

From: [Jennifer Stanhope](#)
To: [Tiernan Lennon](#)
Subject: another SWP BO
Date: Wednesday, July 5, 2017 9:25:09 AM
Attachments: [managing SWP in Mid-atlantic 1 pager SERC.pdf](#)
[20021218 WindsorMeade, retirement community, JamesCityCty SWP.PDF](#)

Hi Tiernan,

Here's another BO with SWP from 2002. There are some good ideas in the conservation recommendations. It's not on the FWS TEBO website.

Also, Dennis Whigham's group (Smithsonian Environmental Research Center) put this 1 page together but I can't find the actual PDF or where I came from. I think it might have been somewhere in one of their reports. I think it provides some useful info, but I wouldn't directly share it with MVP. They are conducting ongoing research on mid and understory thinning at Ft AP Hill and another site in VA. Preliminary results show some short-term benefits, but don't know about long-term and these sites are actively managed to reduce chances of invasive plants and competition. I wouldn't share that part with them since it's still preliminary.

Jen

--

Jennifer Stanhope
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United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
6669 Short Lane
Gloucester, VA 23061



December 18, 2002

Colonel David L. Hansen
U.S. Army Corps of Engineers
Norfolk District
803 Front Street
Norfolk, Virginia 23510-1096

Attn: Steven Martin
Regulatory Branch

Re: WindsorMeade of Williamsburg
(Virginia United Methodist Homes),
Project No. 02-V1074-18, James
City County, Virginia

Dear Colonel Hansen:

The U.S. Fish and Wildlife Service (Service) has reviewed the permit application (#02-V1074) for WindsorMeade of Williamsburg, a proposed master-planned continuing care retirement community located in James City County, Virginia. This document transmits the Service's biological opinion on the effects of that action on *Isotria medeoloides*, the small whorled pogonia, Federally listed threatened, in accordance with section 7 of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*). Your July 17, 2002 request for formal consultation was received on July 19, 2002.

This biological opinion is based on information provided in the permit application, telephone conversations, field investigations, and other sources of information. A complete administrative record of this consultation is on file in this office. This letter also provides the separate comments of the Service and the Department of the Interior pursuant to the Fish and Wildlife Coordination Act of 1958 (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*), which are included following the biological opinion.

I. CONSULTATION HISTORY

- 10/24/01 The Corps of Engineers (Corps) notified the Service of an upcoming pre-application meeting.
- 10/31/01 The Service conducted a site visit with Donna Ware, College of William and Mary.
- 11/28/01 The Service participated in a pre-application meeting with the Corps, Williamsburg Environmental Group, the applicant, and Donna Ware.
- 06/07/02 The Service received the Corps' public notice.
- 07/19/02 The Service received the Corps' request to initiate formal consultation.
- 07/30/02 Letter from Service to the Corps stating that a biological opinion would be provided to the Corps by December 1, 2002.

II. BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The applicant is proposing to develop a master-planned continuing care retirement community, including a community center, dining facility, wellness and health center, outdoor recreation areas, villas and apartments on a 113.38-acre parcel within the approximate 600-acre Casey/New Town development area in James City County, Virginia (Figure 1). The WindsorMeade project is located north of Monticello Avenue, south of Ford's Colony Section 30, and west of Route 199. The site is primarily within the watershed of a small tributary to Powhatan Creek. A small portion of the property is located within the watershed of Chisel Run. The proposed development will impact 0.42 acres of jurisdictional wetlands. These impacts are associated with two road crossings, villa development, and a utility crossing. The proposed Federal action is the issuance of an individual permit for impacts associated with the construction of the WindsorMeade project. Surveys for the small whorled pogonia have indicated that four colonies occur at the project site. The initial development plans proposed impacts to all four colonies. Each colony has been identified by an acronym based on the watershed it occurs in and the number of the colony found within the watershed. Three colonies are found within the Powhatan Creek watershed; PC-M1, PC-M2, and PC-M3. One colony occurs within the Chisel Run Watershed; CR-M2. The selected alternative proposes avoiding two of the colonies (CR-M2, and PC-M1) and placing deed restrictions on a 5.04 acre area surrounding colony CR-M2 and a 7.80 acre area surrounding colony PC-M1. The colonies PC-M2 and PC-M3 will be eliminated by the proposed development.

