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2013 SRS Environmental Report Overview

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SRS Citizens Advisory Board Meeting
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Purpose

- To fulfill a 2014 Facilities Disposition and Site Remediation Committee Work Plan Commitment
- To provide the CAB and public an understanding of the SRS Environmental Report results for 2013
- To present data that show SRS operations result in minimal impact to the public and environment

Acronyms and Definitions

- **Environmental Monitoring -** Program at SRS that includes effluent monitoring and environmental surveillance with a dual purpose of showing compliance with federal, state, and local regulations, as well as DOE Orders.
- **Criteria Pollutant -** Six common air pollutants found all over the United States: particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur dioxide, nitrogen oxides, and lead. National Ambient Air Quality Standards for the criteria pollutants are established by the EPA.
- **Exposure -** Incidence of radiation on living or inanimate material.
- **Dose -** The amount of energy a person receives internally or externally as a result of a radioactive source.
- **Representative Person -** An individual receiving a dose that is representative of the more highly exposed individuals in the population.
- **Curie –** The traditional measure of radioactivity based on the observed decay rate of 1 gram of radium. One curie of radioactive material will have 37 billion disintegrations in 1 second.

Acronyms and Definitions, continued

- rem = roentgen equivalent man - A unit of radiation dose equivalent; a product of the absorbed dose and a weighting factor which accounts for the effectiveness of radiation to cause biological damage; millirem (mrem) is one thousandth of a rem
- BJWSA = Beaufort-Jasper Water and Sewer Authority
- CFR = Code of Federal Regulations
- CT = Computerized tomography
- EPA = Environmental Protection Agency
- NPDES = National Pollutant Discharge Elimination System
- PCB – Polychlorinated biphenyl
- pCi/L = picocurie per liter
- pCi/m^3 = picocurie per cubic meter
- SCDHEC = South Carolina Department of Health and Environmental Control
- µg/g = microgram per gram

SRS Environmental Report for 2013

- **Chapter 1** – Introduction
- **Chapter 2** – Environmental Management Systems
- **Chapter 3** – Compliance Summary
- **Chapter 4** – Effluent Monitoring
- **Chapter 5** – Environmental Surveillance
- **Chapter 6** – Radiological Dose Assessments
- **Chapter 7** – Groundwater
- **Chapter 8** – Quality Assurance

- **Savannah River Site Environmental Report Summary**

Summary

- **SRS has a comprehensive environmental monitoring program**
  - Monitors facility discharges (air and liquid)
  - Monitors extensively on- and off-site extending to Savannah, Georgia
  - Evaluate Radiological and Chemical constituents
- **Results confirm SRS operations are protective of the environment and human health**
  - Annual dose from SRS operations less than 1 mrem

Why SRS Monitors?

- Characterize and quantify released and legacy contaminants
- Demonstrate compliance with applicable environmental standards
- Calculate radiation exposures to the public
- Assess the effects, if any, to the public and the environment

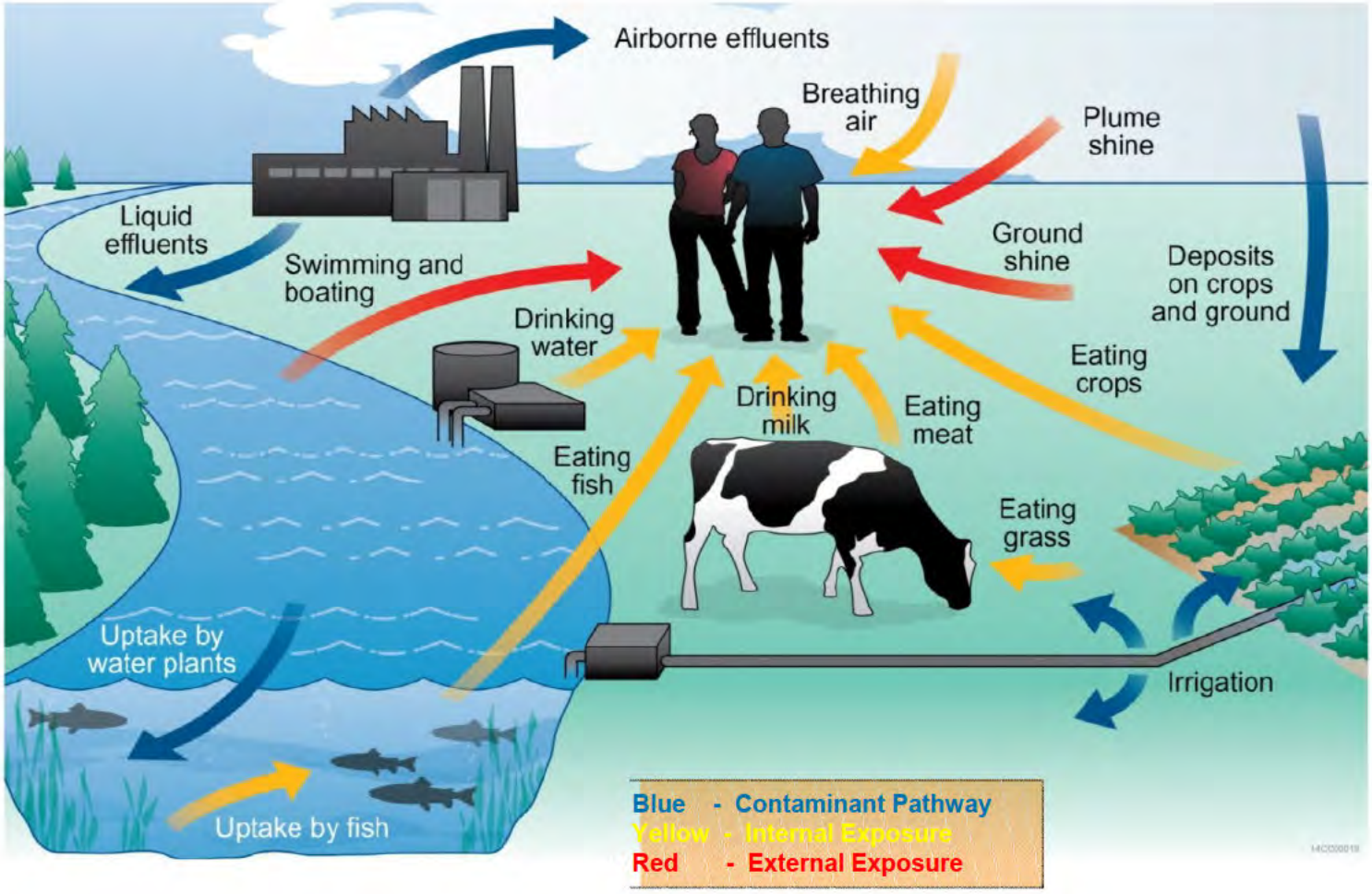
SRS Environmental Program Compliance – Chapter 3

- Environmental program requirements provide specific standards and limits for protection of the public and environment
  - Managed 570 construction and operating permits
  - Federal and State laws, and DOE Orders
    - *Clean Air Act*
    - *Clean Water Act*
    - *Safe Drinking Water Act*
    - *Resource Conservation and Recovery Act*
    - *Comprehensive Environmental Response, Compensation, and Liability Act*
    - *South Carolina Regulations*
    - *DOE Order 458.1, Radiation Protection of the Public and Environment*

SRS Environmental Monitoring

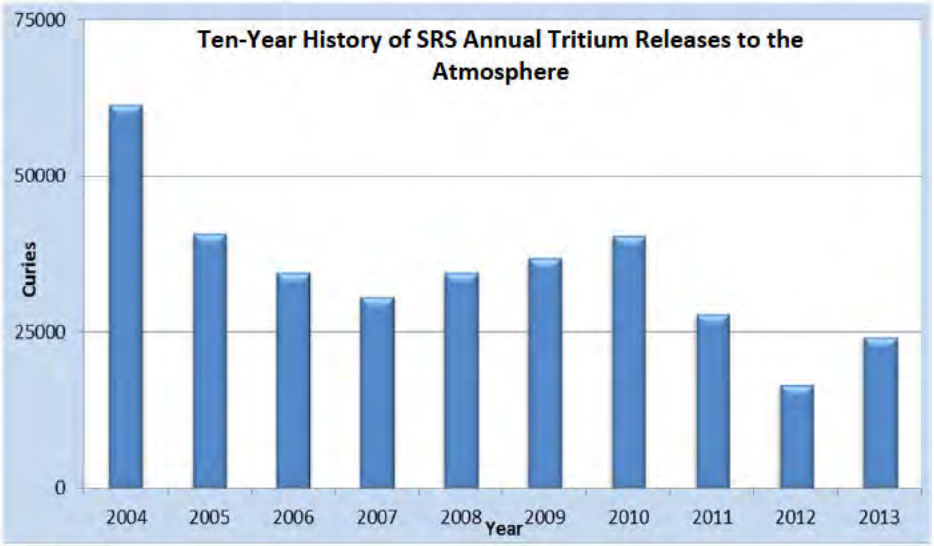
- Effluent Monitoring
  - The collection of samples or data from the point at which a facility discharges liquid or airborne releases to the environment
    - Used for demonstrating compliance with standards and to model radiological doses to the public
- Environmental Surveillance
  - The collection of samples of air, water, soil, vegetation, milk, food products, fish, biota, and other media—or of data—from the environment
    - Used to monitor the pathways of exposure and doses to the public

