Management Plan for the Larrimac Forest

October 2023

Prepared by the Larrimac Forest Stewardship Committee

SUMMARY[1]

In 2022 and 2023, ACRE acquired the geographically adjacent properties known locally as the Dionne/Wilson, Jolicoeur/McMartin and Larrimac Golf Course properties (together the Larrimac Forest). These lands were acquired through a combination of a generous ecological gift from the Wilson Dionne family, financial support from the community and grants from governmental and other organizations. Together, these are a wooded natural environment of 63 Ha.

The Larrimac Forest has a significant wetland area, a variety of mature forest types and the presence of some plant and faunal species at risk. The ecological value of the Forest is acceptable but not excellent because of the declining health of many tree species found in the forest such as beech trees.

The forest is a significant store of ecological carbon and is continuing to sequester and store carbon. The area was last logged by selection cutting about 50 years ago. Its average age is about 60 years and average height about 23 metres. The forest is mix of deciduous and coniferous trees, range from deciduous stands dominated by Sugar maple, Red oak and American Beech, to coniferous stands composed primarily of Eastern Hemlock.

The main threats to the biodiversity of the Larrimac Forest identified in this management plan are significant tree dieback due to various exotic diseases, pathogens and insect pests, damage to the forest caused by the increased frequency of intense impacts due to climate change, and increased fragmentation of the forest resulting from formal and informal trails built in the forest prior to acquisition by ACRE.

Other minor threats identified are localized degradation of wetland banks and streams due to human overuse of wetland edges along some existing slopes, risk of turtle mortality from vehicles on Highway 5, and possible disturbance of wildlife by dogs and people.

This Management Plan provides information and direction for the management and stewardship of the Larrimac Forest. It sets out the:

i. a description of the Committee and the Forest;

ii. conservation value and conservation targets for the Forest;

iii. activities that are consistent with the conservation value of the Forest;

iv. the main threats to conservation in the Forest;

v. the objectives and strategies of management and conservation; and

[1] This Plan is mostly an amalgamation (with thanks) of the Dendroica Environment and Fauna's *2023 Ecological characterization-Jolicoeur-McMartin & Dionne-Wilson property* and Nature Chelsea's *Core Area and Corridor Assessment Series: Assessment of the Larrimac Wildlife Corridor and Conservation Lands, November 2010*

vi. an action plan to achieve the objectives and reduce the risks or threats to the conservation value of the Forest by 2033.

1 ACRE and the Stewardship Committee

1.1 ACRE

ACRE is a not-for-profit corporation that was incorporated on April 12, 2000, under the Quebec Corporations Act (CQLR, C.C-38. ACRE is registered as number 1149266505 under the Quebec Enterprise Register. Its head office is 64 Juniper, Chelsea, Quebec, JGB1T3.

1.2 ACRE's Conservation Mandate

ACRE's mandate includes acquiring and conserving ecologically significant lands in the Municipality of Chelsea and municipalities located near Gatineau Park. As a conservation organization, ACRE is mandated to acquire and conserve in perpetuity lands of ecological significance in the municipality of Chelsea and in municipalities near Gatineau Park. ACRE is particularly interested in areas identified as ecological corridors by the National Capital Commission.

ACRE is committed to applying conservation standards and practices according to the Canadian Land Trust Standards and Practices (2019), which provides technical and ethical guidelines for responsible management of natural environments.

1.3 The Larrimac Forest Stewardship Committee

The Larrimac Forest Stewardship Committee was established by the ACRE Board of Directors in the Spring of 2023 to act as stewards of the Larrimac Forest. The Committee is composed of 6–12 residents who reside in the vicinity of the Forest.

The Committee assists ACRE with the implementation of this Management Plan including the monitoring trail usage and activities in the Forest, identifying risks to users or the Forest,

assisting in removal or remediation of such risks, remediation and conservation of the forest, and trail maintenance. The Committee advises the ACRE Board of Directors on the management of the Forest, community priorities and concerns, and on matters affecting the Forest. It is a liaison between ACRE and local residents/trail users. It assists in addressing issues and suggestions that may arise. It collaborates with ACRE and its Board of Directors and groups such as the Municipality of Chelsea, Sentiers Chelsea, donors and local residents.

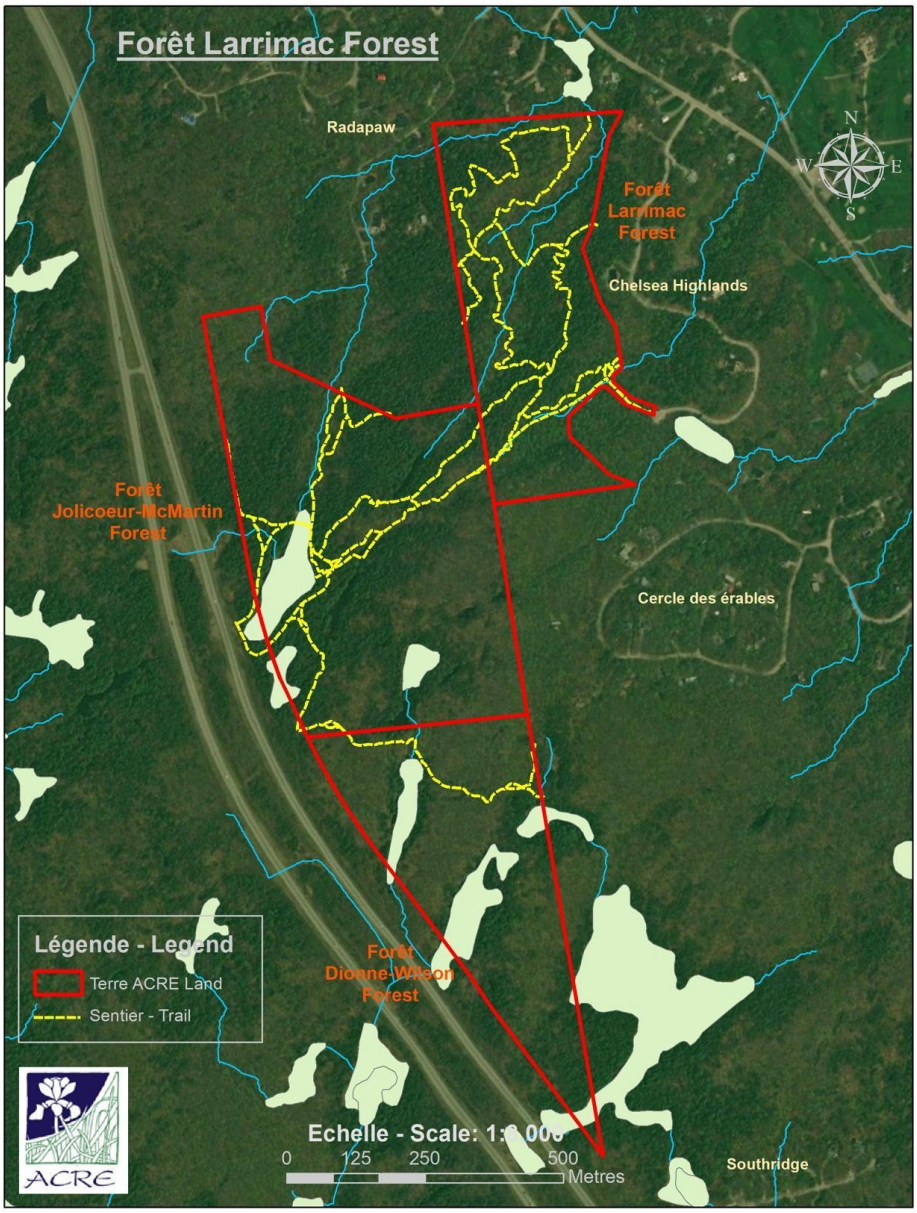
The management of the Forest and all other lands owned by ACRE also benefit from the expertise of the Réseau de milieux naturelles which is an organization that works with and coordinates the majority of private land conservation stakeholders in Quebec to promote conservation of natural environments for the benefit of communities. Members of this network protect more than 66,600 hectares across Quebec and bring together hundreds of conservation experts.

