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Evaluating Sea Turtle & Sturgeon Behavioral Responses to Dredging: A Proposed Comparative Study of Traditional & Hydrodynamic Techniques

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WEDA Eastern Chapter

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Agenda

- WEDA Webinar November 06th
- Dredging Operations & Marine Species Impact
- Comparative Insights From Atlantic Sturgeon Studies
- Proposed Research Design for Sea Turtle Assessment
- Adaptive Management & Operational Decision-Making
- Key Ecological & Conservation Takeaways

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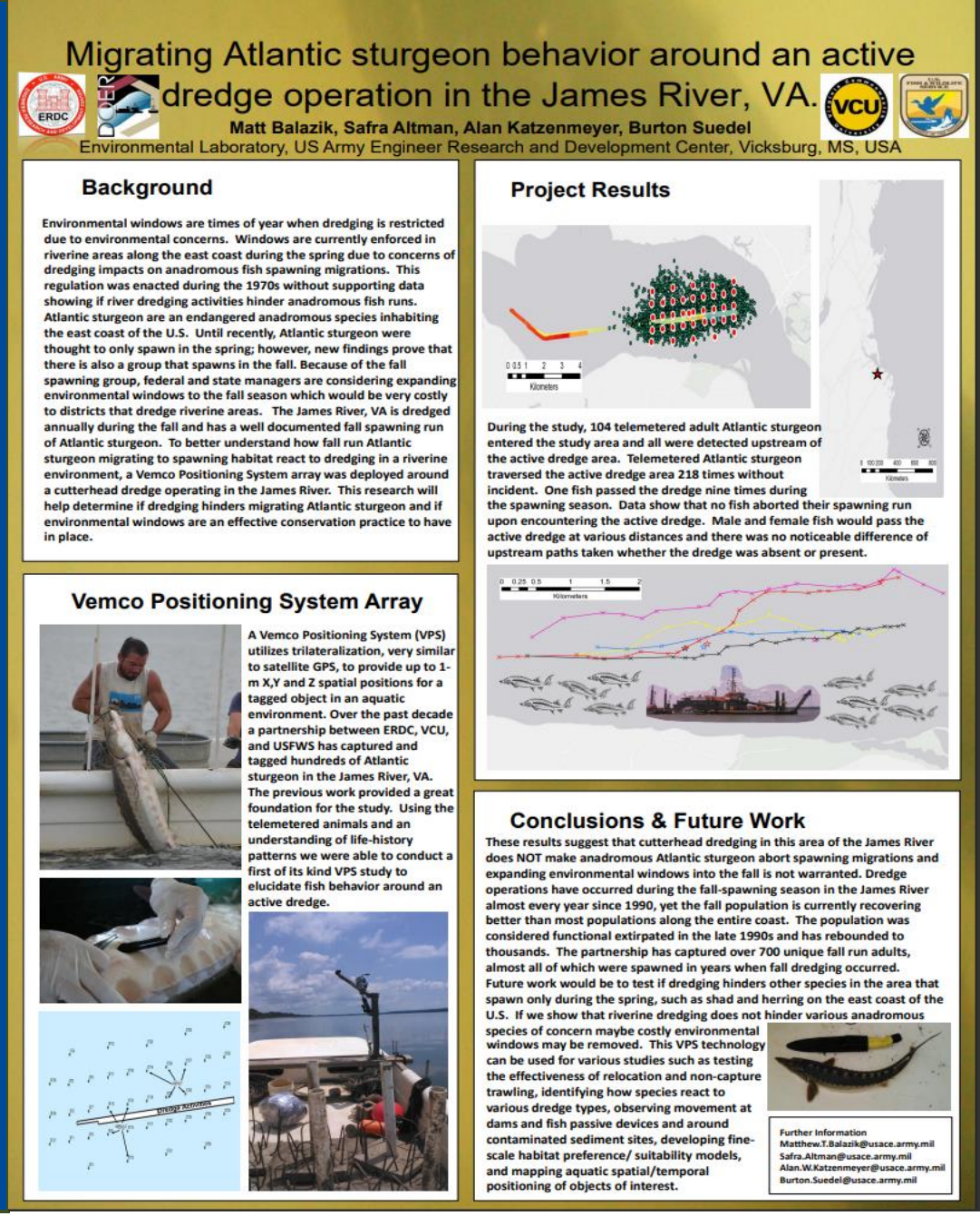
WEDA WEBINAR

