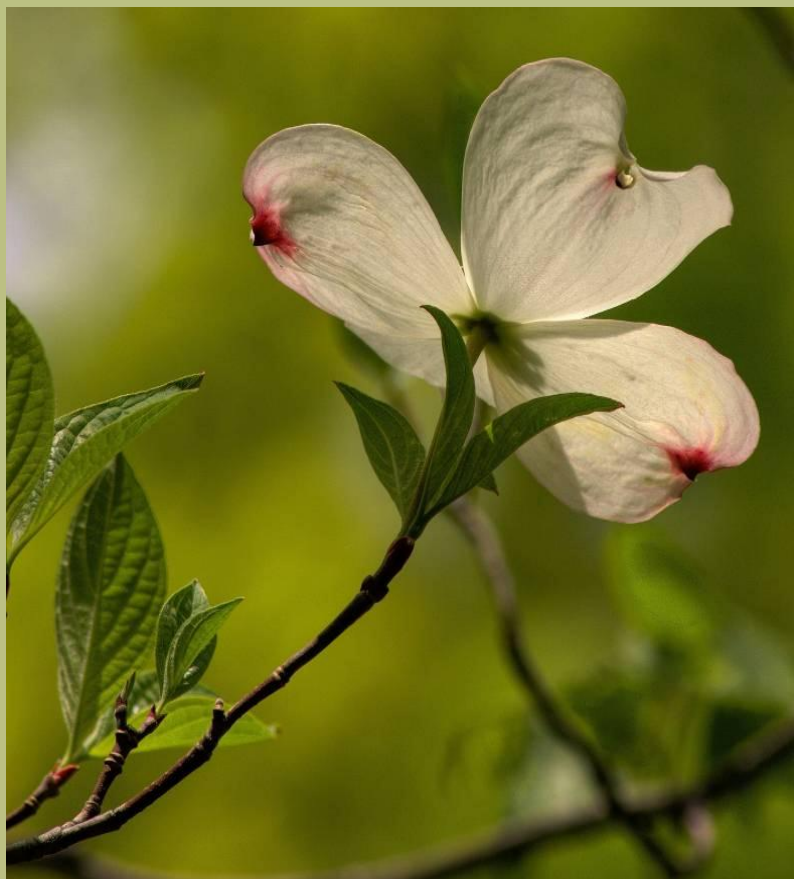


Recovery Strategy for the Eastern Flowering Dogwood (*Cornus florida*) in Canada

Eastern Flowering Dogwood



2013

Recommended citation:

Environment Canada. 2013. Recovery Strategy for the Eastern Flowering Dogwood (*Cornus florida*) in Canada [Proposed]. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. 16 pp. + Appendices.

For copies of the recovery strategy, or for additional information on species at risk, including COSEWIC Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the Species at Risk (SAR) Public Registry (www.sararegistry.gc.ca).

Cover illustration: Nigel Finney ©

Également disponible en français sous le titre

« Programme de rétablissement du cornouiller fleuri (*Cornus florida*) au Canada [Proposition] »

© Her Majesty the Queen in Right of Canada, represented by the Minister of the Environment, 2013. All rights reserved.

ISBN

Catalogue no.

Content (excluding the illustrations) may be used without permission, with appropriate credit to the source.

RECOVERY STRATEGY FOR THE EASTERN FLOWERING DOGWOOD (*Cornus florida*) IN CANADA

2013

Under the Accord for the Protection of Species at Risk (1996), the federal, provincial, and territorial governments agreed to work together on legislation, programs, and policies to protect wildlife species at risk throughout Canada.

In the spirit of cooperation of the Accord, the Government of Ontario has given permission to the Government of Canada to adopt the *Recovery Strategy for the Eastern Flowering Dogwood (Cornus florida) in Ontario* (Part 2) under Section 44 of the *Species at Risk Act* (SARA). Environment Canada has included an addition which completes the SARA requirements for this recovery strategy.

The *Eastern Flowering Dogwood Ontario Government Response Statement* (Part 3) has also been included as a part of the adoption process in order to clarify the priorities for implementation. The Government Response Statement is the Ontario Government's policy response to the recovery strategy and summarizes the prioritized actions that the Ontario Government intends to take.

Environment Canada is adopting the provincial recovery strategy with the exception of section 2.3, Approaches to Recovery. In its place, Environment Canada is adopting the government-led and government-supported actions of the *Eastern Flowering Dogwood Ontario Government Response Statement* (GRS).

The federal recovery strategy for the Eastern Flowering Dogwood in Canada consists of three parts:

Part 1 – Federal addition to the *Recovery Strategy for the Eastern Flowering Dogwood (Cornus florida) in Ontario*, prepared by Environment Canada.

Part 2 – *Recovery Strategy for the Eastern Flowering Dogwood (Cornus florida) in Ontario* prepared by H. Bickerton and M. Thompson-Black for the Ontario Ministry of Natural Resources.

Part 3 – *Eastern Flowering Dogwood: Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources.

TABLE OF CONTENTS

PART 1 – Federal Addition to the *Recovery Strategy for the Eastern Flowering Dogwood* (*Cornus florida*) in Ontario, prepared by Environment Canada.

PREFACE	2
ACKNOWLEDGEMENTS	3
ADDITIONS AND MODIFICATIONS TO THE ADOPTED DOCUMENT	4
1. Species Status Information	4
2. Recovery Feasibility	4
3. Population and Distribution Objectives	6
4. Broad Strategies and General Approaches to Meet Objectives	7
5. Critical Habitat	7
5.1 Activities Likely to Result in the Destruction of Critical Habitat	10
6. Measuring Progress	11
7. Statement on Action Plans	11
8. Effects on the Environment and Other Species	11
REFERENCES	13
APPENDIX A Subnational Conservation Ranks of Eastern Flowering Dogwood in the United States	15

PART 2 – *Recovery Strategy for the Eastern Flowering Dogwood* (*Cornus florida*) in Ontario, prepared by H. Bickerton and M. Thompson-Black for the Ontario Ministry of Natural Resources.

PART 3 – *Eastern Flowering Dogwood: Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources.

**PART 1 - Federal Addition to the *Recovery Strategy for Eastern Flowering Dogwood* (Cornus florida) in Ontario,
prepared by Environment Canada**

PREFACE

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996) agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress within five years.

The Minister of the Environment and the Minister responsible for the Parks Canada Agency are the competent ministers for the recovery of the Eastern Flowering Dogwood and have prepared the federal component of this recovery strategy (Part 1), as per section 37 of SARA. It has been prepared in cooperation with the Department of National Defence and the Ontario Ministry of Natural Resources. SARA section 44 allows the federal Minister to adopt all or part of an existing plan for the species if it meets the requirements under SARA for content (sub-sections 41(1) or (2)). The Province of Ontario (Ontario Ministry of Natural Resources) led the development of the attached recovery strategy for the Eastern Flowering Dogwood (Part 2) in cooperation with Environment Canada and the Parks Canada Agency. The Ontario Ministry of Natural Resources prepared the Government Response Statement (Part 3) which is the Ontario Government's policy response to the recovery strategy and summarizes the prioritized actions that the Ontario Government intends to take. Environment Canada is adopting parts of the provincial recovery strategy (Part 2) and parts of the Government Response Statement (Part 3), as specified in this document.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment Canada and the Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Eastern Flowering Dogwood and Canadian society as a whole.

This recovery strategy will be followed by one or more action plans that will provide information on recovery measures to be taken by Environment Canada and the Parks Canada Agency and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

ACKNOWLEDGEMENTS

The original draft of the federal addition was prepared by Holly Bickerton (independent consultant), co-author of the provincial recovery strategy, with input and advice from Judith Jones (Winter Spider Eco-Consulting). The draft was updated by Kathy St. Laurent, Angela Darwin and Christina Rohe (Environment Canada, Canadian Wildlife Service – Ontario). Madeline Austen and Lesley Dunn (Environment Canada, Canadian Wildlife Service – Ontario), Wendy Dunford (Environment Canada, Canadian Wildlife Service – National Capital), Amelia Argue, Vivian Brownell, Eric Snyder and Melinda Thompson (Ontario Ministry of Natural Resources), Department of National Defense staff and Parks Canada Agency staff reviewed and provided comments and advice during the development of this document.

ADDITIONS AND MODIFICATIONS TO THE ADOPTED DOCUMENT

The following sections have been included to address specific requirements of SARA that are not addressed in the *Recovery Strategy for the Eastern Flowering Dogwood (Cornus florida) in Ontario* (Part 2). In some cases, these sections may also include updated information or modifications to the provincial recovery strategy for adoption by Environment Canada.

1. Species Status Information

The Eastern Flowering Dogwood, a small understory tree of deciduous forests, is listed as Endangered¹ on Schedule 1 of the federal *Species at Risk Act* (SARA). In Ontario, the Eastern Flowering Dogwood is listed as Endangered² under the provincial *Endangered Species Act, 2007* (ESA).

The Eastern Flowering Dogwood's global conservation status is secure³ (G5); however, it should be noted that the species has not been reviewed since 1996 (NatureServe 2010). Population declines (7% to 8% annually in Canada) and high mortality rates (25% to 75% in some areas of the United States) from the dogwood anthracnose fungus have been observed within the intervening time period. In Canada, the national conservation status is imperilled (N2), and the conservation status in Ontario, the only province within which the species occurs in Canada, is also imperilled (S2?) (NHIC 2010; NatureServe 2010). Formerly widespread throughout the eastern United States, Eastern Flowering Dogwood is secure nationally (N5) and is secure or is not ranked in most American states where it occurs (Appendix A). It is identified as critically imperilled (S1) in Kansas, Maine and Vermont (NatureServe 2010).

The species is at the northern edge of its North American range in Ontario and is restricted to the Carolinian Zone of southern Ontario. It is estimated that less than 5% of its global range occurs in Canada; the remainder occurs in the United States.

2. Recovery Feasibility

Based on the following four criteria outlined by the draft SARA Policies (Government of Canada 2009), there are unknowns regarding the feasibility of recovery of the Eastern Flowering Dogwood. Therefore, in keeping with the precautionary principle, a full recovery strategy has been prepared as would be done when recovery is determined to be feasible. This recovery strategy addresses the unknowns surrounding the feasibility of recovery.

1. Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance.

¹ A wildlife species facing imminent extirpation or extinction in Canada.

² A species that lives in the wild in Ontario but is facing imminent extinction or extirpation.

³ Status definitions can be found in Appendix A.

Yes. Records (from 1975-2005) indicate that at least 154 populations of Eastern Flowering Dogwood occurred within Canada, all within the province of Ontario. It is unknown how many of these populations currently exist due to the effects of the dogwood anthracnose fungus and because many sites have not been visited recently; however, it is estimated that approximately 1,500 trees exist (COSEWIC 2007). The species also remains widespread, although in decline, in the eastern United States. Large seed crops have been recently observed on open-grown trees on sandy soils in Norfolk County (M. Gartshore, pers. comm. 2009) and probably exist elsewhere in Ontario. It is likely that sufficient propagules⁴ will continue to be available to restore this species, if required. However, it should be noted that trees infected with the dogwood anthracnose fungus show reduced levels of fruit production prior to succumbing to the fungus, thus indicating that the anthracnose fungus may impair the species' ability to regenerate (Carr and Banas 2000).

2. Sufficient suitable habitat is available to support the species or could be made available through habitat management or restoration.

