

# RYAN J. ECKERT

Coral reef ecology, mesophotic coral ecosystems, molecular ecology



## EDUCATION

- Ph.D. Candidate in Integrative Biology**  
Florida Atlantic University 📍 Boca Raton, FL  
Dissertation: Population genetics, community ecology, and larval dispersal in shallow and mesophotic coral ecosystems in the Tropical Western Atlantic  
Advisor: Dr. Joshua Voss  
Present | 2019
- M.Sc. in Biological Sciences**  
Florida Atlantic University 📍 Boca Raton, FL  
Thesis: Population genetics and algal symbiont communities of the coral species *Montastraea cavernosa* on the Belize Barrier Reef  
Advisor: Dr. Joshua Voss  
2019 | 2017
- B.Sc. in Biological Sciences**  
Florida State University 📍 Tallahassee, FL  
Thesis: Associational resistance and susceptibility in *Solanum carolinense*  
Advisor: Dr. Nora Underwood  
2009 | 2005

## RESEARCH EXPERIENCE

- Graduate Research Assistant**  
FAU, Harbor Branch Oceanographic Institute 📍 Fort Pierce, FL  
Coral Reef Health and Molecular Ecology Lab  
Present | 2017
- Research Specialist**  
NOAA's Flower Garden Banks NMS 📍 Galveston, TX  
Science Division  
2017 | 2009
- Research Assistant**  
Florida State University 📍 Tallahassee, FL  
Underwood Lab  
2009 | 2007

## TEACHING EXPERIENCE

- Graduate Teaching Assistant / Lecturer**  
FAU / FIO 📍 Long Key, FL  
FIO Summer Marine Field Studies  
2022
- Graduate Teaching Assistant**  
FAU, Harbor Branch Oceanographic Institute 📍 Fort Pierce, FL  
Marine Biodiversity  
2017
- Guest Lecturer**  
Texas A&M University at Galveston 📍 Galveston, TX  
Scientific Diving Field Survey Methods  
2014 | 2013

## CONTACT

📍 5600 US1 N, Ft. Pierce, FL 34946  
📞 +1 (772) 224-2396  
✉ [ryan.j.eckert@gmail.com](mailto:ryan.j.eckert@gmail.com)  
🌐 [ryanjeckert.weebly.com](http://ryanjeckert.weebly.com)  
⚙ [cnidaryan.bsky.social](https://cnidaryan.bsky.social)  
🎧 [RyanEckert](#)  
📺 [Ryan J Eckert](#)

## SKILLS

Coral reef ecology  
Technical SCUBA diving  
Closed-circuit rebreather diving  
1000+ Scientific Dives  
500+ days at sea  
100+ research expeditions  
Multivariate data analysis  
NGS library prep  
Bioinformatic analyses

## LANGUAGE SKILLS



2010



## Instructor

Galveston Independent School District  
21<sup>st</sup> Century ACE

📍 Galveston, TX



## STUDENTS MENTORED

2018



### Emily Chei

#### Link fellowship intern

Assessing population connectivity of the coral *Montastraea cavernosa* along the northern Florida Reef Tract  
Presently a Ph.D. student at The University of Hong Kong

2017



### Ashley Reaume

#### Link fellowship intern

Optimized extraction and amplification of algal symbiont DNA from TRIzol preserved corals  
Presently a Ph.D. student at The University of Central Florida



## REFEREED PUBLICATIONS

2024



### 24. Recent trends and biases in mesophotic ecosystem research

*Biol Lett* (2024). doi: [10.1098/rsbl.2024.0465](https://doi.org/10.1098/rsbl.2024.0465)

Radice VZ, Hernandez-Agreda A, Pérez-Rosales G, Booker R, Bellworthy J, Broadribb M, Carpenter GE, Diaz C, **Eckert RJ**, Foster NL, Gijsbers JC, Gress E, Laverick JH, Micaroni V, Pierotti M, Rouzé H, Stevenson A, Sturm AB, Bongaerts P

2024



### 23. Assesment of nutrient amendments on stony coral tissue loss disease in Southeast Florida

*Front Mar Sci* (2024). doi: [10.3389/fmars.2024.1384534](https://doi.org/10.3389/fmars.2024.1384534)

