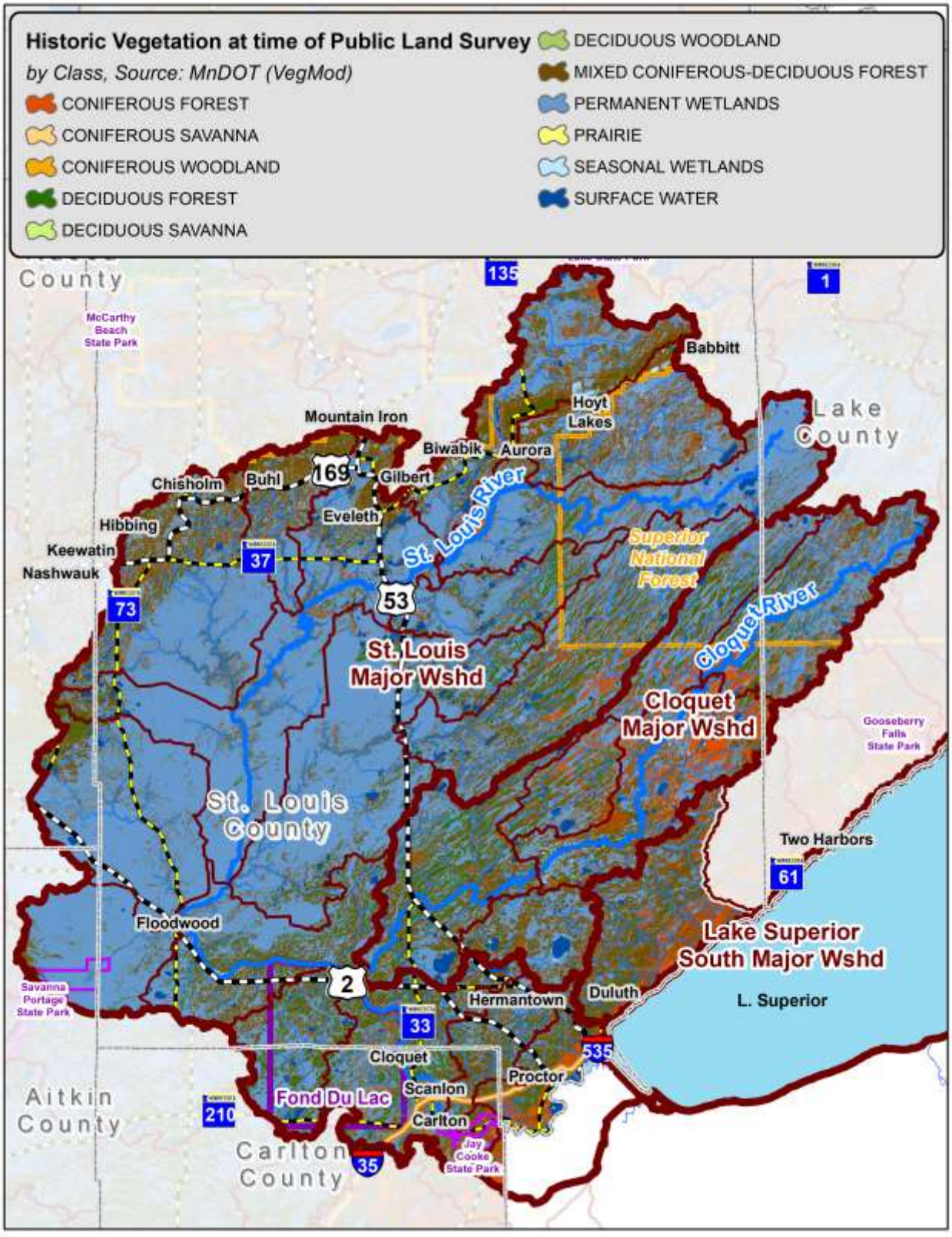


Figure 9. Current vegetation and areas of historic forest loss.

Figure 10. Land cover, 2016.

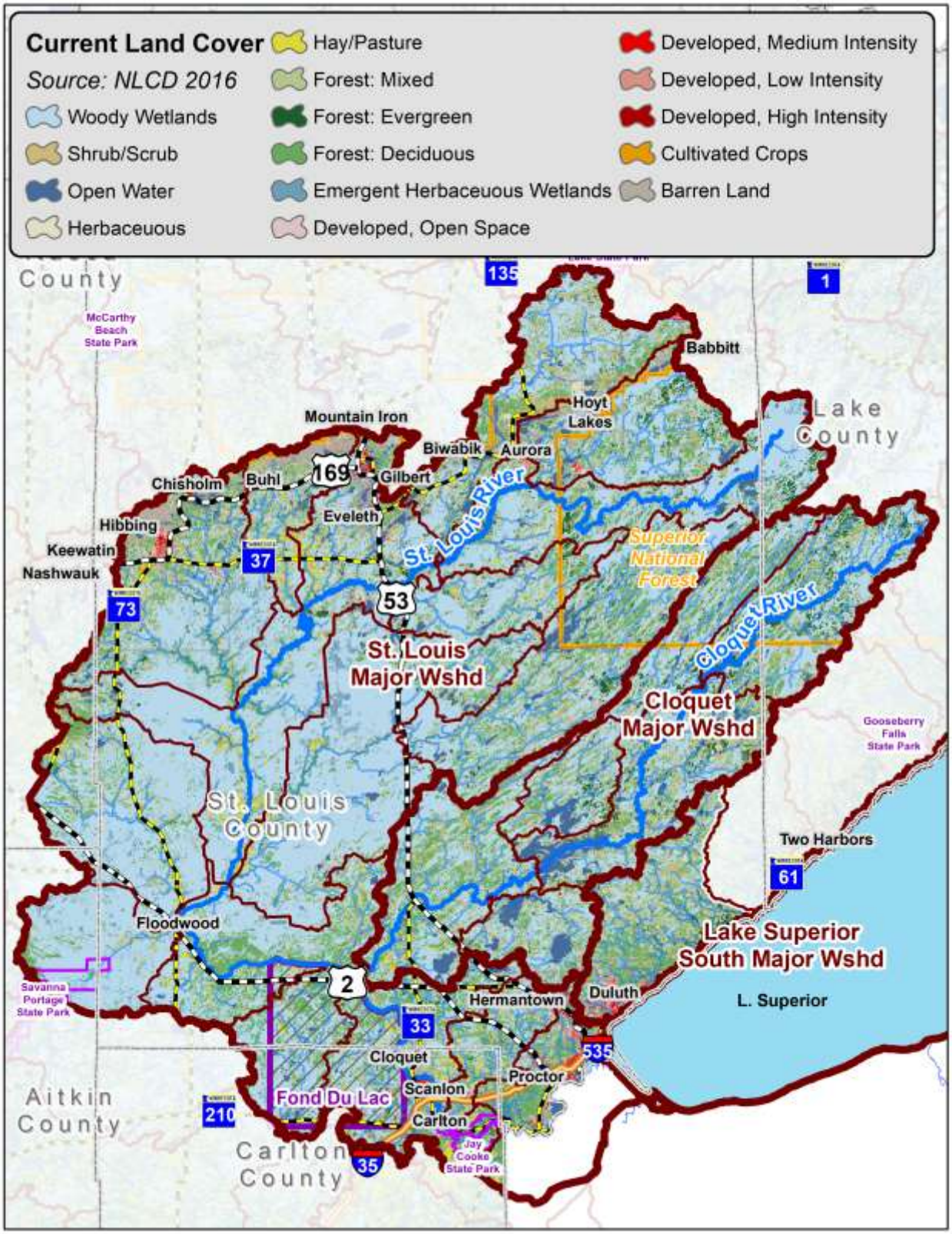


Figure 11. Percent forest land by minor watershed (HUC 14).

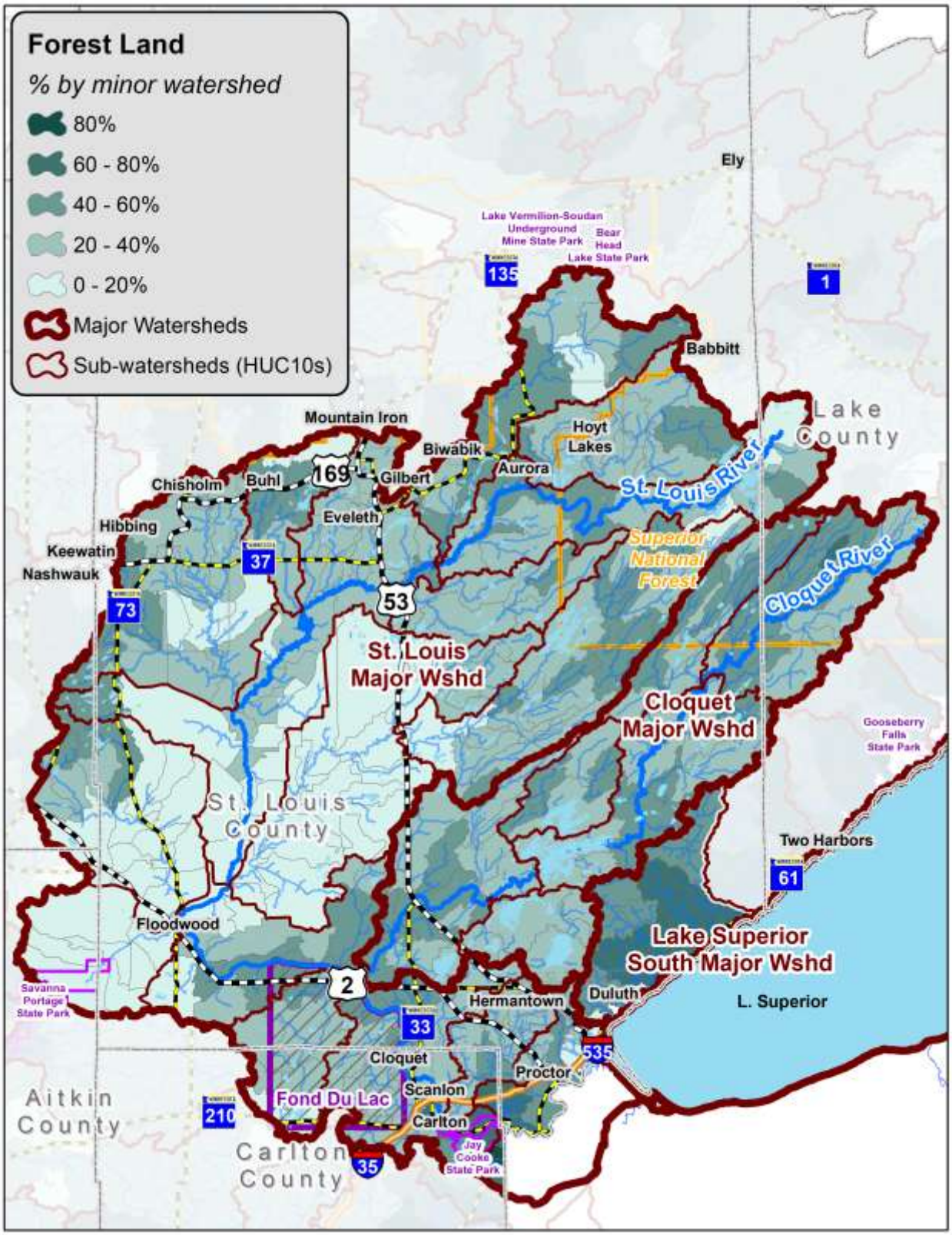


Figure 12. USFS forest type groups.

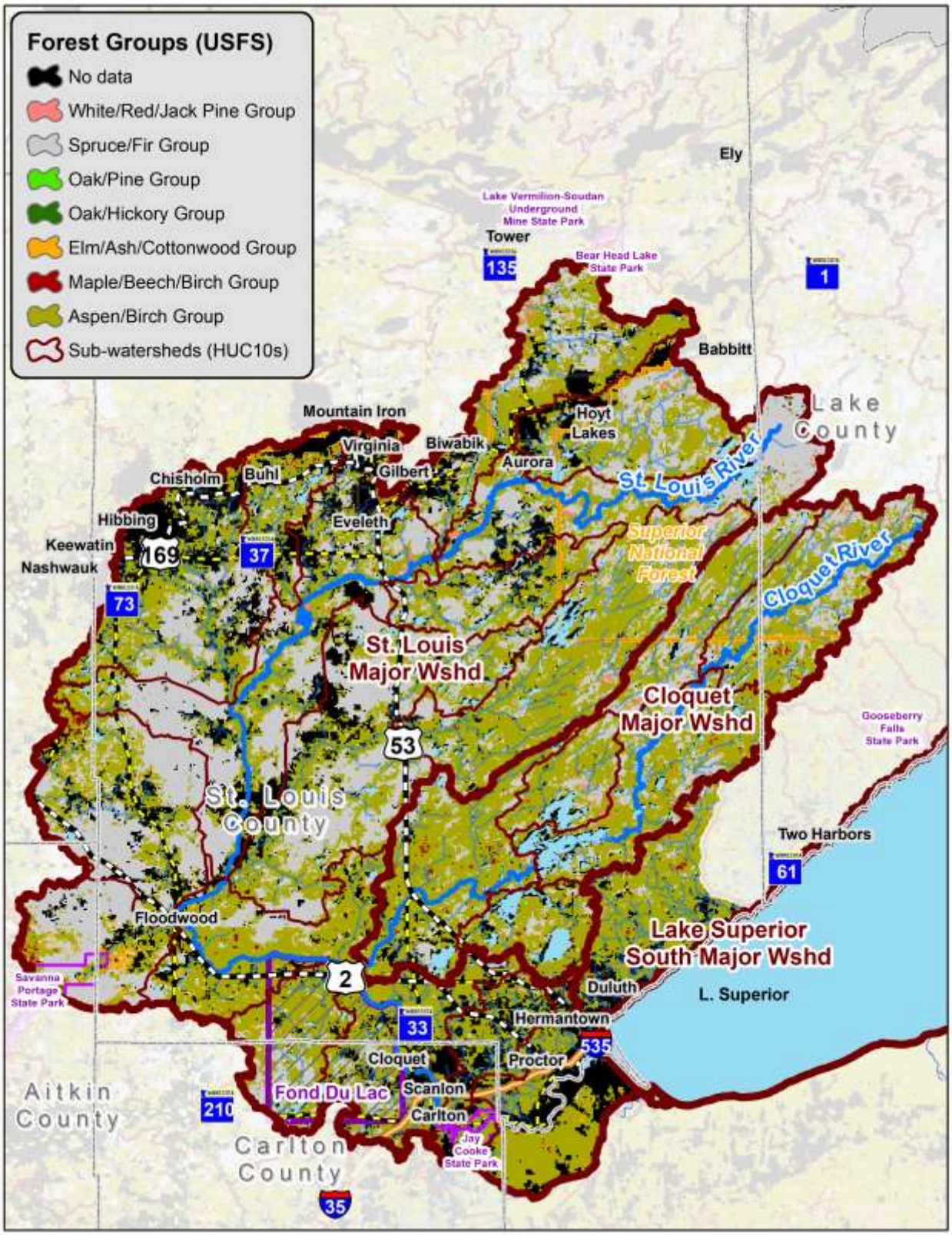


Figure 13. White cedar stands.

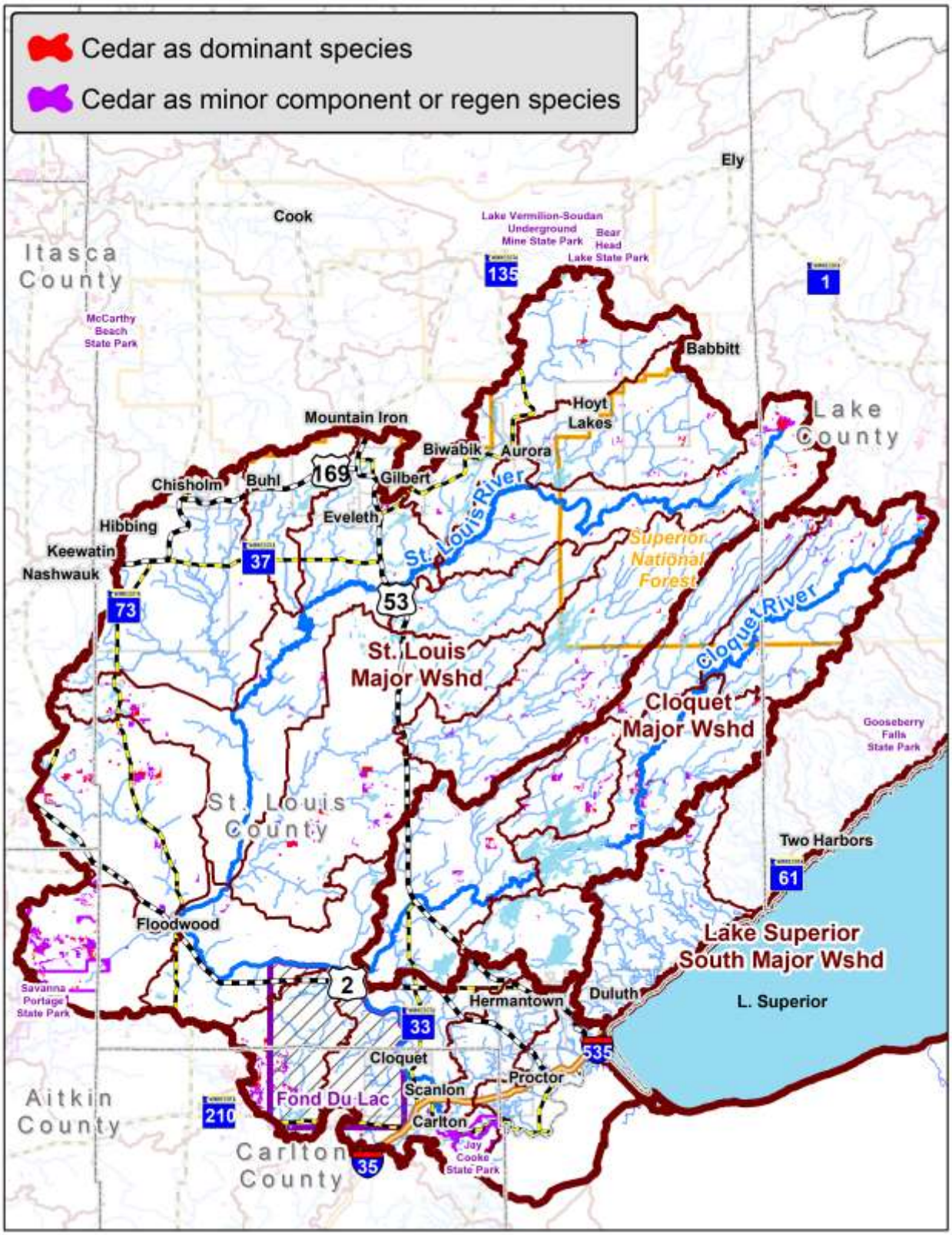


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Figure 14. Lakes of biological significance.

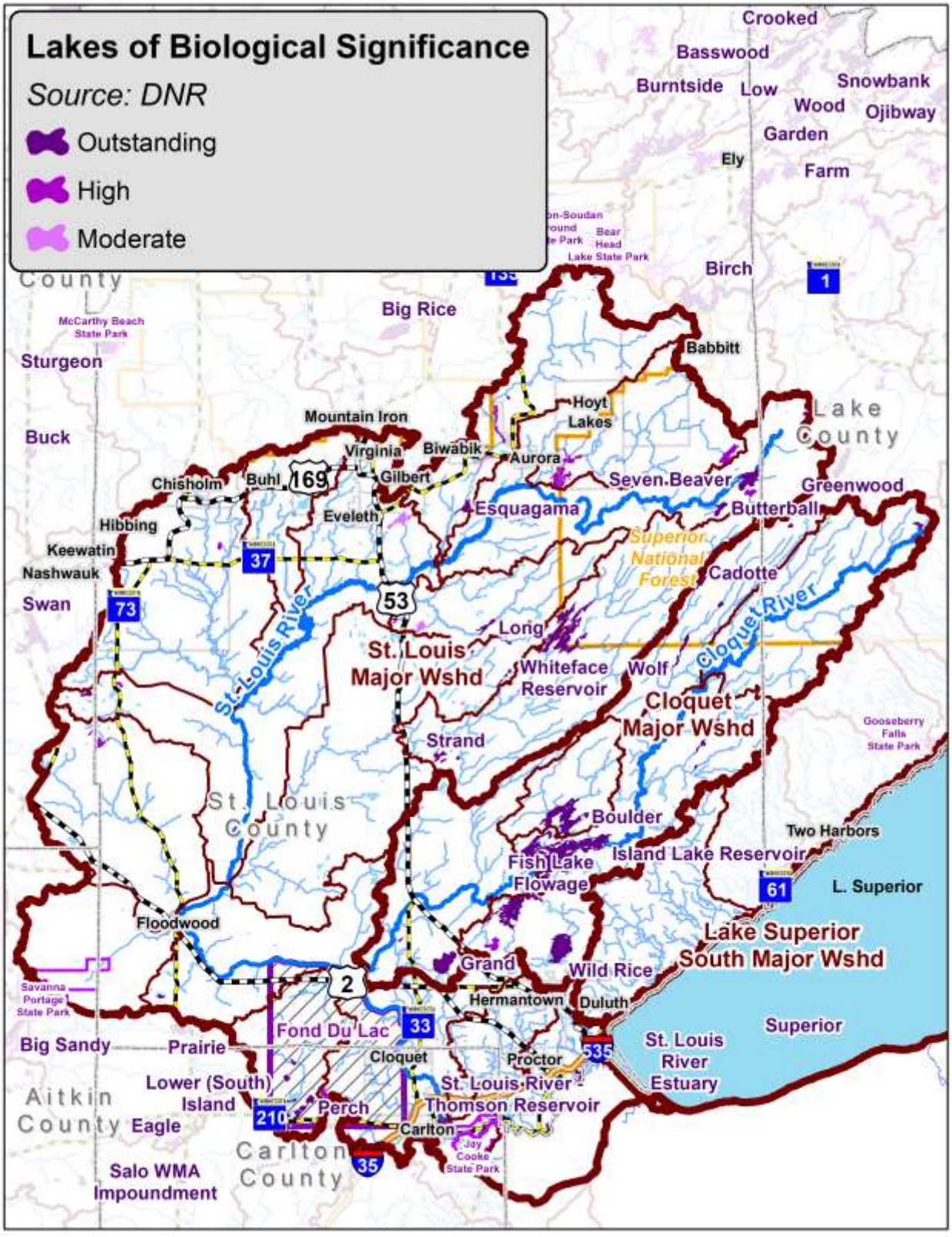

Figure 15. Outstanding lakes and streams.

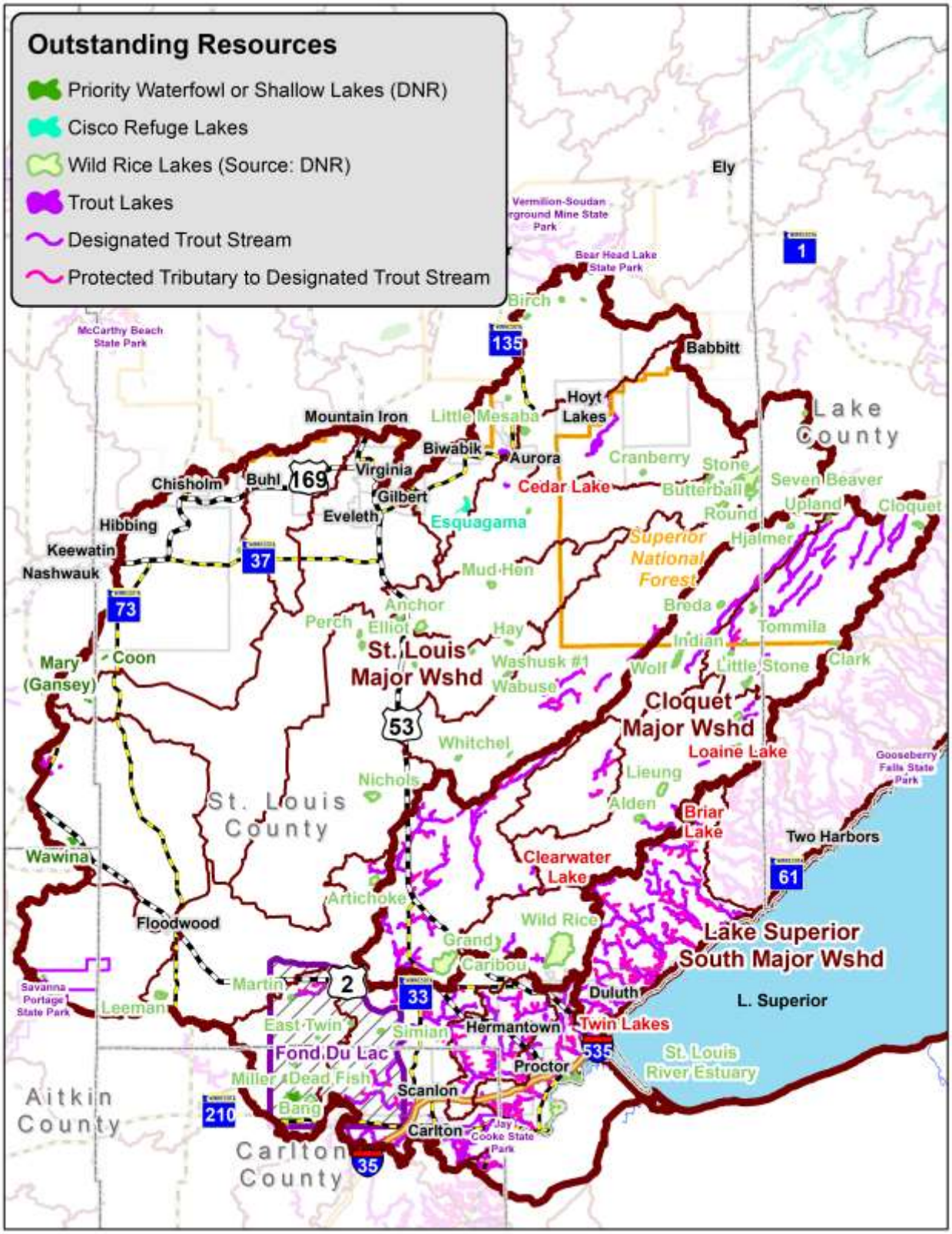

Figure 16. Non-mercury impaired lakes and streams.

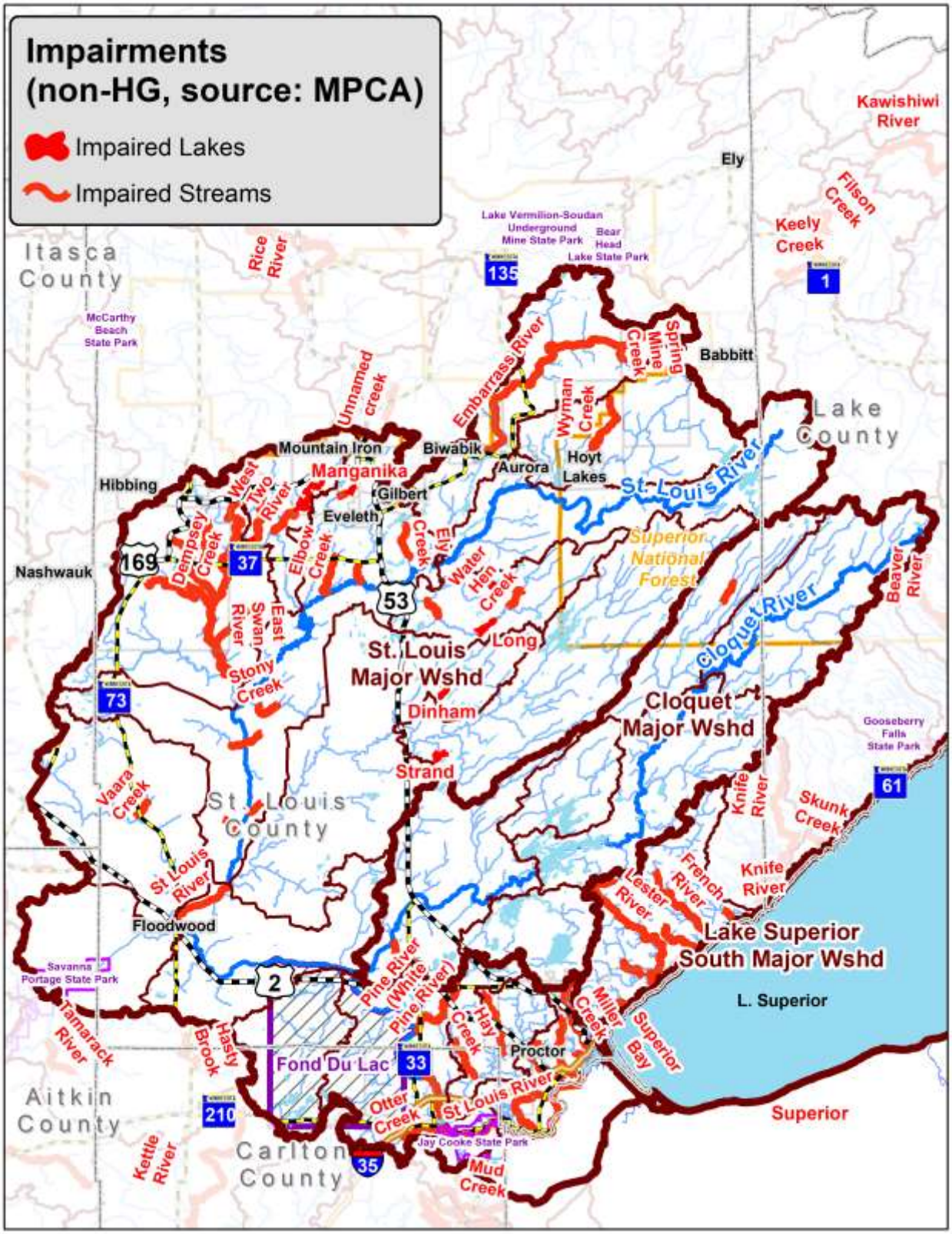

Figure 17. Lakes of phosphorus sensitivity significance.

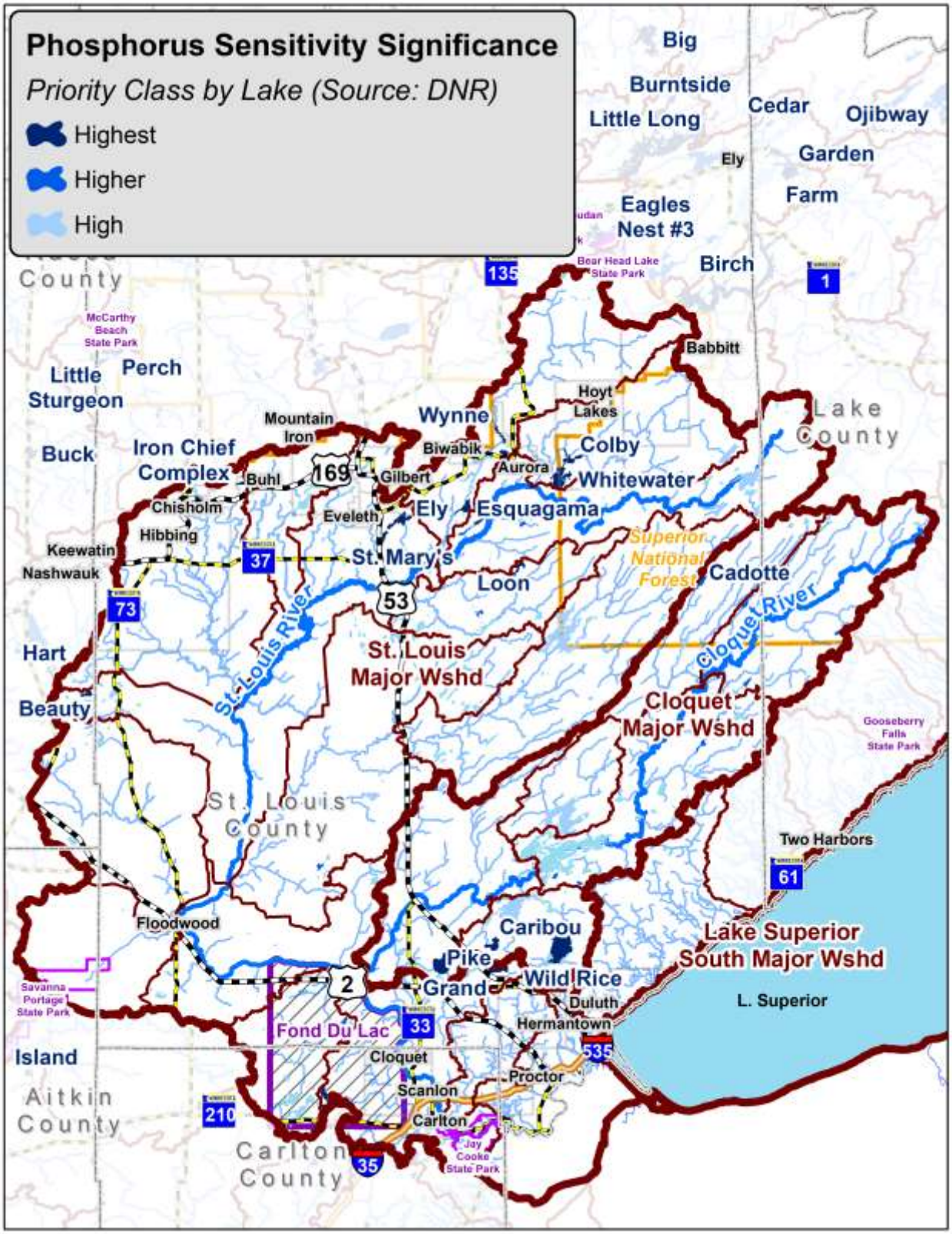

Figure 18. Water quality trends.

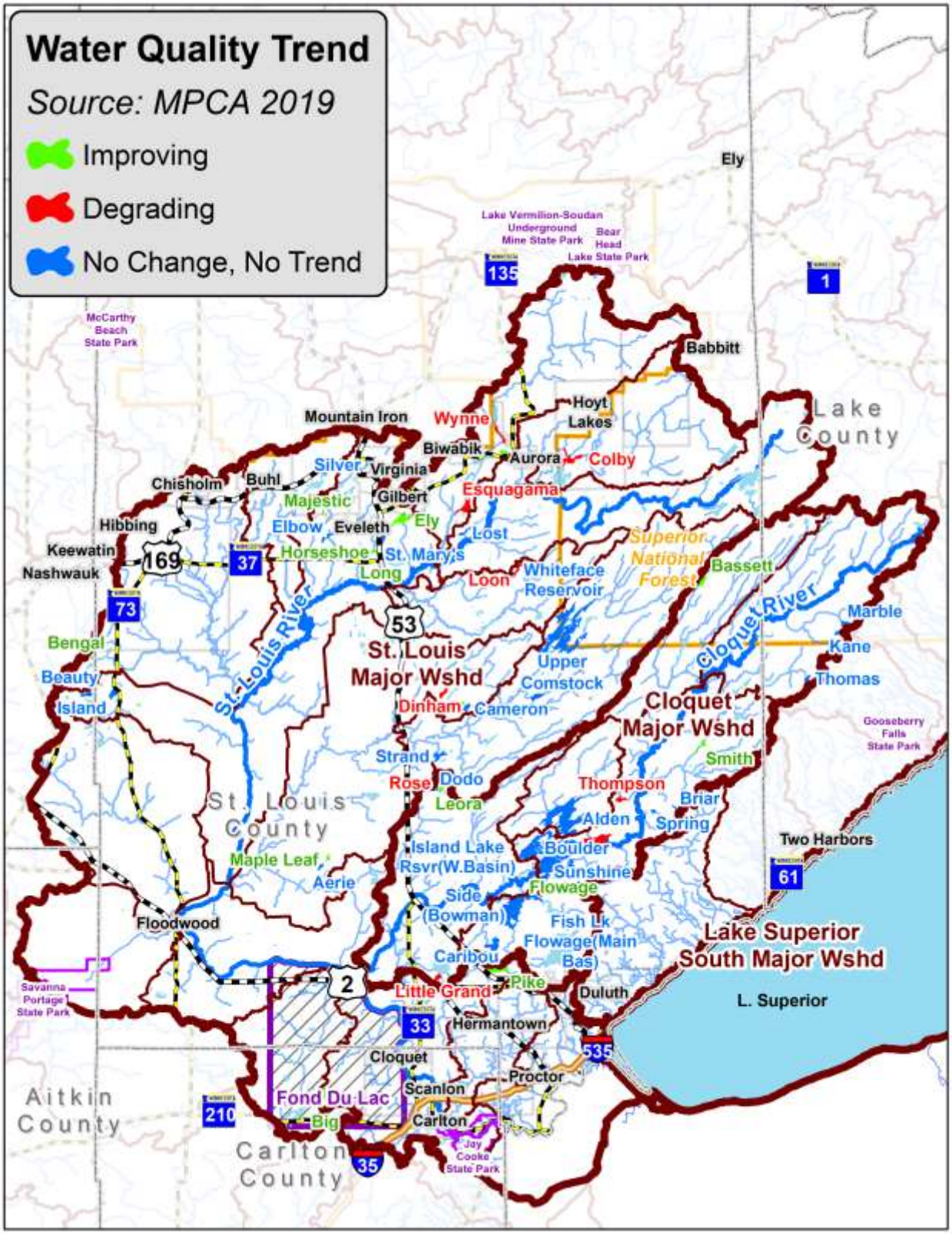

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Figure 19. Forest disturbance areas by year.

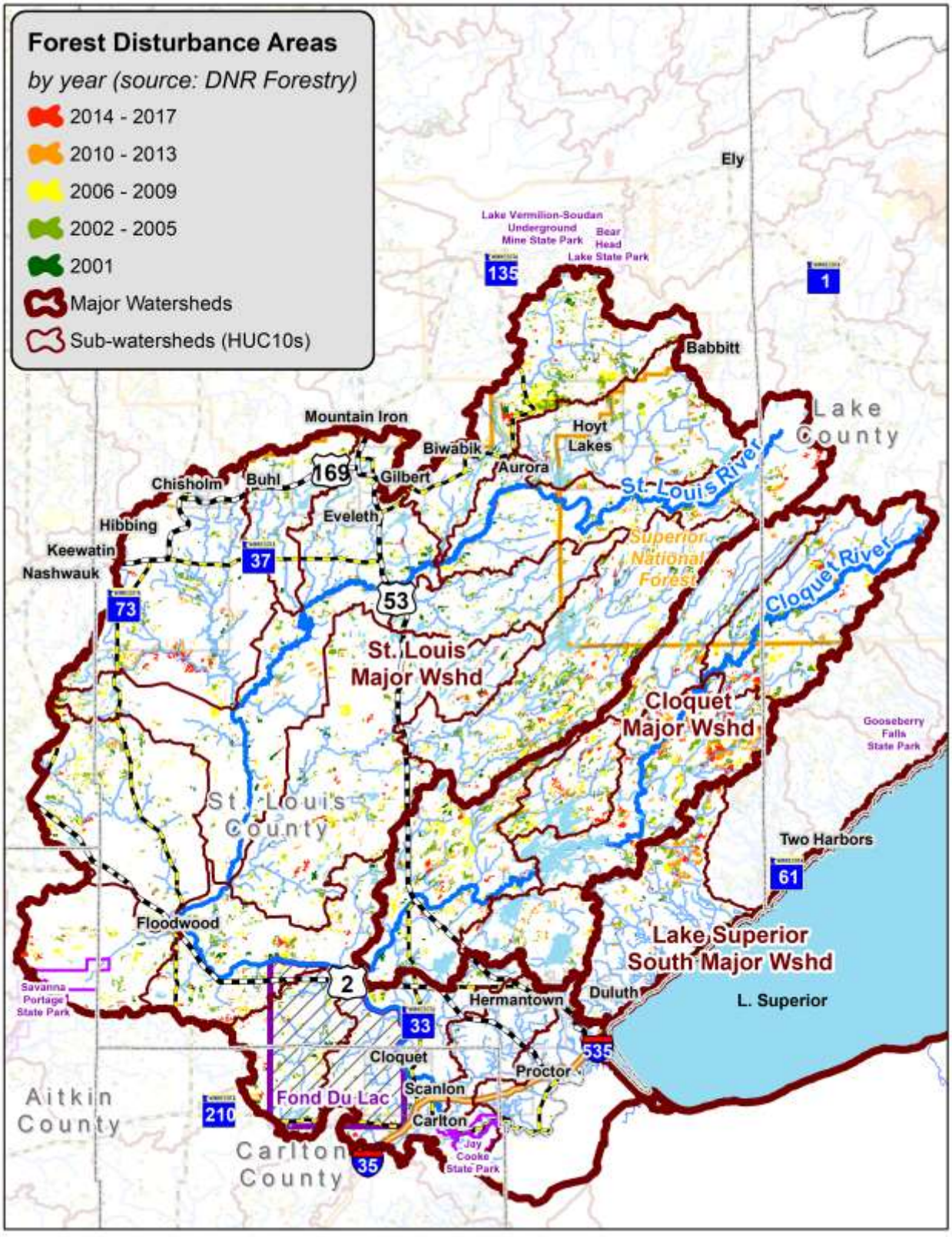

Figure 20. Disturbed land cover by minor watershed (HUC 14).

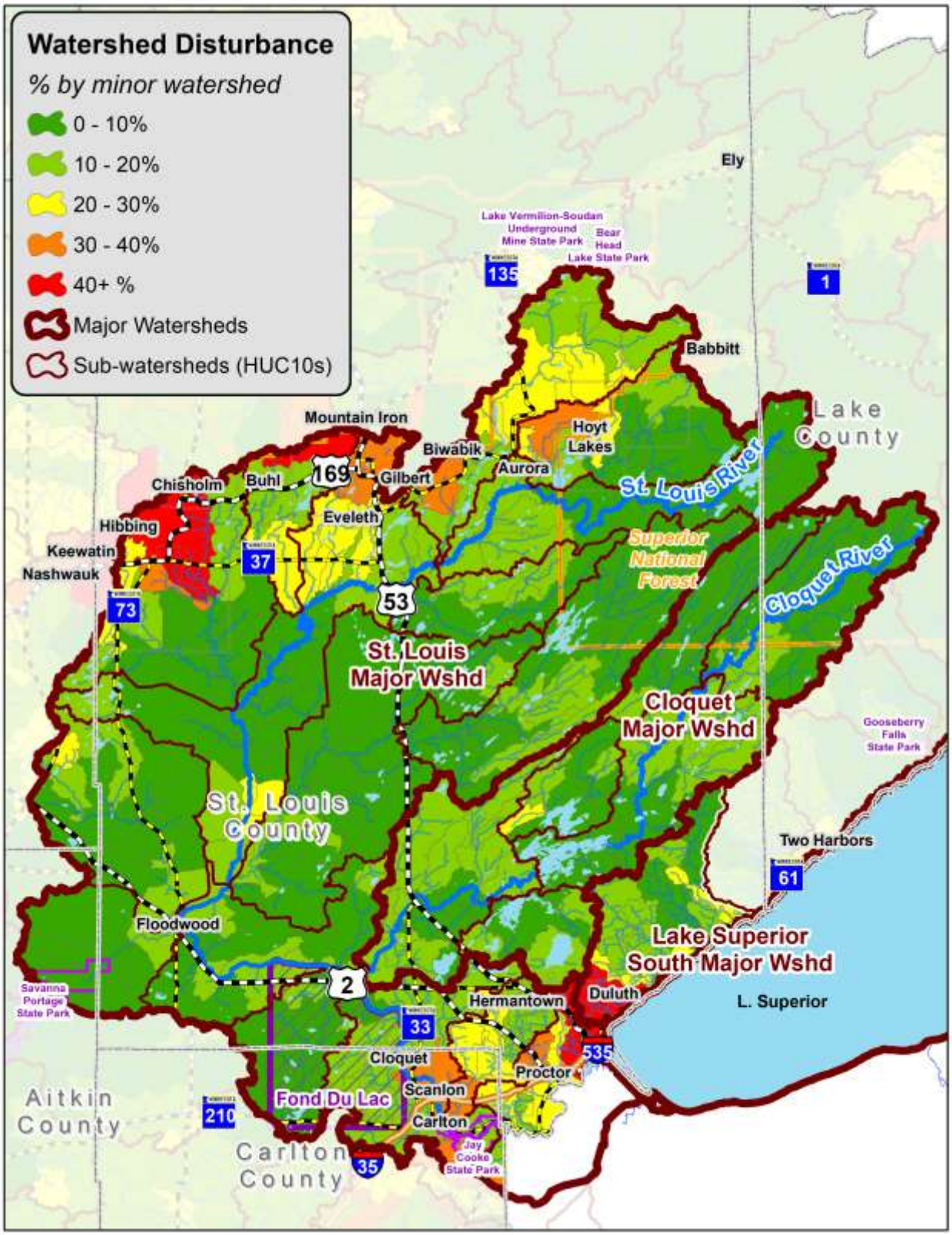

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Figure 21. Protected lands and waters.

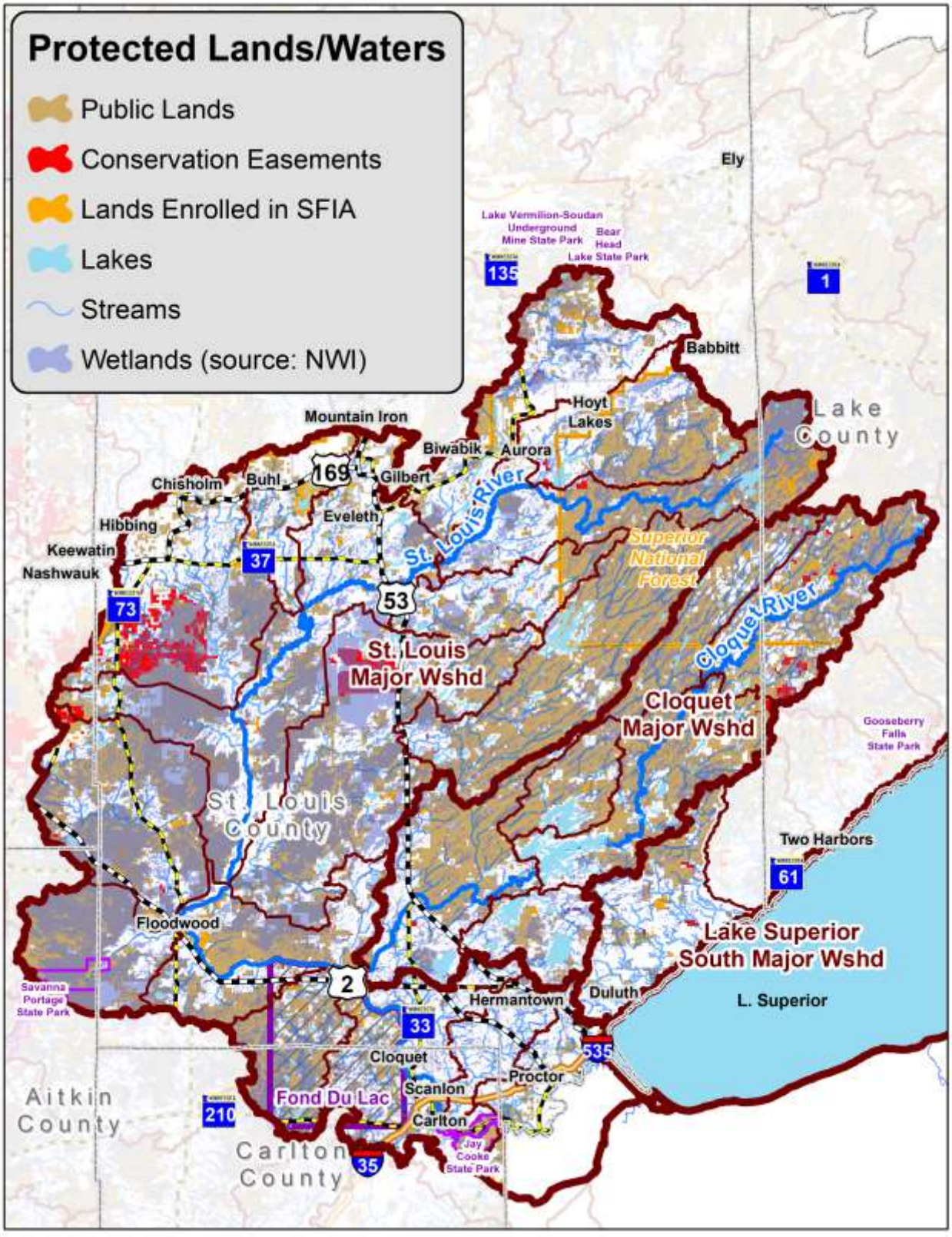

Figure 22. Subwatershed (HUC 10) protection levels.

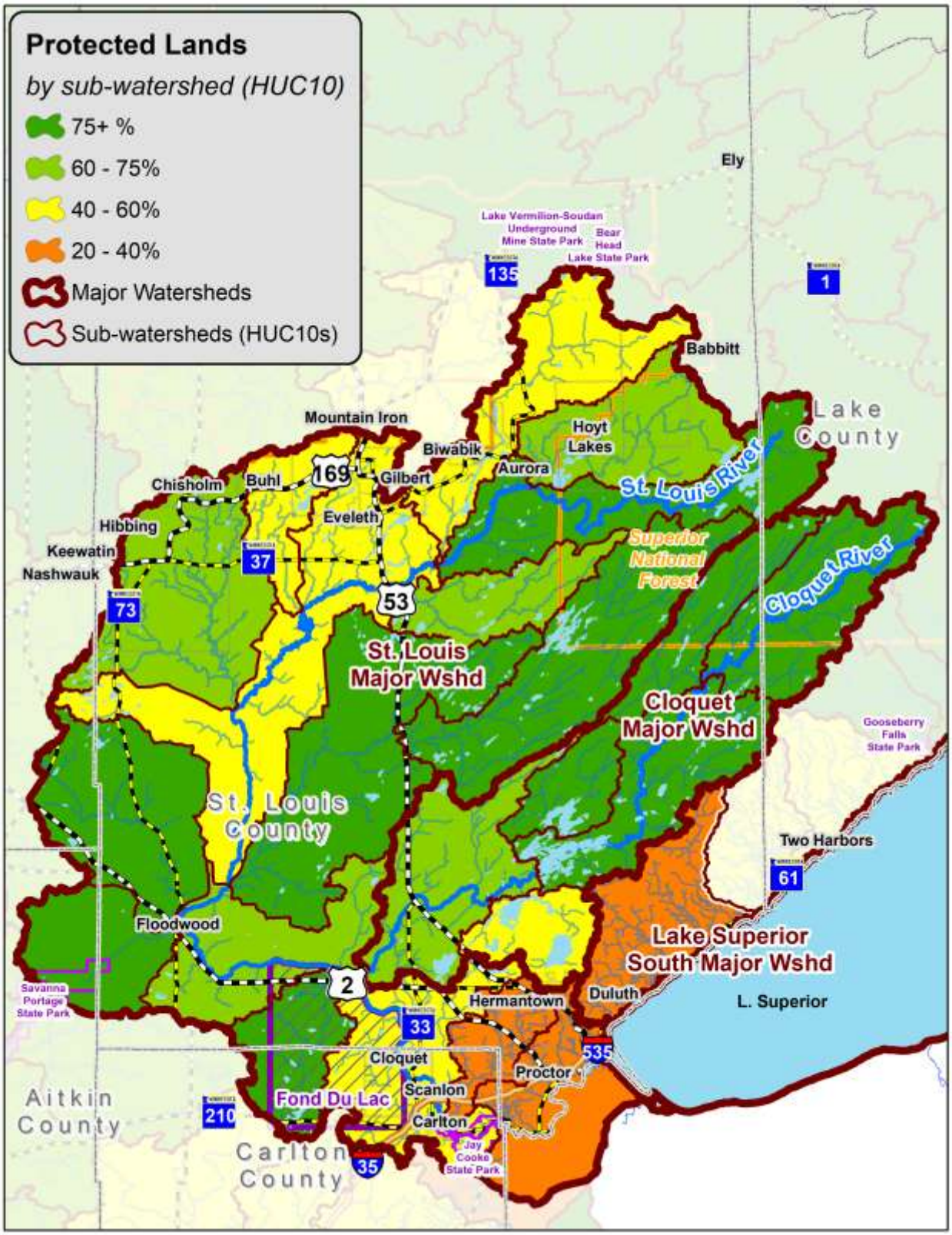

Figure 23. Minor watershed (HUC 14) protection levels.