The "action area" is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. The Service has determined that the action area for the WindsorMeade development is the project limits as denoted on the Selected Alternative Wetland Impacts Map provided by Williamsburg Environmental Group and dated February 15, 2002.

STATUS OF THE SPECIES RANGEWIDE

Species Description

The small whorled pogonia is a herbaceous, perennial orchid with slender, hairy, fibrous roots that radiate from a crown or rootstock. This species has pale green, elliptical leaves, usually five or six, that grow in a single whorl at the top of a hairless, grayish-green, hollow stem. The one or two flowers per plant are yellowish-green, unscented, and form in the center of the whorl. Flowering begins in mid-May in the south to mid-June in the northern part of its range. This species is often confused with the Indian cucumber-root (*Medeola virginiana*) and the large whorled pogonia (*Isotria verticillata*). The Indian cucumber-root has deep green leaves with a stem that is thin, hairy, and wiry. The large whorled pogonia has a reddish-purple stem and dark green leaves; its flower is reddish-purple.

Life History

This plant typically occurs in both fairly young and in maturing stands of mixed-deciduous or mixed-deciduous/coniferous forests. The plants are usually associated with decaying vegetative matter such as fallen trunks and limbs, leaf litter, bark, and tree roots. Sites where *Isotria medeoloides* occur tend to share several characteristics: sparse to moderate ground cover in the microhabitat, relatively open understory, and proximity to canopy openings such as logging roads or streams. The pogonia is found in soils that are highly acidic sandy loams with low nutrient content. Soil moisture values at pogonia sites are moderately high. Slope exposure and degree, and the position of the plant on the slope are not consistent throughout the range of the pogonia (U.S. Fish and Wildlife 1992). Too much shading may be a limiting factor for this species. Stuckey (1967) stated that for both species of *Isotria*, considerably more light was needed for flowering and seed production than for vegetative growth. Preliminary results of ongoing research by Bill Brumback in New Hampshire indicate that selective tree cutting adjacent to colonies may be beneficial to the plant. An increase in reproductive status of the New Hampshire colony has been noted when light is introduced obliquely (Bill Brumback, New England Wildflower Society, pers. comm., 2002).

The plant may be found in one of the following states: vegetative, with an abortive flower bud, flowering, or dormant (Mehrhoff 1989a). The small whorled pogonia reproduces primarily through self-pollination and occasionally vegetatively. No evidence of insect pollination has been documented. Vitt (1997) found that reproductive output is closely related to plant size and that larger individuals produced higher total seed weight. Mehrhoff (1989b) also found that

larger individuals were most likely to flower the following year and small plants, in declining populations, were more likely to die or remain in a vegetative state. Orchid seeds lack sufficient quantities of food reserves. Therefore, in order for germination to occur, the seed requires a substrate that contains a suitable mycorrhizal fungus. In this symbiotic relationship, the fungus provides nutrients and water to the orchid seedling, and the orchid provides the fungus with carbohydrates (U.S. Fish and Wildlife 1992). Host-specific mycorrhizae have not been identified for the small whorled pogonia (U.S. Fish and Wildlife 1994).

Population Dynamics

The Small Whorled Pogonia Recovery Plan, First Revision (1992) defines two terms that are frequently used to describe small whorled pogonia populations: site and colony. A site is defined as "the proximal area where one isolated small whorled pogonia colony or a cluster of colonies occurs." Colonies within a site are typically within the same watershed and within a half-mile of each other. A colony is defined as "a single natural grouping of plants in a particular locality." Many researchers monitoring populations throughout the range of this species have documented fluctuations in the size of individual colonies, and growth status and number of flowering individuals within those colonies. Mehrhoff (1989b) concluded that performance in one year is closely associated with the accumulation of resources in the previous season. One of the reasons that colony sizes fluctuate among years is that the small whorled pogonia can exhibit plant dormancy. Verified dormancy periods have typically been less than 3 years (Mehrhoff 1989b). A dormancy period of nine years was documented from a population in New Hampshire (Cairns 2001). In this same population, seventy-five percent of known dormancy periods were only one year long and ninety-five percent were five years or less (Cairns 2001).

As defined in Small Whorled Pogonia Recovery Plan, First Revision (1992), a site is considered viable if it has a three-year geometric mean of 20 emergent stems, of which 25 percent are flowering stems. An alternative viability definition for the southern part of the range has been developed since the recovery plan was published. Smaller populations with less than 20 stems may be considered viable if those stems have persistently emerged over 15 years (U.S. Fish and Wildlife 1994).

