

## FIGURES

Figure 1 Legend:  
Watershed and Major Tributaries

- |     |                             |     |                               |
|-----|-----------------------------|-----|-------------------------------|
| 1.  | West Branch Maple River     | 37. | Mullett Creek                 |
| 2.  | Brush Creek                 | 38. | Ballard Creek                 |
| 3.  | Cold Creek                  | 39. | Black River                   |
| 4.  | Lancaster Creek             | 40. | Saunders Creek                |
| 5.  | Douglas Lake                | 41. | Tubbs Creek                   |
| 6.  | East Branch Maple River     | 42. | Hardwood Creek                |
| 7.  | Van Creek                   | 43. | Stewart Creek                 |
| 8.  | Maple River                 | 44. | East Branch Black River       |
| 9.  | West Branch Minnehaha Creek | 45. | Rattlesnake Creek             |
| 10. | Minnehaha Creek             | 46. | Foch Creek                    |
| 11. | Silver Creek                | 47. | Little McMasters Creek        |
| 12. | Crooked Lake                | 48. | McMasters Creek               |
| 13. | Pickrel Lake                | 49. | Canada Creek                  |
| 14. | Berry Creek                 | 50. | Packer Creek                  |
| 15. | McPhee Creek                | 51. | Van Hetton Creek              |
| 16. | Crooked River               | 52. | Oxbow Creek                   |
| 17. | Burt Lake                   | 53. | Tomahawk Creek                |
| 18. | Little Carp River           | 54. | Bowen Creek                   |
| 19. | Sturgeon River              | 55. | Milligan Creek                |
| 20. | Mossback Creek              | 56. | Gokee Creek                   |
| 21. | Pickrel Creek               | 57. | Stony Creek                   |
| 22. | Club Stream                 | 58. | West Branch Upper Rainy River |
| 23. | Stewart Creek               | 59. | Healy Creek                   |
| 24. | Blackjack Creek             | 60. | Rainy River                   |
| 25. | West Branch Sturgeon River  | 61. | East Branch Rainy River       |
| 26. | Marl Creek                  | 62. | Little Rainy River            |
| 27. | Little Sturgeon River       | 63. | Cold Creek                    |
| 28. | Crumley Creek               | 64. | Stony Creek                   |
| 29. | Indian River                | 65. | Stewart Creek                 |
| 30. | Pigeon River                | 66. | Black Lake                    |
| 31. | South Branch Pigeon River   | 67. | Mud Creek                     |
| 32. | Cornwall Creek              | 68. | Long Lake Outlet              |
| 33. | Little Pigeon River         | 69. | Owens Creek                   |
| 34. | Wilkes Creek                | 70. | Myers Creek                   |
| 35. | Little Pigeon River         | 71. | Laperell Creek                |
| 36. | Mullett Lake                | 72. | Cheboygan River               |

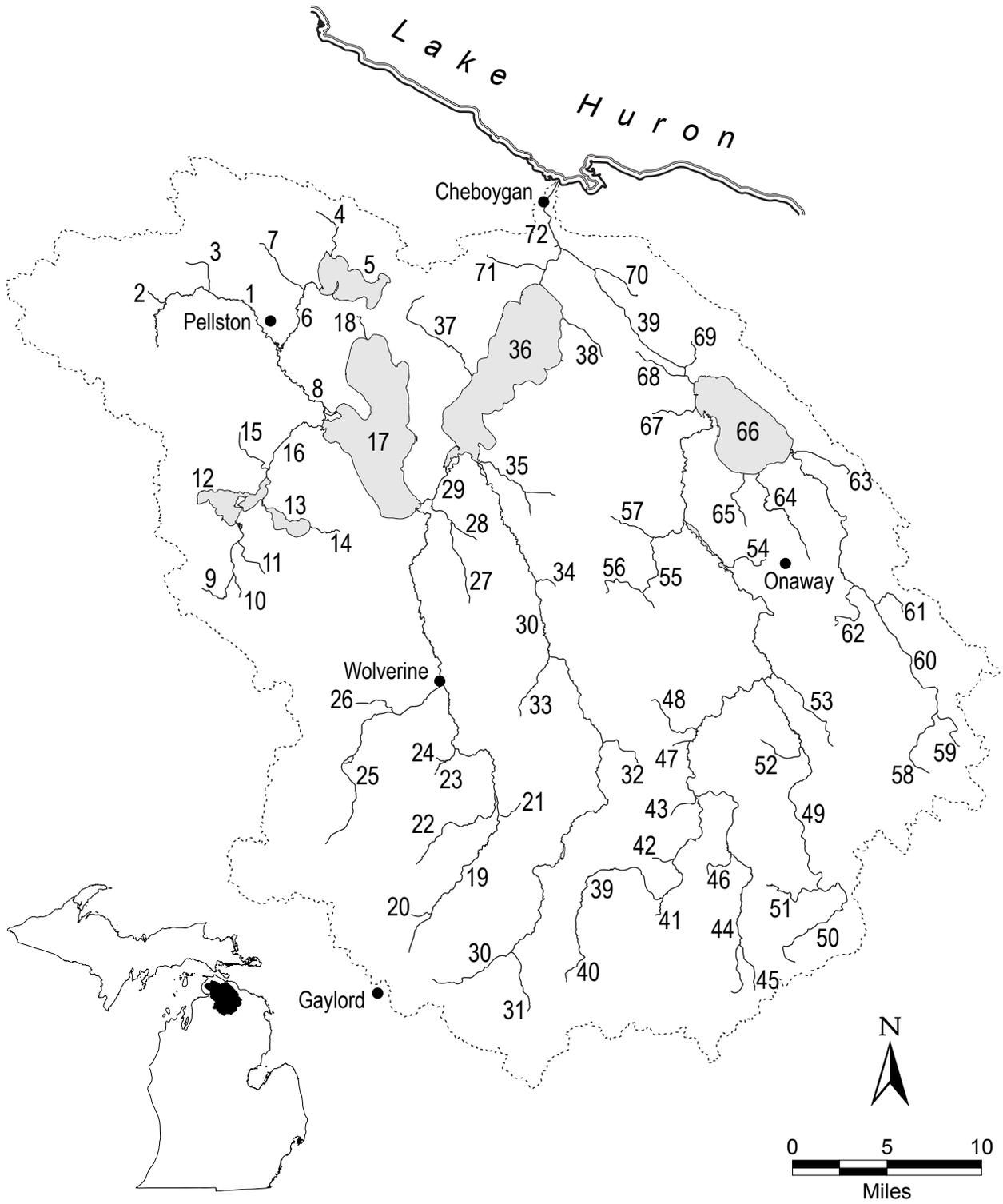
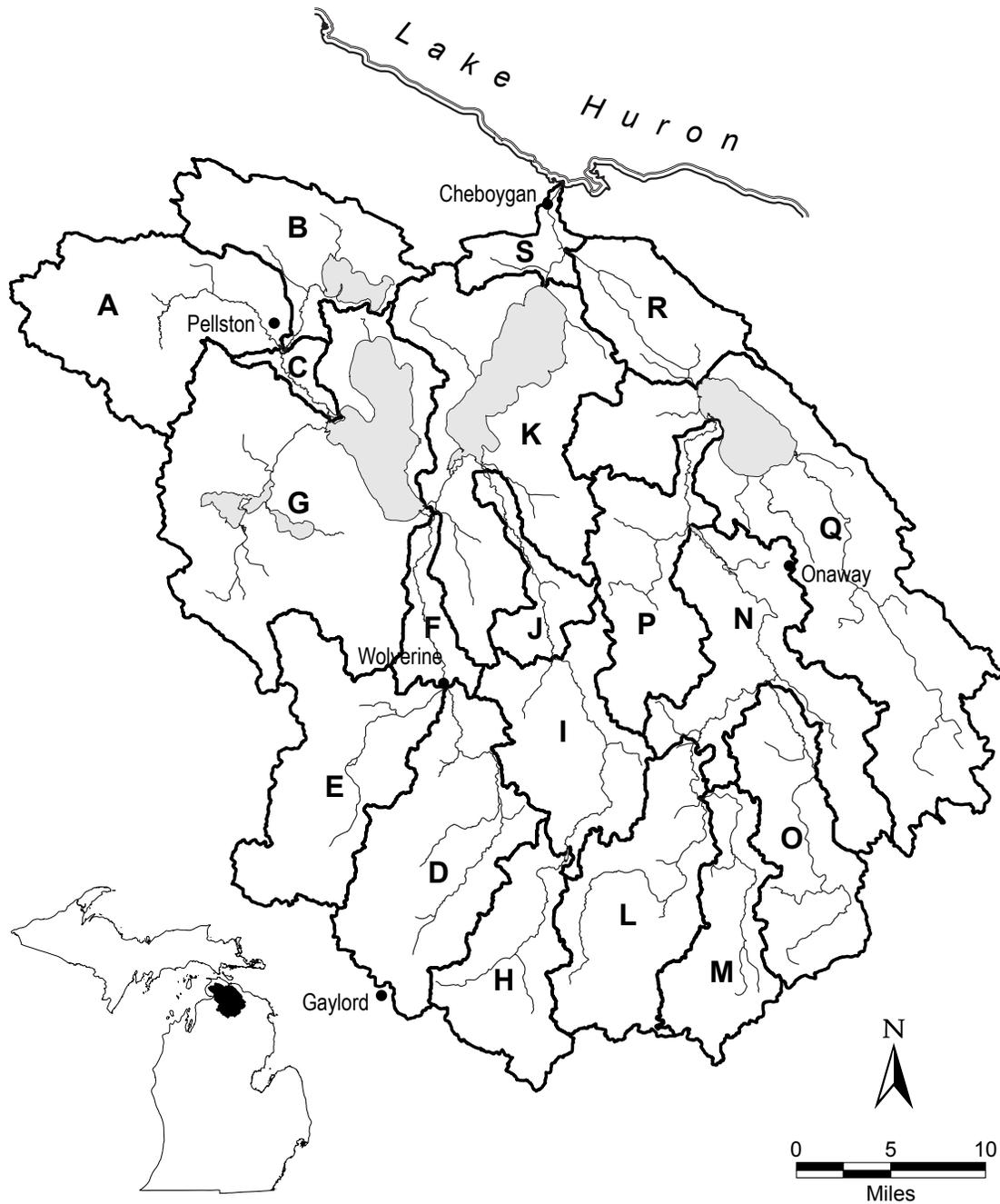


Figure 1.—Map of Cheboygan River watershed and major tributaries.



