U.S. DEPARTMENT of ENERGY

Lower Three Runs Remediation Completion

75 Years of service to the Nation
SRS™
SAVANNAH RIVER SITE
★ 1950-2025 ★

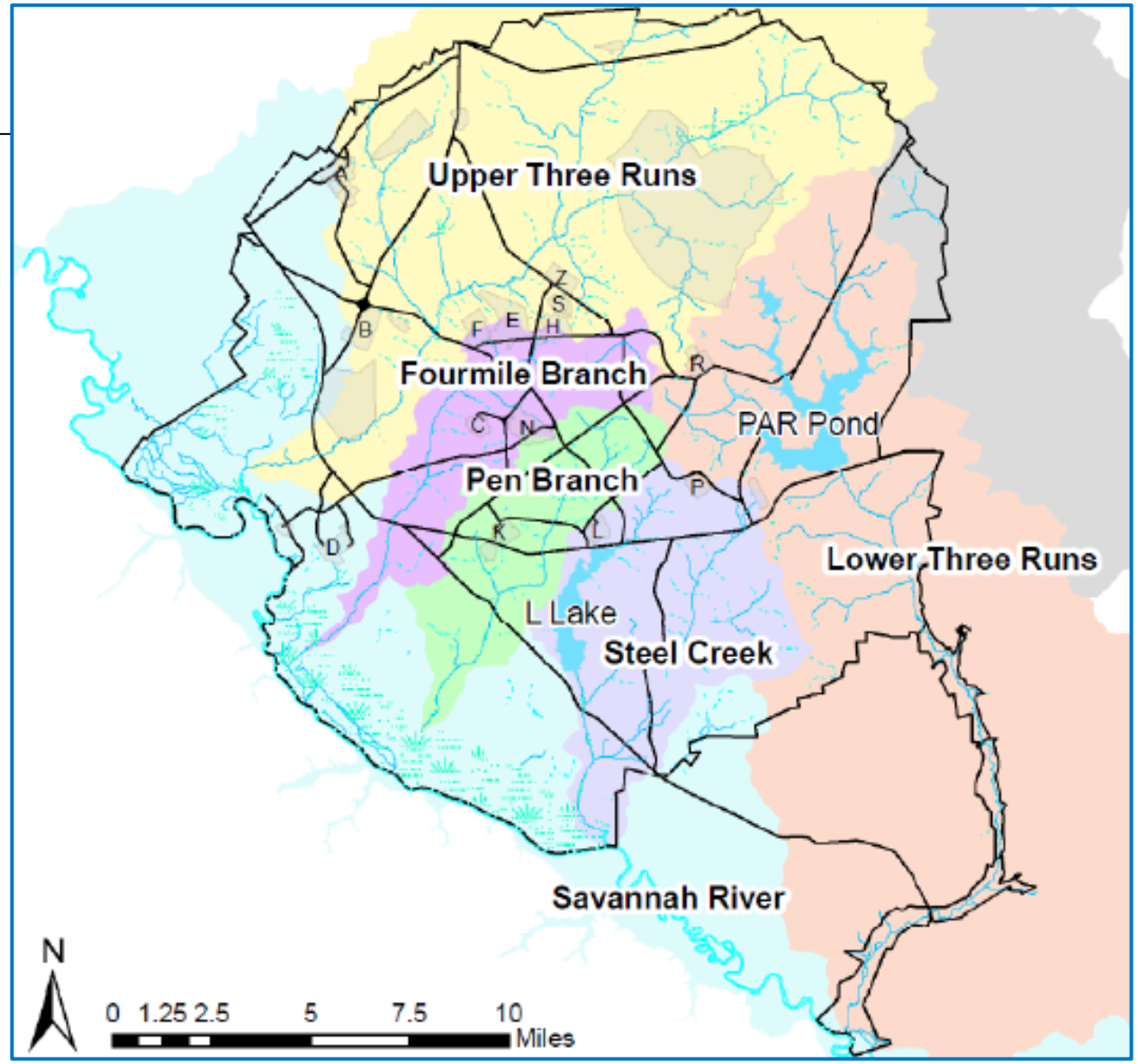
Lower Three Runs Integrator Operable Unit

Susan Blas, PhD
Fellow Scientist

Citizen Advisory Board, Full Board Meeting
May 2025

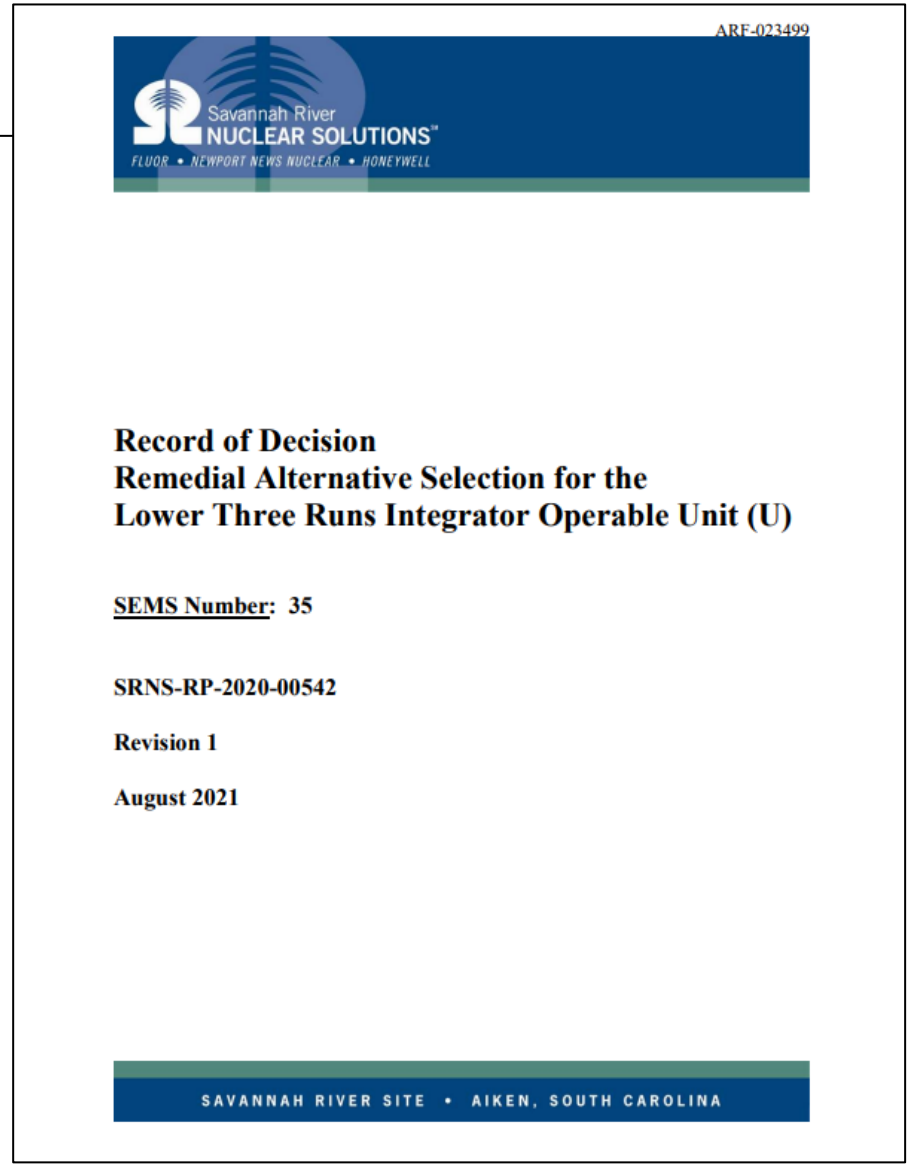
SRS Integrator Operable Units

- The SRS stream systems were added to the Federal Facility Agreement (FFA) in 1997.
- SRS is divided into 6 watersheds that align with the stream systems that transverse the SRS and includes a portion of the Savannah River.
- A watershed is the land area that drains into a common waterbody/stream system.
- The SRS stream systems are Integrator Operable Units (IOUs) that include surface water, sediment, floodplain soils and biota (plants/animals).