Monitoring within the last decade has indicated a decline in viability of many of the known populations of small whorled pogonia. No causes of decline have been determined. Cairns (2001) attempted two types of population viability analyses on a population in New Hampshire to identify additional field data that was needed to evaluate the long term persistence of that population. Despite these recent studies, there continues to be a lack of understanding of specific habitat requirements to maintain a viable population. Characteristics that may be important in this determination of viability include soil type, nutrient availability, overstory cover, understory density, slope position and aspect (U.S. Fish and Wildlife 1994). Precipitation and temperatures may also be important factors in understanding reproduction and population size (Cairns 2001).

Status and Distribution - The small whorled pogonia was Federally listed as endangered on October 12, 1982 (U.S. Fish and Wildlife Service 1982). At the time of listing, only 17 sites in ten states and Ontario, Canada were known to be extant. On November 7, 1994, this species was reclassified to threatened because the recovery objective of having a minimum of 25 percent of the known viable sites (as of 1992) permanently protected was achieved (U.S. Fish and Wildlife Service 1994). No critical habitat has been designated for this species.

Isotria medeoloides is broadly distributed with a primary range extending from southern Maine through the Atlantic seaboard states to northern Georgia and southeastern Tennessee. Outlying colonies have been found in Pennsylvania, Ohio, Michigan, Illinois, West Virginia, and Ontario, Canada. There are three main population centers. The northernmost population is centered in the Appalachian Mountains in New England and northern coastal Massachusetts, with one outlying site in Rhode Island. The second center is concentrated in the Coastal Plain and Piedmont provinces of Virginia, with outliers in Delaware, and New Jersey. A third grouping is located in the Blue Ridge Mountains where North Carolina, South Carolina, Georgia, and Tennessee join (U.S. Fish and Wildlife Service 1994). Eight sites scattered in five outlying states (Pennsylvania, Ohio, Michigan, Illinois, West Virginia) and Ontario are considered disjunct populations. The rangewide status of this species is stable. In Virginia, a number of sites have been found in the last decade, but many of these sites lack the information and long term monitoring to determine viability. A summary of the rangewide population data is listed in Appendix A.

ENVIRONMENTAL BASELINE

Status of the Species Within the Action Area - Four pogonia colonies are located within the action area: PC-M1, PC-M2, PC-M3, and CR-M2. In 2001, PC-M1 had 10 plants, PC-M2 had 10 plants, PC-M3 had 5 plants, and CR-M2 had 1 plant. Colony CR-M2 is also known as the Grimes' Colony. Dr. E. J. Grimes found 3 flowering stems at this location in 1920 and the following year located 15 flowering stems (Grimes 1921). This colony has been monitored by various members of the College of William and Mary Biology Department since that initial discovery, particularly Dr. J. T. Baldwin who monitored the plant until his death in 1974 (Ware 2001). The location of this colony was temporarily lost until 1986, when a team of five biologists from the College of William and Mary relocated it. Also while searching for the Grimes' Colony, Dr. Donna Ware and her colleague Bill Saunders discovered CR-M1, the Casey Colony, which is located on the current New Town property, east of Route 199 (Ware 2001). CR-M1 is not located within the action area. In 1996, 14 plants were found on CR-M2. In 2001, 1 vegetative plant was present at CR-M2 (Ware 2001).

Colony PC-M1 was documented in 1996 with 6 plants (2 reproductive, 4 vegetative). In 1998, 15 plants were present (9 reproductive, 6 vegetative). In 2001, 9 plants were present (2 reproductive, 7 vegetative). Colony PC-M2 was discovered in 2001 with 10 plants (3 reproductive, 7 vegetative). Colony PC-M3 was discovered in 2001 with 5 vegetative plants (Ware 2001).

Factors Affecting Species Habitat Within the Action Area - The Service is not aware of any factors affecting the environment of the species within the action area.

EFFECTS OF THE ACTION

Direct Effects - The proposed project will result in the destruction of two colonies of small whorled pogonia and adjacent appropriate habitat through landclearing and construction. These two colonies, PC-M2 and PC-M3, contained a total of 15 plants in 2001, 10 and 5 plants respectively. Because the landclearing and construction will occur in areas of appropriate habitat, the Service anticipates an unquantifiable loss of plants that are likely to be dormant within that area.

