Survey for Three Threatened and Endangered Plants:

V. C. Summer Nuclear Station

October 2007

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ABSTRACT

Additional reactor sites and ancillary construction will take place at the V. C. Summer Nuclear Station, Fairfield County, South Carolina. An assessment for presence and location of three rare plant species, *Echinacea laevigata* ("Smooth coneflower"), *Helianthus schweinitzii* ("Schweinitz's sunflower"), and *Symphyotrichum georgianum* ("Georgia aster") was performed in conjunction with the planned development. These three plants are the most likely blooming/fruiting species considered from a larger list of taxa; these three were not considered during earlier (2006) assessments, which were performed for earlier-blooming (spring-summer) species. Of the three species, Georgia aster is the most likely to occur at the study site. Thirteen projected impact sites were inventoried, along with their margins, for these three plants. Based upon this study, none of the three target species occurs in any future construction sites.

ACKNOWLEDGEMENTS

I am grateful to Mike Whitten and Steve Summer for their assistance in this project, both for access to study sites and for help in the field.

INTRODUCTION

SITE DESCRIPTION

The V. C. Summer Nuclear Station (VCSNS), located in southwestern Fairfield County, lies entirely within the outer piedmont physiographic region. This region features dissected river drainages on generally rolling topography, ultimately draining west to the Broad River. The geology of Fairfield County is dominated by the presence of crystalline (igneous) and metamorphic strata. The Charlotte Slate Belt dominates the lower portion of Fairfield County, including VCSNS. In general, the most prominent rock types include granite, gneiss, and schist. Indeed, several active quarries and mines operate in Fairfield County, which is renowned for its high quality granite. Although some inclusions or plutons of gabbro or similar rock occur in nearby piedmont counties (especially Chester and York), none apparently occur near VCSNS, and there are no known sites that feature circumneutral or basic soil in the vicinity.

The two basic soil groups occurring in this part of Fairfield County (Hardee, 1982) may be considered “upland” soils (Anonymous, 1980):

Cecil-Pacolet-Appling soils tend to be well-drained and gently sloping to moderately steep, very clayey, and very strongly acidic to moderately acidic in the subsoil.

Madison-Cecil-Hiawassee soils are topographically and chemically much like those above, but tend to be slightly less acidic in the subsoil.

In addition, a narrow zone of Chewacla-Toccoa series soils is present along the east side of the Broad River and Parr Reservoir, and along drainages of smaller creeks within the area. These are alluvial deposits that are poorly to well drained, subject to flooding, and generally strongly to slightly acidic throughout.

The human disturbance history of Fairfield County is much like that of the rest of the Piedmont. Native Americans probably had relatively little impact. European settlers, however, began clearing forested land upon arrival in the middle 18th Century. With the development of the cotton industry, destructive soil practices resulted in the depletion of many sites. Continuing cotton production eventually led to a tendency toward gullying throughout much of the county, with the land commonly abandoned after that, up until the early 1920's, when cotton dramatically declined as a profitable enterprise.

Intensive surveys for rare and endangered plant species were performed in 2006, during June and September. Target species were those developed after consultation with the South Carolina Nongame & Heritage Trust. Twenty-three species occurring in South Carolina are listed as threatened within the parameters of the US Fish & Wildlife Service, or are candidates for listing (Table 1). Of these 23, only five (*Amphianthus pusillus*, "poolsprite"; *Echinacea laevigata,* "Smooth coneflower"; *Helianthus schweinitzii*, "Schweinitz's sunflower"; *Isoetes melanospora*, "Black-spored quillwort"; *Symphyotrichum georgianum,* "Georgia aster") are considered as possibly occurring or likely to occur at VCSNS. Three of these species are fall-bloomers (smooth coneflower, Schweinitz's sunflower and Georgia aster), and not likely to be visible in any form during the earlier study. The impetus for this project arose from a need to assess future VCSNS construction sites for the presence of these three plants.

SURVEY METHODOLOGY

Smooth coneflower, Schweinitz's sunflower, and Georgia aster were designated as "target" species within the scope of this project. Of the five listed or candidate species potentially occurring at VCSNS, these are the mostly likely to be found during early autumn, rather than in spring or summer.

