MAPTITE
A Geospatial Tool for Estuary Restoration

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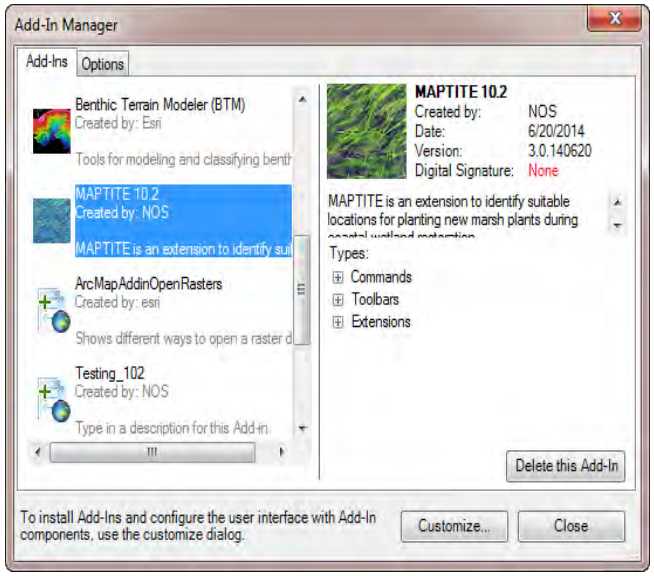
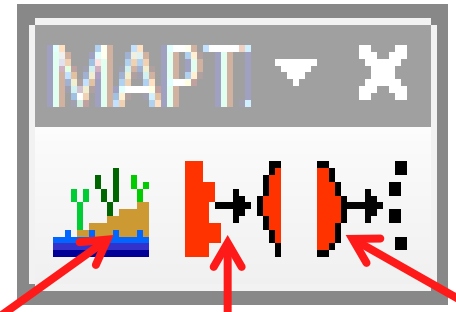
MAPTITE 10.2

Marsh Analysis & Planning Tool Integrating Tides & Elevations





Selection Form

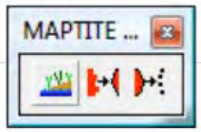
Grid to polygon

Polygon to GPS

An ESRI ArcGIS add-in that automates the process of connecting tidal datums and land elevations to produce planting zones.

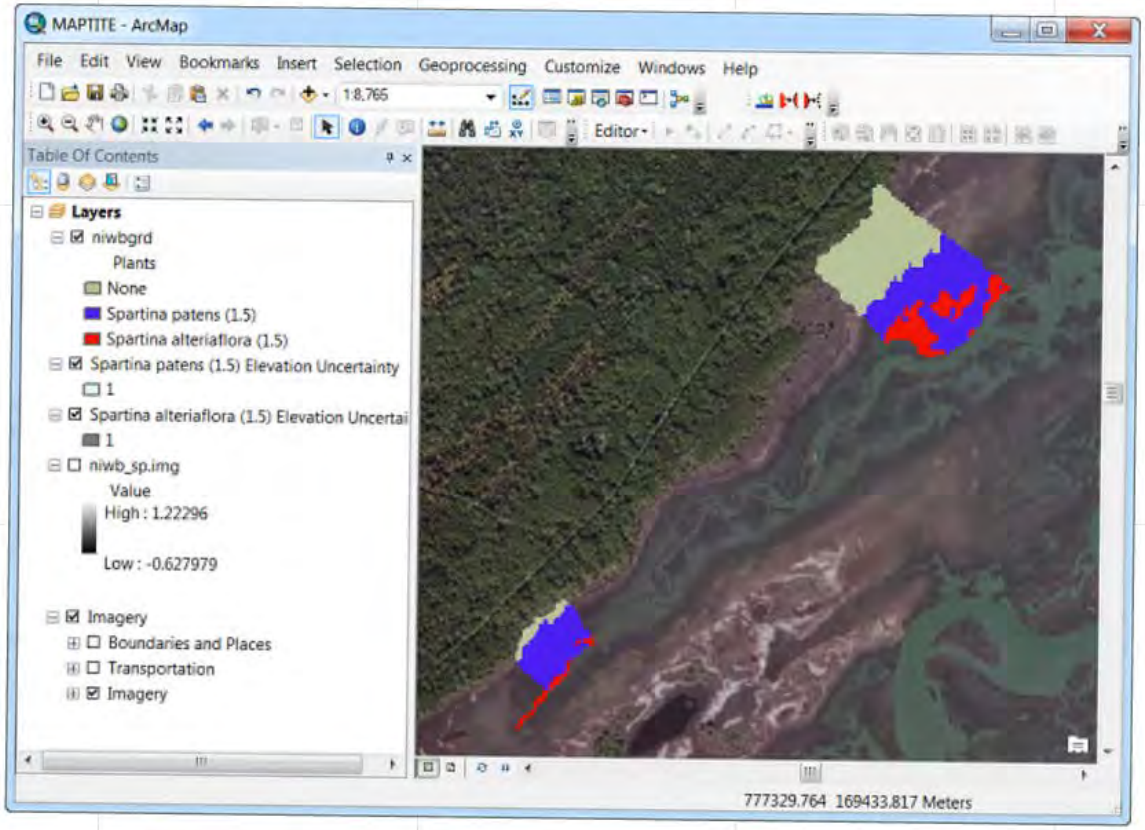
Installation, Operation and Features

System Requirements for MAPTITE operation:
ArcGIS 10.2
ArcGIS Spatial Analyst extension



Installation

MAPTITE_102



Application – Restoration Project Planning

Before

Marsh Restoration Project Planning

Fort McHenry Wetland Restoration

… into this!

