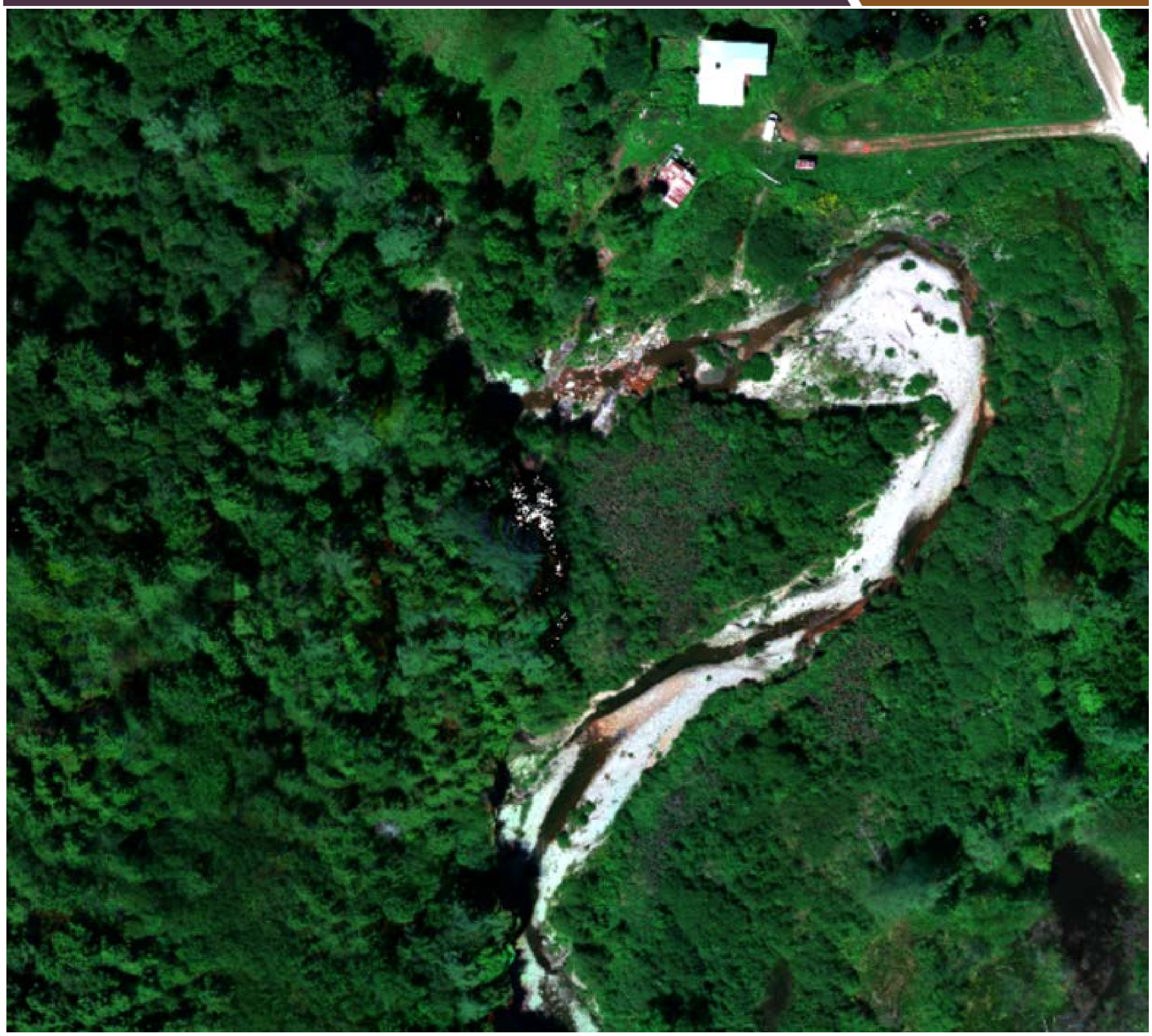
Johnsons Mill Dam Removal Multi-Year Monitoring Sediment Transport Analysis Report

STONE
ENVIRONMENTAL



PROJECT NO.

19-093

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Johnsons Mill Sediment Transport Analysis Report

***Cover Photo**: Orthomosaic imagery of the Johnsons Mill Dam Removal site collected in August 2025, Year 4 of the monitoring project.*

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1. Introduction & Background

1.1. Introduction

Stone completed a multi-year habitat monitoring project at the Johnsons Mill Dam Removal site on the Bogue Branch in Bakersfield, Vermont. The goal of the project was to improve understanding of dam removal impacts on aquatic habitat in order to inform future river restoration designs. The dam removal, completed in August 2021, involved minimal upstream sediment removal, allowing for natural sediment movement through the system. This four-year monitoring effort focused on tracking channel evolution and sediment transport processes, including streambed material characterization through pebble counts and surficial armor layer analysis, as well as high-resolution topographic and bathymetric surveying utilizing LiDAR data collected via unmanned aerial vehicle and helicopter. Overall, this project and on-going work at the Johnsons Mill Dam site provides insight into how sediment moves through riverine systems, how streambanks and floodplains re-establish, and how the system re-naturalizes, ultimately seeking geomorphic equilibrium, following dam removal. This report summarizes the sediment transport and channel evolution observations collected during the monitoring study and explores methods for using high-resolution LiDAR data to quantify sediment transport and channel adjustment.

1.2. Channel Evolution

River systems are dynamic and undergo continuous adjustment, a process known as channel evolution. This process involves changes in channel dimension, pattern, and profile as a stream seeks to re-establish equilibrium based on its watershed inputs, including sediment and hydrologic inputs. The F-stage channel evolution model describes the adjustment processes and stages that occur following a disturbance, such as dam removal, as a stream channel returns to dynamic equilibrium. These adjustments are driven by factors such as stream power, the resistance of bed and bank materials, and sediment transport capacity. The impact of adjustment processes on channel geometry, pattern, and longitudinal profiles is shown in the F-stage channel evolution model diagram from Appendix C of the Vermont Agency of Natural Resources (VTANR) Stream Geomorphic Assessment Handbook included in Figure 1 below.

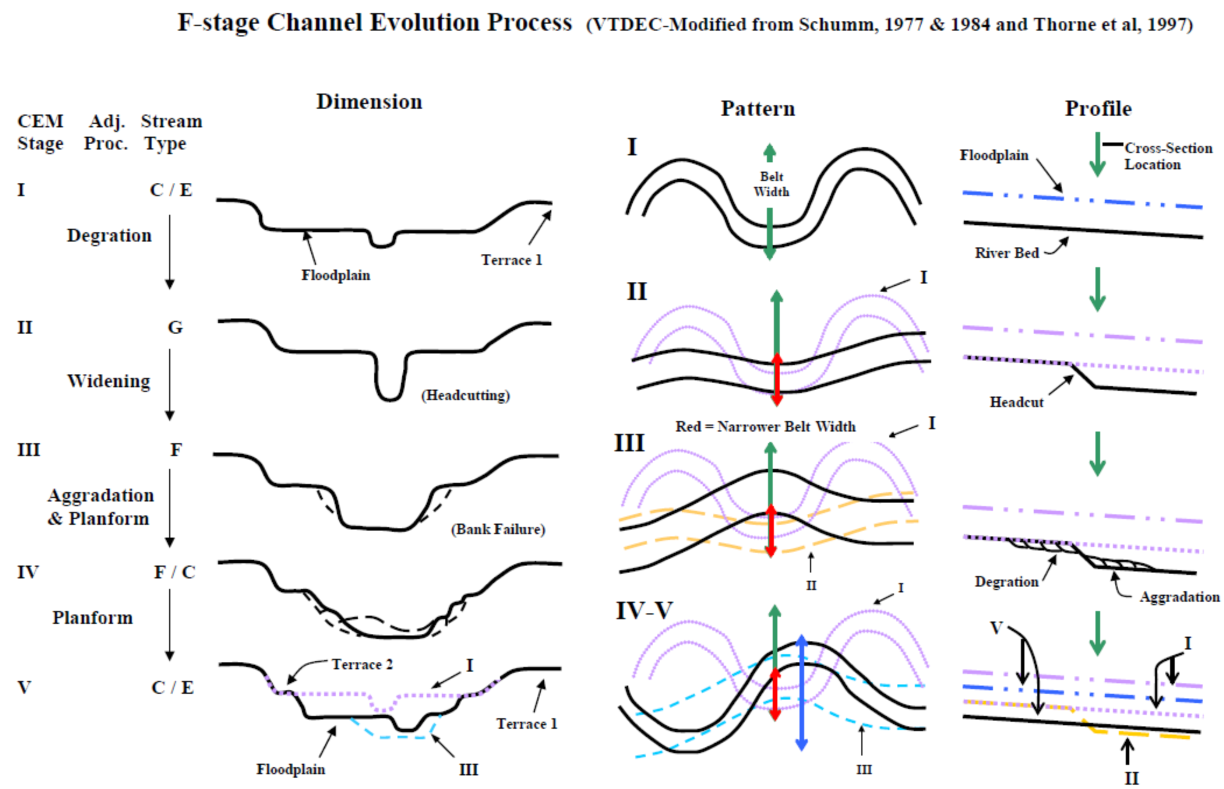


Figure 1. F-stage channel evolution model diagram from VTANR (2007).

Sediment transport is a fundamental aspect of river dynamics. A river's ability to transport sediment is referred to as its sediment transport capacity. Sediment transport capacity is controlled by factors such as sediment load, hydrology, and channel slope and dimension. When sediment transport capacity is not in balance with the sediment load, the channel will respond through erosion or deposition to restore equilibrium, as illustrated by Lane's Diagram (Figure 2). When sediment transport capacity and sediment load are in balance the river is considered to be in equilibrium. These processes provide an understanding of how rivers will respond to natural or human-induced events and changes within their watersheds, floodplains, and channels.

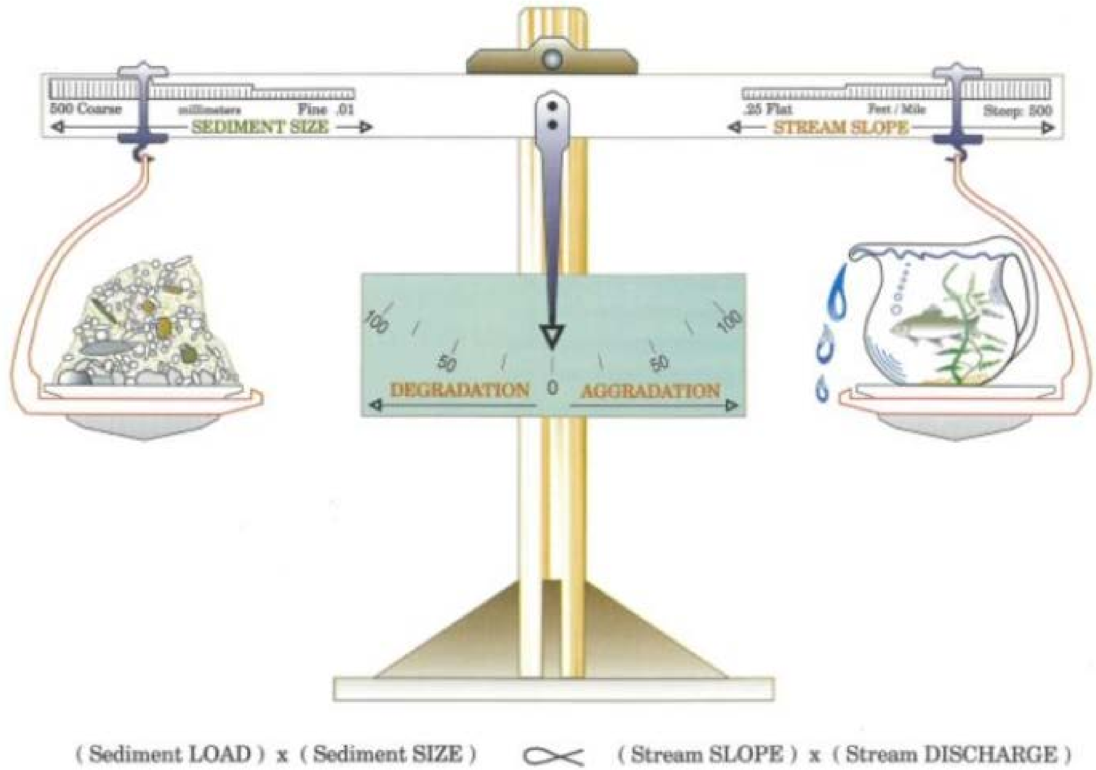


Figure 2. Lane's Balance diagram from Rosgen (1996).

