

ClinchRiverESPEnvPEm Resource

From: Davis, Jennifer
Sent: Friday, September 21, 2018 2:33 PM
To: isham.t@sno-nsn.gov
Cc: Dozier, Tamsen; Kennedy, Ellen P (Ellen.Kennedy@pnnl.gov)
Subject: FW: RE: Early Site Permit Application for the Clinch River Nuclear Site in Roane County, Tennessee
Attachments: TVA Clinch River SMR Site Terrestrial Plant and Botanical Survey.pdf; TVA Clinch River Barge-Traffic Area Terrestrial Res and Botanical Res Survey Report.pdf

Mr. Isham,

Thank you for speaking with us yesterday. Per our teleconference, we are re-sending links to the redacted cultural resource reports and TVA's programmatic agreement. As mentioned during our teleconference, we have received permission from TVA to send the unredacted cultural resources survey reports and will be transmitting those via formal letter in the near future.

Between 2011 and 2015, TVA conducted five historic and cultural resource investigations as part of its NHPA Section 106 compliance responsibilities for its proposed project (Barrett et al. 2011 [draft], Barrett et al. 2011 [final]; Hunter et al. 2015; Karpyneć 2011; TVA 2015). These investigations, taken together with the field efforts completed by Stanyard et al. in 2003 and Leigh 1999, resulted in an updated and complete inventory of archaeological and architectural resources located within the onsite direct- and indirect-effects Areas of Potential Effect (APE).

Redacted versions of the cultural resource reports are available in Agencywide Documents Access and Management System (ADAMS), NRC's official recordkeeping system. Below are links to the redacted reports:

Leigh 1999 – [ML17296A408](#)
Stanyard et al. in 2003 – [ML17296A412](#)
Barrett et al. 2011 [draft] – ADAMS No. [ML17284A317](#)
Barrett et al. 2011 [final] – ADAMS No. [ML17284A318](#) and [ML17284A319](#)
Karpyneć 2011 – ADAMS No. [ML17298A063](#)
Hunter et al. 2015 – ADAMS No. [ML17296A405](#)
TVA 2015 – ADAMS No. [ML18036A936](#)

Between 2015 and 2016, TVA developed and executed a programmatic agreement (PA) in consultation with Tennessee Historical Commission and American Indian Tribes to address how TVA would comply with ongoing NHPA Section 106 requirements associated with its proposed project. The PA also includes stipulations that address inadvertent discovery and deeply buried deposits. Stipulation 1A of the PA states that if project plans include activities that would disturb soils or sediments greater than the maximum depth investigated previously during the archaeological surveys of the APE (approximately 80 cm or 31 inches), in areas with potential for deeply buried cultural deposits, the APE will be enlarged in the vertical dimension. Link to the PA: TVA 2016 (see [ML17296A399](#)).

During our teleconference, we discussed and gained clarity regarding the Seminole Nation's concern with identifying all flora in your ancestral homelands as they relate to the identification of possible traditional cultural properties. Per this discussion, we are attaching two botanical survey reports completed of the proposed TVA Clinch River Nuclear (CRN) Site. As we discussed yesterday, once you have had a chance to review the reports, you will let us know if you have any further concerns or comments. If you could get back with us within the next week, we would greatly appreciate it.

During our call yesterday, we presented an overview of the following topics:

- NRC's undertaking – is to issue an early site permit (ESP) which allows TVA to set aside the CRN site for future development of two or more SMRs, and does not authorize construction and operation of a nuclear power plant.
- NRC is coordinating its Section 106 through the NEPA process per 36 CFR 800.8(c) for the ESP
- TVA would need to submit a separate application (combined license) to the NRC in order to construct and operate a nuclear power plant.
- Issuance of a combined license would be a separate NRC undertaking requiring NRC to prepare a supplemental EIS and complete a separate NHPA Section 106 review and consultation.
- TVA's undertaking – is to construct and operate two or more SMRs.
- TVA has initiated NHPA 106 and executed a programmatic agreement as described above.
- TVA will be conducting its own NEPA analysis independent of NRC.

It was clarified during the call that because the ESP does not authorize construction or operation of a nuclear power plant the Seminole Nation's concerns regarding mitigation of potential impacts that could occur to TCPs associated with traditional plants would not apply to the ESP, but would apply to TVA's undertaking and to the NRC's review of a future combined license application.

We appreciate your time and look forward to hearing back from you regarding the botanical survey reports.

Sincerely,

Jennifer

Jennifer A. Davis
Senior Project Manager
Office of New Reactors
U.S. Nuclear Regulatory Commission
(301) 415-3835

From: Davis, Jennifer
Sent: Friday, March 09, 2018 9:25 AM
To: isham.t@sno-nsn.gov
Cc: Vokoun, Patricia
Subject: FW: RE: Early Site Permit Application for the Clinch River Nuclear Site in Roane County, Tennessee

Mr. Isham,

We tried sending you the email below back on March 5th. Yesterday, we received an error message stating that the system was unable to deliver the email. We want to make sure you receive the information, thus we are re-sending the email.

Thank you,

Jennifer

Jennifer A. Davis
Senior Project Manager
Office of New Reactors
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(301) 415-3835

From: Davis, Jennifer

Sent: Monday, March 05, 2018 11:22 AM

To: Theodore Isham <isham.t@sno-nsn.gov>

Cc: Vokoun, Patricia <Patricia.Vokoun@nrc.gov>

Subject: RE: RE: Early Site Permit Application for the Clinch River Nuclear Site in Roane County, Tennessee

Mr. Ishom,

Thank you for your comments. The applicant (TVA) has conducted natural and cultural resource surveys for the CRN site, the details of which will be documented in the draft environmental impact statement (EIS) that is scheduled to be published in June 2018.