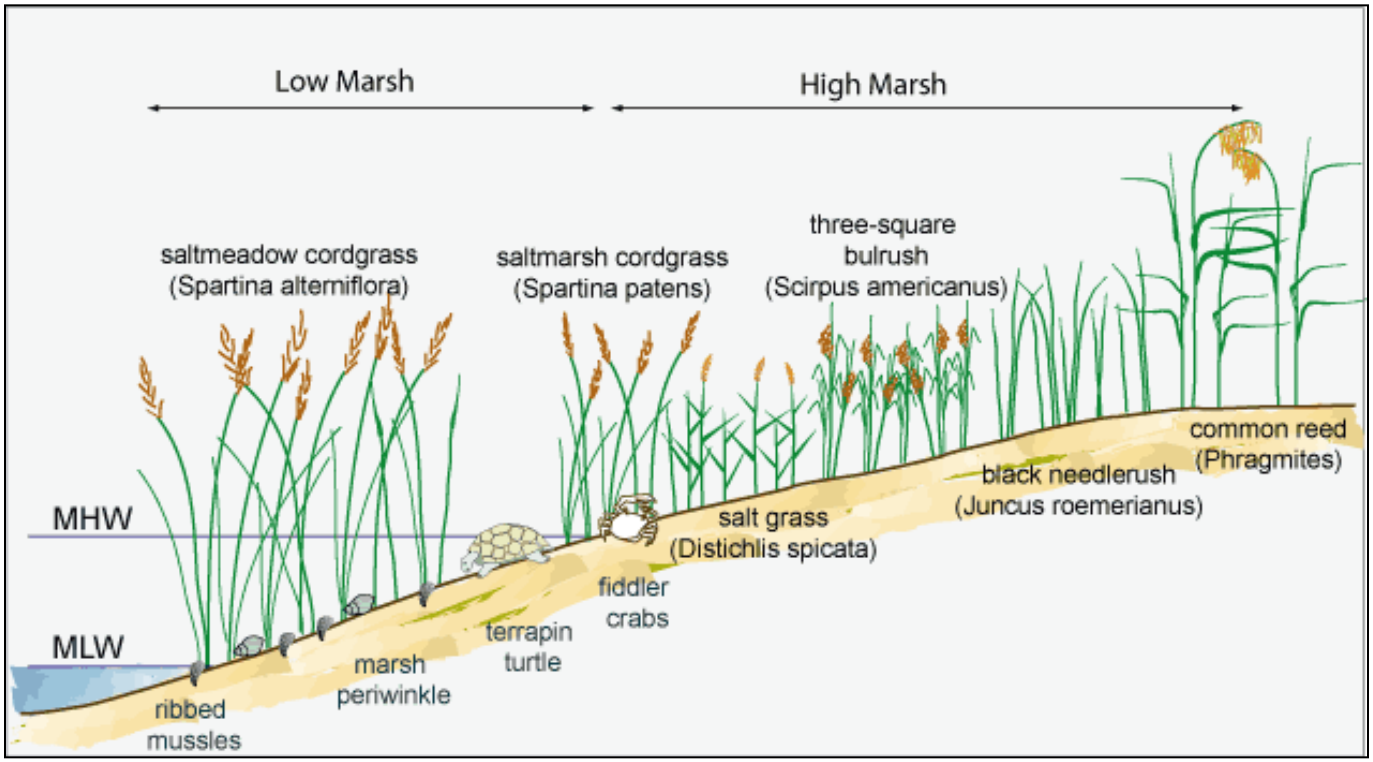
After

Helping to turn this …

Using:

- DEM
- Tide gauge
- Datums
- Native Plant Species
- Hard work &
- MAPTITE

Salt Marsh Zonation



Tidal marsh zonation. Courtesy of USGS.

- High marsh and the low marsh for their various tolerances to salinity, flooding from tides, temperature, and oxygen

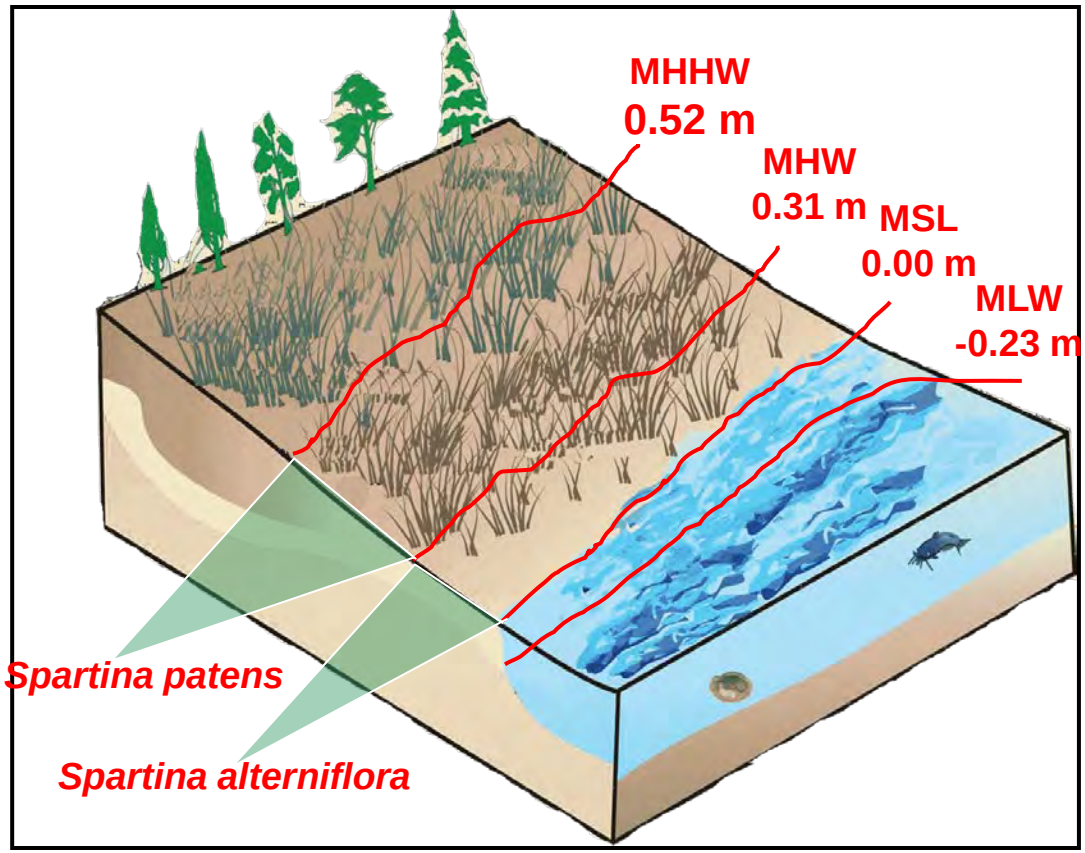
Concept Model

Frequency* of Inundation*:

- How often the water reaches a spot on the marsh surface

***Duration* of Inundation:**

- How long the water stays on that spot on the marsh surface



Salt Marsh – Tidal Range

- Elevations of marsh platform within watersheds are dependent upon tidal datums
- The marsh surface and tidal surface elevation relationship is one of the ultimate controls in dictating wetland flooding frequency, length of inundation, available and potential suspended sediment concentrations, and type and density of vegetation cover (Morris et al., 2002)

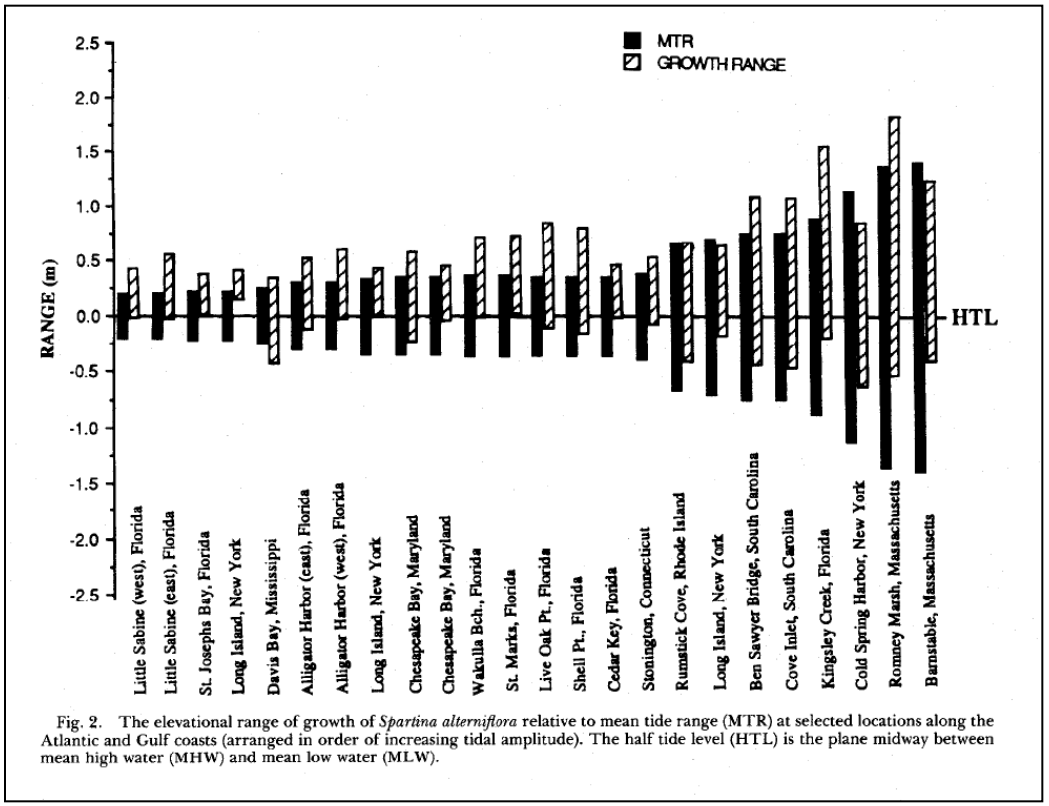


Fig. 2. The elevational range of growth of *Spartina alterniflora* relative to mean tide range (MTR) at selected locations along the Atlantic and Gulf coasts (arranged in order of increasing tidal amplitude). The half tide level (HTL) is the plane midway between mean high water (MHW) and mean low water (MLW).

