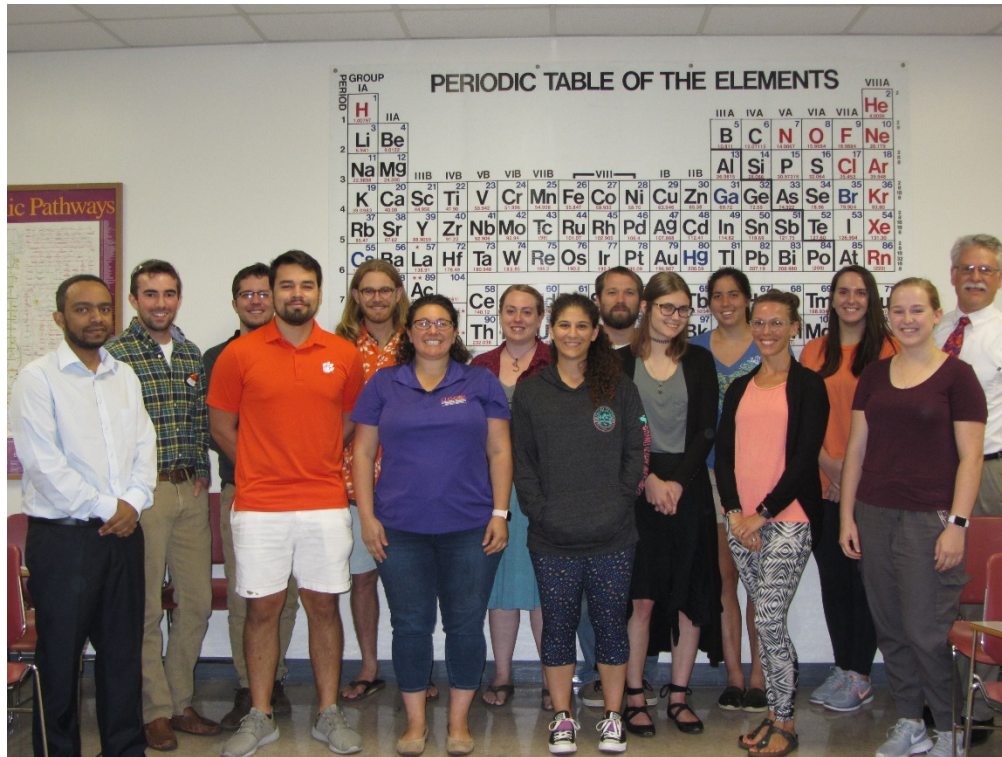
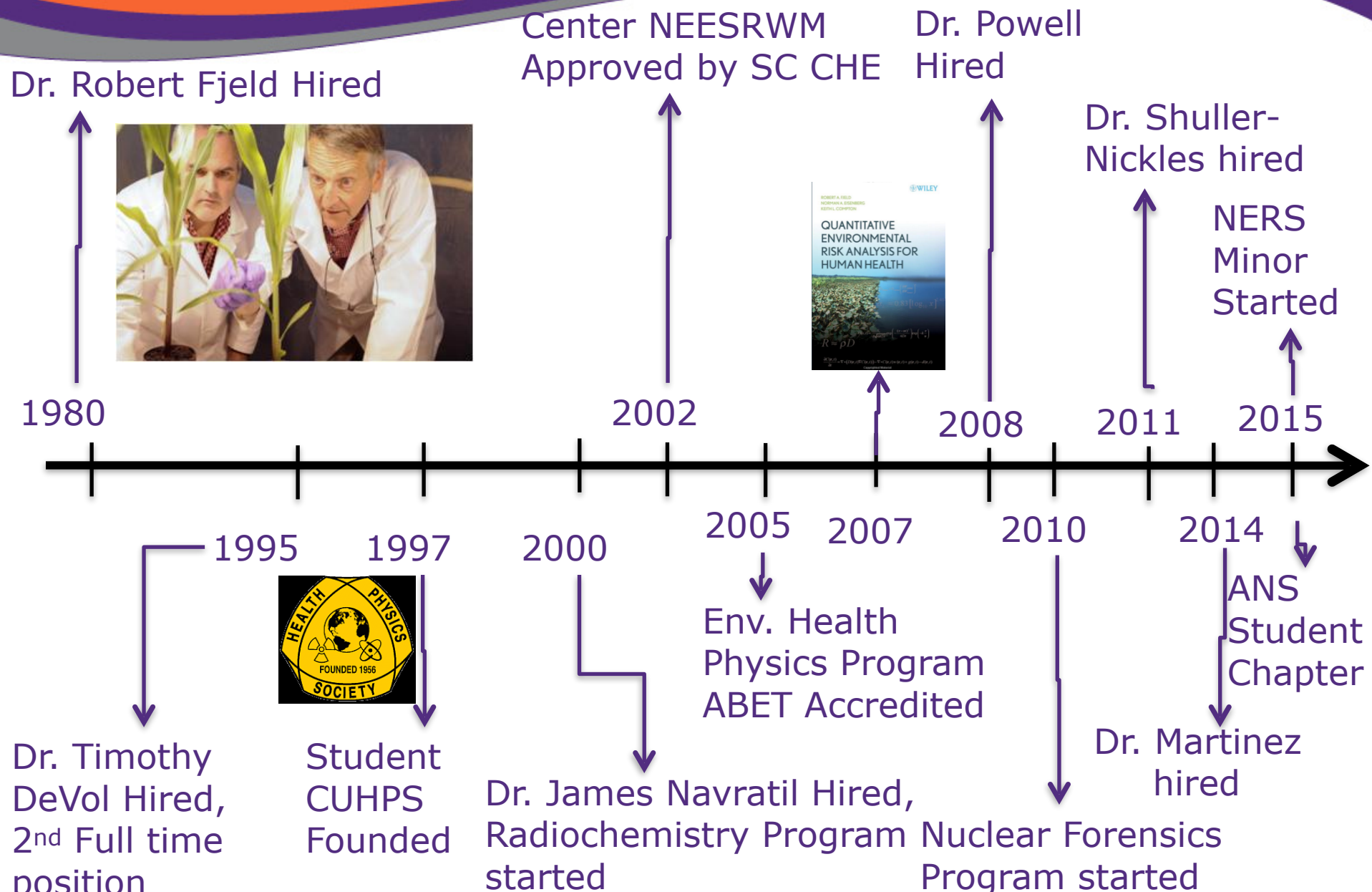


