Screening-Level Wetland Analysis Using Land Cover and Road Proximity Metrics

Kayaderasseras Creek HUC-12, Saratoga County, New York

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Software: ArcGIS Pro 3.6

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Project Overview

Freshwater wetlands provide important hydrologic, ecological, and water-quality functions, yet their condition and surrounding landscape context can vary widely across a watershed. Understanding the spatial relationship between wetlands, surrounding land use, and nearby infrastructure can help identify areas where wetlands may be subject to greater anthropogenic pressure.

This project presents a screening-level GIS analysis of mapped freshwater wetlands within the Kayaderasseras Creek HUC-12 watershed in Saratoga County, New York. The analysis evaluates surrounding land cover and proximity to road infrastructure using publicly available spatial datasets. The purpose of this project is to demonstrate applied environmental GIS workflows and provide watershed-scale spatial context for wetland conditions. Results are intended for screening and exploratory purposes only and are not intended for regulatory decision-making or site-specific impact assessment.

Study Area and Data

The study area is the Kayaderasseras Creek HUC-12 watershed, located in Saratoga County, New York. The watershed boundary was selected as the spatial extent for analysis to provide a hydrologically meaningful unit commonly used in wetland and water-resources assessments.

Figure 1 shows the location of the Kayaderasseras Creek watershed and the distribution of mapped freshwater wetlands within the study area.

