

2012 SRS Environmental Report Overview

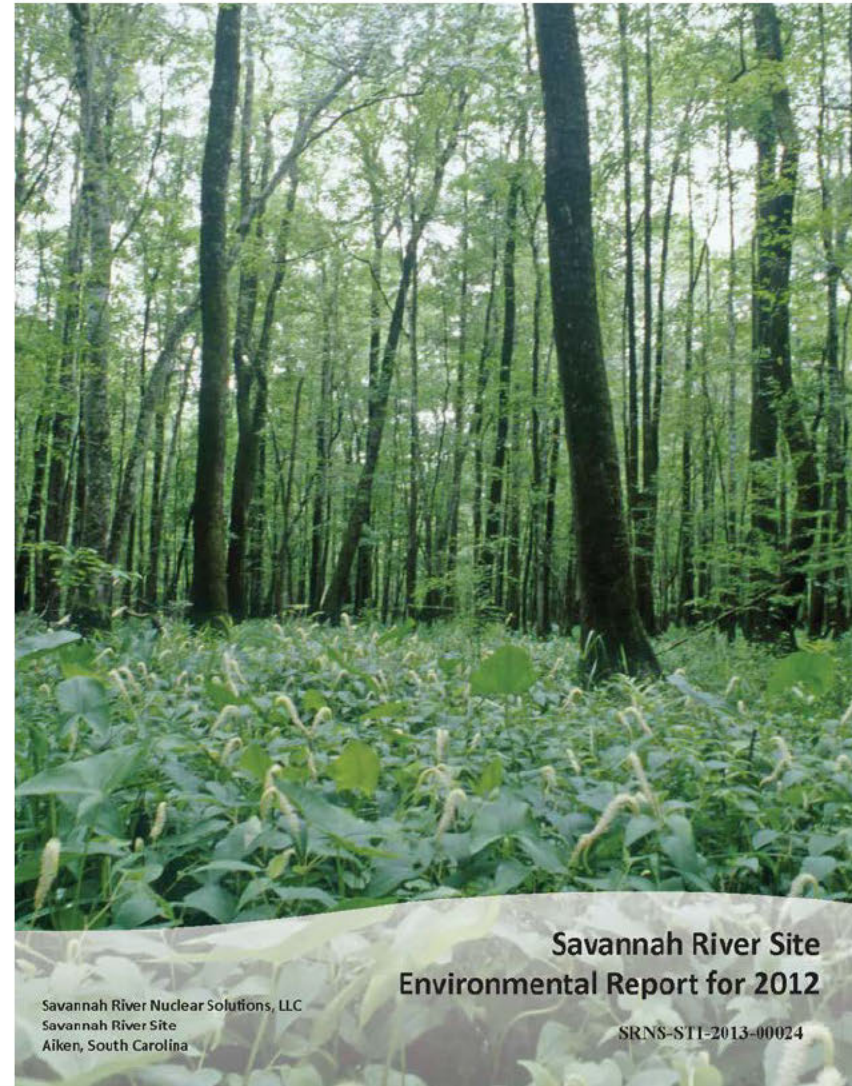
Amy Meyer

Manager, Sample Data Management

Savannah River Nuclear Solutions, LLC
November 19, 2013

Purpose

- To fulfill a Facilities Disposition and Site Remediation Committee Work Plan Commitment
- To provide the CAB and public an understanding of the SRS Environmental Report results for 2012
- To present data that show SRS operations result in minimal impact to the public and environment



Savannah River Site Environmental Report for 2012

Savannah River Nuclear Solutions, LLC
Savannah River Site
Aiken, South Carolina

SRNS-STI-2013-00024

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
- **EPA = Environmental Protection Agency**
- **MCL = Maximum Contaminant Level**
- **NPDES = National Pollutant Discharge Elimination System**
- **SCDHEC = South Carolina Department of Health and Environmental Control**
- **TLDs = Thermoluminescent Dosimeters**
- **VEGP = Vogtle Electric Generating Plant**
- **pCi/L = picocurie per liter**
- **pCi/m³ = picocurie per cubic meter**
- **ug/g = microgram per gram**

Why SRS Monitors?

- Purpose
 - 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

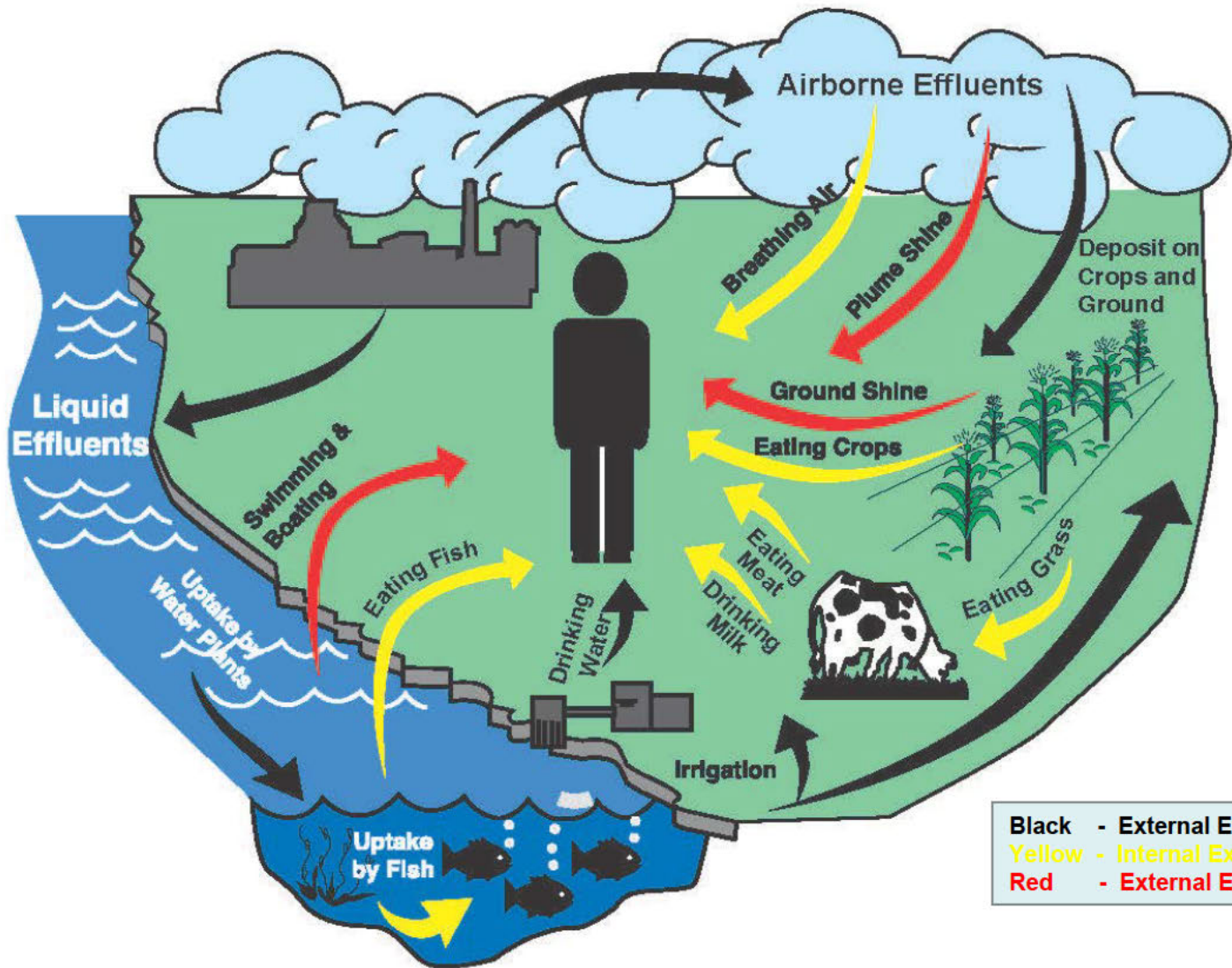
SRS Environmental Program Compliance

- Environmental program requirements provide specific standards and limits for protection of the public and environment
- Federal and State laws, and DOE Orders
 - DOE Order 458.1, *Radiation Protection of the Public and the Environment*
 - DOE Order 436.1, *Departmental Sustainability*
 - The Clean Air Act
 - The Clean Water Act
 - The Safe Drinking Water Act
 - The Comprehensive Environmental Response, Compensation, and Liability Act
 - The Endangered Species and Migratory Bird Treaty Act
 - The National Environmental Policy Act
 - South Carolina Permits and Regulations

SRS Environmental Monitoring

- **Effluent Monitoring**
 - The collection of samples or data from the point at which a facility discharges liquid or gaseous 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 individuals and populations in the vicinity of the Site