Both the channel evolution model and Lane's Balance can be applied to the Johnson's Mill Dam Removal site to help understand sediment transport and channel adjustment that occurred at the site following dam removal.

1.3. Project Site & Design Approach

Bogue Branch generally flows south to north towards the project, with elevations ranging from 610 feet to 760 feet. After flowing through the project site, it flows northwest until it eventually merges with Tyler Branch in West Enosburg at an elevation of 480'. The Tyler Branch discharges into the Missisquoi River soon after. The Bogue Branch is a relatively shallow, moderately sinuous system with a productive brook trout population. The contributing watershed at the former dam location is approximately 8.65 mi^2, of which 2.1% is developed and the remainder is forest, wetlands and other open space (StreamStats, 2020).

The Johnsons Mill Dam was a 132 feet long by 17 feet high dam founded on bedrock, and was made mostly of stone masonry and earth fill. It was classified as "low hazard" by the Vermont Dam Safety Program, but was in poor condition and partially breached along the crest of the dam and stop log weir structure. On October 31 2019, the stop log weir, a 6-foot wide vertical opening in the dam with stacked logs used to control the water surface, breached during a 100-year storm event. This breach resulted in the release of impounded sediment upstream of the dam. Post-breach the channel substrate upstream of the dam consisted primarily of coarse sands, gravels, and cobbles. Prior to the breach, substrate upstream of the dam consisted of sands and silts in areas of low flow energy and behind some areas of the dam structure.

Additionally, there are existing wetlands located along river right, adjacent to a meander bend that heads toward the dam. A review of aerial images indicates that these wetlands are an abandoned meander bend of Bogue Branch.

The Johnsons Mill Dam was removed in August 2021. The dam removal design approach consisted of creating conditions that would allow the channel to cut down to the bedrock grade control at the dam via natural channel evolution processes. Based on the final designs, the extent of vertical channel adjustment was anticipated to range from 2 ft at the upstream extent of the impoundment to as much as 8 ft near the former dam site. The channel slope was expected to change from 0.55% to 1.0%. An additional 1,950 CY of impounded material was anticipated to be conveyed downstream following dam removal during a large storm event or in multiple smaller events.

The final dam removal design approach consisted of the following elements:

- Full dam removal;
- Removal of 2019 dam breach debris;
- Channel development through the former dam impoundment via natural channel evolution processes;
- Minimal sediment removal and creation of a "channel ramp" upstream of the dam. The "channel ramp" acted as a head cut intended to migrate upstream with the anticipated long-term channel thalweg slope of 1%;
- Rootwad installation on outside of meander bends;
- Willow live stake and fascine planting on graded banks, with anticipated natural revegetation of floodplain areas developed following natural transport of impounded sediment and channel formation processes.

A timeline of naturally occurring flood events and dam breach and removal activities at the site is provided below to provide additional context for the monitoring data presented in the report (Figure 3).

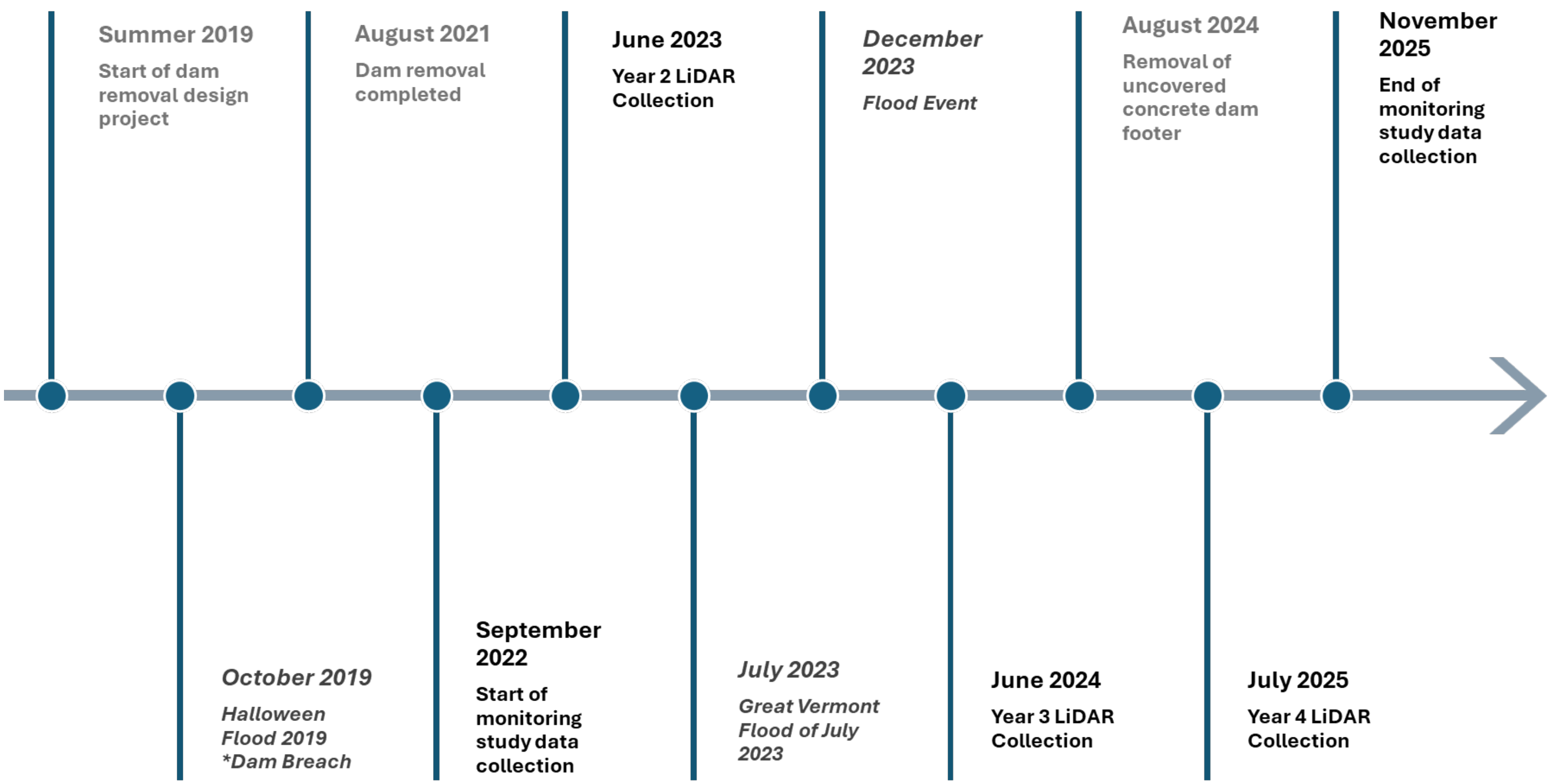


Figure 3. Johnsons Mill Dam Removal Site Timeline

2. Methods

2.1. Topographic and Bathymetric Data Collection

Topographic and bathymetric data were collected to evaluate the extent and evolution of channel adjustment laterally and vertically over time. Survey control points were established and surveyed in each LiDAR data collection flight. Whiteout Solutions collected remotely sensed data for the 82-acre project extent in monitoring Year 2 (2023), Year 3 (2024), and Year 4 (2025). Data were collected using a dual topo-bathymetric and LiDAR system mounted to an unmanned aerial vehicle (UAV) in monitoring Year 2 and Year 3, and to a helicopter in Year 4. This system collected photogrammetric and multispectral images, including RGB, orthomosaic, and multispectral imagery, and elevation data using LiDAR to capture the ground surface and streambed. The LiDAR collection sensor was factory calibrated and Whiteout completed additional data validation before each flight. The multispectral imagery collection sensor was calibrated prior to each flight. The system collected approximately 300 points per square meter with a vertical accuracy of 2-3 centimeters. LiDAR data deliverables included geo-rectified point cloud files along with digital surface models (DSM) and digital elevation models (DEM) files generated from the LiDAR data. Generated DSM and DEM files had a resolution of approximately 6 cm. Multispectral images were delivered as geospatially rectified GeoTif's.

2.2. Streambed Characterization

Field observations and measurements of the streambed sediment were taken in Reach 2 of the monitoring project extent. The same two monitoring locations were assessed every year, though due to the changes experienced on the site, the habitat type did not remain the same throughout the monitoring period. At each location, Stone staff completed pebble counts using the Wolman pebble count method to determine grain size distributions. After pebble counts were completed, visual and tactile assessment methods were used to determine relative percentages of material beneath the surficial armor layer at one location toward the center of the channel at each streambed monitoring site. Each monitoring location was inspected for key roughness features and if present, dimensions and angularity were recorded. Photos were taken of each station. Data were processed in MS Excel to determine grain size distributions and approximate percentage of materials.

2.3. Geospatial Data Sources

In addition to newly collected LiDAR topographic and bathymetric data, existing topographic and bathymetric data sets were used in the change over time analysis for at the project site. Elevation data were complemented by aerial and orthomosaic imagery datasets, providing the ability to visually identify changes at the site. These data sources are summarized in Table 1 and Table 2.

Table 1. Summary of topographic and bathymetric data used to create DEMs for change over time analysis.

Surface No.	Date Collected	Method & Organization	Description
0	October 2019	Total Station Survey; Stone Environmental	Pre-dam breach existing conditions surface
1	January 2020	Total Station Survey; Stone Environmental	Post-dam breach existing conditions surface
2	August 2021	Total Station Survey; Stone Environmental	As-built survey data used to create a DEM
3	April 2022	Topographic Lidar Only; University of Vermont	Post-dam removal lidar for entire 84-acre AOI
4	June 2023	Topographic and Bathymetric LiDAR; Whiteout Solutions	Monitoring geospatial data collection using UAV for the entire 84-acre AOI
5	June 2024	Topographic and Bathymetric LiDAR; Whiteout Solutions	Monitoring geospatial data collection using UAV for the entire 84-acre AOI
6	August 2025	Topographic and Bathymetric LiDAR; Whiteout Solutions	Monitoring geospatial data collection using helicopter for the entire 84-acre AOI

Table 2. List of aerial and orthomosaic imagery available for the project site that was used to qualitatively assess channel migration over time or delineate channel centerline to assess lateral change.

Imagery No.	Date Collected	Source/Collected By
3	April 13, 2022	University of Vermont
4	November 2, 2022	Stone Environmental
5	January 9, 2023	Stone Environmental
6	June 2023	Whiteout Solutions
7	July 17, 2023	Stone Environmental
8	October 26, 2023	Stone Environmental
9	March 25, 2024	Stone Environmental
10	June 2024	Whiteout Solutions
11	July 29, 2024	Stone Environmental
12	October 25, 2024	Stone Environmental
13	March 14, 2025	Stone Environmental
14	August 2025	Whiteout Solutions
15	November 19, 2025	Stone Environmental

2.4. Channel Migration Analysis

A GIS-based analysis was completed to visualize the horizontal shift in the stream channel centerline over time using the aerial imagery and topographic and bathymetric lidar data collected during the monitoring study. The stream channel centerline was manually traced in ArcGIS Pro for each monitoring year, then added to the same map for visualization. Within the former dam impoundment, areal channel shift was calculated for the meander bend actively migrating downstream towards the former dam site.