Interrelated and Interdependent Actions - An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. No activities interrelated to and interdependent with the proposed action are known at this time.

Indirect Effects - Indirect effects are defined as those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR § 402.02). Developments adjacent to colonies may create large openings in the canopy that may encourage denser understory growth, thus increasing competition and shading. Trampling by people and pets may cause direct damage to plants. As deer herds are forced into smaller tracts of land by development in this area, this may increase the likelihood of deer browse of *Isotria medeoloides*.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. The Service is not aware of any cumulative effects within the action area at this time.

CONCLUSION

After reviewing the status of the small whorled pogonia, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the development of WindsorMeade of Williamsburg, as proposed, is not likely to jeopardize the continued existence of the small whorled pogonia. No critical habitat has been designated for this species, therefore, none will be affected.

III. INCIDENTAL TAKE STATEMENT

Section 7(b)(4) and 7(o)(2) of the ESA generally do not apply to listed plants species. However, limited protection of listed plants from take is provided to the extent that the ESA prohibits the removal and reduction to possession of Federally listed endangered plants or the malicious damage of such plants on areas under Federal jurisdiction, or the destruction of endangered plants on non-Federal areas in violation of state law or regulations or in the course of any violation of a state criminal trespass law. This limited protection does not apply to the small whorled pogonia since this plant is Federally listed threatened. If a project is on private land and the landowner is not the project proponent, in addition to landowner permission, a Virginia Endangered Species Permit for plants may be needed. To determine if such a permit is necessary or to apply for this permit, contact:

Mr. Keith Tignor
Virginia Department of Agriculture and Consumer Services
Office of Plant Protection
P.O. Box 1163
Richmond, VA 23209
(804) 786-3515

IV. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to further minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans and other recovery activities, or to develop information to benefit the species.

The Service recommends that the Norfolk District use its authority to enact the following recommendations to further minimize impacts to small whorled pogonia plants and habitat:

1. Explore alternatives on the northwestern side of the development to avoid impacts to PC-M2 with an adjacent buffer protecting the upland drainage area of this colony. Protecting both PC-M1 and PC-M2 will increase the quality of this site in terms of recovery since viable sites are determined, in part, by the number of stems. It appears that there is enough land to reconfigure the site and utilize those areas denoted as future development.
2. If it is determined that PC-M2 cannot be avoided, the buffer for PC-M1 should at the minimum be extended south to the road as close as possible. We understand that this area will need to be cleared for road construction and a right-of way will need to be maintained.

3. The Service recommends that those areas set aside for the small whorled pogonia be protected in perpetuity with a permanent legally binding real estate instrument such as a conservation easement held by a conservation organization approved by the Service. This instrument shall be in place prior to initiation of construction authorized by this Corps' permit, if issued. Any instrument should be perpetual and the Service and the Corps should approve the language prior to recording. The instrument should not preclude removal of vegetation. The instrument should allow selective cutting of vegetation if it is determined (in coordination with the Service) to be beneficial to the small whorled pogonia. The instrument should provide resource agencies and/or designated representatives access to the site for monitoring purposes. After establishment of a real estate instrument, monitoring should be conducted by the permittee annually for 15 years, to assess the colony's status, and any potential threats to its continued existence. Fifteen years of monitoring is necessary to determine population viability of small sites. The monitoring protocol should be submitted to the Service for review and approval. Monitoring data should be reported to the Service and the Virginia Department of Conservation and Recreation, Division of Natural Heritage. Monitoring should be conducted by an individual or individuals proficient in the identification and biology of small whorled pogonia, to be approved by the Service. Management actions should be determined after annual evaluations of each monitoring report. If monitoring determines that herbivory by deer or other threats severely impact the colony, the conservation organization, in coordination with the Service, should develop a proposal to eliminate these threats.
4. Prior to any construction or landclearing, the preservation areas should be clearly demarcated through the placement of weatherproof signs. These signs should be placed and maintained along the entire boundary of the easement areas. The signs should identify these areas as being ecologically sensitive to discourage incompatible activities in these areas. The proposed size, language, and layout of the sign should be submitted to and approved by the Service.
5. If after exploring alternatives, the project will result in direct impacts to small whorled pogonia plants, the Service would like to work with the applicant to develop an experimental design to transplant these stems to the easement area or to utilize these individual plants for research purposes. Transplantation of the small whorled pogonia has not been successful in the past. Transplanting endangered or threatened plant species from project impact areas is generally not recommended. The intent of the ESA is to protect the ecosystems upon which these Federally-listed species depend. However, if the plants would otherwise be killed, an attempt to translocate them to appropriate habitat or to utilize the plant for research purposes may benefit the recovery of the species by increasing our knowledge of the species.