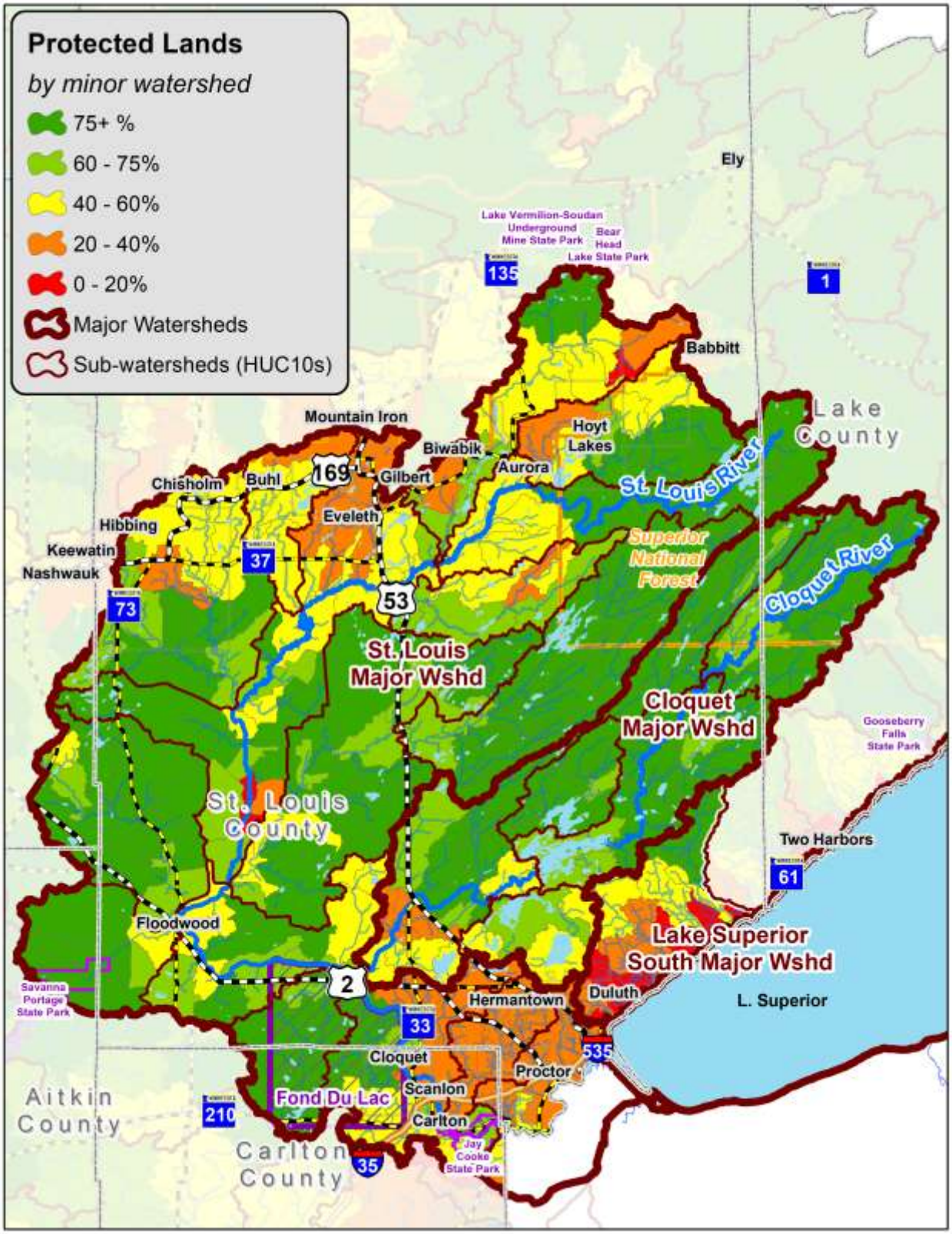

Figure 24. Potential to protect by minor watershed (HUC 14).

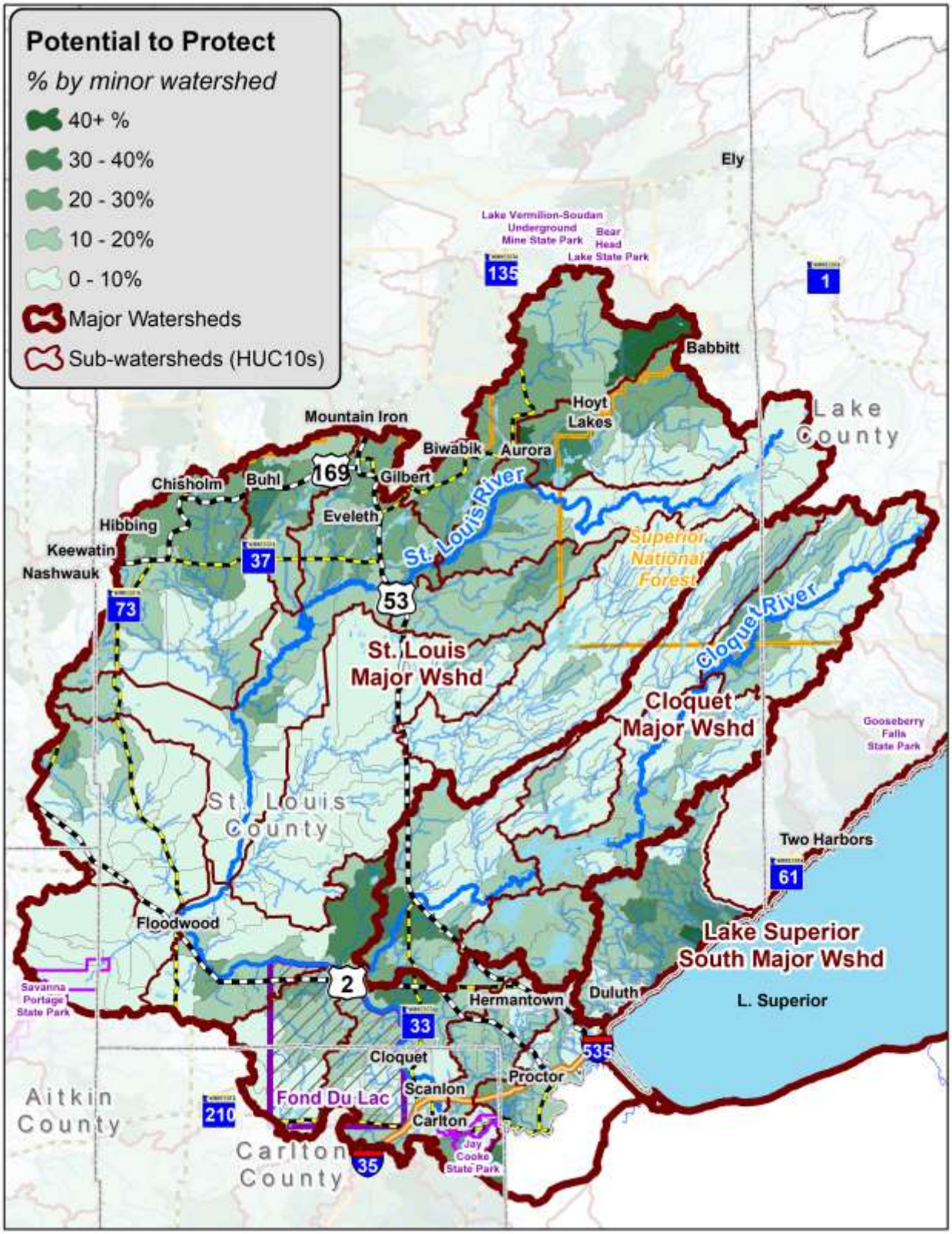

Figure 25. Protection/restoration classifications.

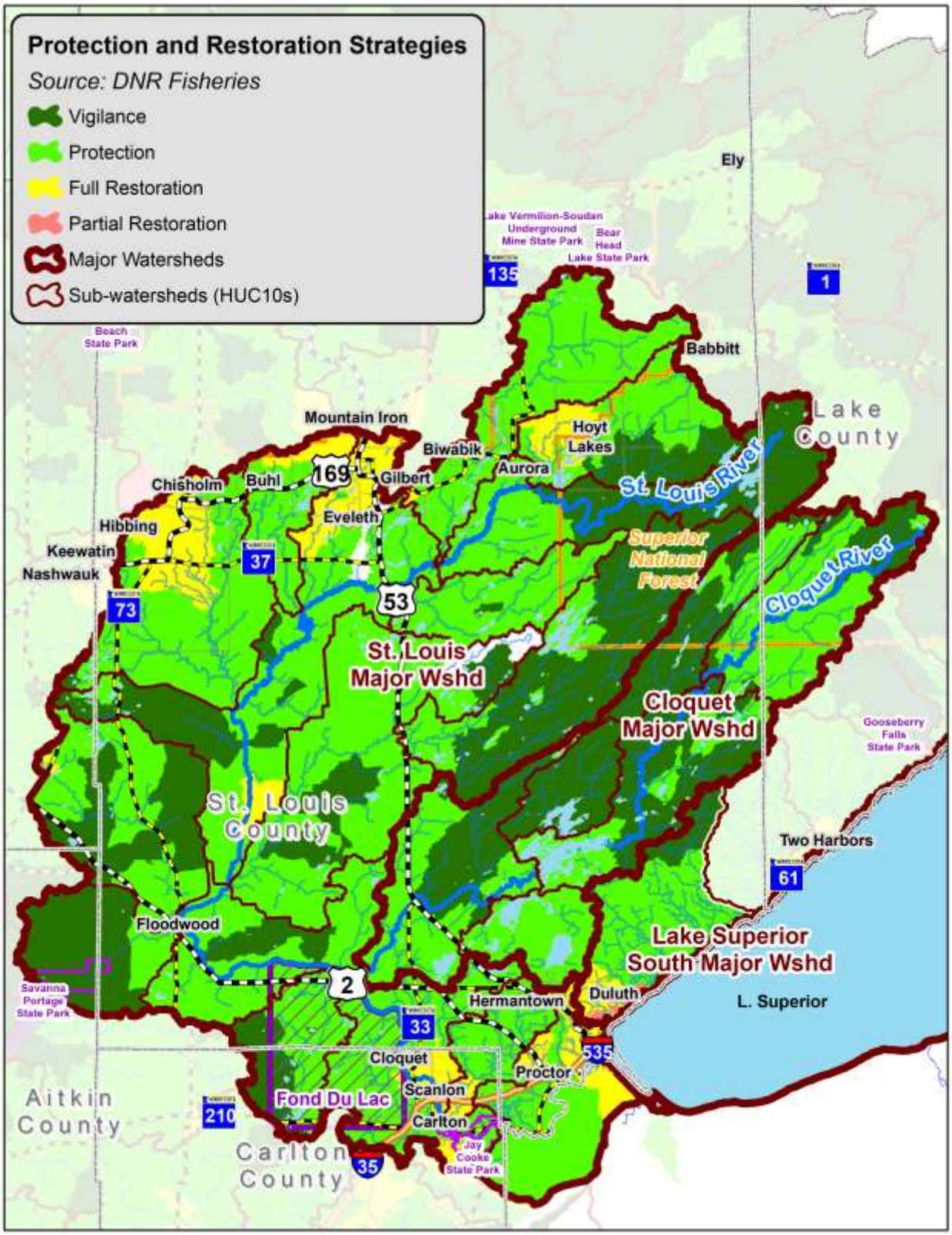

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Figure 26. Lessard-Sams Outdoor Heritage Council priorities.

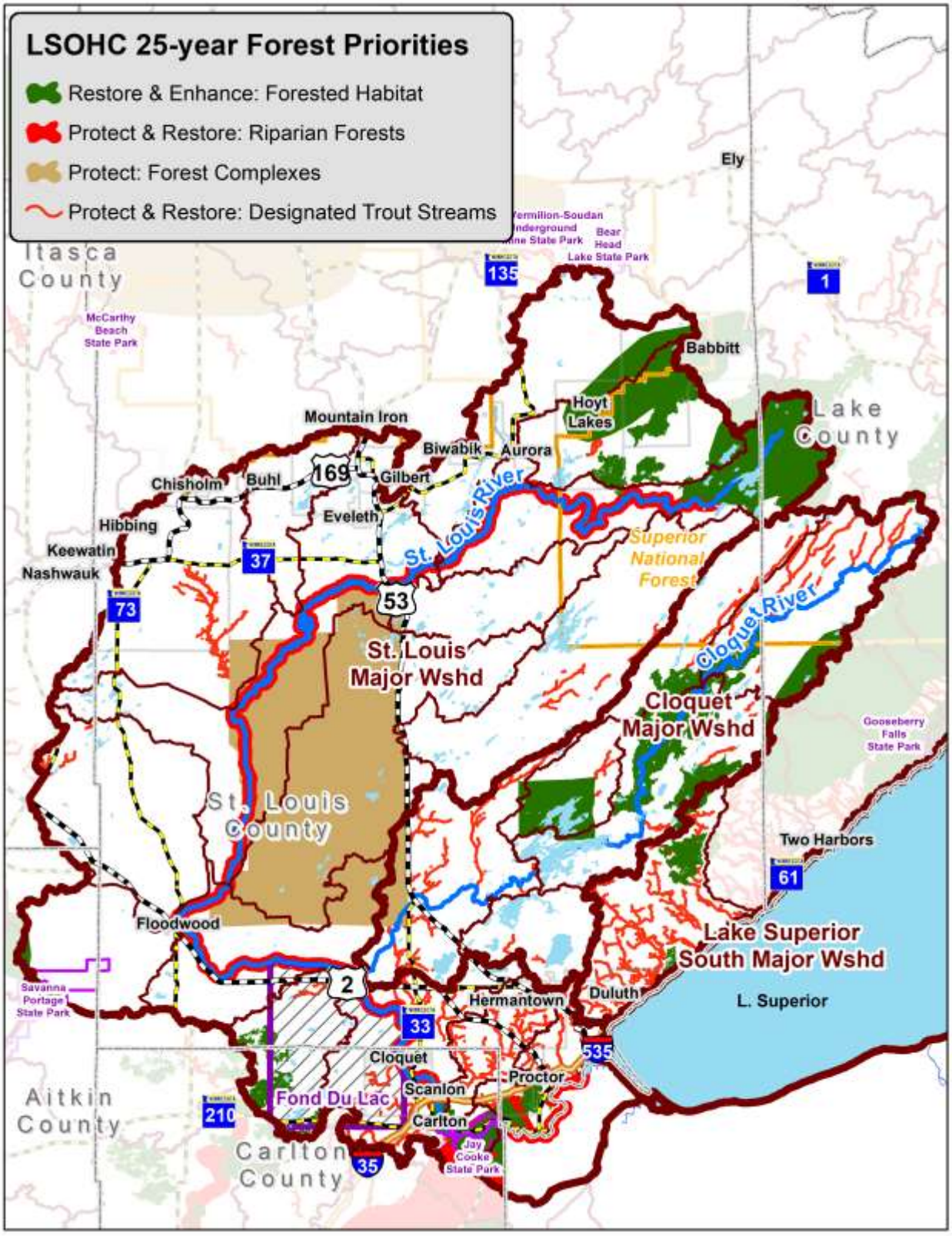


Figure 27. DNR Wildlife Action Network rankings.

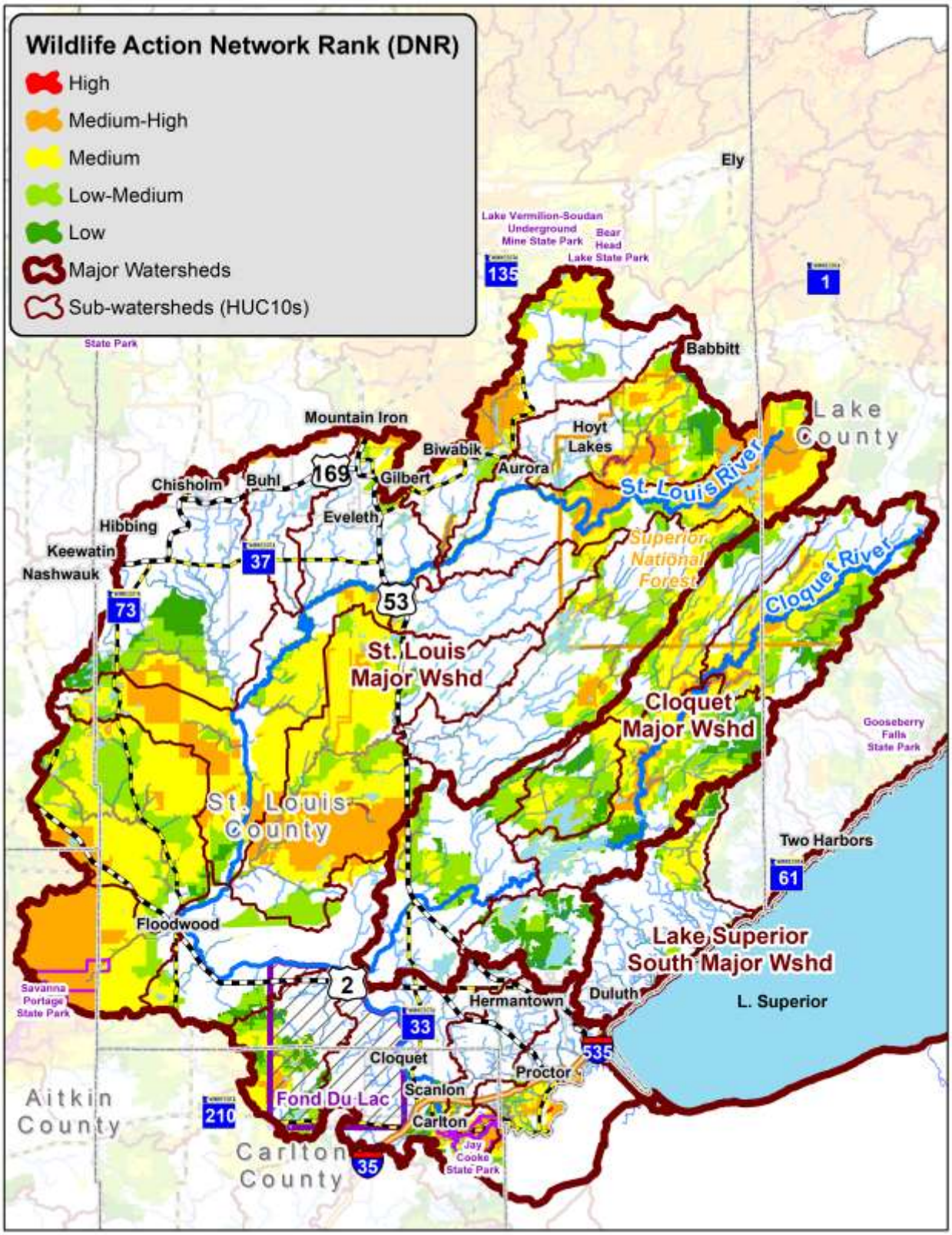


Figure 28. DNR Forests for the Future composite scores.

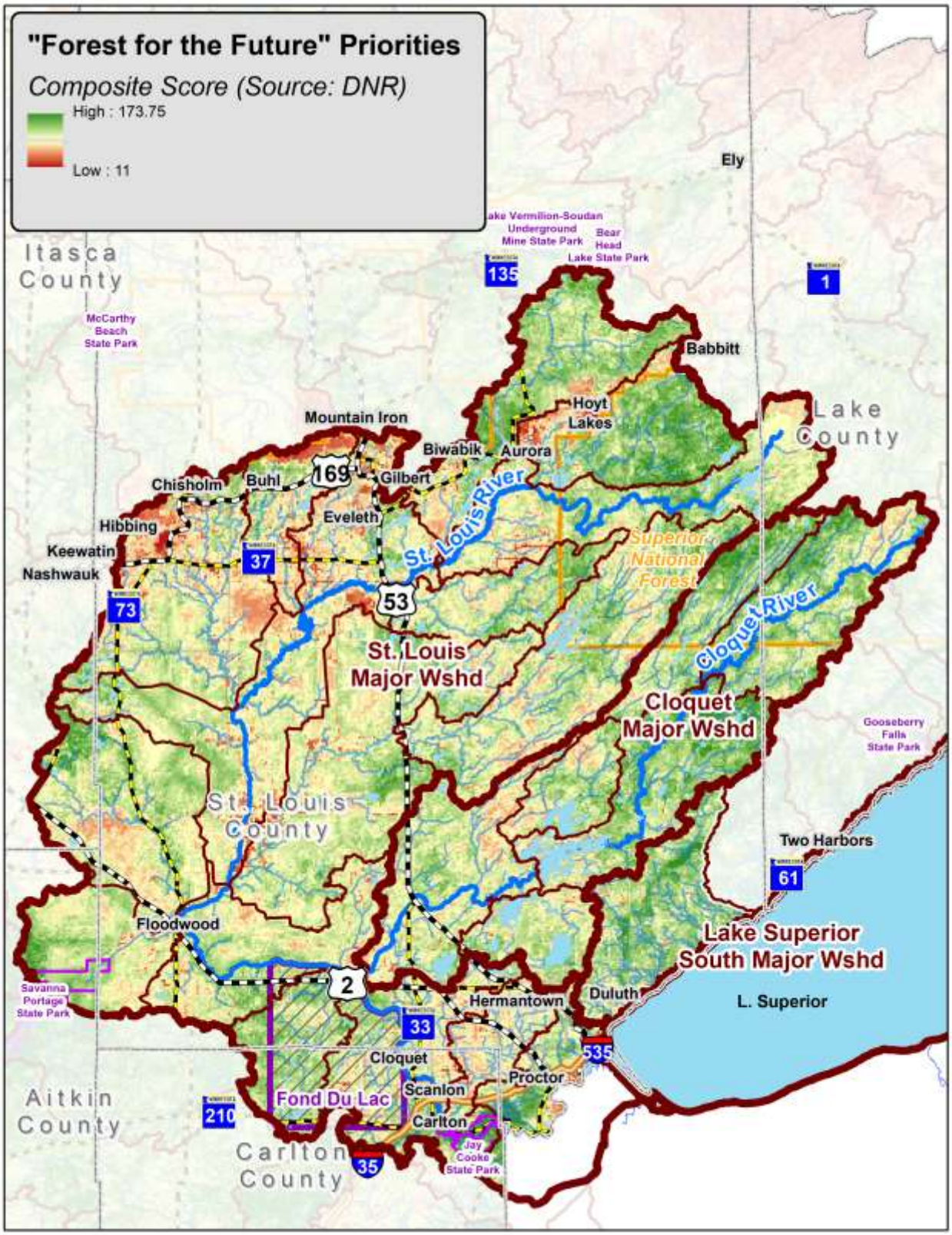


Figure 29. DNR Forests for the Future composite scores by minor watershed (HUC 14).

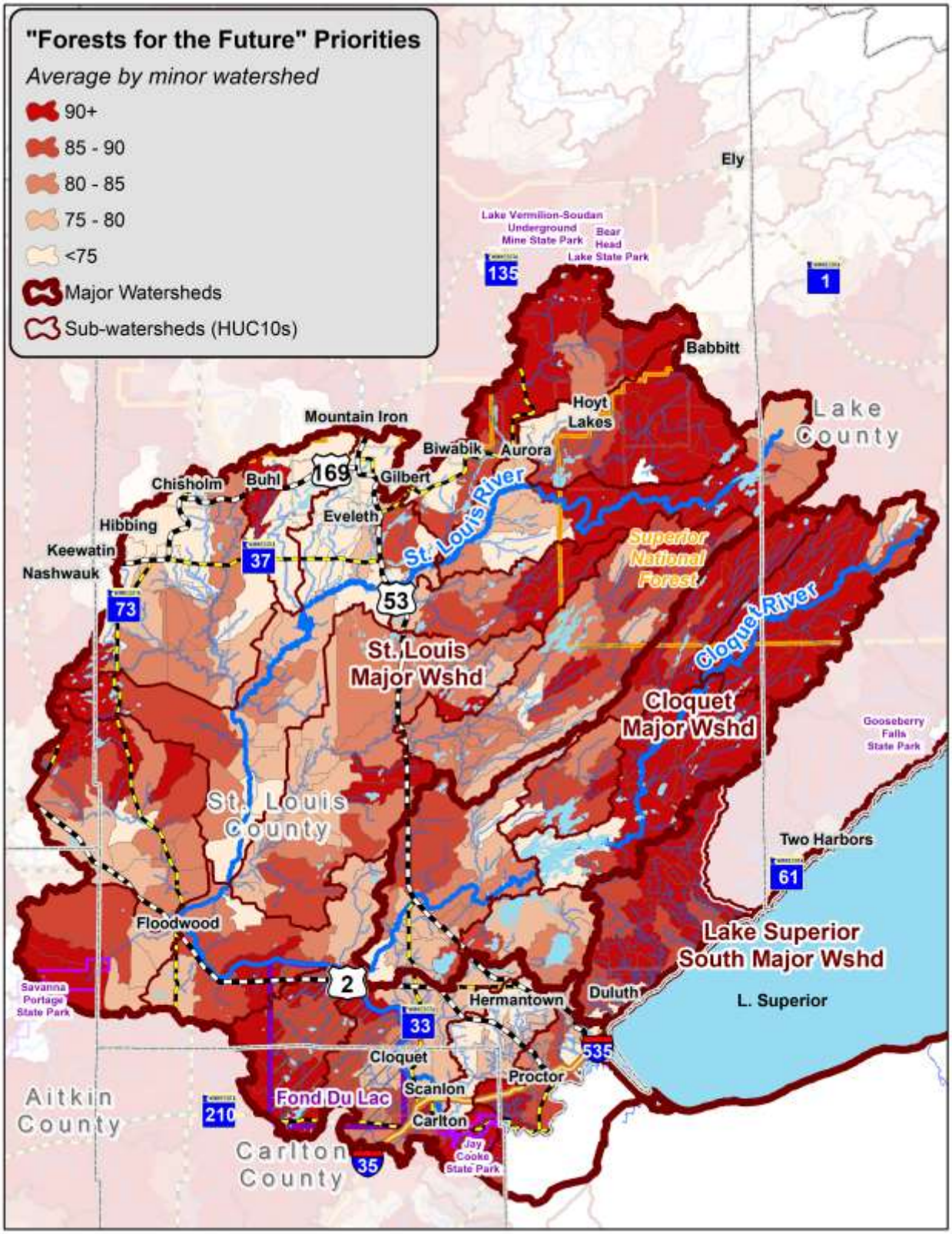
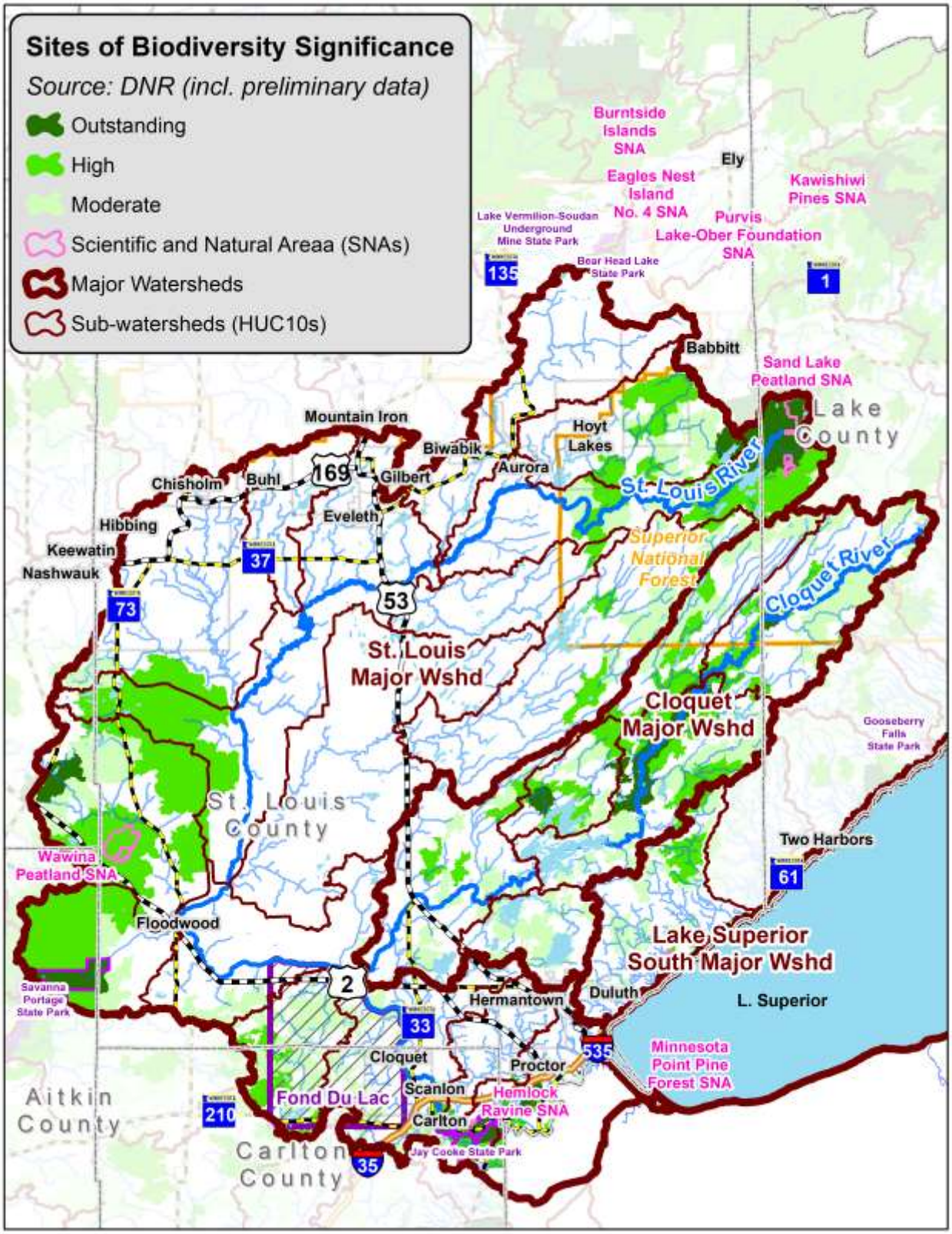


Figure 30. Minnesota Biological Survey (DNR) sites of biological significance.



Land Ownership/Management

Figure 31. Land ownership/management.

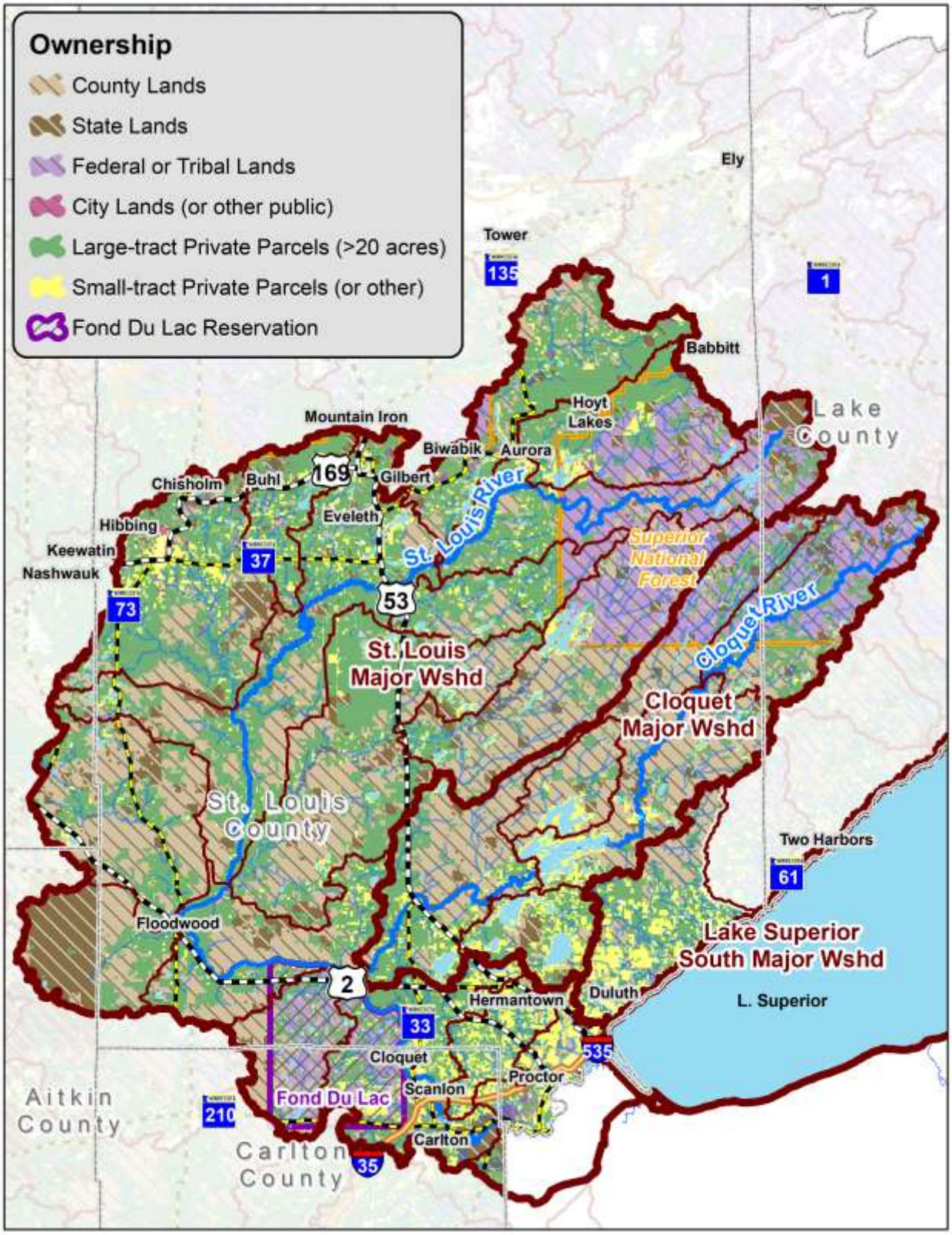


Figure 32. Public and tribal lands.

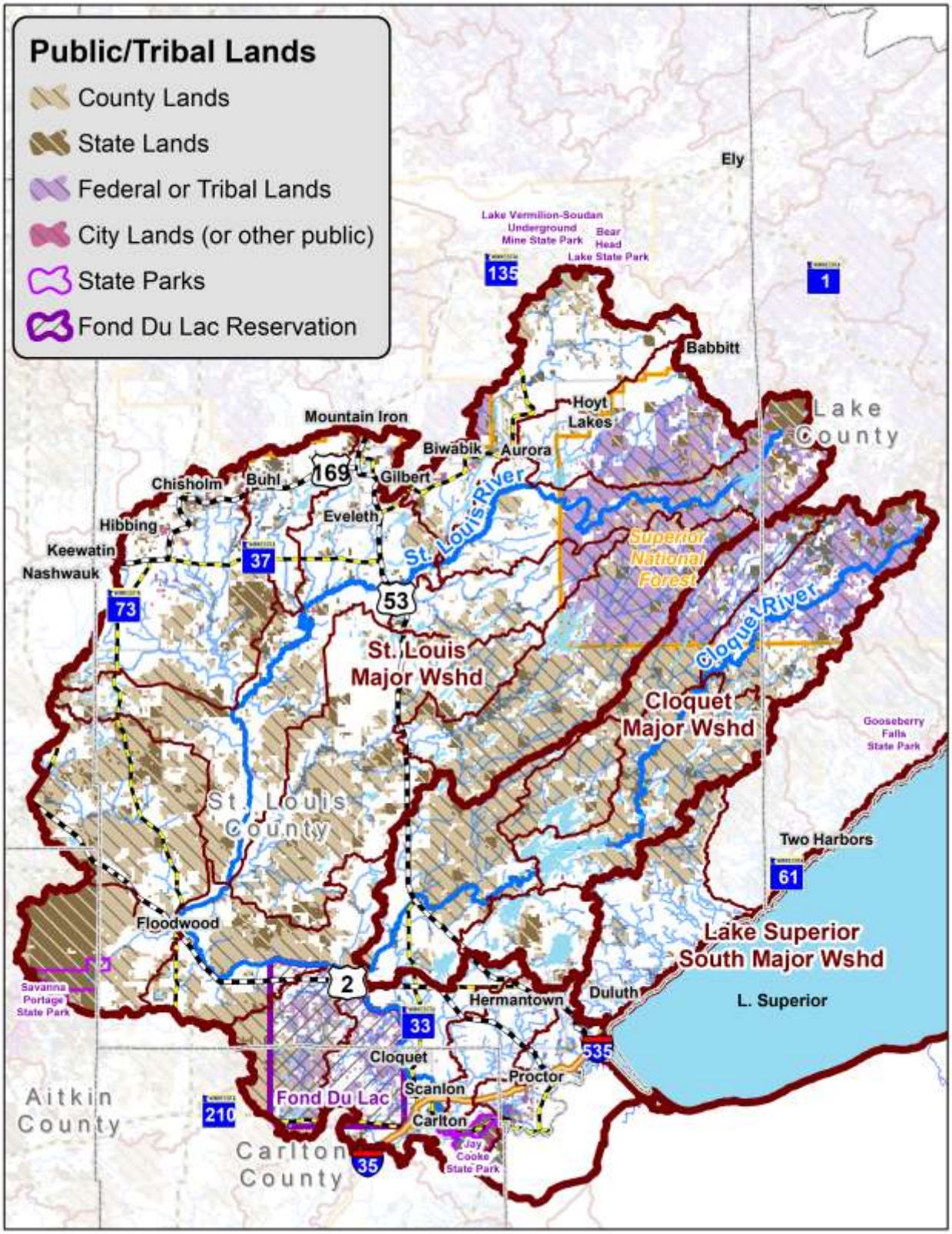


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Figure 33. Total property values by subwatershed (HUC 10).

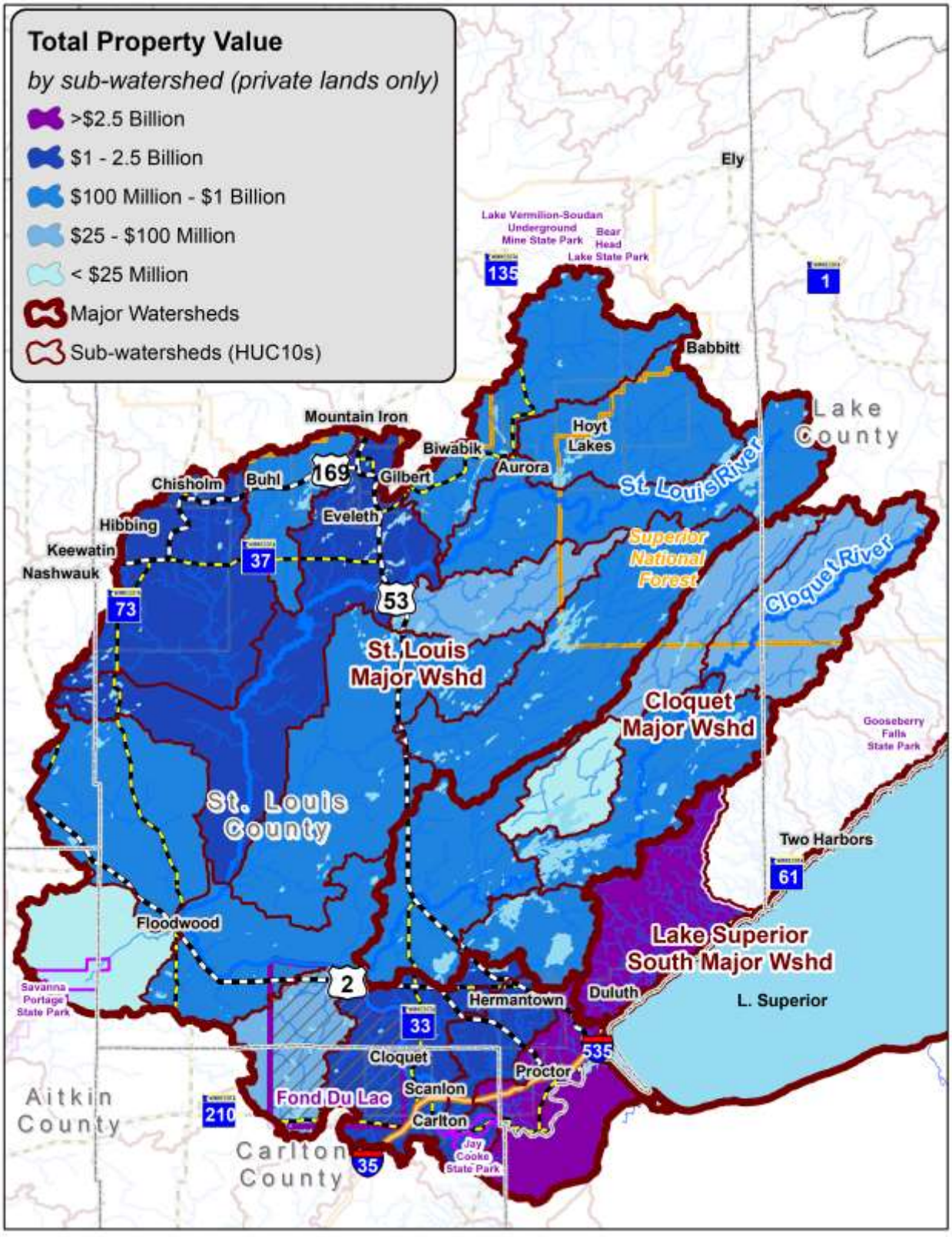


Figure 34. Total property values by minor watershed (HUC 14).

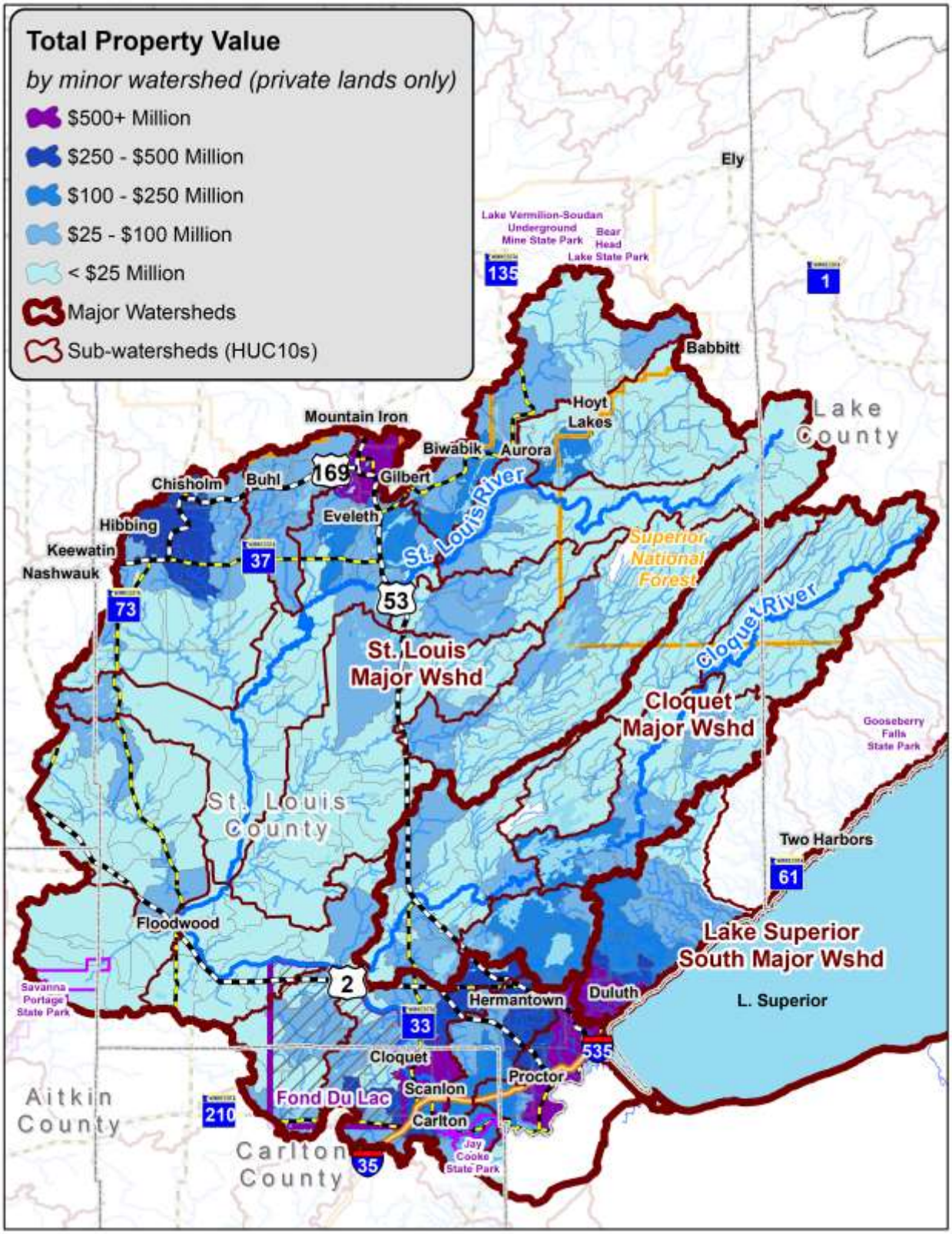
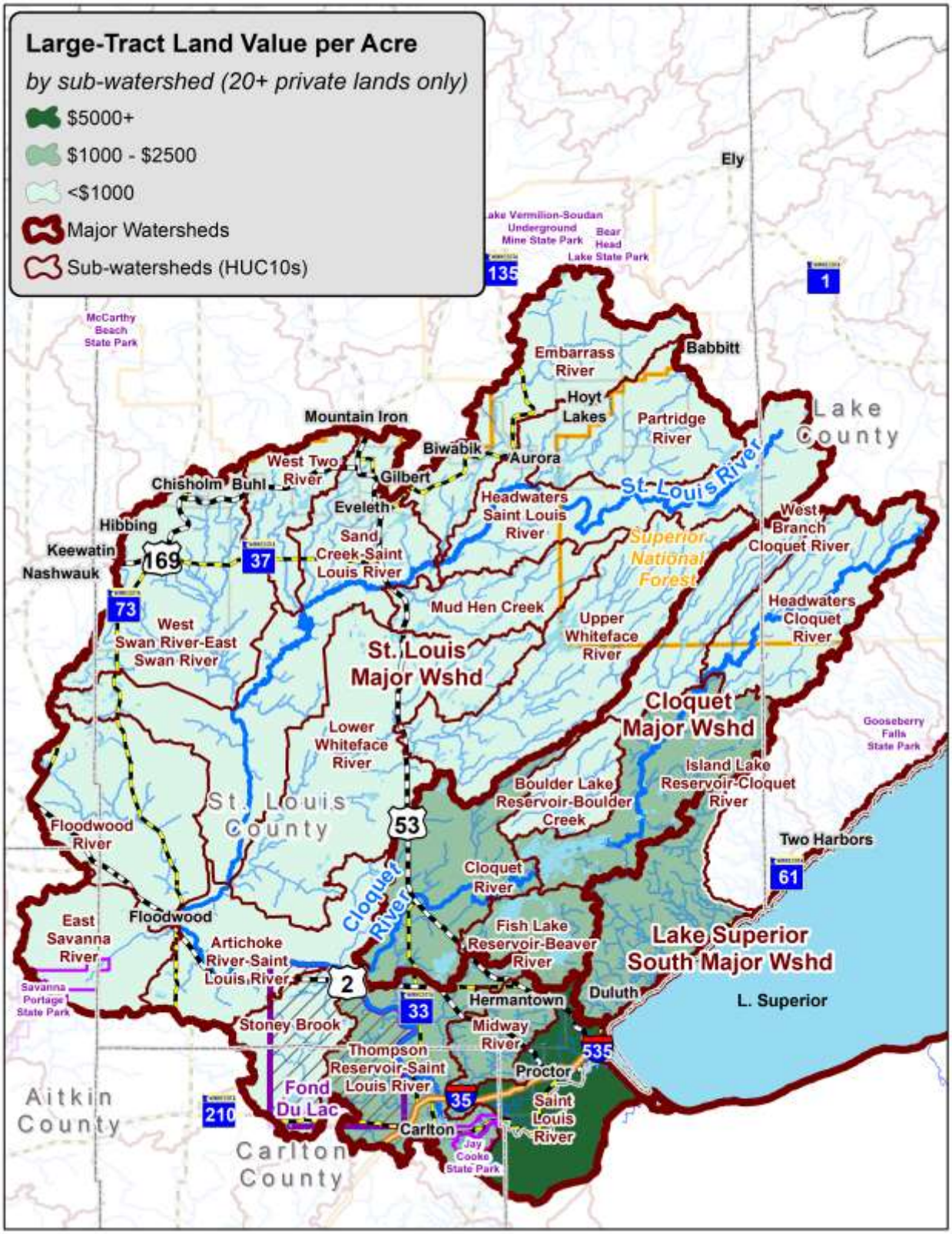


Figure 35. Large tract property values by subwatershed (HUC 10).



Large tract property values by minor watershed (HUC 14).

