

SERDP & ESTCP Webinar Series

Thank you for signing in early

The webinar will begin promptly at
12:00 pm ET, 9:00 am PT



SERDP and ESTCP Webinar Series

***The webinar will begin promptly at 12:00 pm ET,
9:00 am PT***

- You have two options for accessing the webinar
 1. Listen to the broadcast audio if your computer is equipped with speakers
 2. Call into the conference line: 303-248-0285
Required conference ID: 6102000
- For any question or issues, please email serdp-estcp@noblis.org or call 571-372-6565

SERDP & ESTCP Webinar Series

Defense Coastal/Estuarine Research Program (DCERP): Ten Years of Ecosystem-Focused Research and Management

May 3, 2018



SERDP & ESTCP Webinar Series

Welcome and Introductions

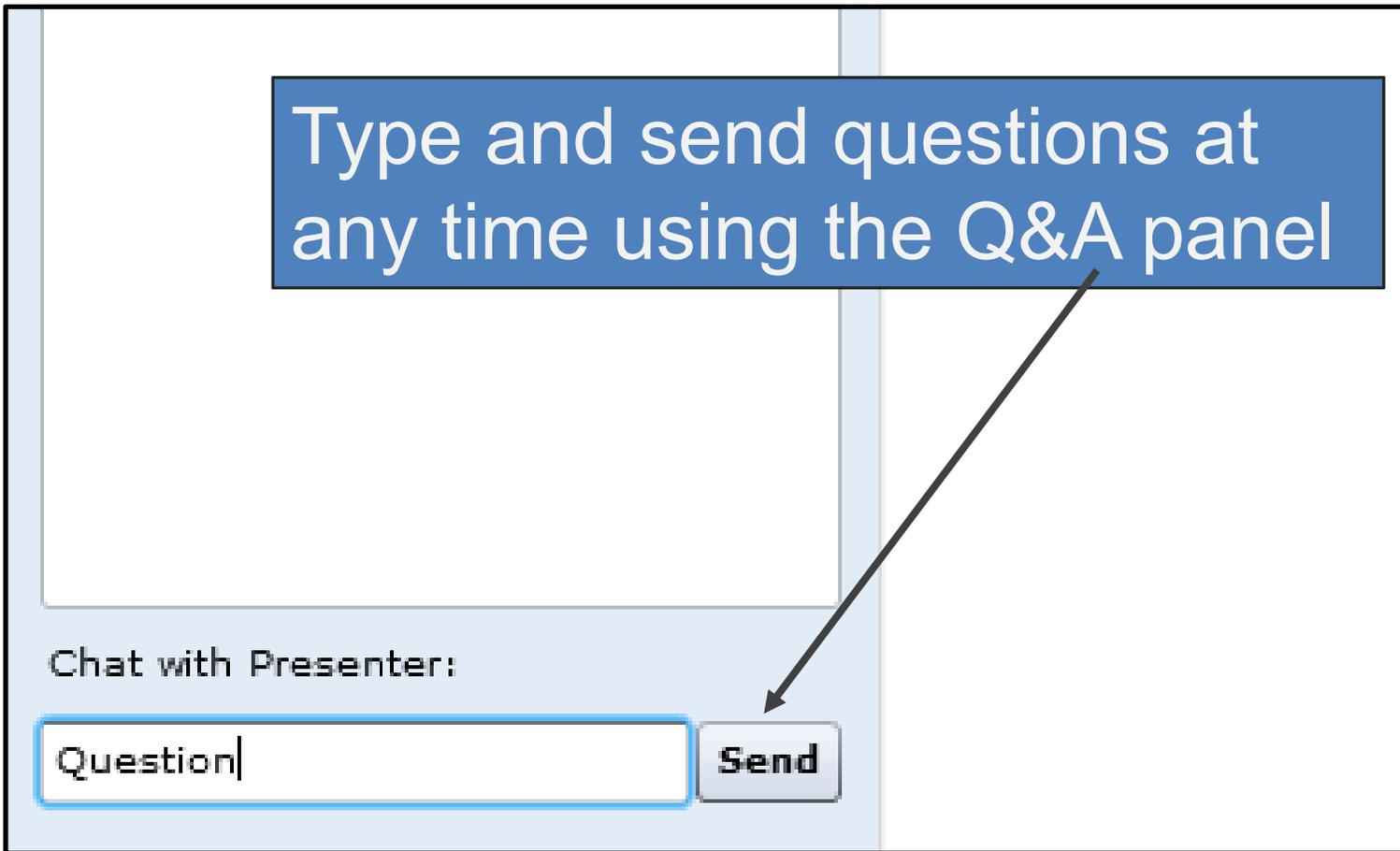
Rula A. Deeb, Ph.D.
Webinar Coordinator



Webinar Agenda

- **Webinar Logistics** (5 minutes)
Dr. Rula Deeb, Geosyntec Consultants
- **Overview of SERDP and ESTCP** (5 minutes)
Dr. Kurt Preston, SERDP and ESTCP
- **Defense Coastal/Estuarine Research Program (DCERP):
Ten Years of Ecosystem-Focused Research and
Management** (25 minutes + Q&A)
Dr. Patricia Cunningham, RTI International
- **DCERP Coastal Barrier and Terrestrial
Ecosystems** (25 minutes + Q&A)
Dr. Susan Cohen, Naval Facilities Engineering Command
Engineering and Expeditionary Warfare Center
- **Final Q&A session**

How to Ask Questions



Type and send questions at any time using the Q&A panel

Chat with Presenter:

Question|

The image shows a screenshot of a Q&A panel interface. A large blue box with white text is overlaid on the top part of the panel, stating "Type and send questions at any time using the Q&A panel". Below this, the interface shows a text input field with the placeholder text "Question|" and a "Send" button. An arrow points from the blue box to the "Send" button.

In Case of Technical Difficulties

- Delays in the broadcast audio
 - Click the mute/connect button
 - Wait 3-5 seconds
 - Click the mute/connect button again
 - If delays continue, call into the conference line
 - Call into the conference line: 303-248-0285
 - Required conference ID: 6102000
- Submit a question using the chat box

SERDP and ESTCP Overview

Kurt Preston, Ph.D.
Resource Conservation and
Resiliency Program Manager



SERDP

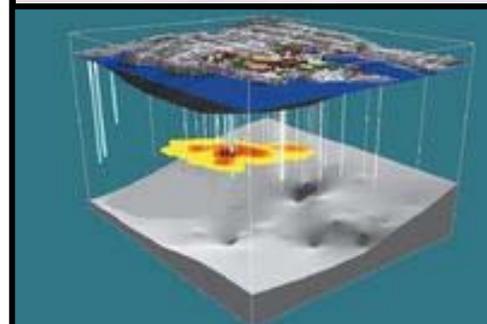
- Strategic Environmental Research and Development Program
- Established by Congress in FY 1991
 - DoD, DOE and EPA partnership
- SERDP is a requirements driven program which identifies high-priority environmental science and technology investment opportunities that address DoD requirements
 - Advanced technology development to address near term needs
 - Fundamental research to impact real world environmental management

ESTCP

- Environmental Security Technology Certification Program
- Demonstrate innovative cost-effective environmental and energy technologies
 - Capitalize on past investments
 - Transition technology out of the lab
- Promote implementation
 - Facilitate regulatory acceptance

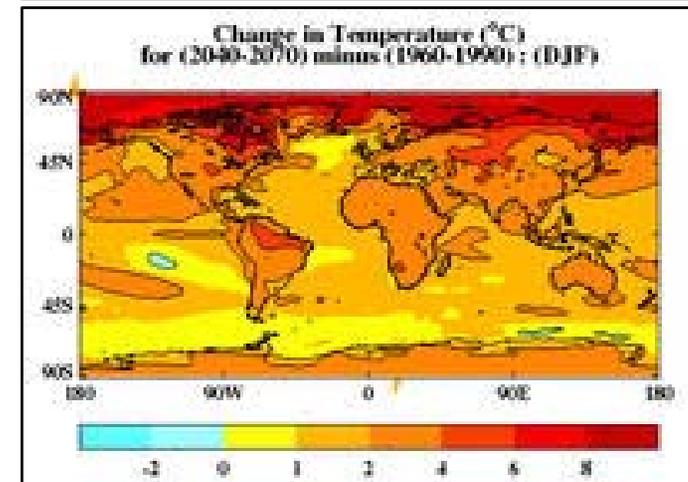
Program Areas

1. Installation Energy and Water
2. Environmental Restoration
3. Munitions Response
4. Resource Conservation and Resiliency
5. Weapons Systems and Platforms



Resource Conservation and Resiliency

- **Natural resources**
 - Ecological forestry
 - Arid lands ecology and management
 - Cold regions ecology and management
 - Pacific island ecology and management
 - Coastal and estuarine ecology and management
 - Living marine resources ecology and management
 - Species ecology and management
 - Watershed processes and management
- **Climate change**
 - Vulnerability and impact assessment
 - Adaptation science
 - Land use and carbon management
- **Air quality**
 - Fugitive dust
 - Fire emissions



SERDP and ESTCP Webinar Series

Date	Topic
May 17, 2018	Sediment Volume Search Sonar Development
May 31, 2018	Resonant Acoustic Mixing of Energetic Material Formulations
June 14, 2018	Approaches to Managing Threatened, Endangered and At-Risk Bird Species
June 28, 2018	Energy Sustainable Wastewater Treatment Systems for Forward Operating DoD Installations
July 12, 2018	Innovative Low-cost Building Automation Sensors and Controls
August 16, 2018	Plant Species Recovery

SERDP & ESTCP Webinar Series

For upcoming webinars, please visit

<http://serdp-estcp.org/Tools-and-Training/Webinar-Series>



Save the Date!

SERDP • ESTCP
SYMPOSIUM
2018 | Enhancing DoD's Mission Effectiveness

A three-day symposium showcasing the latest technologies that enhance DoD's mission through improved environmental and energy performance

November 27 - 29, 2018

Washington Hilton Hotel

Registration is coming soon

SERDP & ESTCP Webinar Series

Defense Coastal Estuarine Research Program (DCERP): Ten Years of Ecosystem-Focused Research and Management

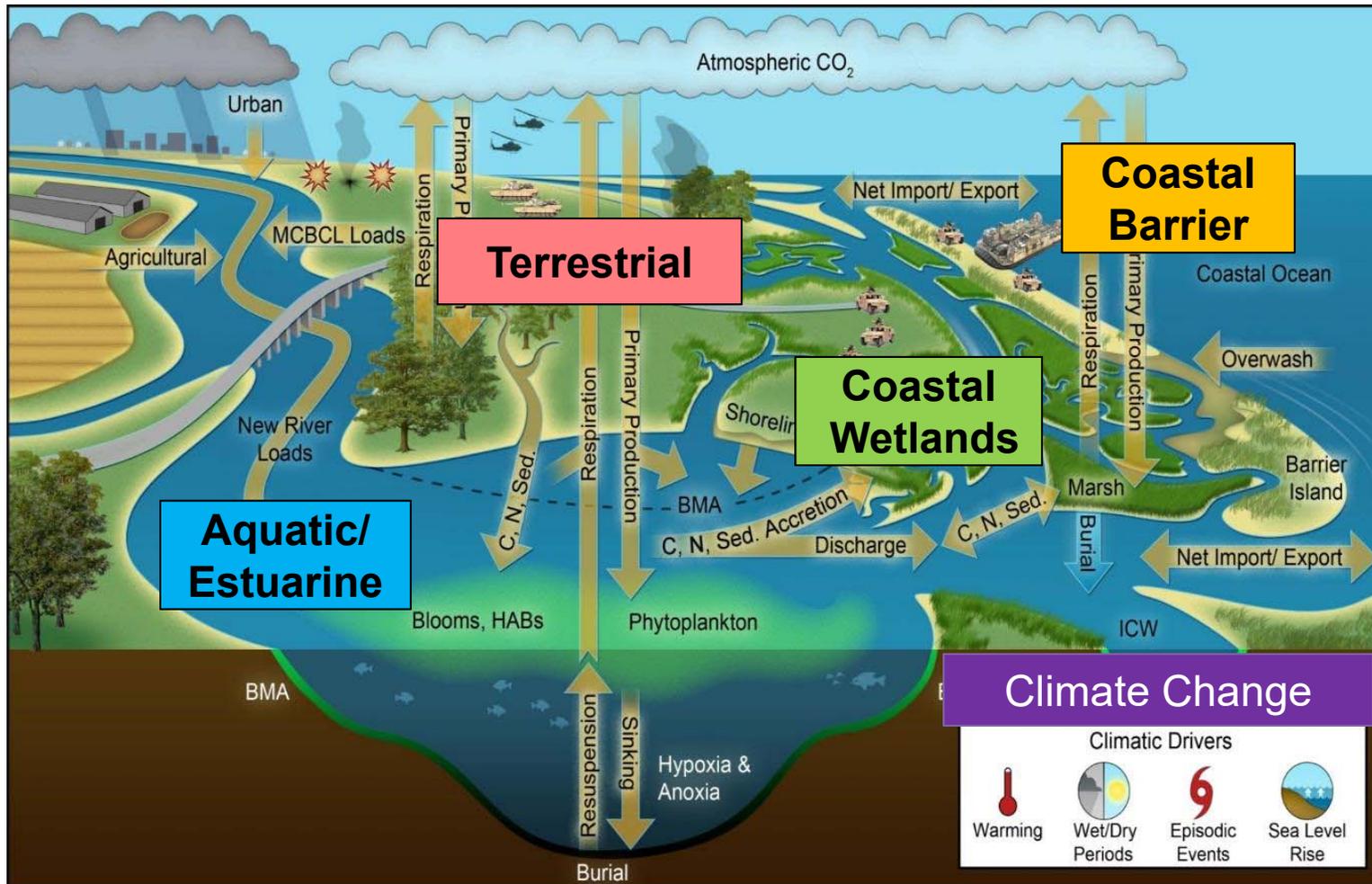
Patricia Cunningham, Ph.D.
RTI International



Agenda

- DCERP background
- Research approach and objectives
- Aquatic estuarine ecosystem
 - Water quality challenges
 - Benefits to DoD
- Coastal wetlands ecosystem
 - Resilience and sustainability
 - Benefits to DoD