Exposure Pathways



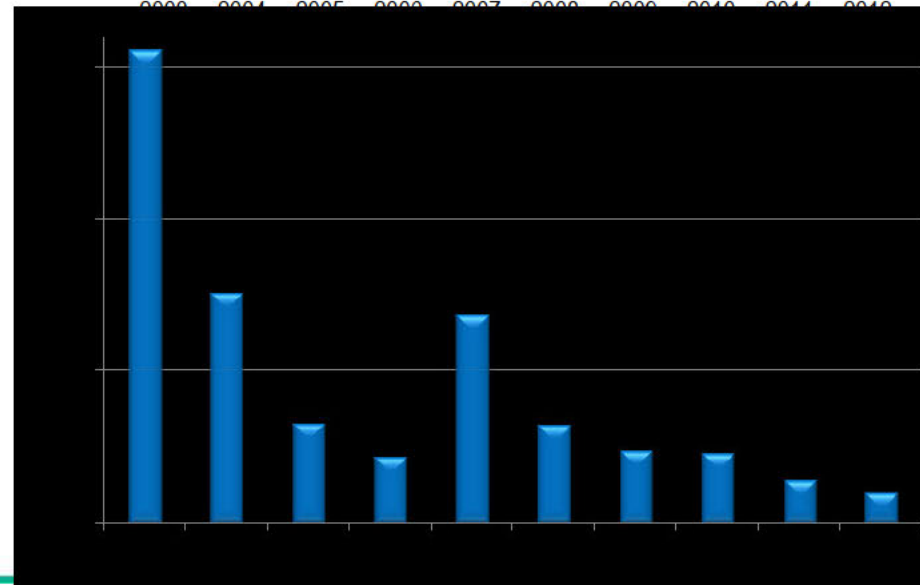
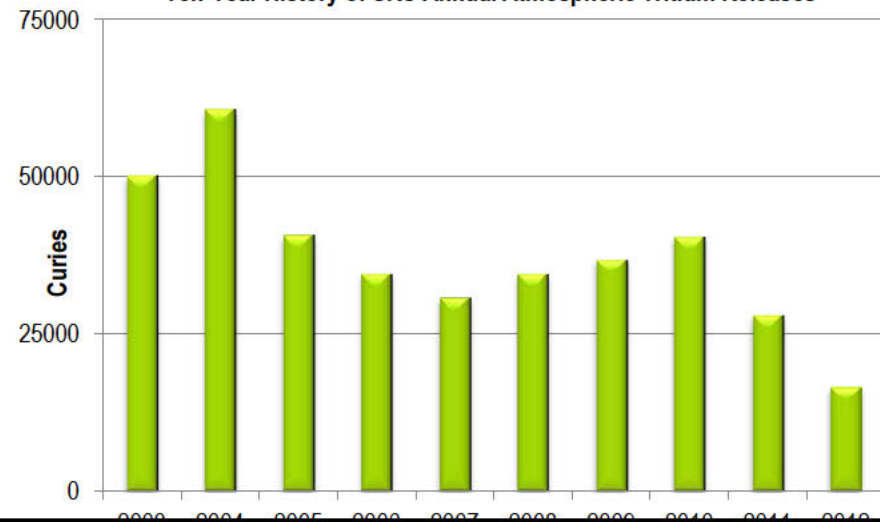
Surveillance Monitoring of Exposure Pathways

Radiological Surveillance Monitoring	Nonradiological Surveillance Monitoring
<i>Airborne Pathway</i>	<i>Airborne Pathway</i>
Air	Rainwater/wet disposition
Rainwater	Air
Food products	<i>Liquid Pathway</i>
Soil	Surface water
Vegetation	Sediment
<i>Liquid Pathway</i>	Fish
Fish	Drinking water
Sediment and settleable solids	
Surface water (river, streams)	
Drinking water	
<i>SRS Deer and Hog Consumption Pathway</i>	
Wildlife	

Radiological Effluent Monitoring

- Tritium is the radionuclide of greatest abundance in SRS releases
- In 2012, SRS released a total of 16,796 Curies versus 28,238 in 2011
 - Air
 - 16,700 Curies to the atmosphere
 - Liquid
 - 96 Curies to SRS streams

Ten-Year History of SRS Annual Atmospheric Tritium Releases



Non-Radiological Effluent Monitoring

- LIQUID

- NPDES Permit Compliance Status

- Industrial Wastewater

- Analyses of more than 5,000 samples were 99.89% compliant with industrial wastewater permit requirements
 - SRS received one Notice of Violation from SCDHEC for exceedance of copper limits at one outfall

- Stormwater Outfalls

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

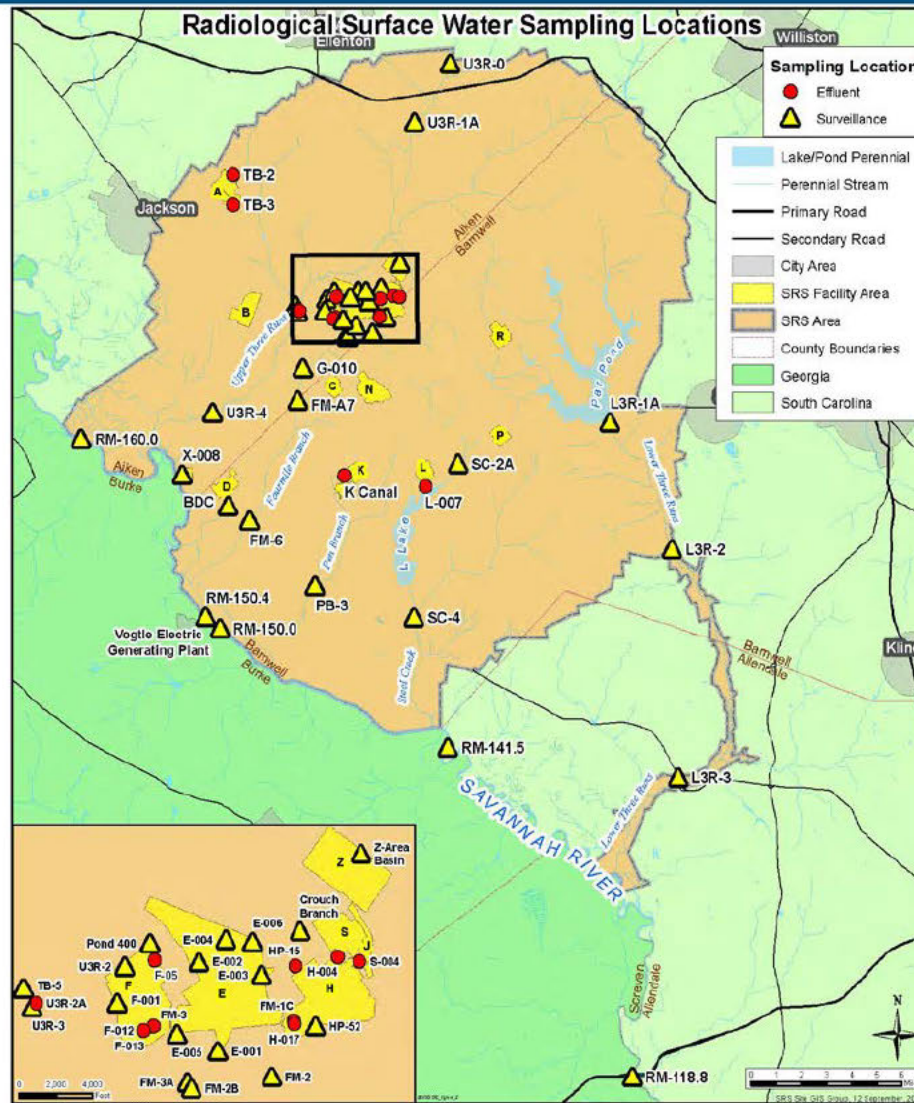


An Automated Water Sampler is programmed at an Industrial Wastewater Outfall

- AIR

- **ALL** permitted emission limits for air pollutants were met in 2012

Radiological Liquid Sampling Locations

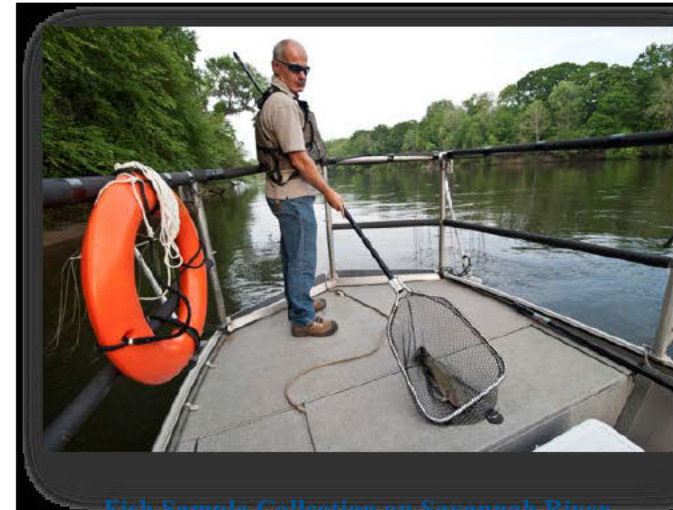


Non-Radiological Surveillance – Water Quality

- Water Quality parameters were analyzed on all stream and river surveillance samples
 - *Parameters include E. coli, pH, temperature, dissolved oxygen, metals, organics, total suspended solids*
 - *Water quality parameters were measured at all 16 sampling locations*
 - *Metals were detected in at least one sample at each location*
 - *With the exception of off-patent pesticide, Endosulfan II, detected in July 2012 at Steel Creek, no other sample results showed detectable levels of pesticides or herbicides.*
 - *SRS discharges did not impact the water quality in onsite streams or the Savannah River*