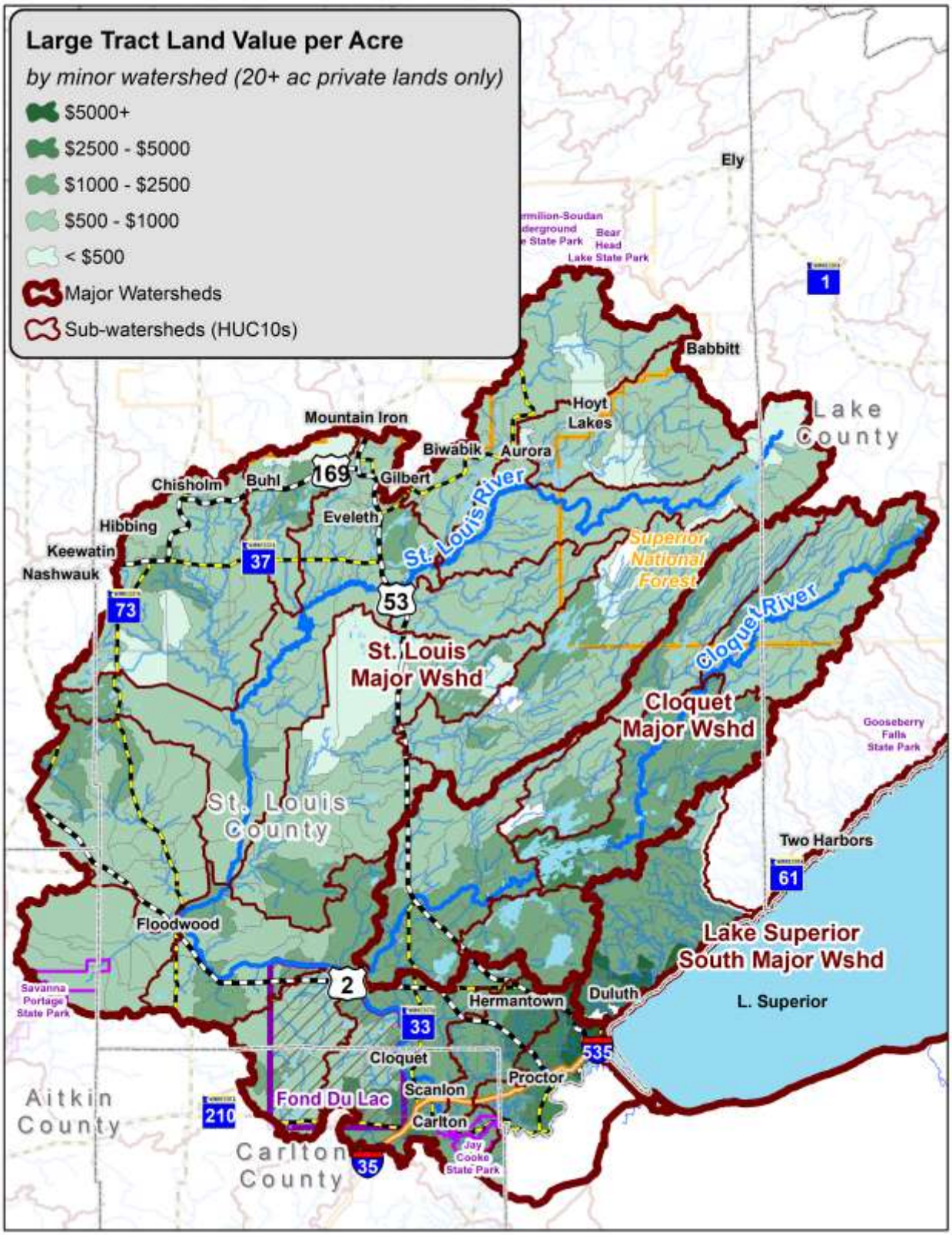
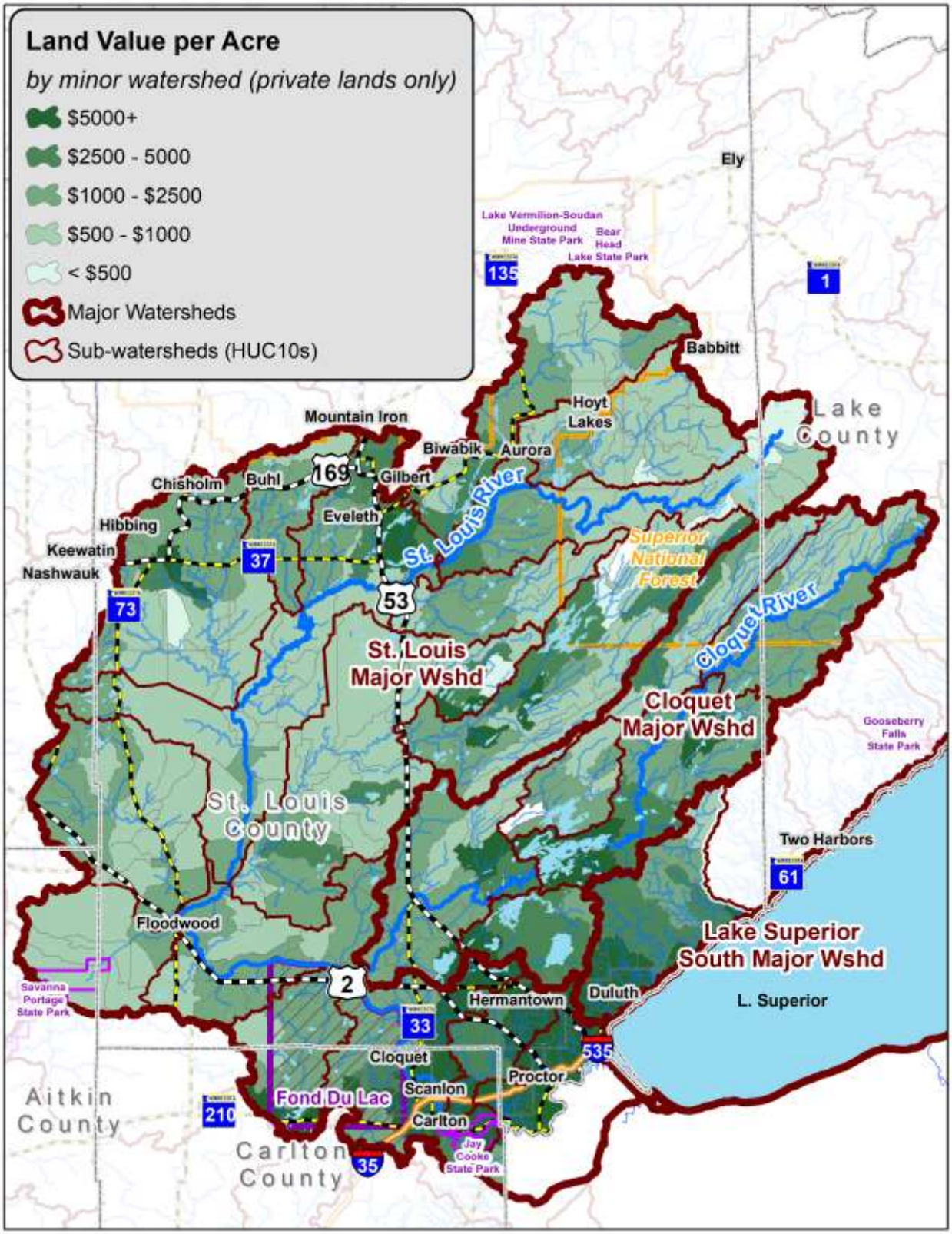


Figure 36. Property values by minor watershed (HUC 14).



Other

Figure 37. Current forest stewardship plan areas.

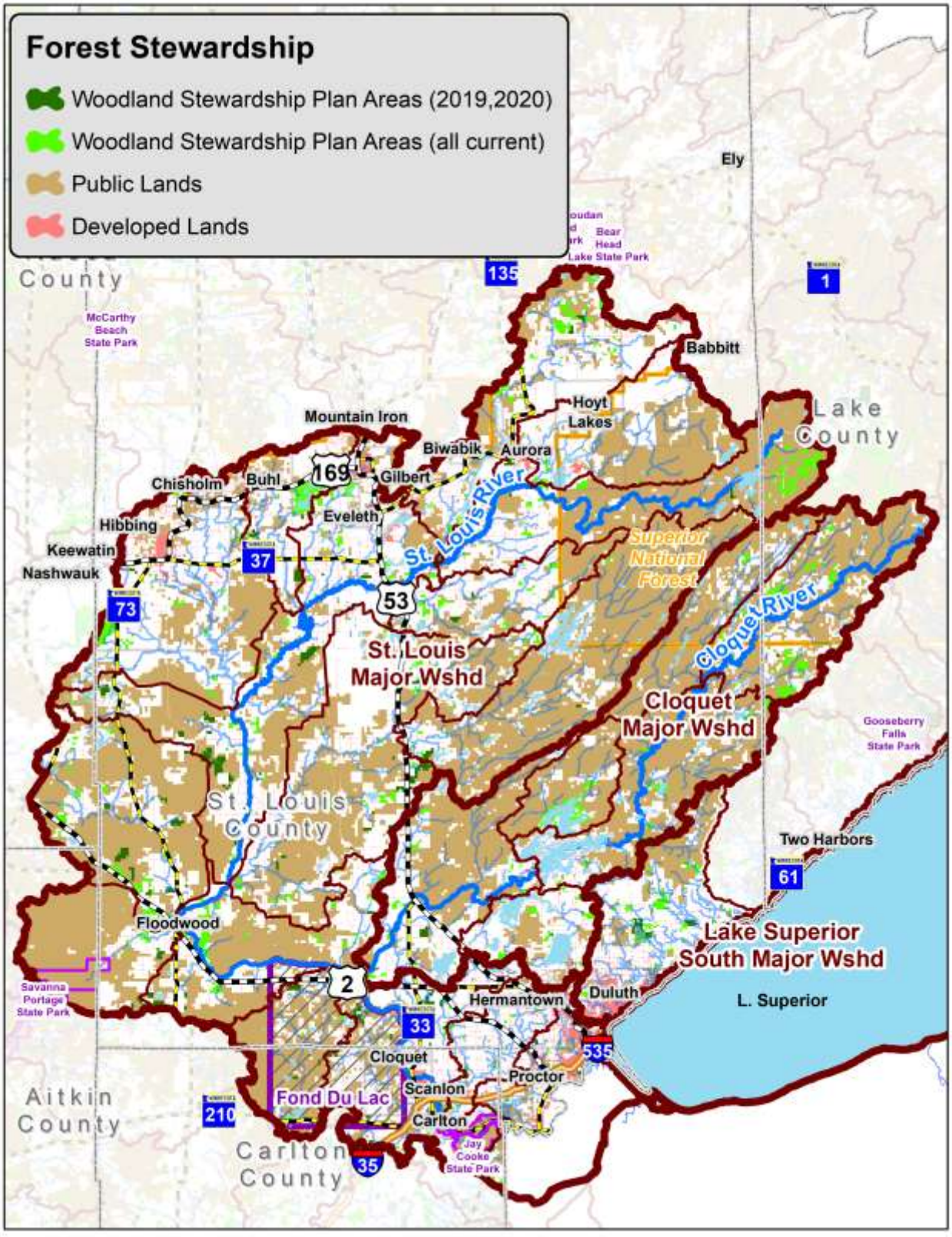


Figure 38. Address density.

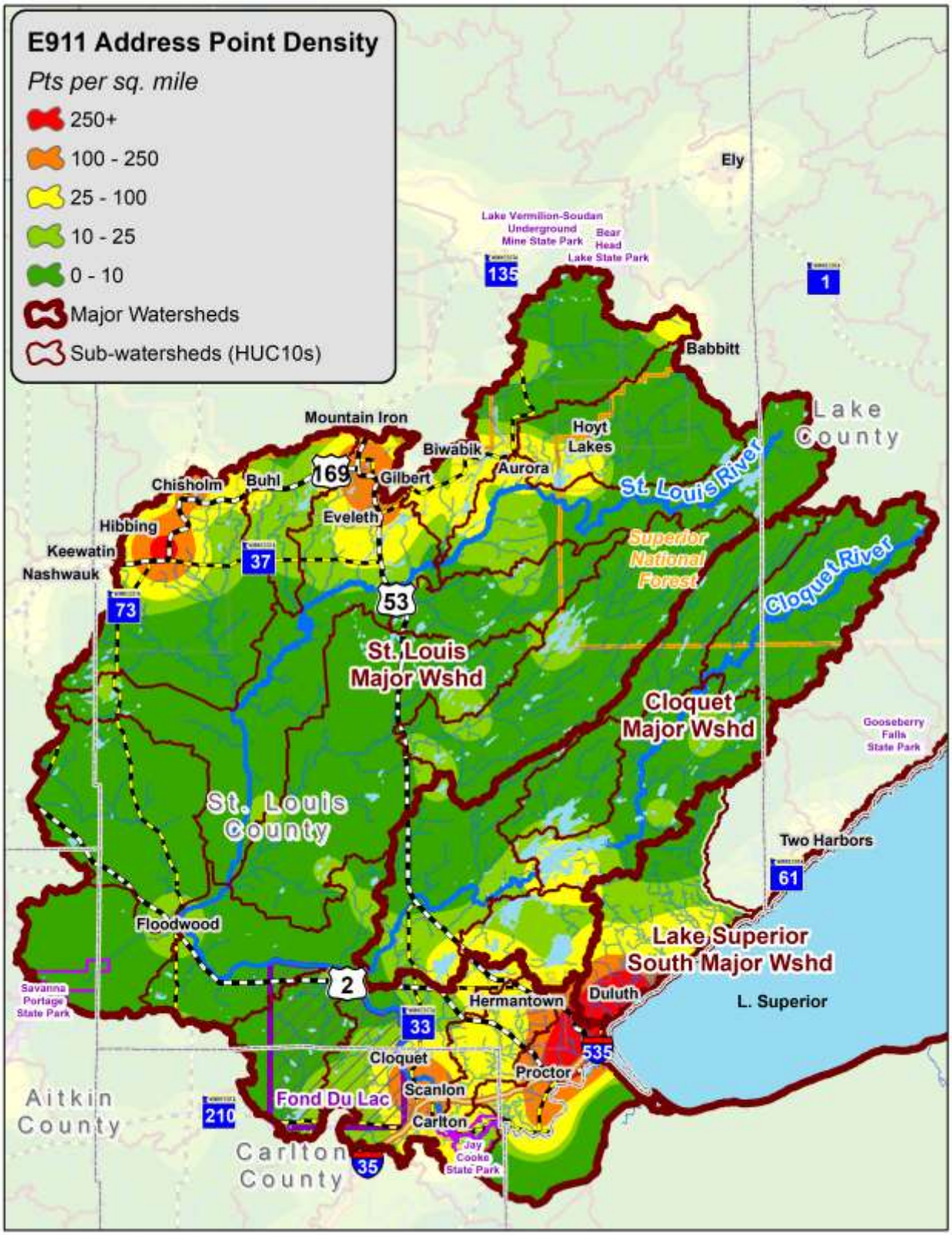


Figure 39. Pollution sensitivity of near-surface materials.

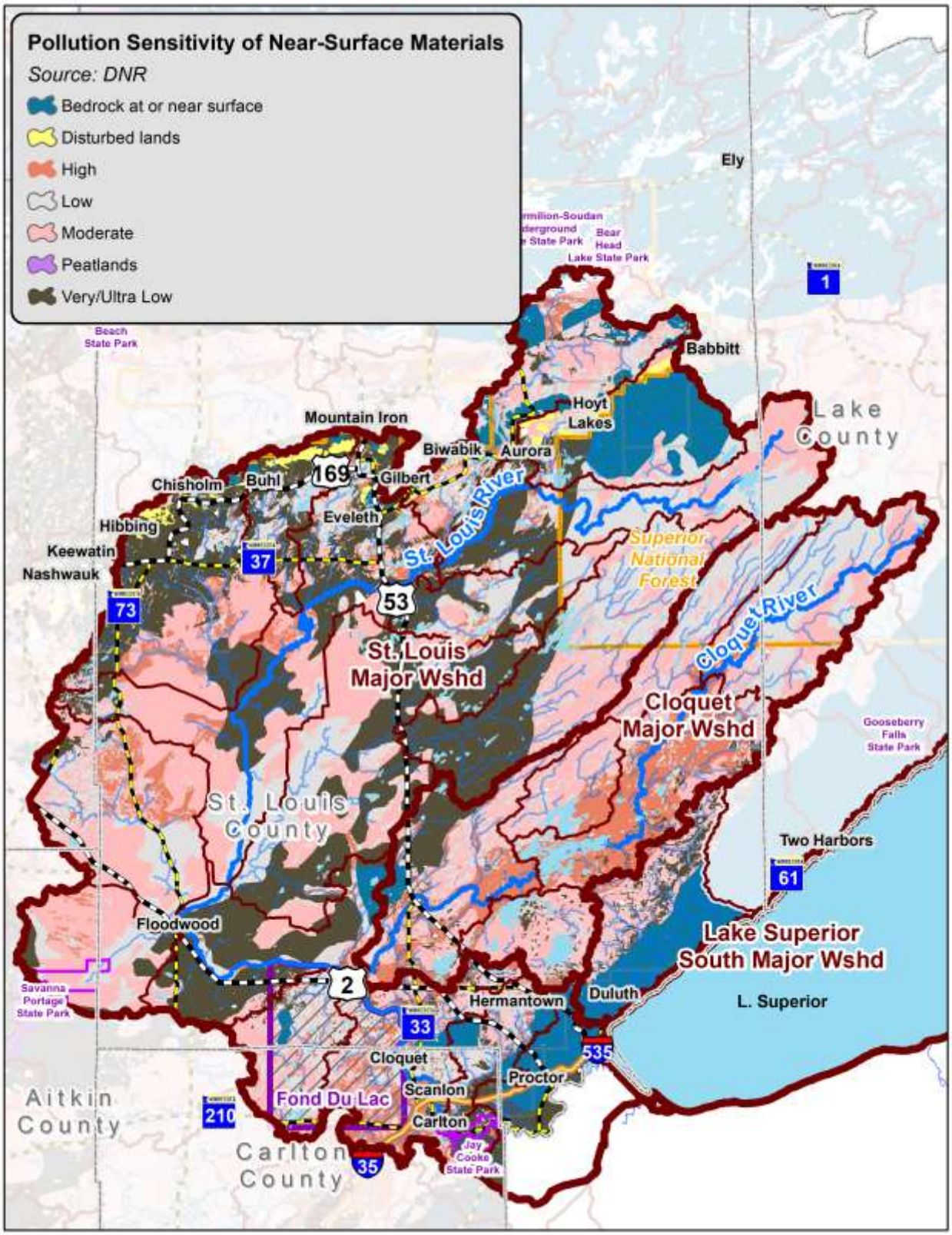


Figure 40. Depth to water table.

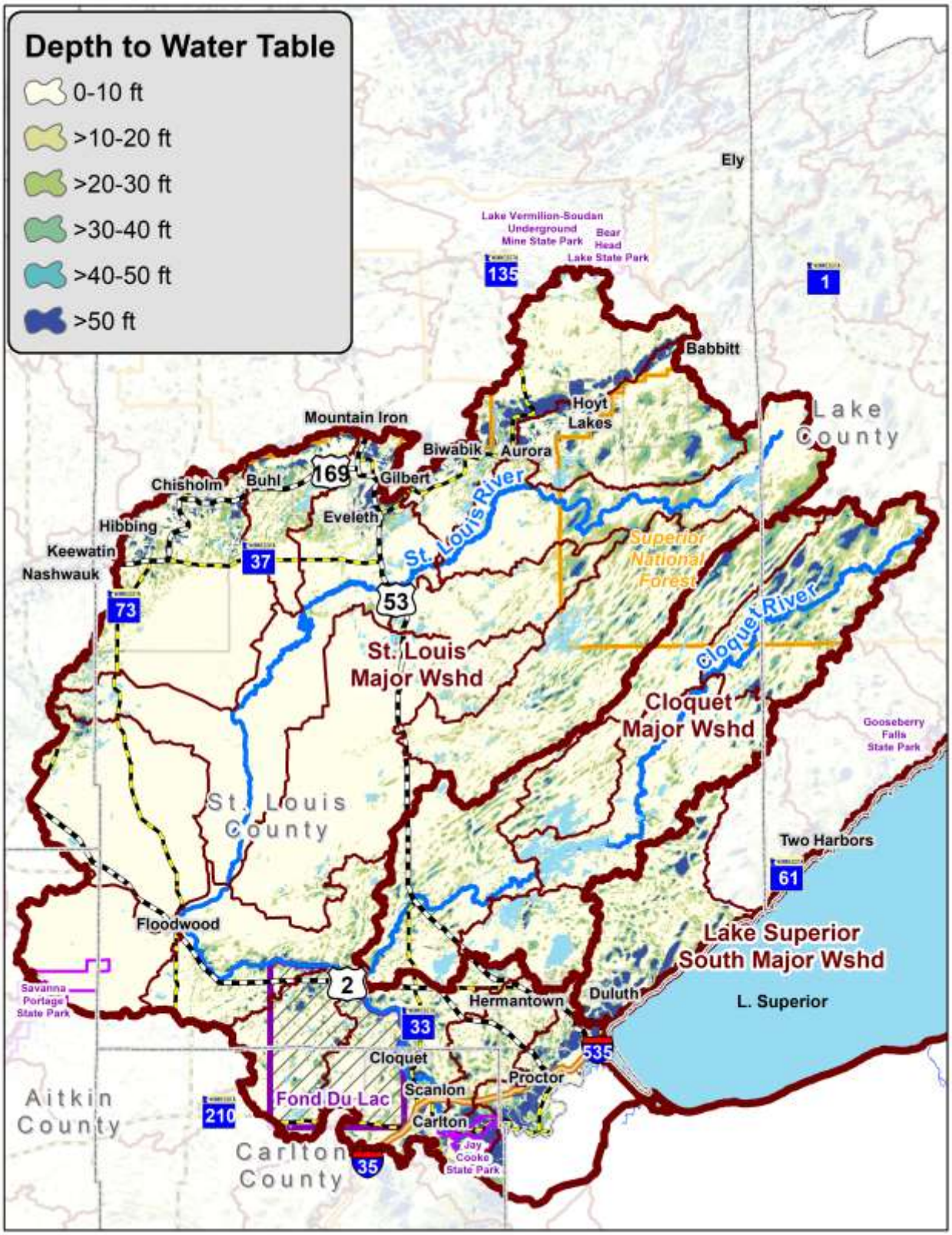
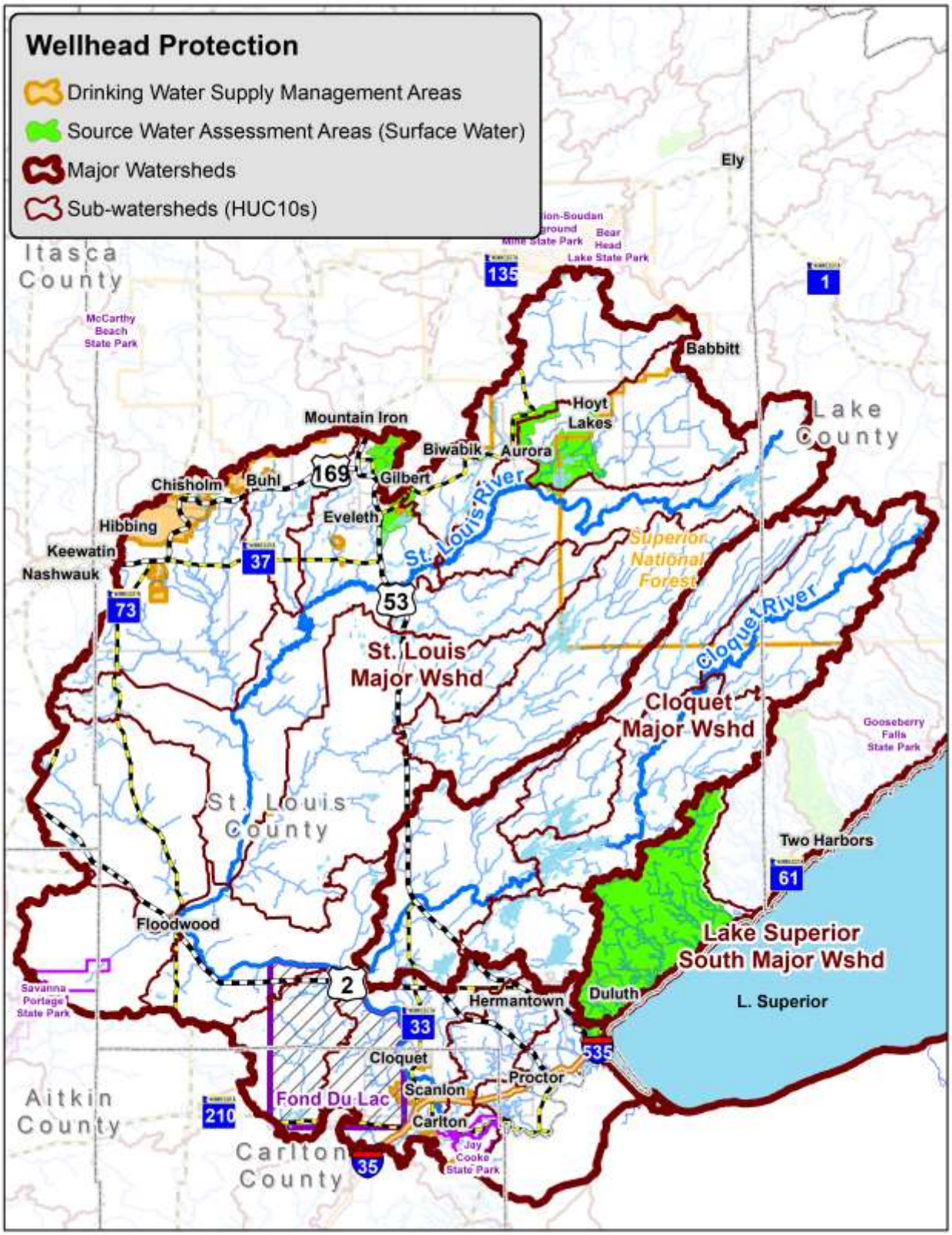


Figure 41. Wellhead protection areas.



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 St. Louis River and Cloquet Rivers Major Watersheds are divided into 23 smaller or "sub" watershed units (HUC10 scale) as shown in the map below. Within each of these HUC10 sub-watersheds, are 4 to 24 minor watersheds, which are on average are 9,411 acres (14.7 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 264 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 tables on the following pages:

Below is a summary of the subwatershed and forest characteristics of the St. Louis River LSP planning area by subwatershed (HUC10):

Table 1. Subwatershed characteristics – Cloquet River Major Watershed.

	Headwaters Cloquet R.	W Branch Cloquet R.	Boulder Lk Res.	Island Lk Res.	Fish Lk. Res.-Beaver R.	Cloquet R.
# of minor wshds	**15**	**9**	**6**	**10**	**4**	**14**
% forest cover	92%	92%	81%	75%	75%	83%
% protected	82%	89%	87%	82%	57%	71%
Potential to protect	10%	7%	7%	8%	12%	13%
Land use disturbance	6%	6%	10%	13%	10%	12%
# of lakes	27	7	6	56	8	23
Avg. lake size	75	201	655	224	919	146
Miles of streams	156	102	38	124	30	128
Stream density (miles/square mile)	0.85	0.96	0.57	0.70	0.40	0.70

Table 2. Subwatershed characteristics – upper reaches of St. Louis River Major Watershed.

	Partridge R.	Headwaters St. Louis R.	Embarrass R.	Mud Hen Creek	W Two R.	W Swan R.-E Swan R.	Sand Creek-St. Louis R.	Upper Whiteface R.	Lower Whiteface R.
# of minor wshds	**11**	**12**	**9**	**6**	**4**	**13**	**24**	**20**	**21**
% forest cover	79%	88%	74%	86%	63%	74%	82%	86%	87%
% protected	66%	78%	52%	61%	45%	64%	58%	89%	78%
Potential to protect	18%	9%	24%	14%	21%	17%	13%	5%	5%
Land use disturbance	13%	7%	20%	8%	30%	19%	15%	8%	5%
# of lakes	7	28	28	13	9	14	24	29	41
Avg. lake size	416	150	107	162	191	83	117	249	95
Miles of streams	97	109	93	71	49	175	182	207	150
Stream density (miles/square mile)	0.62	0.52	0.49	0.70	0.61	0.70	0.56	0.79	0.46

Table 3. Subwatershed characteristics – lower reaches of St. Louis River Major Watershed plus City of Duluth/Lake Superior Frontal Subwatershed.

	Floodwood R.	E Savanna R.	Stoney Brook	Artichoke R.	Midway R.	Thompson Res.	St. Louis R.	City of Duluth / Lk. Sup.
# of minor wshds	**15**	**7**	**6**	**13**	**6**	**11**	**8**	**20**
% forest cover	81%	91%	85%	85%	76%	77%	55%	79%
% protected	81%	90%	94%	68%	27%	53%	30%	38%
Potential to protect	6%	1%	6%	14%	14%	15%	13%	20%
Land use disturbance	7%	2%	6%	9%	21%	17%	33%	20%
# of lakes	32	3	22	13	1	17	5	9
Avg. lake size	76	76	146	65	3	71	85	41
Miles of streams	84	12	38	69	82	159	102	205
Stream density (miles/square mile)	0.37	0.10	0.37	0.41	1.24	0.83	1.21	1.28

Table 4. Composite Forests for the Future (FFF) scores and potential native plant communities.

Name	FFF score (composite mean)	Fire-Dependent		Mesic Hardwood		Acid Peatland		Forested Rich Peatland		Flooplain Forest		Wet Forest	
Headwaters Cloquet R.	93.8	61,302	52%	2,057	2%	2,278	2%	38,819	33%	341	0%	686	1%
W Branch Cloquet R.	95.2	37,105	55%	226	0%	3,169	5%	19,446	29%	0	0%	805	1%
Boulder Lk Res.	85.0	23,125	54%	2,211	5%	2,621	6%	5,721	13%	0	0%	2,024	5%
Island Lk Res.	95.2	61,333	54%	2,191	2%	4,235	4%	13,348	12%	787	1%	6,980	6%
Fish Lk. Res.-Beaver R.	81.7	22,573	47%	524	1%	403	1%	14,128	29%	0	0%	136	0%
Cloquet R.	81.5	63,341	54%	5,914	5%	9,660	8%	21,040	18%	2	0%	5,959	5%
Partridge R.	94.6	61,403	61%	299	0%	6,209	6%	19,651	20%	0	0%	1,188	1%
Headwaters St. Louis R.	84.5	43,274	32%	5,649	4%	29,119	22%	23,080	17%	0	0%	8,061	6%
Embarrass R.	91.1	70,385	58%	1,953	2%	7,831	6%	23,079	19%	0	0%	4,492	4%
Mud Hen Creek	87.3	19,871	31%	5,783	9%	19,136	30%	3,026	5%	0	0%	9,726	15%
W Two R.	74.1	11,424	23%	18,126	36%	5,855	12%	571	1%	0	0%	7,507	15%
W Swan R.-E Swan R.	75.9	45,531	28%	24,020	15%	41,056	26%	6,576	4%	0	0%	22,918	14%
Sand Creek-St. Louis R.	78.4	26,934	13%	32,186	15%	80,349	38%	7,293	3%	0	0%	32,946	16%
Upper Whiteface R.	83.8	90,297	54%	4,815	3%	17,751	11%	30,929	18%	147	0%	9,864	6%
Lower Whiteface R.	83.1	26,846	13%	15,792	8%	100,259	48%	12,642	6%	0	0%	36,720	18%
Floodwood R.	85.0	2,503	2%	33,469	23%	71,357	49%	14,103	10%	0	0%	13,803	9%
E Savanna R.	88.8	119	0%	10,694	14%	35,428	45%	13,868	18%	0	0%	11,528	15%
Stoney Brook	92.9	872	1%	26,338	41%	5,720	9%	23,623	37%	1	0%	1,627	3%
Artichoke R.	83.4	9,524	9%	38,176	35%	24,856	23%	7,923	7%	1	0%	18,669	17%
Midway R.	74.6	20,713	49%	2,105	5%	771	2%	8,435	20%	0	0%	584	1%
Thompson Res.	85.0	41,848	34%	21,639	18%	5,171	4%	25,439	21%	53	0%	2,925	2%
St. Louis R.	86.0	8,203	15%	17,954	33%	179	0%	2,776	5%	55	0%	1,241	2%
City of Duluth / Lk. Sup.	93.3	48,335	47%	19,006	19%	664	1%	12,772	13%	0	0%	2,434	2%
Total (or avg for FFF)	85.5	796,862	33%	291,126	12%	474,076	19%	348,290	14%	1,387	0%	202,823	8%

Table 5. Priority and at-risk lake estimates.

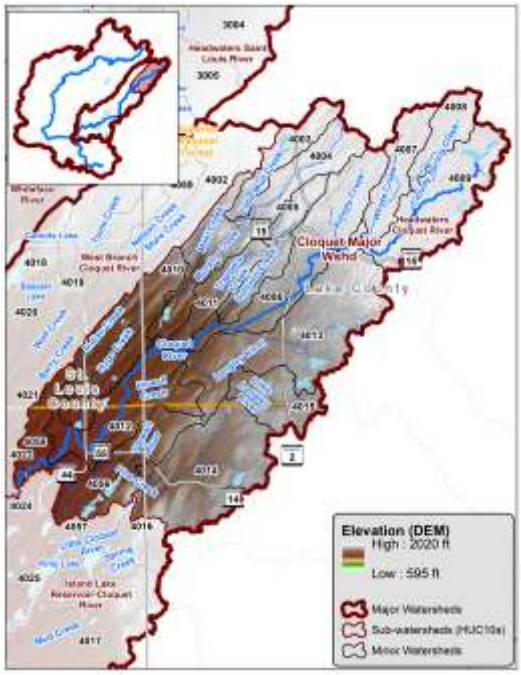
	Lakes of phosphorous sensitivity significance			Lake of biodiversity significance			Lake water quality trends			Outstanding water resources		
Name	High	Higher	Highest	Moderate	High	Outstanding	Improving	Declining	Stable	Trout lakes	Wild rice lakes	Shallow lakes
Headwaters Cloquet R.	6	3	0	0	0	4	0	0	3	0	11	5
W Branch Cloquet R.	2	1	0	0	0	4	1	0	0	0	3	4
Boulder Lk Res.	1	0	0	0	0	1	0	0	1	0	0	0
Island Lk Res.	6	4	2	4	0	4	4	5	4	3	6	9
Fish Lk. Res.-Beaver R.	2	0	2	0	1	2	0	0	2	0	2	3
Cloquet R.	1	2	2	1	1	2	2	1	1	0	1	1
Partridge R.	1	0	2	0	3	0	0	1	0	0	2	1
Headwaters St. Louis R.	4	2	1	1	4	5	0	0	1	1	7	7
Embarrass R.	2	0	3	1	3	2	1	2	0	1	9	3
Mud Hen Creek	2	1	1	1	0	2	0	1	0	0	3	5
W Two R.	0	0	0	0	0	0	0	0	0	0	0	0
W Swan R.-E Swan R.	3	0	1	0	1	0	1	0	0	1	1	2
Sand Creek-St. Louis R.	2	2	4	1	1	1	4	0	5	1	0	1
Upper Whiteface R.	2	0	1	0	0	5	0	1	3	1	2	3
Lower Whiteface R.	4	1	0	2	0	6	2	1	3	0	8	10
Floodwood R.	2	0	0	1	2	0	0	0	0	0	0	1
E Savanna R.	0	0	0	0	0	0	0	0	0	0	2	0
Stoney Brook	0	2	0	0	0	5	0	0	0	1	10	7
Artichoke R.	0	0	0	0	0	1	0	0	0	0	2	2
Midway R.	1	0	0	0	0	1	0	0	0	0	0	0
Thompson Res.	1	0	2	1	1	1	2	0	0	0	4	1
St. Louis R.	0	0	0	0	0	1	0	0	0	1	1	0
City of Duluth / Lk. Sup.	1	0	0	0	0	2	0	1	0	1	1	1
Totals	**43**	**18**	**21**	**13**	**17**	**49**	**17**	**13**	**23**	**11**	**75**	**66**

Subwatershed No. 1
Headwaters Cloquet River (HUC 401020201)

Description

The Headwaters Cloquet River Subwatershed drains 183 square miles of Lake and St. Louis counties and is the headwaters to the Cloquet River.

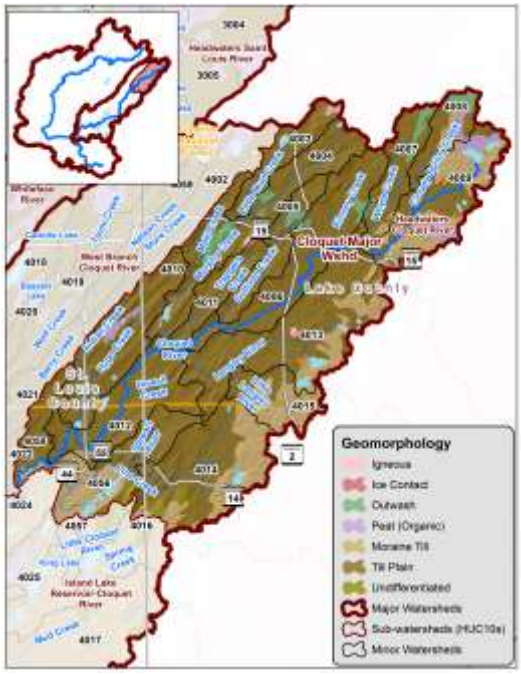
Figure 42. Elevation.



Geography

This subwatershed has roughly three geographic areas characterized by different soils and landforms. The area near to the eastern border is rolling to hummocky end moraine with fine sandy loam soils. The area to the north of Highway 15 is nearly level to gently rolling till plain with sandy loam soils. The remainder of the subwatershed is a rolling drumlin plain with drumlins orientated in a northeast to southwest direction. Soil textures on the drumlin plain are sandy loam over a gravelly sandy loam hardpan.

Figure 43. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Headwaters Cloquet River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest in the uplands. Today the forest remains intact with little conversion or fragmentation. The composition of the forest is primarily aspen/birch and spruce/fir forest type groups. Minor amounts of white/red/jack pine and maple/beech/birch forest type groups are also present.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas have the potential to support fire-dependent NPCs. The lowland areas primarily support forested rich peatland NPCs.

Figure 44. Historic vegetation cover.

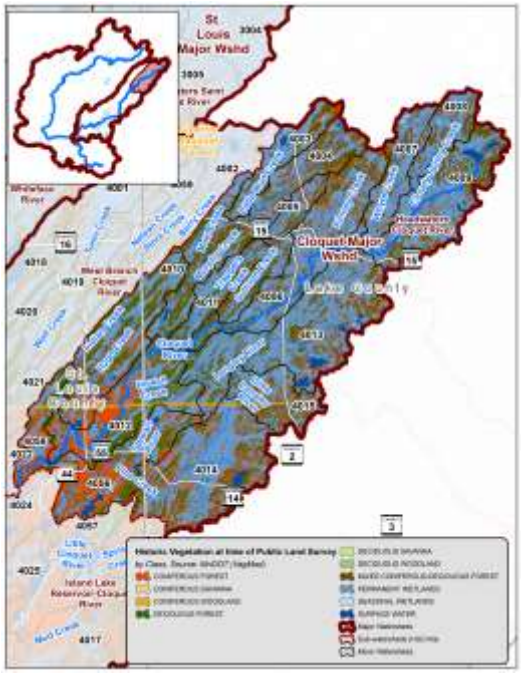


Figure 45. Potential native plant communities.

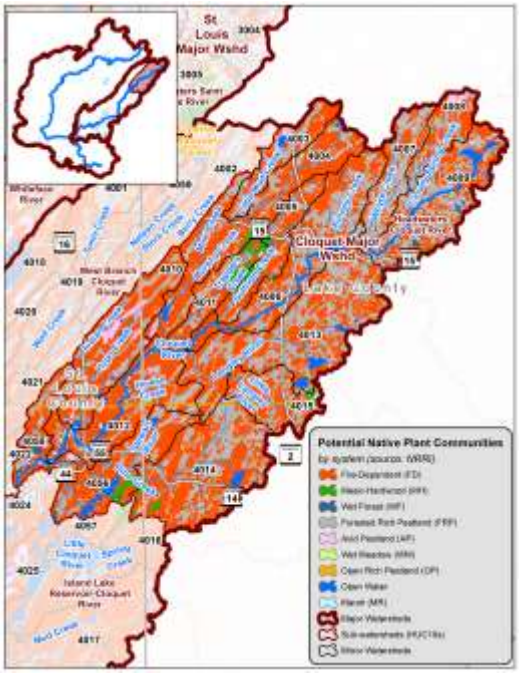
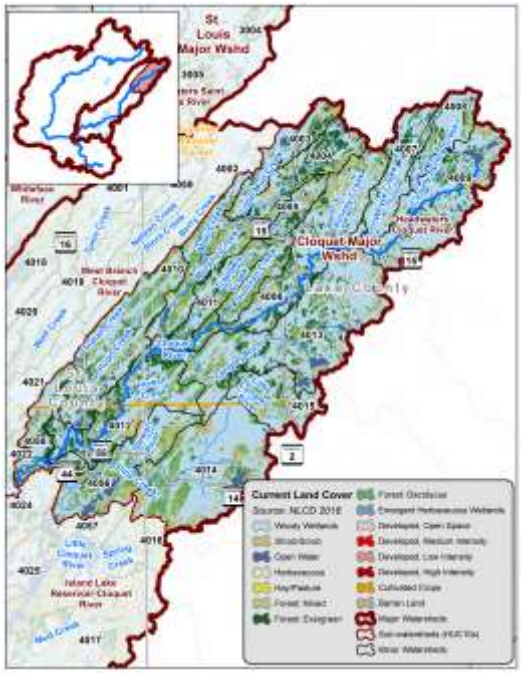


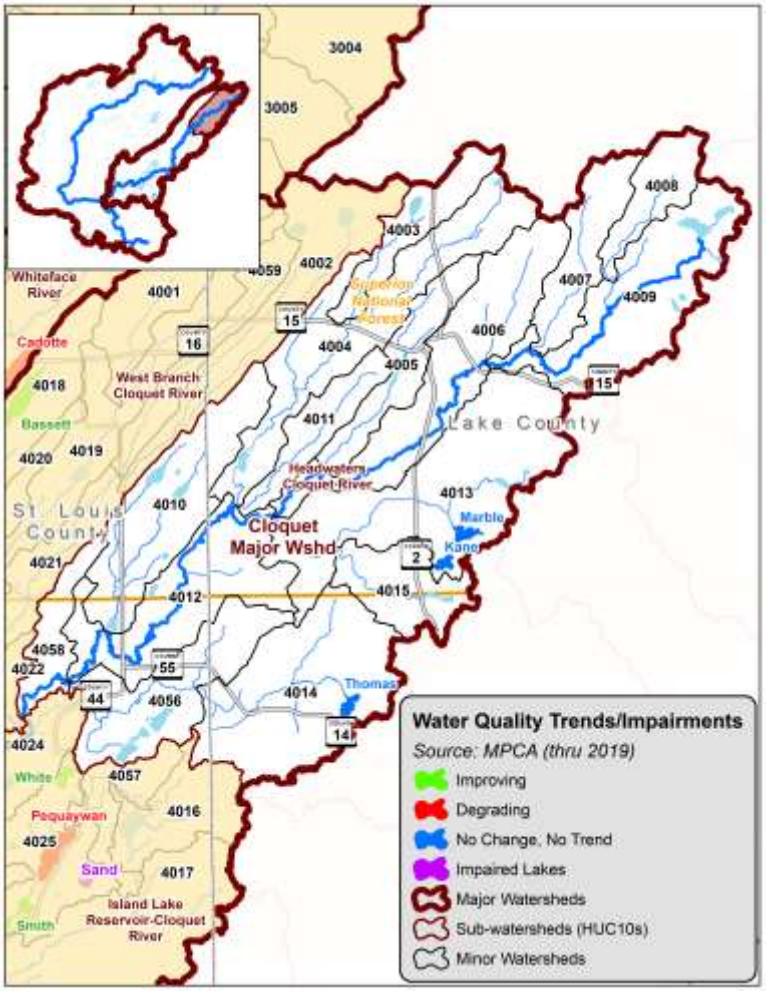
Figure 46. Current land cover.



Water Resources Summary

The Headwaters Cloquet River Subwatershed is the headwaters to the Cloquet River as its name implies, and home to several other streams and dozens of lakes. Of the lakes with available water quality data, three have stable water quality. Three lakes have higher or highest phosphorous sensitivity rankings. This subwatershed also has four lakes of high or outstanding biodiversity significance, as well as 16 wild rice lakes. Additionally, the Headwaters Cloquet River Subwatershed contains 156 miles of streams, including 64 miles of trout streams.

Figure 47. Water quality trends.



Protection Status

82% of the Headwaters Cloquet River Subwatershed is currently protected, mostly by the Superior National Forest, county tax-forfeited land, and the Finland State Forest.

Figure 48. Protected lands.

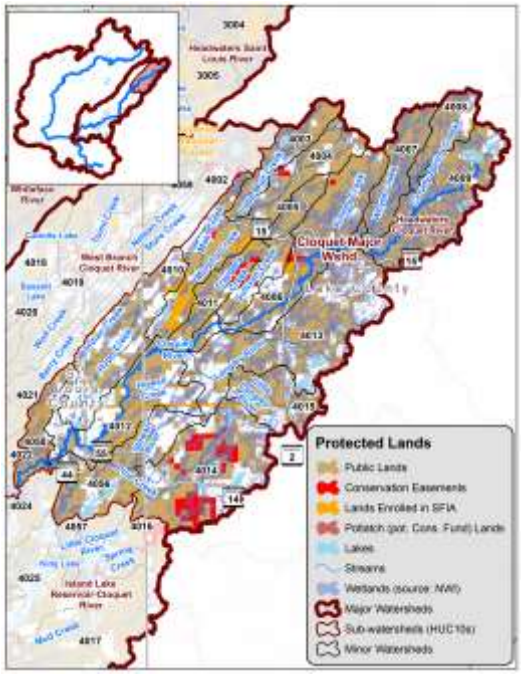


Figure 49. Potential to protect.

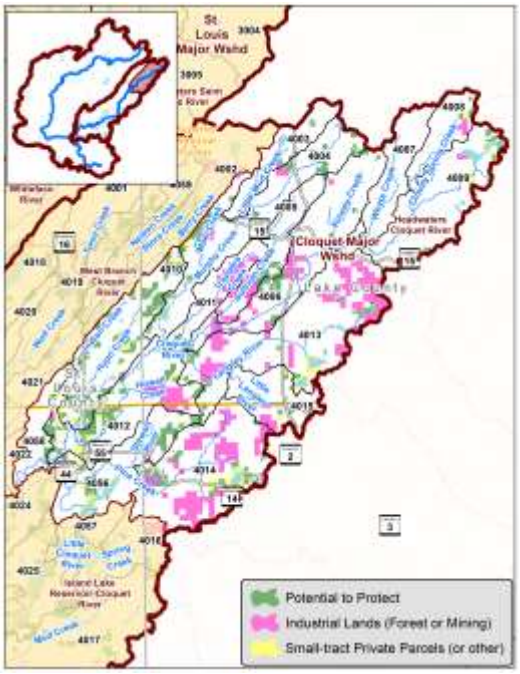
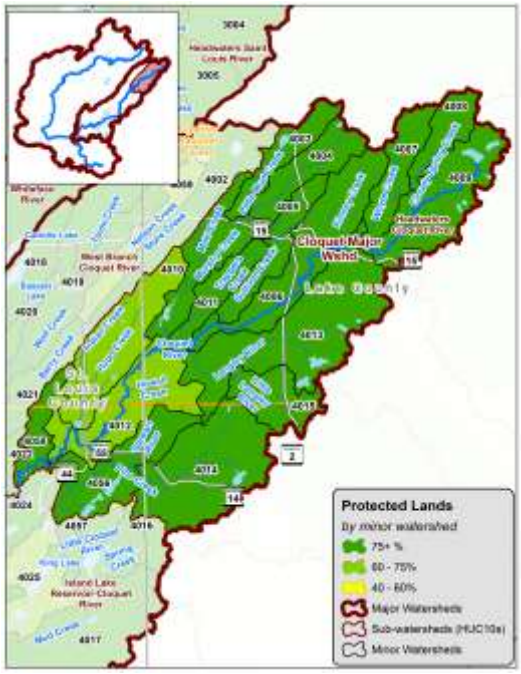


Figure 50. Minor watershed protection levels.

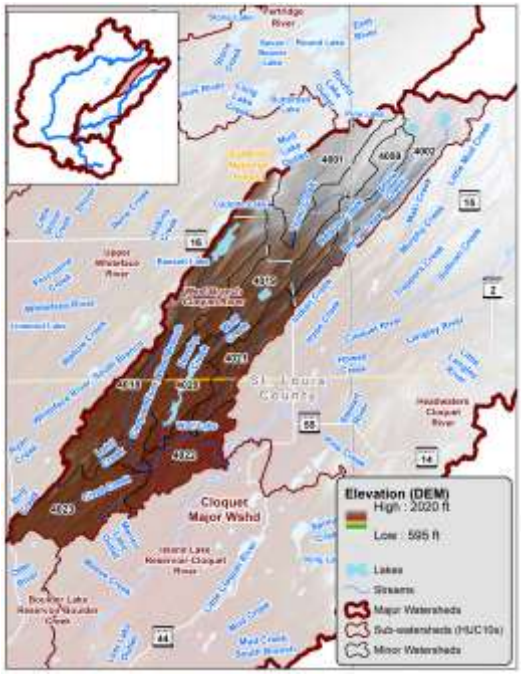


Subwatershed No. 2
West Branch Cloquet River (HUC 401020202)

Description

The West Branch Cloquet River Subwatershed is a tributary watershed to the Cloquet River and drains 106 square miles of Lake and St. Louis counties.

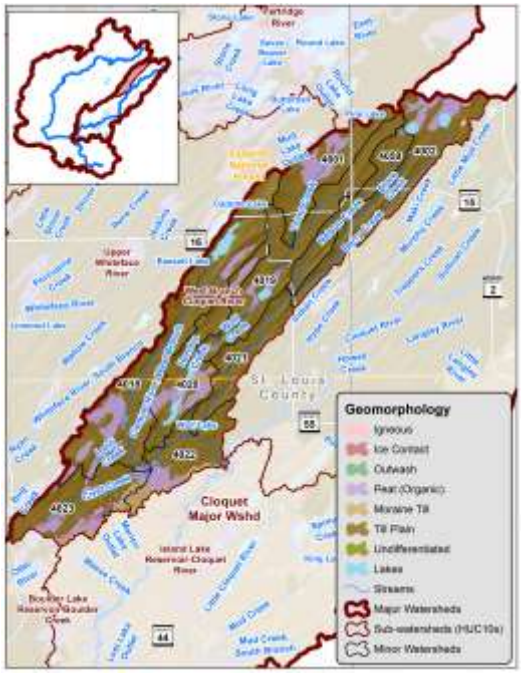
Figure 51. Elevation.



Geography

This subwatershed has a striated appearance owing to a rolling drumlin plain formed by the Rainy Lobe glacier. The drumlins are oriented parallel to each other generally in a northeast-southwest direction. Wetlands commonly occur in between the drumlins. Soil textures on the drumlin plain are sandy loam over a gravelly sandy loam hardpan.

Figure 52. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the West Branch Cloquet River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest in the uplands. Lesser amounts of white pine and paper birch forests were also present. Today the forest remains intact with little conversion or fragmentation. The composition of the forest is primarily aspen/birch and spruce/fir forest type groups. Minor amounts of the white/red/jack pine forest type group are also present.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas have the potential to support fire-dependent NPCs. The lowland areas primarily support forested rich peatland NPCs.

Figure 53. Historic vegetation cover.

