2009

Assessment of LIDAR for Simulating Existing and Potential Future Marsh Conditions in Casco Bay: Appendix A. Figures

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APPENDIX A

Note: All base GIS imagery is courtesy of Maine Office of GIS.

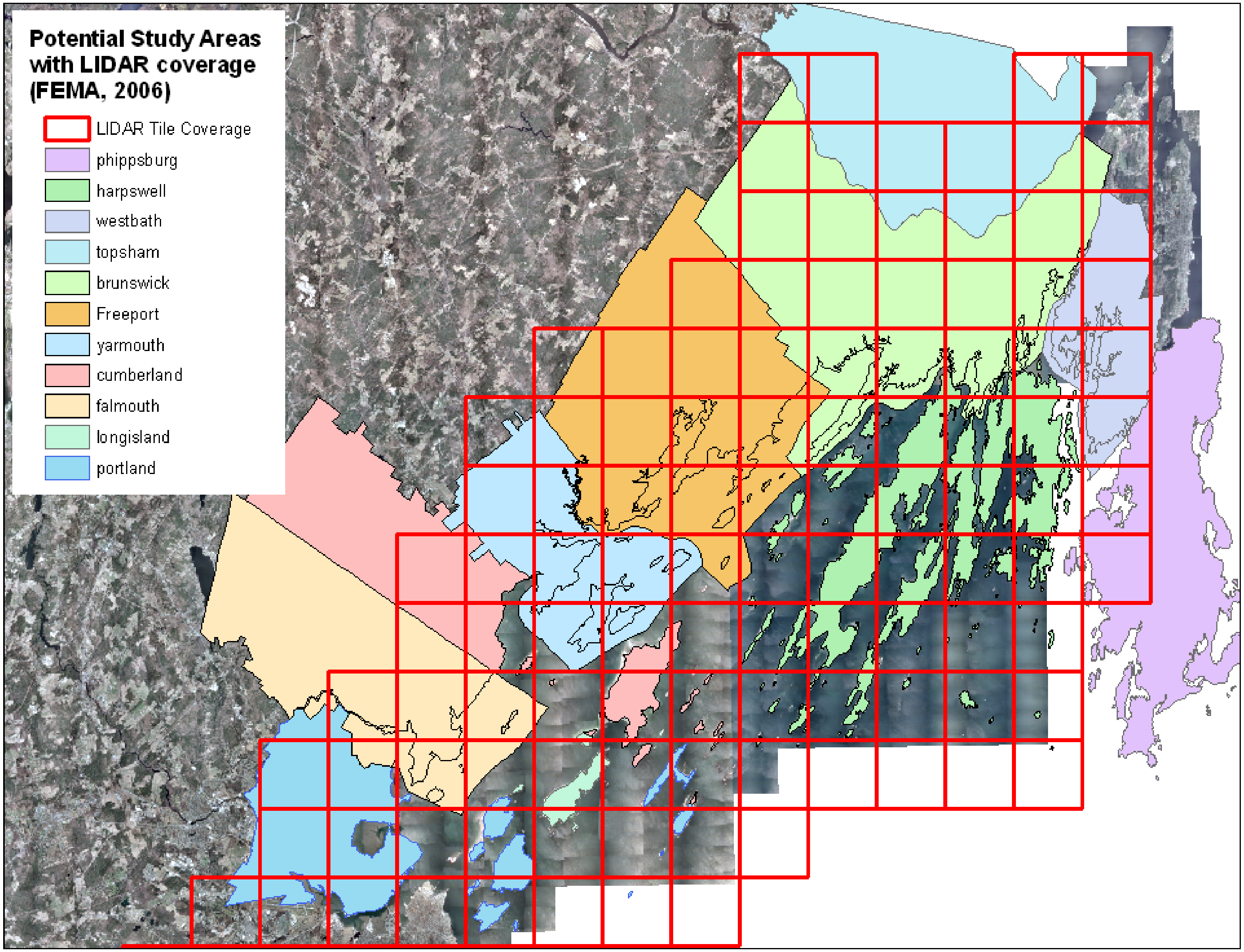


Figure 1. Spatial distribution of 2006 FEMA LIDAR coverage.

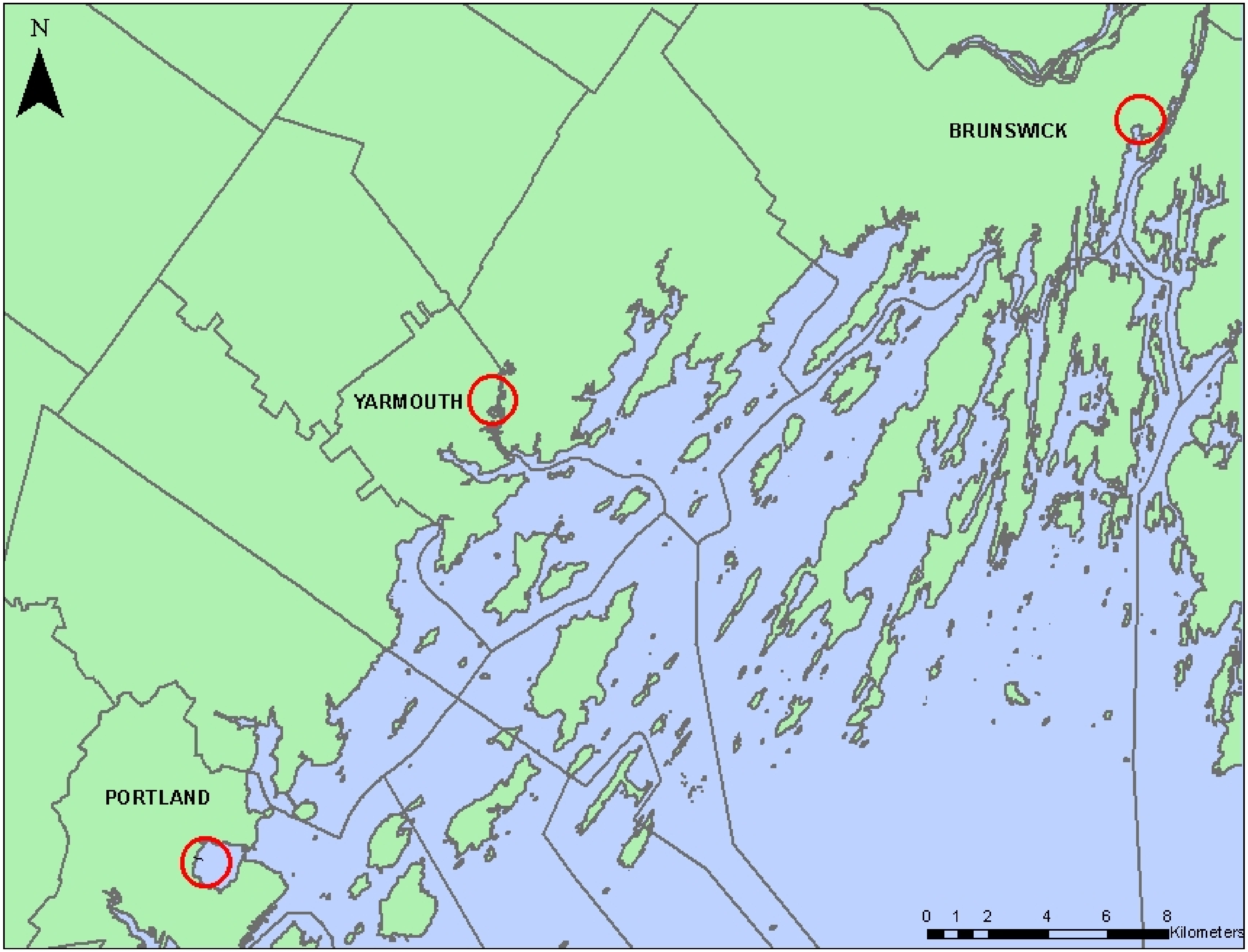


Figure 2. Locations of the 3 study areas: Cousins River, Yarmouth; Back Cove, Portland; and Thomas Bay, Brunswick.

Figure 3. Collected GPS data at the Cousins River study area. The study area can be divided into southern and northern portions.

Figure 4. GPS data collection at Back Cove, Portland.