Yes. Sufficient suitable habitat is available, or could be made available across the species' range (COSEWIC 2007). Eastern Flowering Dogwood grows in, and at the edge of, a variety of open deciduous and mixed forest communities, and also along fencerows and roadsides. While habitat loss, fragmentation, and alteration of Ontario's Carolinian forests have likely contributed to the species' decline, management actions such as prescribed burning or canopy thinning (to produce more open conditions) could provide additional suitable habitat to assist in the recovery of this species, if necessary.

3. The primary threats to the species or its habitat (including threats outside Canada) can be avoided or mitigated.

Unknown. The primary threat to the Eastern Flowering Dogwood is the dogwood anthracnose fungus, which was confirmed or likely present at 20 of 32 (63%) stands inventoried in 2004 and 2005 in Ontario (COSEWIC 2007). Mortality from the fungus is high: Canadian population declines are estimated at 7% to 8% annually, and infected populations in the U.S. show mortality rates of 25% to 75%, with some populations declining by 95% (Schwegman et al. 1998 as cited in COSEWIC 2007; Holzmüller et al. 2006). The dogwood anthracnose fungus is spread by asexual spores originating from cankers on the host tree; spores may be spread locally by splashing rain, and more widely by insects and birds (Sherald et al. 1996). A resistant cultivar of the species, originating in Maryland, has been released for ornamental planting (Windham et al. 1998), but to date, no resistance has been documented in native Canadian populations. Most techniques that have been successfully used to control the anthracnose fungus (e.g., watering during drought, fungicide use, pruning of infected branches, fertilization, and mulching) require highly intensive management (Holzmüller et al. 2006). As a result, these techniques are largely untested in natural forest settings, and their utility on a larger scale is not known.

4. Recovery techniques exist to achieve the population and distribution objectives or can be expected to be developed within a reasonable timeframe.

⁴ Any structure (e.g., seed) that will give rise to a new individual.

Unknown. Although the dogwood anthracnose fungus was first observed in the United States in the late 1970s (Daughtrey et al. 1996), the research to examine successful methods to minimize its impacts in forest ecosystems is relatively recent (e.g., Holzmüller et al. 2006; Jenkins et al. 2007; Pierce et al. 2008; Holzmüller et al. 2008). An American study suggests that prescribed burning may reduce the impacts of the fungus in forested environments, but many research questions remain (Holzmüller et al. 2008). It is believed that fire lessens the impacts of dogwood anthracnose by opening up the forest to provide drier conditions unsuitable for fungal growth (Holzmüller et al. 2008).

The Eastern Flowering Dogwood in Ontario occurs at the northern edge of its North American range. The species is restricted to the Carolinian Zone in southwestern Ontario. Due to the Eastern Flowering Dogwood's naturally limited distribution in Canada, it will likely always be vulnerable to anthropogenic and natural stressors.

3. Population and Distribution Objectives

The provincial recovery strategy contains the following recovery goal for the recovery of the Eastern Flowering Dogwood in Ontario:

- The goal of this recovery strategy is to conserve and protect extant populations of Eastern Flowering Dogwood, to reduce its rate of decline, and where possible, to restore populations of the species across its range in southern Ontario.

The Government Response Statement⁵ for the province of Ontario lists the following goal for the recovery of the Eastern Flowering Dogwood in Ontario:

- The government's goal for the recovery of the Eastern Flowering Dogwood is to protect and conserve existing populations, reduce its rate of decline, and where possible, restore populations of the species across its range in southern Ontario.

Under SARA, population and distribution objectives for the species must be established. The population and distribution objectives established by Environment Canada for Eastern Flowering Dogwood are to:

- Conserve existing populations, reduce the rate of decline and, if biologically and technically feasible, restore populations across its range in Canada.

Due to the severity of the dogwood anthracnose fungus, the observed rates of decline and the uncertainty around how many individuals/populations currently exist of Eastern Flowering Dogwood in Canada and the United States, it is considered inappropriate to set objectives pertaining to the abundance of mature individuals in Canada.

⁵ The response statement is the Ontario government's policy response to the scientific advice provided in the recovery strategy.

Eastern Flowering Dogwood is a common species in the nursery trade due to its showy white flowers in the spring, and its striking red berries in the autumn and winter. It has been widely planted throughout the U.S. and Canada in parks and gardens. Trees that are believed to be horticultural specimens and cultivars (e.g., those clearly planted in landscaped settings such as urban/suburban gardens and parks or in orchards) are not considered as existing populations (or portions thereof) in the above objective.

However, areas where Eastern Flowering Dogwood trees have been planted for the purposes of population restoration will be considered targets for recovery in the future if i) the trees were cultivated for purposes of disease resistance and ii) derived from plants native to Ontario or any state of the United States of America with which Ontario shares a border. As information is currently lacking on the status and genetic origin of restoration plantings in Ontario, these populations cannot be considered targets for recovery at this time.

4. Broad Strategies and General Approaches to Meet Objectives

The government-led and government-supported actions tables from *Ontario's Government Response Statement for the Eastern Flowering Dogwood* (Part 3) are adopted as the broad strategies and general approaches to address the threats and meet the population and distribution objectives. Environment Canada is not adopting the approaches identified in section 2.3 of the *Recovery Strategy for the Eastern Flowering Dogwood (Cornus florida) in Ontario* (Part 2).

5. Critical Habitat

Under SARA, critical habitat is 'the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species'.

Identification of critical habitat is not a component of the provincial recovery strategy process undertaken by the Ontario Ministry of Natural Resources under the ESA 2007. However, a recommendation to the Minister of Natural Resources on the area that should be considered in developing a habitat regulation is provided in the *Recovery Strategy for the Eastern Flowering Dogwood (Cornus florida) in Ontario*. Following completion of the provincial recovery strategy for this species, a provincial habitat regulation was developed for the Eastern Flowering Dogwood under the ESA 2007. A habitat regulation is a legal instrument that prescribes an area that will be protected as the habitat of the species by the Province of Ontario. The areas described in #1 and #2 below are prescribed as the provincially regulated habitat of the Eastern Flowering Dogwood:

1. The terrestrial area⁶ within 20 metres of the stem of an Eastern Flowering Dogwood.
2. The area populated by a vegetation type described by the Ecological Land Classification (ELC) for Southern Ontario (Lee et al. 1998) if,
 - i. the vegetation type occurs naturally in Ontario, and
 - ii. Eastern Flowering Dogwood also exists in the area.

⁶ Terrestrial area means an area where the water table is rarely or briefly above the substrate surface, and where hydric soils have not developed.

The areas described in #1 and #2 above only apply in the following cities, counties and municipalities: the cities of Brantford, Hamilton, London and Windsor; the counties of Brant, Elgin, Essex, Haldimand, Lambton, Middlesex, Oxford and Norfolk; the Municipality of Chatham-Kent; and the regional municipalities of Halton and Niagara.

Eastern Flowering Dogwood inhabits a range of naturally occurring forest and woodland vegetation types. It is considered a facultative⁷ upland species, meaning that it usually occurs in non-wetland settings (Reed 1988). In Canada, it typically occurs in deciduous forests ranging from open, dry oak (*Quercus* spp.) -hickory (*Carya* spp.) deciduous forests to more mesic⁸ maple (*Acer* spp.) - beech (*Fagus grandifolia*) associations (COSEWIC 2007). It may also occur in mixed (deciduous-coniferous) forests containing coniferous species including White Pine (*Pinus strobus*) and Eastern Hemlock (*Tsuga canadensis*). At many Canadian sites, Eastern Flowering Dogwood occurs in dry, open woodlands, often on sandy soils, and it has also been documented within Black Oak (*Quercus velutina*) savannah (NHIC 2010). However, the species also occurs in rich woods, and occasionally in moist or lowland sites, as long as these are not seasonally flooded (COSEWIC 2007; NHIC 2010). Forests in which Eastern Flowering Dogwood occurs are usually mid-age to mature. Eastern Flowering Dogwood is also frequently reported from the successional vegetation types that follow anthropogenic modification (e.g., agriculture, roadside maintenance). Such vegetation types include successional meadows and thickets containing young oak (*Quercus* spp.), hickory (*Carya* spp.), ash (*Fraxinus* spp.) and hawthorn (*Crataegus* spp.).

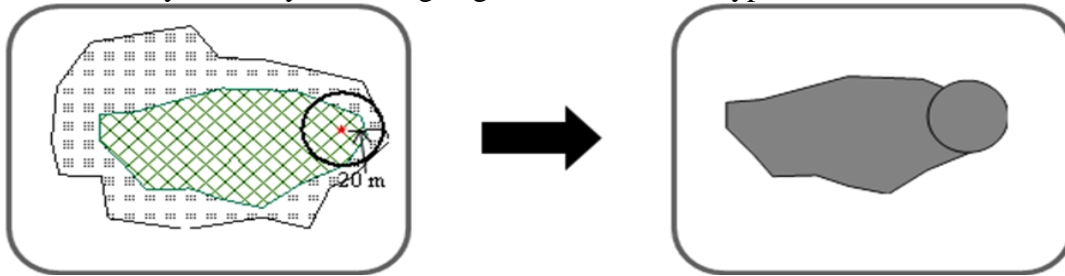
The critical habitat under SARA will be the regulated habitat under Ontario's ESA 2007 for Eastern Flowering Dogwood. Thus, in the geographic areas described above, critical habitat is the terrestrial area within 20 m of each existing stem of Eastern Flowering Dogwood, and in situations where the species occurs in a natural vegetation type (described by ELC) in Ontario, it also includes the entire area of the natural vegetation type within which the Eastern Flowering Dogwood exists (Figure 1; A, B and C). The 20 m distance represents the dripline⁹ of a mature Eastern Flowering Dogwood tree. The ELC framework, used to define the vegetation types within the area surrounding the trees, provides a standardized approach to the interpretation of dynamic ecosystem boundaries. It uses environmental and vegetation characteristics to identify vegetation types, and as such captures the biophysical attributes of Eastern Flowering Dogwood. If an Eastern Flowering Dogwood exists in a vegetation type that is not naturally-occurring in Ontario, critical habitat is the terrestrial area within 20 m of the stem (Figure 1: D).

⁷ Capable of existing under varying environmental conditions. Species that are considered facultative upland species can live in both non-wetland and wetland environments.

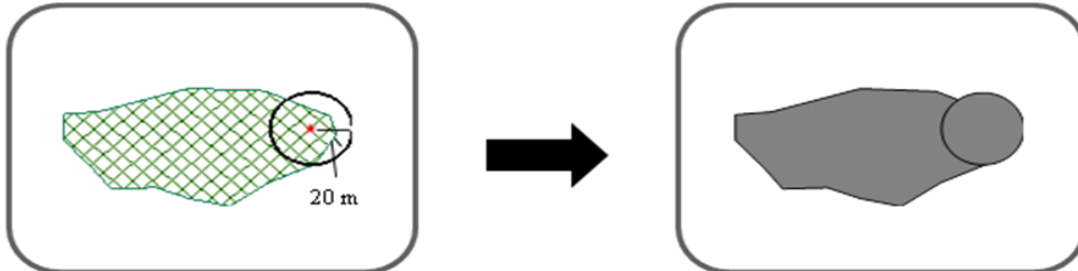
⁸ Relating or adapted to a moderately moist habitat.

⁹ The area beneath a tree occupied by the roots into which water drips from the leaf canopy.

