Lake Ontario Inundation Map Package Tutorial
For use with the Coastal Resilience Index or as a standalone tool
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1. Introduction

This tutorial will guide you through how to make inundation maps for your community either as part of the New York Sea Grant's (NYSG) Coastal Resilience Index (CRI) or as a standalone exercise. The goal is to visualize inundation at different lake levels to bring awareness to infrastructure and services that may be at risk. Using this tutorial, you will be able to generate a series of maps for your community with the following predetermined lake levels scenarios:

- 247.3 ft: The upper limit of the 4-foot range for Plan 1958 DD
- 249 ft: Benchmark water level (approximate peak water level from 2017)
- 249.5 ft: Future water level scenario
- 250 ft: Future water level scenario

Note that the water levels are based on elevation data and do not account for wind-driven effects. These materials were developed by New York Sea Grant for Lake Ontario coastal communities.

Disclaimer: The data and maps in this tool illustrate the scale of potential flooding or land exposure at a given water level, not the exact location. They do not account for erosion, subsidence, or future construction. Water levels are shown as they would appear during calm conditions (excludes wind-driven changes in water levels). The data, maps, and information provided should be used only as a screening-level tool for management decisions. As with all remotely sensed data, all features should be verified with a site visit. The data and maps in this tool are provided "as is," without warranty to their performance, merchantable state, or fitness for any particular purpose. The entire risk associated with the results and performance of these data is assumed by the user. This tool should be used strictly as a planning reference tool and not for navigation, permitting, or other legal purposes.
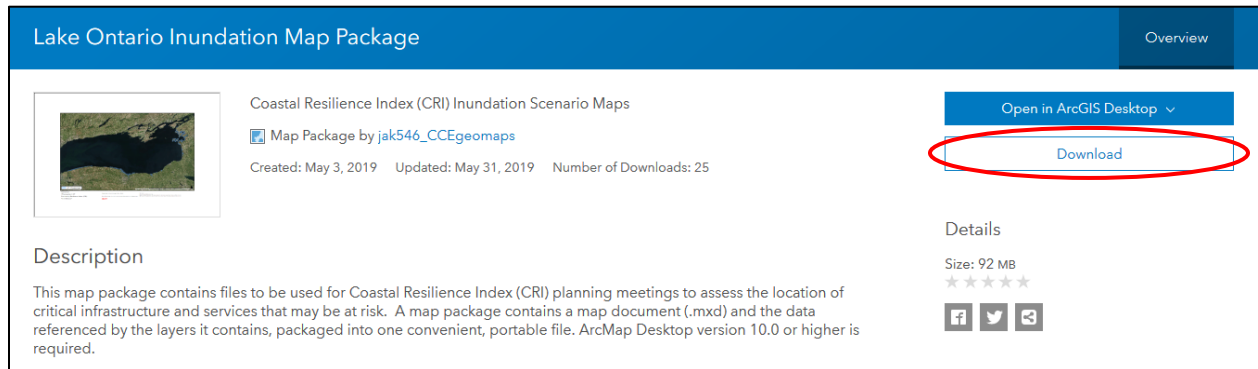
1a. What you need

- A computer and internet connection
- A printer
- ArcMap Desktop (Version 10.0 or higher)
    - To find out which version of ArcMap Desktop you are working with, Open the program and go to **Help > About ArcMap…**

2. Access the Data

The map and data are provided in a map package (.mpk) format. A map package contains a map document (.mxd) and the data referenced by the layers it contains, packaged into one convenient, portable file.