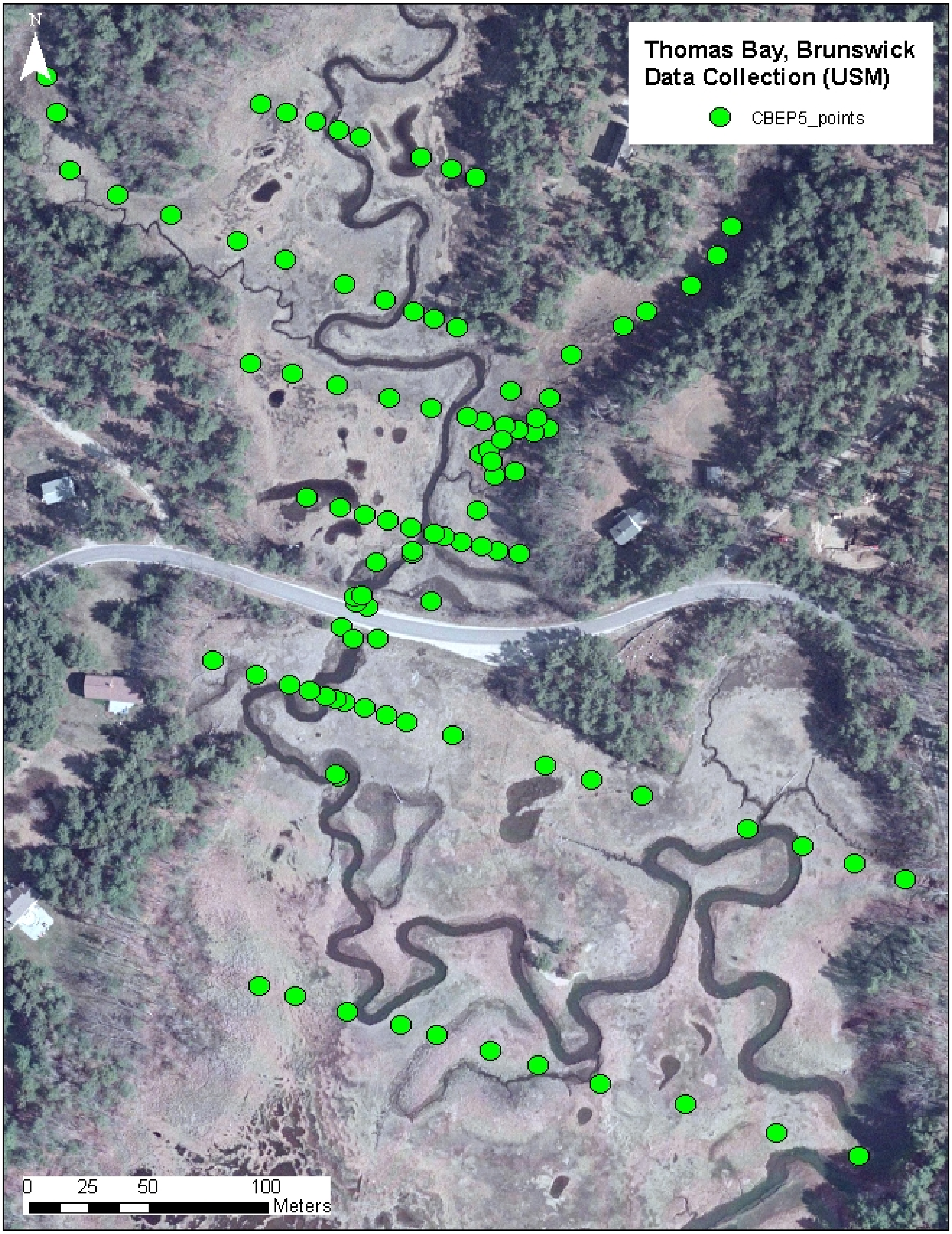


Figure 5. GPS data collection by USM GIS Laboratory at Thomas Bay marshes, Brunswick.

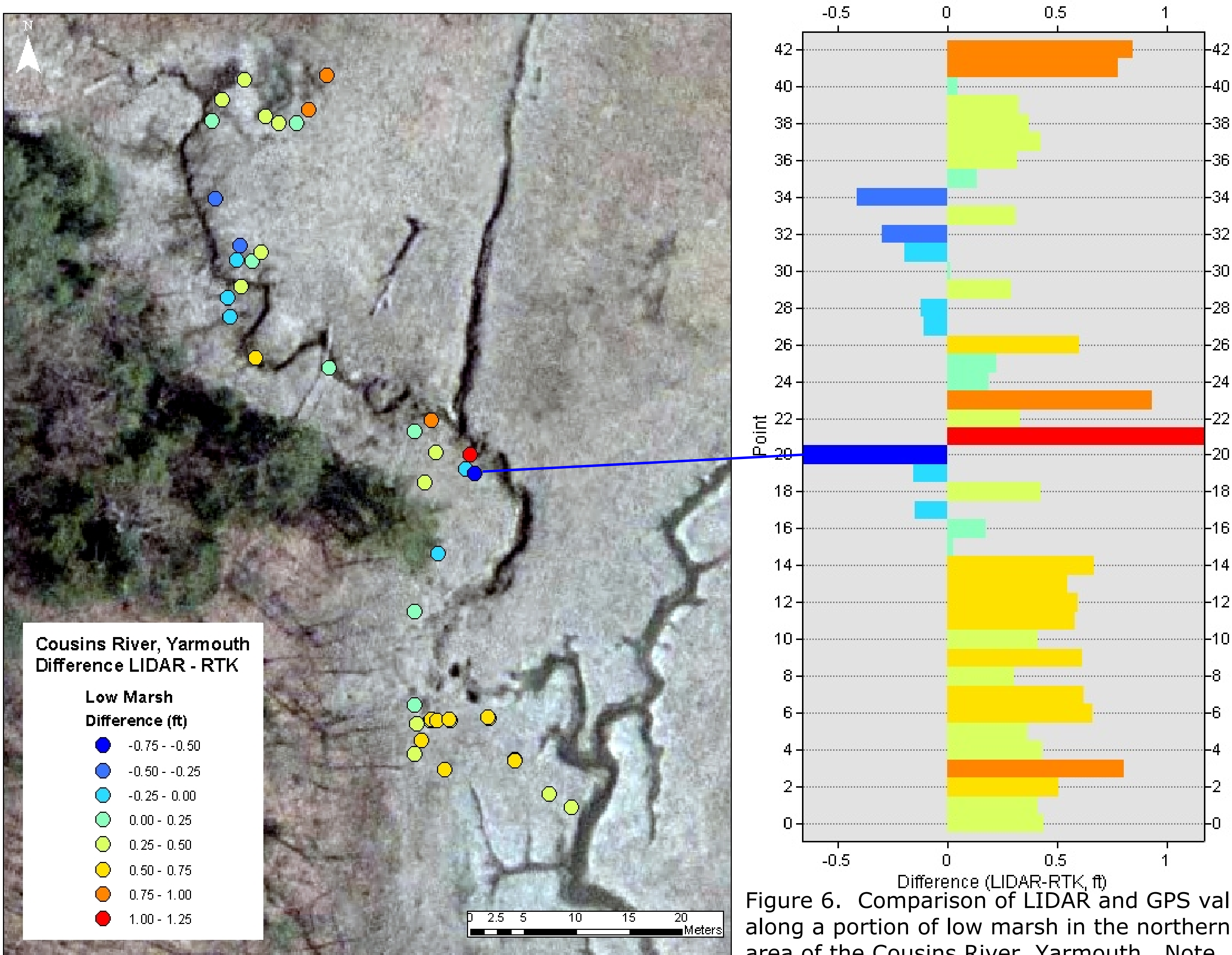


Figure 6. Comparison of LIDAR and GPS values along a portion of low marsh in the northern study area of the Cousins River, Yarmouth. Note positive bias.

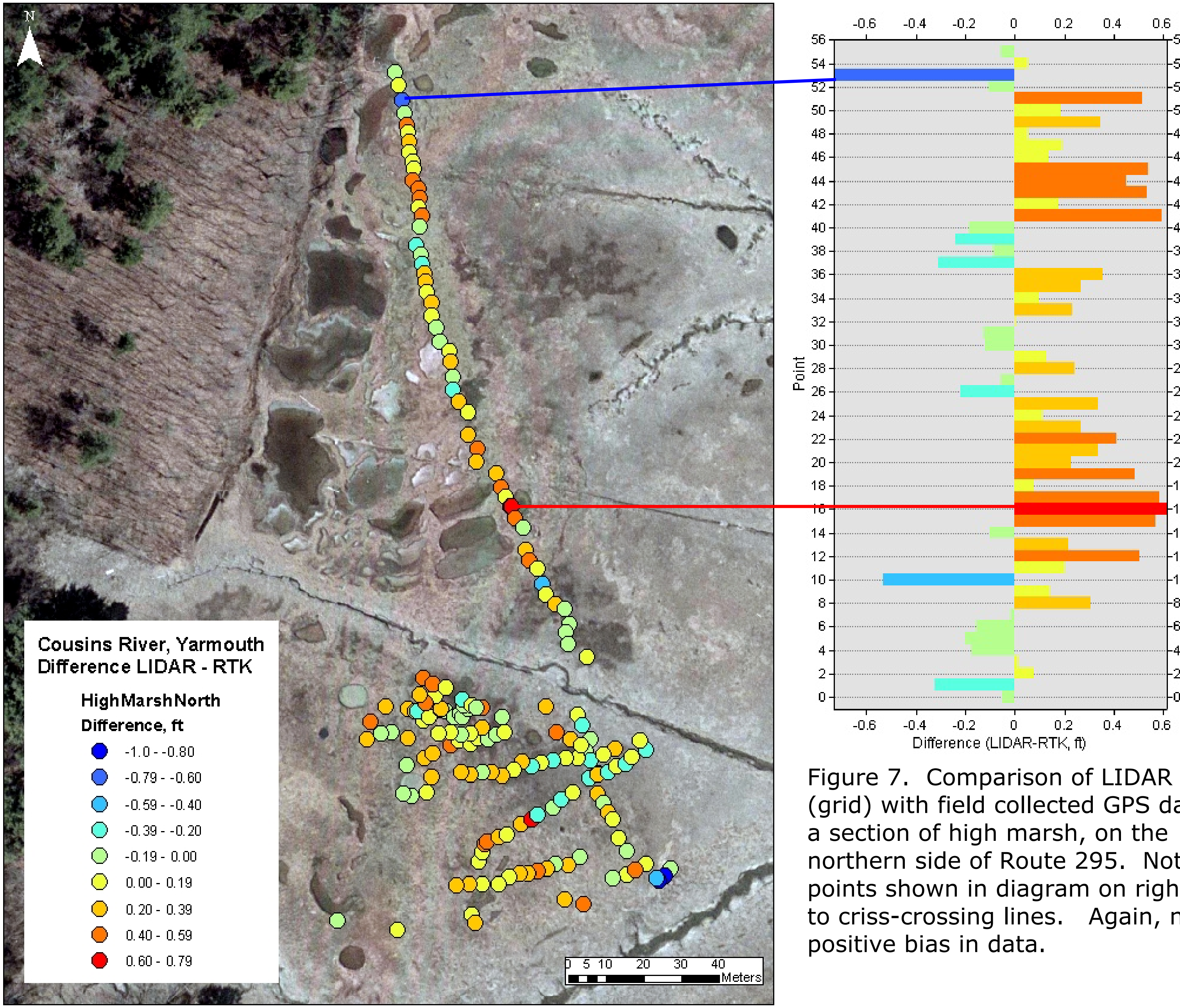


Figure 7. Comparison of LIDAR data (grid) with field collected GPS data for a section of high marsh, on the northern side of Route 295. Not all points shown in diagram on right due to criss-crossing lines. Again, note positive bias in data.