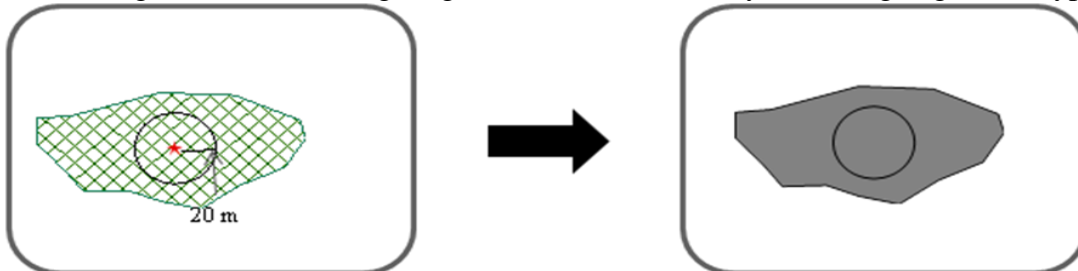
A) Existing Eastern Flowering Dogwood at the edge of a naturally-occurring vegetation type surrounded by naturally-occurring vegetation of another type



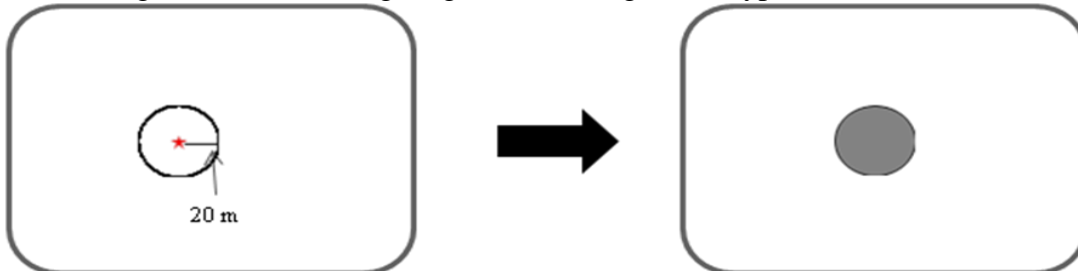
B) Existing Eastern Flowering Dogwood at the edge of a naturally-occurring vegetation type surrounded by a vegetation type that does not occur naturally



C) Existing Eastern Flowering Dogwood within a naturally-occurring vegetation type



D) Existing Eastern Flowering Dogwood in a vegetation type that does not occur naturally



Legend






-  Eastern Flowering Dogwood
-  Vegetation type that does not occur naturally (e.g. lawn)
-  Naturally-occurring vegetation type 1
-  Naturally-occurring vegetation type 2
-  Critical Habitat

Figure 1. Critical habitat schematic for existing Eastern Flowering Dogwood in Ontario.

Areas where Eastern Flowering Dogwood trees have been planted for population restoration purposes will be considered for critical habitat identification if the trees were cultivated for purposes of disease resistance and derived from plants native to Ontario or any state of the United States of America with which Ontario shares a border. In cases where the aforementioned criteria are met, determination of restoration success and viability – as measured through plant vigour and fitness, successful sexual reproduction and level of disease tolerance – will precede identification of critical habitat at restoration sites. Currently, no sites are known to meet the above mentioned criteria; however, critical habitat may be identified in the future at restoration plantings that meet the aforementioned criteria following long-term monitoring to determine success and level of disease tolerance.

In accordance with the population and distribution objectives, critical habitat is not identified for cultivars of Eastern Flowering Dogwoods planted within horticultural settings. Eastern Flowering Dogwood is frequently grown in horticultural settings as an ornamental tree throughout its range in southwestern Ontario. These trees are not included in the identification of critical habitat as trees within such intensively manicured settings are likely to have originated from non-native stock, and such areas do not allow for the natural dispersal or population expansion that would occur naturally in the vegetation types described above.

5.1 Activities Likely to Result in the Destruction of Critical Habitat

Destruction is determined on a case-by-case basis. Destruction would result if part of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from a single activity, multiple activities at one point in time, or the cumulative effects of one or more activities over time (Government of Canada 2009).

Activities that are likely to result in the destruction of critical habitat include, but are not limited to:

- Activities that compact the soil and/or cause soil erosion (e.g., use of off-trail vehicles [ATVs] or heavy machinery) resulting in alteration of the biophysical conditions required for germination, establishment and growth of the Eastern Flowering Dogwood;
- Activities that remove the vegetation component of critical habitat, such as clear-cut forest harvesting, spraying of herbicides and conversion to other land-uses, resulting in alteration of the biophysical conditions required for survival and reproduction of the Eastern Flowering Dogwood;
- Activities that alter the hydrology or moisture levels of the ground (e.g., ditching or tiling to alter drainage, construction of water control structures) resulting in ground that is too wet or too dry to be suitable for establishment and growth of the Eastern Flowering Dogwood. In addition, wet conditions can increase the severity of dogwood anthracnose fungal infections;
- Activities that encourage the expansion of exotic, invasive or introduced species into the Eastern Flowering Dogwood critical habitat (e.g., introduction of seeds and/or plants

through direct seeding or planting; or through vectors such as ATVs; or through dirt, gravel or soil that may contain propagules of non-native, invasive species) may increase resource competition resulting in unsuitable habitat characteristics and/or conditions for growth and survival. In addition, invasive species can increase shading at Eastern Flowering Dogwood sites, potentially increasing the severity of dogwood anthracnose fungal infections.

6. Measuring Progress

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution objectives. Every five years, success of recovery strategy implementation will be measured against the following performance indicators:

- Existing populations of Eastern Flowering Dogwood in Canada have been conserved;
- The rate of decline of Eastern Flowering Dogwood in Canada has been reduced.
- Where required and considered to be biologically and technically feasible, populations of Eastern Flowering Dogwood in Canada have been restored.

7. Statement on Action Plans

One or more action plans will be completed for the Eastern Flowering Dogwood and posted on the Species at Risk Public Registry by December 2018.

8. Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below in this statement.

In general, protecting the woodland habitat of this species and the ecosystems within which it is found will benefit many other species and ecosystem functions within the heavily impacted Carolinian forest. Because Eastern Flowering Dogwood remains widespread, protection activities could benefit many other rare and at-risk species and ecological communities.

This recovery strategy will benefit the environment by encouraging the recovery of the Eastern Flowering Dogwood and the Carolinian forest communities in which it occurs. Several other Canadian at-risk species are found within the Carolinian forest zone. The species shares the range

and preferred habitat characteristics of species at risk such as American Chestnut (*Castanea dentata*), Butternut (*Juglans cinerea*), Bird's-foot Violet (*Viola pedata*), Eastern Hog-nosed Snake (*Heterodon platirhinos*), Hoary Mountain-mint (*Pycnanthemum incanum*), Milksnake (*Lampropeltis triangulum*), Red-headed Woodpecker (*Melanerpes erythrocephalus*), Spotted Wintergreen (*Chimaphila maculata*), Whip-poor-will (*Caprimulgus vociferus*), and White Wood Aster (*Eurybia divaricata*), among others.

The potential for the strategy to inadvertently lead to adverse effects on other species was considered. Some management activities, such as prescribed burns and selective thinning of the forest canopy, have the potential to harm some species, at least in the short term. The maintenance of open conditions within forested settings may not benefit shade-tolerant and/or forest interior species. The ecological risks of such management activities will be considered before they are undertaken, in order to avoid or mitigate any negative effects. The SEA concluded that this strategy will clearly benefit the environment and will not entail significant adverse effects.

REFERENCES

- Carr, D.E. and L.E. Banas. 2000. Dogwood anthracnose (*Discula destructiva*): effects and consequences for host (*Cornus florida*) demography. *The American Midland Naturalist* 143 (1): 169-177.
- COSEWIC 2007. COSEWIC Assessment and status report on the eastern flowering dogwood *Cornus florida* in Canada. Committee of the Status of Wildlife in Canada. Ottawa. vi + 22 pp.
- Daughtrey, M.L., C.R. Hibben, K.O. Britton, M.T. Windham, and S.C. Redlin. 1996. Dogwood Anthracnose: understanding a disease new to North America. *Plant Disease* 80: 349-358.
- Gartshore, M. Pers. comm. 2009. *Telephone conversation with H. Bickerton*. August 2009. *Pterophylla* Native Plants and Seeds, R.R. #1, Walsingham, ON.
- Government of Canada. 2009. *Species at Risk Act Policies, Overarching Policy Framework [Draft]*. *Species at Risk Act Policy and Guidelines Series*. Environment Canada. Ottawa. 38 pp.
- Holzmuehler, E.J., S. Jose, M. Jenkins, A. Camp, and A. Long. 2006. Dogwood anthracnose in eastern hardwood forests: what is known and what can be done? *Journal of Forestry* 104: 21-26.
- Holzmuehler, E.J., S. Jose, and M.A. Jenkins. 2008. The relationship between fire history and an exotic fungal disease in a deciduous forest. *Oecologia* 155: 347-356.
- Jenkins, M.A., S. Jose and P.S. White. 2007. Impacts of an exotic disease and vegetation change on foliar calcium cycling in Appalachian forests. *Ecological Applications* 17: 869-881
- Lee, H., W. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig, and S. McMurray. 1998. *Ecological Land Classification for Southern Ontario: First Approximations and Its Application*. Ontario Ministry of Natural Resources. SCSS Field Guide FG-02.
- Natural Heritage Information Centre (NHIC). 2010. Element Occurrence and Observation data for Eastern Flowering Dogwood. Obtained from NHIC staff, December 2010. Peterborough, Ontario.
- NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life. Version 7.1. NatureServe, Arlington, Virginia. Web site: <http://www.natureserve.org/explorer> (accessed November 2010).

- Pierce, A.R., W.R. Bromer, and K.N. Rabenold. 2008. Decline of *Cornus florida* and forest succession in a *Quercus-Carya* forest. *Plant Ecology* 195: 45-53.
- Reed, P. 1988. National List of Plant Species that Occur in Wetlands: National Summary. National Wetland Inventory, U.S. Department of the Interior, Fish and Wildlife Service, St. Petersburg, Florida. 90 pp.
- Schwegman, J.E., W.E. McLean, T.L. Esker and J.E. Ebinger. 1998. Anthracnose-caused mortality of Flowering Dogwood (*Cornus florida*) at the Dean Hills Nature Preserve, Fayette County, Illinois, USA. *Natural Areas Journal* 18:3.
- Sherald, J. L., T. M. Stidham, J. M. Hadidian, and J. E. Hoeldtke. 1996. Progression of the dogwood anthracnose epidemic and the status of flowering dogwood in Catocin Mountain Park. *Plant Disease* 80:310-312.
- Windham, M.T., E.T. Graham, W.T. Witte, J.L. Knighten, and R.N. Trigiano. 1998. *Cornus florida* "Appalachian Spring": A white flowering dogwood resistant to dogwood anthracnose. *Hortscience* 33:1265–1267.