2 THE LARRIMAC FOREST

2.1 Location and Size

The Forest consists of 63 hectares located on lots # 6 517 942, #3 030 805 and #X XXX XXX in the Municipality of Chelsea, Quebec. It is a primarily an upland, mesic forest characteristics of thr Great Lakes, St. Lawrence transition. Forest ecotypes range from pure deciduous (Sugar maple, red oak and American Beech) to pure coniferous (Eastern Hemlock) with gradiants of mixed stands. In addition there are non-forest communities including numerous wetlands (fens and marshes), ponds, intermittent streams and vernalpools..

The Forest is bordered to the west by Highway 5 and Gatineau Park, to the north and south by private wooded and undeveloped land, and to the east by residential properties. The Forest is connected to Gatineau Park via a stream and riparian habitat as well as a large tunnel underpass. It is a wildlife corridor to the Gatineau Park.



2.2 Past Use

The Forest has not been exploited for residences, or agriculture for at least 90 years. There was some selection cutting on the area as recently as 60 years ago but the area was never clearcut. There are no traces of old habitation or agricultural livestock such as the presence of rock fences or young homogeneous forests. There is evidence of an old, very small mica mine dating back to the 1800's.

2.3 Current State of Conservation

The general health of the ecosystems found at the Forest is acceptable from a conservation perspective. Although the lands are situated next to residential areas, there has been little degradation of the mature forest cover by human activities. See Annex 1 to this Management Plan for a detailed description of the priority natural communities and ecosite descriptions.

However, there are several threats identified in Section 3 of this Plan including the prevalence of exotic diseases affecting several tree species, the effects of climate change, and increased fragmentation of the forest resulting from the recent construction of trails in the Forest, prior to acquisition by ACRE..

2.4 Public Use of the Larrimac Forest

The trails in the Forest have been frequented for over 80 years by residents for low-impact recreational activities such as hiking, dog walking, skiing, trail running, and mountain/fat biking. The trails are part of a larger network of trails that connect the community to private and community lands, and the Gatineau Park.

In July 2023, a 25-day trail camera survey conducted by ACRE, identified that there are approximately 25 users of the trails each day. About one third of users are walking dogs, one third are hiking and one third are biking. The total numbers and user profiles may vary depending on the time of year, the day of the week, weather conditions and special events from time to time. As Chelsea continues to grow and as the forest becomes better known by residents and the public at large, the number of users is expected to increase.

ACRE's mandate includes engaging the local community in conservation activities and active lifestyles that involve a respect for nature. Accordingly, community uses of the trails will continue to the extent that public liability insurance can be secured for the activities and can be balanced with maintaining the ecological integrity of the lands.

2.5 Infrastructure on the Property

There are no temporary or permanent human structures in the Larrimac Forest.

2.6 Ecological Information

2.6.1 Geology

The Forest is part of the Grenville Geological Province, an area characterized by sedimentary rocks such as marble, calco-silicate rocks, dolomite, shale and quartzite. The underlying Canadian Shield is composed mainly of granite and some metamorphosed igneous rocks. The oldest bedrock in the municipality of Chelsea consists of Precambrian rock (over 570 million years old), composed of igneous and metamorphic rocks, on which other geological units have been deposited. The Larrimac Forest is located at an altitude of 210 to 240 m above sea level and the terrain is generally hilly.

2.6.2 Hydrology

The Forest is part of the Gatineau River watershed system. The Forest has a network of wetlands that covers about 15% of the forest area. These wetlands consist mainly of beaver ponds and, to a lesser extent, marshes and afen. There are also several vernal ponds, although these latter habitats are not considered wetlands as such. Several intermittent streams associated with wetlands are also present on the property.

2.6.3 Surface Matter

The soil surface layer of the Forest is an undifferentiated glacial deposition till originating from a bottom moraine without morphology (thin). This till consists of blocks, pebbles, pebbles, and gravel of various kinds (most often from sedimentary rocks in the study area) incorporated into a matrix of fine particles varying from sandy to clayey.

This deposit was set up during the last Upper Wisconsinian glaciation, more than 15,000 years ago.

2.6.4 Climate

The Larrimac Forest is part of the Southern Laurentian Natural Province with the mildest climate in Quebec. There is an estimated 165–199 days of plant growth and an average annual temperature ranging from -0.2 to 4.2 degrees.

2.6.5 Flora

The Forest is in the bioclimatic domain of the sugar maple. It contains three distinct forest types: a sugar maple and mature red oak, mature hemlock stands and a basswood and other shade tolerant deciduous ress.

