

Presentation to the Savannah River Site Citizens Advisory Board

Savannah River Ecology Laboratory (SREL) FY20 and REMOP Update

July 26, 2021

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Professor, University of Georgia (UGA)**



The University of Georgia
Savannah River Ecology Laboratory

Objectives

- ◎ **Savannah River Ecology Lab (SREL) Mission**
- ◎ **Staffing**
- ◎ **Funding and Work Scope**
- ◎ **Significant Events**
- ◎ **Advances**
- ◎ **Opportunities For Fiscal Year 2021**
- ◎ **Challenges for Fiscal Year 2021**
- ◎ **REMOP Summary**

Consistent with the Facilities Disposition and Site Remediation Committee's 2021 Work Plan

Acronyms

ACP	Area Closure Project
DOE	Department of Energy
DOE-HQ	Department of Energy – Headquarters
DOE-SR	Department of Energy – Savannah River
ERDA	U.S. Energy Research and Development Administration
HVAC	Heating, Ventilation and Air Conditioning
NERP	National Environmental Research Park
NNSA	National Nuclear Security Administration
REU	Research Experience for Undergraduates
SREL	Savannah River Ecology Laboratory
SRNL	Savannah River National Laboratory
SRR	Savannah River Remediation
SRS	Savannah River Site
UGA	University of Georgia
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS-SR	U.S. Forest Service – Savannah River

SREL History

1951 - Atomic Energy Commission (AEC) had concerns about environmental impacts resulting from Savannah River Site (SRS) construction and operations.

1951 to present – Funding from AEC, ERDA, and Department of Energy (DOE)

1954 – Established permanent lab on the SRS



Dr. Eugene Odum



1977 – Established current lab facilities

SREL's Mission:

“To enhance our understanding of the environment by acquiring and communicating knowledge that contributes to sound environmental stewardship.”

“To provide the public with an independent evaluation of the ecological effects of SRS operations on the environment”

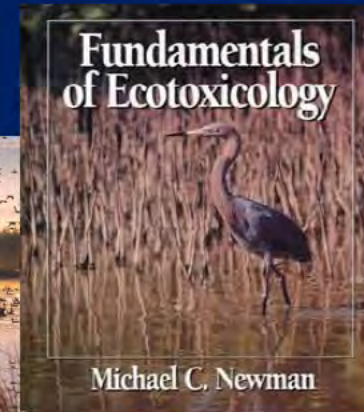
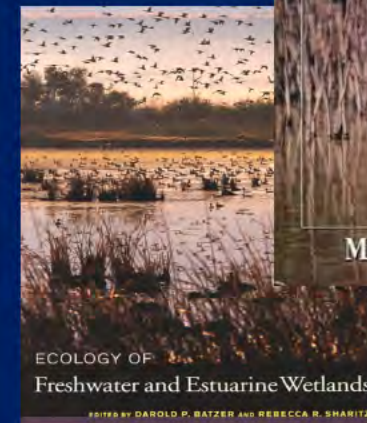
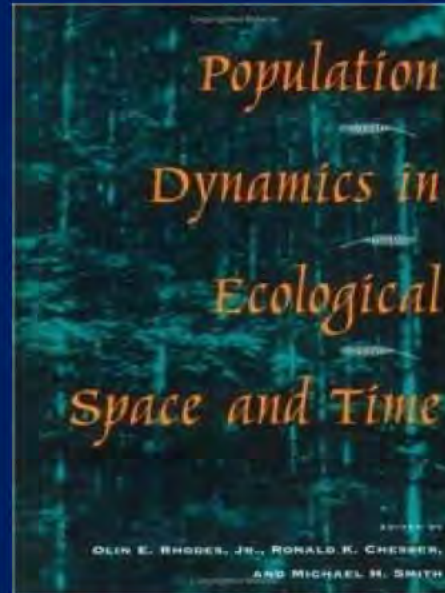
- An interdisciplinary program of field and laboratory **Research** conducted largely on the SRS and published in the peer-reviewed scientific literature
- **Education** and research training for undergraduate and graduate students
- **Service** to the community through environmental outreach activities



SREL Research Program's

- >**3625** peer-reviewed scientific publications to date
- **66** books

Conservation Biology



SREL Education Program

Education Programs

- >450 theses and dissertations
- SREL graduate students have received more than 200 awards
- Over 700 undergraduates representing all 50 states have participated in SREL-sponsored research to date

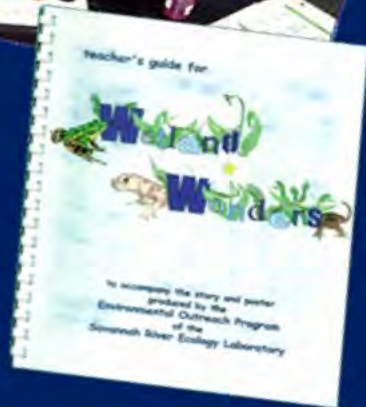


SREL Environmental Outreach Program

- Integrates SREL research into presentations for the general public
- Provides hands-on classroom and field experience for students
- Conducts educator workshops

In FY19, SREL reached ~ **63,000** people
by providing :

- **442** talks
- **36** public tours
- **34** exhibits at local or regional events, and
- **36** “Ecologist for a Day” programs for local schools



SREL in 2021 (this is our 70th anniversary year)