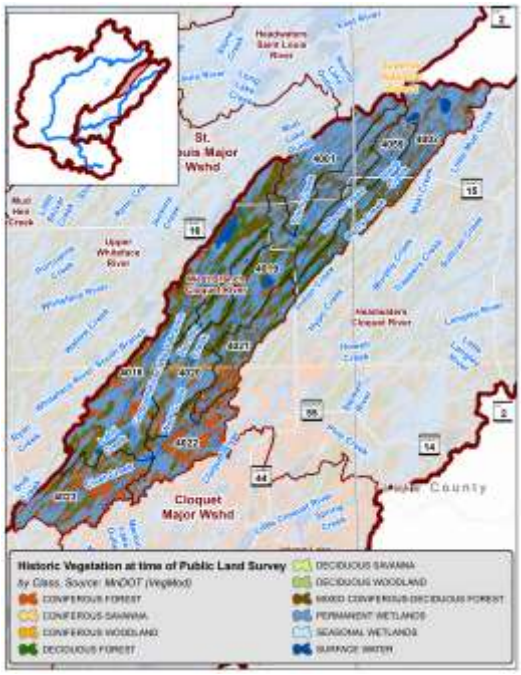


Figure 54. Potential native plant communities.

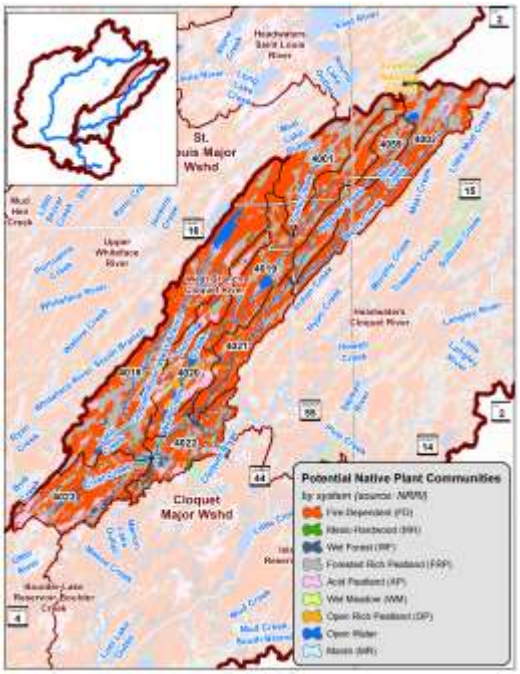
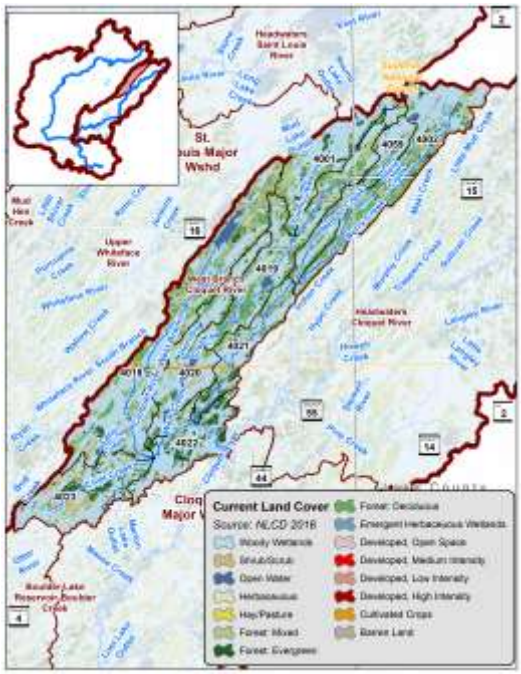


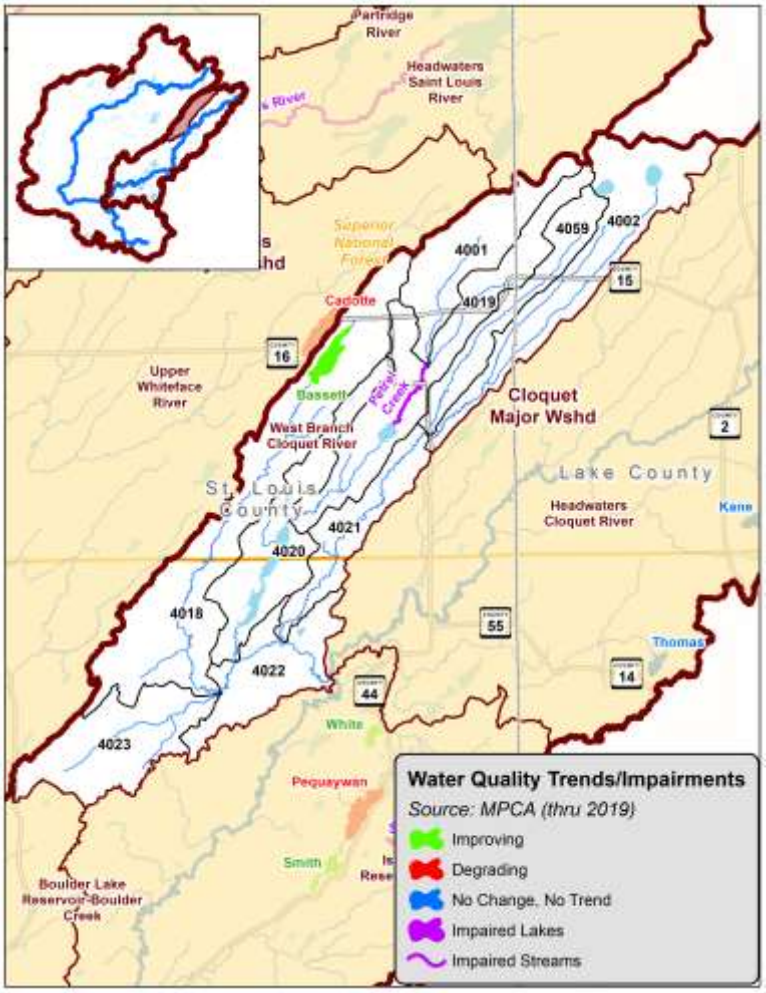
Figure 55. Current land cover.



Water Resources Summary

The West Branch Cloquet River is home to the West Branch Cloquet River as its name implies, as well as numerous other streams and a few lakes. The single lake with available water quality data – Bassett – has increasing water quality and a higher phosphorous sensitivity ranking. Four of its lakes are wild rice lakes. Additionally, this subwatershed contains 102 miles of streams, including 27 miles of trout streams. Two miles of streams are impaired by fish bioassessments.

Figure 56. Water quality trends.



Protection Status

89% of the West Branch Cloquet River Subwatershed is currently protected, mostly by the Superior National Forest, St. Louis County tax-forfeited lands, and state forestry lands.

Figure 57. Protected lands.

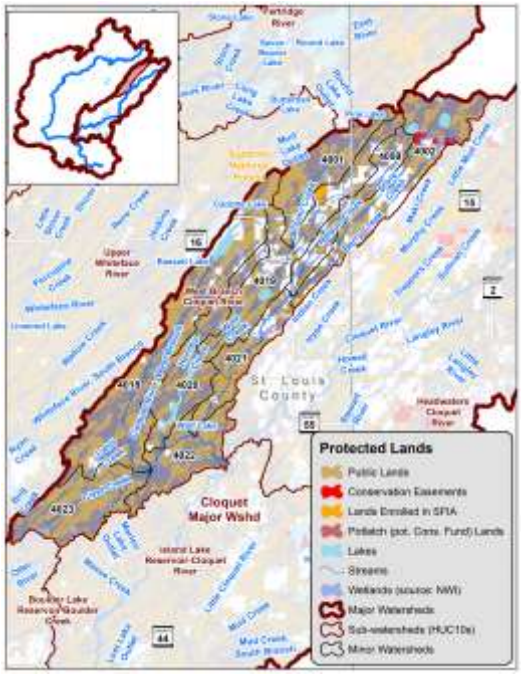


Figure 58. Potential to protect.

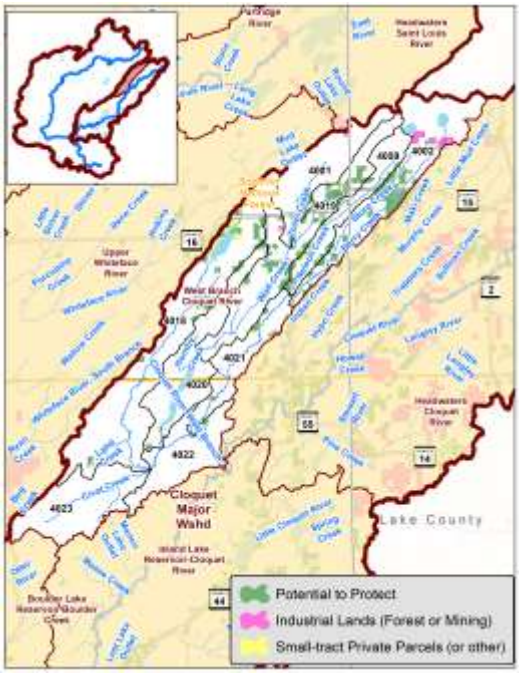
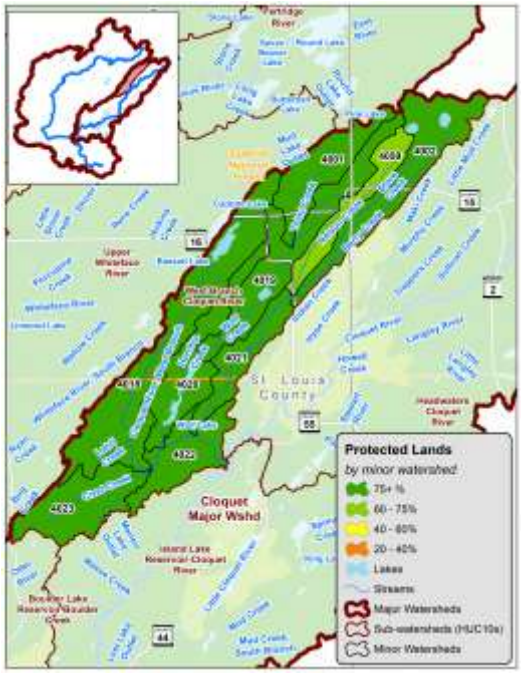


Figure 59. Minor watershed protection levels.



Subwatershed No. 3
Boulder Lake Reservoir-Boulder Creek (HUC 401020203)

Description

The Boulder Lake Reservoir-Boulder Creek Subwatershed is a tributary to the Cloquet River and drains 67 square miles of St. Louis County.

Geography

The northern two thirds of this subwatershed is a rolling drumlin plain with drumlins orientated in a northeast to southwest direction. Soil textures on the drumlin plain are sandy loam over a gravelly sandy loam hardpan. The southern third is a level to rolling moraine and outwash plain with sandy loam soil texture.

Figure 60. Elevation.

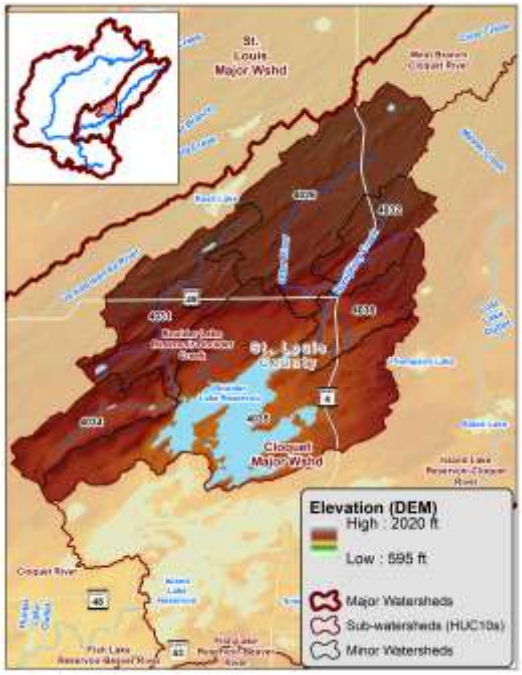
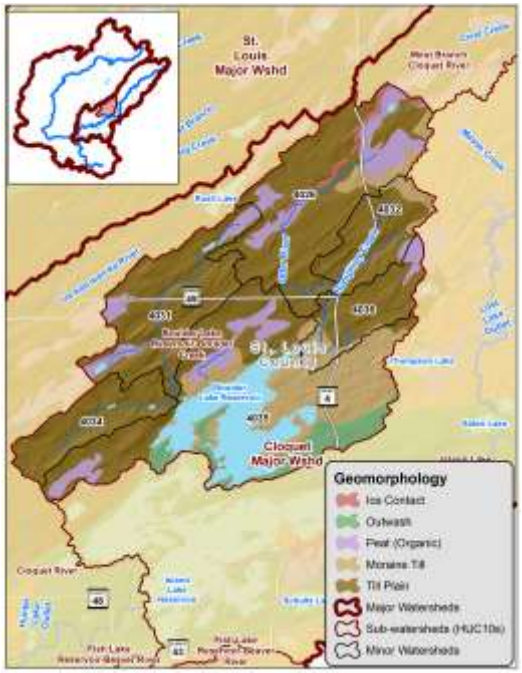


Figure 61. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Boulder Lake Reservoir-Boulder Creek Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest or white pine forest in the uplands. Lesser amounts of paper birch forests were also present. Today the forest remains intact with little conversion or fragmentation. The composition of the forest is primarily aspen/birch and spruce/fir forest type groups. Minor amounts of the white/red/jack pine forest type group are also present.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas have the potential to support fire-dependent NPCs, although mesic hardwood forests also have potential in an area to the northwest of the Boulder Lake. The lowland areas may support a mix of forested rich peatland, acid peatland, and wet forest NPCs.

Figure 62. Historic vegetation cover.

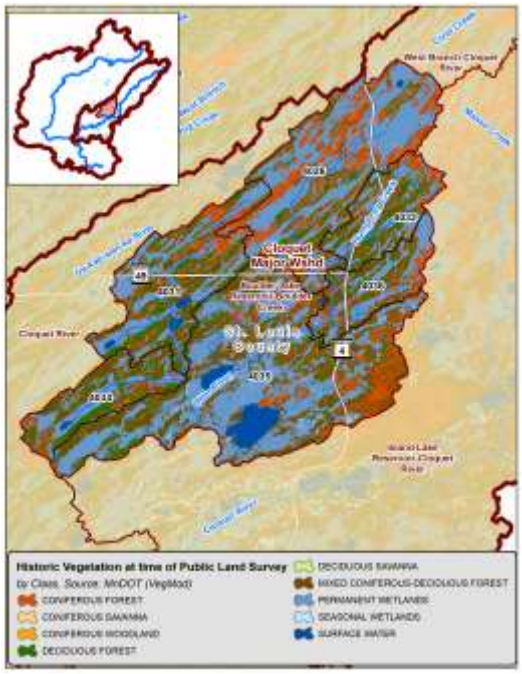


Figure 63. Potential native plant communities.

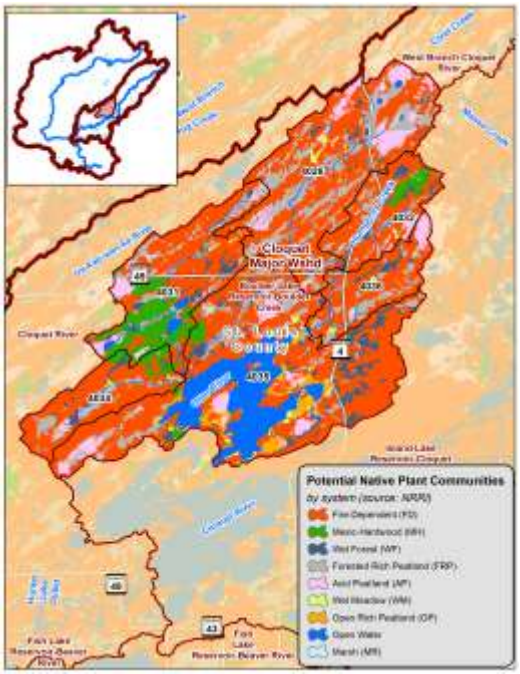
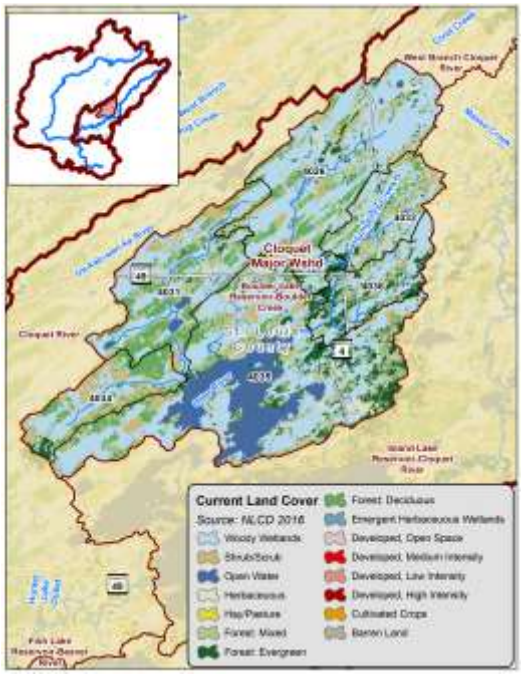


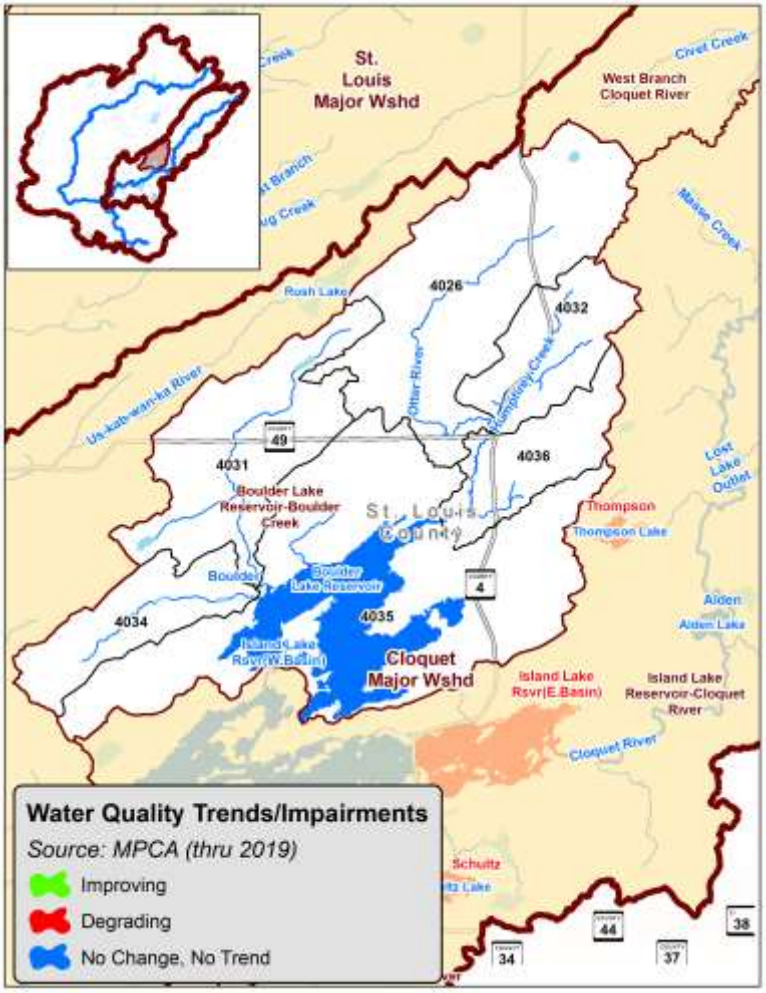
Figure 64. Current land cover.



Water Resources Summary

The Boulder Lake Reservoir-Boulder Creek Subwatershed is home to the Boulder Lake Reservoir as its name implies, as well as several other smaller lakes and numerous streams. The single lake with available water quality data - Boulder Lake – has stable water quality and is a lake of outstanding biodiversity significance. This subwatershed also contains 38 miles of streams, including eight miles of trout streams.

Figure 65. Water quality trends.



Protection Status

87% of the Boulder Lake Reservoir-Boulder Creek Subwatershed is currently protected, mostly by St. Louis County tax-forfeited lands and the Cloquet Valley State Forest.

Figure 66. Protected lands.

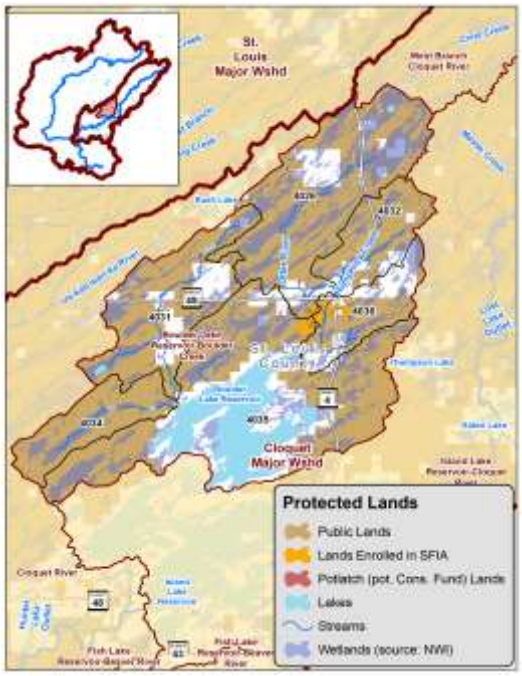


Figure 67. Potential to protect.

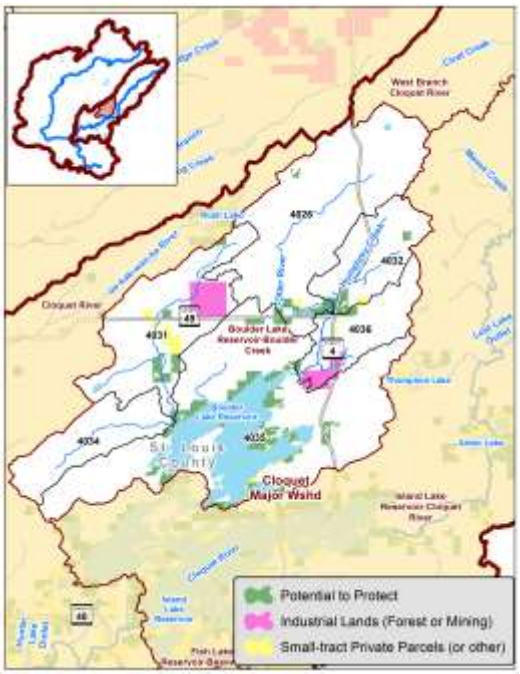
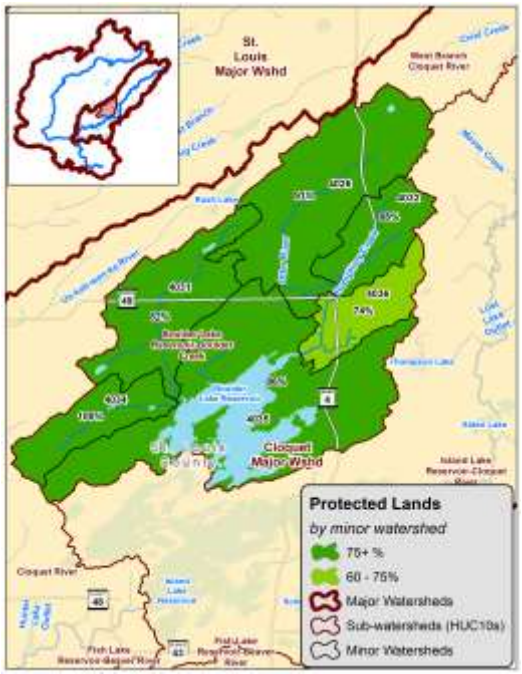


Figure 68. Minor watershed protection levels.



Subwatershed No. 4
Island Lake Reservoir-Cloquet River (HUC 401020204)

Description

The Island Lake Reservoir-Cloquet River Subwatershed drains 177 square miles of St. Louis County and receives water from the Headwaters Cloquet River, West Branch Cloquet River, and Boulder Lake Reservoir-Boulder Creek subwatersheds.

Geography

This subwatershed is dominated by a level to rolling moraine and outwash plain formed by the Superior Lobe glacier. Soil texture is primarily sandy loam over sand and gravel.

Figure 69. Elevation.

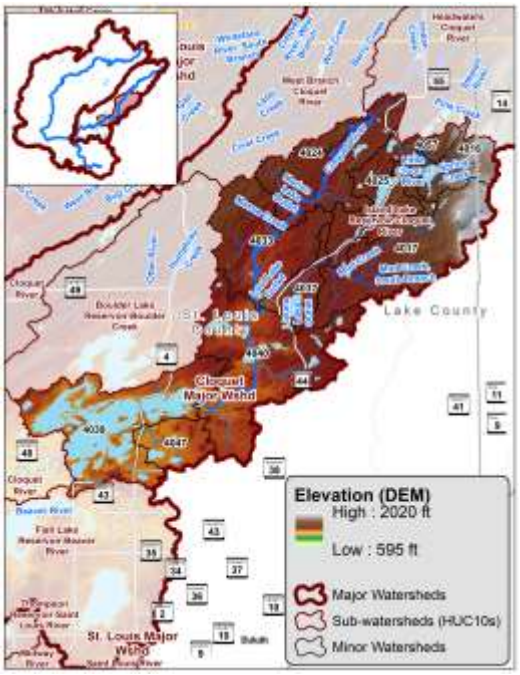
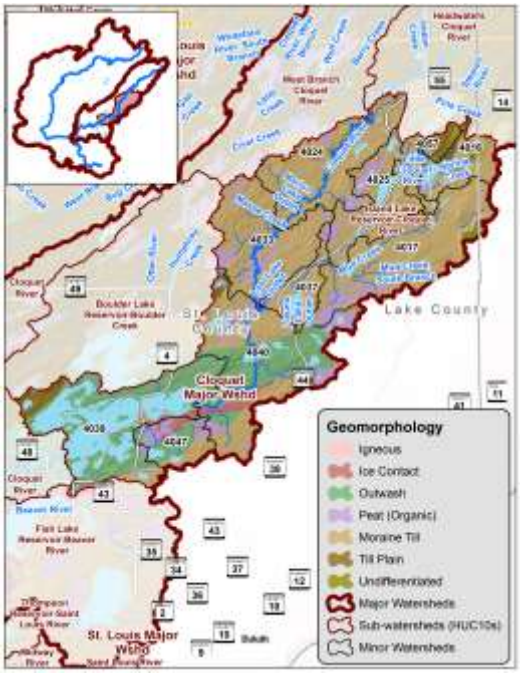


Figure 70. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Island Lake Reservoir-Cloquet River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest or white pine forest in the uplands. Today the forest remains intact with little conversion or fragmentation. The composition of the forest is primarily aspen/birch and spruce/fir forest type groups. Minor amounts of the white/red/jack pine and maple/beech/birch forest type groups are also present.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas have the potential to support fire-dependent NPCs. The lowland areas may support a mix of forested rich peatland, acid peatland, and wet forest NPCs.

Figure 71. Historic vegetation cover.

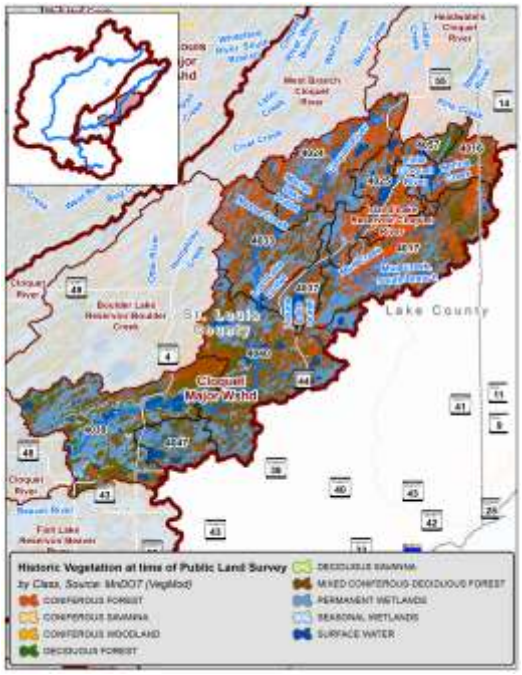


Figure 72. Potential native plant communities.

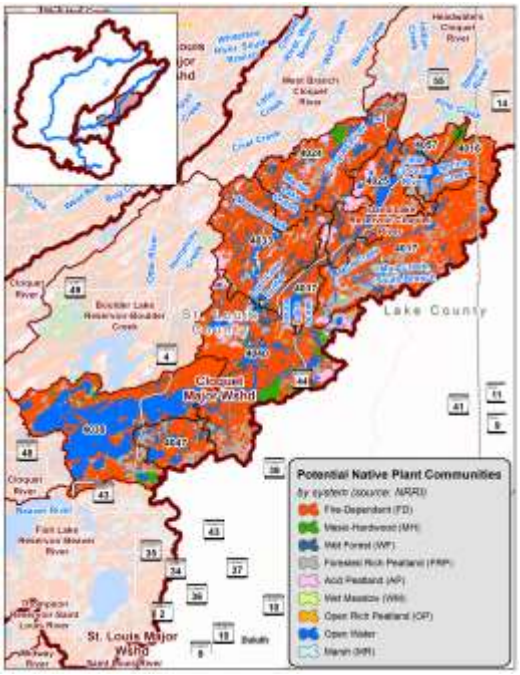
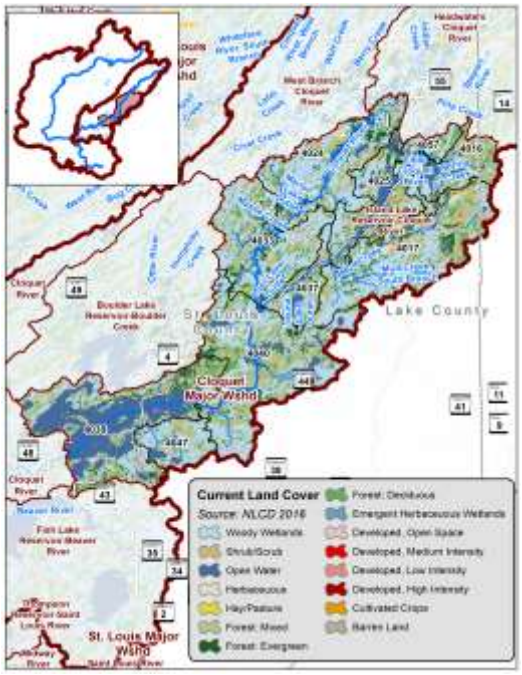


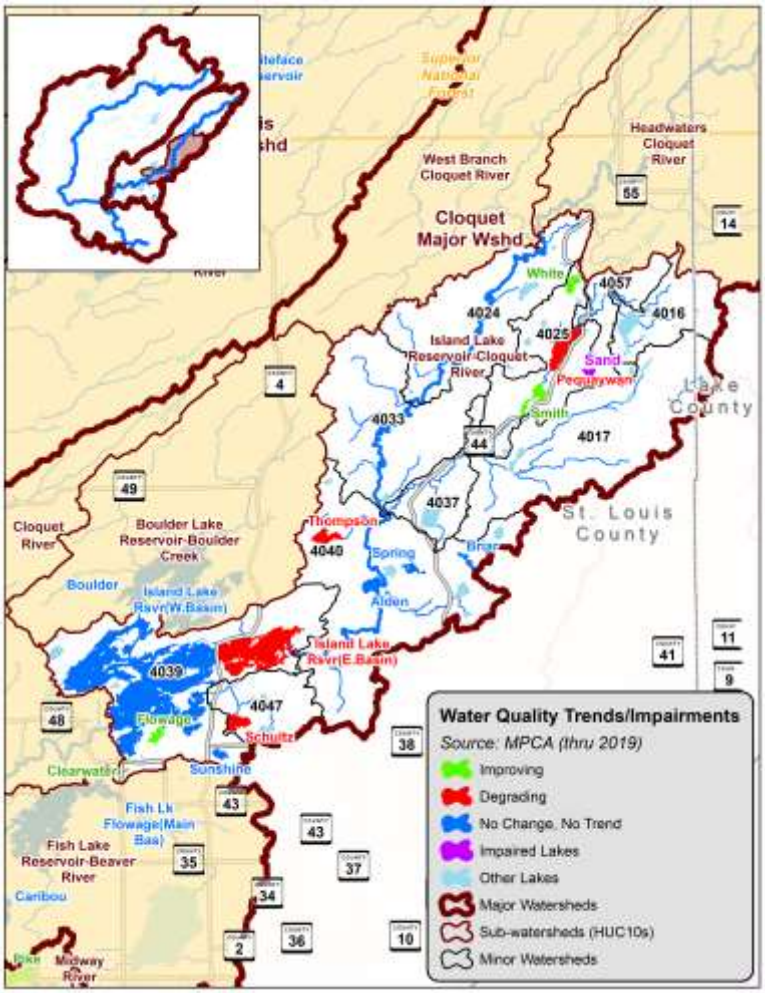
Figure 73. Current land cover.



Water Resources Summary

The Island Lake Reservoir-Cloquet River Subwatershed is home to the Island Lake Reservoir as its name implies, as well as dozens of other lakes and many streams. Of the lakes with available water quality data, four have increasing water quality, four are stable, five are degrading, and one is impaired. Six lakes have higher or highest phsophorous sensitivity rankings. This subwatershed also has six lakes of high or outstanding biodiversity significance, as well as three trout lakes and 14 wild rice lakes. Additionally, the Island Lake Reservoir-Cloquet River Subwatershed contains 124 miles of streams, including 14 miles of trout streams.

Figure 74. Water quality trends.



Protection Status

82% of the Island Lake Reservoir-Cloquet River Subwatershed is currently protected, mostly by St. Louis County tax-forfeited lands and the Cloquet Valley State Forest.

Figure 75. Protected lands.

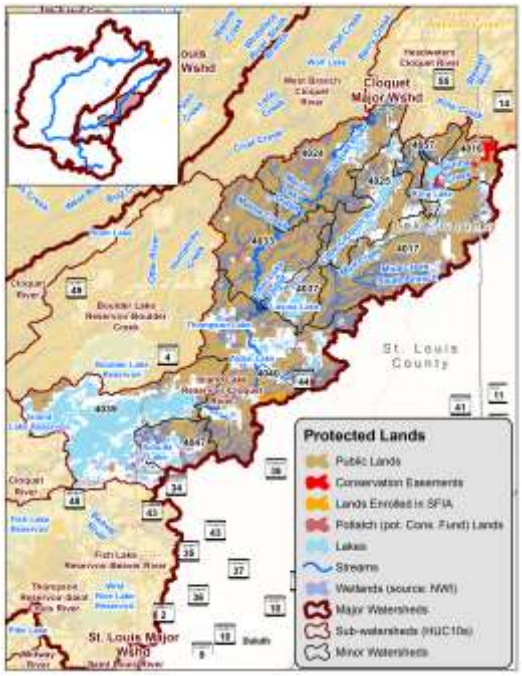
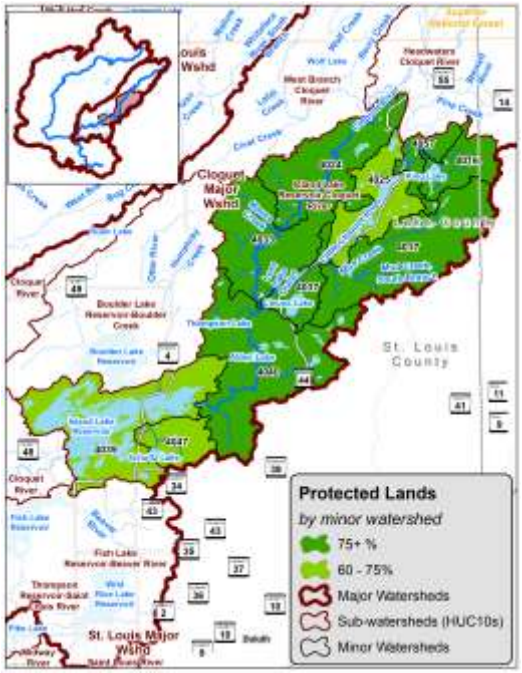


Figure 76. Potential to protect.

Figure 77. Minor watershed protection levels.



Subwatershed No. 5
Fish Lake Reservoir-Beaver River (HUC 401020205)

Description

The Fish Lake Reservoir-Beaver River Subwatershed is a tributary to the Cloquet River drains 76 square miles of St. Louis County.

Geography

This subwatershed is largely covered by a rolling to hummocky end moraine formed by the Superior lobe. The soil texture is dominated by fine sandy loam soils with hardpans.

Figure 78. Elevation.

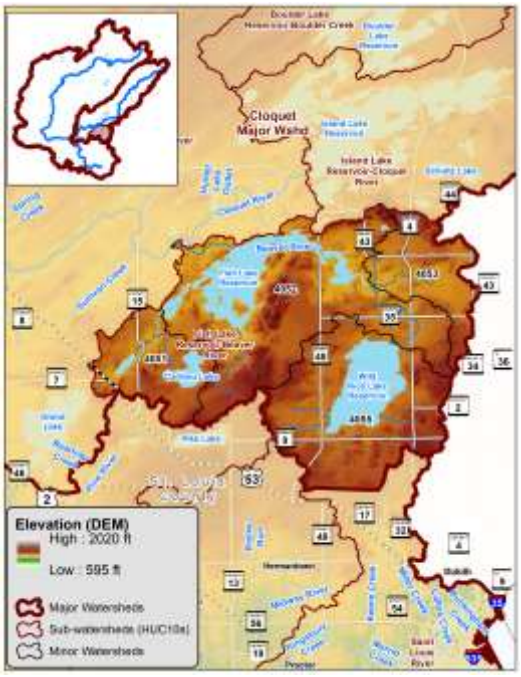
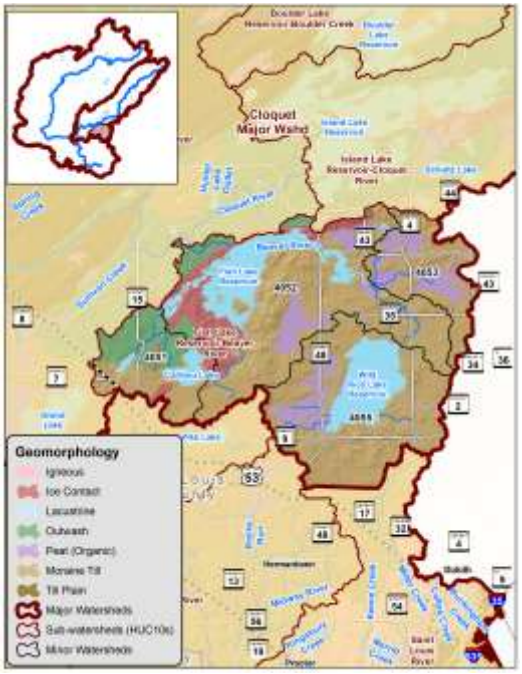


Figure 79. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Fish Lake Reservoir-Beaver River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest in the uplands. Today the forest remains intact with minor amounts of conversion and fragmentation, although increasing development is a risk in this subwatershed. The composition of the forest is primarily aspen/birch and spruce/fir 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 NPCs. The lowland areas primarily support forested rich peatland NPCs.

Figure 80. Historic vegetation cover.

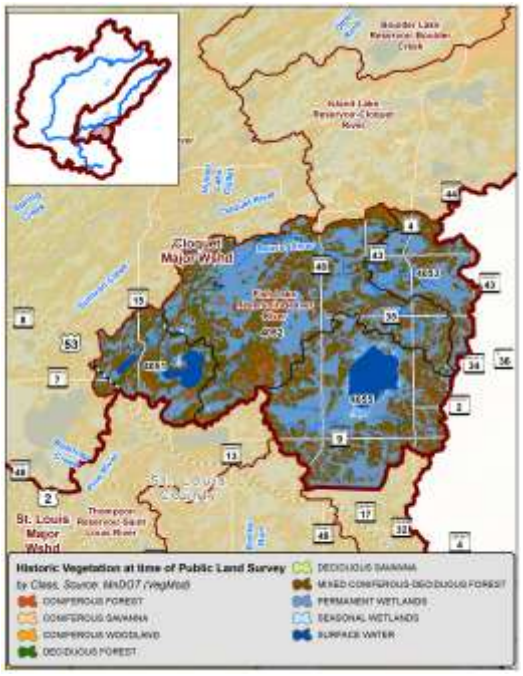


Figure 81. Potential native plant communities.

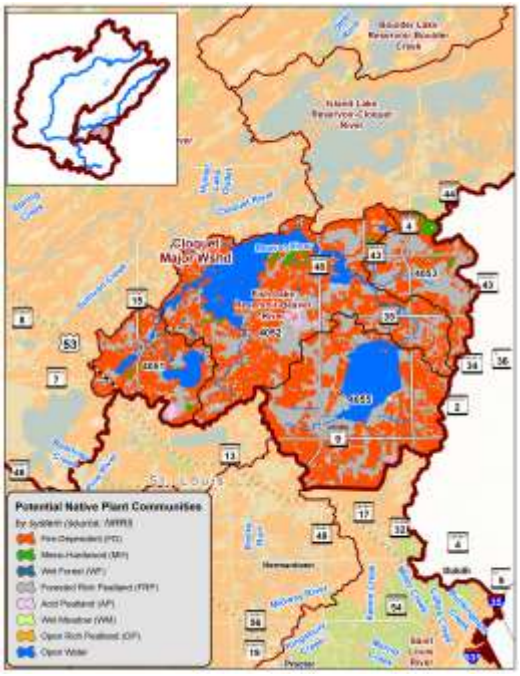
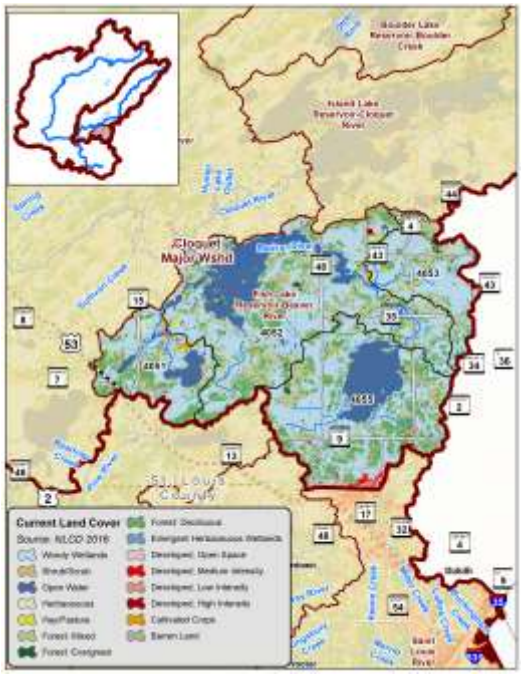


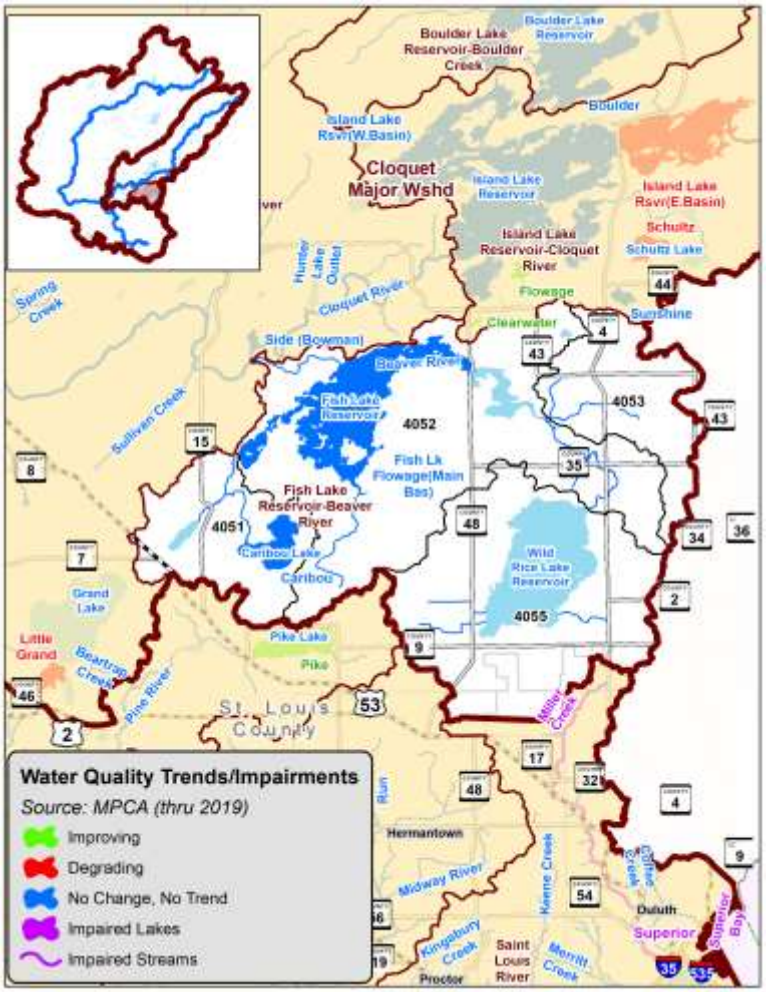
Figure 82. Current land cover.



Water Resources Summary

The Fish Lake Reservoir-Beaver River Subwatershed is home to the Fish Lake Reservoir as its name implies, as well as several other lakes and streams. Of the two lakes with available water quality data – Fish Lake and Caribou Lake - both have stable water quality. This subwatershed has two lakes with a highest phosphorous sensitivity ranking, and two lakes of high or outstanding biodiversity significance as well as three wild rice lakes. Additionally, the Fish Lake Reservoir-Beaver River Subwatershed contains 30 miles of streams, including 5 miles of trout streams.

Figure 83. Water quality trends.



Protection Status

57% of the Fish Lake Reservoir-Beaver River Subwatershed is currently protected, mostly by private wetlands, public waters, and public lands (St. Louis County tax-forfeited lands and the Canosia Wildlife Management Area). Overall protection levels are higher around the Fish Lake Reservoir.

Figure 84. Protected lands.

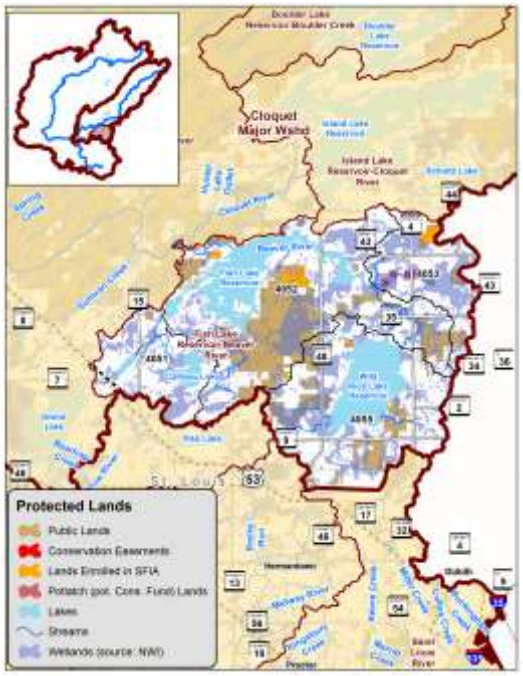
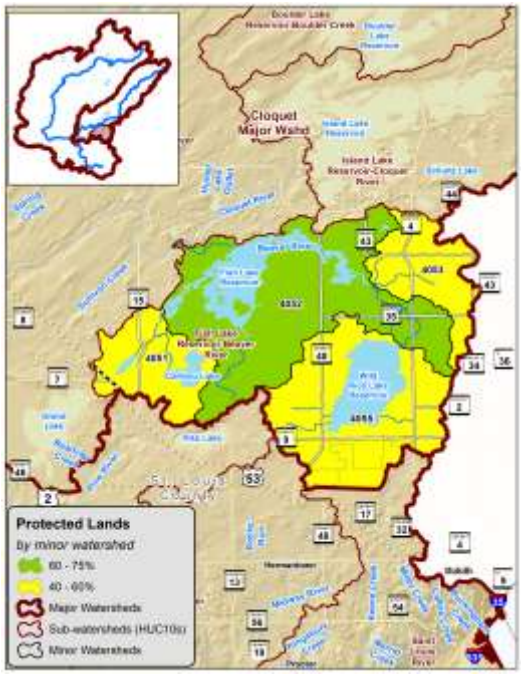


Figure 85. Potential to protect.

Figure 86. Minor watershed protection levels.



Subwatershed No. 6
Cloquet River (HUC 401020206)

Description

The Cloquet River Subwatershed drains 185 square miles of St. Louis County and receives water from the Island Lake Reservoir-Cloquet River and Fish Lake Reservoir-Beaver River subwatersheds.

Geography

Most of the northern portion of the Cloquet River Subwatershed is a rolling drumlin plain with drumlins orientated in a northeast to southwest direction. Soil textures on the drumlin plain are sandy loam over a gravelly sandy loam hardpan. Around the edges of this feature are sandy outwash deposits, which also follow the river channels. Near the southern end of the subwatershed is a rolling to hummocky end moraine with fine sandy loam soil textures.

Figure 87. Elevation.

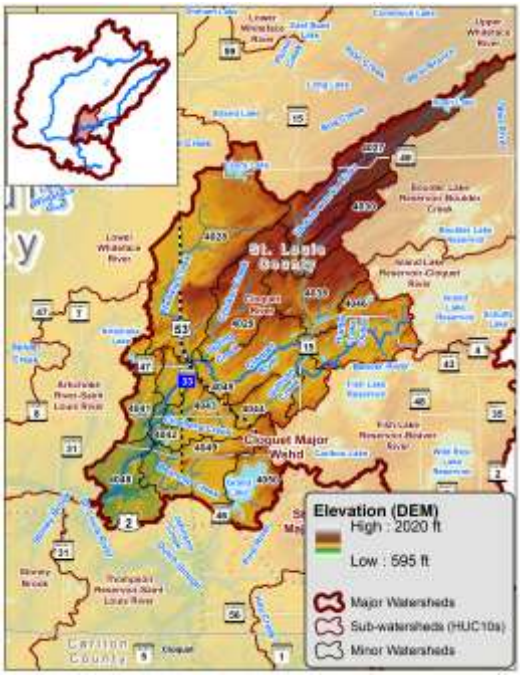
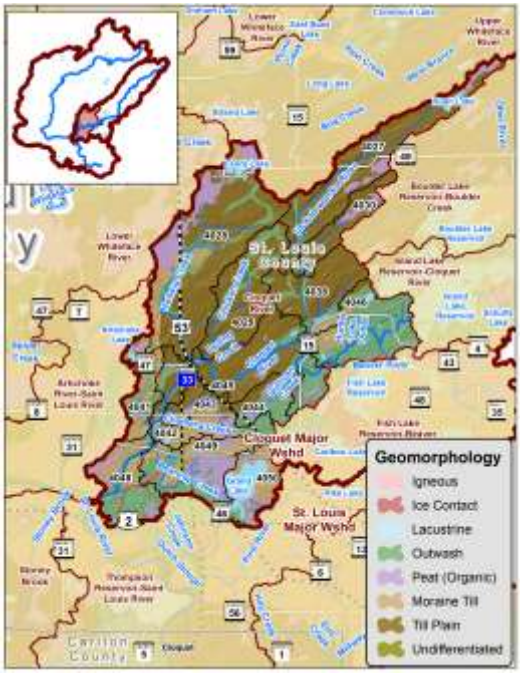


Figure 88. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Cloquet River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest and paper birch forest in the uplands. Today the forest remains intact with minor amounts of conversion and fragmentation, which is concentrated towards the southwestern end of the subwatershed. The composition of the forest is primarily aspen/birch and spruce/fir forest type groups. Minor amounts of the maple/beech/birch forest type group are also present.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas have the potential to support fire-dependent NPCs, although patches of mesic hardwood NPCs may be sustained as well. The lowland areas may support a mix of acid peatland, forested rich peatland, and wet forest NPCs.