The flora is generally diverse with more than 84 plant species documented by Dendroica Environment and Wildlife in 2022. A more thorough survey conducted by Nature Chelsea in June 2009 and 2010, identified 117 plant species. See Annex 1 to this Plan for a more detailed description of Priority Natural Communities and Ecosite Descriptions prepared by Nature Chelsea in 2010.

2.6.6 Fauna

A wildlife data survey of the Forest conducted during two site visits in 2022 by Dendroica Environment and Wildlife identified 6 species of mammals, 25 species of birds, 4 species of amphibians and reptiles, and 12 species of invertebrates. Large mammals included black bear, eastern coyots and white-tailed deer.

Surveys conducted by Nature Chelsea in June 2009 and 2010, identified a total of 190 species in the Larrimac forest, including 117 plant species, 31 bird species, four amphibian species, 28 insect species, and 11 mammal species. Among the bird species recorded during breeding season, five species are considered forest interior birds, including veery, black-throated green warbler, black and white warbler, ovenbird

and yellow-throated vireo. These species are sensitive to forest loss and fragmentation, and overall habitat degradation.

Nature Chelsea also conducted a wildlife survey using remote cameras, visual records and snow tracking transects during fall 2009 – spring 2010. Among the bird species recorded during breeding season, five species are considered forest interior birds, including veery, black-throated green warbler, black and white warbler, ovenbird, and yellow-throated vireo. These species are sensitive to forest loss and fragmentation, and overall habitat degradation. In addition, as part of a wildlife corridor study, a mammal survey was conducted using remote cameras and snow tracking transects during fall 2009 – spring 2010. The camera surveys document use of the Larrimac areas by a wide range of species, characteristic of a rich and diverse forest being 11 white-tail deer, 4 bear, 9 American fox, 7 red squirrel, 18 racoon, 8 eastern coyote, 8 fisher, I chipmunk and 3 snowshoe hares.

2.6.7 Species at Risk in the Forest

2009–2010 Nature Chelsea Species at Risk Survey

Nature Chelsea recorded "*three species at risk in the Larrimac forest, being the butternut tree (Juglans cinerea), the white trillium (Trillium grandiflorum), and the bellwort (Uvulaire grande-fleur). The butternut is listed as endangered by the Species at Risk Act, and the white trillium and the bellwort are listed as threatened under the Québec Species at Risk Act. During fall 2009 and 2010, a survey of Butternut trees was conducted. The Larrimac forest contains stands of healthy butternut trees. Butternuts are dying throughout their range due to an introduced canker species (a fungus). It is not well known whether some individuals are resistant to the canker. If this is indeed the case, the future of the butternut tree may depend on finding a preserving healthy stands of trees.*

Large-flowered bellwort (Uvularia grandiflora) is a plant in the family Colchicaceae, native to eastern North America. It is found in the Gatineau at the northern extend of its range and is listed as threatened in Quebec because of forest cutting and urbanisation. In the Larrimac forest it is found in rich, older growth sites.

Trillium grandiflorum, commonly known as Great White Trillium, is a perennial member of the lily family. In Quebec, it is found only is the rich sugar maple forests of south. Like Large-flowered bellwort, its status as a species at risk is because of poor forestry practices and land conversion to urbanisation.

All of the above species are also impacted by high populations of white-tailed deer. At high population levels, excessive browsing by deer can eliminate species such as bellwort and great white trillium. The presence of wolves and coyotes control deer populations and allows the persistence of these rare species. Wolves and deer are maintained by keeping core conservation lands and wildlife corridors. This is just one example of how the maintenance of species at risk requires the maintenance of health connected ecosystems."

2.7.2 Species at Risk Survey: Dendroica Environment and Wildlife

Dendrocia Environment and Wildlife conducted two site visits in 2022 and identified five species at risk in the Larrimac Forest including the Eastern Pewee, Painted Turtle, Butternut, Wild Garlic and American Conopholis as follows:

French name	Latin name	SARA	LEMV	Notes
Painted turtle	*Chrysemys picta*	Worrying	_	Several individuals present in the larger ponds of both properties
Eastern Pioui	*Contopus virens*	Worrying	No status	3 breeding pairs in both properties
Butternut*	*Juglans cinerea*	Endangered	ESDMV	15 live but dying stems north of the Jolicoeur-McMartin sector
Wild garlic	*Allium triccocum*	_	Vulnerable	12 plants north of the Dionne-Wilson sector
Conopholis of America	*Conopholis americana*	_	Threatened	70 plants divided into 4 sectors of the Dionne-Wilson sector

*ESDMV: Species likely to be designated threatened or vulnerable

3 THREATS TO BIODIVERSITY

MAJOR THREATS

3.1 Tree Mortality Due to Diseases and Pathogens

Several tree species on the Larrimac Forest are currently affected by invasive exotic indects and diseases, causing the dieback and death of many trees. Most recently,here is a high rate of death in American beech (*Fagus grandifolia*) This disease is caused by a combination of an introduced beech scale insect (Cryptococcus fagisuga) from Europe, coupled with a native nectria fungus.. We are observing high mortality rates in beech and trees that are now infected will likely succumb to the disease in a few years. The diminishment of beech is significant ecologically as many species of native wildlife rely heavily on beech nut, including Black bear, Brech are currently common in the forest and the death of large beech trees results in falling branches and boles which are a public safety issue for trail users.

There has also been a severe mortality rate in all 3 species of Ash (Fraxinus sp.) due to the current region-wide outbreak of the emerald ash borer (*Agrilus planipennis*), which only came into our region in the last 15 years.Most of the ask trees in the Larrimac are white ash (*Fraxinus americana) although* Back ash *(Fraxinus nigra)* has been recorded a few wet locations Ash is already much reduced in the Larrimac. It remains to be seen of some trees will be resistant to Emerald ask borer.

Finally, a butternut tree *(Juglans cinerea*) mortality rate of over 90% has occurred mainly in the north-west sector of the Forest. These trees are dying because of the presence of walnut canker (*Ophiognomonia clavigignenti-juglandacearum*) which affects this butternut trees throughout the region. Bitternuts produce a large crop of nuts that are valued by wildlife but there are fewer trees every year.

3.2 Climate Change

Strong windstorms like the Derecho in May 2022 and the ice storms in April 2023 are predicted to be more frequent with climate change. These weather events can lead to

the fall of mature trees and broken branches, open the trees to insect and fungal attacks, as well as creating safety issues for users of the Forest. They also can compromise the over-all ecology of the Forest and degrade the mature forest microhabitats where shade-tolerant species are found.