◎ UGA Employees

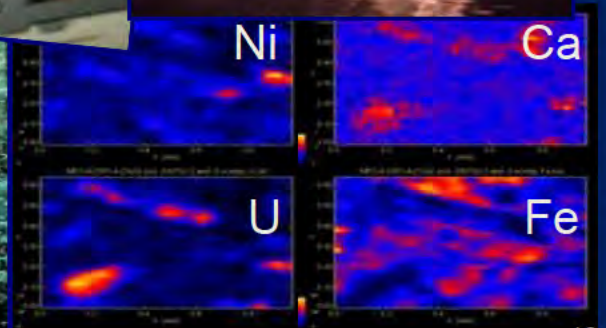
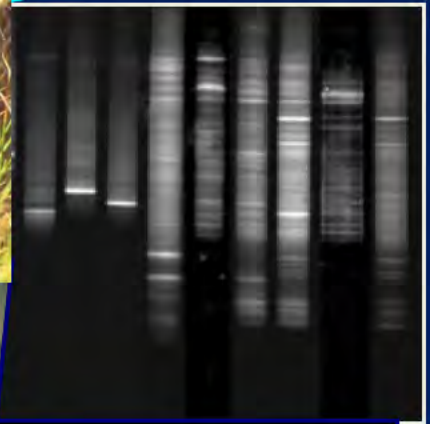
- Research Faculty – 7
- Tenure Track Faculty - 7
- Emeritus Faculty - 4
- Post Docs – 3
- Outreach - 9
- Res. Professional - 14
- Research Support - 52
- Graduate Students - 56
- Undergraduates - 3
- Admin & Support - 19

173 Staff & Students

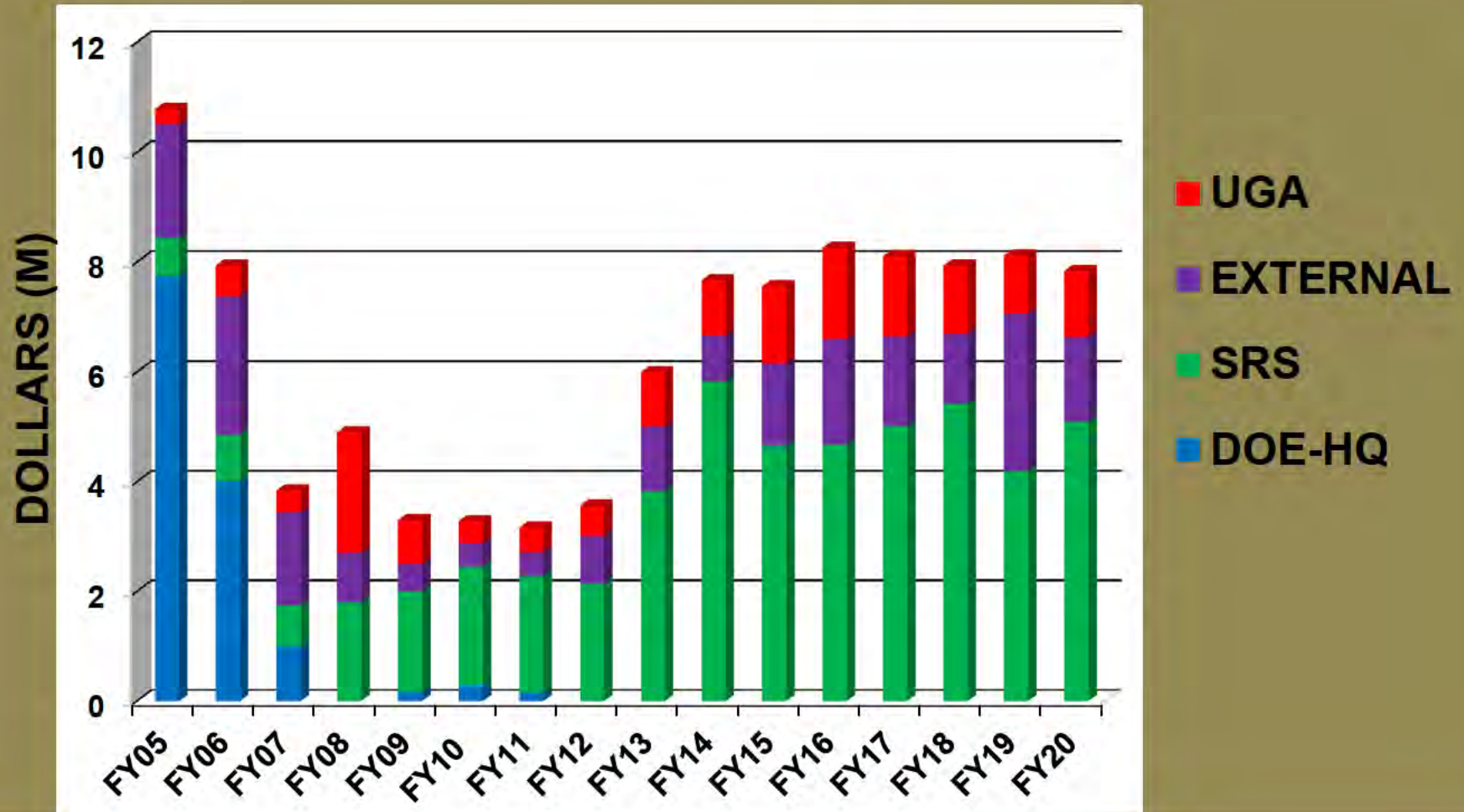


Disciplinary Expertise

- Aquatic and Terrestrial Ecology
- Geology / Soil Science
- Environmental Microbiology
- Epigenetics
- Molecular Genetics
- Environmental Chemistry
- Radioecology
- Ecotoxicology and Risk Assessment
- Wildlife Ecology
- Disease Ecology
- Plant Physiology
- Proteomics and Glycomics