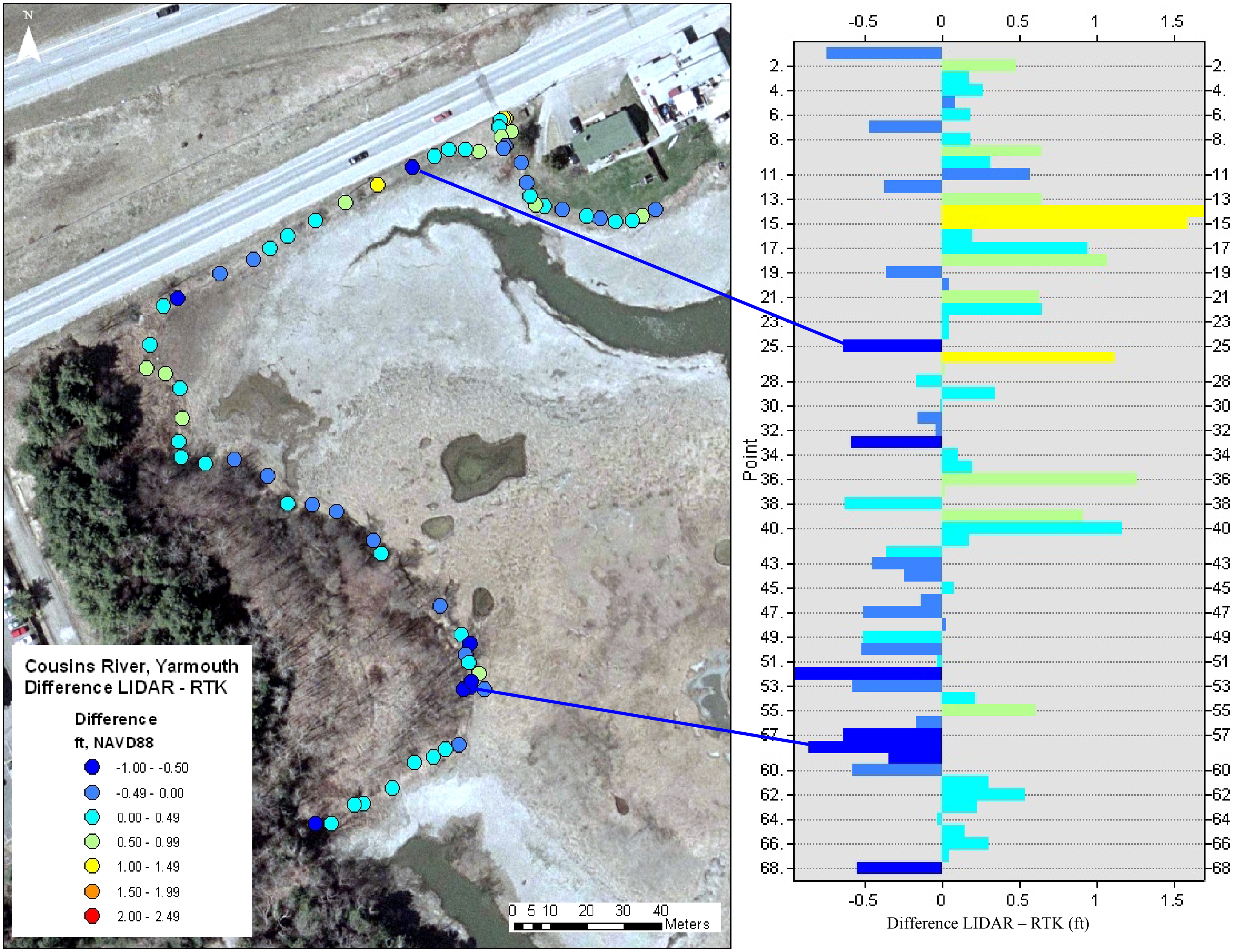


Figure 8. Variation of difference in elevations of the HAT boundary for the southern area.

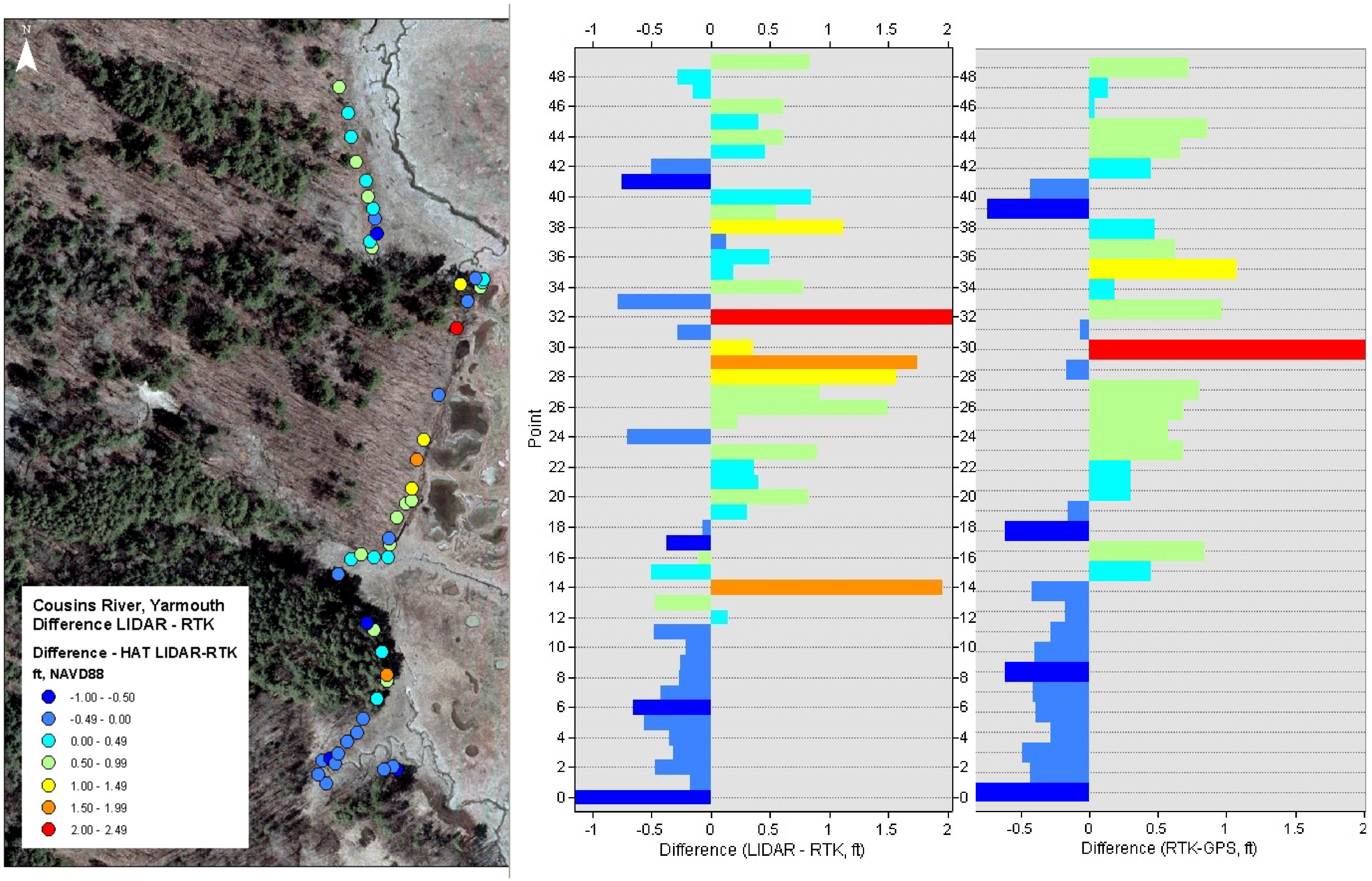


Figure 9. Comparison of unfiltered (center) and filtered (far right) LIDAR data at the HAT boundary in the northern marsh. Filtered GPS data decreased the overall difference between LIDAR and GPS to an average near +0.1 ft.

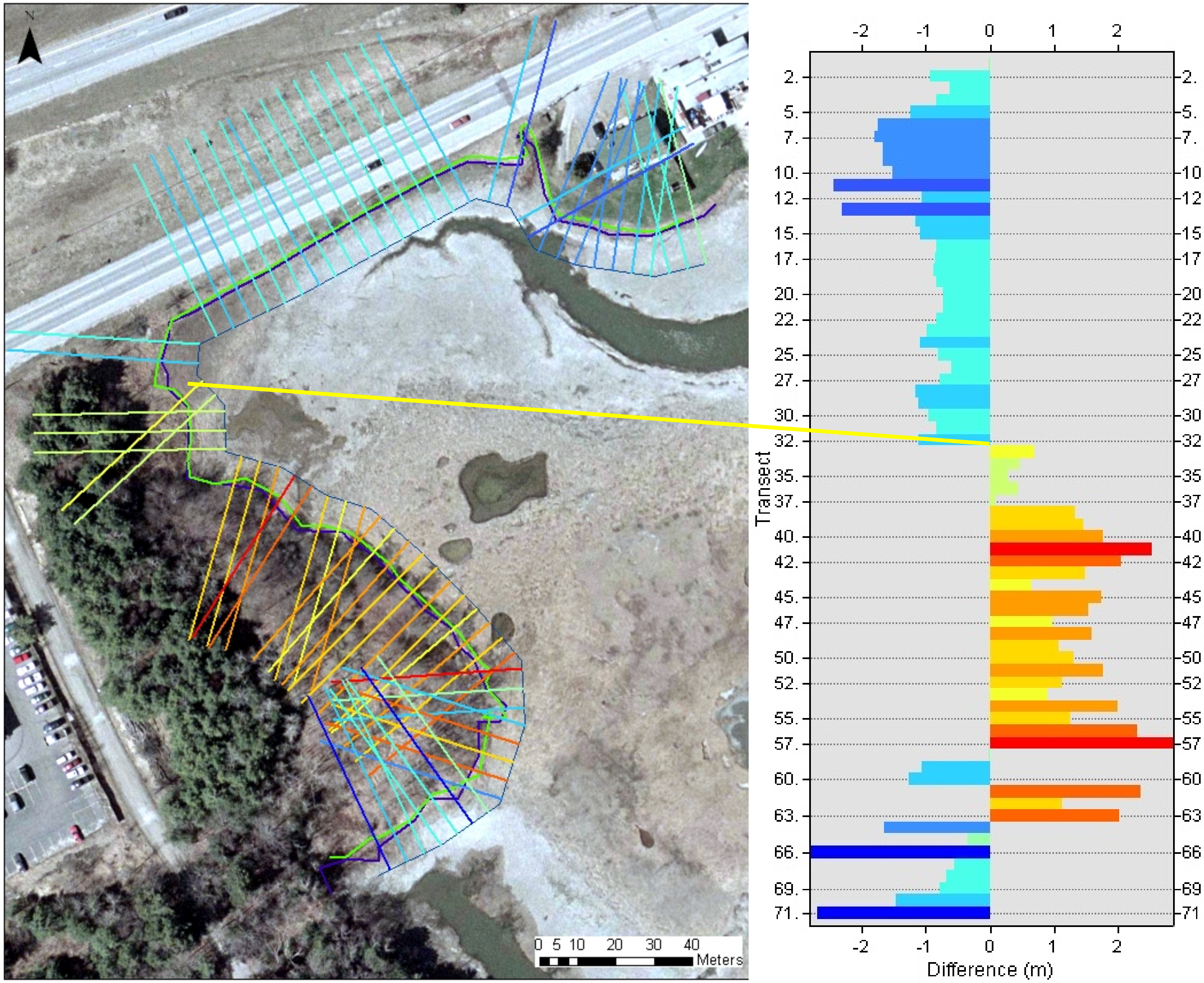


Figure 10. Difference in horizontal position of HAT boundary extracted from LIDAR (blue line) and field mapped boundary (green line) for the southern marsh area. The LIDAR overestimates (positive values, too far landward) the boundary along wooded areas, and underestimates the boundary (negative values, seaward) along the more open areas.