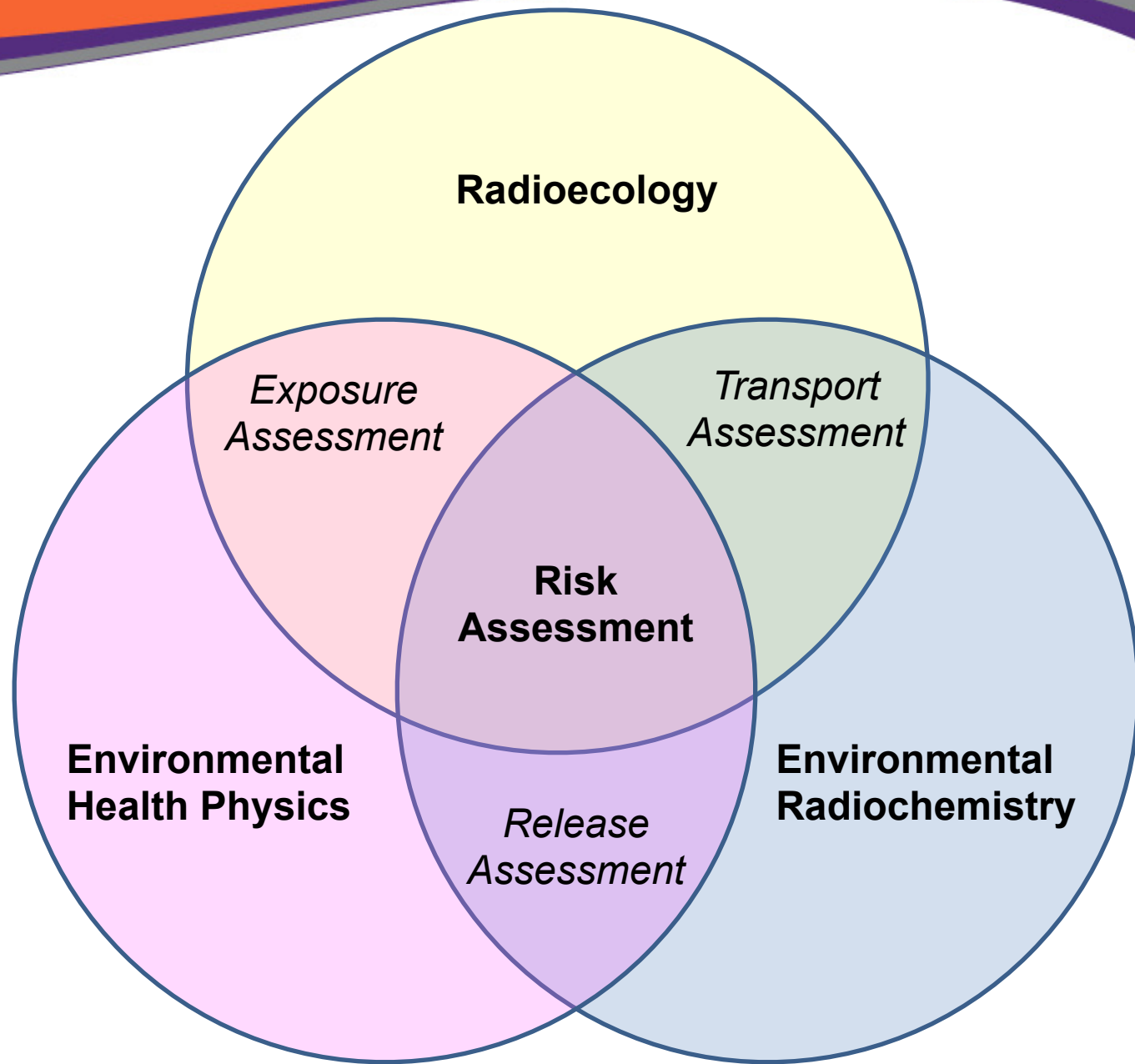
## Nuclear Environmental Engineering and Science at Clemson University