Recent Funding History



Significant Events in FY20

◎ UGA

- Allowed majority (66%) of the 34% Indirect Costs to be retained by SREL
- Cost-Shared 6 faculty positions with SREL
- Provided funding for equipment and personnel
- Cost-shared graduate student and postdoctoral positions

◎ DOE / SRS / External

- Building, equipment, utilities, and site access
- Funding provided by Department of Energy – Savannah River (DOE-SR) under **5-year Cooperative Agreement**
- Funding provided by DOE – National Nuclear Security Administration (NNSA)
- Continued project funding from Area Closure Project (ACP) and Savannah River Remediation (SRR)
- 1.6 million in external funding from non-SRS sources leveraged

Advancements in FY20

1. Work scope:

Research Set-Asides, Site Use Permitting

Enacted significant land management activities for set asides

Graduate and Undergraduate Education Programs

Advised 56 graduate students

Mentored over 98 graduate students total

Taught 23 courses on main UGA campus and 3 at SREL

General Public Outreach and Education Programs

Conducted over 142 public outreach events reaching >23,000 people

Interdisciplinary Research

Continuing collaborative research programs with Savannah River National Laboratory (SRNL), U.S. Forest Service–Savannah River (USFS-SR), Savannah River Remediation (SRR), UGA, U.S. Department of Agriculture (USDA), U.S. Army Corps of Engineers (USACE) & other university, federal, state, and private partners involving research on radionuclide and metal remediation, feral swine control & radioecology

Advancements in FY20

1. Work scope: Continued

Site-wide Source of Ecological Expertise

Provided ecological research support to Area Closures Project, SRR, SRNL, etc.

Scientific Expertise

Submitted Renewal Grant for REU in Radioecology

Submitted 39 Proposals as PI or coPIs to External Granting Agencies

Hired a New Assistant Research Scientist – Wetland Ecology - Microbiology

Scientific Productivity

SREL staff and students published over 118 scientific articles and gave over 139 scientific presentations in FY20

Analytical Services

SREL staff and students analyzed over 3,200 samples for metal contaminants using ICP-MS or ICP-OES technologies

SREL staff and students analyzed over 850 samples for total or methyl mercury using SREL-based equipment

Opportunities for FY21

1. Pursuing Land Lease Near Conference Center
2. New UGA Involvement with SRNL
3. Potential Addition of New Faculty Through Campus Initiatives and UGA Commitments to Battelle
4. Cooperative Agreement Proposal for FY22-FY26
5. Continued Development of Core Missions on the SRS:
 - a) Radioecology and Low Dose Radiation Effects
 - b) Metal and Radionuclide Ecotoxicology
 - c) Radionuclide Fate and Transport Studies
 - d) Enhanced Biomonitoring Technologies
 - e) Outreach and Education Programs

Challenges for FY21

- 1. Funding Environment for External Grants and Contracts**
- 2. Long Term Stability of SREL Model**
- 3. Graduate and Undergraduate Housing Needs**
- 4. Administrative Burden at Current Staff Levels**
- 5. Staff Turnover**
- 6. Additional Resources to Fulfill NERP Mission on SRS**



SUMMARY

Radiological
Environmental
Monitoring and
Outreach
Project

Background

- Outreach project focused on radiological environmental monitoring programs
- Data collection from and with the community as an educational tool
- DOE-funded University of Georgia Savannah River Ecology Lab (UGA SREL) as the independent, third-party
- Working with Georgia WAND to create valuable community connections and networks





Background

- **Historic Burke County**
- **Radiological Environmental Monitoring**
 - South Carolina DHEC sampling in Savannah River
 - SRS has 9 water well locations (2016)
 - Historic SRS air monitoring station located within the county
 - Southern Company's Plant Vogtle through the NRC
 - Georgia EPD monitored in the county until 2004
- **Community Involvement**
 - Engaged in figuring out what is in their environment
 - EPA Technical Assistance Needs Assessment





Background

REMOP Goals

- Data-driven understanding of environment
- Educate community about monitoring programs and associated resources
- Collect community samples to illustrate how environmental monitoring programs operate
- Synthesize data from environmental monitoring programs for use in educational talks and resources





ACHIEVEMENTS

Education and Outreach Programming

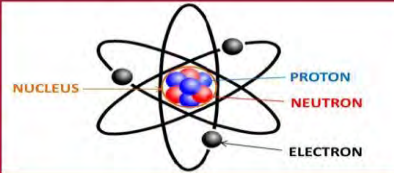
- **Community Talks**
 - 20 Community Talks (July 2017-January 2019)
 - 148 Community Residents Attended
- **Middle School Curriculum**
 - 7th Grade STEM Curriculum (2017-18 & 2018-19)
 - 50 Students/ 3 Weeks/ Each Year
- **Burke County Ecology Day**
 - 19 Table Displays and 22 SREL Volunteers
 - 2018 – 36 Attendees
 - 2019 – 806 3rd, 4th & 5th Graders and 41 Teachers



02: Radiation in Our Lives

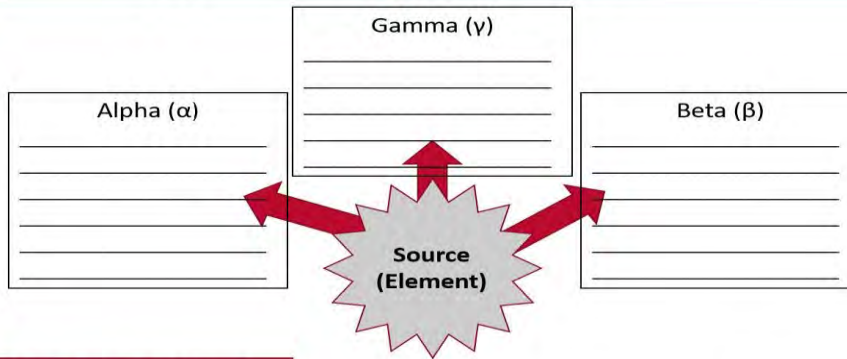
The Radiological Education, Monitoring, and Outreach Project
University of Georgia Savannah River Ecology Laboratory

This handout is to follow along with the presentation, Radiation in Our Lives. If you have questions while participating, please let us know.

