1 AUGUST 2023 | BREAKOUT SESSION

oneCAPE 2023

Cape Cod Pond Network Meeting

PRESENTERS

Nicole Bartlett, Regional Coordinator, NOAA North Atlantic Regional Collaboration Team

Megan Coffer, PhD, NOAA/NESDIS Center for Satellite Applications and Research; Global Science & Technology, Inc.

SESSION FACILITATORS

Kathleen Mason, Water Resources Analyst, Cape Cod Commission

Tim Pasakarnis, Water Resources Analyst, Cape Cod Commission

This session is being recorded and will be made available on the OneCape website after the event.

Discussion Groups 2

Session Overview and Introduction
Kathleen Mason, Cape Cod Commission

Remote Sensing Overview Presentation
Nicole Bartlett & Megan Coffer

Discussion Group 1

1. Organizing an Association
- Facilitator*: Kim Comart, Falmouth Pond Coalition*
- Staff*: Kathleen Mason, Cape Cod Commission*

2. Communicating Challenges and Solutions
- Facilitator: *Kristin Andres, APCC*
- Staff: *Jessica Rempel, Cape Cod Commission*

Discussion Group 2

1. Monitoring Your Pond
- Facilitator: *Julie Hambrook Berkman, APCC*
- Staff: *Tim Pasakarnis, Cape Cod Commission*

2. Thinking Bigger
- Facilitator: Amber Unruh, Town of Barnstable
- Staff: *Kathleen Mason, Cape Cod Commission*

Wrap Up

Cape Cod Pond Network Meeting

Nicole Bartlett, Regional Coordinator, NOAA North Atlantic Regional Collaboration Team

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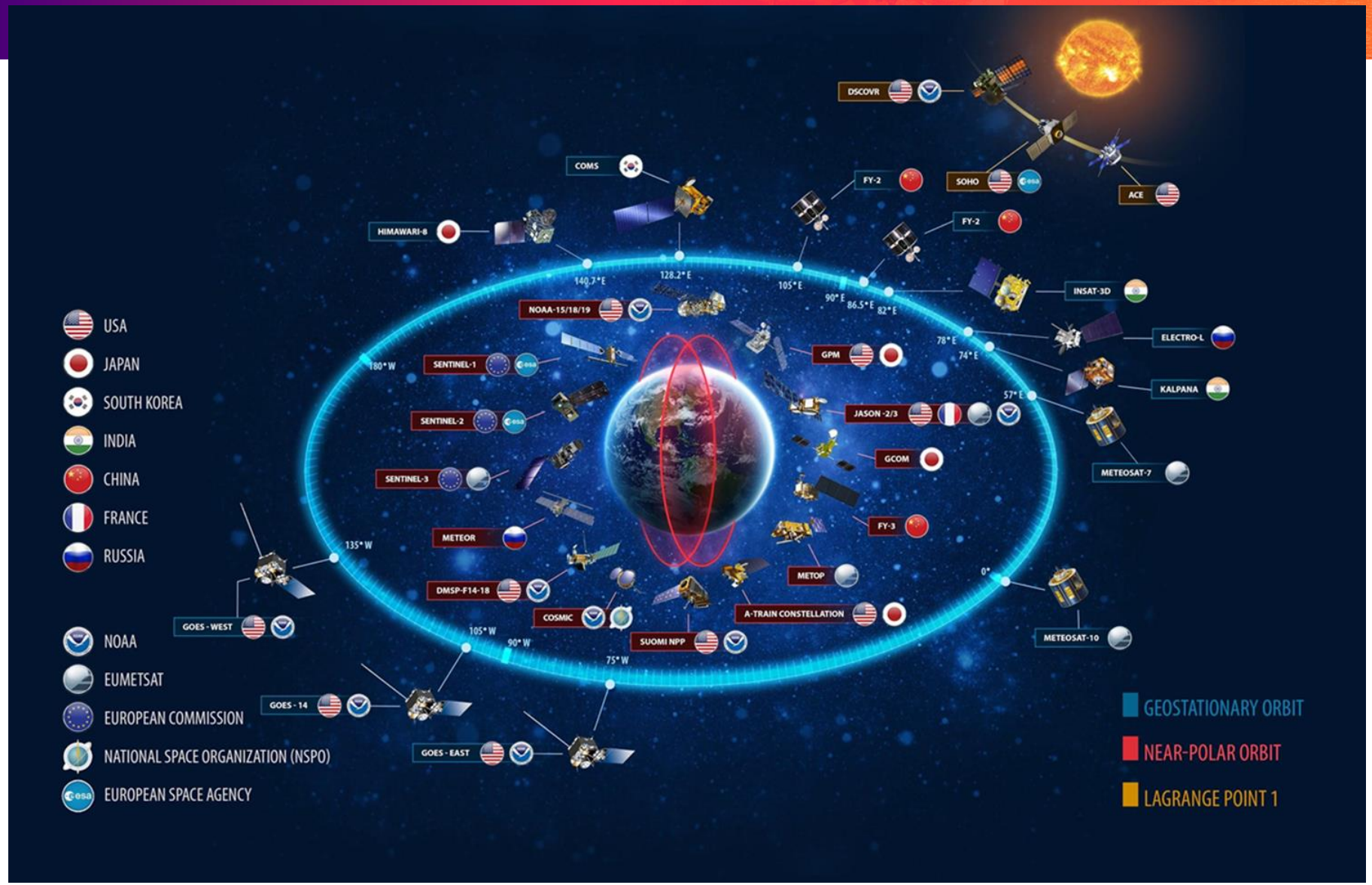
NOAA ON CAPE COD

- WOODS HOLE: Northeast Fisheries Science Center, Woods Hole Sea Grant, Cooperative Institute for the North Atlantic Region (CINAR) - Science Stroll Aug 12
- FALMOUTH: Waquoit Bay National Estuarine Research Reserve
- MASHPEE: MIT Sea Grant, NERACOOS partnerships with Mashpee Wampanoag Tribe
- NORTON, MA: Weather forecast office, Northeast River Forecast Center, Regional Climate Services
- CAPE-WIDE: NOAA Restoration Center, Office for Coastal Management


DSCOVR
NOAA-15/18/19
JASON-3
EWS-G1
GOES - 18
GOES - WEST
GOES - 15
DMSP-F14-18
NOAA-20
SUOMI NPP
GOES - 14
GOES - EAST
140.7° E
128.2° E
105° E
90° E
86.5° E
82° E
78° E
74° E
180° W
41.5° E
137° W
135° W
105° W
89.5° W
75° W
9.5° E
0
3.4° W
USA
FRANCE
NOAA
EUMETSAT
EUROPEAN COMMISSION
NATIONAL SPACE ORGANIZATION (NSPO)
EUROPEAN SPACE AGENCY
NASA
DEPARTMENT OF DEFENSE
GEOSTATIONARY ORBIT
NEAR-POLAR ORBIT
LAGRANGE POINT 1

GLOBAL GOVERNMENT SATELLITE CONSTELLATION



- COMMITTEE ON EARTH OBSERVATION SATELLITES (CEOS)
  - SOURCE-AGNOSTIC MODEL FOR APPLYING SATELLITE EARTH OBSERVATIONS
- Coastal Observations, Applications, Services and Tools (COAST)
  - GLOBAL EFFORT TO CO-DESIGN/CO-DEVELOP APPLICATIONS FOR SATELLITE EO TO SERVE COASTAL STAKEHOLDER NEEDS

CLIMATE CHANGE | OPINION

U.S. Secretary of the Interior: Satellites Will Help Us Fight Climate Change

As USGS takes over operations of a Landsat satellite, Secretary of the Interior Deb Haaland explains how the data gathered will help the Biden administration's climate change plans

By Deb Haaland on October 10, 2022

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smartHarbour initiative: satellite data to help monitor and protect our ecosystems

Français

CANADIAN SPACE AGENCY
AGENCE SPATIALE CANADIENNE

NEWS PROVIDED BY
Canadian Space Agency →
29 Jun, 2023, 10:11 ET

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NEWS RELEASE 24-JUL-2023

Beyond protected areas: Novel method shows promise for monitoring biodiversity on working lands

Combo of bioacoustic recorders, satellite imagery shows how birds are faring on cropfields

Peer-Reviewed Publication

UNIVERSITY OF MARYLAND BALTIMORE COUNTY

SCIENCE & TECHNOLOGY

Stanford researchers calculate groundwater levels from satellite data

A new computer algorithm that can "fill in" underground water levels in areas where quality dat is not available could lead to improved models of groundwater flow in regions where pumping and aquifer depletion are a concern.

How to use free satellite data to monitor natural disasters and environmental changes

Published: March 14, 2023 8.24am EDT

Cityscapes Create Cloud Cover, Satellite Images Reveal

The skies over U.S. cities are cloudier than their surrounding areas.