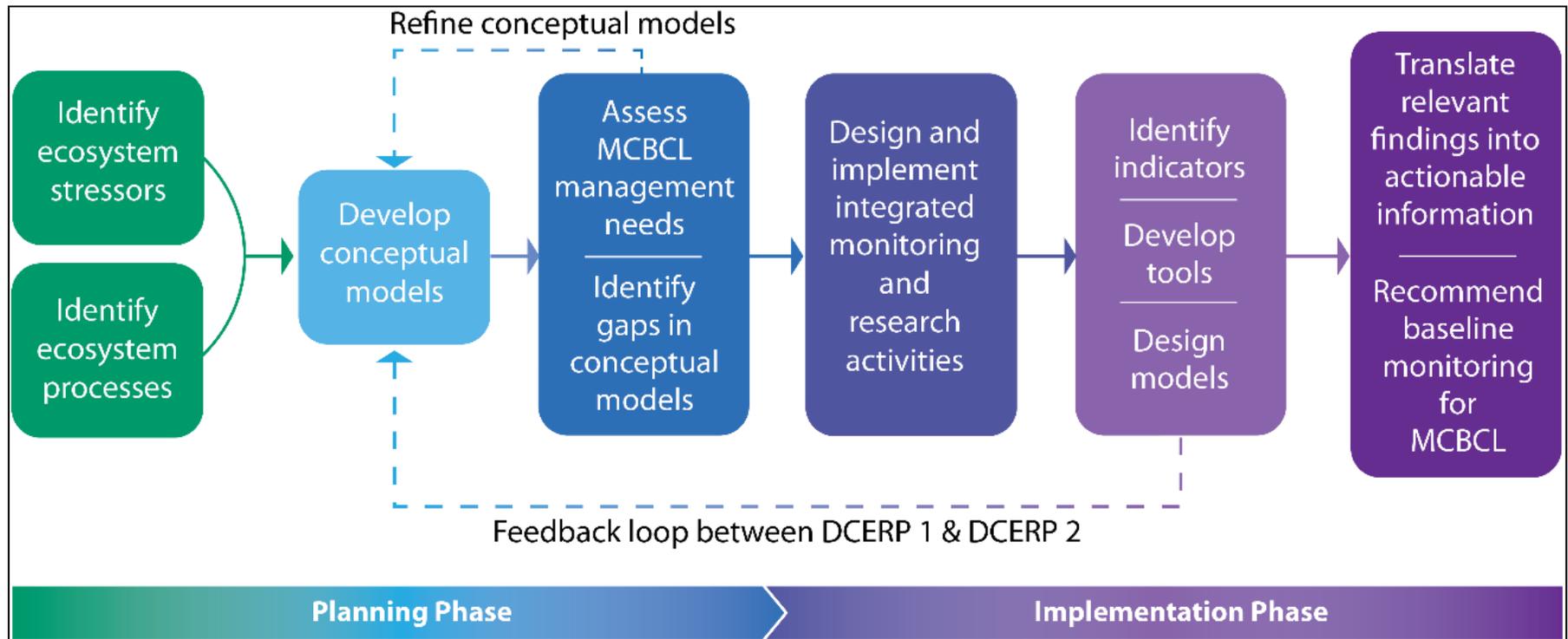
DCERP Overarching Strategy



DCERP Technical Objectives

- Understand ecosystem function and processes at Marine Corps Base Camp Lejeune (MCBCL)
- Determine ecosystem processes response to climate change
- Model current and future ecosystem changes
- Develop coastal carbon budget
- Share scientific findings
 - Scientific community
 - DoD managers
 - Other coastal managers
 - Public

DCERP Technical Approach



Aquatic Estuarine Ecosystem Researchers

- University of North Carolina
 - Mike Piehler, Adam Gold, Suzanne Thompson, Hans Paerl, Nathan Hall, Ben Peierls, Bryce Van Dam
- Aquatic Analysis and Consulting, Inc.
 - Scott Ensign
- Virginia Institute of Marine Science
 - Iris Anderson, Mark Brush
- University of Connecticut
 - Craig Tobias
- Commonwealth Scientific and Industrial Research Organization (Australia)
 - Joseph Crosswell

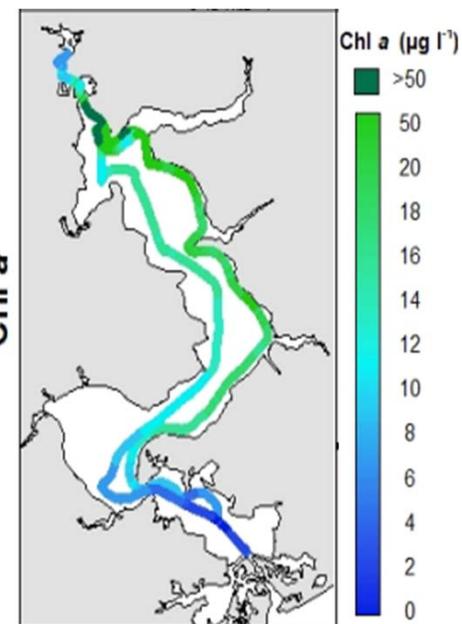
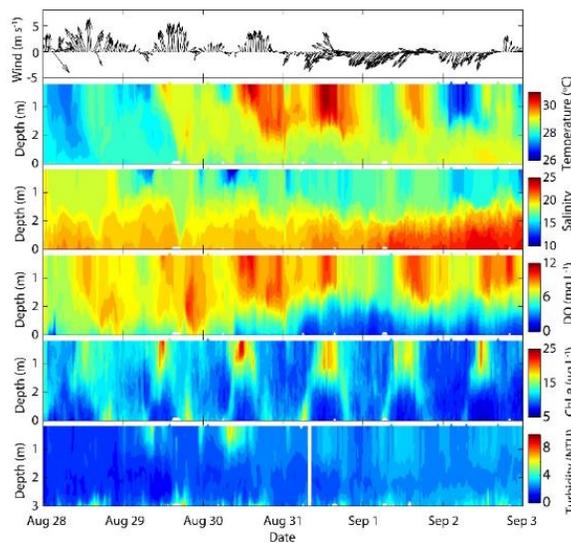


Photo courtesy of Paul Goetz

New River Estuary (NRE) *Research and Monitoring*



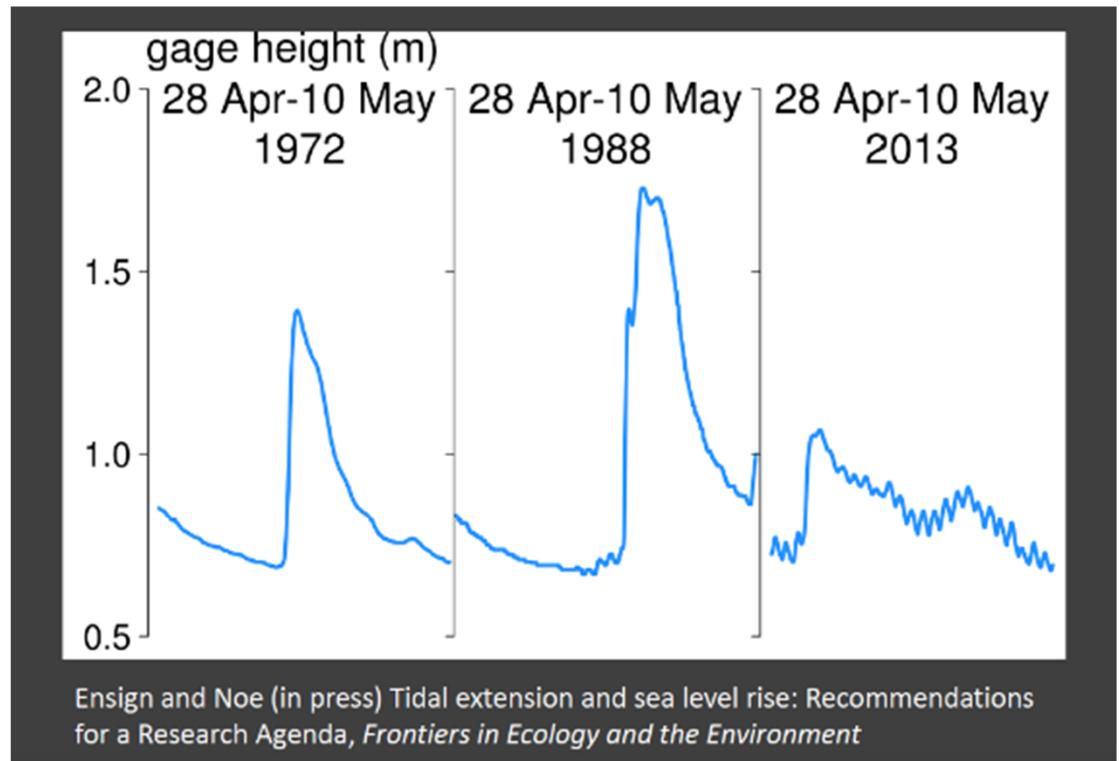
1. Sonde (YSI), Temperature, salinity, chlorophyll, dissolved O₂, pH, turbidity
2. Pump and debubbler
3. Flow-through chamber
4. Base



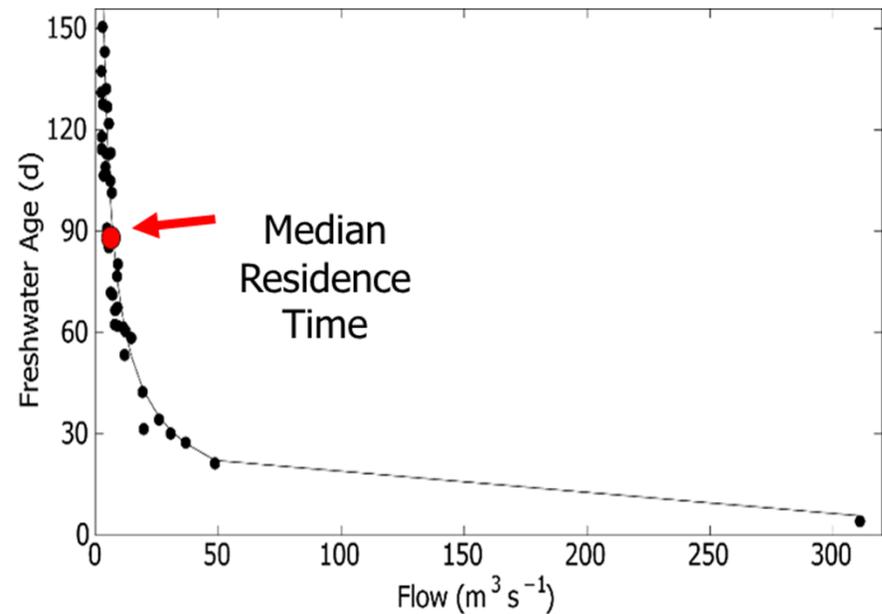
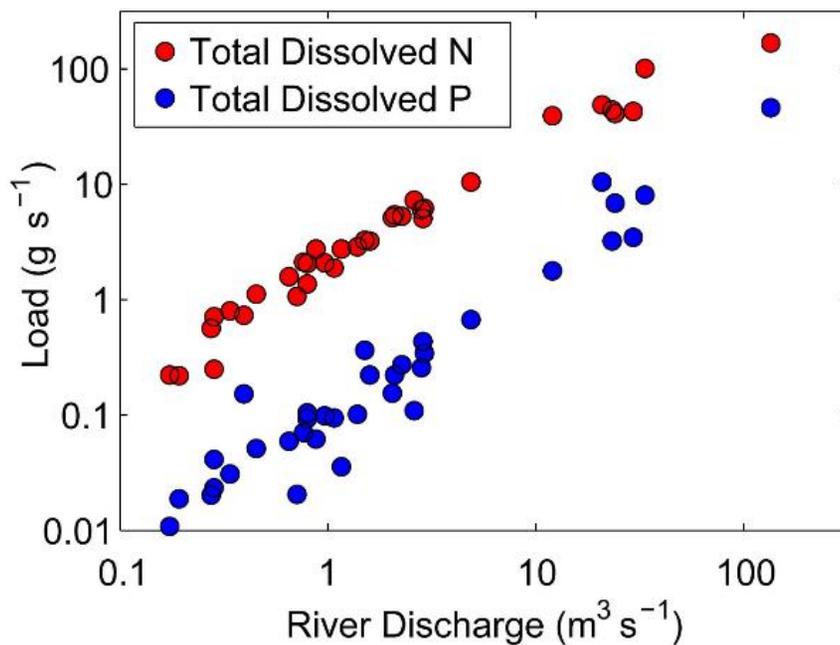
Tidal Excursions at Gum Branch