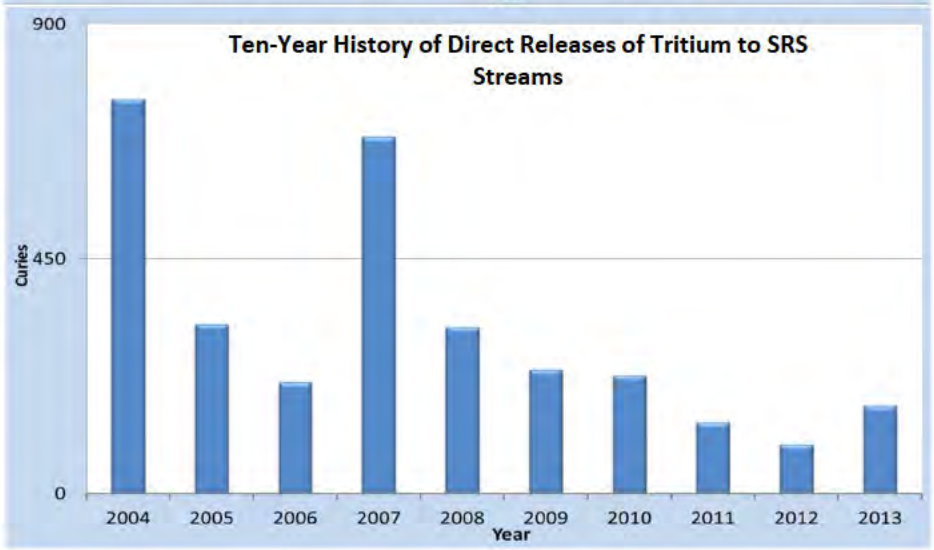
Exposure Pathways – Chapter 6



Radiological Effluent Monitoring – Chapter 4

- Tritium is the radionuclide of greatest abundance in SRS releases
- In 2013, SRS released a total of about 24,470 Curies versus about 16,800 in 2012
  - Air
    - *About 24,300 Curies to the atmosphere*
    - *Increase due to shutdown activities in H Area*
  - Liquid
    - *About 170 Curies to SRS streams*
    - *Increase due to higher than average rainfall*





Chapter 4 – Environmental Report

Non-Radiological Effluent Monitoring – Chapter 4

Compliance Sample Collection at an Industrial Wastewater Outfall

- AIR
  - ***ALL*** *permitted emission limits for air pollutants were met in 2013*

- LIQUID
  - NPDES Permit Compliance Status

    Industrial Wastewater

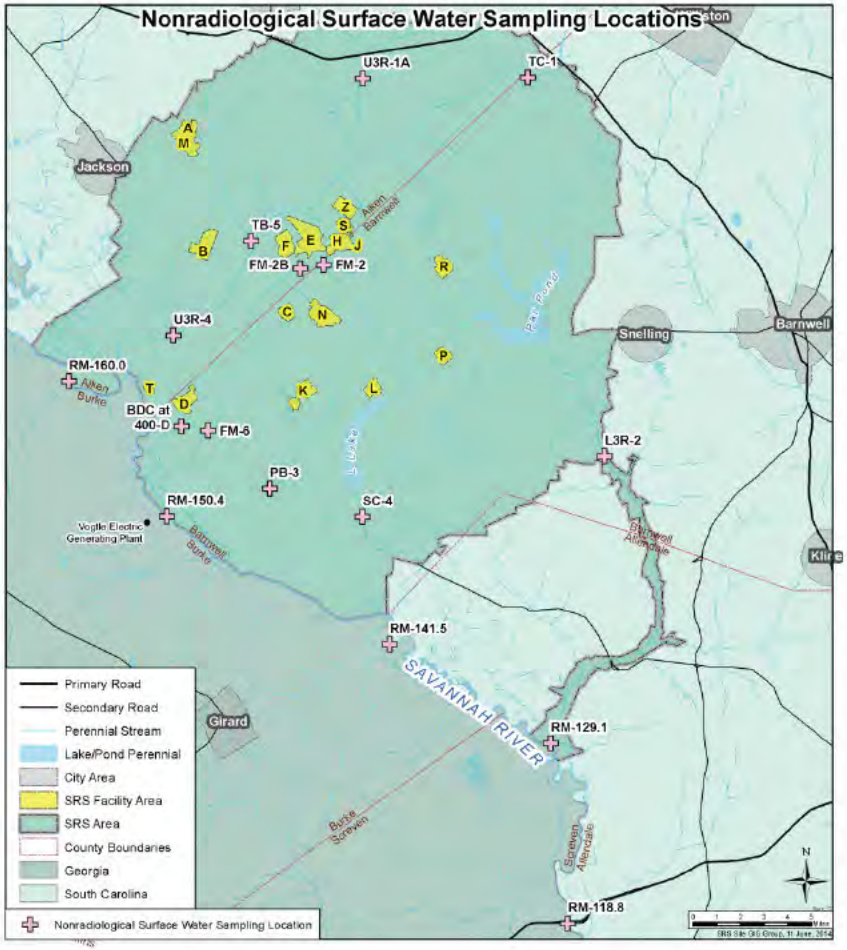
    - *Analyses of about 4,000 samples were 99.9% compliant with industrial wastewater permit requirements*
    - *SRS received two Notices of Violation from SCDHEC for exceedance of total suspended solids and toxicity at two different outfalls*

    Stormwater Outfalls

    - ***ALL*** *outfalls were monitored and in 100% compliance with stormwater permit requirements*

Non-Radiological Surveillance – Water Quality – Chapter 5

- ***SRS discharges did not impact the water quality in onsite streams or the Savannah River***
- **Water Quality parameters were analyzed on all stream and river surveillance samples**
  - *Parameters include pH, temperature, dissolved oxygen, metals, organics, total suspended solids, pesticides, herbicides, and PCBs*
  - *Metals were detected in at least one sample at each location*
  - *With the exception of one pesticide detected in January 2013 at Upper Three Runs, no other sample results showed detectable levels of pesticides, herbicides, or PCBs*

