

Ecology at SRS

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UGA Athletic Association Professor of
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The University of Georgia

Savannah River Ecology Laboratory

Where Ecology Started at the SRS

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



Dr. Eugene Odum

1954 – Established permanent lab on the SRS



1970 – Elected to the National Academy of Sciences

Where Ecology Started at the SRS

1951 - Atomic Energy Commission (AEC) funded Dr. Patrick to collect baseline data on water quality and biota of the Savannah River – these surveys were conducted for decades to assess impacts of SRS operations on the environment



Dr. Ruth Patrick



**1990 – Ruth Patrick Science Center
is Established at USC-Aiken**

1970 – Elected to the National Academy of Sciences



UNIVERSITY OF GEORGIA

Savannah River Ecology Laboratory

The University of Georgia operates SREL on the SRS under a Cooperative Agreement with DOE and is funded by a combination of DOE-EM, DOE-NNSA and other external funding sources, including USDA, DoD, COE, NSF, state agencies, and private NGO's. SREL has been on the SRS for 65 years.



SREL's Mission

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

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

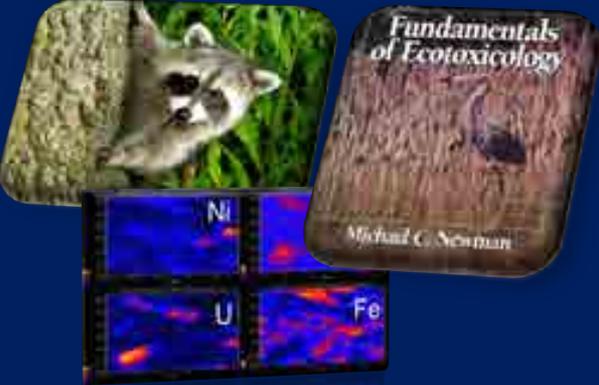
SREL's Value to DOE

SREL is a significant asset to the DOE and its contractors on the SRS. The laboratory provides ecological expertise and peer-reviewed scientific research critical to understanding the fate and transport of radioactive and heavy metal contaminants on the SRS, the health and function of ecosystems on the SRS, and the education of the general public on the success of and requirements for remediation of the site to reduce risk.

SREL is a good partner to DOE and its contractors on the SRS. The laboratory management leverages ~1.5 dollars from other sources for every EM dollar invested in the laboratory.

SREL's outreach program builds public trust, reaching over 65,000 people per year and helping to educate the public about the role that the SRS plays in environmental stewardship in the region

SREL's education programs fill gaps in critical scientific expertise for SRS and the nation, educating graduate students and providing experiential learning to undergraduates, many of whom go on to work for DOE or SRS contractors



History of Radioecology Research at SREL

◎ 1950's and 60's –

- Studies of the **effects of ionizing radiation** on plants and animals
- Use of radionuclides as **tracers for studies of basic ecological processes** such as food web dynamics, biogeochemistry, and behavioral and physiological processes of individual species

◎ 1970's and 80's –

- Studies of **fine-scale distribution and mobility** of radionuclides in contaminated environments
- Studies of **uptake and transport of radionuclides** in soils, water, vegetation, fish, and wildlife
- Studies of uptake and **health risks** of radionuclides in **agricultural ecosystems**

