FIU | Center for Aquatic Chemistry and Environment
NSF Center of Research Excellence
In Science and Technology

FIU's CREST Center for Aquatic Chemistry and Environment:

Untangling Sources, Transport and Ecosystem Responses to Contaminants, Pollutants And Other Stressors in Aquatic Ecosystems

All-Hands Meeting
January 31, 2020

Centers of Research Excellence in Science and Technology (CREST)

Goals:
- Integrate education and research
- Promote development of new knowledge
- Enhance faculty research productivity
- Increase diversity in STEM disciplines

Success:
- Promote faculty engagement in research activities at the highest level
- Engage undergraduate and graduate students in the process of discovery and innovation
- Provide students opportunities to become significant participants in the broader community of scholarship in their respective fields
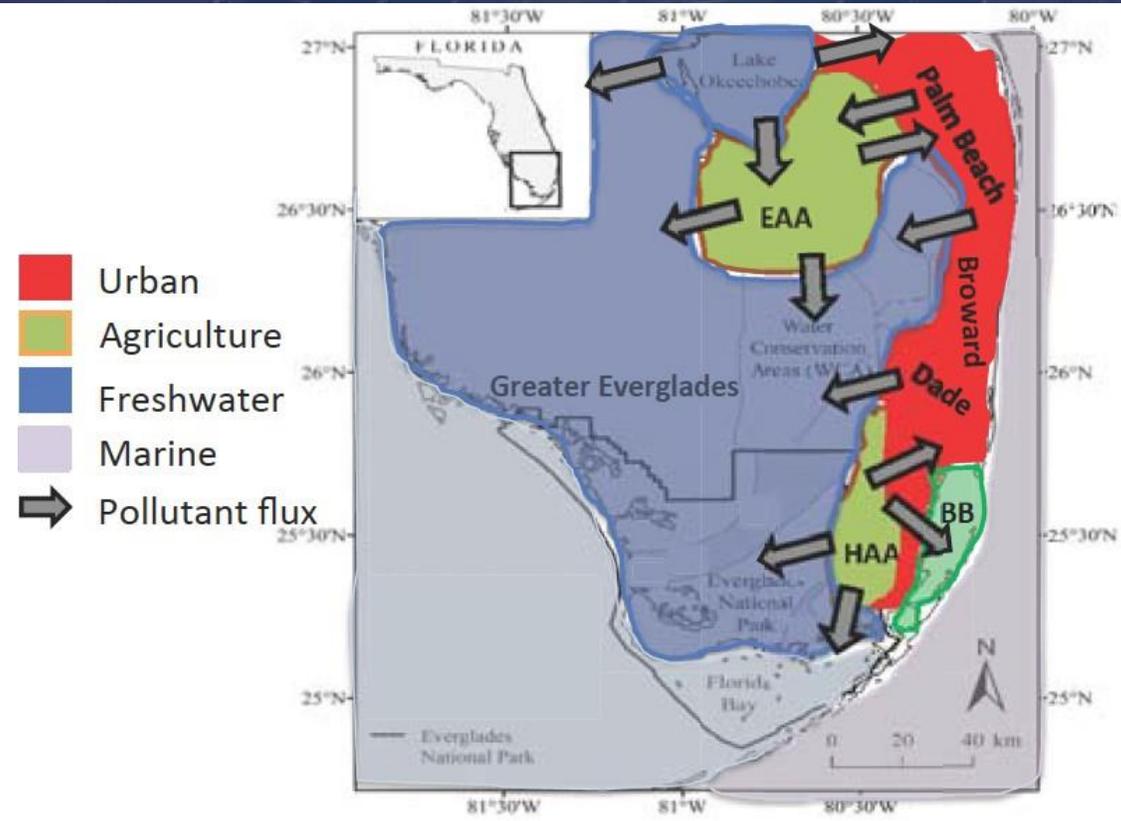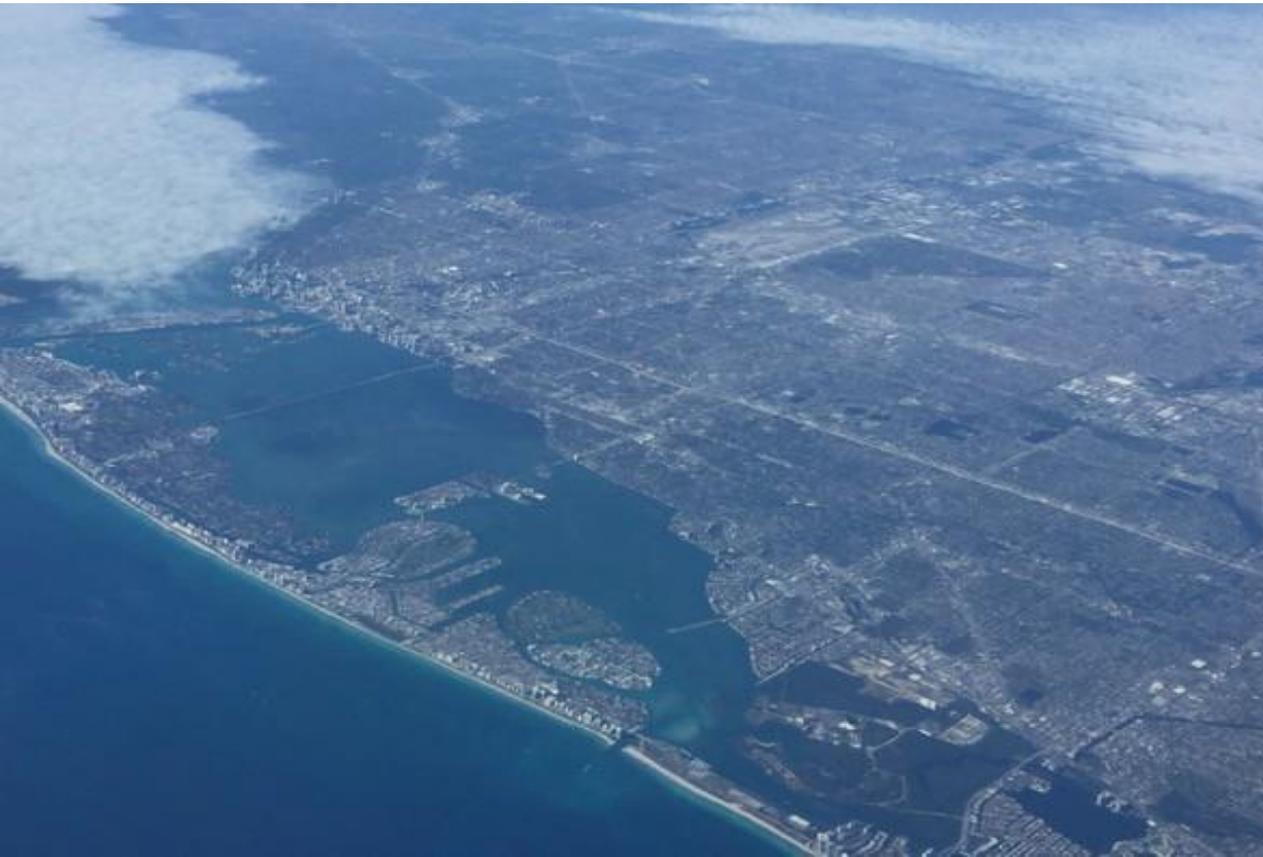
Context:

The hydrologic connectivity between the natural, agricultural, and urban landscapes results in a highly complex network of contaminant sources that are transported throughout the landscape

CREST CAChE Research Mission

To detect the sources, transport, transformation and ecosystem responses to contaminants, pollutants and other natural stressors, under changing land-use and environmental conditions.

CREST CAChE Research Focus Areas

1. Advanced sensing of environmental exposure to anthropogenic contaminants, pollutants and other natural stressors.

2. Quantifying the fate and transport of contaminants across landscape gradient transects in South Florida.

3. Assessing the effects on South Florida's aquatic ecosystems through data analytics, interpretation and visualization to convey environmental impacts to policy- and decision-makers.

CREST CAChE

A campus-wide integration of students and faculty from 14 departments, 4 colleges, 3 Centers and the STEM Transformation Institute in fields from *environmental chemistry* to *computer intensive data analysis and visualization*…working together to tackle one of the region's most complex challenges: *environmental contamination*.
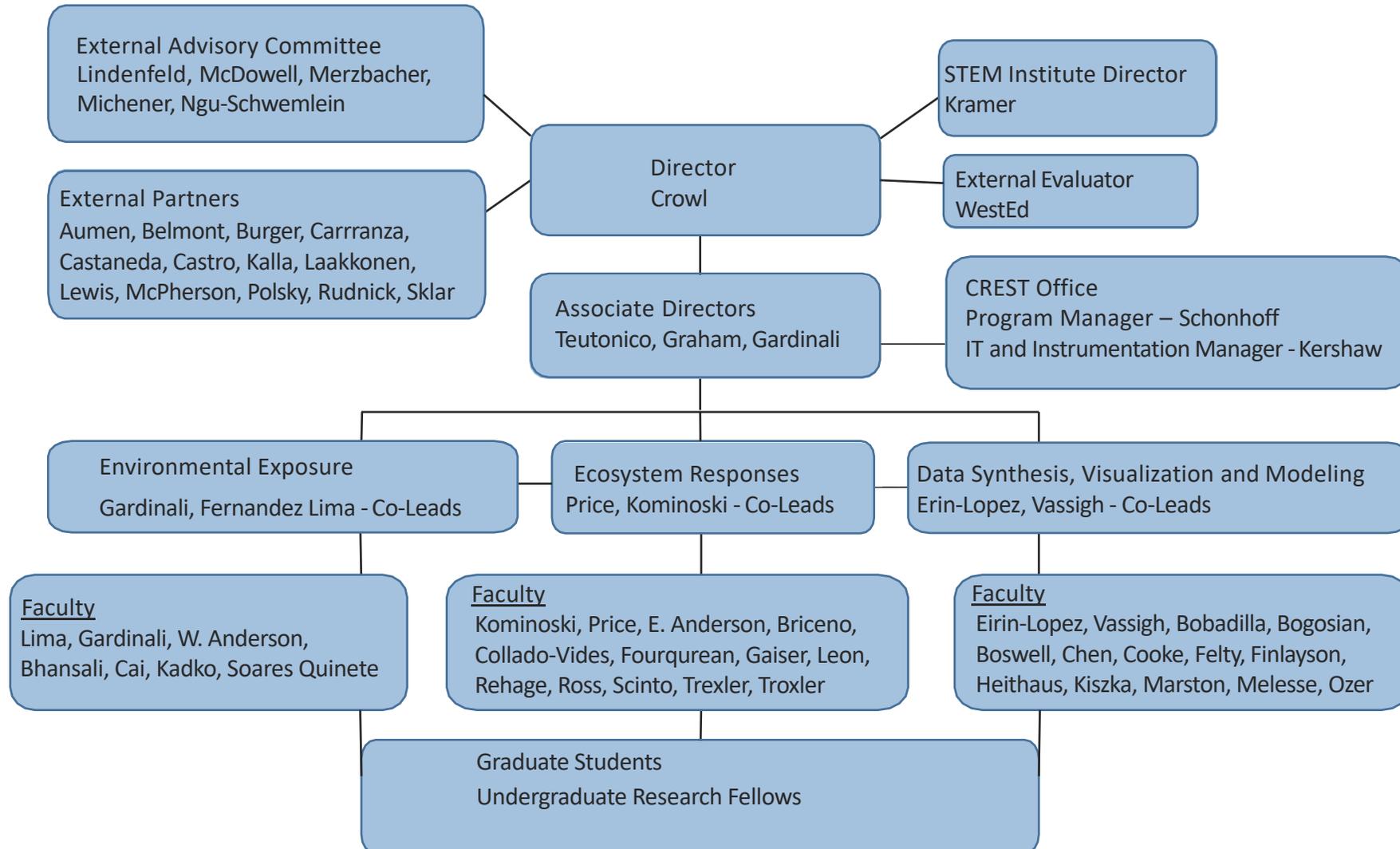
Organizational Structure

External Advisory Committee
Lindenfeld, McDowell, Merzbacher, Michener, Ngu-Schwemlein

STEM Institute Director
Kramer

Director
Crowl

External Evaluator
WestEd

External Partners
Aumen, Belmont, Burger, Carrranza, Castaneda, Castro, Kalla, Laakkonen, Lewis, McPherson, Polsky, Rudnick, Sklar

Associate Directors
Teutonico, Graham, Gardinali

CREST Office
Program Manager – Schonhoff
IT and Instrumentation Manager - Kershaw

Environmental Exposure
Gardinali, Fernandez Lima - Co-Leads

Ecosystem Responses
Price, Kominoski - Co-Leads

Data Synthesis, Visualization and Modeling
Erin-Lopez, Vassigh - Co-Leads

Faculty
Lima, Gardinali, W. Anderson, Bhansali, Cai, Kadko, Soares Quinete

Faculty
Kominoski, Price, E. Anderson, Briceno, Collado-Vides, Fourqurean, Gaiser, Leon, Rehage, Ross, Scinto, Trexler, Troxler

