

United States Department of Energy

Savannah River Site

Scoping Summary for the Savannah River and Floodplain Swamp Integrator Operable Unit

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1.0 PROJECT PHASE AND STATUS OF THE SR/FS INTEGRATOR OPERABLE UNIT

This Scoping Summary reflects the status of the Savannah River and Floodplain Swamp (SR/FS) Operable Unit (IOU) Periodic Report 1 preparation effort which will be submitted in August 2005. This Scoping Summary has resulted from the ongoing data evaluation conducted under Phase II of the SR/FS IOU Remedial Investigation. Because five years have elapsed since the submittal of the draft IOU Work Plan, data evaluated in the Work Plan was reevaluated in context with the new Periodic Report (PR1) data so that a more thorough understanding of this IOU can be presented. With the exception of one sediment sample location at the mouth of Beaver Dam Creek, all data needs identified in the SR/FS IOU Work Plan have been met.

2.0 BACKGROUND

The SR/FS IOU has been defined as the Savannah River, Savannah River swamp, and associated contiguous wetlands within the 100-year floodplain, including surface water, sediment, sediment/soil, and related biota (fish and deer). The area under investigation includes approximately 72 km (45 mi), from the northern boundary of SRS southward to the U.S. Highway 301 bridge. This area represents the integration of potential contaminant exposure pathways to onsite and offsite human and ecological receptors from other SRS IOUs.

For data evaluation purposes, the SR/FS IOU is divided into the following eight exposure areas (Figure 1):

- Savannah River upstream
 - Upper Three Runs
 - D/TNX Area
 - Fourmile Branch
 - Pen Branch
 - Steel Creek
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- Lower Three Runs
- Savannah River downstream

The Savannah River provides SRS its western boundary for a 56-km (35-mi) stretch (as measured from the upriver boundary of the site, near Jackson, South Carolina, to the Lower Three Runs corridor). SRS is approximately 258 river-km (160 river-mi) from the Atlantic Ocean. Five major SRS streams feed into the river: Upper Three Runs, Fourmile Branch, Pen Branch, Steel Creek, and Lower Three Runs (Figure 1). During non-flood stages, Fourmile Branch, Beaver Dam Creek, and Steel Creek flow through the Savannah River swamp and enter the river at well-defined breaches in the natural levee. During high river water levels, the water from these site streams flow through the swamp parallel to the river on the inland side of the levee and discharge into the Savannah River near Steel Creek. The D Area Ash Basin Wetlands, located in the D/TNX subunit, was formerly an OU, but it is now administratively part of the SR/FS IOU.

3.0 LAND USE

Current land use in the SR/FS IOU is mixed. The portion of the IOU located on the SRS is primarily a mixed bottomland hardwood floodplain forest and cypress/tupelo swamp. These habitats also continue beyond the SRS boundary between Steel Creek and Lower Three Runs. The SRS-controlled section of the Savannah River swamp, from above Upper Three Runs to below Steel Creek, is currently posted “No Hunting, No Fishing, and No Unauthorized Access” and patrolled by SRS, as part of the sites access control program. SRS industrial areas exist adjacent to the SR/FS IOU in D and TNX Areas.

Hunting is allowed on SRS for deer and hog and each onsite animal taken during site hunting is sampled by SRS to measure the activity of radionuclides and to keep track of the cumulative annual dose to individual hunters. Deer and hog hunting in offsite public and private properties are regulated by the South Carolina Department of Natural Resources (SCDNR). Two private offsite areas close to the SRS boundary are Creek Plantation (located between the Steel Creek and Lower Three Runs IOUs) and Cowden Plantation (located approximately 3.2 km [2 mi] south of Jackson, South Carolina). The Creek Plantation swamp is an approximately 15 km (9.5 mi) long by 1.6 km (1 mi) wide portion of the approximately 40-km (25-mi) long Savannah River swamp. The Creek Plantation swamp is located between the deltas of Steel Creek and Lower Three Runs.

Most of the Creek Plantation swamp and inland property is privately owned. The state of South Carolina owns two small sections in the Creek Plantation swamp, consisting of the roadway, boat ramp, and parking area associated with the Steel Creek and Little Hell boat landings.