THURSDAY, NOVEMBER 6, 2025: Noon - 1:00 PM ET

“Evaluating Sea Turtle Behavioral Responses to Dredging: A Proposed Comparative Study of Traditional & Hydrodynamic Techniques”

- **Gracie Hejmanowski** (Black & Veatch, Environmental Engineer I)
- **Matt Balazik , Ph.D**. (USACE-ERDC, Research Ecologist)
- **Andrew Pledger, Ph.D.** (UDlive Limited, Head of Hydromorphometry & Flood)
- **Joe Wagner, PE, BCNE, BCEE** (Black & Veatch, National Sediment Management & Dredging Lead)



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Background: Dredging Operations & Marine Species Impact

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Overview of Dredging Methods & Techniques

Hydraulic Cutterhead Suction Dredges

Hydraulic cutterhead suction dredges loosen & suck materials using a rotating cutterhead, suitable for hard sediments.

Hopper Dredges

Hopper dredges collect dredged material in a ship's hopper for transport & disposal offshore.

Hydrodynamic Dredging

Hydrodynamic dredging uses water flow to mobilize sediments, minimizing mechanical disruption & environmental footprint.

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Known Ecological Impacts of Dredging Activities

Sediment Suspension Effects

Dredging stirs up sediments, reducing water clarity & impacting aquatic ecosystems.

Habitat Alteration

Physical changes to seabed habitat disrupt marine organisms' living environments.

Species-specific Impacts

Dredging effects vary among species, requiring tailored impact assessments.

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Comparative Insights From Atlantic Sturgeon Studies

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Summary of Atlantic Sturgeon Behavioral Research Near Dredges

Behavioral Avoidance

Atlantic sturgeon exhibit avoidance behaviors to steer clear of dredging activities, indicating sensitivity to disturbances.

Movement Pattern Changes

Dredging operations lead to altered movement patterns in Atlantic sturgeon, impacting their natural navigation & habitat use.

Mortality Risks

Exposure to dredging activities increases mortality risks for Atlantic sturgeon, highlighting conservation concerns.

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Observed Avoidance & Mortality Rates

Avoidance Success Variation

Avoidance success varies among species exposed to dredging activities, reflecting different ecological behaviors.

Mortality Linked to Dredging

Some mortality events occur due to dredging, highlighting the potential harmful impacts on marine life.

Need for Risk Quantification

Quantifying risks for species with different ecologies is essential to mitigate dredging impacts effectively.

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Relevance of Sturgeon Findings to Sea Turtle Study Design

Research Hypotheses Adaptation

Sturgeon findings help develop hypotheses for sea turtle responses to environmental disturbances like dredging.

Monitoring Techniques

Effective sturgeon monitoring methods guide sea turtle tracking to assess behavioral changes during dredging activities.

Mitigation Strategies

Mitigation approaches from sturgeon studies inform protective measures to reduce dredging impacts on sea turtles.

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Proposed Research Design for Sea Turtle Assessment

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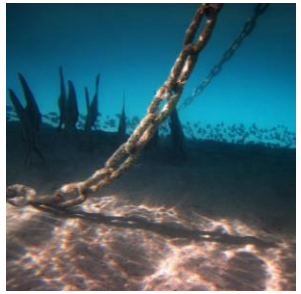
Study Hypotheses & Objectives

Behavioral Avoidance Testing

The study will test whether sea turtles avoid areas near dredging operations to understand behavioral responses.



Survival Impact Assessment

Researchers will assess potential survival impacts on sea turtles caused by proximity to dredging activities.

Movement & Habitat Use

Objectives include quantifying changes in sea turtle movement patterns & habitat use near dredging zones.