The Relationship of Smooth Cordgrass (*S. alterniflora)* to Tidal Range (McKee and Patrick, 1988).

Vertical Datum

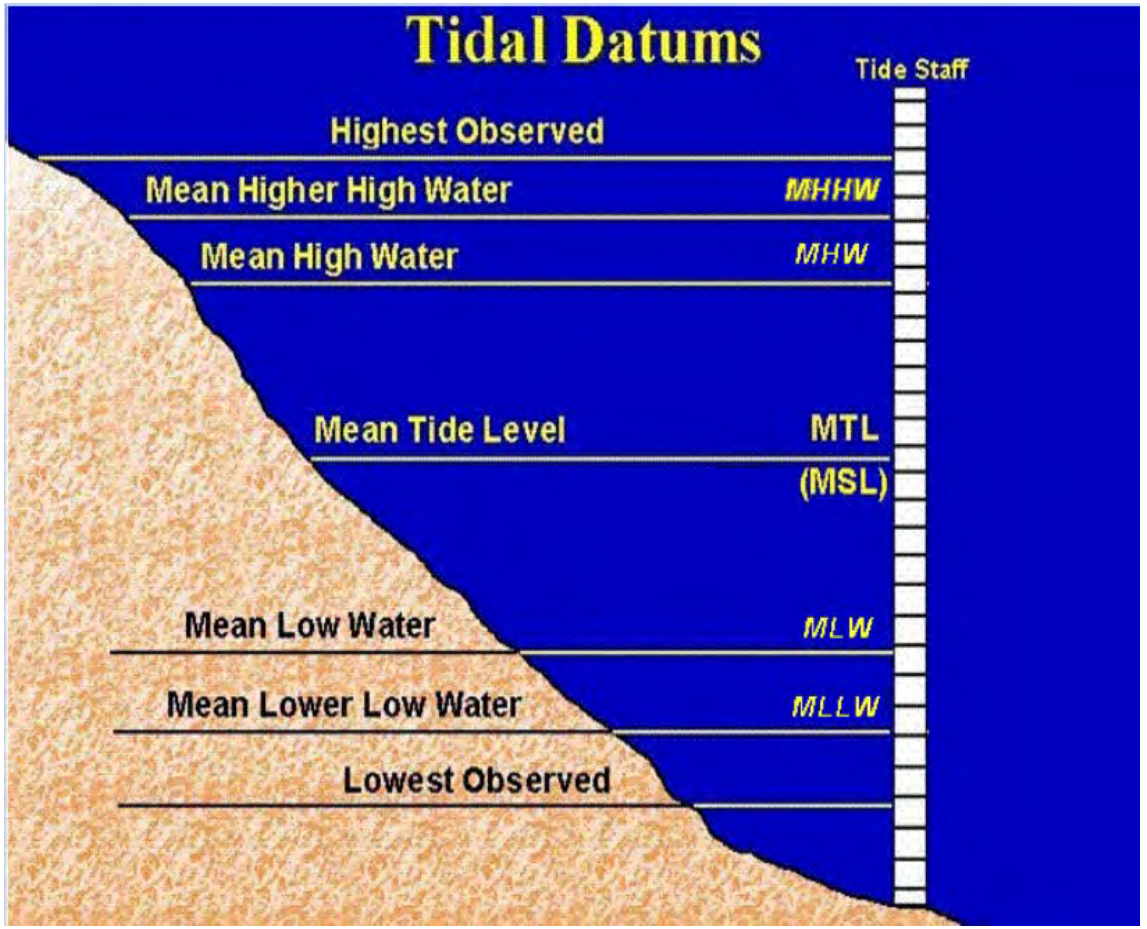
Datum – base elevation used as a reference from which to reckon heights or depths