Carreiro AM, **Eckert RJ**, Sturm AB, Ingalls TC, Combs IR, Walker BK, Voss JD

2024



### 22. Cryptic diversity of shallow and mesophotic *Stephanocoenia intersepta* corals across Florida Keys National Marine Sanctuary

*Heredity* (2024). doi:[10.1038/s41437-024-00698-x](https://doi.org/10.1038/s41437-024-00698-x)

**Eckert RJ**, Sturm AB, Carreiro AM, Klein AM, Voss JD

2024



### 21. Algal symbiont genera but not coral host genotypes correlate to stony coral tissue loss disease susceptibility among *Orbicella faveolata* colonies in South Florida

*Front Mar Sci* (2024). doi:[10.3389/fmars.2024.1287457](https://doi.org/10.3389/fmars.2024.1287457)

Klein, AM, Sturm AB, **Eckert RJ**, Walker BK, Neely KL, Voss JD

2023



### 20. Does depth divide? Variable genetic connectivity patterns among shallow and mesophotic *Montastraea cavernosa* coral populations across the Gulf of Mexico and western Caribbean

*Ecol Evol* (2023). doi:[10.1002/ece3.10622](https://doi.org/10.1002/ece3.10622)

Sturm AB, **Eckert RJ**, Carreiro AM, Klein, AM, Studivan MS, Dodge Farelli D, Simões N; González-Díaz P, González Méndez J, Voss JD

2023



### 19. *Porites astreoides* coral populations demonstrate high clonality and connectivity in southeast Florida

*Coral Reefs* (2023). doi:[10.1007/s00338-023-02417-0](https://doi.org/10.1007/s00338-023-02417-0)

Shilling EN, **Eckert RJ**, Sturm AB, Voss JD

Citations: 593

h-index: 14

i10-index: 19

- 2023 • **18. Stony coral tissue loss disease intervention with amoxicillin leads to a reversal of disease-modulated gene expression pathways**  
*Mol Ecol* (2023). doi:10.1111/mec.17110  
Studivan MS, Eckert RJ, Shilling EN, Soderberg N, Enochs IC, Voss JD
- 2023 • **17. Diet and Feeding Ecology of the Whitespotted Eagle Ray (*Aetobatus narinari*) from Florida Coastal Waters Revealed via DNA Barcoding**  
*Fishes* (2023). doi:10.3390/fishes8080388  
Cahill BV, Eckert RJ, Bassos-Hull K, Ostendorf TJ, Voss JD, DeGroot BC, Ajemian MJ
- 2023 • **16. Coral disease outbreak at the remote Flower Garden Banks, Gulf of Mexico**  
*Front Mar Sci* (2023). doi:10.3389/fmars.2023.1111749  
Johnston MA, Studivan MS, Enochs IC, Correa AMS, Besemer N, Eckert RJ, Edwards K, Hannum R, Hu X, Nuttall MF, O'Connel K, Palacio-Castro AM, Schmahl GP, Sturm AB, Ushijima B, Voss JD
- 2022 • **15. Depth-dependent genetic structuring of a depth-generalist coral and its Symbiodiniaceae algal communities at Campeche Bank, Mexico**  
*Front Mar Sci* (2022). doi:10.3389/fmars.2022.835789  
Sturm AB, Eckert RJ, Carreiro AM, Simões N, Voss JD
- 2022 • **14. Population genetic structure of a broadcast spawning coral, *Montastraea cavernosa*, demonstrates refugia potential of upper mesophotic populations in the Florida Keys**  
*Coral Reefs* (2022). doi:10.1007/s00338-021-02112-y  
Sturm AB, Eckert RJ, Carreiro AM, Voss JD
- 2021 • **13. Quantifying impacts of stony coral tissue loss disease on corals in Southeast Florida through surveys and 3D photogrammetry**  
*PLoS ONE* (2021). doi:10.1371/journal.pone.0252593  
Combs IR, Studivan MS, Eckert RJ, Voss JD
- 2020 • **12. Population genetic structure of the great star coral, *Montastraea cavernosa*, across the Cuban archipelago with comparisons between microsatellite and SNP markers**  
*Sci Rep* (2020). doi:10.1038/s41598-020-72112-5  
Sturm AB, Eckert RJ, González Méndez J, González-Díaz P, Voss JD
- 2020 • **11. Depth influences Symbiodiniaceae associations among *Montastraea cavernosa* corals on the Belize Barrier Reef**  
*Front Microbiol* (2020). doi:10.3389/fmicb.2020.00518  
Eckert RJ, Reaume AM, Sturm AB, Studivan MS, Voss JD
- 2020 • **10. Population structure of the scleractinian coral, *Montastraea cavernosa*, in Southeast Florida**  
*Bull Mar Sci* (2020). doi:10.5343/bms.2019.0074  
Dodge DL, Studivan MS, Eckert RJ, Chei E, Beal J, Voss JD