APPENDIX A SUBNATIONAL CONSERVATION RANKS OF EASTERN FLOWERING DOGWOOD IN THE UNITED STATES

	Global (G) Rank	National (N) Rank (United States)	Sub-national (S) Rank
Eastern Flowering Dogwood (<i>Cornus florida</i>)	G5 (Secure: widespread, still common, but being depleted by a fungus disease)	N5 (Secure)	Alabama (SNR) Arkansas (SNR) Connecticut (SNR) Delaware (S5) District of Columbia (S5) Florida (SNR) Georgia (SNR) Illinois (SNR) Indiana (SNR) Kansas (S1) Kentucky (S5) Louisiana (SNR) Maine (S1) Maryland (SNR) Massachusetts (SNR) Michigan (SNR) Mississippi (SNR) Missouri (SNR) New Hampshire (SNR) New Jersey (S5) New York (S4S5) North Carolina (S4) Ohio (SNR) Oklahoma (SNR) Pennsylvania (S5) Rhode Island (SNR) South Carolina (SNR) Tennessee (SNR) Texas (SNR) Vermont (S1) Virginia (SNR) West Virginia (S5)

S1: Critically Imperilled = extreme rarity (often 5 or fewer occurrences) or very steep declines making it especially vulnerable to extirpation.

S2: Imperilled = rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation.

S3: Vulnerable = restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S4: Apparently Secure = Uncommon but not rare; some cause for long-term concern due to declines or other factors

S5: Secure = common, widespread and abundant

SNR: Not Ranked = state/provincial conservation status not yet assessed

SH: Historical / possibly extirpated = species occurred historically and there is some possibility that it may be rediscovered. Its presence in the state or province has not have been verified in the past 20 or more years.

SX: Presumed Extirpated. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.

?: Denotes inexact numeric rank.

**PART 2 - *Recovery Strategy for Eastern Flowering Dogwood*
(*Cornus florida*) in Ontario, prepared by H. Bickerton and M.
Thompson-Black for the Ontario Ministry of Natural
Resources**



Eastern Flowering Dogwood

(*Cornus florida*) in Ontario

Ontario Recovery Strategy Series

Recovery strategy prepared under the Endangered Species Act, 2007

February 2010

Natural. Valued. Protected.

About the Ontario Recovery Strategy Series

This series presents the collection of recovery strategies that are prepared or adopted as advice to the Province of Ontario on the recommended approach to recover species at risk. The Province ensures the preparation of recovery strategies to meet its commitments to recover species at risk under the Endangered Species Act, 2007 (ESA, 2007) and the Accord for the Protection of Species at Risk in Canada.

What is recovery?

Recovery of species at risk is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of a species' persistence in the wild.

What is a recovery strategy?

Under the ESA, 2007, a recovery strategy provides the best available scientific knowledge on what is required to achieve recovery of a species. A recovery strategy outlines the habitat needs and the threats to the survival and recovery of the species. It also makes recommendations on the objectives for protection and recovery, the approaches to achieve those objectives, and the area that should be considered in the development of a habitat regulation. Sections 11 to 15 of the ESA, 2007 outline the required content and timelines for developing recovery strategies published in this series.

Recovery strategies are required to be prepared for endangered and threatened species within one or two years respectively of the species being added to the Species at Risk in Ontario list. There is a transition period of five years (until June 30, 2013) to develop recovery strategies for those species listed as endangered or threatened in the schedules of the ESA, 2007. Recovery strategies are required to be prepared for extirpated species only if reintroduction is considered feasible.

What's next?

Nine months after the completion of a recovery strategy a government response statement will be published which summarizes the actions that the Government of Ontario intends to take in response to the strategy. The implementation of recovery strategies depends on the continued cooperation and actions of government agencies, individuals, communities, land users, and conservationists.

For more information

To learn more about species at risk recovery in Ontario, please visit the Ministry of Natural Resources Species at Risk webpage at: www.ontario.ca/speciesatrisk

RECOMMENDED CITATION

Bickerton, H. and M. Thompson-Black. 2010. Recovery Strategy for the Eastern Flowering Dogwood (*Cornus florida*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. vi + 21 pp.

Cover illustration: Wasył Bakowsky

© Queen's Printer for Ontario, 2010
ISBN 978-1-4435-2089-8 (PDF)

Content (excluding the cover illustration) may be used without permission, with appropriate credit to the source.

AUTHORS

Holly Bickerton – Consulting Ecologist, Ottawa

Melinda Thompson-Black – Ontario Ministry of Natural Resources, Aurora District

ACKNOWLEDGMENTS

Many thanks to John Ambrose, Eric Holzmüller, Barb Boysen, Mary Gartshore and Anita Imrie for providing background information and references.

DECLARATION

The Ontario Ministry of Natural Resources has led the development of this recovery strategy for the Eastern Flowering Dogwood in accordance with the requirements of the *Endangered Species Act, 2007* (ESA 2007). This recovery strategy has been prepared as advice to the Government of Ontario, other responsible jurisdictions and the many different constituencies that may be involved in recovering the species.

The recovery strategy does not necessarily represent the views of all of the individuals who provided advice or contributed to its preparation or the official positions of the organizations with which the individuals are associated.

The goals, objectives and recovery approaches identified in the strategy are based on the best available knowledge and are subject to revision as new information becomes available. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy.

RESPONSIBLE JURISDICTIONS

Ontario Ministry of Natural Resources
Environment Canada - Canadian Wildlife Service, Ontario
Parks Canada Agency

EXECUTIVE SUMMARY

Eastern Flowering Dogwood (*Cornus florida*) is a small, showy tree native to the deciduous forest understorey of eastern North America. In Canada, it is found only in southwestern Ontario, where it was documented at 154 sites between 1975 and 2005. Eastern Flowering Dogwood is listed as an endangered species on the Species at Risk in Ontario (SARO) List and under Schedule 1 of the federal Species at Risk Act (SARA).

Across its North American range, Eastern Flowering Dogwood is undergoing a steep population decline due to the dogwood anthracnose fungus (*Discula destructiva*). In Ontario, the rate of decline has been estimated at 7-8 percent annually. Other threats include forest succession, herbivory by White-tailed Deer (*Odocoileus virginianus*), habitat loss, and insects and pests. These probably exacerbate the species' decline, but are relatively minor in comparison with the aggressive anthracnose fungus.

Eastern Flowering Dogwood is a species of the Ontario Carolinian forest. It occurs in a variety of vegetation communities, and is most commonly found in habitats ranging from open dry-mesic oak-hickory woodlands to mesic maple-beech eastern deciduous or mixed forests. Eastern Flowering Dogwood prefers mid-aged to mature forests, and can tolerate some shade. It is also found along fencerows and roadsides. The species prefers lighter, acidic sandy-loam soils with good drainage. Able to resprout profusely from its rootstock following fire, Eastern Flowering Dogwood shows some adaptation to forest fire. Prescribed burning shows promise as a management tool as it opens the forest canopy which results in environmental conditions less favourable to fungal disease.

The goal of this recovery strategy is to conserve and protect extant populations of Eastern Flowering Dogwood, to reduce its rate of decline, and where possible, to restore populations of the species across its range in southern Ontario. The recovery objectives are to:

- Identify and protect extant populations of Eastern Flowering Dogwood across its native range in southern Ontario
- Undertake monitoring of health, threats and possible resistance to dogwood anthracnose
- Develop, implement and assess management approaches for dogwood anthracnose and other threats in natural stands, and
- Where possible, restore habitat and/or populations of Eastern Flowering Dogwood

It is recommended that areas where natural populations of Eastern Flowering Dogwood occur be prescribed as habitat within a habitat regulation under the *Endangered Species Act, 2007* (ESA 2007). The boundaries of this area should be identified as the Ecological Land Classification (ELC) ecosite type(s) surrounding Eastern Flowering Dogwood trees. For naturally growing trees in non-forest settings (e.g. roadsides and fencerows), an area extending 25 metres from the stem of each tree is recommended to be included within the habitat regulation.

TABLE OF CONTENTS

RECOMMENDED CITATION	i
AUTHORS	ii
ACKNOWLEDGMENTS	ii
DECLARATION	iii
RESPONSIBLE JURISDICTIONS	iii
EXECUTIVE SUMMARY	iv
1.0 BACKGROUND INFORMATION.....	1
1.1 Species Assessment and Classification.....	1
1.2 Species Description and Biology.....	1
1.3 Distribution, Abundance and Population Trends	2
1.4 Habitat Needs	5
1.5 Threats to Survival and Recovery	5
1.6 Knowledge Gaps.....	7
1.7 Recovery Actions Completed or Underway.....	8
2.0 RECOVERY	10
2.1 Recovery Goal	10
2.2 Protection and Recovery Objectives	10
2.3 Approaches to Recovery.....	11
2.4 Area for Consideration in Developing a Habitat Regulation	15
GLOSSARY	16
REFERENCES	18
RECOVERY STRATEGY DEVELOPMENT TEAM MEMBERS	21

LIST OF FIGURES

Figure 1. Native range of Eastern Flowering Dogwood	3
Figure 2. Total native distribution of Eastern Flowering Dogwood in Ontario.....	4

LIST OF TABLES

Table 1. Protection and recovery objectives.....	10
Table 2. Approaches to recovery for Eastern Flowering Dogwood in Ontario.....	11

1.0 BACKGROUND INFORMATION

1.1 Species Assessment and Classification

COMMON NAME: Eastern Flowering Dogwood

SCIENTIFIC NAME: *Cornus florida*

SARO List Classification: Endangered

SARO List History: Endangered (2009)

COSEWIC Assessment History: Endangered (2007)

SARA Schedule 1: Endangered (March 18, 2009)

CONSERVATION STATUS RANKING:

GRANK: G5

NRANK: N2

SRANK: S2?

The glossary provides definitions for the abbreviations above.

1.2 Species Description and Biology

Eastern Flowering Dogwood (*Cornus florida*) is a member of the *Cornaceae* (dogwood) family. Several subspecies or varieties have been recognized in the past, but most of these are no longer accepted (Tirmenstein 1991). Although native to the forests of eastern North America, this showy species has long been popular as an ornamental tree, and many cultivars have been developed by the horticulture industry.

Species Description

Eastern Flowering Dogwood is a small tree, growing 3-10 metres, with opposite leaves, very rough bark, and mostly greenish twigs and branchlets. The large, simple, opposite leaves average 5-15 centimetres in length. The most conspicuous character is the presence of 4-6 large, showy, petal-like white bracts that surround the small clusters of flowers (Soper and Heimbürger 1982). The fruit is a smooth, red, berrylike drupe about 10-12 millimetres long; these are borne in clusters of two to six. Each drupe contains one or two cream-colored, ellipsoid seeds approximately 7-9 millimetres in length. The fruits mature in August and September (Soper and Heimbürger 1982). This species is slow-growing and may live up to 125 years (Strobl and Bland 2000). Detailed species descriptions, taxonomic keys, and technical illustrations can be found in Soper and Heimbürger (1982), Gleason and Cronquist (1991), and Holmgren (1998).

Species Biology

In Ontario, flowers of this species open between late May and early June (COSEWIC 2007). Flowers are pollinated by bees, beetles, butterflies, and flies (Mayor et al. 1999). Seed set appears to be more successful when flowers are cross-pollinated (Reed 2004, cited in COSEWIC 2007). Seeds are dispersed throughout the forest litter by many species of birds, mammals, and through gravity (Rossell et al. 2001). Under natural conditions, seeds overwinter before germination occurs, and some seeds do not germinate until the second spring (Strobl and Bland 2000).

The fruits of Eastern Flowering Dogwood provide food for over 50 species of birds and many small mammals, and these animals disperse its fruits throughout the forest. Individual healthy trees can reportedly produce up to 10 kilograms of fruit in a season (Rossell et al. 2001). In parts of the United States where Eastern Flowering Dogwood can be a common species of the forest understorey, its branches provide an important food for White-tailed Deer (*Odocoileus virginianus*) (Tirmenstein 1991).