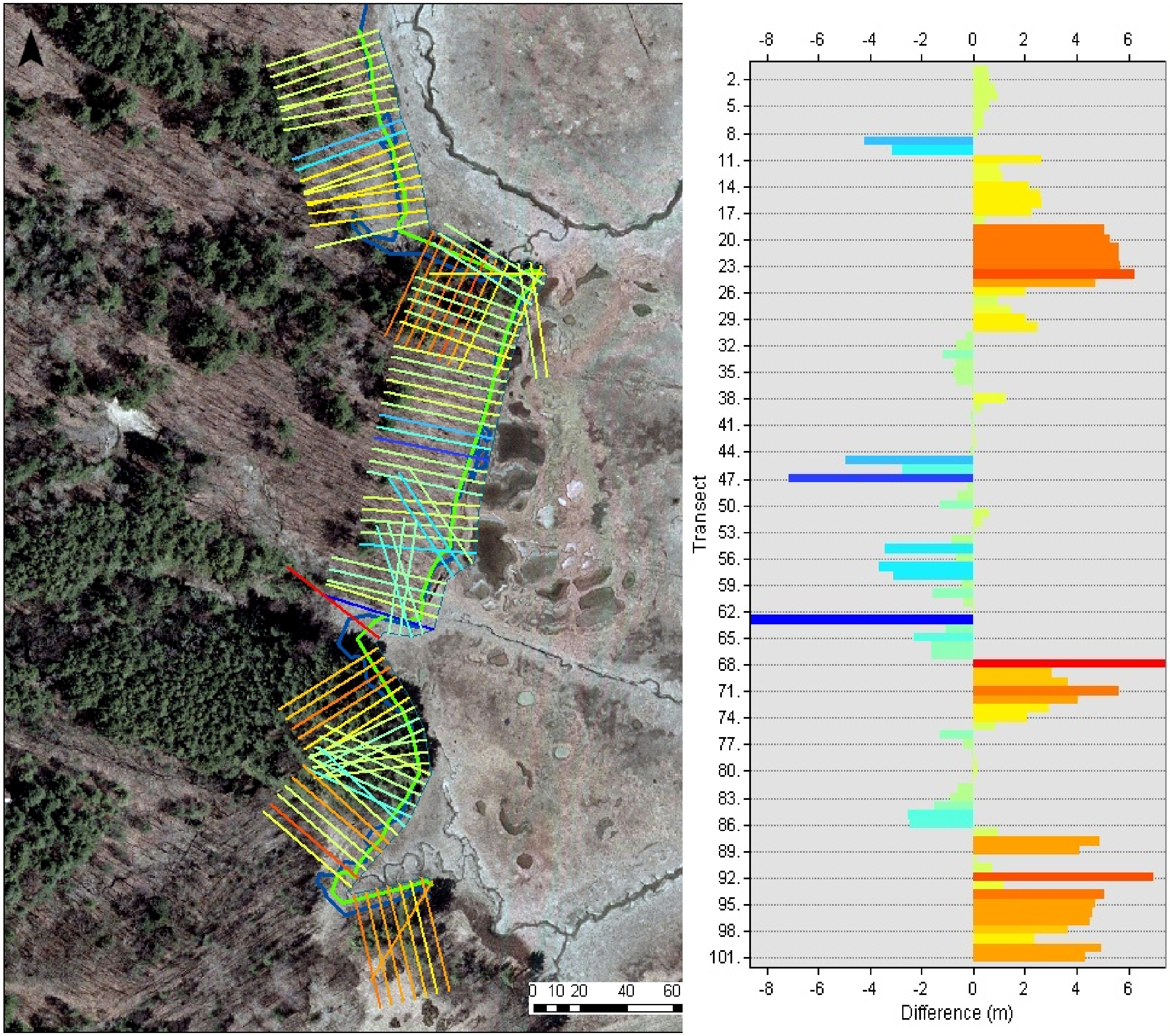


Figure 11. Comparison of HAT boundaries in the northern portion of the study area indicates that the LIDAR data has a tendency to overestimate (positive values) the inland extent of the boundary along heavily wooded areas.

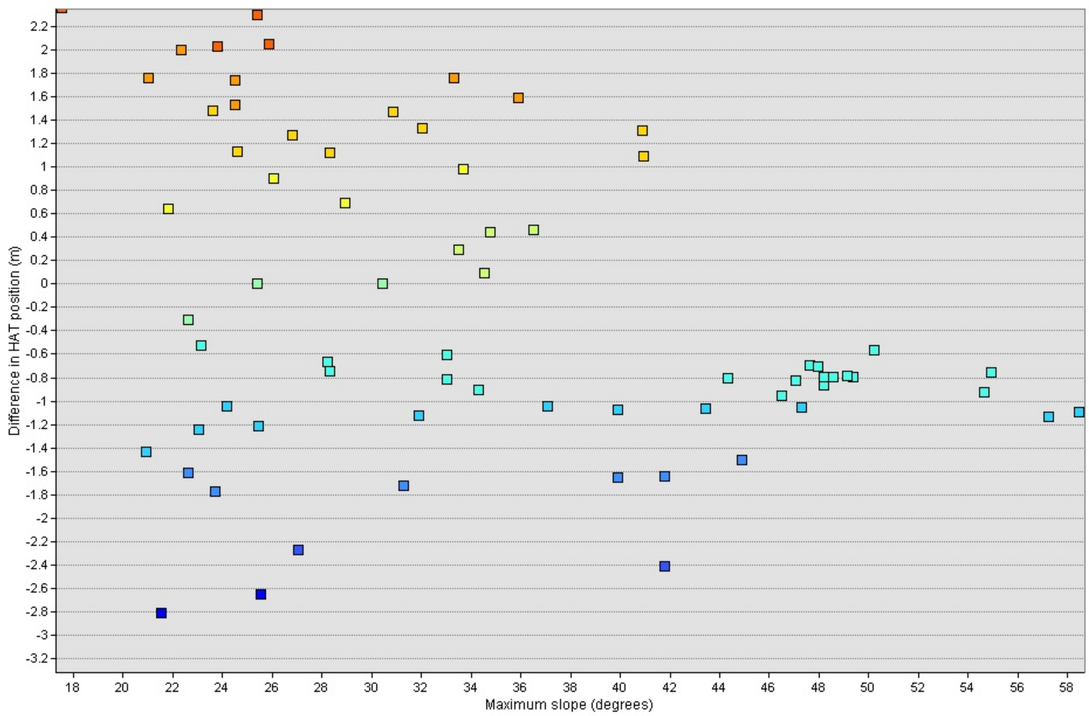
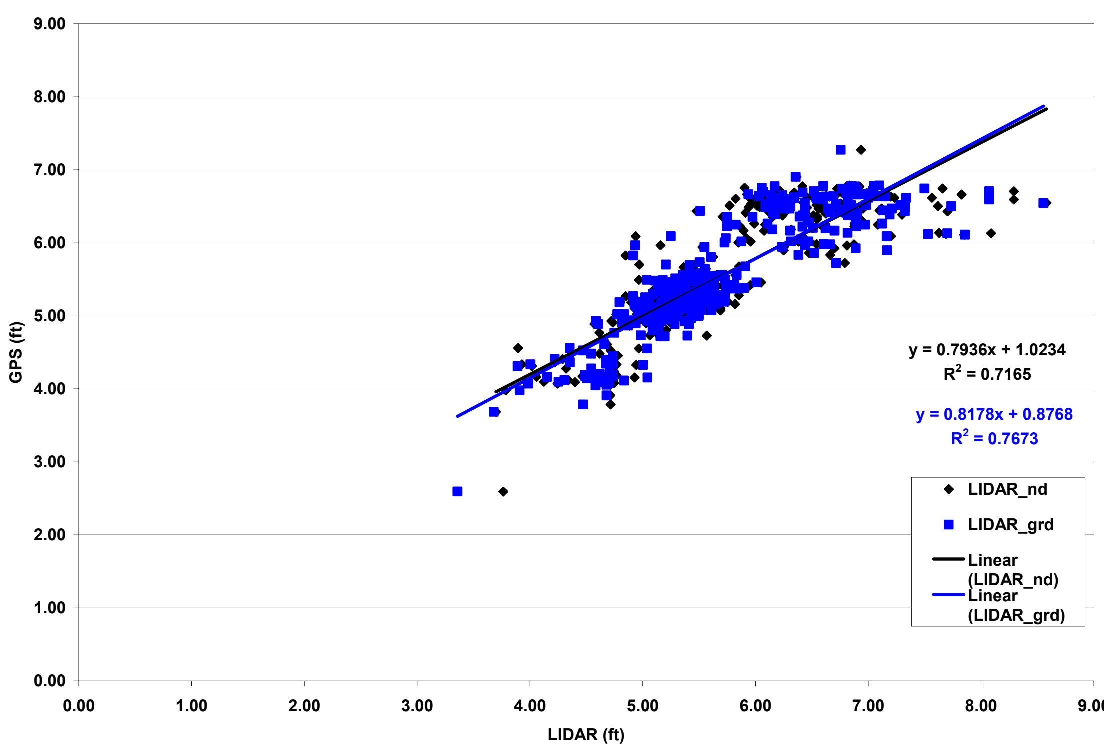


Figure 12. There is no linear relationship between the difference in the HAT position and maximum slope; however, it appears that when slopes exceed about 35-40%, the LIDAR will underestimate the boundary's inland position.
Figure 13. Although the relationship is not perfect, there is a strong linear relationship between LIDAR being able to accurately predict measured GPS values. Gridded data appears to work slightly better.