Between 2011 and 2015, TVA conducted five historic and cultural resource investigations as part of its NHPA Section 106 compliance responsibilities for its proposed project (Barrett et al. 2011 [draft], Barrett et al. 2011 [final]; Hunter et al. 2015; Karpyneć 2011; TVA 2015). These investigations, taken together with the field efforts completed by Stanyard et al. in 2003 and Leigh 1999, resulted in an updated and complete inventory of archaeological and architectural resources located within the onsite direct- and indirect-effects Areas of Potential Effect (APE).

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Karpyneć 2011 – ADAMS No. [ML17298A063](#)

Hunter et al. 2015 – ADAMS No. [ML17296A405](#)

TVA 2015 – ADAMS No. [ML18036A936](#)

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The terrestrial ecology section of the draft EIS will describe the ecology affected by the proposed project.

Please let me know if you have additional questions or comments.

Sincerely,

Jennifer

Jennifer A. Davis
Senior Project Manager
Office of New Reactors
U.S. Nuclear Regulatory Commission
(301) 415-3835

From: Theodore Isham [<mailto:isham.t@sno-nsn.gov>]
Sent: Saturday, January 20, 2018 10:45 AM
To: Davis, Jennifer <Jennifer.Davis@nrc.gov>
Cc: Vokoun, Patricia <Patricia.Vokoun@nrc.gov>
Subject: [External_Sender] RE: Early Site Permit Application for the Clinch River Nuclear Site in Roane County, Tennessee

This *Opinion* is being provided by Seminole Nation of Oklahoma's Cultural Advisor, pursuant to authority vested by the Seminole Nation of Oklahoma General Council. The Seminole Nation of Oklahoma is an independently Federally-Recognized Indian Nation headquartered in Wewoka, OK.

In keeping with the National Environmental Policy Act (NEPA), and Section 106 of the National Historic Preservation Act (NHPA), 36 CFR Part 800, this letter is to acknowledge that the Seminole Nation of Oklahoma has received notice of the proposed project at the above mentioned location.

Based on the information provided and because the potential for buried cultural resources, the proposed project has an extreme probability of affecting archaeological resources, some of which may be eligible for listing in the National Register of Historic Places (NRHP).

We recommend that an intensive literature/phase I survey reports of the nearby archaeological sites be conducted and sent to SNO. Also, we request that a listing of all the flora in the affected area be provided.

We do request that if cultural or archeological resource materials are encountered at all activity cease and the Seminole Nation of Oklahoma and other appropriate agencies be contacted immediately.

Furthermore, due to the historic presence of our people in the project area, inadvertent discoveries of human remains and related NAGPRA items may occur, even in areas of existing or prior development. Should this occur we request all work cease and the Seminole Nation of Oklahoma and other appropriate agencies be immediately notified.

Theodore Isham

Seminole Nation of Oklahoma
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From: Davis, Jennifer [<mailto:Jennifer.Davis@nrc.gov>]
Sent: Friday, January 19, 2018 3:07 PM
To: Theodore Isham
Cc: Vokoun, Patricia
Subject: Early Site Permit Application for the Clinch River Nuclear Site in Roane County, Tennessee

Mr. Isham,

My colleague Pat Vokoun and I called your office to follow up on a letter sent by our agency (U.S. Nuclear Regulatory Commission (NRC)) from April 2017. Per request, we are re-sending this letter for your files.

The NRC is reviewing an application for an early site permit (ESP) from Tennessee Valley Authority for the proposed construction and operation of two or more Small Modular Reactors (SMRs) at the Clinch River site in Oak Ridge, Roane County, Tennessee. As part of this application process, the NRC will be completing an environmental impact statement in compliance with the National Environmental Policy Act (NEPA). NRC will also be coordinating its National Historic Preservation Act (NHPA) Section 106 review through the NEPA process in accordance with 36 CFR 800.8(c).

The ESP application and review process makes it possible to evaluate and resolve safety and environmental issues related to siting potential future SMRs at the CRN Site. An ESP does not, however, authorize construction and operation of the SMRs. Such authorization would require a separate application by TVA to the NRC, necessitating additional NEPA and NHPA review.

If you have any questions, please feel free to reach out to me or with Patricia Vokoun. Patricia is the environmental project manager for this review. Her contact information is provided in the attached letter.

Thank you,

Jennifer

Jennifer A. Davis
Senior Project Manager
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(301) 415-3835

Hearing Identifier: ClinchRiver_ESP_EnvDocs_Public
Email Number: 34

Mail Envelope Properties (BL2PR09MB1089EE4D3DF752C3B5CE61E185120)

Subject: FW: RE: Early Site Permit Application for the Clinch River Nuclear Site in Roane County, Tennessee
Sent Date: 9/21/2018 2:32:49 PM
Received Date: 9/21/2018 2:32:53 PM
From: Davis, Jennifer

Created By: Jennifer.Davis@nrc.gov

Recipients:

"Dozier, Tamsen" <Tamsen.Dozier@nrc.gov>
Tracking Status: None
"Kennedy, Ellen P (Ellen.Kennedy@pnnl.gov)" <Ellen.Kennedy@pnnl.gov>
Tracking Status: None
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Tracking Status: None

Post Office: BL2PR09MB1089.namprd09.prod.outlook.com

Files	Size	Date & Time
MESSAGE	17175	9/21/2018 2:32:53 PM
TVA Clinch River SMR Site Terrestrial Plant and Botanical Survey.pdf		108870
TVA Clinch River Barge-Traffic Area Terrestrial Res and Botanical Res Survey Report.pdf		
197060		

Options

Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

THE TENNESSEE VALLEY AUTHORITY



Clinch River Small Modular Reactor Site Terrestrial Plant Communities and Botanical Resources Survey Report

Patricia B. Cox, Adam J. Dattilo, John T. Baxter, Jr.