Geodetic Datum

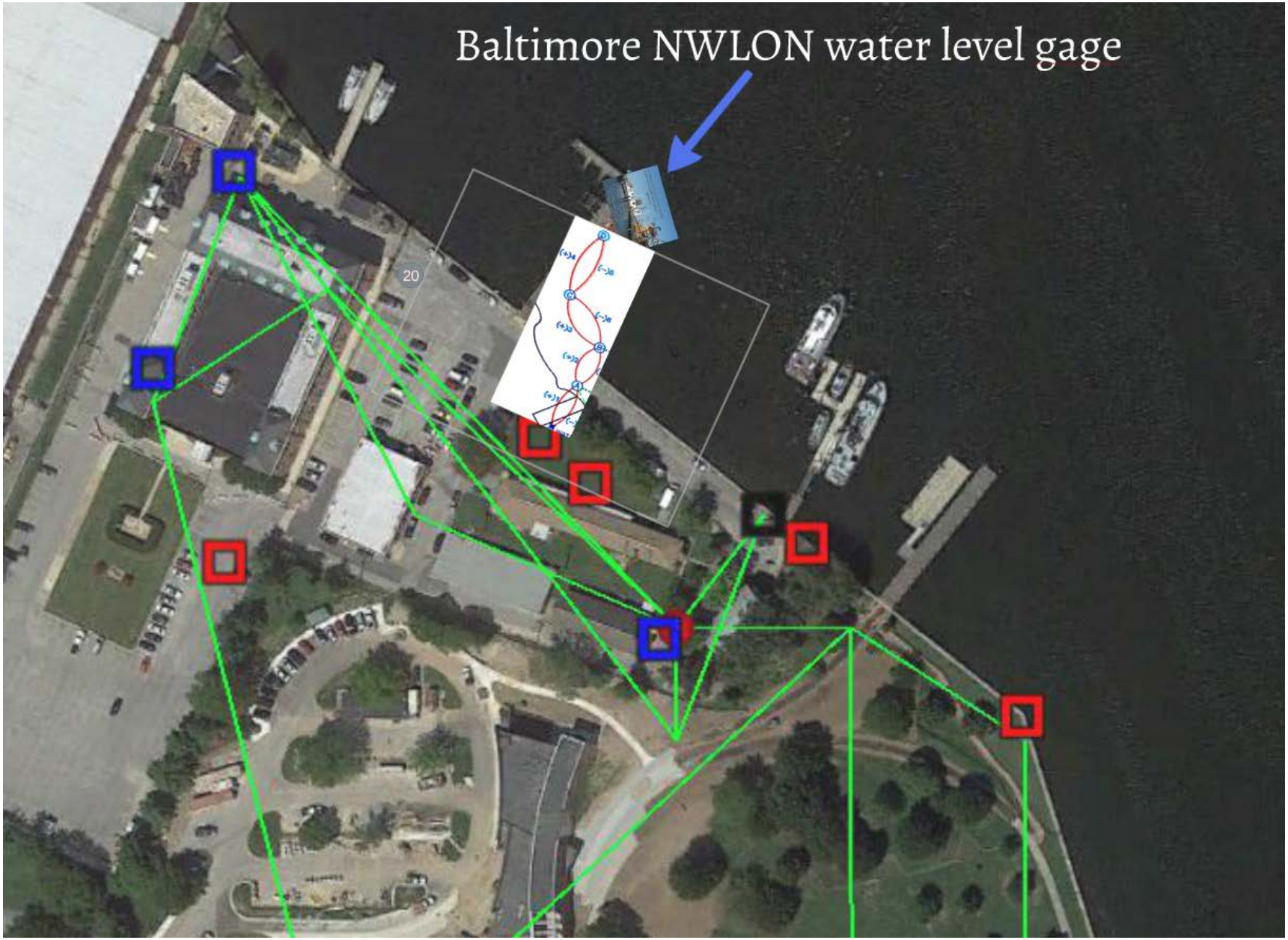
- Use NAVD 88

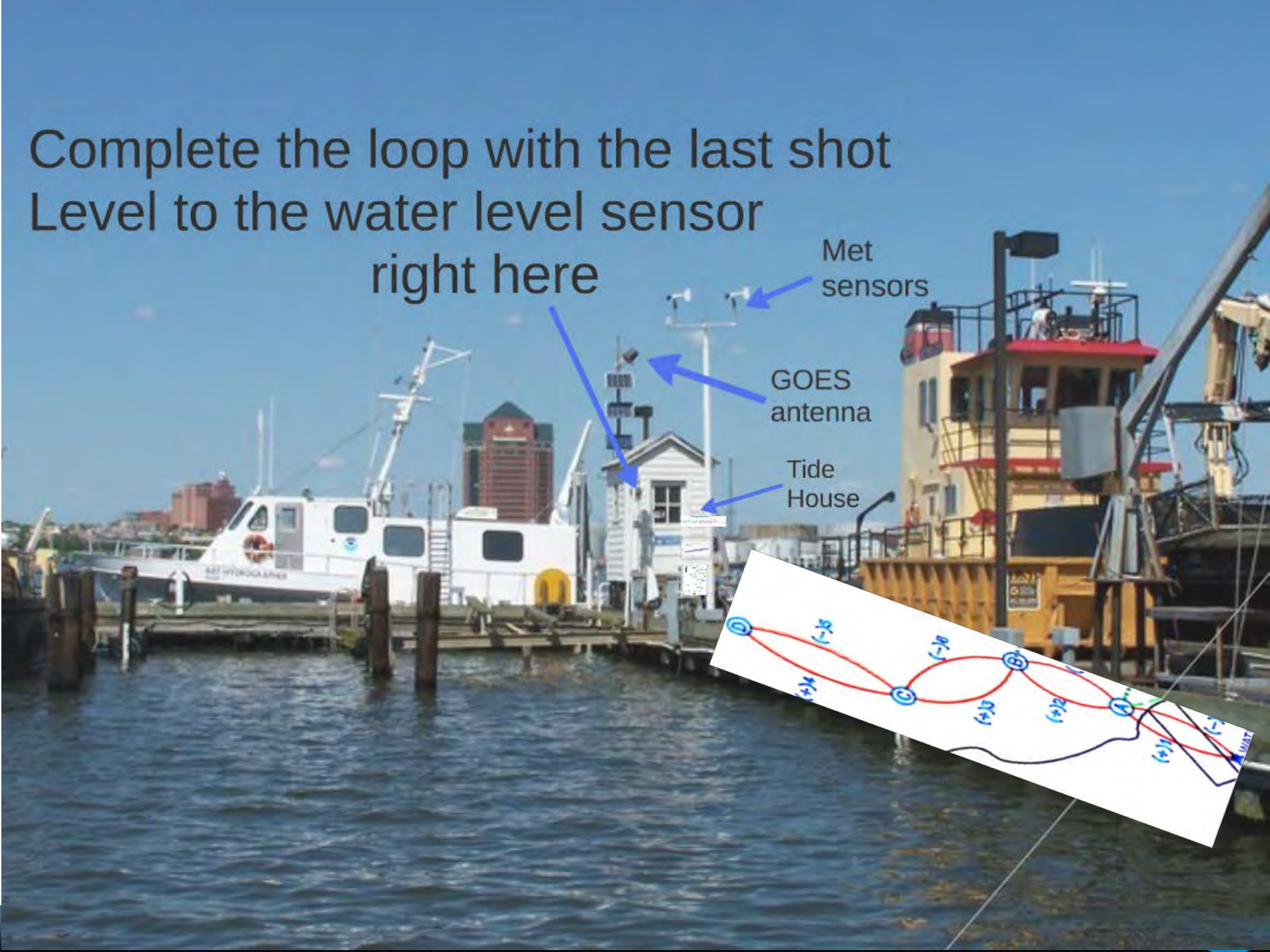
Tidal Datum –

- Based on 19-year period, 1983 – 2001



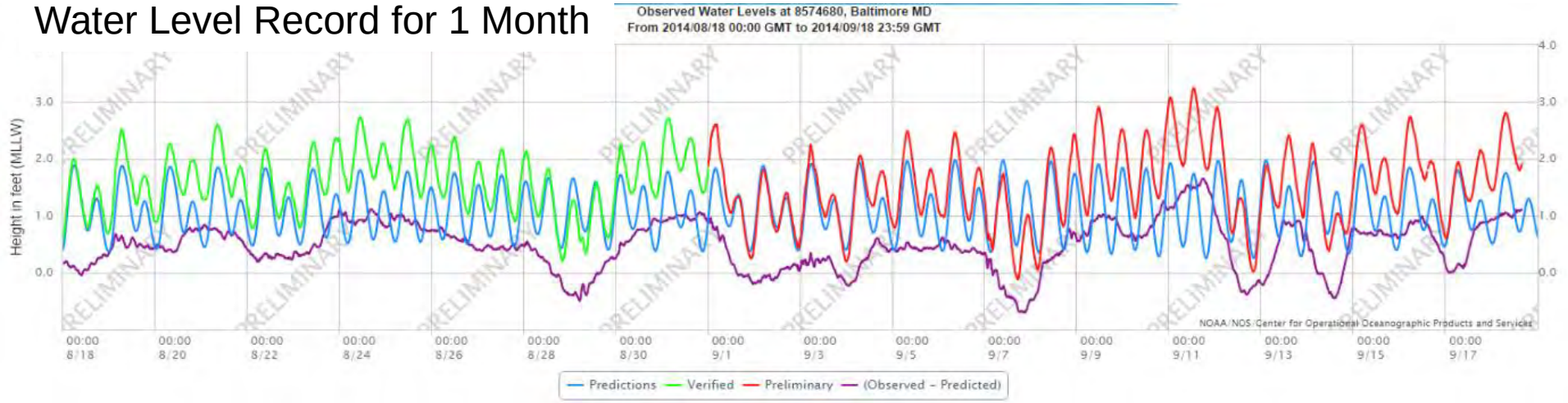
Datums at Ft. McHenry


Baltimore NWLON water level gage

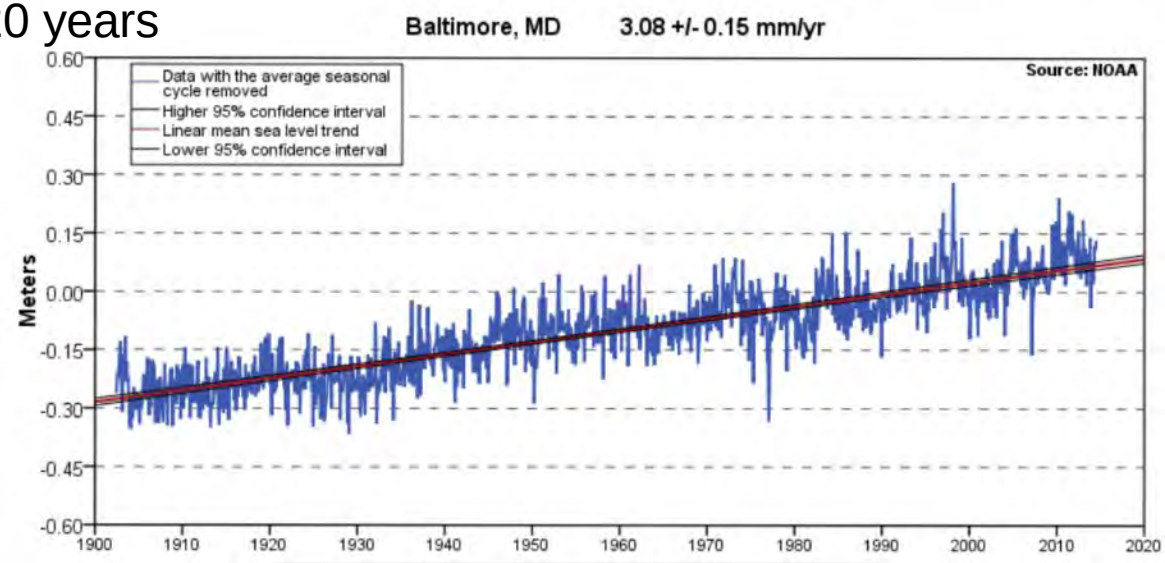

Complete the loop with the last shot
Level to the water level sensor
right here
Met
sensors
GOES
antenna
Tide
House