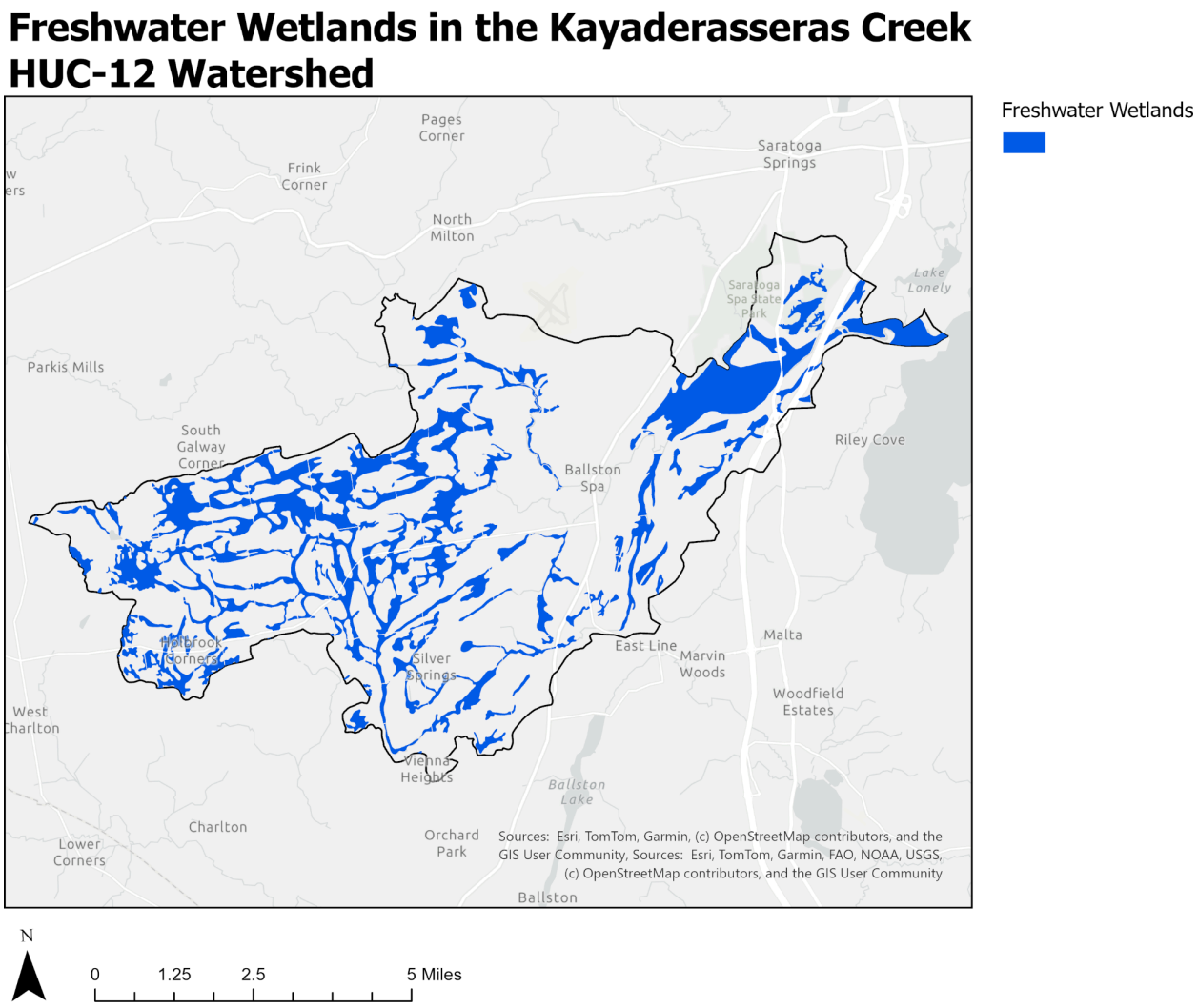

Figure 1. *Location of the Kayaderasseras Creek HUC-12 watershed and mapped freshwater wetlands in Saratoga County, New York.*

Data Sources

The following datasets were used in this analysis:

- **Freshwater Wetlands:** New York State Department of Environmental Conservation (NYS DEC) freshwater wetlands mapping
- **Watershed Boundaries:** U.S. Geological Survey (USGS) Watershed Boundary Dataset (HUC-12)
- **Land Cover:** National Land Cover Database (NLCD)
- **Road Infrastructure:** New York State Department of Transportation (NYS DOT) statewide roads dataset

All spatial data were projected to **NAD 1983 UTM Zone 18N** to ensure accurate area and distance calculations.

Methods

Wetland Preparation and Baseline Metrics

Mapped freshwater wetlands were clipped to the Kayaderasseras Creek HUC-12 boundary. Individual wetland polygons were dissolved by Wetland ID to represent wetland complexes rather than fragmented polygon components. Wetland area was recalculated using projected geometry, and baseline metrics were summarized, including total mapped wetland area, percent of watershed area composed of wetlands, number of wetland complexes, and wetland size range.

Land-Use Pressure Analysis

To evaluate surrounding land-use context, buffers of 100 ft and 300 ft were generated around each wetland complex. These distances were selected to represent near-wetland conditions at two commonly used screening scales.

NLCD land-cover data were clipped to each buffer extent and reclassified into two categories:

- Natural land cover
- Developed land cover

For each buffer distance, the following metrics were calculated:

- Area-weighted percent developed land within all wetland buffers
- Percent developed land within buffers for individual wetland complexes

Figures 2 and 3 illustrate reclassified land cover within 100-ft and 300-ft wetland buffers, respectively.