The Crackerneck Wildlife Management Area, managed by the SCDNR, is a public hunting area located adjacent to the SR/FS IOU near Upper Three Runs and covers an area of over 39 km² (15 mi²). Deer and hogs are hunted 21 days per year with a yearly limit of five deer and no limit on hogs.

All of the Savannah River swamp, including the Creek Plantation swamp area, is uninhabited. The Savannah River is used for recreational purposes by the general public including boating and fishing. The public has access to the Savannah River from the Steel Creek and Little Hell boat landings. The river and inland borders of the swamp and Savannah River floodplain are densely wooded with relatively heavy underbrush.

3.1 Human Health and Ecological Screening

For the purposes of identifying problems warranting early actions, the evaluation focuses on assessment of the most likely human health receptors for each medium.

These human health scenarios include:

- adolescent trespasser for sediment and sediment/soil
- resident for surface water; and
- subsistence fisherman for the ingestion of fish
- recreational hunter for ingestion of game meat (deer/hogs)

Surface water benchmarks for human health are based on the Maximum Contaminant Level (MCL). When an MCL is not available, benchmark values are based on residential use resulting in a cancer risk of 1E-04 or a hazard quotient (HQ) of 3.

Biological data and ecological screening values (ESVs) are used to assess the ecological health of the SR/FS IOU.

4.0 SEDIMENT AND SEDIMENT/SOIL EXPOSURE MEDIA

There were no human health benchmark exceedances for the sediment media for the adolescent trespasser.

SRPR1 data shows adolescent trespasser exceedances for cesium-137 at SR Steel Creek and SR Fourmile Branch exposure groups (sediment benchmark of 118 pCi/L). SR Steel Creek showed benchmark exceedances in 2 out of 207 samples with a maximum activity of 212 pCi/L and mean of 14.33 pCi/L. SR Fourmile Branch had a maximum activity of 183.9 pCi/L and a mean of 40.99 pCi/L in 2 of 173 samples.

Based on the most recent round of sampling at Creek Plantation, there are no human health benchmark exceedances for the adolescent trespasser, and there have only been two exceedances at a single location historically. Therefore, no CERCLA early action will be conducted at this time. However, DOE agreed to post signs along Creek Plantation to fulfill the GPRA requirement. This action is also consistent with the SR/FS IOU Early Action Fact Sheet that was published in the August 2003, Environmental Bulletin. Posting of the signs has been initiated and the Core Team will be notified upon completion.

The SR PR1 ecological evaluation of sediment showed acute level exceedances for 2-methylnaphthalene, arsenic, chromium, mercury, PCB-1254, PCB-1260 for the SR D/TNX subunit based on CCME benchmarks. Of those, arsenic, mercury, and the PCBs had means greater than the associated benchmark. Acute ORNL benchmarks showed exceedances for 2-methylnaphthalene, arsenic, bis[2-ethylhexyl]phthalate, copper, mercury, PCB-1254, PCB-1260, and zinc in SR D/TNX and bis[2-ethylhexyl]phthalate in the SR Lower Three Runs subunit. Of those exceedances, PCB-1254, PCB-1260 and bis[2-ethylhexyl]phthalate were present at mean levels above the benchmark. Sediment screening against ORNL median benchmarks shows PCB-1254 and PCB-126 with mean levels above the benchmark. For the sediment/soil medium, chromium exceeded the acute-level benchmark for the SR Upper Three Runs subunit. Chromium and mercury exceeded acute level benchmarks in the SR Fourmile Branch subunit. Chromium exceeded the acute level benchmark in the Pen Branch subunit. In SR Steel Creek subunit, arsenic, chromium, lead, and mercury exceeded acute level benchmarks and in SR Lower Three Runs, chromium and mercury exceeded acute level benchmarks.

Graphical review of the acute level exceedances for sediment show exceedances associated with the D-Ash Basin Wetlands. Although these exceedances alone do not warrant early action consideration, results of biological studies indicate that the contamination present in the area (primarily associated with coal ash settling basins) may be impacting ecological receptors. Further evaluation of this area is planned to determine if early action is warranted.