12/07/2011

**Revision 1 – 01/09/2013
Revision 2 – 08/20/2014
Revision 3 – 09/22/2014
Revision 4 – 03/01/2015
Revision 5 - 10/28/2015**

This study has been prepared as a supporting document for the Clinch River Small Modular Reactor Site (CR SMR) Early Site Permit Application Project and is being distributed for project use. The study provides a summary of documented terrestrial plant communities and protected botanical resources present in CR SMR study area including the adjacent Clinch River, Roane County, TN.

Affected Environment

Terrestrial Ecology (Plants)

The Clinch River Property is located in the Southern Limestone/Dolomite Valleys and Rolling Hills and Southern Dissected Ridges and Knobs ecoregions, which are subdivisions of the Ridge and Valley. The Ridge and Valley, which occurs between the Blue Ridge Mountains on the east and the Cumberland Plateau on the west, is a relatively low-lying region made up of roughly parallel ridges and valleys that were formed through extreme folding and faulting events in past geologic time (Griffith et al. 1998). Over 95 percent of the area of potential effect is found within the Southern Limestone/Dolomite Valleys and Rolling Hills, which is a heterogeneous region, composed predominantly of limestone and cherty dolomite. Landforms are mostly undulating valleys and rounded ridges with many caves and springs. Land cover in this ecoregion varies and includes forest, pasture, intensive agriculture, and areas of commercial, industrial, and residential development. The southern tip of Clinch River Property, which comprises less than five percent of the site, is part of the Southern Dissected Ridges and Knobs ecoregion. This region contains more crenulated, broken, or hummocky ridges, that support chestnut oak and pine forests in the higher elevations and stands of white oak, mixed mesophytic forest, and tulip poplar on the lower slopes (Griffith et al. 1998).

Field surveys were conducted in April and July 2011 and September 2013 to assess the terrestrial community structure, to document infestations of invasive plants, and to search for possible threatened and endangered plant species on the Clinch River Property. Representative plant species observed during field inspections are listed in Appendix A – Table 1. This list is not comprehensive and only includes representative species noted during site visits. Areas representative of each vegetation type present on the Clinch River Property were visited during the surveys.

Using the National Vegetation Classification System (Grossman et al. 1998), vegetation types found on the Clinch River Property can be classified as a combination of deciduous, evergreen, and mixed evergreen-deciduous forest and herbaceous vegetation (Table 2). Developed areas have been heavily manipulated and have no appreciable vegetative cover. Previous environmental reviews state that much of the site was undergoing secondary succession due to previous disturbance associated with farming and logging and that plant communities present there were not unique because thousands of acres of comparable habitat occur on adjacent lands within the Oak Ridge National Reservation (NRC 1977; NRC 1982). In addition, 292 forested acres were cleared in preparation for construction of the original Clinch River Breeder Reactor project (NRC 1982).

Mixed evergreen-deciduous forest is defined as a forest stand where both evergreen and deciduous species contribute from 25 to 75 percent of total canopy cover. This forest type accounts for approximately 42 percent of the vegetation cover on the Clinch River Property and occurs primarily as dry oak-hickory-pine stands along ridgelines. The oak-hickory-pine forest is dominated by oaks (black, chestnut, northern red, southern red, and white), hickories (mockernut, pignut, and shagbark) and Virginia pine with scattered eastern redcedar. Black gum, muscle wood and sourwood are common understory species with black snakeroot, Christmas fern, little brown jug, ebony spleenwort, pennywort, running ground cedar, spotted wintergreen, wood sorrel and yellow giant hyssop in the herb layer.

Deciduous forest, which is characterized by trees with overlapping crowns where deciduous species account for more than 75 percent of the canopy cover, covers about 31 percent of the the Clinch River Property. The mixed mesophytic forest subtype has a rich herbaceous layer including species like bishop’s cap, blue cohosh, bloodroot, dog-tooth violet, doll’s eyes, foam-flower, Jack-in-the-pulpit, maidenhair fern, Solomon’s plume, and Solomon’s seal. The forest is dominated by tulip poplar with American beech, white oak and yellow buckeye. The midstory is also diverse and includes American holly, Carolina buckthorn, flowering dogwood, maple-leaf viburnum, pawpaw, sassafras, serviceberry, and wild black cherry.

A second subtype, calcareous forest, occurs on portions of the Clinch River Property underlain by limestone. Species present here include the woody plants bladdernut, eastern redcedar, eastern redbud and the herbaceous species Appalachian bugbane, glade fern, green violet, harbinger of spring, Jacob’s ladder, twin-leaf and walking fern. Most of the calcareous forest occurs within the Grassy Creek Habitat Protection Area and along a few mesic slopes adjacent to the river. This habitat type supports two Tennessee species of special concern: American ginseng and spreading false foxglove.

The third subtype of deciduous forest present on the Clinch River Property is wetland forest. Wetland forest was found primarily near the edge of Watts Bar Reservoir and within riparian areas of tributaries found on the site. These areas are dominated by American sycamore, black willow, buttonbush, silky dogwood and tag alder. In addition, persimmon is common along the shoreline along with box elder, Chinese privet, false indigo, multiflora rose and silver maple. Herbaceous species such as netted chain fern, jewelweed, lizard tail, poison hemlock, rose mallow, water willow, yellow flag, and several species of grasses, rushes, and sedges are present. *Populus X jackii* (Balm of Gilead) was encountered in a forested wetland associated with an unnamed stream near a transmission line that borders parcels 142 and 143. This species is often cultivated and can escape in natural areas (Dickmann and Kuzovkina 2008).

