ORNL/NERP-7

ENVIRONMENTAL SCIENCES DIVISION

RESOURCE MANAGEMENT PLAN FOR THE OAK RIDGE RESERVATION

VOLUME 29: RARE PLANTS ON THE OAK RIDGE RESERVATION

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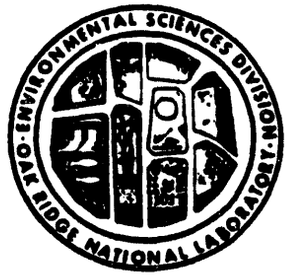
Date Published — August 1993



Prepared for the
Oak Ridge Reservation—Resource Management Organization
and
Oak Ridge National Environmental Research Park
Office of Health and Environmental Research
(Activity No. EW 20 10 30 1)

Environmental Sciences Division Publication No. 4054

Prepared by the
OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831
managed by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

RESOURCE MANAGEMENT PLAN FOR THE
U.S. DEPARTMENT OF ENERGY
OAK RIDGE RESERVATION

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ACKNOWLEDGMENTS

We wish to thank Dr. Vern McNeilus and Dr. Hal DeSelm for their help, particularly in identifying sedges and grasses. Thanks to Carole Kappelmann not only for the typing of this document but also for help in organizing the layout.

This report was prepared by the Oak Ridge National Environmental Research Park, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831, managed by Martin Marietta Energy Systems, Inc., under contract DE AC05 84OR21400 with the U.S. Department of Energy. Research conducted on the Oak Ridge National Environmental Research Park. Publication No. 4054, Environmental Sciences Division, ORNL.

ACRONYMS AND INITIALISMS

DOE	U.S. Department of Energy
NA	ORR Research Park Natural Area
NEPA	National Environmental Policy Act
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
OSHA	Occupatinal Safety and Health Administration
SARA	Superfund Amendments and Reauthorization Act
TDEC	Tennessee Department of Environment and Conservation
USFWS	United States Fish and Wildlife Service
UT	The University of Tennessee
RA	ORR Research Park Reference Area

U.S. POSTAL SERVICE ABBREVIATIONS

USA

AK	ALASKA
AL	ALABAMA
AR	ARKANSAS
AZ	ARIZONA
CA	CALIFORNIA
CO	COLORADO
CT	CONNECTICUT
DC	DISTRICT OF COLUMBIA
DE	DELAWARE
FL	FLORIDA
GA	GEORGIA
HI	HAWAII
IA	IOWA
ID	IDAHO
IL	ILLINOIS
IN	INDIANA
KS	KANSAS
KY	KENTUCKY
LA	LOUISIANA
ME	MAINE
MA	MASSACHUSETTS
MD	MARYLAND
MI	MICHIGAN
MN	MINNESOTA
MO	MISSOURI
MS	MISSISSIPPI
MT	MONTANA
NC	NORTH CAROLINA
ND	NORTH DAKOTA
NE	NEBRASKA
NH	NEW HAMPSHIRE
NJ	NEW JERSEY
NM	NEW MEXICO
NV	NEVADA
NY	NEW YORK
OH	OHIO
OK	OKLAHOMA
OR	OREGON
PA	PENNSYLVANIA
PR	PUERTO RICO
RI	RHODE ISLAND
SC	SOUTH CAROLINA
SD	SOUTH DAKOTA
TN	TENNESSEE
TX	TEXAS
UT	UTAH
VA	VIRGINIA
VT	VERMONT
WA	WASHINGTON
WI	WISCONSIN
WV	WEST VIRGINIA
WY	WYOMING

CANADA

AB	ALBERTA
BC	BRITISH COLUMBIA
LB	LABRADOR
MB	MANITOBA
NB	NEW BRUNSWICK
NF	NEW FOUNDLAND
NT	NORTHWEST TERRITORIES
NS	NOVA SCOTIA
ON	ONTARIO
PE	PRINCE EDWARD ISLAND
PQ	QUEBEC
SK	SASKATCHEWAN
YT	YUKON TERRITORY

ABSTRACT

Rare plant species listed by state or federal agencies and found on or near the Department of Energy's Oak Ridge Reservation (ORR) are identified. Seventeen species present on the ORR are listed by the Tennessee Department of Environment and Conservation as either endangered, threatened. or of special concern. Four of these are under review by the U.S. Fish and Wildlife Service for possible listing as threatened or endangered species. Ten species listed by the state occur near and may be present on the ORR; four are endangered in Tennessee, and one is a candidate for federal listing. A range of habitats supports the rare taxa on the ORR: river bluffs, calcareous barrens, wetlands, and deciduous forest. Sites for listed rare species on the ORR have been designated as Research Park Natural Areas. Consideration of rare plant habitats is an important component of resource management and land-use planning; protection of rare species in their natural habitat is the best method of ensuring their long-term survival. In addition, the National Environmental Policy Act requires that federally funded projects avoid or mitigate impacts to listed species. The list of rare plant species and their location on the ORR should be considered provisional because the entire ORR has not been surveyed, and state and federal status of all species continues to be updated.

OBJECTIVES

The objectives of the management plan for rare plant species on the ORR are:

1. To identify plant species occurring on the Department of Energy's Oak Ridge Reservation (ORR) that are listed, including those proposed or under review by state or federal agencies as endangered, threatened, or of special concern.

2. To identify listed plant species that may be present on the ORR based on occurrence near the ORR and presence of suitable habitat.

3. To provide information on the location and habitats of rare species known to occur on the ORR.

4. To consider significant threats to the rare plant populations on the ORR.

5. To recommend rare species protection through natural area designation and habitat preservation and management.

1. INTRODUCTION

The Oak Ridge Reservation (ORR) is an island of primarily natural vegetation surrounded by dramatically different land uses. Since 1942 when the land was purchased for the wartime Manhattan Project, the 15,000-ha reservation has been undisturbed except for project development activities of the Department of Energy (DOE) and its predecessors and for forest management. Today residential, commercial, industrial, and agricultural land uses outside the reservation boundaries contrast with the natural vegetation on the ORR. The ORR is thus an important large tract of natural habitats and in 1989 was designated a unit of the Southern Appalachian Biosphere Reserve by the United Nations Man and the Biosphere Program.

Federal environmental regulations require that significant natural resources on the ORR be considered in DOE project development. The policy of the DOE Oak Ridge Operations Office for Project Planning on the ORR requires that:

> "Prior to initiation of any project that could directly or indirectly impact significant land area that might contain resources protected under the Endangered Species Act or the National Historic Preservation Act, a thorough and up-to-date survey of the specific land area proposed for the project should be conducted by appropriate professionals to confirm the absence of any protected resources . . . . In addition to resources protected under federal law, state statutes and regulations pertaining to wildlife protection and historical protection should also be considered." (Lenhard 1988).

The purpose of this document is to present information on the listed rare plant species currently known to occur on the ORR, as well as listed species potentially occurring on the ORR based on geographic range and habitat availability. (Note that for most of the ORR, detailed rare plant surveys have not been performed. It is not the intention of this report to imply that the ORR has been entirely surveyed or that the rare species list for the ORR is complete.) For project planning purposes, this report is most useful in alerting planners that rare species are known to exist in certain areas. Site-specific surveys are necessary to verify the presence of protected species in an area.

1.1 GENERAL VEGETATION AND FLORA

Rare plant resources are best described in the context of the general vegetation and species richness of an area. Significant habitats for rare species occur within the vegetation matrix on the ORR described in the following paragraphs.

The general vegetation of the ORR was described by Kitchings and Mann (1976). Major plant communities of the ORR were grouped into seven categories by Dahlman et al. (1977).

Plant communities on the ORR are characteristic of those found in the intermountain regions of Appalachia from the Allegheny Mountains in southern Pennsylvania to the southern extension of the Cumberland Mountains in northern Alabama. The dominant association on the ORR is oak-hickory forest, which is most widely distributed on ridges and dry slopes. Common overstory species are chestnut oak,

black oak, northern and southern red oak, scarlet oak, white oak, and several species of hickory. Shortleaf and Virginia pine are also present. Abundant understory species include red maple, blackgum, and sourwood.

Northern hardwoods are found in coves that are interspersed along the dissected ridge system. Common overstory species in these areas are tulip-poplar, beech, sugar maple, buckeye, and white ash. Some white pine, hemlock, basswood, and magnolia also occur in these areas. Hemlock and white pine are abundant in the Cumberland Mountains but are uncommon in natural stands on the ORR. Small areas on steep slopes and limestone bluffs along Poplar Creek on Black Oak Ridge and McKinney Ridge are good examples of this type. Cove communities often grade into floodplains in lower slope positions where more-flood-tolerant tree species such as box elder, elm, sycamore, and green ash become abundant.

The original forests on the ORR were extensively cleared, and the land was cultivated or partially cleared and used for rough pasture during settlement. Except on very steep slopes, most of the forest had been cut for timber, though not necessarily cleared and put into cultivation. Because cultivation ended on the ORR in 1942, cultivated fields have developed into forest either through natural succession or planting of pines. Many of these old, abandoned fields that were not planted in pines now support stands of tulip-poplar, whereas others contain mixtures of pine, hickory, dogwood, and other hardwoods. Between 1948 and 1954, many of the abandoned fields that were not already well-stocked with naturally regenerating timber species were planted with loblolly, shortleaf, and white pines. Most of these plantations have been maintained with little or no invasion by hardwoods. Additional pine plantations have since been established in some areas that have been harvested. Most pine stands that currently exist are on lower slopes; relatively level, wide ridgetops; and well-drained bottomlands.

Small cedar barrens are common on the ORR. These drought-tolerant plant communities occur on shallow, flaggy, limestone soils. Dominant species are grasses, such as little bluestem and dropseed, and a variety of forbs with scattered cedars and stunted oaks. Bare rock is fairly common. Cedar barrens are habitat for several species of rare plants. Prairie species more common in the midwestern United States are characteristic of cedar barrens.

The vascular flora of the ORR has been inventoried and updated several times (Olson et al. 1966; Mann and Bierner 1975; Mann et al. 1985; L. R. Pounds, The University of Tennessee, personal communication to P. Parr, ORR Research Park 1989). Field surveys on the ORR conducted in 1990 by Cunningham and Pounds resulted in 57 additions to the checklist for the site; the number of vascular plant taxa now known to be present on the ORR is 983 species and varieties (Appendix C). A previous report (Dahlman et al. 1977) lists the number of species on the ORR as 1370; this earlier checklist included taxa likely to occur on the site based on composite county records.

1.2 RARE PLANT SURVEY PROTOCOL

The ORR National Environmental Research Park staff has responsibility for conducting surveys of the ORR for the presence of rare taxa and potential habitat for rare taxa. The objectives of the rare plant surveys are to (1) identify and document rare taxa, (2) characterize rare plant habitats on the ORR, (3) manage selected rare plant

populations and, (4) recommend rare species protection through natural area designation and habitat preservation and management.

Taxa is a general term used for any taxonomic rank from subspecies to division. Taxa, or the singular taxon, is used instead of the term species because rare plants can include subspecies and varieties as well as species. For the purpose of surveys conducted on the ORR, rare taxa are defined as those taxa that have state or federal status or the potential to obtain such status.

The U.S. Fish and Wildlife Service (USFWS; 1991) and the Tennessee Department of Environment and Conservation (TDEC; unpublished data, 1991) list rare species by one of several status codes (see Appendix A). Currently, there are 17 species on the ORR that are listed by the TDEC. The USFWS is reviewing four of these taxa for possible federal listing. An additional ten state-listed species are known to occur in the vicinity of the ORR and may be present on the reservation. One of these, the prairie goldenrod (*Solidago ptarmicoides*), is being cultivated in the Barrens Garden at ORNL. Ginseng (*Panax quinquefolius*), a species found on the ORR, is threatened by excessive harvesting. A summary of Tennessee law governing the harvesting and sale of ginseng is presented in Appendix B.

We try to anticipate taxa that might obtain state or federal status in the future and include them in our surveys. The grounds for doing this are:

1. The plant is a newly discovered taxon.

2. The plant is a taxon newly discovered for Tennessee.

3. The plant is a previously known taxon for which the taxonomic status has been changed (e.g., changed from a variety to a species).

4. The plant is recommended for consideration or listing by experienced observers (i.e., professional and amateur botanists).

To date, there have been no newly discovered taxa on the reservation. For examples of items 2, 3, and 4, see Appendix C. Based on their knowledge of rare plants and habitats, the Research Park staff may make recommendations to the TDEC to consider for listing certain taxa found during surveys on the ORR.

Portions of the ORR have been systematically surveyed for the presence of rare plant taxa. In general, such surveys have been performed to address environmental issues associated with specific development projects on the ORR. Rare plant surveys must be conducted in the preliminary phases of any proposed ORR project that is subject to the provisions of the National Environmental Policy Act (NEPA). The survey is initiated by a written request to the Research Park offices from the site [Oak Ridge Y-12 Plant, Oak Ridge K-25 site, and Oak Ridge National Laboratory (ORNL)] NEPA coordinators. In addition to the project-driven rare plant surveys, rare plants are sometimes searched for, and have been found, during general ecological fieldwork on the reservation.

The four-step process for project-driven rare plant surveys which consists of (1) a survey request, (2) data review, (3) a field survey, and (4) a survey report (Table 1). An additional step involves working with the project leaders and government agencies to devise solutions to manage the particular plant population, and in some cases, the process to establish a Research Park Natural Area (NA) may be initiated if rare plants are

Table 1. Protocol for rare plant surveys on the ORR

Step	Protocol
I.	Submission of Paperwork to Rearch Park Offices
	A. Survey request form B. Topographic map of site and surrounding area
II.	Data Review
	A. Reports and maps from previous rare plant surveys B. ORR S16-A map C. Other relevant reports and maps
III.	Field Survey
	A. Survey of entire site to identify potential rare plant habitat and rare plants in atypical habitats B. The potential habitat is intensively surveyed for rare plants
IV.	Report Preparation
	A. Written report and map sent to NEPA coordinator and distributed to project leaders and others
V.	Rare Plant Protection
	A. Designation of NAs B. Mitigation: Alternative project design, construction, and/or operations

identified on or near the project site. The survey request and the survey report are omitted from non-project-driven surveys, which are conducted by the field botanist in selected areas of the ORR as time and funds permit. Information concerning rare plants found during nonproject surveys is maintained in files in the Research Park office. The data review, field survey methods, agency interaction, and potential NA establishment are the same as for project-driven surveys.

1.2.1 Survey Request Form

Individuals requiring a survey of an area for rare plants first must complete a survey request form (Fig. 1). The request form may be completed by the project leaders or the project NEPA coordinator. However, if completed by the project leaders, the form must identify the NEPA coordinator. The completed request form, along with a topographic map showing the project site, site boundaries, and surrounding areas, is returned to the Research Park staff member indicated on the bottom of the form.

The inclusion in the survey of areas that surround the proposed project site allows evaluation of potential direct and indirect impacts of development on any rare plant populations or habitats to off-site as well as on-site areas. The width of the adjacent areas to be surveyed will depend on the natural landscape and human-made features. Potential impacts of site development include soil erosion, sedimentation of streams and stream bottomlands, creation of forest clearings and sharply defined forest edges, dust generation, and altered water flows. The creation of forest openings and abrupt edges can expose the adjacent forested areas to greater light penetration, dust and soil deposition on leaf surfaces and around trees and shrubs, and potential invasion by highly competitive exotic species (i.e., Japanese honeysuckle, kudzu, microstegium, and fescue). Therefore, at a minimum, a 30-m (30-yd) buffer around the site boundaries should be surveyed for rare plants. Eroding soil, sedimentation, and increased flow rates and volumes can impact off-site rare plant populations on lower slopes and in bottomland areas. Thus, the survey area should include any stream bottomlands and areas on downslope sides of the site.

Existing topographic features, such as hilltops, watershed divides, stream bottomlands, and hollows, form natural boundaries for the adjacent area survey, except where they are crossed by the proposed project, in which case the 30-m (30-yd) minimum or other landscape features should be used. Well-traveled, paved, or graveled roads and utility rights-of-way form easily definable boundaries; however, natural features such as stream valleys and potential rare plant habitat should take precedence when these features exist on the far side of the road or right-of-way. Adjacent utility corridors, which have been known to support rare plant populations on the ORR, should always be included in the rare plant survey.

1.2.2 Review of Existing Data

Prior to the field survey, existing reports and maps are reviewed to determine if the area has been recently surveyed and if rare taxa have been found in the vicinity and to initially characterize the site and surrounding area (i.e., topography, vegetation cover type, and disturbance). Changes are periodically made to the state and federal rare taxa lists, and information on rare taxa on the ORR is constantly being updated; therefore, the value of reviewing previous reports is limited. For example, several listed plant taxa

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In order to arrange surveys of areas to investigate the occurrence of rare plants and/or wetlands, the following information or material is needed.

1. Date, project title, and a short description of the project.

2. Type of survey needed (please circle):

   Rare plant Preliminary wetlands Wetlands delineation

   (We do not arrange floodplain, wildlife, or archaeological surveys.)

3. Location and size of area to be surveyed:

4. Two copies of a detailed map showing existing topography. (A 2-ft contour map is best, if available. Do not send site grading plans.)

   Site boundaries should be clearly defined. It is essential that the map(s) show enough detail to assure that wetlands and/or rare plants can be accurately located on the map. This avoids confusion and the resulting expense of repeated trips to the site.

5. Names, phone numbers, and addresses of field contact and regular contact individuals:

   We may request that you provide a field escort to show us the site boundaries and any potential hazards or problem areas. You will also need to contact the appropriate individuals for any specific access or security requirements. Although our staff has completed the necessary 24-h Superfund Amendments and Reauthorization Act (SARA)/Occupational Safety and Health Administration (OSHA) and Radiation Worker training, we will request a Health Physics escort in areas of known contamination, such as WAG sites.

Fig. 1. Request form for rare plant and wetland surveys.

6. When are the survey results needed (please be as specific as possible):

   Please keep in mind that rare plant surveys can be done only during the growing season (spring, summer, fall). It is not possible to determine plant occurrence when plants are dormant, as in the winter months. Some rare plants may be evident in spring or summer only, and some are not evident until fall. Please schedule your survey as much in advance as possible to allow for species identification during the various growing seasons. A year ahead of time is recommended. If a survey is requested during one part of the growing season and we find that the habitat is such that a species that grows during a different season is potentially on the site, we will recommend that the survey be completed at that time.