Smooth coneflower (*Echinacea laevigata*, formally listed as Endangered), is rare throughout its somewhat fragmented range in South Carolina; some populations (viz. Richland County) have been questioned as possibly of garden origin. This species is practically always associated with open, prairie-like habitats with relatively high soil pH values, and may be considered a calciphile. The largest and healthiest populations occur in Pickens County on weathered marble. The presence of this plant in Richland County, and there in an acidic, sandy habitat suggests that soil "demands" of this species may be more complicated than previously thought. Nevertheless, it remains most likely that this plant would be found in soils underlain by high-pH substrates. That smooth coneflower could exist anywhere at VCSNS is extremely unlikely, given known soil profiles. Nevertheless, it is an extremely "charismatic" species, and easily recognizable when in flower (or fruit). Because of this, and due to the coincidental blooming/fruiting time of both Schweinitz's sunflower and Georgia aster, it was included as a target species.

Schweinitz's sunflower (*Helianthus schweinitzii*, formally listed as Endangered), is absolutely endemic to North and South Carolina, known in South Carolina with certainty only from southeastern York County. It occurs only on prairie-like settings, including rights of way for transmission lines and highways, and only on soils allied to the "Iredell" series. Such soils are relatively circumneutral, and thus chemically different from most of the surrounding soils. (Although this sunflower is an apparent edaphic "specialist", it does in fact lend itself to rather easy cultivation in gardens, and without

reliance on special soil types.) This species is fairly easy to identify in the field, throughout its blooming/fruiting period, and is unusual for most native sunflower species in being recognizable in vegetative condition. The relative proximity of western Fairfield County to southeastern York County is not a particularly compelling reason for including this plant in the current study as a target. As well, there are apparently no plutons of appropriate rock in the vicinity of VCSNS, and thus presumably appropriate soils for naturally occurring populations are absent. Nevertheless, its blooming period and ease of identification suggests an economy of field effort in combining a search for it with the other two plants.

Unlike the two species listed above, Georgia aster (*Symphyotrichum georgianum*, formally listed as a Candidate species) is indeed likely to occur at VCSNS. It apparently does not have specific demands for soils, and occurs in a variety of somewhat disturbed habitats or landscape features elsewhere in the outer Piedmont. This aster is rather closely allied to the more common and more widespread "clasping aster" (*S. patens*), and indeed, some taxonomists have considered both as two varieties of the same species (in such a case, the name *S. patens* has nomenclatural priority, so that Georgia aster as a variety would be called *Aster patens* var. *georgianus*…interestingly, the varietal combination has not been made within the genus *Symphyotrichum*, although it may be in the future.). Georgia aster is rather easily distinguished from typical clasping aster, in having considerably larger and showier blooming heads, along with white disk flowers and white pollen; clasping aster has yellow disk flowers and yellow pollen.

Twelve formally designated, mapped project sites were inventoried on foot on October 4 and 5, 2007, with special attention paid to open areas within them, along whatever open margins they exhibit, including transmission line rights of way. Additionally, a transmission line right of way, not formally mapped, was included (Project area 6). These 13 project sites can be divided into northern and southern portions of VCSNS.

Field inventory included preparation of pressed specimens for positive identification, as needed. All specimens developed from this study are on deposit at the Herbarium of the University of South Carolina.

RESULTS

For convenience, project sites (Figure 1) are considered in a clockwise fashion starting at the 12 o'clock position immediately north of the site for the main reactor complex (proposed).

1. Project area 1 is a roughly triangular area, composed technically of six smaller subunits ("Construction Laydown and Module Fabrication", "Construction Laydown/Fabrication Heavy Haul Road", "Cooling Tower Construction and Minor Laydown Areas, "Construction Offices/Parking", "Plant Construction", "Construction Laydown/Parking", thus forming a complex. All of these six are considered here together, considering their contiguity and relatively small size.

This project area consists of secondary/planted pine forests and highly disturbed ground. In addition to the main portions of the study area, northeast/southwest trending powerline on its west margin was examined. No significant plant species were located.

2. Project area 2 ("Water Treatment Plant") is dominated by a softball field, old house site, and test garden. All of the open areas within this site are heavily disturbed, and regularly mowed. Non-mowed margins tend to be very weedy. No significant plant species were located.

3. Project area 3 ("Construction Spoils Earthwork") is located on the east side of a powerline, with a prominent bend in it. The powerline was carefully studied as well as the interior of the forested part of this site. The powerline has been heavily manipulated, and features a large number of native species, including *Aster dumosus* and several goldenrods (*Solidago*). Neither the powerline nor the remaining forested area adjacent to it contains any significant plant species.