Purpose of the IOU Program

- **Evaluate contaminants from FFA operable units: basins, disposal piles and trenches, spills, post-operational facility remnents, etc.)**
  - Assess human health risk (onsite worker, recreational fisherman, adolscent trespasser, hypothetical resident)
  - Assess stream health (habitat quality, biota)
  - Determine if early action remedial actions are needed to protect human health or the environment
- **Final IOU decisions can be made when operable units within the watershed are complete (i.e., no additional sources of contamination).**
- **The Lower Three Runs (LTR) IOU is the first IOU to reach a final decision and completion of remedial action.**
- **The Record of Decision outlined the requirements for the remedial action.**


ARF-023499

Savannah River NUCLEAR SOLUTIONS
FLUOR • NEWPORT NEWS NUCLEAR • HONEYWELL

Record of Decision
Remedial Alternative Selection for the
Lower Three Runs Integrator Operable Unit (U)

SEMS Number: 35

SRNS-RP-2020-00542

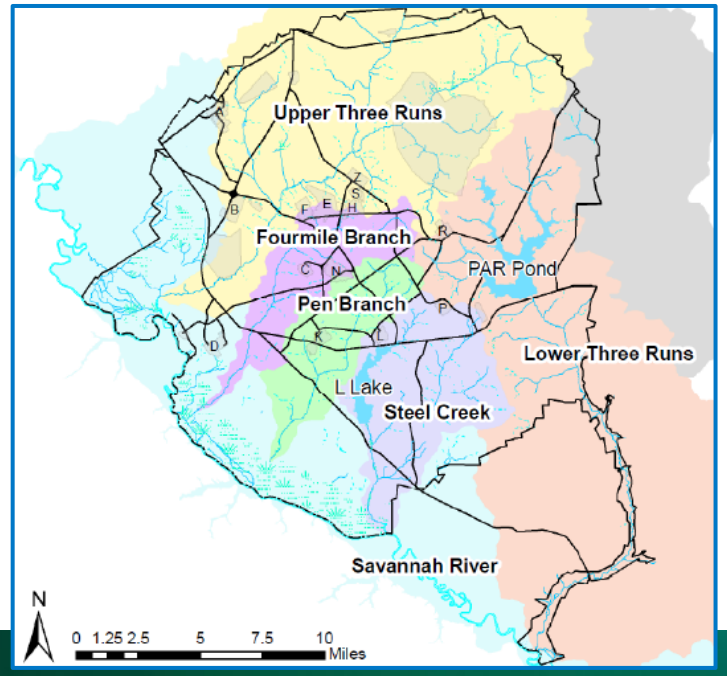
Revision 1

August 2021

SAVANNAH RIVER SITE • AIKEN, SOUTH CAROLINA

Lower Three Runs IOU

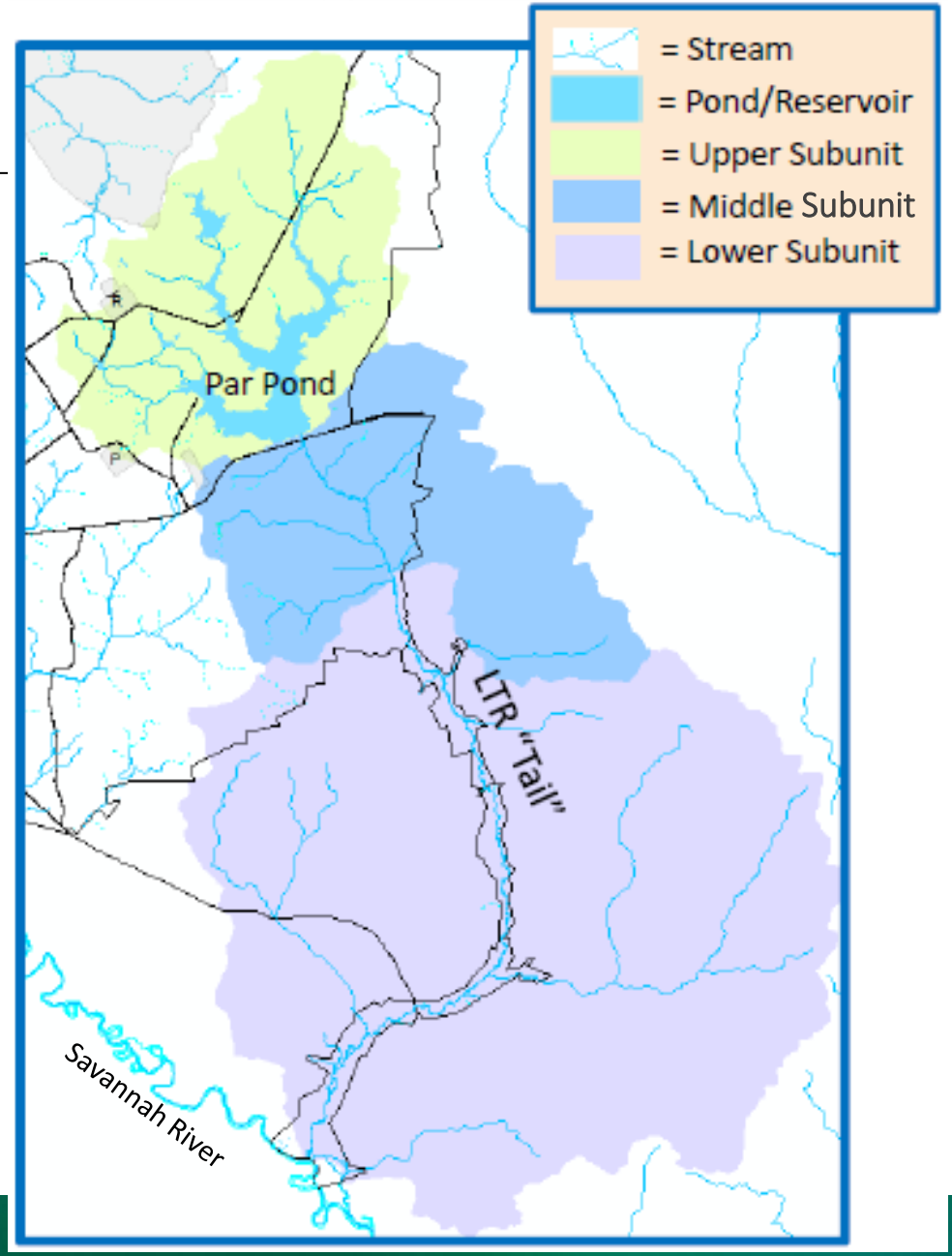
LTR is a bottomland hardwood stream system that includes water tupelo/cypress swamp habitat.



PAR Pond is a 2,640-acre reservoir within LTR that received cooling water from P- and R- Reactor.