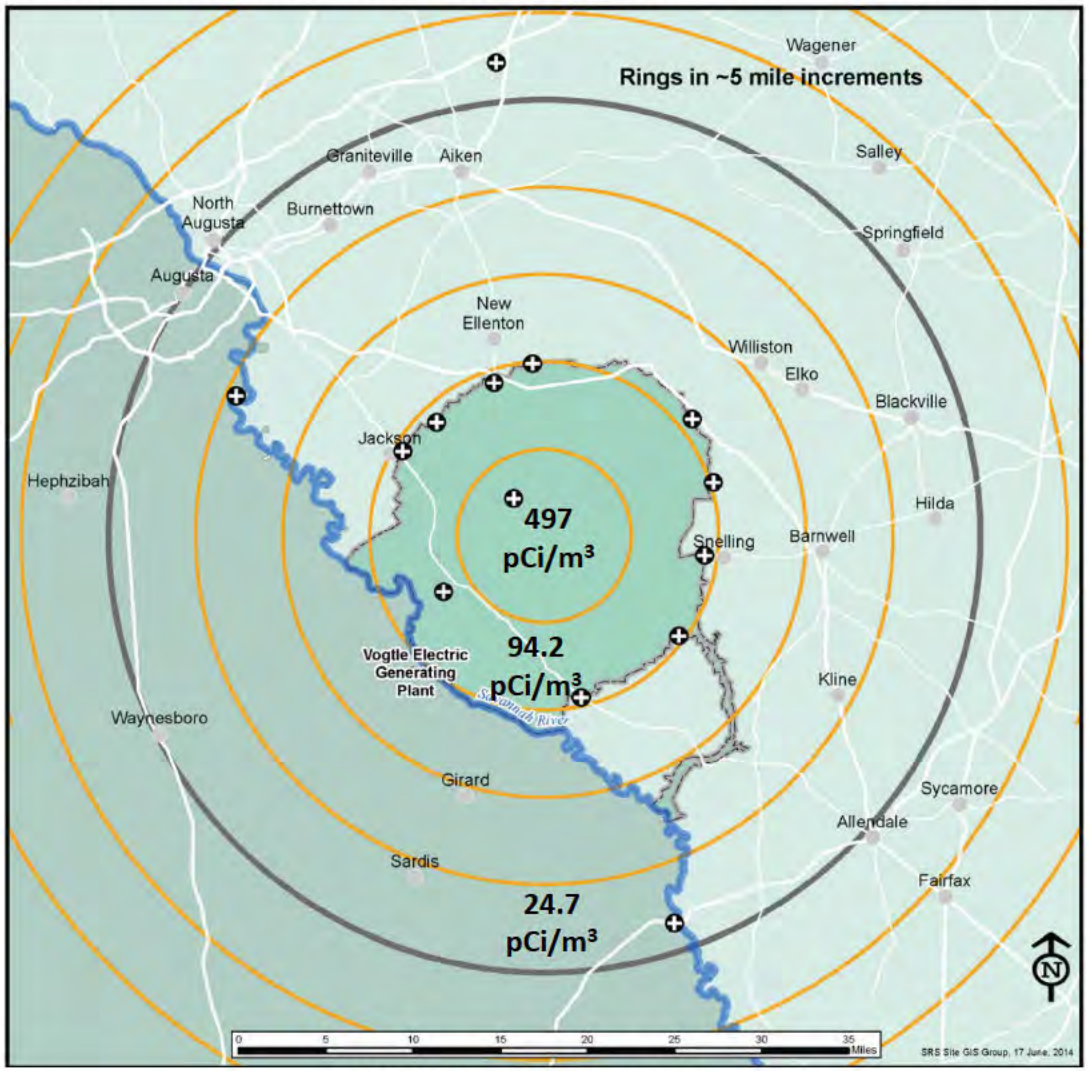


Offsite Georgia & South Carolina Monitoring – Chapter 5

- **SRS collects samples beyond the Site perimeter to assess exposures to the public from SRS operations**
  - Samples include air, water, soil, vegetation, milk, food products, fish and other media
  - Many locations 25 miles from SRS and some locations as far as 100 miles from SRS

2013 Offsite Sample Collection		
	Samples	**Locations**
Georgia	472	43
South Carolina	303	38

Radiological Surveillance – Air – Chapter 5

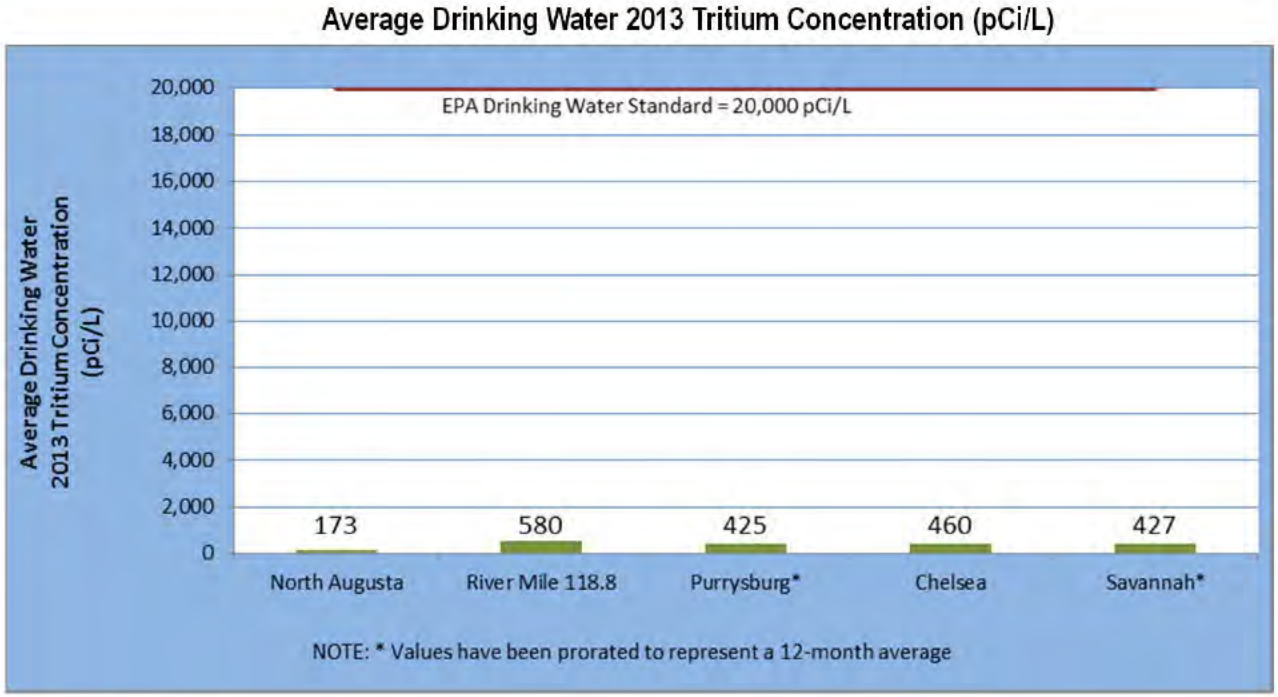


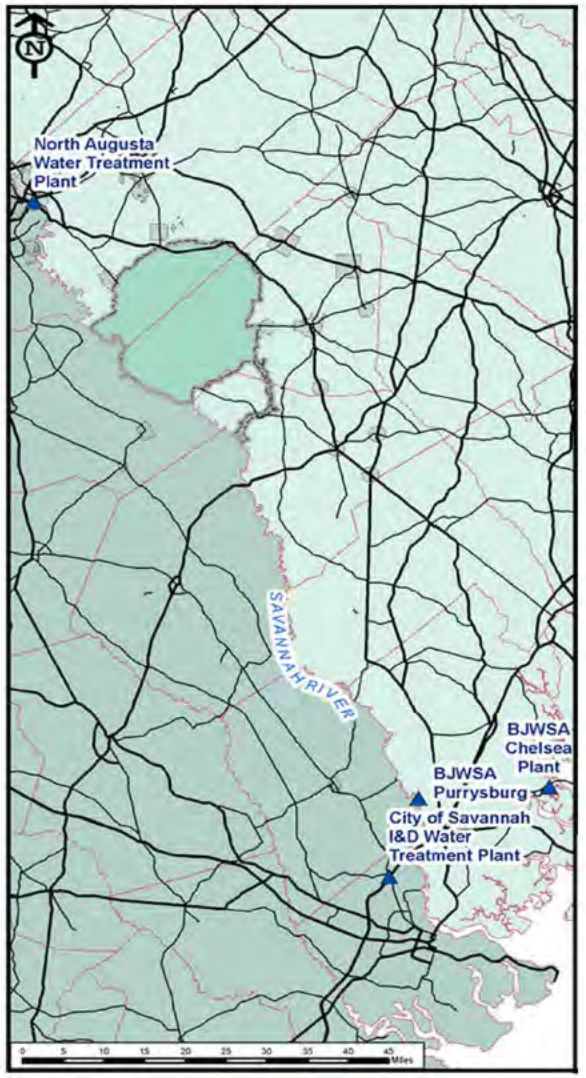
Note: Rings in 5 Mile increments

- Tritium in air results are well below the concentration of 2,000 pCi/m³ which is equivalent of 1 mrem exposure

Radiological Surveillance - Drinking Water – Chapter 5

- **Monitored above and below SRS as well as onsite**
- **Tritium concentrations remain well below the drinking water standard of 20,000 pCi/L**





Radiological and Non-Radiological Surveillance – Fish – Chapter 5

- SRS collected 190 fish from seven locations along the Savannah River, upstream and downstream from SRS, and shellfish from the South Carolina coast
- Cesium levels for fish in the Savannah River ranged from below detectable levels to 0.330 pCi/g in bass
  - Results are consistent with historical trends
- Mercury levels for fish in the Savannah River ranged from below detectable levels to 1.00 µg/g in bass; lower than 1.08 µg/g in bass observed in 2012
  - Review of mercury data shows a decreasing trend by location