Figure 89. Historic vegetation cover.

Figure 90. Potential native plant communities.

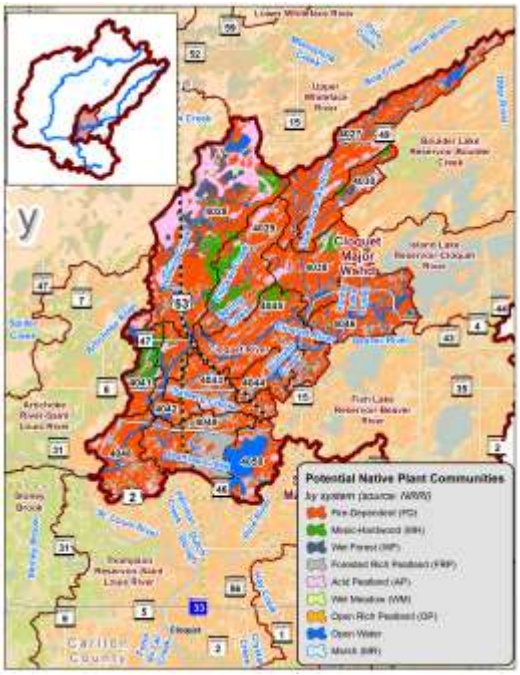
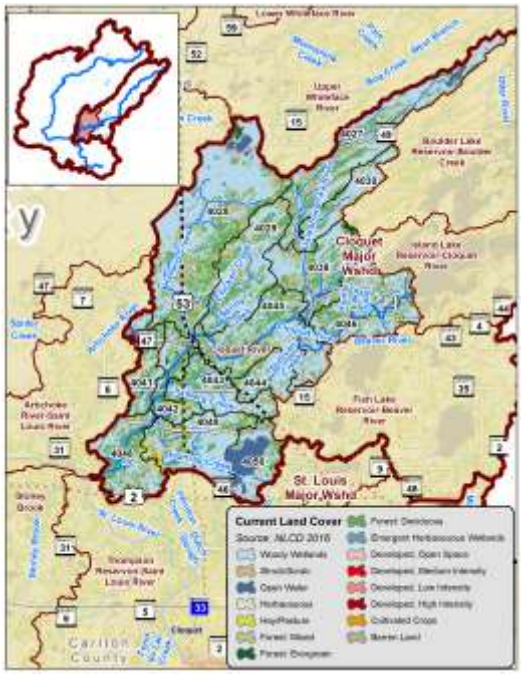


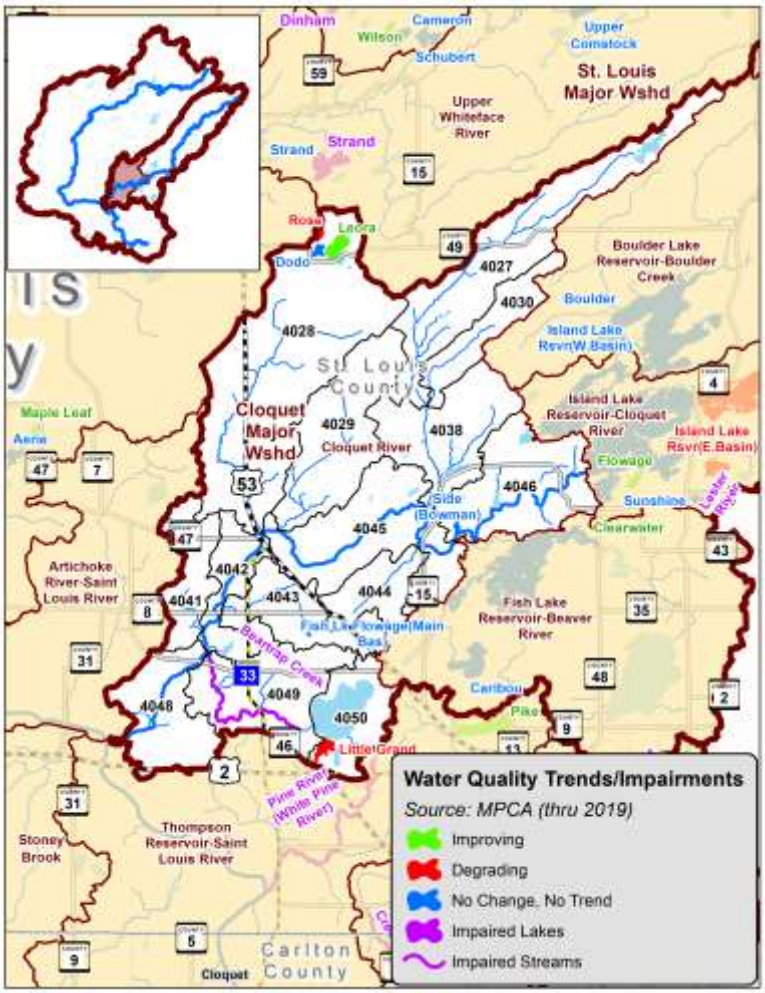
Figure 91. Current land cover.



Water Resources Summary

The Cloquet River Subwatershed is home to the lower reaches of the Cloquet River, as well as many other streams and dozens of lakes. Of the lakes with available water quality data, one has improving water quality, one is stable, and two are degrading. Four lakes have higher or highest phosphorous sensitivity rankings. This subwatershed also has two lakes of high or outstanding biodiversity significance as well as three wild rice lakes. Additionally, the Cloquet River Subwatershed contains 128 miles of streams, including 90 miles of trout streams. 25 miles of streams are impaired by mercury in water column, fish bioassessments, or invertebrate bioassessments.

Figure 92. Water quality trends.



Protection Status

71% of the Cloquet River Subwatershed is currently protected, mostly by St. Louis County tax-forfeited lands, the Cloquet Valley State Forest, and private wetlands. Overall protection levels are higher to the north and east of Highway 53.

Figure 93. Protected lands.

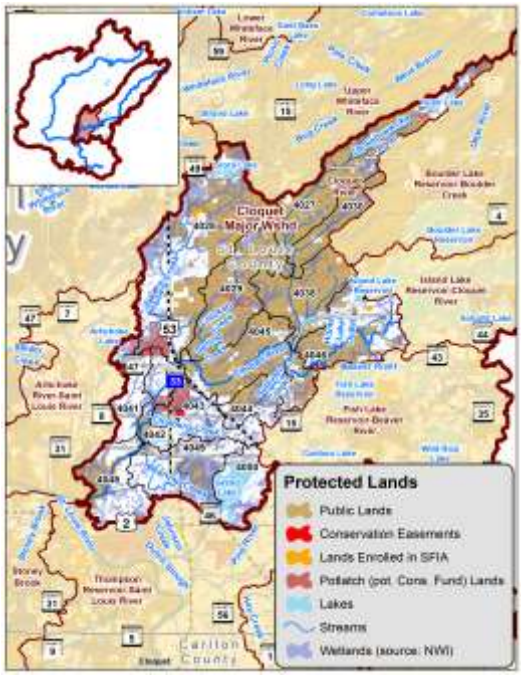
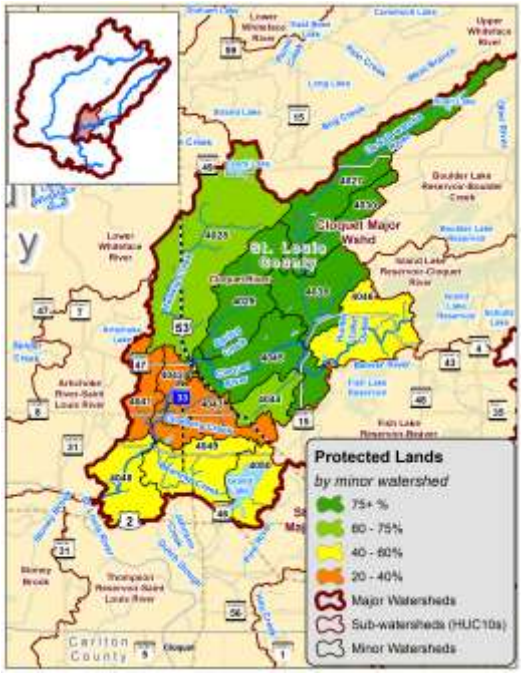


Figure 94. Potential to protect.

Figure 95. Minor watershed protection levels.



Subwatershed No. 7
Partridge River (HUC 401020101)

Description

The Partridge River Subwatershed is a tributary to the St. Louis River and drains 156 square miles of St. Louis County.

Geography

The Partridge River Subwatershed is dominated by a nearly level to rolling till plain with scattered end moraines. Soil textures are gravelly sandy loam. Along the subwatershed's northern border is a rolling to steep till plain with shallow bedrock.

Figure 96. Elevation.

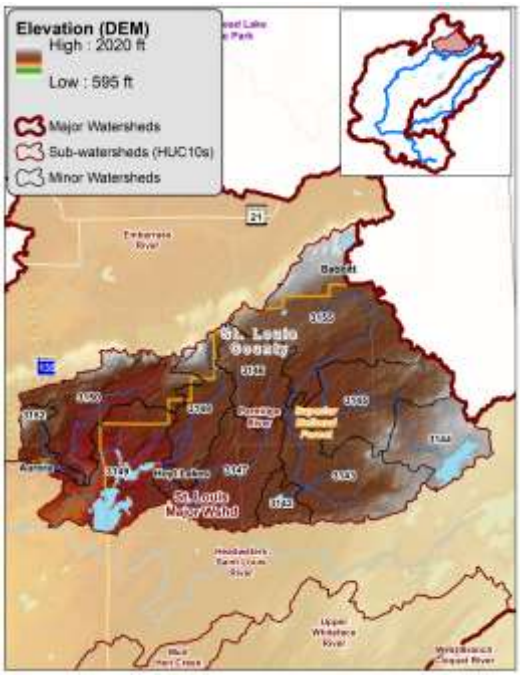


Figure 97. Geomorphological landforms.

Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Partridge River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest in the uplands. Today the forest remains mostly intact with some conversion to development near Hoyt Lakes and mining along its northern border. The composition of the forest is primarily aspen/birch and spruce/fir forest type groups. Minor amounts of the white/red/jack pine forest type group are also present.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas have the potential to support fire-dependent NPCs. The lowland areas may support a mix of acid peatland and forested rich peatland NPCs.

Figure 98. Historic vegetation cover.

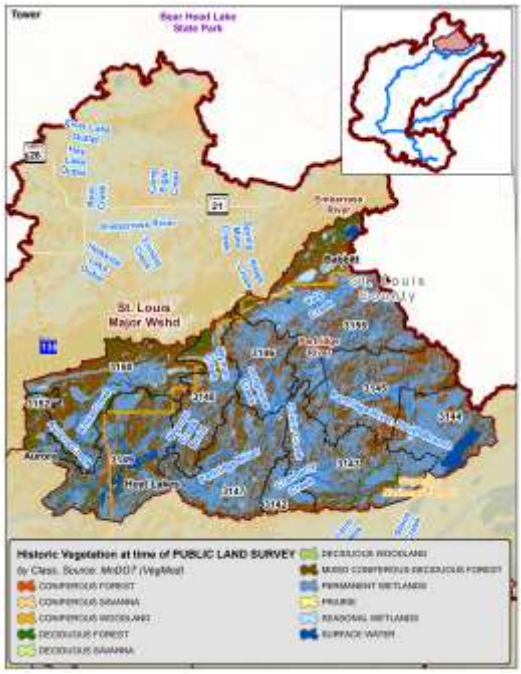


Figure 99. Potential native plant communities.

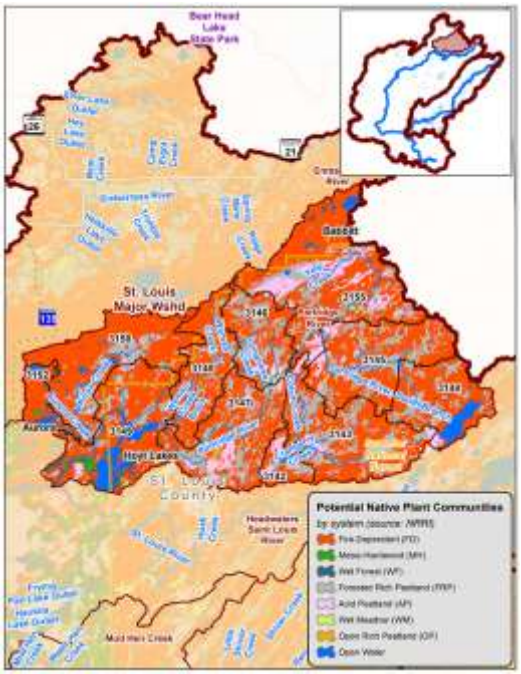
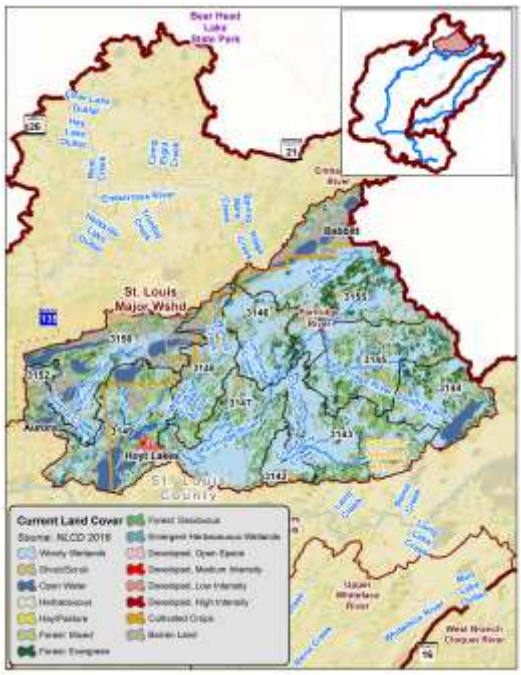


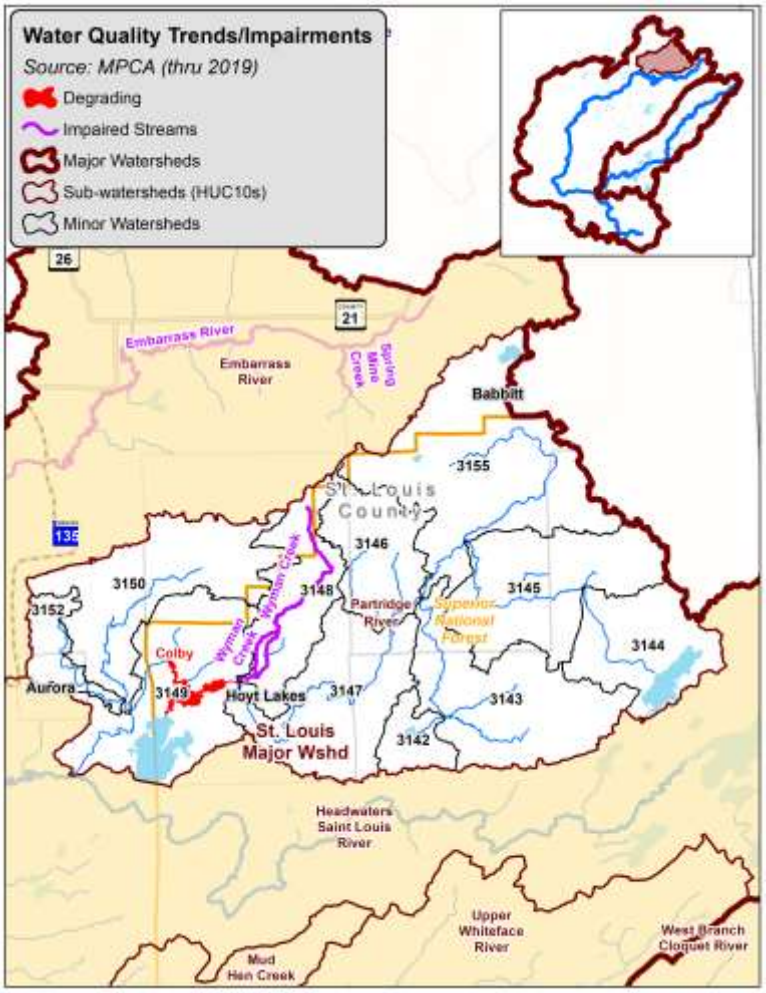
Figure 100. Current land cover.



Water Resources Summary

The Partridge River Subwatershed is home to the Partridge River as its name implies, as well as several other streams and a few lakes, including a couple wild rice lakes. The single lake with available water quality data – Colby – has degrading water quality. Two lakes have higher or highest phosphorous sensitivity rankings. This subwatershed also contains 97 miles of streams, including 11 miles of trout streams. 47 miles of streams are impaired by fish bioassessments or mercury in water column.

Figure 101. Water quality trends.



Protection Status

66% of the Partridge River Subwatershed is currently protected, mostly by the Superior National Forest, state forestry lands, and private wetlands. Overall protection levels are higher in the southeastern half of the subwatershed than other areas.

Figure 102. Protected lands.

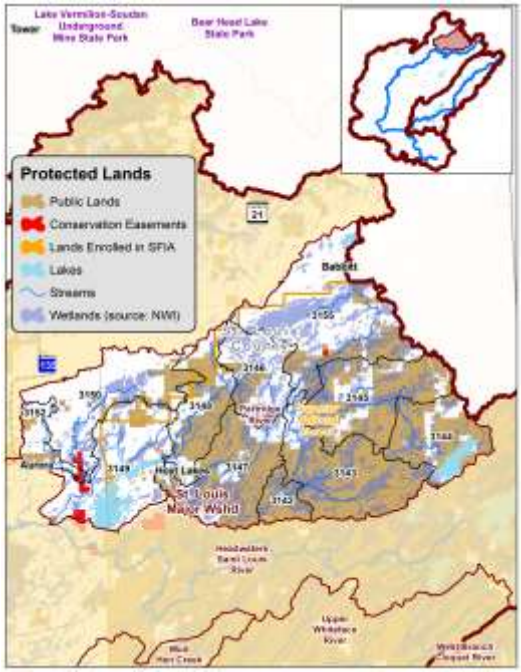


Figure 103. Potential to protect.

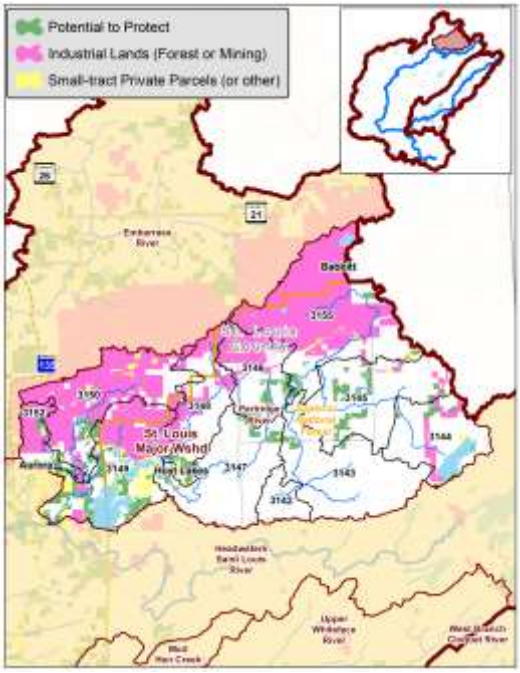
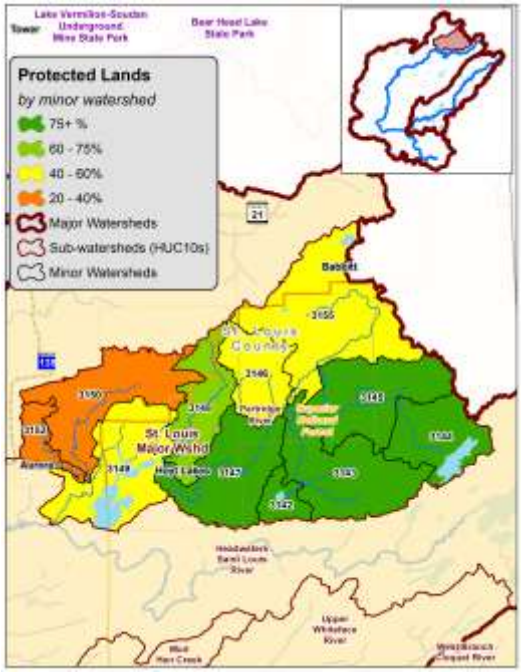


Figure 104. Minor watershed protection levels.



Subwatershed No. 8
Headwaters Saint Louis River (HUC 401020102)

Description

The Headwaters St. Louis River Subwatershed drains 209 square miles of Lake and St. Louis counties, and is the headwaters to the St. Louis River. It also receives water from the Partridge River Subwatershed.

Geography

The Headwaters St. Louis River Subwatershed has several different landform and soil types. Near the headwaters is a nearly level landscape dominated by large contiguous peatlands with scattered upland islands. Gently rolling till and drumlin plains occupy the middle reaches of the subwatershed. Near the lower reaches are gently rolling sand plains and level lake plains.

Figure 105. Elevation.

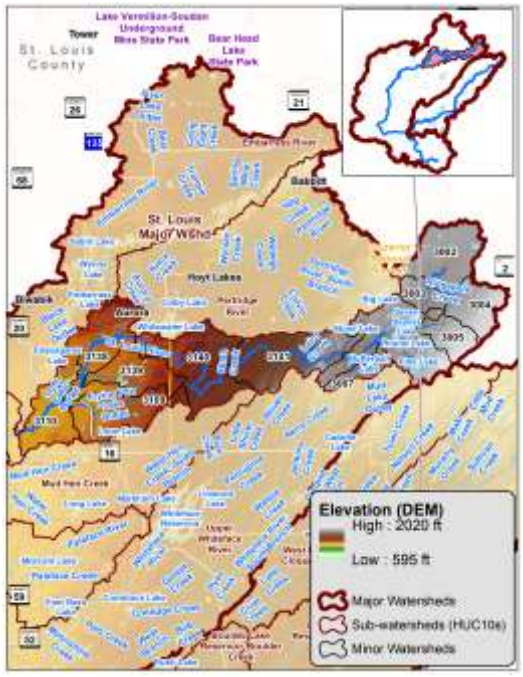


Figure 106. Geomorphological landforms.

Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Headwaters St. Louis River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest in the uplands. Today the forest remains largely intact with some conversion to development or agriculture towards the subwatershed's western end. The composition of the forest is primarily aspen/birch and spruce/fir forest type groups. Minor amounts of the white/red/jack pine forest type group are also present.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas have the potential to support fire-dependent NPCs, although patches of mesic hardwood NPCs may be sustained as well. The lowland areas may support a mix of acid peatland, forested rich peatland, and wet forest NPCs.

Figure 107. Historic vegetation cover.

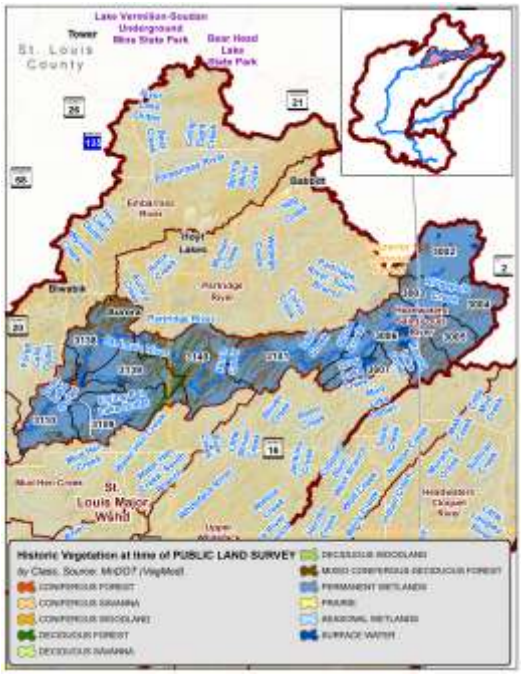


Figure 108. Potential native plant communities.

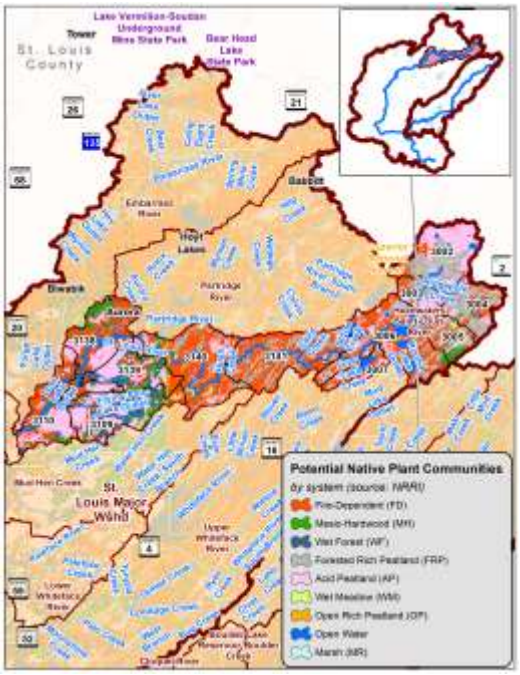
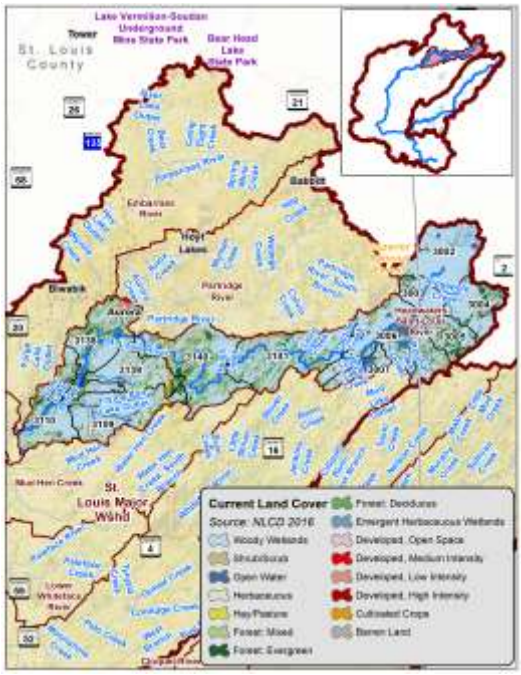


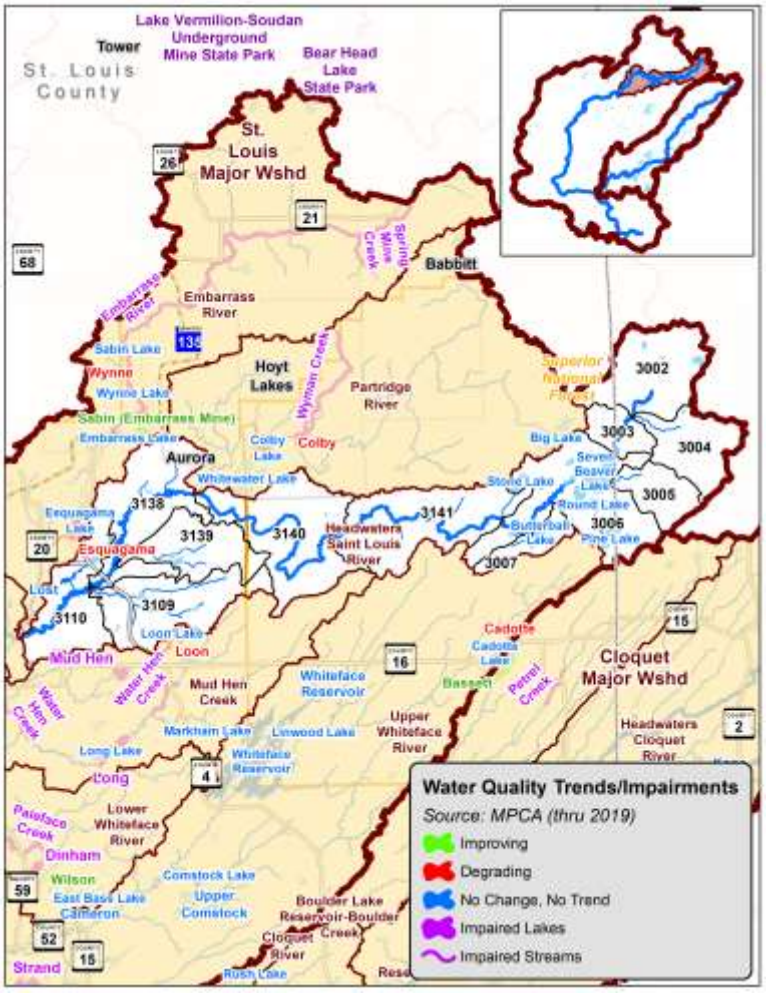
Figure 109. Current land cover.



Water Resources Summary

The Headwaters St. Louis River Subwatershed is the headwaters to the St. Louis River as its name implies, and home to many other streams and dozens of lakes. The single lake with available water quality data – Lost – has stable water quality. Three lakes have higher or highest phosphorous sensitivity rankings. This subwatershed also has six lakes of high or outstanding biodiversity significance, as well as six wild rice lakes and one trout lake. Additionally, the Headwaters St. Louis River Subwatershed contains 109 miles of streams, 26 miles of which are impaired by mercury in water column.

Figure 110. Water quality trends.



Protection Status

78% of the Headwaters St. Louis River Subwatershed is currently protected, mostly by the Superior National Forest, state forestry lands, and St. Louis County tax-forfeited lands. Overall protection levels are lower in the westernmost quarter of the subwatershed than other areas.

Figure 111. Protected lands.

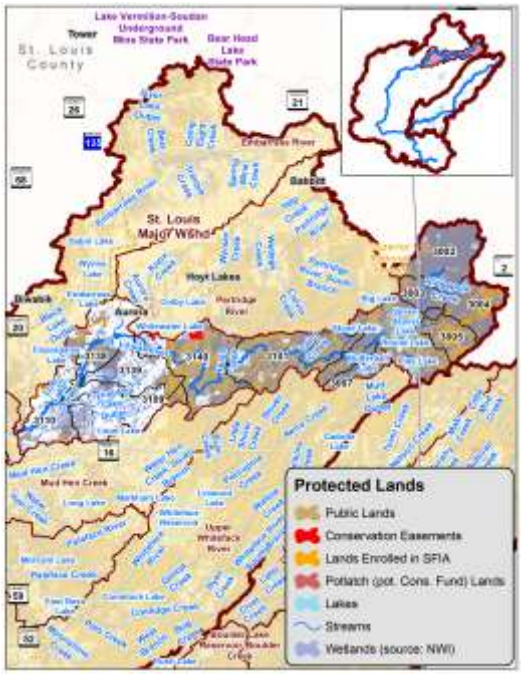
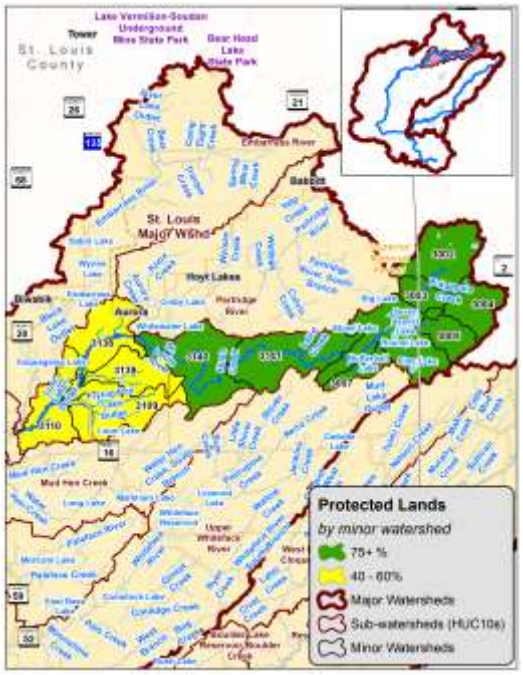


Figure 112. Potential to protect.

Figure 113. Minor watershed protection levels.



Subwatershed No. 9
Embarrass River (HUC 401020103)

Description

The Embarrass River Subwatershed is a tributary to the St. Louis River and drains 190 square miles of St. Louis County.

Geography

The northern half of the Embarrass River Subwatershed is a complex of Rainy lobe outwash plains and moraines. The Mesabi Range runs through the middle of the in a northeast to southwest direction. The Mesabi Range is characterized by rolling to steep terrain with shallow bedrock. The southern end of the subwatershed is a gently rolling till plain with loam over clay or silty over loam soil textures.

Figure 114. Elevation.

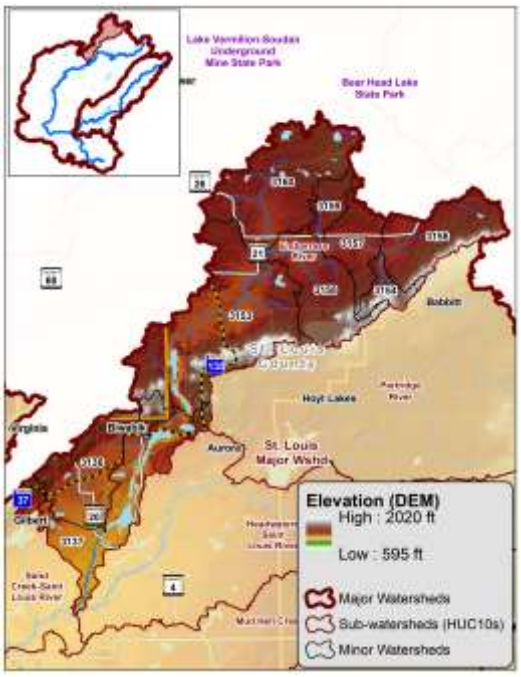
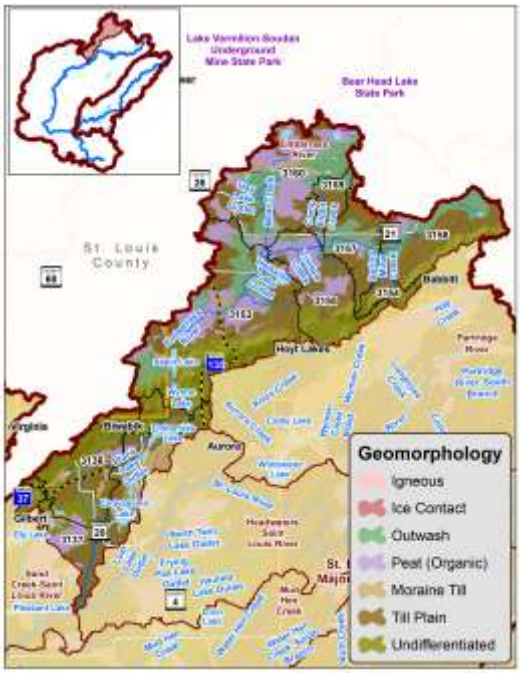


Figure 115. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Embarrass River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest in the uplands. Today the forest is partially intact with some conversion to development, mining, or agriculture. The conversion is concentrated around the subwatershed's southern border and towards Biwabik. The composition of the remaining forest is primarily aspen/birch and spruce/fir forest type groups. Minor amounts of the white/red/jack pine forest type group are also present.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas have the potential to support fire-dependent NPCs. The lowland areas may support a mix of acid peatland, forested rich peatland, and wet forest NPCs. The potential for wet forest NPCs is greater in the area to the south of Biwabik.

Figure 116. Historic vegetation cover.

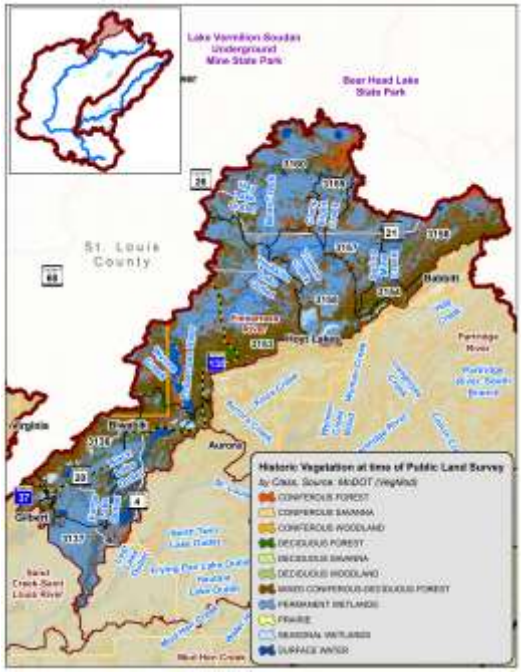


Figure 117. Potential native plant communities.

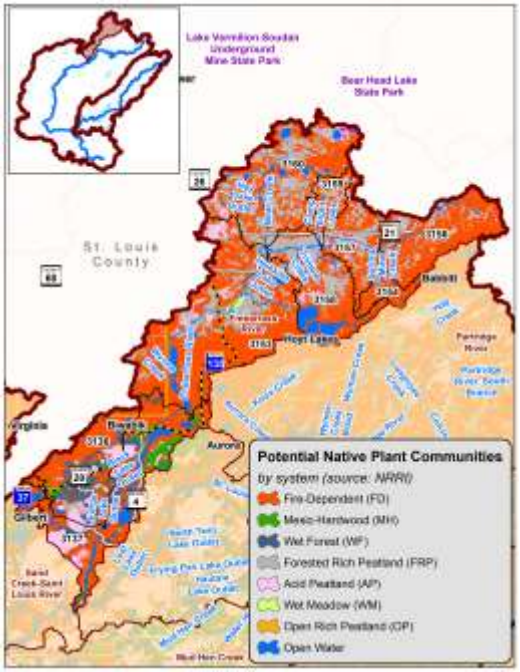
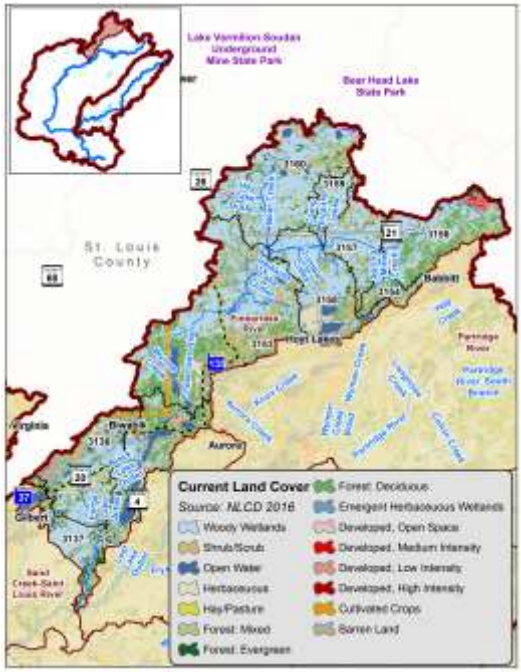


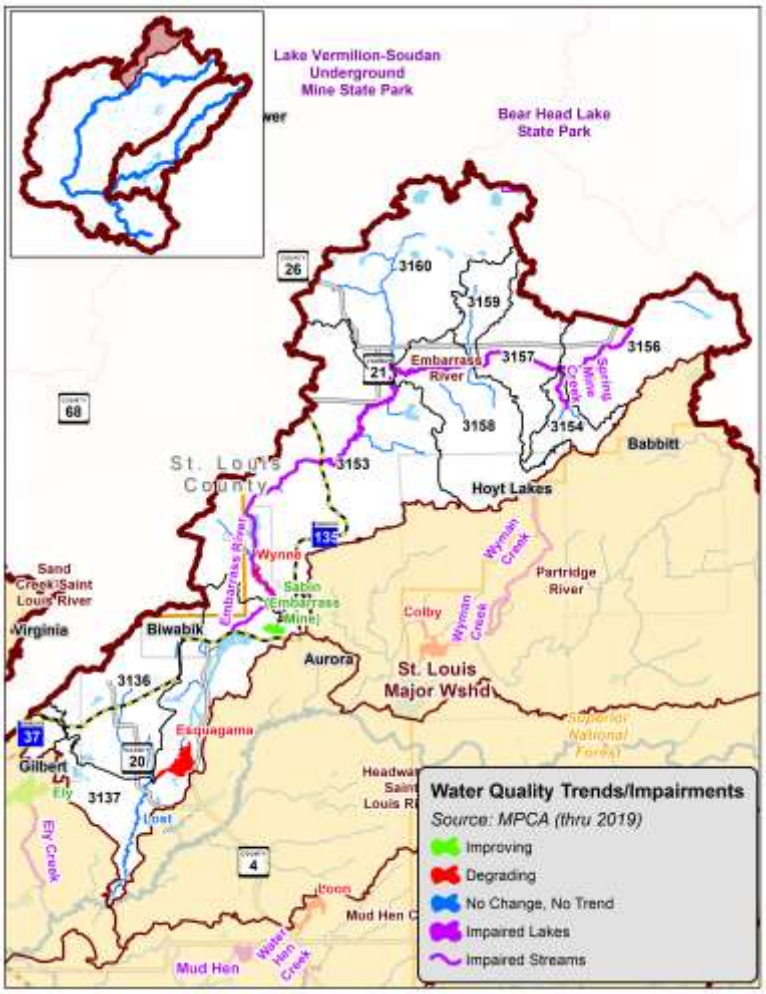
Figure 118. Current land cover.



Water Resources Summary

The Embarrass River Subwatershed is home to the Embarrass River as its name implies, as well as several other streams and dozens of lakes. Of the lakes with available water quality data, one has improving water quality, two are degrading, and two are impaired. Three lakes have higher or highest phosphorous sensitivity rankings. This subwatershed also has three lakes of high or outstanding biodiversity significance, as well as 17 wild rice lakes, one cisco lake, and one trout lake. Additionally, the Embarrass River Subwatershed contains 93 miles of streams, 51 miles of which are impaired by fish bioassessments, invertebrate bioassessments, or mercury in water column.

Figure 119. Water quality trends.



Protection Status

51% of the Embarrass River Subwatershed is currently protected, mostly by St. Louis County tax-forfeited lands and private wetlands.

Figure 120. Protected lands.

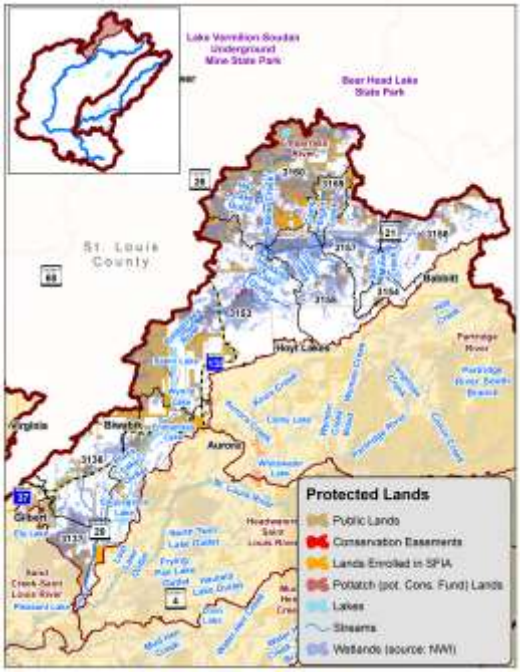


Figure 121. Potential to protect.

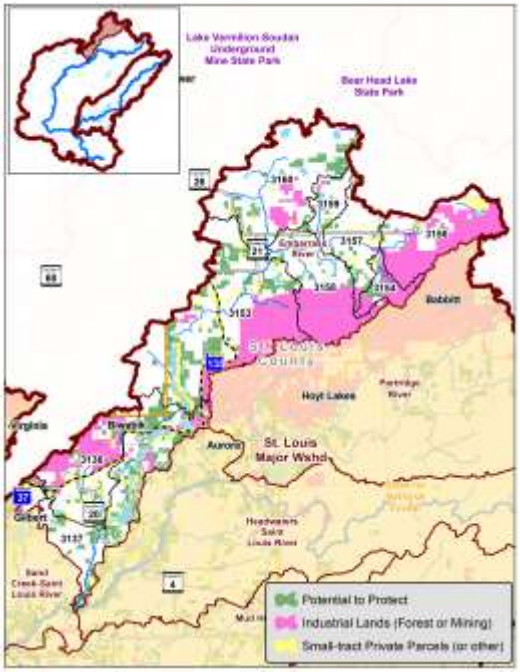
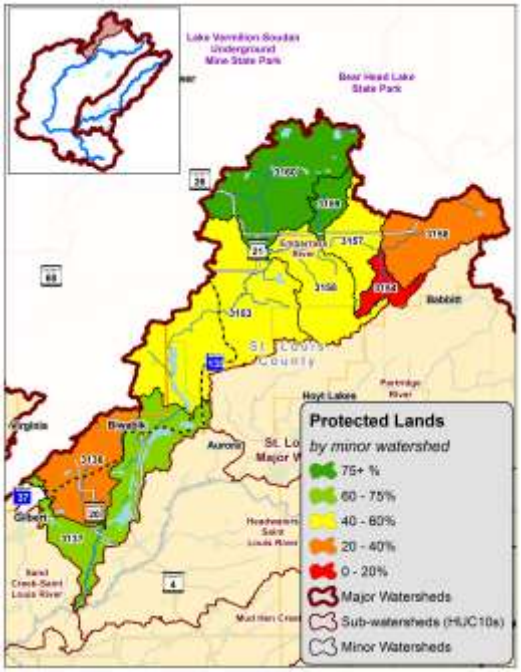


Figure 122. Minor watershed protection levels.

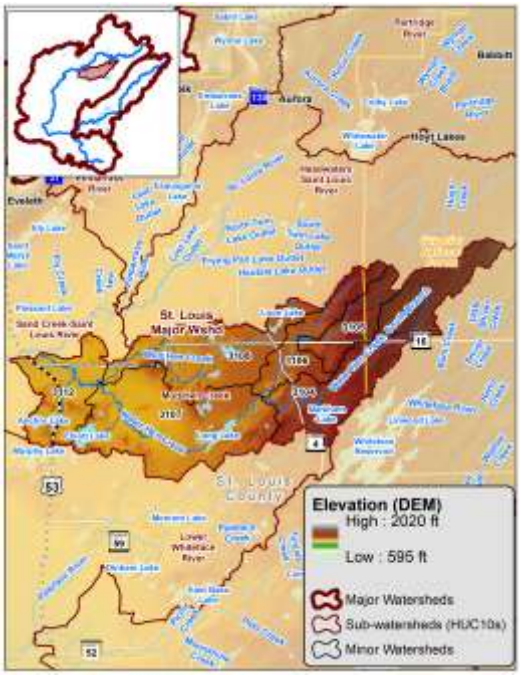


Subwatershed No. 10
Mud Hen Creek (HUC 401020104)

Description

The Mud Hen Creek Subwatershed is a tributary to the St. Louis River and drains 101 square miles of St. Louis County.

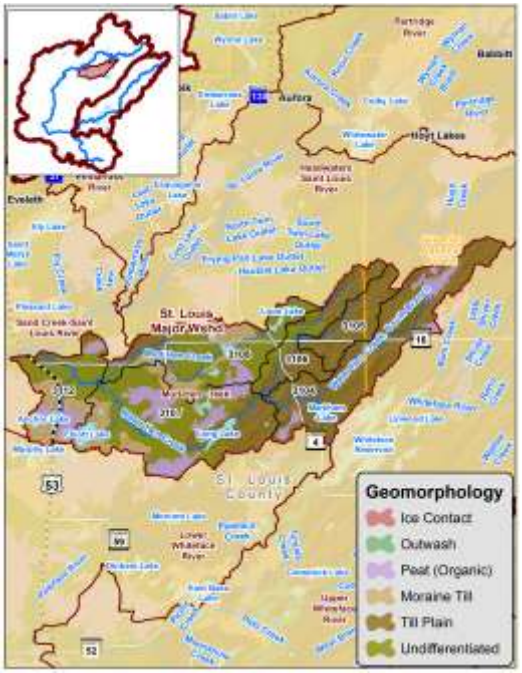
Figure 123. Elevation.



Geography

The eastern side of the Mud Hen Creek Subwatershed is a gently rolling till plain with a few drumlins. The western side is a flat and somewhat poorly drained lake plain with silty clay or fine sand soil textures.

Figure 124. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Mud Hen Creek Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest and paper birch forest in the uplands. Today the forest is mostly intact with some conversion to agriculture towards the center of the subwatershed. The composition of the forest is primarily aspen/birch and spruce/fir 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 NPCs, although near the center of the subwatershed mesic hardwood NPCs also have good potential. The lowland areas may support a mix of acid peatland, forested rich peatland, and wet forest NPCs. The potential for wet forest NPCs is greater towards the center of the subwatershed in areas adjacent to mesic hardwood NPCs.

Figure 125. Historic vegetation cover.

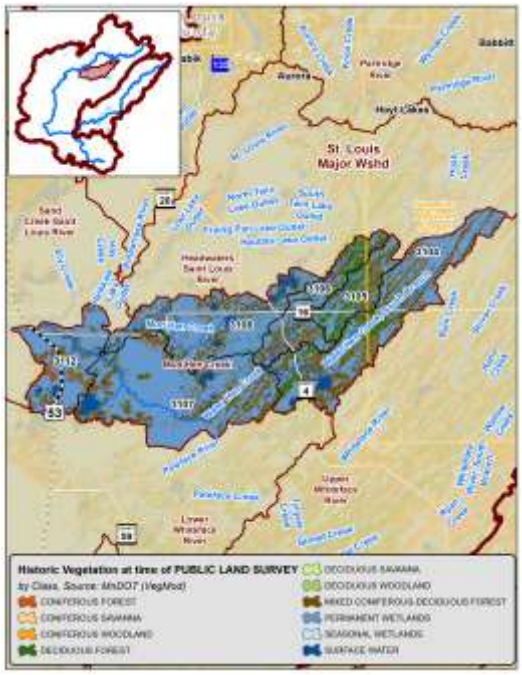


Figure 126. Potential native plant communities.

