



An Evolution of Water Level Partnerships at NOAA Center for Operational Oceanographic Products and Services (CO-OPS)

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Stakeholder Services Branch

Who is CO-OPS

Our Mission: Meaningful oceanographic data for the Nation

CO-OPS is the authoritative source for accurate, reliable, and timely tides, water levels, currents and other oceanographic information.

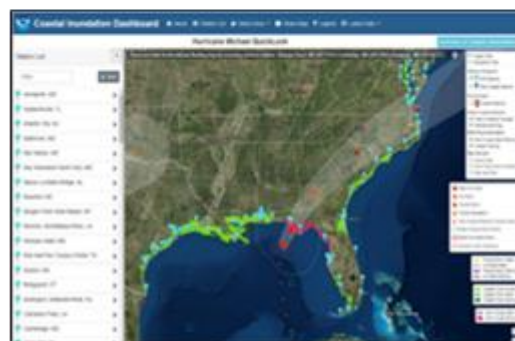
Vision

Supporting the Nation's economy and safeguarding coastal communities with oceanographic information accessible by anyone, at any time, from any place.



Supporting

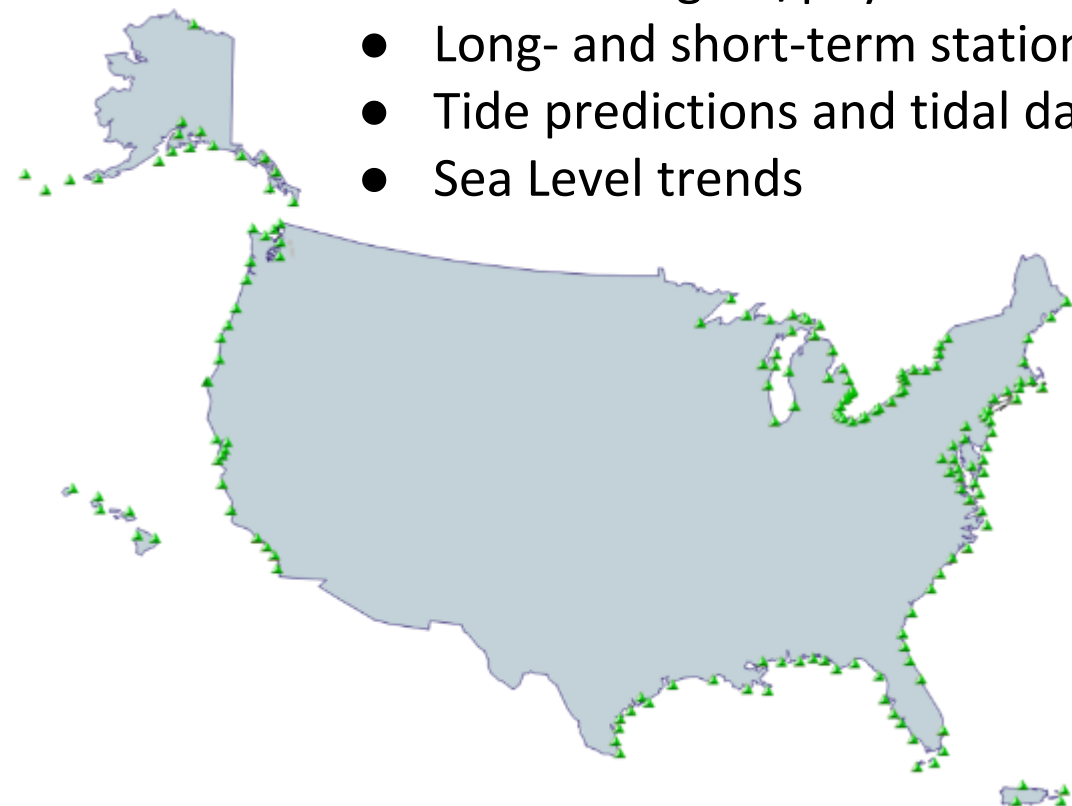
- Mapping and charting for the nation
- Safe and efficient navigation
- Coastal resilience and planning for coastal inundation
- Ecological forecasting



Water Level Observations

National Water Level Observation Network (NWLON)

- Real-time Water Levels
- Meteorological/physical oceanographic data
- Long- and short-term stations
- Tide predictions and tidal datums
- Sea Level trends