7. Name and address of the site NEPA contact, to whom a memo of the results of this survey will be addressed, and the names and addresses of individuals to whom a copy of the memo should be sent:

   Findings of the surveys and/or delineation will be provided in a written format, which will include a description of the primary vegetation communities, existing and surrounding land use, and any rare plant species and wetland locations identified on-site or adjacent to the site. The rare plant and preliminary wetland investigations are viewed as a preliminary, information-gathering step in the NEPA process. Wetland delineations usually occur as a later step in the compliance process; however, may be requested as part of the information-gathering process. A preliminary wetlands investigation report is not a prerequisite to a wetland delineation.

8. Special requests or other comments?

9. Charge number (We will need this prior to the survey; you may choose to wait until you have the cost estimate. Please state if you will need a cost estimate):

Fig. 1. Request form for rare plant and wetland surveys (continued).

previously unknown on the ORR were discovered in the 1990 season and one taxon (*Juglans cinerea*) has recently been given state and federal status.

A field botanist unfamiliar with the plant communities, rare plants, and rare plant habitats on the reservation should follow these steps before conducting a rare plant survey on the ORR: (1) consult TDEC and Research Park documents and staff to determine what taxa have been found on and in the vicinity of the ORR; (2) view as many of the rare taxa in the field as possible; and (3) consult photographs, botany references, and herbaria [ORR and The University of Tennessee (UT)] to become familiar with the plants growth forms, habitats, and life cycles (see Appendix D for a list of the taxa with specimens in the ORR and UT herbaria). The botanist should also be familiar with the typical appearance of the common plant communities found on the ORR.

1.2.3 Field Survey

The field survey consists of two basic steps: (1) identification of potential habitat in the survey area and (2) an intensive survey of that habitat. The entire site, including the adjacent areas, are surveyed for probable rare plant habitat [i.e., wetland, rock outcrops, steep slopes, cedar barrens, certain disturbances, and areas where woody plants are suppressed and native plants dominate (e.g., under power lines)]. The identification of potential habitat is based on a knowledge of the listed taxa that occur or may occur in eastern Tennessee.

The search is systematic in that the field botanist walks the entire site along roughly defined transects; however, the transects are not marked in the field and do not follow specific compass bearings. For ease of walking, the transects generally follow topography (i.e., across steep slopes and parallel to streams); however, they can be oriented differently if it is necessary or desired. The transects will vary in width depending on the season, topography, type of vegetation present, and degree of site disturbance. For example, during early spring when forest understory vegetation is not dense, the transects can be wide (10 to 15 m). In dense herbaceous or shrubby growth, in pine plantations, or later in the growing season, the transect width is dictated by the distance one can see clearly on either side.

Potential rare plant habitats identified during the initial site survey are more intensively surveyed for the presence of the particular taxon. As in the initial site survey, the transects are not established along specific compass bearings and tend to follow topography; however, the distance between transects is smaller to allow for a close scan of the entire ground surface. The width of the transects is dictated by the growth characteristics of the taxon. For example, closer scrutiny of the habitat is required for an herbaceous plant that grows singly than for those that grow in clusters or for a shrub. Search images are mental pictures of the particular rare taxa. The strongest search images are formed by seeing the plants in the field. Although it is possible to view all of the state-listed species at various locations in Tennessee, this is not always possible because of time, budget, and travel constraints. In the absence of direct observation, adequate search images may be formed by viewing herbarium samples and studying drawings and photographs. A file of color photographs of the rare plants found on the ORR is maintained by Research Park staff and is available for viewing.

Compiling a flora of an area or conducting quantitative analyses based on random and nonrandom sampling are common field botany practices. Neither of these methods is very useful in conducting a rare plant survey. Compiling a flora, which consists of identifying

all of the species on a site, may result in the identification of rare plants, but it is a highly time- and cost-intensive project.

Quantitative sampling techniques based on establishing quadrats is not useful because the probability of finding certain rare taxa at randomly chosen sites is low, even in likely habitat. Rare taxa often occur singly or in small groups in localized areas within specific habitats. Therefore, a systematic survey along transects covering the entire area intended to identify rare taxa rather than to quantify all species is more likely to succeed.

Because of life cycle and vegetative characteristics of certain rare plant taxa, it is usually necessary to survey a site throughout the growing season if potential habitat is present. For example, the emergence and flowering dates of rare taxa known to occur or with the potential to occur on the ORR range from spring through fall. In addition, identification of certain taxa requires that a specific plant part such as the flower, fruit, or seed be present. If potential habitats for rare plants are found on a site, it will be necessary to conduct a survey of those habitats at the appropriate time of year for the taxa in question.

Other characteristics that confound efforts to find rare plants are plant dormancy and occurrence in atypical habitats. Some rare plants, including species that have been found on the ORR, may have prolonged periods of dormancy under certain environmental conditions in which the individual or population exists for many years either as rhizomes (underground) or as propagules in soil seedbanks. Therefore, the identification of potential habitat, especially near known rare plant occurrences, is important to the goal of rare plant identification and management. If there is a strong possibility that rare plants could be found in the identified habitat, it is recommended that disturbance in that area be avoided if possible. Upon the return of favorable conditions for growth, if they are known, the area can be resurveyed. For these three reasons—life-cycle and vegetative characteristics, specific plant parts needed for identification, and plant dormancy, it is essential that the field botanist be familiar with life-cycle and vegetative characteristics of the rare plants that might be in the area, including the dates of emergence, flowering, and setting fruit or seed and other specific characteristics.

Plants, including rare plants, will sometimes occur in habitats atypical for the species. An example of a rare taxon occurring in an atypical habitat on the reservation is gravid sedge (*Carex gravida*), a prairie species typical of dry, open sites, which has been found in a forested wetland and on a dry, forested, rocky slope. Rare taxa in atypical habitat are less likely to be discovered because (1) the habitat is not identified during the initial survey as potential habitat for the taxon, (2) the field botanist might not be using a particular search image if the taxon is not expected to occur in the habitat, or (3) the taxon might have an unusual growth form because of habitat location and, thus, differ from the botanists search image. Conversely, if the plant appears unusual for the vegetation community, it could also be more easily observable. During the initial and intensive habitat searches, the field botanist is on the alert for plants whose forms may appear atypical for the particular habitat or vegetation community. It is necessary for the field botanist to be familiar with the appearance of the typical plant communities on the ORR so that he or she can detect plants that appear unusual or that are present in atypical habitats.

1.2.4 Rare Plant Survey Report

A rare plant survey report is prepared, which includes an introduction to the status of rare plants on the ORR, a brief explanation of field methods, a description of the site, the field findings, and a map showing the approximate location of any rare taxa that were found. The report is sent to the project NEPA coordinator and distributed to the project leader and others as specified on the survey request form.

1.3 MANAGEMENT OF RARE PLANT POPULATIONS

Plant species may be rare for a number of reasons including collecting/harvesting, competition from introduced foreign species, pollution or other environmental changes, or habitat fragmentation and alteration (Leitzell 1986). "Management" is defined (Merriam-Webster 1988) as "to handle or direct with a degree of skill, to treat with care, [and] to alter by manipulation." Management of rare plant populations is not a straightforward, standardized procedure. It involves knowing what plant species occur on the site, what their environmental requirements are, protection of the habitat, and manipulation of the habitat in some cases.

Understanding what the plants' environmental requirements are is basic to making management decisions. Studies of the area where the tall larkspur (*Delphinium exaltatum*) occurs have shown that periodic mowing (in early winter after seed drop and prior to germination) has benefitted the population, probably by reducing competition. However, this kind of information is simply not available for most of the species. Common sense decisions based on the available information and resources are necessary.

Leitzell (1986) recommends that "where scientific knowledge necessary to manipulate populations is unavailable, protection of large areas of habitat is the best strategy allowing natural processes not properly understood by humans to serve the needs of threatened species." Protecting large areas on the ORR is difficult because of the various uses of the ORR that are not compatible with protection. On the ORR, areas where rare plant species/populations are known to occur have been designated as NAs. Although these are not large areas, they are one means of providing a degree (though limited) of protection to populations we want to preserve.

Although the ORR is not open to the public, illegal harvesting has occurred for species such as ginseng (*Panax quinquefolius*). Management for such a species would involve increasing security and enforcement of the no trespassing regulations for federal land. Competition from introduced foreign species has not impacted any of our currently known rare plant sites; the threat of kudzu, microstegium, and honeysuckle crowding out rare plants is a possibility, and careful management of land adjacent to protected areas is required. Pollution and other environmental changes don't appear to have presented a problem in recent years. Care is taken to avoid herbicide application of power-line areas near protected areas. The major threat to rare plant species on the ORR is habitat alteration. Changes in the tree canopy (altering light and nutrient availability), severe fire, changes in hydrologic regime (especially impacting wetland species), maintenance of rights-of-way (by mowing or applying herbicides), decrease of habitat size, and changes in adjacent land use can all impact a population significantly.

Preservation of the rare plant species on the ORR is not a passive responsibility. The following objectives are recommended for management of the ORR threatened, endangered, and other rare plant species:

1. Continue to survey the ORR for the occurrence of rare plants and unusual habitats.

2. Computerize the data base of information on where plants are known to occur and areas that have been surveyed.

3. Maintain updated rare plant lists and communication with state and federal agencies.

4. Maintain an updated list, including voucher specimens or photographs, of all plant species that occur on the ORR.

5. Continue communication with taxonomic botanists to identify and verify difficult species.

6. Designate areas where rare plant populations occur as NAs and notify site development planners so that the areas are recognized when making land-use planning decisions.

7. Conduct literature searches for information on plant species national distribution, research on the species, or management information.

8. Develop a monitoring scheme to obtain information on the populations: What are their environmental requirements? and Do they need some type of management?

9. Conduct research through greenhouse or field studies to determine requirements, and work with state and federal agencies to attempt some reintroductions into appropriate habitats.

10. Continue to evaluate management techniques currently in use on rare plant populations on the ORR.

11. Continue to coordinate rare plant surveys, research, protection, and data base information through the Oak Ridge National Environmental Research Park.

12. Educate and inform employees on the ORR and the general public about protection of rare taxa.

Although these steps are necessary to meet the goal of preserving rare plants on the ORR, they will require funding. Without basic funds to conduct these recommendations, the management will be piecemeal and its effectiveness diminished.

2. PLAN

Rare plant taxa on the ORR are listed in Table 2 and described in Sect. 3.1. A map showing some locations of some of these taxa is shown in Fig. 2. Listed taxa that occur close to and that may be present on the ORR are listed in Table 3 and described in Sect. 3.2. Listed species that occur in the Ridge and Valley physiographic province of Tennessee and that occur in habitat similar to those on the ORR are listed in Table 4. Species listed in Table 4 are considered to be potentially present on the ORR, but with lesser likelihood than those listed in Table 3. Nomenclature of listed taxa is based on the official Tennessee list (Somers 1989).

General habitat information for each species was taken from *The Manual of Vascular Flora of the Carolinas* (Radford et al. 1968). If the species was not included in that manual, other references were used:

1. *Guide to the Vascular Plants of the Blue Ridge* (Wofford 1989).

2. *Vascular Flora of the Southeastern United States* (Cronquist 1980).

3. *A Report on Some Rare and Endangered Plant Species of the Southeastern United States* (Kral 1983).

4. *An Atlas and Guide to the Threatened and Endangered Vascular Plants of the Mountains of North Carolina and Virginia* (Massey et al. 1983).

5. *The New Britton and Brown Illustrated Flora of the Northeastern United States and Adjacent Canada* (Gleason 1952).

Range information was compiled from these sources, the TDEC, and a recent survey of government and private conservation organizations conducted by L. Edwards of Clemson University (unpublished data 1991). Descriptive information compiled from various sources for each taxa focuses on distinguishing characteristics. Specific locations of rare plants are kept on file by the Oak Ridge National Environmental Research Park.

Table 2. Habitats and rarity status of plant species listed by state or federal agencies that occur on the ORR[a]

Species	Common name	Habitat on ORR	Status[b]
Aureolaria patula	Spreading false-foxglove	River bluffs	C1, T
Carex gravida	Gravid sedge	Varied	S
Cimicifuga rubifolia	Appalachian bugbane	River slopes	C2, T
Cypripedium acuale	Pink lady-slipper	Dry to rich woods	E*
Delphinum exaltatum	Tall larkspur	Barrens, woods	C2, E
Diervilla lonicera	Northern bush-honeysuckle	River bluffs	T
Elodea nuttallii	Nuttall waterweed	Ponds, embayments	S
Fothergilla major	Mountain witch-alder	Woods	T
Hydrastis canadensis	Golden seal	Rich woods	T
Juglans cinerea	Butternut	Slopes near streams	C2, T
Lilium canadense	Canada lily	Moist woods	T
Liparis loeselii	Fen orchid	Forested wetland	E
Panax quinquifolius	Ginseng	Rich woods	3C, T
Platanthera flava var. *herbiola*	Tuberculed rein-orchid	Forested wetland	T
Platanthera peramoena	Purple fringeless orchid	Wet meadow	3C, T
Saxifraga careyana	Carey saxifrage	River bluffs, sinks	C3, S
Spiranthes ovalis	Lesser ladies tresses	Moist to dry woods	S

[a]Other similar lists for ORR include *Lilium michiganense*. It is excluded here because it is not definitely known to be currently on the ORR.

[b]Status codes (see Appendix A for full explanation):
C1 — Candidate for federal listing. Proposed listing considered likely.
C2 — Candidate for federal listing. More information needed to determine status.
C3 — Taxa no longer considered for federal listing. Subcategories indicate reasons.
3C — Taxa more widespread or abundant than previously thought, or taxa not subject to immediate threat.
E — Endangered in Tennessee.
E* — Endangered in Tennessee due to commercial exploitation.
T — Threatened in Tennessee.
S — Special Concern in Tennessee.

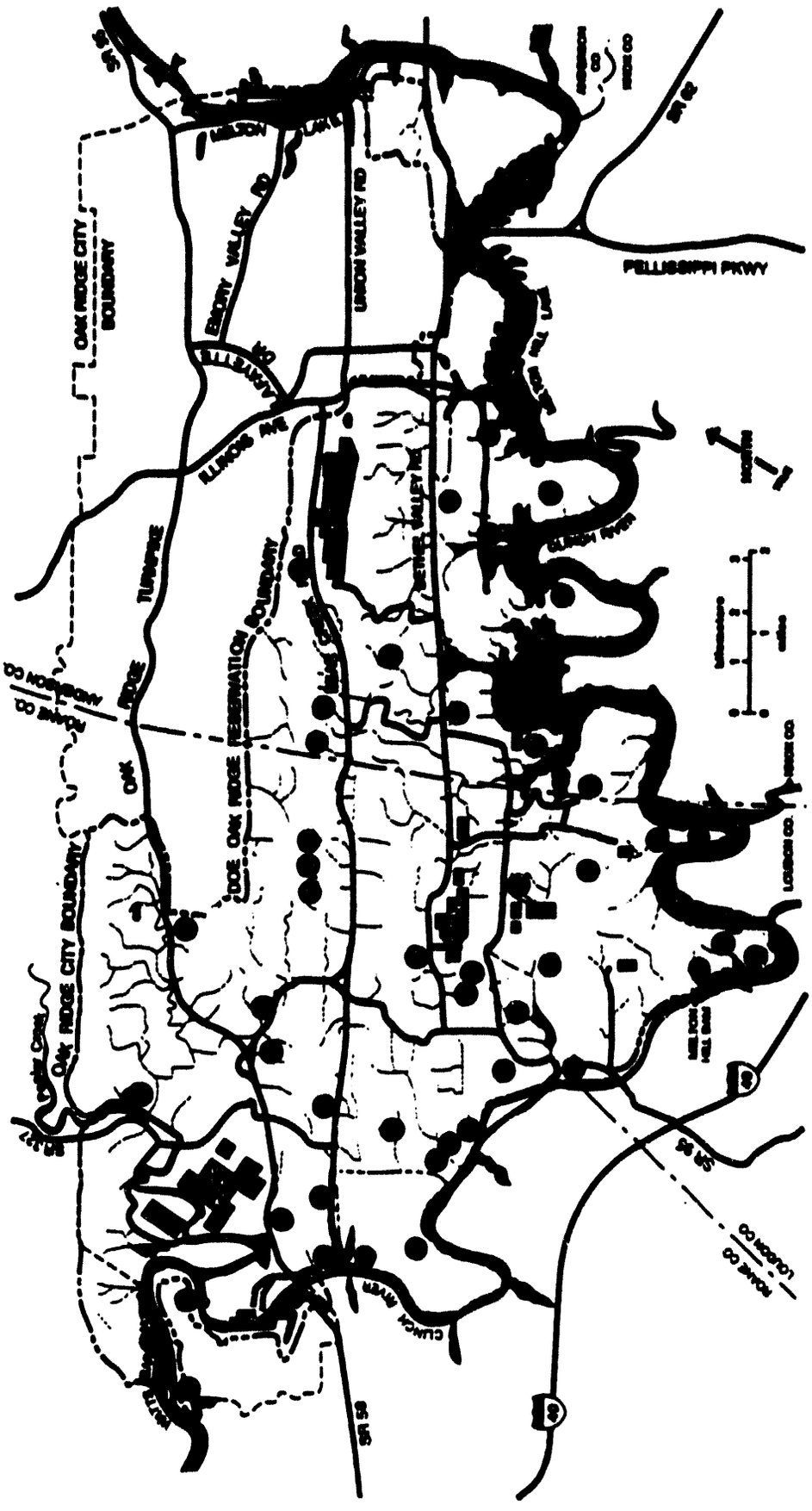

Fig. 2 Location of rare plants on the Oak Ridge Reservation.

Table 3. Habitats and rarity status of plant species listed by state or federal agencies that occur near and may be present on the ORR

Species	Common name	Habitat on ORR	Status[a]
Berberis canadensis	American barberry	Rocky bluffs	S
Draba ramosissima	Branching whitlow-grass	River bluffs	S
Gnaphalium helleri	Catfoot	Dry forest edge	S
Liatris cylindracea	Slender blazing star	Barren	E
Lonicera dioica	Mountain honeysuckle	Rocky river banks	S
Meehania cordata	Heartleaf meehania	River slopes	T
Pedicularis lanceolata	Swamp lousewort	Wet meadow, seeps	T
Pycnanthemum verticillatum	Whorled mountain-mint	Wet woods	E-P
Solidago ptarmicoides	Prairie goldenrod	Barren	E
Tomanthera auriculata	Earleaf false-foxglove	Barren	C2, E

[a]Status codes (see Appendix A for full explanation):
C2 — Candidate for federal listing. More information needed to determine status.
E — Endangered in Tennessee.
P — Possibly extirpated in Tennessee.
T — Threatened in Tennessee.
S — Special Concern in Tennessee.