- 2019 ● **9. Populations of the coral species *Montastraea cavernosa* on the Belize Barrier Reef lack vertical connectivity**  
*Sci Rep* (2019). doi:10.1038/s41598-019-43479-x  
Eckert RJ, Studivan MS, Voss JD
- 2019 ● **8. The Mesoamerican Reef**  
*In: Loya Y, Puglise KA, Bridge TCL (eds) Mesophotic Coral Ecosystems of the World. Springer International Publishing, Cham, pp 71–84* (2019). doi:10.1007/978-3-319-92735-0\_5  
Gress E, Voss JD, Eckert RJ, Rowlands G, Andradi-Brown DA
- 2019 ● **7. Coral bleaching and recovery from 2016 to 2017 at East and West Flower Garden Banks, Gulf of Mexico**  
*Coral Reefs* (2019). doi:10.1007/s00338-019-01788-7  
Johnston MA, Hickerson EL, Nuttall MF, Blakeway RD, Sterne TK, Eckert RJ, Schmahl GP
- 2019 ● **6. Localized coral reef mortality event at East Flower Garden Bank, Gulf of Mexico**  
*Bull Mar Sci* (2019). doi:10.5343/bms.2018.0057  
Johnston MA, Nuttall MF, Eckert RJ, Blakeway RD, Sterne TK, Hickerson EL, Schmahl GP, Lee MT, MacMillan J, Embesi JA
- 2018 ● **5. Seasonal variability of carbonate chemistry and decadal changes in waters of a marine sanctuary in the Northwestern Gulf of Mexico**  
*Mar Chem* (2018). doi:10.1016/j.marchem.2018.07.006  
Hu X, Nuttall MF, Wang H, Yao H, Staryk CJ, McCutcheon MR, Eckert RJ, Embesi JA, Johnston MA, Hickerson EL, Schmahl GP, Manzello D, Enochs IC, DiMarco S, Barbero L
- 2016 ● **4. Persistence of coral assemblages at East and West Flower Garden Banks, Gulf of Mexico**  
*Coral Reefs* (2016). doi:10.1007/s00338-016-1452-x  
Johnston MA, Embesi JA, Eckert RJ, Nuttall MF, Hickerson EL, Schmahl GP
- 2016 ● **3. Rapid invasion of Indo-Pacific lionfishes *Pterois volitans* (Linnaeus, 1758) and *P. miles* (Bennett, 1828) in Flower Garden Banks National Marine Sanctuary, Gulf of Mexico, documented in multiple data sets**  
*BioInvasions Rec* (2016). doi:10.3391/bir.2016.5.2.09  
Johnston MA, Nuttall MF, Eckert RJ, Embesi JA, Sterne TK, Hickerson EL, Schmahl GP
- 2014 ● **2. Lionfish (*Pterois volitans* [Linnaeus, 1758] and *P. miles* [Bennett, 1828]) records within mesophotic depth ranges on natural banks in the Northwestern Gulf of Mexico**  
*BioInvasions Rec* (2014). doi:10.3391/bir.2014.3.2.09  
Nuttall MF, Johnston MA, Eckert RJ, Embesi JA, Hickerson EL, Schmahl GP
- 2012 ● **1. Flower Garden Banks – A refuge in the Gulf of Mexico?**  
*In: Yellowlees D, Hughes TP (eds) Proceedings of the 12th International Coral Reef Symposium* (2012).  
Hickerson EL, Schmahl GP, Johnston MA, Nuttall MF, Embesi JA, Eckert RJ