- |  |   |
|--|---|
| A. West Branch Maple River - Headwaters to Maple River Dam                   | J. Pigeon River – Confluence with Little Pigeon River to Mullett Lake |
| B. East Branch Maple River - Douglas Lake to Maple River Dam                 | K. Mullett Lake   |
| C. Maple River – Maple River Dam to Burt Lake                                | L. Black River – Headwaters to Clark Bridge Road                      |
| D. Sturgeon River – Headwaters to confluence with West Branch Sturgeon River | M. East Branch Black River  |
| E. West Branch Sturgeon River  | N. Black River – Clark Bridge Road to Kleber Dam                      |
| F. Sturgeon River – Confluence with West Branch Sturgeon River to Burt Lake  | O. Canada Creek   |
| G. Burt Lake   | P. Black River – Kleber Dam to Black Lake                             |
| H. Pigeon River – Headwaters to Golden Lotus Dam                             | Q. Black Lake   |
| I. Pigeon River – Golden Lotus Dam to confluence with Little Pigeon River    | R. Lower Black River  |
|  | S. Cheboygan River  |

Figure 2.–River valley segments within the Cheboygan River watershed.

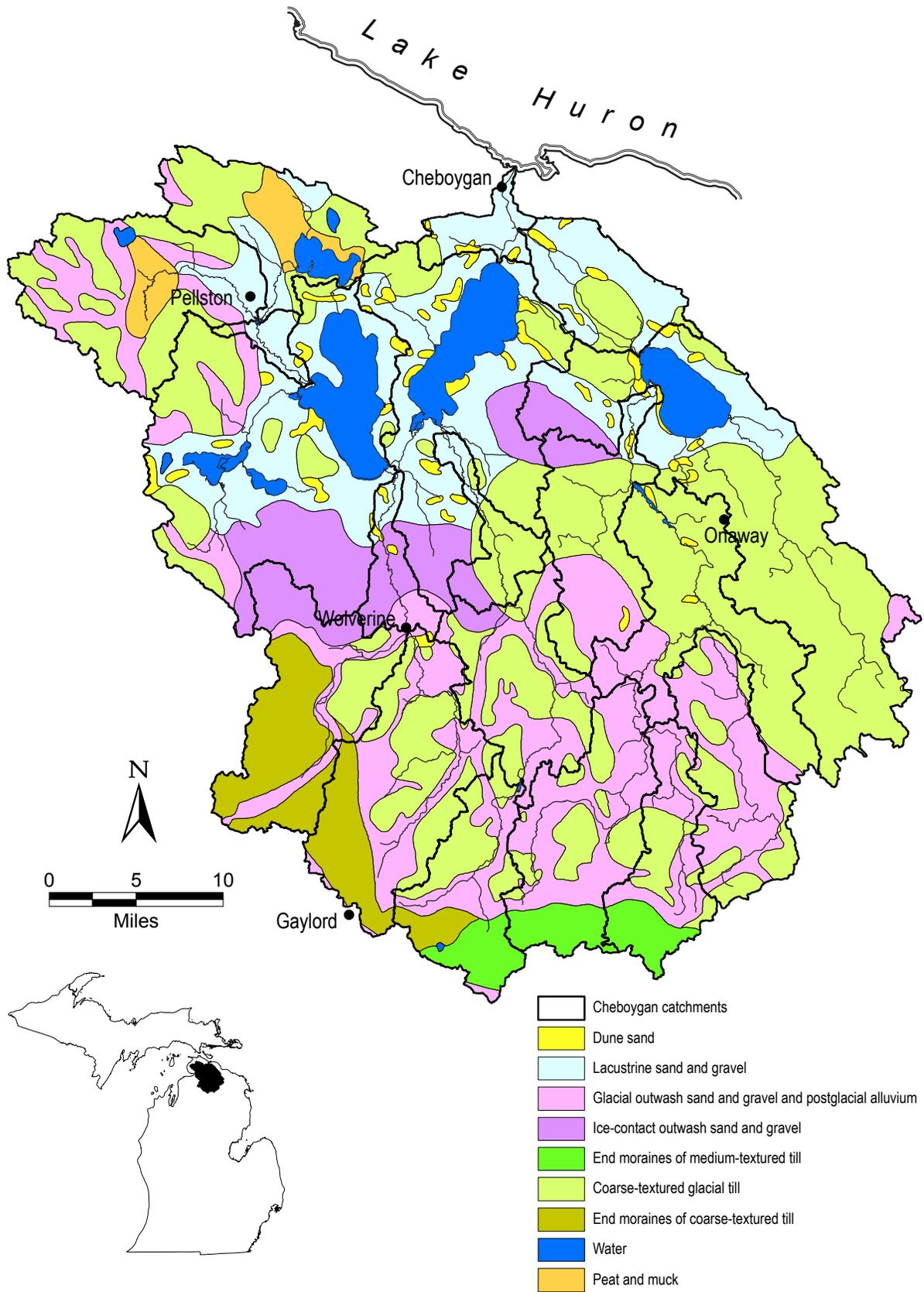


Figure 3.—Surficial geology of the Cheboygan River watershed (Fisheries Division, unpublished data).

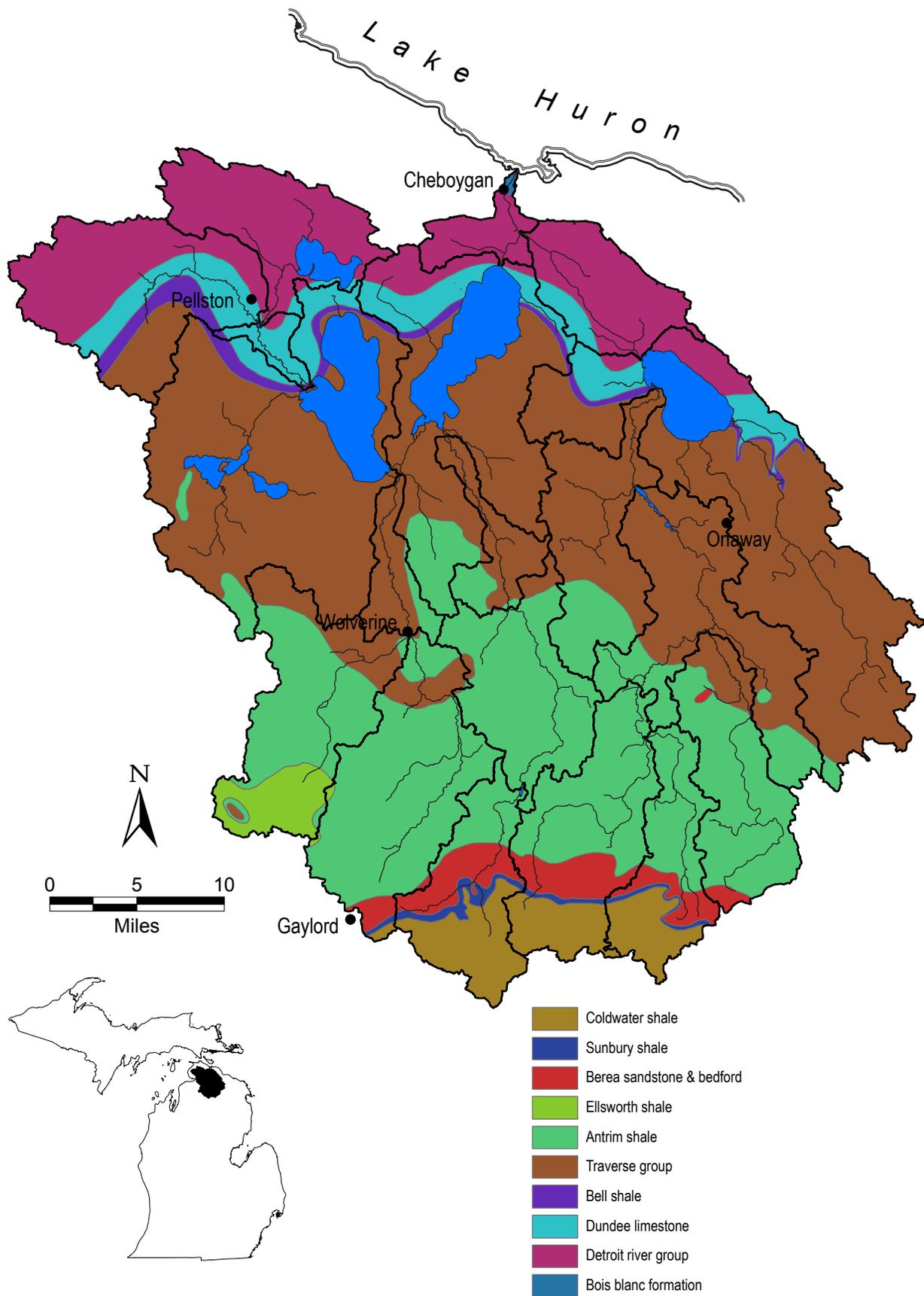


Figure 4.–Bedrock geology of Cheboygan River watershed.