Table 2. Vegetation/land cover types, percent coverage, and acreage on the CRN Site.

Vegetation/land cover type	Approximate acreage	Percent site coverage
Mixed evergreen-deciduous forest ¹	390	42
Deciduous forest ²	292	31
Herbaceous vegetation ³	204	22
Evergreen forest	32	3
Roads/developed areas	14	2
Ponds	3	0.3
Total	935	100

Notes:

- 1 – Includes 1.0 ac of wetlands
- 2 – Includes 12.72 ac of wetlands
- 3 – Includes 1.82 ac of wetlands

Herbaceous vegetation has greater than 25 percent cover of grasses and forbs and occurs on about 22 percent of the Clinch River Property. Approximately 292 acres of the site has been previously cleared for construction projects and much of that land was revegetated with non-native species like sericea lespedeza and tall fescue. These cleared areas are in the process of undergoing secondary succession and support a number of weedy species such as black-eyed Susan, broom-sedge, Canada goldenrod, Johnson grass, Queen Anne's lace, tickseed, and various other common forbs. Young eastern redcedar is scattered throughout these heavily disturbed areas. One area of herbaceous vegetation differs from that found on the rest of site in having a predominantly native flora. This small site covers about 1.4 acres in a transmission line right-of-way and resembles a disturbed cedar glade, which are areas of exposed limestone that support sparse vegetation dominated by low-growing herbaceous species and eastern red cedar (Quarterman 1993). In addition to eastern red cedar and winged elm, herbaceous vegetation included blue-eyed grass, butterfly weed, hoary puccoon, creeping bush clover, false pennyroyal, pale spiked lobelia, rose pink, roundleaf thoroughwort, twining snoutbean, and whorled milkweed. Given its position on the landscape, it is likely the plant community formed as a result of disturbance associated with previous work on the Clinch River Site and construction of the 161-kV Kingston FP – Fort Loudoun HP #1 line. Considered along with the small size and anthropogenic origin of the plant community, the absence of any rare plant species typical of glades further indicates that this site possesses little if any conservation value.

Several small emergent wetlands occur on the Clinch River Property. See the wetland section of this document for additional information on the structure and composition of vegetation on those sites.

Evergreen forest occur as remnants of planted loblolly and white pine plantations and accounts for about three percent of the total land cover.

Invasive Non-Native Plant Species

Much of the Clinch River Property was extensively altered during previous projects, resulting in the introduction and spread of invasive non-native plants. Executive Order 13112 defines an invasive non-native species as any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem; and whose introduction does or is likely to cause economic or environmental harm or harm to human health (USDA 2007). Some invasive nonnative plants have been introduced into this country accidentally, but most were brought here as ornamentals or for livestock forage. These robust plants arrived without their natural competitors that tend to keep native plants in check. According to Morris et al. (2004), invasive non-native species are the second leading threat to imperiled native species.

Common invasive plant species occurring on the Clinch River Property include autumn olive, Chinese privet, Japanese honeysuckle, Japanese stilt grass, Johnson grass, mimosa, multiflora rose, and sericea lespedeza. All of these species have the potential to adversely impact the native plant communities because of their potential to spread rapidly and displace native vegetation and are considered a severe threat in Tennessee (Tennessee Exotic Plant Pest Council 2009). No federal noxious weeds were encountered during field surveys of the Clinch River Property.

Threatened and Endangered Plant Species

A review of the TVA Regional Natural Heritage database indicates that no federally listed plants have been previously reported from within five miles of the Clinch River Property, but two federally listed and one candidate for federal listing have been previously reported from Roane County, Tennessee (Table 3). Designated critical habitat for plants does not occur on the Clinch River Property. American Hart's-tongue fern, monkey-face orchid, and Virginia spiraea have very specific requirements and the assemblage of elements constituting suitable habitat do not occur on the site. Federally listed plant species would not be affected by the proposed action.

The TVA Regional Natural Heritage database indicates that seventeen species listed by the state of Tennessee have been reported from within five miles of the Clinch River Property (Crabtree 2014). In preparation for field surveys, the TVA botanist considered the unique habitat requirements of each of the species and used remote sensed data including aerial photos, geologic quadrangles, national wetland inventory data, and topographic maps to identify areas where rare species would be most likely to occur. Specifically, glade/barrens habitat, rich calcareous forest, and forested wetlands were prioritized as areas of interest. Field survey efforts were subsequently focused on locating these habitats to maximize the likelihood that rare plants would be found if present on the property. Two plants designated by the state of Tennessee as species of special concern were observed within the boundaries of the Grassy Creek Habitat Protection Area during field surveys of the Clinch River Property. These species were observed within the Grassy Creek Habitat Protection Area only and would not be affected by the proposed work on the Clinch River Nuclear Site.

American ginseng (*Panax quinquefolius*) is a commercially exploited herb valued for the purported medicinal value of the roots. This species prefers mesic sites and flowers from May-July, with fruits ripening later in the summer. Collection of ginseng is regulated by the state of Tennessee through the Ginseng Dealer Registration Act of 1983 and the Ginseng Harvest Season Act of 1985.

Spreading false-foxglove (*Aureolaria patula*) is perennial member of the figwort family that is parasitic on the roots of oaks. It grows on steep, partially shaded calcareous slopes above large streams and rivers and is often found within a few meters of the water. This species flowers from August through the first frost.

Table 3. All plant species of conservation concern previously reported from within five miles of the Clinch River Property as well as candidates for federal listing and federally listed plants reported from Roane County, Tennessee.