Eastern Flowering Dogwood is also important in nutrient cycling in the eastern North American forest. Its leaves retain large amounts of calcium during the growing season, and these fall to the forest floor and decompose more rapidly than those of many other forest trees. Calcium is an especially important but mobile element in forest soils, and Eastern Flowering Dogwood keeps calcium available within the biologically active layer of the forest soil (Thomas 1969, Blair 1988 cited in Holzmueller et al. 2006). There is concern that its widespread decline across eastern North America may result in additional negative ecological effects, as forest nutrient cycles are altered. Calcium cycling in oak-hickory forests may be especially affected (Jenkins et al. 2007).

This species has adapted to fire, but is not necessarily fire-tolerant (Tirmenstein 1991). Following damage or destruction of its aboveground vegetation by fire, Eastern Flowering Dogwood may sprout profusely from the root crown. However, many plants may not survive fire. Mortality of individual plants following fire can exceed 50%. Mortality rates appear to vary with fire characteristics, including intensity, frequency, season, and site effects (Tirmenstein 1991).

1.3 Distribution, Abundance and Population Trends

Distribution

Eastern Flowering Dogwood occurs across eastern North America (Figure 1). It is common in deciduous forests and ranges widely from Michigan and southern Ontario to Maine, and south into eastern Texas and northern Florida. In Canada, the species is restricted to the Carolinian Zone of southern Ontario (Figure 2) (COSEWIC 2007).

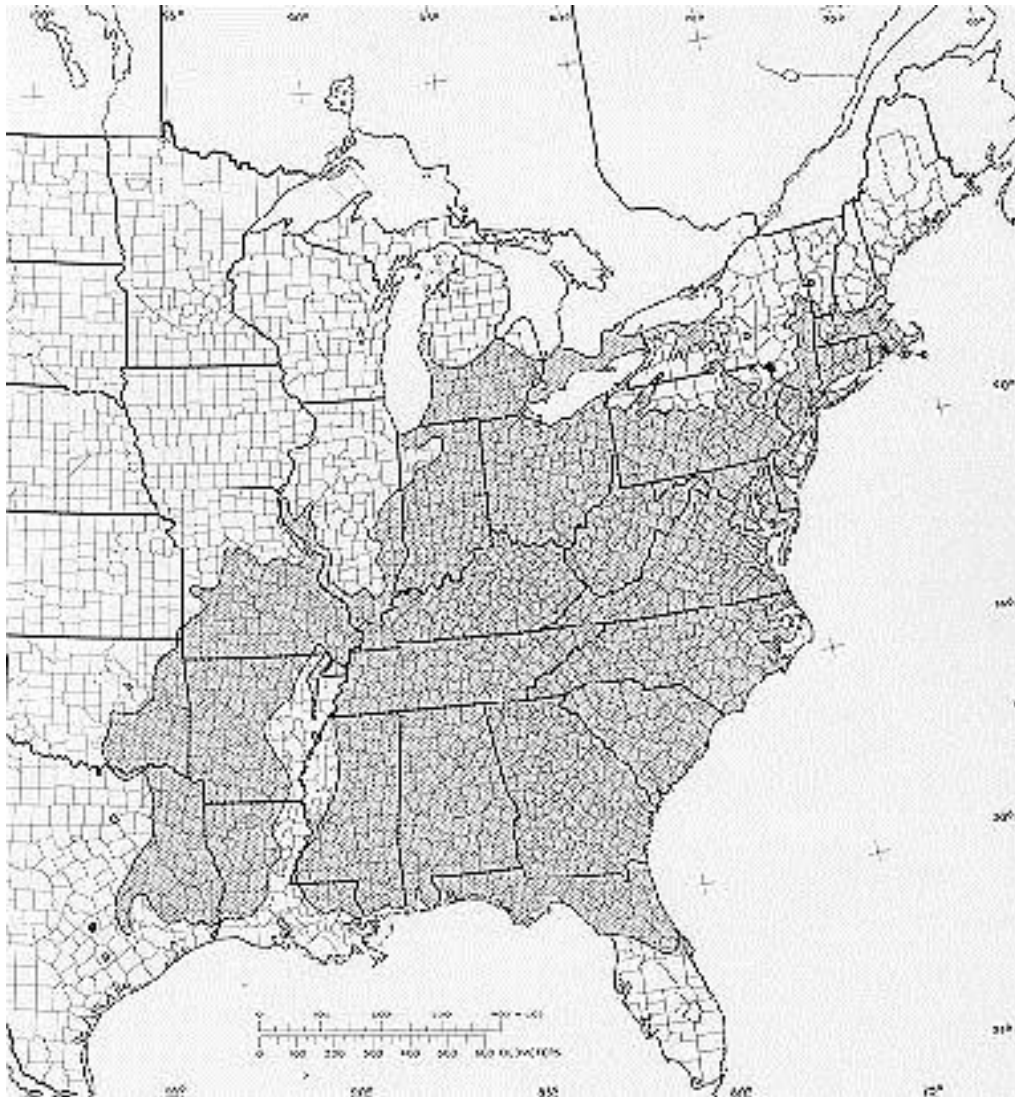


Figure 1. Native range of Eastern Flowering Dogwood (McLemore 1990)

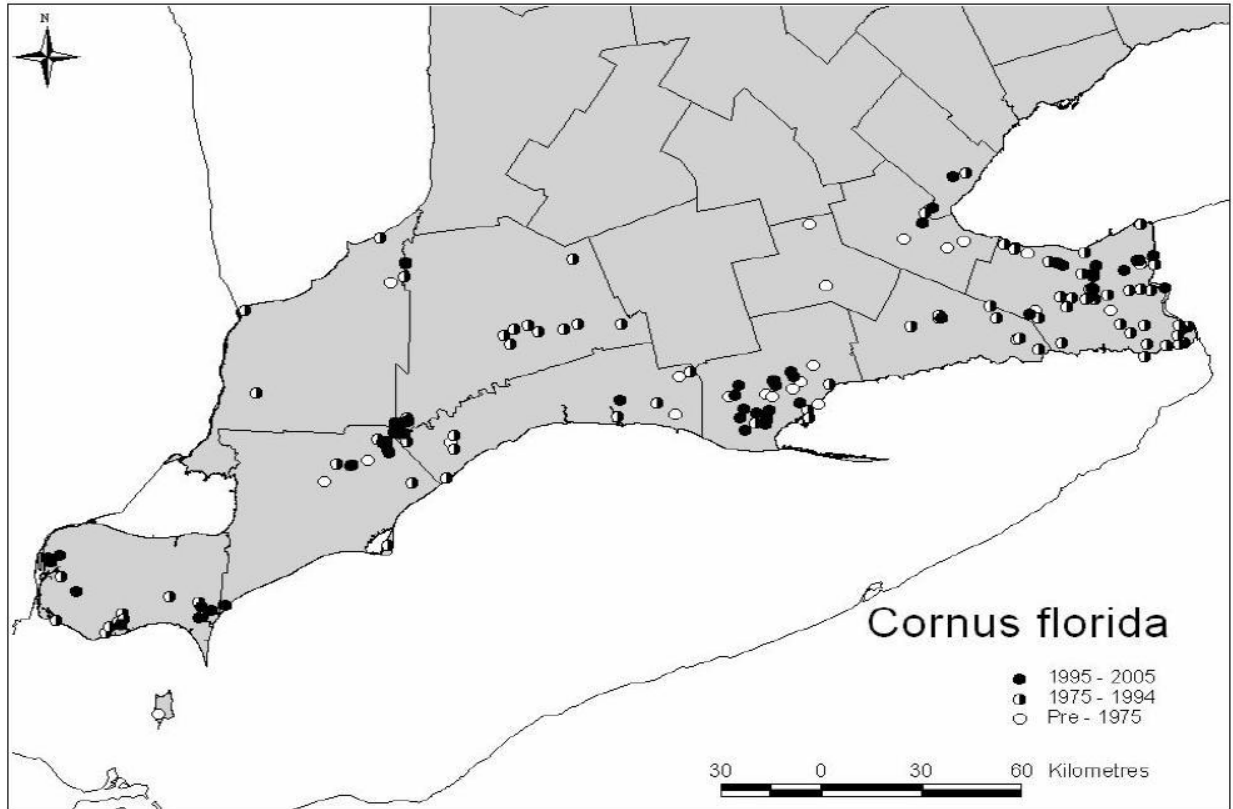


Figure 2. Total native distribution of Eastern Flowering Dogwood in Ontario (COSEWIC 2007).

Abundance and Population Trends

Recent records indicate that at least 154 populations of Eastern Flowering Dogwood were recorded in Ontario between 1975 and 2005. It is not known how many of these populations are still extant, but it is estimated that there are fewer than 2000 trees occurring in scattered populations across southern Ontario (COSEWIC 2007).

A rapid decline in the health of populations of Eastern Flowering Dogwood has been observed since the arrival of the dogwood anthracnose fungus in Ontario in the 1990s (Natural Resources Canada 2001). Field visits to 32 sites across the species' Ontario range has shown that mortality due to anthracnose exists at most sites where Eastern Flowering Dogwood occurs. Through analysis of data collected at Ecological Monitoring and Assessment Network (EMAN) plots, it is estimated that there is a 7-8 percent annual decline of Ontario's populations of Eastern Flowering Dogwood (COSEWIC 2007) due to anthracnose. This rapid rate of decline indicates that most of the populations of Eastern Flowering Dogwood in Ontario may be lost within a matter of decades (Natural Resources Canada 2001).

1.4 Habitat Needs

In Ontario, Eastern Flowering Dogwood commonly grows as an understory species in open dry-mesic oak-hickory to mesic maple-beech eastern deciduous or mixed forests (COSEWIC 2007). The forests where it is found are generally mid-age to mature.

This species shares a similar range in the Ontario Carolinian forest, and may co-occur with species such as Dwarf Chinquapin Oak (*Quercus prinoides*), Tulip Tree (*Liriodendron tulipifera*), Winged Sumac (*Rhus copallina*), Black Oak (*Quercus velutina*), Pin Oak (*Quercus palustris*), Black Walnut (*Juglans nigra*), Pignut Hickory (*Carya glabra*), American Witch-hazel (*Hamamelis virginiana*), and Black Gum (*Nyssa sylvatica*), as well as other species at risk such as American Chestnut (*Castanea dentata*) and Butternut (*Juglans cinerea*) (COSEWIC 2007).

Eastern Flowering Dogwood can be found in open woods and forest edges within its southwestern Ontario range (S. Brinker pers. comm. 2009). It can also occur along roadsides and in fencerows (A. Woodliffe pers. comm. 2009). Eastern Flowering Dogwood occurs on soils that range from moist, deep soils to light-textured, well-drained upland soils (McLemore 1990 cited in Tirmenstein 1991). Most commonly, it occurs on coarse to medium-textured acidic soils such as sand and sandy loams, although it can occur on clay loam soils (COSEWIC 2007). Abundance appears to increase with better drainage and lighter soil textures, and the species is not usually found in areas that are periodically flooded, or on poorly drained soils (COSEWIC 2007). Soil pH generally ranges from 6 to 7 (Fowells 1965 cited in Tirmenstein 1991).