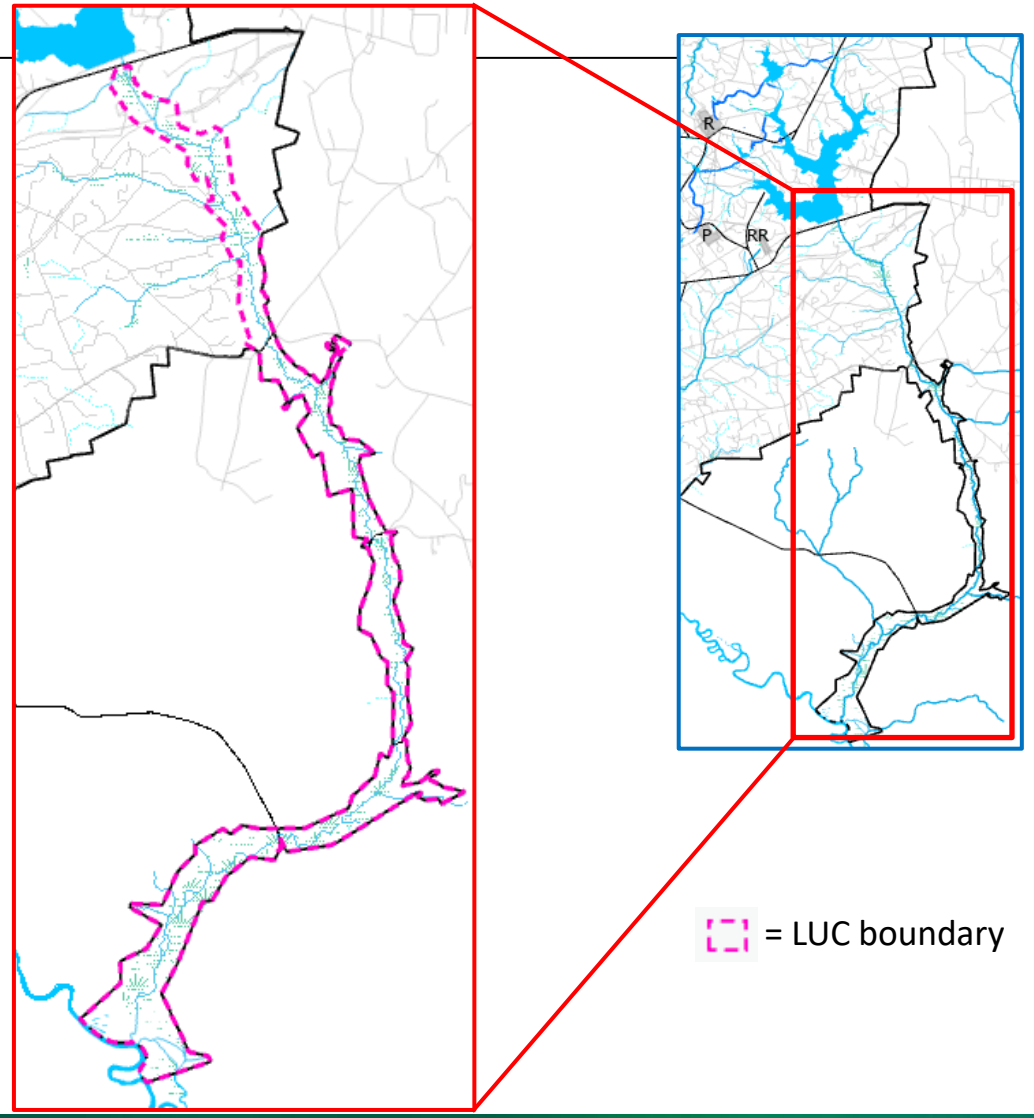
Lower Three Runs IOU

- **LTR watershed is divied into three subunits (Upper, Middle, and Lower).**
- **The LTR watershed contains**
  - R-Reactor
  - P-Reactor
  - Pre-cooler ponds and canal system
  - PAR Pond
- **The discharges from reactor operations included releases of radionuclides (cesium (Cs)-137 and cobalt (Co)-60, to a lesser extent) that pose a risk to human health.**
- **The discharges also included mercury (Hg) from pumping Savannah River water that provided cooling water for the reactors.**



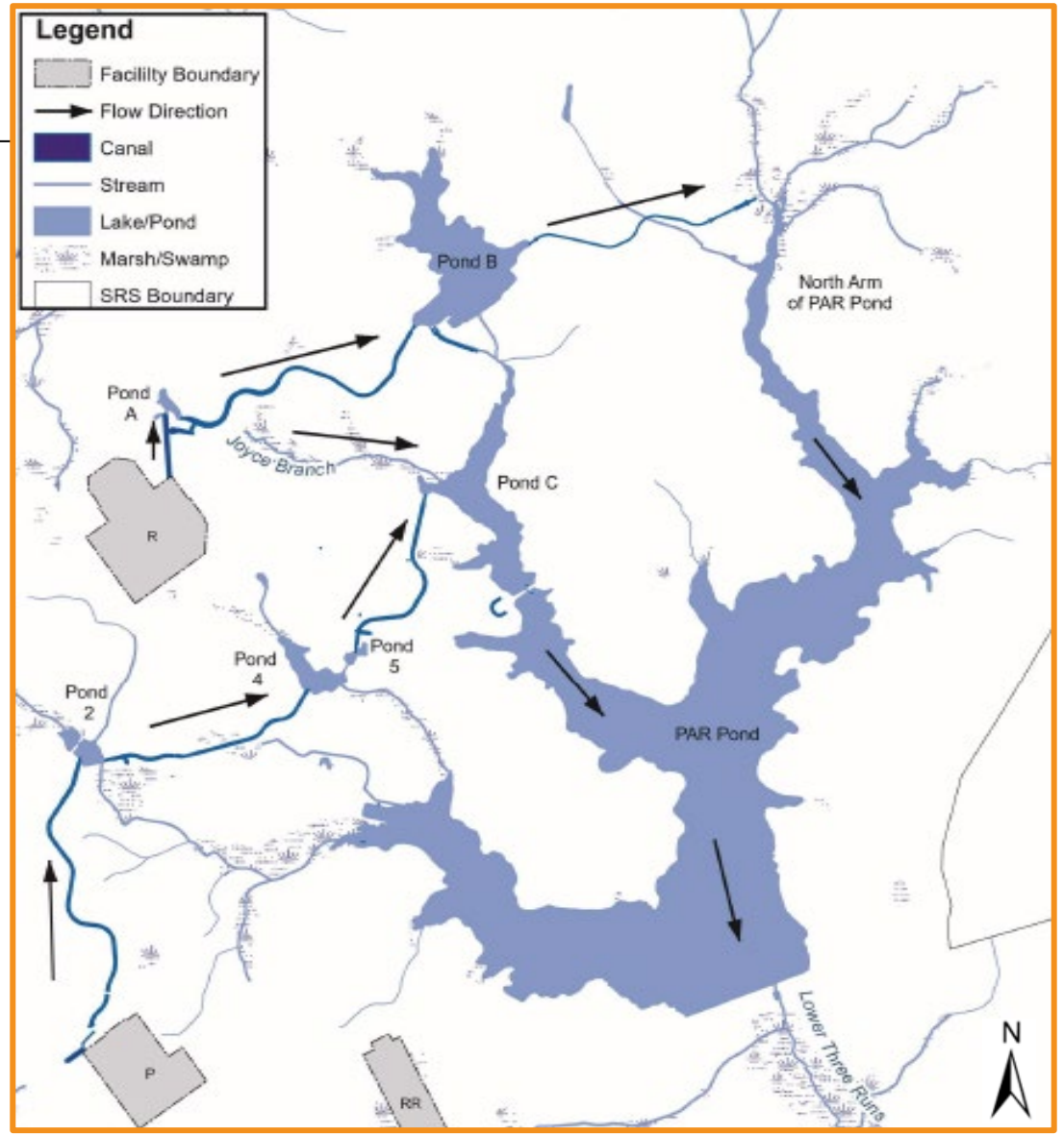
Lower Three Runs IOU

- A removal action for the Middle and Lower LTR subunits (below PAR Pond dam) was completed in 2012
  - Land Use Controls (LUCs)
  - Removal of sediment from three locations
- The remedial action implemented for the Middle and Lower subunits remain protective of human health and the environment
- Remedial action for the Upper Subunit were completed in 2022