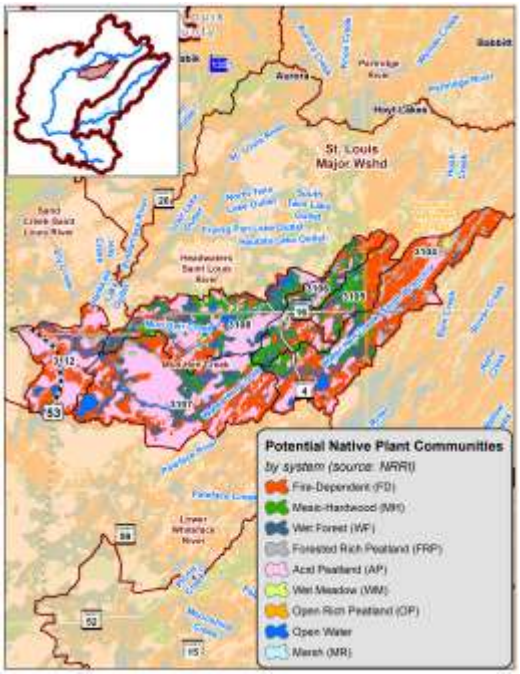
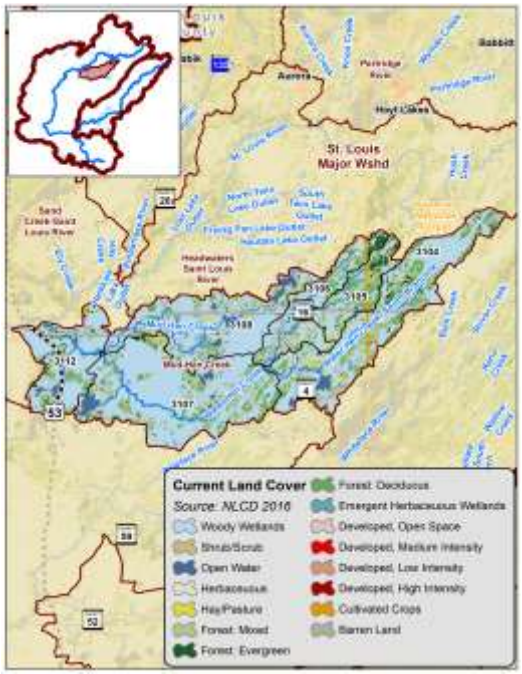


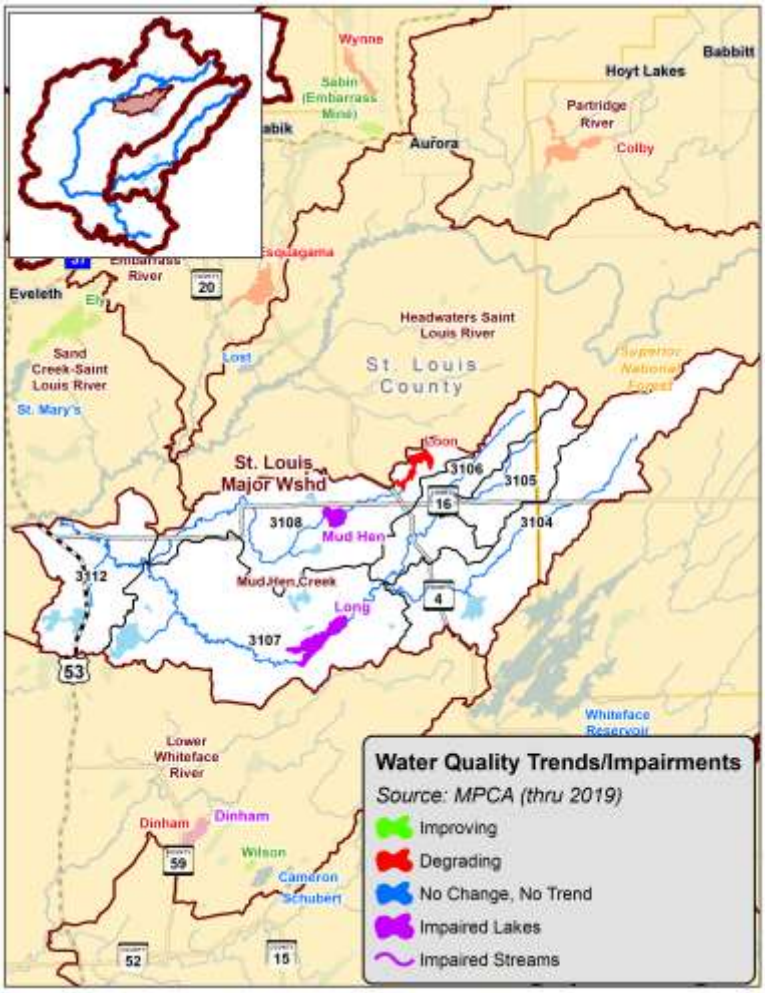
Figure 127. Current land cover.



Water Resources Summary

The Mud Hen Creek Subwatershed is home to Mud Hen Creek as its name implies, as well as several other streams and lakes. Of the lakes with available water quality data, one has degrading water quality and two are impaired. Two lakes have higher or highest phosphorous sensitivity rankings. This subwatershed also has two lakes of high or outstanding biodiversity significance as well as five wild rice lakes. Additionally, the Mud Hen Creek Subwatershed contains 71 miles of stream, 7 miles of which are impaired by invertebrate bioassessments.

Figure 128. Water quality trends.



Protection Status

61% of the Mud Hen Creek Subwatershed is currently protected, mostly by private wetlands, Superior National Forest, state forestry lands, and St. Louis County tax-forfeited lands. Overall protection levels are higher in the north-central portion of the subwatershed than other areas.

Figure 129. Protected lands.

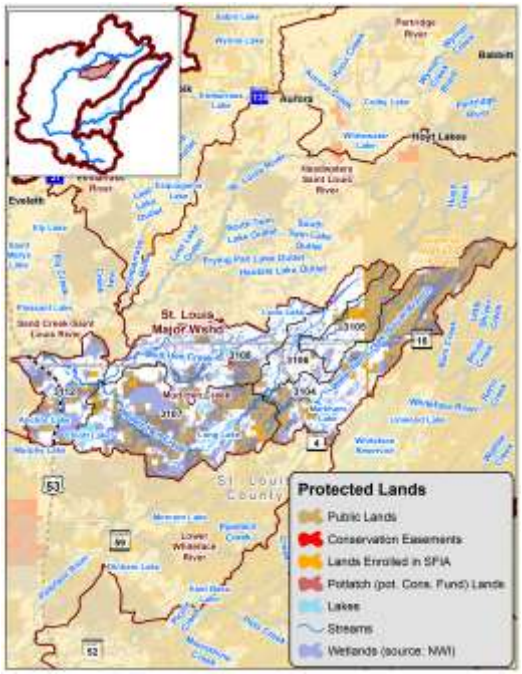
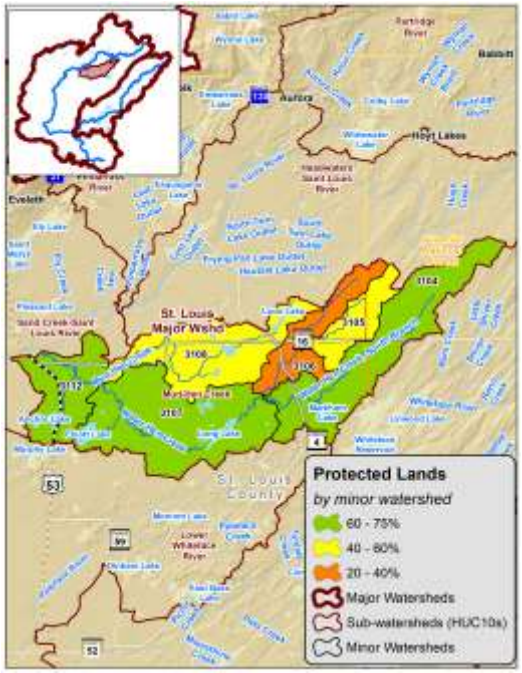


Figure 130. Potential to protect.

Figure 131. Minor watershed protection levels.

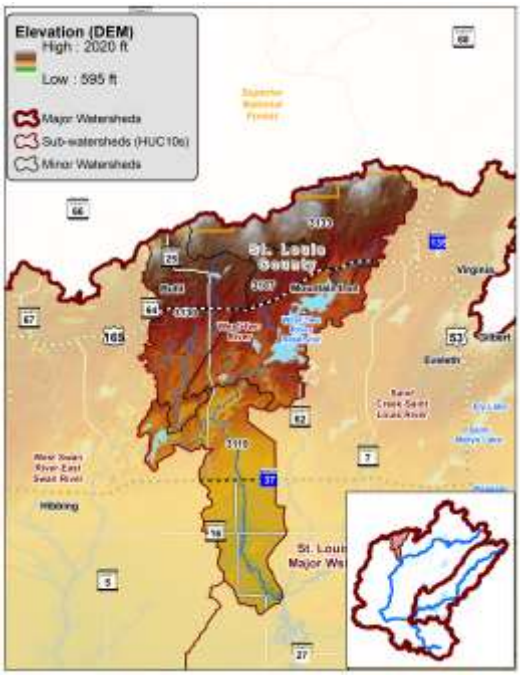


Subwatershed No. 11
West Two River (HUC 401020105)

Description

The West Two River Subwatershed is a tributary to the St. Louis River and drains 79 square miles of St. Louis County.

Figure 132. Elevation.



Geography

The northern border of the West Two River Subwatershed is in the Mesabi Range, which is characterized by rolling to steep terrain with shallow bedrock. The middle of the subwatershed is a rolling till plain with clayey soil. The southern end is a somewhat poorly drained lake plain with silty clay or fine sand soil textures.

Figure 133. Geomorphological landforms.

Past, Current, and Potential Future Forest Conditions

The historical vegetation of the West Two River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest in the uplands. Today the forest is only partially intact, and a significant amount has been converted to mining, agriculture, or development. Most of the mining is concentrated towards the northern end of the subwatershed while agriculture is towards its southern end. The composition of the remaining forest is primarily aspen/birch and spruce/fir 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, although near the subwatershed's northern border fire-dependent NPCs also have good potential. The lowland areas may support a mix of acid peatland and wet forest NPCs.

Figure 134. Historic vegetation cover.

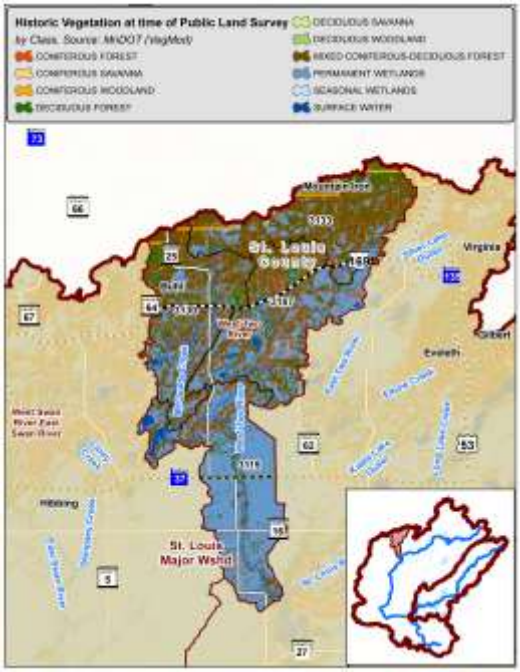


Figure 135. Potential native plant communities.

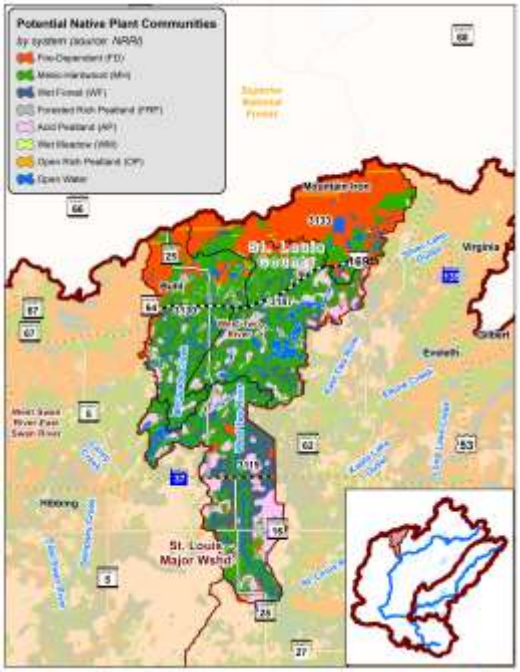
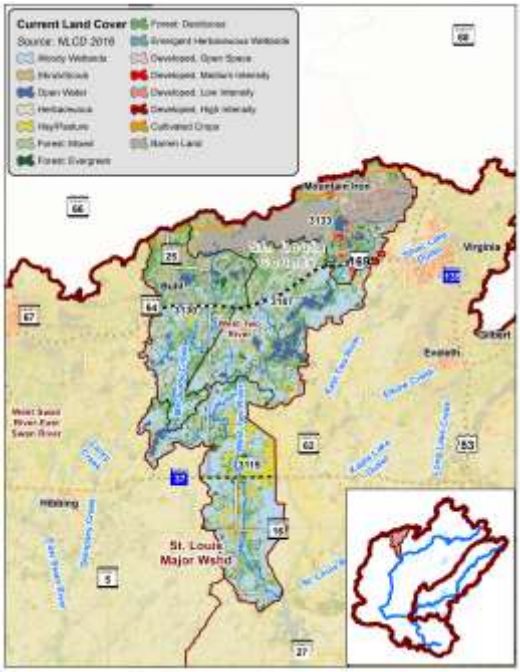


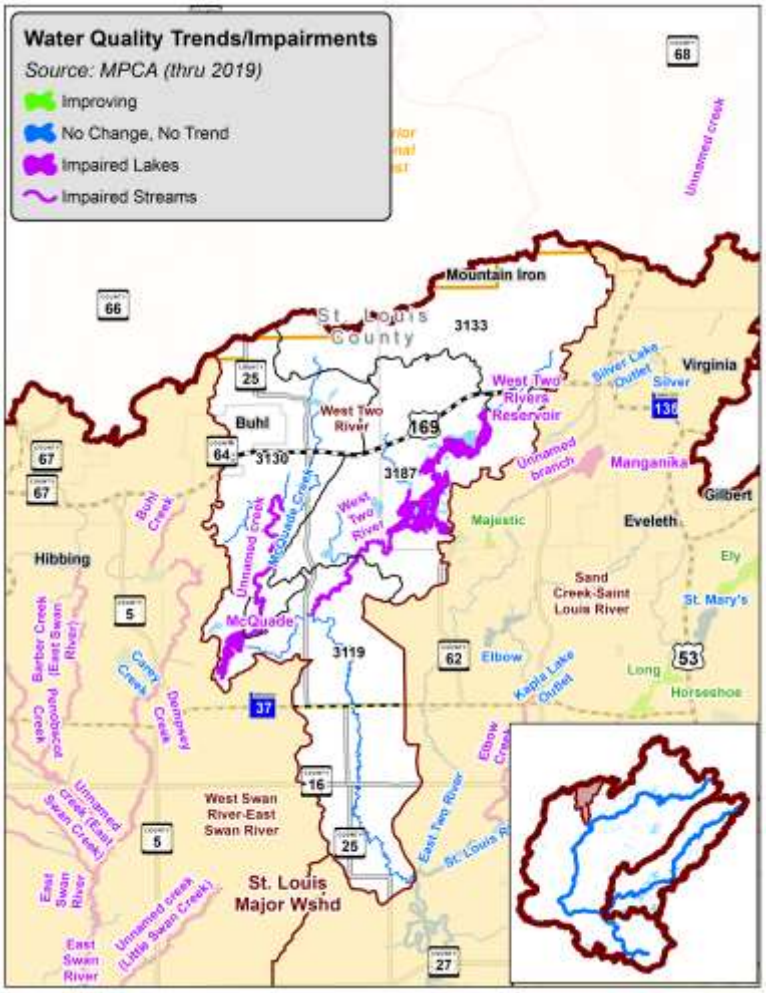
Figure 136. Current land cover.



Water Resources Summary

The West Two River Subwatershed is home to the West Two River as its name implies, as well as numerous other streams and several lakes. Two lakes in the subwatershed are impaired by nutrients. The West Two River Subwatershed also contains 49 miles of streams, 28 miles of which are impaired by mercury in water column or invertebrate bioassessments.

Figure 137. Water quality trends.



Protection Status

45% of the West Two River Subwatershed is currently protected, mostly by private wetlands, state forestry lands, and St. Louis County tax-forfeited lands. Furthermore, a large block of industry land around the West Two River Reservoir is enrolled in SFIA.

Figure 138. Protected lands.

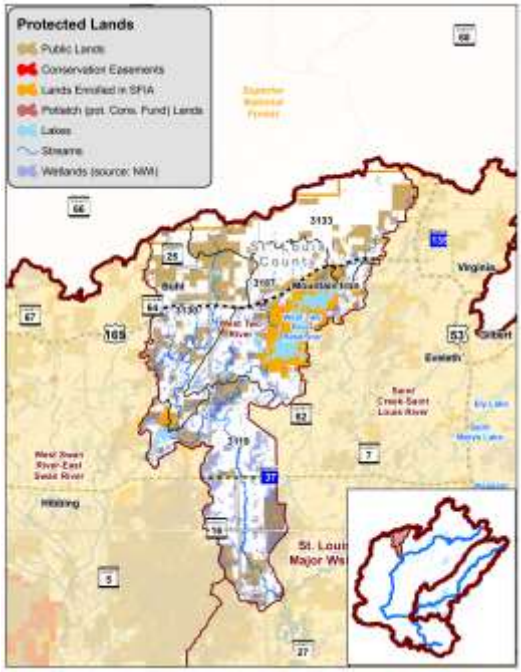


Figure 139. Potential to protect.

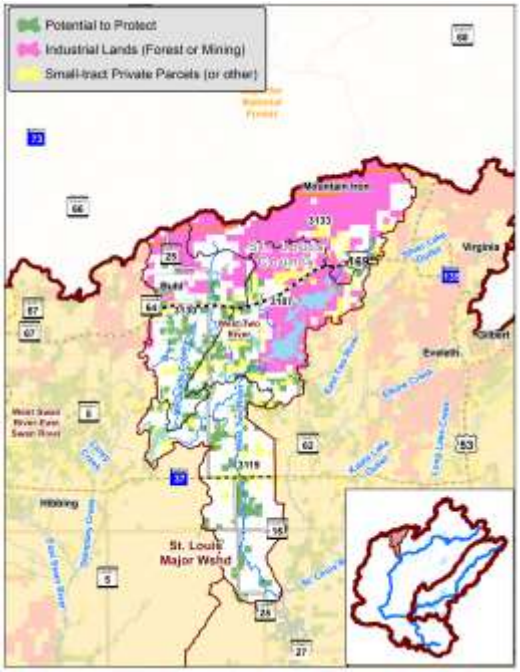
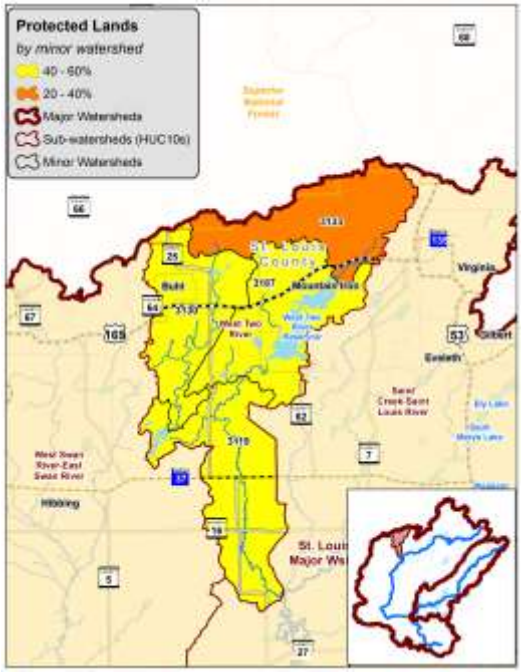


Figure 140. Minor watershed protection levels.



Subwatershed No. 12
West Swan River-East Swan River (HUC 401020106)

Description

West Swan River-East Swan River Subwatershed is a tributary to the St. Louis River and drains 249 square miles of St. Louis County and a small portion of Itasca County.

Geography

The northern border of the West Swan River – East Swan River Subwatershed is in the Mesabi Range, which is characterized by rolling to steep terrain with shallow bedrock. Just south of the Mesabi Range is a rolling till plain with loamy or clayey soil. The southern half of the subwatershed is a flat and somewhat poorly drained lake plain with large areas of peatlands.

Figure 141. Elevation.

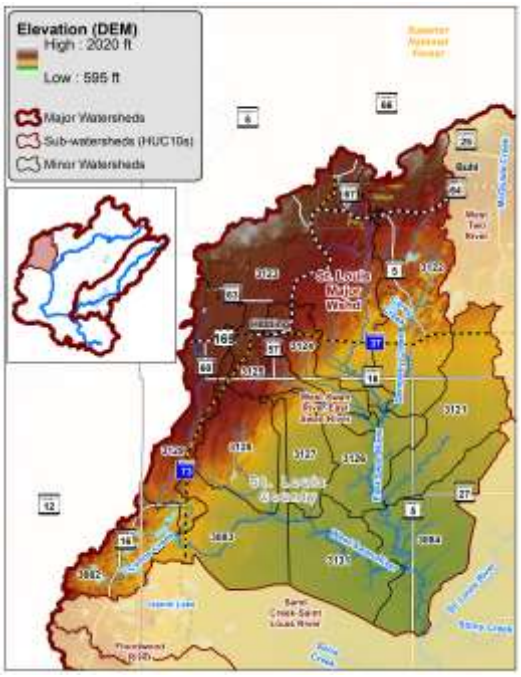


Figure 142. Geomorphological landforms.

Past, Current, and Potential Future Forest Conditions

The historical vegetation of the West Swan River-East Swan River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest in the uplands. Today the forest is somewhat intact, but a significant amount of forest in the subwatershed's northern half has been converted to mining or development. A minor amount of agriculture is also present and spread throughout the area. The composition of the remaining forest is primarily aspen/birch and spruce/fir 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 NPCs, although mesic hardwood NPCs also have good potential near the middle and lower reaches of the West and East Swan River. The lowland areas may support a mix of acid peatland and wet forest NPCs.

Figure 143. Historic vegetation cover.

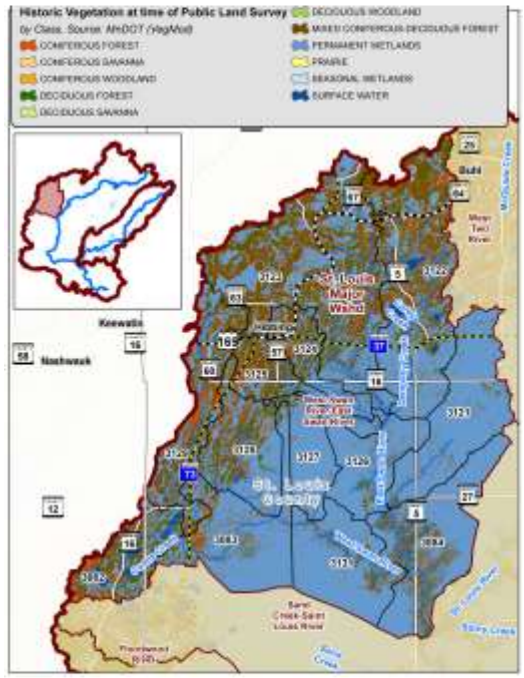


Figure 144. Potential native plant communities.

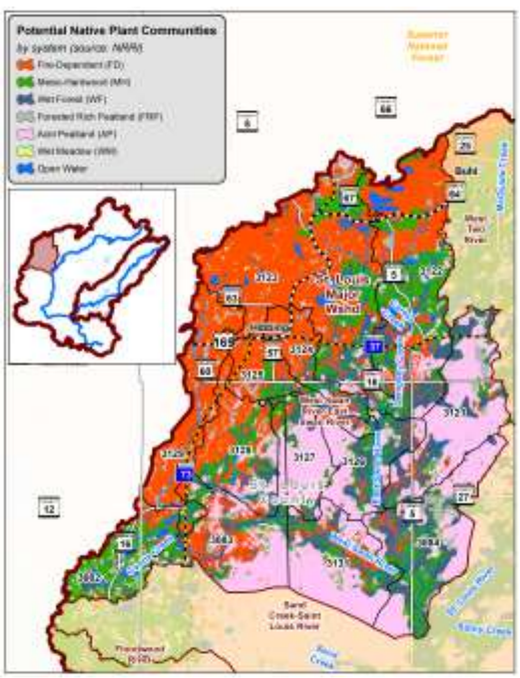
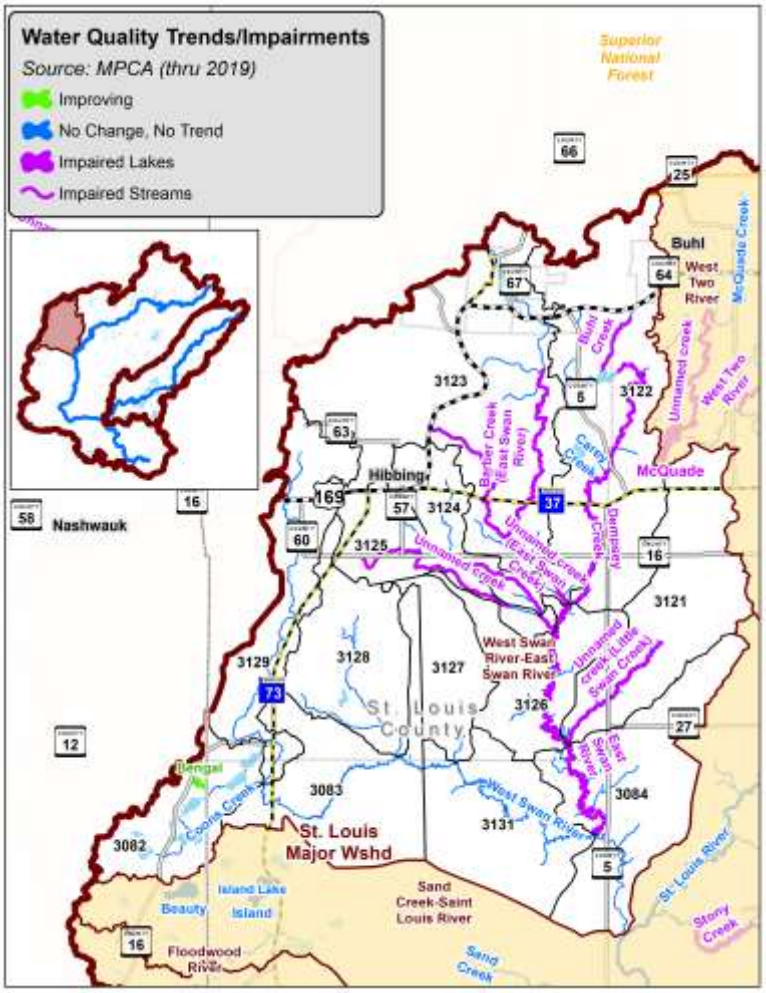


Figure 145. Current land cover.

Water Resources Summary

The West Swan River-East Swan River Subwatershed is home to the West and East Swan River as its name implies, as well as many other streams and several lakes, including one wild rice lake. The single lake with available water quality data – Bengal – has improving water quality. This subwatershed also contains 175 miles of streams, 75 miles of which are impaired by E-coli, invertebrate bioassessments, fish bioassessments, or turbidity.

Figure 146. Water quality trends.



Protection Status

64% of the West Swan River-East Swan River Subwatershed is currently protected, mostly by St. Louis County tax-forfeited lands, state forestry lands, and private wetlands. Many of the public land acres are also wetlands and doubly protected by the Wetland Conservation Act. Furthermore, large blocks of industry lands in the southern half of the subwatershed are protected by conservation easements. Overall protection levels are higher in the southern half of the subwatershed than the northern half.

Figure 147. Protected lands.

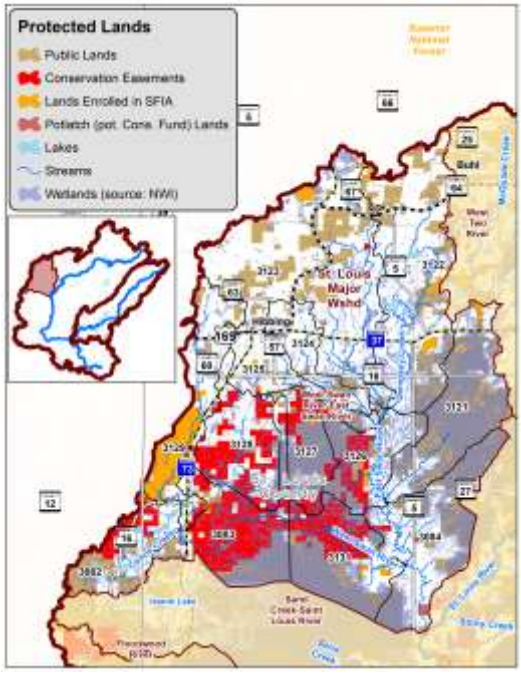


Figure 148. Potential to protect.

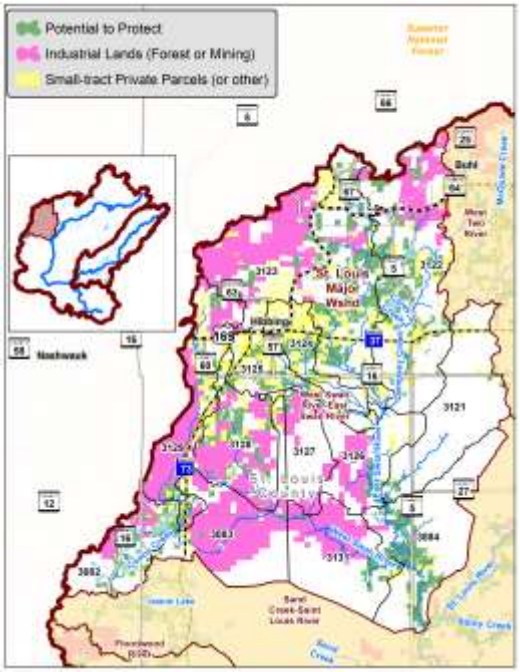
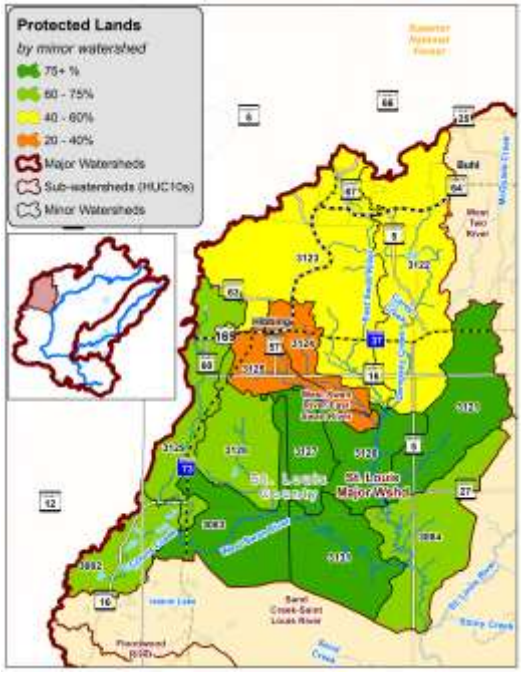


Figure 149. Minor watershed protection levels.



Subwatershed No. 13
Sand Creek-Saint Louis River (HUC 401020107)

Description

The Sand Creek-St. Louis River Subwatershed drains 343 square miles of St. Louis County and a small portion of Itasca County. It also receives water from the Headwaters St. Louis River, Embarrass River, Mud Hen Creek, West Two River, and West Swan River-East Swan River subwatersheds.

Geography

Most of the Sand Creek – St. Louis River Subwatershed is a flat and somewhat poorly drained lake plain with large areas of peatlands.

Figure 150. Elevation.

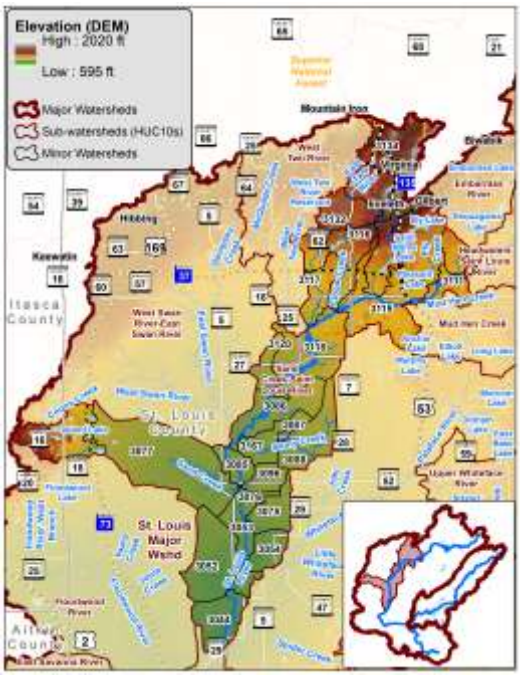
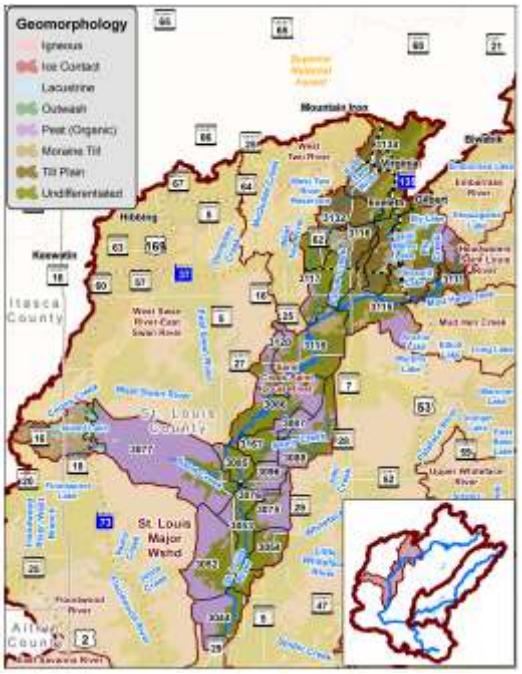


Figure 151. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Sand Creek-St. Louis River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest in the uplands. The lowlands were especially abundant and made up well over half of the subwatershed. Today the forest is somewhat intact, but a significant amount has been converted to agriculture, development, or mining. Development and mining are concentrated in the northern third of the subwatershed while agriculture occurs in pockets throughout the subwatershed. The composition of the remaining forest is primarily aspen/birch and spruce/fir forest type groups.

Estimates of the potential native plant communities (NPCs) indicate that the upland areas around the Iron Range communities have good potential to support fire-dependent NPCs, but uplands elsewhere may be better suited towards mesic hardwood NPCs. The lowland areas may support a mix of acid peatland and wet forest NPCs.

Figure 152. Historic vegetation cover.

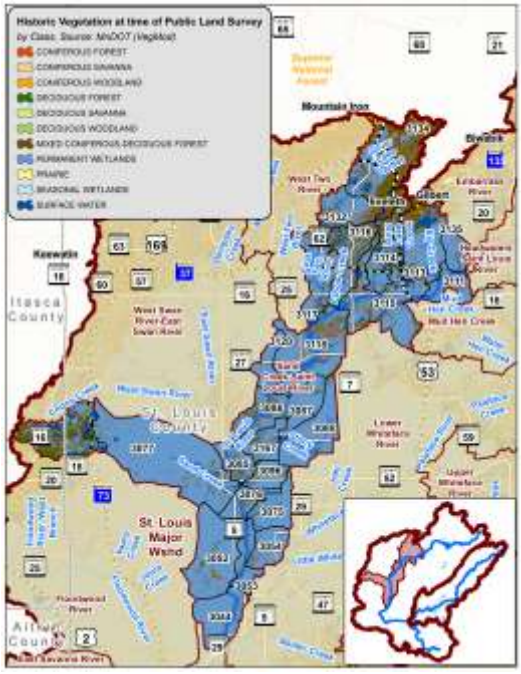


Figure 153. Potential native plant communities.

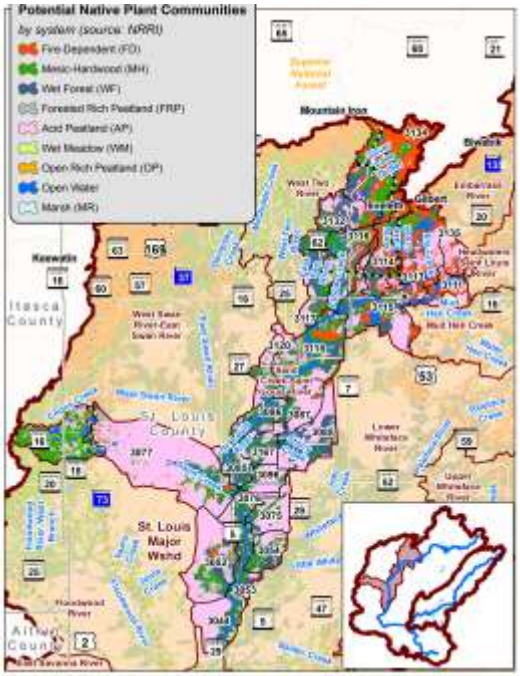
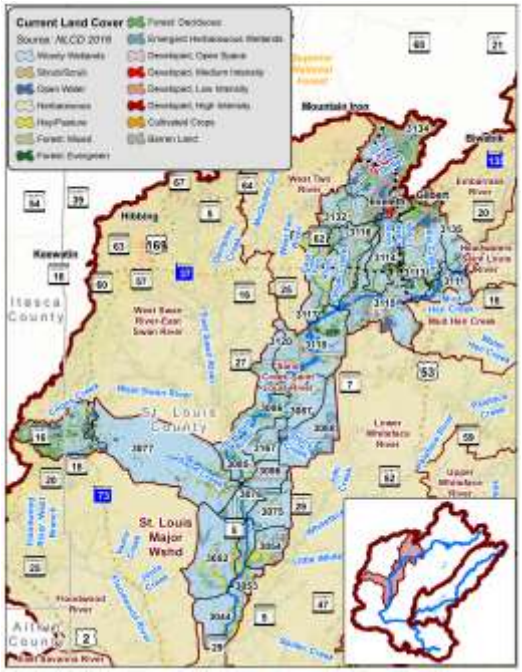


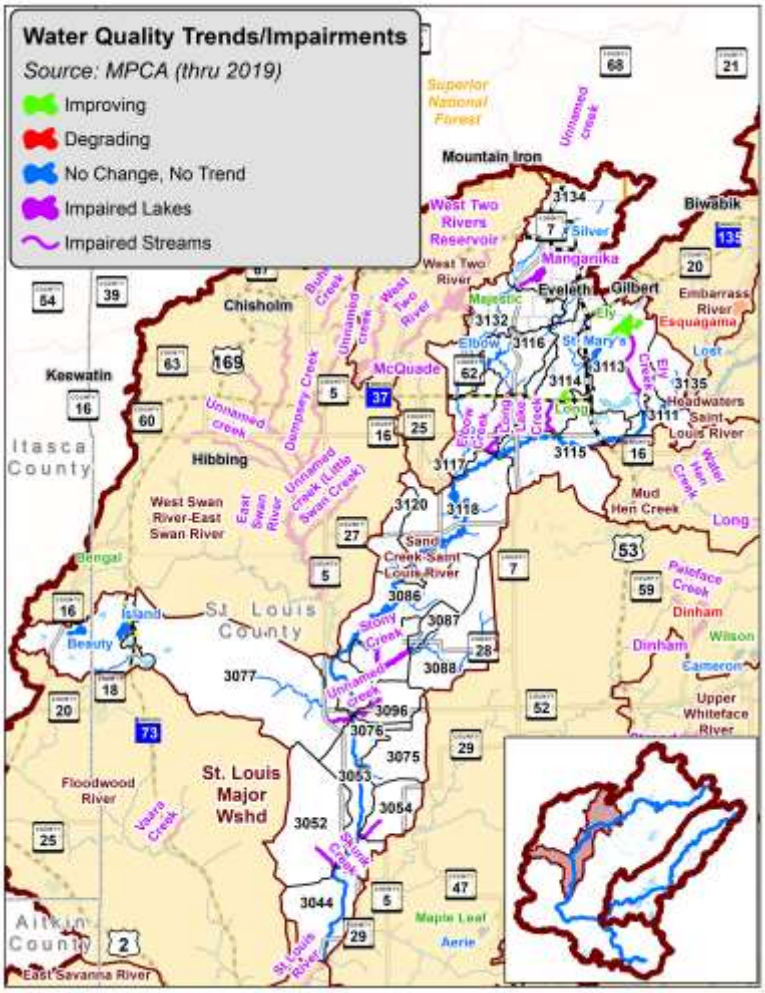
Figure 154. Current land cover.



Water Resources Summary

The Sand Creek-St. Louis River Subwatershed is home to numerous streams and several dozen lakes, including five wild rice lakes. Of the lakes with available water quality data, four have improving water quality, five are stable, and one is impaired. Five lakes have higher or highest phosphorous sensitivity rankings. This subwatershed also contains 182 miles of streams, 65 miles of which are impaired by fish bioassessments, invertebrate bioassessments, or mercury in water column.

Figure 155. Water quality trends.



Protection Status

64% of the West Swan River-East Swan River Subwatershed is currently protected, mostly by St. Louis County tax-forfeited lands, state forestry lands, and private wetlands. Many of the public land acres are also wetlands and doubly protected by the Wetland Conservation Act. Furthermore, large blocks of industry lands in the southern half of the subwatershed are protected by conservation easements. Overall protection levels are higher in the southern half of the subwatershed than the northern half.

Figure 156. Protected lands.

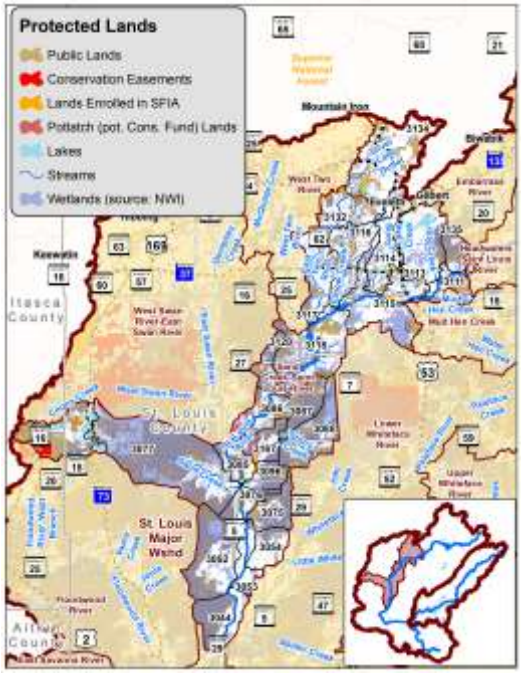


Figure 157. Potential to protect.

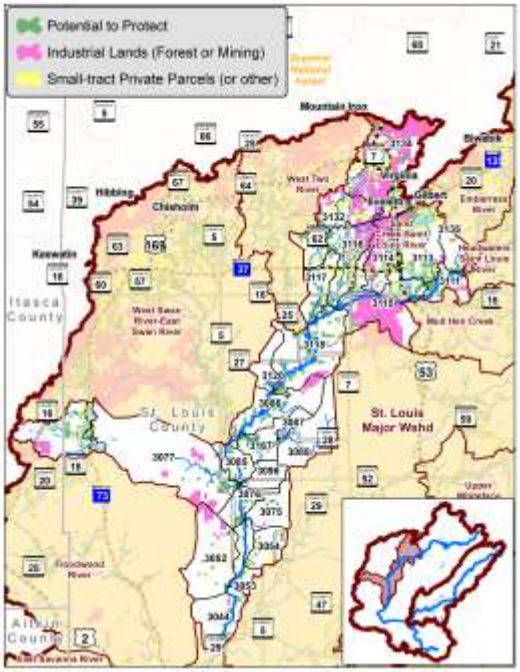
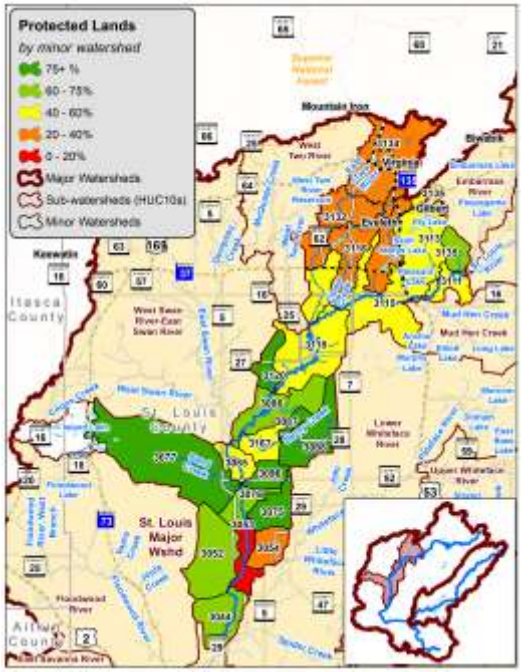


Figure 158. Minor watershed protection levels.



Subwatershed No. 14
Upper Whiteface River (HUC 401020108)

Description

The Upper Whiteface River Subwatershed drains 262 square miles of St. Louis County and is the headwaters to the Whiteface River.

Geography

Most of the Upper Whiteface River Subwatershed is a rolling drumlin plain with drumlins orientated in a northeast to southwest direction. Soil textures on the drumlin plain are sandy loam over a gravelly sandy loam hardpan. The southwestern end of the subwatershed is a gently rolling till plain with loam over clay or silty over loam soil textures.

Figure 159. Elevation.

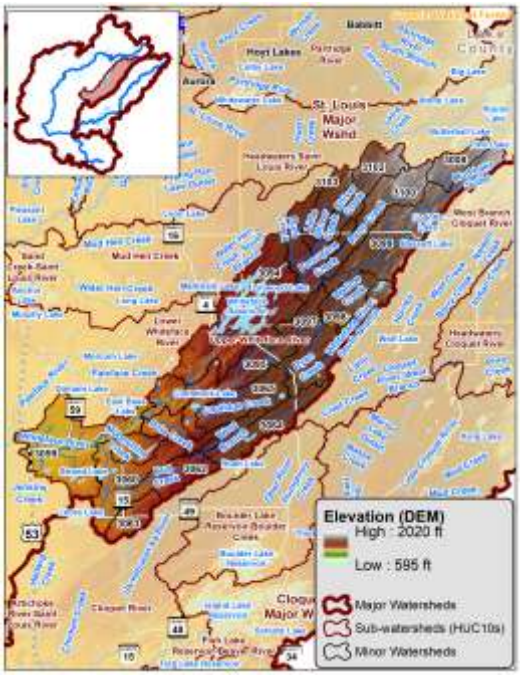
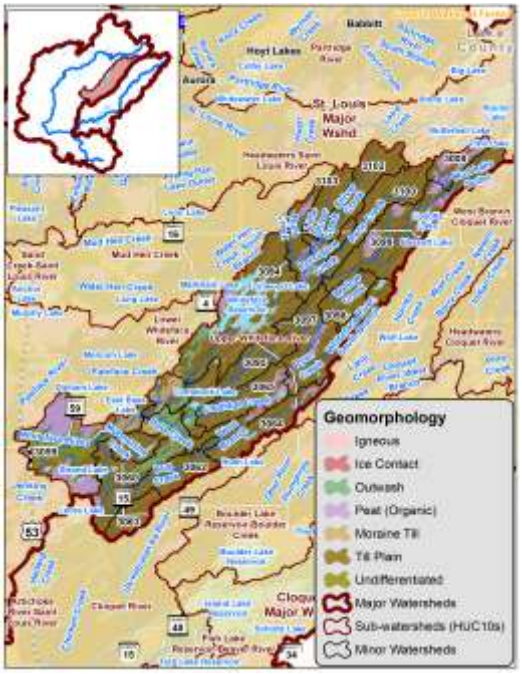


Figure 160. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Upper Whiteface River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest and paper birch in the uplands. Today the forest remains intact with little conversion or fragmentation. The composition of the forest is primarily aspen/birch and spruce/fir 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 NPCs. The lowland areas may support a mix of forested rich peatland, acid peatland, and wet forest NPCs.

Figure 161. Historic vegetation cover.

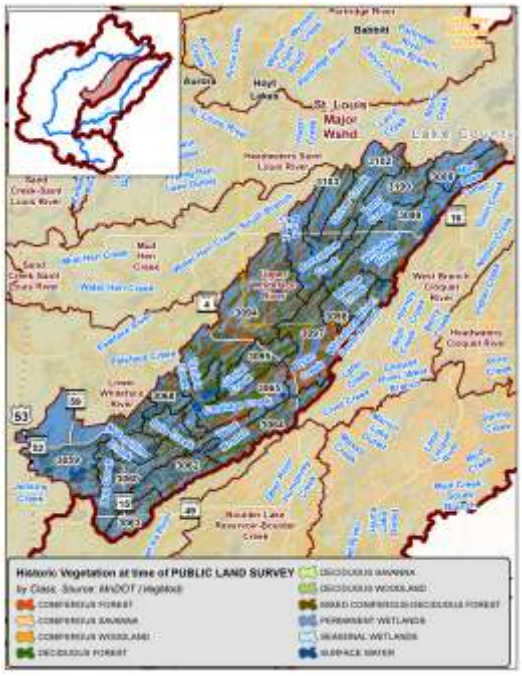


Figure 162. Potential native plant communities.

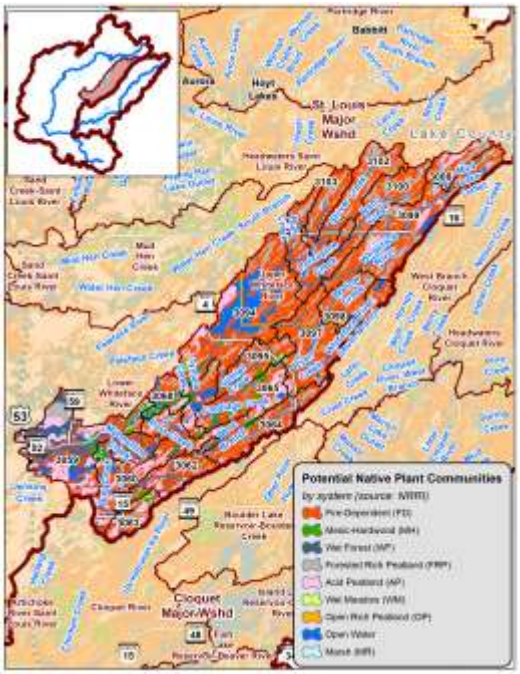
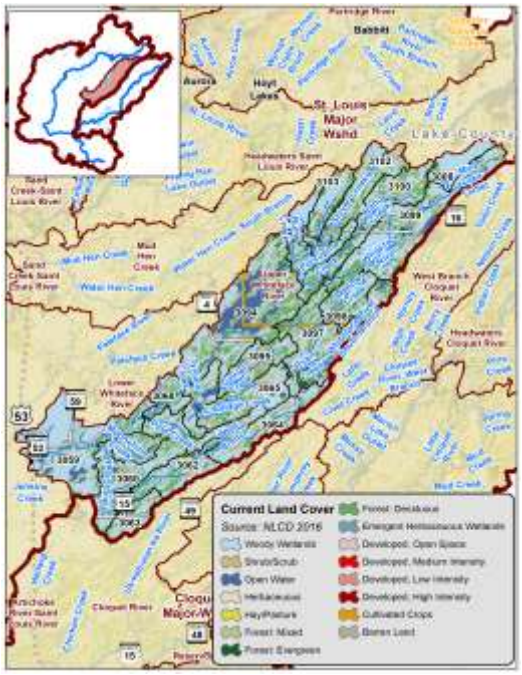


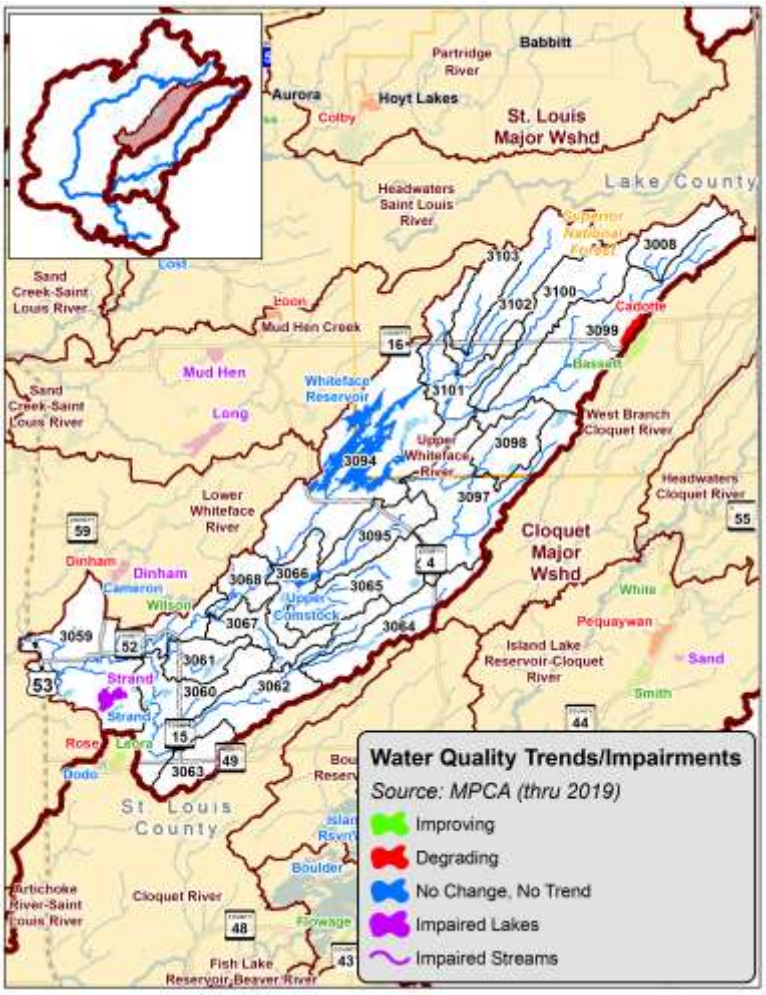
Figure 163. Current land cover.