There were also numerous exceedances (primarily metals) in the SR floodplain swamp. Fish and piscivorous prey species (crayfish) were collected to assess the threat of inorganics and cesium-137 on piscivorous birds. The result of the study revealed that other than mercury, other metals probably pose little risk to potential avian predators and that the risks of cesium-137 is minimal. However, since assessment and measurement endpoints have not been determined for the SR/FS IOU, further review of existing analytical data is warranted.

4.1 Problems Warranting Action (Early Action Only)

Based on the SRPR1 data evaluation and historic review of SR data, no CERCLA early actions are warranted at this time. Although there are ecological exceedances, assessment and measurement endpoints have not been determined and further evaluation is planned (see Section 4.5).

4.2 Interim Remedial Action Objectives

- Protect the adolescent trespasser from unacceptable risk from exposure to site related contaminants in sediment or sediment/soil in SR/FS IOU.
- Protect ecological receptors within the IOU (stream and wetlands) from unacceptable exposure to site related contaminants and biotic contaminant tissue burdens.

4.3 Scope of the Problem Warranting Early Action

The scope of potential future early actions, if required, will be determined as Phase II activities continue.

4.4 Likely Early Response Actions

There are no proposed early response actions for sediment or sediment/soil at this time. Current access controls will be maintained. Additional access controls will be implemented if conditions warrant early action as Phase II activities continue.

4.5 Uncertainties

- The SR/FS IOU Work Plan proposed sediment sampling at the mouth of Beaver Dam Creek. This sample was not collected. Additionally, sediment downstream of D Area in Beaver Dam Creek has not been evaluated for potential impacts to the IOU. This creates uncertainty associated in evaluating the impact of SRS on Beaver Dam Creek and the associated floodplain.

Data Need/Evaluation: SRS proposes sediment sampling in Beaver Dam Creek to assess potential contamination associated with the creek and related wetlands. This data will be evaluated and reported in the next SR/FS IOU Periodic Report.

- The gross alpha screening value (20pCi/g) was exceeded at one sediment/soil location in the Upper Three Runs subunit; two sediment locations in the Upper Three Runs subunit; and one sediment location each in the D/TNX, Pen Branch, and Lower Three Runs subunits. There is uncertainty associated with the identity of the alpha emitting radionuclide which impacts whether there is a problem warranting action.

Data Need/Evaluation: SRS proposes follow-on sediment and sediment/soil sampling for alpha spectroscopy analyses at these locations. This data will be evaluated and reported in the next SR/FS IOU Periodic Report.

- The non-volatile beta screening value (50pCi/g) was exceeded at one sediment location in the D/TNX subunit. There is uncertainty associated with the identity of the non-volatile beta emitting radionuclide which impacts whether there is a problem warranting action.

Data Need/Evaluation: SRS proposes follow-on sediment sampling for non-volatile spectroscopy analyses at this location. This data will be evaluated and reported in the next SR/FS IOU Periodic Report.

- The ecological evaluation shows acute level exceedances associated with the D-Ash Basin Wetlands. Although these exceedances alone do not warrant early action consideration, results of biological studies indicate that the contamination present in the area (primarily associated with coal ash settling basins) may be impacting ecological receptors. Therefore, further evaluation of this area is warranted.

Data Need/Evaluation: Sediment and biological data collected by the Savannah River Ecology Laboratory will be evaluated to determine whether ash contaminants pose a threat to ecological receptors in the SR/FS IOU.

- The ecological evaluation shows acute level exceedances in the SR floodplain swamp. Although results of a biological study indicate little threat to piscivorous birds, contamination may be impacting other ecological receptors. Therefore, further evaluation is warranted.

Data Need/Evaluation: Existing analytical data (sediment, sediment/soil, surface water, and fish) will be used to conduct trophic modeling to determine potential threats to ecological receptors from SR/FS IOU contaminants. This effort will also support selection of appropriate assessment and measurement endpoints for the IOU as Phase II activities continue.