4. Project area 4 is the southernmost portion of a "Construction Laydown" area, along with the lower end of a proposed "Batch Plant" development. A narrow dirt road bisects these two areas. Both sides consist of planted pine on clay; the trees are apparently 5-6 years old and growing very poorly, apparently regularly shedding needles. There is essentially no undergrowth associated with this site; no significant plant species are present.

5. Project area 5 is a trapezoidal area, situated between two powerlines. It is entirely forested with reasonably large pines, featuring a fairly monotonous understory of dogwood, persimmon, and red cedar. This forest is unremarkable in its herbaceous diversity, and apparently contains no significant species. Both powerlines (south and north) were examined. These are weedy, both sides featuring considerable disturbance and windrowing; no significant plant species were seen.

6. Project area 6 is an unmarked (=unspecified) power line right of way that was examined due to its proximity to the study areas in the southeastern end of VSCNS. This right of way is typically weedy and heavily disturbed. No significant species were located.

7. Project area 7 ("Construction Facilities and Fuel Depot") is a narrowly rectangular area, consisting entirely of second-growth loblolly pine. No significant plant species were located within it.

8. Project area 8 ("Construction Facilities") occurs at the southeast end of VCSNS and on the north side of Sec Hwy 16 (=St. Barnabas Church Rd). This is a forested site, consisting mostly of a thin canopy of second growth loblolly pine. No significant species were located within it, or along the road along its western boundary.

9. Project area 9 ("Construction Facilities") occurs at the eastern end of an open field, at the west end of which is a functioning (?) hunt club. The study area consists of a combination of open field and adjacent secondary pine woods; both are heavily disturbed, weedy, and contain no significant species.

10. Project area 10 ("Construction Spoils Earthwork") is pentagonal block of land, divided roughly into equal halves. The northeastern half is forested, with reasonably old pines within an old gullied terrain, and with scarcely any herbaceous cover. The southwestern portion is almost entirely clear-cut and windrowed, except for a tiny inclusion of wetland forest on the southwest edge. None of this site offers reasonable habitat for the target species in question, and no significant species were located within it.

11. Project area 11 ("Construction Parking" and "Construction Dredge and Disposal Area") consists of two small areas considered as a single unit. They consist of upland, secondary pine forest, offering no suitable habitat for the target species in question. No significant plant species were located within either of these two areas.

12. Project area 12 ("Blowdown Line") occurs essentially along both sides of the presently unused railroad right of way terminating on the east side of Parr Reservoir. The wetland area and associated forest immediately adjacent to the reservoir were examined as well. None of this site offers reasonable habitat for any of the target species, and no significant plant species was located. (A small population of *Lotus helleri*, "Carolina prairie trefoil", is present within the right of way, initially discovered in 2006, and persisting. This is a fairly uncommon annual species in the bean family, presumably endemic to the Piedmont of North and South Carolina, and just into Georgia, where it is considered threatened. It is not considered a candidate species for listing, and has not been included within the scope of the current work.)

13. Project area 13 ("Switchyard Construction") was considered along with the eastern edge of the powerline right of way along its western margin. The irregularly-shaped study area features reasonably old, tall loblolly pine in places, over prominently gullied terrain. This forest offers no suitable habitat for any significant plant species, and none was located, either within it or along the powerline.

DISCUSSION

No listed species were found anywhere at VCSNS during this project, including natural ecosystems and transmission line rights of way. The lack of these species may be explained by absence of appropriate habitat, except for Georgia aster (*Symphyotrichum georgianum)*, whose habitat is presumably present in abundance.

In general, the areas surveyed during this project are characteristic of similarly disturbed topographic situations in the outer Piedmont of South Carolina.

SOURCES CITED

Anonymous. 1980. Virgil C. Summer Nuclear Station Operating License Environmental Report, Vol. 1. South Carolina Electric & Gas Company, Columbia SC.

Hardee, G. E. 1982 Soil survey of Chester and Fairfield Counties, South Carolina. US Department of Agriculture, Soil Conservation Service.

Table 1. South Carolina's LISTED and CANDIDATE plant species, compiled from US Fish & Wildlife Service and SC Nongame & Heritage Trust. Target species indicated in bold.