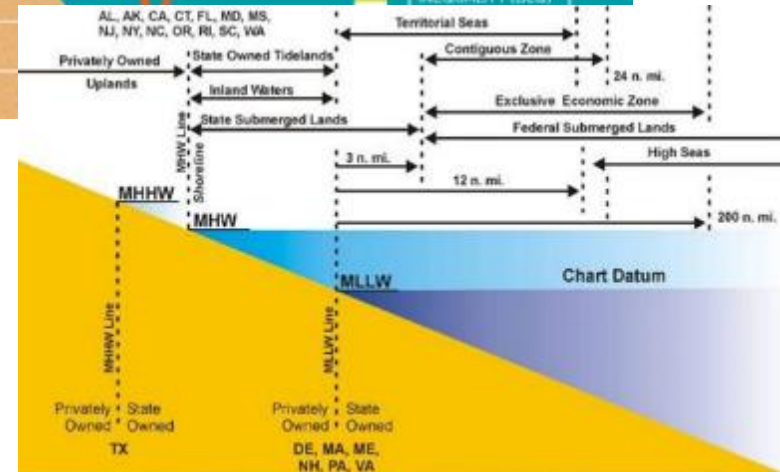
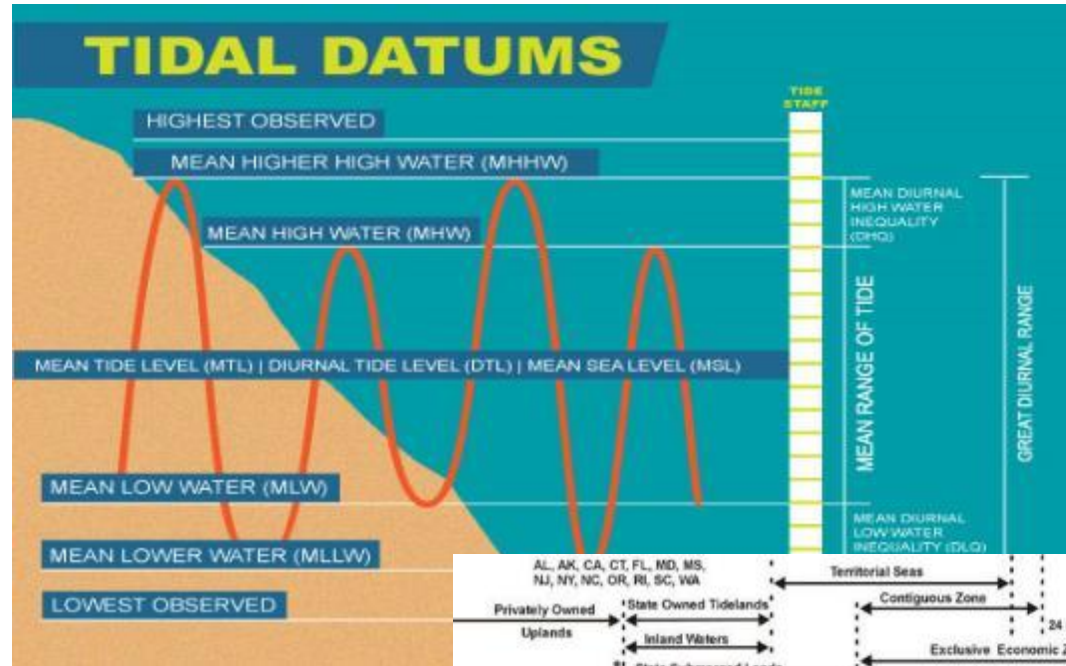


What is a tidal datum?

NWLON provides a reference system for the Nation

A water level **datum** is a reference plane in the ocean or Great Lakes – linked to a point on land known as a benchmark – used to measure local water heights and depths.

National Tidal Datum Epoch is average of 19 years of observations.



Share in the Chat Box

If you have used tide tables or real-time data, what have you used them for?



StationId: 8594900
Source: NOAA/NOS/CO-OPS
Station Type: Primary
Time Zone: LST_LDT
Datum: MLLW

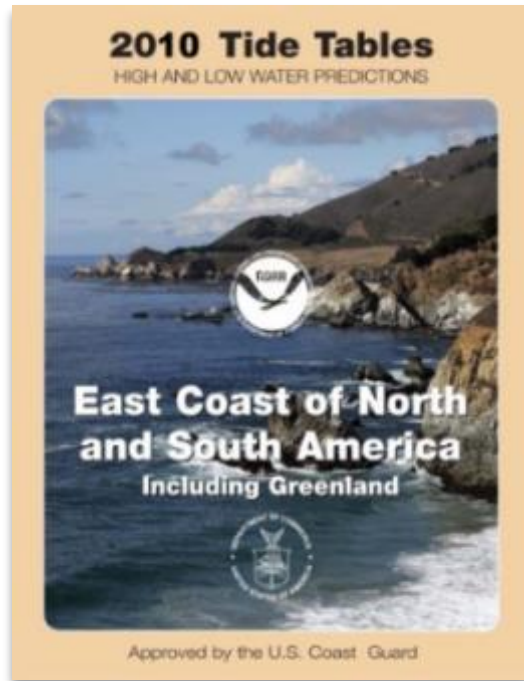
NOAA Tide Predictions

Washington, DC, 2023

(38 52.4N / 77 01.3W)