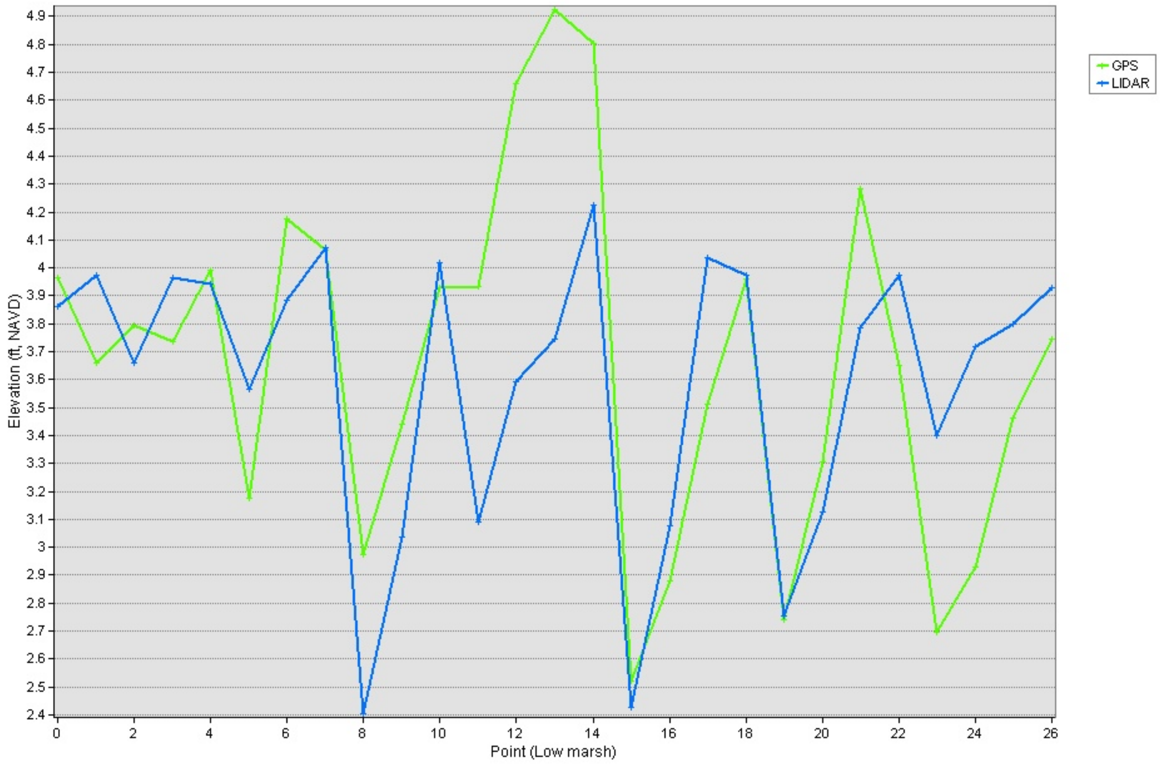
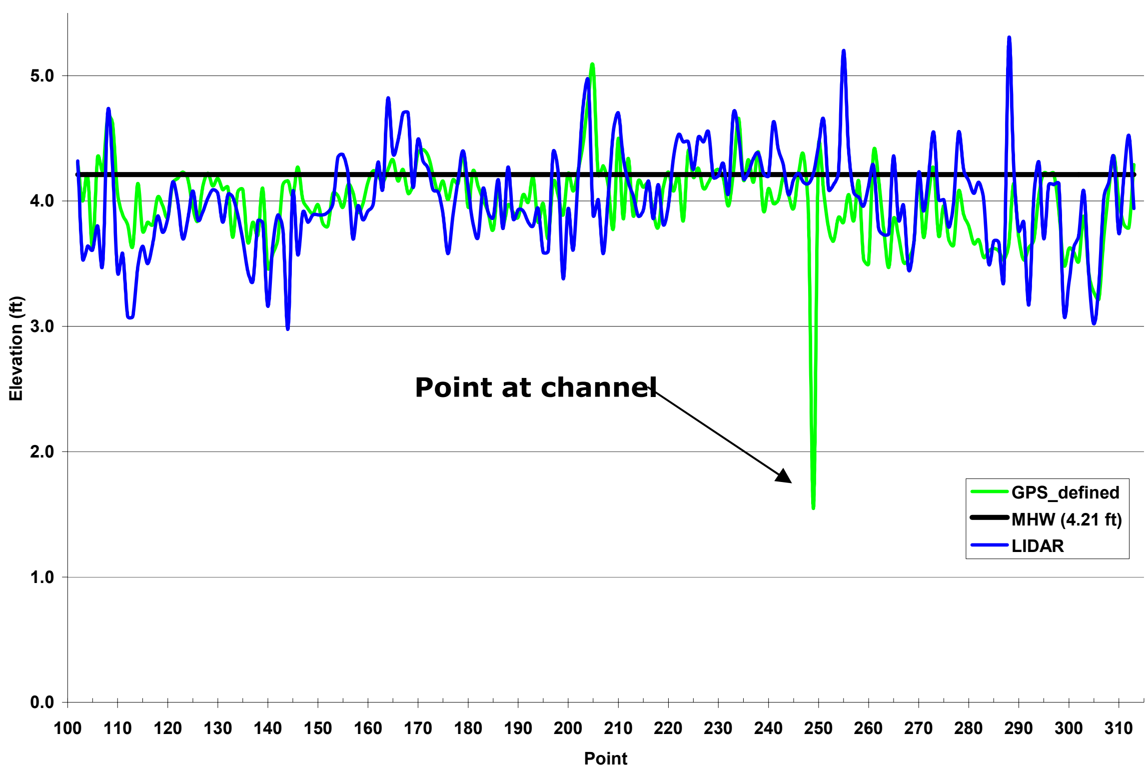


Figure 14. Relationship between LIDAR and GPS elevations within the low marsh. We are unclear as to the high value of the GPS data at this central point.

Figure 15. Relationship of LIDAR and GPS elevations along the high-low marsh (MHW proxy) boundary. The MHW line is shown in black. Note GPS elevations are higher along the left to center portion of the graph, and lower than LIDAR values to the right. The extremely low GPS point appears to be near a new channel.



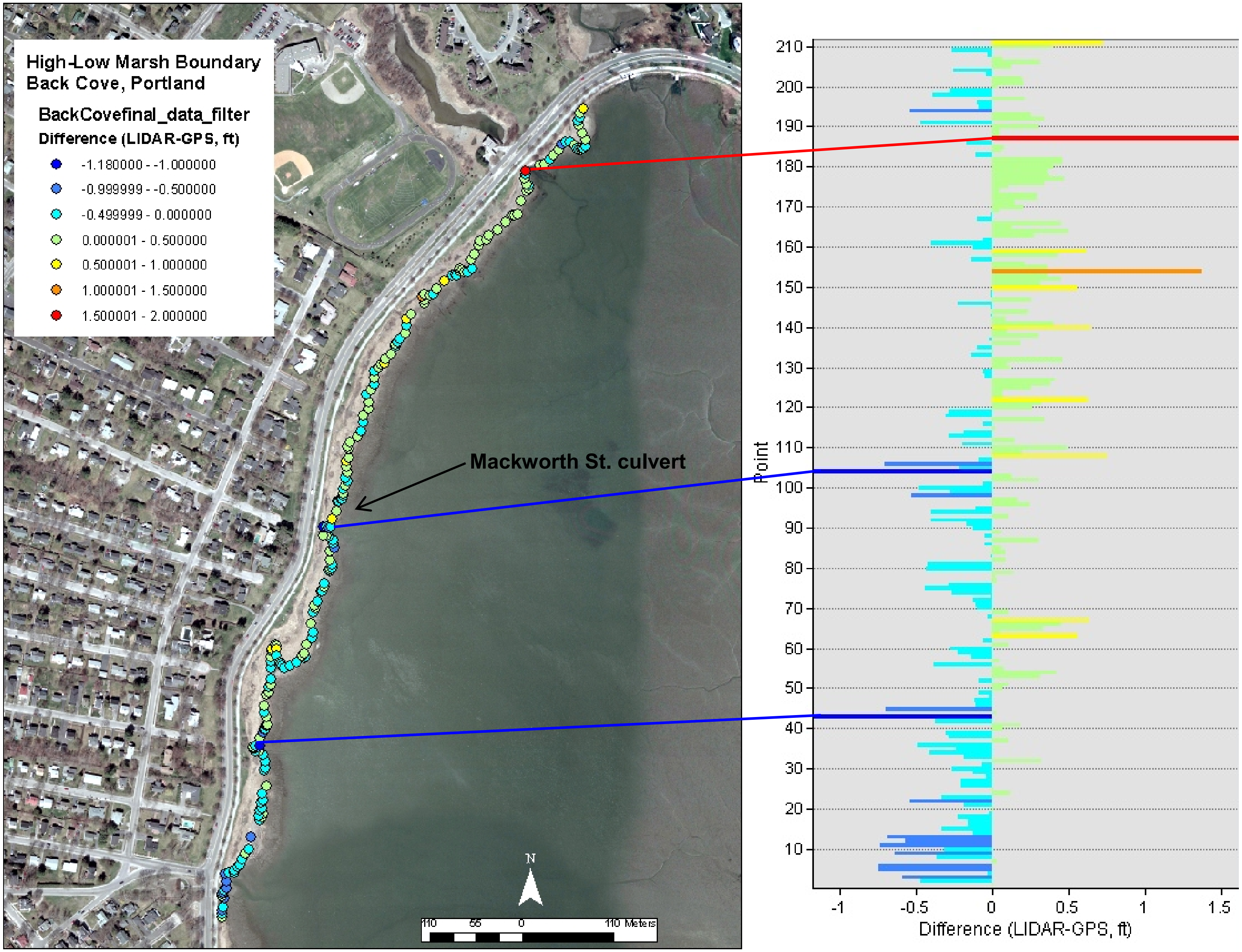


Figure 16. Longshore variation of the difference between LIDAR and GPS elevations at the high-low marsh boundary. Note nodal point near Mackworth Street culvert where signal of accretion (to south) changes to erosion (to north).