It is possible that the opening of forest cover in places by weather events could be beneficial for some species at risk (e.g. Eastern Woodpewe) and could promote greater heterogeneity or complexity in forest structure. However, the random, unpredictable and often catastrophic effects of climate change are difficult to predict and manage. For example, in 2023, a number of mature trees were uprooted by high winds.

In addition, prolonged periods of drought and the migration of evasive species caused by climate change pose additional risks to the biodiversity and health of the Forest.

3.3 Beaver Dam Management and Wetland Degradation

The sometimes-ill-considered destruction and dismantling of beaver dams can be a threat to the wetlands of the Forest. Municipal by-laws require owners of land containing beaver dams to reduce the risk of flooding either by installing water level maintenance systems or by controlling beavers and destroying dams periodically. As beaver ponds are integral to a healthy forest ecosystem, efforts should be taken to control water levels rather than killing the beavers or destroying their dams.

3.4 Harvesting Plants

The population of wild leek plants in the Larrimac Forest has significantly diminished in recent decades because of over harvesting. One strand located in the Dionne/Wilson lands has been reduced to about 15 plants. It is still uncertain whether the species survives in the remainder of the Forest as there is no data on the matter.

3.5 Fragmentation of the Forest

The construction of new trails on the lands previously owned by the Golf Course has resulted in increased the stratification of the Forest. In addition, a number of trails in the Forest have been braided into multiple paths by users avoiding obstacles, mud or other conditions. Annex 2 to this Management Plan sets out the threats caused by stratification of forests caused by trails.

MINOR THREATS

3.6 Human Trampling, Shoreline Erosion

Several sections of trails in the Forest run along wetlands and sometimes cross permanent or intermittent watercourses. Repetitive trampling by trail users can have an impact on forest habitats by widening existing trails, creating habitat loss, compacting soil, and increasing erosion and runoff.

3.7 Mortality of Reptiles (Turtles) On Highway 5

Several wetlands in the Forest are habitat for turtles. As these ponds are situated next to Highway 5, there is a mortality risk when adult turtles cross the highway or lay their eggs in the gravel on the roadside. Data on road fatalities is required to assess the extent of the risk and whether preventative actions are required.

3.8 Impact of Dogs on Fauna and Flora

Approximately one third of the users of the trails in the Larrimac Forest are walking their dog, although the number of dog walkers is relatively small. In the future there many be increase use of the forest, driven by a growing population in Chelsea and more of those people working form home bases offices.

Several recent studies have shown that the regular presence of people and dogs, on or off leash, along trails in natural environments can cause significant disturbance to

wildlife (Lenth et al., 2006; Banks and Bryant, 2007; Weston and Stankowich, 2013; Parsons et al., 2016; De Frenne et al., 2022). These studies are from a variety of different ecological communities and generally higher intensities if use. We have not specific information on impacts for the Larrimac Forest. This could therefore be the subject of further consideration, study, or follow-up in the future.

4 ACTION PLAN AND TIMELINE

Target Objective	Strategies/Actions	Completion Date	Priority	Results
Promote Biodiversity	Continue biodiversity censuses on a regular basis through citizen science (Bioblitz, iNaturalist, eBird).	2028	1	Increased ecological knowledge of the distribution, threats, and use of habitats by species at risk.
	Assess the presence of fish in wetlands.	2033	3	Maintain or increase medium term populations of wildlife and plant species.
	Initiate a program for the installation and monitoring of artificial bat houses to assist these species at rick.	2028	3	
	Reduce and manage the impact of trail use: ● Educate users on the importance of staying on existing trails and not making new trails; ● Install signs to mark trails and set out trail etiquette/cooperation guidelines; ● Prohibit harvest of any species ● ● Manage the Forest to avoid adversely affecting the safety, peace and	2024 2024 2024 2024	1 1 1 1	Reduction of wildlife disturbance by certain human activities. Reduction of habitat degradation. Reduction and maintenance of trail stratification.

	enjoyment of the community and neighbours; ● Identify and relocate trail sections that may harm plant species at risk. Update ACRE's biodiversity database annually Limit the removal of dead or damaged trees to safety concerns outside the bird nesting period of mid-April to late August. Assess the distribution and impact of invasive alien plant species (e.g. buckthorn) across the property	On-going 2024 2028 On-going On-going 2028	2 2 2 2 3 3	
Tree Health	Assess the severity and extent of disease in broadleaf beech, butternut, ash, and hemlock using mortality plots and specific tree tagging Study the possible reintroduction of disease resistant butternut and ask and other threatened tree species to the Forest.	2028 2028 2028	1 2 3	Increased knowledge related to tree pathogens and diseases. Recovery of a species at risk. Increase of the butternut tree population in the Forest.
Fauna and Flora in	Initiate inventories of bats between June and	2033	3	Increase in the quantity and quality of

Precarious Situations	September, including the Echo Meter application.			habitat for fauna and flora at risk.
		2033	1	
	Monitor turtle mortality on Highway 5.			
		On-going	2	
	Monitor use levels people and dogs on wildlife.			
		On-going	3	
	Increase species at risk populations including pubescent goodyerie, five-leafletgins	2028	3	Goodyerie  Five-leafletgins 
	Restore the existing wild leek population through seeding or bulb planting.	2028	1	Wild Leek 
	Submit data on species at risk to the Centre de données sur le patrimoine naturel du Québec (CDPNQ)	On-going	3	Increased knowledge and information sharing

Wetlands and bodies of water	Maintain the area and condition of wetlands and bodies of water on the property. ● Establish a joint management plan for the maintenance of beaver pond water levels with the Municipality, MRC and ACRE. ● Identify sections of trails causing harm to watercourses or their banks and relocate trails or otherwise remediate ie: install footbridges.	2028 2025	1 1	Water levels are maintained and wetland degradation and destruction are minimized. Wetlands and water areas are protected

5 References

ACRE. 2021a. Conservation and Management of the 57 Acre property (Johannsen) Lands: Memorandum of Understanding (MOU) between ACRE and the surrounding residents from the Chelsea Community.

ACRE. 2021b. Ecological characterization of the Pond Forest, Chelsea for obtaining the status of nature reserve in a private environment.13 pp.