CNTA Up and Atom  
June 12, 2019

# NEES History





## Welcome to NEESRWM

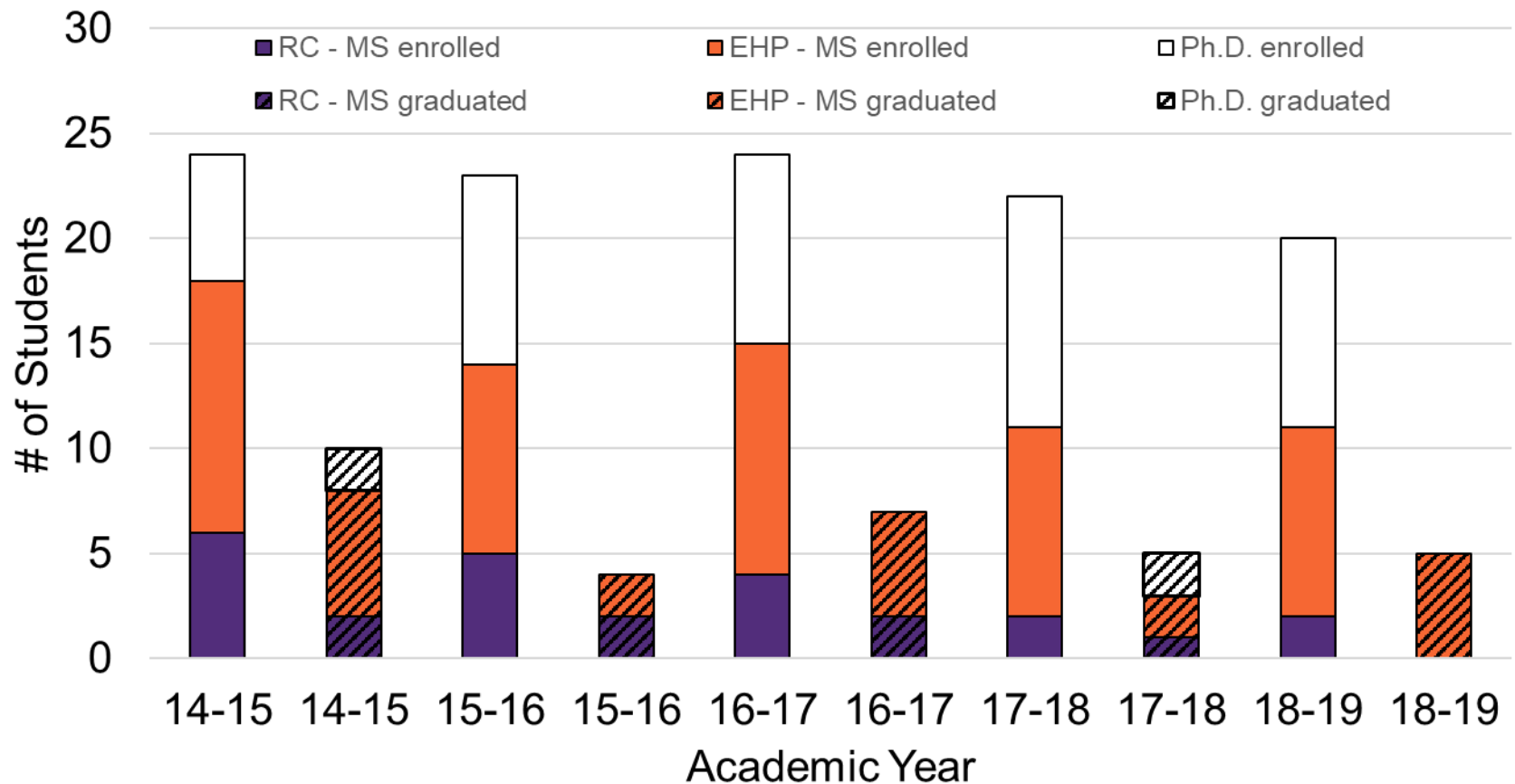


Goal: To conduct research related to the environmental aspects of nuclear technologies and naturally occurring radioactivity and radiation

To contribute to the education of graduates who are capable and qualified to take future leadership roles in the nuclear environmental community within South Carolina, the nation, and the world.