Species	Status	Notes	SC counties of occurrence
Amaranthus pumilus, "Seabeach amaranth"	Federally LISTED as threatened, State Threatened	An annual species of intertidal beaches	Georgetown, Horry
Amphianthus pusillus, "Poolsprite"	Federally LISTED as threatened, State Threatened	Shallow vernal depressions on granitic flatrocks. Previous detailed studies of this plant suggest a very low likelihood of additional sites in South Carolina other than known populations.	Lancaster, Saluda, York
***Echinacea laevigata,* "Smooth coneflower"**	**Federally LISTED as Endangered, State Endangered**	**Meadows, open woodlands, roadsides. Questions remain concerning the biology and natural distribution of this species in South Carolina; it is most likely found on circumneutral throughout its range, such as the upstate SC populations.**	**Aiken, Pickens, Richland**
***Helianthus schweinitzii,* "Schweinitz's sunflower"**	**Federally LISTED as Endangered, State Endangered**	**Relictual prairies on gabbro plutons; known in SC only from York County**	**York**
Helonias bullata, "Swamp pink"	Federally LISTED as Threatened, State Threatened	Mountain bogs	Greenville
Hexastylis naniflora, "Dwarf-flowered heartleaf"	Federally LISTED as Threatened, State Threatened	Bogs of the inner Piedmont	Cherokee, Greenville, Spartanburg

Isoetes melanospora, "Black-spored quillwort"	Federally LISTED as Endangered, State Endangered	Temporary pools on granitic flatrocks	Edgefield, Kershaw, Lancaster
Isotria medeoloides, "Small whorled pogonia"	Federally LISTED as Threatened, State Threatened	Mountains forests, stream drainages of the upper Savannah	Oconee
Lindera melissifolia, "Pondberry"	Federally LISTED as Endangered, State Endangered	Coastal plain isolated wetlands	Beaufort, Berkeley, Colleton
Lysimachia asperulaefolia, "Rough-leafed loosestrife"	Federally LISTED as Endangered, State Endangered	Sandhills seepages of the midlands: one known population at Fort Jackson. This species appears to be very dependent on periodic fires.	Richland
Narthecium americanum, "Bog asphodel"	Federal CANDIDATE for listing	Coastal plain bogs	Dorchester
Oxypolis canbyi, "Canby's cowbane"	Federally LISTED as Endangered, State Endangered	Carolina bays, rarely (in SC) elsewhere.	Clarendon, Orangeburg, Richland
Platanthera integrilabia, "White fringeless orchid"	Federal CANDIDATE for listing	Mountain bogs	Greenville
Ptilimnium nodosum, "Harperella"	Federally LISTED as Endangered, State Endangered	Unusual distribution ecologically. In the northern part of its range, this plant may occur on rocky river shoals. In the southern part of the range, including SC, it is more likely in Carolina bays.	Horry, Saluda
Rhus michauxii, "Michaux's sumac"	Federally LISTED as Endangered, State Endangered	Anomalous historic distribution: extirpated in SC?	Kershaw, Pickens
Ribes echinellum, "Miccosukee gooseberry"	Federally LISTED as Threatened, State Threatened	A single population, known only from rich woods along Steven's Creek	McCormick

Sagittaria fasciculata, "Bunched arrowhead"	Federally LISTED as Endangered, State Endangered	Inner piedmont bogs	Greenville
Sarracenia rubra var. *jonesii,* "Mountain sweet pitcher-plant"	Federally LISTED as Endangered, State Endangered	High-altitude cataract bogs in the mountains	Greenville, Pickens
Schwalbea americana, "American chaffseed"	Federally LISTED as Endangered, State Endangered	Fire-maintained flatwoods and savannas	Beaufort, Berkeley, Charleston, Clarendon, Horry, Jasper, Sumter, Williamsburg
Sisyrinchium dichotomum, "White irisette"	Federally LISTED as Endangered, State Endangered	High-elevation forests	Greenville
***Symphyotrichum georgianum,* "Georgia aster"**	**Federal CANDIDATE for listing**	**Upland sites, including roadsides and powerline rights of way**	**Abbeville, Cherokee, Edgefield, Kershaw, Oconee, Pickens, Richland**
Trillium persistens, "Persistent trillium"	Federally LISTED as Endangered, State Endangered	High elevation forests within the upper Savannah drainage	Oconee
Trillium reliquum, "Relict trillium"	Federally LISTED as Endangered, State Endangered	Rich ravines over mafic rock and/or circumneutral soils. Known in SC only from certain stream bottoms along the Savannah River.	Aiken Edgefield