By **Elissa Welle** 15 May 2023

TECH

NASA steps in to help Brazil fight Amazon deforestation

Brazil is facing a lot of challenges in its bid to stop or even slow down the rapid deforestation of the Amazon forest. To help combat the situation, NASA has decided to step in and share feeds from satellites flying over the Amazon forest

Mehul Reuben Das | Last Updated:July 26, 2023 13:47:14 IST

890

PONDS ACROSS THE CAPE, WHICH PROVIDE NITROGEN FILTERING CAPACITY AND RECREATIONAL AND ECOLOGICAL OPPORTUNITIES

90%

OF THESE PONDS HAD INSUFFICIENT DATA TO ASSESS WATER QUALITY STATUS IN 2021

CAPE COD COMMISSION, 2021; *POND & LAKE ATLAS*

INCOMPLETE

LABOR INTENSIVE

COLLECTED BY MULTIPLE ENTITIES/JURISDICTIONS

WITH SATELLITES

- COST-EFFECTIVE FOR END USERS
- CONTINUOUS DATA COLLECTION ACROSS JURISDICTIONS
- TIMELY ESTIMATES FOR DECISION-MAKING
- LONG-TERM STABILITY OF ESTIMATES
- RETROSPECTIVE ANALYSES
- MORE COMPLETE PICTURE

PARTNERS FOR

Utility, scalability, sustainability

CAPE COD COMMISSION

APCC
Association to Preserve Cape Cod

APCC.ORG

RESEARCH QUESTION

- CAN SATELLITES REVEAL INFORMATION ABOUT ALL OR SOME OF CAPE COD'S 890 PONDS THAT CAN BE INCORPORATED INTO A PARTNER-DRIVEN REGIONAL WATER QUALITY MONITORING STRATEGY?

Using Satellite Imagery and Sensors to Analyze Pond Health

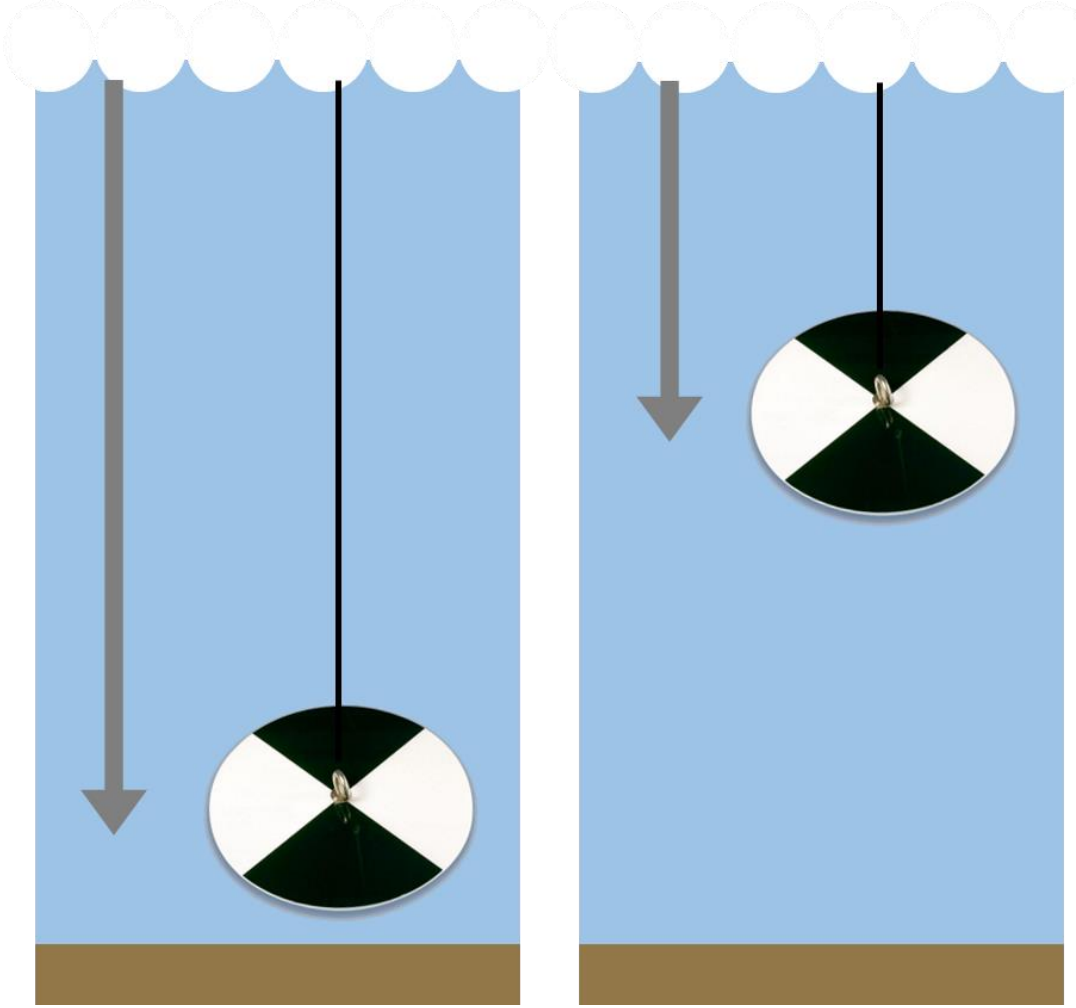
MEGAN COFFER & NIKOLAY NEZLIN

PHD, NOAA/NESDIS CENTER FOR SATELLITE APPLICATIONS AND RESEARCH; GLOBAL SCIENCE & TECHNOLOGY, INC.

SECCHI DISK DEPTH (SDD) IS USED TO MEASURE **WATER CLARITY**.

THE **CAPE COD COMMISSION** (CCC) HAS SECCHI DISK DEPTH FOR **217 PONDS** COLLECTED INTERMITTENTLY FROM **2001-2022**.

CCC ALSO HAS **MAXIMUM POND DEPTH** FOR APPROXIMATELY **200 POND**S.