## MANUSCRIPTS IN PREPARATION

- **Population genetics of the giant barrel sponge, *Xestospongia muta*, reveal distinct, hybridizing lineages across the Florida Reef Tract**  
(in review)  
Eckert RJ, Sturm AB, Carreiro AM, Voss JD
- **Genetic insights of key habitat-forming coral and sponge populations in Flower Garden Banks National Marine Sanctuary**  
(in prep)  
Eckert RJ, Sturm AB, Pantoni GS, Herrera S, Voss JD
- **Coral genetic lineages do not predict disease resistance or survivorship: a multi-species restoration experiment to assess stony coral tissue loss disease susceptibility**  
(in revision)  
Bell SL, Shilling EN, Pantoni GS, Eckert RJ, Sturm AB, Sharp WC, Muller EM, Gilliam DS, Lirman D, Bourque AS, Voss JD



## TECHNICAL REPORTS

- 2018 ● **Stetson Bank Long-term monitoring: 2016 annual report**  
*Marine Sanctuaries Conservation Series ONMS-19-02. U.S. Department of Commerce, NOAA, FGBNMS, Galveston, TX. (2018).*  
Nuttall MF, Sterne TK, Eckert RJ, Hu X, Sinclair J, Hickerson EL, Embesi JA, Johnston MA, Schmahl GP
- 2017 ● **Long-term monitoring at East and West Flower Garden Banks: 2016 annual report**  
*Marine Sanctuaries Conservation Series ONMS-17-09. U.S. Department of Commerce, NOAA, FGBNMS, Galveston, TX. (2017).*  
Johnston MA, Sterne TK, Eckert RJ, Nuttall MF, Embesi JA, Walker RD, Hu X, Hickerson EL, Schmahl GP
- 2017 ● **Long-term monitoring at Stetson Bank, Flower Garden Banks National Marine Sanctuary, 2015 annual report**  
*Marine Sanctuaries Conservation Series ONMS-17-06. U.S. Department of Commerce, NOAA, FGBNMS, Galveston, TX. (2017).*  
Johnston MA, Sterne TK, Eckert RJ, Nuttall MF, Embesi JA, Walker RD, Hu X, Hickerson EL, Schmahl GP
- 2017 ● **Long-term monitoring at the East and West Flower Garden Banks National Marine Sanctuary, 2013–2015, volume 1: technical report**  
*U.S. Dept. of Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2017-058. (2017).*  
Johnston MA, Eckert RJ, Nuttall MF, Sterne TK, Embesi JA, Manzello DP, Hickerson EL, Schmahl GP

- 2016 ● **Long-term monitoring at East and West Flower Garden Banks: 2015 annual report**  
*U.S. Marine Sanctuaries Conservation Series ONMS-16-02. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Flower Garden Banks National Marine Sanctuary, Galveston, TX. (2016).*  
 Johnston MA, **Eckert RJ**, Sterne TK, Nuttall MF, Hu X, Embesi JA, Hickerson EL, Schmahl GP
- 2015 ● **Long-term monitoring at East and West Flower Garden Banks National Marine Sanctuary: 2014 annual report**  
*U.S. Department of Commerce, NOAA, FGBNMS, Galveston, TX. (2015).*  
 Johnston MA, Sterne TK, **Eckert RJ**, Nuttall MF, Embesi JA, Walker RD, Hu X, Hickerson EL, Schmahl GP
- 2015 ● **Long-term monitoring at East and West Flower Garden Banks National Marine Sanctuary, 2011–2012, volume 1: technical report**  
*U.S. Dept. of Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, Louisiana. OCS Study BOEM 2015-027. (2015).*  
 Johnston MA, Nuttall MF, **Eckert RJ**, Embesi JA, Slowey NC, Hickerson EL, Schmahl GP
- 2014 ● **Long-term monitoring at East and West Flower Garden Banks National Marine Sanctuary: 2013 annual report**  
*U.S. Department of Commerce, NOAA, FGBNMS, Galveston, TX. (2014).*  
 Johnston MA, Nuttall MF, **Eckert RJ**, Embesi JA.
- 2013 ● **Long-term monitoring at the East and West Flower Garden Banks National Marine Sanctuary, 2009–2010, volume 1: technical report**  
*U.S. Dept. of Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, Louisiana. OCS Study BOEM 2013-214. (2013).*  
 Johnston MA, Nuttall MF, **Eckert RJ**, Embesi JA, Slowey NC, Hickerson EL, Schmahl GP