USGS gaging station at Gum Branch



NRE: Nutrients

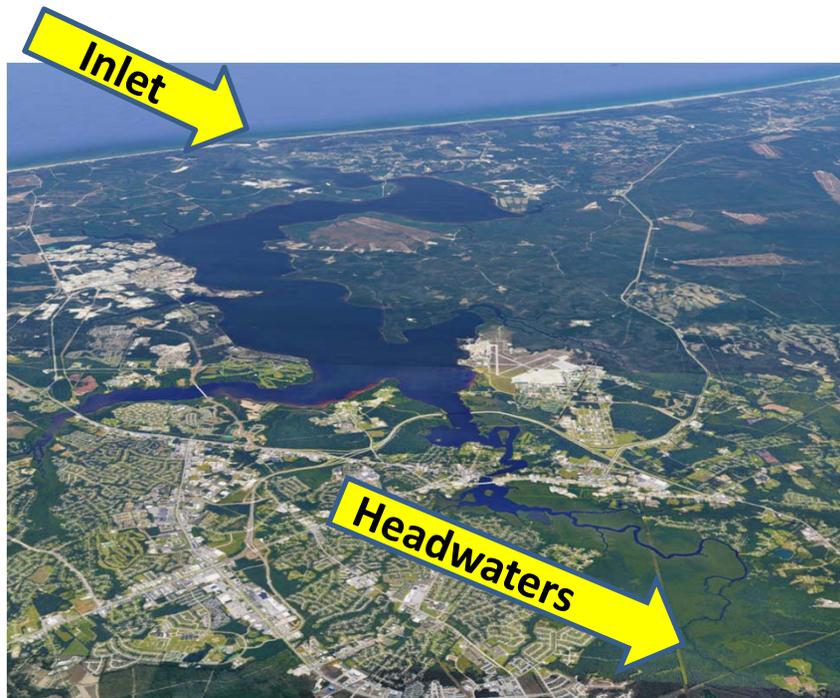


Nutrient loading and residence time governed by river flow

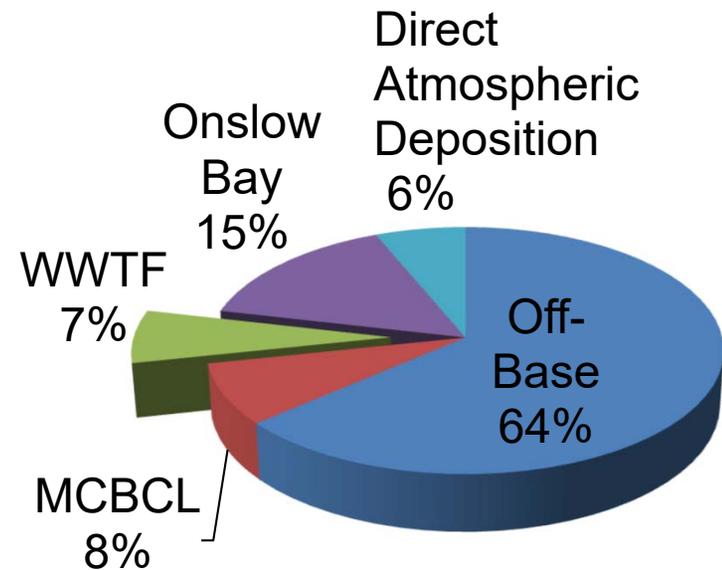
Nutrient Loading Sources

System-Wide Contributions

NRE

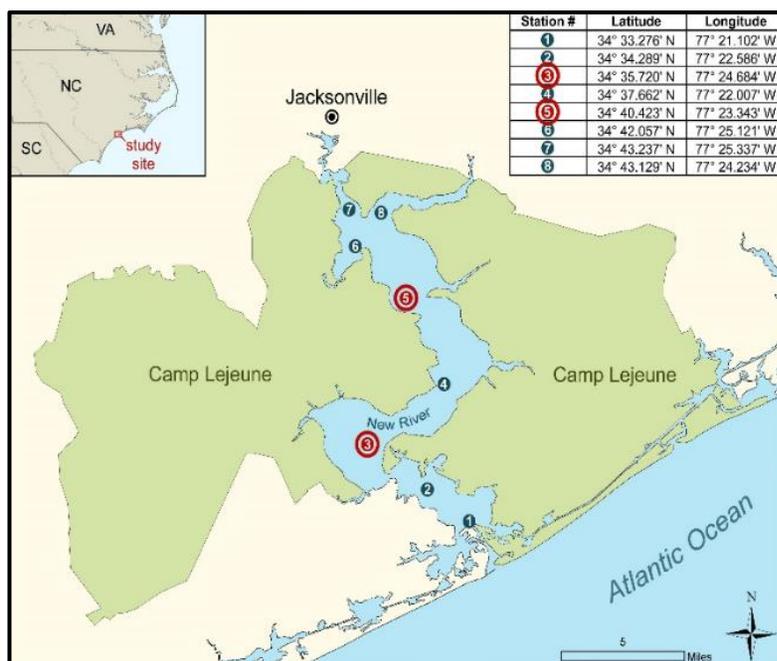


Annual Contribution



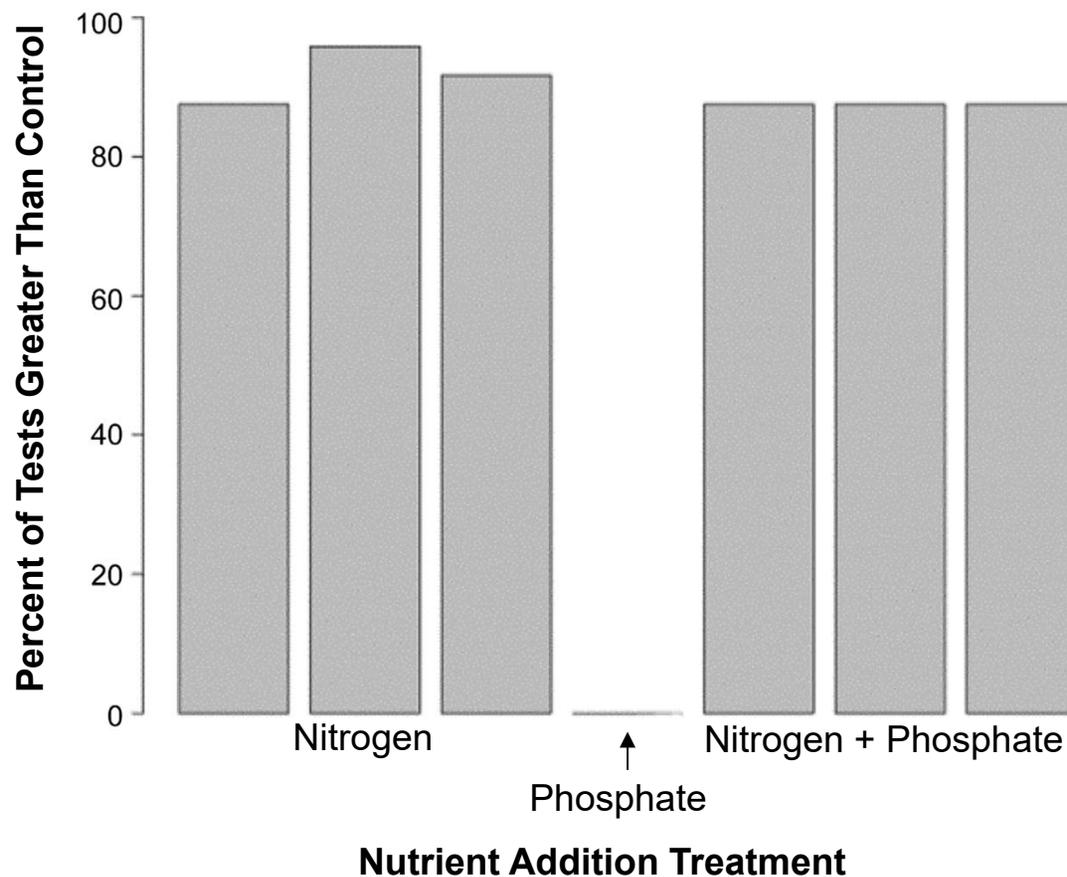
Majority of nutrient loadings from upper watershed = off-base