2.5. DEM Comparisons

Since elevation data was collected using a variety of methods, vertical datums, and resolutions prior to the monitoring project, individual DEMs were pre-processed as needed to enable comparison across years. All DEMs were converted to NAD 83 Vermont State Plane, tied to ground control points (GCPs), and cell sizes resampled to a cell size of 0.5 ft to ensure consistency across rasters.

The ArcGIS CutFill tool was used to calculate elevation and volume differences between DEMs. The extent of each comparison was determined by 1) the extent of available elevation data and 2) the anticipated extent of channel change and river corridor. This approach reduced the amount of noise introduced in total volume calculations by elevation differences calculated in cells in upslope and overbank areas outside of the limits of channel and bank adjustment. DEM comparisons were used to understand erosion and deposition rates within the monitoring area. The total net sediment gained and lost was estimated using the Visualize Statistics tool. Raster elevations were compared to the ground control elevations; the average difference between raster pixel values and GCP elevations at the same location was ± 0.3 ft. This value was used to estimate uncertainty in elevation change and sediment volume calculations.

3. Results

3.1. DEM Comparisons

3.1.1. Monitoring Study

Comparison of the DEMs generated from the topographic and bathymetric LiDAR data collected as part of this study were used to calculate annual changes in bed elevations using ArcGIS Pro surface processing tools, resulting in estimates of the total cubic yard (CY) differential between years and maps depicting areas of erosions and deposition. This comparison was possible for Year 1 to Year 2, Year 2 to Year 3, Year 3 to Year 4, Year 1 to Year 4, and Year 2 to Year 4. Topographic and bathymetric LiDAR was not collected by Whiteout in Year 1. Instead, the 2022 topographic LiDAR data collected by UVM SAL during low flow conditions was used and may include minor discrepancies due to the absence of bathymetric data. Results of this analysis are summarized in Table 1 and Figure 4 through Figure 14. Net change in sediment volume was calculated as the net loss minus the net gain. Individual DEMs are provided in Appendix A.

The Year 1 to Year 2 DEM comparisons indicate an total CY differential of approximately -2,174 ± 1,820 CY from the former dam impoundment extents. This is consistent with the migration of the head cut established during the dam removal migrating upstream (Stage II of the channel evolution model in Figure 1). Bank failure was also observed during this time and contributed to channel widening.

The greatest amount of change is seen between Year 2 (2023) and Year 3 (2024), with DEM comparison results indicating overall sediment loss from the entire project AOI. Estimated sediment loss from the former dam impoundment (11,443 ± 1,710 CY) accounts for approximately half of the total sediment loss from the entire project AOI (24,355 ± 6,750). This suggests that sediment was mobilized throughout the system between Year 2 and Year 3. In addition to channel change attributable to more frequently occurring bankfull flows, two high-magnitude flood events, The Great Vermont Flood of July 2023 (July 2023 Flood) and December 2023 Flood, occurred between the Year 2 and Year 3 LiDAR data acquisition flights (Figure 3). The high flows and stream velocities, along with increased sediment transport capacity, associated with these events appear to be a primary driver of the extent of erosion seen in the sediment volume differential calculations and elevation change maps between Year 2 and Year 3.

While localized instances of erosion and deposition can be seen in the color-coded maps in Figure 6 and Figure 7, there was no measurable change in sediment loss or gain outside the range of uncertainty between Year 3 (2024) and Year 4 (2025) at the scale of the former dam impoundment (-590 ± 1,630) or the entire project AOI. The positive net change seen in the DEM comparison for the entire project AOI suggests that aggradation along this reach of the Bogue Branch. This is consistent with point bar development and deposition observed in aerial imagery and Stage III of the channel evolution model. While additional monitoring data would be needed to confirm, the Year 3 and Year 4 DEM comparison results suggest that the channel is trending toward equilibrium.

The Year 2 and Year 4 topographic and bathymetric LiDAR DEMs were compared to calculate the total sediment differential captured by LiDAR data collected over the monitoring period.

Table 3. Summary of sediment volume differential calculated from the LiDAR generated DEMs for two extents, the former dam impoundment and the entire length of Bouge Branch in the project AOI.

Period of Comparison	Comparison Extent	Net Change (CY)[2]
April 13, 2022 to June 12, 2023 (Year 1 to Year 2)	Dam Impoundment Extended	-2,174 ± 1,820
June 12, 2023 to June 5, 2024 (Year 2 to Year 3)	Fromer Dam Impoundment	-11,443 ± 1,710
June 5, 2024 to August 26, 2025 (Year 3 to Year 4)[1]	Former Dam Impoundment	-590 ± 1,630
June 12, 2023 to June 5, 2024 (Year 2 to Year 3)	Entire AOI River Corridor	-24,355 ± 6,750
June 5, 2024 to August 26, 2025 (Year 3 to Year 4)[1]	Entire AOI River Corridor	3,105 ± 6,750
June 12, 2023 to August 26, 2025 (Year 2 to Year 4)	Entire AOI River Corridor	-21,107 ± 6,800

[1]Calculated change falls within range of uncertainty; no measurable change

[2]Negative values indicate net loss; positive values indicate net gain.

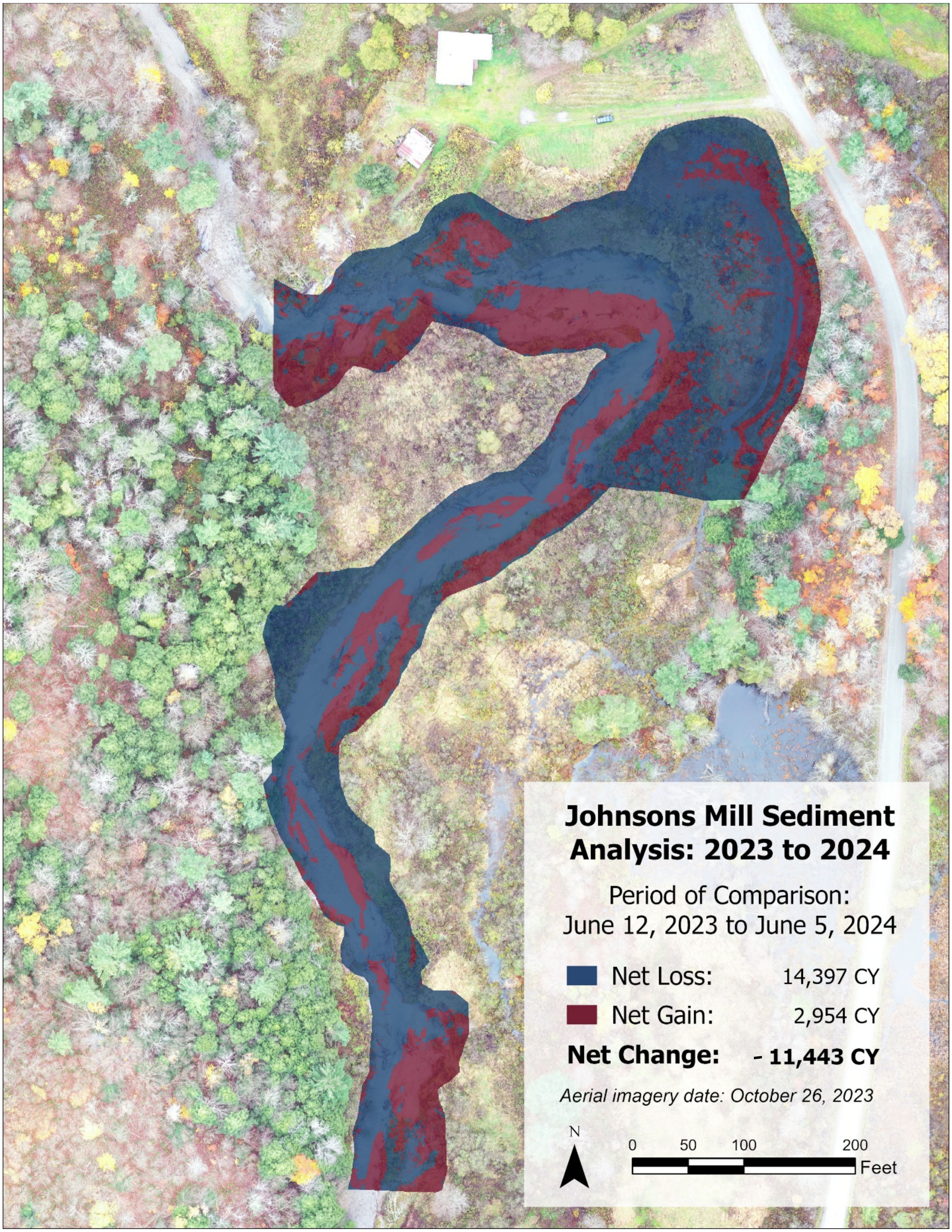


Figure 4. Map depicting areas of potential erosion (blue) and deposition (red) between Year 2 (2023) and Year 3 (2024) within the former dam impoundment.

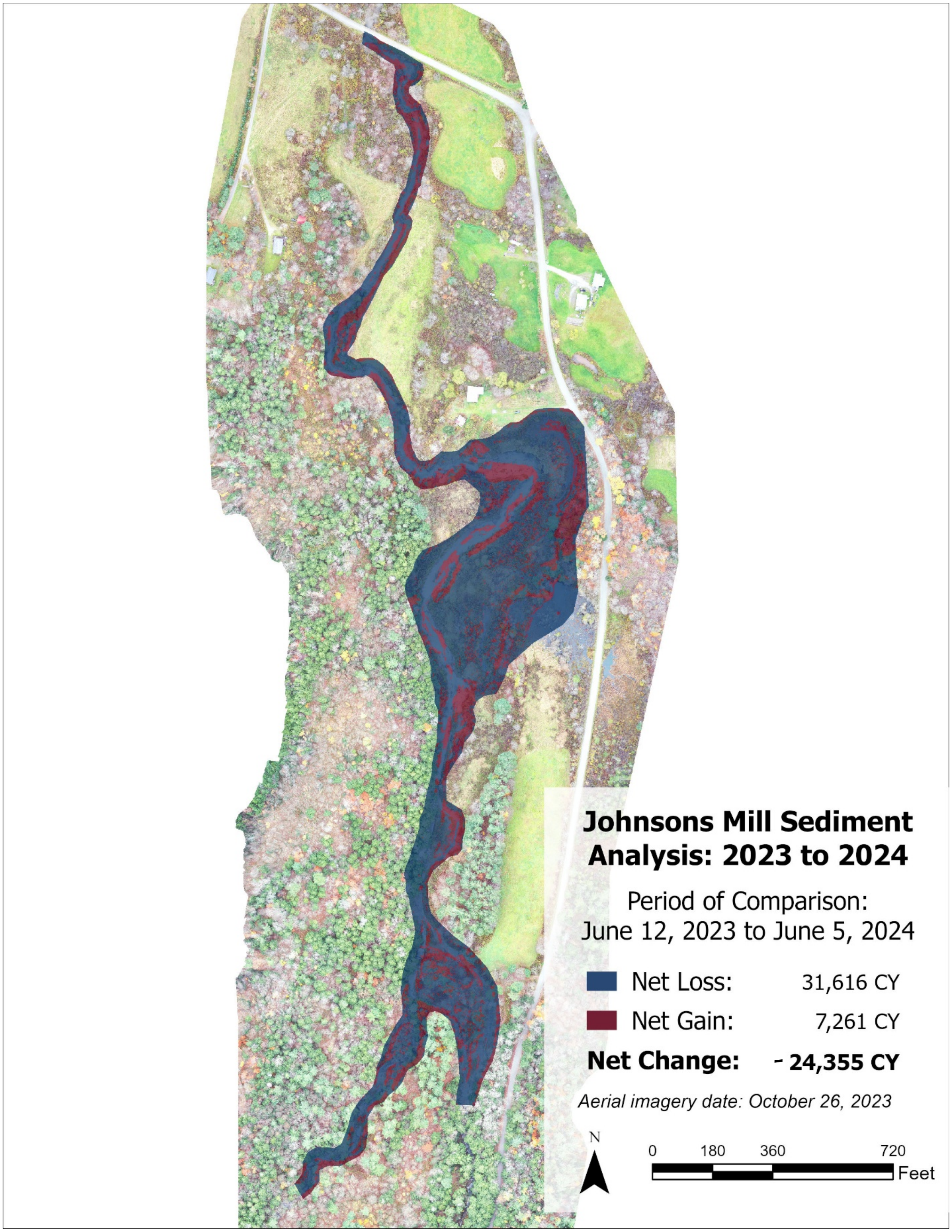


Figure 5. Map depicting areas of potential erosion (blue) and deposition (red) between Year 2 (2023) and Year 3 (2024) along the entire Bogue Branch reach within the project AOI.

