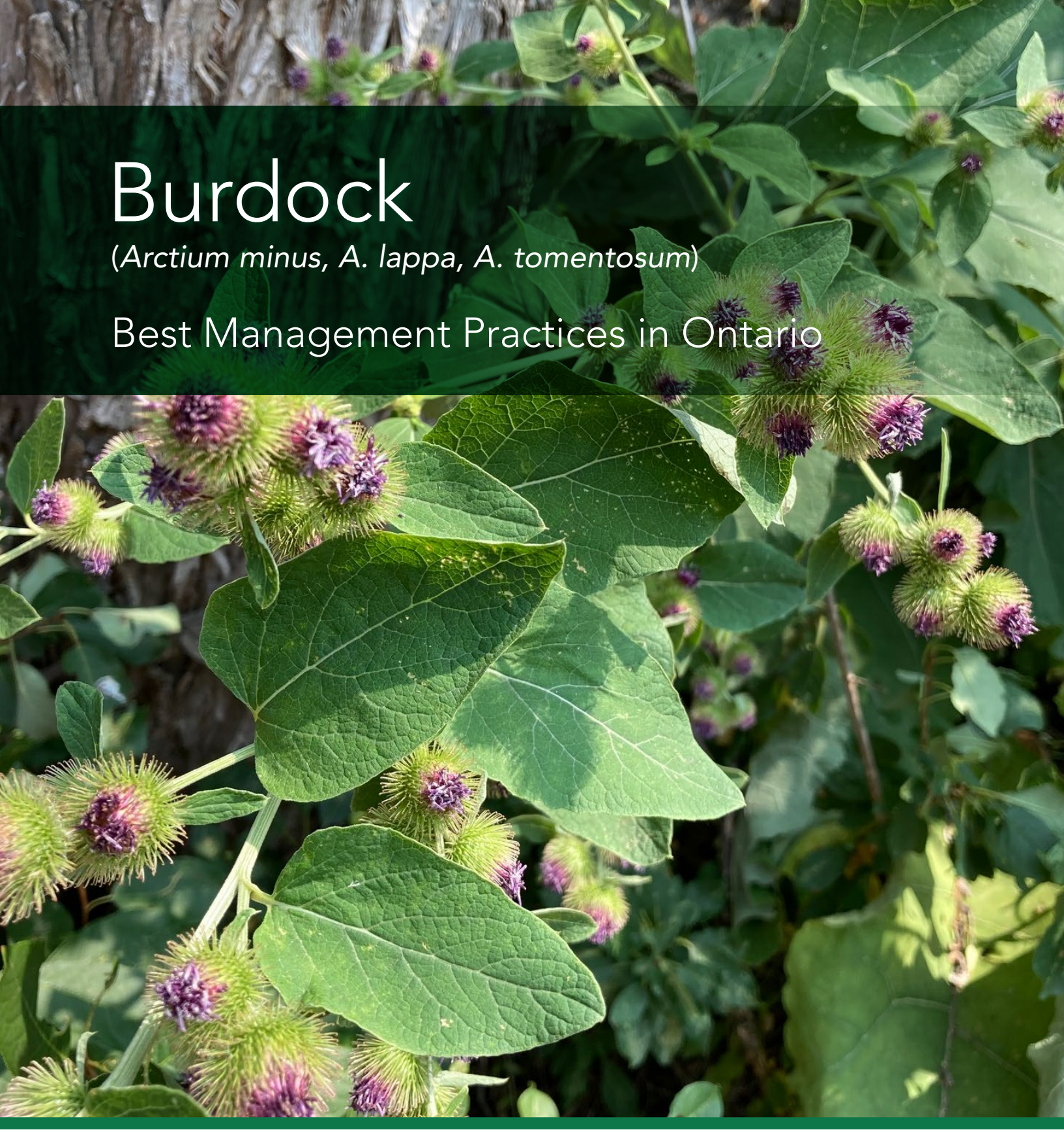
Burdock

(*Arctium minus, A. lappa, A. tomentosum*)

Best Management Practices in Ontario



TORONTO

ONTARIO INVASIVE PLANT COUNCIL

Foreword

This Best Management Practices (BMP) document provides guidance for managing burdock species (*Arctium. minus, A. lappa, A. tomentosum*) when they are regarded as invasive in Ontario. Funding and leadership to produce this document was provided by the City of Toronto. This BMP was developed by the Ontario Invasive Plant Council (OIPC) and its partners to facilitate invasive plant control initiatives by individuals and organizations concerned with the protection of biodiversity, agricultural lands, infrastructure, crops and species at risk in Ontario. This document also supports and advances the management of invasive species identified as a priority by the City of Toronto's Ravine Strategy and Biodiversity Strategy.