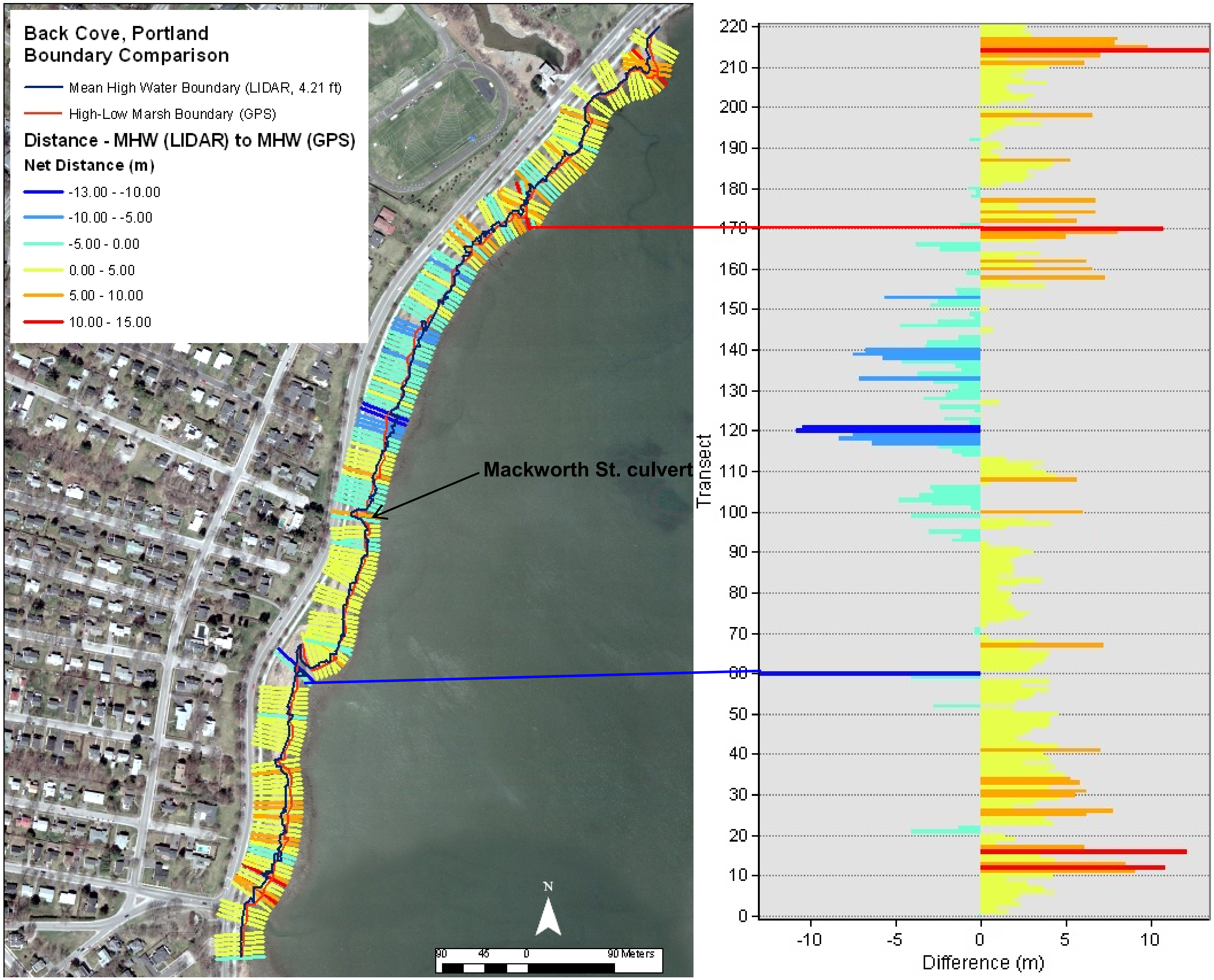


Figure 17. Spatial variation of the horizontal difference between LIDAR and GPS derived MHW (high-low marsh) boundaries. The overall difference is generally positive, indicating that the LIDAR data overpredicts the inland extent of the field defined boundary.

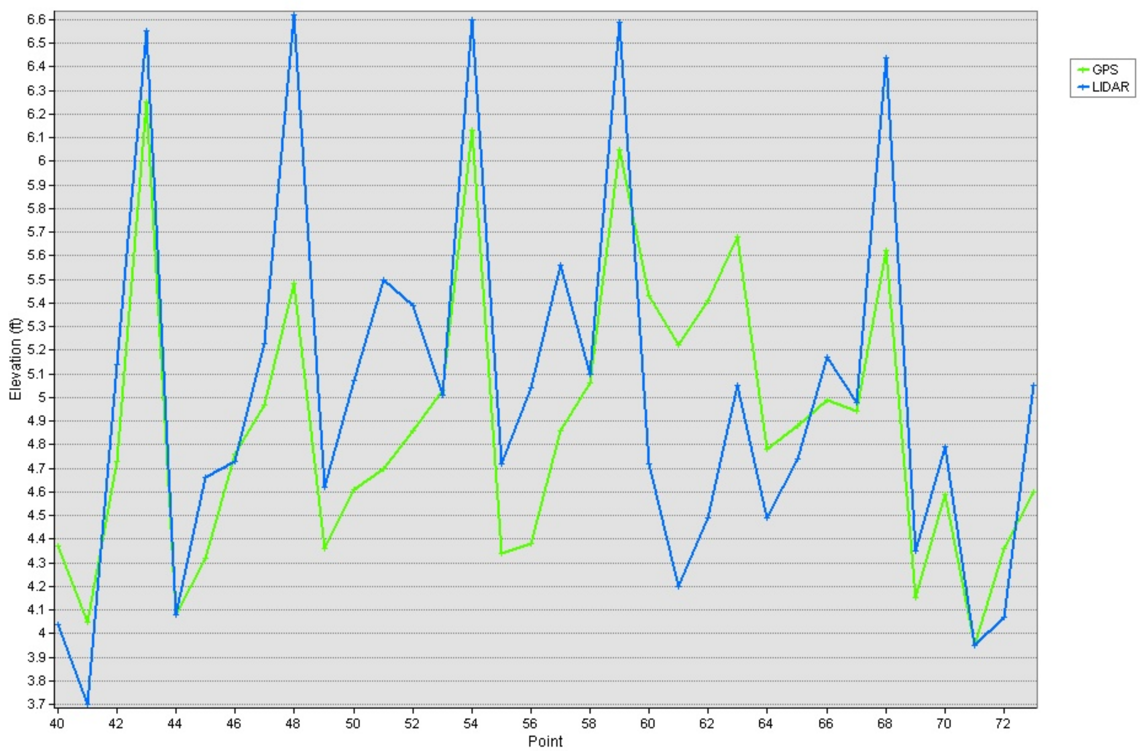
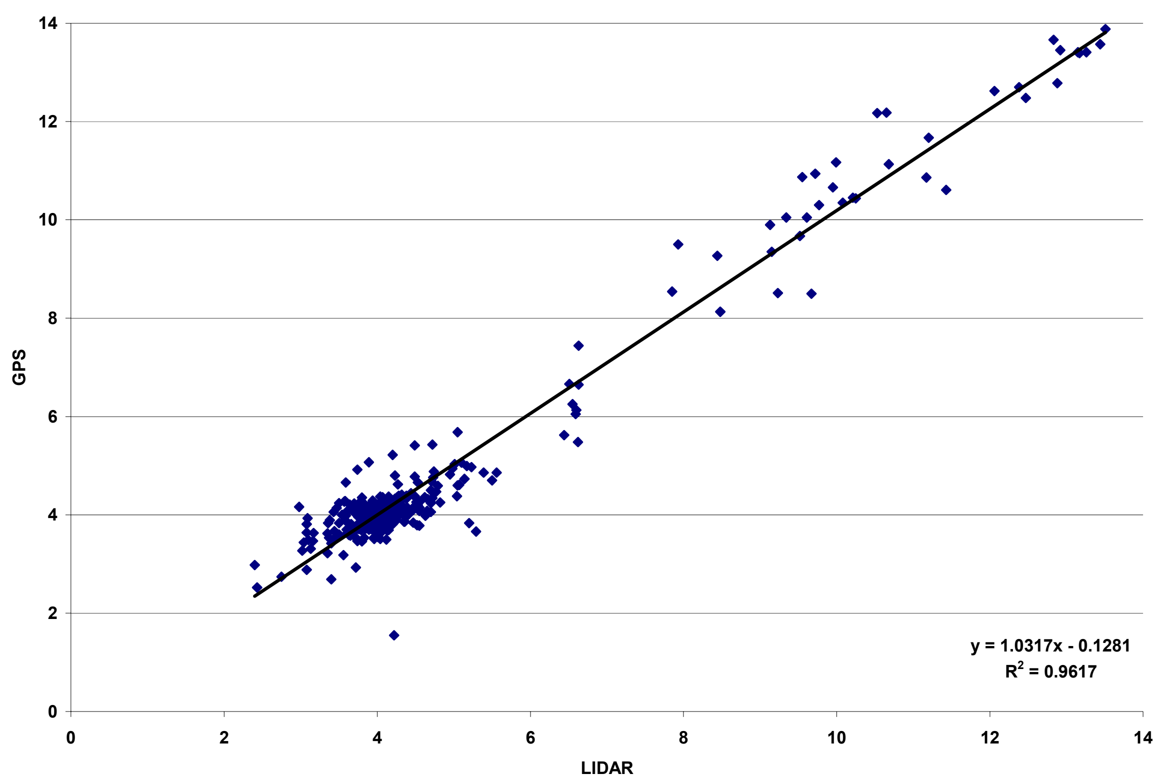


Figure 18. Relationship between GPS and LIDAR derived elevations within the high marsh area. LIDAR generally overpredicts the ground elevations.
Figure 19. There is a very good linear relationship between elevations from LIDAR and GPS (in ft) for the Back Cove study area.