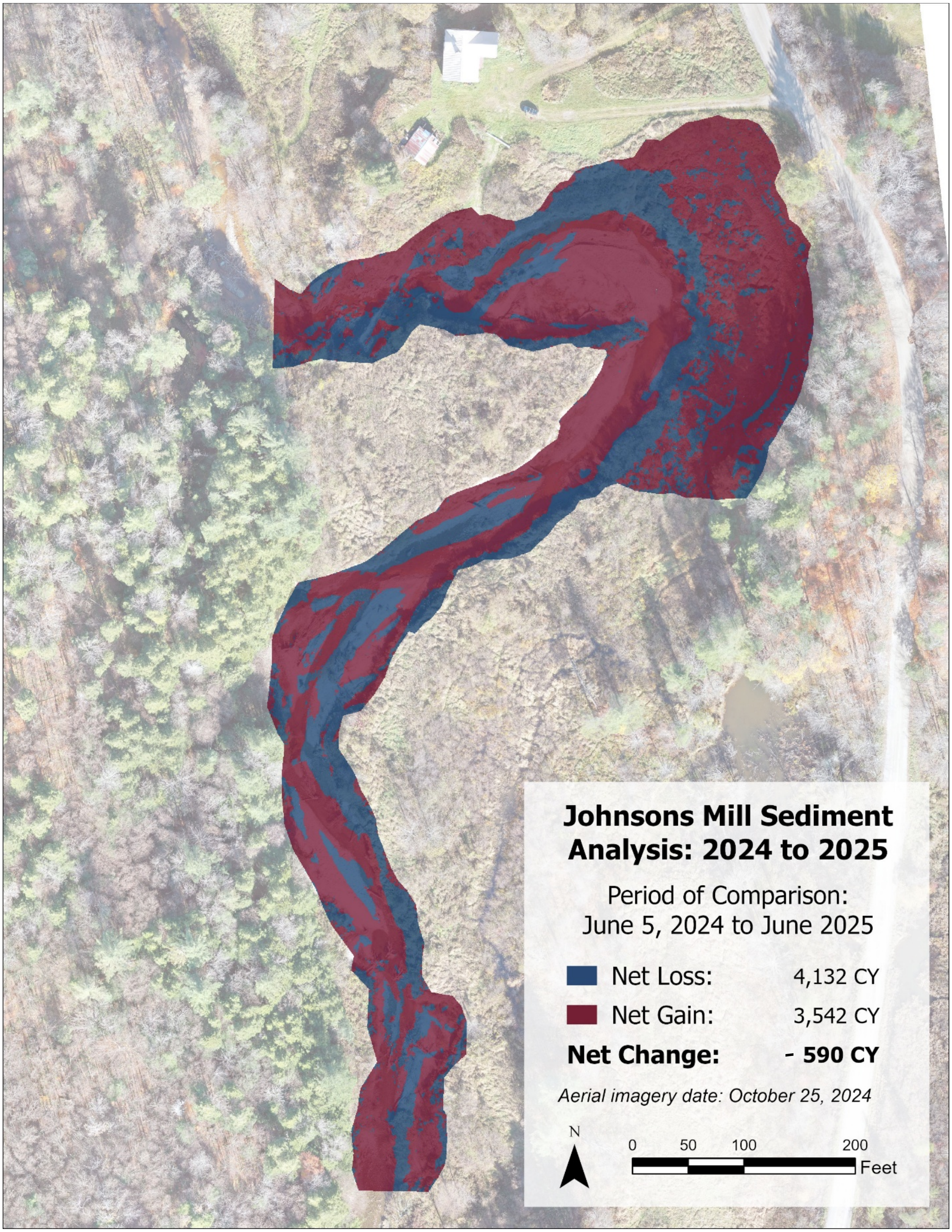


Figure 6. Map depicting areas of potential erosion (blue) and deposition (red) between Year 3 (2024) and Year 4 (2025) within the former dam impoundment.

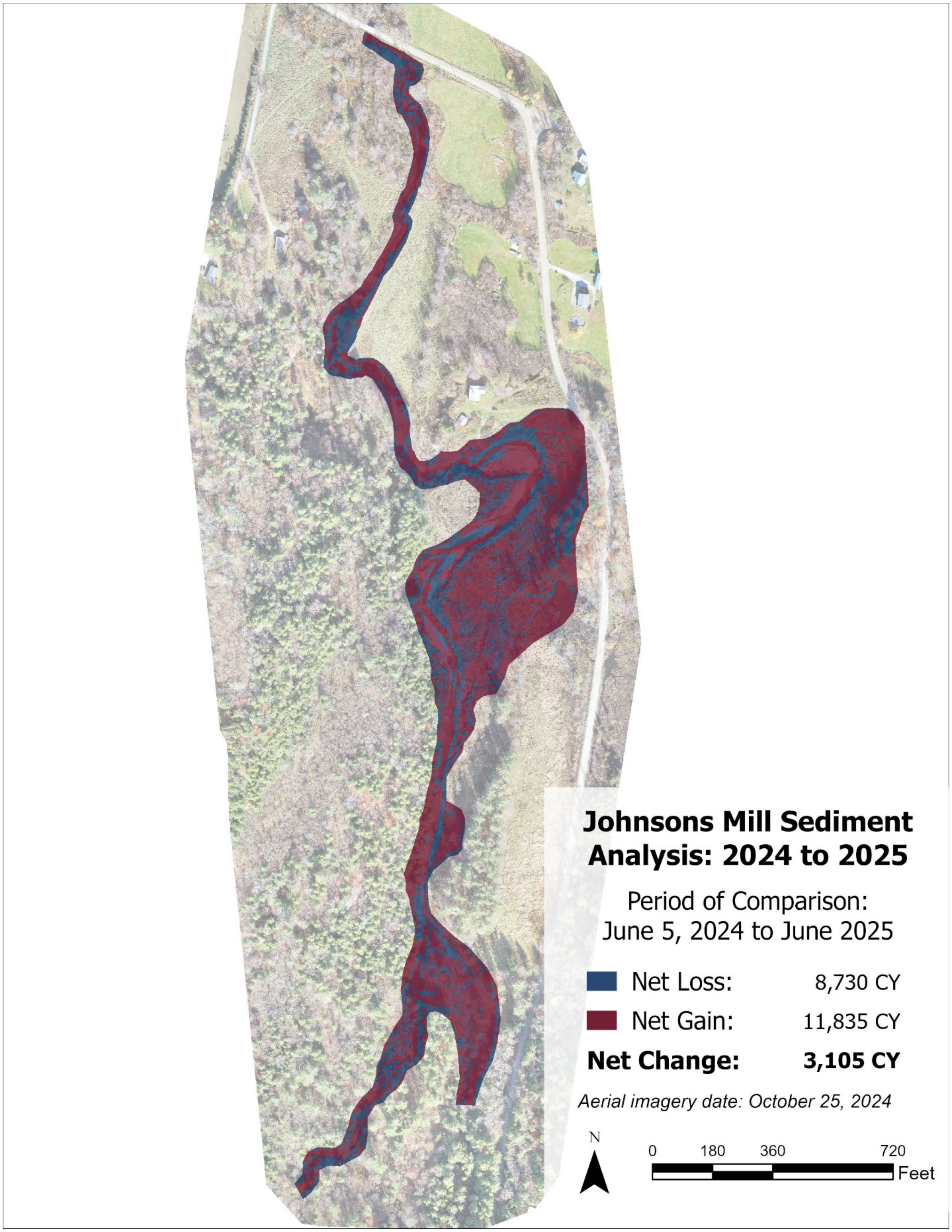


Figure 7. Map depicting areas of potential erosion (blue) and deposition (red) between Year 3 (2024) and Year 4 (2025) along the entire Bogue Branch reach within the project AOI.

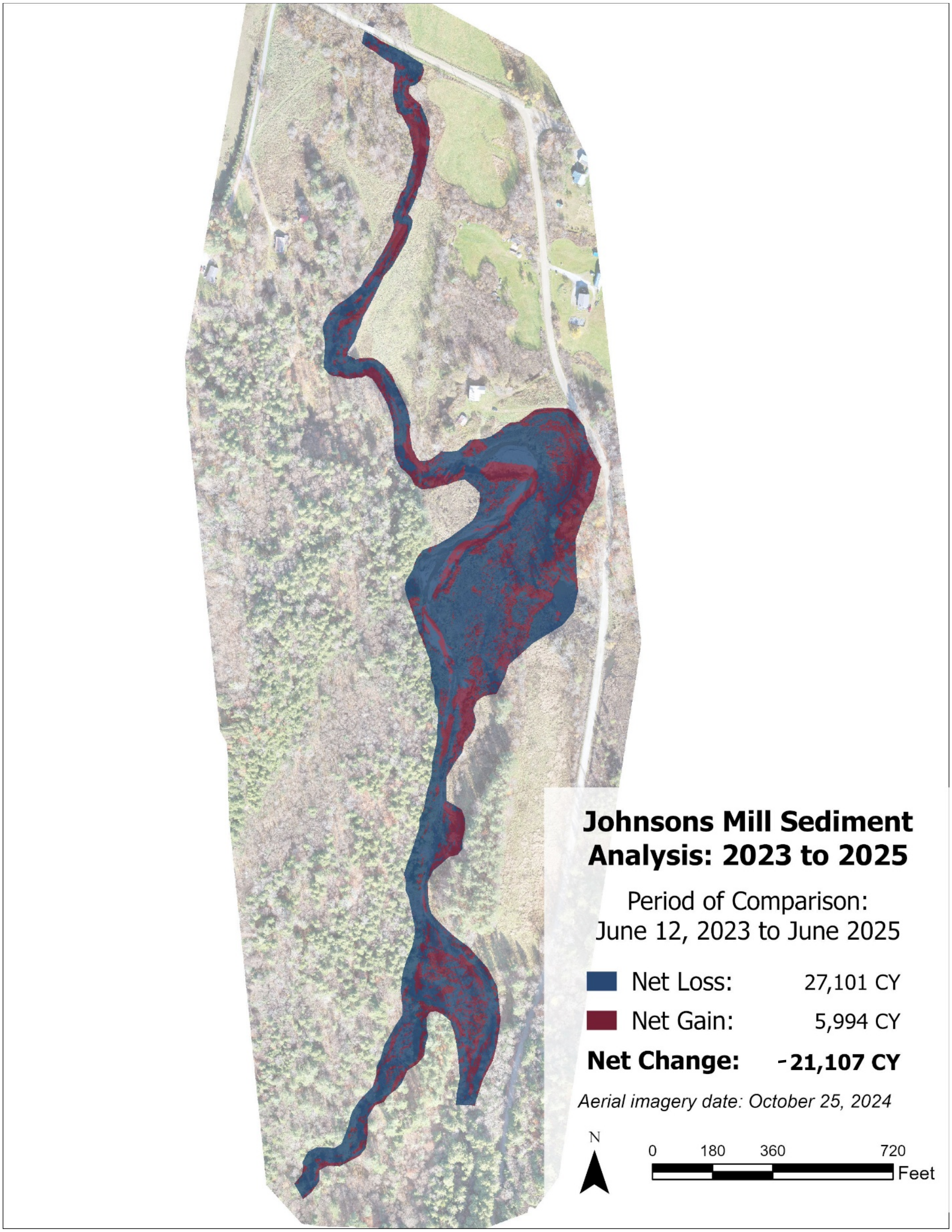


Figure 8. Map depicting areas of potential erosion (blue) and deposition (red) between Year 2 (2023) and Year 4 (2025) along the entire Bogue Branch reach within the project AOI.

