



U.S. DEPARTMENT OF  
**ENERGY**

Savannah River Site

**A Presentation to the  
SRS Citizens Advisory Board  
Facilities Disposition and Site Remediation Committee**

# **Annual Integrator Operable Unit (IOU) Program Update**

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Federal Facility Agreement Project Manager  
Department of Energy, Savannah River Operations Office**

**December 6, 2011**

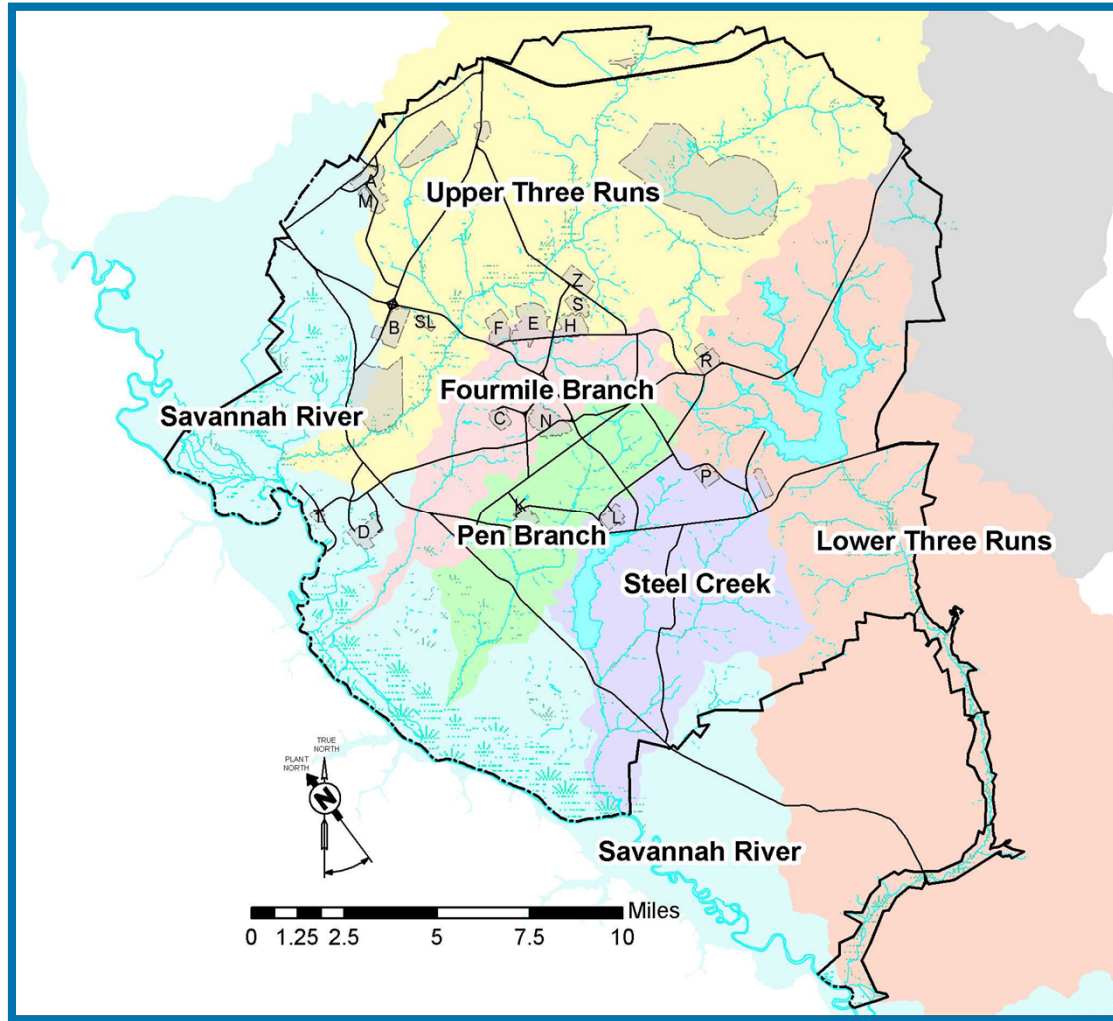


## Purpose

- **Present to the Facilities Disposition and Site Remediation committee and update on the IOU Program in accordance with the work plan.**
- **Provide brief description of the IOU Program**
- **Present an update on:**
  - **Upper Three Runs (UTR) IOU**
  - **Fourmile Branch IOU**
  - **Lower Three Runs (LTR) IOU**
- **Path Forward for the IOU Program**



## IOU Program



- **SRS streams added to the Federal Facility Agreement (FFA) in FY 1997**
- **Includes surface water, sediment, sediment/soil, and biota (plants and animals)**