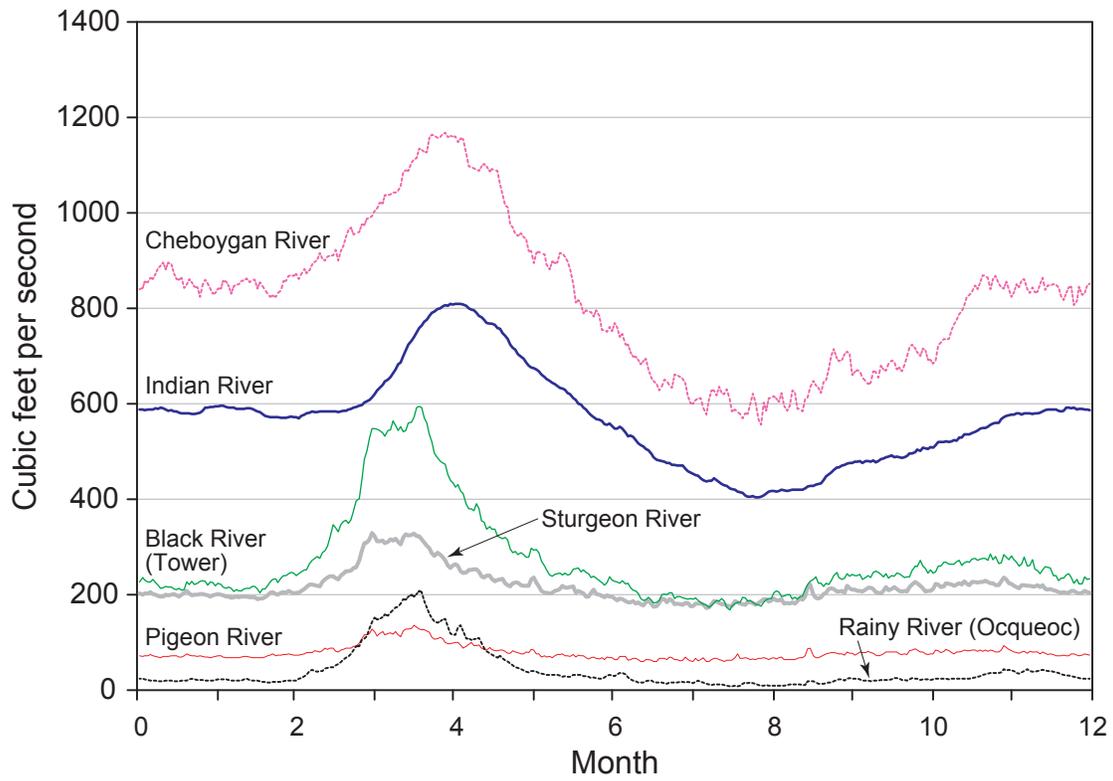


Figure 5.—Annual hydrograph for entire period of record at six United States Geological Survey gage sites in the Cheboygan River watershed.

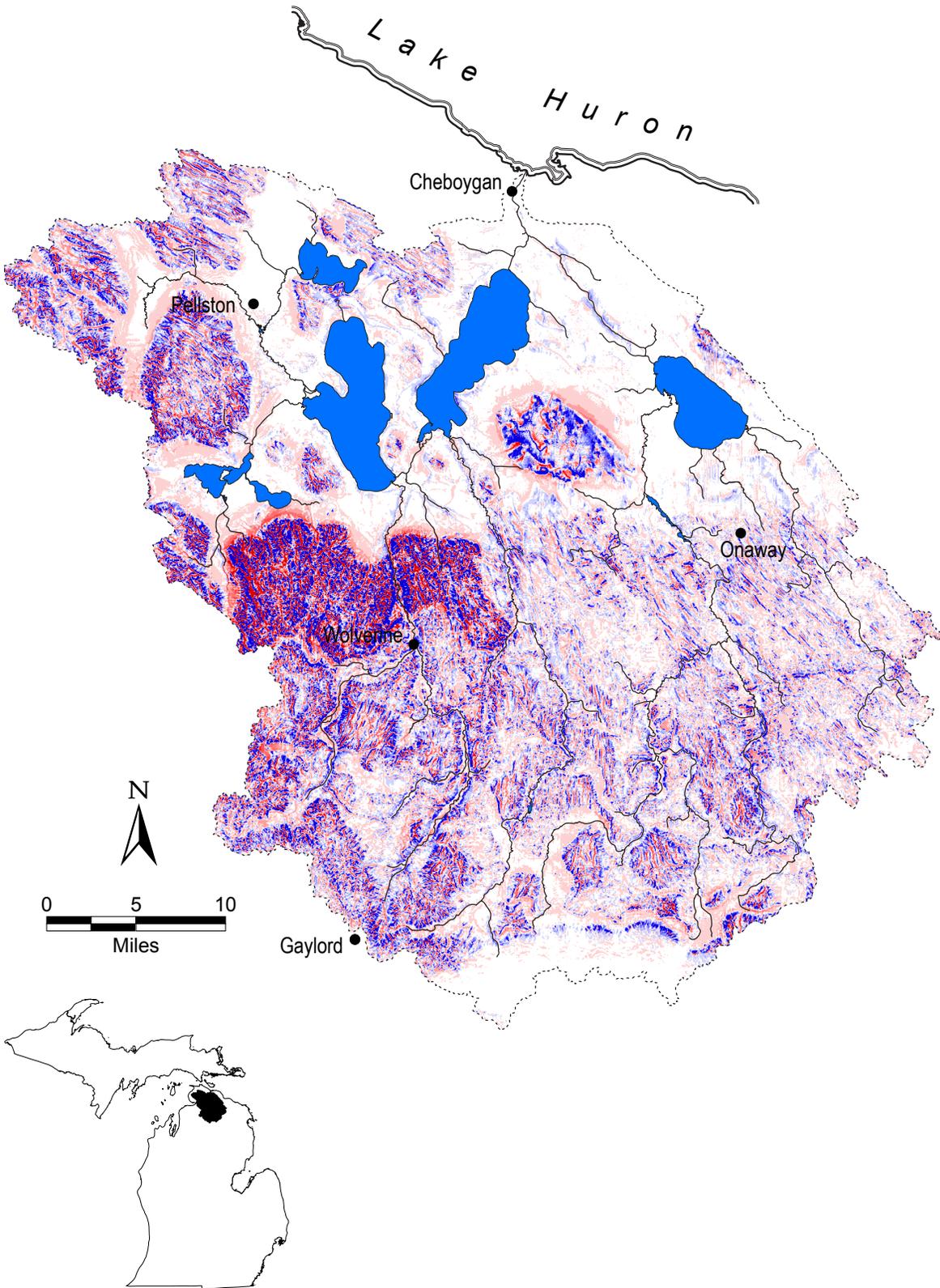


Figure 6.—Darcy groundwater movement predictions for the Cheboygan River watershed (Baker et al. 2003a). Areas of groundwater potential are highlighted in blue (recharge) and red (discharge).

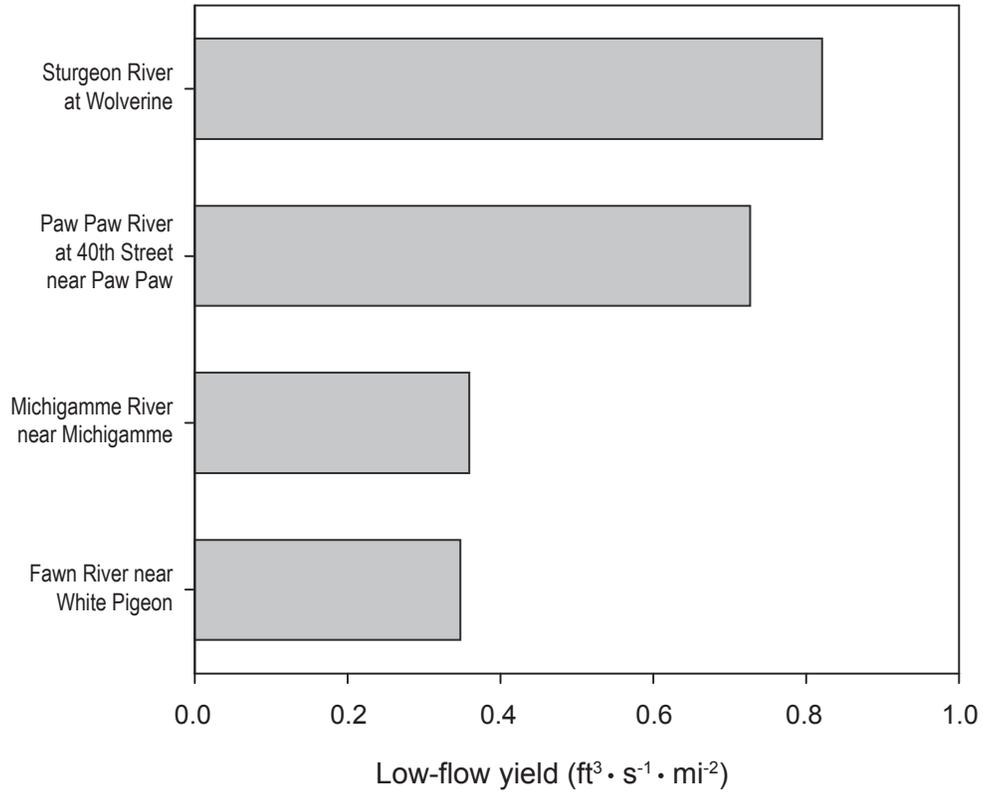


Figure 7.—Low-flow yield (90% exceedence flow divided by catchment area) expressed as  $\text{ft}^3/\text{s}/\text{mi}^2$  for the Sturgeon River at Wolverine, compared to low-flow yields for other Michigan streams with similar-sized catchments. Note that some flow regulation occurs upstream of gages on the Paw Paw and Fawn rivers. Data are from the United States Geological Survey.