Times and Heights of High and Low Waters

January					February					March				
Time	Height	Time	Height		Time	Height	Time	Height		Time	Height	Time	Height	
1	h m ft cm	16	h m ft cm		1	h m ft cm	16	h m ft cm		1	h m ft cm	16	h m ft cm	
03:28 AM 2.1 64		02:06 AM 2.0 61			04:53 AM 1.9 58		03:53 AM 2.0 61			03:28 AM 2.1 64		03:24 AM 2.3 70		
10:10 AM -0.3 -9		08:39 AM -0.2 -6			11:21 AM -0.1 -3		10:29 AM -0.1 -3			09:49 AM 0.2 6		10:04 AM 0.3 9		
Su 03:54 PM 2.4 73		M 02:30 PM 2.3 70			W 05:10 PM 2.3 70		Th 04:13 PM 2.5 76			W 03:42 PM 2.3 70		Th 03:42 PM 2.7 82		
11:02 PM -0.3 -9		09:49 PM 0.0 0					11:50 PM -0.1 -3			10:58 PM 0.1 3		11:23 PM 0.3 9		
2	04:25 AM 2.1 64	17	03:11 AM 1.9 58		2	12:26 AM -0.2 -6	17	05:00 AM 2.1 64		2	04:26 AM 2.1 64	17	04:38 AM 2.3 70	
11:02 AM -0.3 -9		09:39 AM -0.2 -6			05:46 AM 2.0 61		11:47 AM -0.2 -6			10:48 AM 0.2 6		11:26 AM 0.2 6		
M 04:48 PM 2.4 73		Tu 03:34 PM 2.4 73			Th 12:16 PM -0.2 -6		F 05:19 PM 2.6 79			Th 04:39 PM 2.3 70		F 04:58 PM 2.7 82		
11:59 PM -0.3 -9		11:03 PM -0.1 -3			05:59 PM 2.3 70					11:51 PM 0.1 3				
3	05:18 AM 2.1 64	18	04:17 AM 1.9 58		3	01:15 AM -0.3 -9	18	12:52 AM -0.2 -6		3	05:20 AM 2.2 67	18	12:28 AM 0.2 6	
11:54 AM -0.3 -9		10:46 AM -0.2 -6			06:35 AM 2.0 61		06:00 AM 2.2 67			11:46 AM 0.2 6		05:45 AM 2.5 76		
Tu 05:37 PM 2.5 76		W 04:37 PM 2.5 76			F 01:07 PM -0.2 -6		Sa 12:57 PM -0.3 -9			F 05:32 PM 2.4 73		Sa 12:40 PM 0.1 3		
4	12:53 AM -0.3 -9	19	12:12 AM -0.2 -6		4	01:59 AM -0.3 -9	19	01:47 AM -0.3 -9		4	12:40 AM 0.0 0	19	01:27 AM 0.1 3	
06:09 AM 2.1 64		05:19 AM 1.9 58			07:21 AM 2.1 64		06:56 AM 2.4 73			06:09 AM 2.3 70		06:43 AM 2.7 82		
W 12:44 PM -0.3 -9		Th 11:58 AM -0.3 -9			Sa 01:54 PM -0.2 -6		Su 01:58 PM -0.5 -15			Sa 12:41 PM 0.1 3		Su 01:46 PM -0.1 -3		
06:24 PM 2.5 76		05:36 PM 2.6 79			07:29 PM 2.3 70		07:20 PM 2.7 82			06:21 PM 2.4 73		07:08 PM 2.8 85		
5	01:42 AM -0.4 -12	20	01:14 AM -0.3 -9		5	02:38 AM -0.3 -9	20	02:37 AM -0.4 -12		5	01:24 AM 0.0 0	20	02:22 AM 0.0 0	
06:57 AM 2.1 64		06:17 AM 2.0 61			08:02 AM 2.1 64		07:49 AM 2.6 79			06:53 AM 2.4 73		07:37 AM 2.9 88		
Th 01:31 PM -0.3 -9		F 01:07 PM -0.4 -12			Su 02:36 PM -0.3 -9		● 08:14 PM 2.7 82			Su 01:30 PM 0.0 0		M 02:45 PM -0.2 -6		
07:08 PM 2.5 76		06:35 PM 2.6 79			08:09 PM 2.3 70					07:06 PM 2.5 76		08:05 PM 2.9 88		
6	02:27 AM -0.4 -12	21	02:09 AM -0.5 -15		6	03:15 AM -0.3 -9	21	03:25 AM -0.5 -15		6	02:04 AM 0.0 0	21	03:11 AM -0.1 -3	
07:42 AM 2.1 64		07:13 AM 2.2 67			08:39 AM 2.2 67		08:39 AM 2.7 82			07:33 AM 2.5 76		08:28 AM 3.0 91		
F 02:14 PM -0.2 -6		Sa 02:09 PM -0.5 -15			M 03:16 PM -0.3 -9		Tu 03:47 PM -0.6 -18			M 02:13 PM -0.1 -3		Tu 03:38 PM -0.3 -9		
O 07:49 PM 2.5 76		● 07:32 PM 2.7 82			08:46 PM 2.3 70		09:06 PM 2.7 82			07:46 PM 2.5 76		● 08:57 PM 2.9 88		
7	03:07 AM -0.4 -12	22	03:00 AM -0.6 -18		7	03:49 AM -0.3 -9	22	04:11 AM -0.5 -15		7	02:39 AM -0.1 -3	22	03:57 AM -0.1 -3	
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Sa 02:55 PM -0.2 -6		Su 03:06 PM -0.6 -18			Tu 03:54 PM -0.3 -9		W 04:39 PM -0.6 -18			Tu 02:54 PM -0.1 -3		W 04:29 PM -0.3 -9		
08:28 PM 2.4 73		08:27 PM 2.6 79			09:21 PM 2.3 70		09:58 PM 2.6 79			O 08:22 PM 2.5 76		09:47 PM 2.9 88		
8	03:45 AM -0.3 -9	23	03:49 AM -0.6 -18		8	04:21 AM -0.3 -9	23	04:57 AM -0.4 -12		8	03:13 AM 0.0 0	23	04:41 AM -0.1 -3	
09:05 AM 2.1 64		08:58 AM 2.4 73			09:44 AM 2.2 67		10:18 AM 2.8 85			08:39 AM 2.6 79		10:02 AM 3.2 98		
Su 03:34 PM -0.2 -6		M 04:02 PM -0.7 -21			W 04:31 PM -0.3 -9		Th 05:31 PM -0.5 -15			W 03:32 PM -0.1 -3		Th 05:19 PM -0.3 -9		
09:06 PM 2.4 73		09:21 PM 2.6 79			09:56 PM 2.3 70		10:51 PM 2.5 76			08:56 PM 2.5 76		10:35 PM 2.8 85		



Legislative Mandates

- **Organic Act of Feb 10, 1807 founding of Survey of the Coasts**
 - Founded the Survey of the Coasts, in order “to cause a survey to be taken of the coast . . . for completing an accurate chart of every part of the coasts.”
 - Tides and currents observations began in order to support the hydrographic and shoreline surveys and to create tide prediction capability
- **US Coast and Geodetic Survey Act of 1947**
 - Authorizes tide and current observations for safe and efficient navigation
- **Hydrographic Services Improvement Act (1998)**
 - Authorizes real time data
 - Authorizes other uses; coastal resource management, emergency response, homeland security
- **Boundary Waters Treaty of 1909**
 - Creates guidelines governing the management of any waters bordering the US and Canada
- **US Tsunami Warning and Education Act (2006)**
 - Authorizes tide gauge warning networks
- **Harmful Algal Bloom and Hypoxia Amendments Act (2004)**
 - Mandates NOAA to advance the scientific understanding and ability to detect, monitor, assess, and predict HAB and hypoxia events.