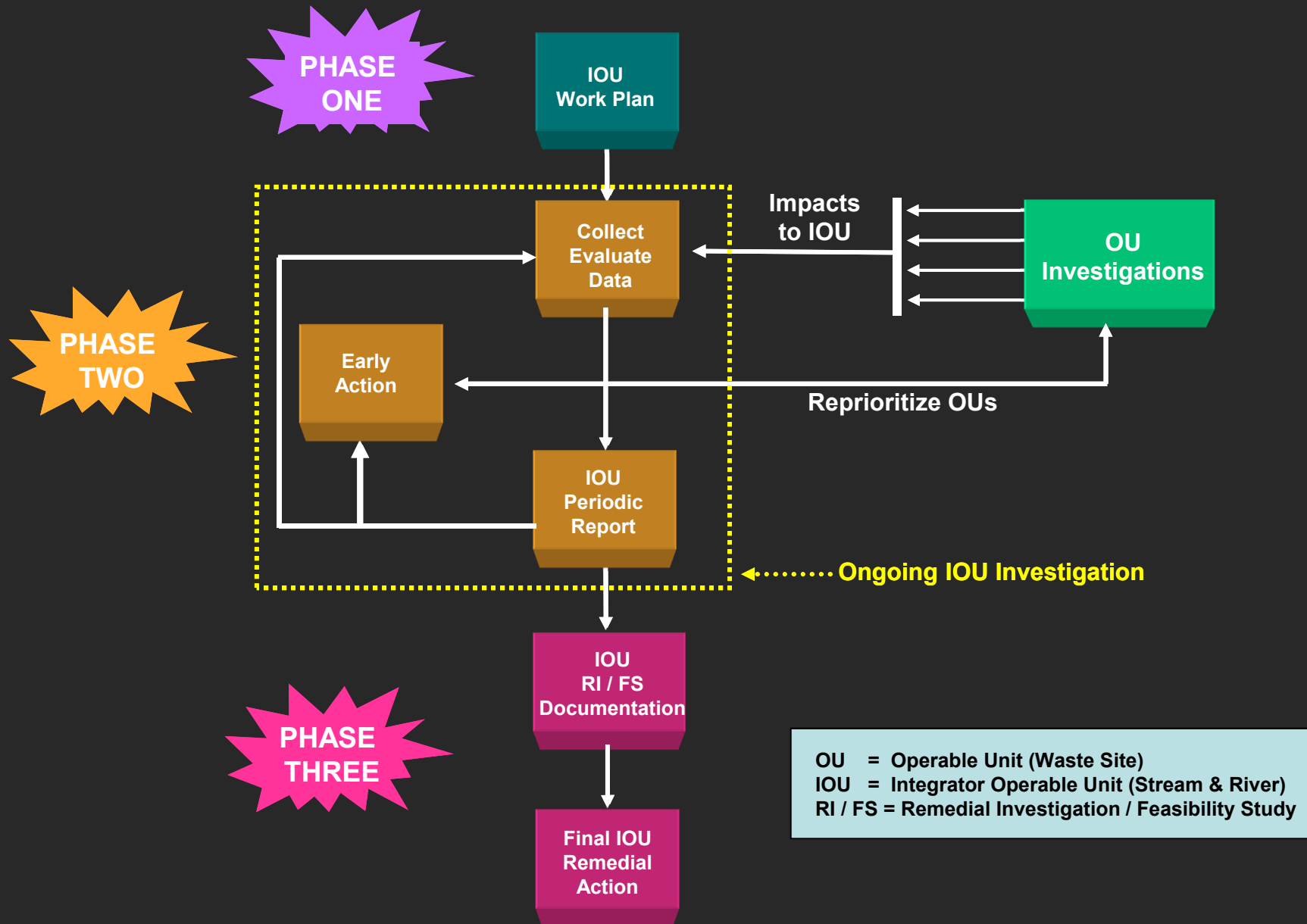


## IOU Purpose

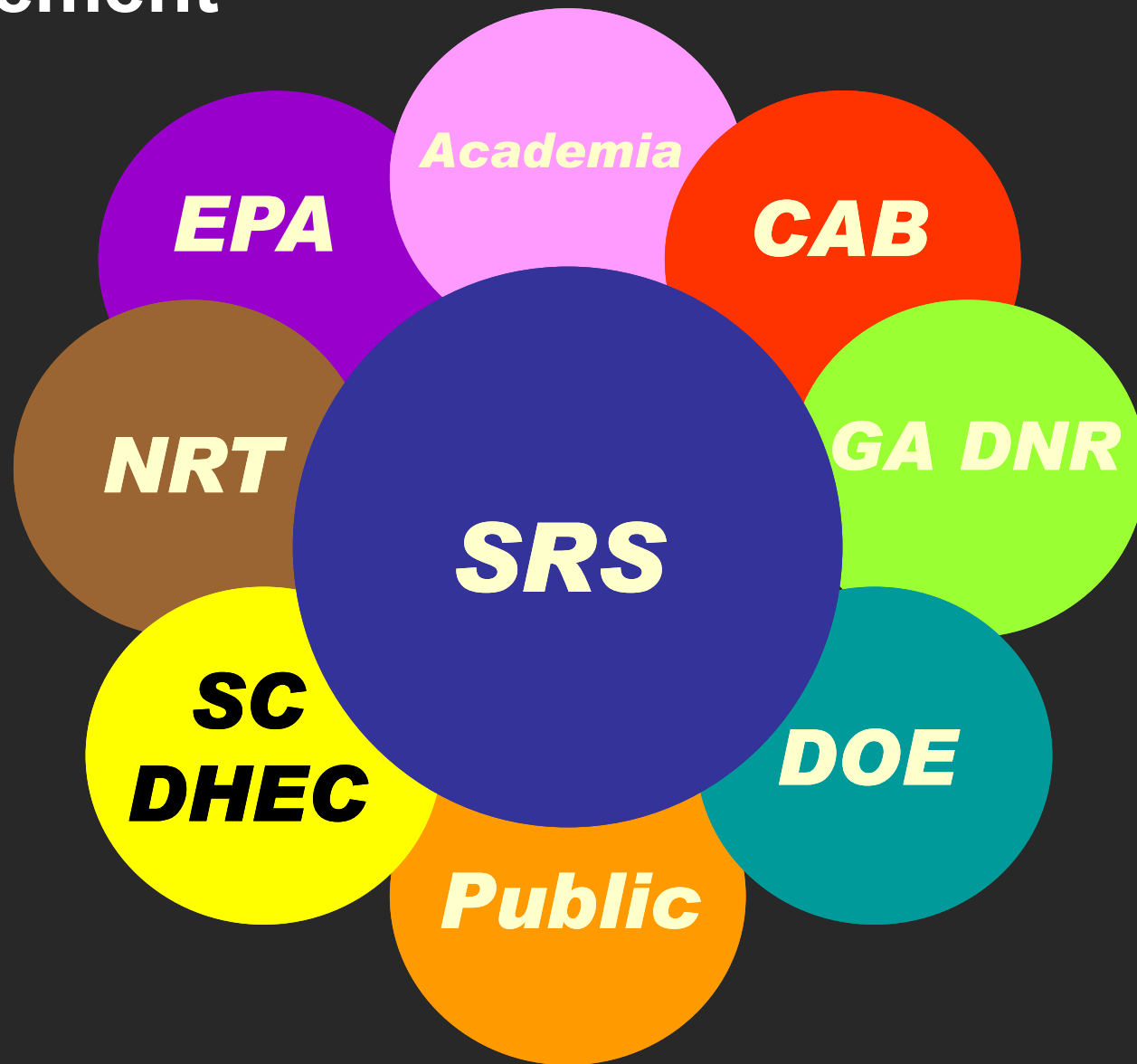
- **Determine and monitor contaminants in SRS streams**
- **Assess the health (i.e., habitat quality) of the stream systems**
- **Evaluate human health risk in stream corridors**
- **Determine whether early actions are needed**
- **Make final IOU cleanup decisions after operations have ceased and as operable unit cleanup decisions are completed**



# ***IOU Program***



# Involvement





## IOU Schedule

IOU	Phase II Began	Phase III	ROD
Steel Creek	May 2000	May 2024	March 2030
Savannah River / Floodplain Swamp	May 2001	December 2024	March 2028
Fourmile Branch	August 2001	November 2024	June 2030
<b>Lower Three Runs</b>	November 2001	<b>March 2013</b>	March 2020
Pen Branch	June 2002	January 2024	June 2030
Upper Three Runs	January 2003	June 2022	March 2028



## IOU Documents

IOU	Remedial Investigation Work Plan Approved	Periodic Report No. 3 Approved	Periodic Report No. 4 Approved
Upper Three Runs	May 2003	Rev. 0 Submitted August 2011	Rev. 0 Due August 2016
Fourmile Branch	March 2002	November 2008	Rev. 0 Submitted October 2011
Pen Branch IOU	November 2002	January 2011	Rev. 0 Due January 2016
Steel Creek	September 2000	May 2007	May 2010
Lower Three Runs	March 2002	December 2009	Rev. 0 Due January 2012
Savannah River / Floodplain Swamp	May 2003	Rev. 0 Due May 2012	Rev. 0 Due February 2017

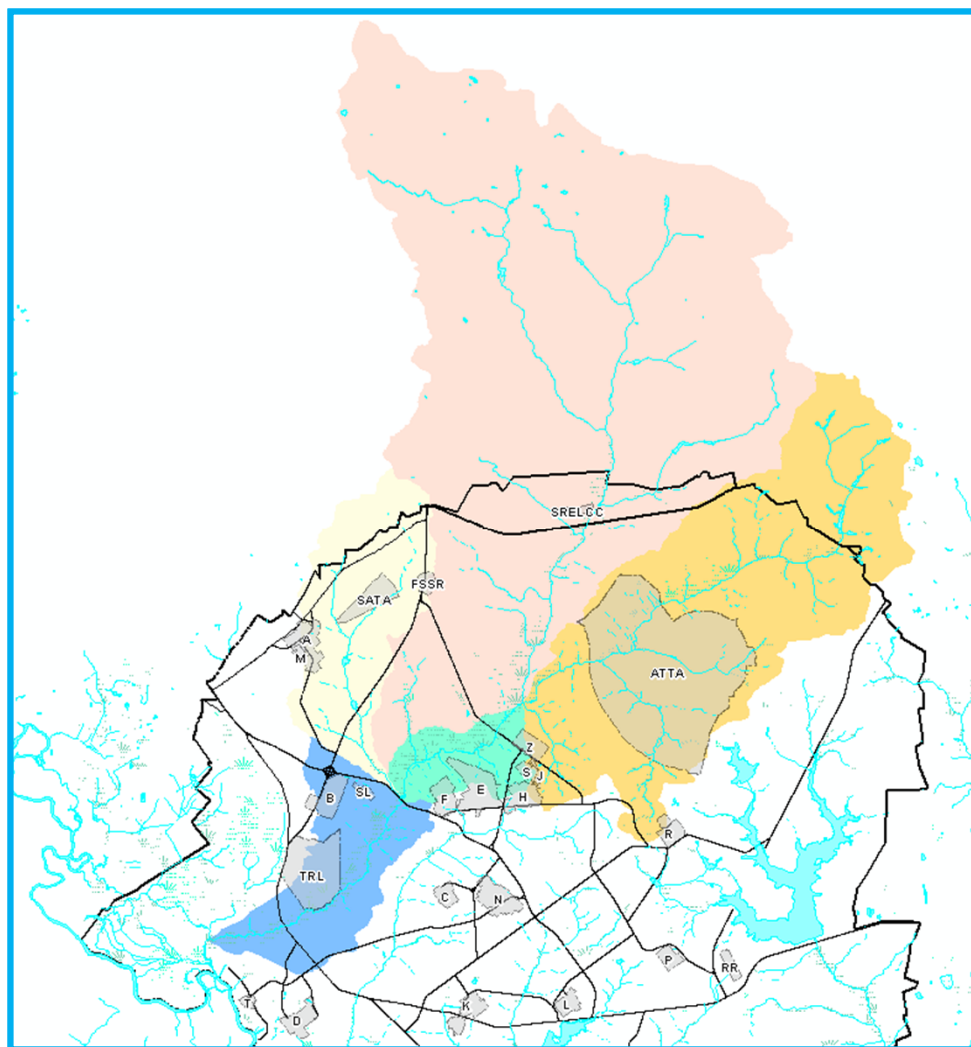


## Status

- **Upper Three Runs Periodic Report (PR)**
  - **UTR PR3 Rev. 0 submitted August 2010**
  - **No radiological or non-radiological chemicals were retained for early action consideration based on the human health or ecological evaluation**
  - **No early actions were identified**
  - **Ecological data need: Conduct additional trophic modeling to assess threats of metal contaminants (in sediment and surface water) based on new data and add additional receptors (raccoon and great blue heron) to existing modeled receptors (river otter and belted kingfisher)**