3.1.2. Pre-Monitoring Study Datasets

While the uncertainty in results from comparisons of topographic and bathymetric datasets collected prior to the monitoring study is higher due to the variety of survey methods used, data acquisition extents, and spatial resolution, these comparisons still provided insight into areas of erosion and deposition and general magnitude of the volume of sediment transported through portions of the monitoring reach. The overall net change in these periods of comparison is not directly comparable to the annual net change seen in the comparisons presented for the monitoring study period. Results of these comparisons are summarized in Table 4 with erosions and deposition color maps provided in Figure 9 through Figure 11.

Table 4. Estimated sediment deposition and erosion volume by year.

Period of Comparison	Comparison Extent	Net Change[2]
October 2019 to December 2019 (Pre-Breach to Post-Breach)	Dam Impoundment	-1,024 ± 534
December 2019 to Fall 2021 (Post-Breach to As-Built)[1]	As-Built Extent	-118 ± 211
Fall 2021 to April 13, 2022 (As-Built to Monitoring Year 1)	As-Built Extent	-2,000 ± 160

[1]Calculated change falls within range of uncertainty; no measurable change.
[2]Negative values indicate net loss; positive values indicate net gain.

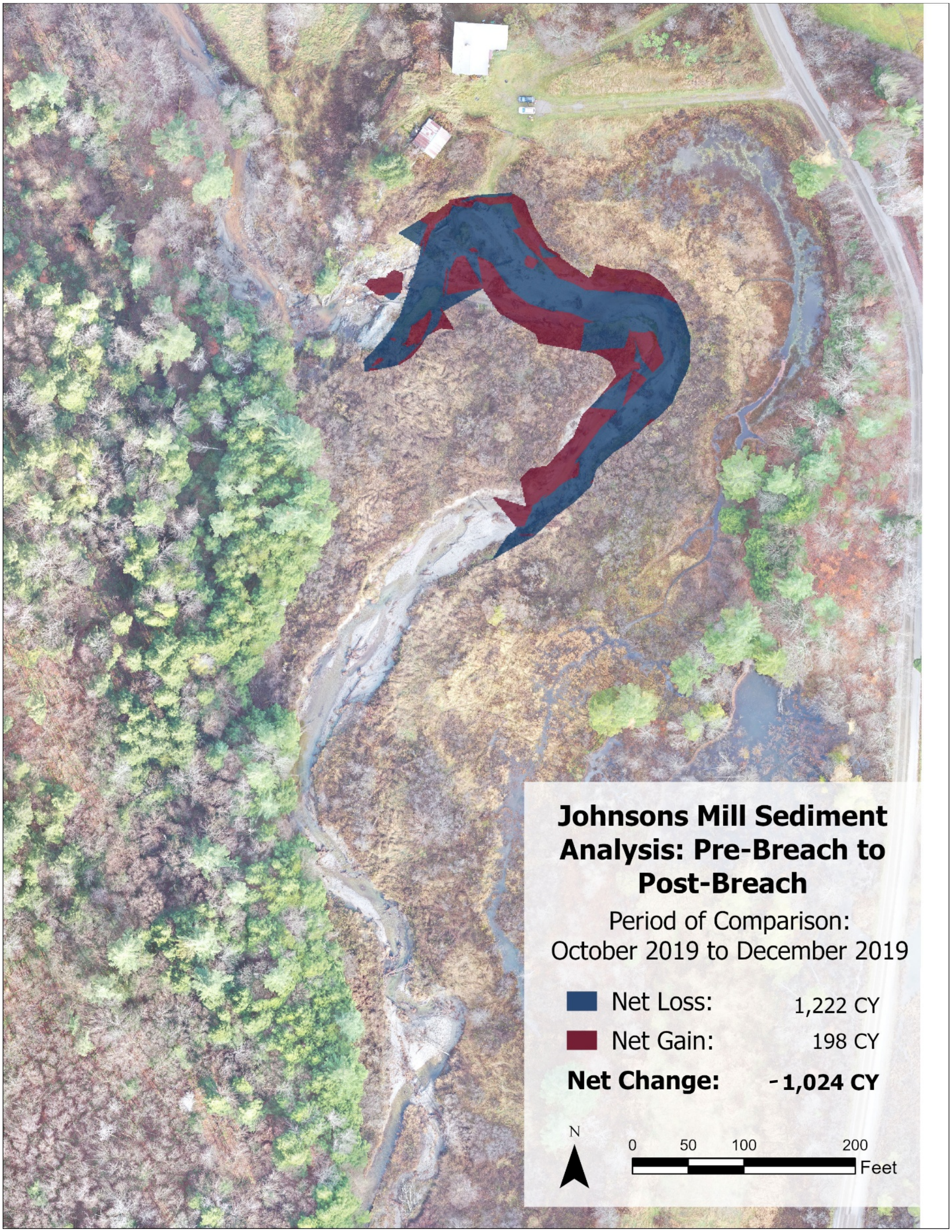


Figure 9. Map depicting areas of potential erosion (blue) and deposition (red) between Year 3 (2024) and Year 4 (2025) within the former dam removal project design extent.

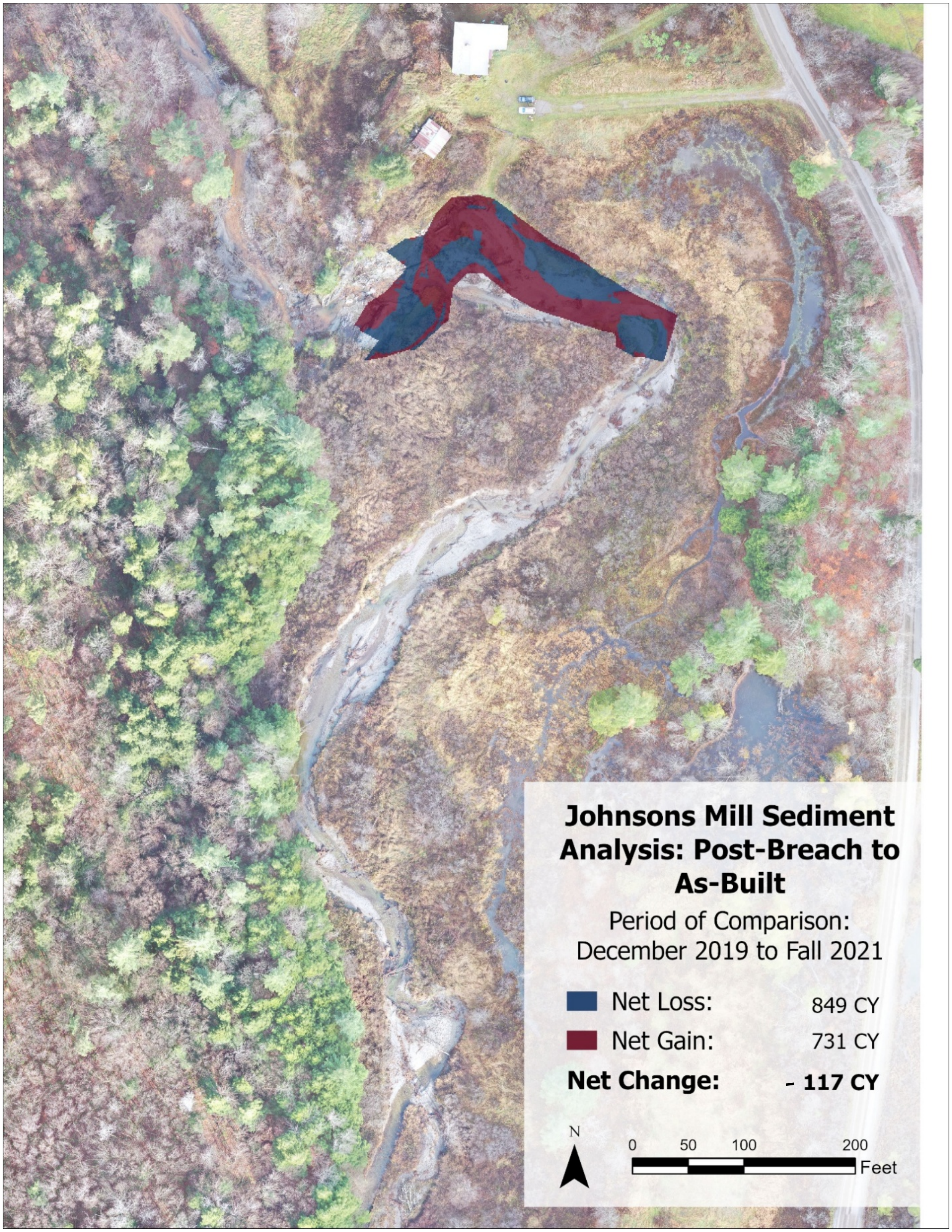


Figure 10. Map depicting areas of potential erosion (blue) and deposition (red) between post-breach and post-dam removal as-built total station surveys within the former dam removal project design extent.

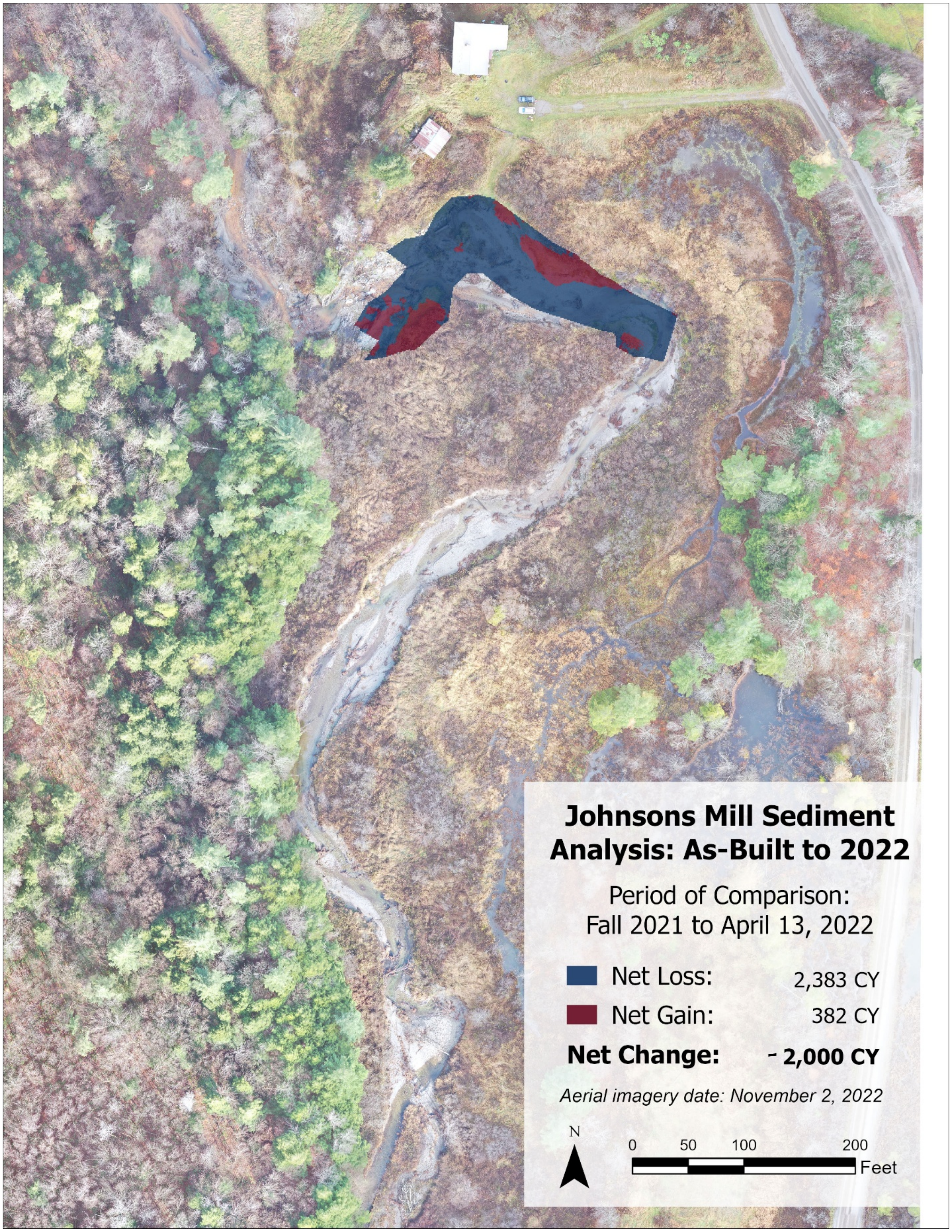


Figure 11. Map depicting areas of potential erosion (blue) and deposition (red) between the as-built total station survey and the UVM SAL 202 LiDAR data within the former dam removal design project extent.