Study will use telemetry & environmental monitoring to test how different dredging methods affect sea turtle behavior.

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Adaptation of Telemetry, Acoustic Monitoring, CPUE, & Sonar Indexing

Telemetry Tracking

Telemetry allows remote tracking of sea turtles by transmitting movement data in real-time for detailed behavioral study.

Acoustic Monitoring

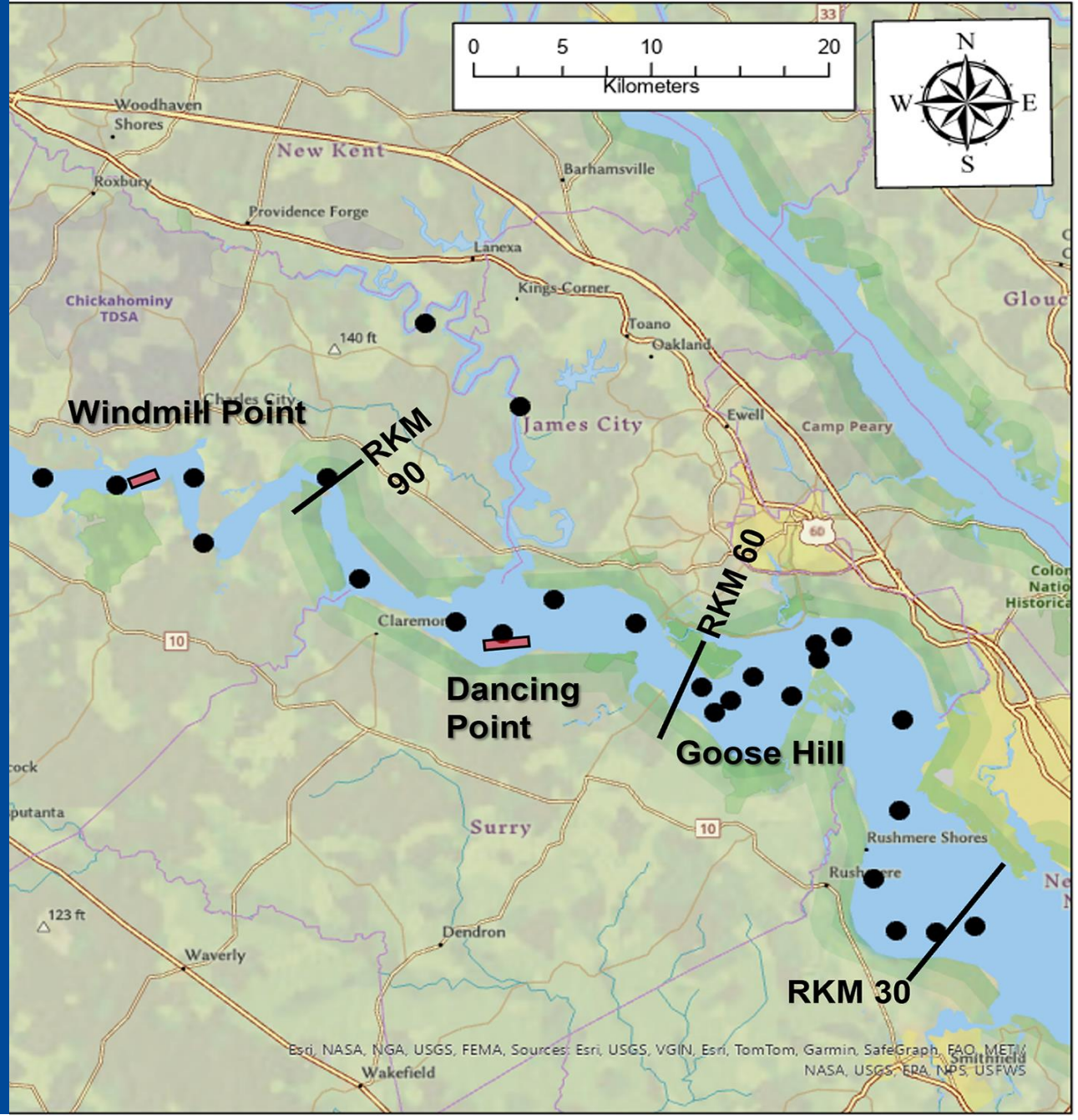
Acoustic monitoring uses underwater sound detection to monitor sea turtle presence & movement in aquatic habitats.