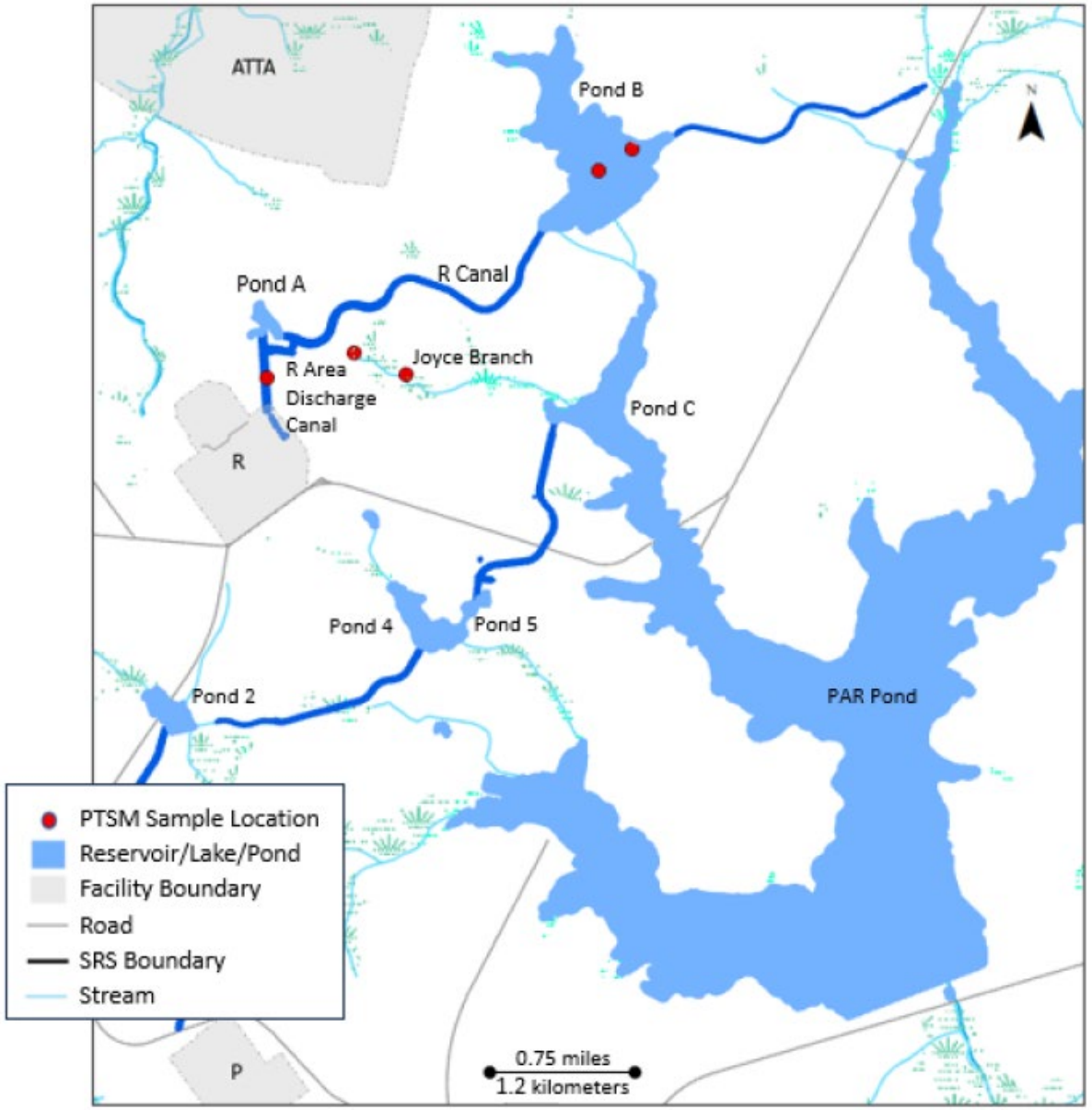
Lower Three Runs IOU – Upper Subunit

- **R-Reactor began operations in 1953**
  - Prior PAR Pond, **R-Reactor** discharged into Joyce Branch (the "Old Discharge Canal")
  - PAR Pond was created in 1958
  - Pre-cooler ponds and canal system discharged into the north arm of PAR Pond
  - Effluent discharges ceased in 1964
- **P-Reactor began operations in 1954**
  - Prior to PAR Pond, P-Reactor discharges were sent to Steel Creek
  - With PAR Pond, cooling water was released into Pond C and the middle arm of PAR Pond.
  - Effluent discharges ceased in 1987



Problems Warranting Action – Upper Subunit

- **Contamination from reactor discharges resulted in Cs-137, (with Co-60 to a lesser extent) in sediment/soil**
- **Mercury in fish tissue is present due to pumping river water from the Savannah River**
  - Fish also contain levels of Cs-137 that pose a potential threat to the recreational fishermen
  - Fishing is prohibited on SRS except for monitoring/research purposes
- **Sample locations with sediment/soil above Principal Threat Source Material (PTSM) levels for Cs-137 were identified in R Discharge Canal, Pond B, and Joyce Branch**
  - The PTSM threshold is 144 pCi/g which equates to a potential 1 in 1000 additional cancer risk