Non-Radiological Surveillance - Fish

- 476 Fish were collected and analyzed to determine concentrations of non-radiological contaminants
- Mercury levels for fish in the Savannah River ranged from below detectable levels to 1.08 ug/g in bass; lower than 1.30 ug/g in bass observed in 2011
- Results are within or below the levels for the SCDHEC-issued fish advisories
- Review of mercury data shows a decreasing trend by location
- Primary source of mercury deposition from global fallout
- Industrial facilities upstream of SRS are considerable contributors



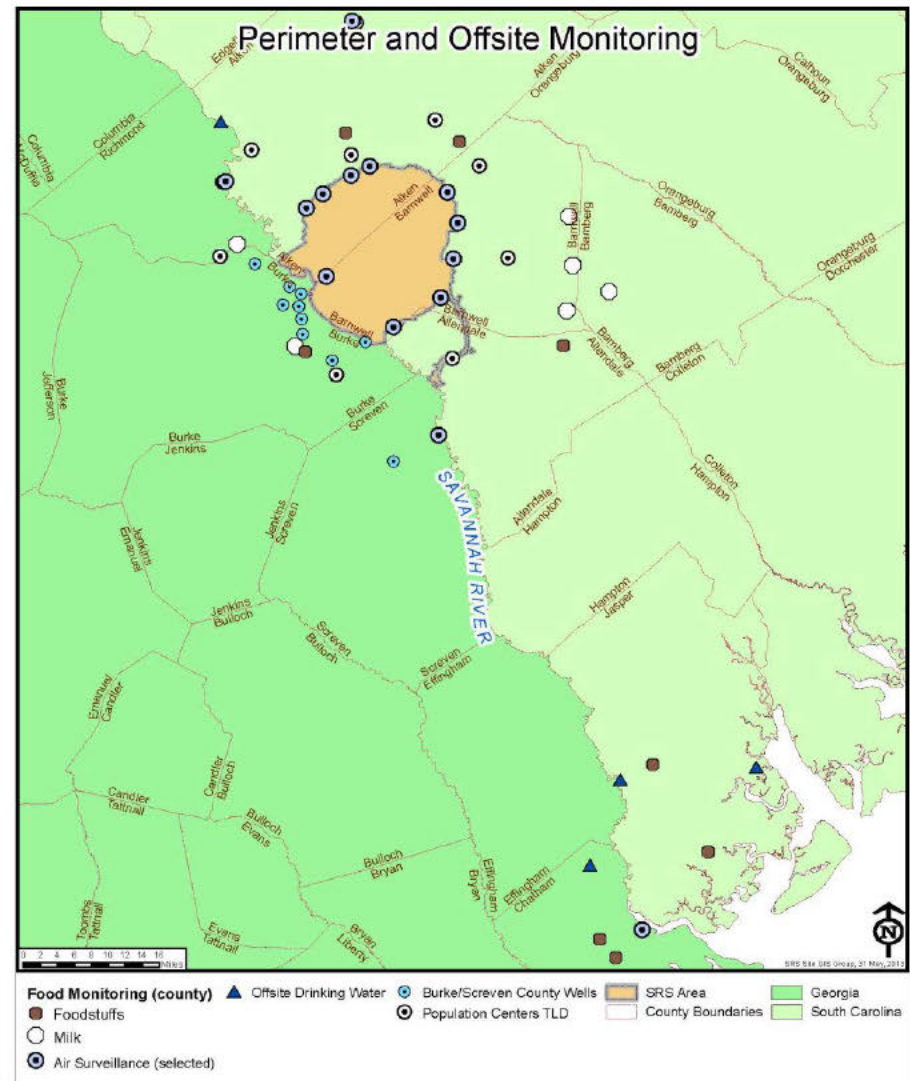
Fish Sample Collection on Savannah River

Offsite Georgia & South Carolina Monitoring

- **SRS collects samples beyond the Site perimeter**
 - 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

2012 Offsite Sample Collection

	Samples	Locations
Georgia	477	38
South Carolina	319	24



Radiological Air Surveillance Results

2012 Average Tritium-in-Air Results (pCi/m³), 2008 - 2012

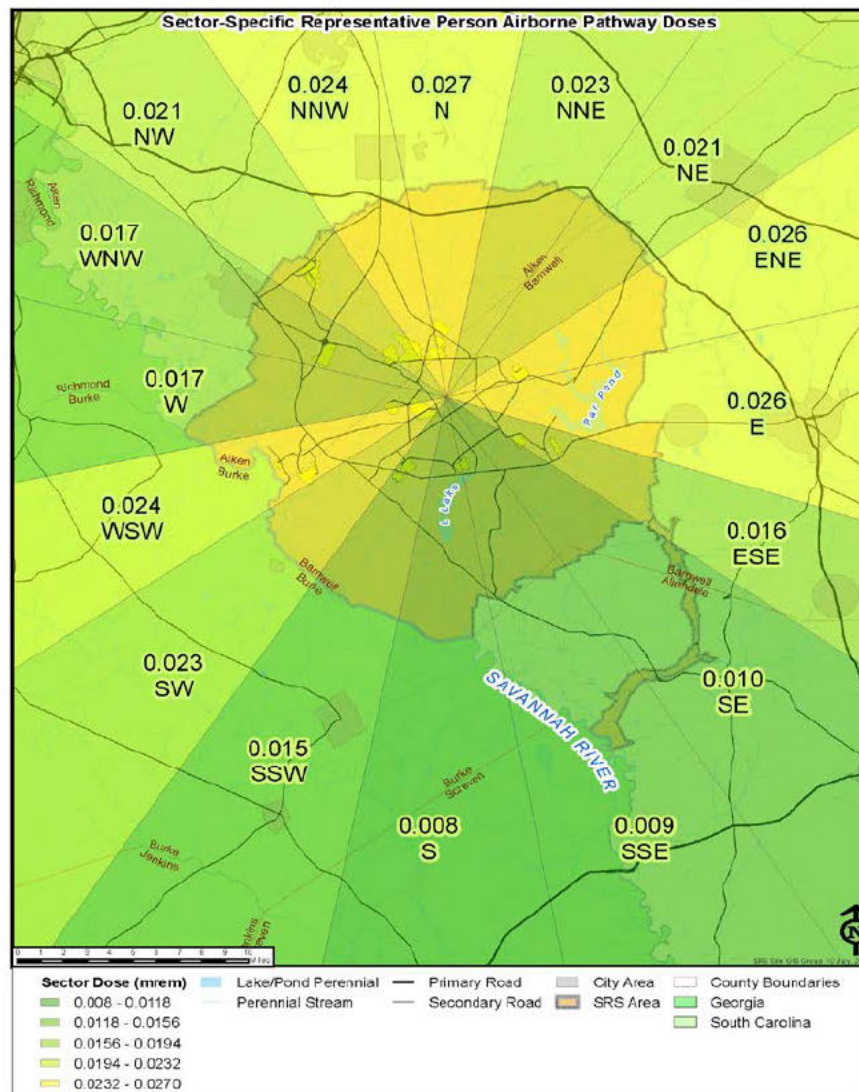
Location	2008	2009	2010	2011	2012
Onsite (Center)	200	233	170	190	172
Site Perimeter (Northwest)	11.5	7.90	6.49	7.49	5.79
Site Perimeter (North)	13.3	8.71	8.15	9.93	8.98
Site Perimeter (Northeast)	10.2	5.36	6.61	8.09	4.25
Site Perimeter (East)	27.2	6.30	6.91	8.63	5.83
Site Perimeter (East)	13.2	7.03	8.48	7.47	5.25
Site Perimeter (East)	16.4	9.04	7.11	6.30	4.93
Site Perimeter (Southeast)	8.43	5.97	5.09	4.81	4.91
Site Perimeter (South)	7.45	5.26	4.93	4.86	4.47
Site Perimeter (Southwest)	14.7	15.3	7.91	12.6	7.00
Site Perimeter (West)	8.26	6.88	7.59	9.01	6.17
25-miles from SRS (Northwest)	14.1	3.83	2.03	5.27	3.82
25-miles from SRS (North)	8.44	6.60	3.77	7.71	5.55
25-miles from SRS (South) - CONTROL	5.18	3.29	2.99	5.28	7.76
100-miles from SRS (Southeast) - CONTROL	5.24	3.34	2.86	3.86	3.03

Tritium in air results are well below concentration equivalent of 1 mrem (2,000 pCi/m³)