Phytoplankton



Incubating phytoplankton samples

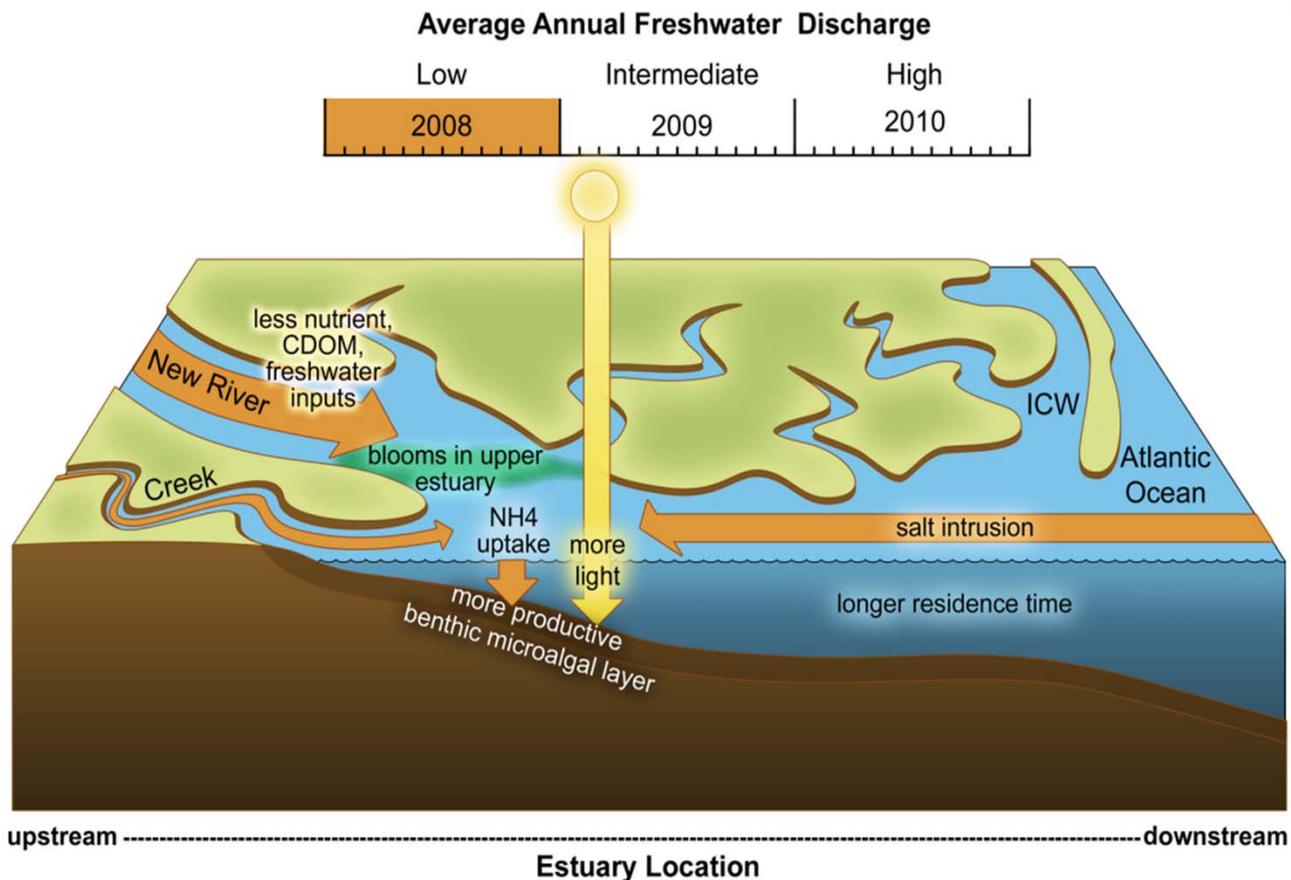
Phytoplankton Production



Phytoplankton production is strongly nitrogen limited

New River

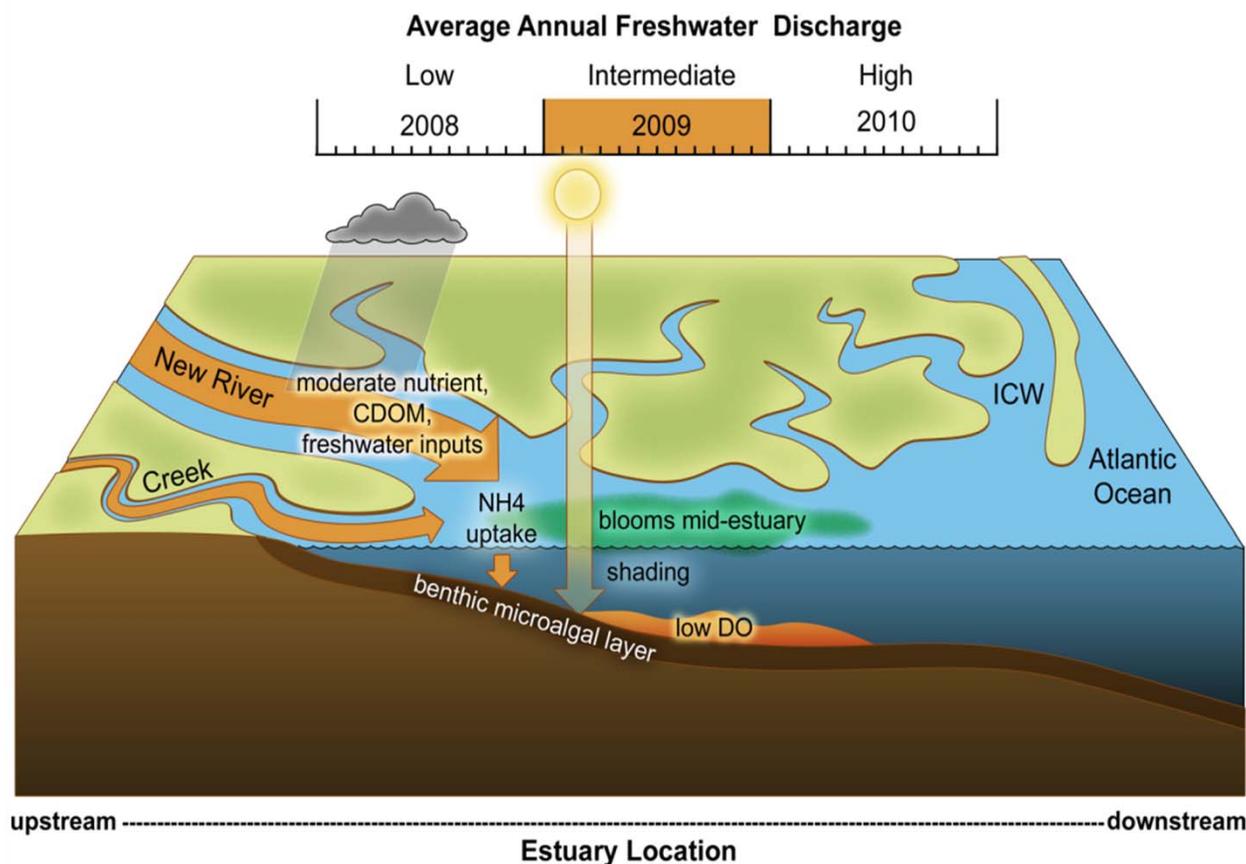
Low River Flow Conditions



H₂O Clarity +++ Sediment + Nutrients + Blooms + Salinity +++ Hypoxia +

New River

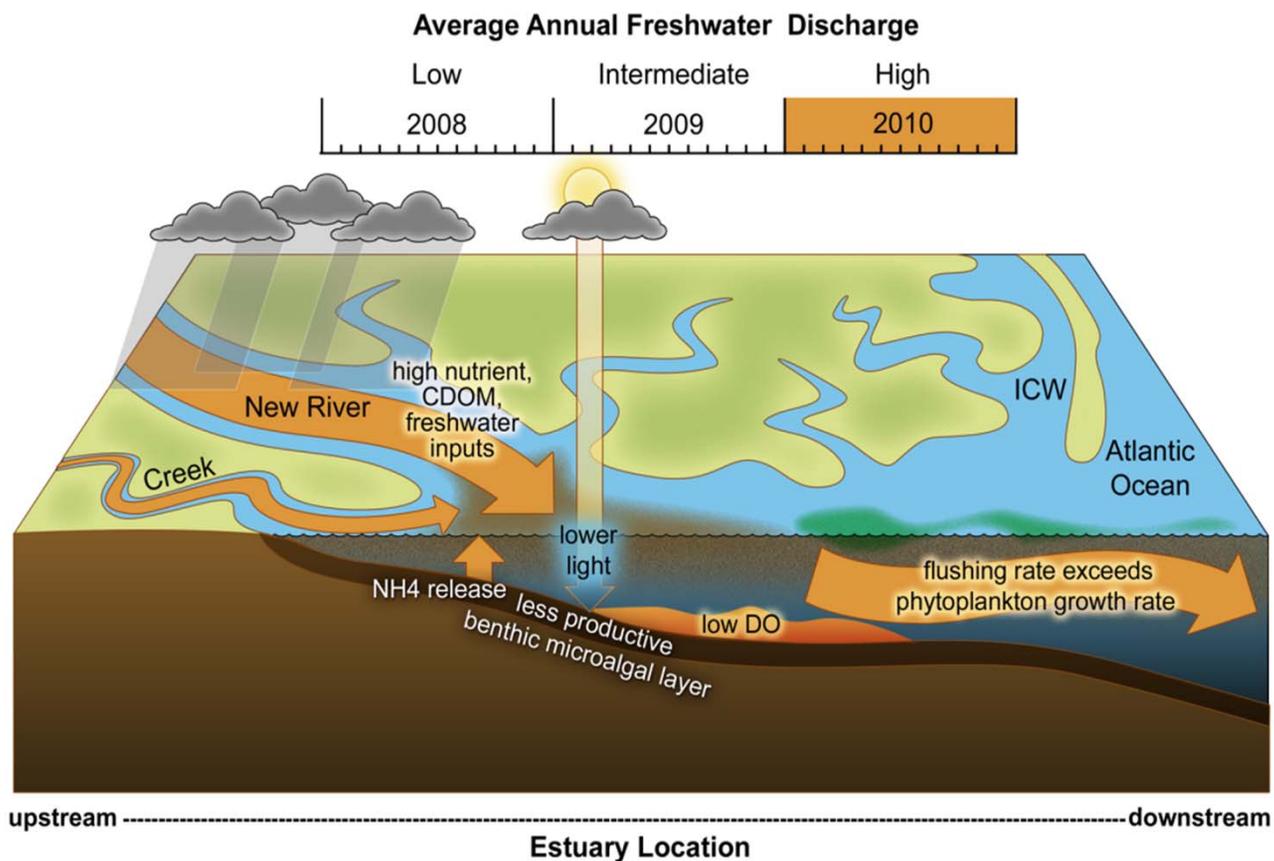
Moderate River Flow Conditions



H₂O Clarity ++ Sediment ++ Nutrients ++ Blooms ++ Salinity ++ Hypoxia ++

New River

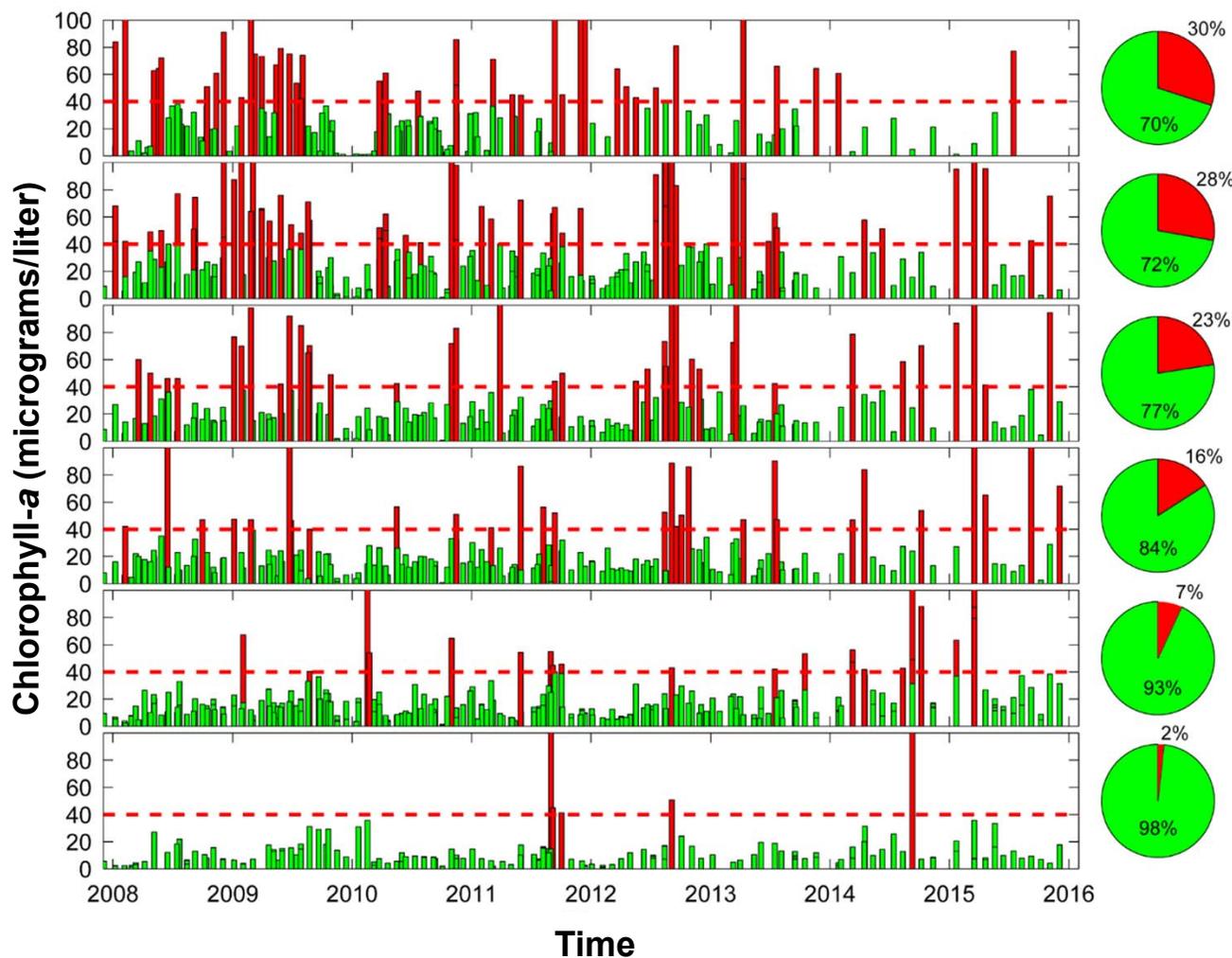
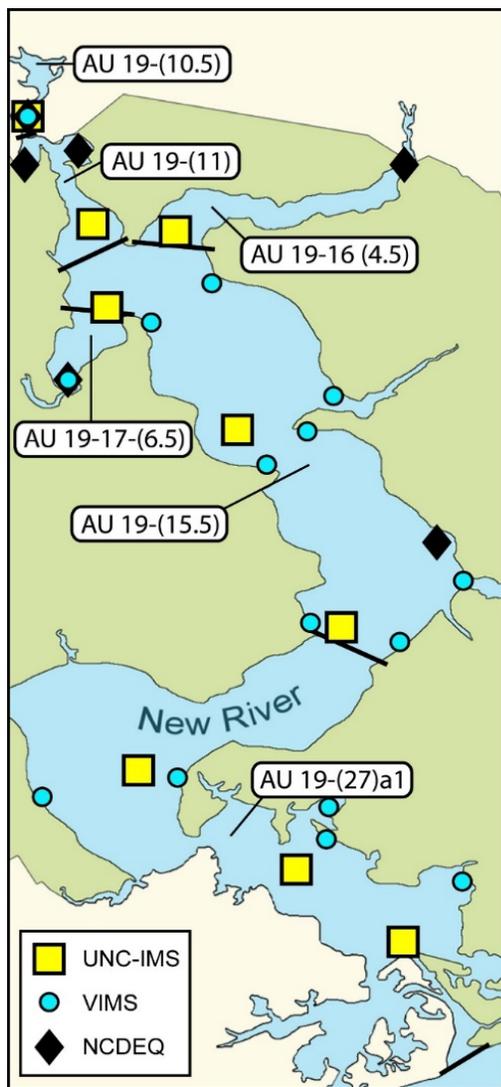
High River Flow Conditions



H₂O Clarity + Sediment +++ Nutrients +++ Blooms + Salinity + Hypoxia +++

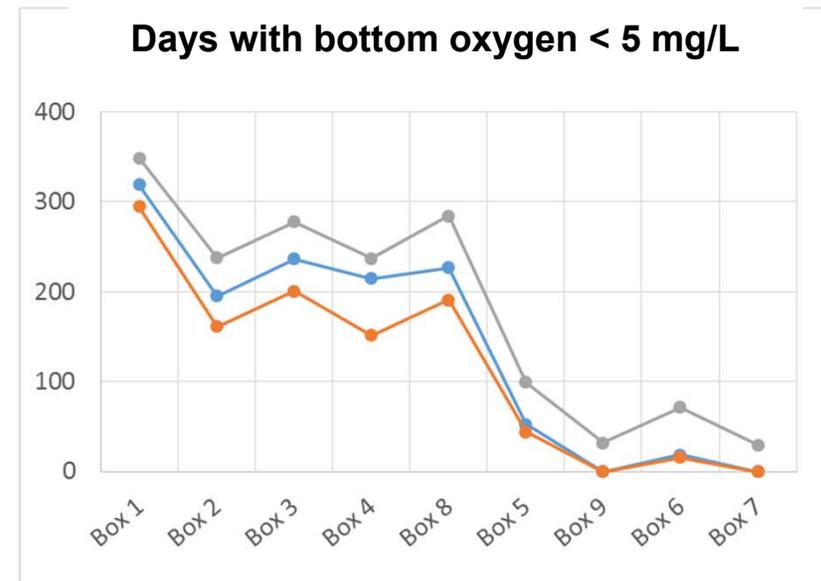
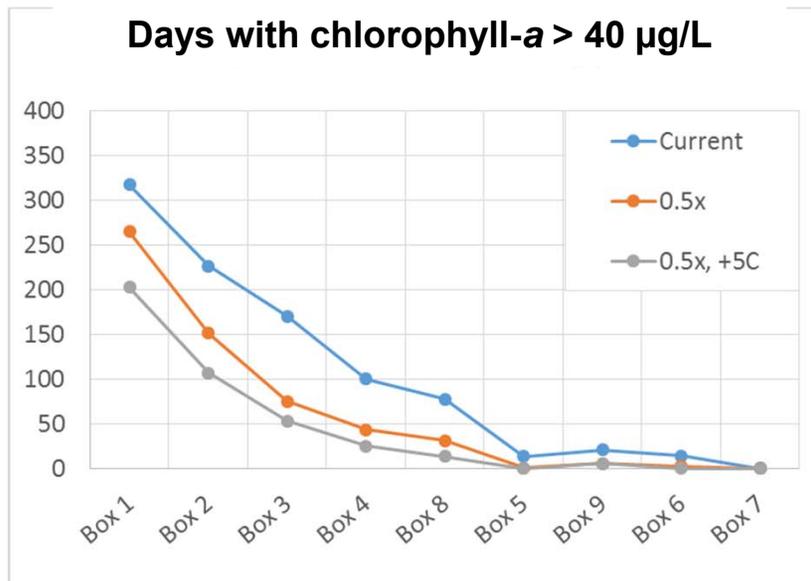
Upper Estuary - Hot Spot for Blooms

Exceedances of NC Chlorophyll a Standard



Future Climatic and Human Stressors

Impacts on Water Quality



Scenario Analysis: Interactive effects of nutrient loading and climate

Current management strategies may not be adequate to control water quality in the future

Benefits to DoD: Aquatic /Estuarine

- Water quality management must be watershed-wide
- Monitor essential parameters to understand issues, sources, and remedies
- Future land use and climate will complicate management
 - Installation land uses change over time – affect water quality
 - Management options needs to be adaptable
- Sustainability of ecosystem services for watershed should be a priority

Coastal Wetlands Ecosystem Researchers

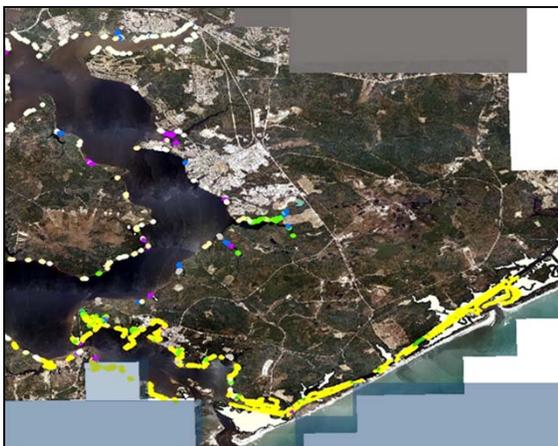
- NOAA-Morehead City
 - Carolyn Currin
- Virginia Institute of Marine Science
 - Iris Anderson and Matt Kirwan
- University of North Carolina
 - Brent McKee
- University of Connecticut
 - Craig Tobias
- Aquatic Analysis Consulting
 - Scott Ensign



Salt marsh photo – courtesy of NOAA

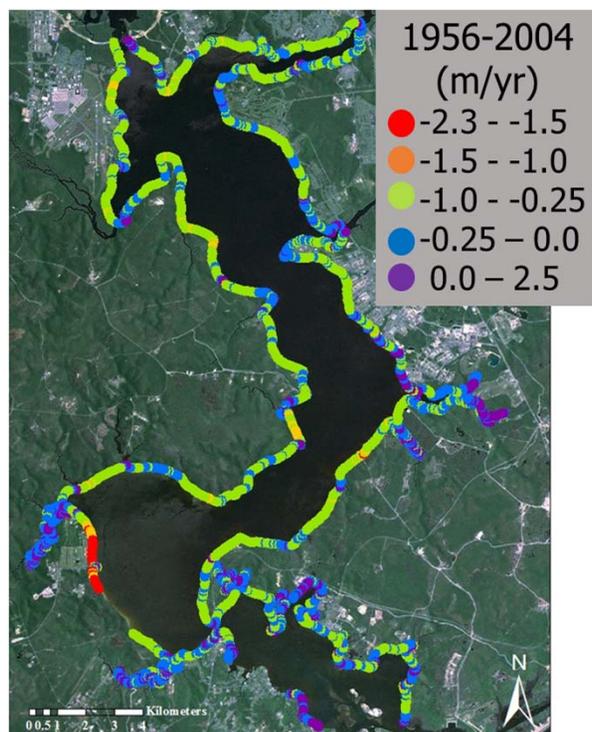
MCBCL Coastal Wetland Landscape

- 2,600 acres of coastal wetlands
- Fringing *Juncus* marshes border NRE, back barrier island and mainland *Spartina* marshes
- Resource benefits = shoreline protection, habitat, carbon burial, and nutrient/sediment removal
- Resource management challenges = sea level rise and ICW