Common Name	Scientific Name	Federal Status	State Rank/Status
Earleaf Foxglove	<i>Agalinis auriculata</i>	-	END/S2
American Hart's-tongue fern ²	<i>Asplenium scolopendrium</i> var. <i>americanum</i>	THR	END/S1
Spreading False-foxglove ¹	<i>Aureolaria patula</i>	-	SPCO/S3
River Bulrush	<i>Bolboschoenus fluviatilis</i>	-	SPCO/S3
Tall Larkspur	<i>Delphinium exaltatum</i>	-	END/S2
Branching Whitlow-wort	<i>Draba ramosissima</i>	-	SPCO/S2
Waterweed	<i>Elodea nuttallii</i>	-	SPCO/S2
Godfrey's Thoroughwort	<i>Eupatorium godfreyanum</i>	-	SPCO/S1
Naked-stem Sunflower	<i>Helianthus occidentalis</i>	-	SPCO/S2

Butternut	<i>Juglans cinerea</i>	-	THR/S3
Short-head Rush	<i>Juncus brachycephalus</i>	-	SPCO/S2
Slender Blazing-star	<i>Liatris cylindracea</i>	-	THR/S2
Loesel's Twayblade	<i>Liparis loeselii</i>	-	THR/S1
American ginseng ¹	<i>Panax quinquefolius</i>	-	S-CE/S3S4
Pale Green Orchid	<i>Platanthera flava</i> var. <i>herbiola</i>	-	THR/S2
Monkey-face orchid ²	<i>Platanthera integrilabia</i>	C	S2S3/END
Heller's Catfoot	<i>Pseudognaphalium helleri</i>	-	SPCO/S2
Prairie Goldenrod	<i>Solidago ptarmicoides</i>	-	END/S1S2
Virginia Spiraea ²	<i>Spiraea virginiana</i>	THR	END/S2
Shining Ladies'-tresses	<i>Spiranthes lucida</i>	-	THR/S1S2

Status codes: **C** = Candidate; **END** = Endangered; **SPCO** = Special Concern; **S-CE** =Special Concern-Commercially Exploited; **THR** = Threatened.

Rank Codes: **S1** = Extremely rare and critically imperiled in the state with 5 or fewer occurrences, or very few remaining individuals, or because of some special condition where the species is particularly vulnerable to extirpation; **S2** = Very rare and imperiled within the state, 6 to 20 occurrences; **S3** = Rare or uncommon with 21 to 100 occurrences; **S4** = Apparently secure; **S#S#** = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2).

¹Species of conservation concern observed during field surveys of the Clinch River Property.

²Federal-listed plant species previously reported from Roane County, Tennessee, but not from within 5 miles of the Clinch River Property..

Literature Cited

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- U.S. Department of Agriculture. 2007. *Invasive and Noxious Weeds*. Retrieved from <http://plants.usda.gov/java/noxiousDriver> (18 October 2011).

Appendix A –

Plant List from field reviews at the Clinch Small Modular Reactor Site (2011 and 2013)

Table 1. Representative plant species observed during field reviews of the Clinch Small Modular Reactor Site (2011 and 2013).

Common Name	Scientific Name
American beech	<i>Fagus grandifolia</i>
American ginseng	<i>Panax quinquefolius</i>
American holly	<i>Ilex opaca</i>
American sycamore	<i>Platanus occidentalis</i>
Amur honeysuckle	<i>Lonicera maackii</i>
Angularfruit milkvine	<i>Matelea gonocarpos</i>
Appalachian bugbane	<i>Cimicifuga rubifolia</i>
Autumn olive	<i>Elaeagnus umbellata</i>
Axilflower	<i>Mecardonia acuminata</i>
Balm of Gilead	<i>Populus X jackii</i>
Beaked panic grass	<i>Panicum anceps</i>
Beechdrops	<i>Epifagus virginiana</i>
Big bluestem	<i>Andropogon gerardii</i>
Bishop's cap	<i>Mitella diphylla</i>
Black oak	<i>Quercus velutina</i>
Black snakeroot	<i>Cimicifuga racemosa</i>
Black walnut	<i>Juglans nigra</i>
Black willow	<i>Salix nigra</i>
Black-eye Susan	<i>Rudbeckia hirta</i>
Blackgum	<i>Nyssa sylvatica</i>
Bladdernut	<i>Staphylea trifolia</i>
Bloodroot	<i>Sanguinaria canadensis</i>
Blue cohosh	<i>Caulophyllum thalictroides</i>
Blue phlox	<i>Phlox divaricata</i>
Blunt broom sedge	<i>Carex tribuloides</i>
Box elder	<i>Acer negundo</i>
Callery pear	<i>Pyrus calleryana</i>
Broad beechfern	<i>Phegopteris hexagonoptera</i>
Bulblet bladderfern	<i>Cystopteris bulbifera</i>
Butterfly weed	<i>Asclepias tuberosa</i>
Buttonbush	<i>Cephalanthus occidentalis</i>
Canada violet	<i>Viola canadensis</i>
Carolina buckthorn	<i>Rhamnus caroliniana</i>
Carolina coralbead	<i>Cocculus carolinus</i>
Cattail	<i>Typha latifolia</i>