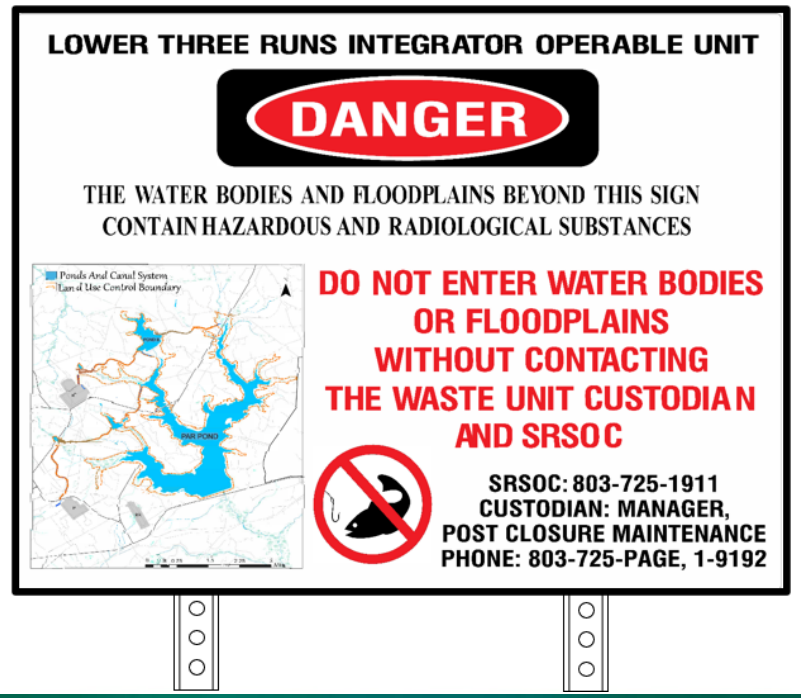


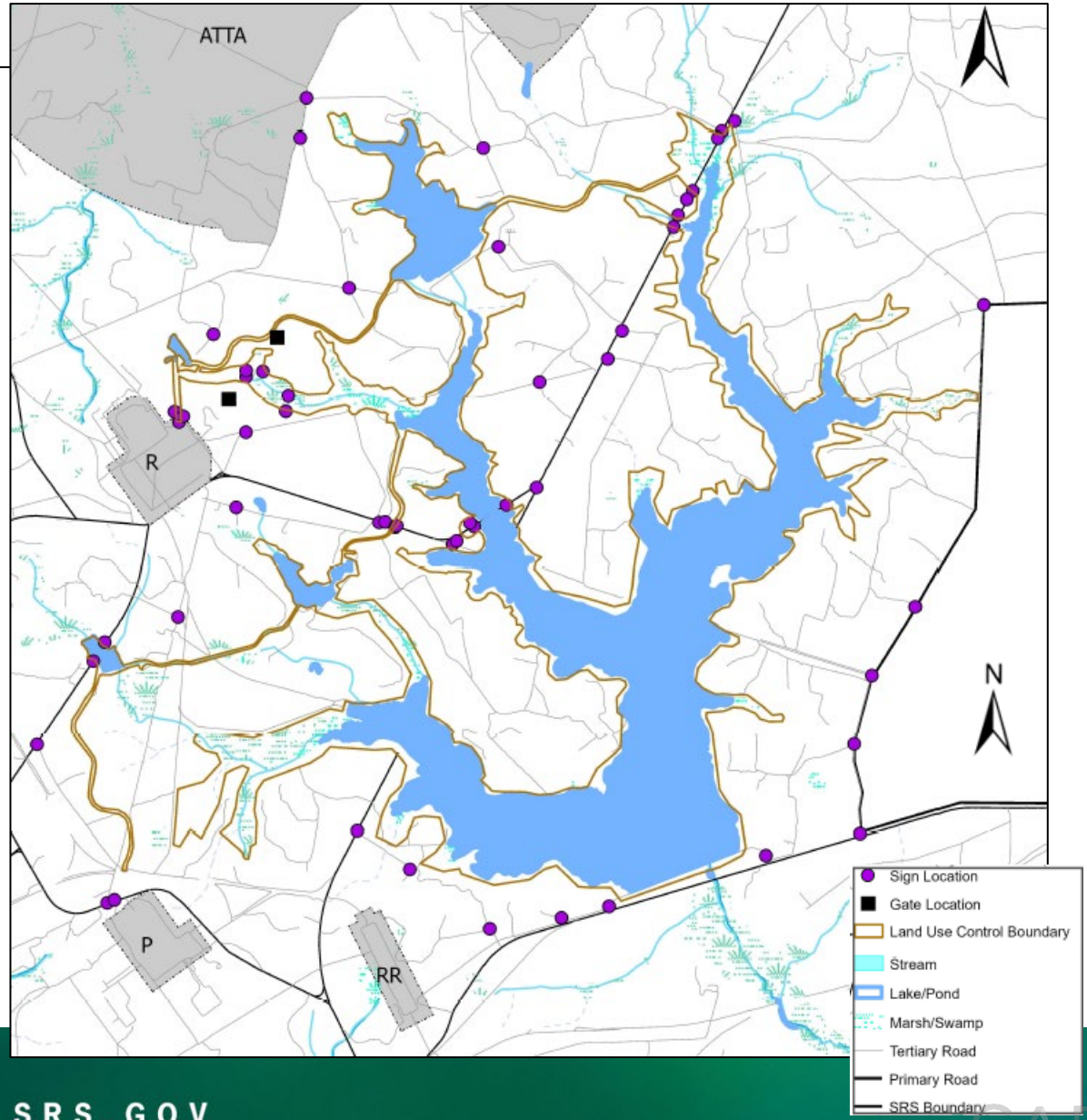
Remedial Actions for the Lower Three Runs IOU - Upper Subunit

- **The remedial actions involved three components**
  - **LUCs with Monitored Natural Recovery (MNR)**
    - *LUCs limit inadvertent human exposure by restricting and controlling access to contaminated areas*
    - *MNR monitors the decay of Cs-137 in sediment/soil and includes biological sampling and passive sampling techniques to assess bioavailability of Cs-137 and Hg*
    - *Five-year remedy review is required*
  - **Excavation, Treatment and Disposal of PTSM in Sediment/soil in R-Discharge Canal**
  - **Maintain Water in Ponds for Pond B and PAR Pond**
    - *Maintain dam structures that minimizes access to submerged sediments and ensures shielding of radionuclide contaminants*
    - *Applies to Pond C as well which is hyrdologically connected to PAR Pond (maintains the same water level in PAR Pond and Pond C)*

Land Use Controls (LUCs)

- **LUCs**
  - LUC Boundary
  - Warning Signs (53) were installed along access roads; gates installed leading to Joyce Branch
  - Worker controls
  - Deed Restrictions





LUCs – Joyce Branch

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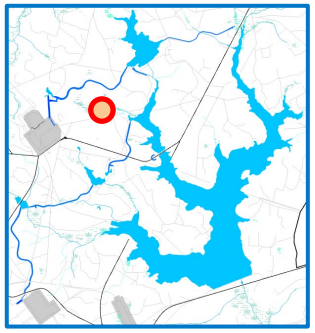


Joyce Branch

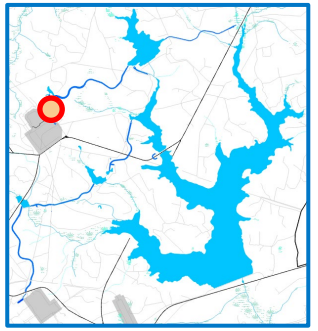
(Old R-Area Discharge Canal)

Monitored Natural Recovery

- **Monitoring consists of:**
  - Aerial gamma surveys for Cs-137 for the Upper subunit
  - Fish Collections for Cs-137 and mercury
    - *Pond B*
    - *PAR Pond*
  - Supplemental sediment/soil sampling (based on aerial surveys) for Cs-137 as necessary
- **Monitoring will support the five-year remedy review reports for SRS OUs with Native Soil Covers and/or Land Use Controls.**
- **The monitoring plan will be re-evaluated after Cs-137 activities decay below PTSM levels.**