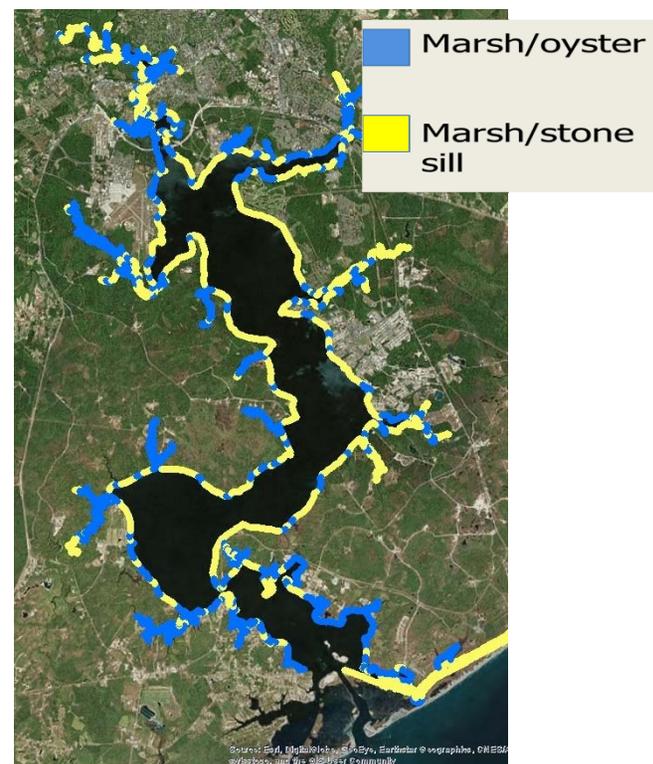


Wetlands and Erosion

Erosion rates of shoreline

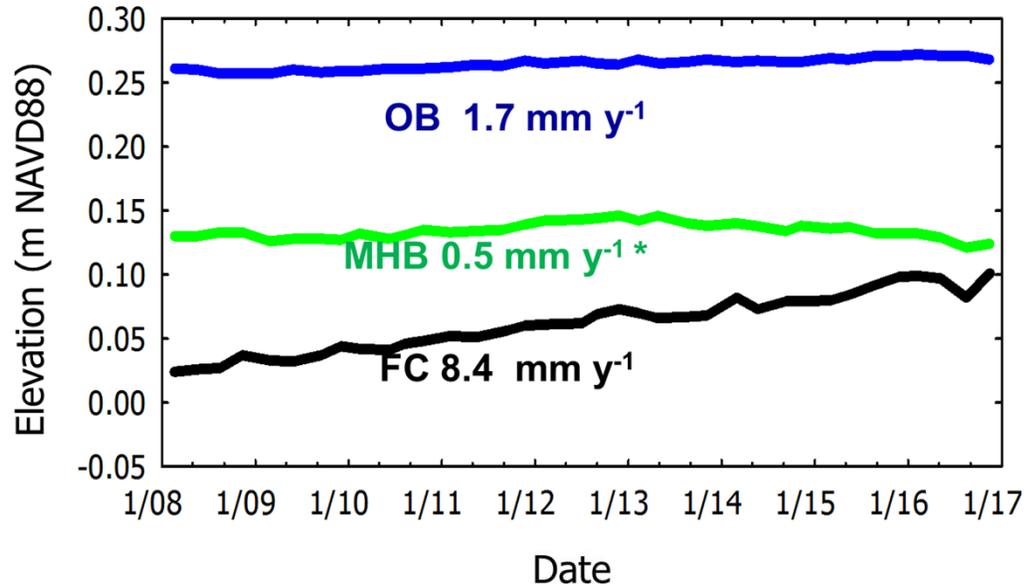


Living shoreline types

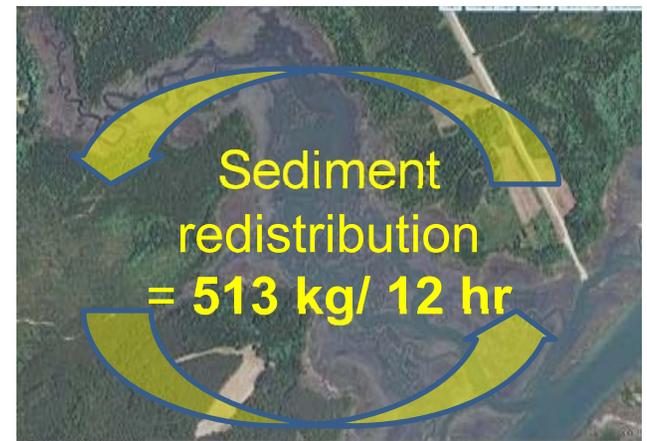
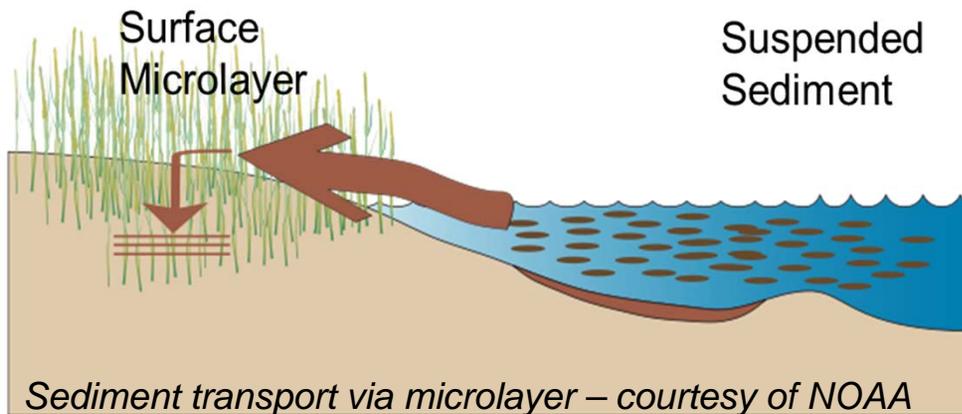


Fringing wetlands slow shoreline erosion

MCBCL Marshes Keep Pace with SLR

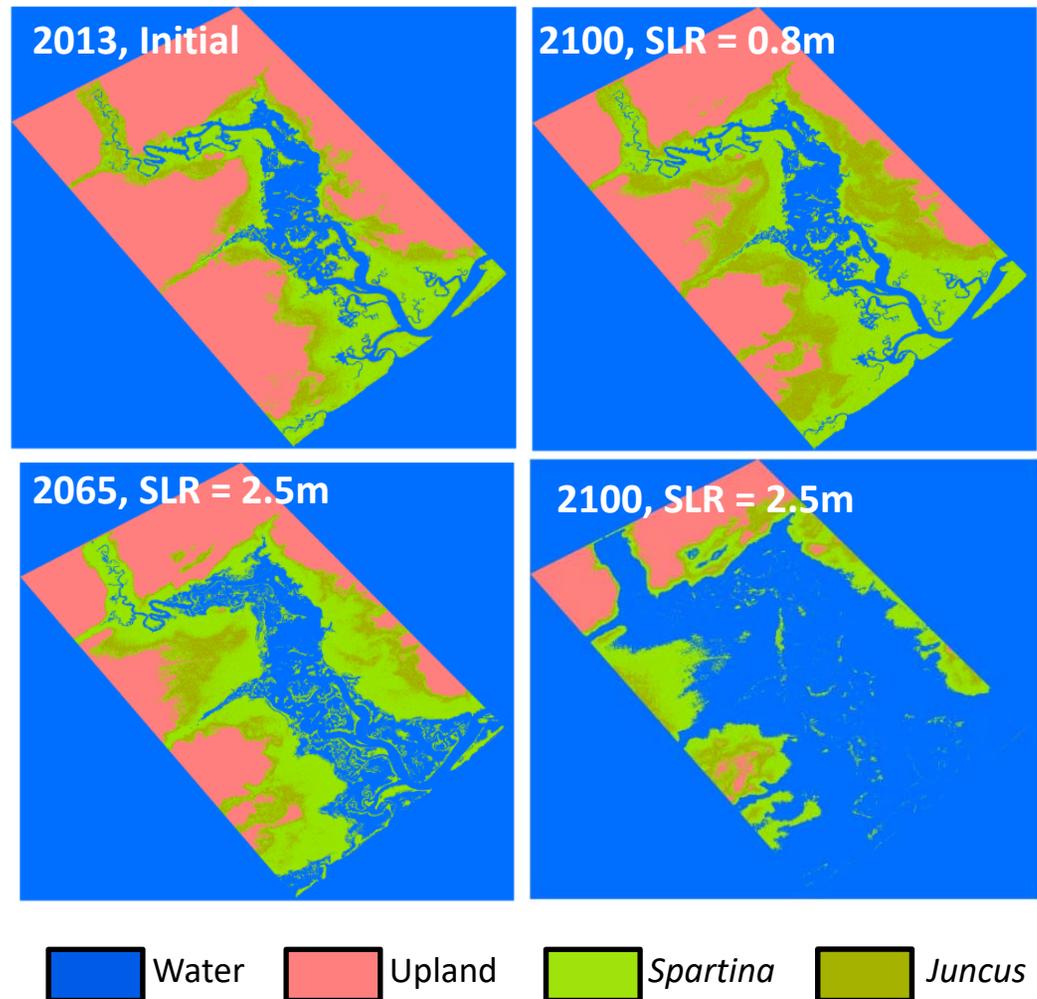


- Elevation maintained by limited sediment supply
- Sediment supply local...very local
- Tidal amplitude



Models Forecast Mainland Marsh Sustainability

- 5 different SLR rates
- Increasing marsh area through time
- At SLR above 2.5 m marsh drowns
- Migration into uplands compensates for limited drowning
- Similar pattern across U.S. Atlantic coast marshes



Benefits to DoD: Coastal Wetlands

- Maintain resilience of marshes by implementing management solutions
 - Living shorelines installations
 - Thin layer application of dredge material
 - Natural shoreline helps maintain sediment supply
 - Upland buffers allow marshes to migrate
- Ecosystem services preserved
 - Buffer shoreline from storm surge
 - Provide fish/shellfish nursery areas
 - Bury additional carbon
 - Remove nutrients/sediment from water



SERDP & ESTCP Webinar Series

For additional information, please visit
<https://www.serdp-estcp.org/Program-Areas/Resource-Conservation-and-Resiliency/Natural-Resources/Coastal-and-Estuarine-Ecology-and-Management/RC-2245>

Speaker Contact Information

patc@rti.org; 919-316-3722



SERDP & ESTCP Webinar Series

Q&A Session 1



DCERP Coastal Barrier and Terrestrial Ecosystems

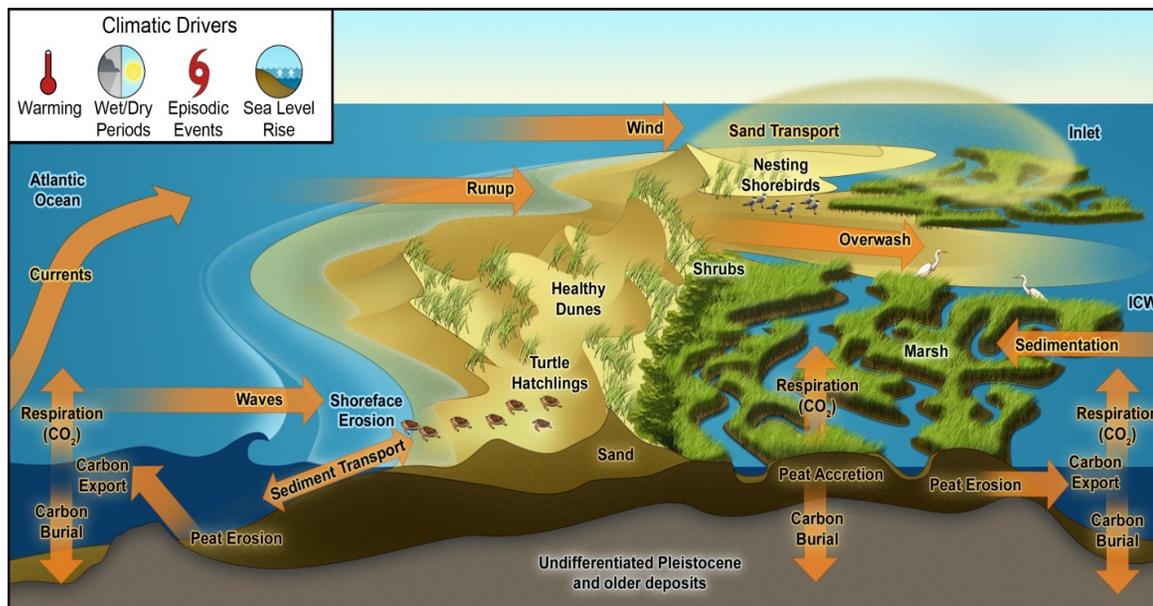
Dr. Susan Cohen
Naval Facilities Engineering Command
Engineering and Expeditionary Warfare Center



Agenda

- Coastal barrier
 - Dynamic system and natural stressors
- Terrestrial
 - Fire and management
- Conclusions

Coastal Barrier Ecosystem



Researchers

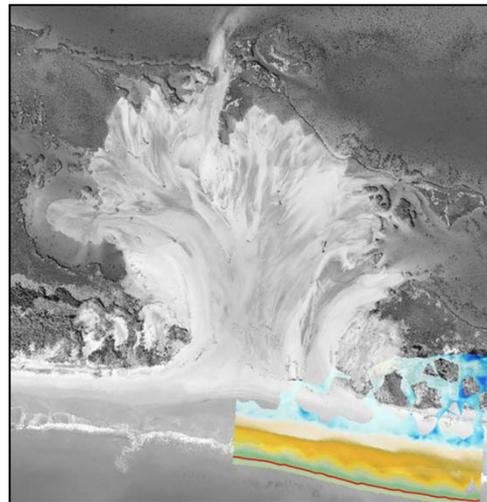
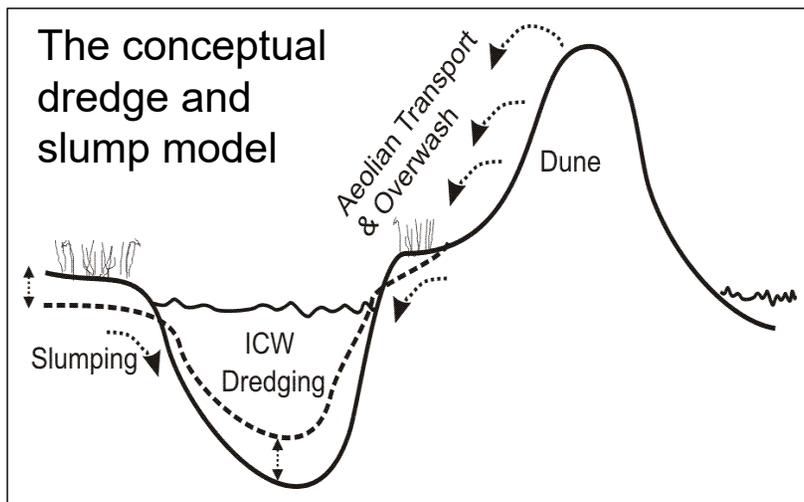
Tony Rodriguez¹
 Carolyn Currin²
 Jesse McNinch³
 Brent McKee¹
 Steve Fegley¹

1 = UNC CH IMS
 2 = NOAA
 3 = USACE

Backbarrier Marshes

Squeezed between ICW and Island Rollover

- ICW
 - Alters sediment supply
 - Increases marsh shoreline erosion/loss of habitat
- Compounded by island washover
- Onslow Beach
 - Little space for new marsh to form landward
 - Decline persistent