Water Resources Summary

The Upper Whiteface River Subwatershed is home to the upper reaches of the Whiteface River as its name implies, as well as numerous other streams and dozens of lakes. Of the lakes with available water quality data, three have stable water quality, one is degrading, and one is impaired. This subwatershed also has five lakes of high or outstanding biodiversity significance as well as four wild rice lakes. Additionally, the Upper Whiteface River Subwatershed contains 207 miles of streams, including 24 miles of trout streams.

Figure 164. Water quality trends.



Protection Status

89% of the Upper Whiteface River Subwatershed is currently protected, mostly by St. Louis County tax-forfeited lands, state forestry lands, and the Superior National Forest.

Figure 165. Protected lands.

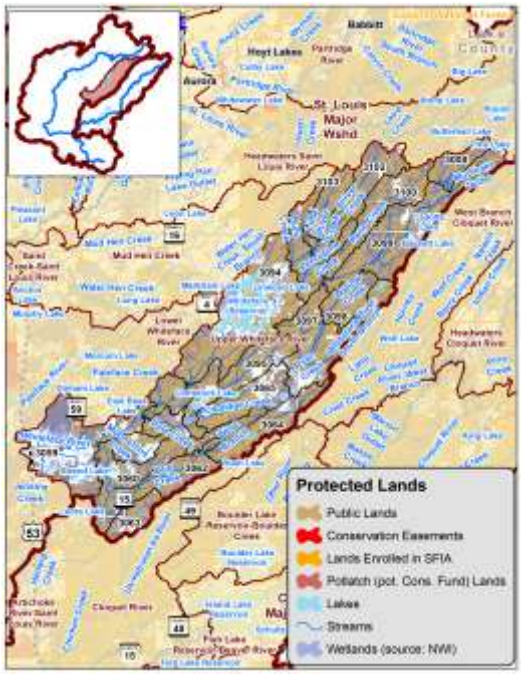
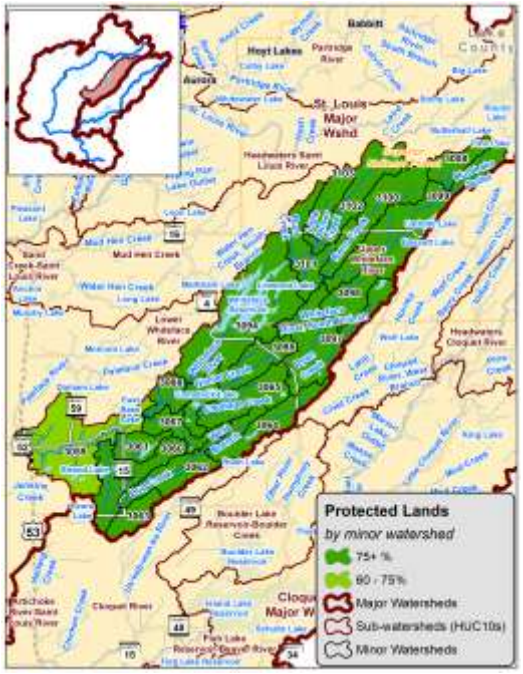


Figure 166. Potential to protect.

Figure 167. Minor watershed protection levels.



Subwatershed No. 15
Lower Whiteface River (HUC 401020109)

Description

The Lower Whiteface River Subwatershed is a tributary to the St. Louis River and drains 325 square miles of St. Louis County. It also receives water from the Upper Whiteface River Subwatershed.

Geography

Most of the Lower Whiteface River Subwatershed is a flat and somewhat poorly drained lake plain with large areas of peatlands. The area along the eastern border of the subwatershed is a gently rolling till plain with loam over clay or silty over loam soil textures.

Figure 168. Elevation.

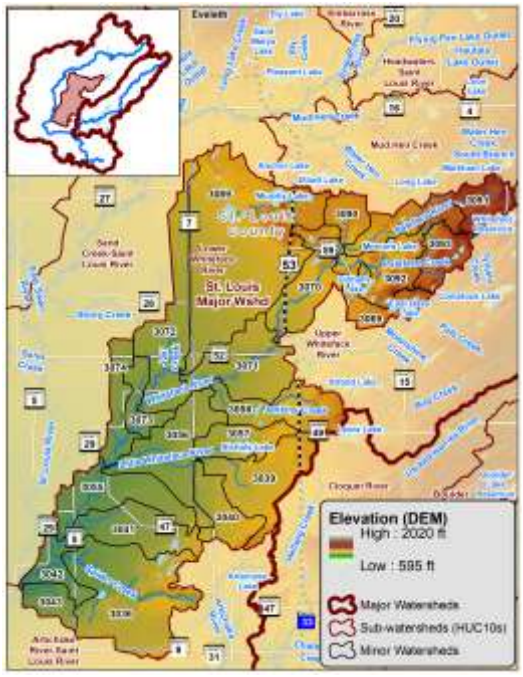
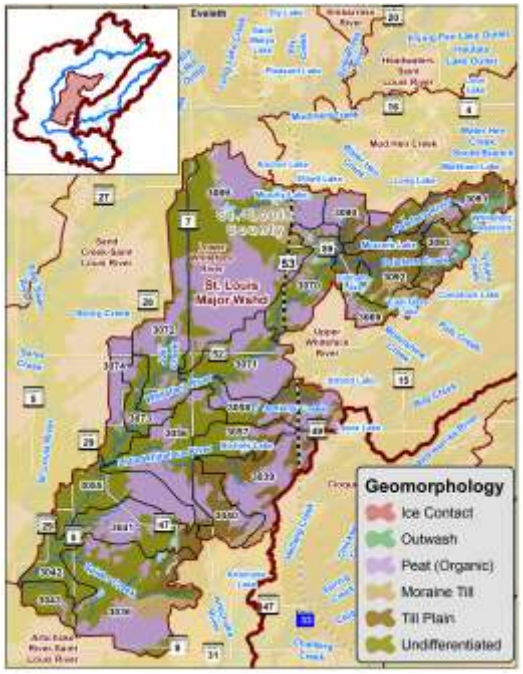


Figure 169. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Lower Whiteface River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest in the uplands. The lowlands were especially abundant and made up well over half of the subwatershed. Today the forest remains largely intact with minor amounts of conversion to agriculture. The composition of the forest is primarily aspen/birch and spruce/fir forest type groups.

Estimates of the potential native plant communities (NPCs) indicate that the upland areas around the northeastern end of the subwatershed have good potential to support fire-dependent NPCs, but uplands elsewhere may be better suited towards mesic hardwood NPCs. The lowland areas may support a mix of acid peatland and wet forest NPCs.

Figure 170. Historic vegetation cover.

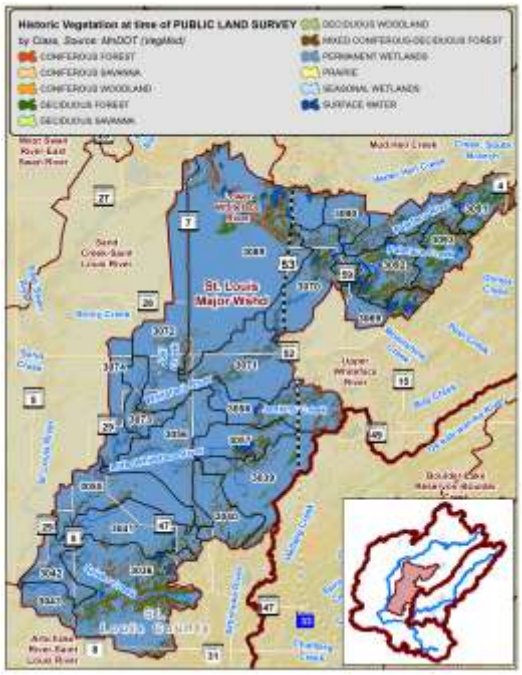


Figure 171. Potential native plant communities.

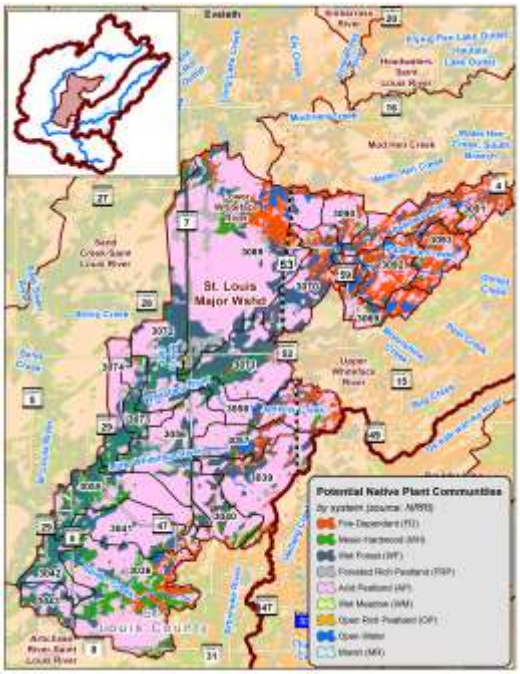
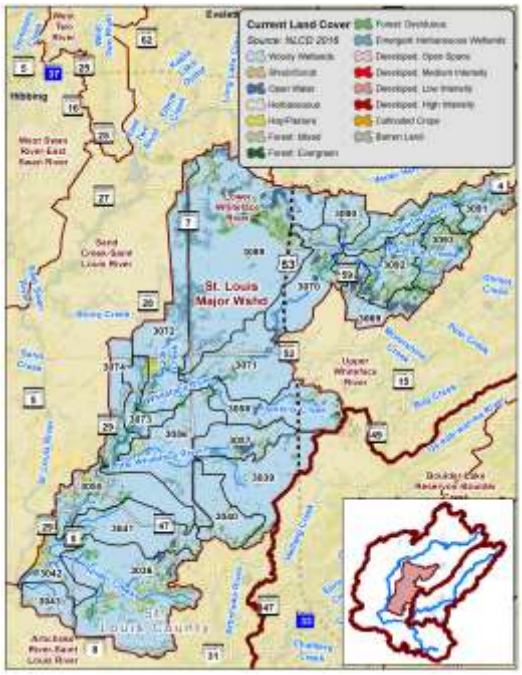


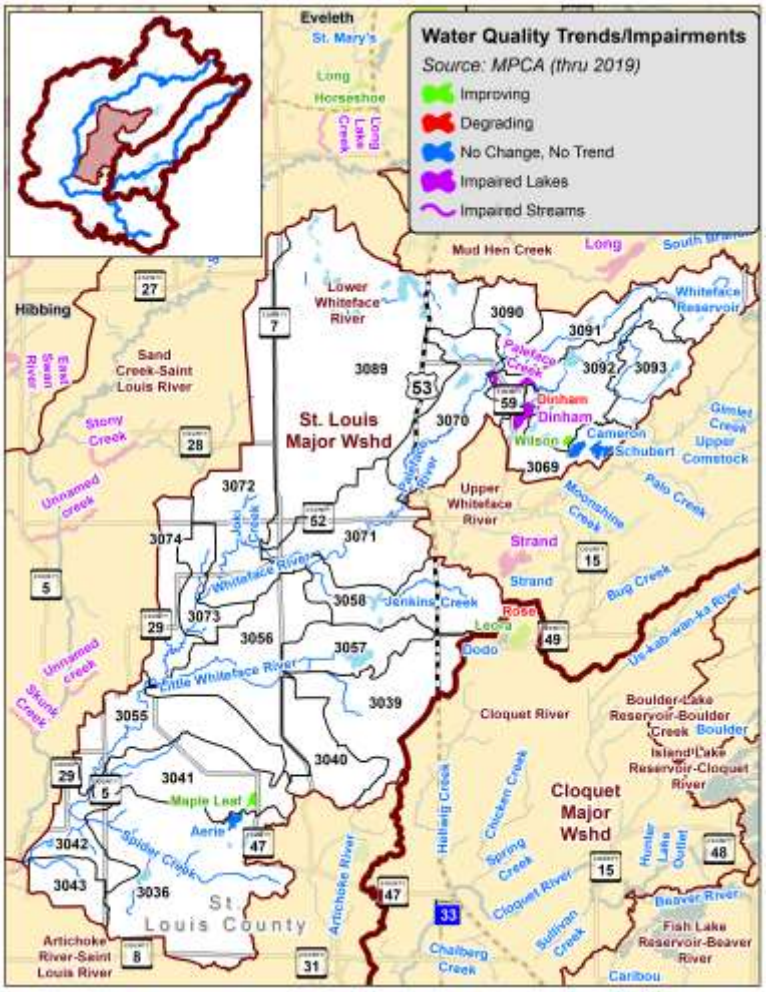
Figure 172. Current land cover.



Water Resources Summary

The Lower Whiteface River Subwatershed is home to the lower reaches of the Whiteface River as its name implies, as well as several other streams and dozens of lakes. Of the lakes with available water quality data, two have improving water quality, three are stable, one is degrading, and one is impaired. This subwatershed also has six lakes of high or outstanding biodiversity significance, as well as 13 wild rice lakes. The Lower Whiteface River Subwatershed also contains 150 miles of streams, 40 miles of which are impaired by fish bioassessments, invertebrate bioassessments, or mercury in water column.

Figure 173. Water quality trends.



Protection Status

78% of the Lower Whiteface River Subwatershed is currently protected, mostly by St. Louis County tax-forfeited lands, state forestry lands, and private wetlands. Many of the public land acres are also wetlands and doubly protected by the Wetland Conservation Act.

Figure 174. Protected lands.

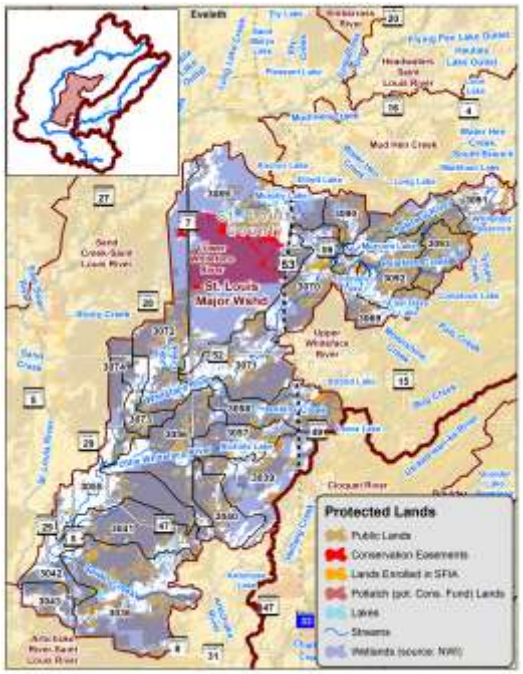


Figure 175. Potential to protect.

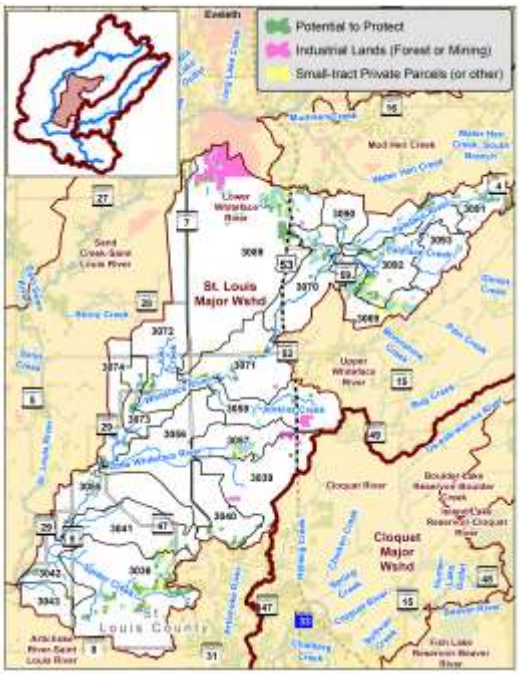
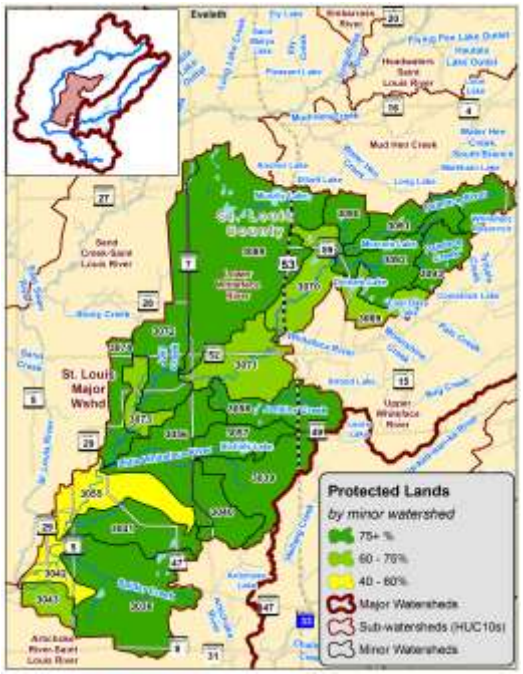


Figure 176. Minor watershed protection levels.



Subwatershed No. 16
Floodwood River (HUC 401020110)

Description

The Floodwood River Subwatershed is a tributary to the St. Louis River and drains 212 square miles of St. Louis, Itasca, and Aitkin counties.

Geography

Most of the Floodwood River Subwatershed is a flat and somewhat poorly drained lake plain with large areas of peatlands. The northwestern tip of the subwatershed is complex of an esker, outwash delta, and an end moraine with steep to rolling topography.

Figure 177. Elevation.

Figure 178. Geomorphological landforms.

Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Floodwood River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest in the uplands. The lowlands were especially abundant and made up well over three-quarters of the subwatershed. Today the forest remains largely intact with low to moderate amounts of conversion to agriculture. The composition of the forest is primarily spruce/fir and aspen/birch forest type groups. Minor amounts of the maple/beech/birch forest type group are also present.

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 a mix of acid peatland, forested rich peatland, and wet forest NPCs.

Figure 179. Historic vegetation cover.

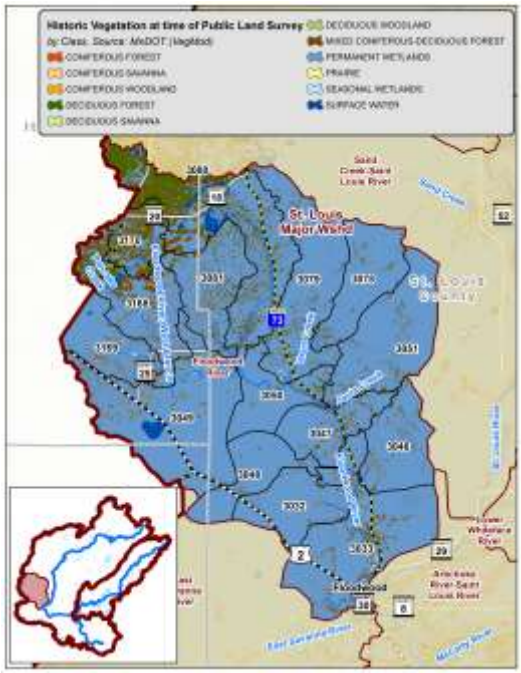


Figure 180. Potential native plant communities.

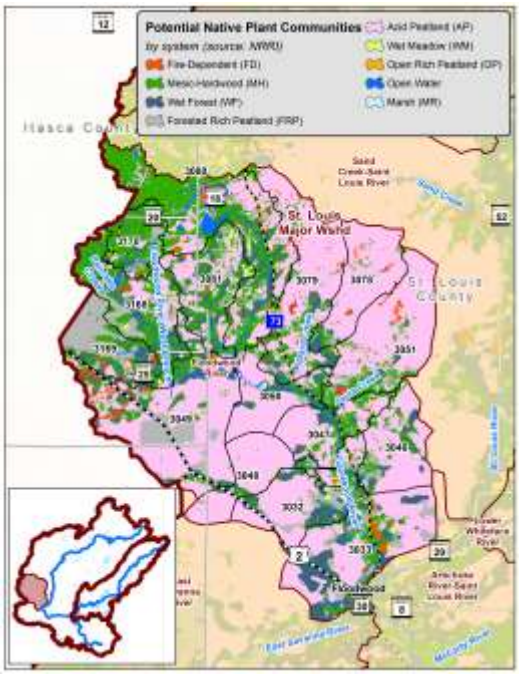


Figure 181. Current land cover.

Water Resources Summary

The Floodwood River Subwatershed is home to the Floodwood River as its name implies, as well as a few other streams and lakes. This subwatershed has one lake of high or outstanding biodiversity significance, and two priority shallow lakes. The Floodwood River Subwatershed also contains 84 miles of streams, including 4 miles of trout streams. 37 miles of streams are impaired by fish bioassessments, invertebrate bioassessments, and mercury in water column.

Figure 182. Water quality trends.

Protection Status

88% of the Floodwood River Subwatershed is currently protected, mostly by county tax-forfeited lands, state forestry lands, Wawina Peatland SNA, and private wetlands. Many of the public land acres are also wetlands and doubly protected by the Wetland Conservation Act.

Figure 183. Protected lands.

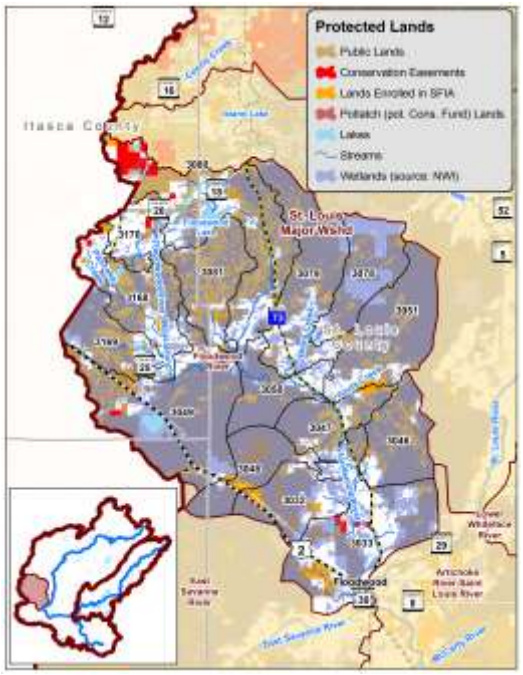
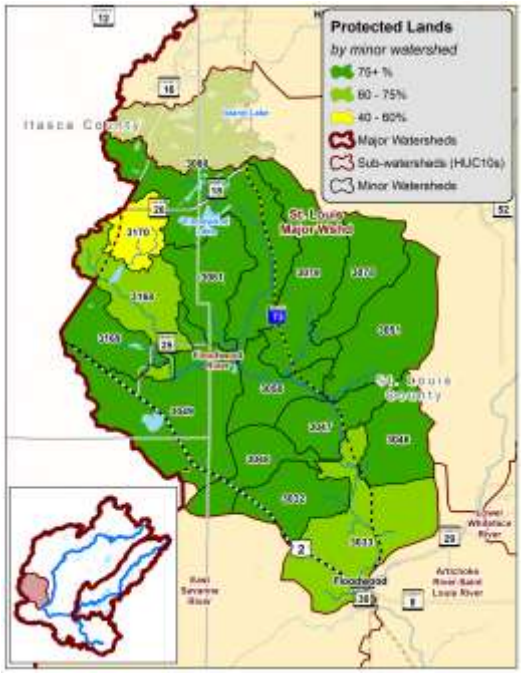


Figure 184. Potential to protect.

Figure 185. Minor watershed protection levels.



Subwatershed No. 17
East Savanna River (HUC 401020111)

Description

The East Savanna River Subwatershed is a tributary to the St. Louis River and drains 122 square miles of Aitkin and St. Louis counties.

Geography

Most of the East Savanna River Subwatershed is a large, flat peatland with small islands of upland mineral soil. The far western end of the subwatershed is a complex of rolling to steep end moraines and till plains separated by outwash. Near Floodwood is a somewhat poorly drained lake plain with silty clay or fine sand soil textures.

Figure 186. Elevation.

Figure 187. Geomorphological landforms.

Past, Current, and Potential Future Forest Conditions

The historical vegetation of the East Savanna River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest in the uplands. The lowlands were especially abundant and covered approximately 90% of the subwatershed. Today the forest remains largely intact with relatively low amounts of conversion to agriculture. The composition of the forest is primarily spruce/fir and aspen/birch forest type groups. Minor amounts of the elm/ash/cottonwood and maple/beech/birch forest type groups are also present.

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 a mix of acid peatland, forested rich peatland, and wet forest NPCs.

Figure 188. Historic vegetation cover.

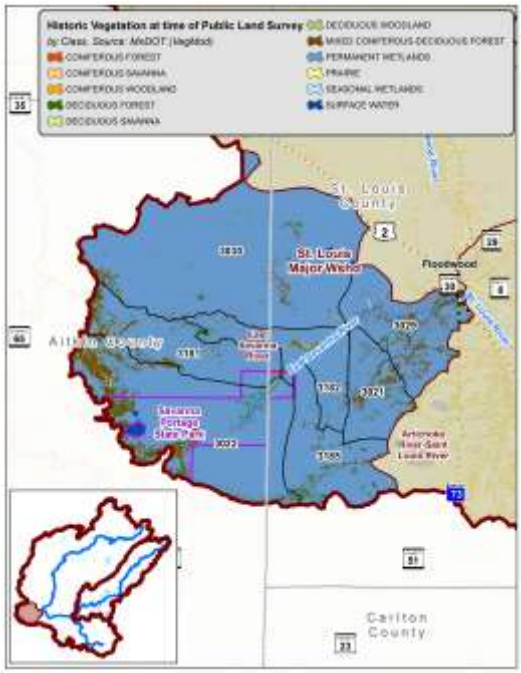


Figure 189. Potential native plant communities.

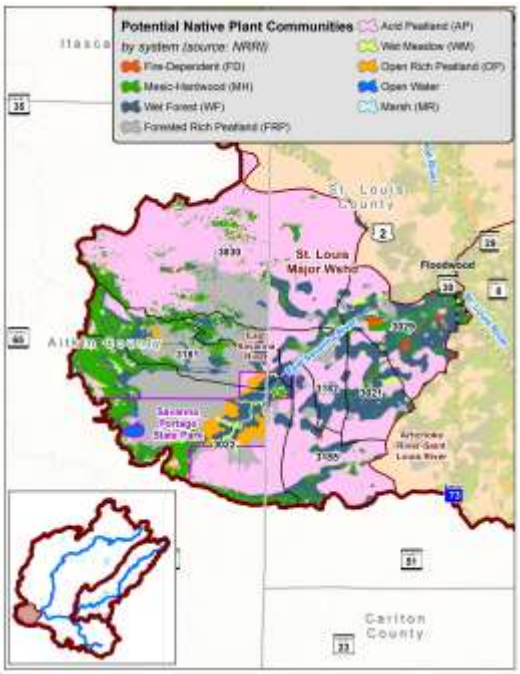
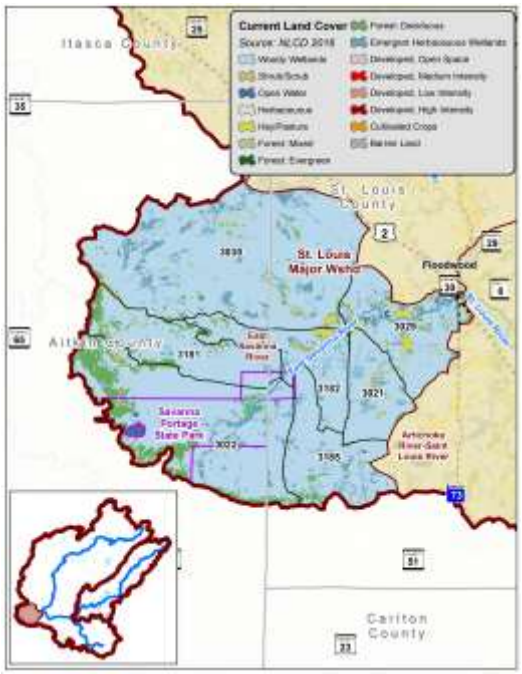


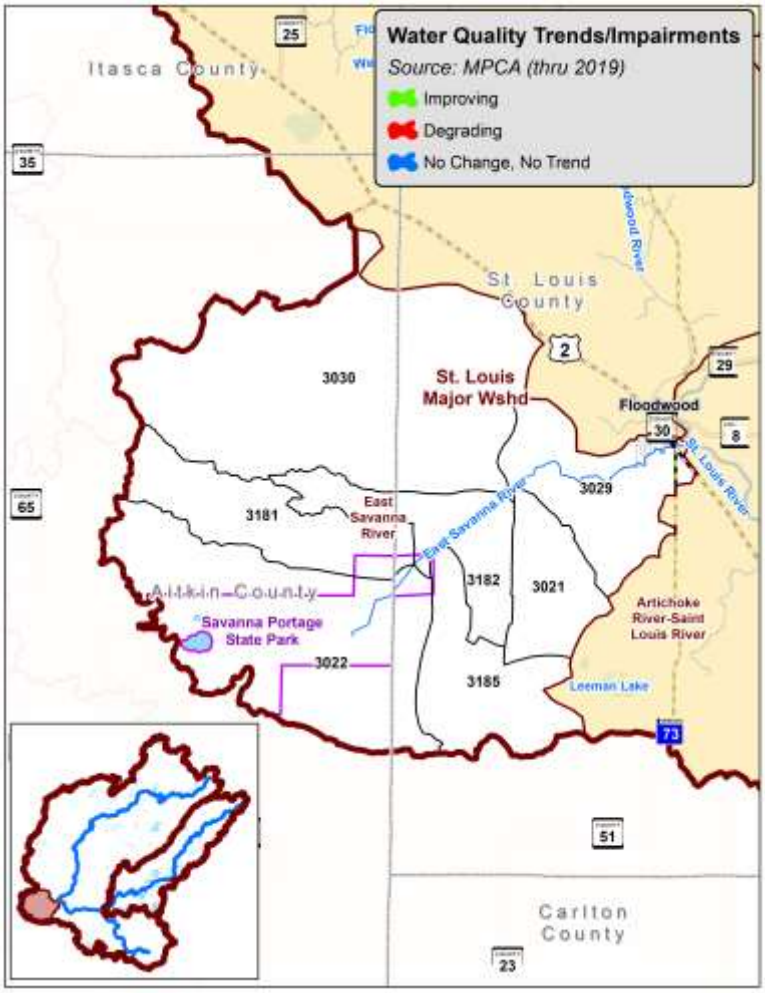
Figure 190. Current land cover.



Water Resources Summary

The East Savanna River Subwatershed is a stream-based watershed with relatively few lakes, although two if its lakes are wild rice lakes. As its name implies it is home to the East Savanna River, as well as a couple other streams. In total this subwatershed contains 12 miles of streams, plus several miles of drainage ditches.

Figure 191. Water quality trends.



Protection Status

90% of the East Savanna River Subwatershed is currently protected, mostly by the Savanna State Forest, Savanna Portage State Park, and St. Louis County tax-forfeited lands. Most of the public lands are also wetlands and doubly protected by the Wetland Conservation Act. Overall protection levels are lower in the eastern portion of the subwatershed, which is adjacent to the City of Floodwood.

Figure 192. Protected lands.

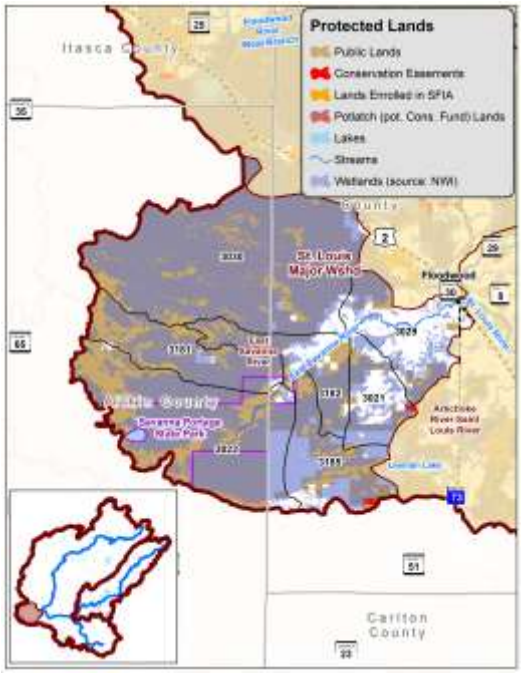
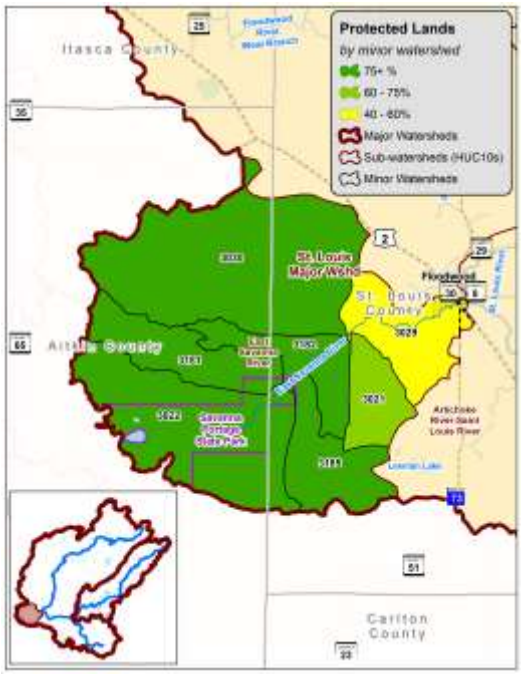


Figure 193. Potential to protect.

Figure 194. Minor watershed protection levels.



Subwatershed No. 18
Stoney Brook (HUC 401020112)

Description

The Stoney Brook Subwatershed is a tributary to the St. Louis River and drains 101 square miles of Carlton and St. Louis counties.

Geography

Most of the Stoney Brook Subwatershed is a complex of hummocky end moraines and rolling till plains with fine sandy loam sandy loam textures.

Figure 195. Elevation.

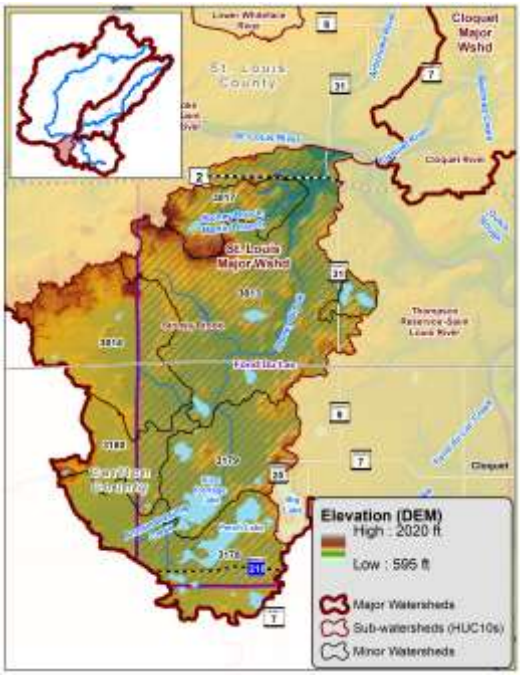
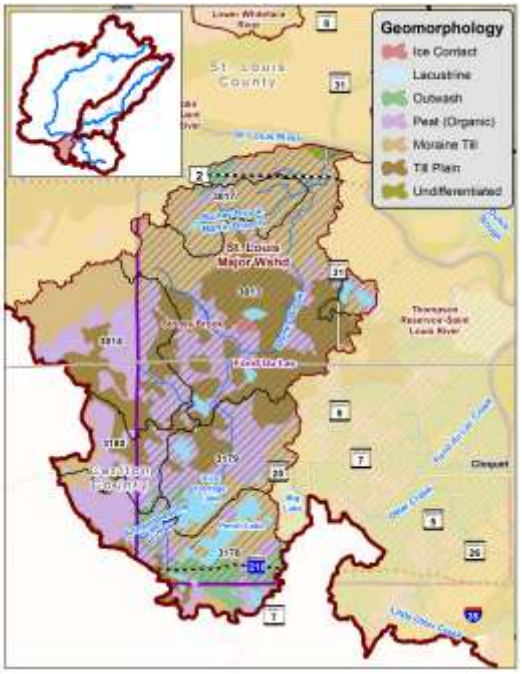


Figure 196. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Stony Brook Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest and paper birch forest in the uplands. Today the forest remains mostly intact with low to moderate amounts of conversion to agriculture. The composition of the forest is primarily aspen/birch and spruce/birch forest type groups. Minor amounts of the elm/ash/cottonwood forest type group are also present.

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 a mix of forested rich peatland, acid peatland, and wet forest NPCs.

Figure 197. Historic vegetation cover.

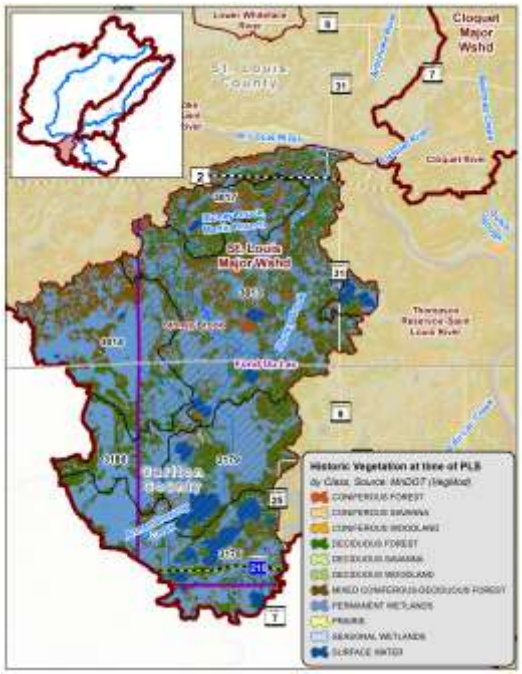


Figure 198. Potential native plant communities.

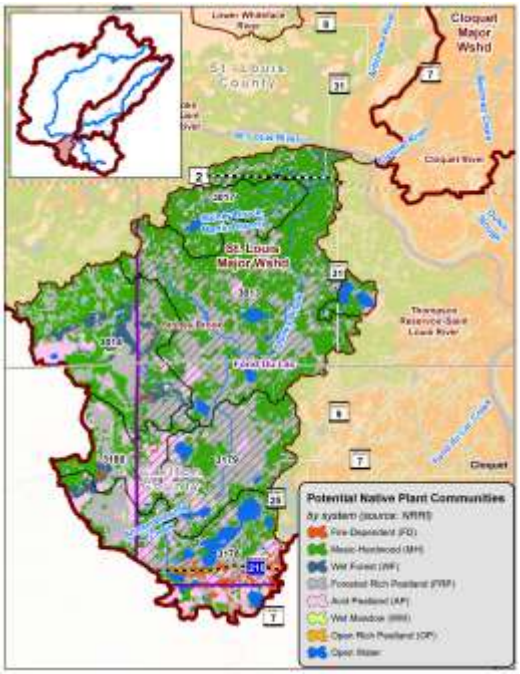
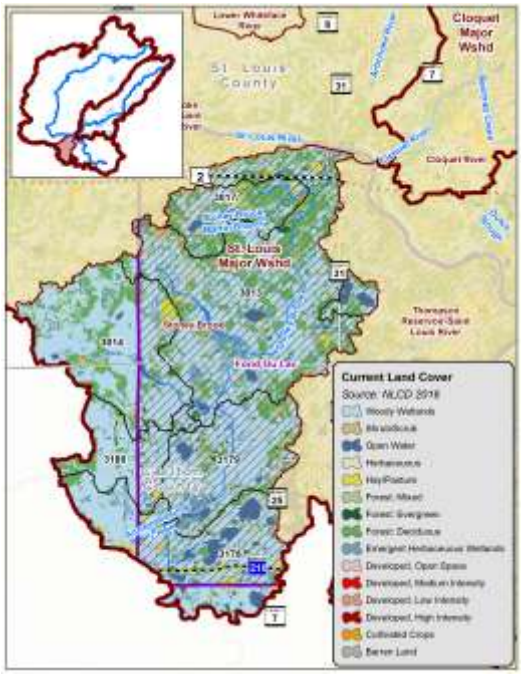


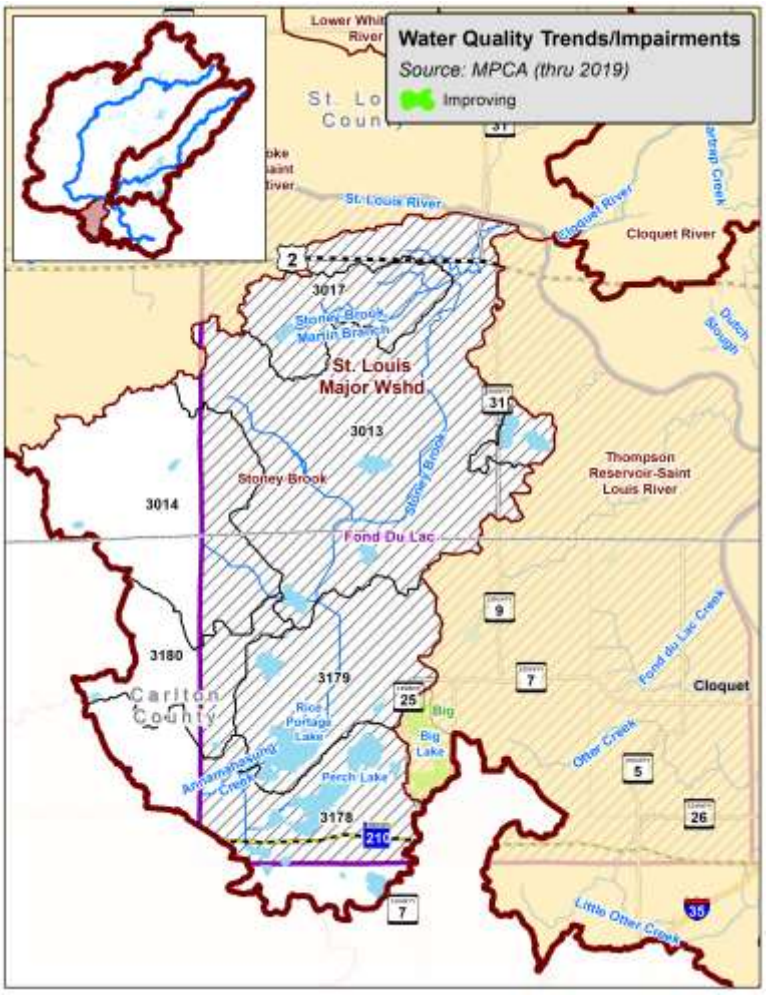
Figure 199. Current land cover.



Water Resources Summary

The Stoney Brook Subwatershed is home to several streams and lakes. Two of the lakes have higher or highest phosphorous sensitivity rankings. This subwatershed also has five lakes of high or outstanding biodiversity significance, as well as one trout lake, three priority shallow lakes, and ten wild rice lakes. Additionally, the Stoney Brook Subwatershed contains 38 miles of streams, including seven miles of trout streams.

Figure 200. Water quality trends.



Protection Status

94% of the Stoney Brook Subwatershed is currently protected, mostly by the Fond du Lac State Forest, county tax-forfeited lands, and Fond du Lac tribal lands. Many of the public land acres are also wetlands and doubly protected by the Wetland Conservation Act.

Figure 201. Protected lands.

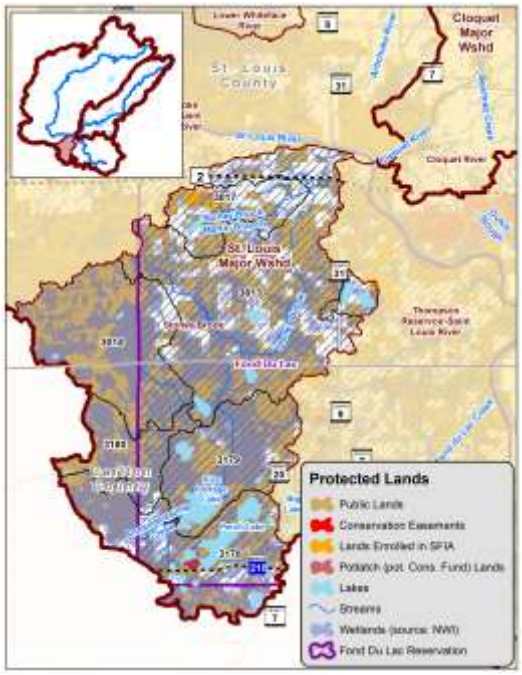


Figure 202. Potential to protect.

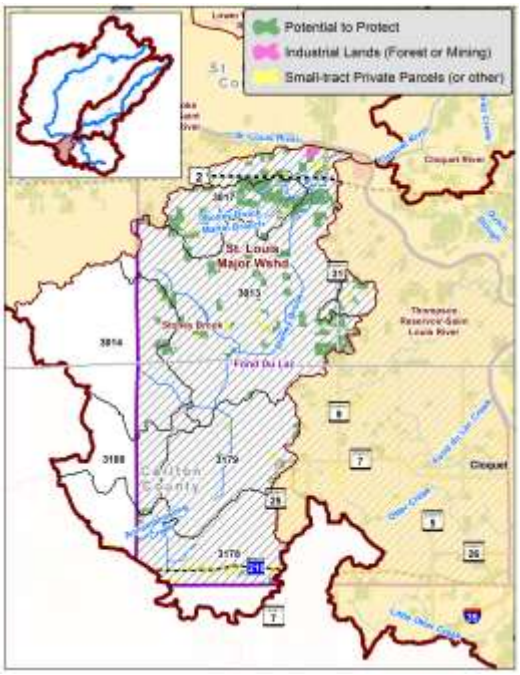
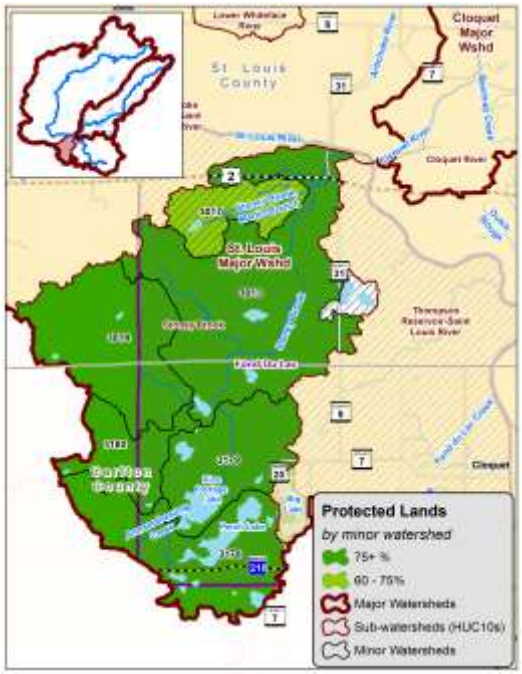


Figure 203. Minor watershed protection levels.



Subwatershed No. 19
Artichoke River-Saint Louis River (HUC 401020113)

Description

The Artichoke River-St. Louis River Subwatershed drains 170 square miles of St. Louis County and receives water from the Sand Creek-St. Louis River, Lower Whiteface River, Floodwood River, East Savanna River, and Stoney Brook subwatersheds.

Geography

This subwatershed is primarily split between a somewhat poorly drained lake plain towards its western end and a gently rolling till plain elsewhere. The lake plain has silty clay or fine sand soil textures, whereas the till plain has loam over clay or silty over loam soil textures.

Figure 204. Elevation.

Figure 205. Geomorphological landforms.

Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Artichoke River-St. Louis River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer forest in the uplands. Today the forest remains mostly intact with low to moderate amounts of conversion to agriculture. The composition of the forest is primarily aspen/birch and spruce/birch 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, although fire-dependent NPCs also have good potential towards the northeastern end of the subwatershed. The lowland areas may support a mix of acid peatland and wet forest NPCs.

Figure 206. Historic vegetation cover.

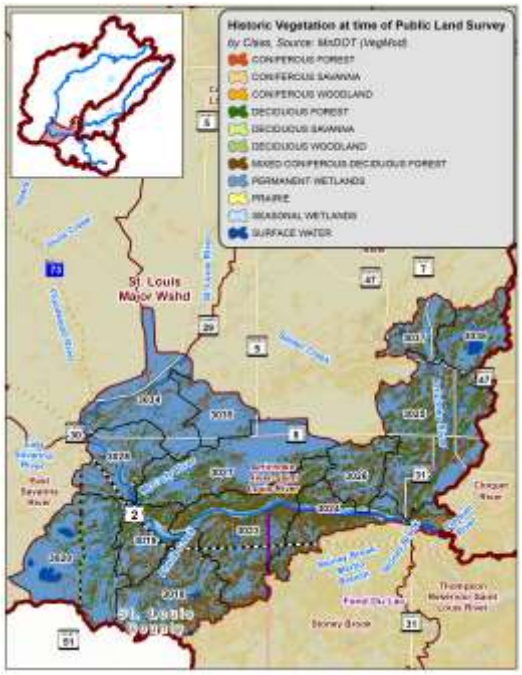


Figure 207. Potential native plant communities.