1. File management: Create a folder on your computer from which you will work. Do not use spaces or special characters in the folder name or ArcMap will not be able to access the folder. Example folder name: LO_Inundation_Maps2019
2. Navigate to the New York Sea Grant New York Sea Grant Inundation Mapping Tools web page: https://seagrant.sunysb.edu/articles/r/12972
3. Select the **Lake Ontario Map Package** listed under "Lake Ontario Tools"
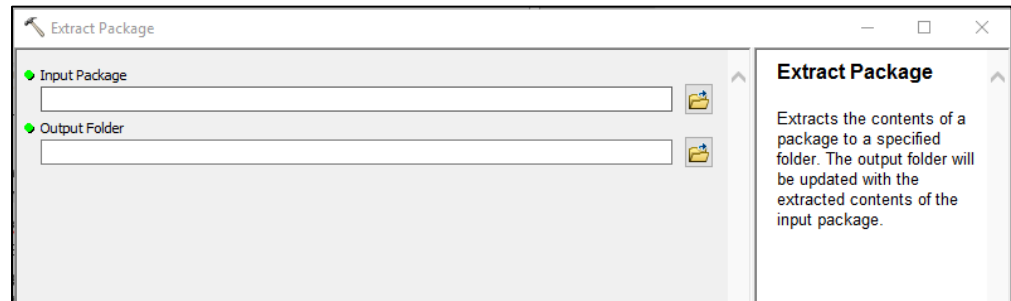
4. Select **Download > Save File** to save the map package (.mpk) to your local drive. (You may need to move it from the Downloads folder to the folder you created in Step 1)

Lake Ontario Inundation Map Package   Overview

Coastal Resilience Index (CRI) Inundation Scenario Maps

Map Package by jak546_CCEgeomaps   Open in ArcGIS Desktop ⌄

Created: May 3, 2019   Updated: May 31, 2019   Number of Downloads: 25   Download

Description

Details

This map package contains files to be used for Coastal Resilience Index (CRI) planning meetings to assess the location of critical infrastructure and services that may be at risk. A map package contains a map document (.mxd) and the data referenced by the layers it contains, packaged into one convenient, portable file. ArcMap Desktop version 10.0 or higher is required.

Size: 92 MB
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5. Open Map Package
   o **Option 1 (Recommended)**
      i. Open ArcMap
      ii. ArcToolbox**: Data Management > Package > Extract Package (double click)**
      iii. Complete **Extract Package** tool form. For **Input Package**, browse and select the map package (.mpk) that you downloaded in step 3. For **Output Folder**, browse and select the folder that you created in step 1. Click **OK**.

Extract Package   —   □   ×

Input Package   Extract Package

Output Folder   Extracts the contents of a
                                                       package to a specified
                                                       folder. The output folder will
                                                       be updated with the
                                                       extracted contents of the
                                                       input package.

      iv. Once complete, in ArcMap go to **File > Open** > navigate to the folder that you created in step 1, which is also now where you have extracted the map package to. There will be 2 folders: v10 and v107. If you are working with the latest version of ArcMap, v 10.7, open the **v107** folder and select the .mxd file to open. If you are working with an earlier 10 version, open the **v10** folder version and select the LO_InundationMap (file type: ArcGIS ArcMap Document) to open.
   o **Option 2**
      i. Double-click map package (.mpk) file in File Explorer. File should automatically open in ArcMap.
6. The default size of the map is 11x17 in Landscape orientation. Depending on your ArcMap settings, you may need to adjust the page size/orientation. **File > Page and Print Setup**. Select Paper Size: **Ledger (11x17")**, Paper Orientation: **Landscape**.

Paper

Size: Ledger (11 x 17")   ⌄

Source: Auto   ⌄

Orientation: ○ Portrait   ◉ Landscape
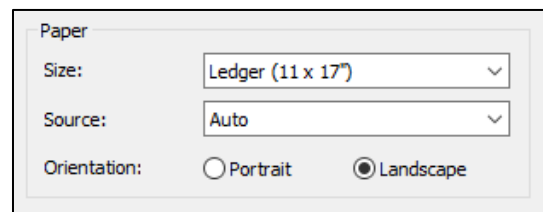
- If you want to make a map in a different size or orientation (ex: Letter (8.5x11")), change the settings under **File > Page and Print Setup** then adjust the data frame and text boxes in Layout View accordingly.

**Once open in ArcMap, you should see a view of Lake Ontario.

3. Create Maps

Create maps for your community by zooming in to areas where critical infrastructure and facilities are located. Use Layout View or Data View. Customize the map. Display the different **Inundation Layers** individually and/or together, adjusting color and transparency as needed. Toggle layers on and off by selecting the box next to the layer. Other layers that may be useful to orienting yourself and locating critical infrastructure are **Roads**, **Municipal Boundaries,** and **Counties**.

### 3b. Considering Critical Infrastructure and Facilities and Different Lake Level Scenarios

The sample list of critical infrastructure and facilities below is a sample taken from the NYSG CRI, and is provided as an example of an application for this map tool.