Table 4. Rare plant species listed by state or federal agencies that occur in the ridge and valley physiographic province of eastern Tennessee and grow in habitat types found on the ORR (excluding those on Table 3)

Species	Common name	Habitat	Status[a]
Arabis patens	Spreading rockcress	Limestone slopes	E-P
Aster ericoides	White heath aster	Dry, open areas	T
Aster pratensis[b]	Aster	Dry prairies	T
Chrysogonum virginianum	Green-and-gold	Rocky woodlands	T
Heuchera longifolia var. *aceroides*	Maple-leaf alumroot	Calcareous woods	S
Lonicera flava	Yellow honeysuckle	Woodlands	S
Polymnia laevigata	Tennessee leafcup	Woodlands	C3, S
Rhamnus alnifolia	Alderleaf buckthorn	Swamps, low woods	E
Rhynchospora capillacea	Capillary beakrush	Limestone seeps	E-P
Silphium laciniatum	Compass plant	Prairies	T
Synandra hispidula	Gyandotte beauty	Rich wooded slopes	C3, T
Tetragonotheca helianthoides	Pineland squarehead	Woods, thickets	E-P
Woodwardia virginica	Virginia chainfern	Wet acid soils	S

[a]Status codes (see Appendix A for full explanation):
C3 — Taxa no longer considered for federal listing. Subcategories indicate reasons.
E — Endangered in Tennessee.
P — Possibly extirpated in Tennessee.
T — Threatened in Tennessee.
S — Special Concern in Tennessee.

[b]Formerly listed as *A. sericeus*.

3. SPECIES ACCOUNTS

3.1 RARE PLANTS ON THE OAK RIDGE RESERVATION

3.1.1 *Aureolaria patula* (Chapm.) Pennell

COMMON NAME: Spreading false-foxglove

FAMILY: Scrophulariaceae

FEDERAL STATUS: Category 1

TENNESSEE STATUS: Threatened

HABITAT: Wooded, calcareous, river and creek bluffs (Kral 1983)

HABITAT ON ORR: In shade on calcareous bluffs and talus slopes along the Clinch River and several tributaries (often at the edge of a lake or large stream)

RANGE: central KY to north GA and AL

TENNESSEE COUNTIES: Anderson, Coffee, Knox, Morgan, and Roane

DESCRIPTION: Erect to decumbent perennial herb with stems up to 12 dm in length. Stem not glaucus. Lower leaves lobed. Corolla yellow, pedicels 15 to 25 mm long, capsule glabrous.

FLOWERING DATE: late August through early October

FRUITING DATE: October through November

LOCATIONS ON THE ORR:

1. NA19. River bank and talus slope on north side of Clinch River. Last observed in 1990. Roane County.

2. NA1. River bluff on Clinch River. Last observed in 1990. Roane County.

3. NA20. Wooded rocky bluffs on Poplar Creek, a tributary to the Clinch River. Also noted at scattered locations on rocky bluffs on Poplar Creek outside the natural area. Last observed in 1990. Roane County.

4. NA14. Wooded bluff on the Clinch River. Last observed in 1990. Anderson County.

5. NA17. Steep slope and bluffs along the Clinch River. Population was not located during a survey in 1990. Roane County.

6. NA32. Rocky river slope upstream from the Melton Dam. Last observed in 1992.

7. NA33. Edge of a pond and wetland area. Only two plants. Last observed in 1991.

LOCATIONS ADJOINING THE ORR:
8. Grassy Creek. Formerly Research Park Natural Area 3; the land has been transferred to the Tennessee Valley Authority. Rocky woods on slope above Grassy Creek, a tributary of the Clinch River. Last observed in 1988. Roane County.

9. Rocky bluffs along the Clinch River, on the opposite shore of the river from the ORR. Last observed in 1990. Knox County and Loudon County.

COMMENTS: Other rare or uncommon species co-occurring with *A. patula* on the ORR are *Cimicifuga rubifolia*, *Diervilla lonicera*, *Thuja occidentalis*, and a mat-forming variant of *Blephilia ciliata*.

THREATS ON ORR: Habitat destruction from project development, reservoir water level fluctuations, recreational activity on river banks, and tree canopy removal.

3.1.2 *Carex gravida* Bailey

COMMON NAME: Gravid sedge

FAMILY: Cyperaceae

FEDERAL STATUS: None

TENNESSEE STATUS: Special concern

HABITAT: Dry, open areas

HABITAT ON ORR: Wooded, rocky slope

RANGE: southeast MI, south IA, and KS; south to TX and further east (TN, NC) perhaps as a recent introduction

TENNESSEE COUNTIES: Knox, Meigs, Montgomery, and Roane

DESCRIPTION: Difficult to identify in the field below genus level. May sometimes be detected in the field by noting that the fruiting culms are leaning over close to the ground.

FLOWERING DATE: No information

FRUITING DATE: No information

LOCATIONS ON THE ORR:
1. NA32. Rocky slopes along Melton Hill Lake.

2. NA20. New Zion boggy area.

LOCATIONS ADJOINING THE ORR:
None known.

COMMENTS: *C. gravida* is growing in a surprisingly shady and undisturbed location on the ORR. Radford et al. (1968) describe the species habitat in the Carolinas as waste places.

THREATS ON ORR: Habitat destruction.

3.1.3 *Cimicifuga rubifolia* Kearney

COMMON NAME: Appalachian bugbane

FAMILY: Ranunculaceae

FEDERAL STATUS: Category 2

TENNESSEE STATUS: Threatened

HABITAT: Wooded bluffs, ravines, coves, north-facing talus slopes; prefers limestone or calcareous shale (Massey et al. 1983)

HABITAT ON ORR: Wooded talus slopes along the Clinch River and Grassy Creek, a tributary of the Clinch River

RANGE: AL, IL, IN, KY, NC, PA, TN, and VA

TENNESSEE COUNTIES: Anderson, Claiborne, Grainger, Hamblin, Hancock, Hawkins, Jefferson, Knox, Loudon, Meigs, Montgomery, Roane, Stewart, and Sullivan

DESCRIPTION: Perennial herb with mostly basal, compound leaves of three to nine leaflets. Base of terminal leaflet is deeply cordate. Solitary, wand-like flowering stem up to 14 dm tall. Flowers white.

FLOWERING DATE: July through October

FRUITING DATE: September through October

LOCATIONS ON THE ORR:

1. NA11. North-facing, wooded talus slope on the Clinch River. Population size is 400 to 500 individuals. Last observed in 1990. Anderson County.

2. NA19. Wooded talus slope on the Clinch River. Last observed in 1990. Roane County.

3. NA1. Wooded, gentle slope with rock ledges along the Clinch River. Last observed in 1988. Roane County.

4. NA15. Wooded slope on hickory Creek Bend along the Clinch River. Last observed in 1987. Roane County.

LOCATIONS ADJOINING THE ORR:

5. Wooded slope along a tributary of the Clinch River. Formerly Research Park Natural Area 3, the land has been transferred to the Tennessee Valley Authority. Population size is about 2000 individuals. Last observed in 1990. Roane County.

6. Steep, east-facing, wooded slope of Pine Ridge along the Clinch River. On property owned by the City of Oak Ridge. Population size is about 300 plants. Last observed in 1989. Anderson County.

7. Hewitt Bluff, a steep wooded bluff along the Clinch River. Last observed in 1982. On private property. Knox County.

COMMENTS: Other rare species co-occurring with *C. rubifolia* on the ORR are *Saxifraga careyana*, *Diervilla lonicera*, and *Aureolaria patula*.

THREATS ON ORR: Habitat destruction from project development, and tree canopy removal.

3.1.4 *Cypripedium acaule* Ait.

COMMON NAME: Pink lady-slipper

FAMILY: Orchidaceae

FEDERAL STATUS: None

TENNESSEE STATUS: Endangered (due to commercial exploitation)

HABITAT: Bogs and dry, acid pine woods (Radford et al. 1968)

HABITAT ON ORR: Moist to dry acid woods

RANGE: east US; south to SC and AL

TENNESSEE COUNTIES: Perhaps in all counties of east Tennessee, but not found west of the eastern Highland Rim.

DESCRIPTION: Two large, ribbed ovate leaves are at the base of a single flowered scape. Flower pink, fissured in front.

FLOWERING DATE: April to July

FRUITING DATE: Unknown

LOCATIONS ON THE ORR: Several locations across the ORR.

LOCATIONS ADJOINING ORR: Probably several.

COMMENTS: *C. acaule* is a showy species much prized in the wildflower trade. Evidence to date indicates that not only is the species being removed from its habitat in large numbers across the state but also no propagation techniques are known to be successful. For this reason, TDEC lists the species as endangered in Tennessee.

THREATS ON ORR: Habitat loss from project development activities, tree canopy removal, and illegal digging.

3.1.5 *Delphinium exaltatum* Ait.

COMMON NAME: Tall larkspur

FAMILY: Ranunculaceae

FEDERAL STATUS: C2

TENNESSEE STATUS: Endangered

HABITAT: Rich, moist, loamy soils of open, calcareous, wooded ravines (Kral 1976)

HABITAT ON ORR: Open, rocky, calcareous woods and barrens

RANGE: IN, MO, NC, OH, PA, TN, VA, WV, IA, and ME

TENNESSEE COUNTIES: Anderson, Hamilton, and Roane

DESCRIPTION: Erect, solitary, stems to 15 dm in height. Branched racemes with blue flowers late in season.

FLOWERING DATE: August through September

FRUITING DATE: September through October

LOCATIONS ON THE ORR:

1. NA8. In Bethel Valley on shallow, calcareous soil in power-line opening and in open, cedar-dominated woods on the north-facing slope of Haw Ridge. Population size is estimated to be about 1000 individuals. Last observed in 1990. Anderson County.

2. NA7. On shallow soil in open, cedar-dominated woods with numerous limestone outcrops. Located on lower slope of Haw Ridge just west of Natural Area 8. Last observed in 1990. Anderson County.

3. NA30. Shallow, calcareous soil along a pipeline on Haw Ridge. Last observed in 1992.

LOCATIONS ADJOINING THE ORR:

4. In open woods in Haw Ridge Park. The park is leased to the City of Oak Ridge and borders the Clinch River from mile 44 to 48. Population is small. Last observed in 1988. Anderson County.

5. In a calcareous barren on Campbell Bend on the Clinch River. Property now owned by Boeing Tennessee, Inc. Significant habitat at the site is protected through a conservation agreement between TDEC and Boeing. Small population, last observed in 1990. Roane County.

COMMENTS: Habitats on the ORR for *D. exaltatum* are more xeric than those described for other parts of its range. No other rare species are known to co-occur with *D. exaltatum* on the ORR. Three species endangered in Tennessee, *Tomanthera auriculata*, *Liatris cylindracea*, and *Solidage ptarmicoides* occur at the Boeing site on Campbell Bend.

THREATS ON ORR: Habitat destruction from project development and invasion of woody species leading to shade.

3.1.6 *Diervilla lonicera* P. Mill.

COMMON NAME: Northern bush-honeysuckle

FAMILY: Caprifoliaceae

FEDERAL STATUS: None

TENNESSEE STATUS: Threatened

HABITAT: Woodlands and rocky bluffs (Radford et al. 1968)

HABITAT ON ORR: Calcareous, rocky bluffs along the Clinch River

RANGE: AL, CT, DE, GA, IA, IL, IN, KS, MA, ME, MI, MN, NC, NH, NY, OH, PA, SC, TN, VA, VT, WI, and WV

TENNESSEE COUNTIES: Anderson, Cheatham, Polk, and Sevier

DESCRIPTION: Deciduous shrub to 20 dm tall. Simple, opposite, lanceolate leaves. Light-yellow flowers resembling honeysuckle that turn red with age.

FLOWERING DATE: June through July

FRUITING DATE: August through October

LOCATIONS ON THE ORR:
1. NA11. Plants grow at the base of a north-facing limestone cliff on the Clinch River. Last observed in 1990. Anderson County.

2. NA14. Wooded bluff and cliff on the Clinch River. Last observed in 1990. Anderson County.

LOCATIONS ADJOINING THE ORR: None known.

COMMENTS: Other rare or uncommon species co-occurring with *D.lonicera* on the ORR are *Thuja occidentalis*, *Cimicifuga rubilfolia*, and *Aureolaria patula*.

THREATS ON ORR: Habitat destruction from project development.

3.1.7 *Elodea nuttallii* (Planch.) St. John

COMMON NAME: Nuttall waterweed

FAMILY: Hydrocharitaceae

FEDERAL STATUS: None

TENNESSEE STATUS: Special Concern

HABITAT: Lakes, ponds, and sluggish streams (Radford et al. 1968)

HABITAT ON ORR: Ponds and embayment of Clinch River

RANGE: MA to VA; west to MN, MO, and OR; now known from TN and NC

TENNESSEE COUNTIES: Lake, Montgomery, Obion, and Roane

DESCRIPTION: Submerged aquatic with whorls of three leaves. Leaves are linear, acute, and densely imbricate at growing tips. Free-floating staminate flowers.

FLOWERING DATE: July through September

FRUITING DATE: Unknown

LOCATIONS ON THE ORR:
1. Spring-fed pond. Last observed in 1990. Roane County.

2. Ponds behind the Aquatic Ecology Laboratory (Building 1504) in the Environmental Sciences Division complex (ORNL). Last observed in 1990. A very small population of nonflowering plants. Roane County.

3. Embayment on Watts Bar Lake separated from main channel by a culvert. Last observed in 1990. Roane County.

LOCATIONS ADJOINING THE ORR:
None known.

COMMENTS: No other rare species are known to co-occur with *E. nuttallii* on the ORR. Probably a recent introduction.

THREATS ON ORR: Habitat loss from project development, water temperature change, and drying of ponds.

3.1.8 *Fothergilla major* (Sims) Lodd.

COMMON NAME: Mountain witch-alder

FAMILY: Hamamelidaceae

FEDERAL STATUS: None

TENNESSEE STATUS: Threatened

HABITAT: Rocky woodlands (Wofford 1989)

HABITAT ON ORR: On west-facing slope in woods

RANGE: AL, AR, GA, NC, SC, and TN

TENNESSEE COUNTIES: Anderson, Grainger, Greene, Scott, and Sevier

DESCRIPTION: Stoloniferous shrub or small tree. Alternately arranged, deciduous leaves are pinnately veined. Flowers are white amd epetalate and occur in terminal spikes.

FLOWERING DATE: April through May

FRUITING DATE: July

LOCATIONS ON THE ORR:
1. NA12. On upper, west-facing slope in Walker Branch Watershed. Last observed in 1991. Anderson County.

LOCATIONS ADJOINING THE ORR:
None known.

COMMENTS: No other listed species are known to occur with *F. major* on the ORR.

THREATS ON ORR: Habitat destruction from project development, severe fire, and tree canopy removal.

3.1.9 *Hydrastis canadensis* L.

COMMON NAME: Golden seal

FAMILY: Ranunculaceae

FEDERAL STATUS: 3C

TENNESSEE STATUS: Threatened

HABITAT: Rich woods (Radford et al. 1968)

HABITAT ON ORR: Rich, moist woods

RANGE: AL, AR, CT, DE, GA, IA, IL, IN, KY, MA, MI, MN, MO, MS, NC, NY, OH, PA, TN, VA, VT, WI, and WV

TENNESSEE COUNTIES: Anderson, Blount, Campbell, Cannon, Carter, Clay, Coffee, Cumberland, Davidson, DeKalb, Fentress, Franklin, Grundy, Hancock, Hardin, Jackson, Knox, Loudon, Marion, Montgomery, Morgan, Obion, Putnam, Rhea, Roane, Scott, Shelby, Stewart, Sullivan, Sumner, Tipton, Van Buren, Warren, Wayne, and White

DESCRIPTION: Erect, perennial herb with thick yellow rhizomes. Stems 1.5 to 5 dm tall. Solitary, greenish-white, epetalate flowers with numerous stamens.

FLOWERING DATE: April to May

FRUITING DATE: June through July

LOCATIONS ON THE ORR:
1. NA2. On slopes and in stream bottoms of mesic forest on East Fork Ridge. Last observed in 1982. Roane County.

2. NA6. Moist stream bottom near embayments of the Clinch River. Last observed in 1990.

3. NA10. Gentle slope of maturing woodland. Size of plants in this population is dwarfed compared with site of others on the ORR. Small population, last observed in 1990. Anderson County.

4. NA21. Wooded slopes near Rainy Knob. Small population, last observed in 1987. Anderson County.

LOCATIONS ADJOINING THE ORR:
Private property on Loudon County side of the Clinch River. Last observed in 1990. Loudon County.

COMMENTS: *Hydrastis canadensis* is a valued medicinal herb on both national and international markets. Like ginseng, its rarity is primarily the result of herb collectors digging the plants. Other rare species that co-occur with *H. canadensis* on the ORR are *Spiranthes ovalis* and *Lilium canadense*.

THREATS ON ORR: Habitat destruction from project development, unauthorized digging to remove plants, and tree canopy removal.

3.1.10 *Juglans cinerea* L.

COMMON NAME: Butternut, white walnut

FAMILY: Juglandaceae

FEDERAL STATUS: C2

TENNESSEE STATUS: Threatened

HABITAT: Rich woods

HABITAT ON ORR: Slopes near major streams

RANGE: New Brunswick to Ontario; south to MI and ND; south to VA, GA, AR, and KS

TENNESSEE COUNTIES: Anderson, Blount, Campbell, Carter, Chester, Cooke, Cumberland, Franklin, Hamilton, Hawkins, Hickman, Houston, Lewis, Monroe, Polk, Roane, Sevier, Stewart, Sumner, Tipton, Van Buren, Wayne, and Williamson

DESCRIPTION: A walnut nut tree that can be distinguished from the common walnut by its elongated fruit (ellipsoidal vs spherical) and dark brown pith (vs light brown pith).

FLOWERING DATE: April through May

FRUITING DATE: October

LOCATIONS ON THE ORR:
1. NA32 on a rocky slope just above Melton Hill Lake. Two young trees.

2. On the south side of White Oak Creek embayment. One small tree with the upper part dead.

LOCATIONS ADJOINING THE ORR:

COMMENTS: Butternut has been given status as a candidate for federal listing (C2) by the USFWS because of the threat of a fatal disease. We have observed no nut production on the ORR.

THREATS ON ORR: Habitat destruction.