Legal Precedent

- **1936 Borax, Ltd v. City of Los Angeles U.S. Supreme Court case**
 - Use of 19-year tidal datum epoch concept in legal context
- **United States v California, 332 U.S. 19, 26 (1947)**
 - Established use of ordinary low water mark as baseline for offshore submerged lands as defined and determined by Coast and Geodetic Survey.
- **National Tidal Datum Convention of 1980**
 - Authorized the NOAA definitions of MHW, MHHW, MLW and MLLW as the official policy of the U.S. Government.
- **Dinkum Sands Court case**
 - Submerged Lands in AK

CO-OPS Traditional Partnership Model

Local Partners

- Quasi-Reimbursable projects under the COASTAL program
 - Tulalip Bay – marine boundary
 - San Francisco Coyote Creek - restoration
 - Poplar Island - restoration

State Partners

- U.S. Marine Boundary Program - 1970s
- Texas Coastal Ocean Observation Network
 - 20+ year partnership
 - TCOON replicated NOAA standards end-to-end
 - *Sentinels of the Coast* stations

Federal Partners

- Other NOAA offices (NWS, OAR, NERRS – sensor installs)
- Integrated Ocean Observing System (Standards, Datums)
- U.S. Army Corps of Engineers (Technical guidance, gauging)

PORTS partners

- Cost-share with local seaport stakeholders
 - Local partner covers equipment and O&M
 - CO-OPS covers overhead



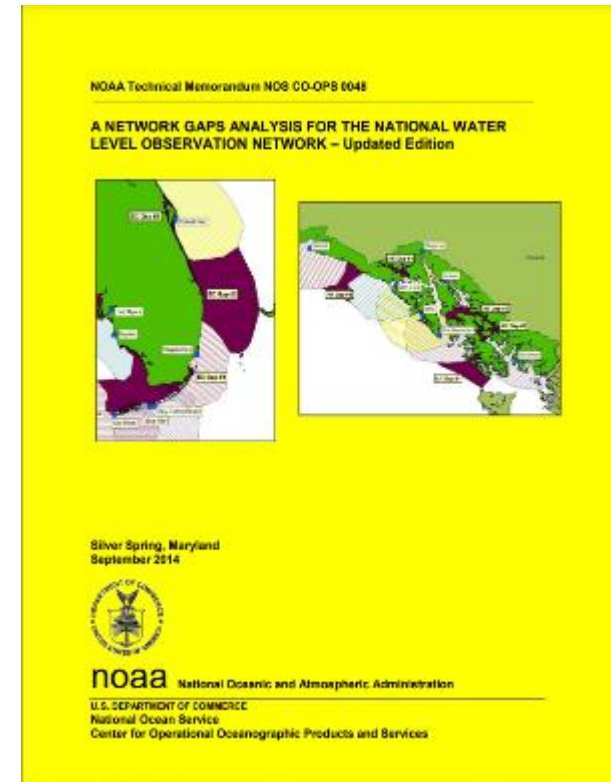
Why partner with USGS?

- Partnering leverages strengths and eliminates duplication of efforts; also a great story to be able to provide Congress
- CO-OPS has over 100 gaps in its NWLON network; No new funds have been identified
- USGS **Surge, Wave, and Tide Hydrologic (SWaTH) Network** and its Stream Gauge network operate long and short-term gauges for hydrologic purposes – many located in NWLON gaps
- USGS received funding from Sandy supplemental to enhance their coastal gauge network
- NOAA: Water level data for navigation, sea level trends, predictions, datums
- USGS: Water level data for real-time storm data