Water Level - Baltimore

Water Level Record for 1 Month

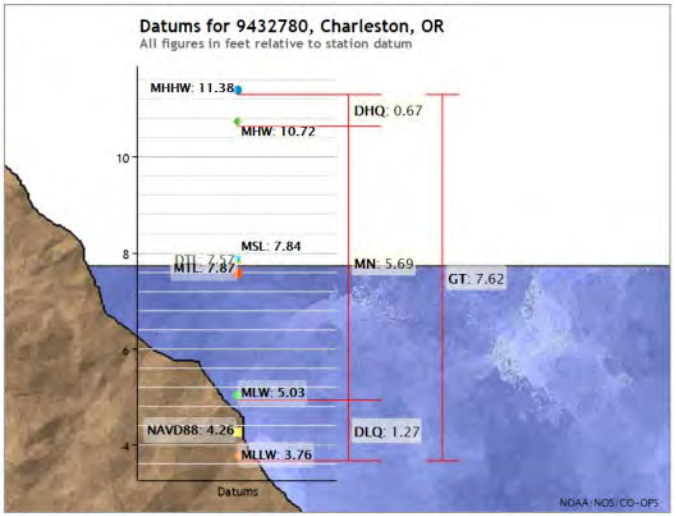


Water Level Record for 120 years



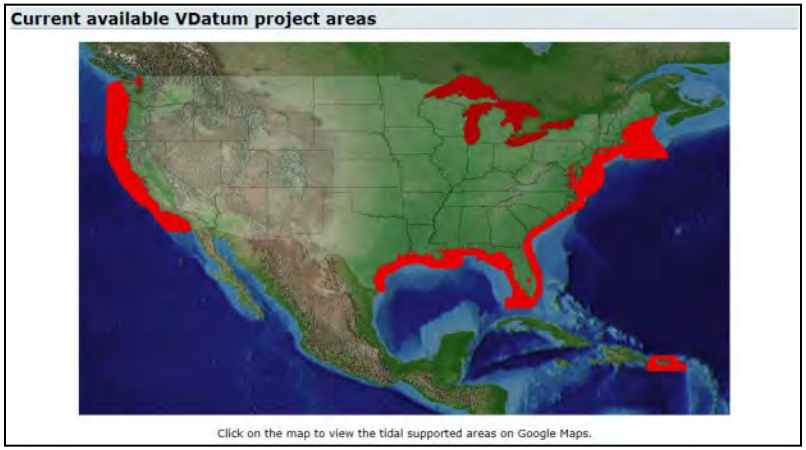
Mean Sea Level Adjustment

- Datums Page
- Benchmark Sheet
- VDatum Transformation



Datums page

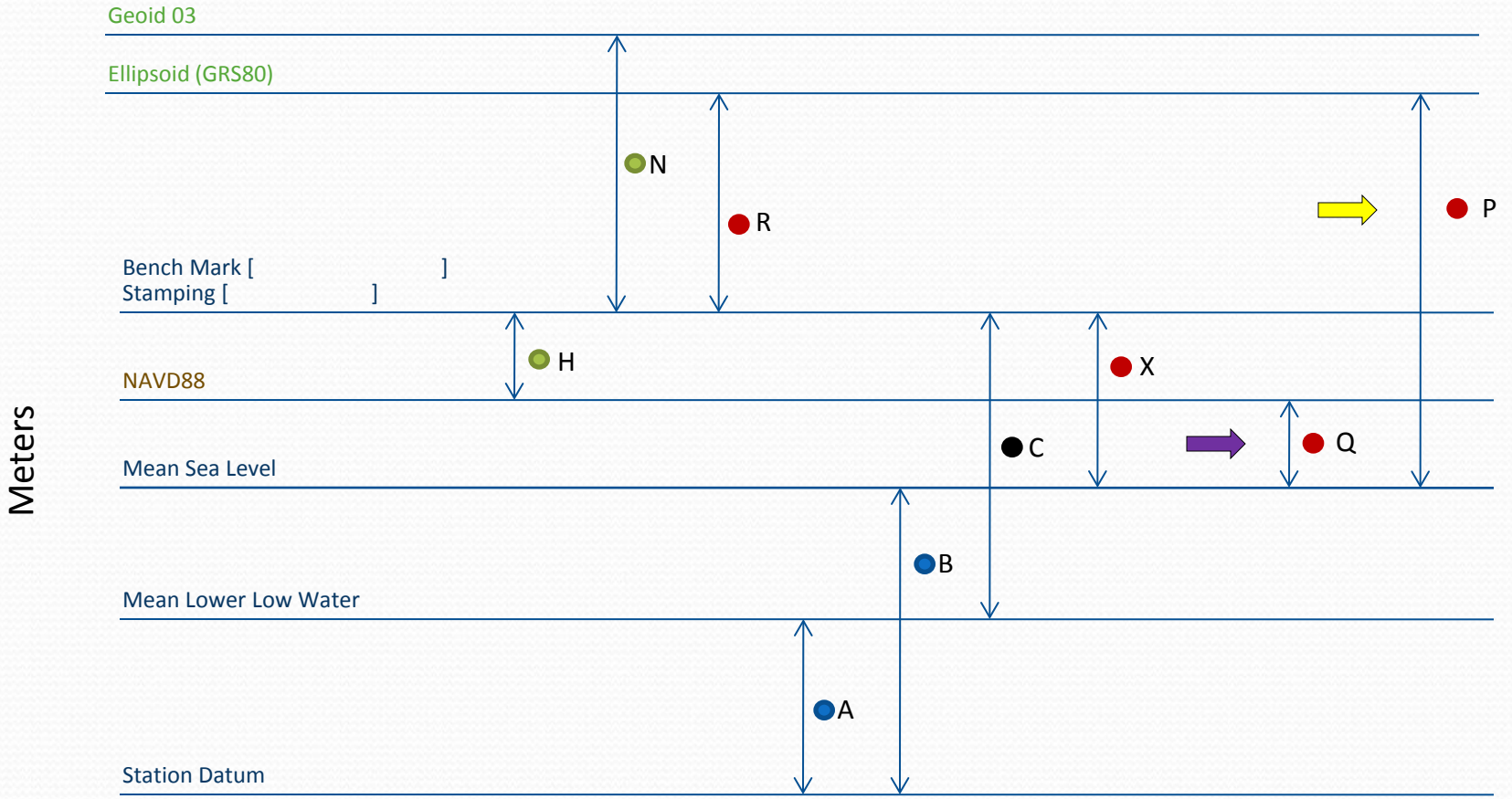
Bench mark sheet



VDatum Transformation

MAPTITE

Datums Worksheet Example



[* Not to Scale]

