Memo

To:	Geoff West First Wind	From:	Matt Arsenault Stantec Consulting Topsham, ME
File:	195600522	Date:	July 13, 2010

Reference: Rare, Threatened, and Endangered Plant Survey Results, Proposed Bowers Mountain Wind Project, Carroll Plantation, Maine

On June 8 and June 9, 2010, Stantec Consulting (Stantec) completed rare, threatened, and endangered (RTE) plant field surveys within the Bowers Mountain Wind Project area in Carroll Plantation, Maine. Surveys were completed along the proposed transmission line corridor and along the proposed summit generation ridgelines. In summary, five RTE plant populations were located within the project area. The following details the methodology and results of the field investigations.

Methodology

In fall 2009 and spring 2010, Stantec wetland scientists and ecologists completed a series of ecological field surveys, including wetland and stream delineations and vernal pool surveys, throughout the project area. These field surveys provided an initial characterization and assessment of the existing condition and quality of the natural communities within the project area. In addition to the initial field surveys, a landscape analysis was completed by reviewing high-resolution aerial photographs available from the Maine Office of Geographic Information Systems, as well as other pertinent information such as topography, wetland locations, and stream locations. The results of the initial field surveys and the subsequent landscape analysis were used to identify and target areas within the project area that could potentially support rare plant populations.

RTE plant populations were located using a Trimble® GEO Global Positioning System receiver. Appropriate data were collected on population size, associated habitat, habitat condition, and location.

Results

As a result of the field surveys, four rare plant species were located. These include:

- Large toothwort (*Cardamine maxima*);
- Male fern (*Dryopteris filix-mas*);
- Orono sedge (*Carex oronensis*); and
- Swamp fly-honeysuckle (*Lonicera oblongifolia*).

Each RTE species location is further discussed below.

<u>Large toothwort</u>

In Maine, large toothwort is listed as Special Concern with a state-rarity rank of S1[1] by the Maine Natural Areas Program (MNAP). Two populations were observed within the project area. One population was located along a gravel logging road in a small wetland seep. Four plants were observed within this area. The plants were growing with lady fern (*Athyrium filix-femina*), sensitive fern (*Onoclea sensibilis*), sarsaparilla (*Aralia nudicaulis*), Jack-in-the-pulpit (*Arisaema triphyllum*), and mountain maple (*Acer spicatum*). The canopy consisted of white ash (*Fraxinus americana*), yellow birch (*Betula alleghaniensis*), and beech (*Fagus grandifolia*).

[1] A state-rarity rank of S1 indicates that the species is "Critically imperiled in Maine because of extreme rarity (five or fewer occurrences or very few remaining individuals or acres) or because some aspect of its biology makes it especially vulnerable to extirpation from the State of Maine."

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A second population was located within the proposed express electrical collector corridor in a small streamside floodplain wetland along Barker Brook. Several hundred plants were observed growing within the habitat area. The plants were growing with silvery glade fern (*Deparia acrostichoides*), New York fern (*Thelypteris noveboracensis*), greater bladder sedge (*Carex intumescens*), Jack-in-the-pulpit, lady fern, sarsaparilla, oak fern (*Gymnocarpium dryopteris*), mannagrass (*Glyceria* sp.), and ostrich fern (*Matteuccia struthiopteris*). The canopy consisted of balsam fir (*Abies balsamea*), red spruce (*Picea rubens*), yellow birch, sugar maple (*Acer saccharum*), hemlock (*Tsuga canadensis*), and American elm (*Ulmus americana*).

Male fern

In Maine, male fern is listed as Endangered with a state-rarity rank of S1 by MNAP. A small population with 9 plants was located at the west end of Bowers Mountain within a maturing sugar maple forest near the proposed Turbine 1 location. The plants were growing near the crest of the slope within an area characterized by several small rocky ledges and an open understory. The plants were growing with choke cherry (*Prunus virginiana*), marginal wood fern (*Dryopteris marginalis*), mountain wood fern (*Dryopteris campyloptera*), whorled aster (*Oclemena acuminata*), nerveless woodland sedge (*Carex leptonervia*), starflower (*Trientalis borealis*), sarsaparilla, and fringed bindweed (*Fallopia cilinodis*).