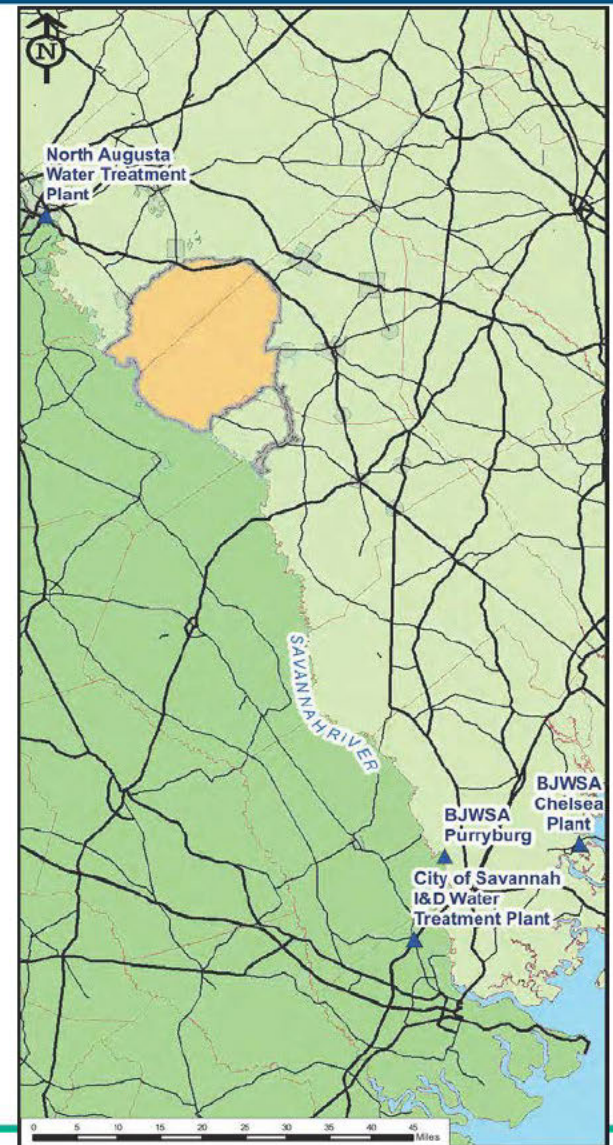
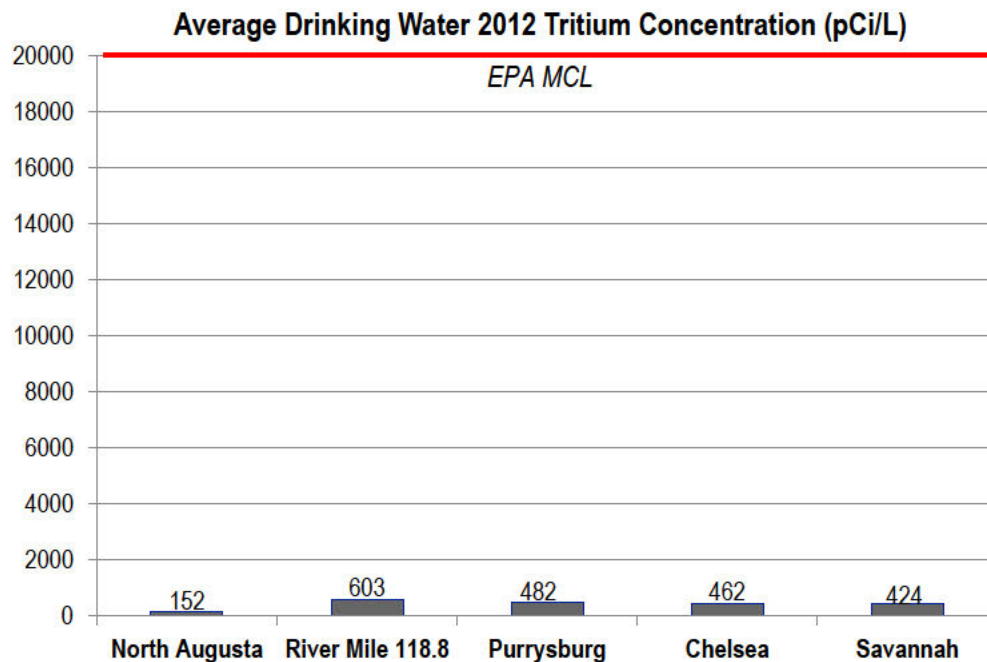
Technician Reads Air Flow at Air Station

Airborne Pathway Doses



Radiological Drinking Water Surveillance

- Monitored above and below SRS as well as onsite
- Tritium concentrations remain well below the drinking water standard



Representative Person

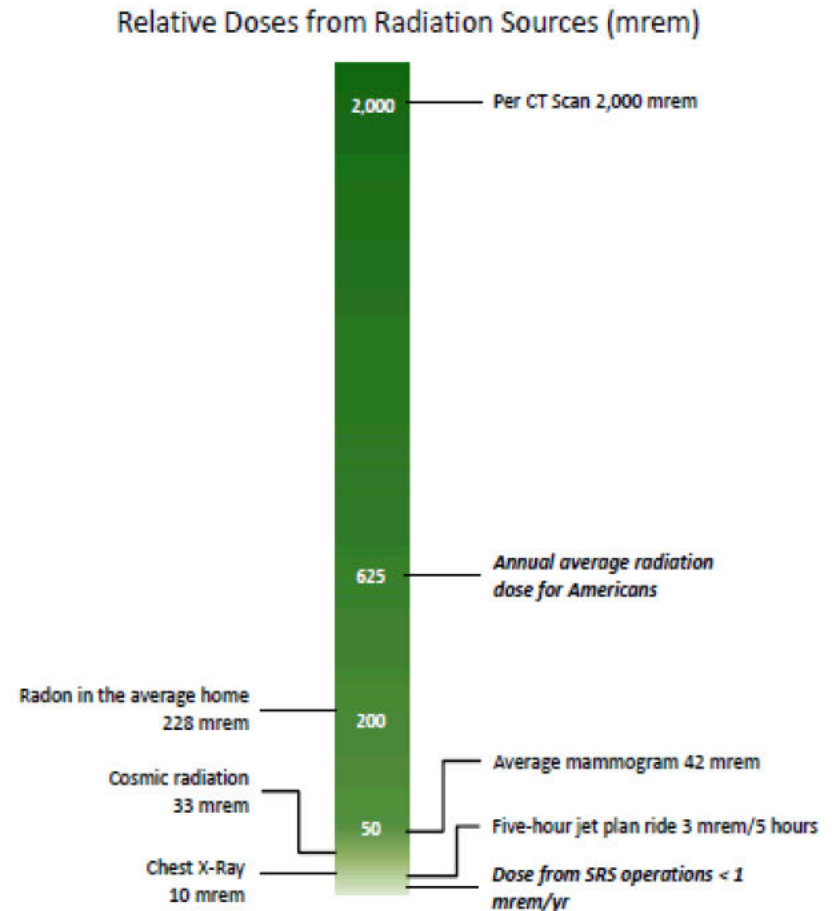
	Maximally Exposed Individual - MEI (Prior to 2012)	Representative Person (2012)
Lives year-round at SRS boundary	√	√
Consumes milk, meat and vegetables that would only be produced from that location	√	√
Consumes water and fish from the Savannah River	√	√
Spends time on or near the river every day	√	√
Uses adult dose coefficients and adult male usage parameters	√	
Uses 6 weighted-averaged male and female age groups for dose coefficients and usage parameters		√

Potential Offsite Doses

	2008	2009	2010	2011	2012
Atmospheric Releases					
Site Boundary Individual (mrem)	0.04	0.04	0.05	0.04	0.03
Liquid Releases					
Downriver Individual (mrem)	0.08	0.08	0.06	0.08	0.10
Irrigation (mrem)				0.09	0.13
DOE Order Public Dose Limit	100	100	100	100	100
TOTAL Representative Person (Air + Liquid)	0.12	0.12	0.11	0.21	0.26

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
- Representative Person Dose - Remain Low
 - 0.26% of the limit