Excavation, Treatment and Disposal of PTSM in Sediment/Soil

Location of Excavation (Removal of Sediment/Soil) – R-Area Discharge Canal

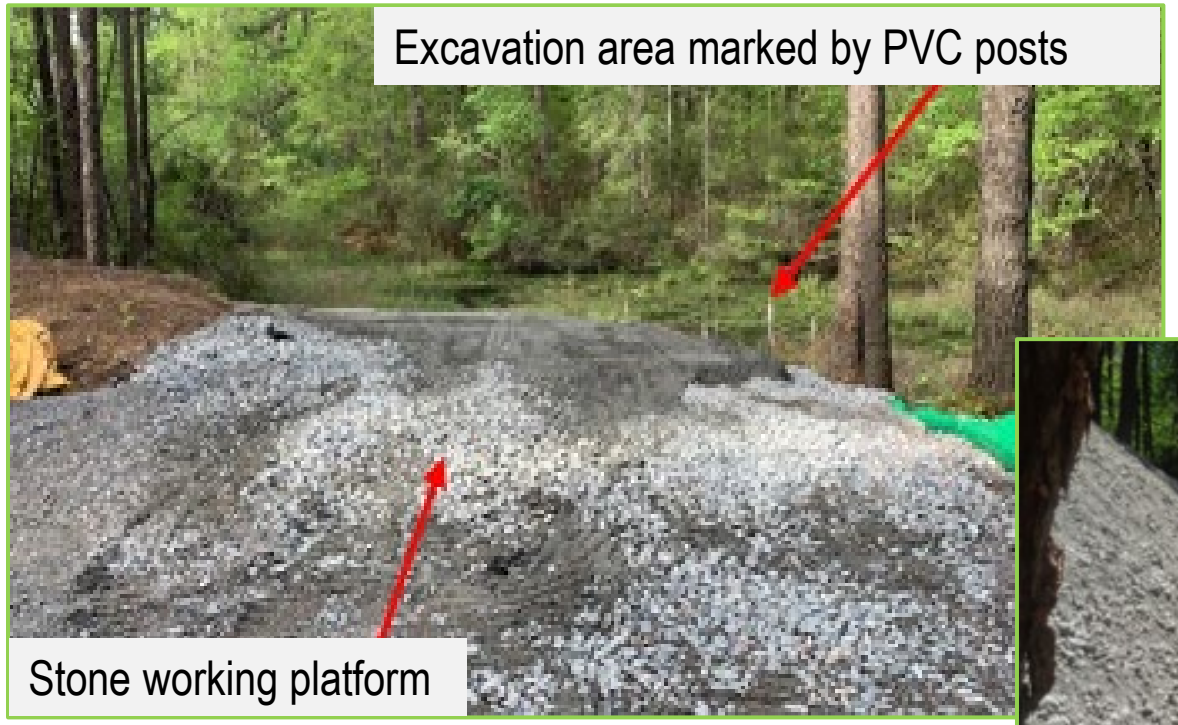


PTSM = Principal Threat Source Material

Site Preparation

- **Land clearing and trail cutting provided access**
- **No root balls were removed to avoild soil disturbance**
- **Erosion control measures were installed**

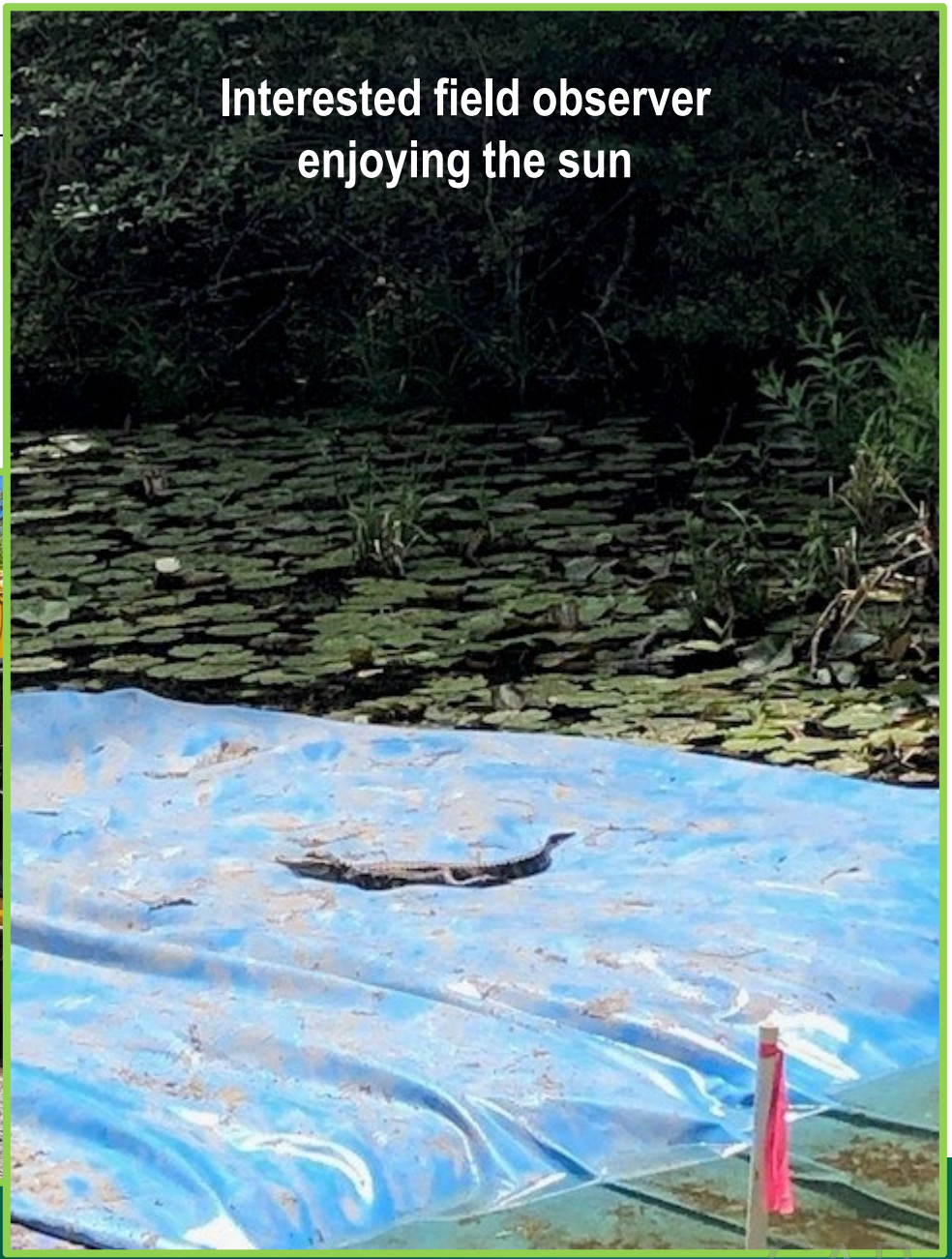

Tree cutting/clearing


Excavation area marked by PVC posts

Stone working platform


Silt-Sediment control

Cofferdam and Dewatering Prior to Excavation



Cofferdam Construction

Treatment after Dewatering

Waste Lock® 770

Sodium Polyacrylate, non-toxic to aquatic/terrestrial organisms at application rates