3.2. Channel Migration & Evolution

Lateral channel migration was visualized over the entire reach of the Bogue Branch within the monitoring AOI, with adjustments measured at the meander bend within the former dam impoundment and dam removal project design reach. While year-to-year lateral shifts in the channel thalweg can be observed throughout the monitoring AOI, the largest lateral adjustments are seen within the former dam impoundment between Year 2 (2023) and Year 4 (2024) (Figure 12).

Aerial imagery collected at a higher frequency than the topographic and bathymetric lidar data sets was used to evaluate the extent of areal channel adjustment associated with each flood event in 2023. This analysis was completed for the meander bend within the former dam impoundment. Following the July 2023 Flood, the channel adjusted by 9,900 sq ft (Figure 13). Following the December 2023 Flood, the channel adjusted by an additional 5,460 sq ft (Figure 14). In both cases, erosion occurred along the outer bank of the meander bend and deposition contributed to the growth of the point bar on the inside of the meander bend, and with overall meander bend migration in the downstream direction. Imagery collected in summer 2025 shows the establishment of vegetation on the developing point bar.

Aerial imagery showing channel migration and planform evolution over the monitoring study period is provided in Appendix B.

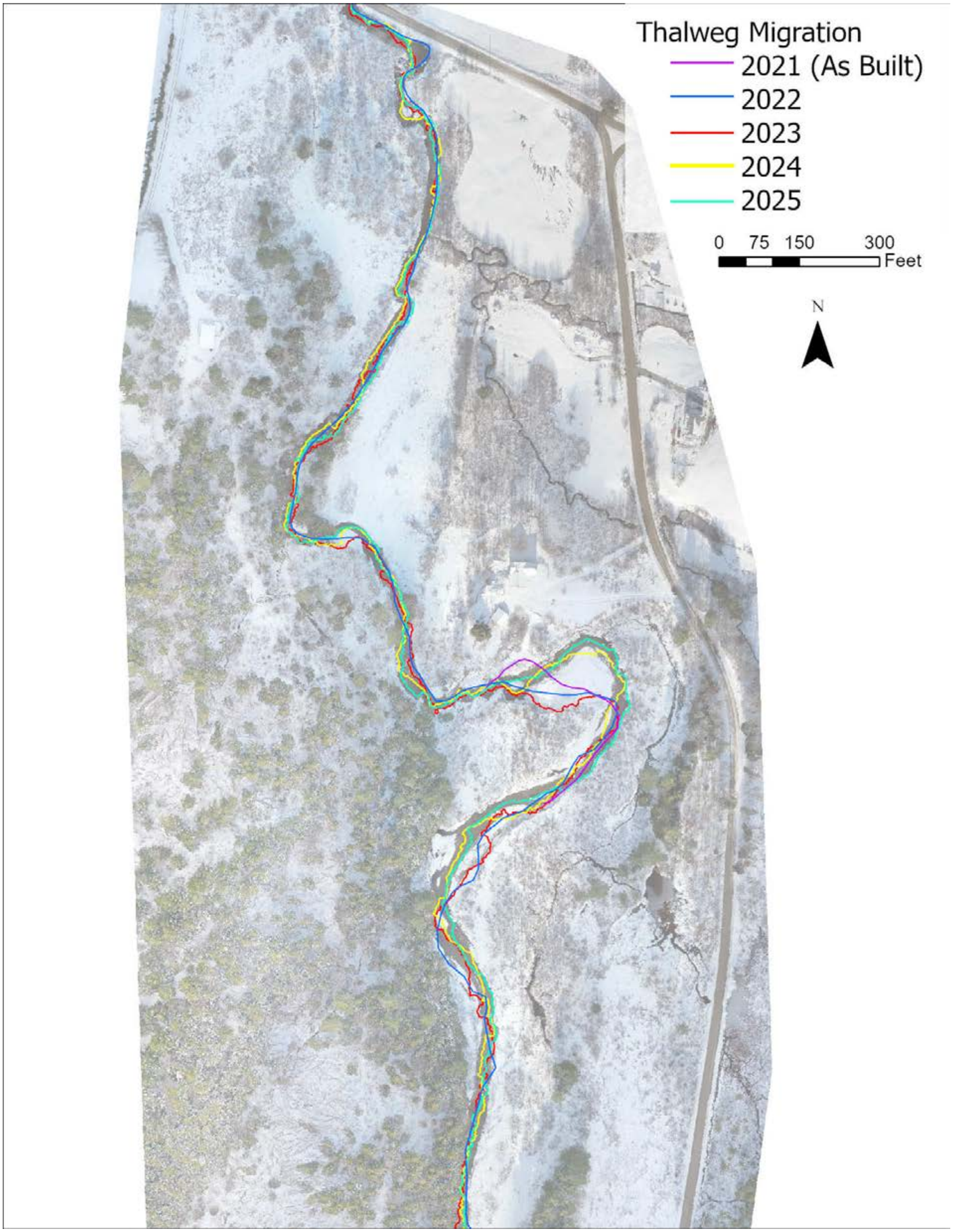


Figure 12. Figure comparing channel thalweg delineated from the as-built survey (2021), topographic LiDAR (2022),and topobathymetric LiDAR data collected in Year 2 (2023), Year 3 (2024), and Year 4 (2025).

Figure 13. Areal channel adjustment in former dam impoundment captured by imagery collected before (June 2023, outlined in yellow) and six days after the July 2023 Flood (shaded in red).

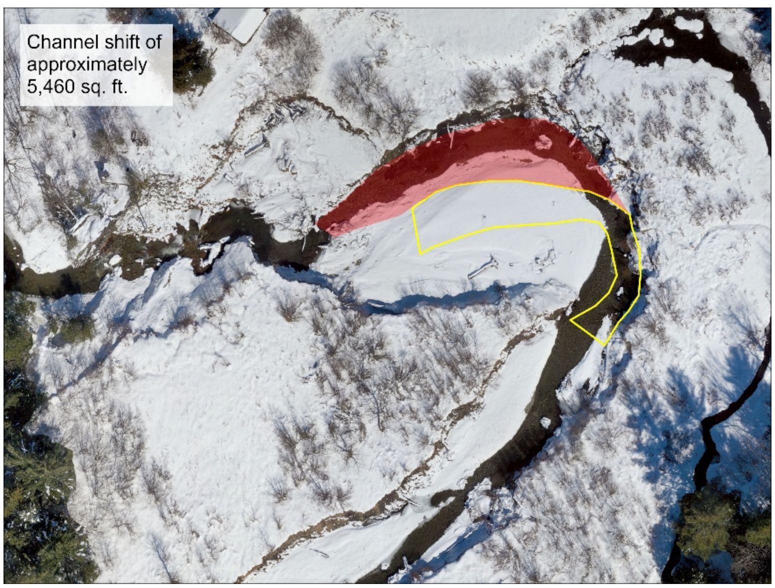


Figure 14. Areal channel adjustment captured by imagery collected before (October 2023, outlined in yellow) and after (March 2024, shaded in red) the December 2023 flood.

3.3. Limitations

It is important to note the limitations of the data collection and analysis methods applied in this monitoring study. Field data collection of streambed sediment data was limited to two locations in Reach 2; therefore, there is a lack of field observations of streambed sediment gradation, erosion, and aggradation in the reaches upstream and downstream of the former dam impoundment to inform the sediment transport analysis and provide context for the DEM comparison results.

Topographic and bathymetric data collected prior to the monitoring study did not have the same high resolution or span the same project extent. This makes it difficult to compare datasets from pre-monitoring study to the monitoring study datasets. This also introduces additional uncertainty in DEM comparisons.

The lack of pre-dam removal field monitoring and/or topographic and bathymetric data spanning the entire project AOI makes it difficult to draw conclusions around how the net change elevation results compare to changes seen due to processes such as erosion and deposition prior to the dam removal. While the dam impounded both water and sediment while it was in place and contributed to reduced stream velocity within the impoundment, it is also likely that fine sediment was mobilized downstream during high flow events even when the dam was in place. Additionally, this project did not include comparisons to publicly available aerial imagery or topographic LiDAR data collected prior to the dam removal design project. Future efforts could include those datasets in comparisons. While publicly available aerial imagery and topographic LiDAR datasets collected pre-dam removal exist for the project site, there is a lack of bathymetry data spanning the entire monitoring project AOI from the pre-dam removal period.

The DEM comparison results indicate the order of magnitude of sediment erosion and deposition between monitoring years. Generally, there is more confidence in changes detected in areas of known erosion, such as the meander bend in the former dam impoundment, than in the overbank or riparian areas that are not expected to have changed significantly. An example of a riparian area where significant deposition was not anticipated is the wetland area along river right (looking downstream) through the former impoundment. The DEM comparison in Figure 4 through Figure 8 indicate an increase in elevation in this area between 2023 to 2024, 2024 to 2025, and 2023 to 2025. Wetland complexes can attenuate flood flows, slowing water which leads to sediment deposition out of the water column. While this process may be contributing to the relative increase in elevation observed over subsequent monitoring years, additional investigations are needed into the primary drivers behind the detection of areas of deposition in the wetland complex.

4. Conclusions

The results of this monitoring effort indicate that the Johnsons Mill Dam removal has driven substantial channel adjustment through the former dam impoundment as the Bogue Branch continues to re-establish dynamic equilibrium. DEM comparisons and channel migration analysis show that the most significant geomorphic change occurred between 2023 and 2024, when two large flood events accelerated erosion, deposition, and downstream meander migration within the former impoundment and across the project corridor. By contrast, changes observed between 2024 and 2025 were within the range of uncertainty, suggesting that the rate of adjustment may be slowing as the system transitions toward a more stable equilibrium condition. Overall, the monitoring results suggest that the natural channel evolution with minimal sediment removal design approach was effective in promoting channel development, sediment transport, and floodplain re-establishment following removal of the Johnsons Mill Dam. This is confirmed by the measured channel slope in 2024 and 2025 approaching the anticipated target thalweg slope of 1% in the final dam removal design plans.

Continued observation would further improve understanding of long-term adjustment processes, particularly as vegetation becomes more established and the channel continues to respond to future flow events. During the monitoring period the development of point bars with vegetation and new floodplain areas can be seen in the aerial imagery and areas of deposition highlighted in the DEM comparison maps. However, it is important to acknowledge that the bank erosion and failure caused by the vertical and lateral adjustment of the channel through the former dam impoundment poses concerns as the meander bend approaches a private driveway and town road. These adjustments highlight the importance of understanding and communicating potential risks to nearby infrastructure when restoration approaches include minimal sediment removal and bank stabilization. Additionally, as the headcut at the former dam location migrated upstream, rootwads installed at the water level at the time of the dam removal became undermined or disconnected from the channel and floodplain and the streambed elevation dropped. This observations suggest that when a minimal sediment removal approach is taken to dam removal design it may be beneficial to wait until some natural channel evolution processes have occurred to install bank treatments and habitat features.

The detailed annual remote sensing data collected for this monitoring project provides a robust data set for future fluvial geomorphology studies and analyses of channel evolution.