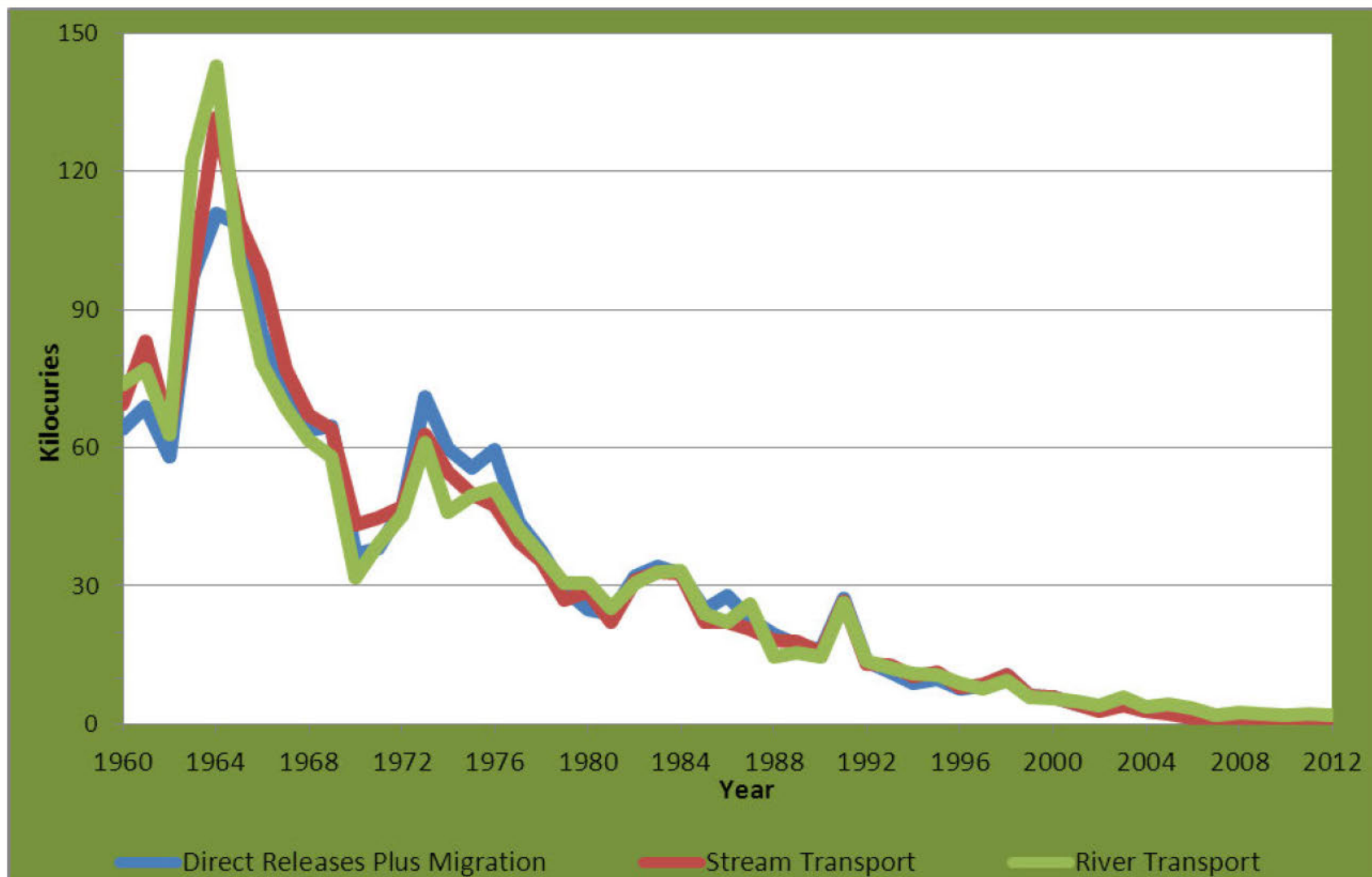
Contact Information

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

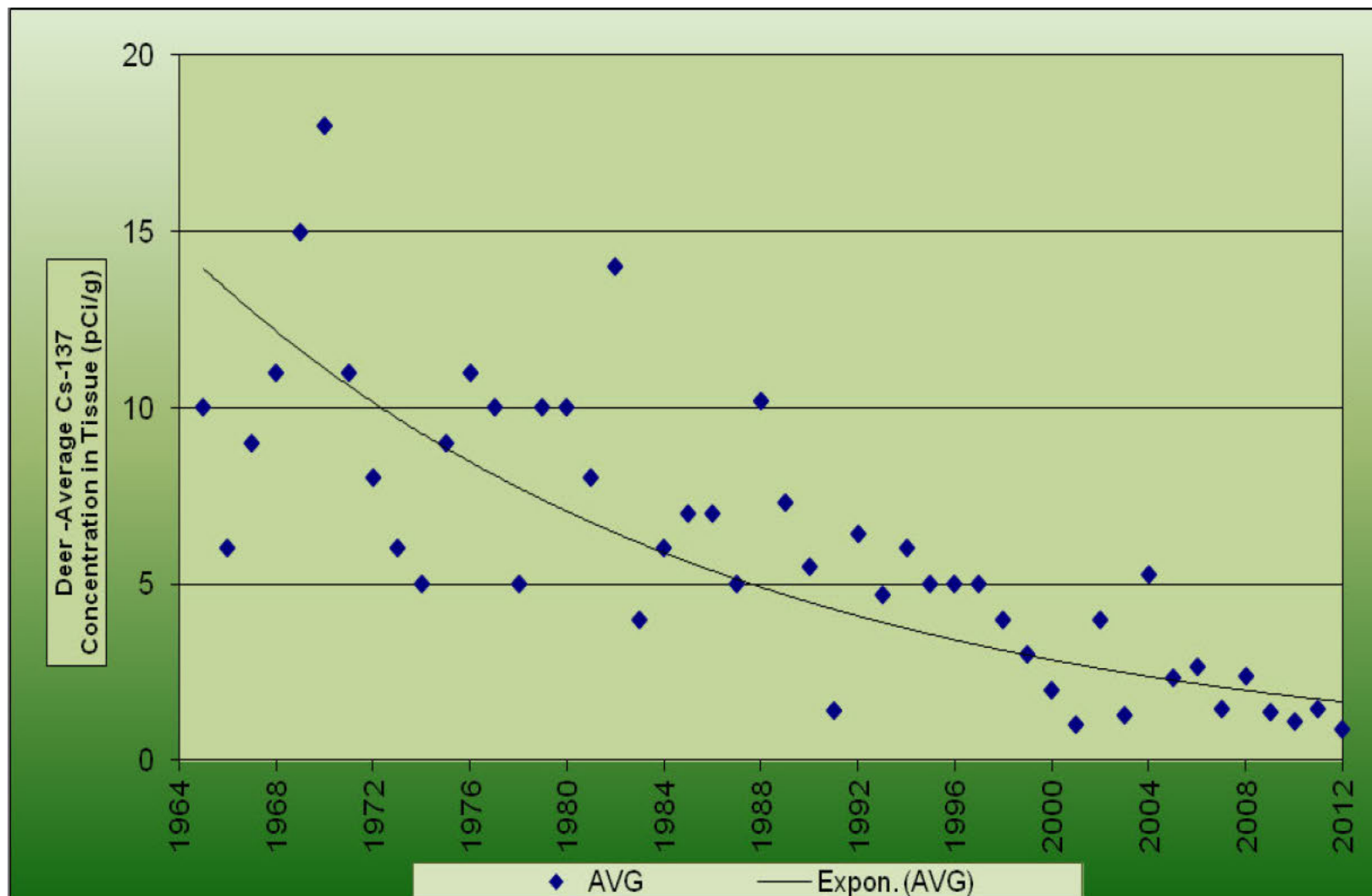
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Backup Slides