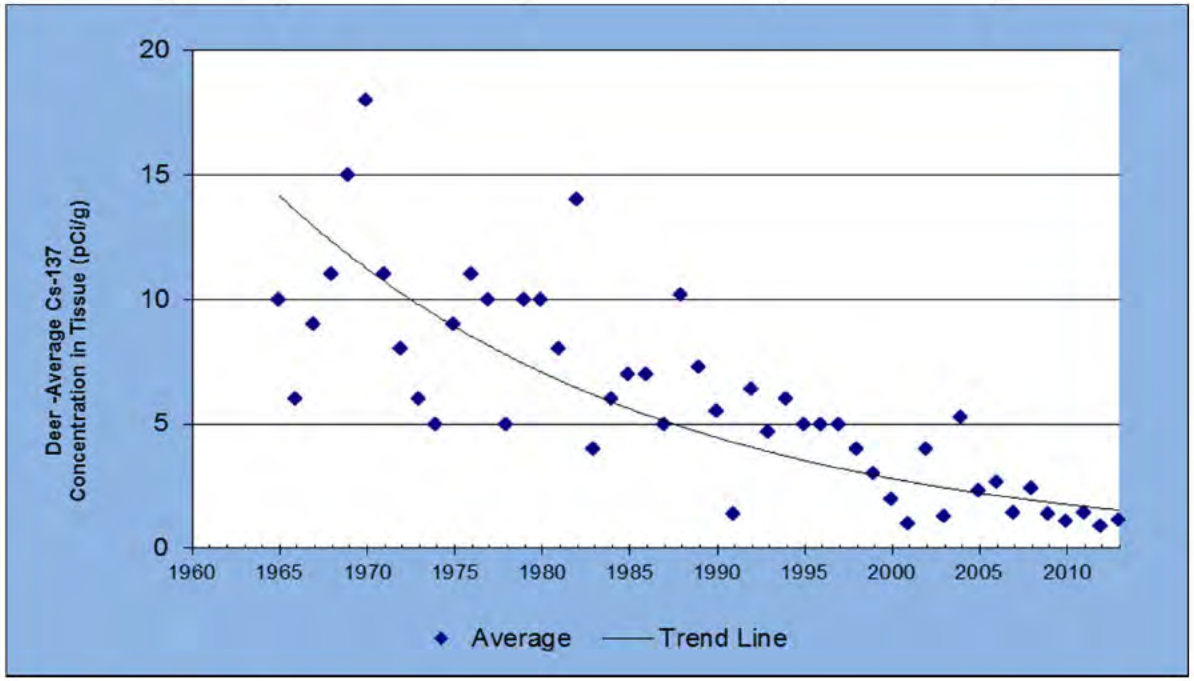
Field Technician Measures Length of Bass Caught in Savannah River

Radiological Surveillance – Wildlife – Chapter 5

- Reduction in number of hunts in 2013
- All animals monitored prior to release from SRS
- Average cesium-137 concentrations in deer indicate an overall decreasing trend for past 50+ years, as well as the last ten years

2013	Number of Animals	Field Gross Average Cs-137 (pCi/g)	Field Maximum Cs-137 (pCi/g)
Deer	156	1.12	3.09
Hog	62	1.32	5.19
Coyote	7	1.02	1.11
Turkey	32	1.09	1.84

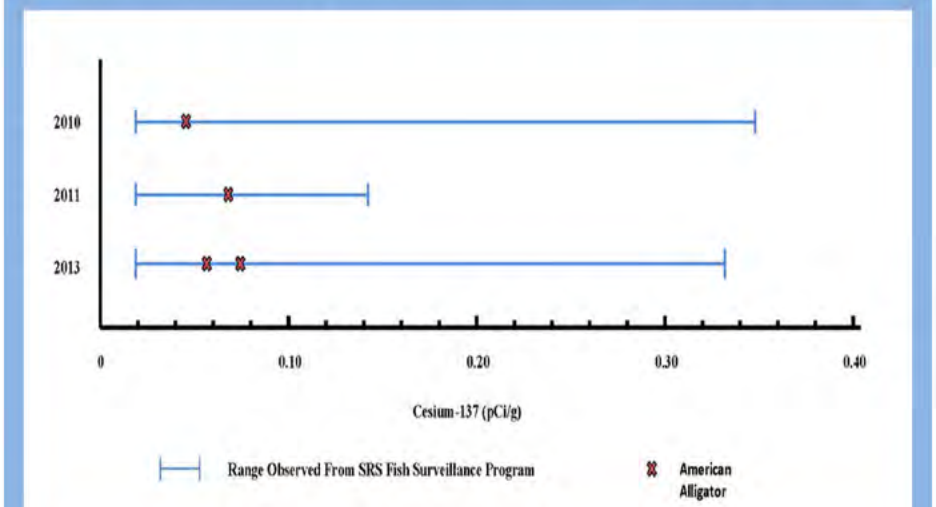
Eastern Wild Turkeys at SRS

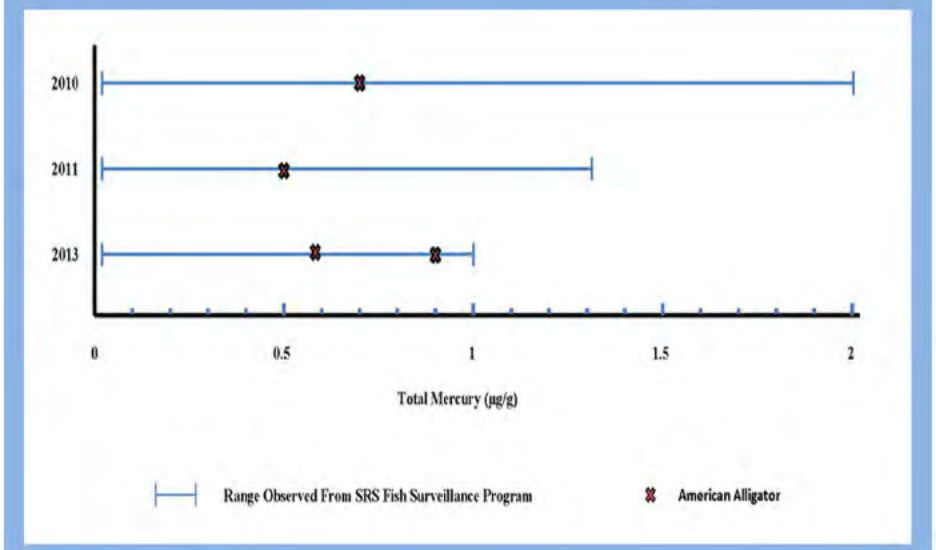


Radiological and Non-Radiological Surveillance – Alligator Results – Chapter 5

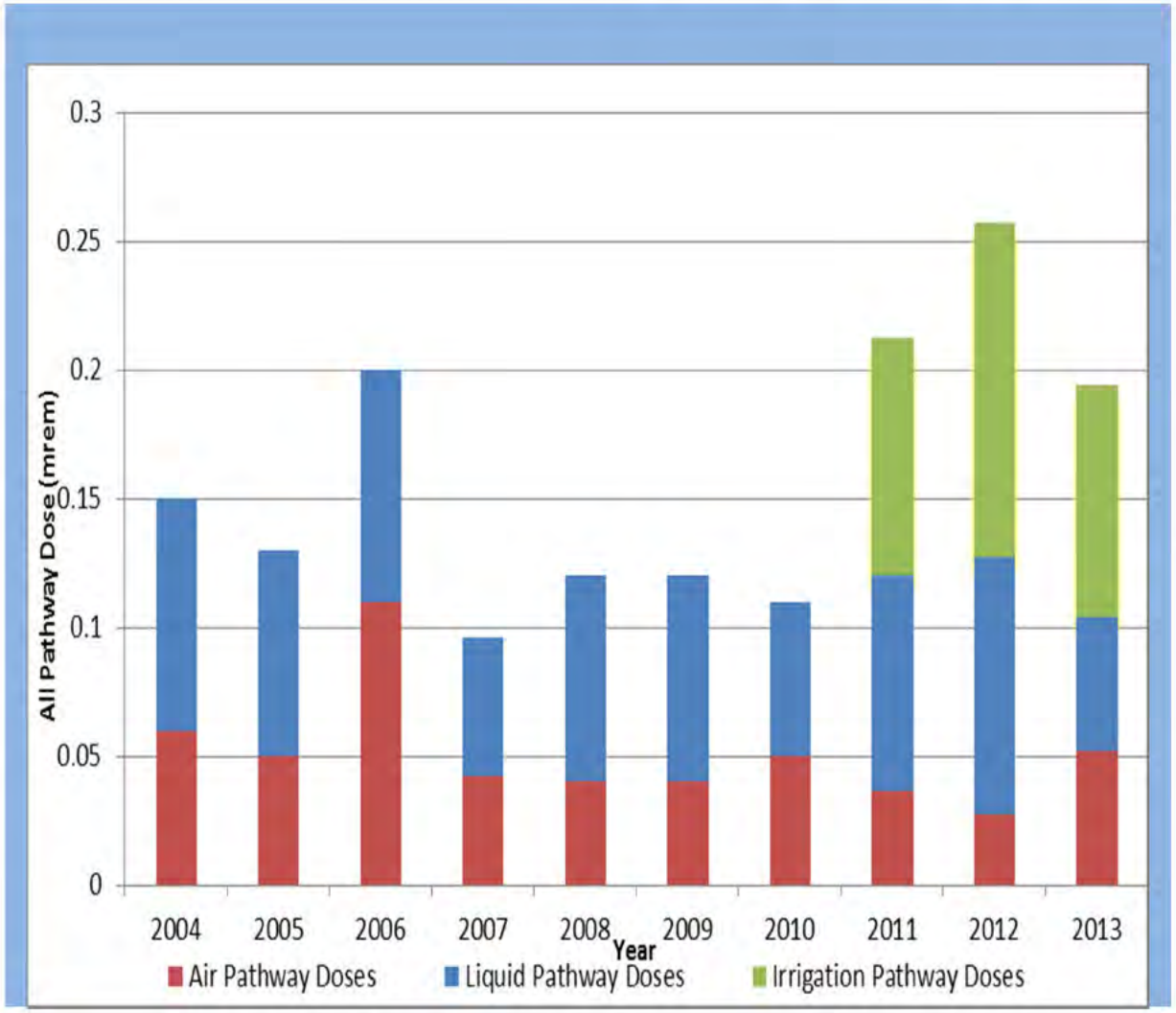
- Analyzed two alligator samples donated by local hunters
- Both animals were harvested from the Savannah River
- Results are comparable to fish results