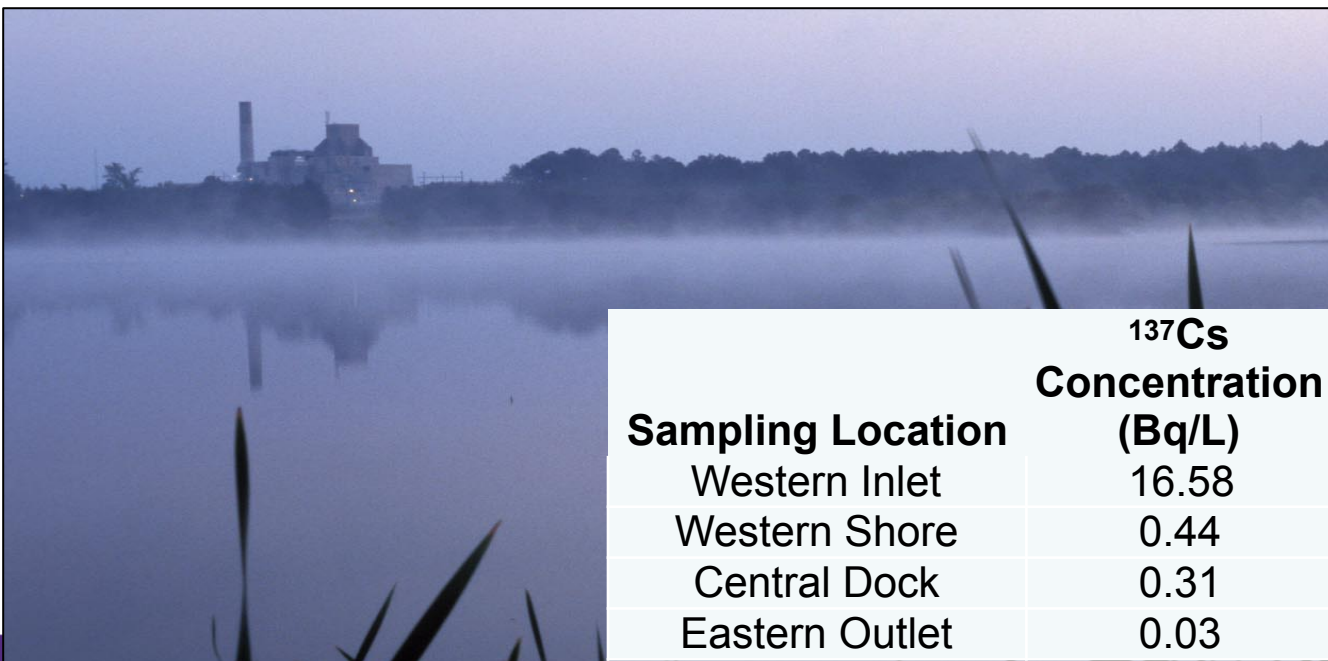
# Nuclear Student Enrollment and Graduation Trends



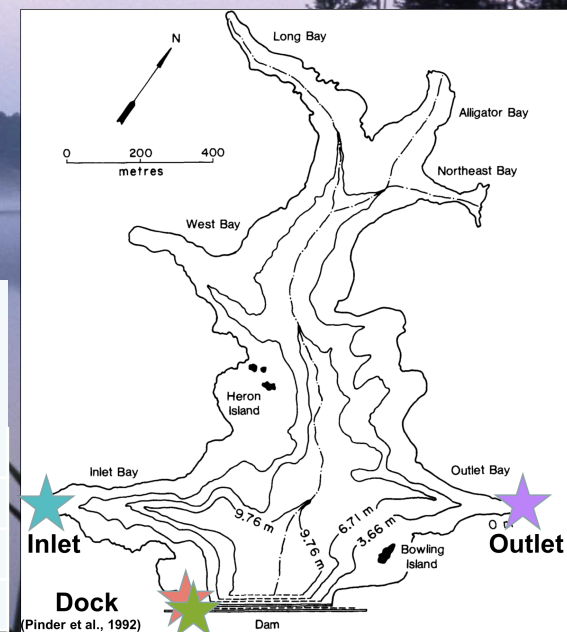
Enrollment based on August of a given academic calendar  
Graduation is Dec, May & August

# Active Grants: Actinide Subsurface Transport

- PI: Powell
- Characterization of Plutonium Migration Under Field Conditions, \$99k/year, 2018-2021
- Funded by DOE- Subsurface Biogeochemical Research Program
- Fourth 3-year competitive renewal cycle - Scientific Focus Area program led by LLNL