Caterpillar



Vision &
Concept



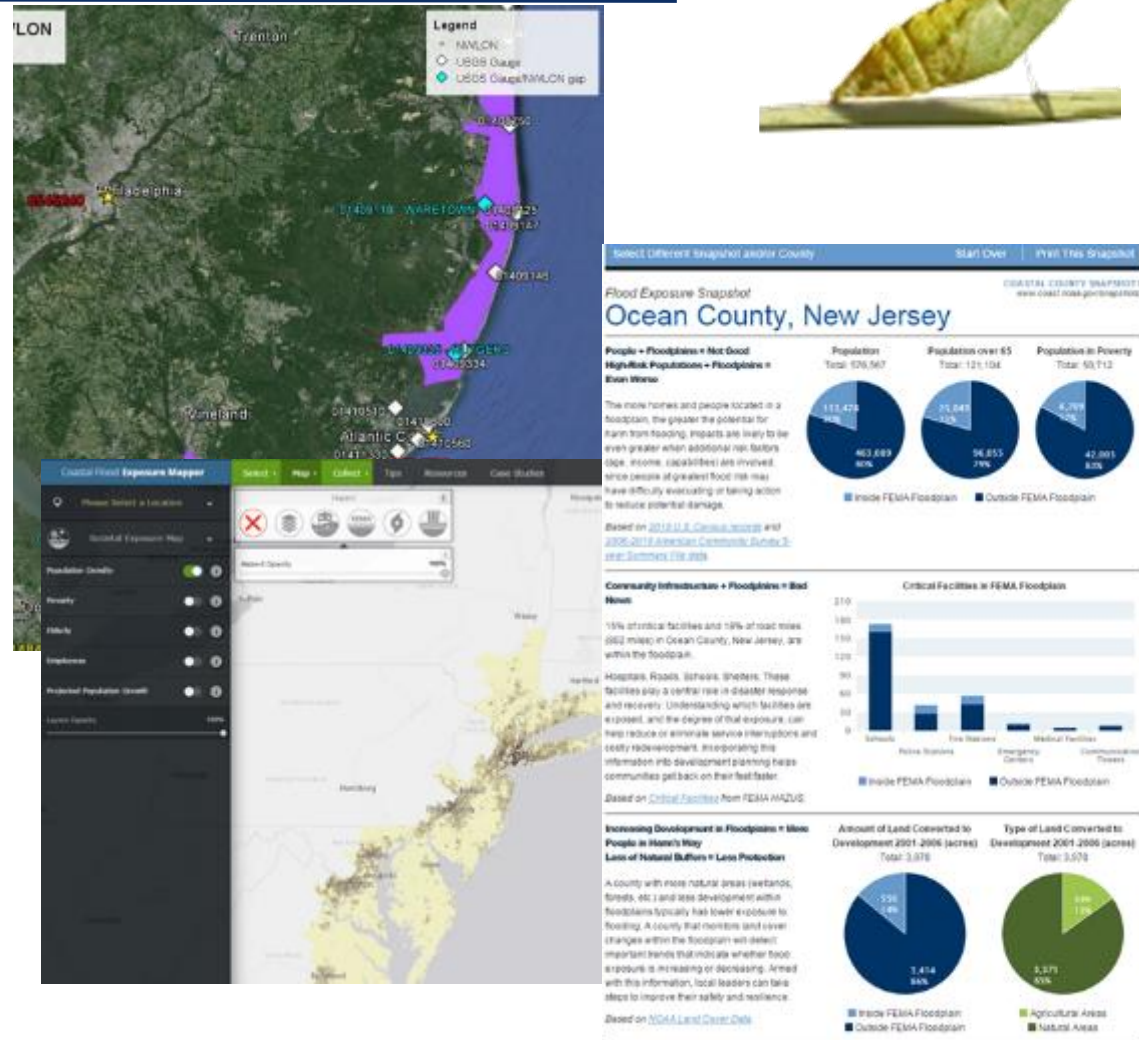
Prioritizing USGS stations

Chrysalis

R&D and
Planning



- Google Earth Framework
- Overlay NWLON gap locations with USGS locations
- Use socio-economic and flood risk data to determine vulnerable areas
- Involved MD, VA, DE DC, NJ USGS Water Science Centers
- Chose 8 stations to ingest



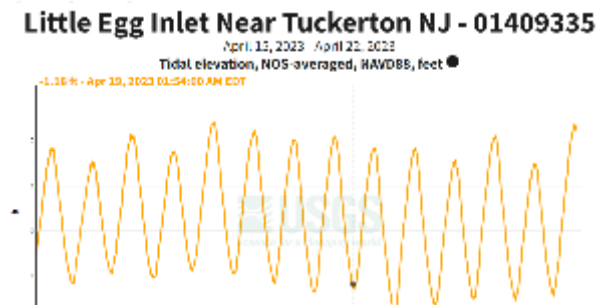
Learning about each other

Chrysalis

R&D and
Planning



- CO-OPS and USGS met several times in 2015 with MD, VA, DE, NJ
- Technical teams exchanged information: specifications, leveling differences, calibration techniques, data collection, ingestion and dissemination methods, etc.
- USGS and CO-OPS field crews met in July 2015 – technical exchange
- USGS upgraded some of their sensors and benchmark networks with CO-OPS recommendations
- CO-OPS determined it will only take USGS data from web services not in real-time due to ingestion differences
- USGS was to provide CO-OPS with annual field leveling information



Draft MOA with USGS

- Memorandum of Agreement – Used to document roles and responsibilities and list any authorities and funding exchanged between different entities.
- CO-OPS Agreements Coordinator determined USGS had existing umbrella agreement with NOAA, so we could draft an annex under the umbrella agreement
- Delivered draft to USGS in Dec 2019 and then **never enacted** (Variety of reasons: CO-OPS partnership lead changed (2x), USGS management changed, COVID, three USGS Water Science Centers, inconsistent follow-up)

I. PARTIES AND PURPOSE

- A. This Agreement is entered into by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), through the Center for Operational Oceanographic Products and Services (CO-OPS) and the U.S. Geological Survey (USGS). NOS and the USGS have a common interest in monitoring water levels in near-real time to support activities such as measuring high water during a storm and for assisting with storm surge models.
- B. The purpose of this Agreement is to delineate the requirements necessary for CO-OPS to receive and distribute data products from the USGS.