Key for Data Location

- This information collected in the field and/or found on the NGS Data Sheet via PID
- CO-OPS Datums page(change units to meters on website)
- CO-OPS Published Bench mark page
- Calculated using the other three data types

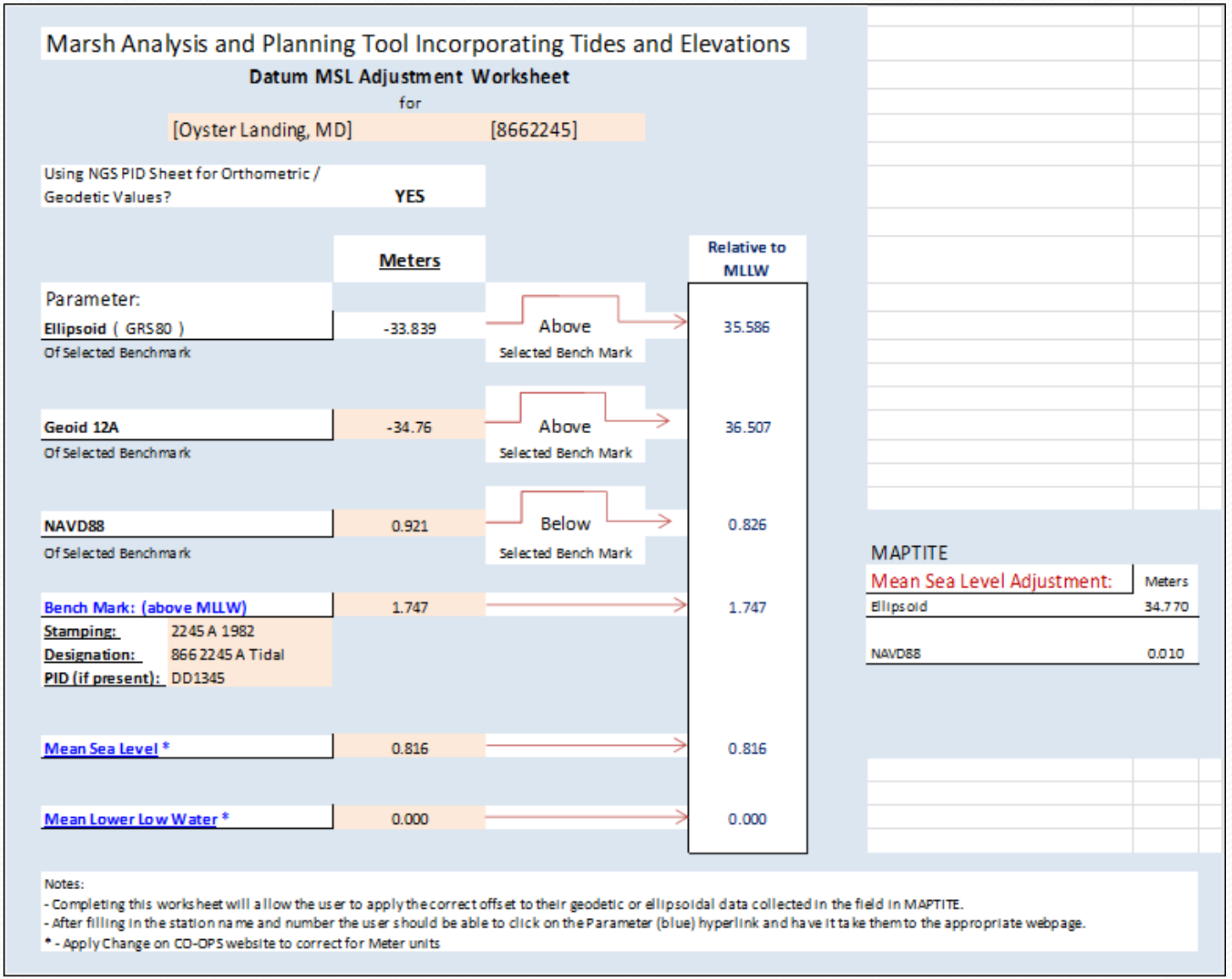
$\mathbf{R}_{BM} = H+N$ $\quad$ $\mathbf{Q} = X - H$

$\mathbf{X} = (A+C) - B$ $\quad$ $\mathbf{P} = X + R$

Value for reducing your GPS data to Mean Sea Level (MAPTITE Input)

Value for reducing your Leveling data to Mean Sea Level (MAPTITE Input)

Tidal Datums Excel Worksheet



Marsh Analysis and Planning Tool Incorporating Tides and Elevations

Datum MSL Adjustment Worksheet

for

[Oyster Landing, MD] [8662245]

Using NGS PID Sheet for Orthometric / Geodetic Values? **YES**

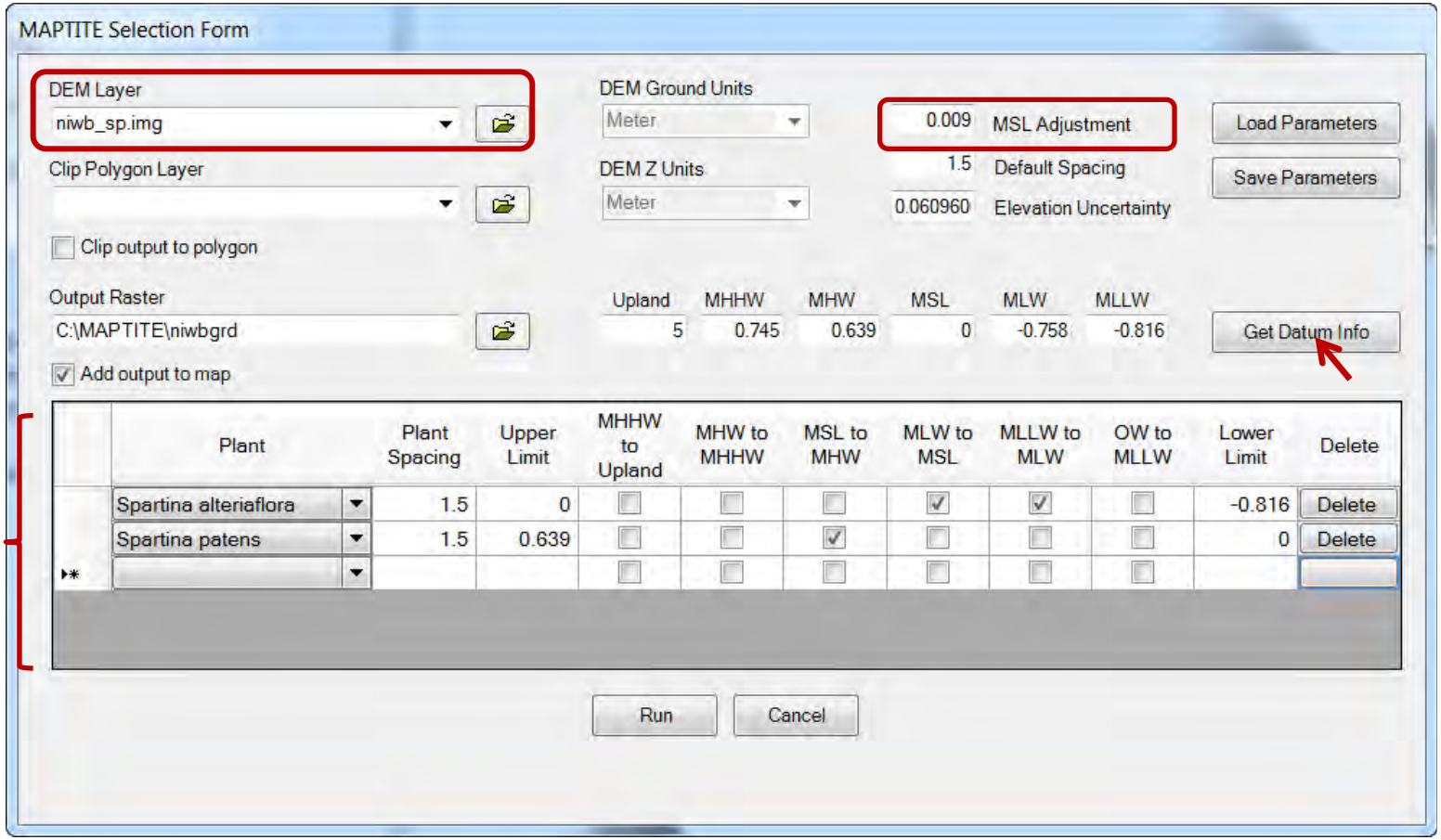
Parameter:	Meters		Relative to MLLW
Ellipsoid (GRS80) Of Selected Benchmark	-33.839	Above Selected Bench Mark	35.586
Geoid 12A Of Selected Benchmark	-34.76	Above Selected Bench Mark	36.507
NAVD88 Of Selected Benchmark	0.921	Below Selected Bench Mark	0.826
Bench Mark: (above MLLW)	1.747		1.747
Stamping:	2245 A 1982		
Designation:	866 2245 A Tidal		
PID (if present):	DD1345		
Mean Sea Level *	0.816		0.816
Mean Lower Low Water *	0.000		0.000