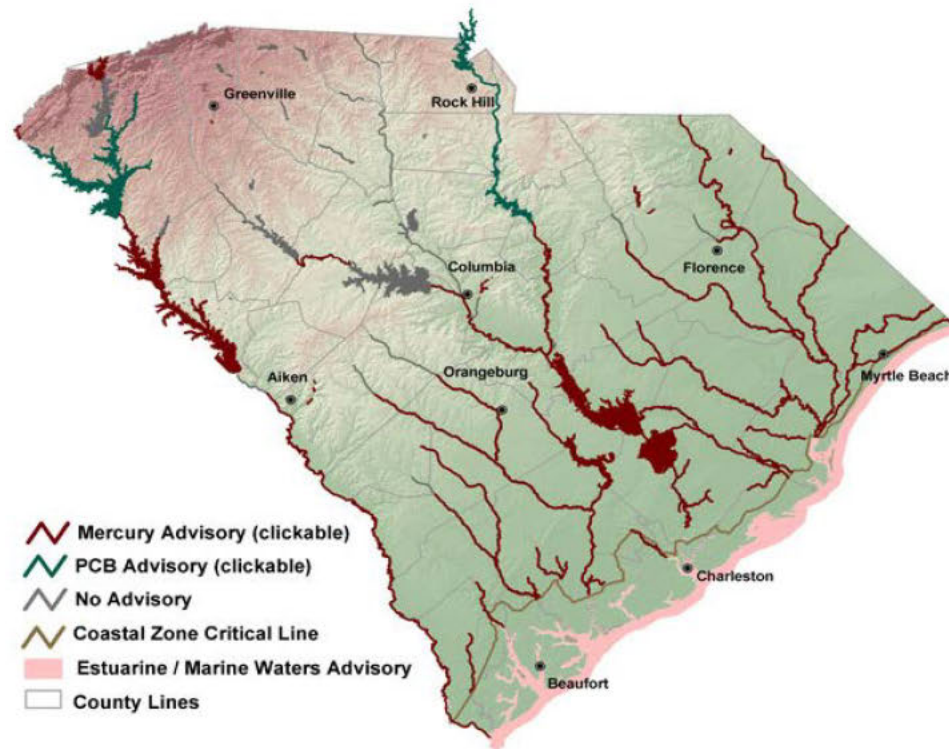
SRS Tritium Transport Summary



Wildlife Surveillance Cs-137 Historical Trend

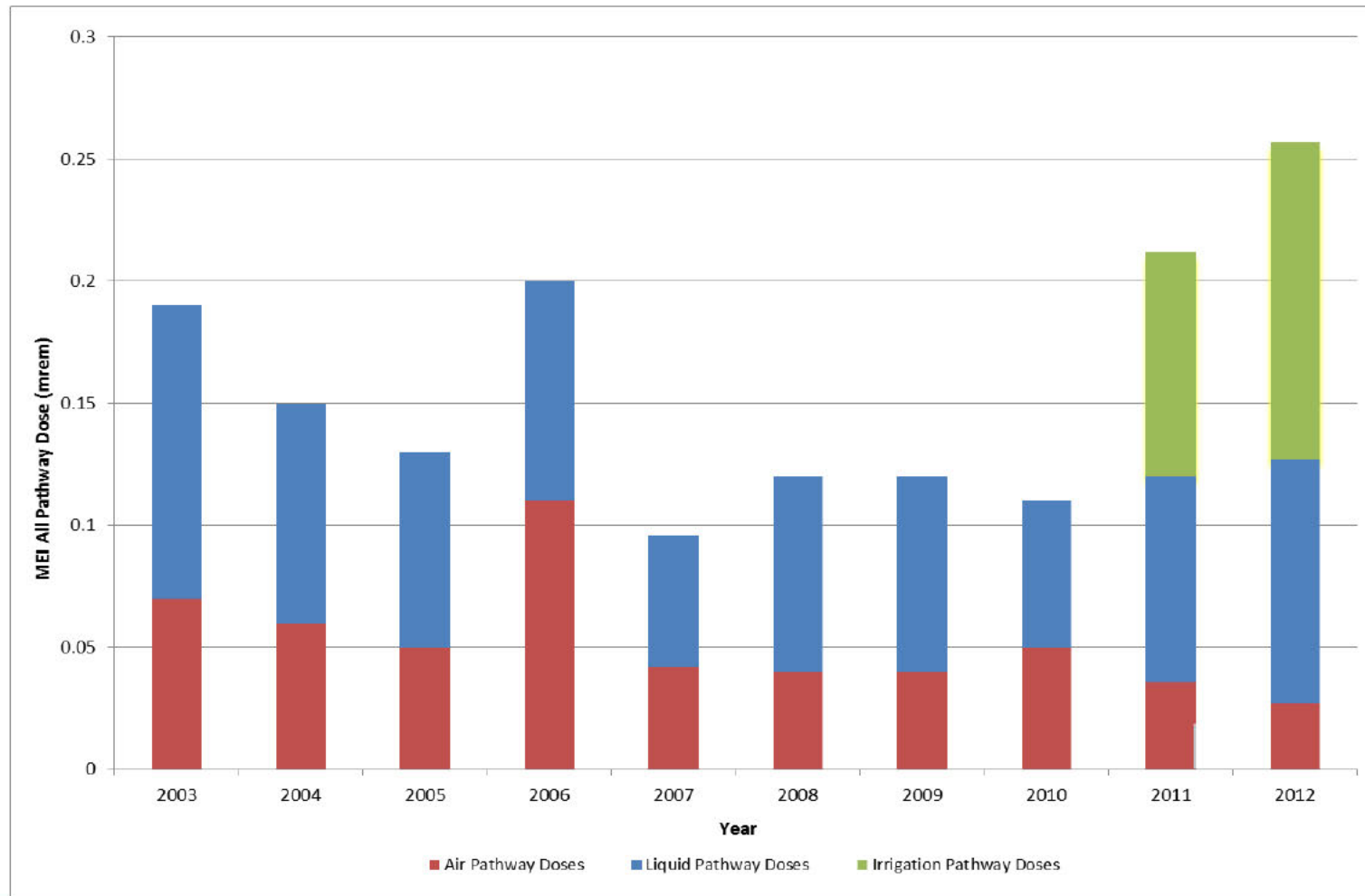


Non-Radiological Surveillance - Water Quality

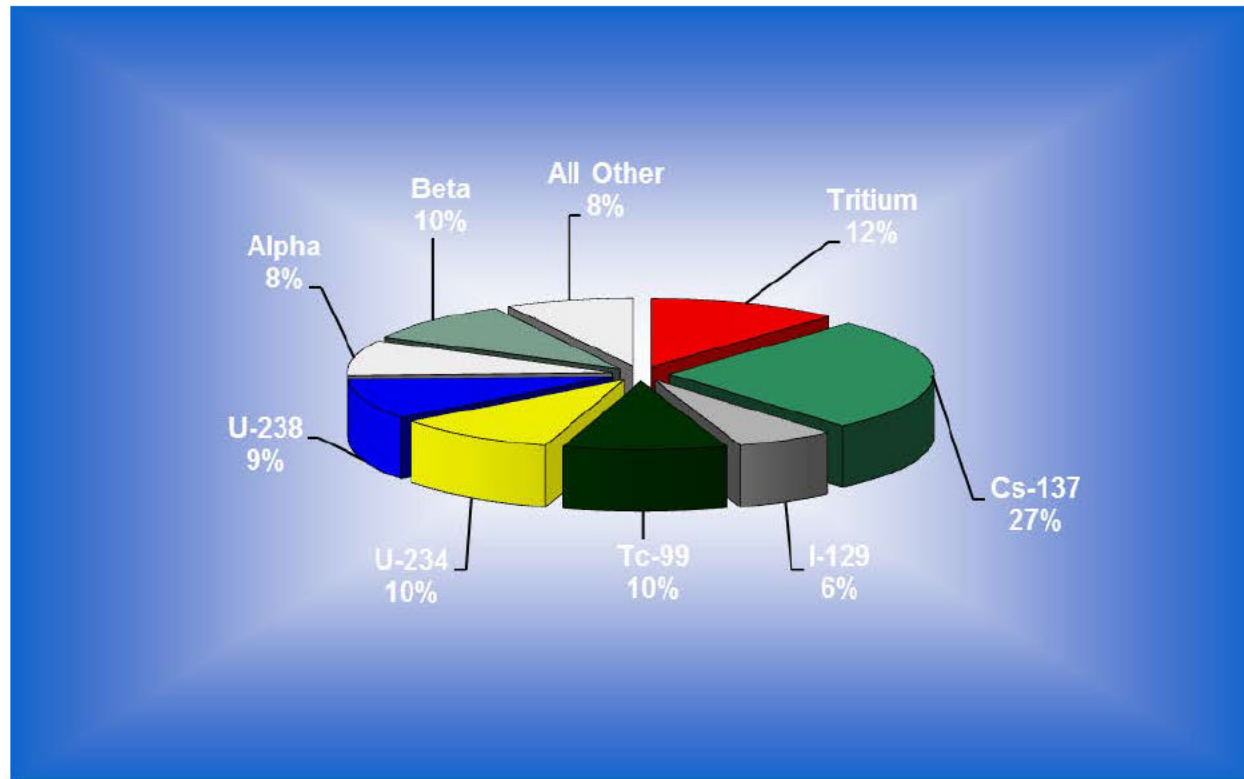


- SCDHEC issued fish consumption advisory for the Savannah River in 2007
<http://www.scdhec.gov/environment/water/fish>
- FDA & EPA issued a joint consumer advisory about mercury in fish/shellfish in 2004
<http://www.epa.gov/mercury/advisories.htm>