Critical Infrastructure
Wastewater treatment/lift system
Storm drains
Power grid (Transformers, substations) and alternate Energy Sources (i.e., solar, wind, etc)
Public water supply
Transportation/evacuation routes
Large-scale shoreline protection (i.e. breakwater, breakwall, etc.)
Places of mass gathering (i.e. fairgrounds, shopping center, etc.)
Critical Facilities
Municipal Hall and Government buildings
Municipal Department of Public Works
Critical Record Storage
Fuel stations
Police station or other law enforcement buildings
Jail, Fire Station(s)/Emergency Medical Service
Communications main office or substations
Emergency Operation Center
Access to Area suitable for disaster response staging & access to points of distribution
Evacuation shelters
Hospitals
Vulnerable populations
Hazardous materials facilities
Private industries with hazardous materials
Abandoned, deteriorated, or underused sites and buildings.

4. Export/Print Maps

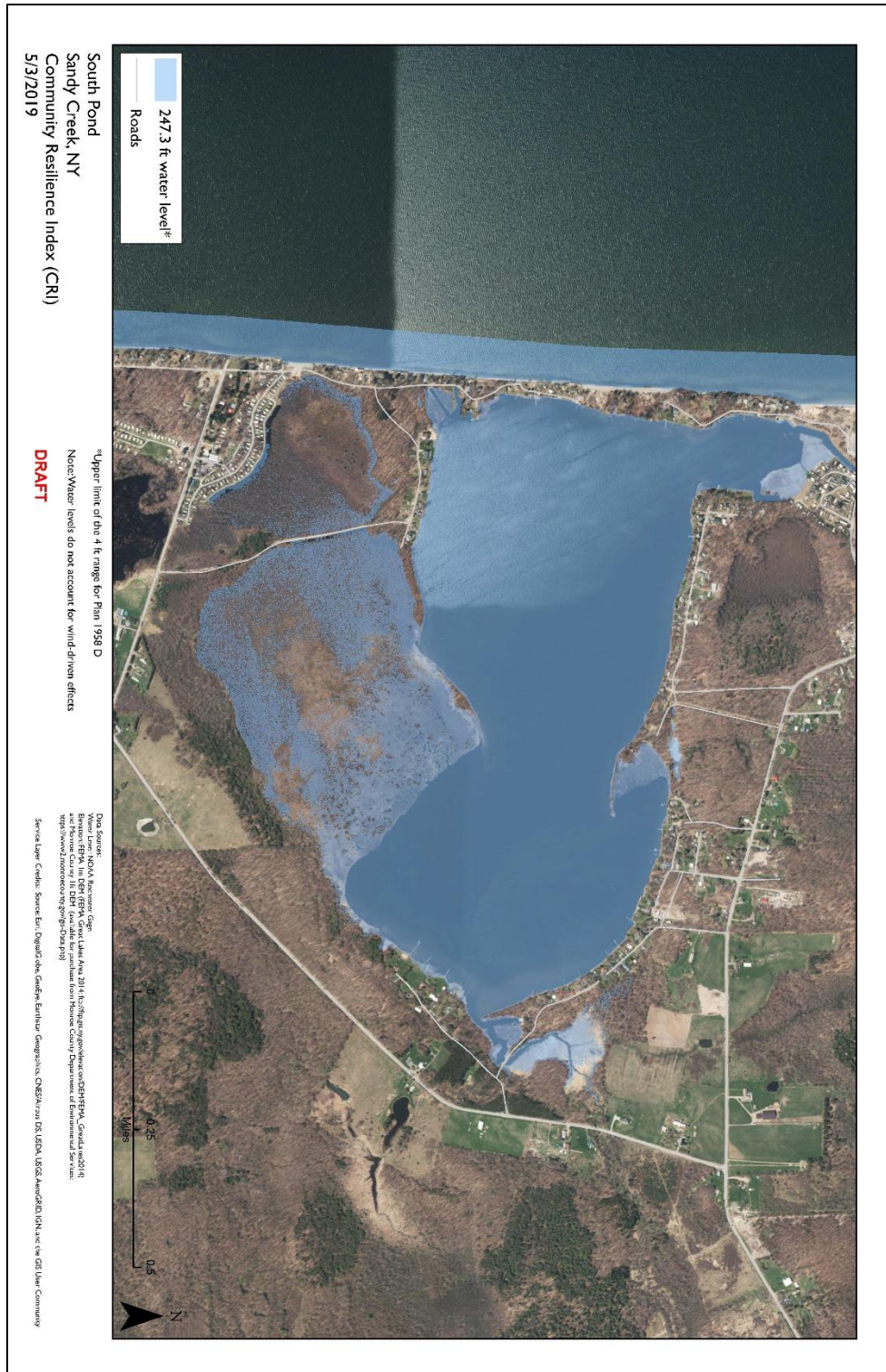When you are happy with your map, return to **Layout View** to finalize the map.