3.1.11 *Lilium canadense* L.

COMMON NAME: Canada lily

FAMILY: Liliaceae

FEDERAL STATUS: None

TENNESSEE STATUS: Threatened

HABITAT: Wet meadows, bogs, and balds (Radford et al. 1968)

HABITAT ON ORR: Moist woods, forest edges, and power-line openings through moist forest

RANGE: QUE and ME to MN; AL, CT, DE, DC, IA, IN, KS, KY, MA, ME, MI, MO, NE, NH, NY, OH, OK, PA, RI, SC, SD,TN, VT, VA, WV, and WI

TENNESSEE COUNTIES: Anderson, Campbell, Claiborne, Cumberland, Davidson, DeKalb, Johnson, Montgomery, Morgan, Overton, Putnam, Roane, Rutherford, Scott, Sevier, and Stewart

DESCRIPTION: Stems to 20 dm tall with whorls of 5 to 11 leaves. Flower segments are yellow-orange to red, spotted, and slightly recurred to spreading. Petals and sepals more than 6 cm long.

FLOWERING DATE: June through July

FRUITING DATE: July through September

LOCATIONS ON THE ORR:
1. NA2. Mesic forest on East Fork Ridge. Scattered individuals, last observed in 1978. Roane County.

2. NA13. Wet forest edge and power-line opening in the lower, south-facing slope of Pine Ridge. This area has been disturbed recently by use of the powerline opening as a haul road. Scattered individuals, last observed in 1978. Roane County.

3. NA22. Stream bottom. Relatively large population has not yet been seen in flower. Last observed in 1990. Anderson County.

4. NA25. Stream bottom in the Haw Ridge area. A small population discovered in 1991. Roane County.

5. NA26. Two very small nonflowering plants were discovered here in 1991. Roane County.

6. NA31. Several small populations in moist areas along Haw Ridge. Last observed in 1992.

LOCATIONS ADJOINING THE ORR:
None known.

COMMENTS: This species is very similar to and may be confused with *Lilium michiganense*, which is also a state-listed threatened species. The populations in NAs 22, 25, 26, and 31 may be either *L. canadense* or *L. michiganense*.

THREATS ON ORR: Habitat destruction from project development, indiscriminant use of herbicides, and digging up for transplanting.

3.1.12 *Liparis loeselii* (L.) L. C. Rich

COMMON NAME: Fen orchid

FAMILY: Orchidaceae

FEDERAL STATUS: None

TENNESSEE STATUS: Endangered

HABITAT: Cool ravines and moist seepage slopes (Radford et al. 1968)

HABITAT ON ORR: Wetland with immature forest cover

RANGE: Nova Scotia and Quebec to Manitoba; south to NJ, AL, OH, IN, and NE

TENNESSEE COUNTIES: DeKalb, Carter, Unico, and Roane

DESCRIPTION: Succulent, scapose herb with 2 basal leaves. Stem slender, 6 to 26 cm tall. Flowers yellowish-green to white. Pedicels 3 to 6 mm long.

FLOWERING DATE: May through July

FRUITING DATE: July through August

LOCATIONS ON THE ORR:
1. NA24. In wet forest adjoining an open area with seeps near Bear Creek. This site, combined with Bear Creek wetland, is a registered Tennessee Natural Area. Last observed in 1991. Roane County.

LOCATIONS ADJOINING THE ORR:
None known.

COMMENTS: *L. loeselii* typically does not occur at low elevations as far south as the ORR.

THREATS ON ORR: Habitat destruction from project development, change in hydrologic regime, and tree canopy removal.

3.1.13 *Panax quinquifolius* L.

COMMON NAME: Ginseng

FAMILY: Araliaceae

FEDERAL STATUS: 3C

TENNESSEE STATUS: Threatened

HABITAT: Rich woods (Radford et al. 1968)

HABITAT ON ORR: Rich, moist to dry woods

RANGE: AL, AR, CT, DE, GA, IA, IL, IN, KY, LA, MA, ME, MI, MN, MO, MS, NC, NE, NH, NJ, NY, OH, OK, PA, SC, SD, TN, VA, VT, WI, and WV

TENNESSEE COUNTIES: Virtually all counties

DESCRIPTION: Glabrous, perennial herb arising from tuberous roots. Stems erect, 1.5 to 6 dm tall. Petiolate, palmately compound leaves in a whorl at apex of the solitary stem.

FLOWERING DATE: May through June

FRUITING DATE: August through October

LOCATIONS ON THE ORR: In rich woods at scattered locations across the ORR. Numerous observations in 1989-1990.

LOCATIONS ADJOINING THE ORR:
Scattered locations on Haw Ridge, Chestnut Ridge, and Blackoak Ridge.

COMMENTS: Ginseng is prized in this country and abroad for its reputed medicinal properties and is highly sought by herb collectors. Its rarity in Tennessee is the result of commercial exploitation. See Appendix B for a description of Tennessee laws regarding the harvesting and sale of ginseng.

THREATS ON ORR: Habitat destruction from project development, unauthorized digging to remove plants, and tree canopy removal.

3.1.14 *Platanthera flava* var. *herbiola* (R.Br.) Luer

COMMON NAME: Tubercled rein-orchid

FAMILY: Orchidaceae

FEDERAL STATUS: None

TENNESSEE STATUS: Threatened

HABITAT: Alluvial woods, wet meadows, and marshes (Radford et al. 1968)

HABITAT ON ORR: Forested wetland

RANGE: Nova Scotia to south Ontario; central MN; south to MO; east to mountains of NC, VA, and TN

TENNESSEE COUNTIES: Anderson, Campbell, Cocke, and Roane

DESCRIPTION: Erect, glabrous plant with lanceolate leaves sheathing the stem, reduced to bracts on upper stem. A spike of yellow-green flowers on stems to 5 dm in height. Floral bracts much exceed the flowers.

FLOWERING DATE: May through August

FRUITING DATE: Unknown

LOCATIONS ON THE ORR:
1. NA4. Bear Creek forested wetland. This site, combined with the Hembree Cemetery marsh area, is a registered Tennessee Natural Area. Last observed in 1990. Roane County.

2. NA13. Found in a series of three wetlands in Bear Creek Valley.

3. NA28. Found in a small wetland in Bear Creek Valley.

LOCATIONS ADJOINING THE ORR:
None known.

COMMENTS: Variety *herbiola* is the northern variety of *P. flava* and is more rare in Tennessee than the southern variety *flava*. It is noteworthy that the Bear Creek wetland and Hembree Cemetery marsh both support typically northern taxa that are rare in Tennessee. *Liparis loeselii*, the northern counterpart of *Liparis lilifolia*, occurs in the forested wetland adjoining Hembree Cemetery marsh.

THREATS ON ORR: Habitat destruction from project development, change in hydrologic regime, and tree canopy removal.

3.1.15 *Platanthera peramoena* (Gray) Gray

COMMON NAME: Purple fringeless orchid

FAMILY: Orchidaceae

FEDERAL STATUS: 3C

TENNESSEE STATUS: Threatened

HABITAT: Moist woods, meadows, and stream banks (Radford et al. 1968)

HABITAT ON ORR: Wet power-line openings

RANGE: North to OH and MO; south to NC, AL, and TN

TENNESSEE COUNTIES: Benton, Bledsoe, Carroll, Dyer, Fayette, Henry, Johnson, McNairy, Roane, Robertson, Shelby, and Weakley

DESCRIPTION: Erect, glabrous herb with elliptic to lanceolate leaves. Inflorescence is a showy raceme of purple flowers up to 10.5 dm tall.

FLOWERING DATE: July through August

FRUITING DATE: Unknown

LOCATIONS ON THE ORR:
1. Wet stream drainages on the power-line right-of-way paralleling Bear Creek Road. Discovered in 1990. Roane County.

2. Wet power-line right-of-way paralleling the Oak Ridge Turnpike. Discovered in 1990. Roane County.

3. Two wet stream drainages on the power-line opening paralleling Bear Creek Road. Discovered in 1990. Roane County.

LOCATIONS ADJOINING THE ORR:
None known.

COMMENTS: No other listed species are known to occur with *P. peramoena* on the ORR.

THREATS ON ORR: Habitat destruction from project development, indiscriminant use of herbicides, change in hydrologic regime, and tree canopy closure.

3.1.16 *Saxifraga careyana* Gray

COMMON NAME: Carey saxifrage

FAMILY: Saxifragaceae

FEDERAL STATUS: C3

TENNESSEE STATUS: Special concern

HABITAT: Moist rocks and seepage slopes (Radford et al. 1968)

HABITAT ON ORR: Rocky, calcareous bluffs and sinks along the Clinch River

RANGE: GA, MA, NC, PA, TN, and VA

TENNESSEE COUNTIES: Anderson, Bledsoe, Blount, Carter, Cocke, Franklin, Grainger, Hamilton, Hancock, Knox, Loudon, Marion, Monroe, Pickett, Polk, Rhea, Roane, Sevier, Sullivan, Unicoi, and Van Buren

DESCRIPTION: Small, perennial herb forming rather fleshy rosettes and short offsets from the crown. Hairy leaves are slightly concave on the upper surface, rounded and frequently reddish on the underside. White to pale-pink flowers with scapes up to 3 dm tall.

FLOWERING DATE: April through June

FRUITING DATE: May through June

LOCATIONS ON THE ORR:
1. NA11. In shade at Bull Bluff, a calcareous bluff along the Clinch River. Last observed 1990. Anderson County.

2. NA15. Rocky bluff and rock outcrops at northern end of Hickory Creek Bend on the Clinch River. Last observed in 1986. Roane County.

3. NA16. Rocky bluff and outcrops at southern end of Hickory Creek Bend on the Clinch River. Last observed in 1986. Roane County.

4. NA17. Rocky bluffs along the Clinch River from river mile 25 to 26, southeast of the ORNL Tower Shielding Facility. Last observed in 1986. Roane County.

5. NA18. Rock outcrops on Copper Ridge above Bearden Creek embayment of the Clinch River. Last observed in 1986. Anderson County.

6. NA21. A large sink with massive rock on two sides and a flooded cave entrance at the bottom. On the northeast side of Rainy Knob on the Freels Bend peninsula on the Clinch River. Last observed in 1989. Anderson County.

7. NA23. On calcareous rock outcrops above the Clinch River at Solway Bridge. About 50 plants, apparently more robust than those in other locations on the ORR. Last observed in 1988. Anderson County.

LOCATIONS ADJOINING THE ORR:

8. Wooded slope with limestone outcrops along Grassy Creek, a tributary of the Clinch River. Formerly, NA3; the land has been transferred to the Tennessee Valley Authority. Scattered individuals, last observed in 1979. Roane County.

COMMENTS: The taxonomy of *S. careyana* and *S. caroliniana* is confusing, so much so that the species have been called "the *careyana-caroliniana* complex." *Saxifrage careyana* is no longer considered a candidate for federal listing, however *S. caroliniana* is a category 2 candidate for federal listing and is listed as endangered in Tennessee. Some of the populations noted above have not been determined in the flowering stage, a stage necessary to distinguish the two species. *Saxifraga caroliniana* is not reported to occur in the Ridge and Valley Province in eastern Tennessee, so the populations are probably *S. careyana*. Rare species that co-occur with *S. careyana* on the ORR are *Aureolaria patula*, *Cimicifuga rubifolia*, and *Diervilla lonicera*.

THREATS ON ORR: Habitat destruction by project development.

3.1.17 *Spiranthes ovalis* Lindl.

COMMON NAME: Lesser ladies'-tresses

FAMILY: Orchidaceae

FEDERAL STATUS: None

TENNESSEE STATUS: Special Concern

HABITAT: Moist, shady woods, thickets, and swamp margins (Radford et al. 1968)

HABITAT ON ORR: Moist second-growth woods

RANGE: AR, DC, FL, GA, IL, IO, KS, KY, LA, MI, MS, MO, OH, OK, PA, SC, TN, VA, WI, and WV

TENNESSEE COUNTIES: Anderson, Cannon, Franklin, Lake, Lewis, Montgomery, Obion, Putnam, Roane, Sevier, Tipton, and Warren

DESCRIPTION: Erect stems to 4.5 dm tall with two to four basal oblanceolate leaves. Small white flowers are congested on the slender spike.

FLOWERING DATE: August through November

FRUITING DATE: October through November

LOCATIONS ON THE ORR:

1. NA9. Mesic, second-growth forest over karst terrain. Small population in a shallow sink. Last observed in 1978. Roane County.

2. NA10. Small population on lower slope in mesic, second-growth forest. Last observed in 1990. Anderson County.

3. NA27. A low area filled with fly ash. The plants were unusually large. Last observed in 1991.

4. Nonflowering plants that are very likely to be this species have been observed (1989–1991) at various locations on Chestnut Ridge and Copper Ridge.

LOCATIONS ADJOINING THE ORR:

5. On Parcel A of the ORR, soon to be transferred to the City of Oak Ridge for residential and industrial development. Large population on lower slope and stream bottom on north side of Chestnut Ridge. Area will be designated as city-owned greenbelt. Last observed in 1989. Anderson County.

COMMENTS: Ginseng and goldenseal co-occur with *S. ovalis* on the ORR.

THREATS ON ORR: Habitat destruction from project development and tree canopy removal.

3.2 RARE PLANT SPECIES THAT OCCUR NEAR AND MAY BE PRESENT ON THE OAK RIDGE RESERVATION

3.2.1 *Berberis canadensis* Mill.

COMMON NAME: Barberry

FAMILY: Berberidaceae

FEDERAL STATUS: None

TENNESSEE STATUS: Special concern

HABITAT: Rocky bluffs, creek banks and roadsides (Radford et al. 1968)

HABITAT NEAR ORR: Rocky bluff on the Tennessee River

RANGE: VA and WV to GA and AL; MO and IN

TENNESSEE COUNTIES: Cumberland, Hawkins, Knot, Knox, Morgan, Sullivan, and Washington

DESCRIPTION: Deciduous shrub 2 to 20 dm in height with three-pronged thorns. Leaves alternate, ovate or elliptic to obovate. Berries scarlet, 5 to 7 mm long.

FLOWERING DATE: April through May

FRUITING DATE: September through October

LOCATIONS NEAR ORR: Rocky bluff along the Tennessee River in Knox Co.

COMMENTS: An immature specimen of *B. canadensis* or a similar species was collected on the ORR in 1983. It is not possible to positively identify the specimen collected, and in a subsequent search for *B. canadensis* in the area of collection, no individuals were observed. The species may be present on the ORR on rocky bluffs along the Clinch River or on creek banks.

3.2.2 *Draba ramosissima* Desv.

COMMON NAME: Branching whitlow-grass

FAMILY: Brassicaceae

FEDERAL STATUS: none

TENNESSEE STATUS: Special concern

HABITAT: Dry, usually calcareous bluffs (Wofford 1989)

HABITAT NEAR ORR: Limestone bluffs along river

RANGE: VA, WV, east KY, NC, and TN

TENNESSEE COUNTIES: Anderson, Blount, DeKalb, Hancock, Polk, and Putnam

DESCRIPTION: Mat-forming perennial. Basal rosettes with oblanceolate, toothed leaves. Petals entire, style persistent, and fruit twisted.

FLOWERING DATE: April through May

FRUITING DATE: May through July

LOCATIONS NEAR ORR: Calcareous bluff along the Clinch River. Anderson County.

COMMENTS: The species may be present on rocky bluffs along the Clinch River on the ORR.

3.2.3 ***Gnaphalium helleri*** **Britt.**

COMMON NAME: Catfoot

FAMILY: Asteraceae

FEDERAL STATUS: None

TENNESSEE STATUS: Special concern

HABITAT: Openings in woods and woodland borders (Radford et al. 1968)

HABITAT NEAR ORR: Dry woodland edge

RANGE: ME to GA; IN, AR, and TX

TENNESSEE COUNTIES: Blount, Grundy, and Roane

DESCRIPTION: Annual with lanceolate leaves not decurrent on stem. Green, conspicuously hairy stem with greater than 15 leaves below the infloresence.

FLOWERING DATE: September through October

FRUITING DATE: September through October

LOCATIONS NEAR ORR: Dry, calcareous soil adjacent to the Clinch River, formerly part of the ORR, now owned by Boeing Tennessee, Inc.

COMMENTS: Specimen collected in 1983 on Campbell Bend. The species may be present on the ORR on barren openings or dry woodland edges.

3.2.4 *Liatris cylindracea* Michx.

COMMON NAME: Slender blazing star

FAMILY: Asteraceae

FEDERAL STATUS: None

TENNESSEE STATUS: Endangered

HABITAT: Dry, open places (Gleason 1952)

HABITAT NEAR ORR: Open, dry, calcareous barrens

RANGE: West NY and south Ontario to south OH; north IN, MI, MN, then south to north AR

TENNESSEE COUNTIES: Decatur, Marion, Roane, and Rutherford

DESCRIPTION: Glabrous perennial with numerous stiff, linear leaves. Pink-purple, discoid flowers on stalks to 6 dm tall. Involucral bracts appressed, broadly rounded, and mucronate.

FLOWERING DATE: August through September

FRUITING DATE: September through October

LOCATIONS NEAR ORR:
1. Dry, calcareous barren at Campbell Bend on the Clinch River, locally called the Crowder Cemetery Barren. Formerly part of NA1; the land is now owned by Boeing Tennessee, Inc. The barren is protected by an agreement between TDEC and Boeing and is a registered Tennessee Natural Area. Last observed in 1990. Roane County.

COMMENTS: Other rare species that co-occur with *L. cylindracea* at the Crowder Cemetery Barren are *Tomanthera auriculata*, *Solidago ptarmicoides*, and *Delphinium exaltatum*. *Liatris squarrosa* also occurs at this site, and an apparent blending of morphological characteristics suggests that it may be hybridizing with *L. cylindracea*. *Liatris cylindracea* may be present on the ORR on barrens.

3.2.5 *Lonicera dioica* L.

COMMON NAME: Mountain honeysuckle

FAMILY: Caprifoliaceae

FEDERAL STATUS: None

TENNESSEE STATUS: Special concern

HABITAT: Woodlands and thickets (Radford et al. 1968)

HABITAT NEAR ORR: Rocky river banks

RANGE: Southwest ME and southwest Quebec to Manitoba; south to GA and MO

TENNESSEE COUNTIES: Anderson, Cheatham, Johnson, Polk, Marion, and Roane

DESCRIPTION: Climbing vine with glabrous stems. Leaves glaucous beneath. Inflorescence a terminal spike, corollas less than 3 cm long. Ovaries not fused.