Backbarrier Marshes

Squeezed between ICW and Island Rollover

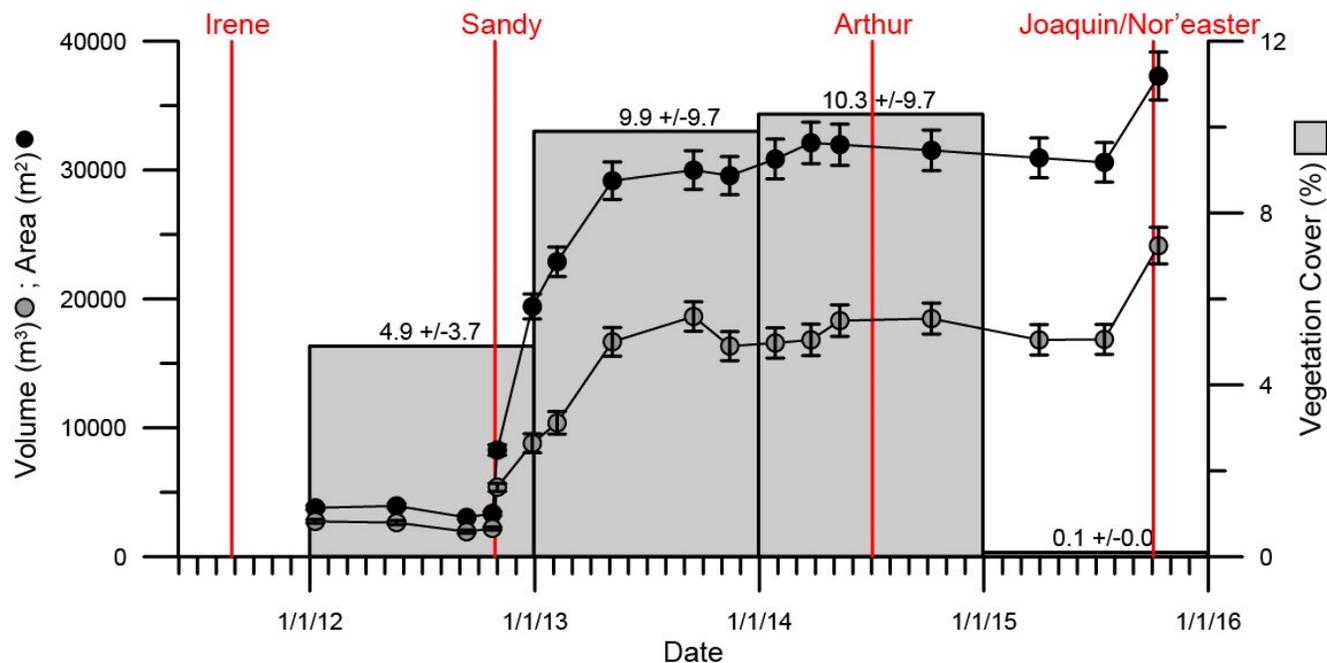


- Intracoastal Waterway (ICW) doubled in width over 66 years
- Recent erosion rates decline as channel widens
- Boat wakes cause of erosion

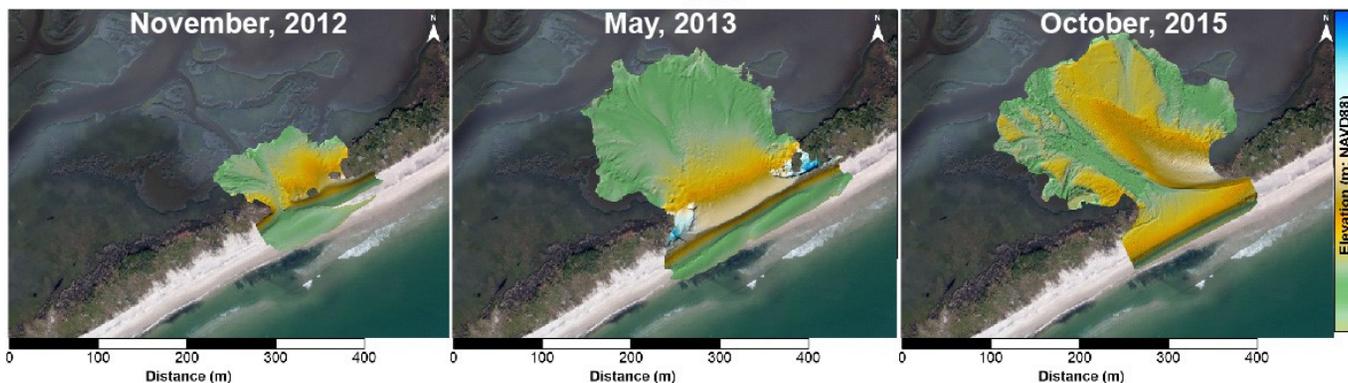


Overwash Frequency

Increasing and Not Limited to Storm Events

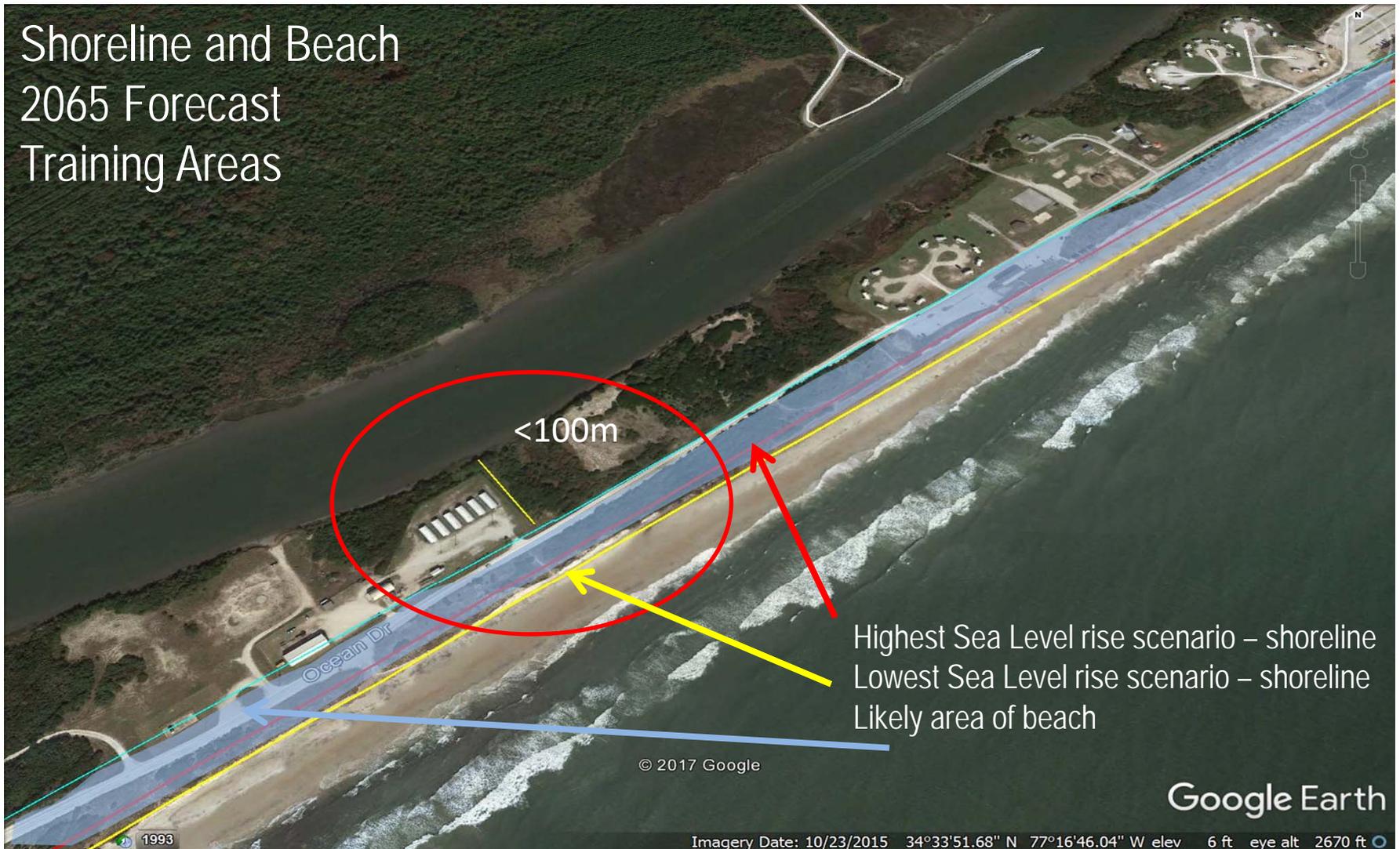


- Washover fans are not necessarily “event deposits”
- >80 fairweather days when overwash occurred



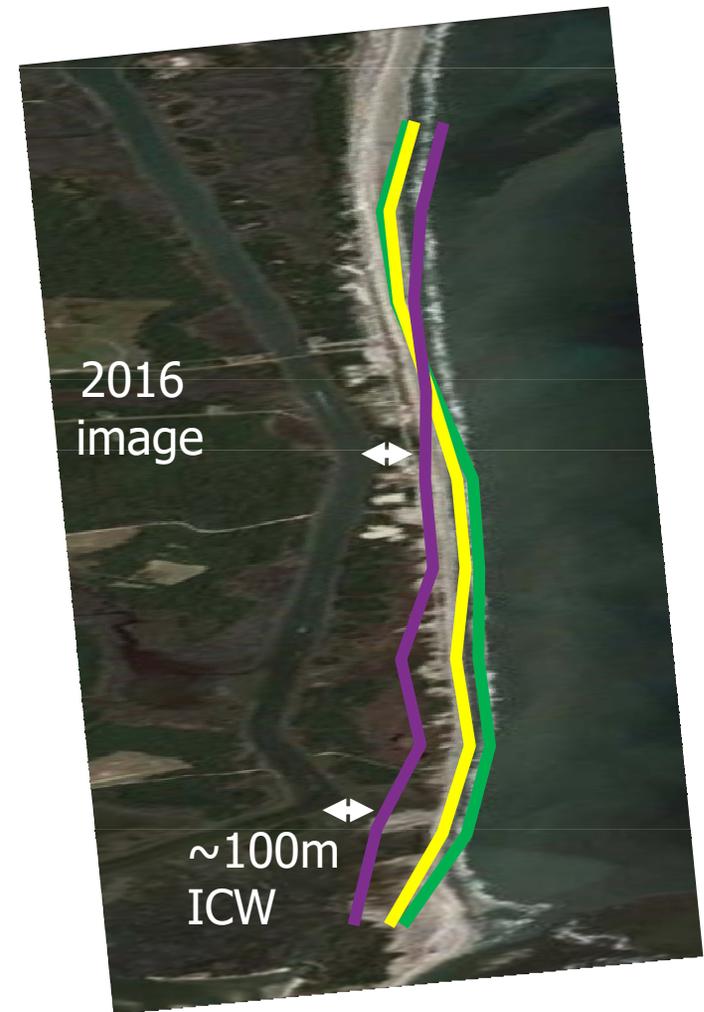
Shoreline and Beach Forecast

Shoreline and Beach
2065 Forecast
Training Areas



Coastal Management Implications

- Natural stressors drive island change
- Stable and accreting northern half of island
- Rapid change and eroding southern half of island
 - Substantial impact to all southern infrastructure
- Engage USACE on ICW management, engineered solutions
- Managing barrier island carbon stocks difficult loss will continue



MCBCL Terrestrial Landscape

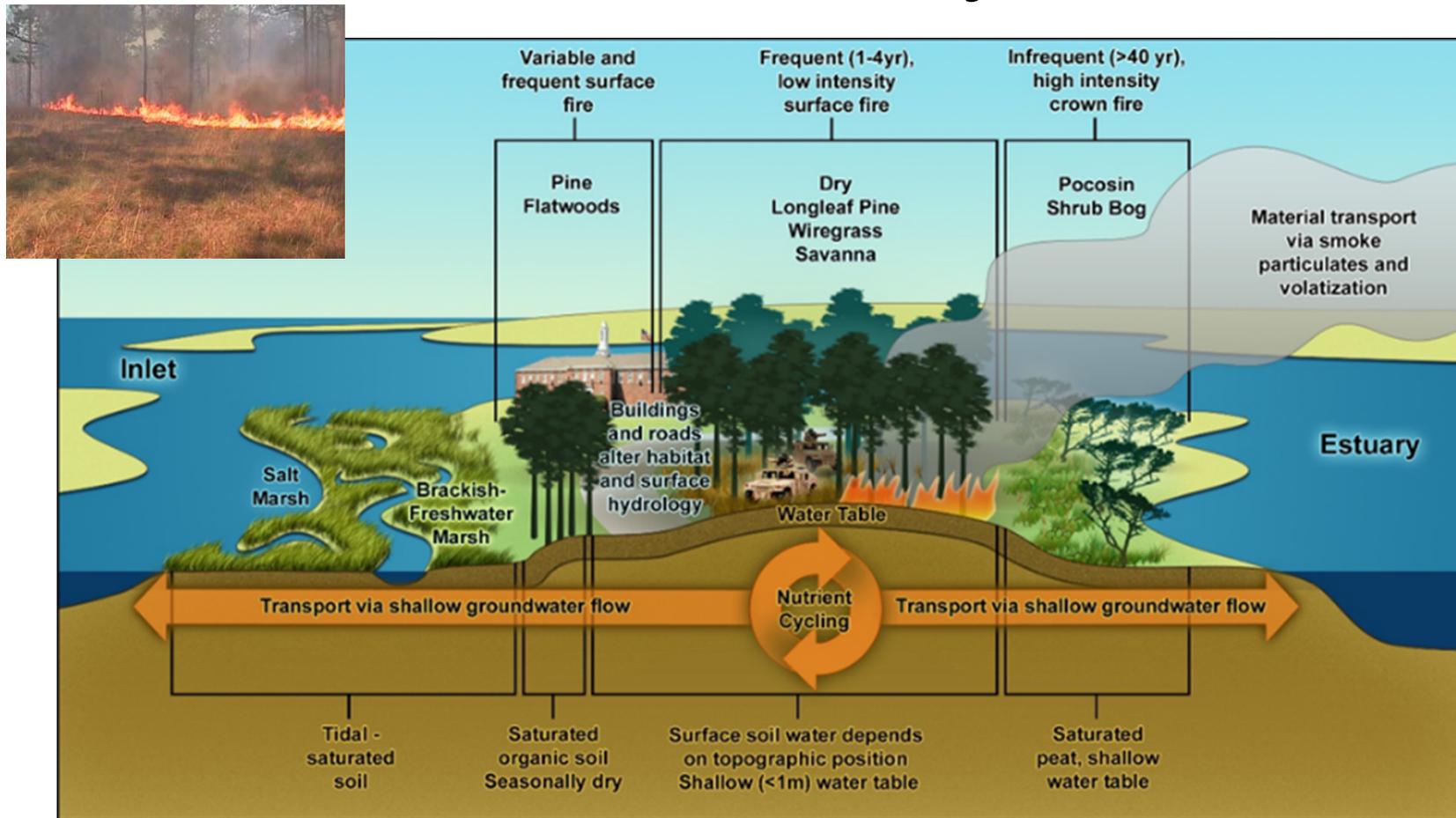
- Variable lower coastal plain terrestrial ecosystems
- Unique conservation challenges
- Unique management goals