1. In **Layout View**, consider setting a **Bookmark** so that you can return to the same extent at a later time.
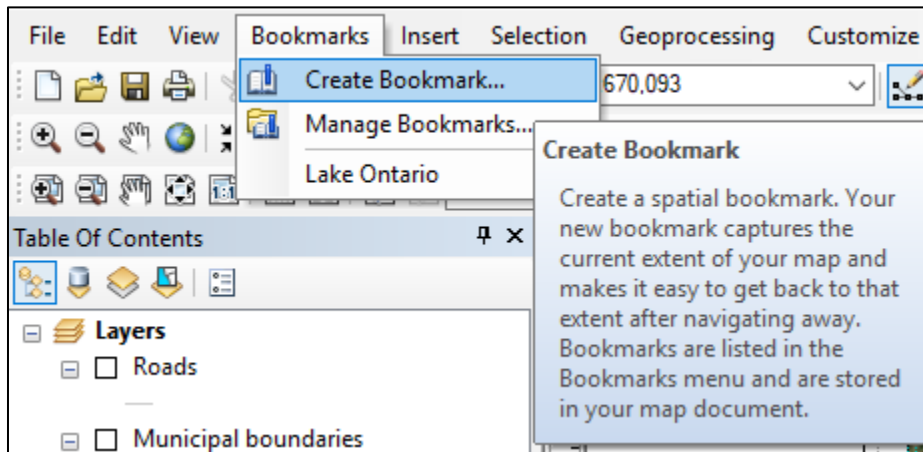
2. Decide which inundation layers you want to display.
3. To update the text at the lower left corner of the map **(<Location>, <Municipality>, <Date>)**, double click on the text area in the layout view. See Appendix A for examples of finished maps.
4. Adjust scale bar as needed.
5. **File > Export Map**
   - Save in: (navigate to a folder where you would like to export the map as a PDF. You may want to create a folder called: Exported_Maps)
   - File name: (create a file name)
   - Save as type: PDF or JPEG
   - Resolution: allow for default identified with file type option
   - Output Image Quality: Best
   - Ratio: 1:1
   - Save
2. Print exported maps as needed.

Appendix: Examples of Finished Maps

1. 247.3 ft water level

South Pond
Sandy Creek, NY
Community Resilience Index (CRI)
5/3/2019

247.3 ft water level*
Roads

*Upper limit of the 4 ft range for Plan 1958 D
Note: Water levels do not account for wind-driven effects

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2. 249 ft water level (benchmark)

South Pond
Sandy Creek, NY
Community Resilience Index (CRI)
5/3/2019

Benchmark water level: 249 ft
Roads

*Upper limit of the 4 ft range for Plan 1958 D
Note: Water levels do not account for wind-driven effects

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N

0   0.25   0.5
Miles

Data Sources:
Water Level: NOAA Rochester Gage
Elevation: FEMA 1m DEM (FEMA Great Lakes Area 2014 - ftp://ftp.glc.org/collection>GDM/FEMA_GreatLakes2014)
and Monroe County 1ft DEM (available for purchase from Monroe County Department of Environmental Services:
https://www2.monroecounty.gov/gis-Data.php)

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

3. All water levels

South Pond
Sandy Creek, NY
Community Resilience Index (CRI)
5/3/2019

247.3 ft water level*
Benchmark water level: 249 ft
Future scenario: 249.5 ft
Future scenario: 250 ft
Roads

*Upper limit of the 4 ft range for Plan 1958 D
Note: Water levels do not account for wind-driven effects

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