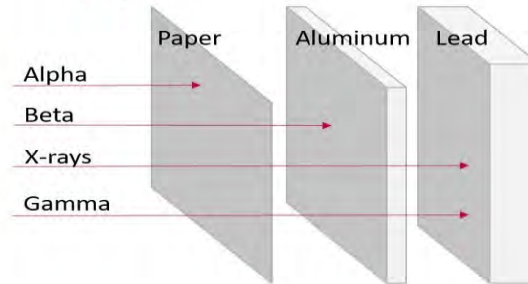


Elements are made up of 3 units: protons, neutrons, and electrons. These are the units that decay.

Elements can exist as a solid, liquid, or gas. Elements are found everywhere and are the building blocks of matter.



Alpha, beta, and gamma radiation can be prevented. Due to their energy levels, different thicknesses and preventative measures can be used. For example, alpha radiation can be prevented by putting a piece of paper between it and yourself.



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RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAMS

DEPARTMENT OF ENERGY SAVANNAH RIVER SITE



The Department of Energy Savannah River Site (SRS) monitors radiological contaminants in the environmental throughout the year and releases an annual environmental report.

This report includes information about site-wide environmental monitoring and surveillance effectiveness as well as to confirm SRS is complying with environmental regulations.

The SRS monitoring program began in 1951 with air monitoring, surface water, sediment, food crops, and well water.

The SRS continues to monitor air, surface water, sediment, food crops, and well water but has since added monitoring of deep ground water wells and fish and game species.

This report can be found on the SRS website, www.srs.gov, under Environmental Reports.



1. Mercury analyzer machines tests samples for the heavy metal mercury. Although mercury is not radioactive, it is significant to human health.
2. Feral hogs are also tested for contaminants because they are a game species.

GEORGIA POWER



The environmental monitoring report for Plant Vogtle, located in Burke County, Georgia, can be found on the Nuclear Regulatory Commission's website (www.nrc.gov).

Annual reports are release by the NRC that are received from Southern Nuclear's monitoring program team. It includes information about Plant Vogtle monitoring and compliance with environmental regulations.

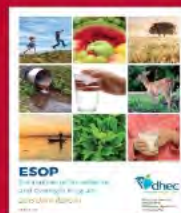
Georgia Power's environmental monitoring report is reported by Southern Nuclear Operating Company as the Annual Radiological Environmental Operating Reports to the Nuclear Regulatory Commission.

This report includes comparisons between samples taken at location where there is no expected radiological levels and where there are expected to be levels of radio-activity.



3. Mercury analyzer machines tests samples for the heavy metal mercury. Although mercury is not radioactive, it is significant to human health.
4. Feral hogs are also tested for contaminants because they are a game species.

OTHER ENVIRONMENTAL MONITORING PROGRAMS IN OUR AREA



The South Carolina Department of Health and Environmental Control also performs environmental monitoring of radionuclides.

This program monitors within the Savannah River as well, which is of interest to Burke County residents who recreate in the river.

The Georgia Environmental Protection Division also monitored the state for radiological contaminants until 2004. It monitored eight radiological facilities in the state, including Plant Vogtle and the SRS.

Old reports can be requested from their office.



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CONTAMINANTS IN WATER



REGULATORY LIMITS AND MONITORING

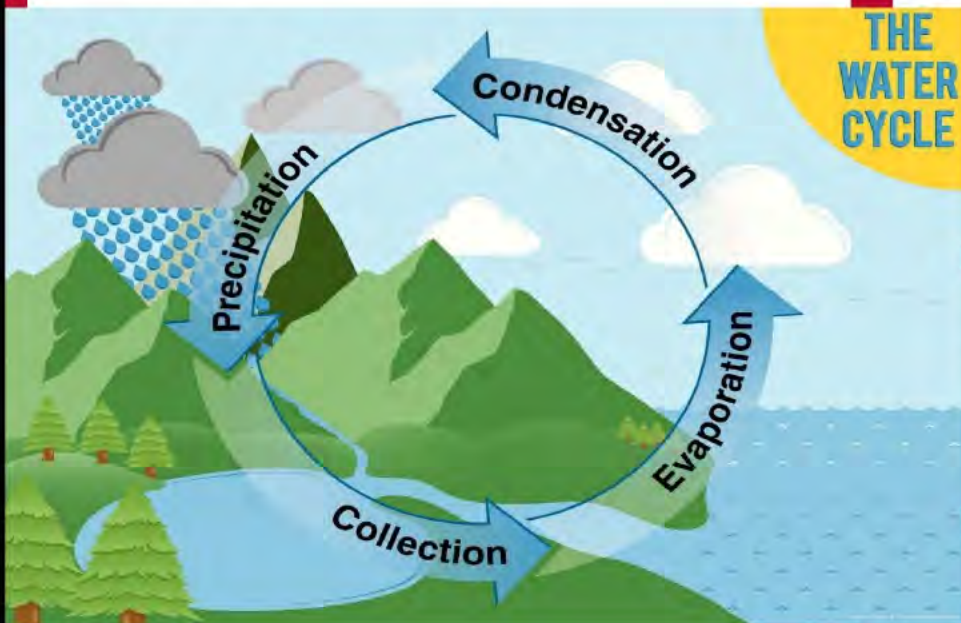
The EPA Drinking Water Standard for Tritium, a radioactive isotope of water, is 20,000 pCi/mL. It is measured at less than 0.03 pCi/mL in Burke County according to the environmental monitoring reports.