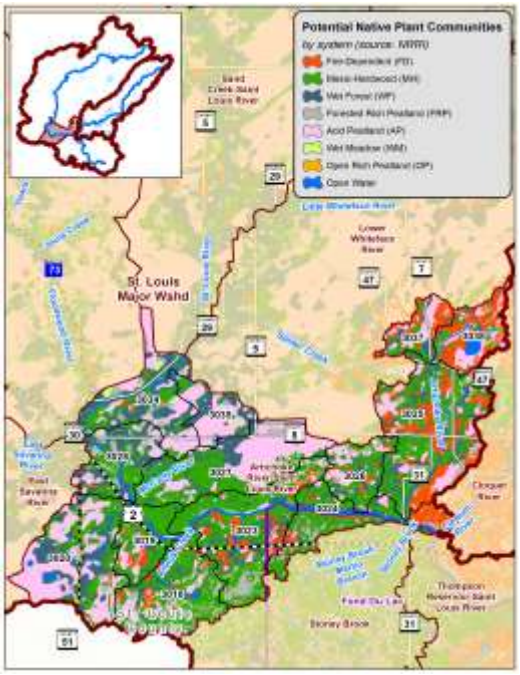
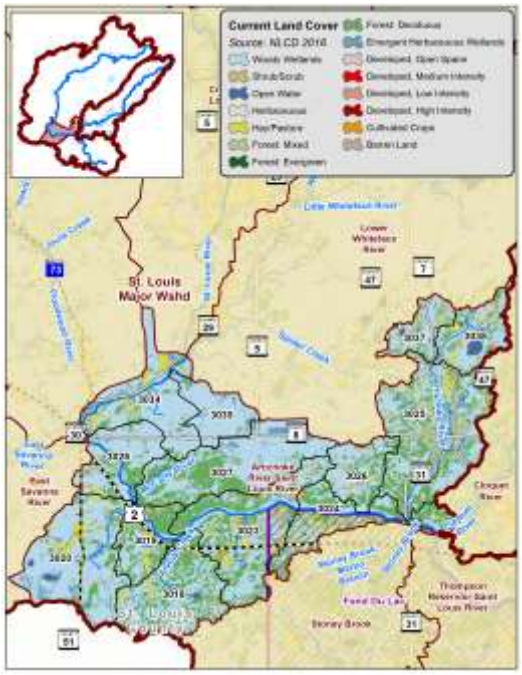


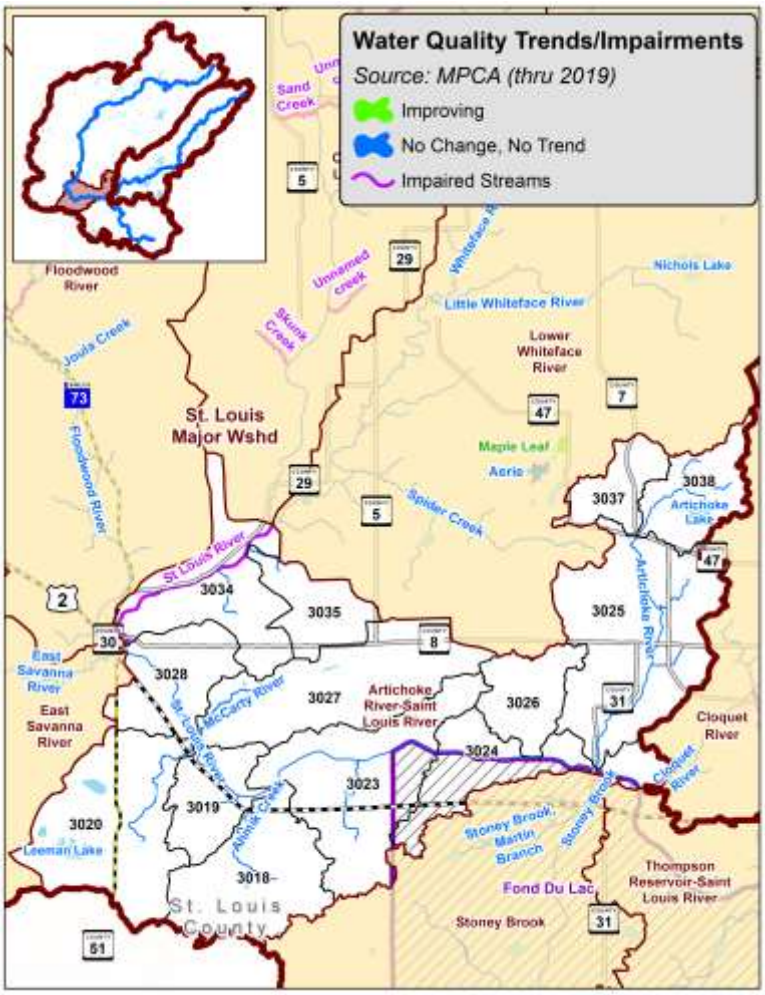
Figure 208. Current land cover.



Water Resources Summary

The Artichoke River-St. Louis River Subwatershed is home to several streams and lakes. One lake – Leeman Lake- is a lake of outstanding biodiversity significance. Five of its lakes are wild rice lakes. This subwatershed also contains 69 miles of streams, seven miles of which are impaired by invertebrate bioassessments.

Figure 209. Water quality trends.



Protection Status

68% of the Artichoke River-St. Louis River Subwatershed is currently protected, mostly by St. Louis County tax-forfeited lands, state forestry lands, and private wetlands. Overall protection levels are higher in the central portion of the subwatershed than the other areas.

Figure 210. Protected lands.

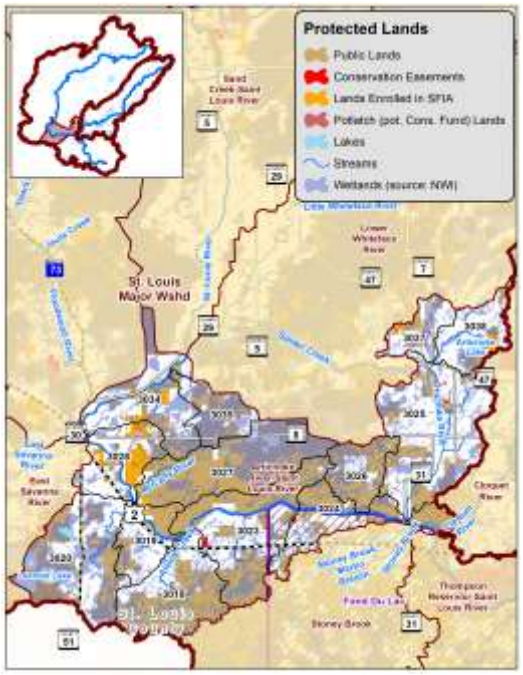
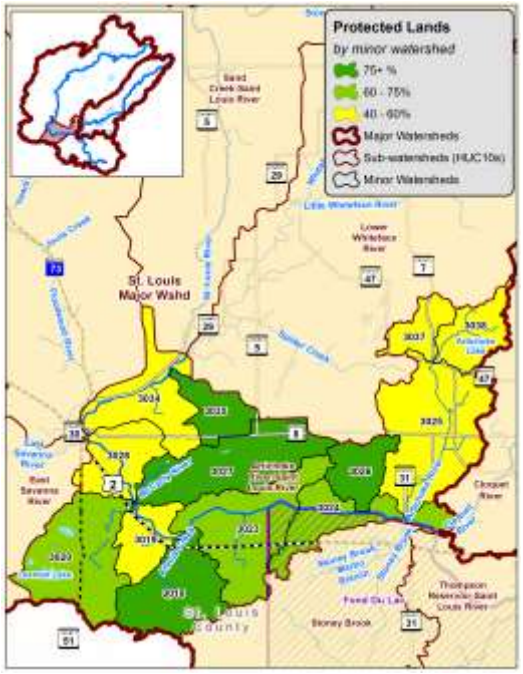


Figure 211. Potential to protect.

Figure 212. Minor watershed protection levels.



Subwatershed No. 20
Midway River (HUC 401020114)

Description

The Midway River Subwatershed is a tributary to the St. Louis River and drains 66 square miles of St. Louis and Carlton counties.

Geography

The Midway River Subwatershed is split between an end moraine in the northern two-thirds of the subwatershed and a till plain in the southern third.

Figure 213. Elevation.

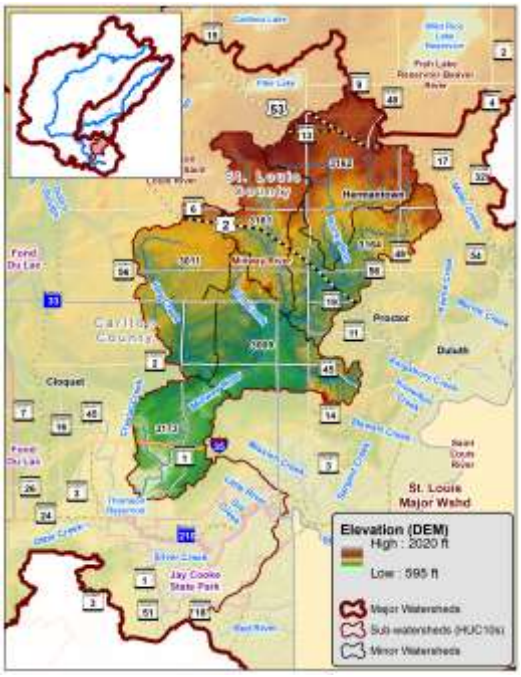


Figure 214. Geomorphological landforms.

Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Midway River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer and paper birch forest in the uplands. Today the forest has been significantly fragmented by conversion to agriculture and development. The composition of the remaining forest is primarily aspen/birch forest type group.

Estimates of the potential native plant communities (NPCs) indicate that most of the upland areas have the potential to support fire-dependent NPCs, although mesic hardwood NPCs also have good potential along the lower reaches of the Midway River. The lowland areas may support a mix of forested rich peatland and wet forest NPCs.

Figure 215. Historic vegetation cover.

Figure 216. Potential native plant communities.

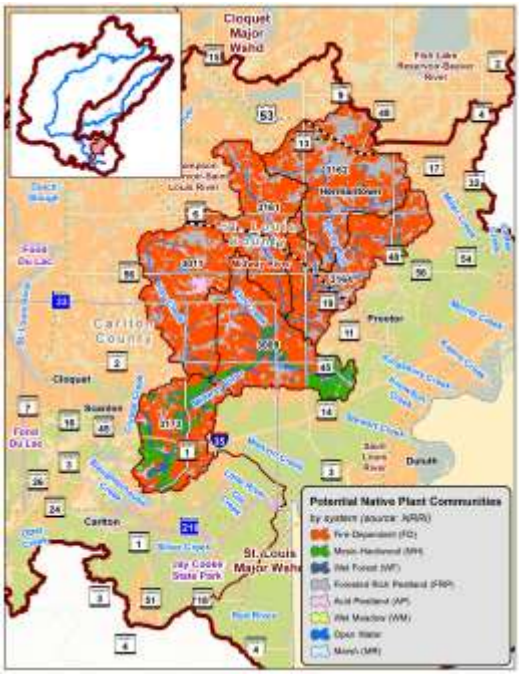
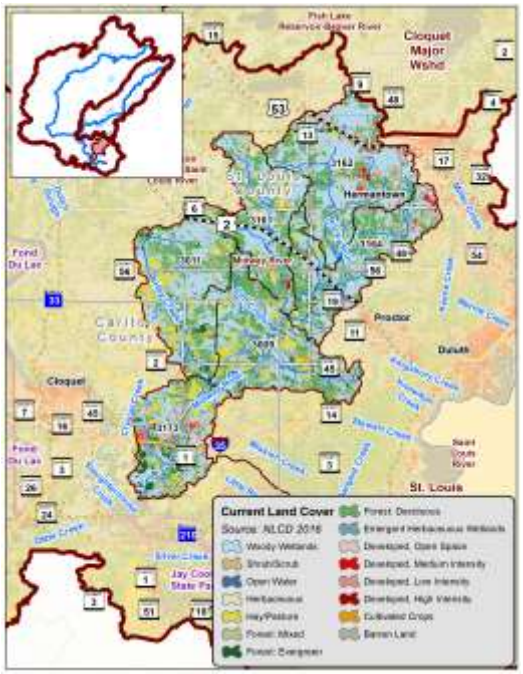


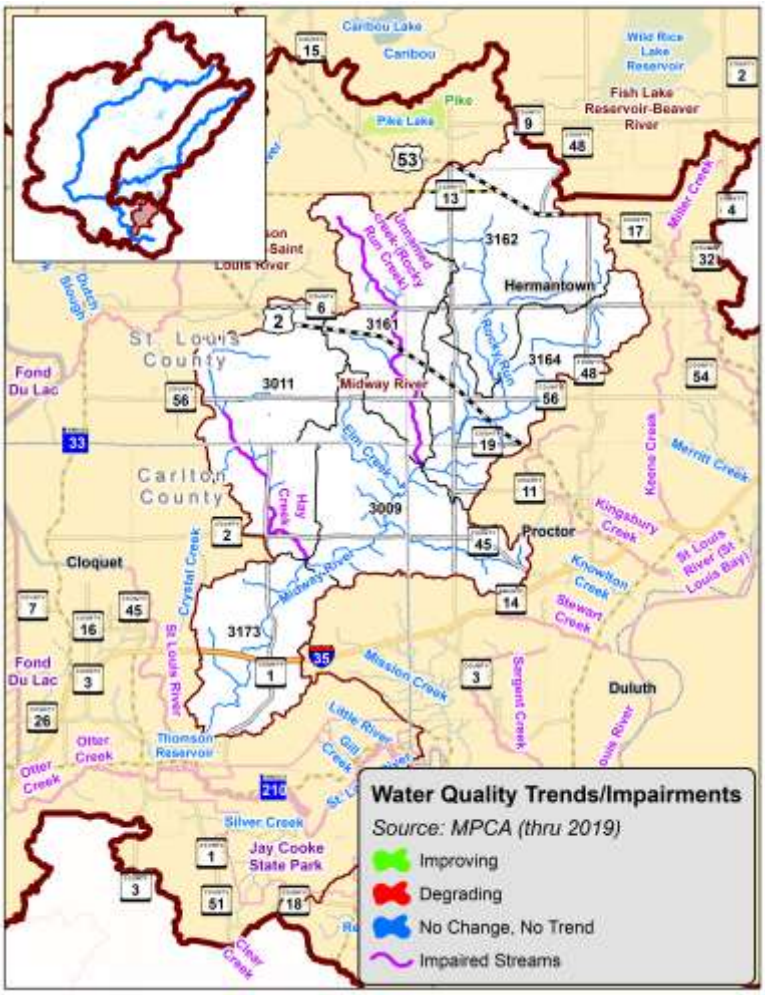
Figure 217. Current land cover.



Water Resources Summary

The Midway River Subwatershed is a stream-based watershed with relatively few lakes. This subwatershed contains 82 miles of streams, nearly all of which are trout streams. 12 miles of streams are impaired by e-coli.

Figure 218. Water quality trends.



Protection Status

27% of the Midway River Subwatershed is currently protected, almost entirely by private wetlands.

Figure 219. Protected lands.

Figure 220. Potential to protect.

Figure 221. Minor watershed protection levels.

Subwatershed No. 21
Thompson Reservoir-Saint Louis River (HUC 401020115)

Description

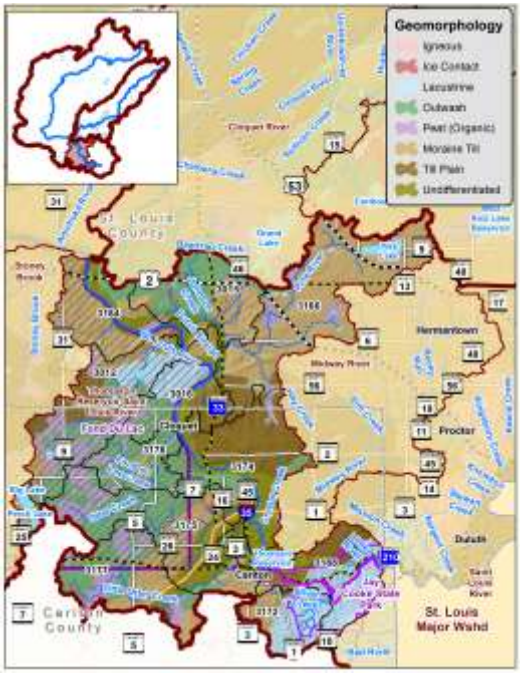
The Thompson Reservoir-St. Louis River Subwatershed drains 192 square miles of St. Louis and Carlton counties. It also receives water from the Cloquet River Major Watershed, as well as the Artichoke River-St. Louis River and Midway River subwatersheds.

Geography

The Thompson Reservoir-St. Louis River Subwatershed is split between several geomorphological landforms (Figure 223) – primarily outwash plain, moraine till, till plain, and lacustrine deposits.

Figure 222. Elevation.

Figure 223. Geomorphological landforms.



Past, Current, and Potential Future Forest Conditions

The historical vegetation of the Thompson Reservoir-St. Louis River Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer, paper birch, and white pine forest in the uplands. Today the forest has been significantly fragmented by conversion to agriculture and development. The composition of the remaining forest is primarily aspen/birch and spruce/fir forest type groups.

Estimates of the potential native plant communities (NPCs) indicate that the upland areas have the potential to support both fire-dependent and mesic hardwood NPCs. Mesic hardwood NPCs have better potential towards the southeastern and northwestern portions of the subwatershed, while fire-dependent NPCs have better potential elsewhere. The lowland areas may support a mix of forested rich peatland and wet forest NPCs.

Figure 224. Historic vegetation cover.

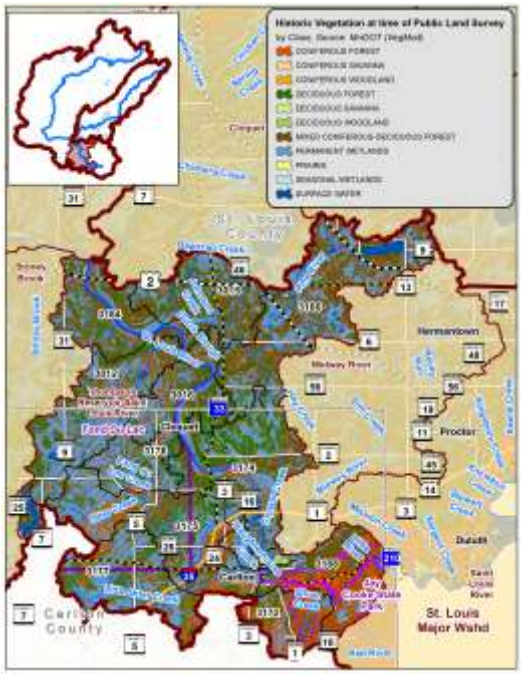


Figure 225. Potential native plant communities.

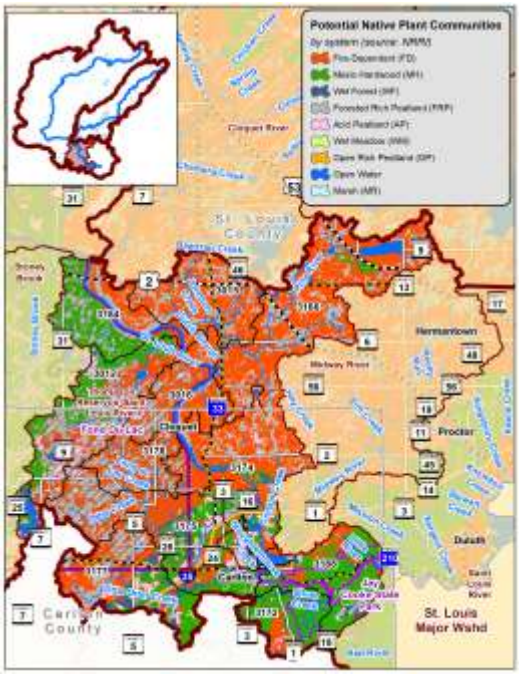
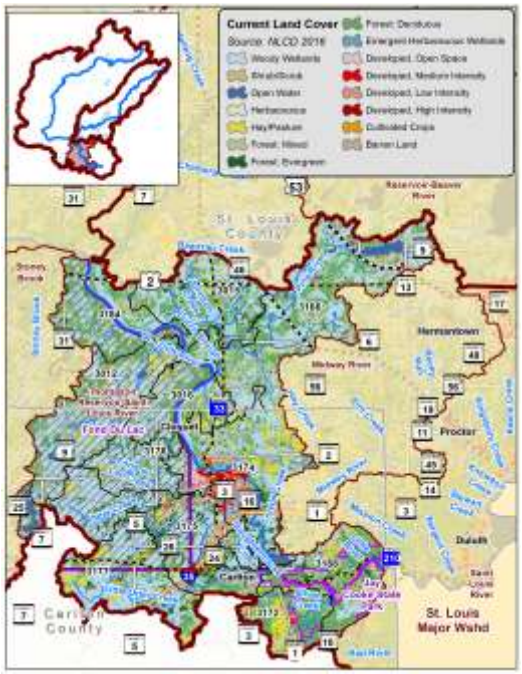


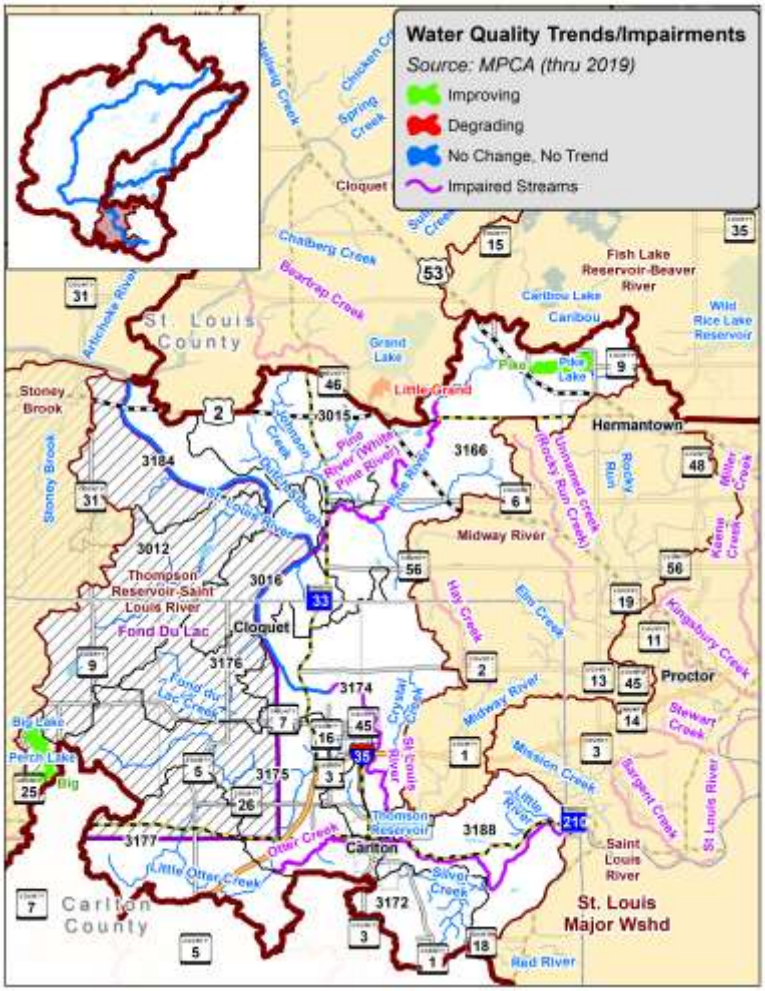
Figure 226. Current land cover.



Water Resources Summary

The Thompson Reservoir-St. Louis River Subwatershed is home to numerous streams and several lakes. Of the lakes with available water quality data, two have improving water quality. Two lakes have high or highest phosphorous sensitivity rankings. This subwatershed also has one priority shallow lake and five wild rice lakes. Additionally, the Thompson Reservoir-St. Louis River Subwatershed contains 159 miles of streams, including 100 miles of trout streams. 46 miles of streams are impaired by DDT, dieldrin, mercury in water column, PCBs, E-coli, or invertebrate bioassessments.

Figure 227. Water quality trends.



Protection Status

53% of the Thompson Reservoir-St. Louis River Subwatershed is currently protected, mostly by Jay Cooke State Park, University of Minnesota Cloquet Forestry Center, Fond du Lac tribal lands, and private wetlands. Overall protection levels are lower in the northeastern portion of the subwatershed than the other areas.

Figure 228. Protected lands.

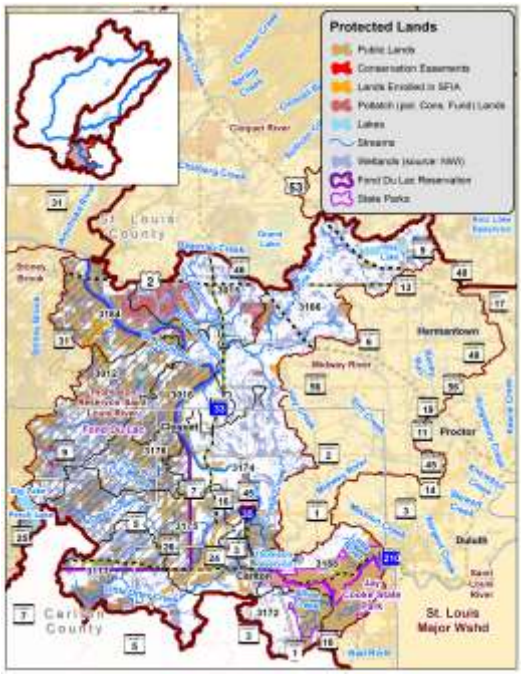
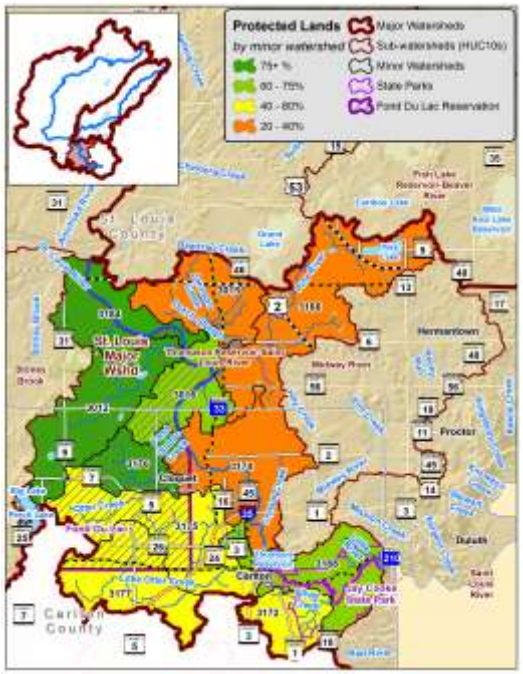


Figure 229. Potential to protect.

Figure 230. Minor watershed protection levels.

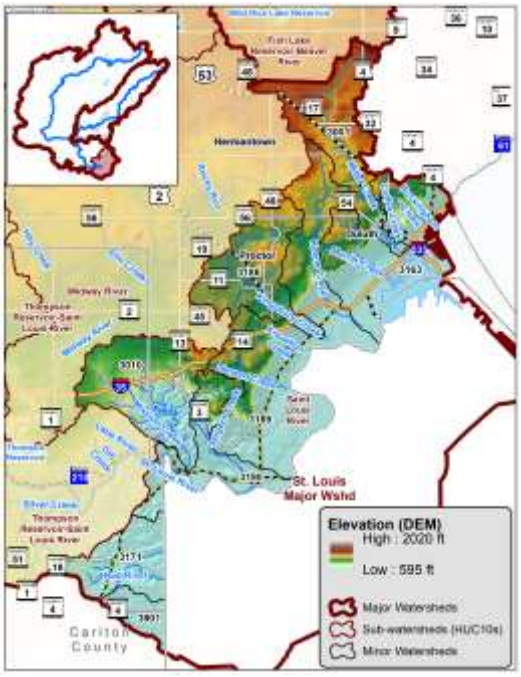


Subwatershed No. 22
Saint Louis River (HUC 401020116)

Description

The St. Louis River Subwatershed drains 155 square miles of Carlton and St. Louis counties, and receives water from the Thompson Reservoir-St. Louis River subwatershed.

Figure 231. Elevation.



Geography

The St. Louis River Subwatershed is split between several geomorphological landforms (Figure 232) – primarily moraine till, till plain, and lacustrine deposits along with igneous (bedrock) landforms. The moraine till is associated with a rolling to hummocky end moraine with fine sandy loam soils. The till plain is rolling and slopes towards Lake Superior and is dominated by red clayey soils. The lacustrine deposits are associated with the Glacial Lake Duluth basin and have a clay texture. Lastly, the igneous landforms are steep and covered by a thin layer of glacial till.

Figure 232. Geomorphological landforms.

Past, Current, and Potential Future Forest Conditions

The historical vegetation of the St. Louis River Subwatershed was mainly conifer swamp and lowland hardwood forest in the lowlands, and boreal hardwood conifer and white pine forest in the uplands. Today the forest has been significantly impacted by conversion to development. The composition of the remaining forest is primarily aspen/birch forest type group and a minor amount of maple/beech/birch forest type group.

Estimates of the potential native plant communities (NPCs) indicate that the upland areas have the potential to support both fire-dependent and mesic hardwood NPCs. Mesic hardwood NPCs have better potential in a band running northeast to southwest through the subwatershed, while fire-dependent NPCs have better potential elsewhere. The lowland areas may support a mix of forested rich peatland and wet forest NPCs.

Figure 233. Historic vegetation cover.

Figure 234. Potential native plant communities.

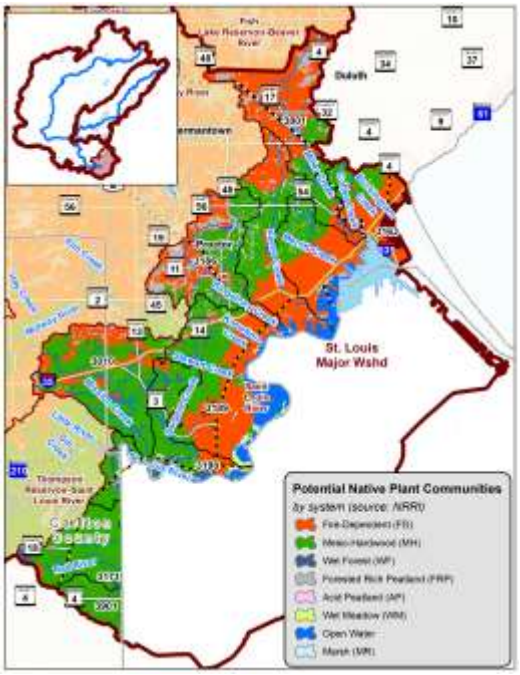


Figure 235. Current land cover.

Water Resources Summary

The St. Louis River Subwatershed is home to several streams, although its defining feature is the St. Louis Estuary. The estuary is considered a lake of outstanding biodiversity significance as well as a wild rice lake. In total this subwatershed contains 102 miles of streams, including 92 miles of trout streams. 45 miles of streams are impaired by chloride, lack of cold water assemblage, temperature, E-coli, invertebrate bioassessments, fish bioassessments, DDT, dieldrin, dioxin, toxaphene, PCBs, or mercury in water column.

Figure 236. Water quality trends.

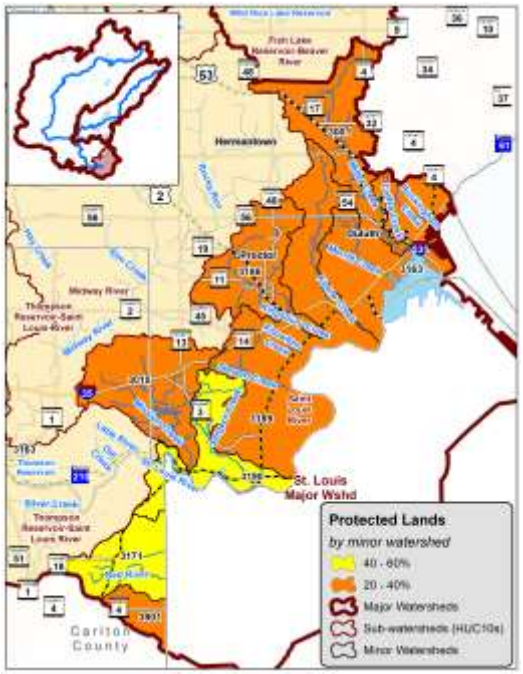
Protection Status

16% of the Saint Louis River Subwatershed is currently protected, mostly by St. Louis County tax-forfeited lands and public waters.

Figure 237. Protected lands.

Figure 238. Potential to protect.

Figure 239. Minor watershed protection levels.



Subwatershed No. 23
City of Duluth / Lake Superior Frontal (HUC 401010204)

Description

The City of Duluth / Lake Superior Frontal Subwatershed drains 160 square miles of St. Louis County directly into Lake Superior.

Geography

The City of Duluth / Lake Superior Frontal Subwatershed slopes towards Lake Superior and is split between a few geomorphological landforms (Figure 241) – primarily moraine till and till plain deposits along with igneous (bedrock) landforms. The moraine till is associated with a rolling to hummocky end moraine with fine sandy loam soils. The till plain is rolling and slopes towards Lake Superior and is dominated by red clayey soils. Lastly, the igneous landforms are steep and covered by a thin layer of glacial till.

Figure 240. Elevation.

Figure 241. Geomorphological landforms.

Past, Current, and Potential Future Forest Conditions

The historical vegetation of the City of Duluth/Lake Superior Frontal Subwatershed was mainly conifer swamp in the lowlands, and boreal hardwood conifer and white pine forest in the uplands. Today the forest has been significantly impacted by conversion to development and some agriculture. The development is primarily concentrated towards the subwatershed's southern end. The composition of the remaining forest is primarily aspen/birch forest type group. Minor amounts of spruce/fir and maple/beech/birch forest type groups are also present.

Estimates of the potential native plant communities (NPCs) indicate that the upland areas have the potential to support both fire-dependent and mesic hardwood NPCs. Mesic hardwood NPCs have better potential in a band running northeast to southwest through the subwatershed, while fire-dependent NPCs have better potential elsewhere. The lowland areas may support a mix of forested rich peatland and wet forest NPCs.

Figure 242. Historic vegetation cover.

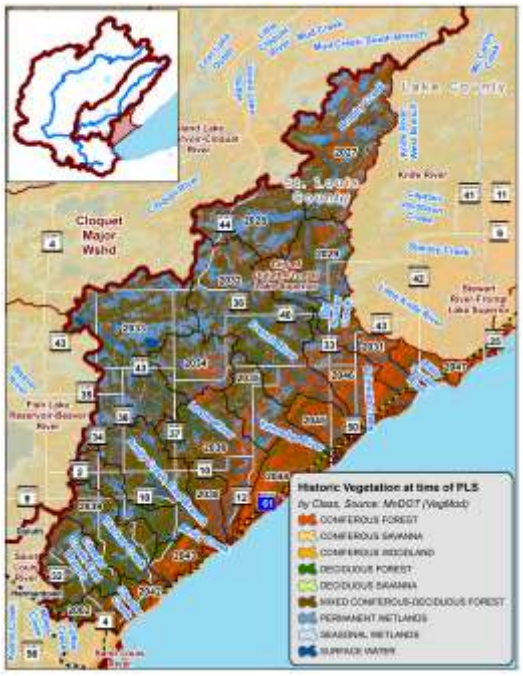


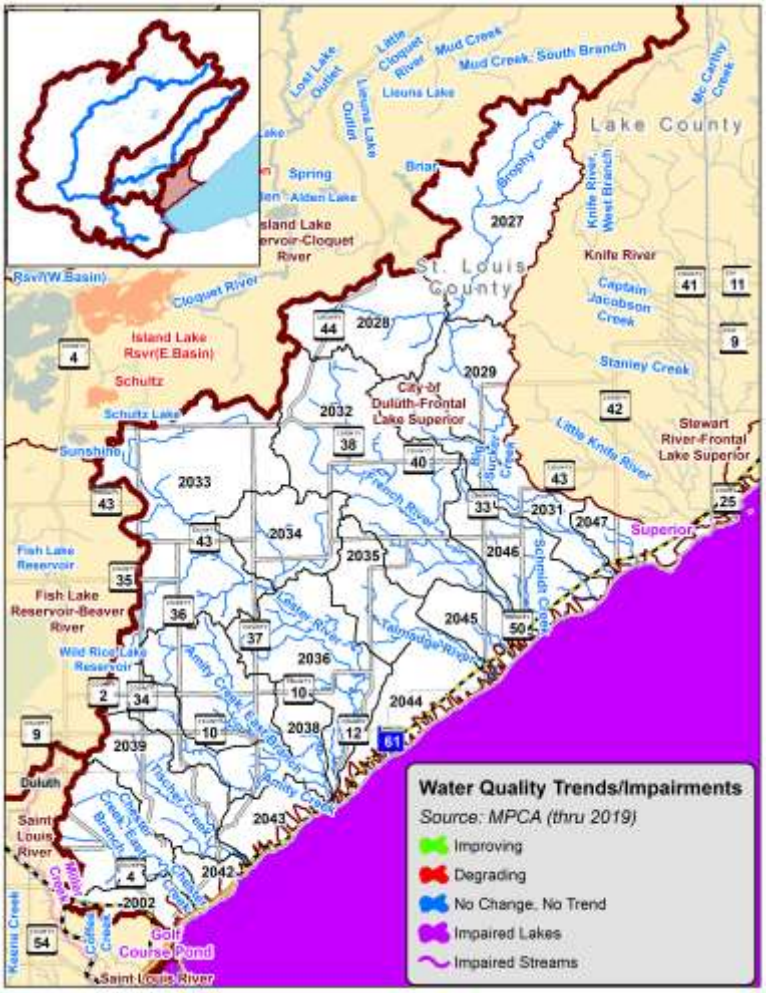
Figure 243. Potential native plant communities.

Figure 244. Current land cover.

Water Resources Summary

The City of Duluth / Lake Superior Frontal Subwatershed is a stream-based watershed with relatively few lakes. One of its few lakes (Eagle Lake) is a priority shallow lake. In total this subwatershed contains 205 miles of streams, including 191 miles of trout streams. 50 miles of streams are impaired by DDT, dieldrin, dioxin, mercury in water column, PCBs, toxaphene, dissolved oxygen, turbidity, E-coli, fish bioassessments, or invertebrate bioassessments.

Figure 245. Water quality trends.



Protection Status

38% of the City of Duluth / Lake Superior Frontal Subwatershed is currently protected, mostly by St. Louis County tax-forfeited lands. Protection levels are high near to the subwatershed's headwaters and low near Lake Superior.

Figure 246. Protected lands.

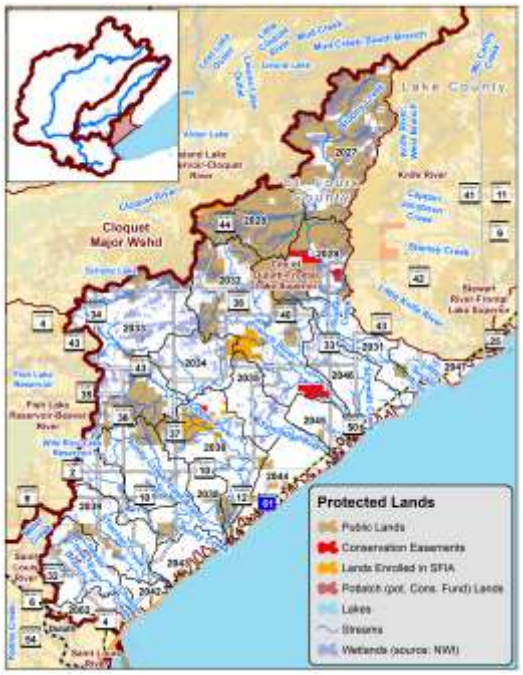
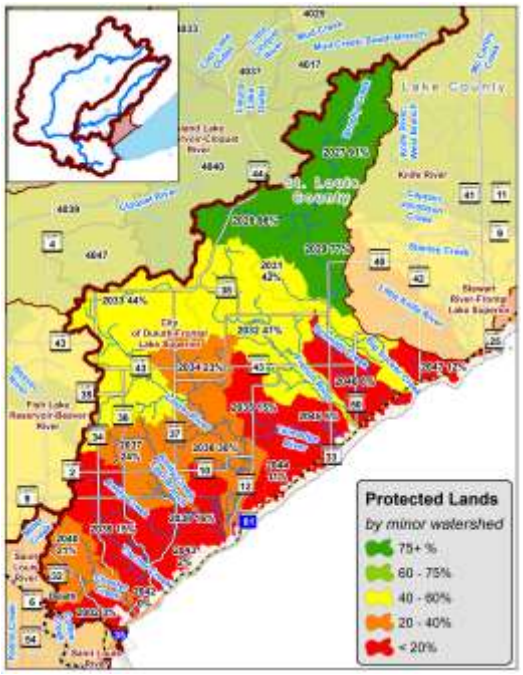


Figure 247. Potential to protect.

Figure 248. Minor watershed protection levels.



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Ecological Pathway to Sustainable Forest Management

Below is the general sequence of concepts and products that were developed for and/or integrated into the 2nd generation Northeast 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. DNR ECS website
    c. Northeast Landscape Conditions and Trends Report (pp. 55-59)
    d. Northeast Landscape Resource Atlas (pp. 27-30)
    e. Northeast Landscape Plan (p. 1.4)

2. **Native Plant Communities**

    a. Field Guide to the Native Plant Communities of Minnesota: The Laurentian Mixed Forest Province
    b. DNR NPC website
    c. Northeast Landscape Conditions and Trends Report (pp. 59-61)
    d. Northeast Landscape Resource Atlas (pp. 47-48)
    e. Northeast Landscape Plan - Appendix D

3. **Potential Native Plant Communities**

    a. Geospatial Modeling of Native Plant Communities of Minnesota's Laurentian Mixed Forest
    b. Mapping Potential Native Plant Communities of Minnesota's Laurentian Mixed Forest
    c. Potential Native Plant communities of Minnesota's Eastern Broadleaf Forest
    d. GIS data sources:
        – Laurentian Mixed Forest
        – Laurentian Mixed Forest & Eastern Broadleaf Forest
    e. Northeast Landscape Conditions and Trends Report (pp. 61-65)
    f. Northeast Landscape Resource Atlas (pp. 51-64)

4. **Vegetation Management Framework Goals and Strategies**

    a. Northeast Landscape Plan – Section 7

5. Climate Change Considerations and Strategies

a. Minnesota Forest Ecosystem Vulnerability Assessment and Synthesis: A Report from the Northwoods Climate Change Response Framework Project
b. Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers
c. Climate Change Field Guide for Northern Minnesota Forests: Site-level consideration and adaption
d. Minnesota Private Landowner Climate Scorecard
e. Climate Change Atlas
f. NPC silviculture strategies for forest stand prescriptions
g. Northeast Landscape Conditions and Trends Report (pp. 73-75)
h. Northeast Landscape Plan - Appendix D

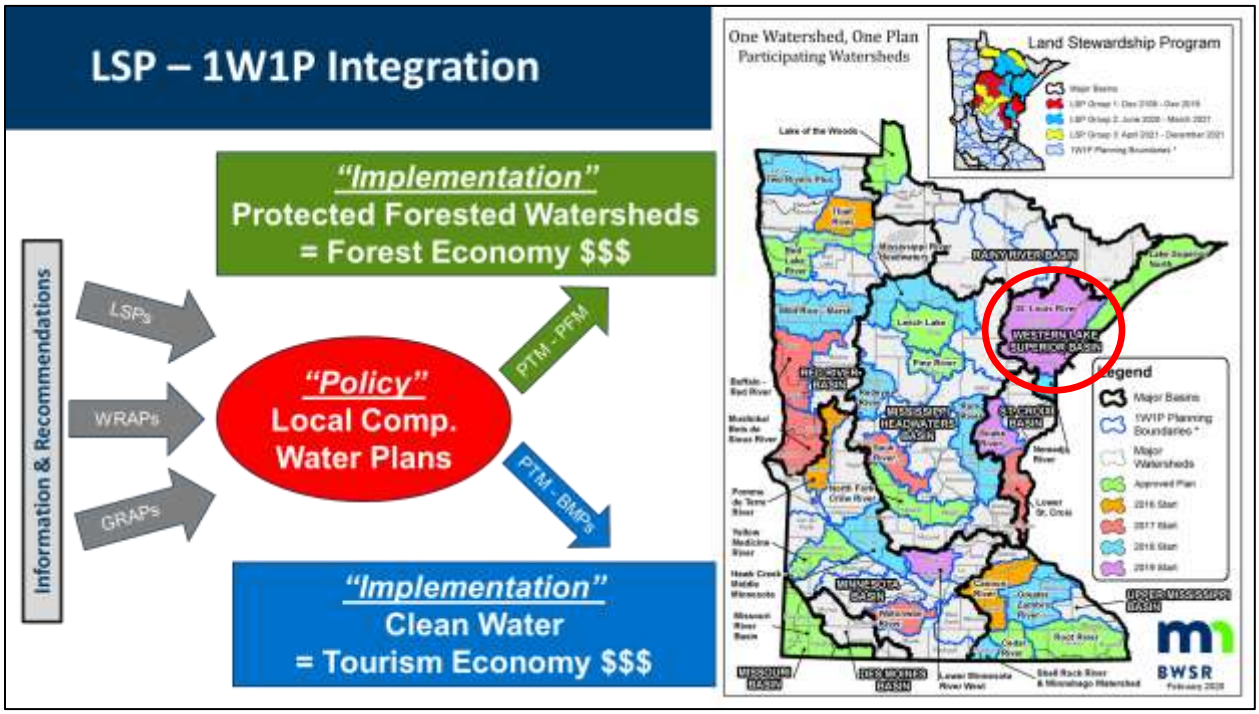
6. Silvicultural Considerations

a. MN DNR tree suitability table
b. NPC silviculture strategies for forest stand prescriptions
c. Great Lakes Silvicultural Library
d. Northeast Landscape Plan - Appendix D
e. Northeast Landscape Plan - Appendix G

7. Tatum Guides – in development

a. NPC silviculture strategies for forest stand prescriptions

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

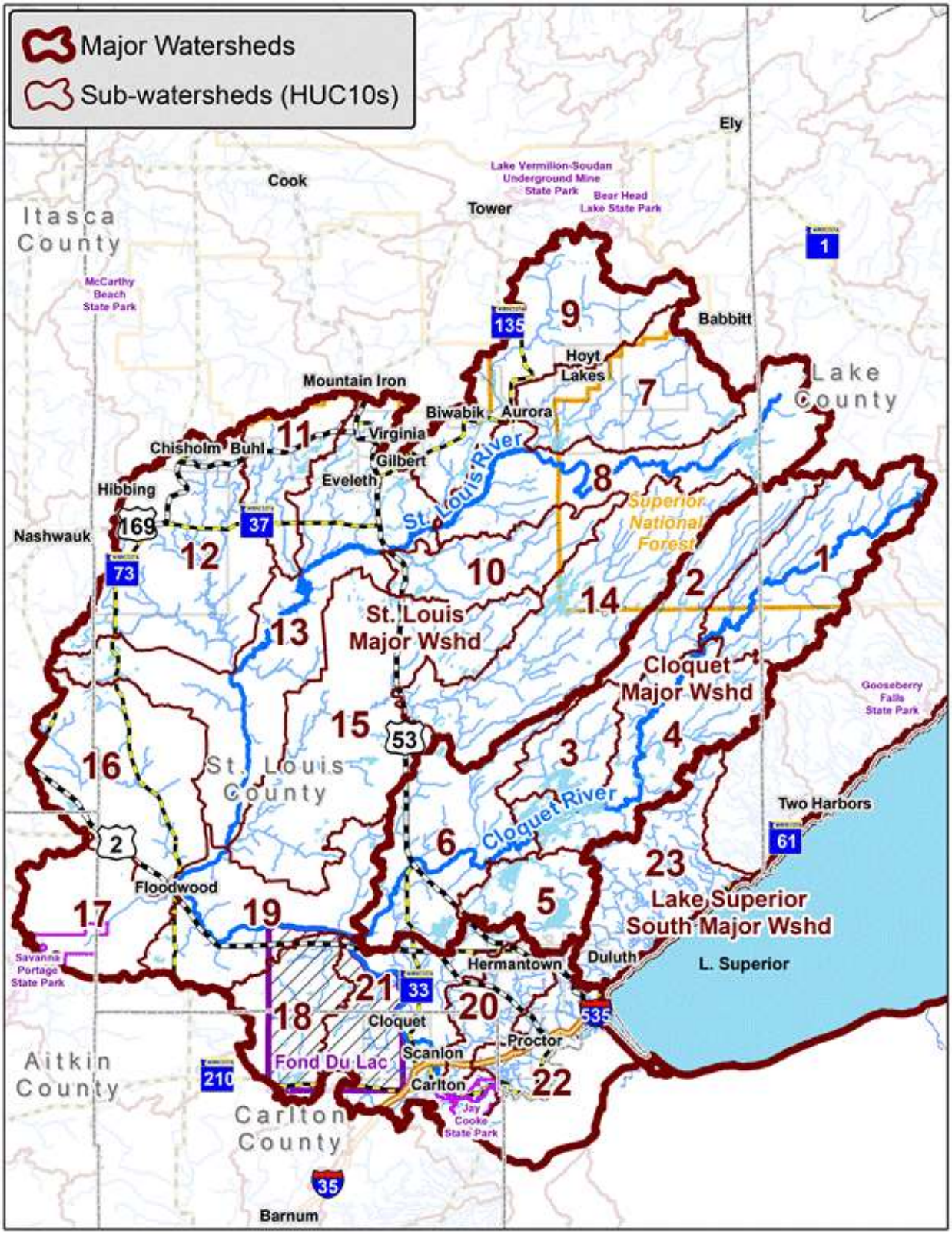


Note: Landscape stewardship plans (LSPs) like the MPCA Watershed Restoration and Protection Strategies (WRAPs) and the MDH Groundwater Restoration and Protection Strategies (GRAPs) provide an important information and relevant context from state water and forest resource programs to inform comprehensive 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 – St. Louis River Major Watershed



Subwd No.	Subwatershed Name (HUC 10)	HUC No.	Acres	No. of Minors
Cloquet Major Watershed (HUC 8)				
1	Headwaters Cloquet River	401020201	116,853	15
2	West Branch Cloquet River	401020202	67,656	9
3	Boulder Lake Reservoir-Boulder Creek	401020203	43,127	6
4	Island Lake Reservoir-Cloquet River	401020204	113,277	10
5	Fish Lake Reservoir-Beaver River	401020205	48,471	4
6	Cloquet River	401020206	118,186	14
St. Louis Major Watershed (HUC 8 – Main Stem)				
7	Partridge River	401020101	99,890	11
8	Headwaters Saint Louis River	401020102	133,795	12
9	Embarrass River	401020103	120,480	9
10	Mud Hen Creek	401020104	64,795	6
11	West Two River	401020105	50,708	4
12	West Swan River-East Swan River	401020106	159,875	13
13	Sand Creek-Saint Louis River	401020107	209,317	24
14	Upper Whiteface River	401020108	167,740	20
15	Lower Whiteface River	401020109	207,751	21
16	Floodwood River	401020110	146,859	15
17	East Savanna River	401020111	78,032	7
18	Stoney Brook	401020112	64,710	6
19	Artichoke River-Saint Louis River	401020113	109,012	13
20	Midway River	401020114	42,494	6
21	Thompson Reservoir-Saint Louis River	401020115	122,162	11
22	Saint Louis River	401020116	53,848	8
Lake Superior - South Major Watershed (HUC 8)				
23	City of Duluth / Lake Superior Frontal	401010204	99,862	20
	Totals		**2,438,900**	**264**