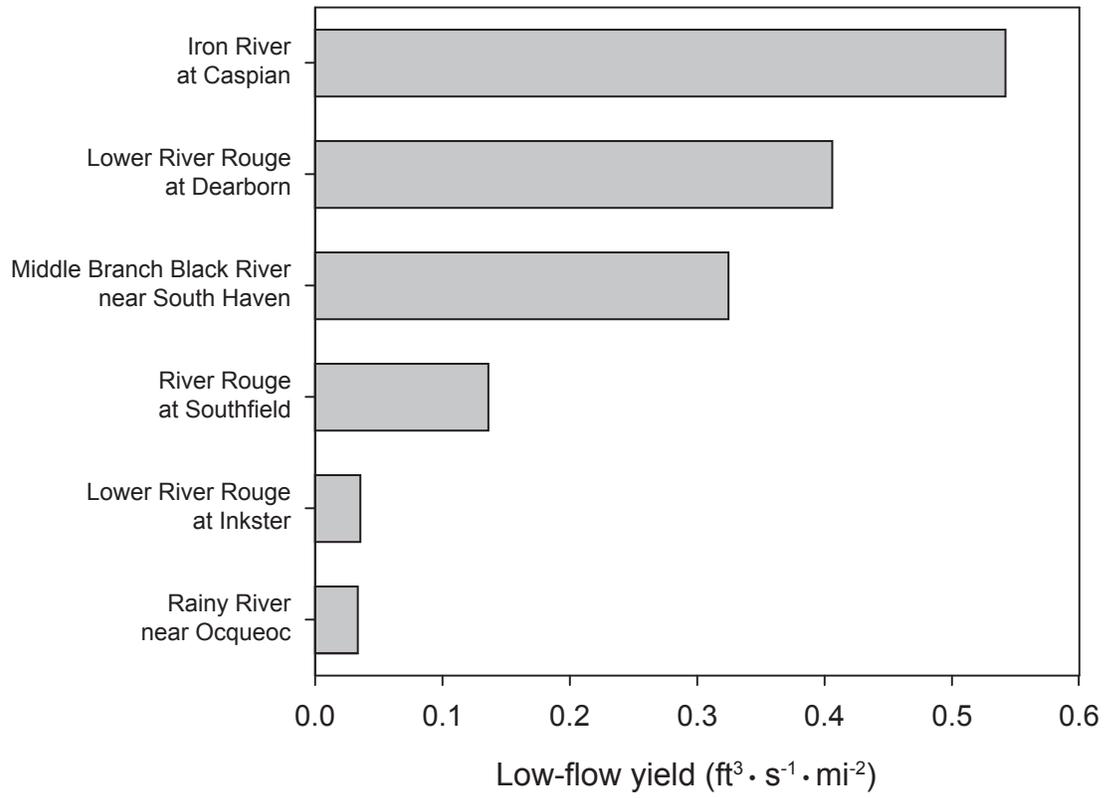


Figure 8.—Low-flow yield (90% exceedence flow divided by catchment area) expressed as ft<sup>3</sup>/mi<sup>2</sup> for the Rainy River near Ocqueoc, compared to low-flow yields for other Michigan streams with similar-sized catchments. Data are from the United States Geological Survey.

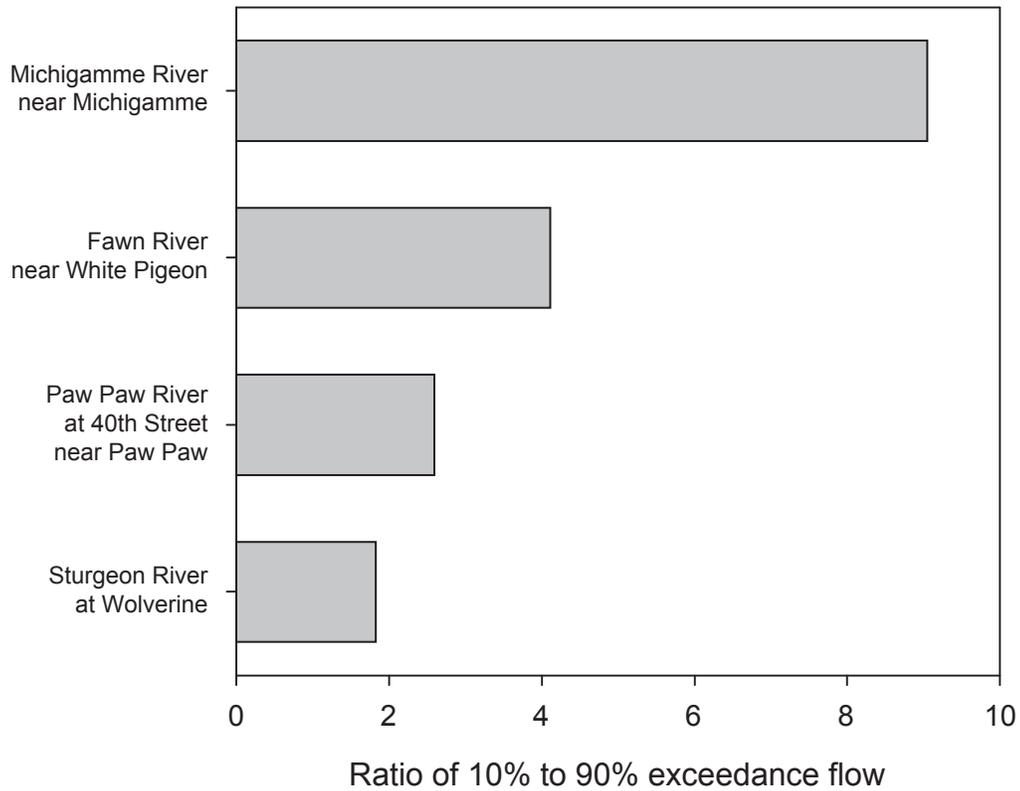


Figure 9.—Flow stability (expressed as the ratio of 10% and 90% exceedance flows) of Michigan streams having catchments comparable in size to the Sturgeon River at Wolverine. Note that some flow regulation occurs upstream of the gages on the Fawn and Paw Paw rivers. Data are from the United States Geological Survey.

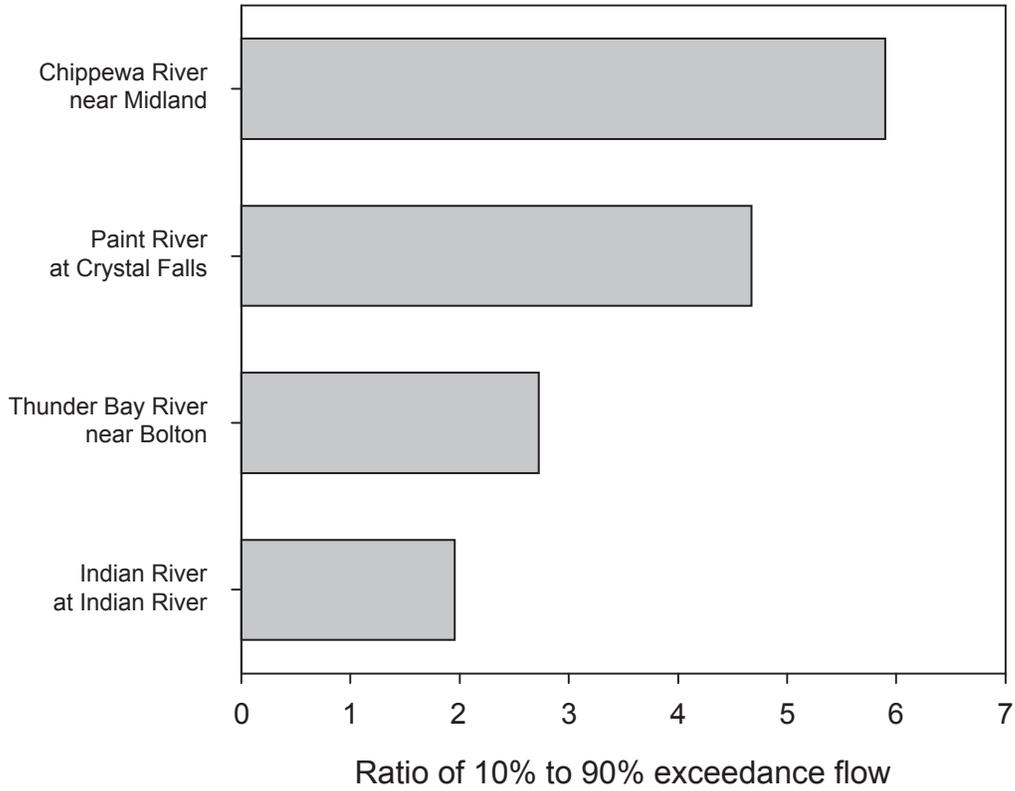


Figure 10.—Flow stability (expressed as the ratio of 10% and 90% exceedance flows) of Michigan streams having catchments comparable in size to the Indian River at Indian River. Note that some flow regulation occurs upstream of gages on the Chippewa, Paint, and Thunder Bay rivers; some flow regulation occurs downstream of the gage on the Indian River. Data are from the United States Geological Survey.