# Upper Three Runs



## Upper Three Runs Subunits

- UTR Upper
- UTR Tinker Creek
- UTR Tims Branch
- UTR Middle
- UTR Lower
- Stream-Perennial
- Lake/Pond-Perennial
- Lake/Pond-Intermittent
- Marsh/Swamp
- Marsh/Swamp - Wooded
- Road, SRS Secondary Center
- Meander Line
- Monumented Line



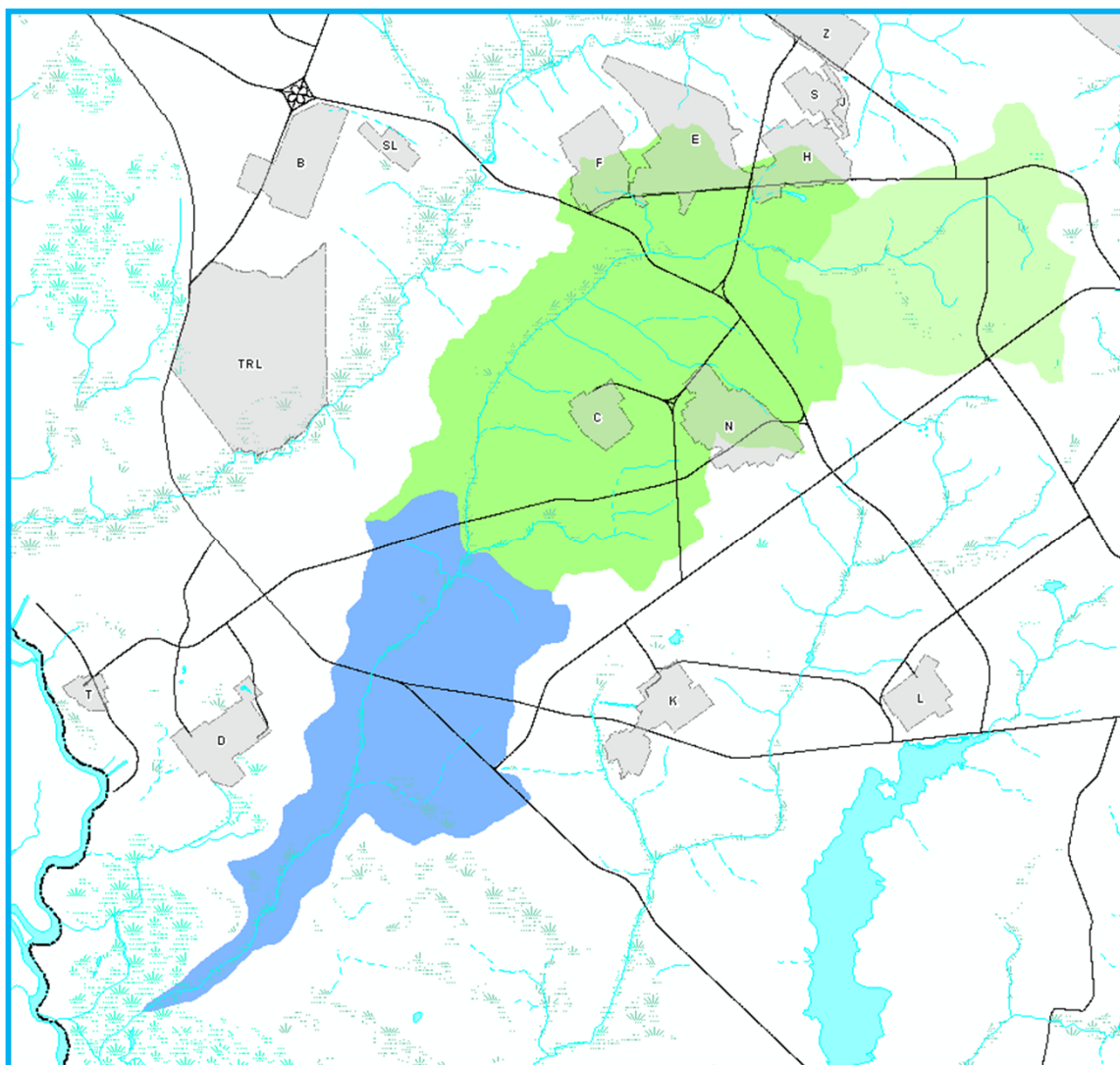


## Status

- **Fourmile Branch PR 4 Rev. 0**
  - **Most recent PR submitted October 2011**
  - **No constituents were retained for early action consideration based on the human health or ecological evaluation**
  - **No early actions were identified.**
  - **Ecological data need: Conduct additional trophic modeling to include new receptors (raccoon and great blue heron) and new data to enhance existing models for the kingfisher and river otter**



# Fourmile Branch



## Fourmile Branch Subunits

- FMB Upper
- FMB Middle
- FMB Lower



## Lower Three Runs (LTR)

- **SRS initiated an extensive characterization effort 2009-2011**
  - **Included R-Area and P-Area Discharge Canals and Pre-Cooler Ponds**
  - **LTR Middle and Lower (tail portion) Subunits**
  - **Background sampling: Tinker Creek-Upper Three Runs, Meyers Branch-Steel Creek, Crackerneck-Savannah River/Floodplain Swamp, Upper subunit of Lower Three Runs**
  - **Media: Sediment, sediment / soil, surface water, biota (fish)**





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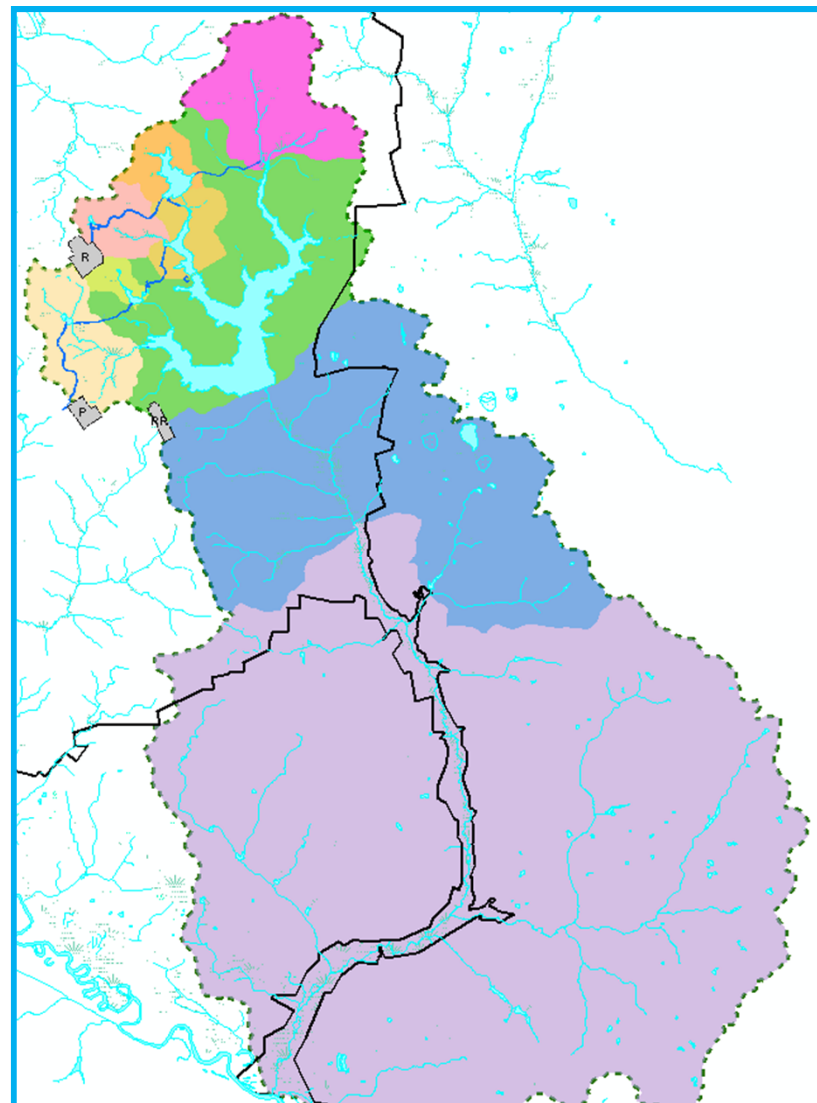
Savannah River Site

