Atlantic Climate Adaptation Solutions Association

LiDAR Acquisition in Support of Flood Hazard Mapping: New Brunswick Flood Risk Priority Areas

Final Report

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LiDAR-generated bare-earth elevation data have been acquired for the areas marked in Fig. 1 through ACASA support and other resources. The acquired data have been processed to generate the following data layers (maps) by way of the wet-areas mapping process as generated at the Forest Watershed research Centre at UNB, each at 1 m resolution (http://watershed.for.unb.ca/):

- Bare-earth digital elevation model (DEM), in raster format.
- Flow direction.
- Flow channel networks, with 4, 1 and 0.25 m upslope flow initiation areas.
- The corresponding depth-to-water wet- areas maps, associated with each of these channel networks, showing where water would, cartographically, be within 1 m from the soil surface next to each flow channel, lake, and shore line.
- The areas that would potentially flood when all culverts and bridges are plugged, and when they are not plugged.
- The areas that would flood when the water level along the main flow channels rises to and beyond historical levels.

The LiDAR point cloud data and the resulting depth-to-water layers have been submitted to NBELG (c/o Reid MacLean).

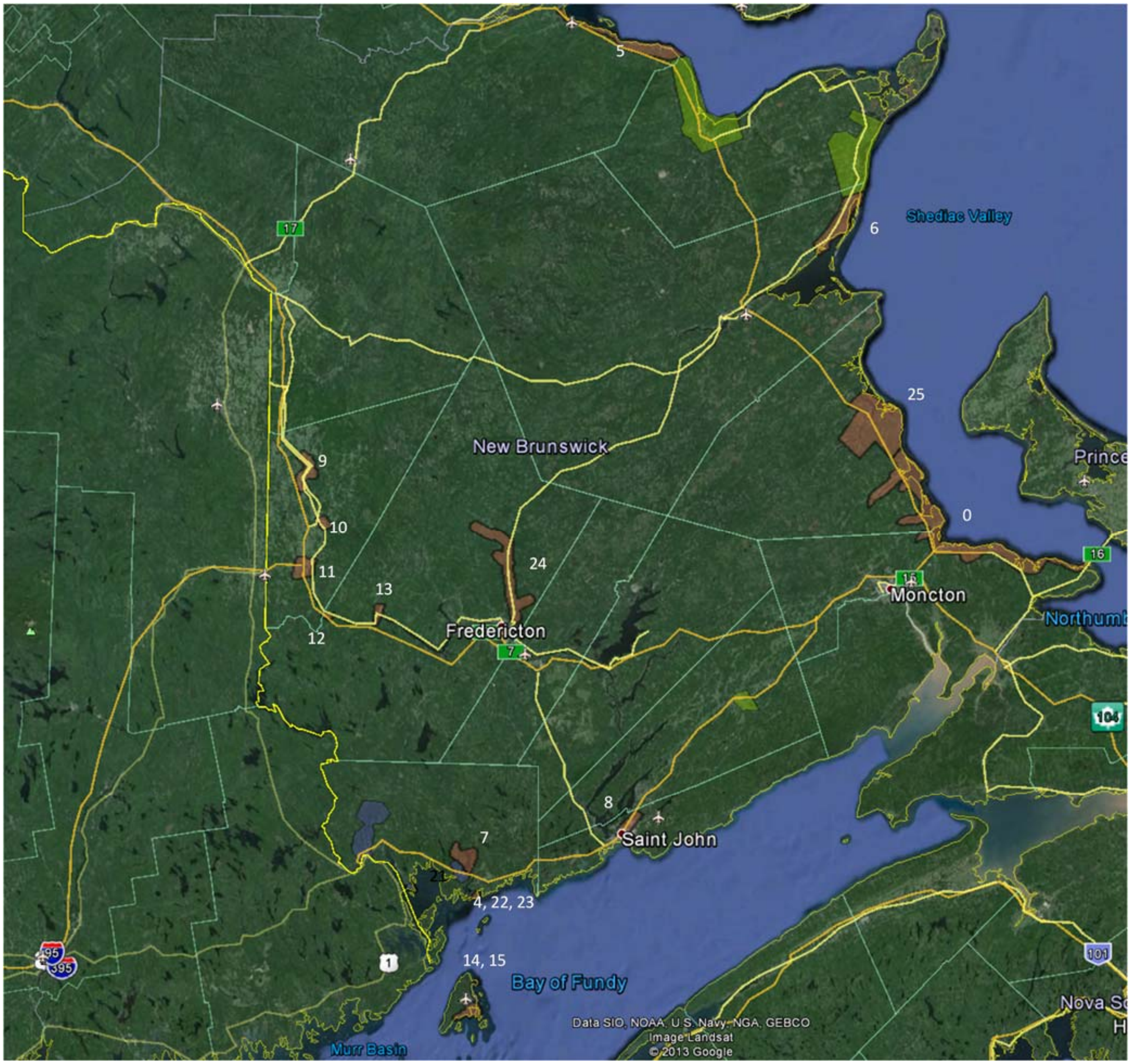

Fig. 1. High flood risk areas: proposed LiDAR data acquisitions, by polygon (Table 1).

The research component dealt with:

- Fine-tuning the high-resolution DTW flood thresholds leads to close representations of historical flood extent along the Saint John River, the Nashwaak River, and select areas along the Bay of Fundy, Bay of Chaleur, and Bay of Northumberland. Along the coast, the DTW extent of tidal marshes are also delineated, as these serve as a natural biomarkers for ascertaining salt-water levels at maximum recurring high tide. This markers, while fairly consistent along the Bay of Northumberland, range from about 3 m asl at Grand Manan to 8 m asl at Sackville. For the inland locations, the DTW index also reveal the extent of the floodplains, including the terrace layout to within these flood plains.