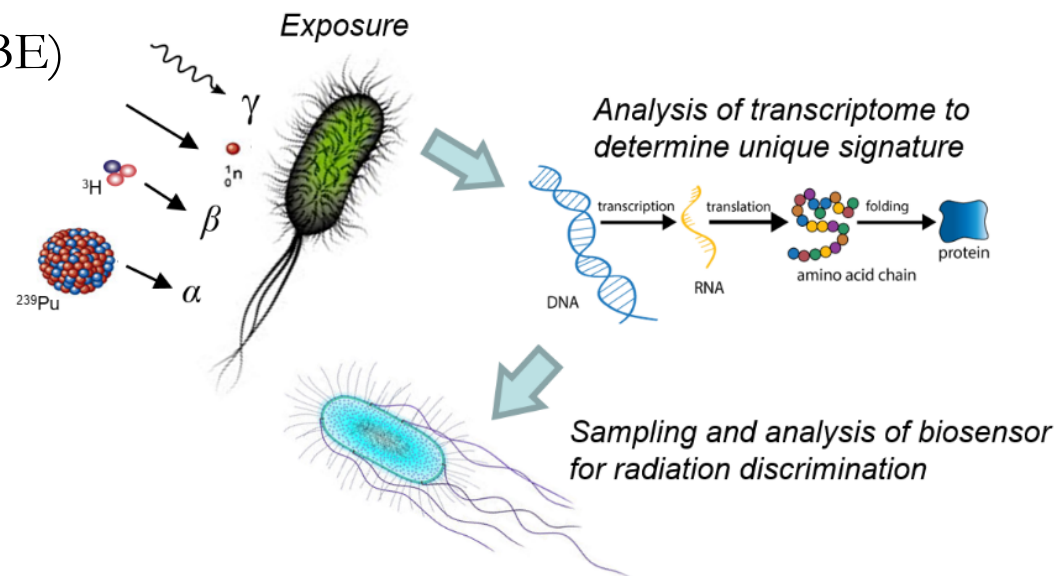


Sampling Location	<sup>137</sup> Cs Concentration (Bq/L)
Western Inlet	16.58
Western Shore	0.44
Central Dock	0.31
Eastern Outlet	0.03



# Active Grants: DTRA

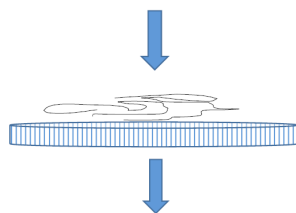
- “Discriminatory Transcriptional Response of Environmental Microorganisms to Low Dose Ionizing Radiation”
- Martinez (PI) and Blenner (Co-PI, ChBE)
- \$866,884 over 3 years
  - Potential 2 year renewal, \$1.5M total
- Graduate students
  - Molly Wintenberg (PhD, ChBE)
  - Lisa Manglass (PhD, EES)
  - Adam Willey (MS, EES)



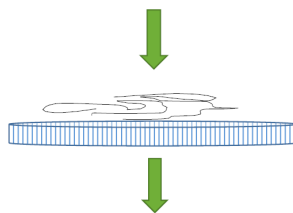
## “Robust Extractive Scintillating Resin and Adsorptive Membranes for Plutonium Isotopic Analyses of Aqueous Media”

**Objective 1:** Develop robust extractive scintillator resins for water-soluble plutonium.

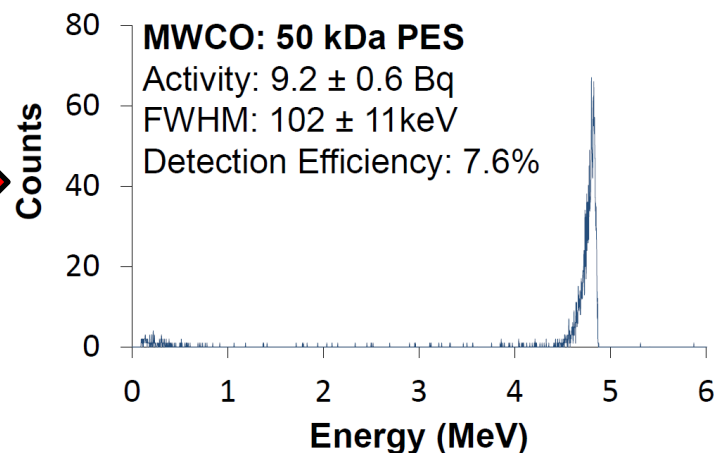
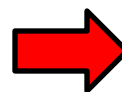
**Objective 2:** Develop an analytical method that combines selective plutonium concentration using an adsorptive membrane with alpha spectroscopy source preparation into a single step.