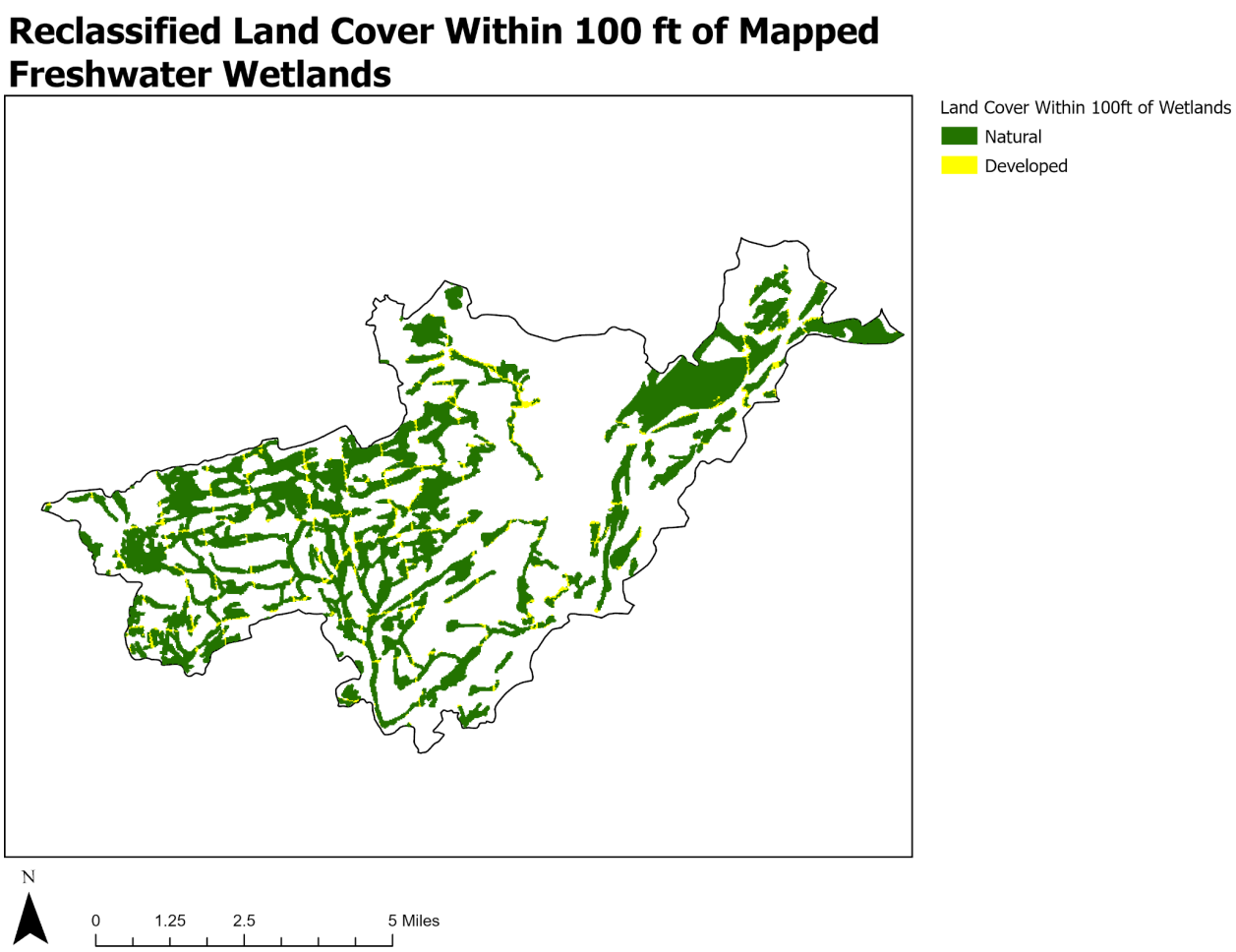

Figure 2. *Reclassified National Land Cover Database (NLCD) land cover within 100 ft of mapped freshwater wetlands in the Kayaderasseras Creek HUC-12 watershed, categorized as natural or developed.*