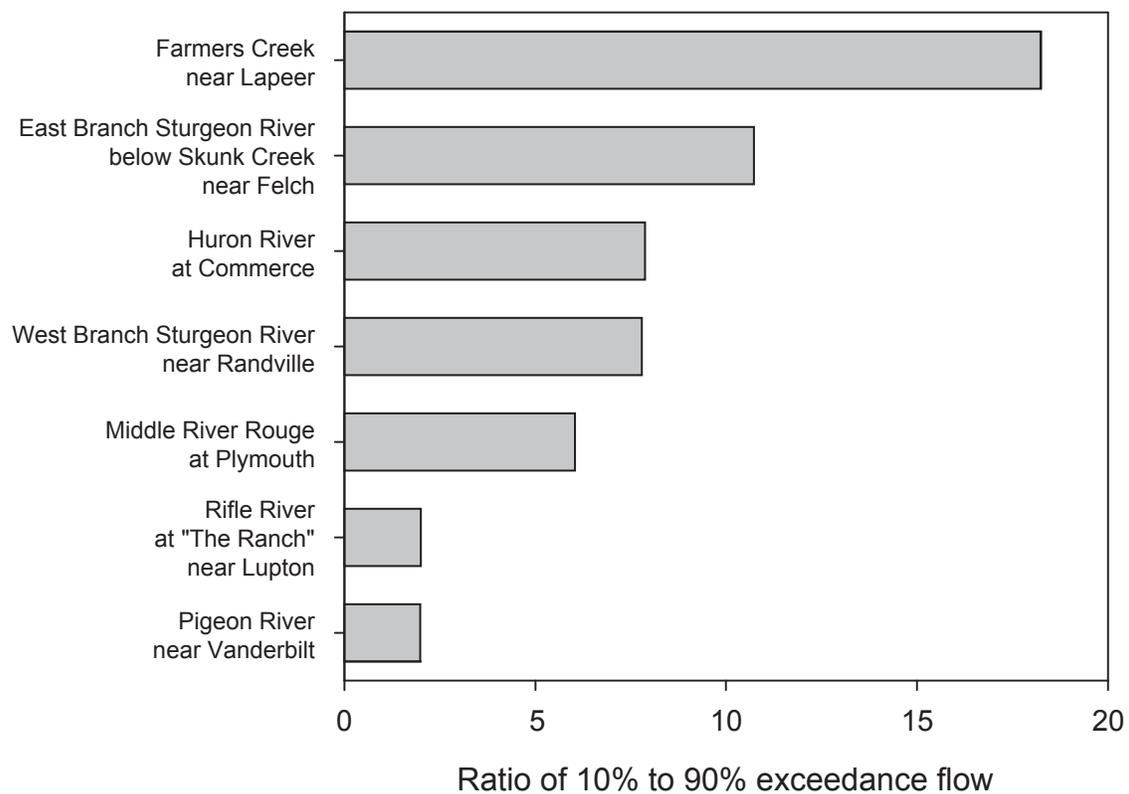


Figure 11.—Flow stability (expressed as the ratio of 10% and 90% exceedance flows) of Michigan streams having catchments comparable in size to the Pigeon River near Vanderbilt. Note that some flow regulation occurs upstream of all gages. Data are from the United States Geological Survey.

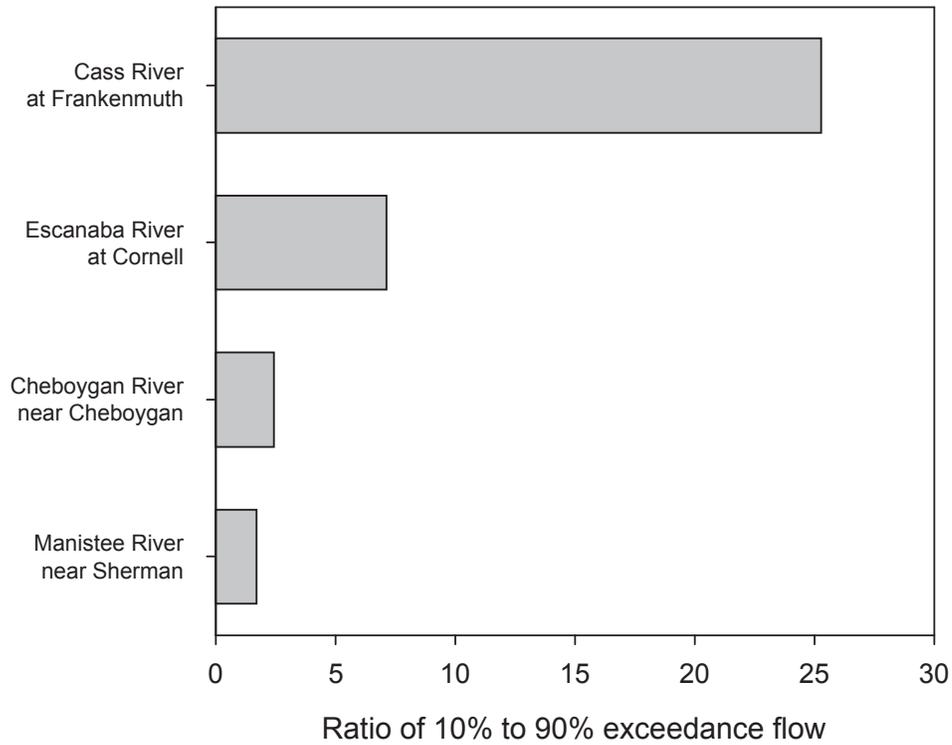


Figure 12.—Flow stability (expressed as the ratio of 10% and 90% exceedance flows) of Michigan streams having catchments comparable in size to the Cheboygan River near Cheboygan. Note that some flow regulation occurs upstream of gages on the Cass and Escanaba rivers; some flow regulation occurs downstream of the gage on the Cheboygan River. Data are from the United States Geological Survey.

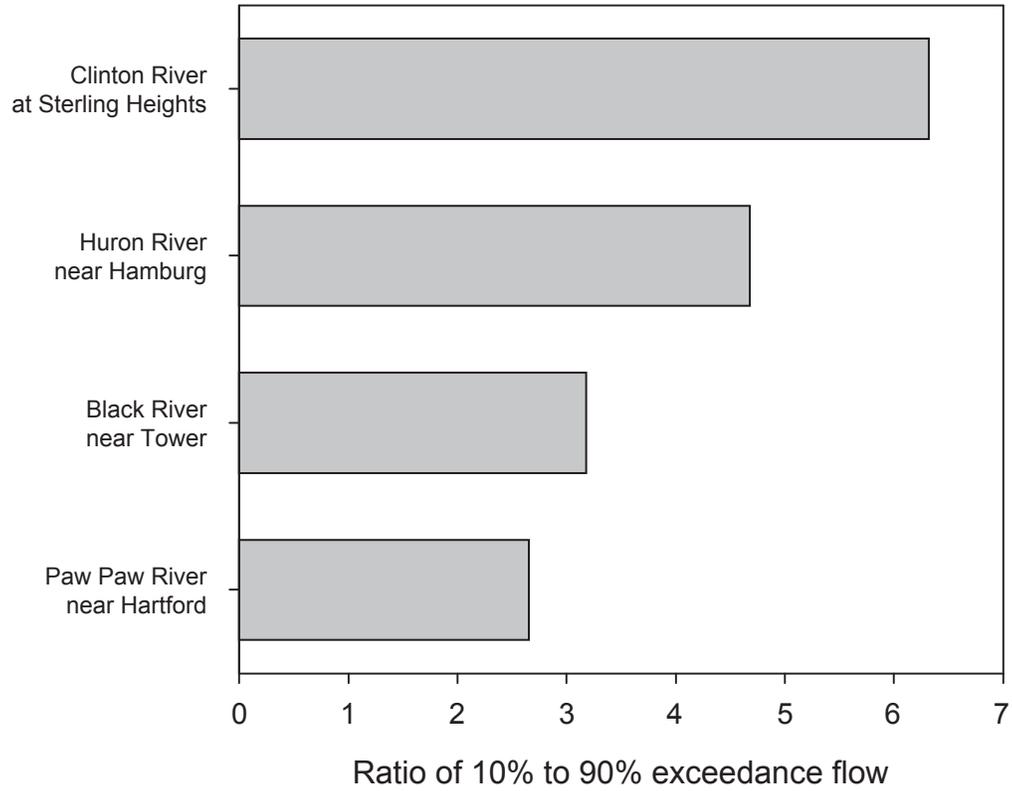


Figure 13.—Flow stability (expressed as the ratio of 10% and 90% exceedance flows) of Michigan streams having catchments comparable in size to the Black River near Tower. Note that some flow regulation occurs upstream of gages on the Huron, Black, and Paw Paw rivers. Data are from the United States Geological Survey.