- The individual LiDAR-based flow-channel wet-area data layers allowed for detailed mapping of actual to potential flood risks along streams, rivers, lakes and shorelines. The outcome of such examinations are illustrated in Figs. 2 to 7 for Nackawic, Bath-Florenceville, Meductic, Hartland, Woodstock, and Sussex Corner.
- Improving the digital elevation model (DEM) for all of NB, using the ACASA LiDAR pieces and others to reduce the elevation error across NB to about +/- 1 m. The resulting DEM allows for (i) improved flow channel and wet-areas mapping across NB, (ii) improved delineation of flood plains and extent of potential flood extent along these floodplains, and (iii) determining the capacity of local hydrological infrastructures referring to bridge and culvert size to accommodate expected stream discharge rates for specific weather events, such as 200 mm of precipitation per day.

Figs. 2 to 7 were introduced and provided to community representatives at community presentations in Hartland, Woodstock, and Sussex Corner (May 2015). Further upcoming presentations (Summer 2015) refer to workshop sessions in Fredericton, Moncton, Miramichi and Bathurst. On request, each of the above communities and others can be provided with project generated data layers, in .pdf format. This format allows direct inspection of individual Project generated data layers at high resolution.

Acknowledgements: Project funding from ACASA was used for LiDAR acquisition (c/o Leading Edge Geomatics) and overall wet-areas mapping, which further research support from 2013/2014 and 2014/2015 support from ETF, and additional support from WWF.. Kim Reeder, Simon Mitchell and Malcolm McLeod facilitated the community meetings. Jeff Hoyt and Reid MacLean provided project administration and management assistance.