The intent of this document is to relay specific information relating to invasive plant control practices that leading professionals across Ontario have recommended. This document contains the most up-to-date, effective, and environmentally safe control practices known from research, experience, and literature available at this time. It complies with current provincial and federal legislation regarding pesticide usage, habitat disturbance, and species at risk protection. It is subject to change as legislation is updated or new research findings emerge. The information provided in this BMP is not to be considered legal advice. Interested parties are advised to refer to the applicable legislation to address specific circumstances.

Check the website of the OIPC (www.ontarioinvasiveplants.ca) for updates.

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For more information on invasive plants in Ontario, please visit the following websites:
www.ontarioinvasiveplants.ca, www.ontario.ca/page/invasive-species-ontario, www.invadingspecies.com, or www.invasivespeciescentre.ca

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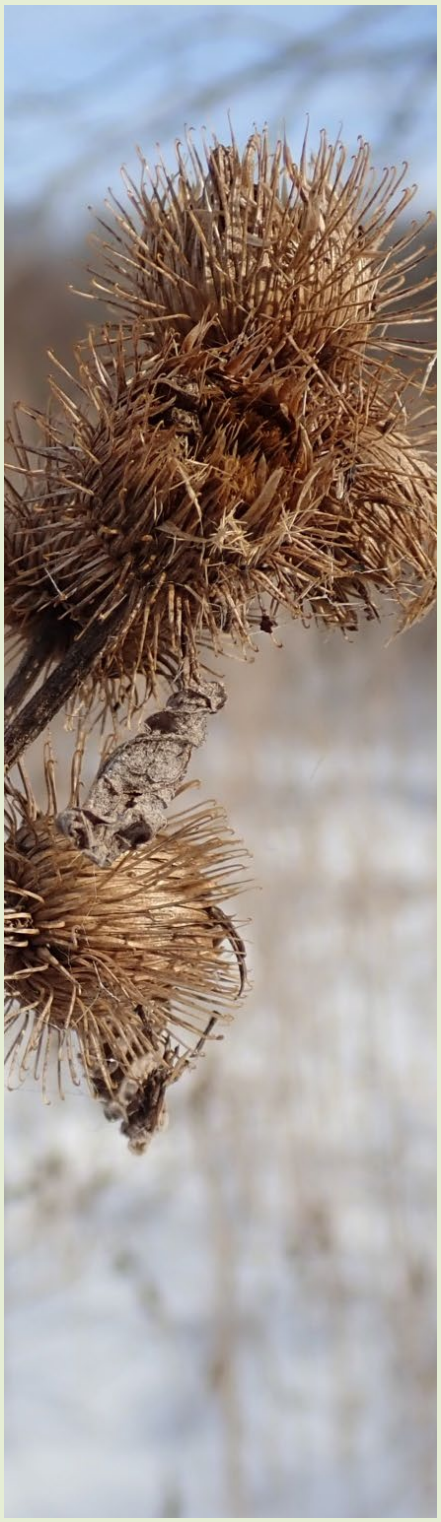


Burdock.

An unmanaged and spreading burdock patch in Rockcliffe Park, Ottawa.
Photo courtesy of: Iola Price

Introduction

Note: In this document, 'burdock species' or 'burdock' refers collectively to the three species of burdock found in Ontario.

Burdock species are biennial, herbaceous plants in the Aster family (Asteraceae). In Ontario, there are three recognized species: common burdock (*Arctium minus*), greater burdock (*A. lappa*), and woolly burdock (*A. tomentosum*). Petitie bardane, grande bardane and bardane tomenteuse are, respetively, the three French common names. All three are weedy species that share similar histories and biology, with some differences in identification features. Since common burdock is the most common species found, it will be the focus of this document. However, much of the information and recommended control measures will apply to all three species.