BETTER WATER CLARITY

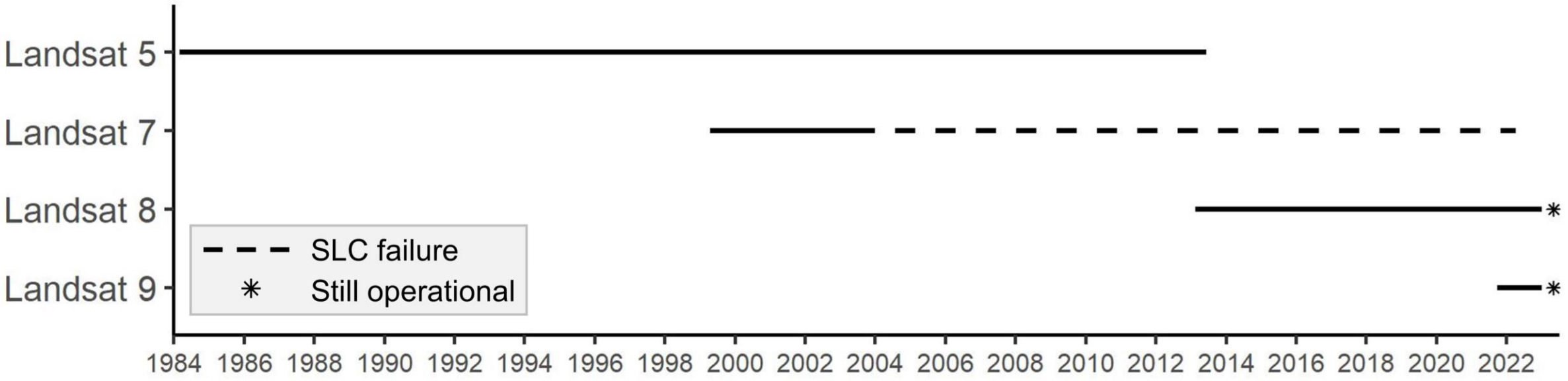
WORSE WATER CLARITY

USE SATELLITE IMAGERY TO **PREDICT SDD** BY ANALYZING ITS RELATIONSHIP WITH FIELD-MEASURED SDD

ASSESS **LONG-TERM CHANGES** IN SDD FOR 201 CAPE COD PONDS AS AN INDICATOR OF CHANGING WATER CLARITY OVER TIME

DEFINE A FRAMEWORK FOR IDENTIFYING PONDS WITH **YEAR-OVER-YEAR CHANGE** IN WATER CLARITY FOR TARGETED MANAGEMENT EFFORTS

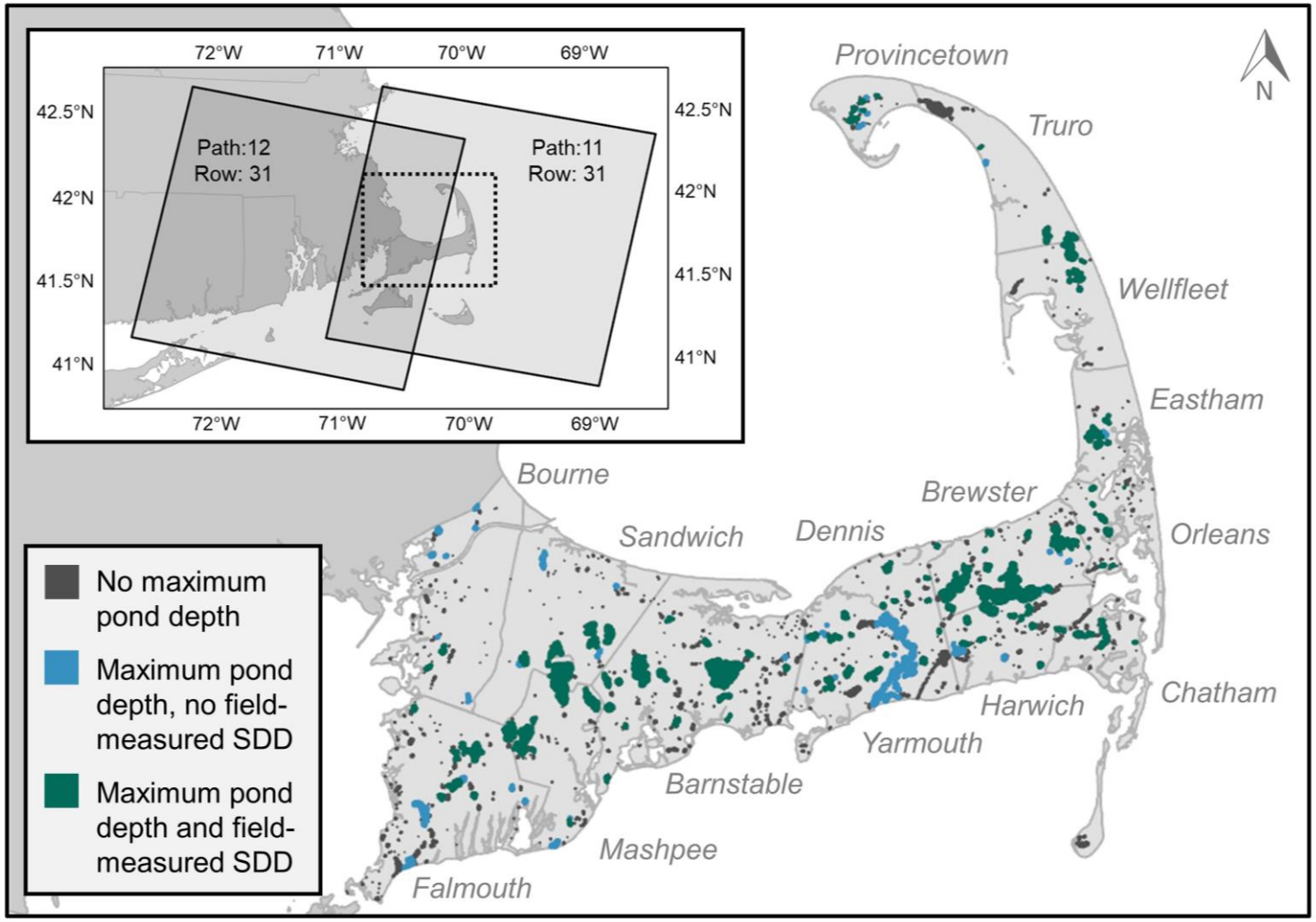
USGS & NASA LANDSAT LEGACY



30 M PIXEL RESOLUTION

8-16 DAY REVISIT FREQUENCY

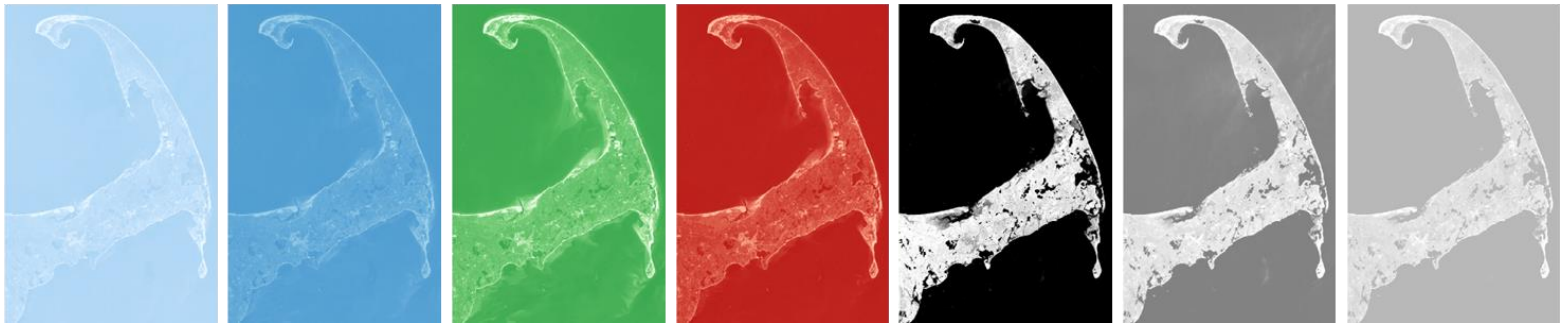
COFFER ET AL., IN PREP.; *J. ENVIRON. MANAG.*



201 PONDS CONTAINED MAXIMUM DEPTH DATA AND WERE ASSESSED FOR **CHANGES**; **155 OF THESE PONDS** WERE ASSESSED **AGAINST SATELLITE DATA**

PONDS WERE AT LEAST A **HECTARE IN AREA** AND CONTAINED **MAXIMUM POND DEPTH DATA**

COFFER ET AL., IN PREP.; *J. ENVIRON. MANAG.*



COASTAL BLUE | BLUE | GREEN | RED | NIR | SWIR #1 | SWIR #2

Extract satellite data corresponding to field measurements

Use machine learning to estimate SDD from satellite data

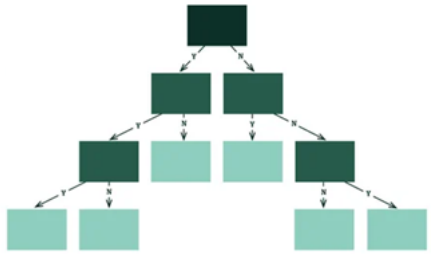
Assess trends and year-over-year change using satellite estimates of SDD

Extract satellite data corresponding to field measurements

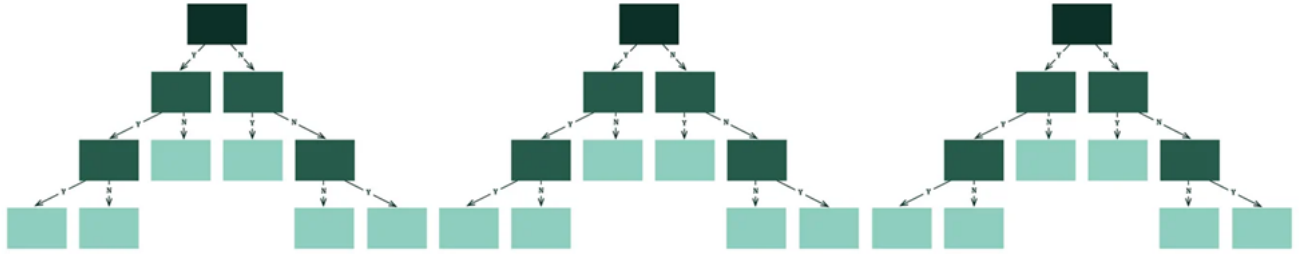
Use machine learning to estimate SDD from satellite data