Fig. 2: Flood extent, depressions, and wet areas mapping: Nackawic, NB

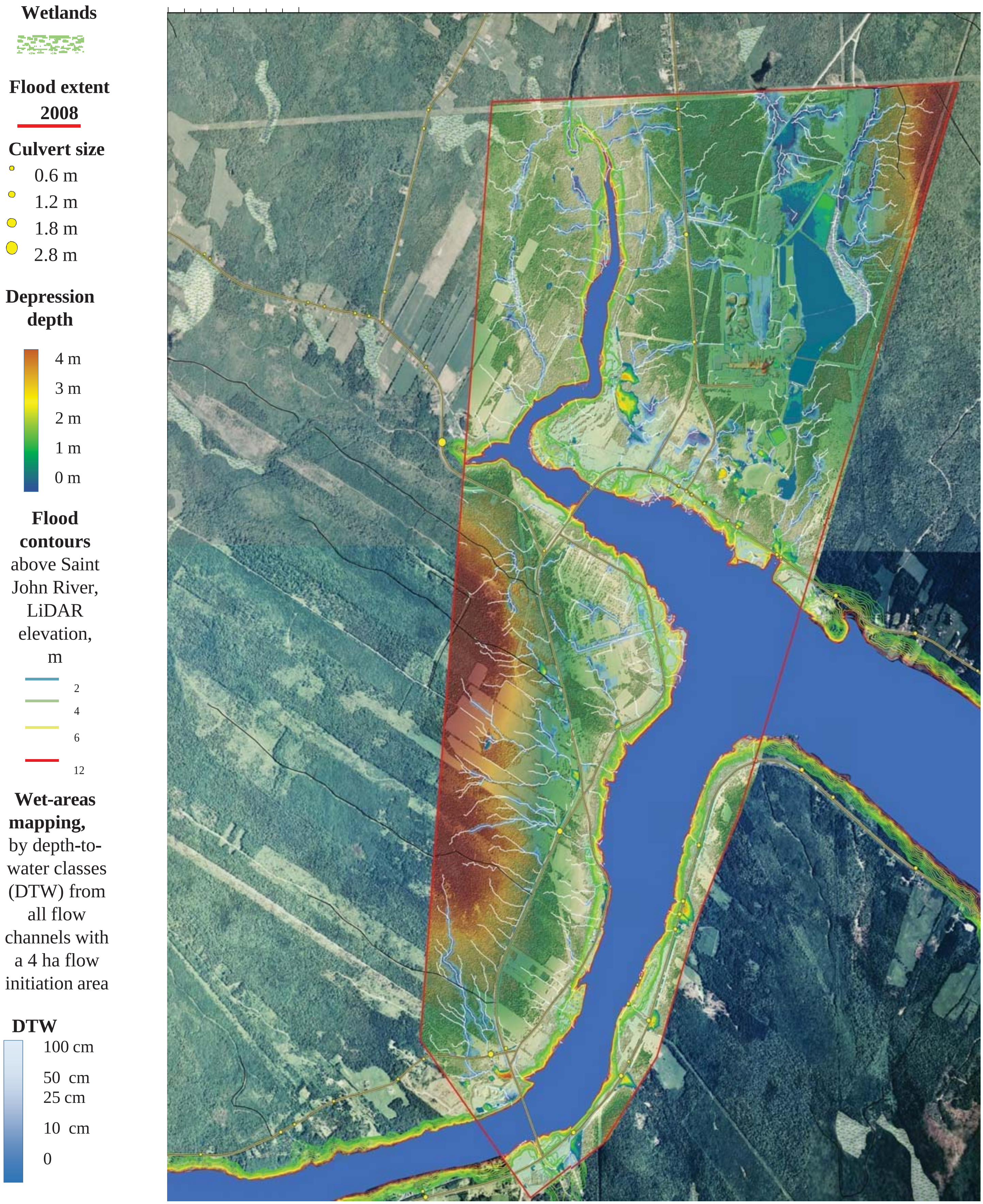

Fig. 3. Flood extent, depressions, and wet areas mapping: Florenceville – Bath, NB