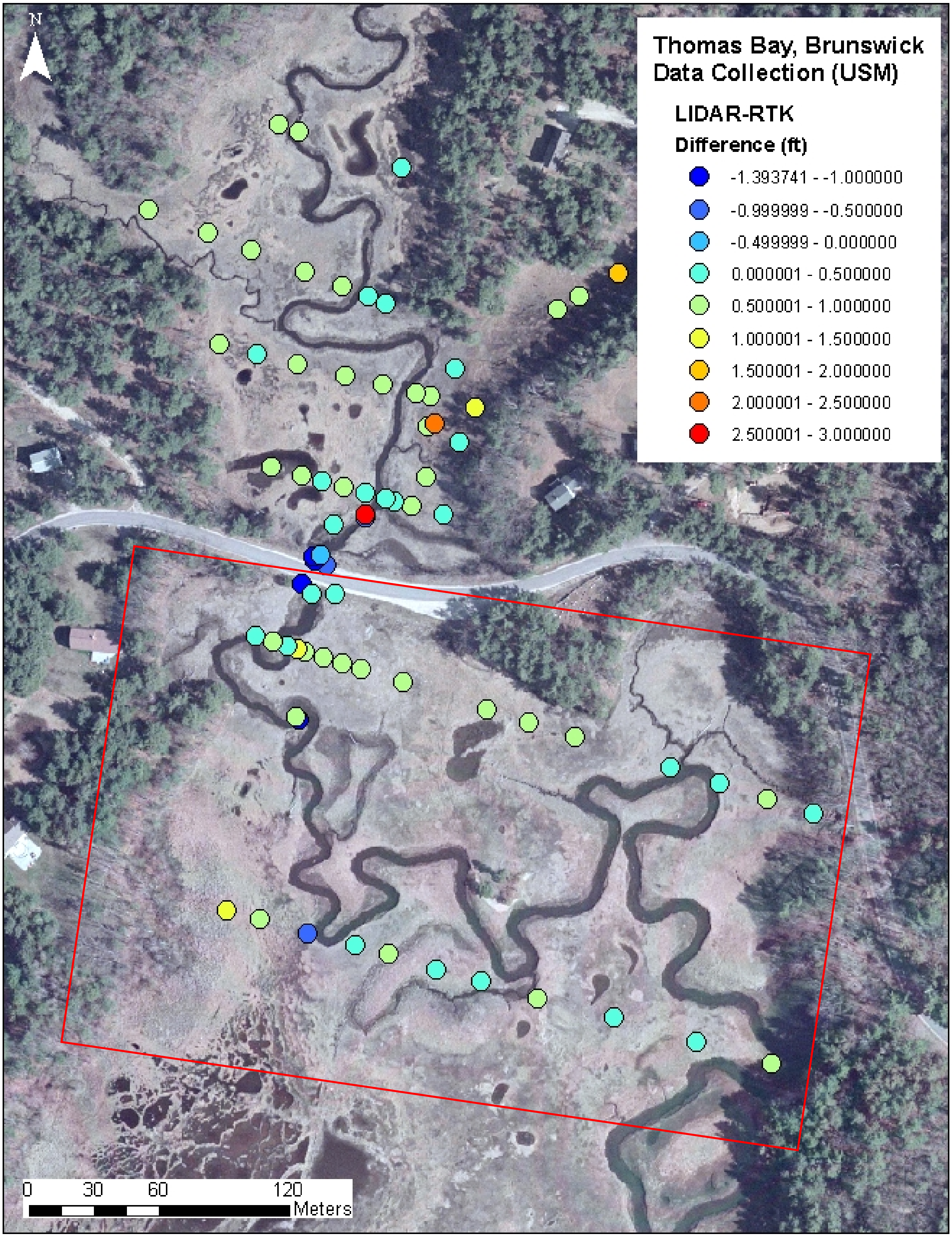


Figure 20. Distribution of LIDAR-RTK values in the southern (inside red box) and northern portions of the study area. Several high LIDAR values in the northern area slightly skew results.

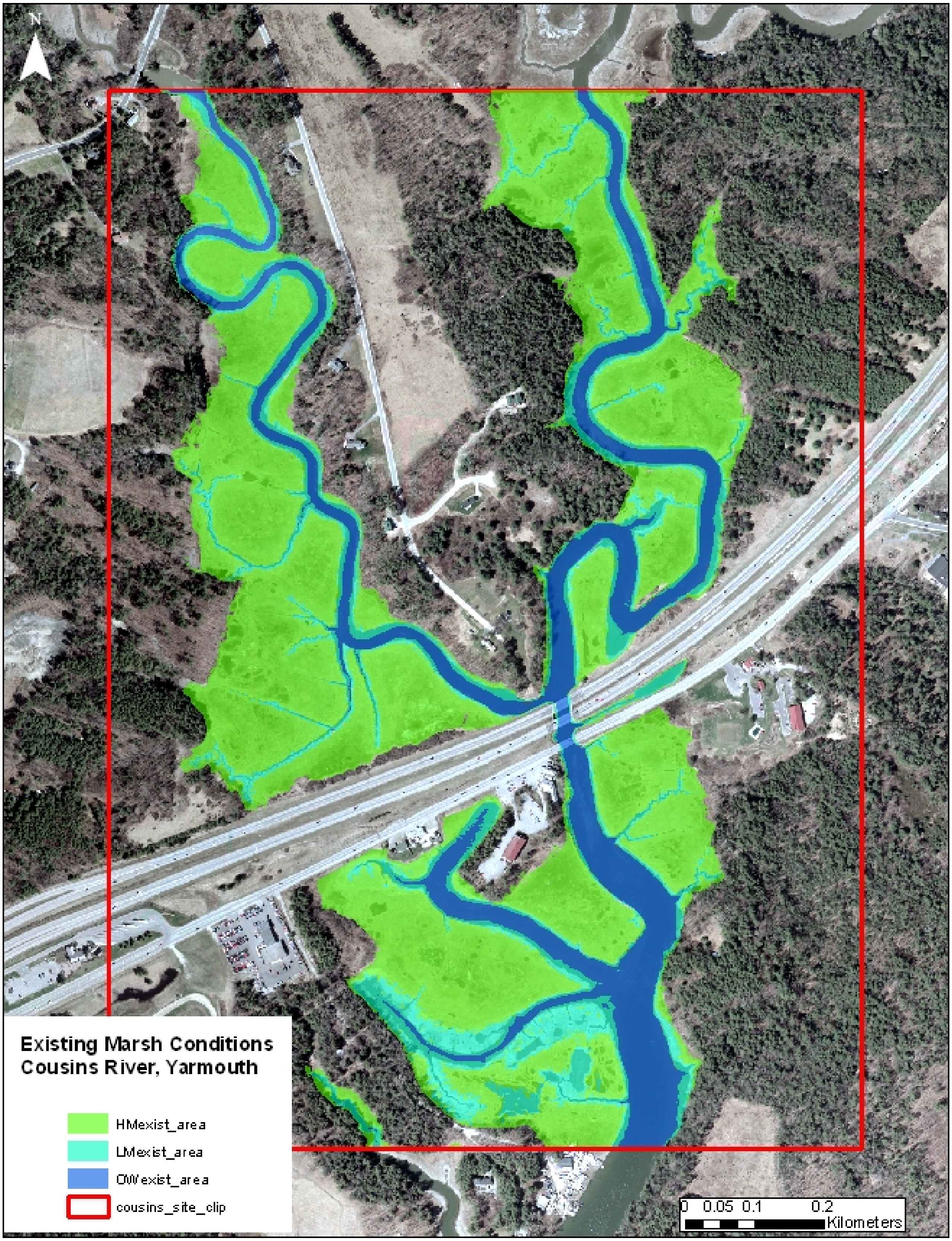


Figure 21. Simulation of existing marsh conditions at the Cousins River study area using applicable NOS tidal elevation data (NOS, 2009a). Note the dominance of high marsh, which has an area of 0.37 km^2.