## PRESENTATIONS

- 2024 ● **Cryptic diversity of *Stephanocoenia intersepta* corals throughout Southeast Florida and the Florida Keys**  
 2024 AAUS Diving for Science Symposium 📍 Fort Pierce, FL  
**Eckert RJ**, Sturm AB, Carreiro AM, Pantoni GS, Klein AM, Voss JD  
**Poster presentation**
- 2024 ● **Cryptic diversity of *Stephanocoenia intersepta* corals throughout Southeast Florida and the Florida Keys**  
 52nd Annual Benthic Ecology Meeting 📍 Charleston, SC  
**Eckert RJ**, Sturm AB, Carreiro AM, Pantoni GS, Klein AM, Voss JD  
**Poster presentation**
- 2023 ● **Genetically divergent mesophotic and shallow *Stephanocoenia intersepta* populations in the Florida Keys**  
 51st Annual Benthic Ecology Meeting 📍 Miami, FL  
**Eckert RJ**, Sturm AB, Carreiro AM, Klein AM, Voss JD  
**Poster presentation**

- 2023 ● **Genetically divergent mesophotic and shallow *Stephanocoenia intersepta* populations in the Florida Keys**  
Mesophotic Coral Ecosystem Gordon Research Conference 📍 Ventura, CA  
Eckert RJ, Sturm AB, Carreiro AM, Klein AM, Voss JD  
Poster presentation  
*Best overall student presentation*
- 2023 ● ***Stephanocoenia intersepta* corals in Florida Keys National Marine Sanctuary exhibit depth-dependent genetic structure**  
Mesophotic Coral Ecosystem Gordon Research Symposium 📍 Ventura, CA  
Eckert RJ, Sturm AB, Carreiro AM, Klein AM, Voss JD  
Oral presentation
- 2022 ● **Genetic connectivity and algal symbiont communities of shallow and mesophotic *Stephanocoenia intersepta* populations in the Florida Keys**  
15th International Coral Reef Symposium 📍 Bremen, Germany.  
Eckert RJ, Sturm AB, Carreiro AM, Klein AM, Voss JD  
Oral presentation
- 2022 ● **Genetic connectivity and genetic diversity of shallow and mesophotic *Stephanocoenia intersepta* populations throughout Florida Keys National Marine Sanctuary.**  
50th Annual Benthic Ecology Meeting 📍 Portsmouth, NH.  
Eckert RJ, Sturm AB, Carreiro AM, Klein AM, Voss JD  
Oral presentation
- 2019 ● **Genetically distinct depth-stratified *Montastraea cavernosa* coral populations on the Belize Barrier Reef harbor relatively homogenous Symbiodiniaceae communities**  
48th Annual Benthic Ecology Meeting 📍 St. John's, NL, Canada.  
Eckert RJ, Reaume A, Voss JD  
Oral presentation
- 2019 ● **Populations of the coral species *Montastraea cavernosa* lack vertical connectivity on the Belize Barrier Reef**  
ASLO Aquatic Sciences Meeting 📍 San Juan, PR.  
Eckert RJ, Studivan MS, Voss JD  
Poster presentation
- 2018 ● **Affordable and ecologically relevant graduate research on the world's second largest barrier reef? You better Belize it!**  
HBOI Science Seminar 📍 Ft. Pierce, FL.  
Eckert RJ and Studivan MS  
Oral presentation
- 2018 ● **Connected corals: population genetics of *Montastraea cavernosa* on the Belize Barrier Reef**  
HBOI Ocean Discovery Center Marine Science Friday 📍 Ft. Pierce, FL.  
Eckert RJ  
Oral presentation

- 2018 ● **Breaking point: population genetics reveal a lack of vertical connectivity of *Montastraea cavernosa* on the Belize Barrier Reef**  
47th Annual Benthic Ecology Meeting 📍 Corpus Christi, TX.  
Eckert RJ, Studivan MS, Voss JD  
Oral presentation
- 2013 ● **Ciguatera fish poisoning in the northwestern Gulf of Mexico.**  
66th Gulf and Caribbean Fisheries Institute Conference 📍 Corpus Christi, TX  
Eckert RJ, Loeffler C, Robertson A, Johnston MA, Hickerson EL, Schmahl GP  
Poster presentation
- 2009 ● **Associational resistance and susceptibility in *Solanum carolinense***  
Southeastern Ecology and Evolution Conference 📍 Gainesville, FL.  
Eckert RJ, Kim T, Underwood N  
Poster presentation