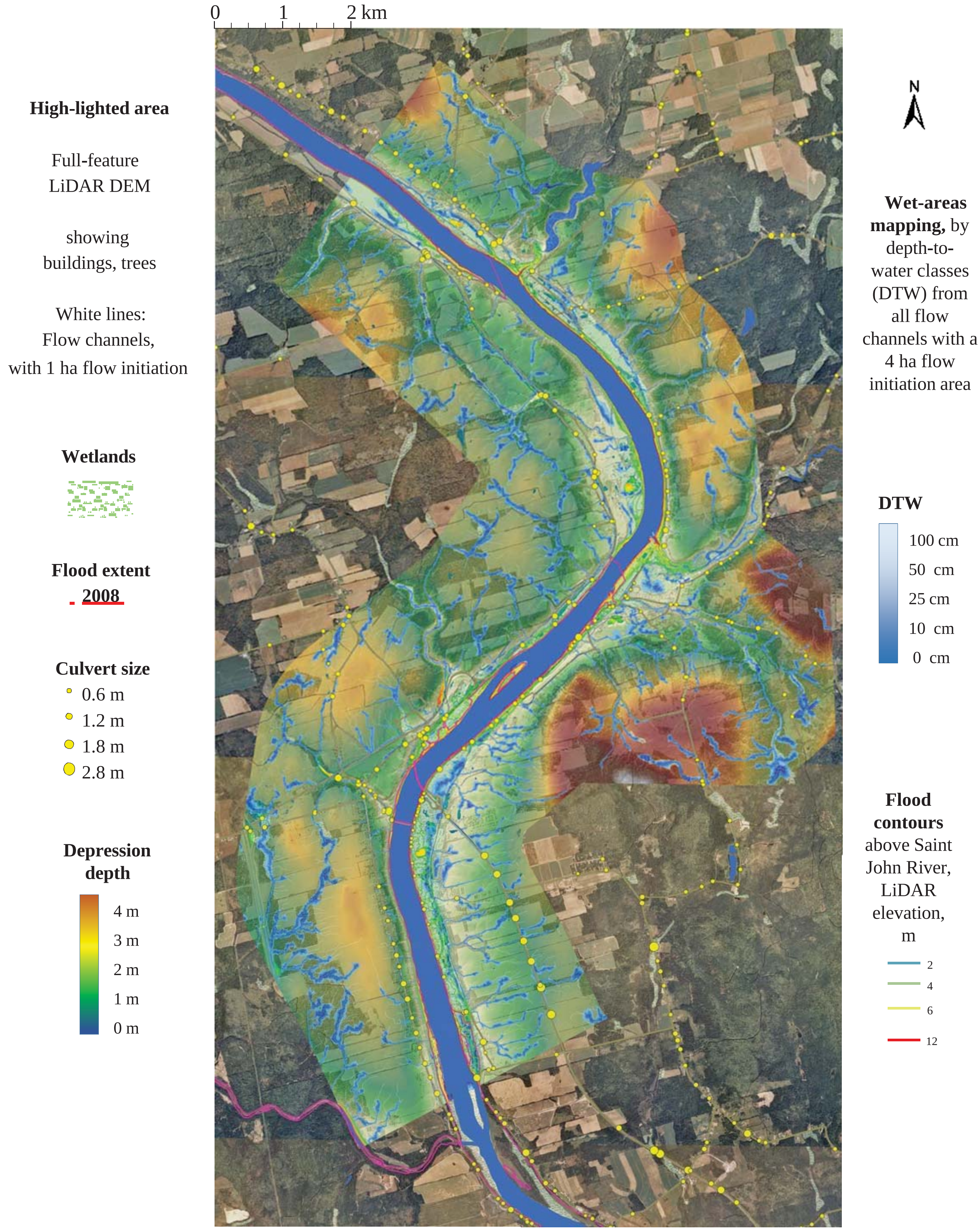

Fig. 4. Flood extent, depressions, and wet areas mapping: Meductic, NB

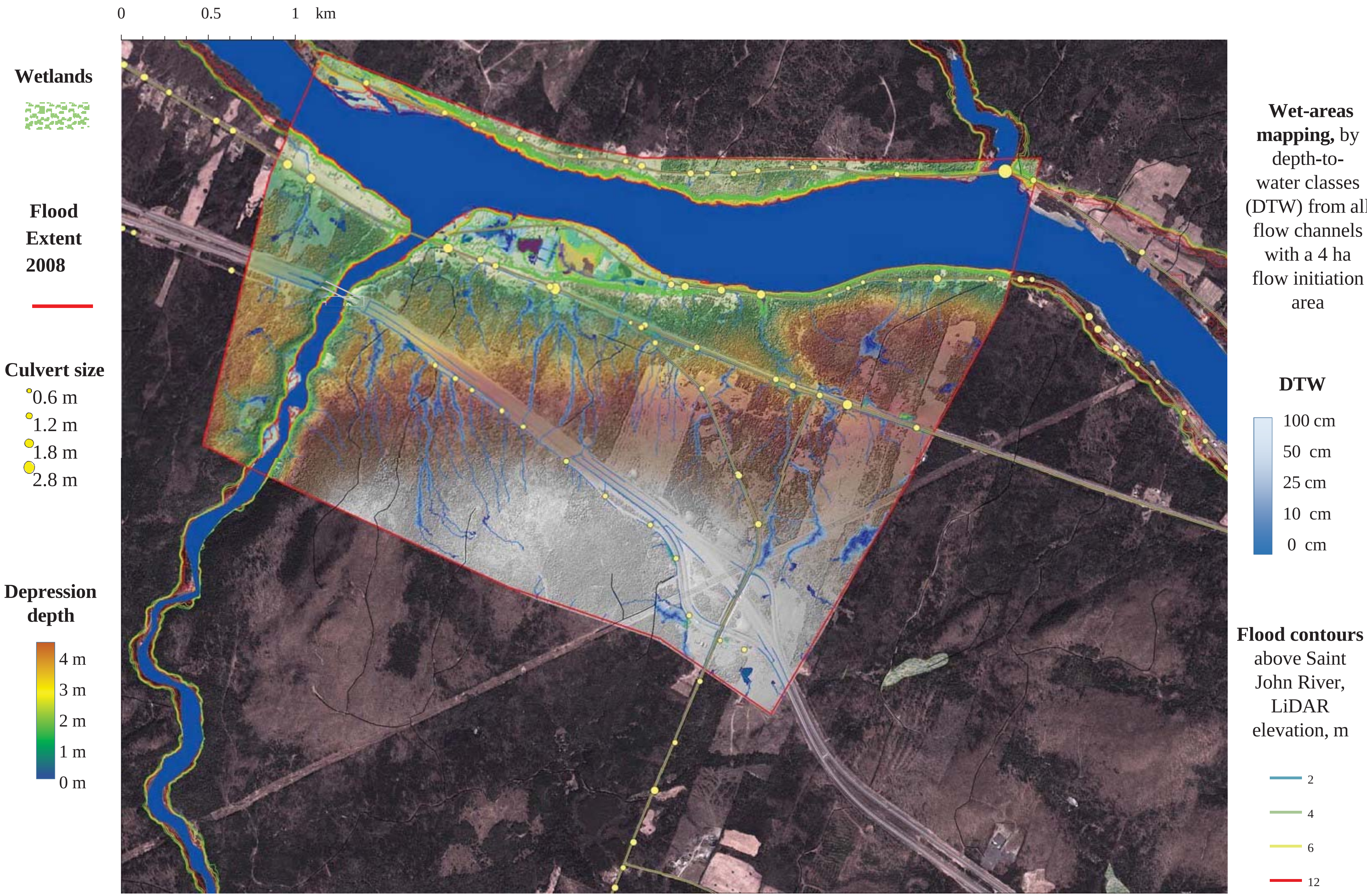

Fig. 5. Flood extent, blocked