1.5 Threats to Survival and Recovery

Dogwood Anthracnose

The primary threat to the species, and the reason for its precipitous population decline in eastern North America, is the dogwood anthracnose fungus (Natural Resources Canada 2001). The origin of the disease is unknown, but many believe that it was introduced to North America (Holzmueller et al. 2006). The disease kills Eastern Flowering Dogwood plants of all sizes, and has particularly severe effects on seedlings, small trees, and on trees in the forest understorey (Natural Resources Canada 2001, Holzmueller et al. 2006). Infection has not been reported on other dogwood species native to Ontario (Natural Resources Canada 2001). Infected Eastern Flowering Dogwood populations show a high degree of mortality, typically 25-75 percent, although mortality of up to 95 percent has been reported in Illinois (Schwegman et al. 1998 cited in COSEWIC 2007).

Dogwood anthracnose appears to spread during cool, wet seasons (Natural Resources Canada 2001). Tan-coloured spots appear on the lower leaves of the tree, and develop into leaf holes and necrotic leaf tissue, resulting in early leaf drop. Infection spreads up the crown, as shoots and twigs become infected and cankers develop. Trees may respond with epicormic branching on the trunk and main branches. Cankers may girdle

the tree and open the cambium to further infection; eventually, the entire tree dies (Natural Resources Canada 2001). Spores are locally dispersed by rain; insects and birds probably assist long-distance spore dispersal (Holzmueller et al. 2006).

The severity of dogwood anthracnose infection is related to levels of light and moisture in the forest understorey. Infection is often more severe in shaded settings and on north-facing slopes than in areas with an exposed aspect or open canopy. Sunlight and improved air circulation probably reduce the spread and severity of the disease (Chellemi and Britton 1992, Daughtrey et al. 1996).

The use of prescribed burning shows promise as a management technique to control the dogwood anthracnose fungus (*Discula destructiva*). In a US study (Holzmueller et al. 2008) examining forest fire history and the impact of the anthracnose fungus, sites that were burned over a 20-year period had higher stem densities of Eastern Flowering Dogwood, and smaller trees in burned areas also showed reduced crown dieback. It is believed that fire lessens the impacts of dogwood anthracnose by opening up the forest to provide drier conditions unsuitable for fungal growth (Holzmueller et al. 2008).

Forest Succession

There is evidence that fire suppression has shifted forest canopy composition throughout the midwestern United States from oak-hickory to sugar maple, and has also resulted in increased shading of Eastern Flowering Dogwood. This may have accelerated its decline due to the anthracnose fungus (Pierce et al. 2008). McEwan et al. (2000) attributed 36 percent of the decline of Eastern Flowering Dogwood in an old growth forest to canopy closure and environmental stresses such as drought. Thus, forest succession may play a role in the decline of Eastern Flowering Dogwood even in stands where anthracnose is not present, and such sites may benefit from management to maintain healthy, stable populations (Pierce et al. 2008).

Herbivory by Deer

In the eastern United States where it is a common species of the forest understorey, Eastern Flowering Dogwood twigs provide important browse for White-tailed Deer (Tirmenstein 1991, Rossell et al. 2001). With high densities of White-tailed Deer across southern Ontario, it is likely that herbivory is a threat to some dogwood populations.

Habitat Loss and Fragmentation

Habitat loss throughout the Carolinian Zone has affected Eastern Flowering Dogwood, especially in southwestern Ontario. Fragmentation and loss of forested land in southern Ontario, particularly in Essex County and in the Chatham–Kent region, reduce the probability that fauna can effectively disperse seeds over long distances from occupied habitats to suitable unoccupied habitats. It is also speculated that habitat loss and fragmentation restrict gene flow and thus could reduce the opportunity for plants to adapt a natural resistance to the anthracnose fungus (COSEWIC 2007).

Insects and Pests

Eastern Flowering Dogwood is susceptible to many insects, although these are of much less concern than the anthracnose fungus. Identified pests include the dogwood borer (*Synanthedon scitula*), flat-headed borers (*Chrysobothris azurea* and *Agrilus cephalicus*), dogwood twig borer (*Oberea tripunctata*), twig girdler (*Oncideres cingulata*), scurfy scale (*Chionaspis linterni*) and dogwood scale (and *Chionaspis corni*) (McLemore 1990 cited in Tirmenstein 1991). Root knot nematode and defoliators can also reduce survival rates (COSEWIC 2007).

1.6 Knowledge Gaps

There is a significant body of research on dogwood anthracnose from the eastern United States, where it was first observed in the late 1970s (Daughtrey et al. 1996). Although research originally addressed the management of horticultural trees and development of resistant cultivars, an increasing focus has been placed on identifying the ecological impacts and developing management recommendations for dogwoods in forested settings (e.g. Holzmueller et al. 2006, Jenkins et al. 2007, Pierce et al. 2008). In general, more research is needed on reducing the severity of the disease in forest settings, and on refining the specific habitat requirements of Eastern Flowering Dogwood in Ontario.

Presence of Resistant Individuals and/or Populations in Ontario

A partial survey of Eastern Flowering Dogwood populations in Ontario was conducted during the development of the COSEWIC status report, in which some populations were identified that are not currently exhibiting signs of decline due to anthracnose (COSEWIC 2007). Ongoing monitoring at selected sites would determine whether any of these populations are resistant over the long term. An evaluation of site conditions would help to determine which natural characteristics (stand composition, structure, etc.) may be contributing to lower levels of mortality.

Management Tools for Use in Ontario

Monitoring of factors such as mortality, stem density and infection rate of Eastern Flowering Dogwood in burned areas would help to determine whether prescribed burning can be used to slow the decline of Eastern Flowering Dogwood. Prescribed burning has been undertaken in some natural areas where Eastern Flowering Dogwood is present (e.g. St. Williams' Forest, Turkey Point), and monitoring regeneration and disease severity at these sites would provide useful information.

Applied research to determine the success of stand thinning in reducing mortality and promoting regeneration would also be helpful. In studies of previously harvested plots, Britton and Pepper (1994) found that partial thinning may be detrimental to Eastern Flowering Dogwood over the long term. At the Spooky Hollow Nature Sanctuary in Norfolk County, pine plantations on sandy soils have been removed, and Eastern Flowering Dogwood has seeded profusely into the new openings (M. Gartshore pers. comm. 2009).

Research would help to determine whether such manual care of trees is effective or feasible in Ontario. For example, removal of diseased twigs and leaves and application of fungicide have been used successfully to slow the spread of dogwood anthracnose in the United States (Daughtrey et al. 1996). It is possible that these techniques can be modified to provide limited control methods under natural site conditions in Ontario.

Identification of Habitat Needs in Ontario

A more thorough description of Eastern Flowering Dogwood habitats across the range of Ontario sites using Ecological Land Classification approach wherever possible (Lee et al. 1998) will ensure that the habitat regulation developed for Eastern Flowering Dogwood is both accurate and sufficient to provide protection for existing habitat and recovery habitat for Eastern Flowering Dogwood.

1.7 Recovery Actions Completed or Underway

In Ontario, a few recovery actions are underway. LandCare Niagara, in partnership with the Ontario Ministry of Natural Resources (OMNR) in Vineland, has conducted inventory and occurrence updates in Haldimand and Niagara regions. The group also developed educational materials aimed at landowners and the general public, to assist landowners in identifying Eastern Flowering Dogwood and the threats facing it.

Monitoring of Eastern Flowering Dogwood has been undertaken at two locations in southwestern Ontario. Two EMAN tree plots in Norfolk County (Backus Woods and Wilson Tract) were first inventoried in 1995 and in subsequent years (2000, 2003, 2005) following the arrival of the anthracnose fungus, to derive an estimate of population decline (COSEWIC 2007).

Prescribed burning is occurring in various blocks at Turkey Point Provincial Park for savannah restoration, which may allow for an assessment of the response to assess the response of Eastern Flowering Dogwood and anthracnose fungus to fire. Monitoring of known trees at these sites is underway (S. Dobbyn pers. comm. 2010).

Eastern Flowering Dogwood seeds were collected by Mary Gartshore from two Norfolk County sites in the mid-late 1990s. The seeds were propagated in a greenhouse and seedlings were planted in the same area. Growing in open conditions and sandy soil, these trees remain in good health and produced large seed crops in 2006 and 2008 (M. Gartshore pers. comm. 2009).

Eastern Flowering Dogwood was also represented in a Gene Bank project at the University of Guelph Arboretum in the 1980s. Focused on a variety of Carolinian species, the Gene Bank was intended to provide surplus populations and open or controlled pollinated seed sources, and to take the seed collecting pressure off natural stands of native species. Losses of some Eastern Flowering Dogwood specimens have

occurred due to dogwood anthracnose, climate, and other diseases, but several healthy trees remain at the arboretum (S. Fox pers. comm. 2009).

2.0 RECOVERY

2.1 Recovery Goal

The goal of this recovery strategy is to conserve and protect extant populations of Eastern Flowering Dogwood, to reduce its rate of decline, and where possible, to restore populations of the species across its range in southern Ontario.

2.2 Protection and Recovery Objectives

Table 1. Protection and recovery objectives

No.	Protection or Recovery Objective
1.0	Identify and protect extant populations of Eastern Flowering Dogwood across its native range in southern Ontario
2.0	Undertake monitoring of health, threats and possible resistance to dogwood anthracnose
3.0	Develop, implement and assess management approaches for dogwood anthracnose and other threats in natural stands
4.0	Where possible, restore habitat and/or populations of Eastern Flowering Dogwood

Restoration is considered an important objective, but it is acknowledged that it may not be successful unless management techniques are in place to control the anthracnose fungus and reduce mortality of Eastern Flowering Dogwood. Related restoration approaches have been accorded a later priority in Table 2.