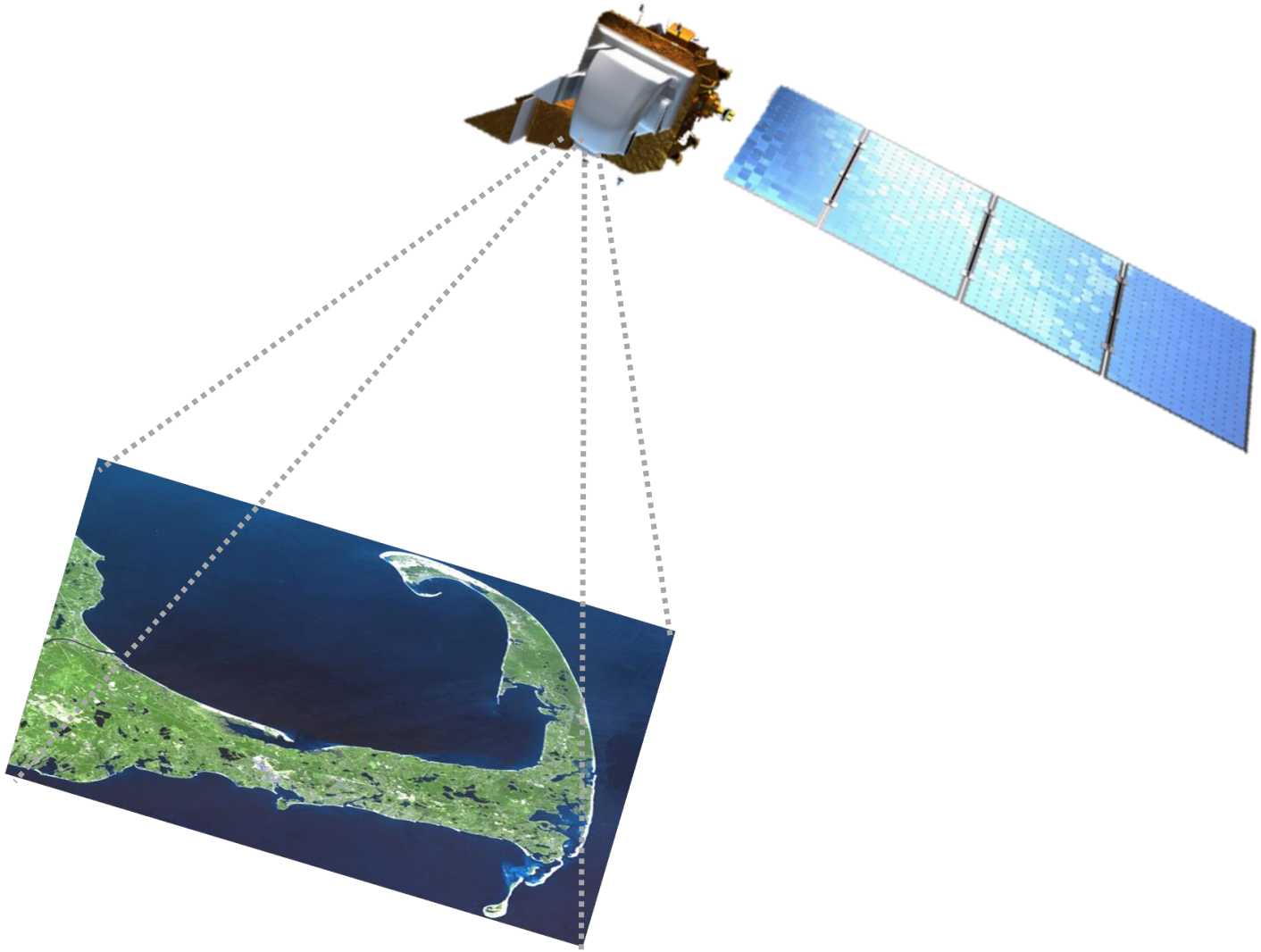
Assess trends and year-over-year change using satellite estimates of SDD

DECISION TREE



RANDOM FOREST





Extract satellite data corresponding to field measurements

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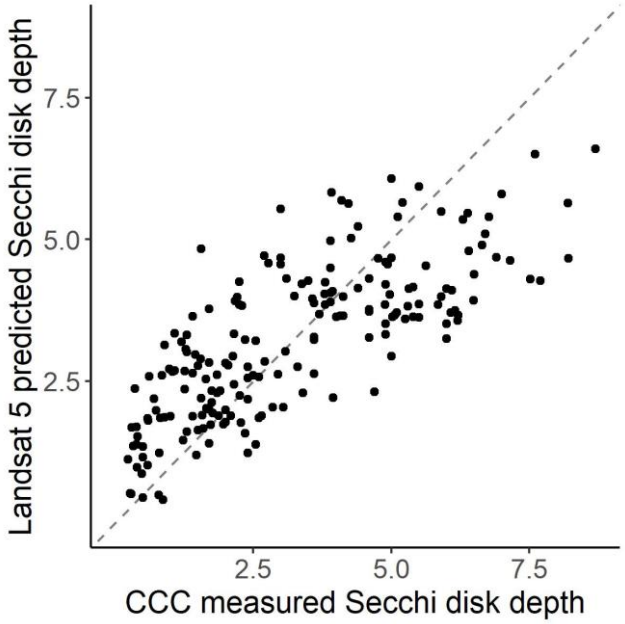
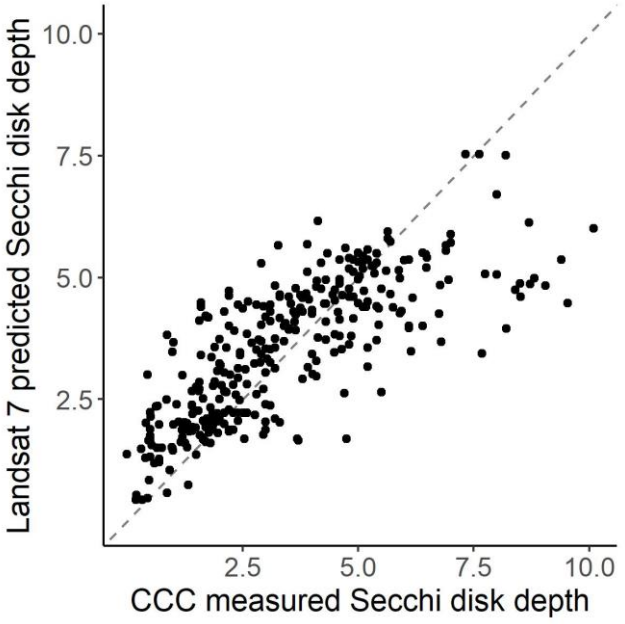
LANDSAT 5