Banks, P. B. and J. V. Bryant. 2007. Four-legged friend or foe? Dog walking displaces native birds from natural areas. Biol Lett. 2007 3: 611–613.

Canadian Land Trust Standards and Practices. 2019. Canadian Land Trust Standards and Practices. Website: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwj_r6Pu8-X8AhV3j4kEHVc6BaUQFnoECAkQAQ&url=https%3A%2F%2Folta.ca%2Fwp-content%2Fuploads%2F2021%2F05%2Fcltsp_2019_en_final.pdf&usg=AOvVaw0dYGT-V4vVePOdBeQMWrvH. Accessed January 2023.

Carolyn Callaghan, Stephen Woodley, Chrystel Losier, Donald McLennan, Sergui Ponomarenko Core Area and Corridor Assessment Series: Assessment of the Larrimac Wildlife Corridor and Conservation Lands, November 2010

DeFrenne, P., M. Cougnon, G.P.J. Janssens, and P. Vangansbeke. 2022. Nutrient fertilization by dogs in peri-urban ecosystems. Ecological Solutions and Evidence, 3, e12128.https://doi.org/10.1002/2688-8319.12128

Dendroica Environmentand Fauna. 2013. Ecological characterization-Jolicoeur-McMartin & Dionne-Wilson property. Final report prepared for Action Chelsea for Environmental Respect (ACRE). Chelsea, Quebec. 21 pp.

Knight, K.S. J. S. Kurylo, A. G. Endress, J. R. Stewar and P.B. Reich. 2007. Ecology and ecosystem impacts of common buckthorn (Rhamnus cathartica): a review. Biological Invasions 9:925–937

Kolka R.K., A. W. D'Amato, J. W. Wagenbrenner, R. A. Slesak, T.G. Pypker, M.B. Youngquist, A.R. Grinde and B.J. Palik. 2018. Review of Ecosystem Level Impacts of Emerald Ash Borer on Black Ash Wetlands: What Does the Future Hold? " Forests 9: 179 "

Lenth B., M. Brennan, and R. L. Knight. 2006. The Effects of Dogs on Wildlife Communities. Final research report submitted to: Boulder County Open Space and Mountain Parks. 29 pp.
Parsons A.W. et al. 2016. The ecological impact of humans and dogs on wildlife in protected areas in eastern North America, Biological Conservation 203: 75–88

Weston M. A. and T. Stankowich. 2013. Dogs as agents of disturbance. pp. 94–116. in Free-Ranging Dogs and Wildlife Conservation (M. E. Gompper, ed.). Oxford University Press. 336 pp.

ANNEX 1

PRIORITY NATURAL COMMUNITIES AND ECOSITE DESCRIPTIONS

PRIORITY NATURAL COMMUNITIES[2]

"A natural community can be defined as an interacting assemblage of plant and animal species that share a common environment and co-occur throughout the landscape. Examples of natural communities include forests, treed swamps, bogs, and marshes. Conservation of these natural communities will support the persistence of characteristic common as well as rare species within Chelsea. The following descriptions of priority natural areas are pertinent to the Larrimac Forest:

Vernal Pools

Vernal, or ephemeral pools are small seasonal wetlands that provide critical habitat for numerous species, particularly during the spring breeding season for amphibians and invertebrates. The persistence of populations of vernal pool-breeding species depends on the presence of the vernal pool as well as the condition of adjacent upland forest habitat for foraging, overwintering, and migration of individuals among pools. Areas with numerous vernal pools support viable populations of vernal pool breeders because individuals breeding at the different pools interact over time and maintain the overall population as breeding success shifts among pools with changing environmental conditions. The Larrimac forest supports numerous vernal pools.

Forest Interior

The Larrimac forest is the best example in Chelsea of an intact forest that is least impacted by roads and housing development. Interior forest habitat supports many bird species sensitive to the impacts of roads and development, such as the Red-eyed Vireo and Ovenbird, and helps maintain ecological processes found in unfragmented forest patches.

Forested Riparian Habitat

[2] All the information on Priority Natural Communities and Eco Site Descriptions comes (with a big thanks), from Nature Chelsea's **Core Area and Corridor Assessment Series:** ***Assessment of the Larrimac Wildlife Corridor and Conservation Lands,*** Carolyn Callaghan, Stephen Woodley, Chrystel Losier, Donald McLennan, Sergui Ponomarenko November 2010

The Larrimac forest is bisected by several streams flowing to northwesterly to the Gatineau River. The streams originate at the height of land where they is a series of wetlands and ponds in Gatineau Park and on the Larrimac forest. The stream flow creates seasonal flooding and the presence of a riparian community. Theses moist communities are critical movement areas for insects, amphibians, and reptiles which cannot tolerate the dryer ridges.

Hemlock Ridges

The Larrimac forest contains a series of prominent Hemlock ridges that run southwest to northeast direction. These ridges are virtually pure hemlock and represent some of the northern most examples of pure stands of this species. The hemlock ridges are important travel corridors or many species of wildlife, offering excellent escape terrain for clear sight lines against predators.

Butternut Forest

The Larrimac forest has a very high diversity of tree species. Butternut (*Juglans* cinerea) is a tree that is listed under Canada's Species at Risk Act as Endangered. This is the highest category of risk, and means the species is facing imminent extirpation or extinction. Butternut is scattered throughout the Larrimac forest. However there is a significant stand of Butternut in the northwest corner of the Larrimac forest, where there are dozens of individuals. Many of these trees are healthy and show no impact of Butternut canker.

Old Growth

Within the Larrimac forest, there are some forest stands containing old growth trees. While we did not core any trees for this study there are some exceptional examples of old growth red oak, white ask and hemlock.

Wetland Complexes

The Larrimac Forest contains several undisturbed wetlands, those with intact buffers and little fragmentation or other stressors associated with development. These wetlands support critical wetland functions (i.e., natural hydrologic conditions, diverse plant and animal habitats, etc.). The wetlands range in size from large cattail marches to small pocket fens that are late successional and have developed over centuries."

