Emily: Wetlands. Located at the interface of land and water, are incredibly diverse, ecosystems. Often misunderstood as worthless smelly swamp land, their true worth has been cited to be as high as 10,000 US dollars an acre. Wetland benefits include preventing soil erosion and flooding, sequestering carbon and filtering water. They also provide economic benefits, such as fishing and other recreational activities.

Robert Atkinson: Well the United States has lost approximately half of wetland acreage that we had during the Colonial era and that’s due to human alterations of the land

Emily: But what about climate change?

Robert Atkinson: Well Climate change will have a variety of effects on wetlands as they will with any other ecosystem. Changing precipitation patterns will alter the life blood which of course is the timing of water and the depth of water that is present on the landscape. But a lot of it is totally unknown because we are only used to ecosystems that have experienced something within the range of something we currently see.

Emily: The Great Lakes Climate II team at NASA Langley partnered with Georgian Bay Forever, The Great Lakes and St. Lawrence Cities Initiative, and Ontario Ministries of Natural Resources and Forestry. We sought to classify the land cover types around the Great Lakes Regions, where over 1700 square kilometersof wetlands are predicted to decline with changing climates.

Emily: We focused on a 10 kilometer buffer zone surrounding both Georgian Bay in Ontario Canada and the Southeastern portion of Lake Ontario

Miriam: Landsat 5 and 8 provided the images for classification, Jason 1 and 2 provided water level data and TERRA ASTER produced the Digital Elevation Model (DEM). Leaf on images were downloaded for 1987 and 2013 for Georgian Bay in order to represent the period of highest and lowest water levels. However, since water levels in Lake Ontario are stabilized through dykes and levees we used 2007 leaf on imagery to coincide with the most recent NOAA C-CAP classification to validate our methodology and 2014 imagery to represent the most recent wetland extents.

Idamis: The classification used a random forest model supervised classifier script, run in r, with training sites, landsat bands, including the thermal band, the DEM and the slope as the inputs. The Model produces classified maps, such as this one. These maps were then consolidated into 2 classes, wetlands or non-wetland areas, seen here.

Stephen: The historic and current wetlands vs non wetlands map were then combined to show wetland extent changes over time. The blue color indicates areas where wetlands have expanded whereas the red area shows where they have been destroyed. Overall, Georgian Bay wetlands extent has decreased by 4% between 1987 and 2013 while the overall percentage for the southern portion of Lake Ontario remained constant. It is clear that for both study areas wetlands locations are shifting.

Robert Atkinson: Reflectance data can measure changes in plant communities before they actually happen because the plant species that are extant in an area may exhibit a different reflectance spectrum when they are stressed by say higher sea levels or salt or changing hydroperiods.

Emily: These maps provide visual reference on the extent of various land cover types. Illustrating this change is important for environmental decision makers developing wetland conservation policies. Utilizing NASA earth observing systems has allowed an efficient and cost effective way to map wetland extent over time. The methodology developed in conjunction with the Great Lakes Climate I team can be applied to other regions in the future to monitor the extent of other types of threatened ecosystems.