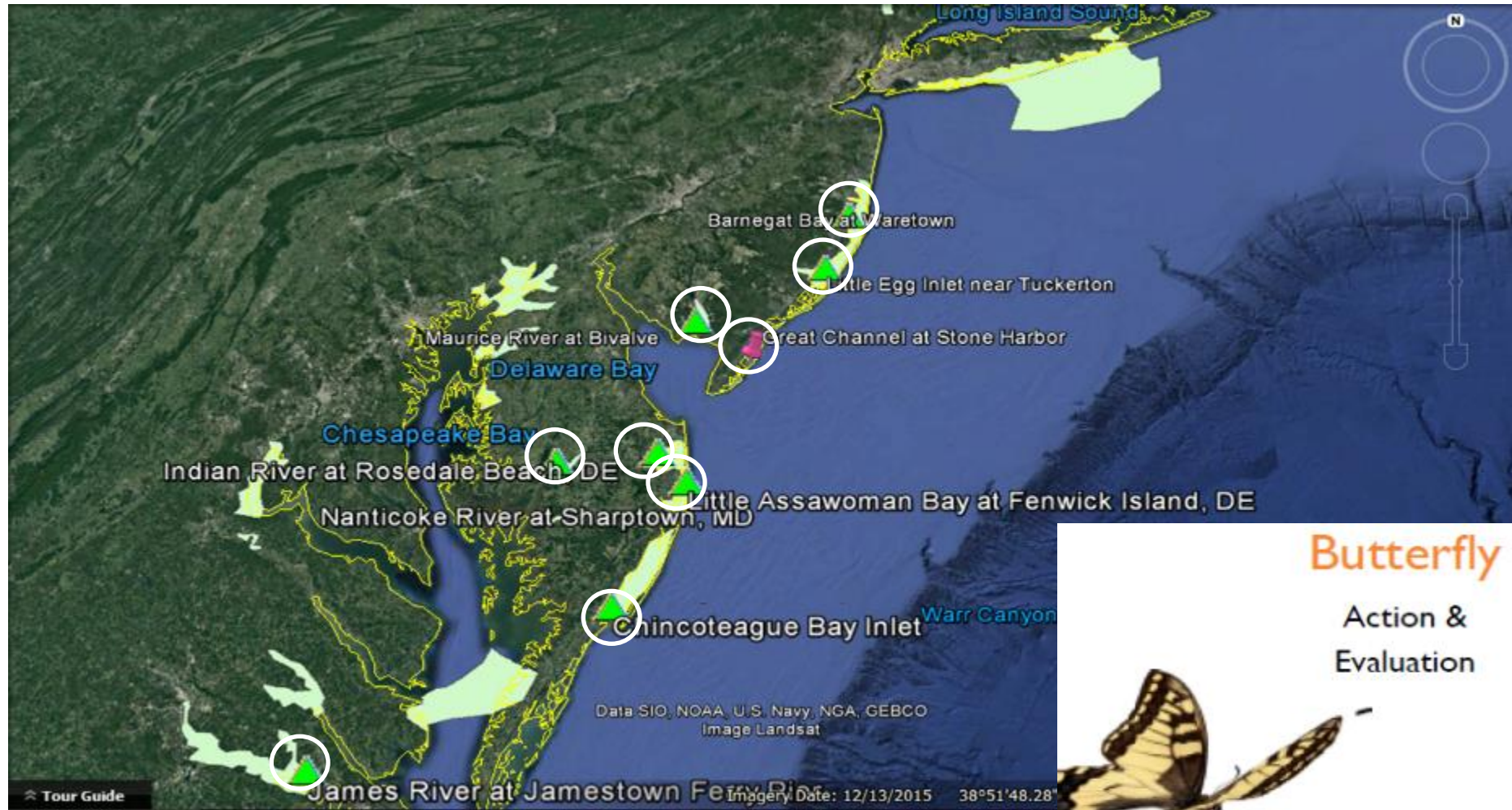
II. AUTHORITIES

- A. The legal authority for NOS and USGS to enter into this Agreement is the Coast and Geodetic Survey Act (CGSA), 33 U.S.C. § 883e, which authorizes the Secretary of Commerce to enter into cooperative agreements, or any other agreement, with, and to receive and expend funds made available by any state, or subdivision thereof, any federal agency, or any public or private organization, or individual for surveys and investigations authorized under § 883a et seq.
- B. The programmatic authority for NOS to enter into this Agreement is the CGSA, 33 U.S.C. § 883a et seq., which authorize the Secretary of Commerce to conduct hydrographic and topographic surveys and tide and current observations, and analysis and prediction of tide and current data.



Credit: Anne Mullan, NOAA

USGS Stations in NWLON Gap Areas



QUESTIONS

Connect to 21 Partnership
Success Factors Check List:
Negotiate a Formal Agreement

Have you ever entered into a
partnership without
documenting and signing a
formal agreement?

(raise hands)

Is that partnership succeeding
today?

(volunteers to share)

BRIAN O'NEILL'S 21 PARTNERSHIP SUCCESS FACTORS



As the former Superintendent, Golden Gate National Parks, Brian O'Neill (1941-2009) and his staff earned a reputation as a model partnership park where partnerships are a way of thinking about how best to accomplish the park's mission and build a community of stewardship. Recently, the park determined that 18% of the park services were being delivered by NPS staff and the other 82% by a host of park partners. These figures underscore the breadth and value of park partnerships.



4. Negotiate a Formal Agreement - Good intentions and a handshake are not enough. Partnerships need formal written agreements and work plans that define mutual interests and expectations, the roles and responsibilities of each partner, and clear accountability for the work to be performed. The formal agreement serves as a mutually binding contract to ensure that each partner acknowledges and fulfills their responsibility. Most people are overextended with work, and tasks can fall through the cracks. If a given partnership is important, provide structure for the partnership through a formal agreement and specific work plans that lay out what tasks need to be performed for each initiative, by whom, and when. In a busy world, clearly written intent, roles, process, schedules, and accountability procedures guide performance and follow through. If differences arise or performance lags, the formal written agreement provides a touchstone for accountability, revisiting intent and commitments, reconciliation, and getting back on track. When needed, the agreement should be updated or amended to keep it current.