Chestnut oak	<i>Quercus montana</i>
Chinese privet	<i>Ligustrum sinense</i>
Christmas fern	<i>Polystichum acrostichoides</i>
Common adder's tongue fern	<i>Ophioglossum vulgatum</i>
Common threesquare	<i>Schoenoplectus pungens</i>
Creeping jenny	<i>Lysimachia nummularia</i>
Crownbeard	<i>Verbesina alternifolia</i>
Crownbeard	<i>Vebesina occidentalis</i>
Cucumber magnolia	<i>Magnolia acuminata</i>
Dog-tooth violet	<i>Erythronium americanum</i>
Doll's eyes	<i>Actaea pachypoda</i>
Dutchman's breeches	<i>Dicentra cucullaria</i>
Dwarf larkspur	<i>Delphinium tricorne</i>
Eastern red bud	<i>Cercis canadensis</i>
Eastern red cedar	<i>Juniperus virginiana</i>
Ebony spleenwort	<i>Asplenium platyneuron</i>
Fall bentgrass	<i>Agrostis perennans</i>
Field thistle	<i>Cirsium discolor</i>
Flowering dogwood	<i>Cornus florida</i>
Fluxweed	<i>Isanthus brachiatus</i>
Foam flower	<i>Tiarella cordifolia</i>
Frank's sedge	<i>Carex frankii</i>
Fringeleaf wild petunia	<i>Ruellia humilis</i>
Frostweed	<i>Verbesina virginica</i>
Fox sedge	<i>Carex vulpinoidea</i>
Giant chickweed	<i>Stellaria pubera</i>
Giant sedge	<i>Carex gigantea</i>
Glade fern	<i>Diplazium pycnocarpon</i>
Golden eye saxifrage	<i>Saxifraga careyana</i>
Green Ash	<i>Fraxinus pennsylvanica</i>
Green violet	<i>Hybanthus concolor</i>
Grooved flax	<i>Linum sulcatum</i>
Hairy small-leaf tick trefoil	<i>Desmodium ciliare</i>
Harbinger of spring	<i>Eriogenia bulbosa</i>
Harper's triparted violet	<i>Viola tripartita</i> var. <i>glaberrima</i>
Hoary puccoon	<i>Lithospermum canescens</i>
Hyssopleaf thoroughwort	<i>Eupatorium hyssopifolium</i>
Indian pink	<i>Spigelia marilandica</i>
Jack in the pulpit	<i>Arisaema triphyllum</i>
Jacob's ladder	<i>Polemonium reptans</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
Japanese stiltgrass	<i>Microstegium vimineum</i>
Jewel weed	<i>Impatiens capensis</i>
Johnson's grass	<i>Sorghum halepense</i>
Kudzu	<i>Pueraria montana</i> var. <i>lobata</i>
Largeleaf waterleaf	<i>Hydrophyllum macrophyllum</i>
Lateflowering thoroughwort	<i>Eupatorium serotinum</i>
Leafy bulrush	<i>Scirpus polyphyllus</i>

Little brown jug	<i>Hexastylis arifolia</i>
Lizard tail	<i>Saururus cernuus</i>
Loblolly pine	<i>Pinus taeda</i>
Longleaf summer bluet	<i>Houstonia longifolia</i>
Maiden hair fern	<i>Adiantum pedatum</i>
Maple-leaf viburnum	<i>Viburnum acerifolium</i>
Maryland senna	<i>Senna marilandica</i>
Mockernut hickory	<i>Carya tomentosa</i>
Monkey flower	<i>Mimulus alatus</i>
Multiflora rose	<i>Rosa multiflora</i>
Muscle wood	<i>Carpinus caroliniana</i>
Narrowleaf vervain	<i>Verbena simplex</i>
Netted chain fern	<i>Woodwardia areolata</i>
Nettleleaf sage	<i>Salvia urticifolia</i>
Northern red oak	<i>Quercus rubra</i>
Orange coneflower	<i>Rudbeckia fulgida</i>
Oriental bittersweet	<i>Celastrus orbiculatus</i>
Pale spike lobelia	<i>Lobelia spicata</i>
Pawpaw	<i>Asimina triloba</i>
Persimmon	<i>Diospyros virginiana</i>
Pignut hickory	<i>Carya glabra</i>
Poison hemlock	<i>Conium maculatum</i>
Poison ivy	<i>Toxicodendron radicans</i>
Princess tree	<i>Paulownia tomentosa</i>
Prostrate ground tick trefoil	<i>Desmodium rotundifolium</i>
Rattlesnake plantain	<i>Goodyera pubescens</i>
Red maple	<i>Acer rubrum</i>
Red mulberry	<i>Morus rubra</i>
Red trillium	<i>Trillium erectum</i>
Resurrection fern	<i>Pleopeltis polypodioides</i>
Rice cutgrass	<i>Leersia oryzoides</i>
Rose mallow	<i>Hibiscus moscheutos</i>
Rosepink	<i>Sabatia angularis</i>
Roughseed St. John's wort	<i>Hypericum sphaerocarpum</i>
Roundhead lespedeza	<i>Lespedeza capitata</i>
Roundleaf thoroughwort	<i>Eupatorium rotundifolium</i>
Roundleaf greenbrier	<i>Smilax rotundifolia</i>
Running ground pine	<i>Diphasiastrum digitatum</i>
Rusty blackhaw	<i>Viburnum rufidulum</i>
Sassafras	<i>Sassafras albidum</i>
Sericea lespedeza	<i>Lespedeza cuneata</i>
Serviceberry	<i>Amelanchier sp.</i>
Showy orchis	<i>Galearis spectabilis</i>
Silky dogwood	<i>Cornus amomum</i>
Silver plume grass	<i>Saccharum alopecuroides</i>
Silver maple	<i>Acer saccharinum</i>
Slippery elm	<i>Ulmus rubra</i>
Softstem bulrush	<i>Schoenoplectus tabernaemontani</i>