2.3 Approaches to Recovery

Table 2. Approaches to recovery for Eastern Flowering Dogwood in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
1.0 Identify and protect extant populations of Eastern Flowering Dogwood across its native range in southern Ontario				
Critical	Ongoing	Communications	1.1 Through a recovery team: <ul style="list-style-type: none"> – co-ordinate actions from the research community, landowners, managers, conservation groups, the landscape industry and government – transfer and exchange information on research results and management techniques 	<ul style="list-style-type: none"> • Dogwood anthracnose • All knowledge gaps
Critical	Ongoing	Communications	1.2 Encourage collaboration among agencies including the Ontario Ministry of Natural Resources (OMNR), Environment Canada (EC), Parks Canada, and the scientific community to develop and implement habitat protection for the species	<ul style="list-style-type: none"> • Habitat loss • Habitat needs
Critical	Short-term	Research	1.3 Describe and identify typical vegetation communities in which Eastern Flowering Dogwood occurs across its southern Ontario range in order to inform habitat regulation	<ul style="list-style-type: none"> • Habitat needs
Necessary	Ongoing	Communications	1.4 Develop educational materials for landowners and land stewards to aid in the identification of Eastern Flowering Dogwood and the dogwood anthracnose fungus	<ul style="list-style-type: none"> • Dogwood anthracnose • Deer browse • Insects and other pests

Recovery Strategy for the Eastern Flowering Dogwood in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
Necessary	Ongoing	Protection	1.5 Secure habitat on private lands across a representative range of the species through public ownership, especially at larger sites where trees exhibit resistance to dogwood anthracnose (if such sites are found)	<ul style="list-style-type: none"> • Habitat loss • Dogwood anthracnose
2.0 Undertake monitoring of health, threats and possible resistance to dogwood anthracnose				
Critical	Long-term	Monitoring and Assessment Research	2.1 Undertake monitoring of known populations: <ul style="list-style-type: none"> – Identify significant and/or resistant populations across a representative range and across habitat types – Monitor health, impacts of other threats, and identify potentially resistant trees or stands – Compare the health of open-grown trees with those from more heavily shaded forests in Ontario – Continue monitoring of EMAN stands where Eastern Flowering Dogwood is present to evaluate decline rates 	<ul style="list-style-type: none"> • Dogwood anthracnose • Herbivory • Insects and other pests
Beneficial	Long-term	Inventory and Monitoring	2.2 Inventory and continue to document new stands of Eastern Flowering Dogwood including information on their health status; record in Ontario NHIC database	<ul style="list-style-type: none"> • All threats

Recovery Strategy for the Eastern Flowering Dogwood in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
3.0 Develop, implement and assess management approaches for dogwood anthracnose and other threats in natural stands				
Necessary	Long-term	Management	3.1 Undertake prescribed burning at selected locations where Eastern Flowering Dogwood is present (e.g. St. Williams Forest, Turkey Point); assess its success as a management technique <ul style="list-style-type: none"> – assess response of Eastern Flowering Dogwood and anthracnose fungus to fire – develop management recommendations for use of prescribed burning in Ontario 	<ul style="list-style-type: none"> • Dogwood anthracnose
Necessary	Long-term	Management Research	3.2 Use current research to identify whether any mechanical, chemical, or biological methods of anthracnose control used by the horticultural industry are effective and/or feasible for use in natural forest settings <ul style="list-style-type: none"> – If so, use these methods on a limited and experimental basis; monitor and report on results 	<ul style="list-style-type: none"> • Dogwood anthracnose
Necessary	Short-term	Management Communication	3.3 Develop and distribute best management practices for Eastern Flowering Dogwood stands (e.g. methods to slow the spread of dogwood anthracnose, habitat restoration opportunities) for use by land owners and stewards	<ul style="list-style-type: none"> • Dogwood anthracnose • Habitat loss
Beneficial	Long-term	Management	3.4 If necessary, control deer population at sites with significant and/or resistant Eastern Flowering Dogwood populations	<ul style="list-style-type: none"> • Herbivory

Recovery Strategy for the Eastern Flowering Dogwood in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
4.0 Where possible, restore habitat and/or populations of Eastern Flowering Dogwood¹				
Beneficial	Long-term	Communications Stewardship	4.1 Cooperate with other initiatives to connect and expand forest fragments to increase potential suitable habitat (e.g. Carolinian Canada)	<ul style="list-style-type: none"> Habitat loss
Beneficial	Long-term	Management	4.2 Consider management (i.e. removal of conifers) in former conifer plantations within the range of Eastern Flowering Dogwood, in order to promote natural seeding, growth and dispersal of Eastern Flowering Dogwood as well as other native species	<ul style="list-style-type: none"> Forest succession
Beneficial	Long-term	Restoration	4.3 Coordinate seed collection across the species' range in order to ensure that locally adapted seeds are available for restoration plantings	<ul style="list-style-type: none"> All threats
Beneficial	Long-term	Restoration	4.4 Consider re-establishing Eastern Flowering Dogwood in suitable habitat at previously documented locations (e.g. pre-1975 sites) using local, potentially resistant seeds, and managing habitat to maintain open conditions and limit the spread and infection of dogwood anthracnose	<ul style="list-style-type: none"> All threats
Beneficial	Long-term	Research	4.5 Develop a source(s) of seeds and/or seedlings for restoration plantings that are potentially resistant to dogwood anthracnose, and define the maximum distance from the source that seeds may be planted	<ul style="list-style-type: none"> All threats

¹ Because dogwood anthracnose particularly affects seeding and small trees and seedlings, restoration plantings are not likely to be successful unless they occur at sites where anthracnose is absent, and/or other management is ongoing to prevent closure of the forest canopy.

2.4 Area for Consideration in Developing a Habitat Regulation

Under the ESA 2007, a recovery strategy must include a recommendation to the Minister of Natural Resources on the area that should be considered in developing a habitat regulation. A habitat regulation is a legal instrument that prescribes an area that will be protected as the habitat of the species. The recommendation provided below by the recovery team will be one of many sources considered by the Minister when developing the habitat regulation for this species.

It is recommended that areas where natural populations of Eastern Flowering Dogwood occur be prescribed as habitat within a habitat regulation. The areas surrounding Eastern Flowering Dogwood trees that are believed to be horticultural specimens (i.e. those clearly planted in landscaped settings such as urban gardens) should not be included in a habitat regulation because these are usually non-native cultivars of Eastern Flowering Dogwood that did not originate in Ontario. However, the areas surrounding trees in restoration plantings or trees of indeterminate origin are recommended for inclusion in a habitat regulation, to help contribute to the recovery of the species.

It is recommended that the habitat regulation include the contiguous ELC ecosite polygon (Lee et al. 1998) within which the species is found. If trees are close to the polygon edge, a minimum distance of 25 metres from the stem of any Eastern Flowering Dogwood tree is recommended for regulation. Regulating habitat based on the vegetation community will help to preserve the ecological function of the area, will help to maintain the ecological conditions required for the persistence of Eastern Flowering Dogwood, and may facilitate dispersal of seeds and species recruitment over a broad area. Protecting a minimum area of 25 metres around each tree represents a precautionary approach to ensure the necessary habitat conditions directly surrounding the tree are maintained and that individual trees are protected from harm.

Because of the wide range of habitats in which Eastern Flowering Dogwood occurs across southern Ontario and the number of ecosites in which it occurs, specific ecosite types are not listed here. Assessment of habitat types across the species' range has been recommended as a recovery approach, which would further inform the development of a habitat regulation.

Where the habitat of naturally growing trees cannot be meaningfully described by an ELC ecosite polygon (e.g. along fencerows and roadsides), a minimum area of 25 metres from the stem of the tree is recommended to be prescribed as habitat within a habitat regulation.

If future scientific studies indicate that additional areas of habitat are necessary to achieve the recovery goals for this species, that information should also be considered in developing the habitat regulation.

GLOSSARY

Bract: A leaf, usually much reduced or modified, which subtends a flower on inflorescences in its axis (Allaby 1992).

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): The committee responsible for assessing and classifying species at risk in Canada.

Committee on the Status of Species at Risk in Ontario (COSSARO): The committee established under section 3 of the *Endangered Species Act, 2007* that is responsible for assessing and classifying species at risk in Ontario.

Conservation status rank: A rank assigned to a species or ecological community that primarily conveys the degree of rarity of the species or community at the global (G), national (N) or subnational (S) level. These ranks, termed G-rank, N-rank and S-rank, are not legal designations. The conservation status of a species or ecosystem is designated by a number from 1 to 5, preceded by the letter G, N or S reflecting the appropriate geographic scale of the assessment. The numbers mean the following:

- 1 = critically imperilled
- 2 = imperilled
- 3 = vulnerable
- 4 = apparently secure
- 5 = secure

Drupe: A fleshy fruit, such as a plum, containing one or a few seeds, each enclosed in a stony layer that is part of the fruit wall (Allaby 1992).

Ecological Monitoring and Assessment Network (EMAN): This national network has developed a series of standard monitoring protocols, including several plot-based protocols to monitor terrestrial vegetation.

***Endangered Species Act, 2007* (ESA 2007):** The provincial legislation that provides protection to species at risk in Ontario.

Epicormic bud: Epicormic buds lie dormant beneath the bark, their growth suppressed by hormones from active shoots higher up the plant. Under certain conditions they develop into active shoots, such as when damage occurs to higher parts of the plant, or light levels are increased following removal of nearby plants

***Species at Risk Act* (SARA):** The federal legislation that provides protection to species at risk in Canada. This act establishes Schedule 1 as the legal list of wildlife species at risk to which the SARA provisions apply. Schedules 2 and 3 contain lists of species that at the time the act came into force needed to be reassessed. After species on Schedule 2 and 3 are reassessed and found to be at risk, they undergo the SARA listing process to be included in Schedule 1.

Species at Risk in Ontario (SARO) List: The regulation made under section 7 of the *Endangered Species Act, 2007* that provides the official status classification of species at risk in Ontario. This list was first published in 2004 as a policy and became a regulation in 2008.

REFERENCES

- Allaby, M. (ed.) 1992. The Oxford Concise Dictionary of Botany. Oxford: Oxford University Press. 442 pp.
- Blair, J.M. 1988. Nutrient release from decomposing foliar litter of three tree species with special reference to calcium, magnesium, and potassium dynamics. *Plant and Soil* 110: 49–55.
- Chellemi, D.O., and K.O. Britton. 1992. Influence of canopy microclimate on incidence and severity of dogwood anthracnose. *Canadian Journal of Botany* 70: 1093-1096.
- COSEWIC 2007. COSEWIC Assessment and status report on the eastern flowering dogwood *Cornus florida* in Canada. Committee of the Status of Wildlife in Canada. Ottawa. vi + 22pp.
- Daughtrey, M.L., C.R. Hibben, K.O. Britton, M.T. Windham, and S.C. Redlin. 1996. Dogwood Anthracnose: understanding a disease new to North America. *Plant Disease*. 80: 349-358.
- Dobbyn, S. 2010. Zone Ecologist, Southwest Zone, Ontario Parks, OMNR. Personal communication.
- Fowells, H. A., compiler. 1965. Silvics of forest trees of the United States. Agricultural Handbook 271. Washington, DC: U.S. Department of Agriculture, Forest Service. 762 pp.
- Fox, S. 2009. Assistant Arboretum Manager, University of Guelph. Personal communication.
- Gartshore, M. 2009. *Pterophylla* Native Plants and Seeds, R.R.#1, Walsingham, ON. Personal communication.
- Gleason, H.A. and A. Cronquist. 1991. Manual of Vascular Plants of Northeastern United States and Adjacent Canada. The New York Botanical Garden. 910 pp.
- Holmgren, Noel. 1998. The Illustrated Companion to Gleason and Cronquist's Manual. Illustrations of the Vascular Plants of Northeastern United States and Adjacent Canada. The New York Botanical Garden, Bronx, New York.
- Holzmueller, E.J., S. Jose, M. Jenkins, A. Camp, and A. Long. 2006. Dogwood anthracnose in eastern hardwood forests: what is known and what can be done? *Journal of Forestry*. 104: 21-26.