5.0 SURFACE WATER EXPOSURE MEDIA

SRPR1 data show human health exceedances for gross alpha, lead, radium-226, and tritium. Radium-226 (benchmark 0.0816 mg/L) was the only constituent with a frequency of exceedance greater than 5% (with 2 exceedances out of 2 samples) and a mean greater than the benchmark (mean of 0.6700 mg/L). Tritium (with 7 exceedances out of 453 samples) and lead (with 1 exceedance out of 56 samples) both had low exceedances frequencies. All tritium exceedances were observed at the mouth of Upper Three Runs and the single lead exceedance occurred in the Savannah River approximately one mile upstream of the mouth of Upper Three Runs. Single gross alpha exceedances occurred at the mouth of Upper Three Runs and in the Savannah River Swamp background location in the Crackerneck Area.

SR PR1 exceedances in the D/TNX subunit were observed for metals (Al, As, Be, Cd, Cr, Fe, Pb, Mn, Ni, Se, and Tl), potassium-40, and gross alpha. For constituents that

exceeded at a frequency greater than 5% and had a mean greater than the benchmark (human health screening criteria), SRPR1 data shows exceedances for arsenic, beryllium, iron, and thallium. All SR PR1 exceedances were located in the Savannah River Swamp or the upland terraces associated with D and TNX Areas. No exceedances were observed in the Savannah River. Comprehensive sampling has not been performed in Beaver Dam Creek since the submittal of the draft SR/FS IOU Work Plan in 2000.

SR PR1 exceedances in the Fourmile Branch subunit were observed for tritium, lead, iron, thallium, and manganese. All exceedances were located near the confluence of Fourmile Branch and the Savannah River. Only thallium (benchmark 0.002 mg/L) exceeded at a frequency greater than 5% (at 11% with 1 exceedances out of 9 samples) with a mean greater than the benchmark (0.0100 mg/L).

SR PR1 exceedances in the Steel Creek subunit were observed for tritium, lead, arsenic, manganese, and thallium. All exceedances were located in the Savannah River Swamp, at the mouth of Steel Creek, and in the Savannah River at River Mile 140. Arsenic (benchmark 0.005678 mg/L), bis[2-ethylhexly]phthalate (benchmark 0.0060 mg/L), and thallium (benchmark 0.0020 mg/L) had frequency of exceedances greater than 5% (arsenic with 2 exceedances out of 7 samples, bis[2-ethylhexly]phthalate with 1 out of 8, and thallium with 2 out of 7) and mean values greater than benchmarks (arsenic with mean of 0.0072 mg/L, bis[2-ethylhexly]phthalate with a mean of 0.0804 mg/L, and thallium with a mean of 0.0079 mg/L). Tritium exceeded the benchmark in 1 out of 718 samples and historic tritium data from Steel Creek at Highway 125 suggests that Steel Creek is not a significant source of the tritium in the Steel Creek subunit. The elevated tritium levels observed in Pen Branch at Highway 125 suggests that Pen Branch is the likely source of the tritium observed in the Steel Creek subunit. The flow from Pen Branch spreads out over the Pen Branch Delta and continues through the Savannah River Swamp as shallow sheet flow until entering the lower reaches of Steel Creek.

In the Lower Three Runs subunit, single exceedances for iron and thallium (with means below benchmark values) were observed in the SRPR1 data at Smith Lake approximately 3.5 miles downstream from the mouth of Lower Three Runs.

No SR PR1 exceedances were observed in the SR upstream unit. In the SR downstream subunit, the only SR PR1 exceedance was a single exceedance (1 out of 274 samples) for gross alpha at U.S. Highway 17 near Savannah, Georgia.

SRPR1 data shows acute AWQC based benchmark exceedances for zinc. The SR Upper Three Runs subunit has acute level exceedances for copper, lead, and zinc. For the SR D/TNX subunit, SRPR1 data shows acute level AWQC exceedances for aluminum, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, and zinc. The SR Fourmile Branch subunits shows acute level exceedances for aluminum, copper, lead, and zinc. The SR Steel Creek subunit shows acute level exceedances for cadmium, copper, lead, silver, and zinc. SR Lower Three Runs has acute level exceedances for aluminum, copper, and zinc and SR down stream has acute level AWQC based exceedances for aluminum, copper, silver, and zinc. Based on ORNL benchmarks, there were acute level exceedances for barium and mercury in the SR Upper Three Runs subunit; arsenic, beryllium, manganese, and mercury in the SR D/TNX subunit; barium and manganese in the SR Fourmile Branch unit; and barium and bis[2-ethylhexly]phthalate in SR Steel Creek subunit.