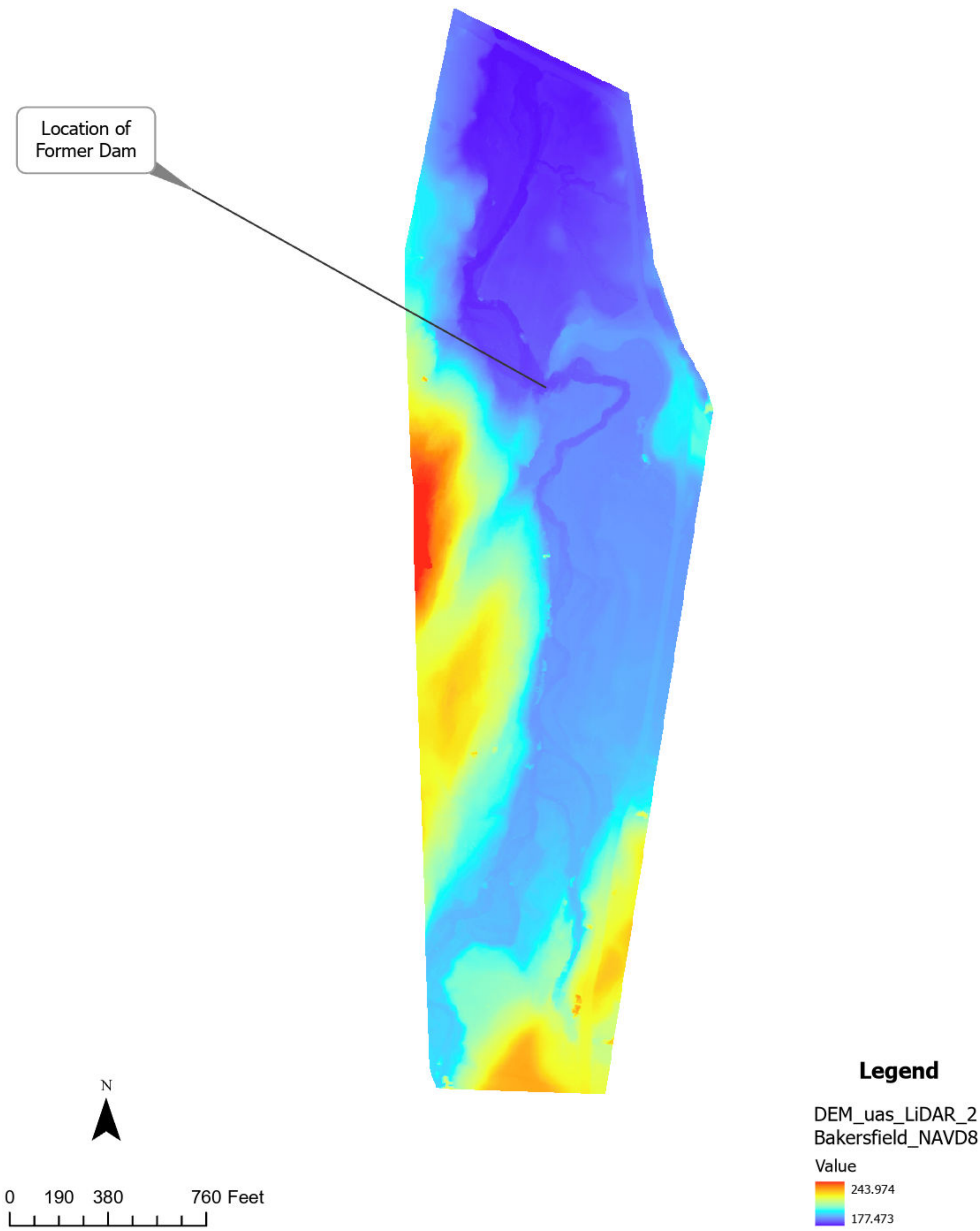
References

Rosgen, D.L. (1996) Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado

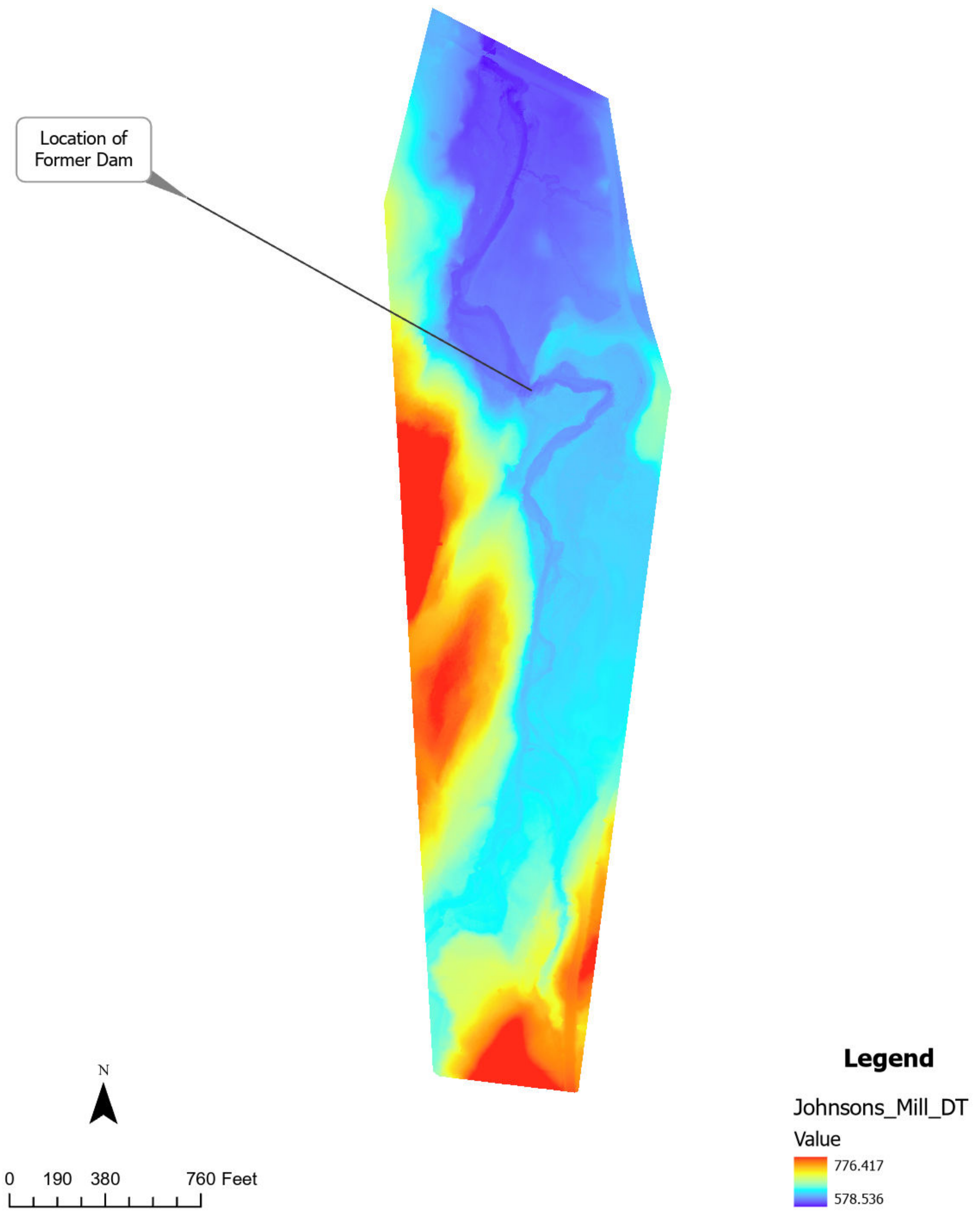
VTANR (2007) Stream Geomorphic Assessment Handbook.