FLOWERING DATE: June through August

FRUITING DATE: August through September

LOCATIONS NEAR ORR: Rocky banks of the Emory River near Harriman.

COMMENTS: The species may be present on the ORR on rocky banks and bluffs on the Clinch River and its tributaries.

3.2.6 *Meehania cordata* (Nutt.) Britt.

COMMON NAME: Heartleaf meehania

FAMILY: Lamiaceae

FEDERAL STATUS: None

TENNESSEE STATUS: Threatened

HABITAT: Rich, wooded slopes and coves (Radford et al. 1968)

HABITAT NEAR ORR: Wooded, calcareous slope along the Clinch River

RANGE: Southwest PA and south OH to TN and NC; IL

TENNESSEE COUNTIES: Anderson

DESCRIPTION: Perennial herb spreading by stolons and forming carpets. Erect flowering stems to 2 dm tall. Four anther-bearing stamens, four-parted ovary, basal style, and flowers more than 2 cm long.

FLOWERING DATE: May through June

FRUITING DATE: June through July

LOCATIONS NEAR ORR: On a wooded slope near Norris Lake on the Clinch River. Anderson County.

COMMENTS: The species may be present on the ORR on rich, wooded slopes along the Clinch River and its tributaries.

3.2.7 *Pedicularis lanceolata* Michx.

COMMON NAME: Swamp lousewort

FAMILY: Scrophulariaceae

FEDERAL STATUS: None

TENNESSEE STATUS: Threatened

HABITAT: Wet meadows on basic soils (Radford et al. 1968)

HABITAT NEAR ORR: Wet meadow/seep at base of ridge

RANGE: MA to MI, MN, MAN, and ND; south to NC, MO, and NE

TENNESSEE COUNTIES: Roane and Union

DESCRIPTION: Perennial with basal rosette. Stems to 8 dm in height. Leaves sessile, lanceolate and shallowly, crenately lobed. Corolla yellow.

FLOWERING DATE: August through October

FRUITING DATE: September through October

LOCATION NEAR ORR: Wet meadow off Highway 72, south of Kingston. On private property. Last observed in 1992. Roane County.

COMMENTS: No other listed plant species co-occur with *P. lanceolata* at this site. This species may be present on the ORR on wet meadows and on seeps.

3.2.8 *Pycnanthemum verticillatum* (Michx.) Pers.

COMMON NAME: Whorled mountain-mint

FAMILY: Lamiaceae

FEDERAL STATUS: None

TENNESSEE STATUS: Endangered, possibly extirpated

HABITAT: Woodlands and woodland borders (Radford et al. 1968)

HABITAT NEAR ORR: Low, shaded, wet area

RANGE: VT to OH; south to west VA; CT, MN, NY, OH, PA, TN, VA, WV, MA, MI, NJ, RI, VT, and NC

TENNESSEE COUNTIES: Anderson, Fentress, and Roane

DESCRIPTION: Pubescent and canescent perennial herb to 8 dm in height. Stems branched in the upper part, pubescence spread over the stem surface, and not confined to the angles of the square stem. Leaves narrowly lanceolate, leaf bases rounded. Reportedly entirely apomictic.

FLOWERING DATE: July through September

FRUITING DATE: August through October

LOCATIONS NEAR ORR:
1. Low, shaded, wet area in Oak Ridge in vicinity of the Clinch River. Specimen collected in 1961. Last observed in 1961; area may have been inundated by Melton Hill Reservoir. Anderson County.

COMMENTS: Three rare and somewhat difficult species of Pycnanthemum occur in our area: *P. verticillatum*, *P. virginiana*, and *P. torrei*. *Pycnanthemum verticillatum* has not been collected recently in Tennessee. *Pycnanthemum torrei* is known in Tennessee only from a recent collection at one site in Oak Ridge. *Pycnanthemum virginianum* is not currently listed by the state but is considered rare in Tennessee (personal communication, Paul Somers, TDEC, to L. Pounds, ORR Research Park, 1989). Further work on identification and habitats of the three species is necessary to assess their status on the ORR.

3.2.9 *Pycnanthemum torrei* Benth.

COMMON NAME: Torrey's mountain-mint

FAMILY: Lamiaceae

FEDERAL STATUS: None

TENNESSEE STATUS: Not previously known to occur in Tennessee prior to 1990. Species is not currently listed.

HABITAT: Dry, upland woods (Gleason 1952)

HABITAT NEAR ORR: Dry, calcareous barren

RANGE: CT to east PA and DE; IL, MO, and east KS; north GA, CT, DC, DE, GA, KS, MD, MO, NC, NJ, NY, PA, SC, and WV

TENNESSEE COUNTIES: Anderson

DESCRIPTION: Perennial herb up to 8 dm in height. Upper leaf surface glabrous. Leaves linear-lanceolate, leaf bases acute to acuminate. Reproduces sexually.

FLOWERING DATE: July through September

FRUITING DATE: August through October

LOCATIONS NEAR ORR:
1. Dry, calcareous opening in Oak Ridge. Occurs both in the opening and under sparse tree canopy at edge of the barren. Last observed in 1990. Anderson County.

COMMENTS: See comments under *P. verticillatum*.

3.2.10 *Solidago ptarmicoides* (Nees) Boivin

COMMON NAME: Prairie goldenrod

FAMILY: Asteraceae

FEDERAL STATUS: None

TENNESSEE STATUS: Endangered

HABITAT: Prairies and open dry places (Gleason 1952)

HABITAT NEAR ORR: Dry, calcareous barren

RANGE: VT and west Quebec to GA; west to Saskatchewan, WY, CO, and AR; CT, CO, GA, IA, IL, MA, MN, MO, NC, ND, NY, OK, PA, SD, TN, WI, KS, WY, NE, OH, and VT

TENNESSEE COUNTIES: Anderson, Rhea, and Roane

DESCRIPTION: Scabrous perennial to 7 dm tall. Leaves stiff, linear-oblanceolate to linear. Infloresence corymbiform, rays and disk of flowers white.

FLOWERING DATE: July through September

FRUITING DATE: September through October

LOCATIONS NEAR ORR:
1. Dry, calcareous barren on Campbell Bend in Clinch River, locally called the Crowder Cemetery Barren. Formerly part of NA1; the land is now owned by Boeing Tennessee, Inc. The barren is protected by an agreement between TDEC and Boeing and is a registered Tennessee Natural Area. Last observed in 1990. Roane County.
2. Dry, calcareous opening at the Oak Ridge Barrens, a registered Tennessee Natural Area owned by the City of Oak Ridge, next to Jefferson Junior High School. Last observed in 1990. Anderson County.

COMMENTS: Other rare species that co-occur with *S. ptarmicoides* at sites near the ORR are *Liatris cylindracea*, *Tomanthera auriculata*, and *Delphinium exaltatum*. *Solidago ptarmicoides* may be present on the ORR on barrens. *Solidago ptarmicoides* was planted in the Environmental Sciences Division's (ORNL) Barrens Research Garden and has been reproducing very successfully.

3.2.11 *Tomanthera auriculata* (Michx.) Raf.

COMMON NAME: Earleaf foxglove

FAMILY: Scrophulariaceae

FEDERAL STATUS: C2

TENNESSEE STATUS: Endangered

HABITAT: Dry or moist soil, in prairies or open, upland woods (Gleason 1952)

HABITAT NEAR ORR: Calcareous barren

RANGE: OH to WI and MN; south to MO and KS; also locally in southern states; AR, PA, MO, MS, KS, IA, IL, OH, TN, and SC

TENNESSEE COUNTIES: Bledsoe, Carroll, and Roane

DESCRIPTION: Hemiparasitic, annual herb to 8 dm in height. Foliage purple-green when in full sun. Upper leaves with divergent basal auricles. Flowers sessile in leafy spikes, corolla pink with purple spots on throat.

FLOWERING DATE: August through September

FRUITING DATE: September through October

LOCATIONS NEAR ORR:

1. Bottom of gentle slope on dry, calcareous barren near Clinch River. Population size estimated to be 2400. Last observed in 1990. Roane County.

COMMENTS: *Tomanthera auriculata* is a hemiparasite that forms haustoria on roots of *Helianthus occidentalis*, *Solidago rigida*, and *Rudbeckia fulgida*. In the field a host is apparently necessary for normal growth and flowering (Cunningham and Parr 1990). Other rare species that co-occur with *T. auriculata* at this site are *Liatris cylindracea*, *Solidago ptarmicoides*, and *Delphinium exaltatum*. *Tomanthera auriculata* may be present on the ORR on barrens.

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APPENDICES

APPENDIX A

EXPLANATION OF RARE PLANT STATUS CODES

Federal Status. Determined by U.S. Fish and Wildlife Service [Federal Register, 50(188):39526-39527, 27 Sept., 1985].

LE – Taxa formally listed as endangered

LT – Taxa formally listed as threatened

PE – Taxa proposed to be formally listed as endangered

PT – Taxa proposed to be formally listed as threatened

C1 – Taxa for which the Service has on file substantial information on biological vulnerability and threat(s) to support the appropriateness to list them as endangered or threatened species. Included are those taxa whose status in recent past is known; some may have already become extinct. Such possibly extinct taxa are indicated by an asterisk (*).

C2 – Taxa for which information now in possession of the Service indicated proposing to list them as endangered or threatened is appropriate, but for which substantial data on biological vulnerability and threat(s) are not currently known or on file to support a proposed rule. If a taxon is considered to be possibly extinct, this is indicated by an asterisk(*). Double asterisk(**) indicate taxa believed to be extinct in the wild, but known to be extant in cultivation.

C3 – Taxa that are no longer being considered for listing as threatened or endangered species. The following subcategories are used to further indicate the reason(s) for removal from consideration.

3A – Taxa for which the Service has persuasive evidence of extinction or being destroyed. If rediscovered, such taxa might acquire high priority for listing.

3B – Names that on the basis of current taxonomic understanding do not represent taxa meeting the Acts definition of "species." Such proposed taxa could be reevaluated in the future on the basis of subsequent research.

3C – Taxa that have proven to be more abundant or widespread than was previously believed and/or those that are not subject to any identifiable threat.

State Status. Status categories and definitions adapted from Collins et al. (1978).

E – **ENDANGERED.** Species now in danger of becoming extinct in Tennessee because of:

(a) their rarity throughout their range, or

(b) their rarity in Tennessee is a result of sensitive habitat destruction or restricted area of distribution.

E* – Taxa considered to be endangered in Tennessee due to evidence of large numbers being taken from the wild and lack of commercial success with propagation or transplantation.

T – **THREATENED.** Species likely to become endangered in the immediately foreseeable future as a result of rapid habitat destruction or commercial exploitation.

S – **SPECIAL CONCERN.** Species requiring special concern because of:

(a) their rarity in Tennessee is because the State represents the limit or near-limit of their geographic range, or

(b) their status is undetermined because of insufficient information.

P – **POSSIBLY EXTIRPATED.** Species that have not been seen in Tennessee within the past 20 years.

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APPENDIX B

HARVESTING AND SALE OF GINSENG IN TENNESSEE

According to the "Ginseng Harvest Season Act of 1985" (Acts 1985, Ch. 177, 1; T.C.A., 11-26-101) it is unlawful in Tennessee for any person to dig, harvest, collect or remove wild ginseng from any land for the purpose of sale or export under the following circumstances:

(a) on any date not within the ginseng harvest season (harvest season is Aug. 15 - Dec. 31).

(b) plants with green berries or less than three prongs.

(c) to remove the berries of wild ginseng from the approximate location harvested.

(d) plants that were harvested from any state other than Tennessee unless such ginseng has been approved for export by the state from which it was harvested.

(e) without permission of the landowner.

Penalties for violation of this law, upon conviction, are a fine not to exceed $250 and forfeiture of all ginseng harvested, collected, removed or sold in violation of the law.

Ginseng dealers must be registered and obtain a permit from the Department of Environment and Conservation, 701 Broadway, Nashville, Tennessee 37243. Monthly records and an annual report must be filed with this department. Dealers exporting ginseng from Tennessee must attach a Tennessee ginseng export certificate with each sale of roots.

APPENDIX B REFERENCES

Ginseng Harvest Season Act of 1985. 1985. Chap. 177 in Acts 1985; Tennessee Code Annotated 11-26-101.

APPENDIX C

TAXA WITH POTENTIAL TO OBTAIN STATUS

As new information becomes available about the flora of Tennessee, changes are made in the list of species with status. There are several species found on the ORR that might be given status in the next few years. Three are discussed in the following:

1. Carolina quillwort (*Isoetes carolinia*). In the summer of 1991, plants of the genus *Isoetes* were observed on the ORR in two locations. One of the plants was identified as *I. carolinia* by Joel Duff, a graduate student at The University of Tennessee who is studying the genus. *I. carolinia* is a newly described species, and if the species is accepted as a valid taxon, then it may be rare enough to warrant status as a federal or state listed species.

2. River bulrush (*Scirpus fluviatalis*). A sedge that is highly likely to be identified as *S. fluviatalis* was found in an emergent-scrub/shrub wetland near the confluence of a small tributary with a small lake near the Clinch River. A sample was collected to determine the plants identity; however, final identification will require sample plants in the fruiting stage. Unfortunately, this species often goes many years without fruiting. There are two other species that are similar in appearance to *S. fluviatalis*; however, these species are more common to coastal marshes.

Although river bulrush currently has no state or federal status, it probably will be considered for state listing. Until 1992, it had not been known to occur in Tennessee or in the southeastern United States, but it has been recently reported from Henry County, Tennessee (Chester and Wofford 1992). This sighting is the first known occurrence of this species in the southeastern United States.

The river bulrush could be a recent arrival in eastern Tennessee. The seeds may have been carried into the area by waterfowl, and the reported occurrences in Tennessee may represent range expansion. Alternatively, the ORR population may be derived from a local unreported population (perhaps along the Clinch River) that has been isolated from the main range of the species for a sufficient period of time to evolve a genetically distinct population. The ORR population would then be significant from the standpoint of genetic diversity and preservation of biodiversity, even if it is not currently a state-listed species. Genetic distinctiveness can sometimes be determined by morphological or electrophoretic studies. Protection of its wetland area in Waste Area Grouping (WAG) 2 is recommended.

3. Whorled horse-balm (*Collinsonia verticillata*). L. Pounds, consultant to the Oak Ridge National Environmental Research Park, has asked the TDEC to consider this species for listing. It appears to prefer mature woods. In its small range (Ludwig 1991), such mature forests may be threatened. There are two known sites for this species on the ORR. It is rare to uncommon throughout its range (Ludwig 1991).

APPENDIX C REFERENCES

Chester, E. H., and B. E. Wofford. 1992. *Scirpus fluviatilis* (Cyperaceae) in Tennessee and the southeast. Sida 15:137–159.

Collins, J. L., and T. F. Wieboldt. 1992. *Trifolium calcaricum* (Fabaceae), a new clover from limestone barrens of eastern United States. Castanea 57(4):282–286.

Porter, D. M. 1991. Whorled horse-balm. pp. 139–140. In K. Terwilliger (ed.), Virginia's Endangered Species. The McDonald and Woodward Publishing Company, Blacksburg, Virginia.

APPENDIX D

ADDITIONAL VERY RARE SPECIES THAT MAY BE PRESENT ON THE ORR

Tables 3 and 4 list the rare plant species thought most likely to be discovered on the ORR in the future. Other species, though not as likely on the ORR, are discussed here because of their great need for protection. The first three species listed herein were suggested to us by USFWS ((D. B. Winford, USFWS, personal communication to B. A. Rosensteel, Oak Ridge National Research Park, Oak Ridge, Tenn., January 1991). The other two species suggested by USFWS are known from the ORR.

1. American hart's tongue fern (*Phyllitis scolopendrium* var. *americana*). This species is found in this part of its range in the microclimate of cave entrances. There is a nineteenth-century record of this species having been found in a cave entrance in Roane County. Known cave entrances on the ORR have been checked for this species. Federal status: T.

2. Virginia spiraea (*Spiraea virginiana*). This species is known from the shores of fast-flowing streams. L. Pounds recently found this species in Roane County outside of the ORR. Its habitat is perhaps lacking on the ORR. Federal status: T.

3. Barbara's buttons (*Marshallia grandifora*). This species is found locally on gravel bars in the Emory–Obed watershed. This habitat is lacking on the ORR.

4. Dwarf whorled pogonia (*Isotria medeoloides*). This species has recently been found in Hamilton County. This species is found in second growth forest, which is a common habitat on the ORR. Federal status: E.

5. *Trifolium calcaricum* (no common name). This is a newly described species of limestone barrens (Collins and Wieboldt 1992). It is known to exist from middle Tennessee and southwest Virginia.

APPENDIX E

THREE CHECKLISTS OF VASCULAR PLANT SPECIES ASSOCIATED WITH THE ORR BASED ON INFORMATION GATHERED THROUGH AUGUST 1992

In brief, the three lists are:

List 1 — Plants verified from the current ORR.

List 2 — Plants (not on List 1) that are known from areas that were originally part of the ORR but have been transferred to other ownership.

List 3 — Plants previously listed as occurring on the ORR but not currently verified.

During the summer of 1991, the updated list of plant species for the ORR from the Research Park files was checked against specimens in the ORR Herbarium (ORRH) and in the U.T. Herbarium (TENN). Also, an effort was made to determine, from locations indicated on herbarium sheets, if the specimens are from areas that are no longer part of the ORR or are permanently flooded by Melton Hill Dam. Botanists Larry Pounds and Rebecca Cook checked the updated ORR species list by using voucher specimens or personal knowledge of the species' occurrence on the ORR. This allowed the creation of the three lists that follow in this appendix.

Maintaining an accurate list of species for the ORR is difficult because of (1) changes in nomenclature, (2) sale of ORR land, (3) continuing discovery of new species, and (4) lack of funding for curating the ORR Herbarium (specimens have been lost). An accurate flora for the ORR is important for many areas of ecological research (e.g., biodiversity research). The flora of the ORR has been used for such research in the past.

The authors believe that this appendix will focus efforts to improve our knowledge of plant species occurring on the ORR. Research Park staff will continue to look for additions to the ORR flora and to provide vouchers for these species as the opportunities arise.

The nomenclature used here is based on Kartesz and Kartesz (1980). Exceptions have been made in special cases. The state of Tennessee is in the process of creating a state flora. When this is complete, the ORR flora should be modified to agree with the nomenclature used by the state of Tennessee.

In all three lists, the species are alphabetical by genus. Table E.1 summarizes the abbreviations used in this appendix.