## Stream and Floodplain Environment





## Lower Three Runs IOU Subunits



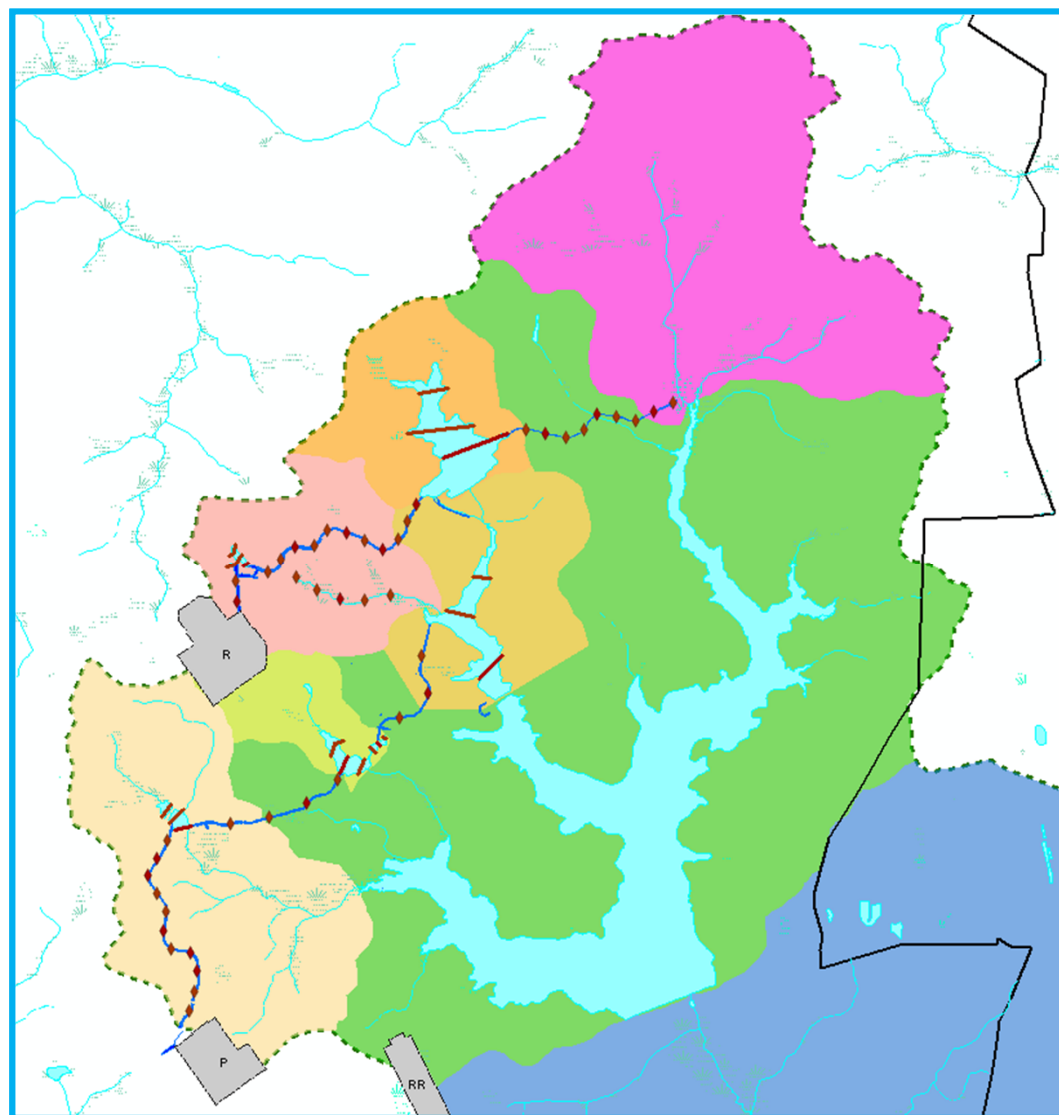
### Subunits

- LTR Upper
- LTR Pond A
- LTR Pond B
- LTR Pond C
- LTR Pond 2
- LTR Ponds 4 and 5
- LTR Par Pond
- LTR Middle
- LTR Lower





## Transects Along Ponds, P and R Canals and Joyce Branch



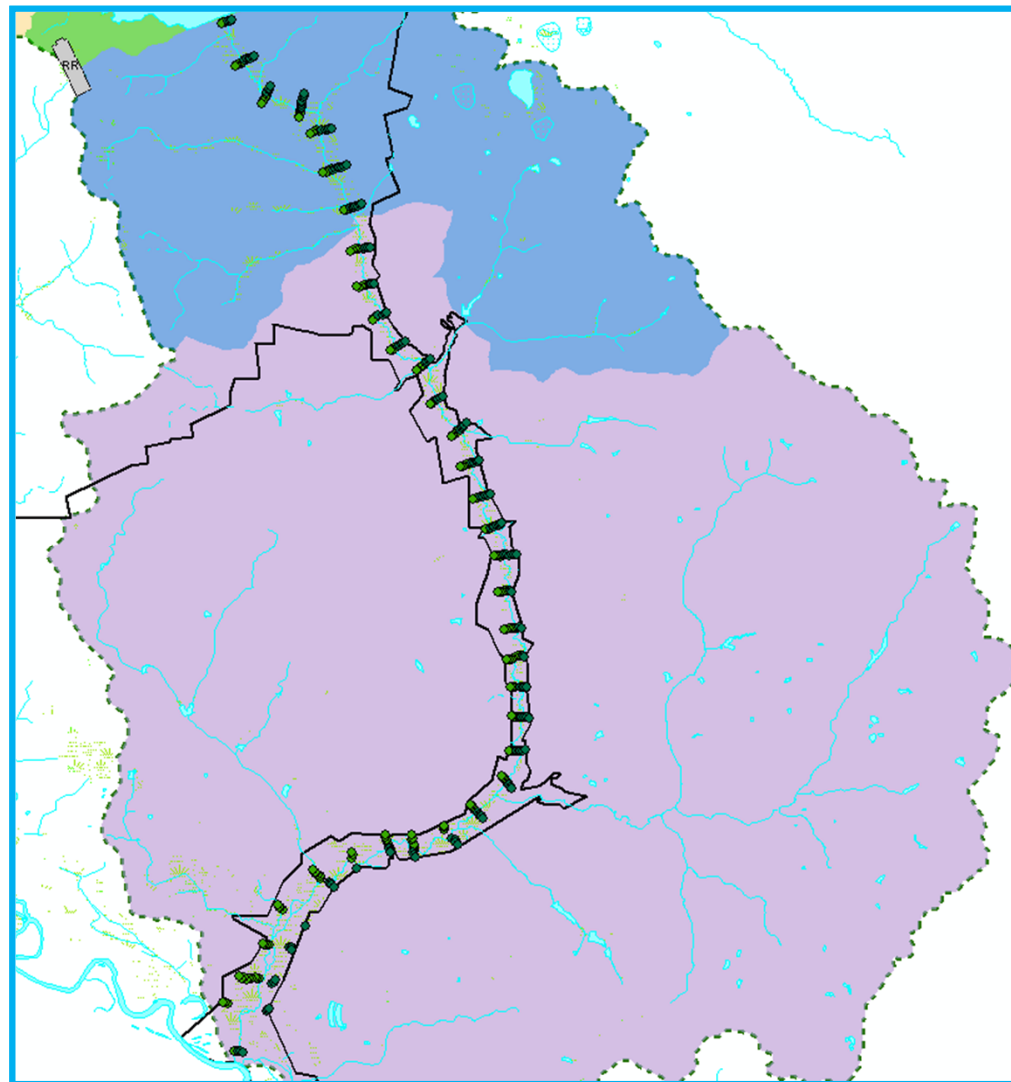
### Subunits

- LTR Upper
- LTR Pond A
- LTR Pond B
- LTR Pond C
- LTR Pond 2
- LTR Ponds 4 and 5
- LTR Par Pond
- LTR Middle
- LTR Lower