For the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

V. REINITIATION NOTICE

This concludes formal consultation on the action(s) outlined in the Norfolk District's request. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (2) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (3) a new species is listed or critical habitat designated that may be affected by the action.

FISH AND WILDLIFE COORDINATION ACT COMMENTS

The following comments constitute the report of the Service and the Department of the Interior on this project and are submitted under provisions of the FWCA.

Powhatan Creek and Chisel Run tributaries, have been identified in the Regional Wetlands Concept Plan (U.S. Fish and Wildlife Service 1990) as priority wetlands under the Emergency Wetlands Resources Act of 1986 (Public Law 99-645), thus identifying them as wetlands that should receive priority attention for protection or acquisition by Federal and state agencies or other methods of protection. Powhatan Creek was placed on the Regional Wetlands Concept Plan list because of significant wildlife, fisheries, water quality and flood protection, and outdoor recreation functions and values. In addition, in the 1993 report by Department of Conservation and Recreation, Division of Natural Heritage entitled *Conservation Planning for the Natural Areas of the Lower Peninsula of Virginia*, Powhatan Creek is described as "the largest and most significant natural area of the Lower Peninsula." Powhatan Creek is confirmed as providing spawning/nursery habitat for alewife (*Alosa pseudoharengus*), American shad (*A. sapidissima*), hickory shad (*A. mediocris*), blueback herring (*A. aestivalis*), white perch (*Morone americana*), and striped bass (*M. saxatilis*). These wetlands also support numerous colonies of the Virginia least trillium (*Trillium pusillum* var. *virginianum*), a species of concern.

Recognizing the significance of this 22-square mile watershed, James City County has recently developed a draft Powhatan Creek Watershed Management Plan to protect the water quality and natural habitats of Powhatan Creek from the impacts of development. It is our understanding that WindsorMeade was approved by the County prior to the development of this draft plan. This plan identifies the sub-watershed where WindsorMeade is proposed as sensitive, since it currently has less than 10 percent impervious cover. The plan indicates that without extraordinary watershed management strategies, this sub-watershed will likely shift to the impacted category. A habitat assessment rated stream corridors in this sub-watershed as

excellent and ranked them second among all the sub-watersheds in this watershed (Center for Watershed Protection 2001). Future goals for this sub-watershed as identified in the plan are to preserve important conservation areas, sensitive streams, and contiguous forest. James City County has also recognized that the current method for identifying perennial streams using the "blue line method" on a topographic map is not accurate. Therefore, the County has recommended extending the 100-foot Resource Protection Area (RPA) buffer as outlined in the Chesapeake Bay Preservation Ordinance to those areas within this sub-watershed that are clearly perennial streams. It is likely that the stream on the WindsorMeade property is a perennial stream.

This project will directly impact 0.42 acres of wetlands. The Service anticipates that the streams and wetlands adjacent to this development will be indirectly impacted in those areas where the forested buffer is less than 100 feet. To compensate for these impacts, the Service recommends that the applicant protect the streams and wetlands on the property with a 100-foot forested buffer in perpetuity through a deed restriction or conservation easement. These recommendations support the goals of James City County's Powhatan Creek Watershed Management Plan.