**Step 1.** Cast polymer film by ultrafiltration



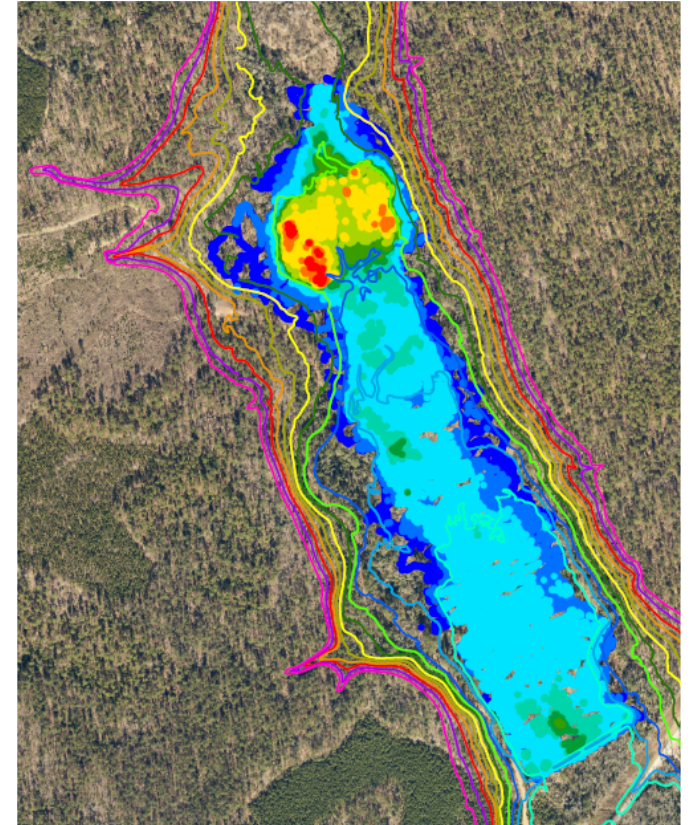
**Step 2.** Filter plutonium solution through polymer coated membrane





# Active Grants: Uranium Wetland Biogeochemistry

- PI: Powell, 2018-2019, \$88,774
- Funded by Savannah River National Laboratory
- Joint appointment (JA) – Support of Laboratory Research and Development



# Active Grant: NRC Jr. Faculty Award

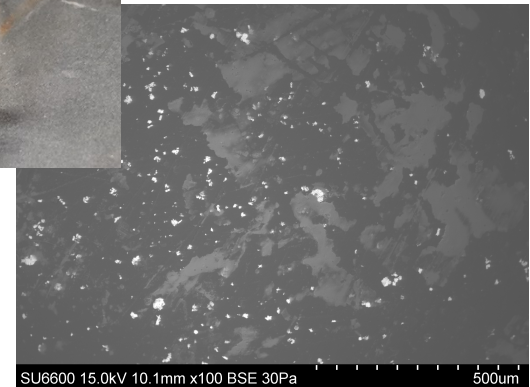
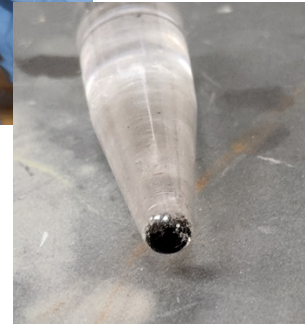
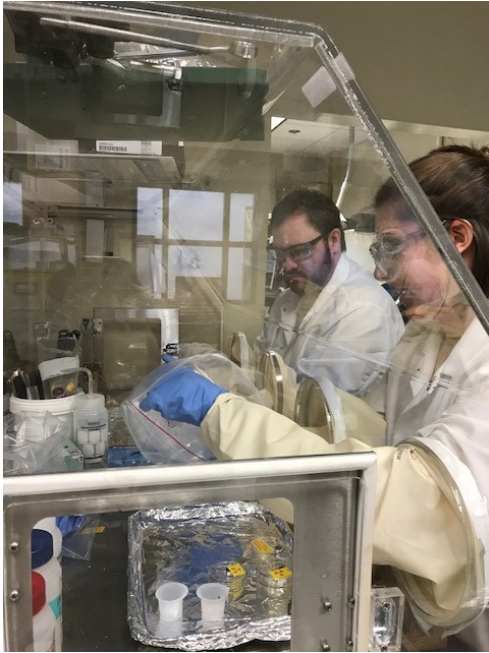
- Funding for a junior faculty hire in one of four targeted research/education areas
- \$450,000 from NRC and \$150,000 Clemson cost-share
- Unique hiring activity across multiple colleges/depts