## Transects Along Middle and Lower Subunits

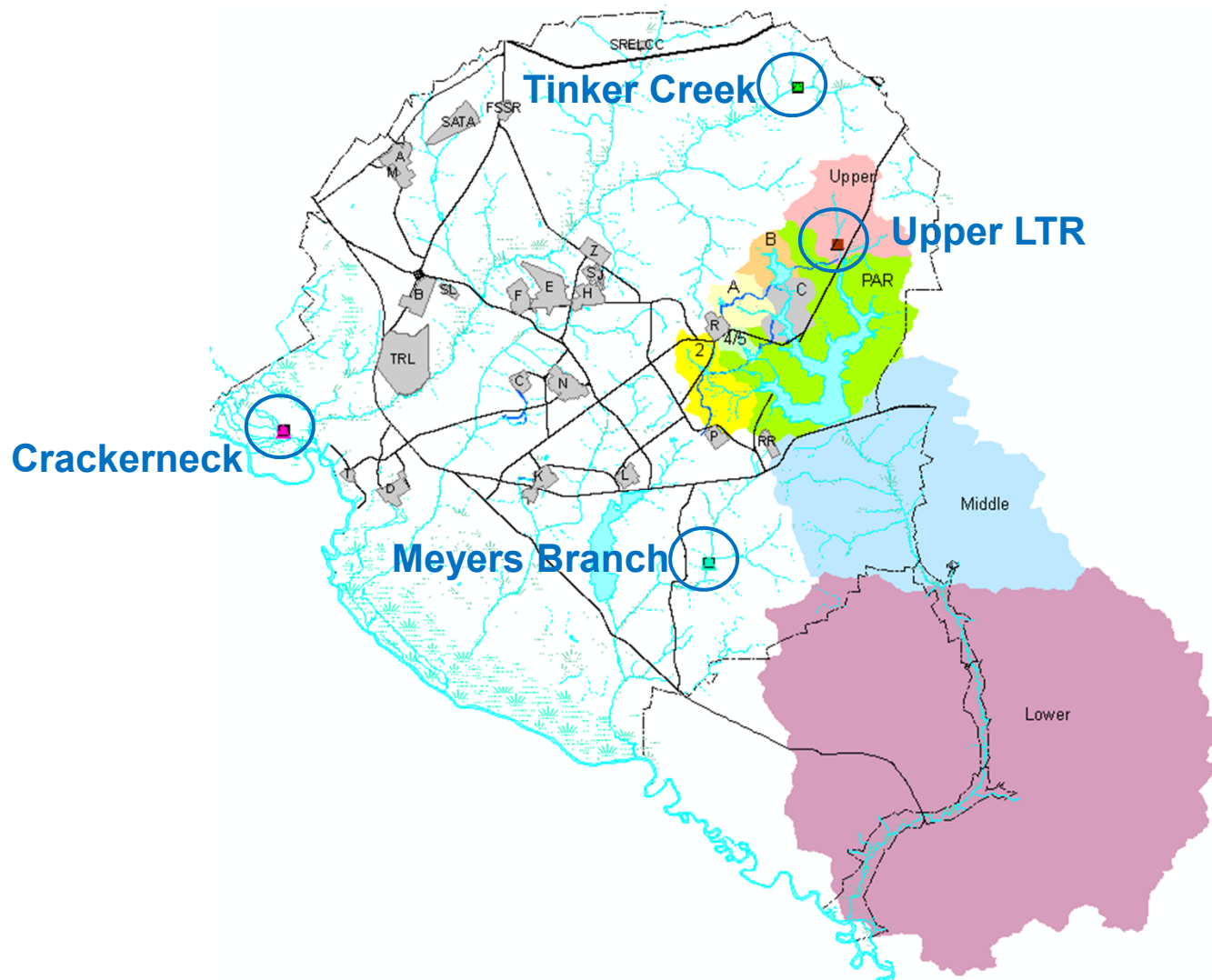


### Subunits

- LTR Upper
- LTR Pond A
- LTR Pond B
- LTR Pond C
- LTR Pond 2
- LTR Ponds 4 and 5
- LTR Par Pond
- LTR Middle
- LTR Lower



## Background Sampling Locations (Sediment, Surface Water, Fish)





## 2009-2010 Expanded Characterization

<b>Media</b>	<b>Data Records (# Samples/Analyses)</b>
<b>Sediment</b>	<b>424 / 6274</b>
<b>Sediment / Soil</b>	<b>517 / 33,587</b>
<b>Lanthanum Bromide detector</b>	<b>343 / 343</b>
<b>Surface Water</b>	<b>129 / 16,666</b>
<b>Fish</b>	<b>24 / 1000</b>
<b>Total Samples / Analyses</b>	<b>1437 / 57,870</b>

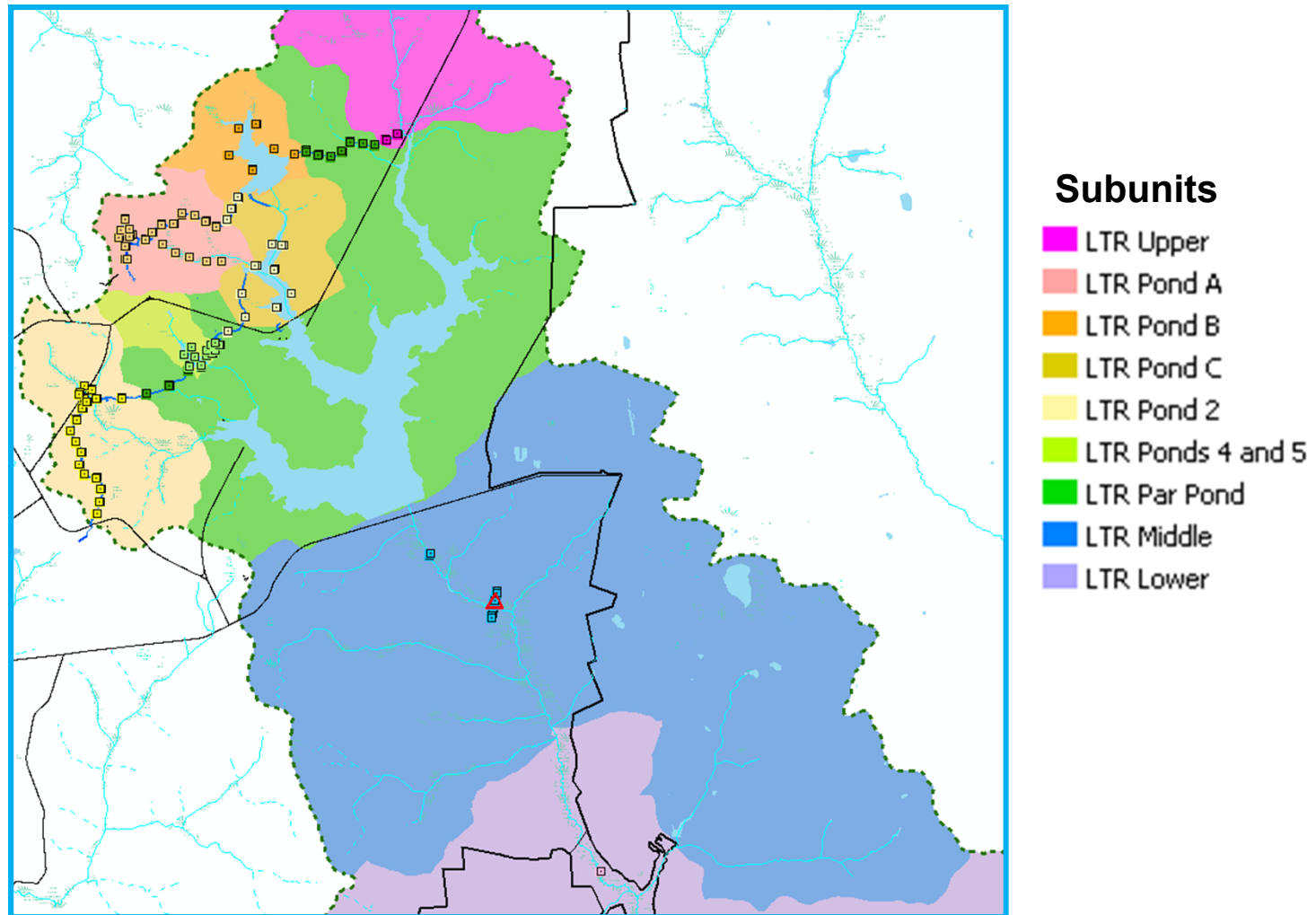


# Human Health and Ecological Screening

- **IOU Phase II Data Evaluation**
  - **Human Health ( $10^{-4}$ /Hazard Quotient 3 risk level *or 1 in 10,000*)**
    - On-site worker (All subunits except Lower)
    - Adolescent Trespasser (Lower subunit)
    - Subsistence fisherman (All subunits)
  - **Ecological**
    - Ecological screening values
      - Chronic/acute level benchmarks
    - Biological data