Researchers

- Norm Christensen and Stephen Mitchell (Duke University)
- Jeff Walters, Sara Ziegler and Vicki Garcia (Virginia Tech)



Terrestrial Ecosystem

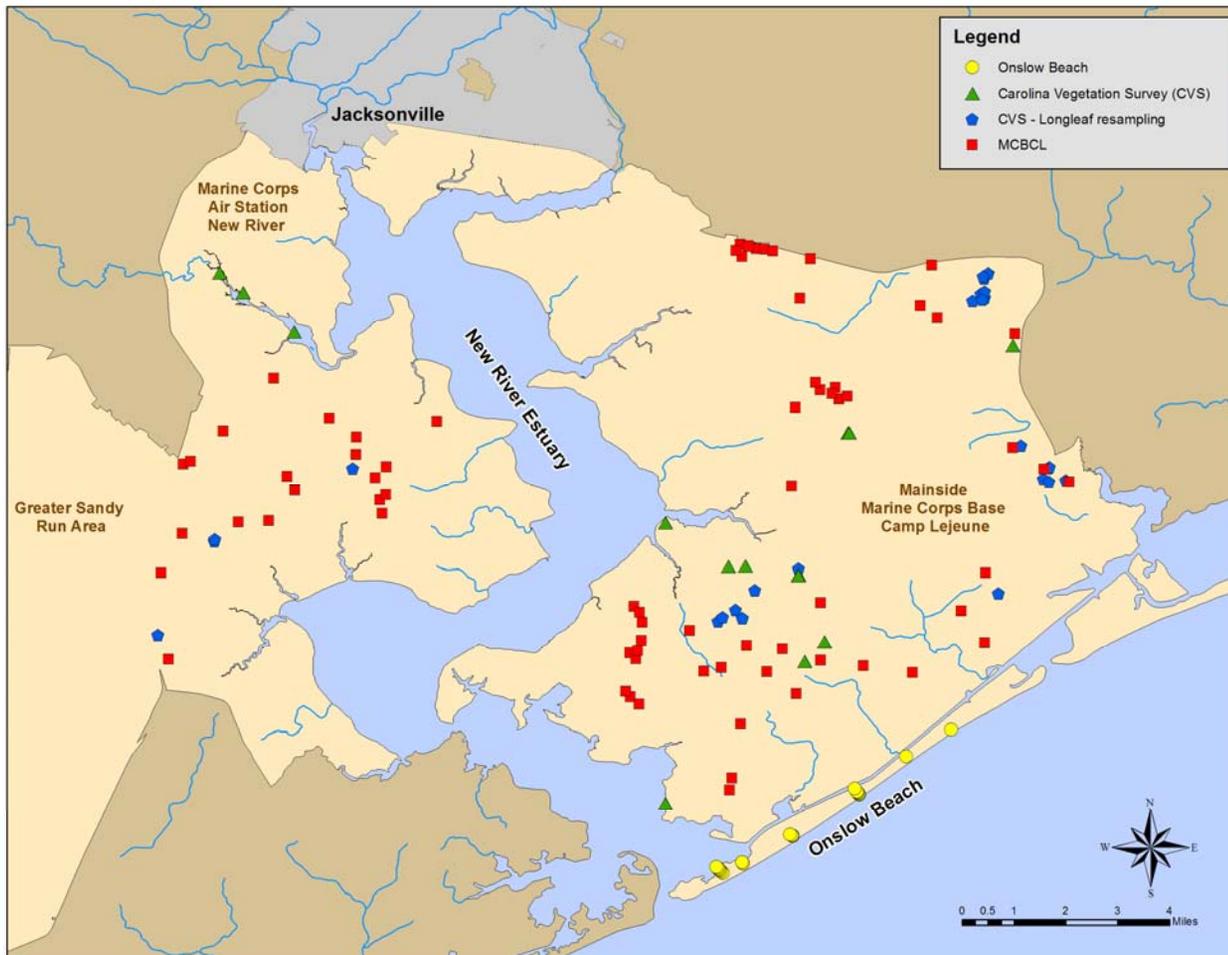


*Biodiversity, variation and change on a complex coastal plain landscape:
Causes, connections and conservation*

Central Questions

- What determines variation in ecosystem structure and diversity across MCBCL?
- What are the relationships between plant composition and diversity and the composition and diversity of avian communities?
- Does management focused particularly on a single species (RCW) put other species at risk or compromise other ecosystem values?
- How effective is understory/midstory thinning as a tool for restoring longleaf pine ecosystems/RCW habitat on sites now dominated by loblolly pine?
- What will the challenges of future climates bring?

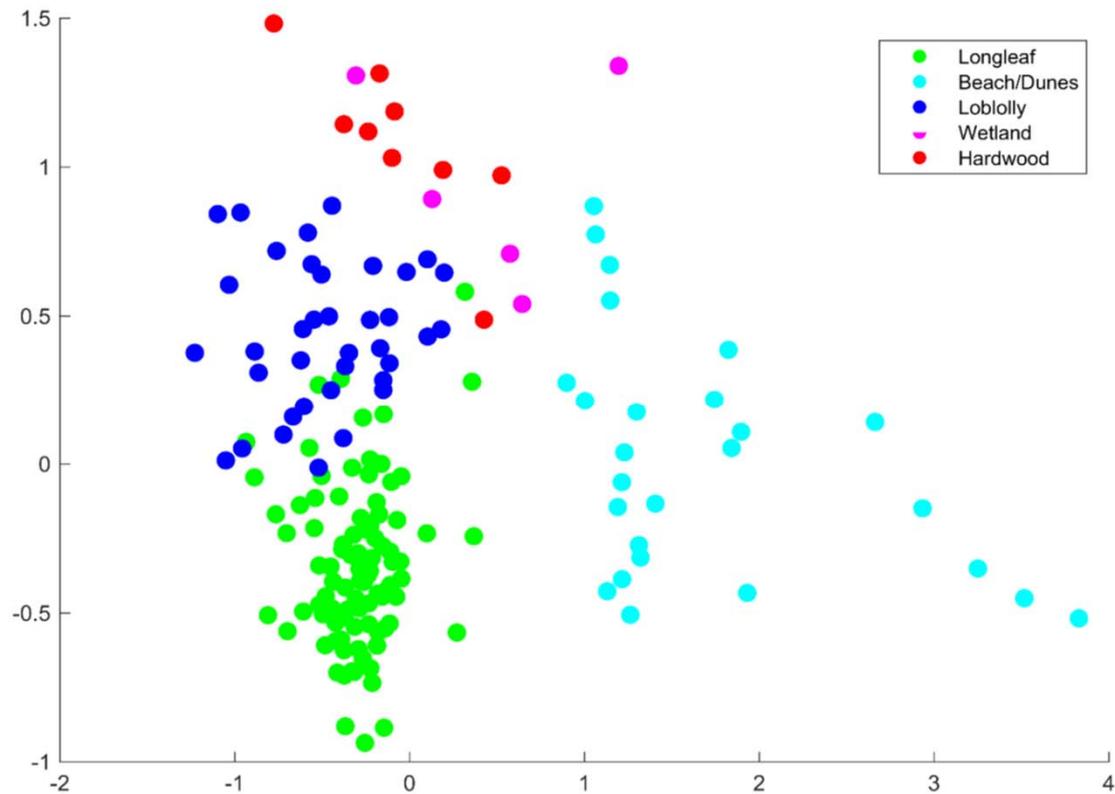
Ecosystem Structure and Diversity



- Vegetation cover
 - Emphasis on pine-dominated ecosystems
- Soil
 - Physical
 - Chemical properties
- Bird species

Ecosystem Structure and Diversity

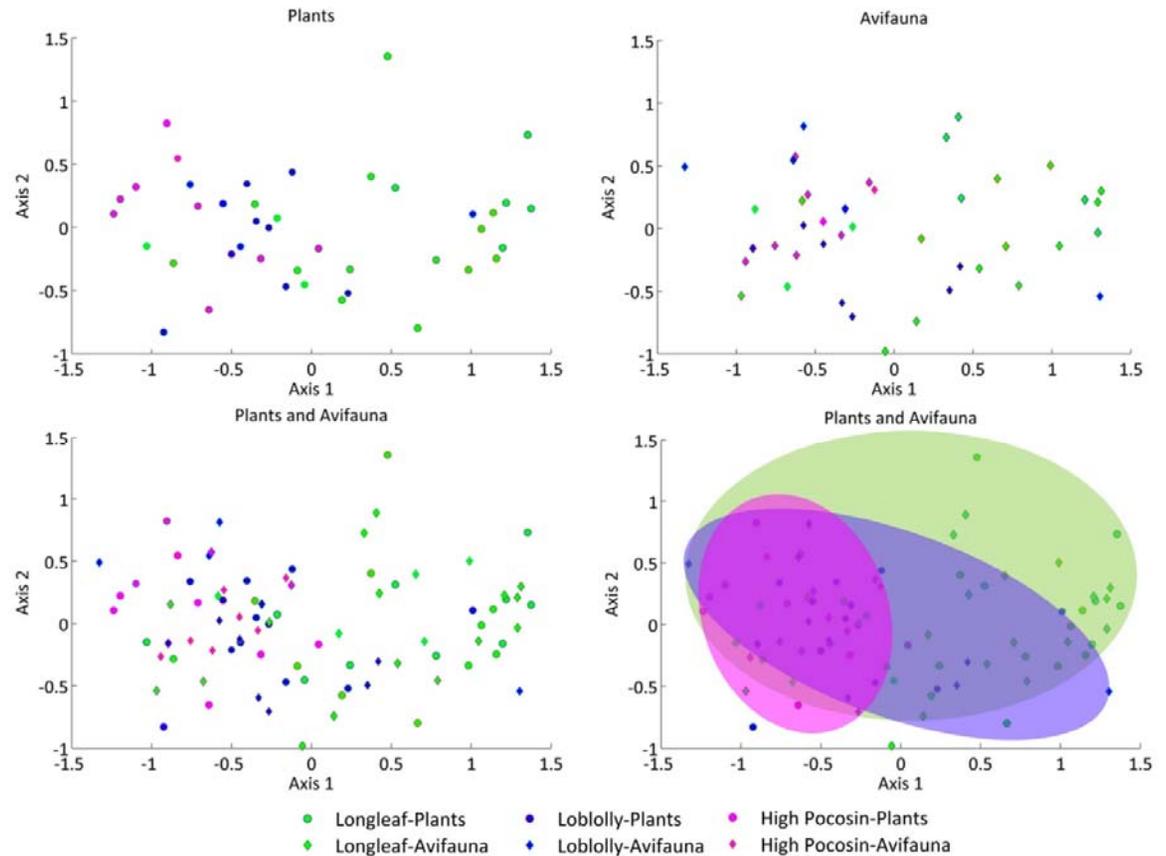
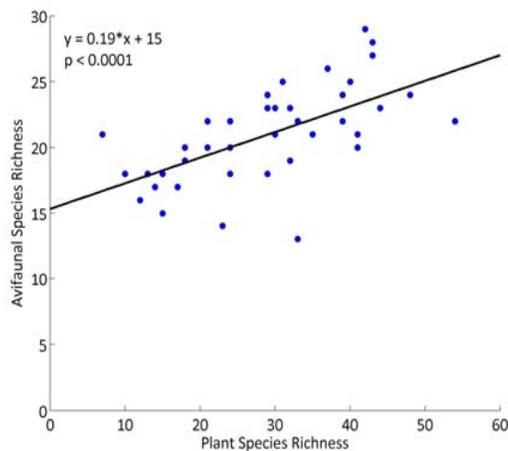
Determining Factors



Ordination of MCBCL Terrestrial Vegetation

Relationships between Plants and Birds

- For both plant and bird communities, 1st axis corresponds to moisture gradient
- High degree of compositional correspondence
- High correlation between plant and bird diversity



RCW (Single Species) Management

Beneficial to Avian Species

- Red-cockaded Woodpecker (RCW) foraging habitat quality is improved through prescribed fire and forest management