5.1 Problems Warranting Action (Early Action Only)

No early actions for surface water in the IOU have been identified at this time based on the evaluation of SRPR1 data. Further evaluation of this area is planned to determine if early action is warranted. Although there are ecological exceedances, assessment and measurement endpoints have not been determine and further evaluation is planned (see Section 5.5).

5.2 Interim Remedial Action Objectives

- Protect the potential resident from unacceptable risk from exposure to site related contaminants in surface water in the SR/FS IOU.
- Protect ecological receptors within the IOU (stream and wetlands) from unacceptable exposure to site related contaminants and biotic contaminant tissue burdens.

5.3 Scope of the Problem Warranting Early Action

The scope of potential future early actions, if required, will be determined as Phase II activities continue.

5.4 Likely Early Response Actions

There are no early response actions for surface water at this time.

5.5 Uncertainties

- Pen Branch is known to be receiving tritium from groundwater discharges in K Area; however, analytical data are limited for the Pen Branch subunit in the SR/FS IOU making it difficult to determine whether the IOU has been impacted.

Data Need/Evaluation: SRS proposes tritium sampling at several locations in the Savannah River Swamp in the Pen Branch subunit. This data will be evaluated and reported in the next SR/FS IOU Periodic Report.

- Comprehensive analytical data is not available for Beaver Dam Creek, and this stream has not been evaluated for potential impacts to the IOU.

Data Need/Evaluation: SRS proposes surface water sampling in Beaver Dam Creek to assess potential contamination associated with the creek and related wetlands. This data will be evaluated and reported in the next SR/FS IOU Periodic Report.

- The ecological evaluation shows acute level exceedances for various metals throughout the SR/FS IOU in sediment, sediment/soil, and surface water. Although biological evaluations (tissue body burden comparisons, health assessment, and condition factors) show no evidence that these constituents were adversely affecting the health of fish from the Savannah River/swamp, further evaluation is warranted.

Data Need/Evaluation: Existing analytical data (sediment, sediment/soil, surface water, and fish) will be used to conduct trophic modeling to determine potential threats to ecological receptors from SR/FS IOU contaminants. This effort will also

support selection of appropriate assessment and measurement endpoints for the IOU as Phase II activities continue.

6.0 GAME EXPOSURE MEDIA

There were 17 human health benchmark exceedances (out of 3803 samples) for the recreational hunter for game (deer and hog) for cesium-137. The mean (3.3834 pCi/g) was less than the benchmark (20.34 pCi/g). All exceedances were for white-tailed deer.

6.1 Problems Warranting Action (Early Action Only)

No early actions for game are warranted based on the evaluation of SRPR1 data.

6.2 Interim Remedial Action Objectives

- Protect the recreational hunter from unacceptable risk from exposure to site related contaminants in game.

6.3 Scope of the Problem Warranting Early Action

The scope of potential future early actions, if required, will be determined as Phase II activities continue.

6.4 Likely Early Response Actions

There are no early response actions for game.

6.5 Uncertainties

- The benchmark for game is based on deer data only and does not include hog data. This may underestimate the risk associated with hog benchmark exceedances.

Data Need/Evaluation: SRS proposes to determine if background data are available for hogs with the intent of developing a benchmark for hogs should said data exist. If data are not available, SRS will propose an appropriate path forward.

- The benchmark for game is not used to determine whether deer are released to hunters who hunt on SRS since the release criteria is based on a DOE dose limit.

Data Need/Evaluation: SRS will evaluate an appropriate path forward.

- There is uncertainty associated with the risk that other game taken offsite may present to a recreational hunter (for example, turkey).

Data Need/Evaluation: SRS will evaluate an appropriate path forward.