Historic Dose Trend

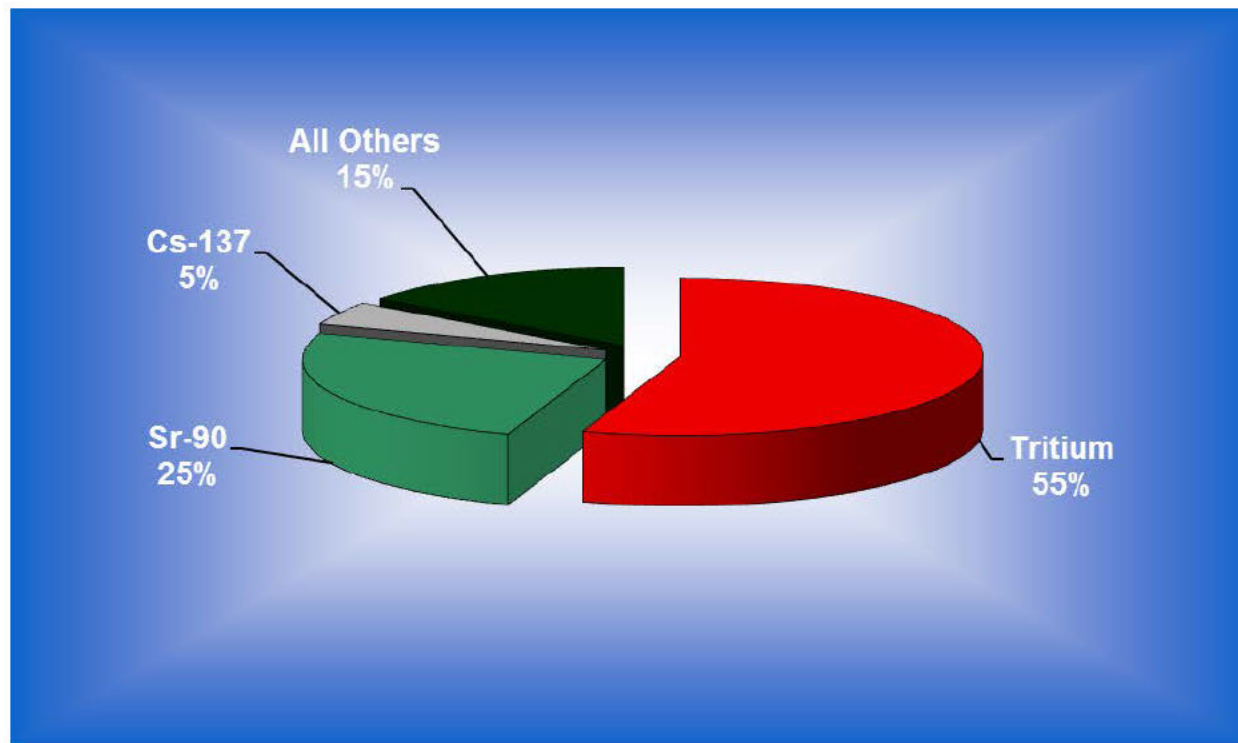


Critical Liquid Pathway Radionuclides



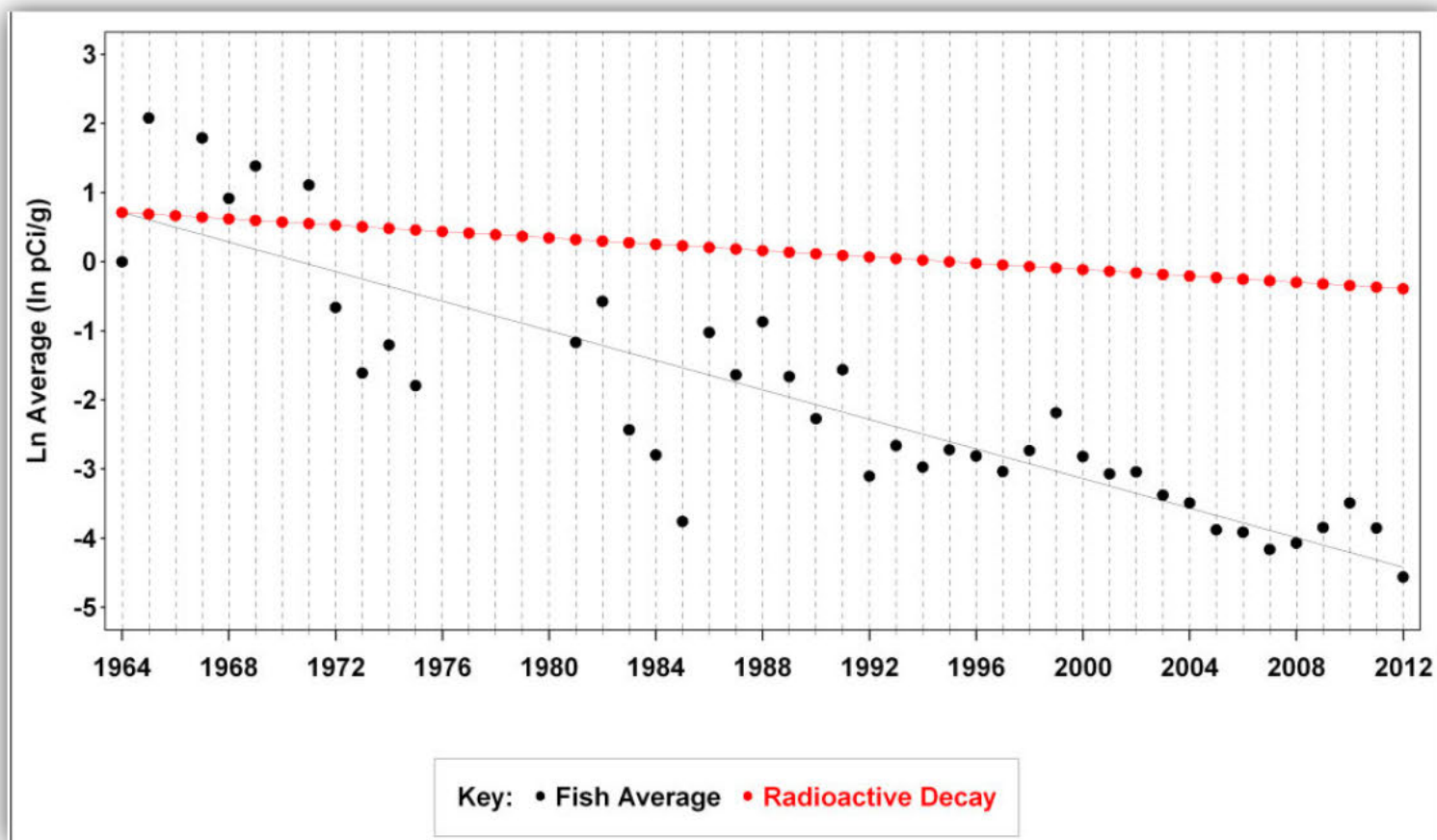
2012 Liquid Pathway Dose = 0.23 mrem

Critical Air Pathway Radionuclides



2012 Air Pathway Dose = 0.027 mrem

Fish Composite at RM 118.8 vs. Cs-137 Decay Rate

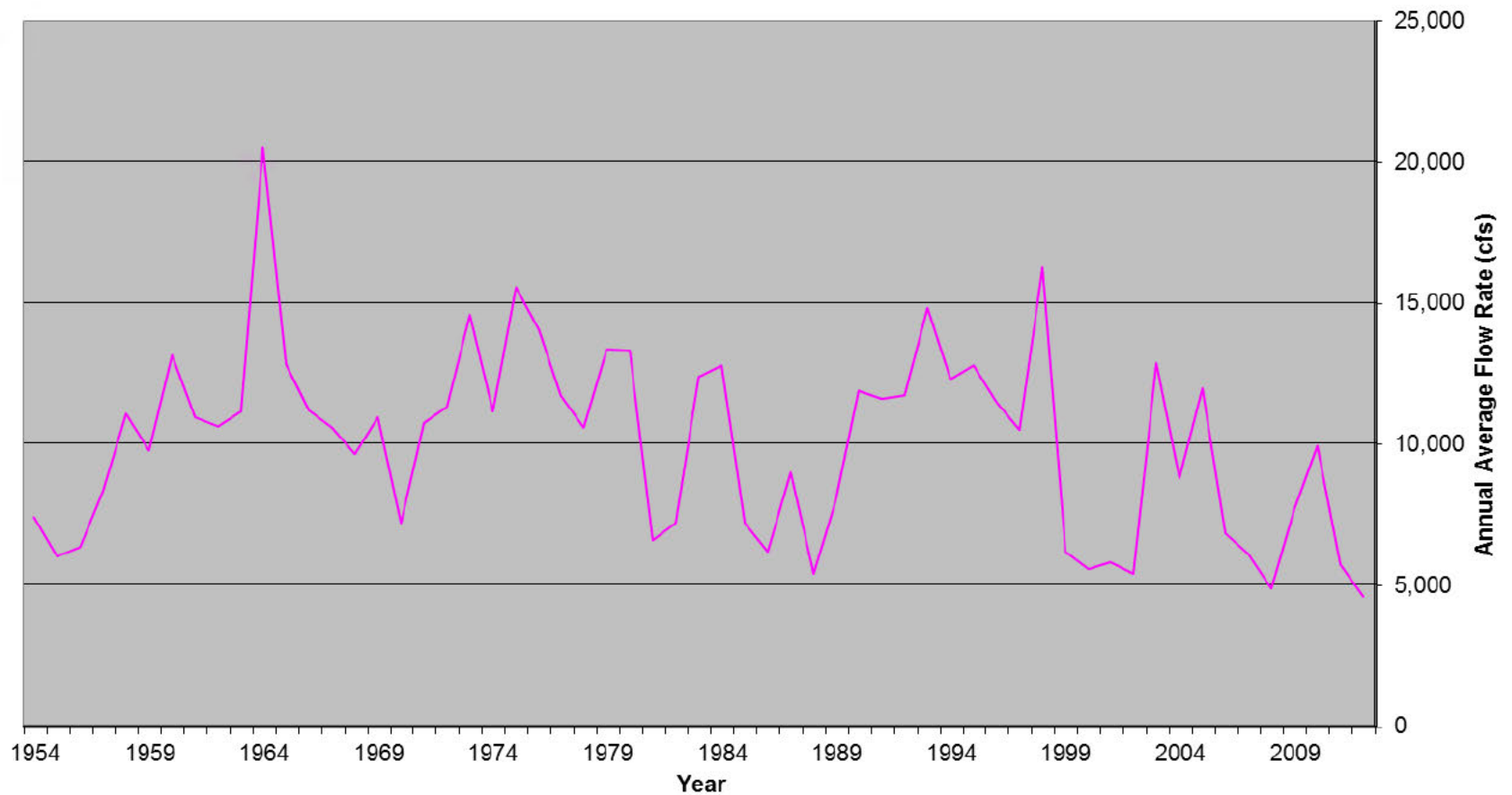


Offsite Sampling Collection Distribution

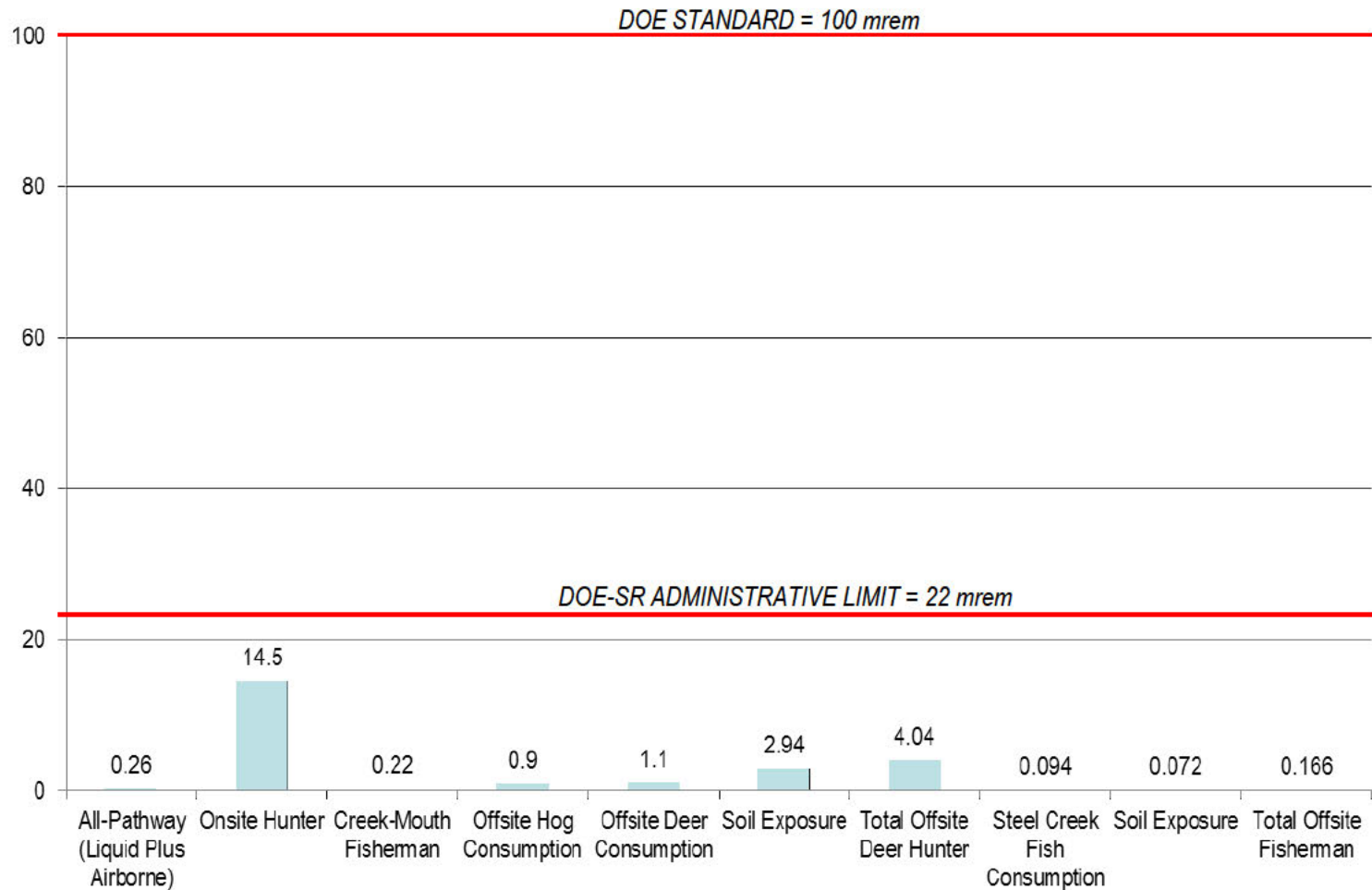
Environmental Media	South Carolina Locations	Georgia Locations	South Carolina Approximate Number of Samples	Georgia Approximate Number of Samples
<i>Airborne Exposure Pathway</i>				
Air Filters	1	3	52	156
Silica Gel	1	3	26	78
TLDs	7	5	140	100
Rain Ion Columns	0	2	0	24
Rainwater	1	3	12	36
Food Products	5	3	35	21
Milk	4	2	16	8
Soil	1	3	1	3
Vegetation (nonedible)	1	3	1	3
<i>Liquid Exposure Pathway</i>				
Drinking Water	3	1	36	12
Groundwater	0	10	0	36
Total	24	38	319	477