Orono sedge

In Maine, Orono sedge is listed as Threatened with a state-rarity rank of S3[2] by MNAP. A small population with approximately eight clumps was located along the eastern edge of an open agricultural field north of Route 6 within the proposed express electrical collector corridor. The plants were growing with yellow king devil hawkweed (*Hieracium caespitosum*), sweet vernal grass (*Anthoxanthum odoratum*), strawberry (*Fragaria virginiana*), rough-stemmed goldenrod (*Solidago rugosa*), and meadowsweet (*Spiraea alba* var. *latifolia*).

Swamp fly-honeysuckle

In Maine, swamp fly-honeysuckle is listed as Special Concern with a state-rarity rank of S3 by MNAP. A dense clump of plants with approximately 50 stems was located within an old skidder trail through a moderately calcareous northern white cedar (*Thuja occidentalis*) swamp along Tolman Brook. The plants were growing with alder-leaved buckthorn (*Rhamnus alnifolia*), interrupted fern (*Osmunda claytoniana*), cinnamon fern (*Osmunda cinnamomea*), sarsaparilla, bunchberry (*Cornus canadensis*), strawberry, dwarf raspberry (*Rubus pubescens*), yellow king devil hawkweed, red maple (*Acer rubrum*) seedlings, star sedge (*Carex echinata*), and northern white cedar.

Recommendations

Stantec offers the following recommendations relative to minimizing and avoiding adverse impacts to the plant populations.

Large toothwort

The population of large toothwort along the gravel logging road can be avoided by limiting potential road upgrades to the opposite (south) side of the road.

Vegetation clearing for the construction of the express electrical collector corridor has the potential to directly impact the large toothwort population along Barker Brook. The removal of overstory vegetation and direct soil impacts from fill, machinery, or compaction from construction mats has the potential to alter

[2] A state-rarity rank of S3 indicates that the species is "Rare in Maine (20-100 occurrences)."

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the microhabitat conditions (e.g., hydrology, sunlight penetration). These potential habitat alterations could favor the recruitment and spread of aggressive and colonizing species such as red raspberry (*Rubus idaeus*) that could in turn out-compete and crowd-out large toothwort from the habitat area. However, observations of large toothwort populations elsewhere in Maine have suggested that the species is fairly resilient to disturbance as evidenced by populations growing amongst colonies of red raspberry, as well as within roadside fill along gravel logging roads with a moderately open canopy. To minimize potential impacts to the population, it is recommended that direct fill or pole placement be located outside of the habitat area along Barker Brook. In addition, it is recommended that vegetation be hand-cleared during fall or winter months to minimize potential soil compaction or hydrology alterations from machinery. Consideration should also be given to utilizing taller poles to retain saplings and small trees within the habitat area in order to avoid complete overstory vegetation removal.

Male fern

Given the scarcity of male fern in Maine and throughout New England, little is known regarding the effects of anthropogenic disturbances on the population's viability. As such, it is recommended that the project design maintain the existing integrity of the habitat in which male fern occurs. Direct impacts should be located outside of the maturing sugar maple forest associated with the populations, and a minimum 100-foot separation should be maintained between direct impacts and the plants. The minimum 100-foot separation is recommended in order to minimize potential indirect impacts to the plants and associated habitat. Potential indirect impacts include alterations in soil moisture and light penetration as a result of canopy removal and thinning. These effects have the potential to change the species composition of the habitat, which could favor the recruitment and spread of aggressive species such as red raspberry or blackberry (*Rubus alleghaniensis*).

Orono sedge

Orono sedge is a species that is largely restricted to human-disturbed habitats, including agricultural fields and mowed roadsides. The proposed electrical collector corridor construction can avoid and minimize impacts to the plant populations by locating direct fill away from the plant locations and conducting construction activities from fall through winter when the plants are dormant. Vegetation clearing around the population will not be necessary as the plants are located within an open field.

Swamp fly-honeysuckle

To avoid and minimize impacts to swamp fly-honeysuckle, vegetation clearing and pole installation within the immediate vicinity of the plants should be cleared by hand to avoid soil compaction or hydrological alterations as a result of machinery and construction mat placement. Consideration should also be given to conducting vegetation clearing during frozen ground conditions when the plants are dormant. The plants are occurring in an area with an open canopy. As such, impacts from additional canopy removal in the vicinity of the plants are not expected to have an adverse impact on the population.

Please let me know if you have any additional questions.

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