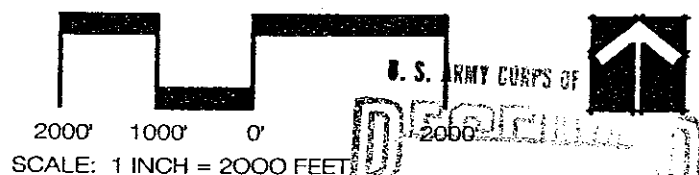
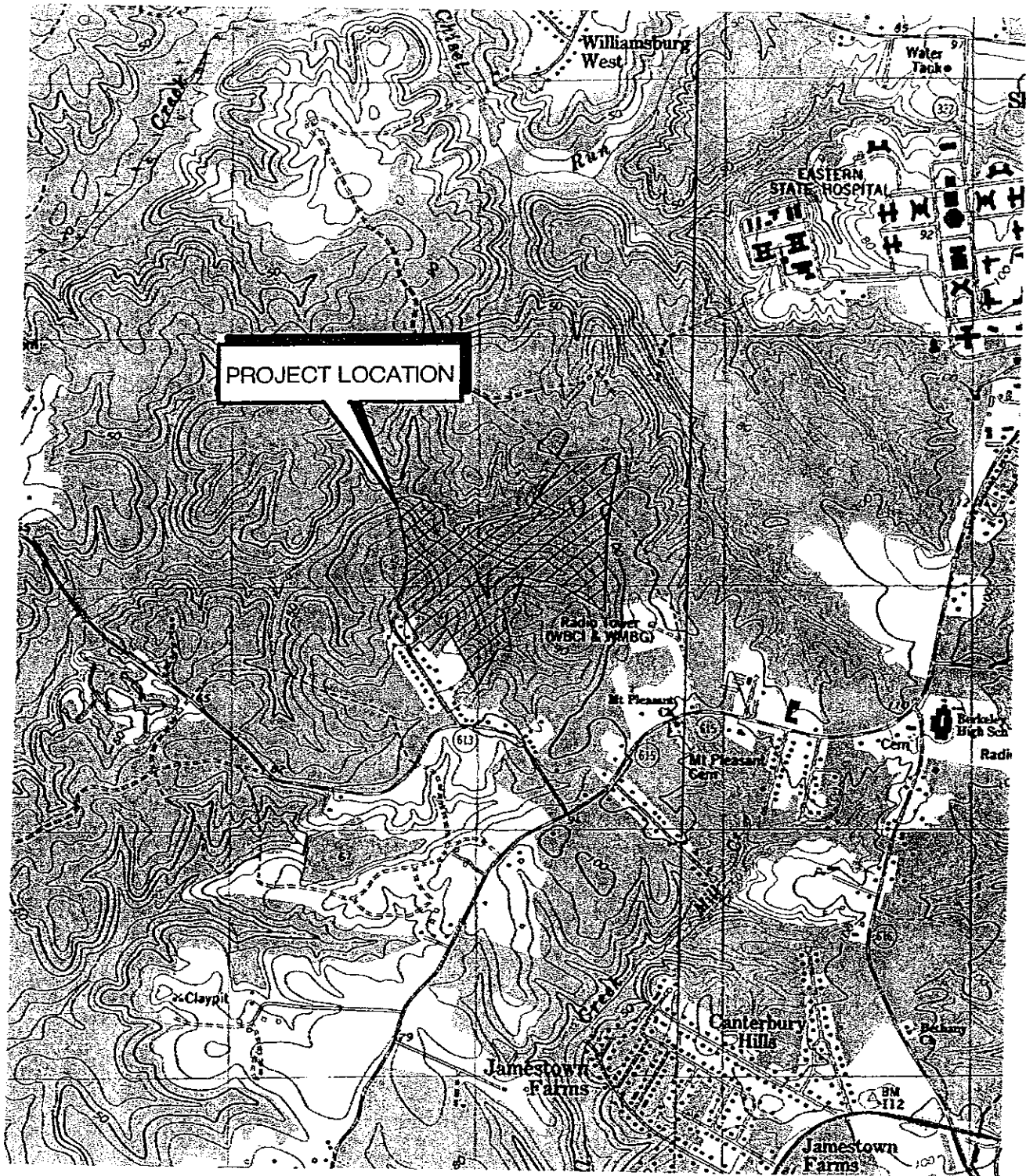
The Service appreciates this opportunity to work with the Norfolk District in fulfilling our mutual responsibilities under the ESA. If you have any questions, please contact Kim Marbain of this office at (804) 693-6694, extension 126.

Sincerely,

A handwritten signature in black ink that reads "Karen L. Mayne". The signature is written in a cursive, flowing style.

Karen L. Mayne
Supervisor
Virginia Field Office

Enclosures



"LATITUDE: 37°16'37"
LONGITUDE: 76°45'35"

SOURCE: USGS 7.5 MINUTE SERIES TOPOGRAPHIC MAP,
NORGE, VA QUADRANGLE, 1984.