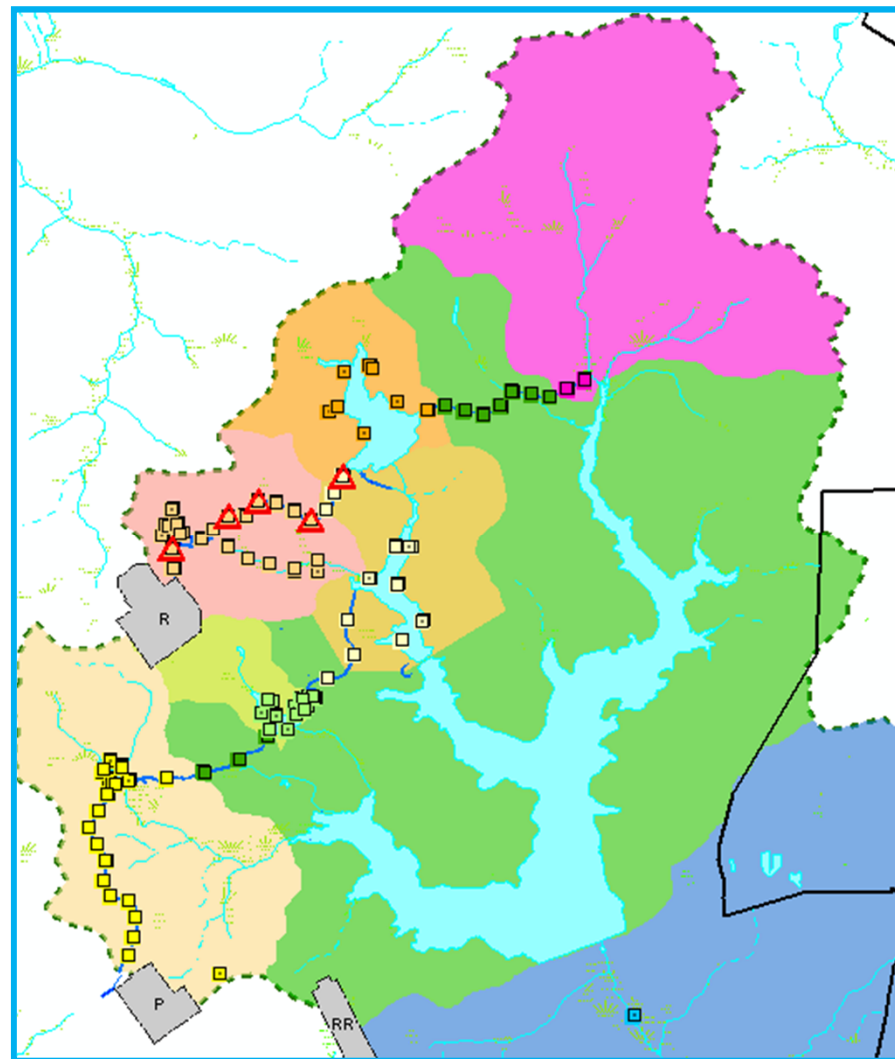
## Location of Sediment/Soil Samples with On-site Worker Exceedances for Cs-137







## Location of Sediment Samples with On-site Worker Exceedances for Cs-137



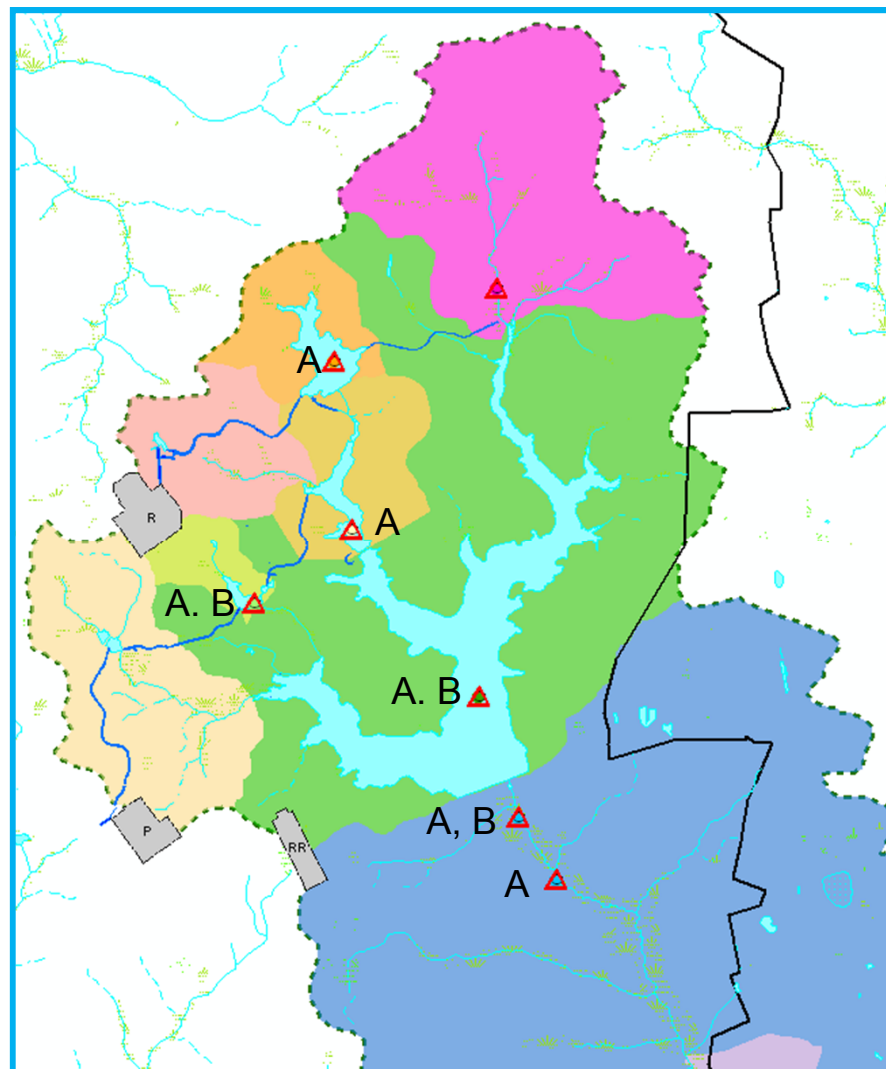
### Subunits

- LTR Upper
- LTR Pond A
- LTR Pond B
- LTR Pond C
- LTR Pond 2
- LTR Ponds 4 and 5
- LTR Par Pond
- LTR Middle
- LTR Lower