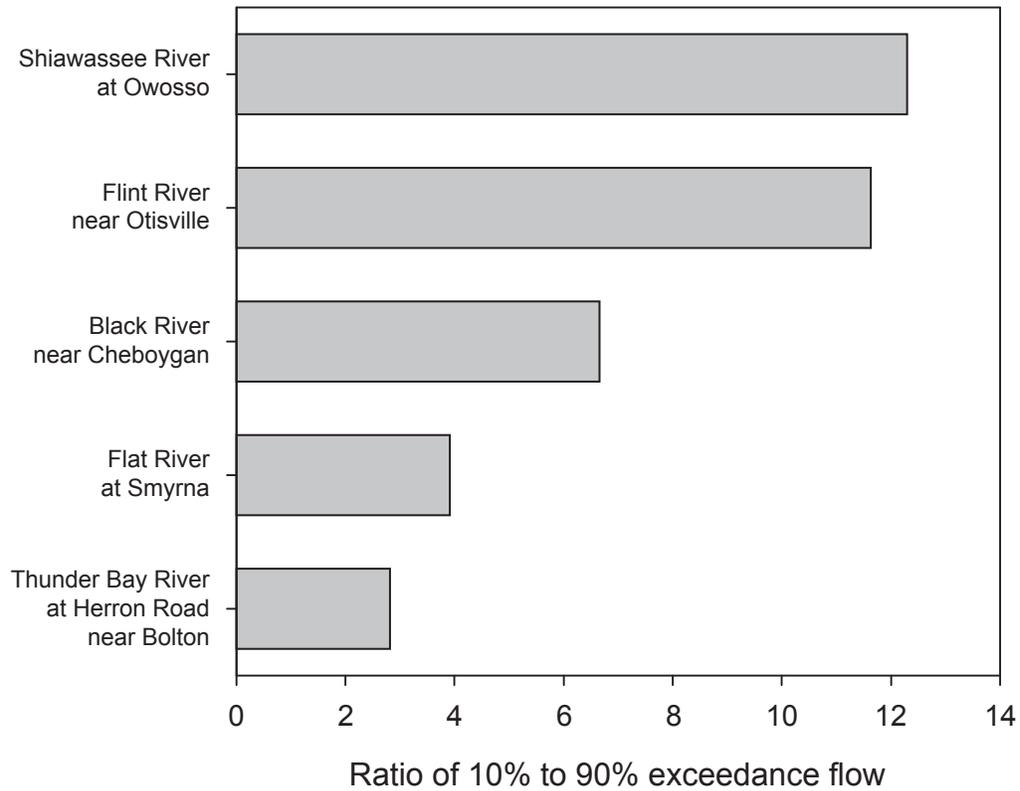


Figure 14.—Flow stability (expressed as the ratio of 10% and 90% exceedance flows) of Michigan streams having catchments comparable in size to the Black River near Cheboygan. Note that some flow regulation occurs upstream of all gages except the Black River, where some regulation occurs downstream of the gage. Data are from the United States Geological Survey.

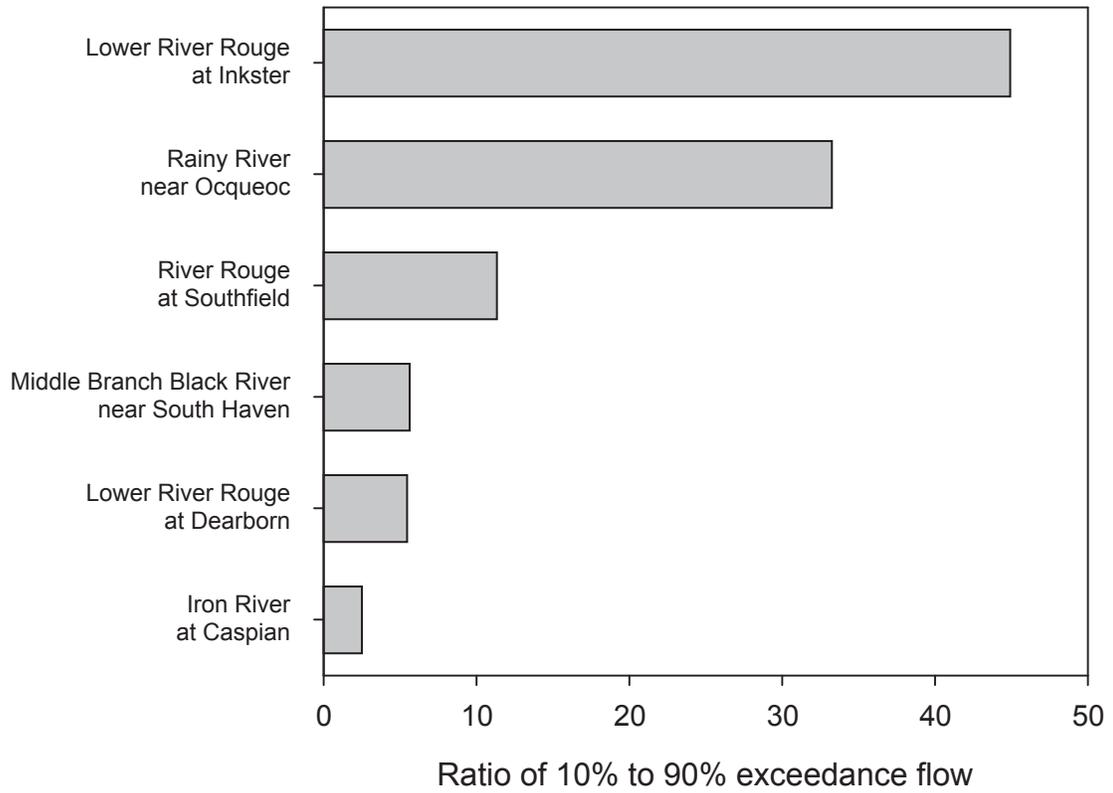


Figure 15.—Flow stability (expressed as the ratio of 10% and 90% exceedance flows) of Michigan streams having catchments comparable in size to the Rainy River near Ocqueoc. Data are from the United States Geological Survey.

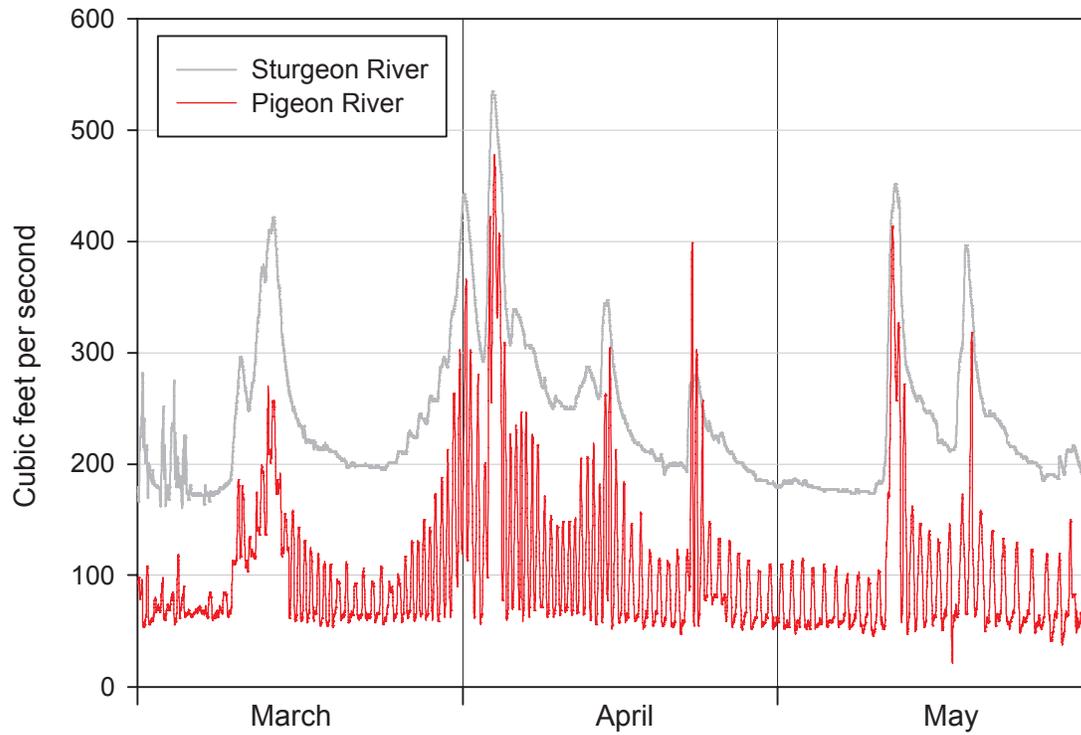


Figure 16.—Daily variation in stream flow (cubic feet per second) of the Pigeon River (red line) and Sturgeon River (gray line), March 01–May 31, 2006. Data are from the United States Geological Survey (2007).