Table E.1. Abbreviations used in Appendix E

Status code abbreviation	Explanation
ORRH	Indicates that there is a specimen for this species at the ORR Herbarium
r	Indicates that this species has been reported confidently to occur on the ORR by a botanist
SC	Indicates that there is a specimen for this species at the ORR Herbarium in the 0800 special collection. This collection has specimens only from the 0800 research area at the ORR
TENN	Indicates that there is a specimen for this species at the U.T. Herbarium
WE	Indicates that there is a specimen for this species collected by William Ellis from an area that was part of the ORR that may now be flooded by Melton Lake
P	Indicates a species that is vouched for by a photograph in the ORR Research Park Office
var.	Indicates a variety of a species
syn.	Indicates a synonym

APPENDIX E REFERENCES

Kartesz, J. T., and R. M. Kartesz. 1980. A Synonymized Checklist of the Vascular Flora of the United States, Canada, and Greenland. The University of North Carolina Press, Chapel Hill.

Mann, L. K., T. S. Patrick, and H. R. DeSelm. 1985. A checklist of the vascular plants on the Department of Energy Oak Ridge Reservation. J. Tenn. Acad. Sci. 60(11):1-12.

LIST 1 THE VERIFIED ORR FLORA

This list includes species with specimens at the ORR Herbarium (coded ORRH or SC), specimens at the U.T. Herbarium (coded TENN), and species coded r with locations on the ORR. Species with the code SC have a specimen at the ORR Herbarium but the specimen is part of the special collection from the 0800 area of the ORR. The species on List 1 coded r do not have a specimen in either herbarium from the ORR but are reported for the ORR with confidence by a botanist.

Genus	Species	Code	Synonym, variety, or comment
Abutilon	*theophrasti*	ORRH	
Acalypha	*gracilens*	ORRH	
Acalypha	*rhomboidea*	ORRH	
Acalypha	*virginica*	ORRH	
Acer	*negundo*	ORRH	
Acer	*rubrum*	ORRH	
Acer	*saccharinum*	ORRH	
Acer	*saccharum*	ORRH	
Achillea	*millefolium*	ORRH	
Aconitum	*uncinatum*	ORRH	
Acorus	*calamus*	ORRH	
Actaea	*pachypoda*	ORRH	
Adiantum	*pedatum*	ORRH	
Aesculus	*flava*	ORRH	
Aesulus	*sylvatica*	ORRH	
Agalinus	*purpurea*	ORRH	
Agalinus	*tenuifolia*	ORRH	
Agastache	*nepetoides*	ORRH	
Agrimonia	*parviflora*	ORRH	
Agrimonia	*pubescens*	ORRH	
Agrimonia	*rostellata*	ORRH	
Agropyron	*repens*	ORRH	
Agrostemma	*githago*	r	
Agrostis	*hyemalis*	SC	
Agrostis	*perennans*	ORRH	
Agrostis	*stolonifera*	ORRH	
Ailanthus	*altissima*	ORRH	
Albizia	*julibrissin*	ORRH	
Alisma	*subcordatum*	ORRH	
Allium	*canadense*	ORRH	
Allium	*cernuum*	ORRH	
Allium	*vineale*	ORRH	
Alnus	*serrulata*	ORRH	
Ambrosia	*artemisiifolia*	ORRH	
Ambrosia	*trifida*	ORRH	
Amelanchier	*arborea*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Amianthium	*muscaetoxicum*	ORRH	
Ammannia	*coccinea*	ORRH	
Amorpha	*fruticosa*	ORRH	
Ampelamus	*albidus*	ORRH	syn. *Cynanchum laeve*
Ampelopsis	*cordata*	TENN	
Amphicarpa	*bracteata*	ORRH	
Amsonia	*tabernaemontana*	ORRH	
Anagallis	*arvensis*	ORRH	
Andropogon	*gerardii*	ORRH	
Andropogon	*ternarius*	ORRH	
Andropogon	*virginicus*	ORRH	
Aneilema	*keisak*	ORRH	
Anemone	*quinquefolia*	ORRH	
Anemone	*virginiana*	ORRH	
Angelica	*venenosa*	ORRH	
Antennaria	*plantaginifolia*	ORRH	
Antennaria	*solitaria*	ORRH	
Apios	*americana*	ORRH	
Apocynum	*cannabinum*	ORRH	
Aquilegia	*canadensis*	ORRH	
Arabidopsis	*thaliana*	ORRH	
Arabis	*canadensis*	r	
Arabis	*laevigata*	ORRH	
Aralia	*spinosa*	ORRH	
Arenaria	*patula*	ORRH	syn. *Minuartia patula*
Arisaema	*dracontium*	ORRH	
Arisaema	*triphyllum*	ORRH	
Aristida	*longespica*	ORRH	
Aristida	*oligantha*	ORRH	
Aristolochia	*macrophylla*	ORRH	
Aristolochia	*serpentaria*	ORRH	
Aronia	*arbutifolia*	ORRH	
Arthraxon	*hispidus*	ORRH	
Aruncus	*dioicus*	r	
Arundinaria	*gigantea*	ORRH	
Asarum	*canadense*	ORRH	
Asclepias	*amplexicaulis*	ORRH	
Asclepias	*incarnata*	ORRH	
Asclepias	*syriaca*	ORRH	
Asclepias	*tuberosa*	ORRH	
Asclepias	*variegata*	ORRH	
Asclepias	*verticillata*	ORRH	
Asimina	*triloba*	ORRH	
Asparagus	*officinalis*	ORRH	
Asplenium	*montanum*	r	
Asplenium	*platyneuron*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Asplenium	*resiliens*	ORRH	
Asplenium	*rhizophyllum*	ORRH	
Asplenium	*ruta-muraria*	ORRH	
Asplenium	*trichomanes*	r	
Asplenium	*x ebenoides*	r	at Bull Bluff
Aster	*cordifolius*	ORRH	
Aster	*dumosus*	ORRH,TENN	
Aster	*infirmus*	ORRH	
Aster	*lateriflorus*	ORRH	
Aster	*novae-anglae*	ORRH	
Aster	*oblongifolius*	ORRH	
Aster	*ontarionis*	ORRH	
Aster	*patens*	ORRH	
Aster	*paternus*	ORRH	
Aster	*pilosus*	ORRH	
Aster	*sagittifolius*	ORRH	
Aster	*shortii*	ORRH	
Aster	*undulatus*	ORRH	
Astilbe	*biternata*	ORRH	
Astragalus	*canadensis*	ORRH	
Athyrium	*filix-femina*	ORRH	var. *asplenioides*
Athyrium	*pycnocarpon*	r	
Athyrium	*thelypteroides*	TENN	
Aureolaria	*laevigata*	ORRH	
Aureolaria	*patula*	ORRH	
Aureolaria	*virginica*	ORRH	
Barbarea	*verna*	ORRH	
Barbarea	*vulgaris*	ORRH	var. *arcuata*
Bartonia	*paniculata*	ORRH	
Bidens	*cernua*	ORRH	
Bidens	*frondosa*	ORRH	
Bidens	*polylepis*	ORRH	
Bidens	*tripartita*	ORRH	
Bignonia	*capreolata*	ORRH	
Blephilia	*ciliata*	r	mat-forming variety
Boehmeria	*cylindrica*	ORRH	
Botrichium	*biternatum*	ORRH	
Botrichium	*dissectum*	ORRH	
Botrychium	*virginianum*	ORRH	
Bouteloua	*curtipendula*	ORRH	
Brachyeletrum	*erectum*	ORRH	
Brassica	*napus*	SC	syn. *Brassica rapa*
Brickellia	*mosieri*	ORRH	syn. *Kuhnia eupatorioides*
Bromus	*commutatus*	ORRH	
Bromus	*japonicus*	ORRH	
Bromus	*pubescens*	ORRH	syn. *Bromus purgans*

Genus	Species	Code	Synonym, variety, or comment
Bulbostylis	*capillaris*	ORRH	
Bumelia	*lycioides*	ORRH	
Cacalia	*atriplicifolia*	TENN	
Callitriche	*heterophylla*	ORRH	
Calycanthus	*fertilis*	r	var. *laevigatus* syn. *C. floridus*
Calystegia	*sepium*	ORRH	
Campanula	*americana*	ORRH	
Campanula	*divaricata*	ORRH	
Campsis	*radicans*	ORRH	
Capsella	*bursa-pastoris*	ORRH	
Cardamine	*angustata*		var. *angustate* syn. *Dentaria heterophylla*
Cardamine	*bulbosa*	ORRH	
Cardamine	*concatenata*	TENN	syn. *Dentaria laciniata*
Cardamine	*diphylla*	TENN	syn. *Dentaria diphylla*
Cardamine	*heterophylla*	ORRH	syn. *Dentaria heterophylla*
Cardamine	*hirsuta*	ORRH	
Carex	*abscondita*	TENN	
Carex	*albolutescens*	ORRH	
Carex	*amphibola*	ORRH	
Carex	*artitecta*	TENN	
Carex	*atlantica*	ORRH	var. *incomperta* (Need to collect again; taxon is questionable.)
Carex	*baileyi*	TENN	
Carex	*blanda*	ORRH	
Carex	*caroliniana*	ORRH	
Carex	*cephalophora*	ORRH	
Carex	*complanata*	ORRH	see *Carex hirsutella*
Carex	*crinita*	ORRH	
Carex	*digitalis*	ORRH	
Carex	*emmonsii*	ORRH	
Carex	*festucacea*	ORRH	
Carex	*frankii*	ORRH	
Carex	*granularis*	ORRH	
Carex	*gravida*	ORRH	
Carex	*grayi*	ORRH	
Carex	*hirsutella*	ORRH	var. *hirsuta* syn. *C. complanata*
Carex	*intumescens*	ORRH	
Carex	*laevivaginata*	ORRH	
Carex	*laxiflora*	ORRH	
Carex	*leptalea*	ORRH	
Carex	*louisianica*	ORRH	
Carex	*lupulina*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Carex	*lurida*	ORRH	
Carex	*meadii*	ORRH	
Carex	*nigromarginata*	TENN	
Carex	*normalis*	ORRH	
Carex	*oligocarpa*	ORRH	
Carex	*pensylvanica*	ORRH	
Carex	*prasina*	ORRH	
Carex	*radiata*	ORRH	syn. *C. rosea*
Carex	*shortiana*	ORRH	
Carex	*squarrosa*	ORRH	
Carex	*striatula*	ORRH	questionable specimen
Carex	*tribuloides*	ORRH	
Carex	*vulpinoidea*	ORRH	
Carex	*willdenowii*	ORRH	
Carpinus	*caroliniana*	ORRH	
Carya	*cordiformis*	ORRH	
Carya	*glabra*	ORRH	
Carya	*ovalis*	r	var. *odorata* syn. *Carya glabra*
Carya	*ovata*	ORRH	var. *ovata*
Carya	*ovata*	ORRH	var. *australis*
Carya	*tomentosa*	ORRH	
Cassia	*fasciculata*	ORRH	
Cassia	*marilandica*	ORRH	
Cassia	*nictitans*	ORRH	
Cassia	*obtusifolia*	ORRH	syn. *C. tora*
Castanea	*dentata*	ORRH	
Caulophyllum	*thalictroides*	ORRH	
Ceanothus	*americanus*	ORRH	
Celastrus	*scandens*	ORRH	
Celtis	*laevigata*	TENN	
Celtis	*occidentalis*	ORRH	
Centaurea	*cyanus*	ORRH	
Centaurea	*maculosa*	ORRH	
Centrosema	*virginianum*	ORRH	
Cephalanthus	*occidentalis*	ORRH	
Cerastium	*glomeratum*	ORRH	
Cerastium	*vulgatum*	ORRH	ssp. *triviale* syn. *C. fontanum*
Ceratophyllum	*demersum*	ORRH	
Cercis	*canadensis*	ORRH	
Chaerophyllum	*tainturieri*	ORRH	
Chamaelirium	*luteum*	r	
Chasmanthium	*latifolium*	ORRH	
Chasmanthium	*sessiliflorum*	ORRH	
Cheilanthes	*alabamensis*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Cheilanthes	*lanosa*	ORRH	
Chelone	*glabra*	ORRH	
Chenopodium	*ambrosioides*	ORRH	
Chimaphila	*maculata*	ORRH	
Chionanthus	*virginicus*	r	
Cichorium	*intybus*	ORRH	
Cicuta	*maculata*	ORRH	
Cimicifuga	*racemosa*	ORRH	
Cimicifuga	*rubifolia*	ORRH	
Cinna	*arundinacea*	ORRH	
Circaea	*lutetiana*	r	var. *canadensis*
Cirsium	*discolor*	ORRH	
Cirsium	*vulgare*	ORRH	
Claytonia	*caroliniana*	ORRH	
Claytonia	*virginica*	ORRH	
Clematis	*versicolor*	ORRH	
Clematis	*viorna*	ORRH	
Clematis	*virginana*	ORRH	
Clitoria	*mariana*	ORRH	
Cocculus	*carolinus*	ORRH	
Collinsonia	*canadensis*	ORRH	
Collinsonia	*verticillata*	r	
Commelina	*communis*	ORRH	
Commelina	*erecta*	ORRH	
Commelina	*virginica*	ORRH	
Conoclinium	*coelestinum*	ORRH	syn. *Eupatorium coelestinum*
Conopholis	*americana*	ORRH	
Consolida	*ambigua*	ORRH	syn. *Delphium ajacis*
Convallaria	*majalis*	ORRH	
Conyza	*canadensis*	ORRH	
Corallorrhiza	*odontorhiza*	ORRH	
Coreopsis	*auriculata*	ORRH	
Coreopsis	*major*	ORRH	
Coreopsis	*tinctoria*	ORRH	
Coreopsis	*tripteris*	ORRH	
Cornus	*amomum*	ORRH	
Cornus	*florida*	ORRH	
Cornus	*foemina*	ORRH	
Coronilla	*varia*	ORRH	
Corydalis	*flavula*	ORRH	
Corylus	*americana*	ORRH	
Crataegus	*crus-galli*	ORRH	
Crotalaria	*sagittalis*	ORRH	
Croton	*glandulosus*	ORRH	
Cryptotaenia	*canadensis*	ORRH	
Cunila	*origanoides*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Cuphea	*viscosissima*	r	
Cuscuta	*campestris*	ORRH	
Cuscuta	*compacta*	ORRH	
Cuscuta	*gronovii*	TENN	
Cynodon	*dactylon*	TENN	
Cynoglossum	*virginianum*	TENN	
Cyperus	*brevifolius*	ORRH	
Cyperus	*dipsaciformis*	ORRH	
Cyperus	*esculentus*	ORRH	
Cyperus	*ferruginescens*	TENN	
Cyperus	*flavescens*	TENN	var. *poaeformis*
Cyperus	*lancastriensis*	ORRH	
Cyperus	*odoratus*	ORRH	
Cyperus	*ovularis*	ORRH	
Cyperus	*strigosus*	ORRH	
Cyperus	*tenuifolius*	ORRH	
Cypripedium	*acaule*	r	
Cystopteris	*bulbifera*	ORRH	
Cystopteris	*protrusa*	r	
Dactylis	*glomerata*	ORRH	
Danthonia	*spicata*	ORRH	
Dasistoma	*macrophylla*	ORRH	
Datura	*stramonium*	ORRH	
Daucus	*carota*	ORRH	
Delphinium	*ajacis*	r	
Delphinium	*exaltatum*	ORRH	
Delphinium	*tricorne*	ORRH	
Dennstaedtia	*punctilobula*	ORRH	
Desmanthus	*illinoesis*	ORRH	
Desmodium	*ciliare*	ORRH	
Desmodium	*cuspidatum*	ORRH	
Desmodium	*dillenii*	TENN	var. *dillenii* syn. *D. paniculatum*
Desmodium	*marilandicum*	ORRH	
Desmodium	*nudiflorum*	ORRH	
Desmodium	*nuttallii*	ORRH	
Desmodium	*pauciflorum*	ORRH	
Desmodium	*rotundifolium*	ORRH	
Desmodium	*viridiflorum*	SC	
Dianthus	*armeria*	ORRH	
Dichanthelium	*acuminatum*	ORRH	syn. *Panicum acuminatum*
Dichanthelium	*boscii*	ORRH	syn. *Panicum boscii*
Dichanthelium	*clandestinum*	ORRH	syn. *Panicum clandestinum*
Dichanthelium	*commutatum*	ORRH	syn. *Panicum commutatum*
Dichanthelium	*depanperatum*	ORR	syn. *Panicum depanperatum*
Dichanthelium	*dichotomum*	ORRH	syn. *Panicum dichotomum*