Research/Educational Area	Potential College/Department	Associated NRC topics of interest
<b>Radiation Tolerant Materials – development of novel materials for reactor materials and waste processing</b>	CECAS/Materials Science and Engineering	Fuels, Advanced Reactor Design, Accident-progression
<b>Nuclear Separations – development of novel separation approaches for fuel production and waste treatment</b>	CECAS/Chemical and Biological Engineering	Fuels, Radiochemistry
<b>Actinide Chemistry – Evaluation of complex f-element behavior during fuel production and waste disposal scenarios</b>	COS/Chemistry	Radiochemistry, Fuels
<b>Nuclear Imaging – Utilization of nuclear imaging techniques to understand chemical and physical processes occurring in heterogeneous systems.</b>	COS/Physics and Astronomy or CECAS/Materials Science and Engineering	Radiation Protection Analysis, Accident-Progression
<b>Medical Physics – Evaluation of risk from low-dose exposures and development of novel low dose imaging techniques</b>	COS/Physics and Astronomy	Radiation Protection and Analysis



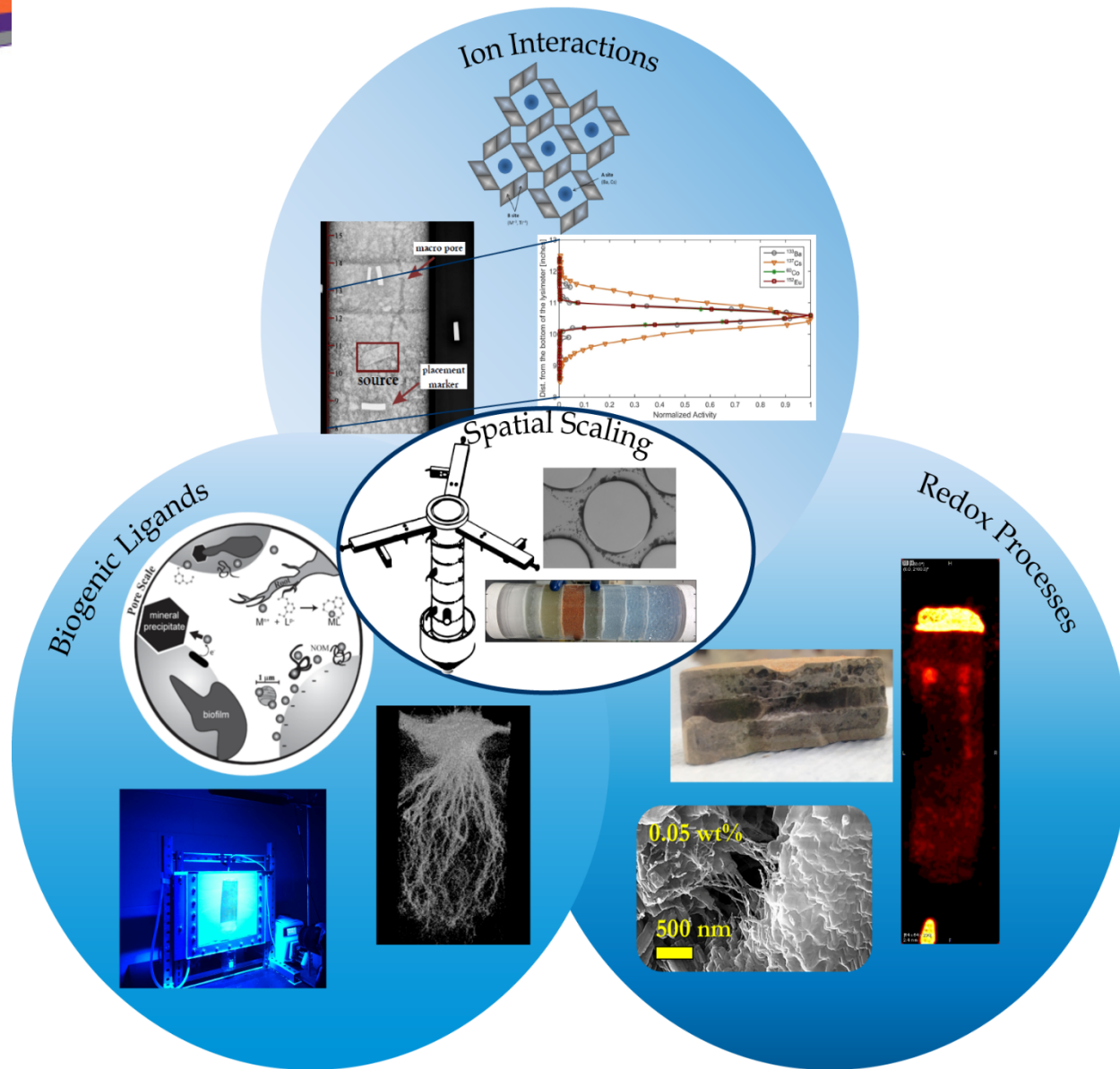
# Active Grant: SRNL- Microscopy

- PI: Shuller-Nickles (co-PI: Powell)
- Prepare and analyze  $\text{PuO}_2$  with known impurities
- Funded through SRNL LDRD Program, ~\$30K