Documenting Success and Closing out

- Some expectations were not met on both sides, including receiving annual information from USGS
- After 7 years, CO-OPS has decided to end the long-term data processing partnership with USGS
- CO-OPS now has a tidal datum and tide prediction at each location where USGS provided information
- CO-OPS has updated its partnership policy



Q&A - BREAK OUT

What are some methods you have used to reinforce, maintain and sustain partnerships?

In your break out:

1. Determine a note taker/reporter
2. 10 minutes in groups to discuss
3. Report out from groups

21. Put Mechanisms in Place to Re-enforce the Partnership - To realize its full potential, a partnership needs: a clear vision, dedicated and skilled people, a rewards and recognition program, incentives that stimulate desired partnership activity, sustained management support and involvement, operational funds, and a clear understanding among supervisors and staff of the potential benefits that result from the partnership arrangements. These are complex, but essential, elements to put in place. The seriousness with which they are addressed will determine your degree of success.

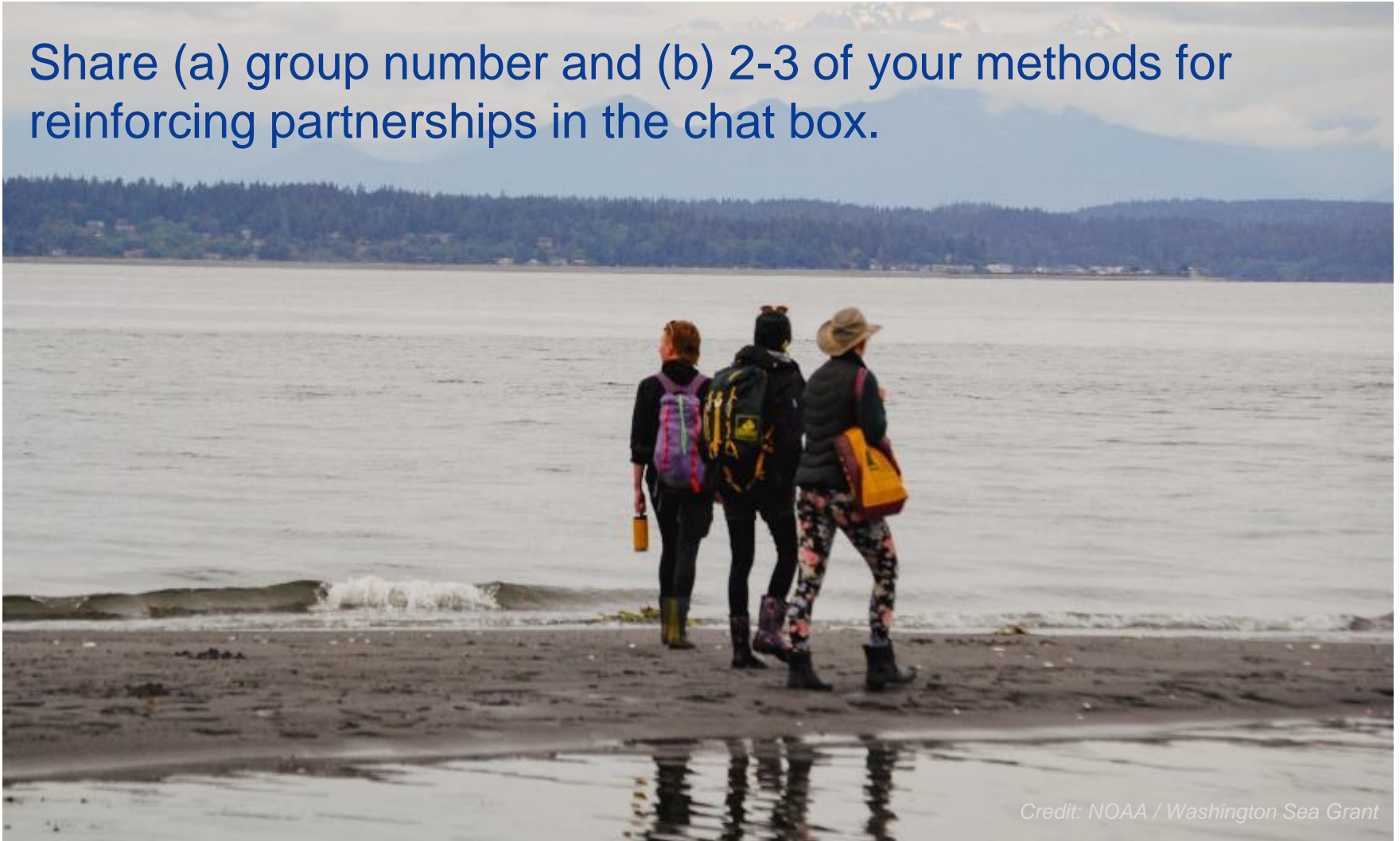
It all boils down to how deliberate and strategic you and your partners are in building a "partnership culture" that incorporates these success factors and the commitments you are willing to make. Understand and adapt success behaviors, develop competencies for these behaviors to be regularly practiced, and align your partnership to succeed.



Credit: NOAA

Report backs

Share (a) group number and (b) 2-3 of your methods for reinforcing partnerships in the chat box.