## 📷 FUNDING

- 2023 ● **Smithsonian NMNH Research Fellowship**  
\$16,000
- 2023 | 2017 ● **FAU GPSA Travel Awards**  
\$3,023
- 2021 ● **PADI Foundation Grant**  
\$4,377
- 2021 | 2019 ● **FAU Presidential Fellowship**  
\$10,000
- 2018 ● **FAU Thesis Award**  
\$500
- 2018 ● **PADI Foundation Grant**  
\$4,973
- 2009 ● **Bess H. Ward Honors Thesis Award**  
\$1,000
- 2009 | 2005 ● **Florida Bright Futures Academic Scholarship**  
\$14,850
- 2009 | 2005 ● **Florida State University Freshman Academic Scholarship**  
\$8,000
- 2005 ● **Florida State University Freshman AP Scholarship**  
\$500

## 🏆 AWARDS

- 2021 | 2019 ● **Florida Atlantic University Presidential Fellow**
- 2020 ● **Florida Atlantic University Student Publishing Award**  
Awarded for 3 publications in 2019



2009  
|  
2006  
2005

- **Florida State University Dean's List**
- **Florida State University President's List**



## CERTIFICATIONS

- **AAUS Scientific Diver**  
100 m, CCR, Trimix
- **TDI Technical SCUBA Diver**  
Advanced Nitrox, Decompression Procedures, Trimix 100 m, Closed-Circuit Rebreather, Advanced Mixed Gas CCR
- **PADI Trimix Gas Blender**
- **DAN Oxygen delivery, First Aid, and CPR for scuba diving injuries**
- **USCG Licensed Merchant Mariner**  
100 GRT
- **USFWS Motorboat Operator Certification Course**
- **Sea-Bird Electronics technician**
- **NOAA Working SCUBA Diver**



## SKILLS

- **DNA and RNA extraction, PCR, qPCR, Gel electrophoresis, NGS library preparation, Agilent Bioanalyzer (DNA, RNA)**
- **Bioinformatic analyses, multivariate statistics, and data visualization**  
R statistical software, Python, Bash, PRIMER7, and CPCe
- **Coral sampling, benthic surveys, fish surveys, photography, navigation and mapping**
- **Offshore field research cruise planning, logistics, and execution**
- **Technical SCUBA diving, closed-circuit rebreather diving, operation of Nitrox compressor systems, and Trimix blending**
- **Setup, operation, and maintenance of oceanographic equipment**  
Sea-Bird Electronics, Onset HOBO, YSI
- **Adobe InDesign, Adobe Illustrator, and Adobe Photoshop**

- **Operation, navigation, and handling of small boats**  
Marlinspike, and mooring buoy construction/installation/maintenance



## MEMBERSHIP AND SERVICE

Present

|  
2020

- **Mesophotic.org**  
Content Editor

Present

|  
2019

- **International Coral Reef Society**

Present

|  
2017

- **Benthic Ecology Meeting Society**

- **Reviewer for:**  
Scientific Reports, Environmental Monitoring and Assessment, Marine Ecology Progress Series

2022

- **HBOI Graduate Student Association**  
Vice President

📍 Ft. Pierce, FL

2021,  
2019

- **HBOI Graduate Student Association**  
Secretary

📍 Ft. Pierce, FL

2019

|  
2018

- **Association for the Studies of Limnology and Oceanography**



## REFERENCES

- **Dr. Joshua Voss**  
*Ph.D. Advisor*  
Florida Atlantic University  
[jvoss2@fau.edu](mailto:jvoss2@fau.edu)
- **Dr. Adrienne Correa**  
*Assistant Professor*  
UC Berkeley  
[amsc@berkeley.edu](mailto:amsc@berkeley.edu)
- **G.P. Schmahl**  
*Superintendent*  
Flower Garden Banks National Marine Sanctuary  
[george.schmahl@noaa.gov](mailto:george.schmahl@noaa.gov)

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