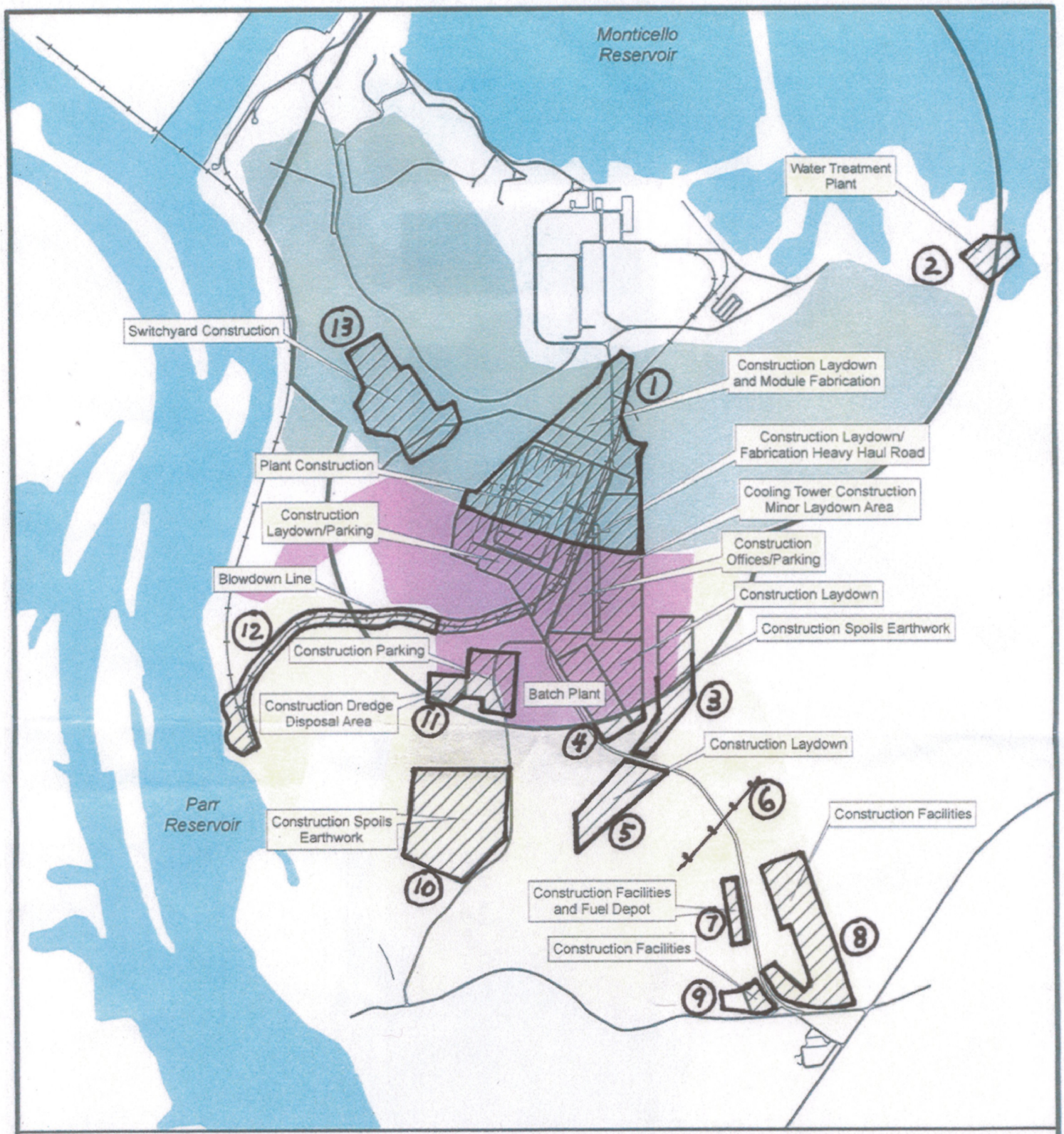

Figure 1. VCSNS Project areas, October 2007.

Legend

- Railroad
- Road
- Areas to be Disturbed
- Surveyed in May 2002
- Surveyed in June and September 2006
- Surveyed in 2007*
- Water

N

0 500 1,000 2,000 3,000 4,000 Feet

*Surveyed in April 2007, additional survey planned for Fall 2007