American Alligator Harvested from the Savannah River



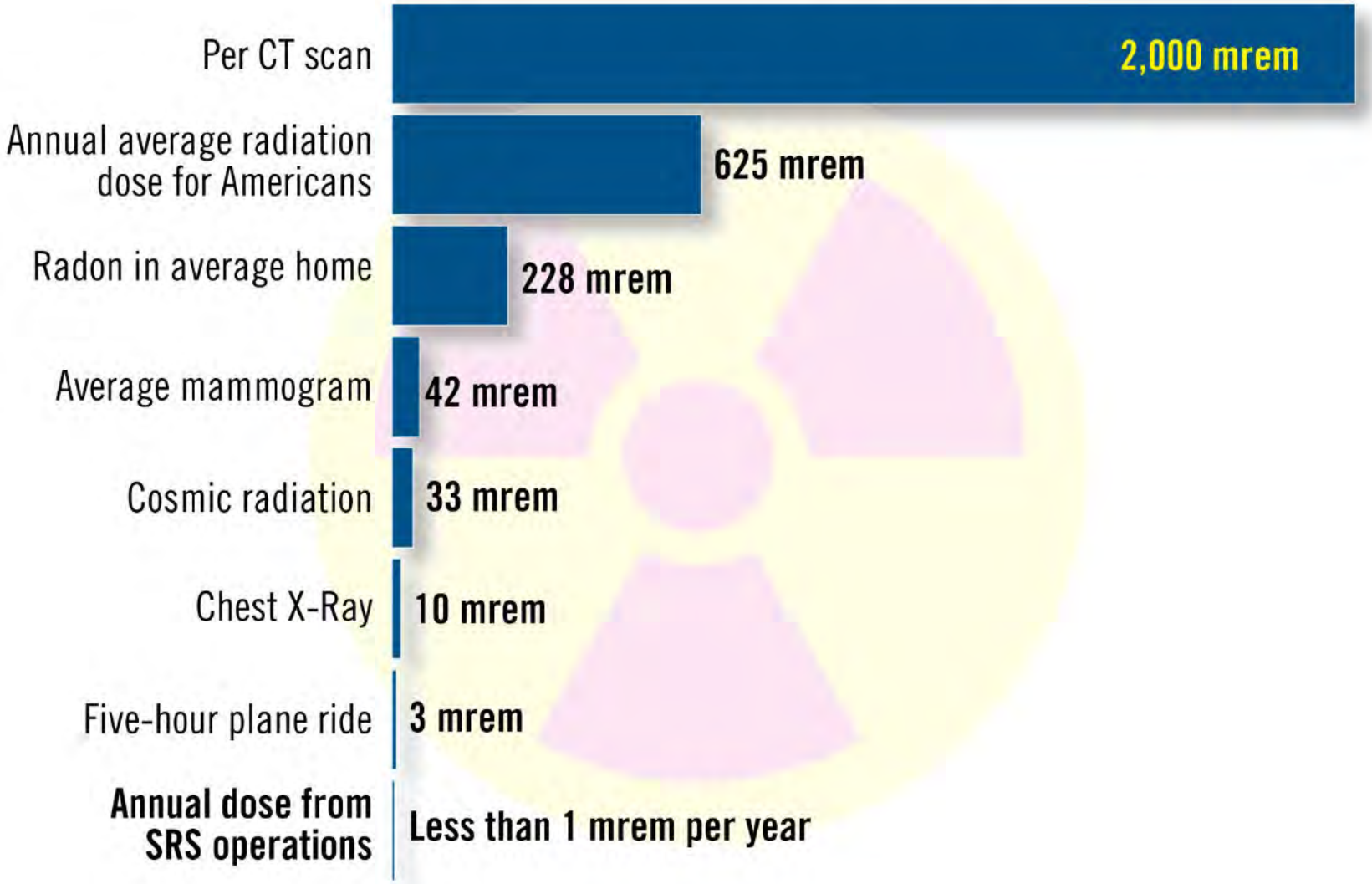


All-Pathway Dose – Chapter 6



- 2013 Representative Person all-pathway dose = 0.19 mrem
- DOE dose standard is 100 mrem/year
- 27% less than the reported 2012 dose of 0.26 mrem
- Decrease due to high Savannah River flow rate in 2013

Impact from Radiation Sources



Environmental Report Communication

- Website Postings
  - Providing link to report and option to request hard copy
- Social Media, Facebook, Twitter
- News Release - local and regional media
- Information Pod Meeting
- SRS Environmental Bulletin
- Post cards
  - Environmental Monitoring program participants
  - area schools and libraries
  - SC, GA and Federal elected and regulatory officials
- Presentations
  - Full CAB, Environmental Justice and CSRA Radiological Environmental Monitoring Program

Conclusions

- SRS has a comprehensive environmental monitoring program
- Monitoring results demonstrate a long-term decreasing trend and are well below regulatory and health-based standards
- Dose - Remain Low
  - 0.19% of the limit

Contact Information

- The report is available on the web at:
  - http://www.srs.gov/general/pubs/ERsum/index.html
- To inquire about the report, contact:

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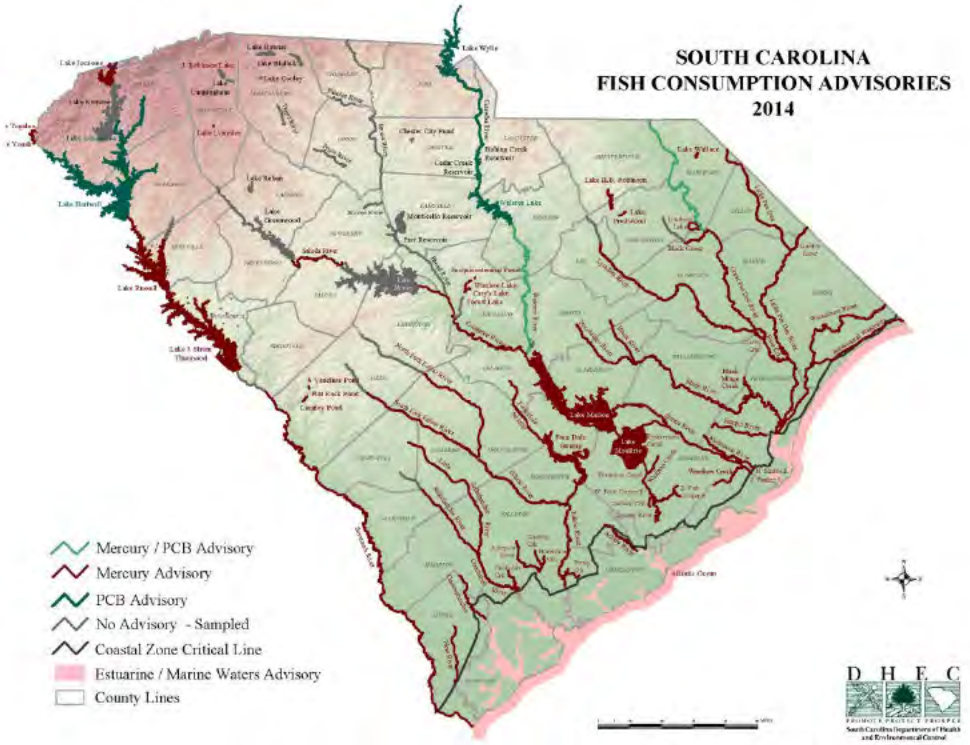
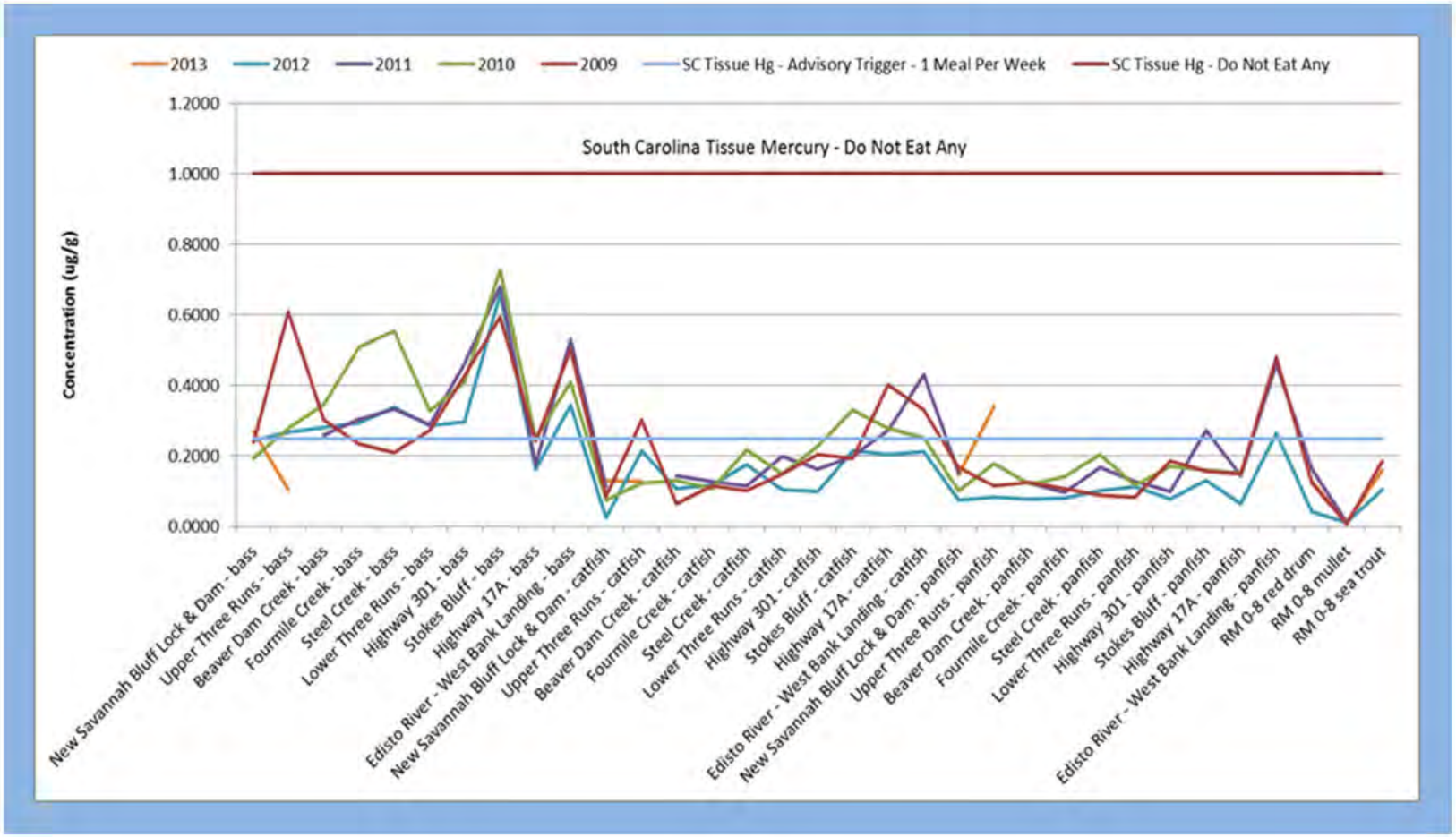
Backup Slides

Non-Radiological Surveillance - Water Quality

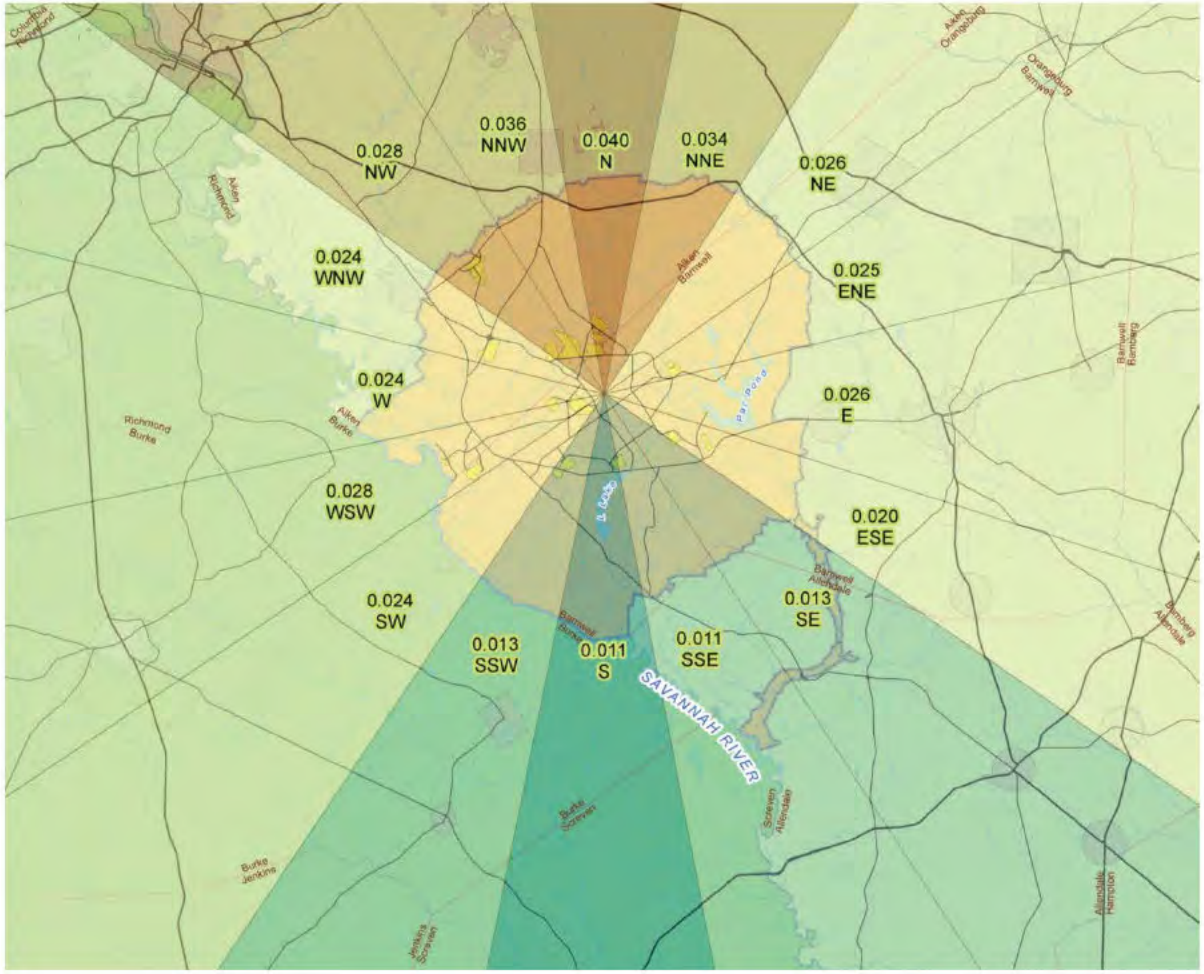


- *SCDHEC Fish Consumption Advisory*
  http://www.scdhec.gov/FoodSafety/FishConsumptionAdvisories/AdvisoryMap/
- *FDA & EPA issued a joint consumer advisory about mercury in fish/shellfish in 2004*
  http://www.epa.gov/mercury/advisories.htm

Mercury Concentrations in Fish



Sector-Specific Representative Person Air Pathway Doses (in mrem)