ECOSITE DESCRIPTIONS

Ecosystems can be described in a hierarchical manner, such as the Ecological Classification System of Canada (ELC), which describes a nested hierarchy of spatially-

defined polygons including ecozones, ecoprovinces, ecoregions, and ecodistricts. Within ecoregions, forested land can be further classified into ecological sites, or ecosites, which are defined by an assemblage of factors such as topography, geology, landforms, soil type and moisture regime, aspect, and slope, together which determine the type of plant community that grows on the site. An ecosite can be defined as a habitat patch with specific natural vegetation community and specific site characteristics, which differs from other types of ecosites in its ability to produce certain types of vegetation.

The Québec ecoforestier classification system has defined and mapped forest units at larger scales than the ecosite level. Ecosites are a finer scale of resolution and describe a suite of site conditions including elevation, slope, aspect, soil drainage and soil texture. Ecosite descriptions can be used to predict the composition and productivity of forest communities. Ecosite maps are useful in landscape planning, habitat supply modeling, forest ecosystem management guidelines, and rare plant habitat delineation (Neily et al. 2003).

Ecosites in the Larrimac forest were defined by delineating landforms on aerial photos that typically govern the location of particular plant communities. The preliminary mapping was via Assessment of the Larrimac Wildlife Corridor and Conservation Landslidwith site visits to define soil type and moisture/nutrient conditions.

Fifteen ecosite types were identified in the Larrimac Forest by plant ecologist Dr. Serguei Ponomarenko and ecosystem ecologist Dr. Donald McLennan (Figure 4). The majority of the Larrimac forest consists of upland sugar maple forest, upland mixed mature forest, and upland hemlock-white pine mature forest. The Larrimac forest also includes wetlands of several types, including shrubby rich fen, open fen, typha march, and beaver ponds. The variety of ecosite types contributes to the ecological value of the Larrimac forest. A description of each ecosite type follows.

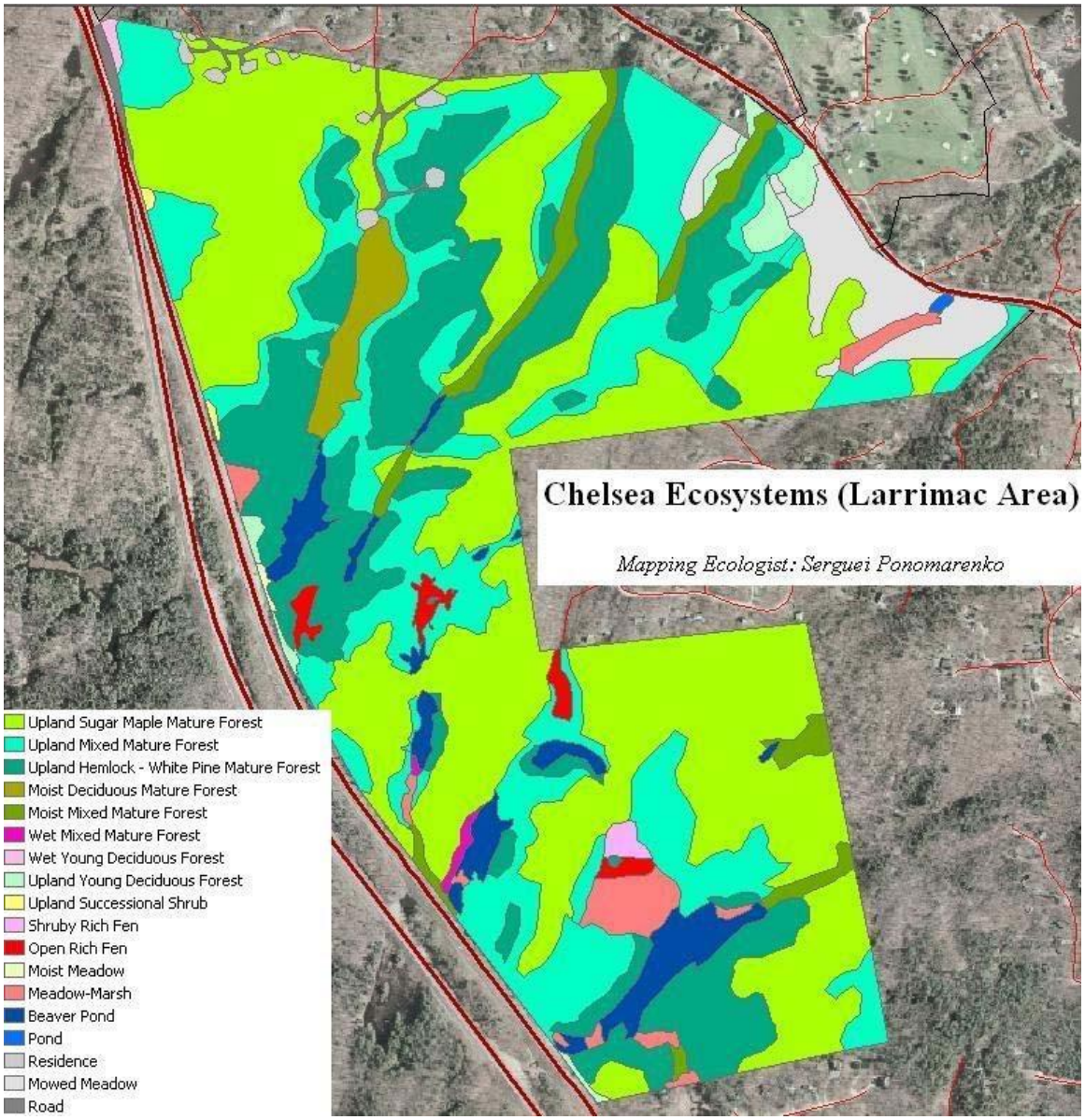


Figure 4. Larrimac Forest Ecosites Map, Chelsea Québec.

Upland Forest Community Group

This group is composed of several moderately to well-drained ecotypes with a high level of floristic similarity, although individual ecotypes have sets of species that are characteristic to them. Upland indicator species are always dominant in this group. These communities also differ by the level of past disturbance and age.

Upland Sugar Maple Mature Forest

This is one of the matrix communities in the area that occupies moderately well-drained gentle slopes of all aspects. Sugar Maple (*Acer saccharum*) is the dominant or co-dominant species in all layers (Figure 5). Other tree species including White Ash (*Fraxinus Americana*), American Beech (*Fagus grandifolia*), Basswood (*Tilia americana*) and Red Oak (*Quercus rubra*) can be codominant in canopy or lower layers. Two variants of this community can be differentiated based on nutrient status: Sugar Maple Mesic Forest and Sugar Maple Rich Forest. Sugar Maple Rich Forest tends to have a poly dominant canopy structure with higher percent of White Ash, Basswood and Butternut (*Juglans ceneria*) [endangered status in Canada] and has a specific set of indicator ground species. Sugar Maple Mesic Forest tends to have a higher dominance of Sugar Maple and occasionally co-dominance of American Beech.