PROTECTING NATURAL AREAS

Water can be naturally filtered of certain contaminants when it is held in natural water bodies, like Carolina Bays and wetlands. Protecting these habitats

will ensure that natural filtering processes can continue to remove harmful contaminants from our environment.

The most common contaminants found in drinking water are industrial solvents, weed killers, and refrigerants.



CYCLING THROUGH THE WATER

Humans can come into contact with contaminants in all of its forms – rain, surface water, and groundwater. Groundwater is most concerning because humans use groundwater for drinking water wells. Contaminants in groundwater can be natural (like iron or manganese) or from human sources, like industry.





ACHIEVEMENTS

Community Engagement

- **Community Advisory Council**
 - 4 Meetings over 2 years
 - Regular Requests for Feedback on Educational Materials
 - 12 Community Residents Served
- **Community Survey**
 - Distributed at Community Events
 - 63 Surveys Returned
- **Community Newsletter**



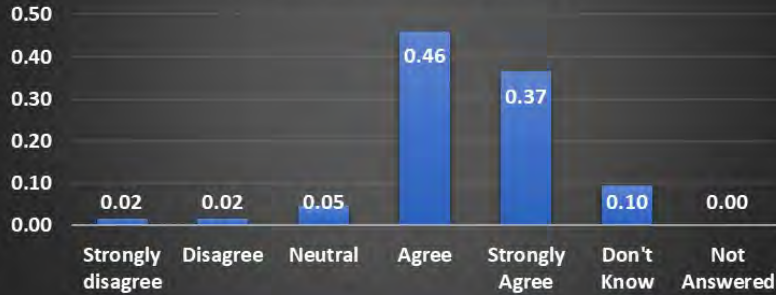
Survey

Please rate your level of agreement with the following statements about contaminants in the environment and how those contaminants affect your health.						
Contaminants are something, like lead, mercury, or radiation, that makes a place or a substance (such as water, air, or food) no longer suitable for use.						
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
Contaminants enter Burke County through multiple ways	1	2	3	4	5	Don't know
Contaminants enter Burke County from the Savannah River Site	1	2	3	4	5	Don't know
Contaminants enter Burke County from Plant Vogtle	1	2	3	4	5	Don't know
Contaminants enter Burke County from agriculture	1	2	3	4	5	Don't know
Contaminants enter Burke County from industry like the paper mill	1	2	3	4	5	Don't know
The contaminants in Burke County affect my health	1	2	3	4	5	Don't know
The contaminants in Burke County affect my family's health	1	2	3	4	5	Don't know
Contaminants enter my body through the water that I drink	1	2	3	4	5	Don't know
Contaminants enter my body through the food that I eat	1	2	3	4	5	Don't know
Contaminants enter my body through the air that I breathe	1	2	3	4	5	Don't know
Radiation is present in everyday items like cell phones	1	2	3	4	5	Don't know
It is healthy to eat all the fish from the Savannah River	1	2	3	4	5	Don't know
Scientists make decisions about regulatory limits of contaminants	1	2	3	4	5	Don't know
Government officials make decisions about regulatory limits of contaminants	1	2	3	4	5	Don't know
I alter my behavior based on how risky something is	1	2	3	4	5	Don't know
Living in Burke County is risky due to the contaminants in the environment	1	2	3	4	5	Don't know
Living in Burke County is risky due to the Savannah River Site	1	2	3	4	5	Don't know
Living in Burke County is risky due to Plant Vogtle	1	2	3	4	5	Don't know
Living in Burke County is risky due to the radiation in the environment	1	2	3	4	5	Don't know
It is a greater risk for me to receive an x-ray at the doctor than to live next to a nuclear power plant	1	2	3	4	5	Don't know
I feel very prepared for potential nuclear emergencies in Burke County	1	2	3	4	5	Don't know