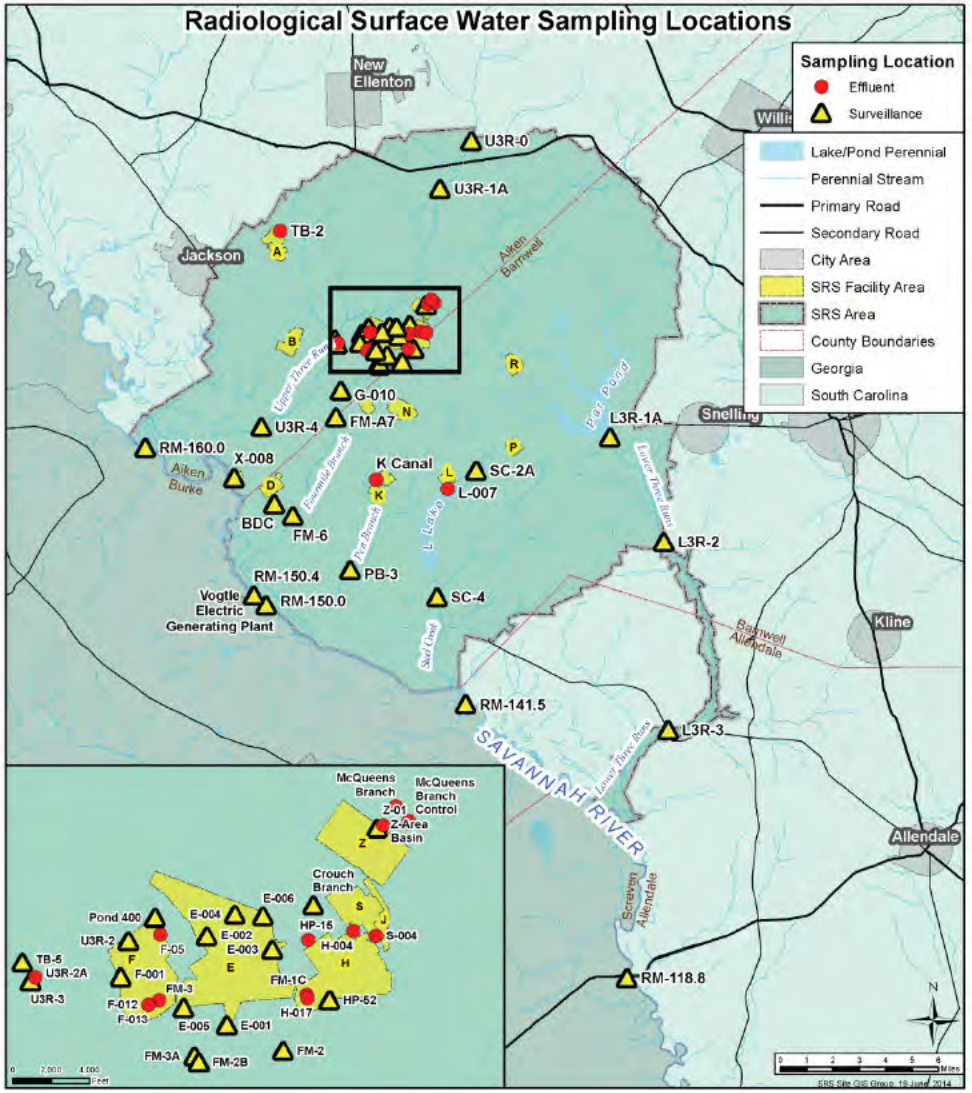


Representative Person All-Pathways and Sportsman Doses

	Committed Dose (mrem)	Applicable Standard	Percent of Standard (%)
Representative Person Dose			
All-Pathways (Liquid Plus Airborne Pathways)	0.19	100	0.19
Sportsman Dose			
Onsite Hunter	5.0	100	5.0
Creek-Mouth Fisherman[b]	0.21	100	0.21
Savannah River Swamp Hunter			
Offsite Hog Consumption	3.3		
Offsite Deer Consumption	2.5		
Soil Exposure[c]	2.9		
Total Offsite Deer/Hog Hunter Dose	6.2	100	6.2
Savannah River Swamp Fisherman			
Steel Creek Fish Consumption	0.21		
Soil Exposure[d]	0.07		
Total Offsite Fisherman Dose	0.28	100	0.28

[a] **All-pathway dose standard; 100 mrem/yr (DOE Order 458.1)**
[b] **In 2013, the maximum dose to a hypothetical fisherman resulted from the consumption of bass from the mouth of Steel Creek**
[c] **Includes the dose from a combination of external exposure to and incidental ingestion and inhalation of the worst-case Savannah River swamp soil**
[d] **Includes the dose from a combination of external exposure and incidental ingestion and inhalation of Savannah River swamp soil near the mouth of Steel Creek**