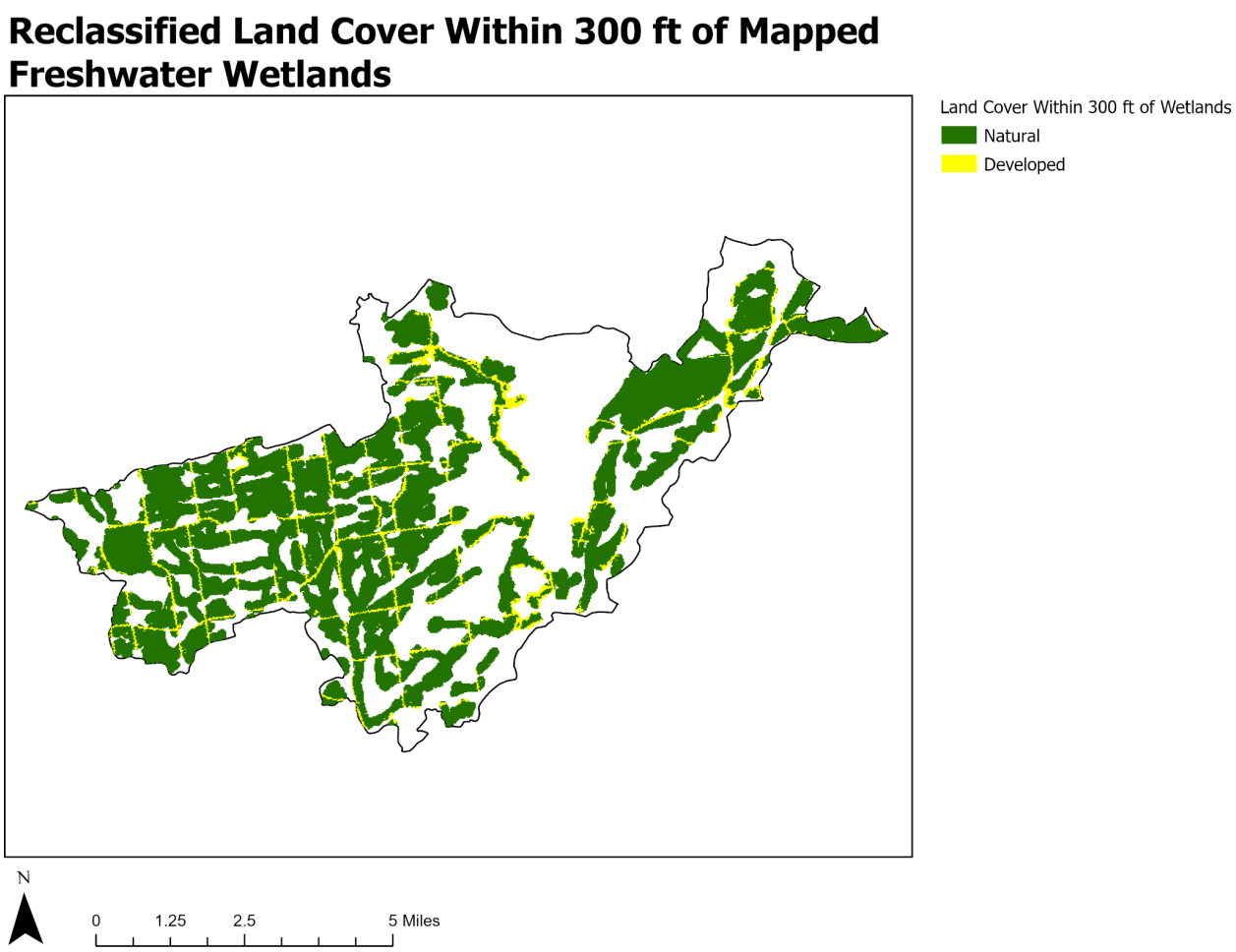

Figure 3. *Reclassified National Land Cover Database (NLCD) land cover within 300 ft of mapped freshwater wetlands in the Kayaderasseras Creek HUC-12 watershed, categorized as natural or developed.*

Infrastructure Proximity Analysis

Road infrastructure proximity was evaluated using the NYS DOT statewide roads dataset. Road segments intersecting the 100-ft and 300-ft wetland buffers were identified. Spatial joins were used to flag wetland complexes with nearby roads at each buffer distance.

To explore relationships between infrastructure proximity and surrounding development, wetlands with and without nearby roads were compared based on percent developed land within buffers.

Figure 4 illustrates road segments occurring within 100 ft and 300 ft of mapped wetlands.