7.0 FISH

SRPR1 data shows human health subsistence fisher exceedances for antimony (benchmark 0.5152 mg/kg), arsenic (benchmark 0.06667 mg/kg), mercury (benchmark 0.3864 mg/kg), potassium-40 (benchmark 1.6333 pCi/g), and thallium (benchmark 0.0902 mg/kg) in the SR up stream subunit. Of those, antimony (5 exceedances out of 21 samples with a mean of 2.5285 mg/kg), arsenic (7 out of 30 with a mean of 0.1409 mg/kg), potassium-40 (104 out of 111 with a mean of 2.7115 pCi/g), and thallium (23 of 25 samples with a mean of 1.8174 mg/kg) had frequency of exceedances greater than 5% and means greater than the benchmark. All these exceedances are located well above SRS. Mercury and potassium-40 exceeded subsistence fisher benchmarks in SR Upper Three Runs. The mean for mercury (0.3253 mg/kg) was less than the benchmark. The SR Fourmile Branch subunit showed exceedances for cesium-137 (benchmark 1.4989 pCi/g), mercury, potassium-40, and strontium-90 (benchmark 0.5878 pCi/g). Cesium-137 and strontium-90 both had low frequencies of exceedance (<1% and 2%, respectively) and means below benchmark values (0.0923 pCi/g and 0.1552 pCi/g, respectively). Mercury had a mean value (0.2702 mg/kg) less than the benchmark. The Pen Branch subunit had 3 benchmark exceedances for cesium-137 out of 214 samples with a mean value (0.8917 pCi/g) less than the benchmark. The D/TNX subunit showed exceedances for arsenic and potassium-40 both with means greater than the benchmark (0.3967 mg/kg and 2.8267 pCi/g). Arsenic had a single exceedance out of 3 samples.

In the Steel Creek subunit, there were exceedances for cesium-137, mercury, and potassium-40. Cesium-137 had a low frequency of exceedance (1 out of 20 samples). Mercury had a mean value (0.1992 mg/kg) less than the benchmark. The SR Lower Three Runs subunit showed exceedances for mercury and potassium-40. Mercury had 7

exceedances out of 35 samples with a mean (0.2644 mg/kg) less than the benchmark. The down stream subunit showed exceedances for mercury and potassium-40 well below SRS. Mercury had a mean value (0.3350 mg/kg) less than the benchmark

7.1 Problems Warranting Action (Early Action Only)

There are no problems warranting action for fish at this time based on SRPR1 data.

7.2 Interim Remedial Action Objectives

- Protect the subsistence fisherman from unacceptable concentrations of contaminants in fish.
- Protect ecological receptors within the IOU (stream and wetlands) from exposure to site related contaminants and biotic contaminant tissue burdens.

7.3 Scope of the Problem Warranting Early Action

There are no early response actions for exposure to contaminants in fish needed at this time. The scope of potential future early actions, if required, will be determined as Phase II activities continue.

7.4 Likely Early Response Actions

There are no early response actions for fish at this time.

7.5 Uncertainties

There are no identified uncertainties associated with the fish medium.

8.0 IOU STRATEGY

As Phase II continues, current IOU data, new OU information, and pertinent OU characterization data will be incorporated into the SR/FS IOU project as it becomes available. Periodic evaluation of data will be used to refine the IOU CSM. Phase III of the SR/FS IOU (completion of RI/FS) will be conducted after the remedial decisions for

the OUs in the SR/FS watershed have been made. No portion of the IOU has been identified to be accelerated into Phase III.

The SR Fish Consumption Communication Plan states that if cesium and/or strontium levels in SR fish ever become a consumption-limiting factor, that SRS will coordinate and host public meetings. The IOU program will continue to screen contaminant levels in fish to determine if levels become elevated.