**WILLIAMSBURG
ENVIRONMENTAL
GROUP, INC.**

FIGURE 1
PROJECT LOCATION MAP
WINDSORMEADE

Appendix A: Distribution and status of *Isotria medeoloides*

STATE	No. SITES 1985	No. SITES 1993 (# viable*)	No. SITES 2001 (# viable*)
Maine	2	17(7)	21(7)
New Hampshire	16	42(15)	40(13)
Massachusetts	1	5(2)	5(2)
Rhode Island	1	1(0)	2(0)
Connecticut	1	1(0)	1(0)
NE Totals	21	66 (24)	69 (22)

STATE	No. SITES 1985	No. SITES 1993 (# viable*)	No. SITES 2001 (# viable*)
Virginia	3	9(6)	40(8)
New Jersey	2	3(1)	3(1)
Delaware	0	1(0)	1(0)
North Carolina	2	5(2)	6(2)
South Carolina	1	4(2)	4(2)
Georgia	1	8(4)	17(4)
Tennessee	0	1(0)	2(0)
Pennsylvania	1	3(0)	3(0)
West Virginia	0	0	1(0)
Ohio	0	1(0)	1(0)
Michigan	1	1(0)	1(0)
Illinois	1	1(0)	1(0)
Canada	1	1(0)	1(0)
Range Total	34	104(39)	150(39)

*as defined in the Small Whorled Pogonia Recovery Plan, First Revision (1992)

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- Ware, D.M.E. 2001. Searches for the small whorled pogonia, *Isotria medeoloides*, on the WindsorMeade Property, James City County, Virginia, July 2001.

KMarbain:9/25/02)

(filename:S:\FEDACT\PERMITS\2002\02-V1074bo.wpd)

bcc: FWS, R5, ES-South, Hadley, MA (Jeff Underwood)
FWS, R5, ES, EndSp, Hadley, MA (Paul Nickerson)
FWS, NEFO, (Susi von Oettingen)
FWS, LE, Richmond, VA (Rick Perry)
VDACS, Richmond, VA (Keith Tignor)
VDCR, DNH, Richmond, VA (Rene Hypes)

Managing *Isotria medeoloides*, the small-whorled pogonia, in the mid-Atlantic



The widely-spaced mid-Atlantic populations of *Isotria medeoloides* are genetically unique and are distinct from Northeastern and more Southern populations. This suggests that conservation of mid-Atlantic populations is important for maintaining species genetic diversity. We have identified two factors that are associated with high rates of *Isotria medeoloides* dormancy and population declines:

- 1) Low light availability
- 2) Low abundance of mycorrhizal fungi in the soil.

Nearly all mid-Atlantic populations are very small and dynamic. Very few individuals develop aboveground shoots for more than two consecutive years and even fewer successfully produce fruits. This means that to accurately determine population sizes it is important to note the locations of individual plants for re-census each year. We recommend:

- 1) Map and/or mark each emergent plant so it can be re-located in subsequent years if it fails to emerge.
- 2) Note plant height, leaf whorl diameter, flowering, and fruiting each year.
- 3) Ideal surveying requires 3 visits per year: early season (mid-May in the mid-Atlantic) to note flowering, mid-June to note late-emerging vegetative plants and fruit set, late season (late September-October) to note successful seed production and overwintering bud formation.

When surveying, it is important to distinguish Indian cucumber root (plant on the left) and *Isotria medeoloides* (plant on the right). Note the thickness and color of the stem. Large-whorled pogonia (*Isotria verticillata*) looks similar to small-whorled, but the stem is often not as pale and is usually somewhat purplish at the base. Large-whorled pogonia is also clonal, so it may appear in larger clumps.



Herbivory, particularly by deer, can be a problem for *I. medeoloides*. We recommend:

- 1) Protect plants with small cages during the growing season.
- 2) However, it is important to remove cages in the winter to allow natural leaf cover.

Preliminary results suggest thinning of understory trees and some overhanging branches of canopy trees can improve population performance. However, *I. medeoloides* plants are supported by specific *Russula* and *Lactarius* fungi that rely on ectomycorrhizal trees (oaks, hickories, beech, possibly pine). The abundance of these fungi in the soil is essential for *I. medeoloides* growth, particularly when light availability is low. We recommend:

- 1) Thinning should be limited to understory and mid-level trees
- 2) Preliminary results suggest that a 30% increase in light availability is sufficient.
- 3) Thinning should involve minimal damage to overstory oaks, hickories, and beeches.