Genus	Species	Code	Synonym, variety, or comment
Dichanthelium	*lanuginosum*	ORRH	syn. *Panicum lanuginosum*
Dichanthelium	*laxiflorum*	ORRH	syn. *Panicum laxiflorum*
Dichanthelium	*meridionale*	ORRH	syn. *Panicum meridionale*
Dichanthelium	*scoparium*	TENN	syn. *Panicum scoparium*
Dichanthelium	*sphaerocarpon*	ORRH	syn. *Panicum sphaerocarpon*
Diervilla	*lonicera*	P	
Digitaria	*ischaemum*	ORRH	
Digitaria	*sanguinalis*	ORRH	
Diodia	*teres*	ORRH	
Diodia	*virginiana*	ORRH	
Dioscorea	*quaternata*	ORRH	syn. *D. villosa*
Diospyros	*virginiana*	ORRH	
Dipsacus	*sylvestris*	r	syn. *D. fullonum*
Dodecatheon	*meadia*	r	
Draba	*verna*	TENN	
Dryopteris	*intermedia*	ORRH	
Dryopteris	*marginalis*	TENN	
Duchnesea	*indica*	ORRH	
Echinacea	*purpurea*	ORRH	
Echinochloa	*crusgalli*	ORRH	
Echinochloa	*muricata*	TENN	
Eclipta	*alba*	ORRH	
Elaeagnus	*umbellata*	ORRH	
Eleocharis	*acicularis*	ORRH	
Eleocharis	*obtusa*	ORRH	
Eleocharis	*palustris*	ORRH	
Eleocharis	*quadrangulata*	ORRH	
Eleocharis	*tenuis*	ORRH	
Elephantopus	*carolinianus*	ORRH	
Elephantopus	*tomentosus*	ORRH	
Eleusine	*indica*	ORRH	
Elodea	*nuttallii*	ORRH	
Elymus	*villosus*	ORRH	
Elymus	*virginicus*	ORRH	var. *virginicus*
Elymus	*virginicus*	ORRH	var. *glabriflorus*
Elymus	*virginicus*	ORRH	var. *hirsutiglumis*
Epifagus	*virginiana*	r	
Epigaea	*repens*	ORRH	
Epilobium	*coloratum*	ORRH	
Equisetum	*arvense*	ORRH	
Equisetum	*hyemale*	ORRH	
Eragrostis	*cilianensis*	ORRH	
Eragrostis	*hypnoides*	ORRH	
Eragrostis	*spectabilis*	ORRH	
Erechtites	*hieracifolia*	ORRH	
Erianthus	*alopecuroides*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Erianthus	*giganteus*	ORRH	
Erigenia	*bulbosa*	ORRH	
Erigeron	*annuus*	ORRH	
Erigeron	*philadelphicus*	ORRH	
Erigeron	*pulchellus*	ORRH	
Erigeron	*strigosus*	ORRH	
Erythronium	*americanum*	ORRH	
Erythronium	*umbilicatum*	TENN	
Eulalia	*viminea*	ORRH	syn. *Microstegium vimineum*
Euonymus	*americanus*	ORRH	
Euonymus	*atropurpureus*	ORRH	
Eupatoriadelphu	*purpureus*	ORRH	syn. *Eupatorium purpureum*
Eupatorium	*capillifolium*	ORRH	
Eupatorium	*fistulosum*	ORRH	
Eupatorium	*hyssopifolium*	ORRH	
Eupatorium	*perfoliatum*	ORRH	
Eupatorium	*rotundifolium*	ORRH	
Eupatorium	*rugosum*	ORRH	
Eupatorium	*serotinum*	ORRH	
Eupatorium	*sessilifolium*	ORRH	
Euphorbia	*corollata*	ORRH	
Euphorbia	*maculata*	ORRH	
Euphorbia	*mercurialina*	r	
Euphorbia	*nutans*	ORRH	
Euthamia	*graminifolia*	ORRH	
Fagus	*grandifolia*	ORRH	
Festuca	*elatior*	SC	var. *arudinacea* syn. *F. arundinacea*
Fimbristylis	*autumnalis*	ORRH	
Fleishmannia	*incarnata*	r	
Fothergilla	*major*	ORRH	
Fragaria	*virginiana*	ORRH	
Fraxinus	*americana*	ORRH	var. *biltimoreana*
Fraxinus	*americana*	ORRH	var. *americana*
Fraxinus	*pennsylvanica*	ORRH	
Fraxinus	*quadrangulata*	ORRH	
Galactia	*volubilis*	ORRH	
Galearis	*spectabilis*	ORRH	
Galinsoga	*quadriradiata*	ORRH	
Galium	*aparine*	ORRH	
Galium	*circaezans*	ORRH	
Galium	*obtusum*	ORRH	
Galium	*parisiense*	ORRH	
Galium	*pedemontanum*	ORRH	
Galium	*pilosum*	ORRH	
Galium	*tinctorium*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Galium	*triflorum*	ORRH	
Gamochaeta	*purpurea*	ORRH	syn. *Gnaphalium purpureum*
Gaultheria	*procumbens*	ORRH	
Gaura	*biennis*	ORRH	
Gaura	*filipes*	ORRH	
Gaylussacia	*baccata*	ORRH	
Gentiana	*saponaria*	TENN	
Gentiana	*villosa*	ORRH	
Gentianella	*quinquefolia*	ORRH	syn. *Gentiana quinquefolia*
Geranium	*carolinianum*	ORRH	
Geranium	*maculatum*	SC	
Geum	*canadense*	ORRH	
Geum	*vernum*	ORRH	
Geum	*virginianum*	TENN	
Gleditsia	*triacanthos*	ORRH	
Glyceria	*striata*	ORRH	
Gnaphalium	*obtusifolium*	ORRH	
Goodyera	*pubescens*	ORRH	
Gratiola	*neglecta*	ORRH	
Gratiola	*virginiana*	ORRH	
Hackelia	*virginiana*	r	
Hamamelis	*virginiana*	r	
Hedeoma	*pulegioides*	ORRH	
Helenium	*autumnale*	ORRH	
Helenium	*flexuosum*	ORRH	
Helianthus	*angustifolius*	ORRH	
Helianthus	*atrorubens*	ORRH	
Helianthus	*hirsutus*	ORRH	
Helianthus	*maximiliani*	ORRH	
Helianthus	*microcephalus*	TENN	
Helianthus	*strumosus*	ORRH	
Helianthus	*tuberosus*	TENN	
Heliopsis	*helianthoides*	ORRH	
Hemerocallis	*fulva*	r	
Hepatica	*nobilis*	ORRH	var. *acuta* syn. *Hepatica acutiloba*
Hepatica	*nobilis*	ORRH	var. *obtusa* syn. *Hepatica americana*
Heterotheca	*camporum*	ORRH	
Heterotheca	*graminifolia*	ORRH	syn. *Pityopsis graminifolia*
Heterotheca	*mariana*	ORRH	syn. *Chrysopsis mariana*
Heuchera	*americana*	ORRH	
Heuchera	*villosa*	ORRH	
Hexalectris	*spicata*	ORRH	
Hexastylis	*arifolia*	ORRH	
Hibiscus	*laevis*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Hibiscus	*moscheutos*	ORRH	
Hieracium	*gronovii*	ORRH	
Hieracium	*venosum*	ORRH	
Holcus	*lanatus*	ORRH	
Houstonia	*caerulea*	ORRH	
Houstonia	*canadensis*	ORRH	
Houstonia	*longifolia*	ORRH	
Houstonia	*nigricans*	ORRH	
Houstonia	*purpurea*	ORRH	
Houstonia	*tenuifolia*	ORRH	
Hybanthus	*concolor*	ORRH	
Hydrangea	*arborescens*	ORRH	
Hydrastis	*canadensis*	P	
Hymenocallis	*occidentalis*	ORRH	syn. *H. caroliniana*
Hypercium	*stragalum*	ORRH	
Hypericum	*densiflorum*	ORRH	
Hypericum	*denticulatum*	ORRH	
Hypericum	*dolabriforme*	ORRH	
Hypericum	*drummondii*	ORRH	
Hypericum	*gentianoides*	ORRH	
Hypericum	*mutilum*	ORRH	
Hypericum	*perforatum*	ORRH	
Hypericum	*punctatum*	ORRH	
Hypericum	*sphaerocarpum*	ORRH	
Hypopitys	*monotropa*	ORRH	
Hypoxis	*hirsuta*	ORRH	
Hystrix	*patula*	r	
Ilex	*beadlei*	ORRH	
Ilex	*montana*	ORRH	
Ilex	*opaca*	ORRH	
Impatiens	*capensis*	ORRH	
Impatiens	*pallida*	ORRH	
Ipomoea	*coccinea*	ORRH	
Ipomoea	*hederacea*	ORRH	
Ipomoea	*lacunosa*	ORRH	
Ipomoea	*pandurata*	ORRH	
Ipomoea	*purpurea*	ORRH	
Iris	*cristata*	r	
Iris	*germanica*	r	may not be established
Isoetes	*caroliniana*	ORRH	further study of *Isoetes* is needed
Isoetes	*engelmannii*	ORRH	
Itea	*virginica*	ORRH	
Jeffersonia	*diphylla*	ORRH	
Juglans	*cinerea*	ORRH	
Juglans	*nigra*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Juncus	*acuminatus*	ORRH	
Juncus	*biflorus*	ORRH	
Juncus	*brachycarpus*	ORRH	
Juncus	*coriaceus*	ORRH	
Juncus	*debilis*	TENN	
Juncus	*effusus*	ORRH	var. *solutus*
Juncus	*interior*	ORRH	
Juncus	*marginatus*	ORRH	
Juncus	*scirpoides*	ORRH	
Juncus	*secundus*	ORRH	
Juncus	*tenuis*	ORRH	var. *dudleyi* syn. *J. dudleyi*
Juncus	*tenuis*	ORRH	var. *tenuis*
Juniperus	*virginiana*	ORRH	
Justicia	*americana*	ORRH	
Kalmia	*latifolia*	r	
Krigia	*biflora*	ORRH	
Krigia	*virginica*	SC	
Lactuca	*canadensis*	ORRH	
Lactuca	*floridana*	TENN	
Lactuca	*saligna*	ORRH	
Lactuca	*serriola*	ORRH	
Lamium	*amplexicaule*	ORRH	
Leersia	*oryzoides*	ORRH	
Leersia	*virginica*	ORRH	
Leonurus	*cardiaca*	ORRH	
Lepidium	*campestre*	ORRH	
Lepidium	*virginicum*	ORRH	
Lespedeza	*capitata*	ORRH	
Lespedeza	*cuneata*	ORRH	
Lespedeza	*hirta*	ORRH	
Lespedeza	*procumbens*	ORRH	
Lespedeza	*repens*	ORRH	
Lespedeza	*stipulacea*	ORRH	
Lespedeza	*striata*	ORRH	
Lespedeza	*violacea*	ORRH	
Leucanthemum	*vulgare*	ORRH	
Leucospora	*multifida*	ORRH	
Leucothoe	*fontanesiana*	ORRH	
Liatris	*spicata*	ORRH	
Ligusticum	*canadense*	ORRH	
Ligustrum	*sinense*	ORRH	
Lilium	*canadense*	P	
Linaria	*vulgaris*	ORRH	
Lindera	*benzoin*	ORRH	
Lindernia	*anagallidea*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Lindernia	*dubia*	ORRH	
Linum	*medium*	ORRH	var. *texanum*
Linum	*striatum*	ORRH	
Linum	*virginianum*	ORRH	
Liparis	*liliifolia*	r	
Liparis	*loeselii*	P	
Liquidambar	*styraciflua*	ORRH	
Liriodendron	*tulipifera*	ORRH	
Lithospermum	*canescens*	TENN	
Lobelia	*cardinalis*	ORRH	
Lobelia	*inflata*	ORRH	
Lobelia	*puberula*	ORRH	
Lobelia	*siphilitica*	ORRH	
Lobelia	*spicata*	ORRH	
Lolium	*multiflorum*	ORRH	
Lolium	*perenne*	ORRH	
Lonicera	*japonica*	ORRH	
Lotus	*corniculatus*	ORRH	
Ludwigia	*alternifolia*	ORRH	
Ludwigia	*decurrens*	ORRH	
Ludwigia	*palustris*	ORRH	
Luzula	*acuminata*	TENN	
Luzula	*campestris*	ORRH	
Luzula	*echinata*	TENN	
Lycopodium	*flabelliforme*	ORRH	
Lycopodium	*lucidulum*	ORRH	
Lycopodium	*obscurum*	ORRH	
Lycopus	*americanus*	ORRH	
Lycopus	*virginicus*	ORRH	
Lygodium	*palmatum*	ORRH	
Lyonia	*ligustrina*	ORRH	
Lysimachia	*ciliata*	ORRH	
Lysimachia	*lanceolata*	ORRH	
Lysimachia	*nummularia*	ORRH	
Lysimachia	*quadrifolia*	ORRH	
Lythrum	*alatum*	ORRH	
Lythrum	*salicaria*	ORRH	
Maclura	*pomifera*	SC	
Magnolia	*acuminata*	ORRH	
Magnolia	*tripetala*	ORRH	
Malaxis	*unifolia*	ORRH	
Malus	*pumila*	TENN	
Manfreda	*virginica*	ORRH	
Matelea	*decipiens*	ORRH	
Matelea	*gonocarpa*	ORRH	
Mecardonia	*acuminata*	TENN	

Genus	Species	Code	Synonym, variety, or comment
Medeola	*virginiana*	ORRH	
Medicago	*lupulina*	ORRH	
Melica	*mutica*	ORRH	
Melilotus	*alba*	ORRH	
Melilotus	*officinalis*	ORRH	
Mentha	*spicata*	ORRH	
Mentha	*x piperita*	ORRH	
(*Microstegium* see *Eulalia*)			
Mimulus	*alatus*	ORRH	
Mimulus	*ringens*	ORRH	
Mitchella	*repens*	ORRH	
Mitella	*diphylla*	ORRH	
Mollugo	*verticillata*	ORRH	
Monarda	*didyma*	ORRH	
Monarda	*fistulosa*	ORRH	
Monotropa	*uniflora*	TENN	
Morus	*rubra*	ORRH	
Mosla	*dianthera*	ORRH	
Muhlenbergia	*frondosa*	TENN	
Muhlenbergia	*schreberi*	ORRH	
Muhlenbergia	*tenuiflora*	ORRH	
Myosotis	*verna*	ORRH	
Myosurus	*minimus*	ORRH	
Myriophyllum	*spicatum*	ORRH	
Najas	*guadalupensis*	ORRH	
Nasturtium	*officinale*	ORRH	
Nicandra	*physalodes*	ORRH	
Nyssa	*sylvatica*	ORRH	
Obolaria	*virginica*	ORRH	
Oenothera	*biennis*	ORRH	
Oenothera	*fruticosa*	ORRH	
Oenothera	*laciniata*	ORRH	
Onoclea	*sensibilis*	ORRH	
Ophioglossum	*engelemannii*	ORRH	
Ophioglossum	*vulgatum*	ORRH	
Opuntia	*humifusa*	r	
Orobanche	*uniflora*	r	
Orontium	*aquaticum*	ORRH	
Osmunda	*cinnamomea*	ORRH	
Osmunda	*regalis*	ORRH	var. *spectabilis*
Ostrya	*virginiana*	ORRH	
Oxalis	*dillenii*	ORRH	
Oxalis	*stricta*	ORRH	
Oxalis	*violacea*	ORRH	
Oxydendron	*arboreum*	ORRH	
Oxypolis	*rigidior*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Pachysandra	*procumbens*	ORRH	
Panax	*quinquefolius*	ORRH	
Panicum	*acuminatum*	ORRH	var. *acuminatum*
Panicum	*acuminatum*	ORRH	var. *lindheimeri*
Panicum	*anceps*	ORRH	
Panicum	*capillare*	ORRH	
Panicum	*dichotomiflorum*	ORRH	
Panicum	*flexile*	ORRH	
Panicum	*philadelphicum*	ORRH	
Panicum	*stipitatum*	ORRH	
Paronychia	*fastigiata*	TENN	
Parthenium	*integrifolium*	ORRH	
Parthenocissus	*quinquefolia*	ORRH	
Paspalum	*boscianum*	TENN	
Paspalum	*dilatatum*	ORRH	
Paspalum	*laeve*	ORRH	var. *pilosum*
Paspalum	*laeve*	ORRH	var. *laeve*
Paspalum	*pubiflorum*	ORRH	var. *glabrum*
Paspalum	*setaceum*	ORRH	var. *muhlenbergii*
Passiflora	*incarnata*	ORRH	
Passiflora	*lutea*	ORRH	
Paulownia	*tomentosa*	ORRH	
Pellaea	*atropurpurea*	ORRH	
Pellaea	*glabella*	TENN	
Penstemon	*canescens*	ORRH	
Penstemon	*digitalis*	ORRH	
Penstemon	*laevigatus*	ORRH	
Penstemon	*pallidus*	ORRH	
Penthorum	*sedoides*	ORRH	
Perilla	*frutescens*	ORRH	
Phacelia	*bipinnatifida*	ORRH	
Phacelia	*purshii*	ORRH	
Philadelphus	*hirsutus*	TENN	
Philadelphus	*inodorus*	ORRH	
Phleum	*pratense*	ORRH	
Phlox	*amoena*	TENN,ORRH	
Phlox	*amplifolia*	ORRH	
Phlox	*carolina*	ORRH	
Phlox	*divaricata*	ORRH	
Phlox	*glaberrima*	ORRH	
Phlox	*maculata*	ORRH	
Phryma	*leptostachya*	ORRH	
Phyla	*lanceolata*	ORRH	syn. *Lippia lanceolata*
Phyllanthus	*caroliniensis*	TENN	
Physalis	*longifolia*	ORRH	var. *subglabrata*
Physalis	*pubescens*	ORRH	var. *integrifolia*