depression, and wet areas mapping: Hartland, NB

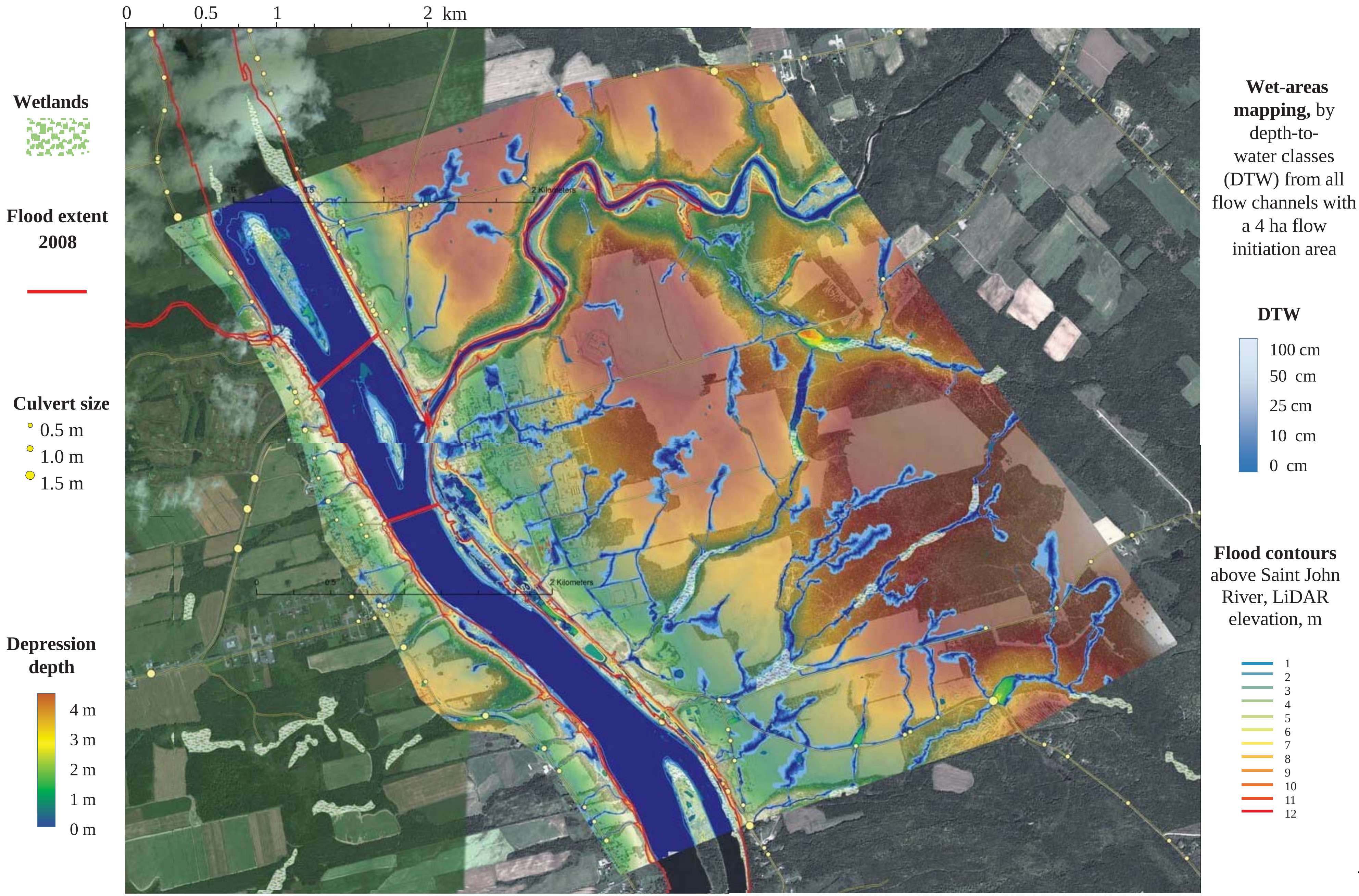

Fig. 6. Flood extent, depressions, and wet areas mapping: Woodstock, NB