History of Radioecology Research at SREL

◎ 1980's and 90's –

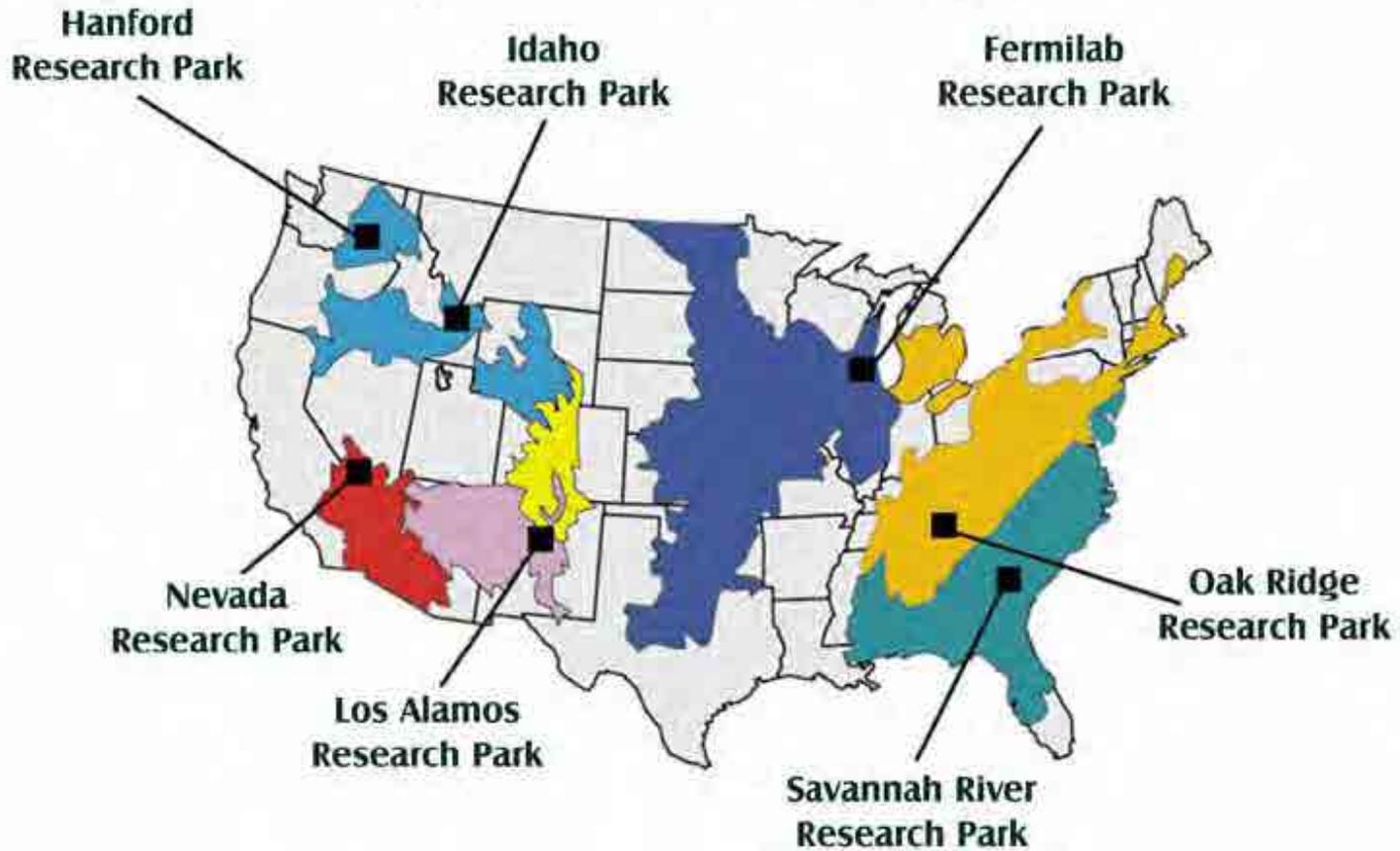
- Studies of the **transport and effects of radio-cesium** in long-lived species of plants and animals
- **Bioavailability** of radionuclides in aquatic sediments and **remediation** options for exposed sediments
- Effects of **radionuclide speciation** on contaminant transport
- **Genetic effects** of radionuclides in vertebrates
- Establishment of the **Par Pond radioecology laboratory** at the Savannah River Site
- Establishment of the **International Radioecology Laboratory at Chernobyl** in partnership with Ukraine, the US State Department, DOE, and SREL

History of Radioecology Research at SREL

◎ 2000's –

- Over **200 scientific papers on radioecology** published by SRS scientists
- SRS has developed **radioecology databases** spanning more than 30 years
- SREL has established a one of a kind facility for the study of the effects of **low dose exposure** to radionuclides in aquatic organisms
- Studies have begun to focus on the **synergistic effects** of radionuclides with other environmental contaminants on the Savannah River Site

National Environmental Research Parks and Associated Ecoregions



- | | | | |
|--|--|---|---|
|  Shrub-steppe |  Juniper-Pinyon and Grassland |  Tallgrass Prairie |  Southeastern Mixed Forest |
|  Desert Shrub |  S. Rockies Conifers |  Eastern Deciduous Forest | |

WHAT IS A NERP ?