Figure 5. Upland sugar maple forest in the Larrimac forest, Chelsea Quebec

Upland Red Oak - Sugar Maple Mature Forest

This community is similar to Upland Sugar Maple Mature Forest, but dominated by red oak. It occupies upper portions of slopes mainly of southern aspect. These sites are well-drained and have a slightly different suite of ground species.

Upland Mixed Mature Forest

This is a transitional community between Upland Sugar Maple Mature Forest and Upland Hemlock Mature Forest. It occupies gentle slopes of predominantly eastern and western aspects. The ground layer is typically composed of mesic forest species.

Upland Hemlock Mature Forest

This community typically occupies northern slopes and is characterized by absence of recent disturbances (Figure 6). Hemlock (*Tsuga canadensis*) is the main canopy species. Minor components include White Pine (*Pinus strobus*), Eastern White Cedar (*Thuja occidentalis*), Yellow Birch (*Betula alleghaniensis*), American Beech and other deciduous species. It has the least number of introduced species and the highest diversity of fungi species.

Figure 6. Upland Hemlock Mature Forest in the Larrimac Forest, Chelsea Quebec.

Moist and Wet Forest Group

This group embraces several ecotypes with imperfect and poor drainage and presence of both upland and wetland indicator species such as Sensitive Fern (*Onoclea sensibilis*) and Cinnamon Fern (*Osmunda cinnamomea*) in the floristic composition.

Moist Mixed Mature Forest

This ecotype is composed of both deciduous and coniferous species such as American Ash, Green Ash (*Fraxinus pensylvanica*), Yellow Birch, Red Maple (*Acer rubrum*) and Eastern Hemlock.

Moist Deciduous Mature Forest

This ecotype often occurs along existing drainage corridors with permanent or intermittent creeks (Figure 6). Canopy dominant species are Red Maple and Yellow Birch; less common are Green Ash, American Ash and Sugar Maple. Species of ferns are often dominant in the ground cover.

Figure 7. Butternut tree, found in moist mature forest ecosite in Larrimac Forest.

Wet Mixed Mature Forest

This is a swamp community with often expressed micro relief. Tree species and some upland ground species grow on hummocks and wetland species occupy depressions between hummocks. Tree species may include Eastern Hemlock, Yellow Birch, Black Ash, Green Ash, Red Maple, Balsam Fir and White Spruce. A variant of this community is Hemlock-Yellow Birch Swamp with two species dominant in the canopy.

Black Ash Swamp

This is a wetter community than Moist Deciduous Mature Forest and typically has mostly Black Ash and Red Maple as co-dominant species in different proportions. It always occupies lower portions of drainage depressions. Ground cover is species rich.

Grey Alder Swamp

This can be a wet to very wet community that grades to a marsh or a rich fen. It occupies margins of large depressions and beaver ponds and experiences fluctuations of water table on an annual and perennial basis. Grey Alder (*Alnus incana ssp. rugosa*) sometimes together with other wetland tall shrubs (such as Mountain Holly (*Nemopanthus mucronata*) and American Winterberry (*Ilex verticillata*)) creates the tall shrub layer. In the low shrubs, Sweet Gale (*Myrica gale*) and Narrow-Leaved Meadowsweet (*Spiraea alba*) are common. A combination of marsh and rich fen species is common in the ground layer.

Open Wetland Ecosites

This group of ecosites includes communities with poor and very poor drainage. They are too wet to sustain tree growth although individual trees may occur in transitional communities or on micro-relief elevations. Wetland indicator species are always dominant in this group.

Open Rich Fen/Shrubby Rich Fen

This community occupies transitional depressions with slow groundwater movement (Figure 8). The water level is relatively stable. The species diversity in this community is very high and some species would not occur in other communities. The main stratum is a herb layer although a sparse shrub layer can be present. The moss layer has high diversity including species of *Sphagnum, Drepanocladus, Aulacomnium* and others.

Figure 8. Open rich fen ecosite found in Larrimac forest, Chelsea Quebec.

Meadow – Marsh

This community occupies portions of beaver pond depressions and is subject to periodic flooding. This community can host a great number of species although the species composition and diversity in a particular stand can vary in broad limits depending on the history of the disturbance regime.

Moist Meadow

This community represents the driest end of Meadow – Marsh community. It can also be found in upland areas with subsurface seepage and periodic anthropogenic disturbance. It has a higher proportion of upland meadow species compared to the Meadow – Marsh community.

Cattail Marsh

This community often occurs adjacent to Meadow – Marsh and occupies wetter areas with stagnant water at or above the surface a significant portion of the growing season (Figure 8). Two species of cattail are dominant in this community. It can have the same species as the Meadow – Marsh community but with lower diversity. Some aquatic species such as Water Lilly (Nuphar variegata) and Frogbit (Hydrocharis morsus-ranae) are also very common in this community.

Pond Community Ecosites

Beaver Pond

This ecotype defines communities that have water above the surface during most of the growing season. It is dominated by floating leaf or submerged aquatic vegetation and may form a complex with floating mat fen. Note that there are no good examples of large floating mat fens within the area, but small fragments of it are common.

Pond

This community is a water body resulting from the damming of a creek. As an ecosystem it has lower biological diversity compared to beaver ponds and more stable water regimes.

Figure 8. Cattail marsh ecosite in Larrimac Forest, Chelsea Quebec

Anthropogenic and Early Successional Upland Community Group

Communities in this group had a severe anthropogenic disturbance in the past or have such disturbances at regular intervals. \\

Upland Young Deciduous Forest

There are a variety of types within this community that differ according to the disturbance history, severity of impacts by invasive species and proximity to the natural forests.

Upland Successional Shrub

This type usually occupies some post-agricultural lands or surfaces created in a course of road construction. This ecosite type typically has a high rate of invasive species presence.

Mowed Meadow

This is an anthropogenic type with frequent disturbance. The species diversity is very low and represented mostly by exotic species. Nevertheless, it represents a very specialized habitat for some species (such as wild thyme, *Thymus serpyllum*).