$r_s = 0.77$

STRONG CORRELATION

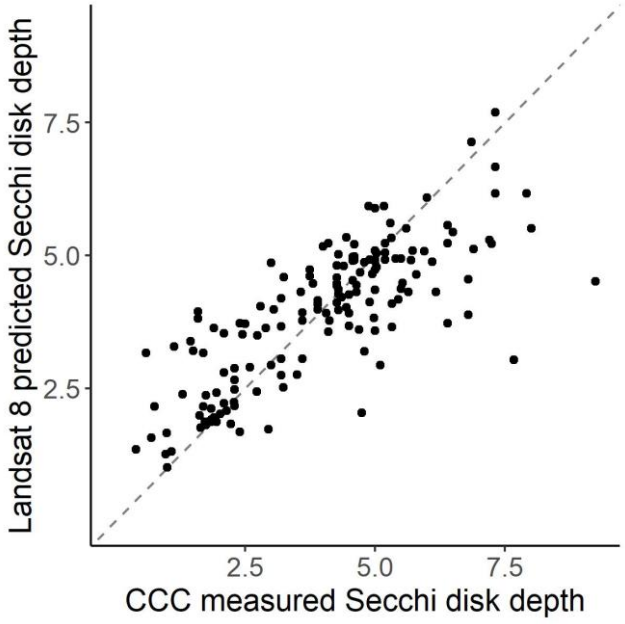
LANDSAT 7



$r_s = 0.80$

VERY STRONG CORRELATION

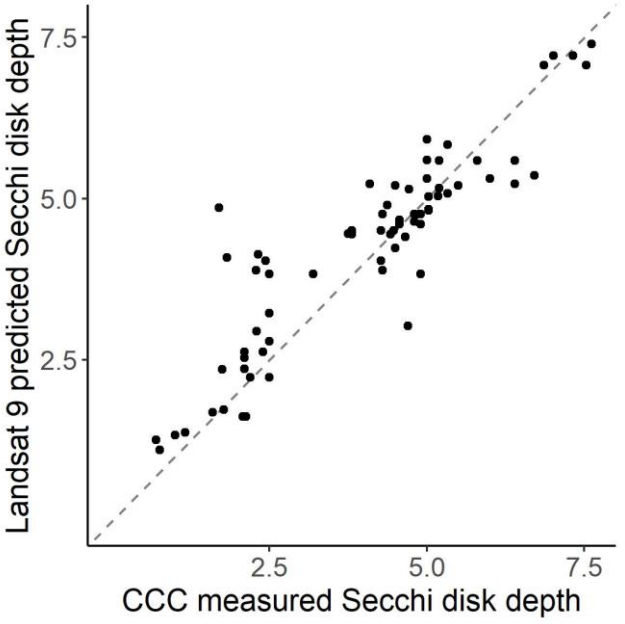
LANDSAT 8



$r_s = 0.79$

STRONG CORRELATION

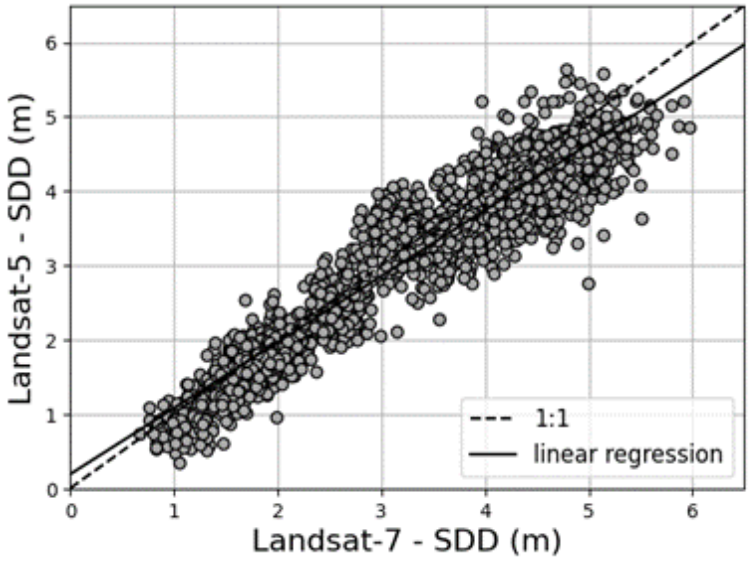
LANDSAT 9

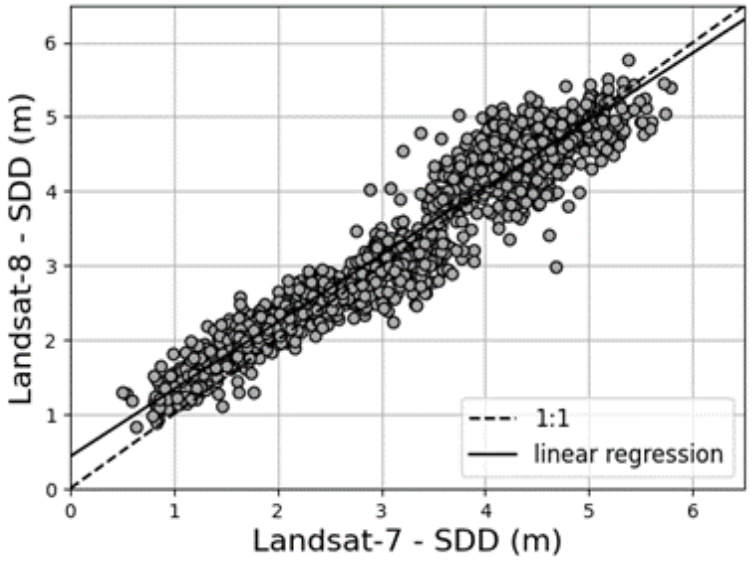


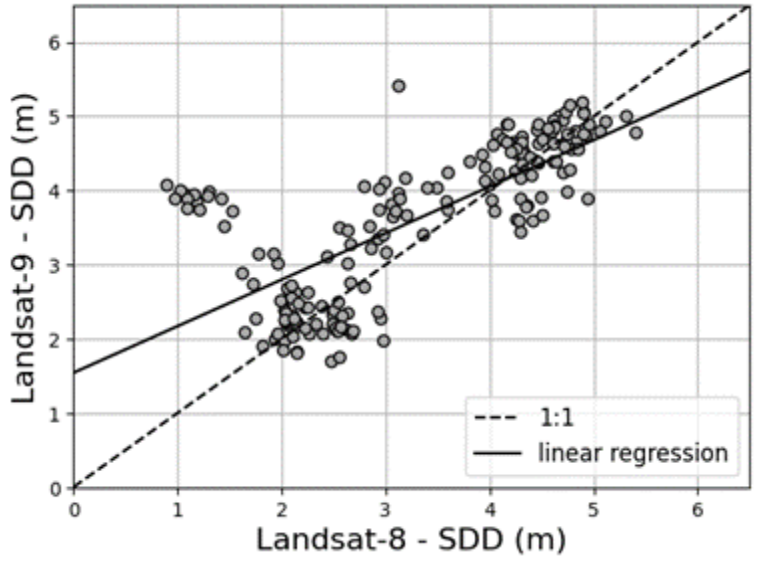
$r_s = 0.89$

VERY STRONG CORRELATION

COFFER ET AL., IN PREP.; *J. ENVIRON. MANAG.*







STRONG AGREEMENT BETWEEN SDD PREDICTED FROM LANDSAT 7 AND BOTH LANDSAT 5 AND LANDSAT 8

SDD PREDICTED FROM **LANDSAT 5, 7, AND 8 CAN BE ANALYZED AS A SINGLE TIMESERIES**

COFFER ET AL., IN PREP.; *J. ENVIRON. MANAG.*

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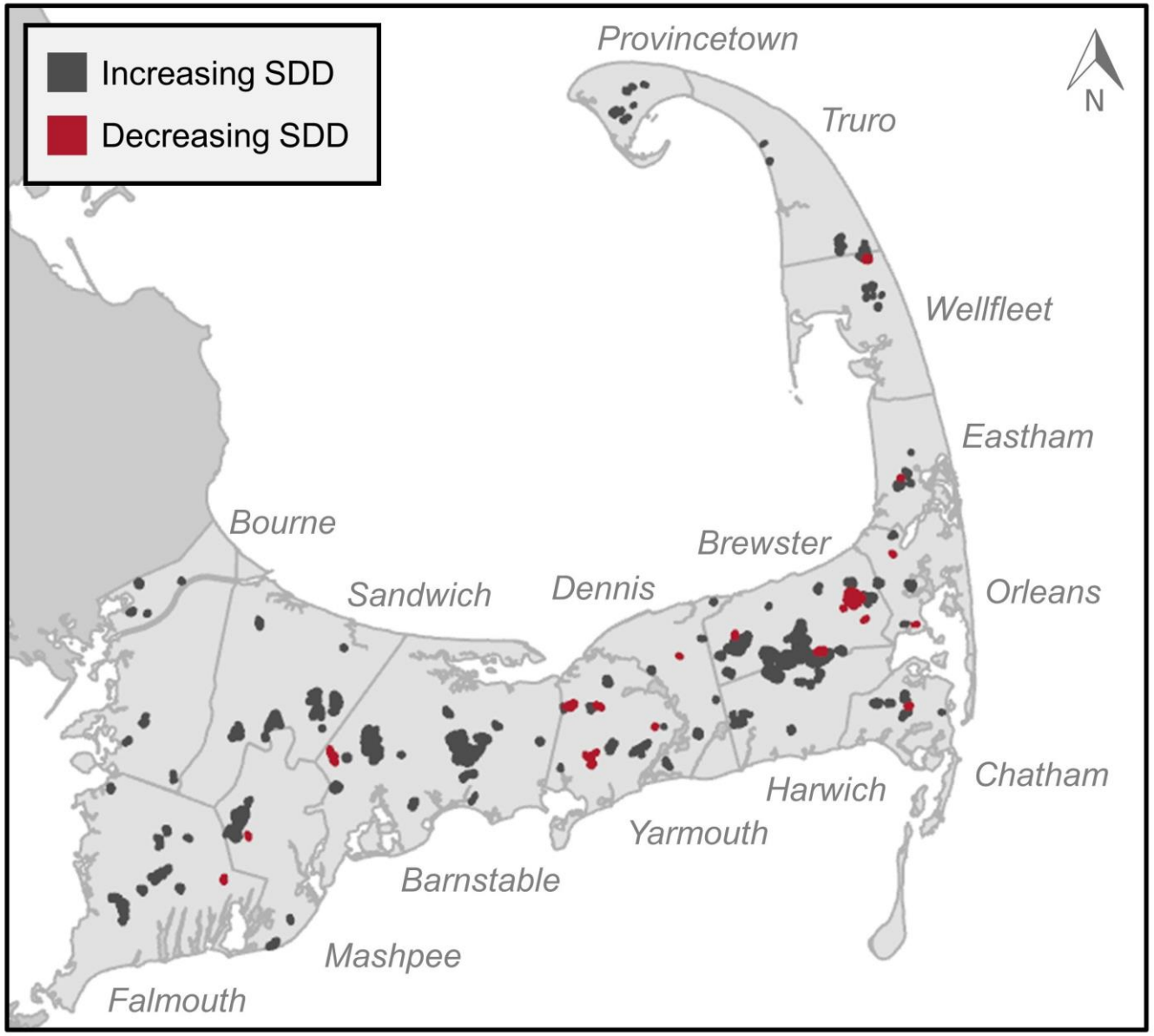
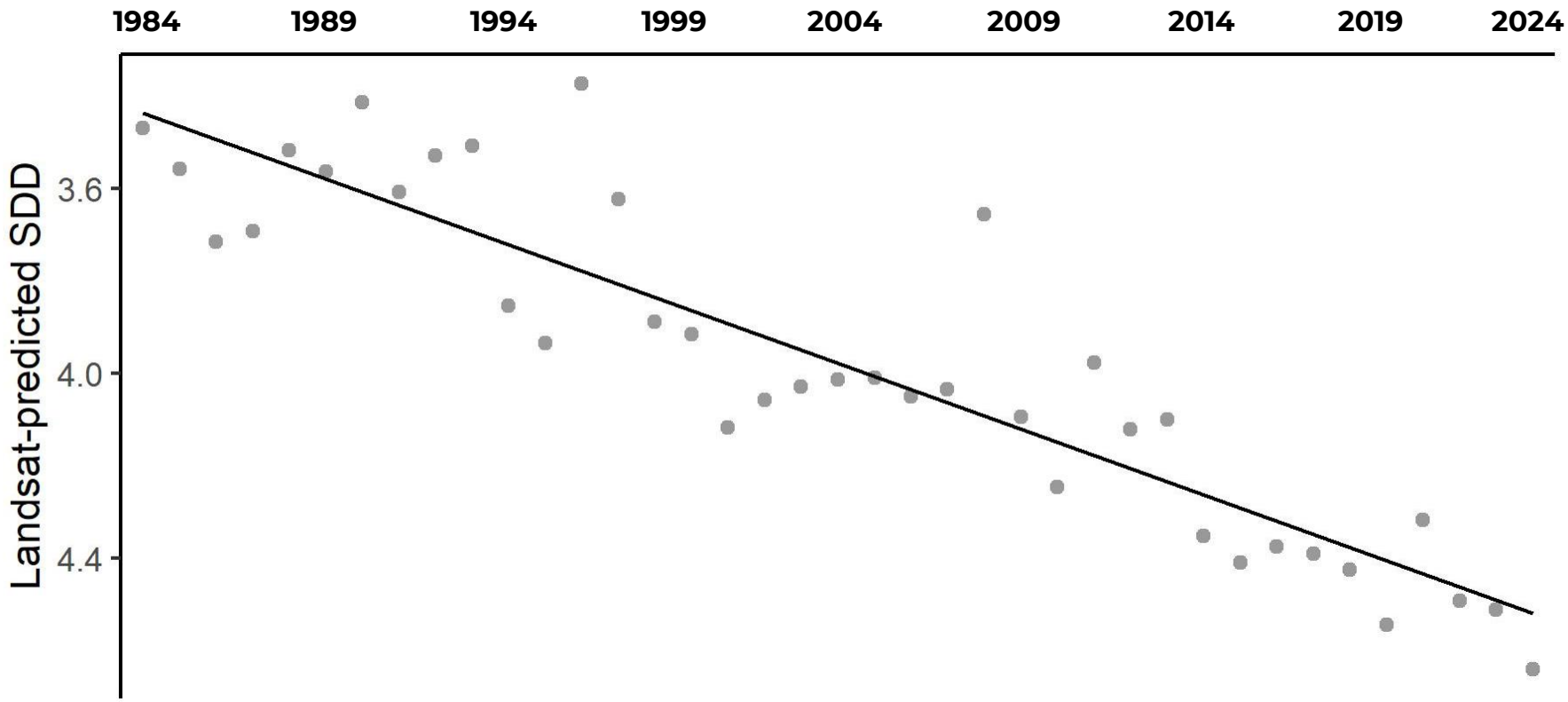