Catch-Per-Unit-Effort (CPUE)

CPUE measures the abundance & catch rates of sea turtles to evaluate population dynamics & habitat use.

Sonar Indexing

Sonar indexing employs sonar technology to map sea turtle locations & estimate population density under water.



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Monitoring Protocols for Hopper, Cutterhead, & Hydrodynamic Dredging

Hopper Dredging Monitoring

Monitoring focuses on detecting sea turtle presence & mitigating risks during hopper dredging operations.

Cutterhead Dredging Monitoring

Protocols are designed to observe sea turtle responses & minimize disturbances around cutterhead dredging sites.

Hydrodynamic Dredging Monitoring

Monitoring captures sea turtle behavior to reduce impacts from hydrodynamic dredging activities.

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Adaptive Management & Operational Decision-Making

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Strategies to Reduce Sea Turtle Entrainment Risk

Temporal Restrictions

Implementing time-based limits on dredging reduces sea turtle interactions during critical periods.

Exclusion Zones

Designating protected areas prevents sea turtles from entering hazardous dredging sites.

Dredging Modifications

Adjusting dredging techniques minimizes risk to sea turtles & their habitats.

Testing temporal restrictions, exclusion zones & dredging modifications will help identify strategies to reduce sea turtle risk.

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Integration of Real-Time Environmental Data

Sea Turtle Monitoring

Real-time tracking of sea turtle presence helps minimize harm during dredging activities.

Environmental Condition Data

Continuous environmental data supports timely decisions to protect marine ecosystems.

Dredging Activity Management

Monitoring dredging in real-time enables adjustments to reduce environmental impacts.

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Potential for Adaptive Dredging Based on Observed Sea Turtle Behaviors

Adaptive Dredging Concept

Adaptive dredging adjusts operations based on real-time sea turtle behavior observations to reduce risks.

Sea Turtle Behavior Monitoring

Observing sea turtles' movements helps inform dredging schedules to minimize harmful interactions.

Conservation Outcomes

Using adaptive dredging improves sea turtle conservation by avoiding high-risk encounters during dredging.

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Key Ecological & Conservation Takeaways

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Interpretation of Sturgeon Behavior Findings for Sea Turtles

Behavioral Avoidance Patterns

Sea turtles may exhibit avoidance behaviors similar to sturgeon to reduce risk in their habitats.

Mortality Risk Factors

Sea turtles face mortality risks influenced by environmental threats, requiring focused risk assessments.

Species-Specific Mitigation

Mitigation efforts must consider species-specific behavior to effectively protect sea turtles.

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Hydrodynamic Dredging as a Potentially Lower Risk Alternative

Reduced Risk to Sea Turtles

Hydrodynamic dredging techniques potentially minimize harm to sea turtles compared to traditional dredging methods.

Conservation Benefits

Using hydrodynamic dredging may enhance marine conservation efforts by lowering environmental disturbances.

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Implications for Future Conservation & Dredging Operations

Behavioral Research Integration

Using behavioral research enhances dredging management to better protect marine life & ecosystems.

Conservation Strategy Improvement

Improved strategies reduce risks to endangered species during dredging activities, aiding ecosystem preservation.

Sustainable Marine Infrastructure

Supporting sustainable infrastructure ensures balanced development alongside marine conservation goals.

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Conclusion

Cross-Species Research Integration

Combining findings from Atlantic sturgeon studies enriches sea turtle research, improving overall marine species knowledge.

Understanding Dredging Impacts

Research highlights the effects of dredging on marine life, guiding more effective conservation strategies.

Adaptive Marine Management

Adaptive management strategies help protect vulnerable marine species by applying research insights systematically.

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Thank You

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