- ⦿ *A National Environmental Research Park (NERP) is an outdoor laboratory where research may be carried out to achieve national environmental goals National Environmental Research Parks are actually field laboratories set aside for ecological research, for study of the environmental impacts of energy developments, and for informing the public of the environmental and land-use options open to them.*
- ⦿ **NERPs consist of several designated Department of Energy (DOE) facilities and their surrounding security buffers. There are currently seven NERPS: Idaho, Hanford, Los Alamos, Oak Ridge, Fermilab, Nevada and Savannah River.**
- ⦿ **The Savannah River Site became the first NERP in 1972.**

SRS as a NERP Site

The SRS NERP is home to >1300 species of vascular plants, >100 species of reptiles and amphibians; 50 species of mammals; nearly 100 species of fish; and provides permanent habitat or migratory rest for >250 species of birds. Nearly 600 species of aquatic insects can be found in Upper Three Runs Creek alone, and in recent decades several new species have been described from SRS streams and wetlands. The SRS also provides habitat for a number of sensitive species, including wood storks, red-cockaded woodpeckers, and smooth purple coneflowers (all federally endangered), and at least 30 plant species of state or regional concern.

SRS as a NERP Site

The Savannah River NERP protects over **300 Carolina bays and other depression wetlands**, most of which have no other form of protection under current wetland law. Four major freshwater streams flow through the SRS, one of which contains the highest reported species richness of aquatic insects for any stream in the Western Hemisphere (**Upper Three Runs Creek**). Retired cooling reservoirs on the SRS also provide habitat for an abundance of alligators, turtles, and migratory waterfowl.

The SRS NERP also protects more than **1300 known archaeological sites**.

SRS Set Aside's

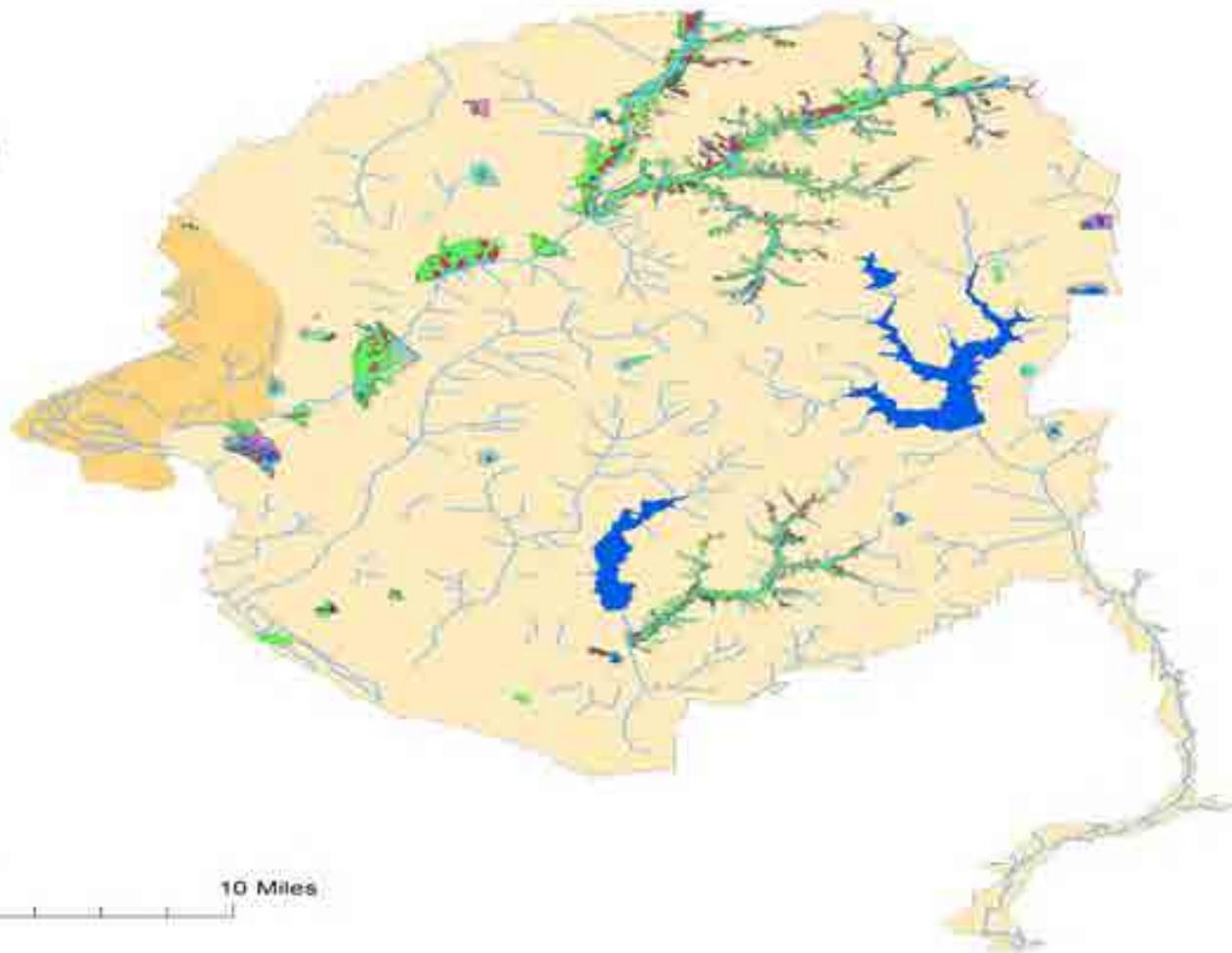
The Savannah River Ecology Laboratory (SREL) represents the Department of Energy for the Savannah River Site NERP. The SRS's Set-Aside Program began in the 1960s when the Atomic Energy Commission (AEC) established 10 relatively small SREL Reserve Areas to represent the various habitats on what was formerly known as the Savannah River Plant and to secure study sites for conducting long-term ecological research. The program was expanded in the 1980s to 30 DOE Research Set-Aside Areas to better protect sensitive species habitats, preserve the biological integrity of Upper Three Runs Creek, and to buffer SREL's long-term research sites from forest management activities.