Savannah River Flow Rates

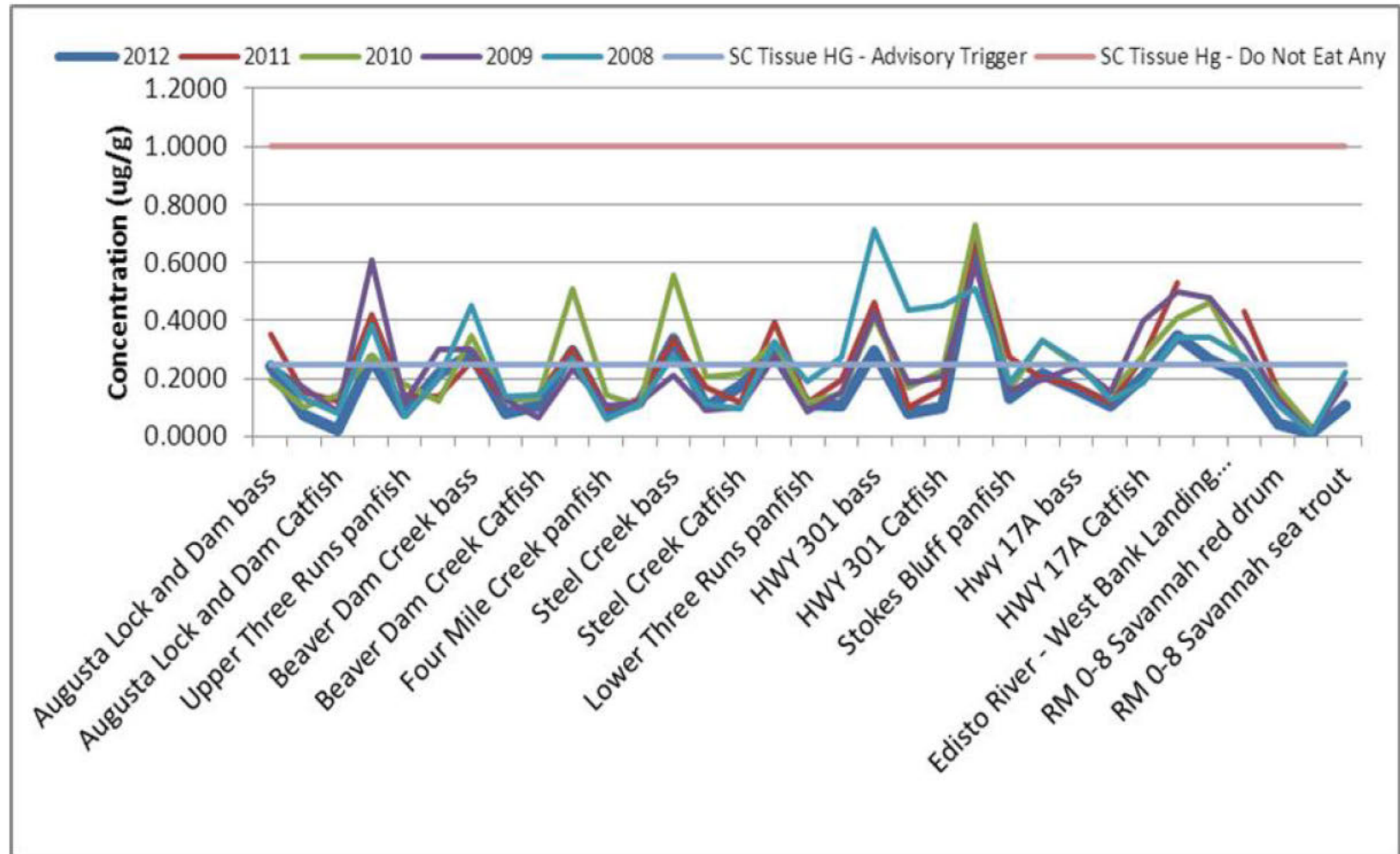
Savannah River Annual Average Flow Rates at River Mile 118.8



2011 Sportsman Dose (mrem)



Average Mercury Concentrations in Fish



Alligator Results

Results from American alligator harvested from the Savannah River near Little Hell Landing

	GA-0003766	SC-12113
Harvest Date	9/24/2012	9/24/2011
Length	8 ft 8 in	6 ft 5 in
Mercury (ug/g)	0.70	0.50
Americium-241 (pCi/kg)	ND	ND
Curium-244 (pCi/kg)	ND	ND
Cobalt-60 (pCi/kg)	ND	ND
Cesium-137 (pCi/kg)	43.3	68.9
Potassium-40 (pCi/kg)	2070	2690
Neptunium-237 (pCi/kg)	ND	ND
Plutonium-238 (pCi/kg)	ND	ND
Plutonium-239 (pCi/kg)	ND	ND
Uranium-234 (pCi/kg)	1.98	0.248
Uranium-235 (pCi/kg)	ND	ND
Uranium-238 (pCi/kg)	1.75	0.282

ND – Indicates that isotope was not detectable at significant levels.

Results from American Alligator Samples Compared to Range Observed from SRS Fish Surveillance Program