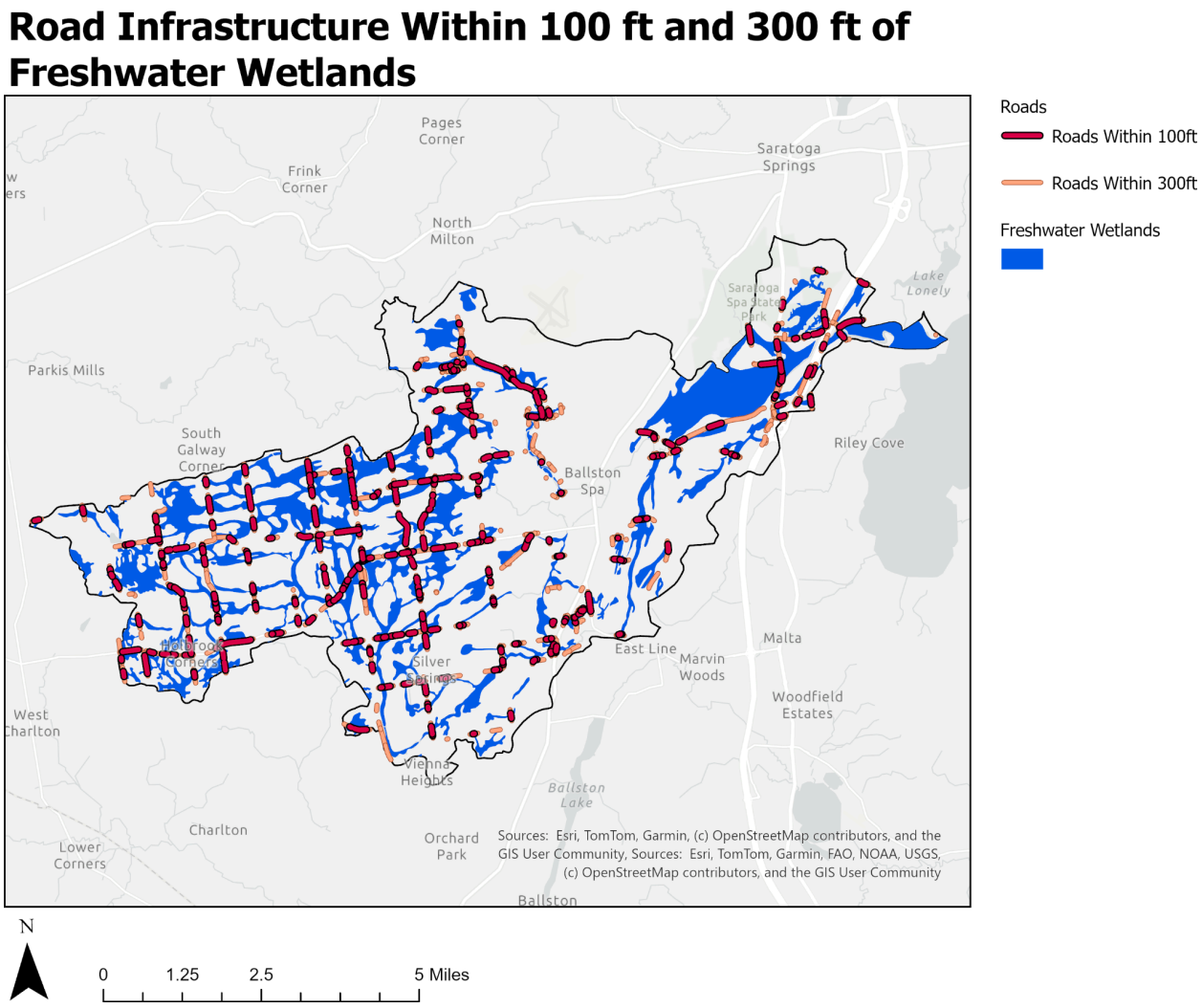

Figure 4. *Road segments occurring within 100 ft and 300 ft of mapped freshwater wetlands in the Kayaderasseras Creek HUC-12 watershed, illustrating infrastructure proximity to wetland complexes.*

Results

Wetland Extent

Mapped freshwater wetlands occupy a portion of the Kayaderasseras Creek watershed and occur in a range of sizes and spatial configurations. Key baseline metrics include:

- **Total mapped wetland area:** 7115.73 acres
- **Percent of watershed area:** 22.49%

- **Number of wetland complexes:** 68
- **Wetland size range:** 0.01 to 2992.86 acres

Land Cover Within Wetland Buffers

Analysis of surrounding land cover indicated that:

- Approximately **6.42%** of land within 100 ft of mapped wetlands is classified as developed.
- Approximately **10.45%** of land within 300 ft of mapped wetlands is classified as developed.

Per-wetland calculations showed variability among wetland complexes, with average developed land percentages of **7.87%** within 100-ft buffers and **12.57%** within 300-ft buffers.

Road Proximity and Surrounding Development

Wetlands with nearby roads exhibited higher surrounding development than wetlands without nearby roads at both buffer distances. Mean percent developed land was:

- **12.20%** (with roads) vs **7.03%** (without roads) within 100 ft
- **17.91%** (with roads) vs **11.54%** (without roads) within 300 ft

These results suggest a spatial association between infrastructure proximity and developed land cover at the screening level.

Integrated Interpretation

Results indicate that wetland complexes within the Kayaderasseras Creek watershed experience varying degrees of surrounding development and infrastructure proximity. Developed land cover generally increased with buffer distance, reflecting broader landscape patterns beyond immediate wetland edges. Wetlands located near roads tended to coincide with more developed surroundings, suggesting that road proximity may serve as a useful spatial indicator of anthropogenic pressure at a screening scale.

Observed patterns were not uniform across the watershed, highlighting spatial heterogeneity in wetland context. These findings demonstrate how watershed-scale GIS analysis can help identify areas where wetlands may warrant closer examination or additional study.

Limitations and Assumptions

This analysis is subject to several limitations:

- Only mapped freshwater wetlands were included; unmapped wetlands were not analyzed.
- NLCD land cover is generalized and may not capture fine-scale development.
- Road proximity was used as a spatial indicator rather than a measure of impact severity.
- No field verification was conducted.
- Results are intended for screening-level interpretation only and do not imply ecological condition or regulatory status.

Conclusions

This project demonstrates a watershed-based GIS approach for evaluating wetland context using land-cover and infrastructure proximity metrics. The analysis provides spatial insight into patterns of development surrounding wetlands in the Kayaderasseras Creek watershed and illustrates how GIS can support screening-level environmental assessments. The methods and outputs presented here could inform future prioritization, monitoring efforts, or more detailed site-specific studies.