

FIU

Applied Research
Center



DOE-FIU Cooperative Agreement Annual Research Review – FIU Year 1

PROJECT 5

Long-Term Stewardship of Environmental Remedies: Contaminated Soils and Water and STEM Workforce Development

*Worlds
Ahead*

Advancing the research and academic mission of Florida International University

FIU Personnel and Collaborators

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DOE-LM: Carmelo Melendez, Jalena Dayvault, David Shafer

DOE-EM:, Kurt Gerdes, Genia McKinley, Jean Pabon



Project Tasks and Scope

TASK 1: USE OF APATITE FOR URANIUM SEQUESTRATION AT OLD RIFLE SITE

TASK 2: REMOTE SENSING TECHNOLOGIES FOR LONG-TERM SURVEILLANCE OF DOE-LM SITES

TASK 3: STEM WORKFORCE DEVELOPMENT



Task 1

Use of Apatite for Uranium Sequestration at Old Rifle Site



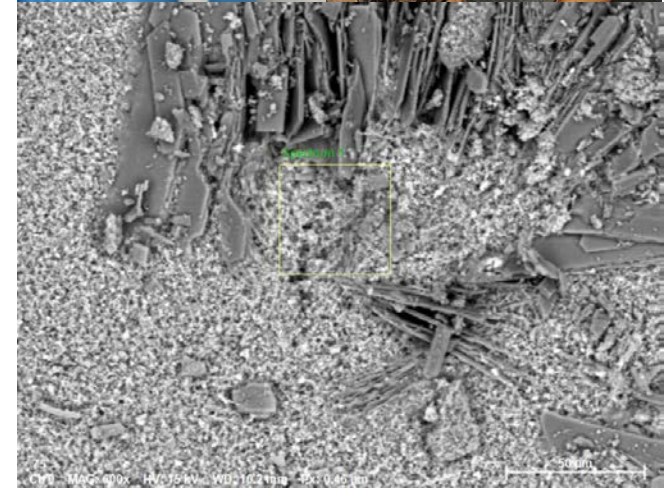
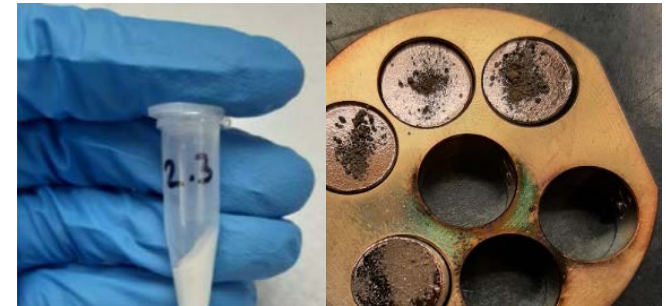
FIU Year 1 Research Highlights & Accomplishments:

Apatite Synthesis and characterization:

- Synthesized hydroxyapatite at four varying Ca:Citrate:PO₄ ratios to determine optimum ratio
- Characterized samples via XRD and EDS to confirm successful synthesis of hydroxyapatite through the elemental composition and via SEM to identify structure

Soil Characterization:

- Received surface-level soil samples from Old Rifle; processed through 2mm sieve to remove rocks
- Conducted SEM-EDS analysis for structural images of the sediment and elemental composition data
- XRD and N₂-BET analysis to confirm prominent elements in soil and determine surface area



FIU Year 2 Projected Scope

- Determine the kinetics of the formation of hydroxyapatite through analysis of aliquot samples using ICP-OES.
- Conduct experiments to examine how uranium interacts with HA when immediately injected, while in the process of precipitation.
- Investigate how uranium interacts with HA after it has precipitated and is interacting with flowing groundwater.