Genus	Species	Code	Synonym, variety, or comment
Physalis	*virginiana*	ORRH	
Physostegia	*virginiana*	ORRH	
Phytolacca	*americana*	ORRH	
Pilea	*pumila*	ORRH	
Pinus	*echinata*	ORRH	
Pinus	*strobus*	ORRH	
Pinus	*taeda*	ORRH	
Pinus	*virginiana*	ORRH	
Plantago	*aristata*	ORRH	
Plantago	*lanceolata*	ORRH	
Plantago	*rugelii*	ORRH	
Plantago	*virginica*	ORRH	
Platanthera	*clavellata*	ORRH	
Platanthera	*flava*	ORRH	var. *herbiola*
Platanthera	*lacera*	ORRH	
Platanthera	*peramoena*	P	
Platanus	*occidentalis*	ORRH	
Pluchea	*camphorata*	ORRH	
Poa	*annua*	r	
Poa	*autumnalis*	ORRH	
Poa	*compressa*	ORRH	
Poa	*cuspidata*	TENN	
Poa	*pratensis*	ORRH	
Poa	*sylvestris*	ORRH	
Podophyllum	*peltatum*	ORRH	
Polemonium	*reptans*	ORRH	
Polygala	*curtissii*	ORRH	
Polygala	*incarnata*	ORRH	
Polygala	*sanguinea*	ORRH	
Polygala	*senega*	r	
Polygala	*verticillata*	ORRH	var. *ambigua*
Polygala	*verticillata*	ORRH	var. *verticillata*
Polygonatum	*biflorum*	ORRH	
Polygonum	*cespitosum*	ORRH	
Polygonum	*hydropiperoides*	ORRH	var. *hydropiperoides*
Polygonum	*hydropiperoides*	ORRH	var. *setaceum*
Polygonum	*lapathifolium*	ORRH	
Polygonum	*pensylvanicum*	ORRH	
Polygonum	*persicaria*	ORRH	
Polygonum	*punctatum*	ORRH	
Polygonum	*sagittatum*	ORRH	
Polygonum	*scandens*	ORRH	var. *scandens*
Polygonum	*scandens*	TENN	var. *cristatum*
Polygonum	*setaceum*	ORRH	
Polygonum	*virginianum*	ORRH	
Polymnia	*canadensis*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Polymnia	*uvedalia*	ORRH	
Polypodium	*polypodioides*	ORRH	
Polypodium	*virginianum*	ORRH	
Polystichum	*acrostichoides*	ORRH	
Populus	*alba*	TENN	
Populus	*deltoides*	ORRH	
Populus	*x jackii*	ORRH	
Porteranthus	*trifoliatus*	r	
Potamogeton	*crispus*	ORRH	
Potamogeton	*diversifolius*	ORRH	
Potamogeton	*foliosus*	ORRH	
Potamogeton	*pusillus*	ORRH	
Potentilla	*canadensis*	ORRH	
Potentilla	*norvegica*	ORRH	
Potentilla	*recta*	ORRH	
Prenanthes	*trifoliata*	ORRH	
Prunella	*vulgaris*	ORRH	
Prunus	*americana*	ORRH	
Prunus	*munsoniana*	TENN	
Prunus	*serotina*	ORRH	
Psoralea	*onobrychis*	ORRH	
Psoralea	*psoralioides*	ORRH	
Pteridium	*aquilinum*	ORRH	
Pueraria	*lobata*	ORRH	
Pycnanthemum	*incanum*	ORRH	
Pycnanthemum	*loomisii*	ORRH	
Pycnanthemum	*pilosum*	ORRH	
Pycnanthemum	*tenuifolium*	ORRH	
Pycnanthemum	*virginianum*	ORRH	
Pyrrhopappus	*carolinianus*	ORRH	
Quercus	*alba*	ORRH	
Quercus	*coccinea*	ORRH	
Quercus	*falcata*	TENN	
Quercus	*marilandica*	ORRH	
Quercus	*michauxii*	ORRH	
Quercus	*muehlenbergii*	ORRH	
Quercus	*prinus*	ORRH	syn. *Quercus montana*
Quercus	*rubra*	ORRH	
Quercus	*velutina*	ORRH	
Ranunculus	*abortius*	ORRH	
Ranunculus	*acris*	ORRH	
Ranunculus	*bulbosus*	ORRH	
Ranunculus	*carolinianus*	ORRH	
Ranunculus	*fascicularis*	TENN	
Ranunculus	*hispidus*	TENN	
Ranunculus	*recurvatus*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Ranunculus	*repens*	ORRH	
Ranunculus	*sceleratus*	TENN	
Ratibida	*pinnata*	ORRH	
Rhamnus	*caroliniana*	ORRH	
Rhexia	*virginica*	ORRH	
Rhododendron	*maximum*	r	
Rhododendron	*minus*	ORRH	
Rhododendron	*periclymenoides*	ORRH	
Rhus	*aromatica*	ORRH	
Rhus	*copallina*	ORRH	
Rhus	*glabra*	ORRH	
Rhynchosia	*tomentosa*	TENN	
Rhynchospora	*capitellata*	ORRH	
Rhynchospora	*globularis*	ORRH	
Robinia	*hispida*	ORRH	
Robinia	*pseudoacacia*	ORRH	
Rorippa	*palustris*	ORRH	
Rorippa	*sessiliflora*	ORRH	
Rosa	*carolina*	TENN	
Rosa	*multiflora*	ORRH	
Rosa	*setigera*	ORRH	
Rotala	*ramosior*	ORRH	
Rubus	*argutus*	ORRH	
Rubus	*flagellaris*	ORRH	
Rubus	*phoenicolasins*	ORRH	
Rudbeckia	*fulgida*	ORRH	
Rudbeckia	*hirta*	ORRH	
Rudbeckia	*laciniata*	ORRH	
Rudbeckia	*triloba*	ORRH	
Ruellia	*caroliniensis*	ORRH	
Ruellia	*strepens*	ORRH	
Rumex	*acetosella*	ORRH	
Rumex	*conglomeratus*	ORRH	
Rumex	*crispus*	ORRH	
Rumex	*obtusifolius*	ORRH	
Sabatia	*angularis*	ORRH	
Sagittaria	*latifolia*	ORRH	var. *latifolia*
Sagittaria	*latifolia*	ORRH	var. *obtusa*
Sagittaria	*montevidensis*	ORRH	
Salix	*babylonica*	ORRH	
Salix	*caroliniana*	ORRH	
Salix	*exigua*	ORRH	
Salix	*humilis*	ORRH	
Salix	*nigra*	ORRH	
Salvia	*lyrata*	ORRH	
Salvia	*urticifolia*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Sambucus	*canadensis*	ORRH	
Samolus	*parviflorus*	ORRH	
Sanguinaria	*canadensis*	r	
Sanicula	*canadensis*	ORRH	
Sanicula	*gregaria*	ORRH	
Sanicula	*smallii*	TENN	
Saponaria	*officinalis*	ORRH	
Sassafras	*albidum*	ORRH	
Satureja	*calamintha*	ORRH	
Satureja	*vulgaris*	ORRH	
Saururus	*cernuus*	ORRH	
Saxifraga	*careyana*	ORRH	
Schizachyrium	*scoparium*	ORRH	syn. *Andropogon scoparius*
Schrankia	*microphylla*	ORRH	
Scirpus	*americanus*	ORRH	
Scirpus	*atrovirens*	ORRH	
Scirpus	*cyperinus*	ORRH	
Scirpus	*pendulus*	ORRH	
Scirpus	*polyphyllus*	ORRH	
Scirpus	*purshianus*	ORRH	
Scirpus	*tabernaemontanii*	ORRH	
Scleria	*oligantha*	ORRH	
Scleria	*triglomerata*	ORRH	
Scrophularia	*marilandica*	ORRH	
Scutellaria	*elliptica*	ORRH	var. *hirsuta*
Scutellaria	*incana*	ORRH	var. *punctata*
Scutellaria	*integrifolia*	ORRH	
Scutellaria	*lateriflora*	ORRH	
Scutellaria	*leonardii*	ORRH	
Scutellaria	*nervosa*	ORRH	
Scutellaria	*pseudoserrata*	r	behind the pond across Highway 58 from K-25 Site
Sedum	*pulchellum*	ORRH	
Sedum	*ternatum*	ORRH	
Selaginella	*apoda*	ORRH	
Senecio	*anonymus*	ORRH	syn. *S. smallii*
Senecio	*obovatus*	ORRH	
Setaria	*faberi*	r	
Setaria	*geniculata*	ORRH	
Setaria	*glauca*	SC	
Setaria	*viridis*	ORRH	
Sibara	*virginica*	ORRH	
Sida	*spinosa*	ORRH	
Silene	*stellata*	ORRH	
Silene	*virginica*	ORRH	
Silphium	*asteriscus*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Silphium	*compositum*	ORRH	
Silphium	*terebinthinaceum*	ORRH	
Silphium	*trifoliatum*	ORRH	
Sisyrinchium	*albidum*	ORRH	
Sisyrinchium	*angustifolium*	ORRH	
Sisyrinchium	*atlanticum*	ORRH	
Sisyrinchium	*mucronatum*	ORRH	
Smilacina	*racemosa*	ORRH	
Smilax	*bona-nox*	ORRH	
Smilax	*ecirrata*	ORRH	
Smilax	*glauca*	ORRH	
Smilax	*hispida*	ORRH	
Smilax	*pulverulenta*	ORRH	
Smilax	*rotundifolia*	ORRH	
Solanum	*americanum*	ORRH	
Solanum	*carolinense*	ORRH	
Solanum	*ptycanthum*	ORRH	
Solidago	*altissima*	SC	
Solidago	*canadensis*	ORRH	
Solidago	*erecta*	ORRH	
Solidago	*flexicaulis*	TENN	
Solidago	*gigantea*	TENN	
Solidago	*nemoralis*	ORRH	
Solidago	*odora*	ORRH	
Solidago	*patula*	ORRH	
Solidago	*rigida*	ORRH	
Solidago	*rugosa*	ORRH	
Solidago	*speciosa*	ORRH	
Solidago	*sphacelata*	TENN	
Solidago	*ulmifolia*	TENN	
Sonchus	*asper*	ORRH	
Sorghastrum	*nutans*	ORRH	
Sorghum	*halepense*	ORRH	
Sphenopholis	*nitida*	ORRH	
Sphenopholis	*obtusata*	ORRH,TENN	
Spigelia	*marilandica*	ORRH	
Spiraea	*douglasii*	ORRH	may not be established
Spiraea	*tomentosa*	r	
Spiranthes	*lacera*	ORRH	var. *gracilis*
Spiranthes	*ovalis*	TENN,ORRH	
Spiranthes	*vernalis*	ORRH	
Sporobolus	*vaginiflorus*	ORRH	
Stachys	*tenuifolia*	ORRH	
Staphylea	*trifolia*	ORRH	
Stellaria	*media*	SC	
Stellaria	*pubera*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Stenanthium	*gramineum*	ORRH	
Strophostyles	*helvola*	TENN	
Stylophorum	*diphyllum*	ORRH	
Stylosanthes	*biflora*	ORRH	
Symphoricarpos	*orbiculatus*	ORRH	
Taenidia	*integerrima*	ORRH	
Taraxacum	*officinale*	ORRH	
Tephrosia	*spicata*	r	
Tephrosia	*virginiana*	ORRH	
Teucrium	*canadense*	ORRH	
Thalictrum	*dioicum*	ORRH	
Thalictrum	*revolutum*	ORRH	
Thalictrum	*thalictroides*	ORRH	syn. *Anemonella thalictroides*
Thaspium	*barbinode*	ORRH	
Thaspium	*trifoliatum*	ORRH	
Thelypteris	*hexagonoptera*	ORRH	
Thelypteris	*noveboracensis*	ORRH	
Thuja	*occidentalis*	ORRH	
Tiarella	*cordifolia*	ORRH	
Tilia	*americana*	ORRH	
Tipularia	*discolor*	ORRH	
Toxicodendron	*radicans*	ORRH	
Tradescantia	*subaspera*	ORRH	
Trichostema	*brachiatum*	r	
Trichostema	*dichotomum*	r	
Tridens	*flavus*	ORRH	
Trifolium	*campestre*	ORRH	
Trifolium	*hybridum*	ORRH	
Trifolium	*pratense*	ORRH	
Trifolium	*repens*	ORRH	
Trillium	*luteum*	ORRH	
Trillium	*sulcatum*	ORRH	
Trillium	*vaseyi*	ORRH	
Triodanis	*perfoliata*	ORRH	syn. *Specularia perfoliata*
Triosteum	*angustifolium*	ORRH	
Tripsacum	*dactyloides*	ORRH	
Tsuga	*canadensis*	ORRH	
Tussilago	*farfara*	ORRH	
Typha	*latifolia*	ORRH	
Ulmus	*alata*	ORRH	
Ulmus	*americana*	ORRH	
Ulmus	*rubra*	ORRH	
Uvularia	*grandiflora*	ORRH	
Uvularia	*perfoliata*	ORRH	
Vaccinium	*arboreum*	ORRH	
Vaccinium	*stamineum*	ORRH	

Genus	Species	Code	Synonym, variety, or comment
Vaccinium	*vacillans*	ORRH	
Valerianella	*radiata*	ORRH	
Verbascum	*blattaria*	ORRH	
Verbascum	*thapsus*	ORRH	
Verbena	*simplex*	ORRH	
Verbena	*urticifolia*	ORRH	
Verbesina	*alternifolia*	ORRH	
Verbesina	*occidentalis*	ORRH	
Verbesina	*virginica*	ORRH	
Vernonia	*gigantea*	ORRH	
Veronica	*arvensis*	ORRH	
Veronica	*anagallis-aquatica*	ORRH	
Veronica	*officinalis*	ORRH	
Veronica	*peregrina*	ORRH	
Veronicastrum	*virginicum*	ORRH	
Viburnum	*acerifolium*	ORRH	
Viburnum	*rufidulum*	ORRH	
Vicia	*dasycarpa*	ORRH	
Viola	*canadensis*	ORRH	
Viola	*conspersa*	ORRH	
Viola	*cucullata*	TENN	
Viola	*hastata*	ORRH	
Viola	*hirsutula*	ORRH	
Viola	*palmata*	TENN	
Viola	*papilionacea*	ORRH	
Viola	*rafinesquii*	ORRH	
Viola	*sagittata*	ORRH	
Viola	*sororia*	ORRH	
Viola	*triloba*	ORRH	
Viola	*tripartita*	ORRH	var. *glaberrima*
Vitex	*agnus-castus*	ORRH	may not be established
Vitis	*aestivalis*	ORRH	
Vitis	*cinerea*	ORRH	
Vitis	*riparia*	SC	
Vitis	*vulpina*	ORRH	
Vulpia	*octoflora*	ORRH	syn. *Festuca octoflora*
Woodsia	*obtusa*	ORRH	
Woodwardia	*areolata*	ORRH	
Xanthium	*strumarium*	ORRH	
Yucca	*filamentosa*	ORRH	var. *smalliana*
Zizia	*aptera*	ORRH	

LIST 2

This list includes species for which specimens are found in ORRH or TENN, but the areas from which they were collected are no longer part of the ORR. Also included in this list are species collected from the ORR by William Ellis as part of a study of the area that was to be flooded by Melton Dam. These species may have been extirpated from the ORR by the dam. These species are coded WE. It is likely that many of the species on this list will be found to occur on the present ORR.

Genus	Species	Code	Synonym, variety, or comment
Aesculus	*sylvatica*	ORRH	
Ageratina	*altissima*	TENN	Syn. *Eupatorium altissimum*
Allium	*ampeloprasum*	TENN	
Alopecurus	*carolinianus*	TENN	
Amaranthus	*spinosus*	ORRH	
Andropogon	*elliotii*	TENN	
Aristida	*purpurea*	TENN	
Asclepias	*viridiflora*	TENN	
Aster	*divaricatus*	TENN	
Aster	*laevis*	TENN	
Aureolaria	*flava*	TENN	
Berchemia	*scandens*	TENN	
Cacalia	*muehlenbergii*	TENN	
Camassia	*scilloides*	TENN	
Carex	*eburnea*	TENN	
Carex	*laxiculmis*	TENN	
Carex	*retroflexa*	TENN	
Carex	*swanii*	ORRH	
Catalpa	*bignonioides*	WE	
Desmodium	*canadense*	TENN	
Desmodium	*canescens*	TENN	
Desmodium	*paniculatum*	TENN	
Dioscorea	*batatas*	ORRH	
Disporum	*lanuginosum*	TENN	
Eragrostis	*curvula*	ORRH	
Eragrostis	*frankii*	TENN	
Erysimum	*cheiranthoides*	WE	
Euphorbia	*dentata*	TENN	
Festuca	*pratensis*	TENN	
Gladiolus	*x gandavensis*	WE	
Gnaphalium	*helleri*	TENN	
Helenium	*amarum*	TENN	
Helianthus	*decapetalus*	TENN	
Helianthus	*occidentalis*	TENN	
Iva	*annua*	TENN	
Lathyrus	*latifolius*	WE	

Genus	Species	Code	Synonym, variety, or comment
Lespedeza	*intermedia*	TENN	
Lespedeza	*virginica*	TENN	
Liatris	*aspera*	TENN	
Liatris	*cylindracea*	TENN	
Liatris	*squarrosa*	TENN	
Ligustrum	*vulgare*	TENN	
Linum	*sulcatum*	TENN	
Lithospermum	*arvense*	TENN	
Menispermum	*canadense*	TENN	
Myosotis	*macrosperma*	TENN	
Najas	*gracillima*	TENN	
Paulownia	*tomentosa*	TENN	
Phlox	*paniculata*	TENN	
Phlox	*pilosa*	TENN	
Potentilla	*simplex*	TENN	
Prunus	*angustifolia*	TENN	
Prunus	*persica*	TENN	
Quercus	*prinoides*	TENN	identification is questionable
Quercus	*shumardii*	TENN	
Quercus	*stellata*	TENN	
Ranunculus	*septentrionalis*	TENN	
Rubus	*betulifolius*	TENN	
Rubus	*hispidus*	TENN	
Rubus	*occidentalis*	TENN	
Ruellia	*humilis*	TENN	
Solidago	*ptarmicoides*	TENN	
Sporobolus	*asper*	TENN	
Sporobolus	*neglectus*	TENN	
Strophostyles	*umbellata*	TENN	
Tomanthera	*auriculata*	TENN	
Triticum	*x aestivum*	TENN	
Vaccinium	*corymbosum*	TENN	
Vinca	*minor*	TENN	
Viola	*pensylvanica*	TENN	
Waldsteinia	*fragarioides*	TENN	var. *parviflora*

LIST 3

This list includes species found on the 1985 list (Mann et al.) for which we have not been able as yet to find support for inclusion in the ORR flora. It is likely that many of them will be found to occur on the ORR. Some are represented by specimens at ORRH that are not identified by location and, thus, may not be from the ORR.

Genus	Species	Synonym, variety, or comment
Aristida	*virigata*	
Aster	*solidagineus*	
Berberis	*canadensis*	
Buxus	*sempervirens*	
Carex	*bushii*	
Carex	*flaccidula*	
Carex	*gracillima*	
Carex	*muhlenbergii*	
Catalpa	*speciosa*	
Celtis	*tenuifolia*	
Cirsium	*muticum*	
Corallorrhiza	*wisteriana*	
Coreopsis	*lanceolata*	
Crataegus	*marshallii*	
Desmodium	*glutinosum*	
Desmodium	*laevigatum*	
Diarrhena	*americana*	
Disporum	*maculatum*	
Eleocharis	*erythropoda*	
Eragrostis	*capillavis*	
Eryngium	*yuccifolium*	
Euphorbia	*pubentissima*	
Festuca	*obtusa*	syn. *F. subverticillata*
Geranium	*sphaerospermum*	
Hedera	*helix*	
Helianthus	*x laetiflorus*	
Holosteum	*umbellatum*	
Hydrophyllum	*canadense*	
Juncus	*bufonius*	
Luzula	*bulbosa*	
Luzula	*multiflora*	
Lycopus	*rubellus*	
Medicago	*sativa*	
Monarda	*x media*	
Narcissus	*pseudonarcissus*	
Panicum	*rigidulum*	syn. *P. agrostoides*
Passiflora	*edulis*	unlikely
Pedicularis	*canadensis*	

Genus	Species	Synonym, variety, or comment
Prenanthes	*altissima*	
Pyrus	*communis*	
Quercus	*bicolor*	
Rhynchosia	*latifolia*	
Scutellaria	*parvula*	var. *parvula*
Scutellaria	*parvula*	var. *australis*
Solidago	*caesia*	
Sorghastrum	*elliottii*	
Thlaspi	*perfoliatum*	
Trillium	*cuneatum*	
Trillium	*flexipes*	
Veronica	*serpyllifolia*	
Viburnum	*prunifolium*	
Vicia	*caroliniana*	
Viola	*affinis*	
Viola	*pubescens*	
Viola	*striata*	
Vitis	*rotundifolia*	

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