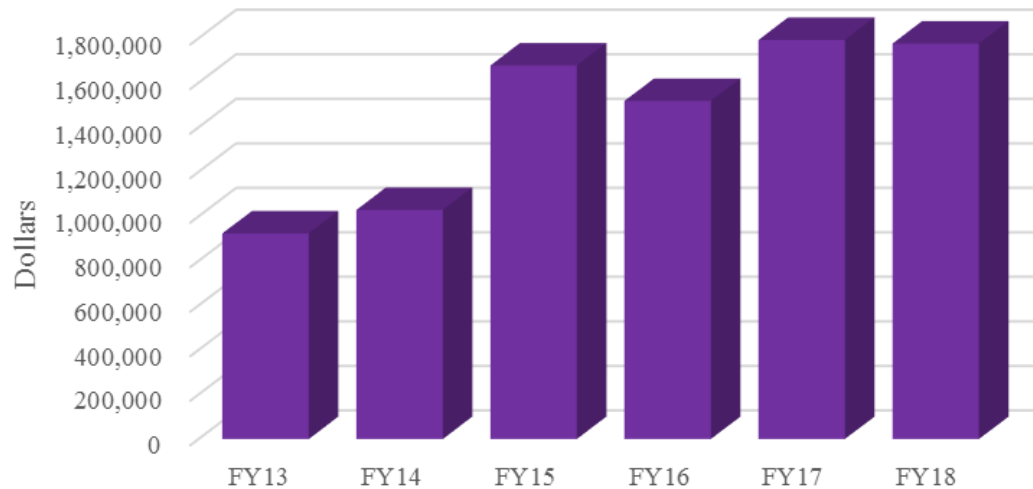
# Renewal Grant: EPSCoR

- Renewal for 24 months at \$2M, Total Funding \$7.5M
- The overarching goal of the renewal phase of the project is to understand the conditions under which important classes of co-reactants, ranging from counter ions in crystal lattices to dissolved oxygen in pores, control the chemistry and transport characteristics of radionuclides in porous media.
- USC and SCSU collaborations

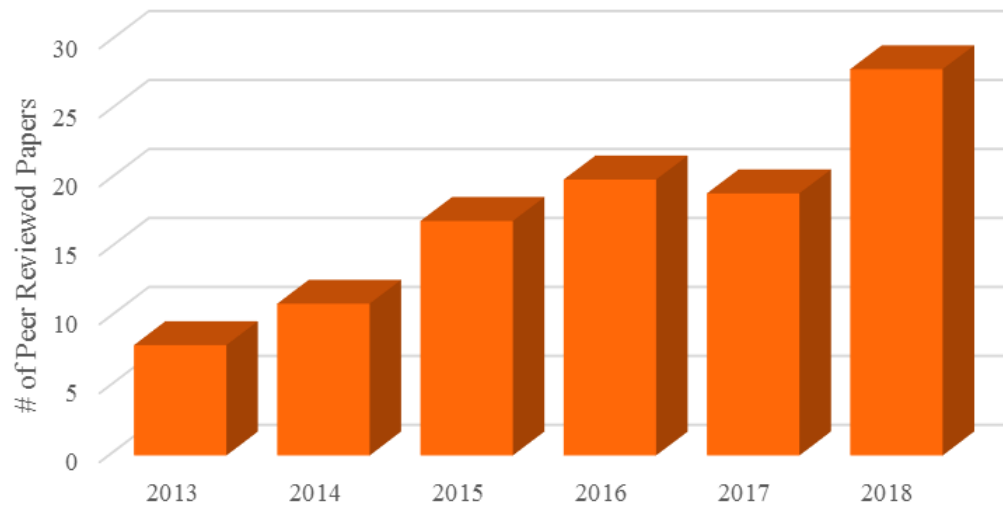


# Research Productivity

NEES Faculty Research Expenditures



NEES Faculty Publication Rate





- 5-Year NEES/NEESRWM Goals
  - Maintain >20 active graduate students in the NEESRWM program
  - Maintain 4 full time NEES focused faculty within EE&ES
  - Add two faculty with nuclear engineering/science focused research interests to the Clemson ranks by 2023.
    - Radiation tolerant materials
    - Nuclear materials separations
    - Actinide chemistry
    - Medical imaging
  - Utilize the NEESRWM center as a focusing point for cross-university collaborations

# Contact Information

- NEESRWM: <https://www.clemson.edu/centers-institutes/neesrwm/>
- Brian Powell, [bpowell@clemson.edu](mailto:bpowell@clemson.edu)
- Timothy DeVol, [devol@clemson.edu](mailto:devol@clemson.edu)
- Nicole Martinez, [nmarti3@clemson.edu](mailto:nmarti3@clemson.edu)
- Lindsay Shuller-Nickles, [lshulle@clemson.edu](mailto:lshulle@clemson.edu)