Faculty
Eirin-Lopez, Vassigh, Bobadilla, Bogosian, Boswell, Chen, Cooke, Felty, Finlayson, Heithaus, Kiszka, Marston, Melesse, Ozer

Graduate Students
Undergraduate Research Fellows

Timelines and Milestones:
CREST awarded summer, 2016

Physical and Human Infrastructure:
2016
Program Coordinator Hired June
IT-Instrumentation Coordinator appointed
BBC CREST Student Office, MMC CREST Student Office/Data Synthesis & Visualization Lab and MMC CREST Student Office/Research and Development Lab space secured

2017
CREST CAChE Analytic Teaching Lab developed
CREST CAChE Analytic Research & Development Lab opened
Program Student Assistant hired
Visualization Computer Lab (including new server) established

2018
Three water quality buoys, sensors and field computers designed and purchased
Buoys successfully deployed providing real-time water quality
Launched FIU Robotics Lab and sensor development activities
Enhanced CREST computer hardware including storage

2019
Created data and meta-data portals
Initiated Biscayne Bay Database Project
Enhanced computer hardware including storage
Second Trapped Ion Mobility – Ultra High Resolution Mass Spectrometer obtained
Two CREST funded faculty hired (Visualization; Novel Contaminants)

Timelines and Milestones:

CREST Post-Docs, Graduate and Undergraduate Students:
2016
1st CREST Graduate Student cohort (10)
CREST Post-Docs Hired (2 funded by ORED and STEM)

2017
Interdisciplinary Philosophy of Science Course
CREST NSF Post-Doctoral Fellow awarded (from UPR CREST)
Initiated REU Program (6 UGs; 3 FIU, 3 UPR)
2nd CREST Graduate Student cohort (7)
Discovery I Course (11)
2 PhD, 1 MS student graduated

2018
Discovery I Course (61)
Discovery II Course (45) REU Program (9 UGs)
3rd CREST Graduate Cohort (10)
5 PhD, 3 MS students graduated

2019
First REU Site Program (10 undergraduates)
Initiated CREST Undergraduate Research Fellows Program (7 undergraduates)
Final Graduate Student Cohort (13)
Workshop on data and database management (Kristin Vanderbilt)
AIBS Science Communications Training Boot Camp (Robert Gropp)
Research Development and Grant/Proposal Writing workshop (Maria Pulido-Velosa)
3 PhD, 2 MS students graduated

Timelines and Milestones:

Leveraged Funding:

2016
- VPR waived tuition ($300k)
- VPR provided CREST Post-Doc
- STEM/CASE provided CREST Post-Doc

2017
- CREST post-doc program – UPR to FIU; FIU to UNM (2 of 3 awards to FIU)
- Partner Supplemental request to expand to Mangroves, initiate collaboration between UPR CREST and LTER and FIU CREST and LTER & initiated collaboration with USF – mangrove sediment dating
- Partner Supplemental request to expand to shallow marine habitats and initiate collaboration with UPR CREST
- Received Tech-Fee funding to install smart-screens and video conferencing facilities in three CREST offices
- Two NSF Career Awards to CREST Affiliated Faculty (Chemistry, Computer Sciences)
- NSF RAPID FIU-UPR

2018
- NSF CREST Supplement for UPR CREST/LTER Analytic Chemistry, Coral Genomics and Restoration and Computing
- NSF Rapids for Hurricane Maria (FCE and UPR)

2019
- NSF REU Site Award
- NSF Supplement for Urban Waterways
- NSF C-Accel Pilot - Track B1 (AI and Future Jobs): Preparing the Future Workforce of Architecture, Engineering, and Construction for Robotic Automation Processes - Vassigh
- NIH Development of Multidimensional, Linear & Differential Ion Mobility MS Separations for Middle-Down Proteoforms (Fernandez Lima)
- NSF URoL: Epigenetics 2: Predicting phenotypic & eco-evolutionary consequences of environmental-energetic-epigenetic linkages (Eirin Lopez)
- NSF $10 Mil Legislative Budget Request to support our Program of Distinction Environmental Resilience

NSF

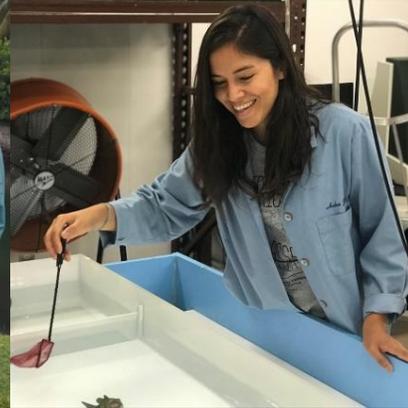FIU | Center for Aquatic Chemistry and Environment