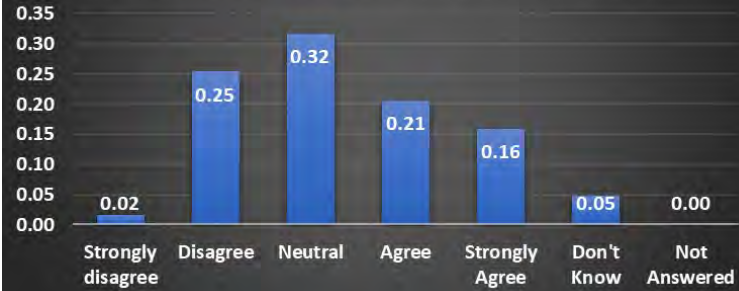




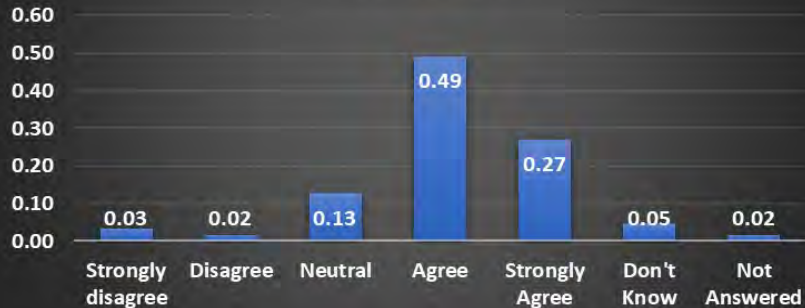
CONTAMINANTS ENTER BURKE COUNTY THROUGH MULTIPLE WAYS



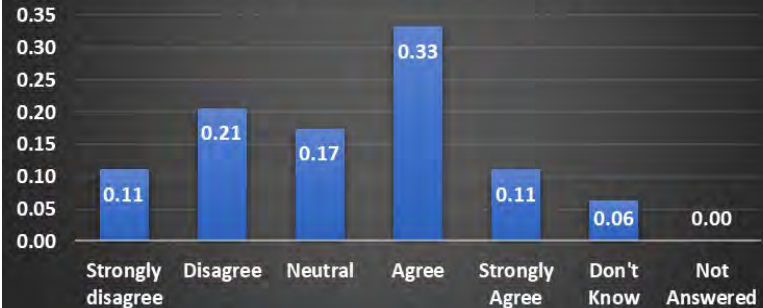
LIVING IN BURKE COUNTY IS RISKY DUE TO THE CONTAMINANTS IN THE ENVIRONMENT



CONTAMINANTS IN BURKE COUNTY AFFECT MY HEALTH



I FEEL VERY PREPARED FOR POTENTIAL NUCLEAR EMERGENCIES IN BURKE COUNTY





REMOP NEWSLETTER



The Radiological Education, Monitoring, and Outreach Project (REMOP) is an outreach project with the goal of increasing community-wide understanding of environmental monitoring programs as well as understanding the data collected by those programs. Monthly talks on different subjects will build foundational knowledge to understanding the multiple pieces of a monitoring program. We will also collect limited samples for educational purposes so that citizens can experience sample collection and learn how data generated from such samples are used in long-term monitoring programs in the region.

If you have any questions or would like to submit information for potential sampling, please call 803-725-2649 or email remop@srel.uga.edu.

EVENTS

Radiation in Our Lives

Monday, September 18, 2017 | 9:30 am | 10:30 am | 1 pm | 6:30 pm

Savannah River Site Citizen's Advisory Board Meetings

Monday, September 25 & 26, 2017
Courtyard Charleston Historic District, 125 Calhoun Street, Charleston, SC 29401

Environmental Monitoring Programs

Monday, October 16, 2017 | 9:30 am | 10:30 am | 1 pm | 6:30 pm

What is Risk?