The genus name "*Arctium*" is derived from the Greek word for bear and refers to the appearance of the bristly seed heads (Damalas *et al.* 2015). The seed heads (called burrs) of all three species are covered with hooked bracts (modified leaves) that allow them to cling to clothing and animal fur. This characteristic inspired the creation of Velcro in the early 1940s (Mink *et al.* 2018). Common burdock (*A. minus*) is also called lesser burdock, or petite bardane in French (Brouillet *et al.* 2010). The word "minus" means small, referring to the size of this plant in comparison to greater burdock (*A. lappa*) (Damalas *et al.* 2015). In Ojibwe it has been referred to as Wi'sugibug', meaning "bitter leaf", but there are other names in use (Densmore 2006; Meeker *et al.* 1994; Smith 1932).

Burdock species are native to Eurasia and thought to have been introduced to North America in the 1600s by French and English colonists (Gross *et al.* 1980; Damalas *et al.* 2015). Introduction to Ontario is uncertain, however, it is suggested that both common and greater burdock were present prior to the 1860s (Norquay *et al.* 2010; Gross *et al.* 1980). Burdock species may have been introduced intentionally for medicinal and edible uses or accidentally as their seed heads can adhere to animal fur and clothing. Common burdock is widely distributed throughout the United States and Canada, occurring in almost every state and province. It is listed as a noxious weed in many parts of its North American range mainly due to its adverse impacts on agriculture and livestock, however it is not currently listed as a noxious weed in Ontario.

Once established, burdock species become difficult to eradicate as their thick, deep taproot is challenging to remove. In addition, each common burdock plant can produce between 6,000 to 17,000 seeds, yielding a substantial seed bank (Gross *et al.* 1980). Burdock species reproduce only via seeds that can disperse widely by clinging to animal fur or clothing. The seeds have high germination rates and remain viable for 1 – 3 years. As biennial plants, the life cycle of burdock occurs over two years. In its first year, it occurs as a circular array of leaves called a basal rosette and allocates resources to its taproot. During its second year, it flowers and produces an erect stem, measuring 1 – 2 m tall. The basal leaves of burdock in its second year are large and can shade out native plants, reducing diversity and altering community composition (Gross *et al.* 1980; Mink *et al.* 2018). The bristly seed heads of these plants pose a threat to small birds and bats that can become entangled and die (Hager *et al.* 2009; Norquay *et al.* 2010).

In addition to ecological impacts, burdock has several negative economic impacts on agriculture. The burrs can reduce the value of sheep wool or dairy products, and livestock that become heavily burred can suffer eye and mouth injuries (Damalas *et al.* 2013; Gross *et al.* 1980; Mink *et al.* 2018). Common burdock is also a secondary host to several significant agricultural pests and diseases such as powdery mildew (*Erysiphe cichoracearum*), root rot (*Phymatotrichum omnivorum*) and root-knot nematodes (*Meloidogyne* spp.).

Despite the negative impacts of these plants, all three species (particularly common and greater burdock) are cultivated in many areas of the world as their roots are edible and parts of the plant can be used to treat various diseases.

This document was developed to help guide the effective and consistent management of burdock species when they are regarded as invasive in Ontario.

Common burdock (*A. minus*) growing on the left and greater burdock (*A. lappa*) growing on the right for comparison.

Photo courtesy of: Sean Blaney, iNaturalist. Available: https://www.inaturalist.org/observations/10625852. Licensed under CC-BY-NC.

Description

Note: there are many similarities between common, greater, and woolly burdock. The most reliable features to separate the species are the size and shape of the seed heads (burrs), if they are held on stalks or are stalkless, and overall plant size.

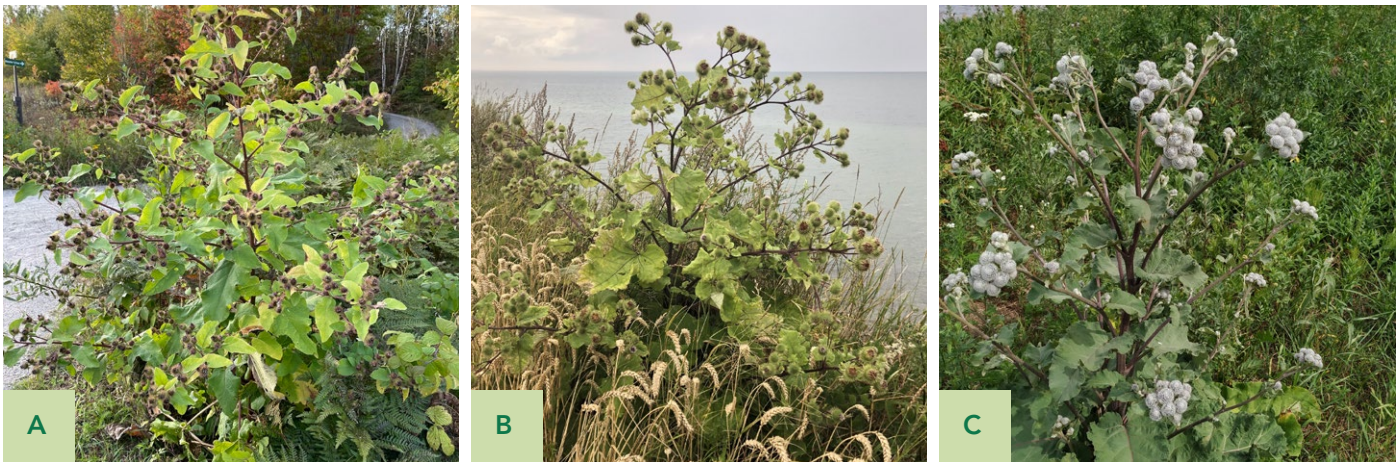
Size and Stem:

Burdocks are biennial, herbaceous plants. First year plants develop large simple heart-shaped leaves that grow low to the ground in a circular structure of leaves called a basal rosette.

Common burdock (left) and Greater burdock (right). First year plants of all three species grow in a basal rosette. Leaf petioles are hollow for common burdock (left), solid for greater burdock (right), and hollow or solid for woolly burdock (not pictured).

Photos courtesy of: Paul Abell, iNaturalist. Available: https://www.inaturalist.org/observations/34191706, https://www.inaturalist.org/observations/26156538, https://www.inaturalist.org/observations/26156561. Licensed under CC-BY-NC.

In its second year, the flowering stalks are erect, branched, thick, hollow, grooved lengthwise, hairy, strongly tapered, and green but can be tinged with reddish-purple. The three species mainly differ in height (although there is overlap): common burdock grows 1 m – 2.5 m tall, greater burdock 1.5 m – 3 m tall, woolly burdock is seldom over 1.3 m tall. Greater burdock has a more sprawling form than common burdock, whereas common burdock is more upright and less tapered.



Common burdock (A), greater burdock (B), woolly burdock (C). Greater burdock is the tallest of the three species and has a more sprawling form than common burdock, which is more upright and less tapered.

Photo courtesy of: a) Mathieu Lefever, iNaturalist. Available: https://www.inaturalist.org/observations/135669268, b) iNaturalist. Available: https://www.inaturalist.org/observations/55206565, c) Svetlana Kutueva, iNaturalist. Available: https://www.inaturalist.org/observations/27832096. Licensed under CC-BY-NC.

Leaves:

Year 1: All burdock species grow in a circular array of leaves called a basal rosette. The leaves are oval or heart-shaped at the base and large, measuring 50 cm long by 30 cm wide for common burdock and 60 cm long by 50 cm wide for greater burdock. The leaf margins are very wavy for common burdock and are less so for greater burdock. In all three species, the upper surface of the leaves is dark green and lower surface is a paler green and covered in white, woolly hairs. The petioles (leaf stalks) often have a maroon colour towards the base and are hollow for common burdock, solid for greater burdock, and hollow or solid for woolly burdock.

Year 2: Basal leaves are large and round to oval or heart-shaped. The leaves occur alternately along the stem, and become progressively smaller up the stem, with less prominently lobed margins. The upper surface of the leaves is dark green and smooth; the lower surface is a more pale green and covered in white, woolly hairs. The leaves of greater burdock are more rounded, slightly thinner, and have less wavy margins compared to common burdock.

The three species can be differentiated by whether the leaf petioles are solid or hollow. The basal leaves of common burdock have hollow petioles, while the middle to upper leaves have solid petioles; the petioles are slightly grooved in the middle. Greater burdock usually has solid petioles throughout, and the petioles are grooved and more deeply grooved in the middle compared to common burdock. Woolly burdock generally has hollow petioles in the lower leaves but can have either hollow or solid petioles.