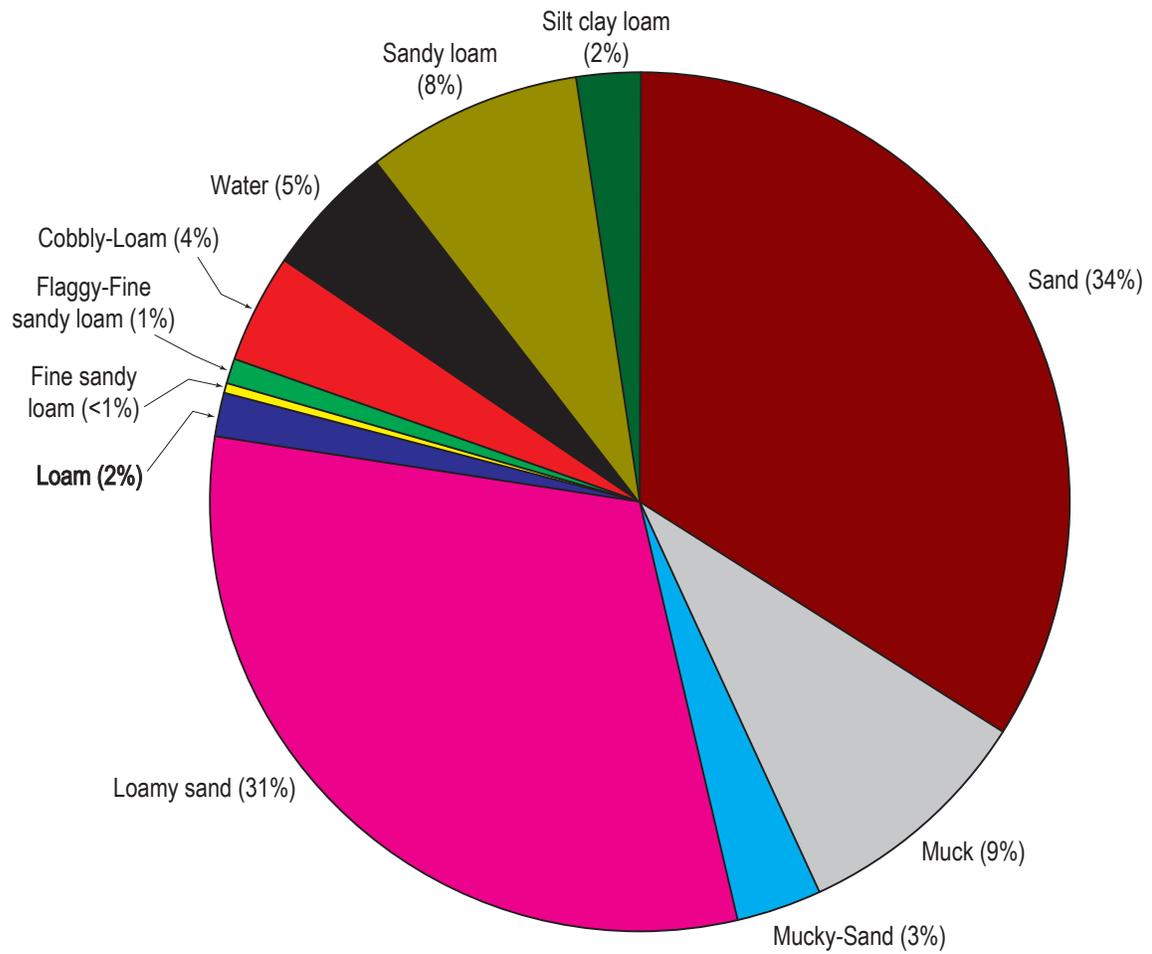


Figure 17.—Percentage of soil types within the Cheboygan River watershed (NRCS 1994).

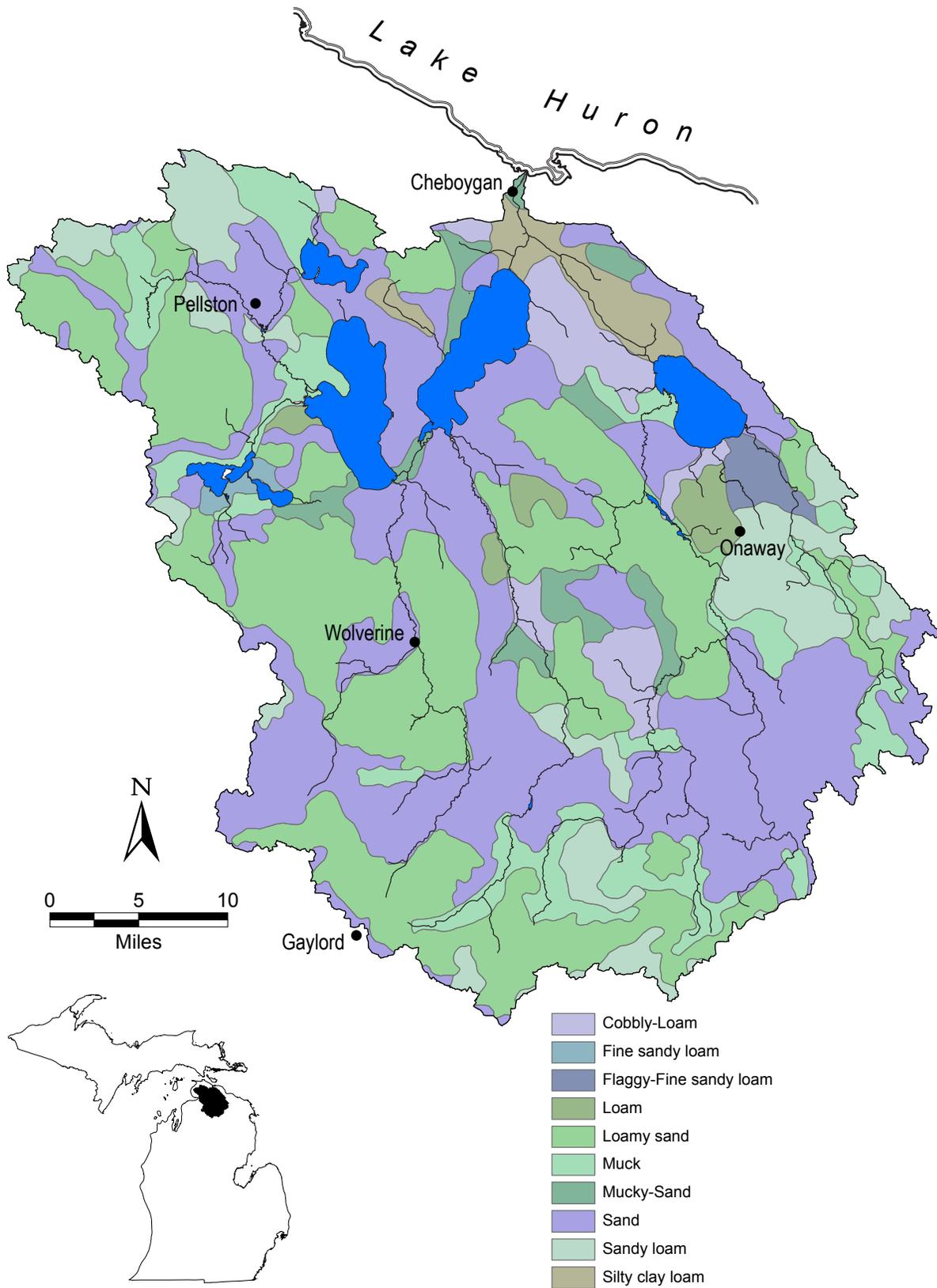


Figure 18.—Soils in the Cheboygan River watershed (NRCS 1994).

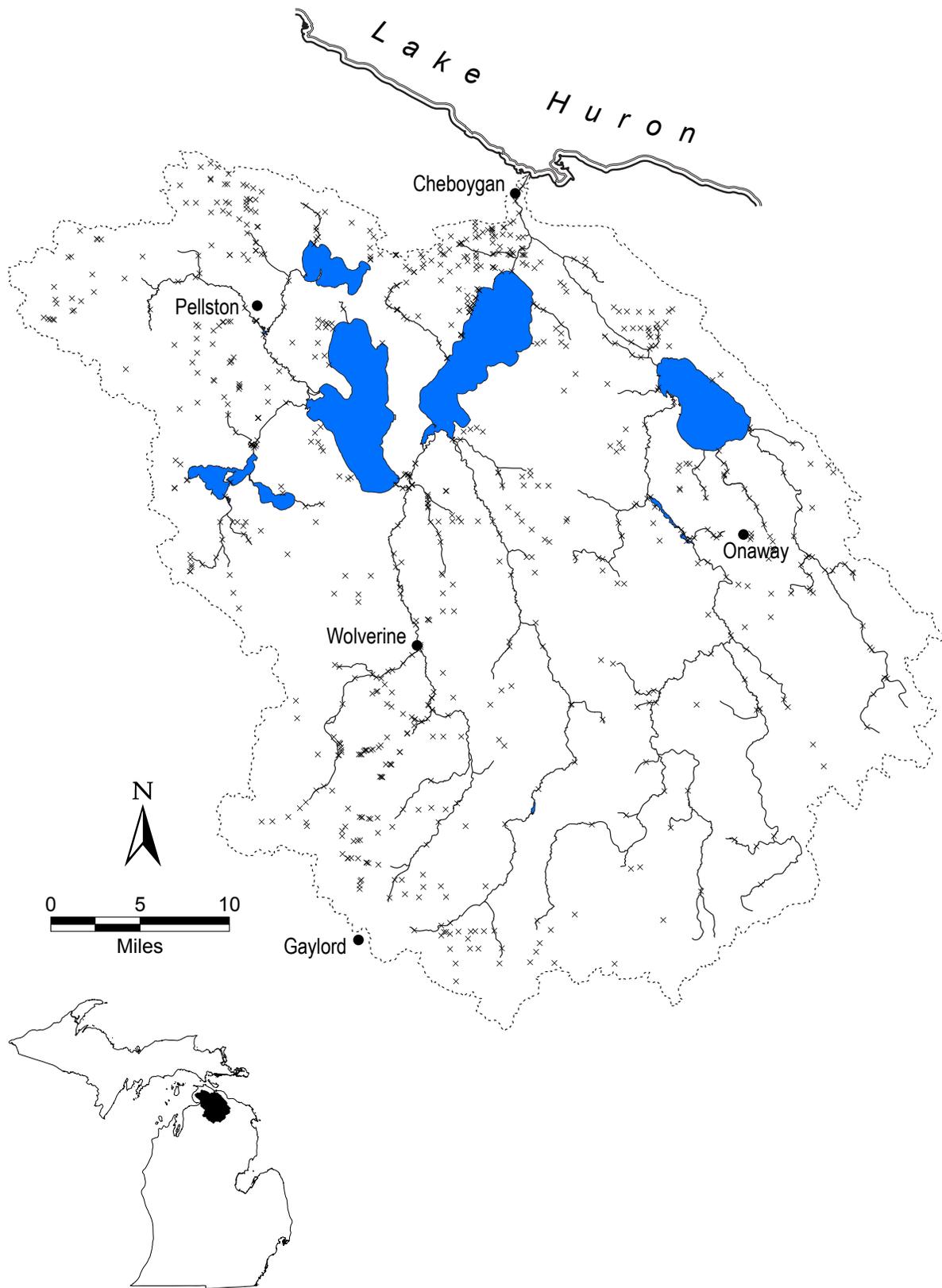


Figure 19.—Road-stream crossings in the Cheboygan River watershed. Data are from a MIRIS-based 1:24,000 scale map clipped to the Cheboygan River watershed (Michigan Geographic Data Library 2007).