Monday, November 27, 2017 | 9:30 am | 10:30 am | 1 pm | 6:30 pm



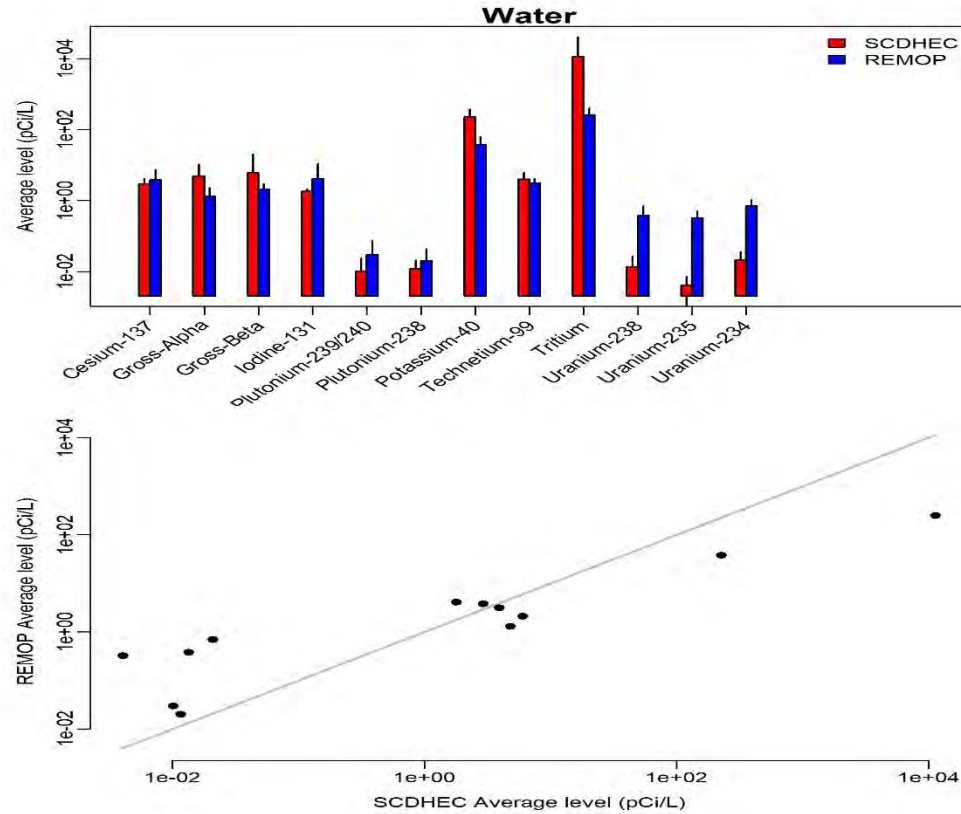


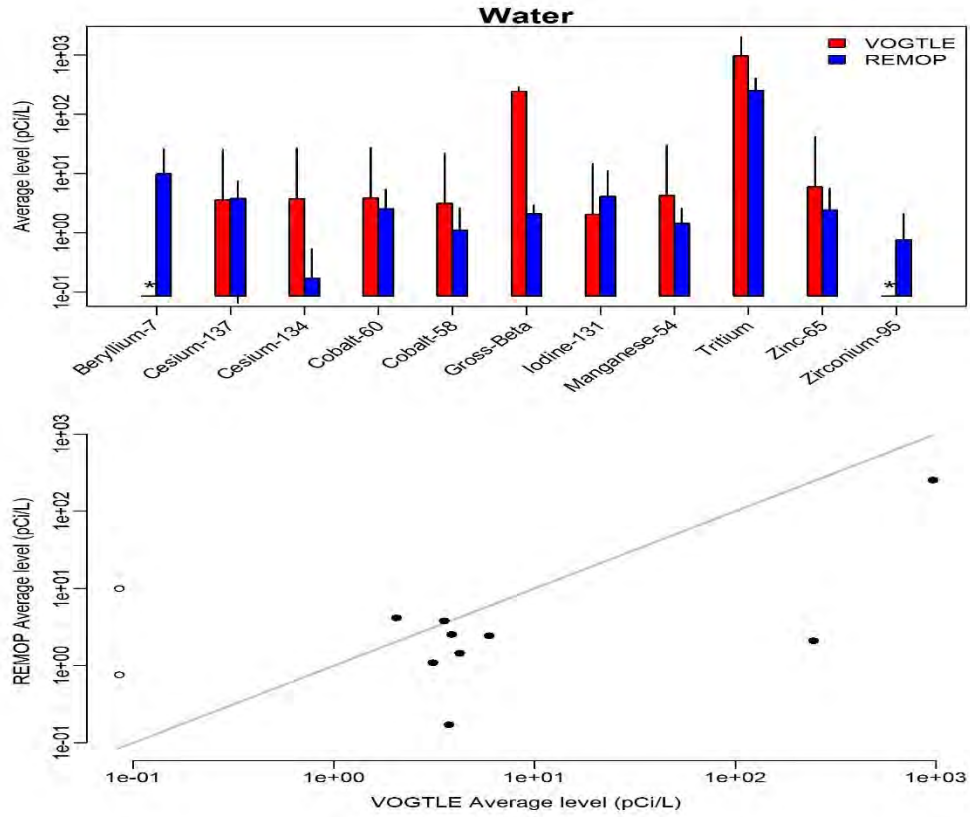
ACHIEVEMENTS

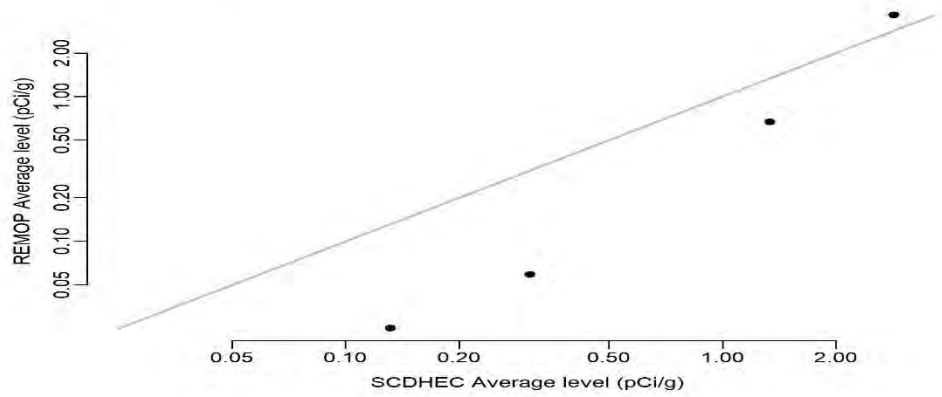
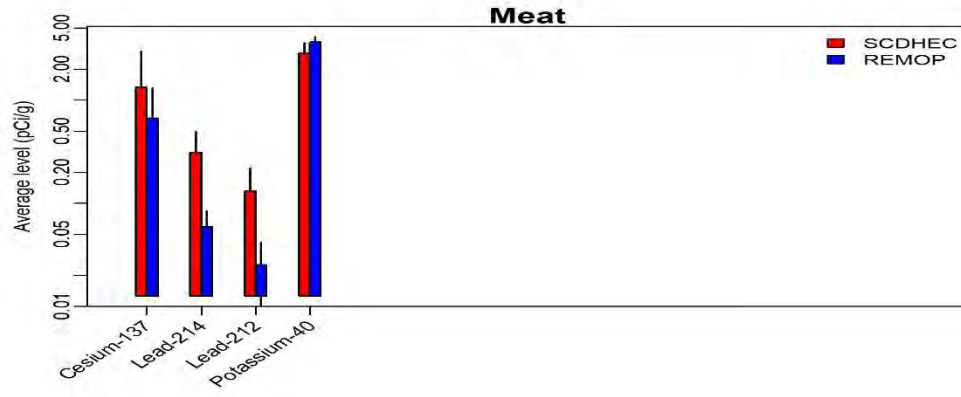
Environmental Sampling