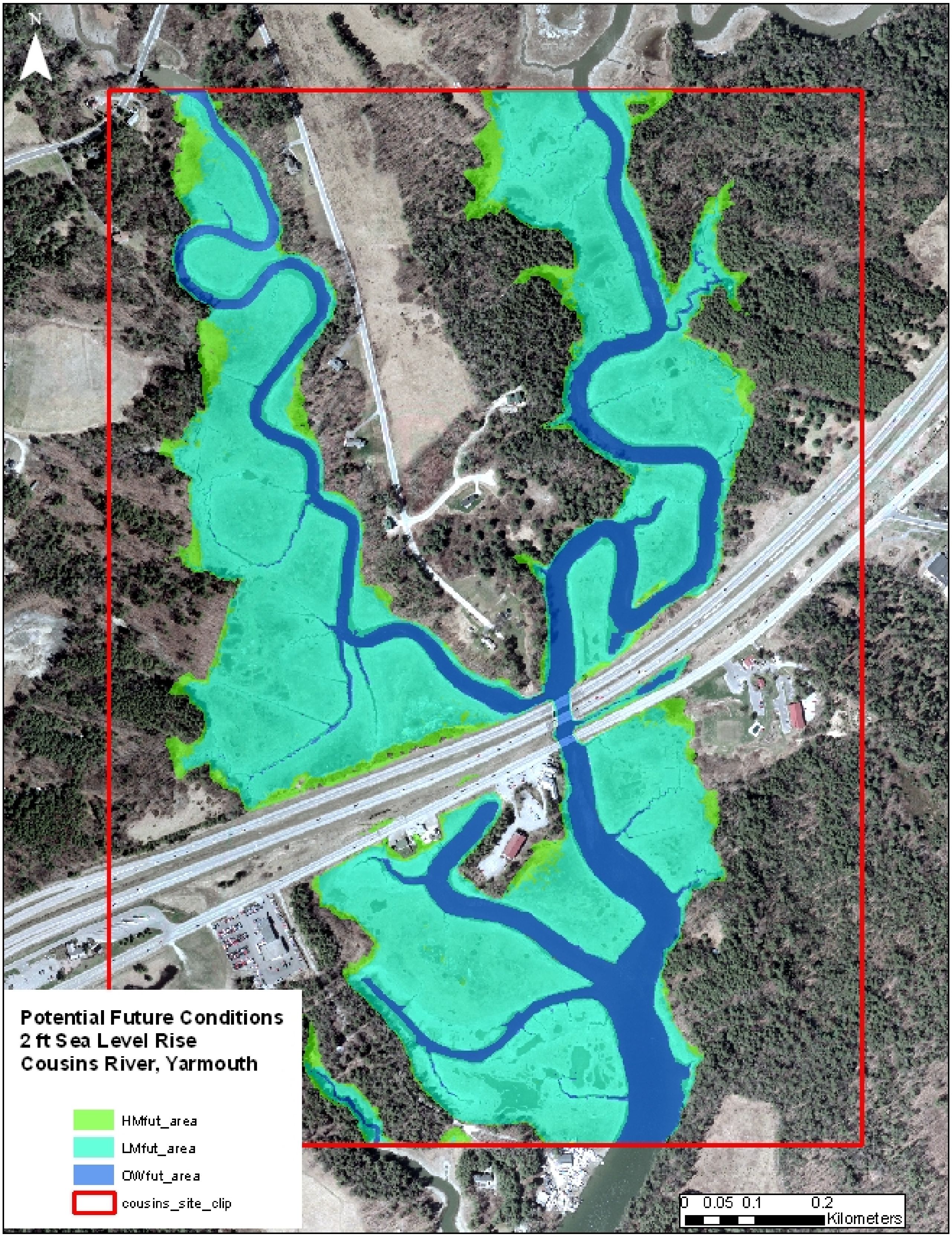


Figure 22. Simulation of potential future marsh conditions at the Cousins River after 2 feet of sea level rise. High marsh decreases by 84%, while low marsh area increases by over 325% from existing conditions.

Figure 23. Simulation of existing marsh conditions at Back Cove using NOS tide data (NOS, 2009a). Note prevalence of fringing low marsh. An area of low lying uplands at the soccer field (lower right) is actually not existing marsh.

Figure 24. Simulation of potential future marsh conditions at Back Cove after 2 feet of sea level rise. Note what little high marsh existed is pinched out by transgressing low marsh. The existing soccer field (southeast) appears to be the only area where the high marsh may have room to transgress, along with smaller finger marshes at the northern side.

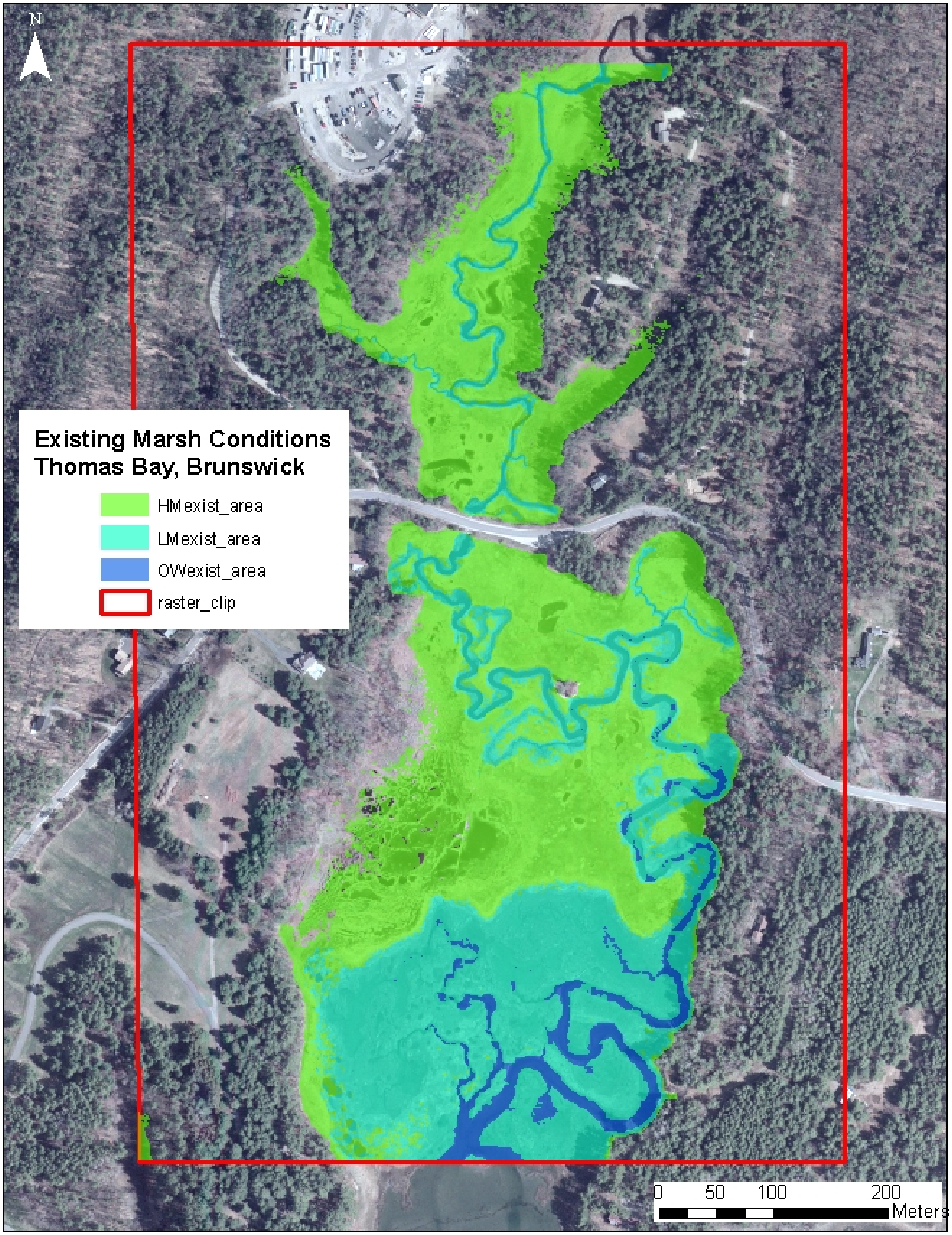


Figure 25. Simulation of existing conditions of marsh areas in Thomas Bay. Note dominant high marsh and area of extensive low marsh at south end of the site.

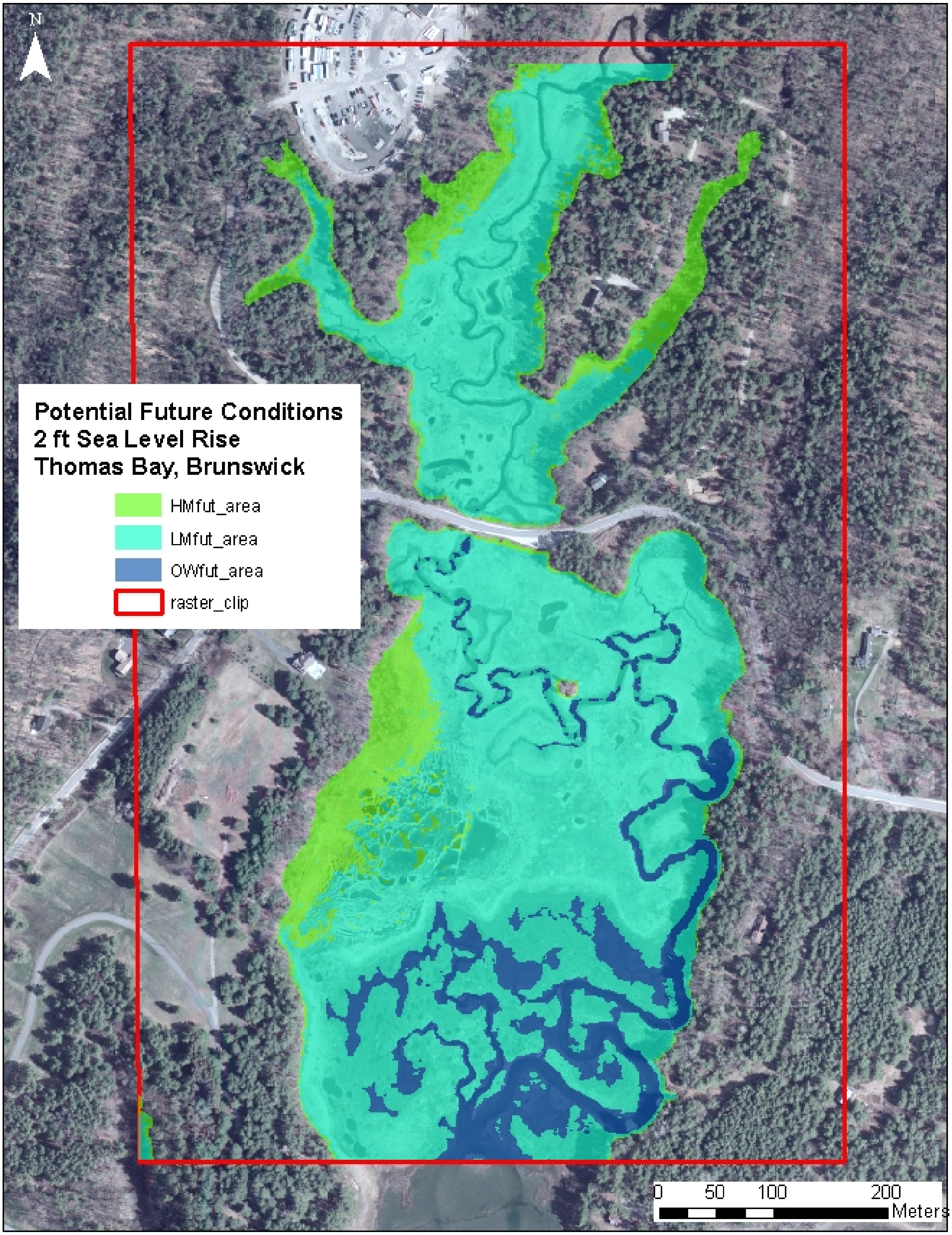


Figure 26. Simulation of potential future marsh areas in Thomas Bay. Note several small areas for high marsh transgression to occur. Low marsh becomes dominant.