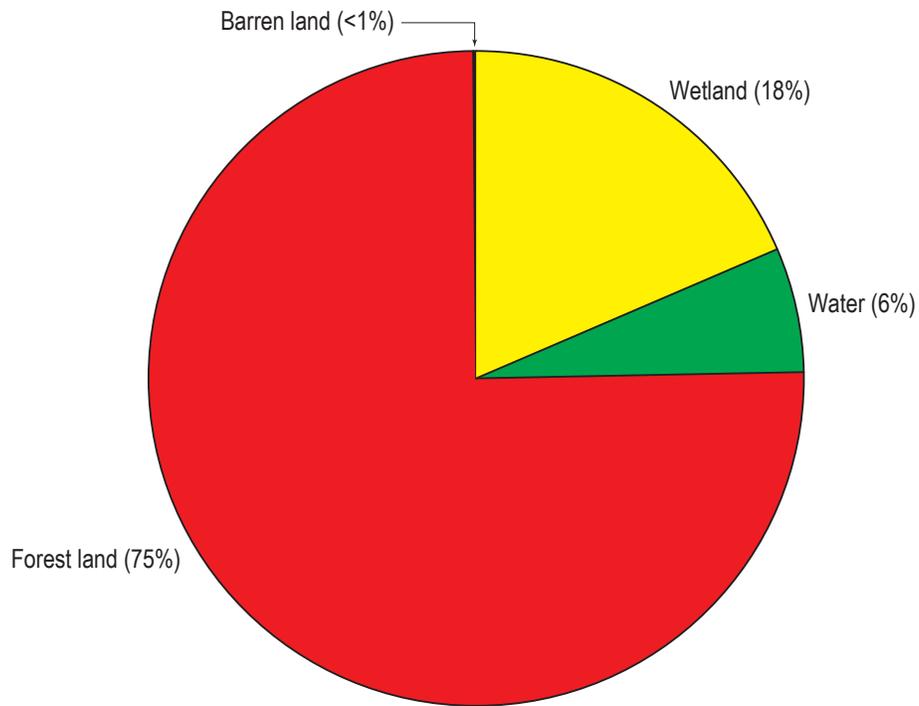


Figure 20a.—Percent land cover in the Cheboygan River watershed circa 1800 (MIRIS 1978).

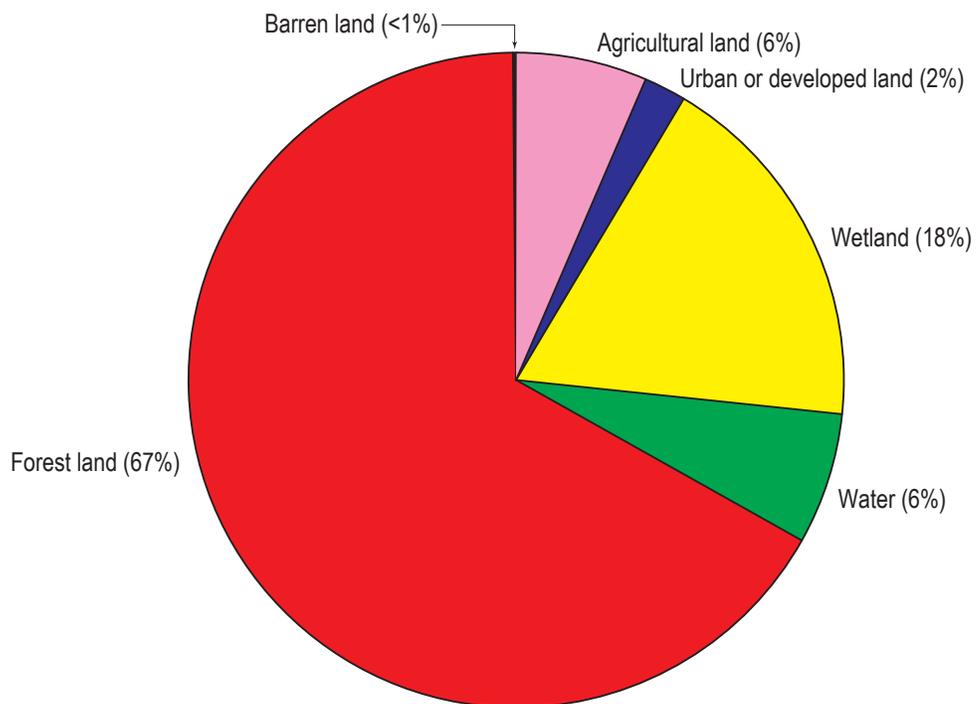


Figure 20b.—Percent land use and land cover in the Cheboygan River watershed in 2000 (NOAA 2001).

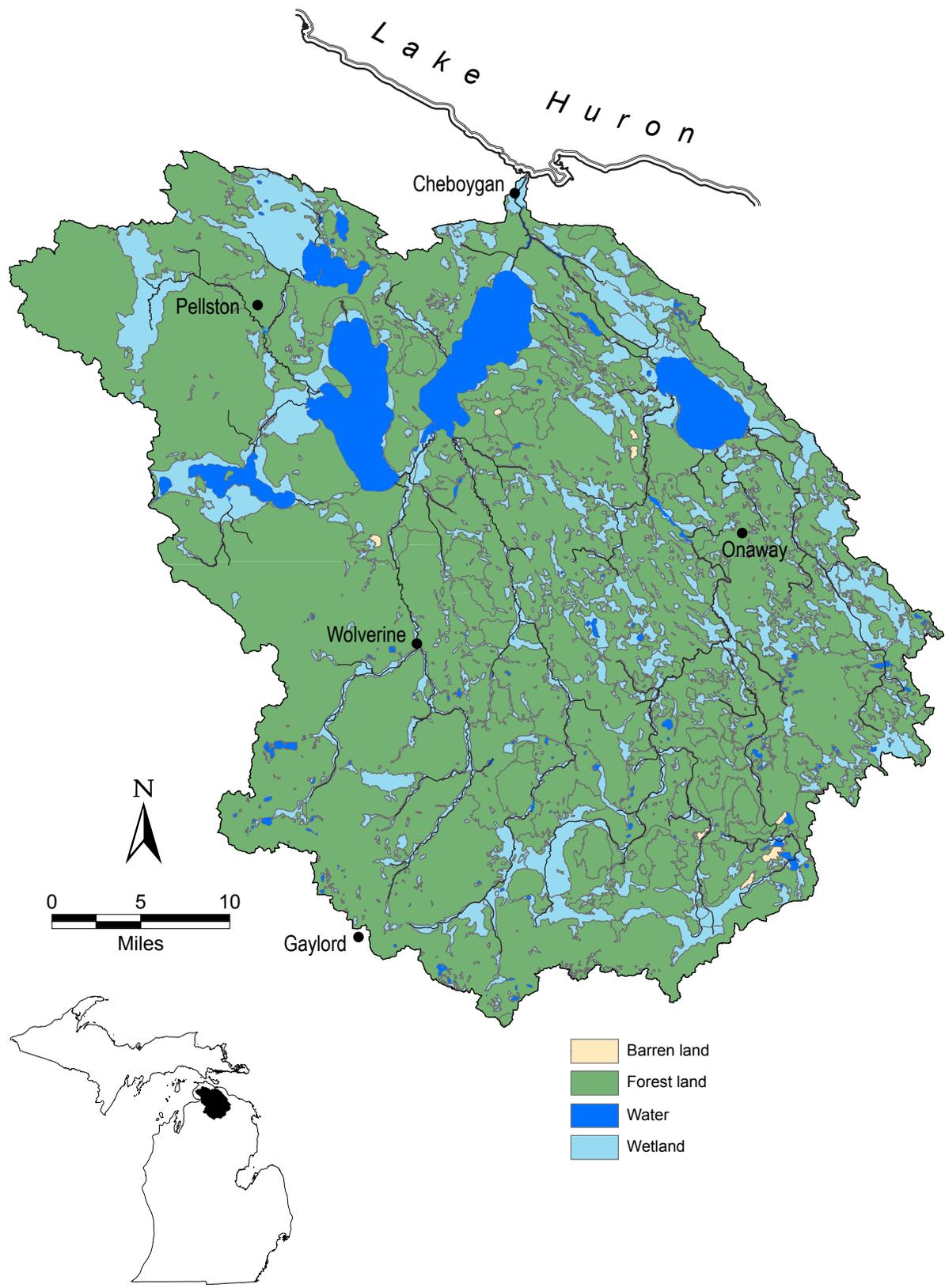


Figure 21.—Land cover in the Cheboygan River watershed circa 1800 (Michigan Geographic Data Library 2007).