117 OF 201 PONDS (65%) HAD AN INCREASE IN SDD (**IMPROVING WATER CLARITY**) FROM **1984-2022**.

21 of 201 PONDS (12%) HAD A DECREASE IN SDD(**DETERIORATING WATER CLARTY**) FROM **1984-2022**.

COFFER ET AL., IN PREP.; *J. ENVIRON. MANAG.*

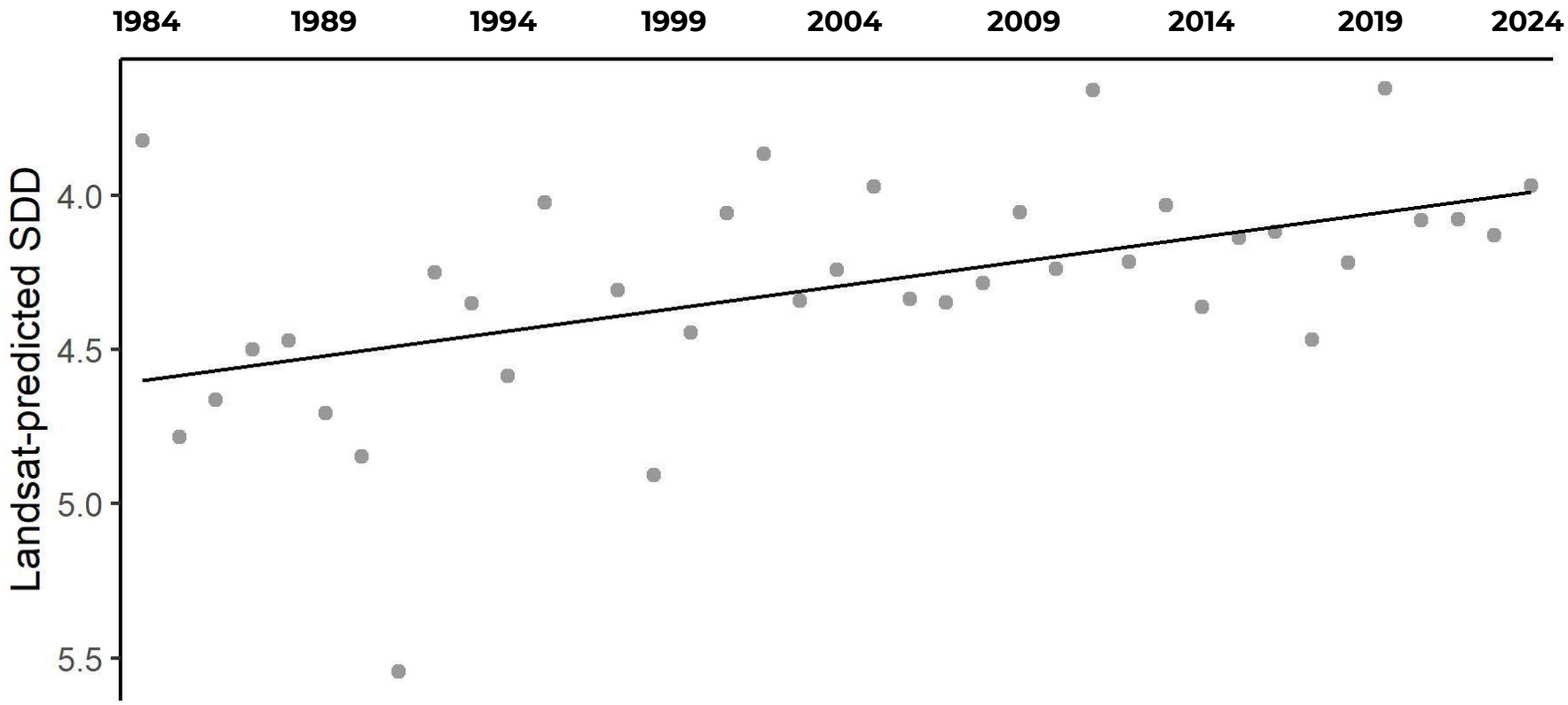
GARRETTS POND (TOWN OF BARNSTABLE)



31% INCREASE IN SDD FROM 1984-2022 (**IMPROVING WATER CLARITY**)

COFFER ET AL., IN PREP.; *J. ENVIRON. MANAG.*

SARAHS POND (TOWN OF ORLEANS)



13% DECREASE IN SDD FROM 1984-2022 (**DETERIORATING WATER CLARITY**)