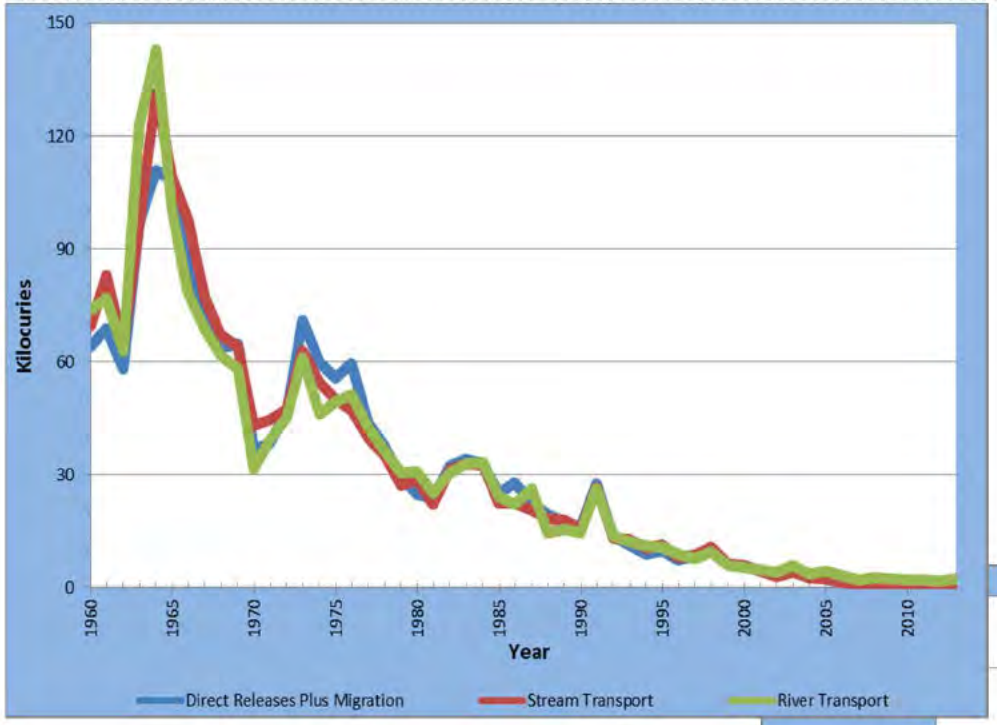
Radiological Liquid Sampling Locations

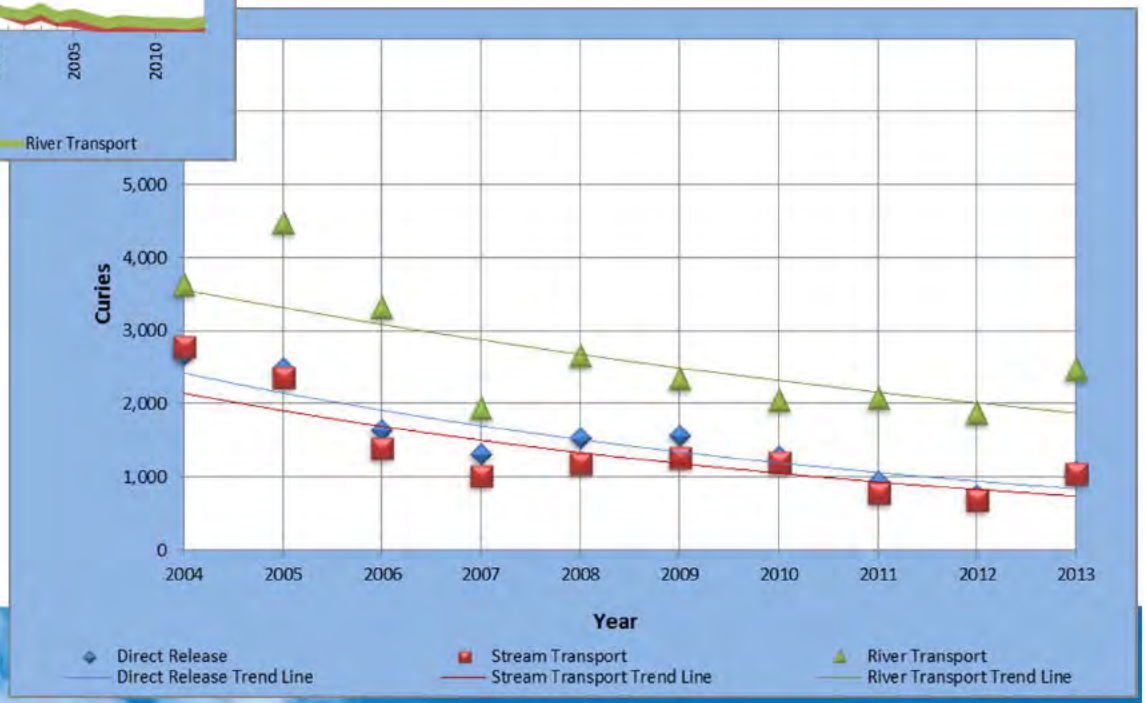


Offsite Sampling Collection Distribution

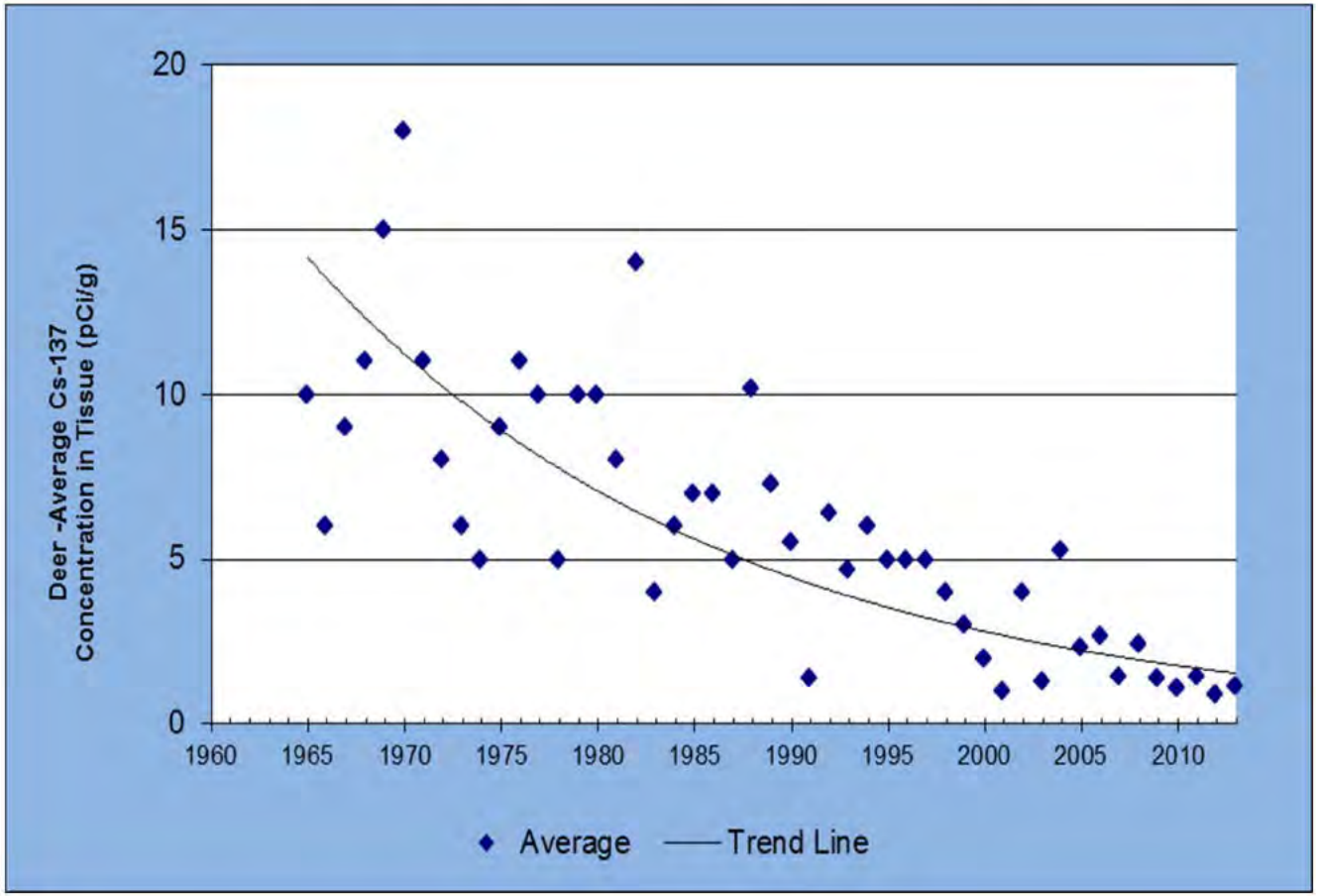
Environmental Media	South Carolina Locations	Georgia Locations	South Carolina Approximate Number of Samples	Georgia Approximate Number of Samples
Media for Airborne Contaminant Pathway				
Air Filters	1	3	52	156
Silica Gel	1	3	26	78
External Ambient Gamma Radiation Monitoring (Thermoluminescent dosimeters[TLDs])	7	5	140	100
Rain Ion Columns	0	2	0	24
Rainwater	1	3	12	36
Food Products	19	6	19	7
Milk	4	4	16	17 6
Soil	1	3	1	3
Vegetation (nonedible)	1	3	1	3
Media for Liquid Contaminant Pathway				
Drinking Water	3	1	36	12
Groundwater	0	10	0	36
Total	**38**	**43**	**303**	**472**

SRS Tritium Transport Summary



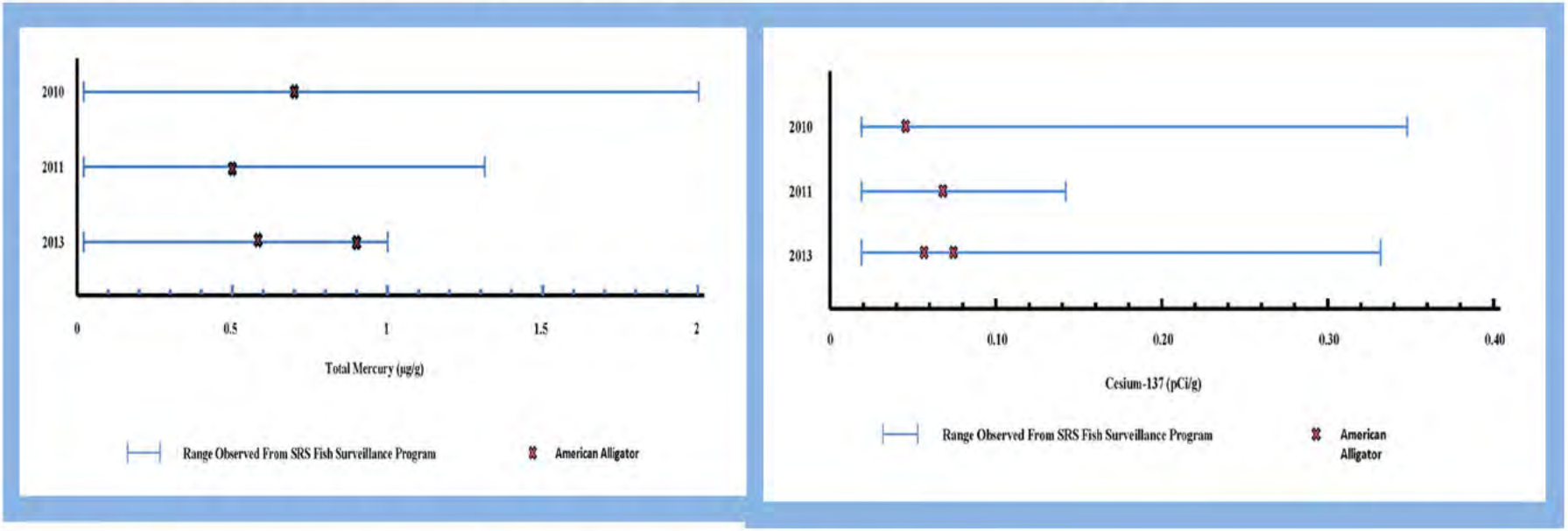


Trend of Cesium-137 Concentration in Deer



Alligator Results

	Alligator GA-0003766	Alligator SC-12113	Alligator GA-001100	Alligator SC-10697
Harvest Date	9/24/2010	9/25/2011	9/18/13	10/11/13
Length	8 ft 8 in	6 ft 5 in	9 ft 2 in	5 ft 9 in
Mercury (ug/g)	0.70	0.50	0.90	0.59
Cesium-137 (pCi/g)	0.0433	0.0689	0.0725	0.0552
Potasium-40 (pCi/g)	2.07	2.69	3.25	3.12
Uranium-234 (pCi/g)	0.00198	0.000248	ND	ND
Uranium-238 (pCi/g)	0.00175	0.000282	0.000167	0.000115
ND – Indicates that isotope was not detectable above the MDA.				



Savannah River Ecology Laboratory

- Technical Assessment of DOE Savannah River Site – Sponsored Radionuclide Monitoring Efforts in the Central Savannah River Area
- Website
  - http://srel.uga.edu/docs/SREL_CAB_317.pdf