Solomon's plume	<i>Maianthemum racemosum</i>
Solomon's seal	<i>Polygonatum biflorum</i>
Sourwood	<i>Oxydendrum arboreum</i>
Spicebush	<i>Lindera benzoin</i>
Spotted wintergreen	<i>Chimaphila maculata</i>
Sprangle-top	<i>Tridens flavus</i>
Spreading false foxglove	<i>Aureolaria patula</i>
Squarestem spike rush	<i>Eleocharis quadrangulata</i>
Squarrose sedge	<i>Carex squarrosa</i>
Sugar maple	<i>Acer saccharum</i>
Sugarberry	<i>Celtis laevigata</i>
Swamp milkweed	<i>Asclepias incarnata</i>
Sweetgum	<i>Liquidambar styraciflua</i>
Tag alder	<i>Alnus serrulata</i>
Tall false indigo	<i>Amorpha fruticosa</i>
Tall fescue	<i>Festuca arundinacea</i>
Tall thoroughwort	<i>Eupatorium altissimum</i>
Trailing lespedeza	<i>Lespedeza procumbens</i>
Tree-of-Heaven	<i>Ailanthus altissima</i>
Trumpet creeper	<i>Campsis radicans</i>
Tulip poplar	<i>Liriodendron tulipifera</i>
Twining snoutbean	<i>Rhynchosia tomentosa</i>
Twinleaf	<i>Jeffersonia diphylla</i>
Umbrella magnolia	<i>Magnolia tripetala</i>
Vasey's trillium	<i>Trillium vaseyi</i>
Virginia dayflower	<i>Commelina virginica</i>
Virginia pine	<i>Pinus virginiana</i>
Walking fern	<i>Asplenium rhizophyllum</i>
Water willow	<i>Decodon verticillatus</i>
White grass	<i>Leersia virginica</i>
White oak	<i>Quercus alba</i>
White pine	<i>Pinus strobus</i>
White-blue-eyed grass	<i>Sisyrinchium albidum</i>
Whorled milkweed	<i>Asclepias verticillata</i>
Wild basil	<i>Satureja vulgaris</i>
Wild black cherry	<i>Prunus serotina</i>
Wild geranium	<i>Geranium maculatum</i>
Wild ginger	<i>Asarum canadensis</i>
Winged elm	<i>Ulmus alata</i>
Wood sorrel	<i>Oxalis sp.</i>
Wool grass	<i>Scirpus cyperinus</i>
Yellow buckeye	<i>Aesculus flava</i>
Yellow flag	<i>Iris pseudacorus</i>
Yellow giant hyssop	<i>Agastache nepetoides</i>
Yellow trillium	<i>Trillium luteum</i>

THE TENNESSEE VALLEY AUTHORITY



Clinch River Barge/Traffic Area

Terrestrial Plant Communities and Botanical Resources Survey Report

Adam J. Dattilo

06/18/2015

Affected Environment

Terrestrial Ecology (Plants)

The Barge/Traffic Area is located in the Southern Dissected Ridges and Knobs and Southern Limestone/Dolomite Valleys and Rolling Hills ecoregions, which are subdivisions of the Ridge and Valley. The Ridge and Valley, which occurs between the Blue Ridge Mountains on the east and the Cumberland Plateau on the west, is a relatively low-lying region made up of roughly parallel ridges and valleys that were formed through extreme folding and faulting events in past geologic time (Griffith et al. 1998). About 80 percent of Barge/Traffic Area is found within the Southern Dissected Ridges and Knobs ecoregion. This region contains crenulated, broken, or hummocky ridges, that support chestnut oak and pine forests in the higher elevations and stands of white oak, mixed mesophytic forest, and tulip poplar on the lower slopes (Griffith et al. 1998). The remaining 20 percent of the study area, located in the Bear Creek Valley, lies within the Southern Limestone/Dolomite Valleys and Rolling Hills. Bedrock geology in this heterogeneous region is composed predominantly of limestone and cherty dolomite. Landforms are mostly undulating valleys and rounded ridges with many caves and springs. Land cover in this ecoregion varies and includes forest, pasture, intensive agriculture, and areas of commercial, industrial, and residential development.

Field surveys were conducted in May 2015 to assess the terrestrial community structure, to document infestations of invasive plants, and to search for possible threatened and endangered plant species on the site. Areas representative of each vegetation type present on the Barge/Traffic Area were visited during the survey. Using the National Vegetation Classification System (Grossman et al. 1998), vegetation types found on the Barge/Traffic Area can be classified as a combination of deciduous forest and herbaceous vegetation. No forested areas in the proposed project area had structural characteristics indicative of old growth forest stands (Leverett 1996). The plant communities observed on-site are common and well represented throughout the region.

Deciduous Forest, which is characterized by trees with overlapping crowns where deciduous species account for more than 75 percent of the canopy cover, is the most common vegetation type and covers more than 90 percent of the Barge/Traffic Area. Common overstory species in dry upland forest includes American beech, black gum, chestnut oak, mockernut hickory, red maple, scarlet oak, sourwood, umbrella magnolia, and white oak. The understory consists of flowering dogwood, lowbush blueberry, and mountain laurel. Herbaceous plants were sparse and included Christmas fern, muscadine, and wild yam. Forested wetlands were also present the Barge/Traffic Area. This forest type was located in bottomlands associated with the Clinch River and contained overstory species including American sycamore, black willow, green ash, red maple, and sweetgum. The size of overstory trees in the Barge/Traffic Area varies by stand and ranges from six to 30 inches diameter at breast height.

Herbaceous Vegetation has greater than 25 percent cover of grasses and forbs and occurs on less than 10 percent of the Barge/Traffic Area. Fields and maintained power line right-of-ways account for the vast majority herbaceous vegetation in the project area. Most of these areas are dominated by plants indicative of early successional habitats including many non-native species. Common species in these disturbed areas include Japanese honeysuckle, lobed tickseed, sericea lespedeza, showy goldenrod, Small's ragwort, southern blackberry, and winged sumac. Several small emergent wetlands support a higher proportion of native species including buttonbush, common rush, groundnut, jewelweed, lizard's tail, shallow sedge, silky dogwood, squarrose sedge, and tall false indigo.