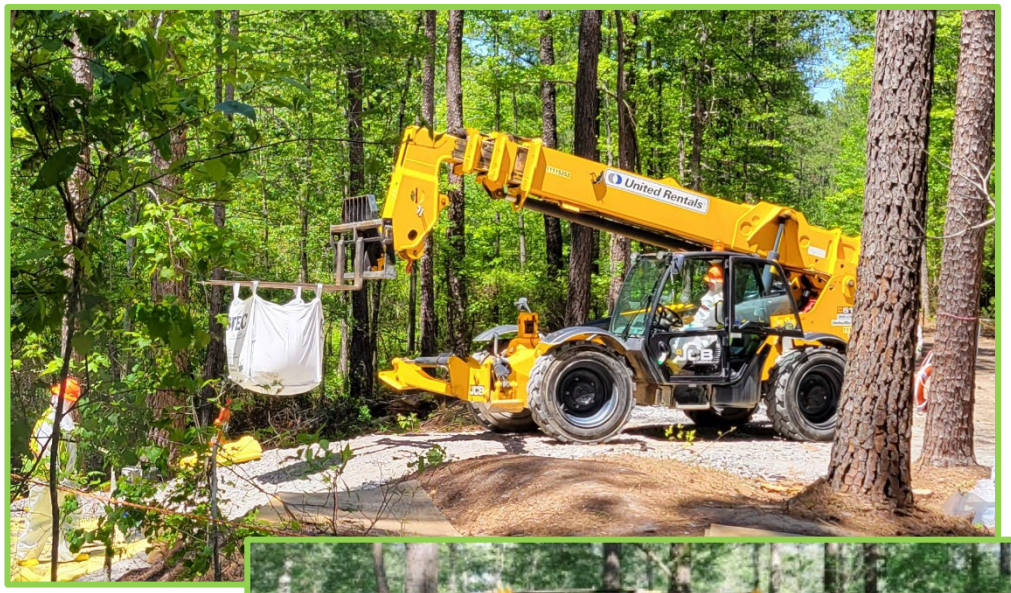
Excavation after Treatment

- Sediments and the drying agent were excavated from an ~ 500 ft^2 area.
- Sediments were excavated to a depth of ~ 1 ft.

Excavation and Treatment

- The excavated sediments were placed in 0.8-m^3 (1-cy) sacks.
- The drying agent was also placed in the bottom of waste disposal sacks prior to adding the sediment.

Excavation, Treatment and Disposal of PTSM in Sediment/Soil



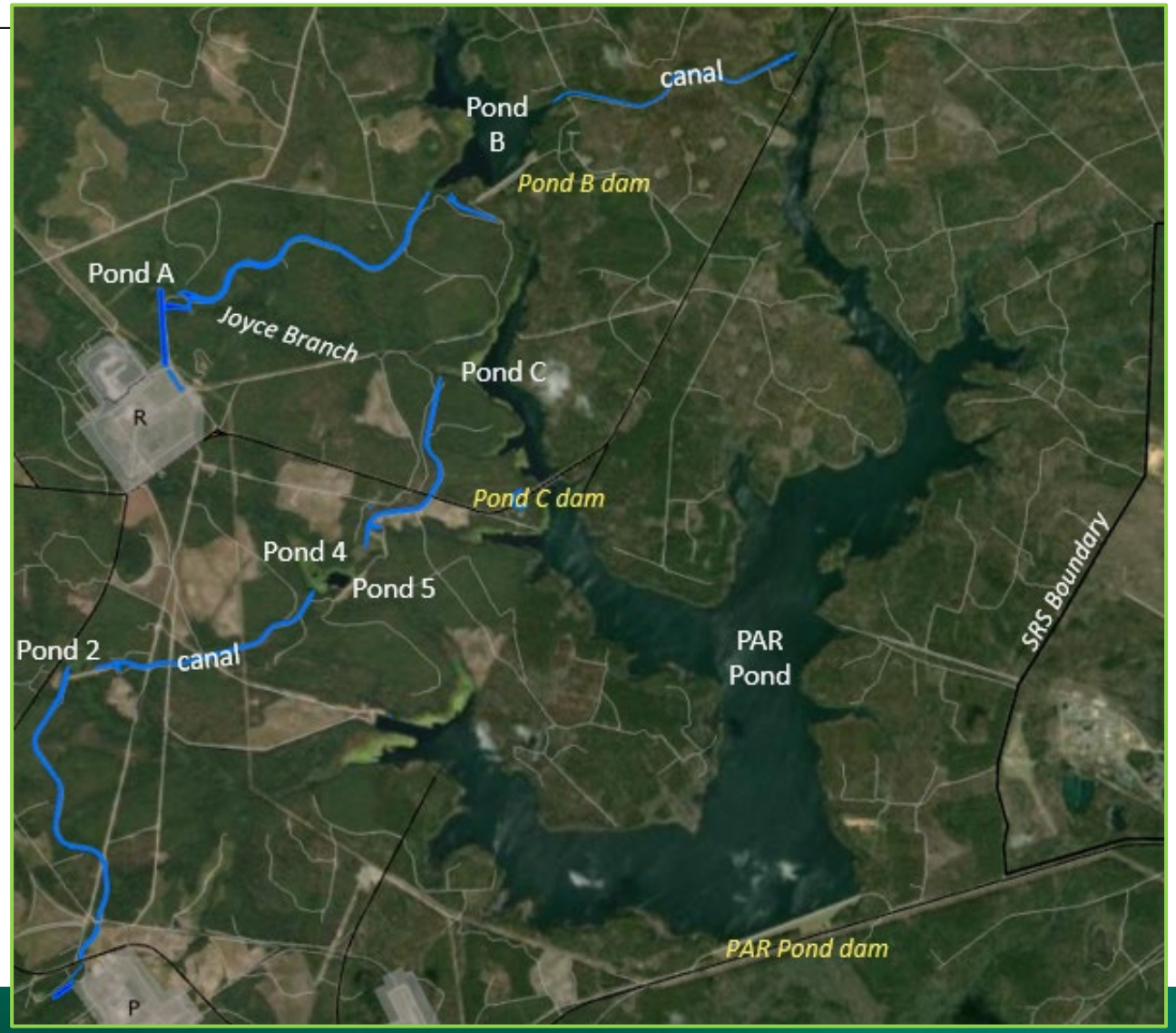
- A total of 21 waste disposal sacks were used.
- The sacks were loaded into a lined roll-off container.
- Covers were placed on the roll-off containers at the end of each day and when the roll-off container was full.
- Containers were sent to the SRS E-Area Low Level Waste Facility for disposal

Confirmation Sampling

- Confirmation samples were collected from 5 locations within the 500 ft^2 excavation area.
- All sample results were below the PTSM threshold of 144 pCi/g for Cs-137.
- Excavation was considered complete after return of the confirmation sampling results on May 8, 2022.