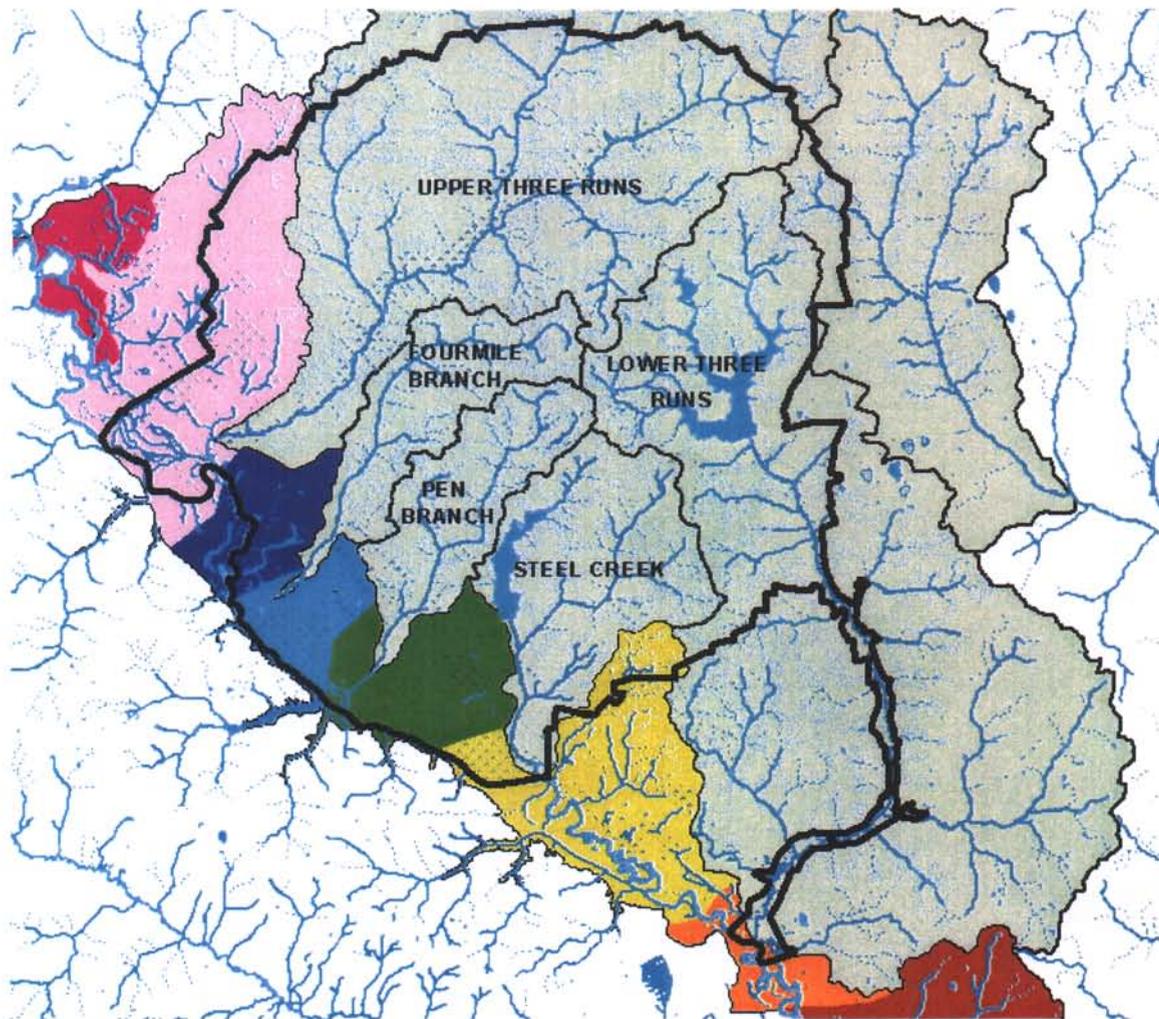
8.1 Early Action Strategy

Early actions in the SR/FS IOU are not warranted at this time.

9.0 RECORD OF KEY CHANGES

This scoping summary was updated to reflect the status of the early action and data needs evaluations associated with the review of SRPR1 data.

FIGURE 1. SAVANNAH RIVER AND FLOODPLAIN SWAMP IOU SUBUNITS



Savannah River IOU Subunits

- SR Upstream
- SR Upper Three Runs
- SR D/TN X
- SR Four Mile Branch
- SR Pen Branch
- SR Steel Creek
- SR Lower Three Runs
- SR Downstream