MAPTITE

Mean Sea Level Adjustment:	Meters
Ellipsoid	34.770
NAVD88	0.010

Notes:
- Completing this worksheet will allow the user to apply the correct offset to their geodetic or ellipsoidal data collected in the field in MAPTITE.
- After filling in the station name and number the user should be able to click on the Parameter (blue) hyperlink and have it take them to the appropriate webpage.
* - Apply Change on CO-OPS website to correct for Meter units

MAPTITE Input



- **Digital Elevation Model**–Vertical adjustment to MSL
- **Tidal Datum Elevations** –MHHW, MHW, MSL, MLW, MLLW relative to NAVD88
- **Plant Species Data** –Elevation ranges and plant spacing

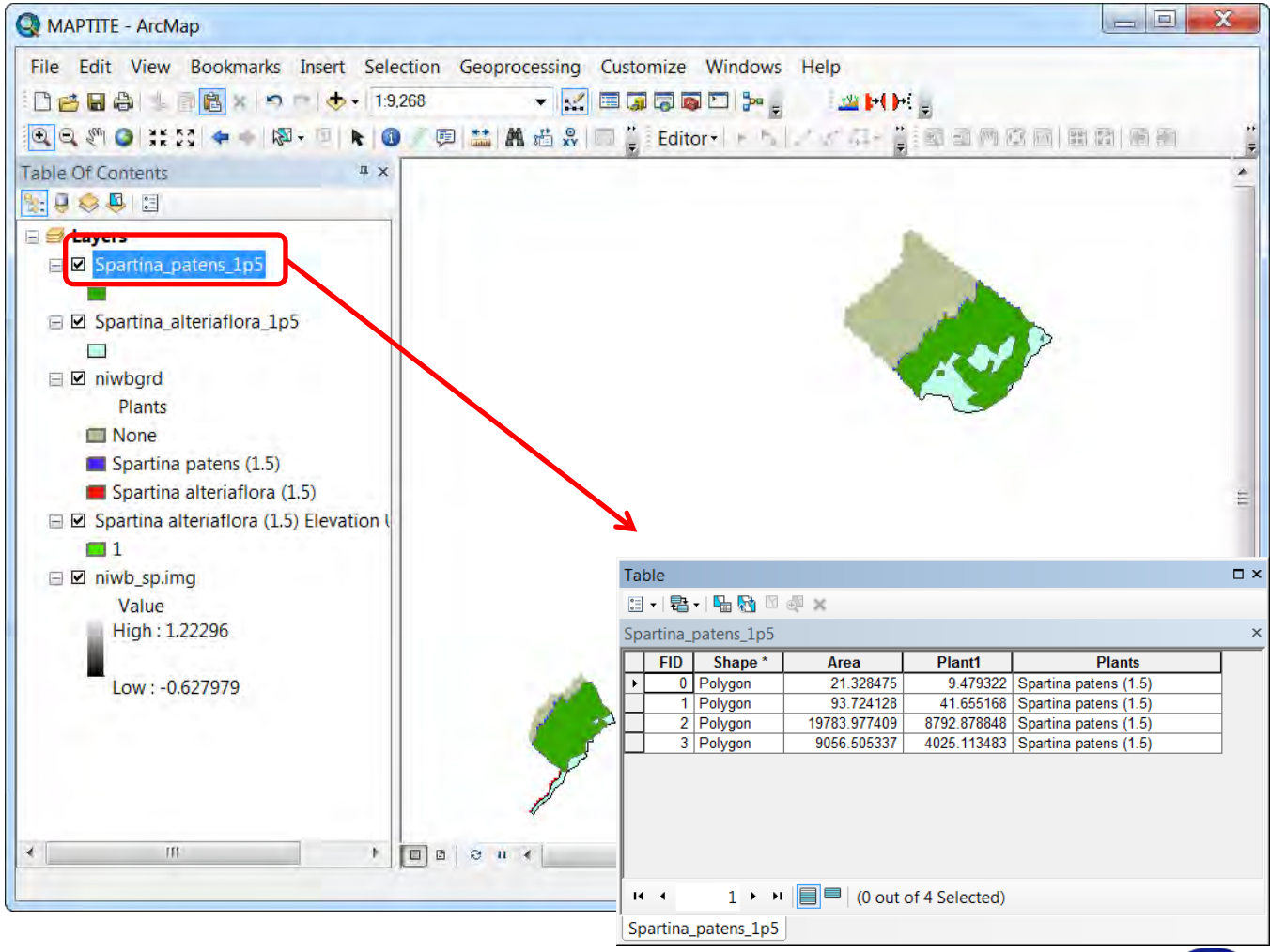
MAPTITE Output

Planting Zones for each grass species

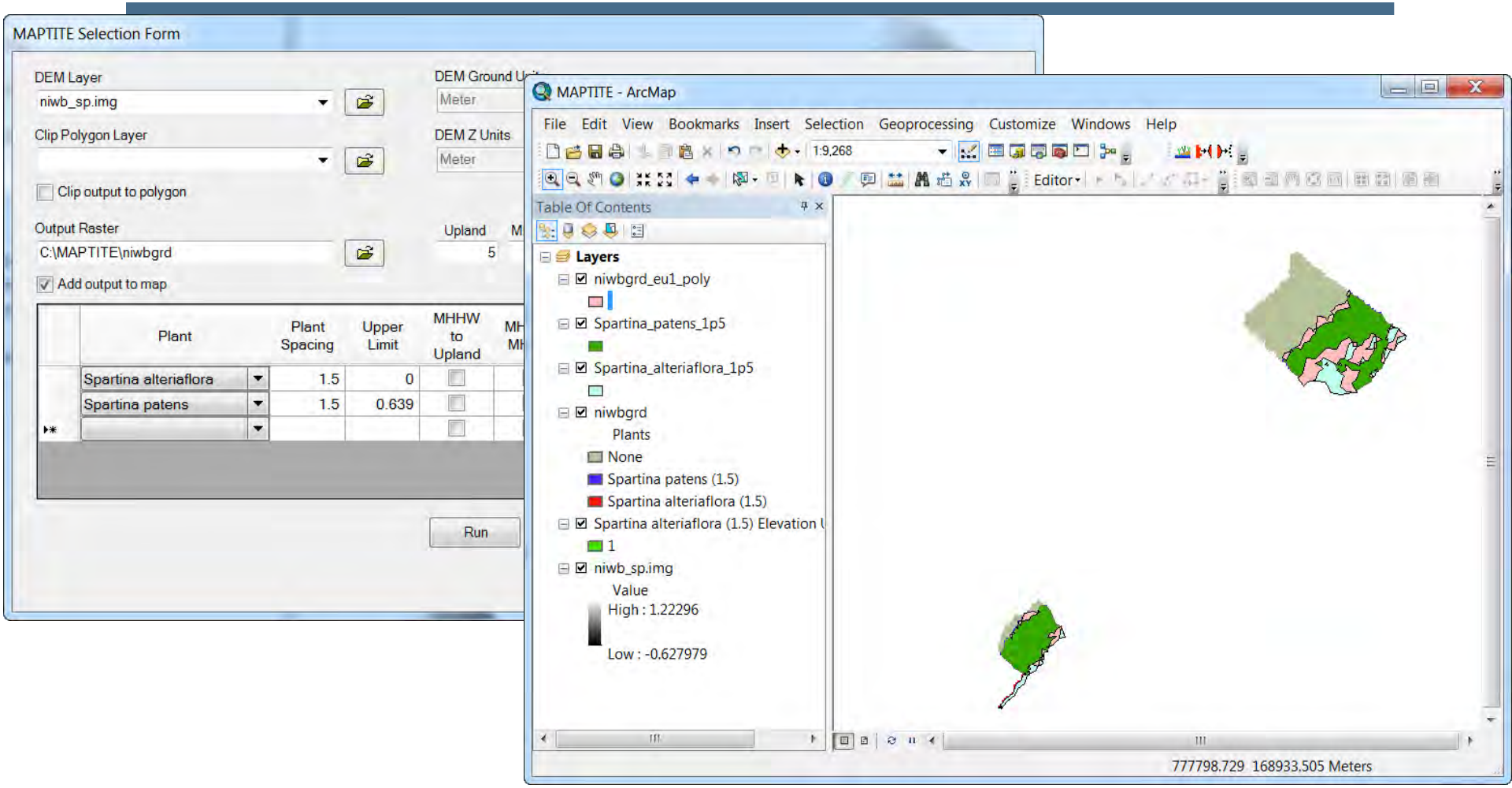
- Individual layers and overlapping zones
- Area statistics for planting zones

GPS Point Files

- Longitude and Latitude for planting points



Be Aware of the Uncertainties



Uncertainty Source: 1). DEM elevation 2). Tidal datum 3). Geodetic Datum

Uncertainties – Addendum

- DEM elevation

  cm level (Local GPS)

  ~ 15 cm (LiDAR)

- Tidal datum

  0 (19 years)

  0 ~ 3 cm (> 1 year)

  1 ~ 6 cm (< 1 year)

- Geodetic Datum