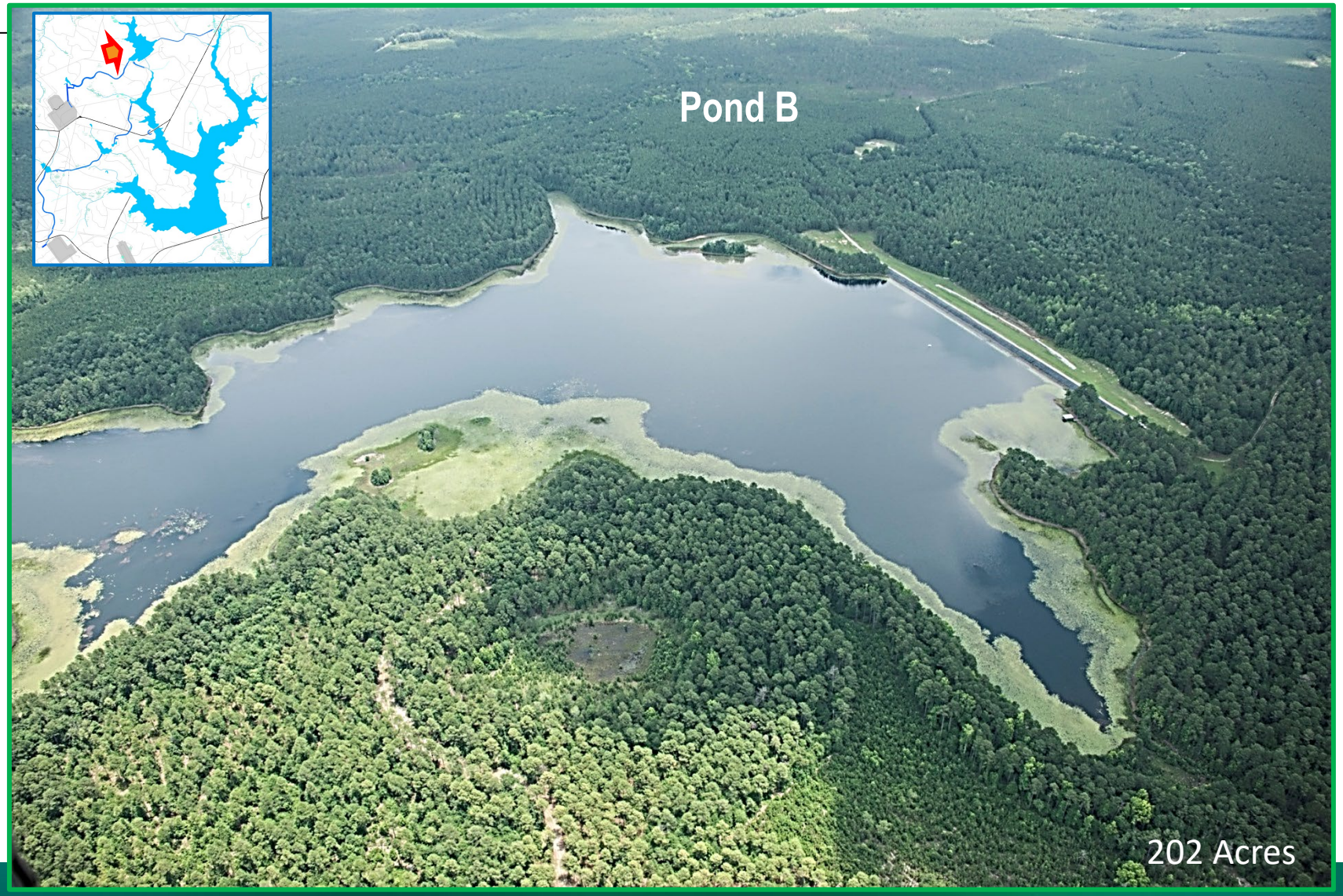
Maintain Water in Ponds (Pond B and PAR Pond)

- Maintaining dam structures allows for continued natural fluctuation of water levels in the pond systems
- SRS has the capability to pump river water to PAR
- Water minimizes <u>access</u> to submerged sediments in Pond B, PAR Pond, and Pond C
- Water prevents <u>exposure</u> to submerged contaminated sediment/soil.



Maintain Water in Ponds for Pond B and PAR Pond

Water serves as a natural shield against radiation exposure



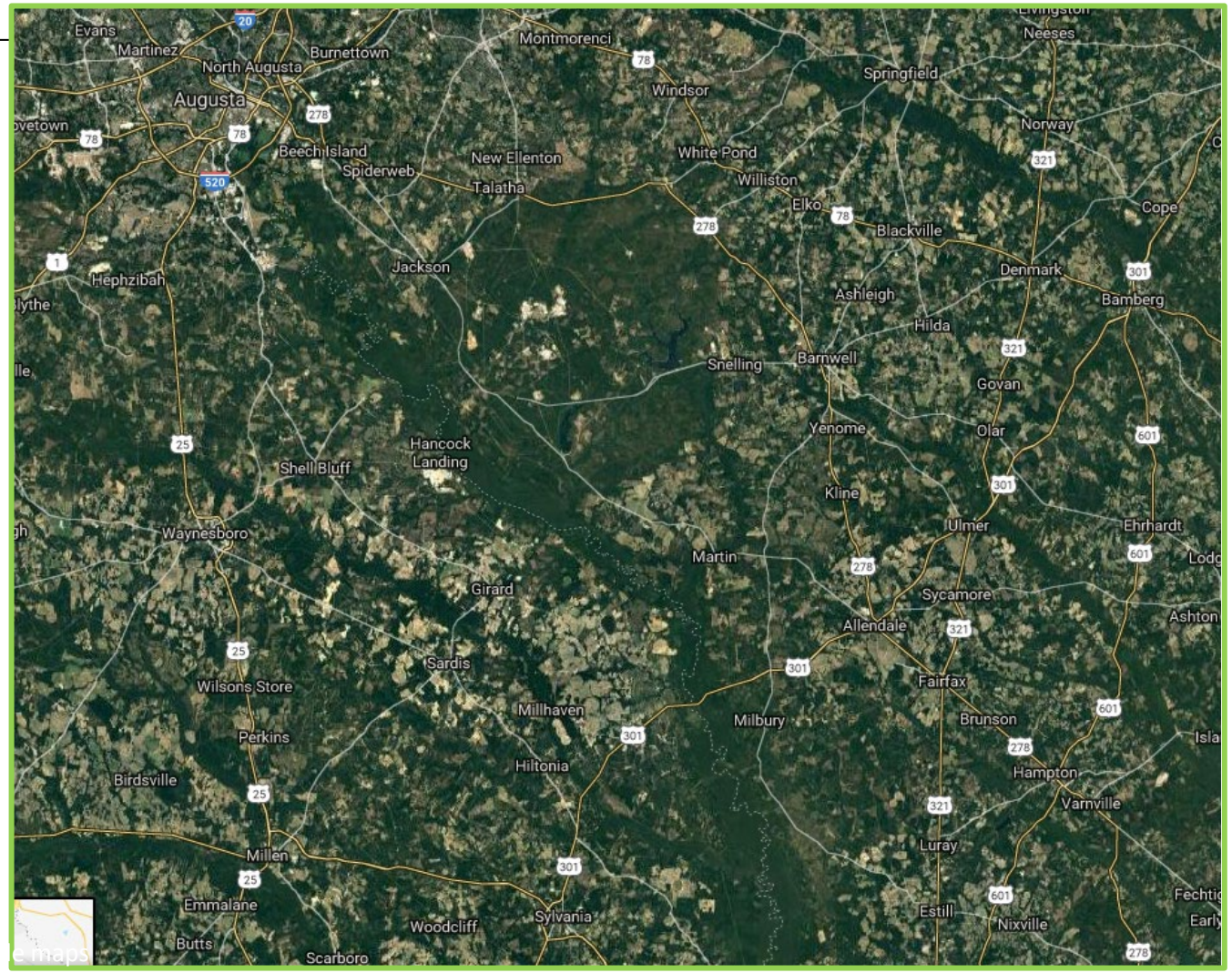
Future Land Use

- The future land use for the LTR IOU – Upper Subunit is non-residential and primarily used for environmental/ecological research.
- Five-year remedy reviews will require additional long-term monitoring.

Graudate student
Savannah River Ecology Laboratory-UGA

LTR IOU Remedial Action Completion

- **Final inspection**
  - excavation and access gate installation was May 25, 2023
  - LUC access warning sign installation July 17, 2023
- **The completed remedial action for the Upper Subunit completes remedial actions for the entire LTR IOU**
- **The LTR remedial effort culminated in**
  - Substantial cost savings
  - Protection of 30 miles of canals and streams
  - Protection over 3,000 acres of aquatic habitat
- **The approach at LTR IOU can be applied to other SRS stream systems to achieve legacy cleanup and long-term environmental stewardship.**



Questions?

Great blue heron
Adrea herodias

For Further Information

Documents associated with the Lower Three Run IOU are available in the Administrative Record File from the USC-Aiken DOE Reading Room

(or online as noted below)

https://library.usca.edu/DOE_reading_room