Wet Young Deciduous Forest

Younger-aged hygric to sub-hygric forests in small depressions composed of red maple with an understory of ferns and sedges. These areas have a history of forest harvest.

ANNEX 2
BACKGROUND ON HABITAT FRAGMENTATION, CORRIDORS IN CONSERVATION

2.1 The Impact of Habitat Fragmentation

Forest fragmentation occurs when large, contiguous forests are divided into smaller patches by roads, residential and commercial development, agriculture, and timber harvesting. (Wilcove et al. 1998). As mature forests become fragmented, they are less able to support their native species (Gilpin and Soule 1986). For example, birds that are sensitive to forest fragmentation experience diminished reproductive success due to factors that are symptomatic of forest fragmentation, such as brood parasitism and nest predation.

Nests constructed near the edge of the forest are vulnerable to parasitism by brown-headed cowbirds, a brood parasite that lays its eggs in the nests of other species. Nest predators such as raccoons, blue jays, common crows, grey squirrels, and domestic cats, are common along forest edges, and nests constructed away from forest interior are more vulnerable to nest predation. Moreover, forest interior species find more of their preferred food in the forest interior, where conditions tend to be moister and there is a greater diversity of microhabitats that support a greater variety of insect species.

Three primary consequences of fragmentation are distinguished: (1) The size of patches becomes smaller, (2) the connectivity between patches decreases due to a reduction in the size of surrounding patches and/or increasing distances to them and (3) the edge to interior ratio increases (Saunders et al. 1991). These changes can disturb the processes of migration, recolonization, and the population dynamics of resident species, resulting in greater risk of population extirpation.

The loss of species from fragmented habitat is well documented in the scientific literature (Samson and Knopf 1994; Laurance et al. 2002). Even large preserves that are isolated cannot maintain viable populations of wide-ranging species (Gurd et al. 2001; Newmark 1995). The impacts of habitat fragmentation are not limited to large-bodied animals; impacts have been documented for small bodied animals such as butterflies (Leidner et al. 2010), insects (Ricketts et al. 2006), birds (Marra et al. 2006) or small mammals (Frankham 2006).

Populations can become isolated within their patch when all of their surrounding patches of habitat are destroyed. This makes migration into different patches difficult and hazardous. Isolated populations experience elevated extinction risk and are prone to decline due to inbreeding and loss of genetic diversity as well as chaotic swings in numbers due to random chance (demographic stochasticity).

In addition to species loss and reduction of individual movements, habitat fragmentation can cause the disruption of ecological processes such as forest dynamics and trophic interactions (e.g. herbivory, predation, or parasitism). The consequences of disrupting vital ecological processes may be profound (Karieva 1987; Laurance et al. 2001; Kolb 2005; Valladares et al. 2006).

2.2 The Role of Core Habitat, Interior Forest, and Wildlife Movement Corridors

Core Habitat identifies key areas that are important for the long-term persistence of populations of species, including rare species, and a diversity of natural communities and ecosystems. Core habitat should 1) be minimally impacted by anthropogenic stress (e.g. roads, housing, logging, agriculture); 2) provide for the needs of wide-ranging native species; 3) support ecological processes; 4) maintain connectivity among habitats; and 5) enhance ecological resilience to natural and anthropogenic disturbances. Protection of core habitats will contribute to the conservation of specific components of biodiversity (genes, species, and ecosystems).

Forest interior habitat occurs within large patches of forest. Such interior habitat is important because several species require it for survival. The influence of forest edges impacts a range of ecological variables, such as rates of predation and microclimate. Forest interior habitat is related to the configuration of the forest patch. Round or square shaped forests would have a greater amount of interior habitat that a long narrow forest of equal area (acres or hectares).

Forest interior habitat has different ecological properties that than habitat along the edges of forests. Forest edges are sunnier, drier paces, and they support species that prefer the edge of a forest to the forest interior, which tend to be shadier, more humid, and less windy than edge habitat. Typically, forest interior species cannot successfully compete for habitat against species found along forest edges. Moreover, predation tends to be more prevalent along forest edges, which attract predators from adjacent habitat types.

Forest edges are also more accessible to parasites that may occur in adjacent fields or developed areas. Nest parasites, such as Cowbirds, are more common in forests adjacent to the open fields where they feed. Cowbirds lay their eggs in the nests of other birds, and typically push out the other nestlings or out-compete them for food, leaving the host birds to care for the cow bird nestling rather than their own young.

A wildlife corridor, also known as a landscape linkage, a land bridge, or greenway, is typically a linear strip of habitat that is connected to larger reserves or patches of habitat and allows for the movement of wildlife between the patches. Corridors perform several ecological functions, such as allowing wildlife to move out of habitats that have become unsuitable, permitting the colonization of habitats that have become suitable for use, and allowing for recolonization of habitat patches following population extirpation. These functions are critical to preventing reserves from becoming genetically isolated from other habitats in a human-dominated landscape matrix.

The negative impact of isolation of protected reserves has been well documented in the scientific literature, and includes species extinction, population extirpation, reduced genetic resiliency, alteration of plant communities, and reduced functionality of ecological processes (Woodley, 2002).

Wildlife corridors connecting core reserves reduce habitat fragmentation and increase the effective amount of habitat that is available for species (Noss 1987, 1992; Saunders and Hobbs 1991; Noss et al. 1996). In a recent volume on wildlife corridors, Kevin Crooks and M. Sanjayan list the benefits of corridors including: 1) increasing or

maintaining species diversity; 2) allowing for individuals to colonize habitat patches thus reduce extirpation risk; 3) allowing for recolonization of extinct local populations; and 4) preventing inbreeding depression due to low amount of genetic material in a small population.

Movement corridors are especially important for migratory animals and those with large home ranges with need several large connected patches for survival. Larger habitats support greater biodiversity, larger populations, and a wider range of food sources and shelter. They also improve the long-term genetic viability of wildlife in core reserves by allowing for movements of individuals and interbreeding of populations between reserves.

Wildlife Corridors must be wide enough to allow easy movement for the largest-bodied mammals, including black bear, white-tailed deer, and wolves. Wildlife Corridors can also function at smaller scales to provide habitat connectivity for small-bodied species, including amphibians, fish, birds, insects, and even plants. In urban areas, corridors can provide important linkages in a highly fragmented landscape.