Invasive Non-Native Plant Species

Executive Order 13112 defines an invasive non-native species as any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem; and whose introduction does or is likely to cause economic or environmental harm or harm to human health (USDA 2007). Some invasive nonnative plants have been introduced into this country accidentally, but many were brought here as ornamentals or for livestock forage. These robust plants arrived without their natural competitors that tend to keep native plants in check. According to Morris et al. (2004), invasive non-native species are the second leading threat to imperiled native species.

Common invasive plant species occurring within the Barge/Traffic Area include Chinese lespedeza, Chinese privet, Japanese honeysuckle, and Nepalese browntop. These species have the potential to spread rapidly and displace native vegetation and are the considered a severe threat in Tennessee (Tennessee Exotic Plant Pest Council 2009). No federal noxious weeds were encountered during field surveys of the Barge/Traffic Area.

Threatened and Endangered Plant Species

A review of the TVA Regional Natural Heritage database indicates that no federally listed plants have been previously reported from within five miles of the Barge/Traffic Area, but two federally listed and one candidate for federal listing have been previously reported from Roane County, Tennessee (Table X). Designated critical habitat for plants does not occur on the Barge/Traffic Area. American Hart's-tongue fern, monkey-face orchid, and Virginia spiraea have very specific habitat requirements and the that do not occur on the site. Federally listed plant species would not be affected by the proposed action.

The TVA Regional Natural Heritage database indicates that seventeen species listed by the state of Tennessee have been reported from within five miles of the Barge/Traffic Area (Crabtree 2014). In preparation for field surveys, the TVA botanist considered the unique habitat requirements of each of the species and used remote sensed data including aerial photos, geologic quadrangles, national wetland inventory data, and topographic maps to identify areas where rare species would be most likely to occur. Specifically, glade/barrens habitat, rich calcareous forest, and forested wetlands were prioritized as areas of interest. Field survey efforts were subsequently focused on locating these habitats to maximize the likelihood that rare plants would be found if present on the property.

Both shining ladies'-tresses (*Spiranthes lucida*) and spreading false foxglove (*Aureolaria patula*) have been previously reported from a small portion of the southern part of the Barge/Traffic Area, just west of the West End Water Treatment facility. The last observation of shining ladies'-tresses and spreading false foxglove on the site have been in the years 2000 and 1991, respectively. May 2015 field surveys of the wetland and associated uplands near the water treatment facility did not relocate individuals of either species; neither currently occurs in the Barge/Traffic Area. State-listed plants would not be affected by the proposed action.

Table X. All plant species of conservation concern previously reported from within five miles of the Barge/Traffic Area as well as candidates for federal listing and federally listed plants reported from Roane County, Tennessee.

Common Name	Scientific Name	Federal Status	State Rank/Status
Earleaf Foxglove	<i>Agalinis auriculata</i>	-	END/S2

American Hart's-tongue fern ²	<i>Asplenium scolopendrium</i> var. <i>americanum</i>	THR	END/S1
Spreading False-foxglove ¹	<i>Aureolaria patula</i>	-	SPCO/S3
River Bulrush	<i>Bolboschoenus fluviatilis</i>	-	SPCO/S3
Tall Larkspur	<i>Delphinium exaltatum</i>	-	END/S2
Branching Whitlow-wort	<i>Draba ramosissima</i>	-	SPCO/S2
Waterweed	<i>Elodea nuttallii</i>	-	SPCO/S2
Godfrey's Thoroughwort	<i>Eupatorium godfreyanum</i>	-	SPCO/S1
Naked-stem Sunflower	<i>Helianthus occidentalis</i>	-	SPCO/S2
Butternut	<i>Juglans cinerea</i>	-	THR/S3
Short-head Rush	<i>Juncus brachycephalus</i>	-	SPCO/S2
Slender Blazing-star	<i>Liatris cylindracea</i>	-	THR/S2
Loesel's Twayblade	<i>Liparis loeselii</i>	-	THR/S1
American ginseng	<i>Panax quinquefolius</i>	-	S-CE/S3S4
Pale Green Orchid	<i>Platanthera flava</i> var. <i>herbiola</i>	-	THR/S2
Monkey-face orchid ²	<i>Platanthera integrilabia</i>	C	S2S3/END
Heller's Catfoot	<i>Pseudognaphalium helleri</i>	-	SPCO/S2
Prairie Goldenrod	<i>Solidago ptarmicoides</i>	-	END/S1S2
Virginia Spiraea ²	<i>Spiraea virginiana</i>	THR	END/S2
Shining Ladies'-tresses ¹	<i>Spiranthes lucida</i>	-	THR/S1S2

Status codes: **C** = Candidate; **END** = Endangered; **SPCO** = Special Concern; **S-CE** =Special Concern-Commercially Exploited; **THR** = Threatened.

Rank Codes: **S1** = Extremely rare and critically imperiled in the state with 5 or fewer occurrences, or very few remaining individuals, or because of some special condition where the species is particularly vulnerable to extirpation; **S2** = Very rare and imperiled within the state, 6 to 20 occurrences; **S3** = Rare or uncommon with 21 to 100 occurrences; **S4** = Apparently secure; **S##S#** = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2).

¹Species of conservation concern previously reported from the Barge/Traffic Area.

²Candidates for federal listing and federally listed plant species previously reported from Roane County, Tennessee, but not from within 5 miles of the Barge/Traffic Area.

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