- Holzmueller, E.J., S. Jose, and M.A. Jenkins. 2008. The relationship between fire history and an exotic fungal disease in a deciduous forest. *Oecologia*. 155: 347-356.
- Jenkins, M.A., S. Jose and P.S. White. 2007. Impacts of an exotic disease and vegetation change on foliar calcium cycling in Appalachian forests. *Ecological Applications*. 17: 869-881
- Lee, H., W. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig, & S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximations and Its Application. Ontario Ministry of Natural Resources. SCSS Field Guide FG-02.
- Mayor, A.J., J.F. Grant, M.T. Windham, and R.N. Trigano. 1999. Insect visitors to Flowering Dogwood, *Cornus florida* L. in Eastern Tennessee: Potential pollinators. Proceedings of Southern Nurserymen's Association Research Conference. 44: 192-196.
- McEwan R.W., R.N. Muller, M.A. Arthur, and H.H. Housman. 2000. Temporal and ecological patterns of Flowering Dogwood mortality in the mixed mesophytic forest of eastern Kentucky. *Journal of the Torrey Botanical Society* 127: 221–229.
- McLemore, B. F. 1990. *Cornus florida* L. Flowering Dogwood. Pp 278-283 In Burns, R. M. and B.H. Honkala. *Silvics of North America*. Vol. 2. Hardwoods. Agric. Handb. 654. Washington, DC: U.S. Department of Agriculture, Forest Service.
- Natural Resources Canada. 2001. Dogwood anthracnose (*Discula destructiva*) in Ontario. Frontline Express, Bulletin No. 1, Canadian Forestry Service, Great Lakes Forestry Centre, Sault Ste. Marie, ON. <http://cfs.nrcan.gc.ca/news/274>.
- Pierce, A.R., W.R. Bromer, and K.N. Rabenold. 2008. Decline of *Cornus florida* and forest succession in a *Quercus-Carya* forest. *Plant Ecology* 195: 45-53.
- Reed, S.M. 2004. Self-incompatibility in *Cornus florida*. *Horticultural Science* 39: 335-338.
- Rossell, I.M., C.R. Rossell, Jr., and K.J. Hining. 2001. Impacts of dogwood anthracnose (*Discula destructiva*) on the fruits of Flowering Dogwood (*Cornus florida* L.): implications for wildlife. *American Midland Naturalist* 146: 379-387.
- Schwegman, J.E., W.E. McLean, T.L. Esker and J.E. Ebinger. 1998. Anthracnose-caused mortality of Flowering Dogwood (*Cornus florida*) at the Dean Hills Nature Preserve, Fayette County, Illinois, USA. *Natural Areas Journal* 18:3.
- Soper, James H. and Margaret L. Heimbürger. 1982. *Shrubs of Ontario*. Life Sciences Misc. Publ. Toronto, ON: Royal Ontario Museum. 495 pp.

- Strobl, S. and D. Bland. 2000. A silvicultural guide to managing southern Ontario forests. Version 1.1. Ontario Ministry of Natural Resources, Queen's Printer for Ontario, 648 pp.
- Thomas, W.A. 1969. Accumulation and cycling of calcium by dogwood trees. *Ecological Monographs* 39: 101–120.
- Tirmenstein, D. A. 1991. *Cornus florida*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis> Accessed September 4, 2009.
- Woodliffe, A. 2009. District Ecologist, Aylmer District OMNR. Personal communication.

RECOVERY STRATEGY DEVELOPMENT TEAM MEMBERS

NAME	AFFILIATION and LOCATION
Anita Imrie	Ontario Ministry of Natural Resources (OMNR), Species at Risk Branch
Melinda Thompson-Black	OMNR, Aurora District
Barb Boysen	OMNR, Forest Gene Conservation Association
Karine Beriault	OMNR, Guelph District
Amy Brant	OMNR, Guelph District
Allan Woodliffe	OMNR, Aylmer District
Sandy Dobbyn	OMNR, Ontario Parks (Southwest Zone)
Sean Fox	University of Guelph

**PART 3 – *Eastern Flowering Dogwood: Ontario Government
Response Statement*, prepared by the Ontario
Ministry of Natural Resources**

Eastern Flowering Dogwood

Ontario Government Response Statement



Photo: Weyl Bakowdy, NHIC Archives

PROTECTING AND RECOVERING SPECIES AT RISK IN ONTARIO

Species at risk recovery is a key part of protecting Ontario's biodiversity. Biodiversity – the variety of living organisms on Earth – provides us with clean air and water, food, fibre, medicine and other resources that we need to survive.

The *Endangered Species Act, 2007* (ESA) is the Government of Ontario's legislative commitment to protecting and recovering species at risk and their habitats. As soon as a species is listed as extirpated, endangered or threatened under the ESA, it is automatically protected from harm or harassment. Also, immediately upon listing, the habitats of endangered and threatened species are protected from damage or destruction.

Under the ESA, the Ministry of Natural Resources (the Ministry) must ensure that a recovery strategy is prepared for each species that is listed as endangered or threatened. A recovery strategy provides science-based advice to government on what is required to achieve recovery of a species.

GOVERNMENT RESPONSE STATEMENTS

Within nine months after a recovery strategy is prepared, the ESA requires the Ministry to publish a statement summarizing the government's intended actions and priorities in response to the recovery strategy. The recovery strategy for Eastern Flowering Dogwood was completed on February 18, 2010.

(<http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@species/documents/document/286964.pdf>)

The response statement is the government's policy response to the scientific advice provided in the recovery strategy. In addition to the strategy, the response statement is based on input from stakeholders, other jurisdictions, Aboriginal communities and members of the public. It reflects the best available traditional, local and scientific knowledge at this time and may be adapted if new information becomes available. In implementing the actions in the response statement, the ESA allows the Ministry to determine what is feasible, taking into account social and economic factors.

The Eastern Flowering Dogwood is a small tree with a layered branching pattern and simple, opposite leaves. In Ontario, the Eastern Flowering Dogwood is found only in the Carolinian Zone, a narrow band extending from the southeastern shore of Lake Huron to the west end of Lake Ontario. The number of Eastern Flowering Dogwood trees is declining steeply, mostly due to the aggressive dogwood anthracnose fungus.

MOVING FORWARD TO PROTECT AND RECOVER EASTERN FLOWERING DOGWOOD

The Eastern Flowering Dogwood is listed as an endangered species under the ESA which protects both the tree and its habitat. The Act prohibits any damage or destruction of that habitat without authorization. Such authorization would require that conditions established by the Ministry of Natural Resources be met.

The government's goal for the recovery of the Eastern Flowering Dogwood is to protect and conserve existing populations, reduce its rate of decline, and where possible, restore populations of the species across its range in southern Ontario.

Protecting and recovering species at risk is a shared responsibility. No single agency or organization has the knowledge, authority, or financial resources to protect and recover all of Ontario's species at risk. Successful recovery requires inter-governmental co-operation and the involvement of many individuals, organizations and communities.

In developing the government response statement, the Ministry considered what actions are feasible for the government to lead directly, and what actions are feasible for the government to support its conservation partners to undertake.

GOVERNMENT-LED ACTIONS

To help protect and recover the Eastern Flowering Dogwood, the government will directly undertake the following actions:

- Educate other agencies and planning authorities on the requirement to consider the protection of the Eastern Flowering Dogwood and its habitat in planning activities and environmental assessment processes.
- Encourage the submission of Eastern Flowering Dogwood data to the Ministry of Natural Resources' central repository at the Natural Heritage Information Centre.
- Undertake communications and outreach to increase public awareness of species at risk in Ontario.
- Protect the Eastern Flowering Dogwood through the ESA. Develop and enforce a regulation protecting the specific habitat of the species.
- Support conservation, agency, municipal and industry partners to undertake activities to protect and recover Eastern Flowering Dogwood. Support will be provided through funding, agreements, permits (including conditions) and advisory services.
- Establish and communicate annual priority actions for government support in order to encourage collaboration and reduce duplication of efforts.

GOVERNMENT-SUPPORTED ACTIONS

The government endorses the following actions as being necessary for the protection and recovery of the Eastern Flowering Dogwood. Actions which are noted as "high" will be given priority consideration for funding or for authorizations under the ESA. The government will focus its support on these high priority actions over the next five years.

Focus Area: Threat Management

Objective: Develop, implement and assess management approaches for dogwood anthracnose and other threats in natural stands.

Actions:

1. **(HIGH)** Conduct research to identify potentially successful techniques of controlling dogwood anthracnose fungus in natural forest settings. These may include evaluating the use of prescribed burning or methods being used by the horticultural industry.
2. **(HIGH)** Develop and distribute best management practices for Eastern Flowering Dogwood stands (e.g., methods to slow the spread of dogwood anthracnose, habitat restoration opportunities) for use by landowners and land stewards.

Focus Area: Monitoring

Objective: Undertake monitoring of health, threats and possible resistance to dogwood anthracnose.

Actions:

3. **(HIGH)** Develop and implement a monitoring program that may include:
 - Identifying significant and/or resistant populations across a representative range and across habitat types.
 - Monitoring tree health, the impacts of other threats, and identification of potentially resistant trees or stands.
 - Comparing the health of open-grown trees with those from more heavily shaded forests in Ontario.
 - Continued monitoring of EMAN (Ecological Monitoring and Assessment Network) stands where Eastern Flowering Dogwood is present to evaluate decline rates.

Focus Area: Protection

Objective: Identify and protect existing populations of Eastern Flowering Dogwood across their range in southern Ontario.

Actions:

4. **(HIGH)** Identify and describe typical vegetation communities in which Eastern Flowering Dogwood occurs across its southern Ontario range.
5. Develop educational materials for landowners and land stewards to help them identify Eastern Flowering Dogwood and the dogwood anthracnose fungus.
6. Encourage collaboration and stewardship among partners to implement habitat protection for the species.
7. As opportunities arise, support the securement of habitat with anthracnose resistant populations of Eastern Flowering Dogwood through existing land securement and stewardship programs.

Focus Area:	Restoration
Objective:	Where possible, restore habitat and/or populations of Eastern Flowering Dogwood.

Actions:

8. Co-operate with existing initiatives to connect and expand forest fragments to increase potential suitable habitat.
9. Consider habitat management within the range of Eastern Flowering Dogwood (e.g. removal of some conifers in former conifer plantations, in order to promote natural seeding, growth and dispersal of Eastern Flowering Dogwood and other native species).
10. Develop a source(s) of seeds and/or seedlings for restoration plantings that are potentially resistant to dogwood anthracnose and define the maximum distance from the source that the seeds may be planted.
11. Consider re-establishing Eastern Flowering Dogwood in suitable habitat at previously documented locations using local, potentially resistant seeds. Manage habitat to maintain open conditions and limit the infection and spread of dogwood anthracnose. (Planting of Eastern Flowering Dogwood should only be considered at sites where the dogwood anthracnose fungus is absent and there will be ongoing management of the site to maintain habitat suitability.)

IMPLEMENTING ACTIONS

Financial support for the implementation of actions may be available through the Species at Risk Stewardship Fund, Species at Risk Farm Incentive Program, or Community Fisheries and Wildlife Involvement Program. Conservation partners are encouraged to discuss project proposals related to the actions in this response statement with the Ministry of Natural Resources. The Ministry can also advise whether any authorizations under the ESA or other legislation may be required for undertaking the project.

Implementation of the actions may be subject to changing priorities across the multitude of species at risk, available resources and the capacity of partners to undertake recovery activities. Where appropriate, the implementation of actions for multiple species will be co-ordinated across government response statements.

REVIEWING PROGRESS

The ESA requires the Ministry to conduct a review of progress towards protecting and recovering a species not later than five years from the publication of this response statement. The review will help identify whether adjustments are needed to achieve the protection and recovery of the Eastern Flowering Dogwood.

ACKNOWLEDGEMENT

We would like to thank everyone who participated in the development of the "Recovery Strategy for the Eastern Flowering Dogwood in Ontario" for their dedication to protecting and recovering species at risk.

For additional information:

Visit the species at risk website at

ontario.ca/speciesatrisk

Contact your MNR district office

Contact the Natural Resources Information Centre

1-800-667-1940

TTY 1-866-686-6072

mnr.nric.mnr@ontario.ca

ontario.ca/mnr