COFFER ET AL., IN PREP.; *J. ENVIRON. MANAG.*

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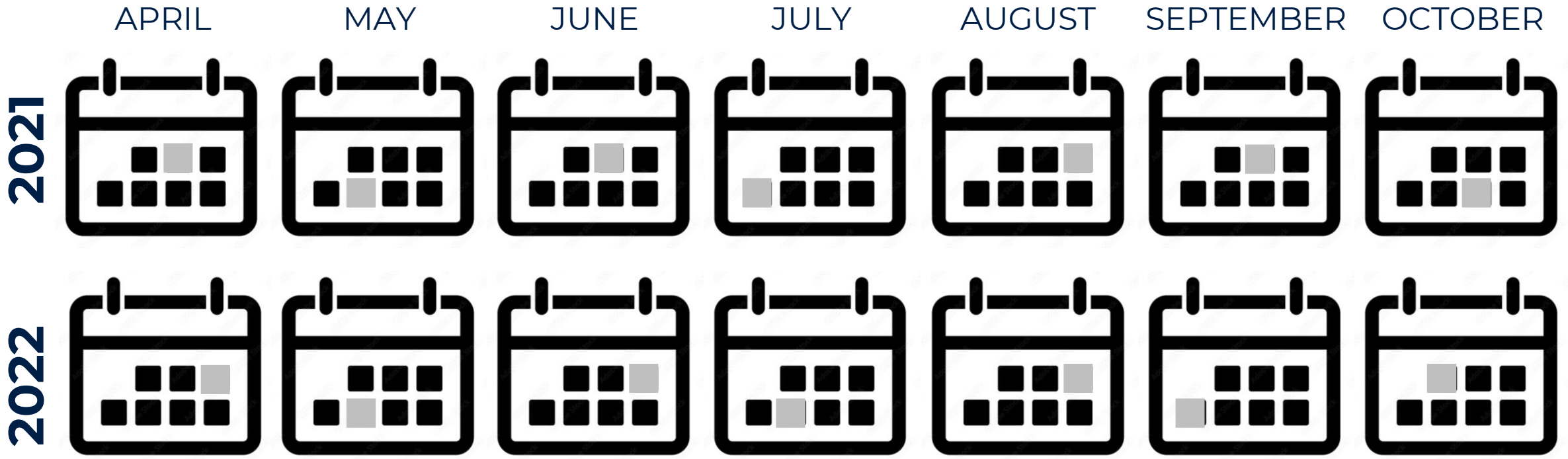
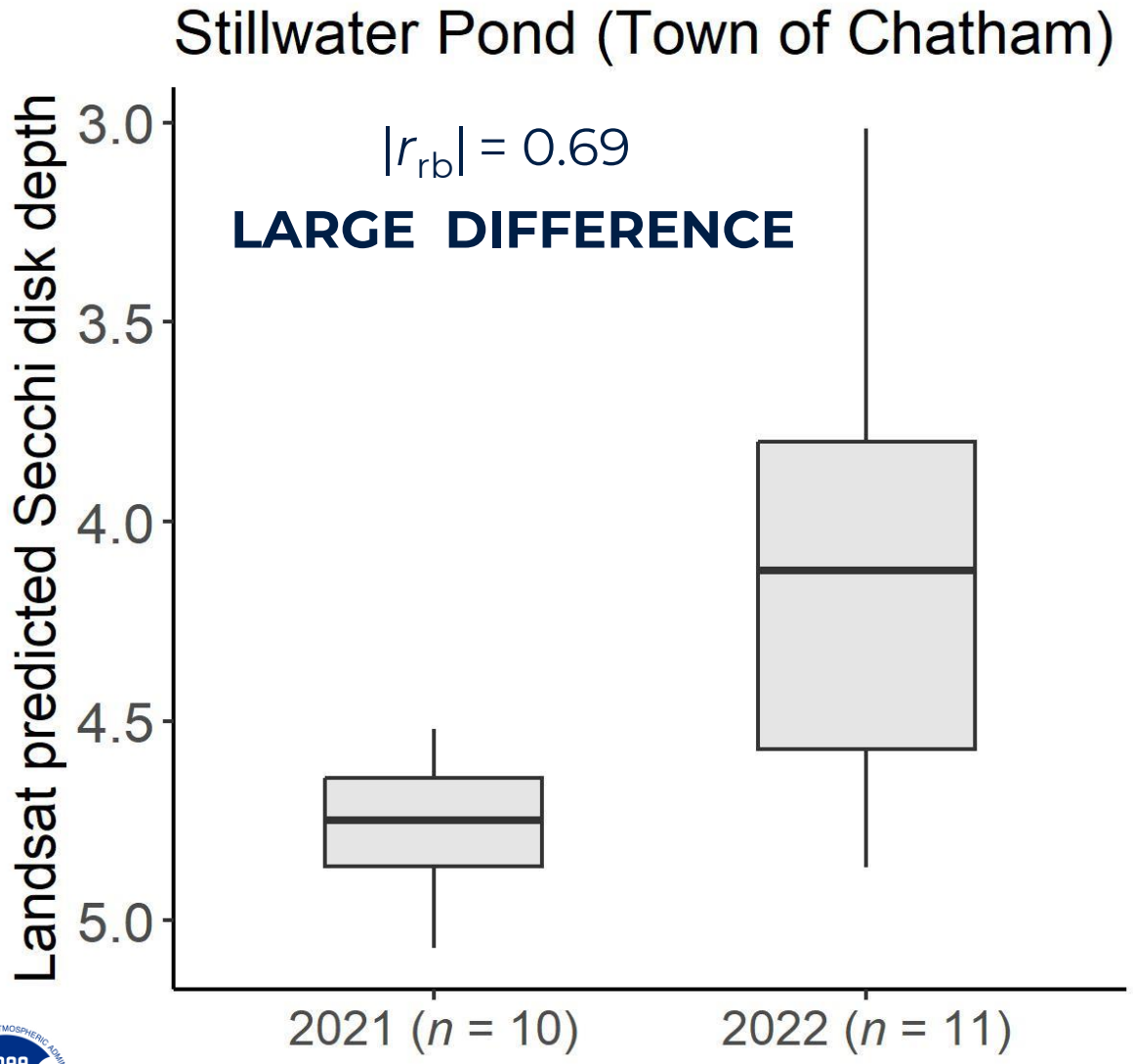


LANDSAT-ESTIMATED SDD FOR **EACH OVERPASS IN 2021** COMPARED TO **EACH OVERPASS IN 2022** USING THE MANN WHITNEY U TEST



1 POND (OF 201) HAD A **LARGE DIFFERENCE** BETWEEN SDD PREDICTED IN 2021 AND 2022 WITH **LOWER WATER CLARITY IN 2022** (2 PONDS HAD HIGHER WATER CLARITY)

17 PONDS (OF 201) HAD A **MODERATE DIFFERENCE** WIT H LOWER WATER CLARITY IN 2022 (11 PONDS HAD HIGHER WATER CLARITY)

COFFER ET AL., IN PREP.; *J. ENVIRON. MANAG.*

LANDSAT IS WELL-EQUIPPED TO PROVIDE **MULTIPLE ESTIMATES PER YEAR** OF SDD ACROSS CAPE COD'S PONDS WITH MAXIMUM DEPTH DATA.

ABOUT **10% OF THE 201 PONDS** ASSESSED EXHIBITED DETERIORATING WATER CLARITY **OVER THE PAST 40 YEARS**

SATELLITE IMAGERY CAN **IDENTIFY PONDS WITH SIGNIFICANT YEAR-OVER-YEAR DECREASES** IN SDD TO PRIORITIZE MANAGEMENT EFFORTS

- TWO SOURCES OF PONDS
  - **CCC PONDS** (DEPTH CSV FILE HAS 883 CCC GIS ID'S)
    - 192 OF THESE HAVE DEPTH DATA FROM CCC
  - **SHAPEFILE OF PONDS FROM 2020** (1035 UNIQUE PONDS)
    - AN ADDITIONAL 9 OF THESE HAVE DEPTH DATA AND WERE APPENDED TO THE CCC DATA

- ADDITIONAL DEPTH DATA RETRIEVED FROM:
  - **NAUTICAL MAP OF THE CAPE** PROVIDED DEPTH DATA FOR FIVE ADDITIONAL PONDS
  - **PORTNOY ET AL. (2001)** PROVIDED DEPTH DATA FOR 1 ADDITIONAL POND

- THIS LEAVES **689 CCC PONDS** WITHOUT MAXIMUM DEPTH DATA

BARNSTABLE HAS 139 PONDS WITHOUT DEPTH, SOME OF WHICH ARE UNNAMED IN THE DATABASE. THE PONDS WITH NAMES AND WITHOUT DEPTH ARE:

- LITTLE POND
- SANDY HILL POND
- CAMPGROUND POND
- STRAIGHTAWAY POND
- SPRUCE POND
- NO BOTTOM POND
- HATHAWAY POND (SOUTH)
- NAOMI POND
- SMALL POND

- FLINT ROCK POND
- LITTLE ISRAEL POND
- FRESH POND
- DUNNS POND
- ROUND POND
- LAMSON POND
- UPPER GATE POND
- LEWIS POND
- FLAX POND
- ANDREAS POND
- BOG POND
- LUMBERT POND

- FAWCETTS POND
- FLOWING POND
- MILL POND
- AUNT BETTYS POND
- PATTYS POND
- HINCKLEY POND
- FILENDS POND
- SAM POND
- SIMMONS POND
- NORTH POND
- SCHOOLHOUSE POND
- COLEMAN POND

- LEWIS POND
- NECK POND
- WEST POND
- PARKER POND
- CRYSTAL LAKE
- BOG POND

BOURNE HAS 53 PONDS WITHOUT DEPTH, SOME OF WHICH ARE UNNAMED IN THE DATABASE. THE PONDS WITH NAMES AND WITHOUT DEPTH ARE:

- BAILEYS POND
- SUCCONNESSETT POND
- OPENING POND
- FISH AND GAME POND (NORTH)
- SPIT POND
- LITTLE HALFWAY POND
- FISH AND GAME POND (SOUTH)
- DONNELY POND
- DEEP BOTTOM POND

- CONNERY SOUTH POND
- GREAT POND
- CLAY POND
- UPPER POND
- LONG POND
- CUFFS POND
- THE BASIN
- MILL POND (TWO WITH THIS NAME)
- BLACK POND
- SHOP POND
- BOURNE POND

BREWSTER HAS 53 PONDS WITHOUT DEPTH, SOME OF WHICH ARE UNNAMED IN THE DATABASE. THE PONDS WITH NAMES AND WITHOUT DEPTH ARE:

- ED SNOW POND
- BALOGS BOG
- NO BOTTOM POND
- TUCKERS POND
- ROUND POND
- GIRL SCOUT POND
- CALF FIELD POND
- BLACK POND
- GRASSY POND

- 1858 BOG
- DARK BOTTOM POND
- PINE POND
- WIDGER HOLE
- SOLS POND
- EEL POND
- SMITH POND
- TRIANGLE POND
- LEES POND
- KEELER POND
- VESPERS POND
- OWL POND

- MYRICKS POND

CHATHAM HAS 28 PONDS WITHOUT DEPTH, SOME OF WHICH ARE UNNAMED IN THE DATABASE. THE PONDS WITH NAMES AND WITHOUT DEPTH ARE:

- MEADOW VIEW POND
- FOX POND
- BASSING POND
- TROUT POND
- MINISTER POND
- PICKEREL POND
- BEARSES POND
- MARYS POND
- BARCLAY POND

- BLACK POND
- PINKWINK POND
- ARCHIES POND
- SOUTH POND
- DUANE POND
- NEWTY POND

DENNIS HAS 38 PONDS WITHOUT DEPTH, SOME OF WHICH ARE UNNAMED IN THE DATABASE. THE PONDS WITH NAMES AND WITHOUT DEPTH ARE:

- THE PLASHES
- GREAT POND PLASH
- LITTLE COLES POND
- JONATHANS POND
- WITTEMORES POND
- CLAY POND
- GRASSY POND
- SOUTHERN SIMMONS POND
- DUCK POND

- CASH POND
- AUNT PATTYS POND
- FUND POND

EASTHAM HAS 13 PONDS WITHOUT DEPTH, SOME OF WHICH ARE UNNAMED IN THE DATABASE. THE PONDS WITH NAMES AND WITHOUT DEPTH ARE:

- PENNYS POND
- DEBORAHS POND
- KROGMANS POND
- HIGGINS POND
- BAKERS POND
- UNCLE DANS POND

FALMOUTH HAS 104 PONDS WITHOUT DEPTH, SOME OF WHICH ARE UNNAMED IN THE DATABASE. THE PONDS WITH NAMES AND WITHOUT DEPTH ARE:

- POTTERS HOLE
- DEEP POND
- TWO PONDS (SOUTH)
- FROG POND
- GRASSY POND
- SPECTACLE POND (TWO PONDS WITH THIS NAME)
- RANDAL POND
- SHALLOW POND
- TURTLE POND

- CROWELL POND
- DEER POND
- PARKER ROAD POND
- FLAX POND (TWO PONDS WITH THIS NAME)
- CROCKER POND
- ANGEL MIRROR POND
- MILES POND
- MILL POND
- SOLS POND
- WING POND
- JONES POND
- TROUT POND

- NYES POND
- BOG POND
- MORSE POND
- WEEKS POND
- SHIVERICKS POND
- DAM POND
- PALMERS POND
- FRESH POND
- NOBSKA POND

HARWICH HAS 42 PONDS WITHOUT DEPTH, SOME OF WHICH ARE UNNAMED IN THE DATABASE. THE PONDS WITH NAMES AND WITHOUT DEPTH ARE:

- PADDOCKS POND
- OKERS POND
- ISLAND POND
- ABRAMS POND
- WHITE POND
- ANDREWS POND
- WASHBURN BOG POND
- LITTLEFIELDS POND
- KIDDIES POND

- BUCKS POND
- SAND LAKE
- MUD POND
- JACKS POND
- BLACK POND
- HAWKSNEST POND
- OLIVERS POND

MASHPEE HAS 57 PONDS WITHOUT DEPTH, SOME OF WHICH ARE UNNAMED IN THE DATABASE. THE PONDS WITH NAMES AND WITHOUT DEPTH ARE:

- DEANS POND
- WASHBURN POND
- FLASHY POND
- CATAQUIN POND
- AMOS POND
- COOMBS POND
- TROUT POND
- BECCAS POND
- LILY POND

ORLEANS HAS 39 PONDS WITHOUT DEPTH, SOME OF WHICH ARE UNNAMED IN THE DATABASE. THE PONDS WITH NAMES AND WITHOUT DEPTH ARE:

- CRITCHETTS POND
- ICE HOUSE POND
- CHIGGER POND
- UNCLE SETHS POND
- SHOAL POND
- DEEP POND
- UNCLE ISRAELS POND
- GOULD POND
- UNCLE HARVEYS POND

- MEADOW BOG POND

PROVINCETOWN HAS 26 PONDS WITHOUT DEPTH, NONE OF WHICH HAVE NAMES

SANDWICH HAS 42 PONDS WITHOUT DEPTH, SOME OF WHICH ARE UNNAMED IN THE DATABASE. THE PONDS WITH NAMES AND WITHOUT DEPTH ARE:

- BOILING SPRINGS POND
- DEEP SWAMP POND
- LILY POND (TWO PONDS WITH THIS NAME)
- MILL POND

PROVINCETOWN HAS 6 PONDS WITHOUT DEPTH, NONE OF WHICH HAVE NAMES

WELLFLEET HAS 12 PONDS WITHOUT DEPTH, SOME OF WHICH ARE UNNAMED IN THE DATABASE. THE PONDS WITH NAMES AND WITHOUT DEPTH ARE:

- PERCH POND
- HAWES POND
- SQUIRES POND
- DOANES BOG POND
- GRASS POND

YARMOUTH HAS 37 PONDS WITHOUT DEPTH, SOME OF WHICH ARE UNNAMED IN THE DATABASE. THE PONDS WITH NAMES AND WITHOUT DEPTH ARE:

- CROW POND
- LITTLE GREENOUGH POND
- HALFWAY POND
- PERERA POND
- WET SANDY POND
- CAT SWAMP POND

Questions

AUGUST 1, 2023

Meeting Agenda

Session Overview and Introduction
Kathleen Mason, Cape Cod Commission

Remote Sensing Overview Presentation
Nicole Bartlett & Megan Coffer

Discussion Group 1

1. **Organizing an Association**
   - Facilitator*: Kim Comart, Falmouth Pond Coalition*
   - Staff*: Kathleen Mason, Cape Cod Commission*
2. **Communicating Challenges and Solutions**
   - Facilitator: *Kristin Andres, APCC*
   - Staff: *Jessica Rempel, Cape Cod Commission*

Discussion Group 2

1. **Monitoring Your Pond**
   - Facilitator: *Julie Hambrook Berkman, APCC*
   - Staff: *Tim Pasakarnis, Cape Cod Commission*
2. **Thinking Bigger**
   - Facilitator: Amber Unruh, Town of Barnstable
   - Staff: *Kathleen Mason, Cape Cod Commission*

Wrap Up

Discussion Logistics

- 25 minutes total
- 2 discussion groups occurring at one time
- Facilitators to guide conversation
- Staff Support recording notes
- Parking Lot notepad for additional ideas/topics

oneCAPE

Discussion Ground Rules

- Listen actively and respect the views of others.
- Everyone is encouraged to participate.
- Speak from your own experience.
- Allow all voices to be heard.

Discussion Groups 1

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1. Organizing an Association

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2. Communicating Challenges and Solutions

- Facilitator: *Kristin Andres, APCC*
- Staff: *Jessica Rempel, Cape Cod Commission*

Discussion Group 2

1. Monitoring Your Pond

- Facilitator: *Julie Hambrook Berkman, APCC*
- Staff: *Tim Pasakarnis, Cape Cod Commission*

2. Thinking Bigger

- Facilitator: Amber Unruh, Town of Barnstable
- Staff: *Kathleen Mason, Cape Cod Commission*

Wrap Up

Discussion Groups 2

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Wrap Up

1 AUGUST 2023 | BREAKOUT SESSION

oneCAPE 2023

Cape Cod Pond Network Meeting

PRESENTERS

Nicole Bartlett, Regional Coordinator, NOAA North Atlantic Regional Collaboration Team

Megan Coffer, PhD, NOAA/NESDIS Center for Satellite Applications and Research; Global Science & Technology, Inc.

SESSION FACILITATORS

Kathleen Mason, Water Resources Analyst, Cape Cod Commission

Tim Pasakarnis, Water Resources Analyst, Cape Cod Commission

This session is being recorded and will be made available on the OneCape website after the event.

Cape Cod Freshwater Initiative: Local Stories

Category	General
Comment	Hathaways Pond has been "our pond" for many years. There's a great trail that circles the pond along with small areas perfect for fishing or launching a kayak.

Last edited on 7/26/2023, 5:08 PM.

Zoom Edit

Find address or place

Cape Cod Bay

Cape Cod Bay

Wellfleet Harbor

www.capecodcommission.org/local-pond-stories

Cape Cod Freshwater Initiative

CALL FOR STAKEHOLDERS

CAPE COD COMMISSION