DOE Research Set-Aside Areas of the SRS

Legend

Set-Aside Area Habitats

- Bottomland Hardwood / Pine Forest
- Bottomland Hardwood Forest
- Carolina Bay Wetland
- Forb / Grassland
- Hardwood Forest
- Loblolly Pine Forest
- Longleaf Pine Forest
- Mixed Pine / Hardwood Forest
- Mixed Pine Field
- Mixed Swamp Forest
- Old Field
- Other - Disturbed Area
- Sand Pine Forest
- Sandhill Pine / Scruboak Forest
- Sandhill Scruboak / Pine Forest
- Scrub / Shrub
- Slash Pine Forest
- Water Body



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

◎ UGA Employees

- Research Faculty – 6
- 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

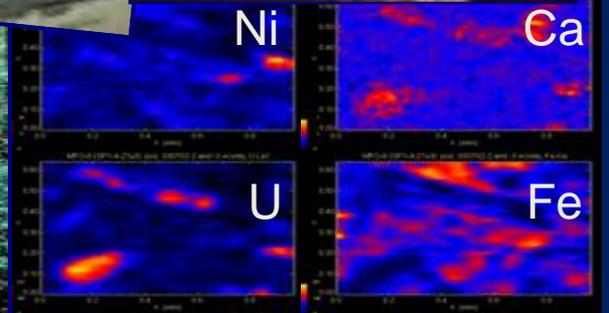
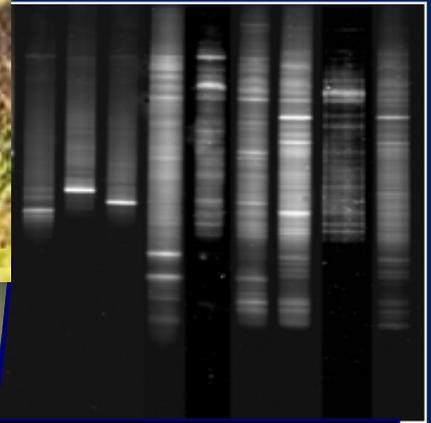
173 Staff & Students

◎ Facilities & Research Areas

- A-Area (laboratories, equipment, offices, animal care, storage)
- Par Pond (low-dose facility)
- 30 DOE Set-Asides
- 75 field research sites

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



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