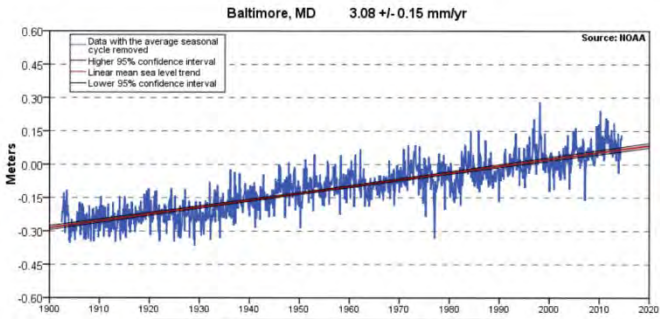
  High Accuracy Reference Network (HARN) > 1 cm level

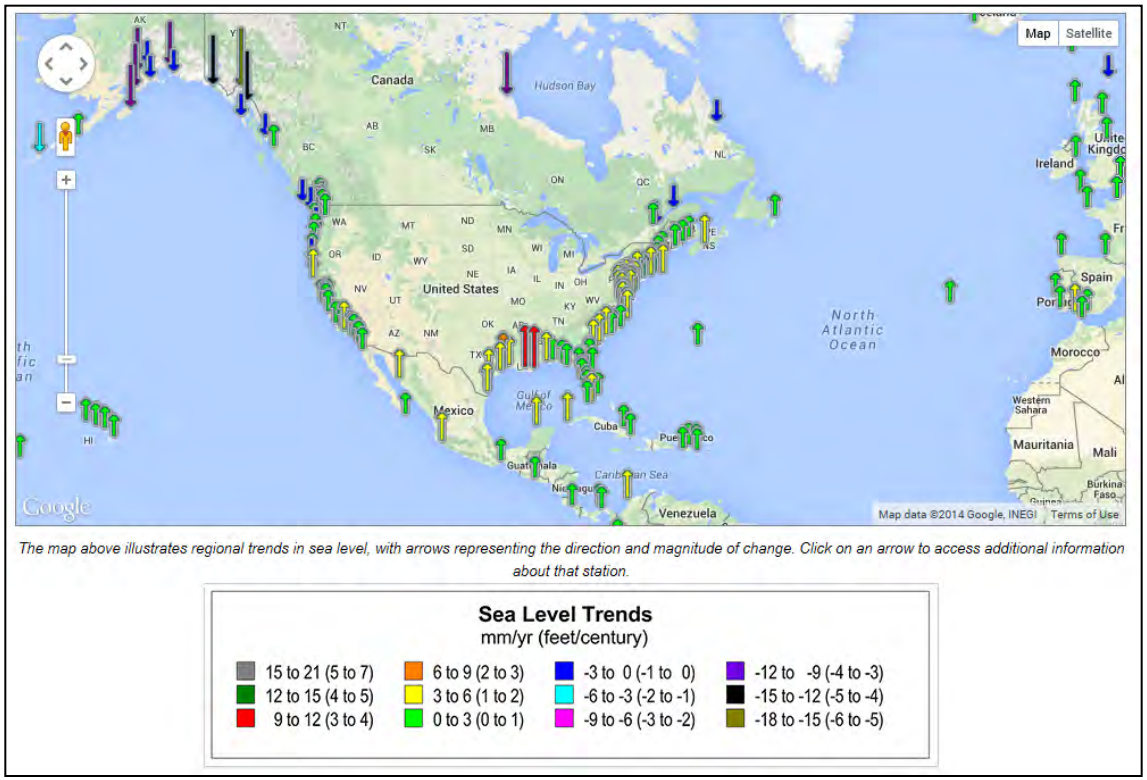
  Static GPS surveys > 2-5 cm

- Vdatum http://vdatum.noaa.gov/docs/est_uncertainties.html

Application – Sea Level Rise Mitigation

- Obtain sea level trend from CO-OPS webpage (mm/yr)
- Apply sea level trend to tidal datums
- Run MAPTITE





The map above illustrates regional trends in sea level, with arrows representing the direction and magnitude of change. Click on an arrow to access additional information about that station.

http://www.tidesandcurrents.noaa.gov/sltrends/sltrends.html

MAPTITE Partners

– Methodology, Tides and Tidal Datums

– Elevations & Geodetic Datums

– ArcGIS scripting and software development

– Restoration and plant ecology

DEMO

- By Lijuan Huang

Where to Access to MAPTITE

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Lijuan Huang Lijuan.Huang@noaa.gov

- CO-OPS MAPTITE website (http://www.tidesandcurrents.noaa.gov/maptite.html)
- Office of Coastal Management

  Digital Coast (http://coast.noaa.gov/digitalcoast/tool/MAPTITE)

  Facebook (https://www.facebook.com/NOAADigitalCoast?fref=nf)
- QGIS version is available (soon)

Questions?