Appendix A. LiDAR DEMs

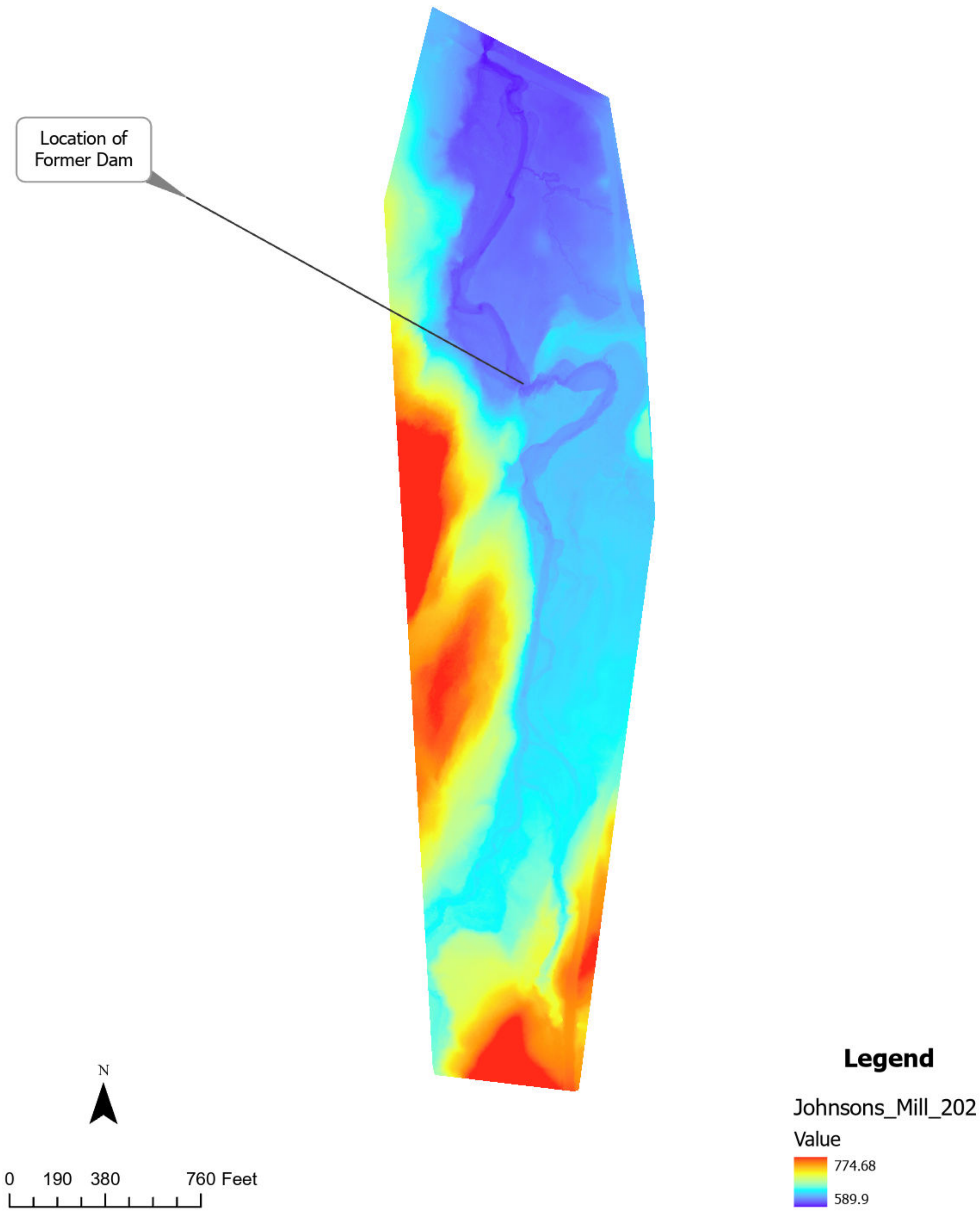
April 13, 2022



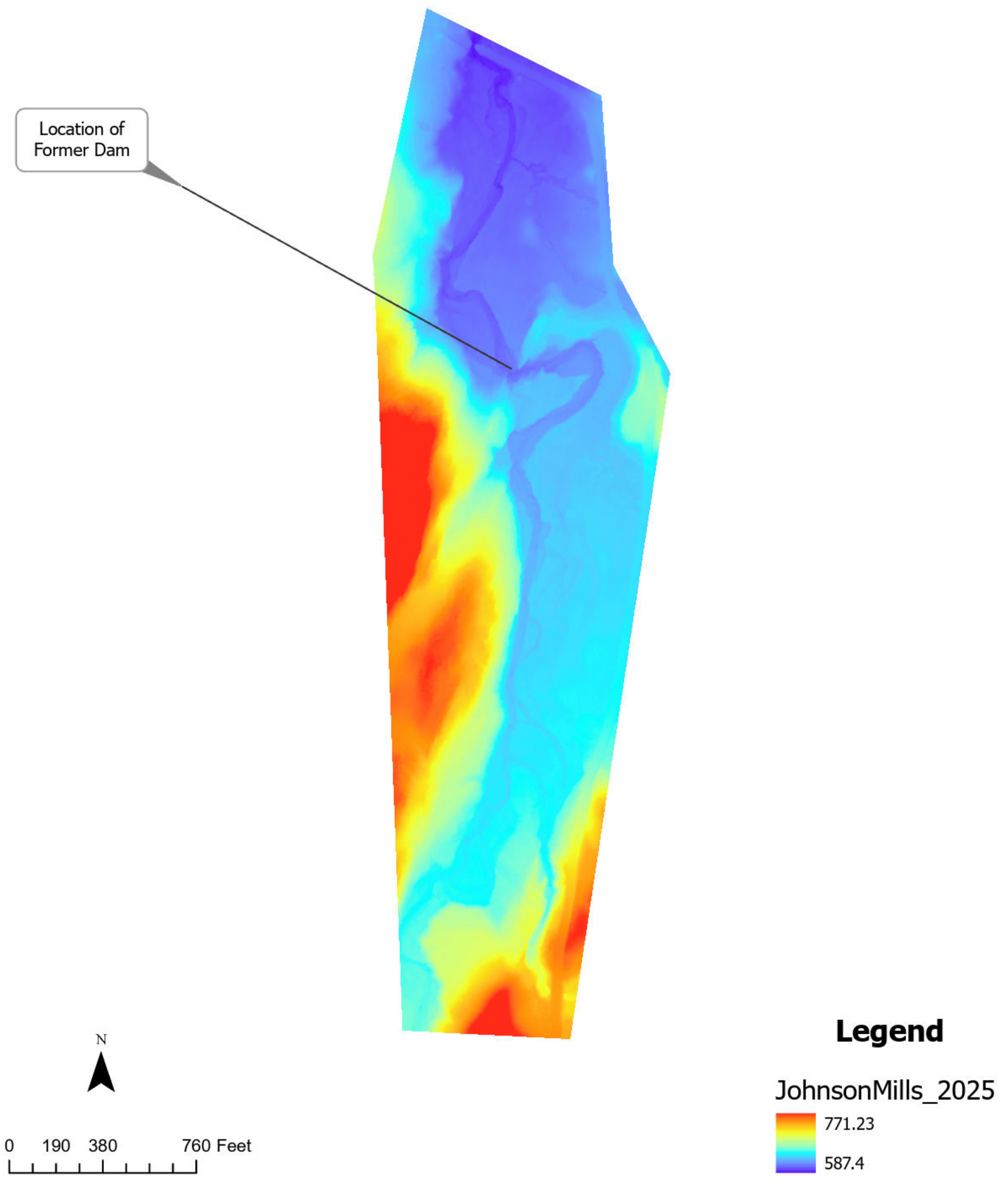
June 12, 2023


Location of Former Dam
N
0 190 380 760 Feet
Legend
Johnsons_Mill_DT
Value
776.417
578.536

June 5, 2024


Location of Former Dam
N
0 190 380 760 Feet
Legend
Johnsons_Mill_202
Value
774.68
589.9

August 2025

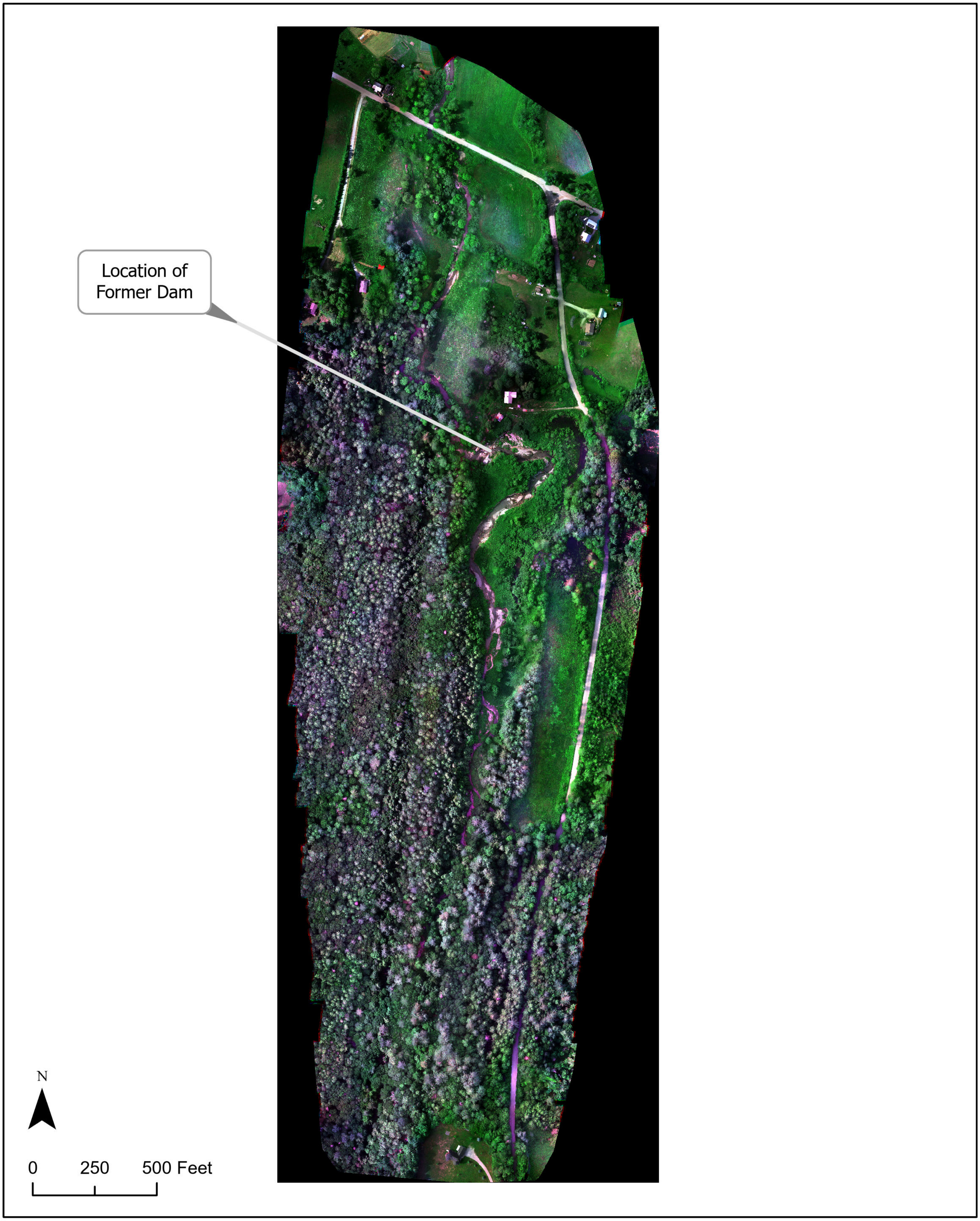

Location of Former Dam
N
0 190 380 760 Feet
Legend
JohnsonMills_2025
771.23
587.4

Appendix B. Orthomosaic Imagery

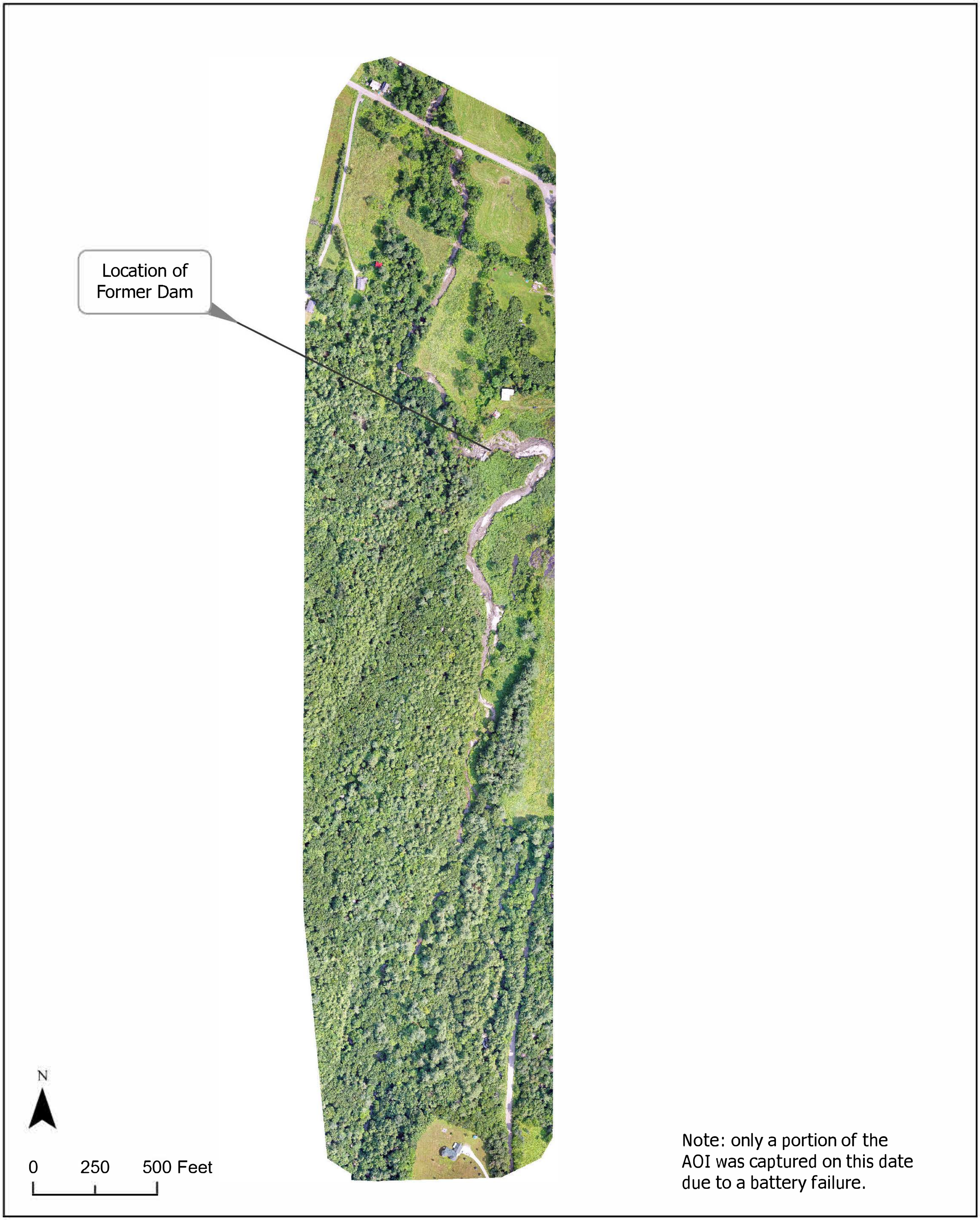
November 2022

Orthoimagery from January 9, 2023

Orthoimagery from June 12, 2023



Orthoimagery from July 17, 2023



Note: only a portion of the AOI was captured on this date due to a battery failure.

Orthoimagery from October 26, 2023

Orthoimagery from March 25, 2024

Orthoimagery from July 29, 2024

Orthoimagery from October 25, 2024

Orthoimagery from March 14, 2025

Orthoimagery from August 2025

Orthoimagery from March 19, 2025