Task 2

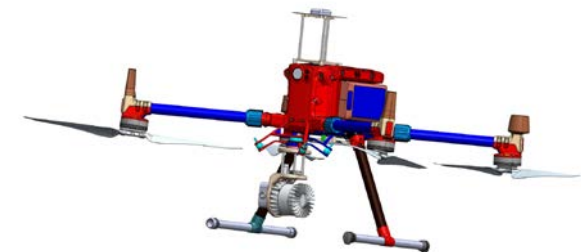
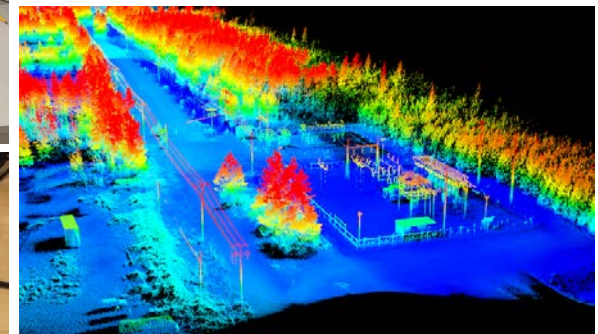
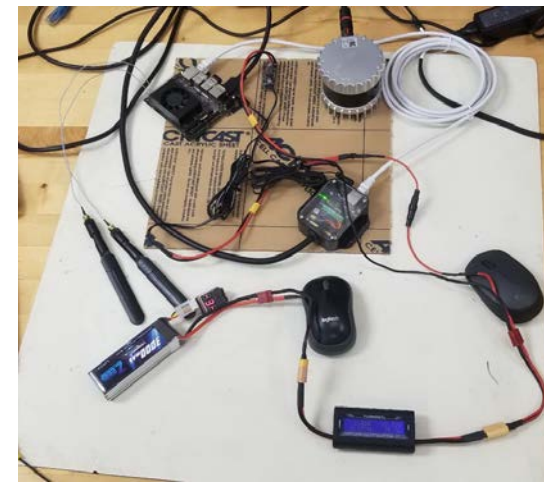
Remote Sensing Technologies for Long-Term Surveillance of DOE-LM Sites



Task 2: Remote Sensing Technologies for Long-Term Surveillance of DOE-LM Sites

FIU Year 1 Research Highlights & Accomplishments:

- Conducted the first Rifle Disposal Site baseline survey capturing aerial imagery and developing the only existing 3D elevation model of the site
- Developed and integrated cost-effective in-house Lidar mapping module for erosional evaluation
- Contributed to the foundation of climate resilience mitigation research to aid LM's mission to ensure long-term surveillance for the environment and the public's safety
- Established the roadmap and procedures for UAV remote sensing deployment at a DOE site



FIU Year 2 Projected Scope

- Investigate the effects of climate change on environmental remedies at DOE-LM sites.
 - Monitoring methods and technologies will be explored in support of meeting LM goals climate resiliency goals for long-term monitoring of DOE-LM sites, considering specific site environmental characteristics.





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Task 3

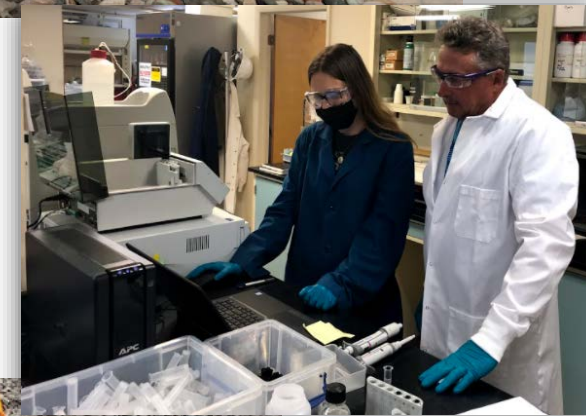
STEM Workforce Development



Task 3: STEM Workforce Development

FIU Year 1 Highlights & Accomplishments:

- 2 Fellows supported FIU scientists and engineers in the development of the technical work relevant to LM need
- Conducted virtual introduction ceremony and welcomed 1 LM Fellows into the program
- Fellows toured several Legacy Management sites in Colorado and met with many scientists and engineers their current goals, as well as the challenges that they face on a daily basis
- Two student posters were presented at WM2021 held virtually
- 2 summer internships were conducted at Grand Junction Colorado with trips to various sites for sample collect and drone deployment



Task 3: STEM Workforce Development

FIU Year 2 Projected Scope

- Recruitment of qualified talented FIU minority STEM students
- Engage in DOE LM research
- Poster exhibition & competition (November 2021)*
- Annual DOE Fellows induction ceremony (November 2021)*
- Summer internships 2022/ Site visits
- Summer internship technical reports
- Conference participation & presentations, including WMS 2022, AGU
- DOE Fellows lecture series forum





Thank You. Questions?