## Location of Fish Samples with Subsistence Fisherman Exceedances



**Cesium-137 (A)  
Mercury (B)**

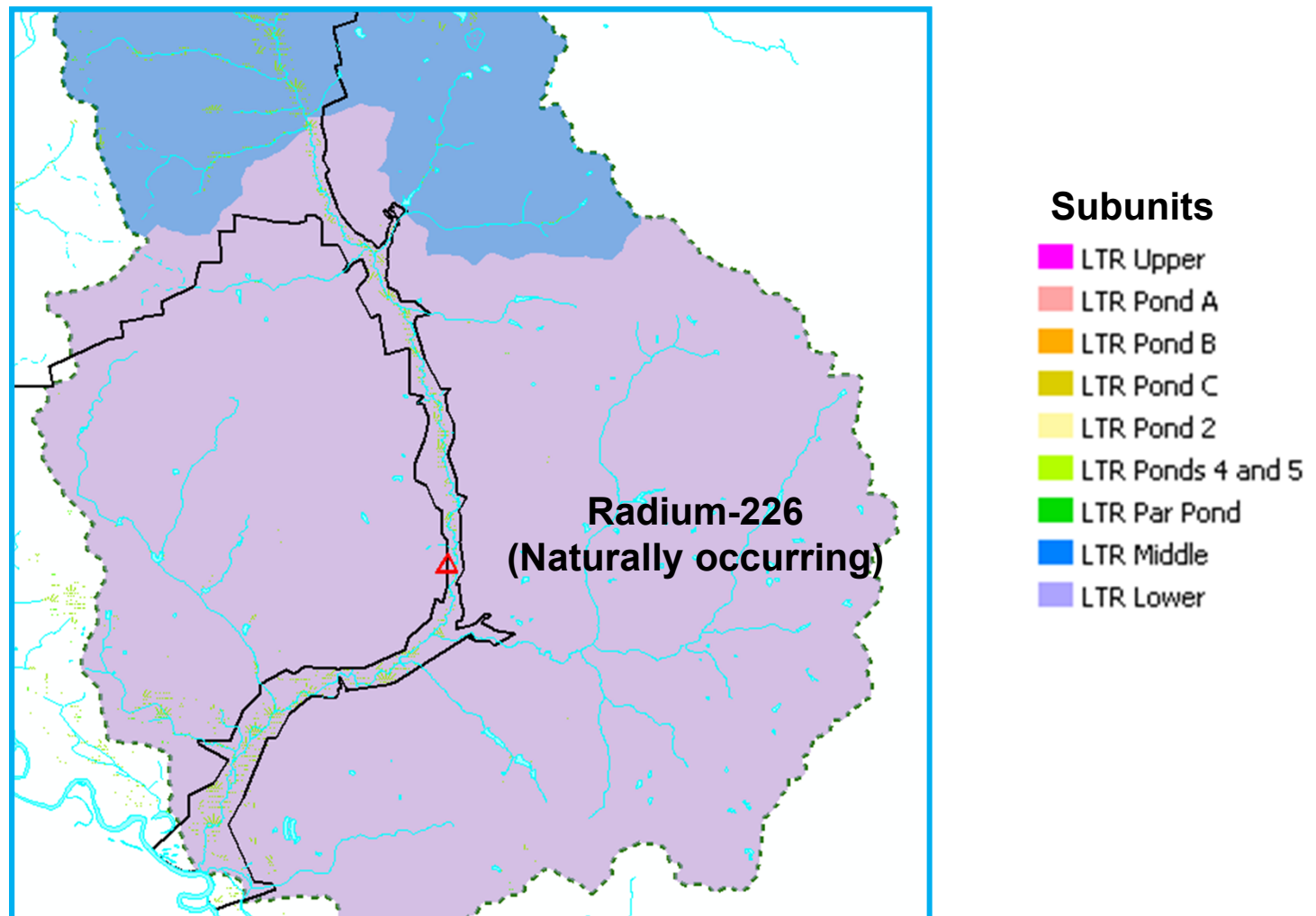
**Potassium-40 (naturally  
occurring) exceedances  
were present at all  
locations**

### Subunits

- LTR Upper
- LTR Pond A
- LTR Pond B
- LTR Pond C
- LTR Pond 2
- LTR Ponds 4 and 5
- LTR Par Pond
- LTR Middle
- LTR Lower