Credit: NOAA / Washington Sea Grant

New Partnership Policy



- **Navigation services partnerships through the (PORTS®) program**
 - Real-time oceanographic and meteorological data used for critical decision making, supporting safe and efficient navigation in and around U.S. seaports.
 - Tailored to the needs of the local stakeholders, that provide accurate and reliable real-time information about environmental conditions.
- **Coastal hazards products and services partnerships.**
 - Long-term real-time data for increasing the density/interoperability of water level observations in CO-OPS Products
 - Improve situational awareness in the context of decision support
 - Stresses use of web services; data are not ingested into the CO-OPS database
- **NOS tidal and water level datum partnerships**
 - Short-term strategic partnerships to fill datum gaps for charting/mapping efforts
 - Reimbursable partnerships for partners requiring NOS datums
 - Long-term partnerships in NWLON gap areas
 - Stresses use of non real-time data (irrespective of how partner disseminates)

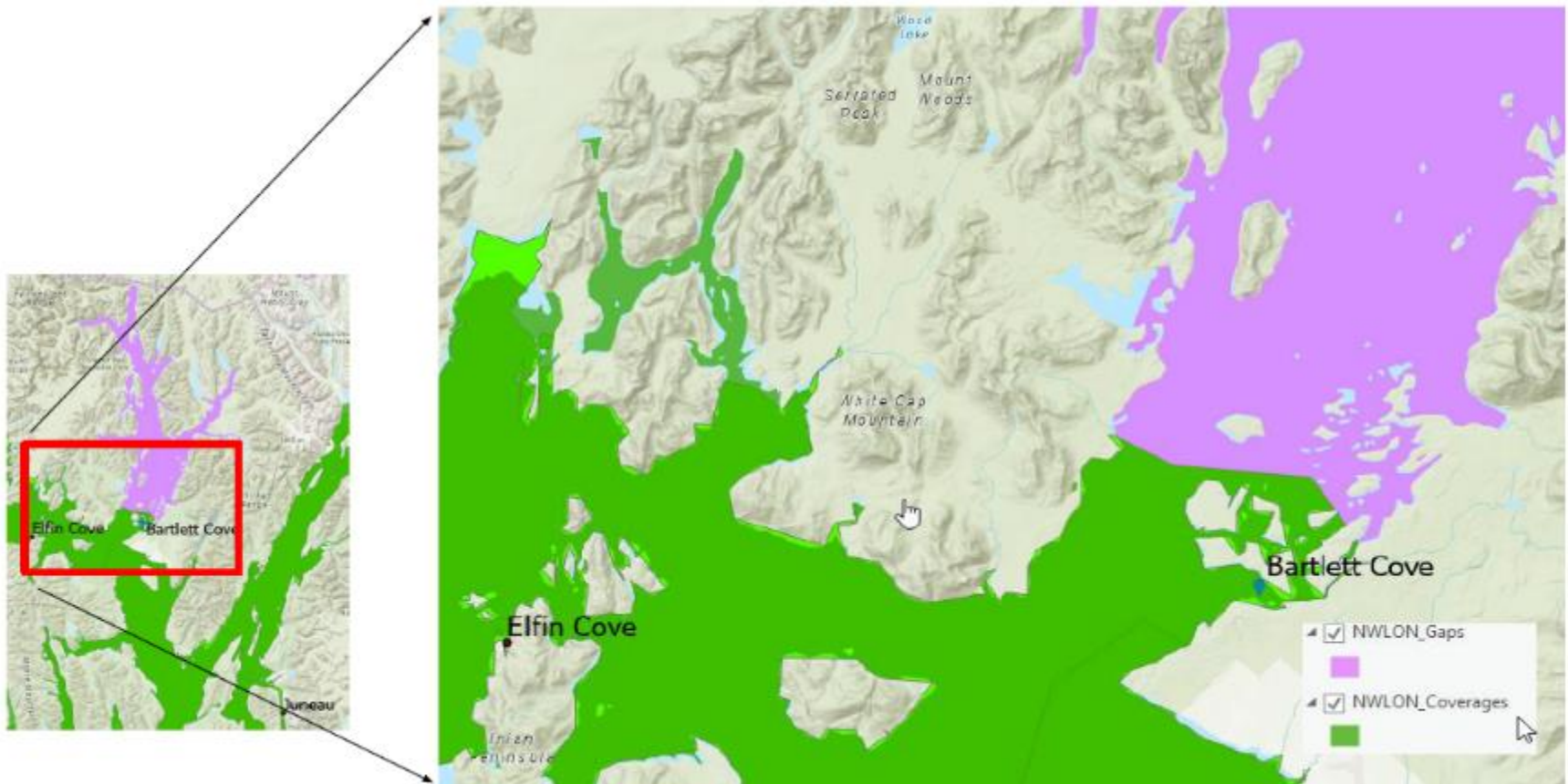
CO-OPS New Partnership Models

- **Full cost reimbursement**
 - USACE fully funding TCOON operations
 - USACE fully funds datum calculations (CEPD)
 - CO-OPS processes WL data for FLDEP
- **Partners Filling NWLON/Mission Gaps**
 - NPS installs sensors to NOAA standards
 - USGS upgrades sensors and practices to NOAA standards
 - NCDDEM upgrades sensors and sampling frequency
- **Partners receiving water level training**
 - IOOS RA installs own sensors
 - RA processes own data and products
 - RA shares data into Coastal Inundation Dashboard



New policy in action

Glacier Bay, Alaska - **MOA** signed with National Park Service in Dec 2022 for ingestion and processing of water level data



Lessons Learned

- Partnerships take care and feeding
- The culture of organizations drives the success of the partnership
- One person's expectations might not be the same as another's in the same office
- Agreements are important
- Communication is key!



unsplash