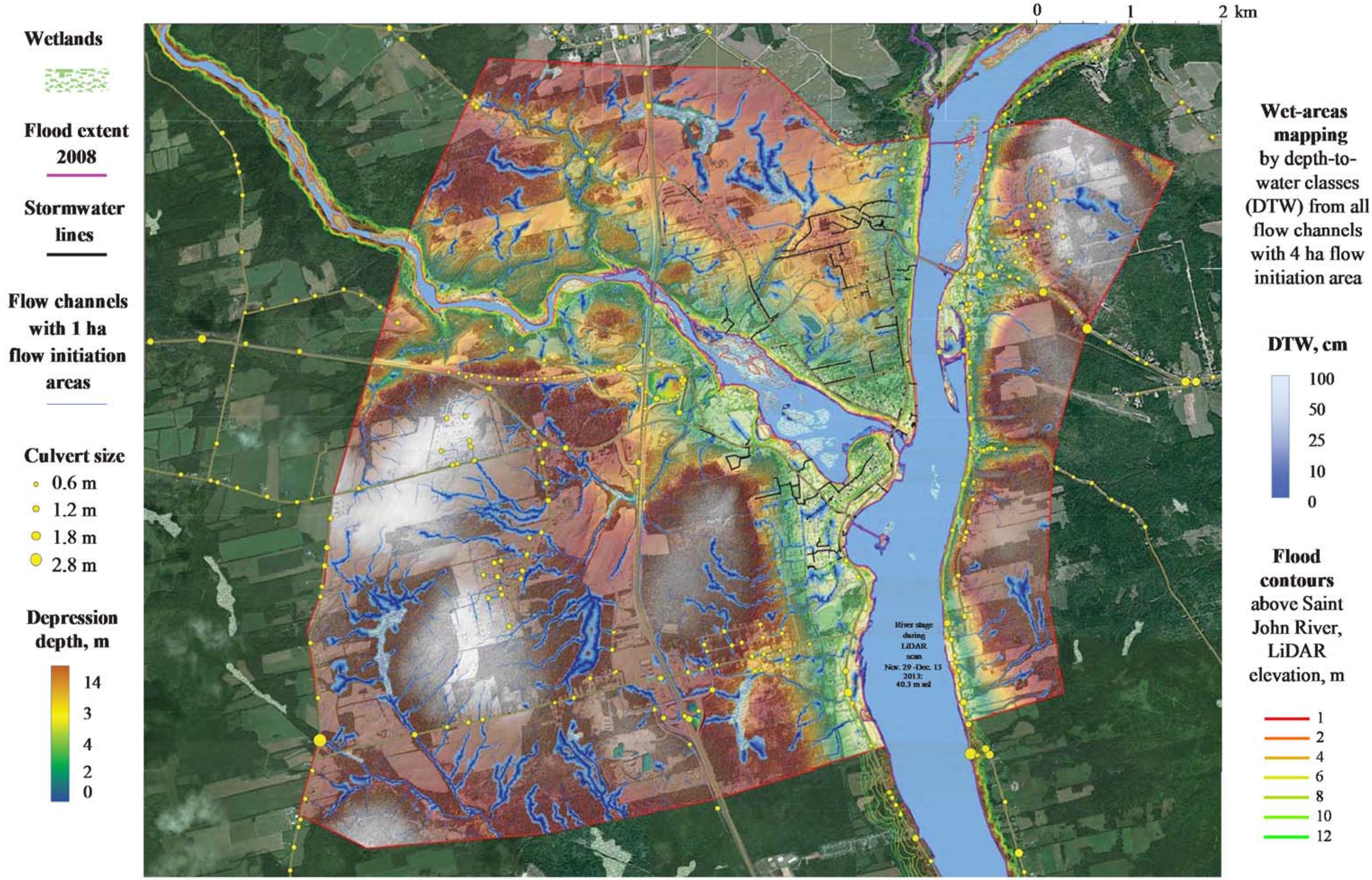

Fig. 7. Flood extent, blocked depression, and wet areas mapping: Sussex Corner, NB

Flood extent, by 1, 2, 3 and 4 m from floodplain flow channel depths

Wet-areas map, by 10, 25 50 and 100 cm depth-to-water classes (DTW) from all flow channels with a 4 ha flow initiation areas; corresponds with soil drainage from very poor to moderately well.