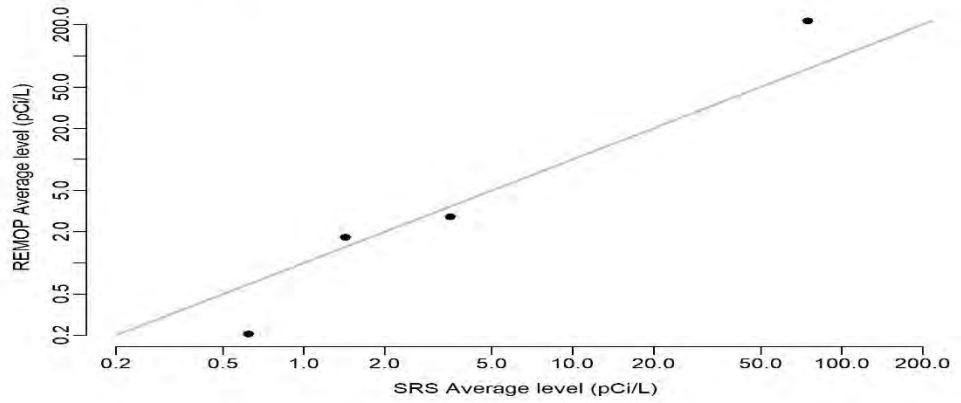
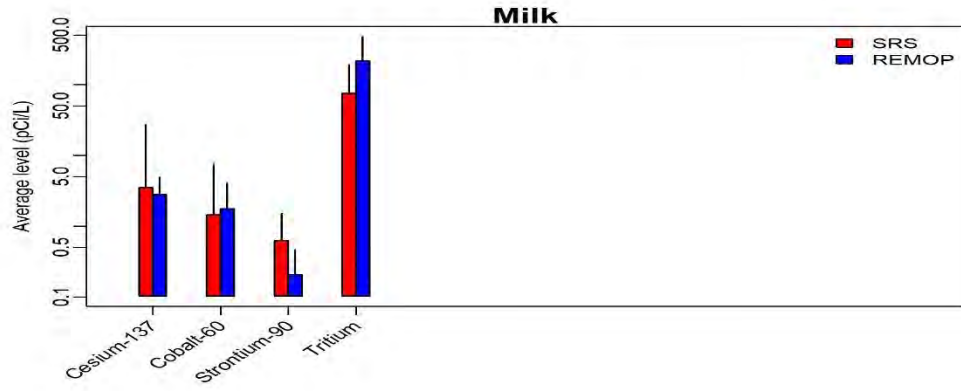
- Radionuclide Analyses of Samples
 - 17 Radionuclides Surveyed 24 times in Air
 - 38 Radionuclides Surveyed in 9 Fruit & 10 Meat Samples
 - 7 Radionuclides Surveyed in 10 Milk Samples
 - 36 Radionuclides Surveyed in 10 Soil Samples
 - 37 Radionuclides Surveyed in 10 Surface Water Samples
 - 38 Radionuclides Surveyed in 10 Vegetable samples
- Historical Data
 - SRS – Summarized Data From 2005-2015
 - SCDHEC – Summarized Data From 2006-2017
 - VOGTLE – Summarized Data From 2005-2016













ACHIEVEMENTS

Environmental Sampling

- **Heavy Metals Analyses of Samples**
 - 23 Heavy Metals Surveyed in 7 Fruit Samples
 - 23 Heavy Metals Surveyed in 10 Meat Samples
 - 23 Heavy Metals Surveyed in 10 Milk Samples
 - 23 Heavy Metals Surveyed in 10 Soil Samples
 - 23 Heavy Metals Surveyed in 10 Surface Water Samples
 - 23 Heavy Metals Surveyed in 10 Vegetable samples





Matrix	Analyte	Unit	Result_Type	N	Mean	SD	Min	Max
Fruit	Total Mg	ppm	Dry weight	7	0.002	0.001	0.001	0.003
Fruit	Mg 24	mg.kg	Dry weight	7	481.571	145.624	350.000	725.000
Fruit	Al 27	mg.kg	Dry weight	7	0.000	0.000	0.000	0.000
Fruit	Fe 56	mg.kg	Dry weight	7	4.929	5.173	0.000	14.800
Fruit	Be 9	mg.kg	Dry weight	7	0.000	0.000	0.000	0.000
Fruit	B 11	mg.kg	Dry weight	7	9.576	10.415	3.120	31.500
Fruit	V 51	mg.kg	Dry weight	7	0.000	0.000	0.000	0.000
Fruit	Cr 52	mg.kg	Dry weight	7	0.073	0.038	0.000	0.129
Fruit	Mn 55	mg.kg	Dry weight	7	18.841	9.333	2.890	26.900
Fruit	Co 59	mg.kg	Dry weight	7	0.000	0.000	0.000	0.000
Fruit	Ni 60	mg.kg	Dry weight	7	0.894	1.247	0.075	3.520
Fruit	Cu 63	mg.kg	Dry weight	7	2.051	1.200	0.728	4.000
Fruit	Zn 66	mg.kg	Dry weight	7	3.136	1.804	1.420	5.740
Fruit	As 75	mg.kg	Dry weight	7	0.000	0.000	0.000	0.000
Fruit	Se 78	mg.kg	Dry weight	7	2.257	5.972	0.000	15.800
Fruit	Sr 88	mg.kg	Dry weight	7	3.301	2.147	1.660	7.720
Fruit	Ag 107	mg.kg	Dry weight	7	0.000	0.000	0.000	0.000
Fruit	Cd 111	mg.kg	Dry weight	7	0.033	0.087	0.000	0.229
Fruit	Ba 138	mg.kg	Dry weight	7	9.804	11.278	2.260	34.400
Fruit	Tl 205	mg.kg	Dry weight	7	0.011	0.030	0.000	0.079
Fruit	Pb 208	mg.kg	Dry weight	7	0.000	0.000	0.000	0.000
Fruit	Th 232	mg.kg	Dry weight	7	0.000	0.000	0.000	0.000
Fruit	U 238	mg.kg	Dry weight	7	0.000	0.000	0.000	0.000

Some Lessons Learned

➤ Outreach and Education

- ❖ Engage the Community Where it Lives
- ❖ Work with Local Partners
- ❖ Put Your Effort Where it is Most Effective

➤ Environmental Monitoring Data

- ❖ Difficult to Collect and Expensive to Analyze
- ❖ Data Directly Influenced by Sample Type and Methods Used

➤ Environmental Monitoring Programs

- ❖ Data Not Easily Comparable Across Programs
- ❖ Differing Media Collected
- ❖ Differing Sample Types, Volumes, and Analytical Methods
- ❖ Differing Data Management Methods



THANK YOU