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Research Focus Areas
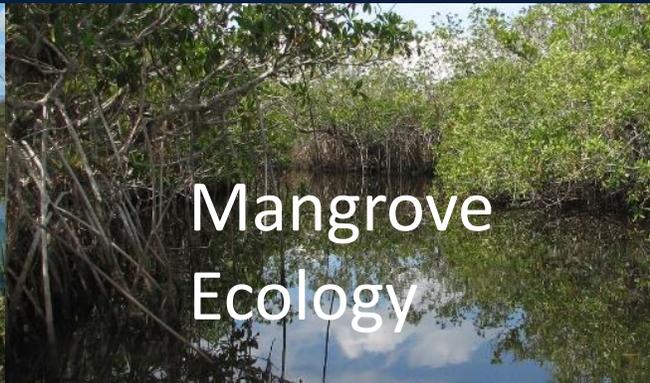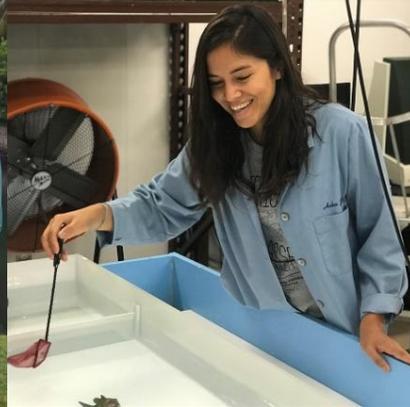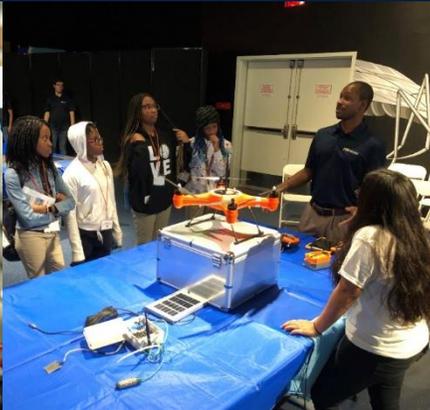
Detection & Identification   Fate & Transport   Impacts & Visualization

Discovery-based Education

Everglades

We have funded:

- 40 graduate fellows
- 21 affiliated graduate students
- 141 undergraduate students
- $91,000 in additional support for CREST students (fellows and non-fellows)
- Supported 12 Postdocs
- Involved 46 faculty members to date

In 2019 CREST CAChE graduated 5 graduate students and was awarded 3rd Supplement to focus on water quality in urban waterways and community engagement.

Where Are They Now?

Anthony Castellanos
Scientist, Bruker

Samira Pouyanfar
Data Scientist II, Microsoft

Fernando Rodriguez
Design Manager,
MSA Architects

Jorge Tubella
External Researcher,
NSF C-Accel at FIU

Kalli Unthank,
Environmental Scientist,
Kleinfelder

Tiffany Yanez
Toxicologist, Diversey

We have produced:

- 39 peer-reviewed publications

- > 200 presentations including 3 award-winning student presentations

- $4.5 million leveraged funding

- 16 graduates – 11 PhDs, 5 Masters

What's next?

- Submitted NSF MRI proposal to enhance buoy sensor platform to include Harmful Algal Bloom Data

- Submitting NSF NRT proposal to use multi-model imagery to understand coastal ecosystems

- Submitted CREST Phase II LOI

- CREST Phase II pre-proposal due in 3 weeks

CREST Phase II

Novel Environmental Stressors

Multi-Level Organismal Impacts and Responses
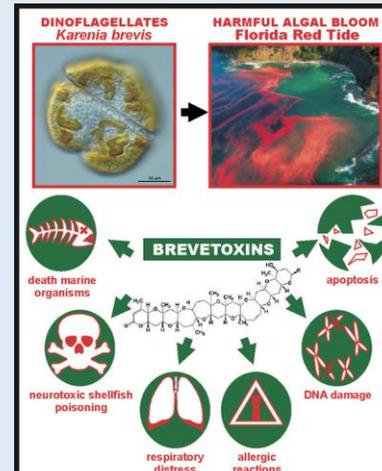
Innovative, Integrated Ecosystem Assessment

Education and Training will focus on Next-Generation Jobs including Robotics, Sensor development and deployment, Visualization and Artificial Intelligence

Thank you!

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