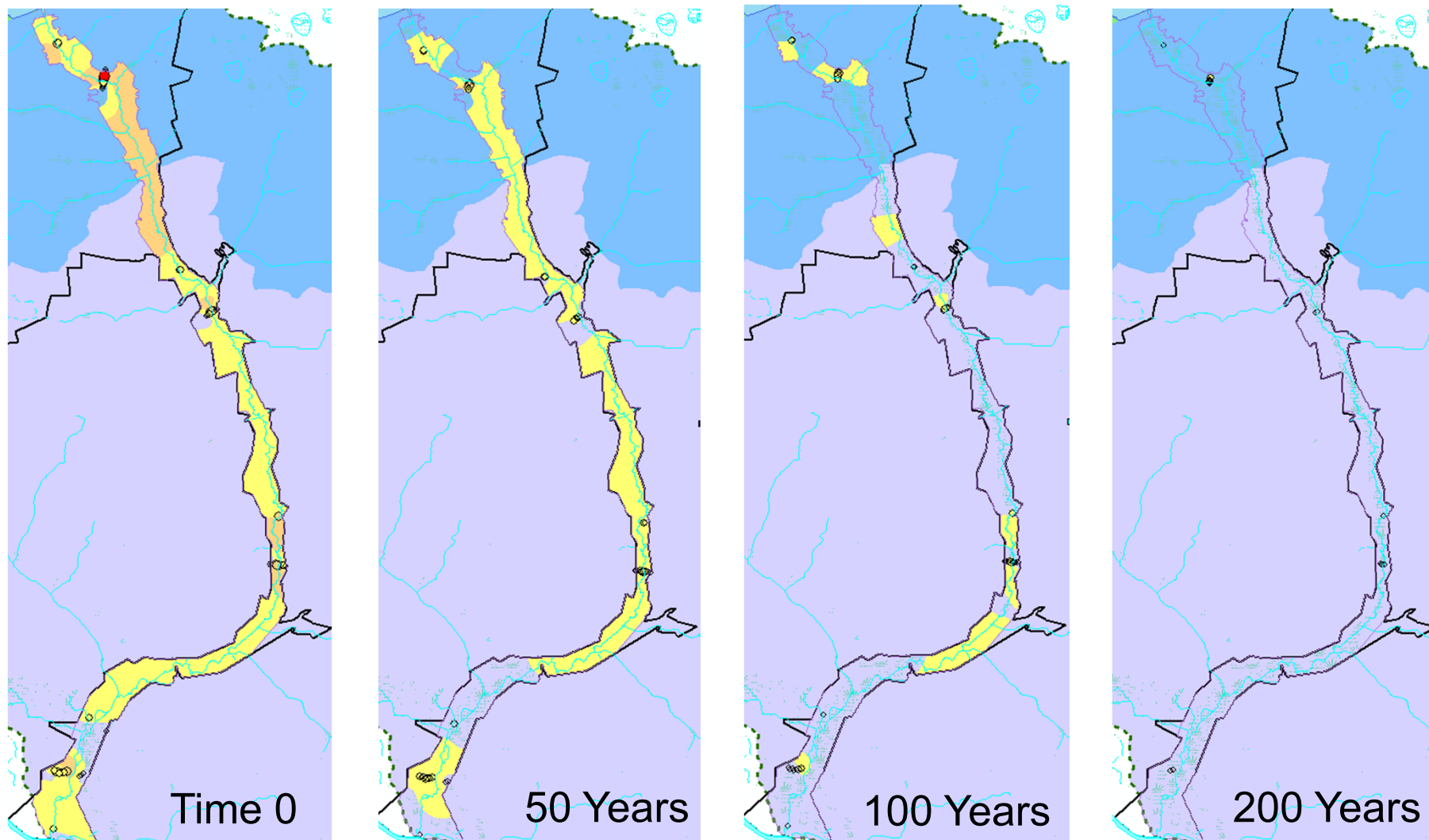


## Location of Sediment/Soil Samples with Adolescent Trespasser Exceedances





## Projections of Cs-137 Activities in Middle and Lower Subunits



Cs-137 Activities (pCi/g) Based on On-Site Worker

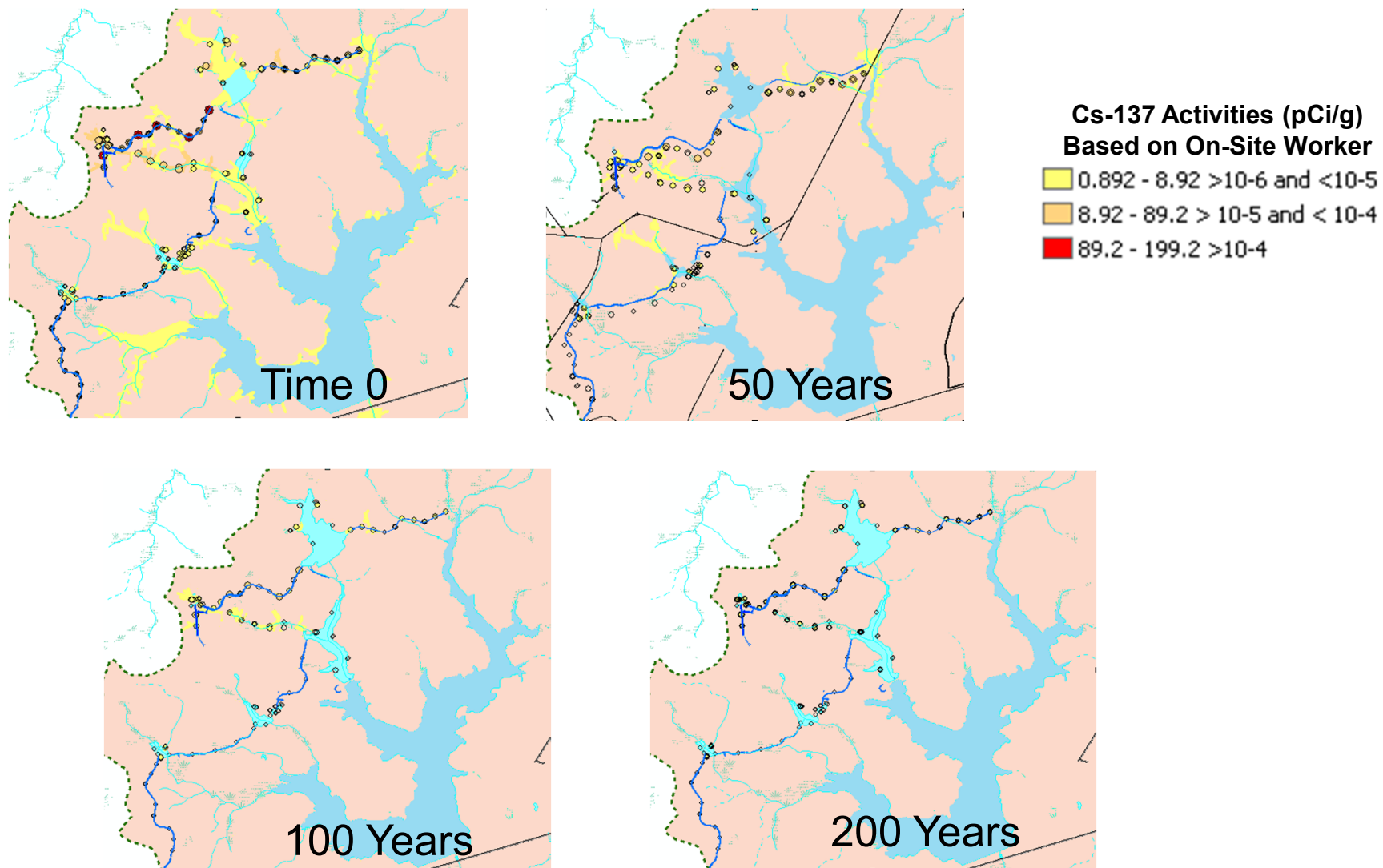
89.2 - 199.2  $> 10^{-4}$

8.92 - 89.2  $> 10^{-5}$  and  $< 10^{-4}$

0.892 - 8.92  $> 10^{-6}$  and  $< 10^{-5}$



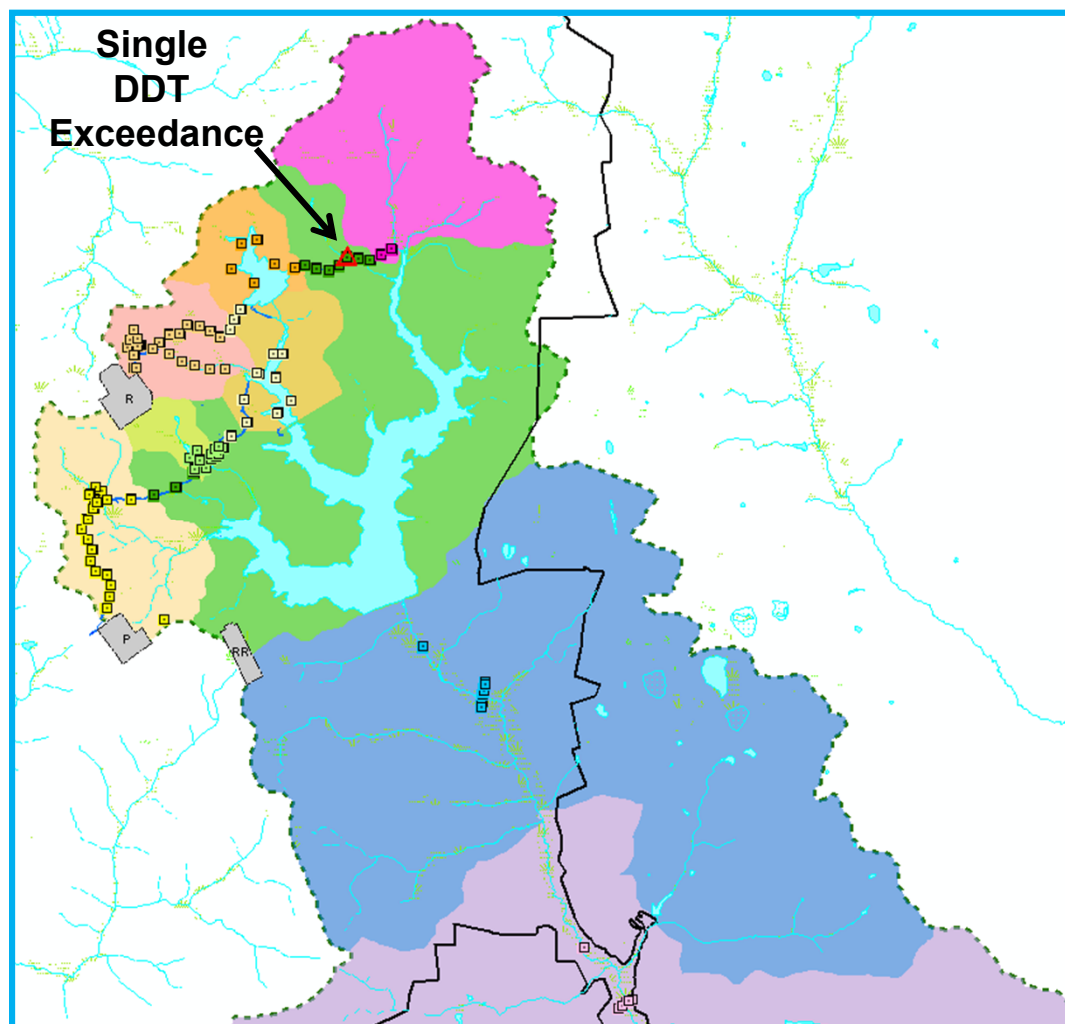
## Projections of Cs-137 Activities within the Pre-Cooler Pond and Canal System







## Location of Ecological Acute Level Exceedances for Sediment/Soil



### Subunits

- LTR Upper
- LTR Pond A
- LTR Pond B
- LTR Pond C
- LTR Pond 2
- LTR Ponds 4 and 5
- LTR Par Pond
- LTR Middle
- LTR Lower

There were no acute level exceedances for sediment



## Biological Data

- **Fish**
  - **Fish and macroinvertebrate assemblages in Middle and Lower LTR are slightly depressed but not significantly different from control sites**
  - **Health of individual fish: no evidence of impact**
- **Trophic modeling (preliminary data)**
  - **River Otter**
    - **Aluminum (Middle, Lower, Ponds A, B, 2, 4/5)**
    - **Mercury (Middle, Lower, PAR, Pond B)**
    - **Selenium (Middle/Lower)**
  - **Belted Kingfisher**
    - **Mercury (Middle, Lower, PAR, Pond B)**





## Ecological Receptors



Belted Kingfisher



Raccoon



## Status Summary

- **Lower Three Runs PR 4 (Due January 2012)**
  - **Human Health Evaluation**
    - **Subsistence fisherman: Cs-137 and mercury exceeds IOU risk benchmarks (assuming daily consumption for 30 years)**
    - **Sediment and Sediment/Soil: Cs-137 exceeds IOU risk benchmark for on-site worker**
  - **Ecological Data Needs**
    - **Enhance trophic modeling effort to include new fish data and add additional models (raccoon and great blue heron) to current modeled species (belted kingfisher and river otter)**
  - **No additional early actions were identified**



## Path Forward

- **Lower Three Runs IOU**
  - Incorporate LTR expanded characterization data (and other available data) into PR 4 (Rev. 0 due January 2012)
  - Scope Remedial Investigation/Baseline Risk Assessment
  - Phase III Field Start March 2013
- **Savannah River/Floodplain Swamp IOU**
  - Periodic Report 3 (Rev. 0) due May 2012
- **Steel Creek IOU**
  - Periodic Report 5 (Rev. 0) due August 2013