Low Score



1

2

3

4

5

High Score

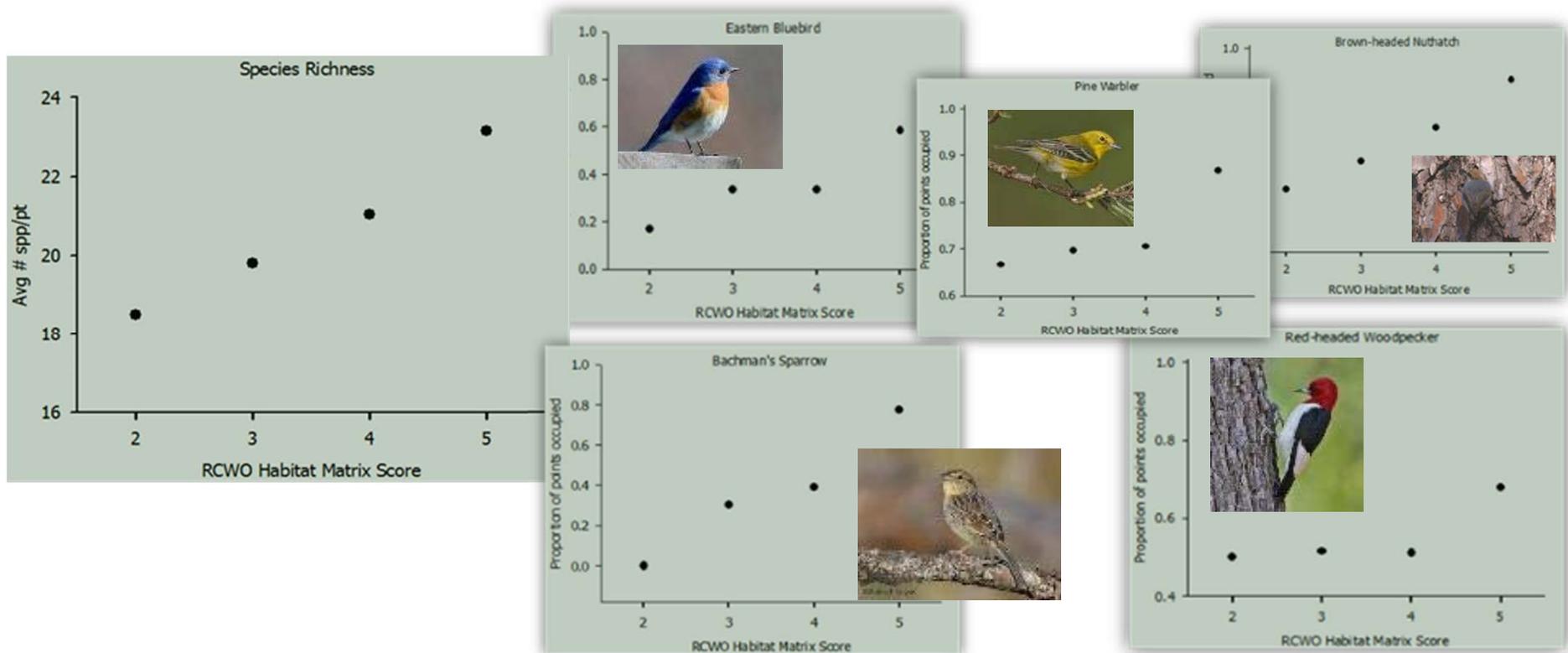


Score of 4 and 5 are indicative of RCW restoration goal

RCW (Single Species) Management

Beneficial to Avian Species

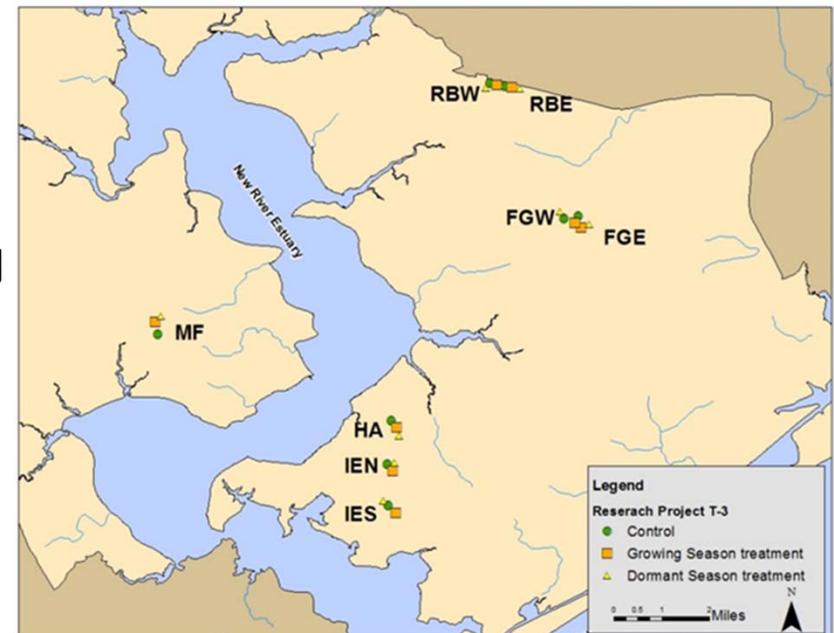
- Bird species richness is strongly positively correlated with RCW habitat quality
- Management for RCW habitat quality benefits all species typical of open longleaf stands, generalists and hardwood species



Restoring RCW Habitat

Sites Dominated by Loblolly Pine

- Treatments installed 2008-2009
- Plots burned post treatment, 2010 (dormant season)
- Plots sampled for vegetation, and birds in growing season after burning
- Plots were to be burned at 3-year intervals thereafter, but this proved not possible
- Plots sampled for vegetation and birds, 2016 growing season



- 8 blocks with 3 treatments plots each (1.0 ha plots)
- Control
- Dormant season thinning
- Growing season thinning

RCW Habitat Without Prescribed Fire

2010

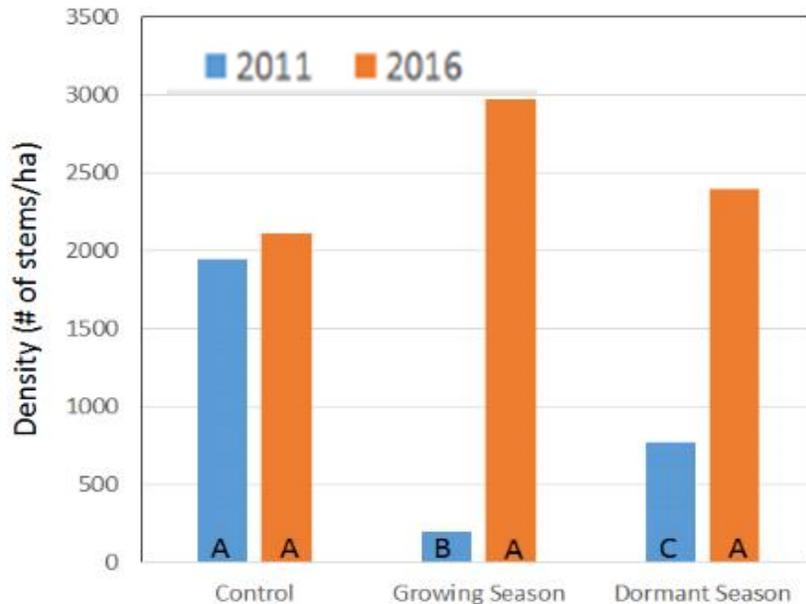


2016

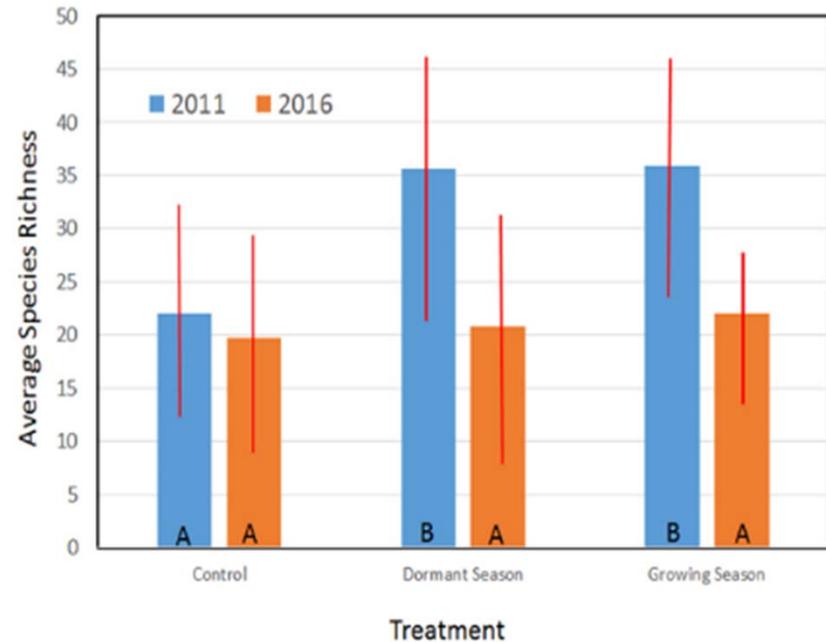


Effect of Midstory Thinning

Stem Density



Plant Species Richness



Midstory thinning is effective for restoring longleaf systems (i.e., RCW habitat) on sites dominated by loblolly pine

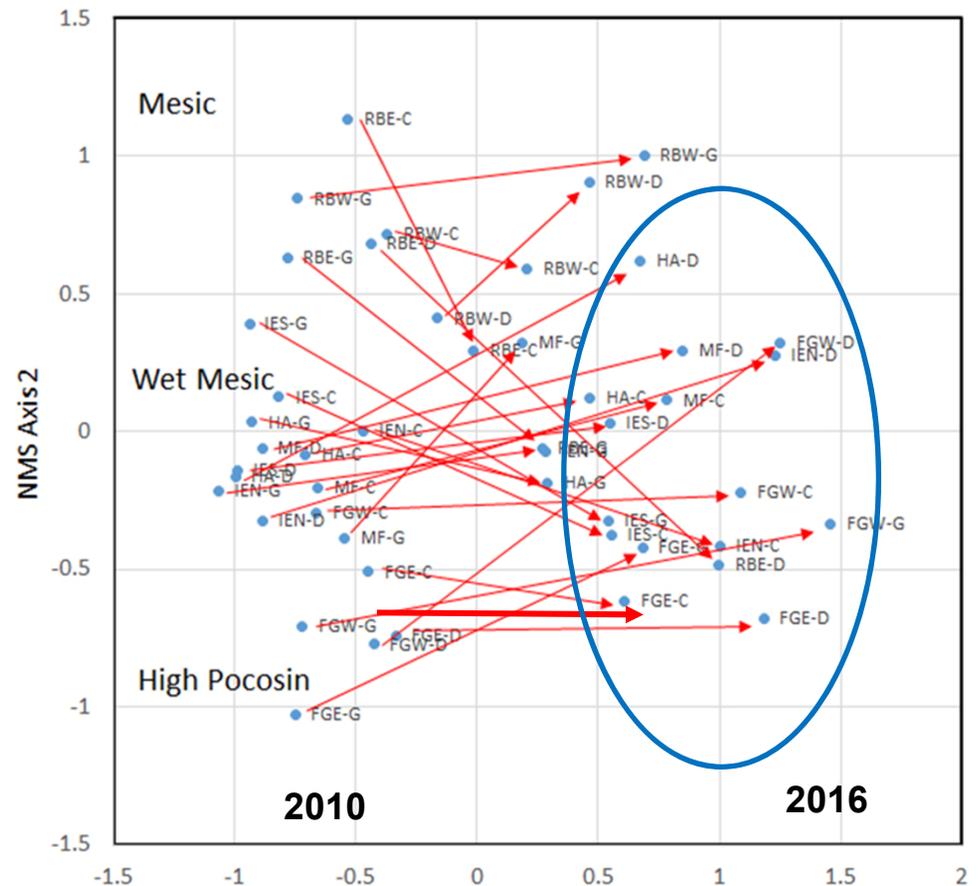
Effects of Midstory Thinning

Bird Species

2010 - 2016

- Significant shift in composition of bird species.
 - Increased dominance
 - Eastern bluebirds
 - Gray catbirds
 - Acadian flycatchers
 - Brown thrashers
 - Diminished importance
 - Bachman's sparrow
 - Blue-gray gnatcatcher
 - Eastern kingbirds
 - White-eyed vireo

Bird Species Ordination



Terrestrial Management Implications

- Midstory thinning moves understory plant species diversity and composition toward restoration goals -must be accompanied by regular prescribed fire
- Restoration challenges increase along the gradient from dry to mesic to wet site conditions. And fire becomes more important, especially on wet mesic and pocosin sites
- Changes in climate (temperature, seasonal) not likely to be detrimental to RCW recovery at MCBCCL; may not hold at more southerly locations

Terrestrial Management Implications (Cont'd)

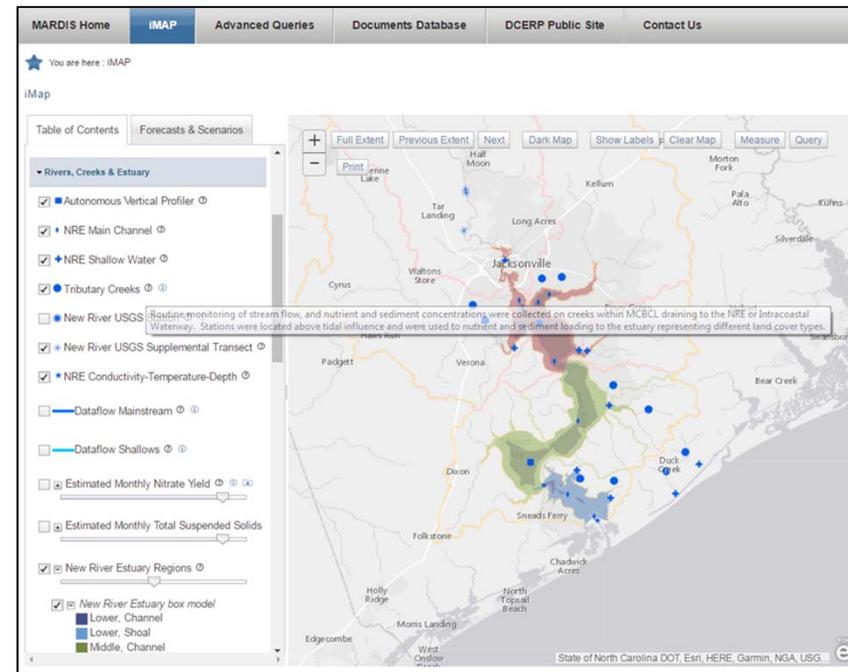
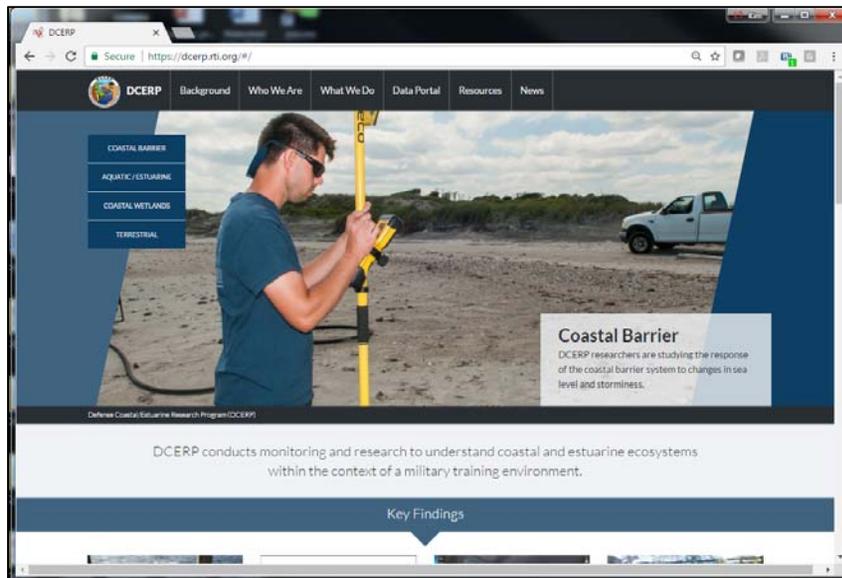
- In general, management aimed at restoration of longleaf pine results in the highest levels of carbon storage on the landscape



Finding DCERP Data and Information

Public Web Site
<https://dcerp.rti.org/#/>

Interactive Mapping Tool
(iMAP)



SERDP & ESTCP Webinar Series

For additional information, please visit
<https://www.serdp-estcp.org/Program-Areas/Resource-Conservation-and-Resiliency/Natural-Resources/Coastal-and-Estuarine-Ecology-and-Management/RC-2245>

Speaker Contact Information

susan.cohen@usmc.mil; 910-451-7900



SERDP & ESTCP Webinar Series

Q&A Session 2



SERDP & ESTCP Webinar Series

The next webinar is on
May 17, 2018

*Sediment Volume Search Sonar
Development*



Survey Reminder

Please take a moment to complete the survey that will pop up on your screen when the webinar ends