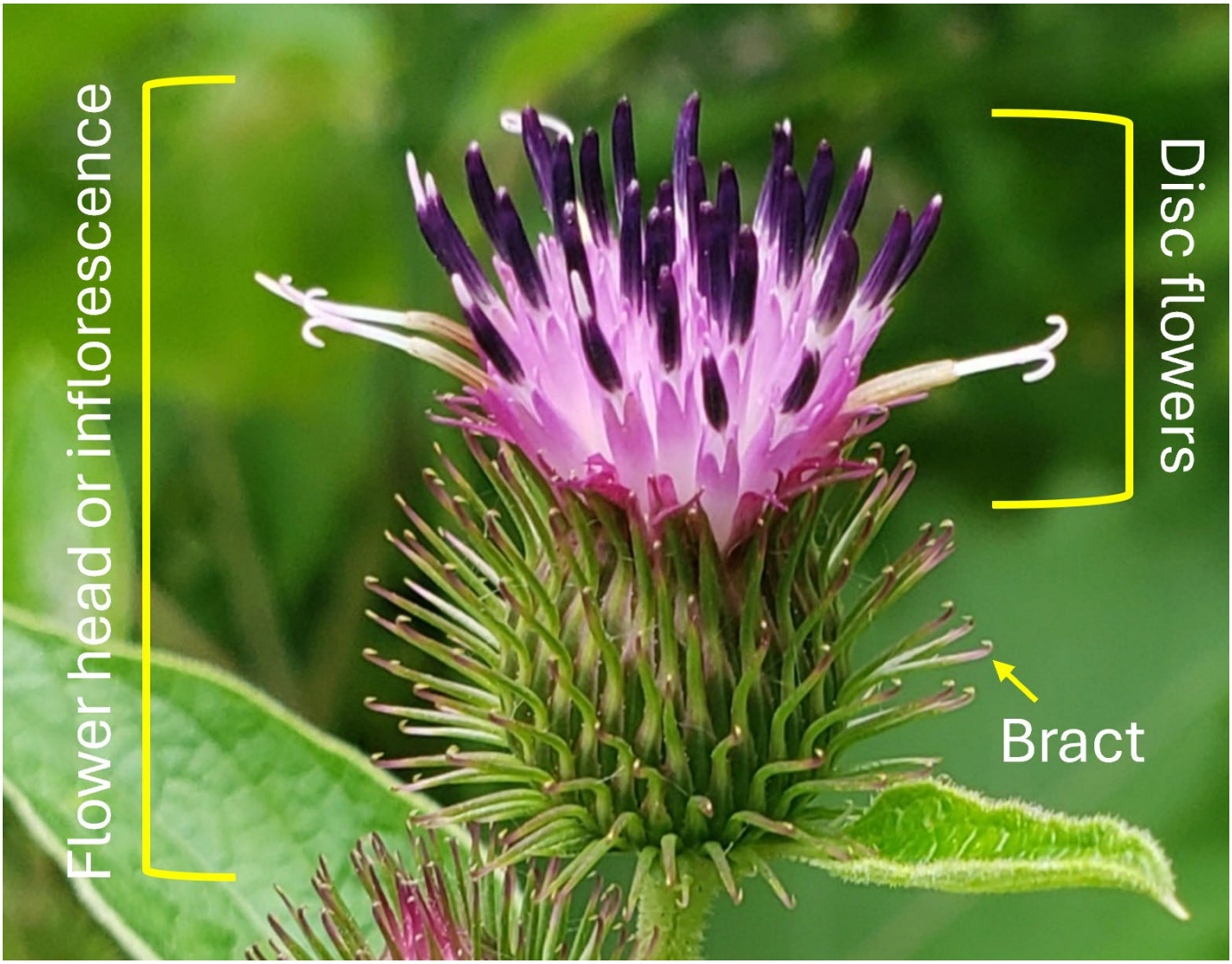
A) The flowering stalks are branched, grooved lengthwise, and can be tinged with reddish-purple B) Leaf upper surface is dark green C) Leaf lower surface paler green, covered in white, woolly hairs D) petioles have a maroon colour towards the base and are hairy (common burdock shown in all pictures).

Photos courtesy of: a) Dominique Pimpare, iNaturalist. https://www.inaturalist.org/observations/35325536. Licensed under CC-BY-NC. b), c), d) Paul Abell, iNaturalist.https://www.inaturalist.org/observations/26156538, https://www.inaturalist.org/observations/26156561. Licensed under CC-BY-NC.

Flowers:

Burdocks are members of the Aster family (*Asteraceae*). Members of this plant family have an inflorescence (flower cluster) called a head. For burdock species, this inflorescence is made up of purple to pink disc flowers crowded in the center surrounded by linear floral bracts (modified leaves) with hooked tips. These flowers have five upward lobes, five dark purple anthers, and a style with a bifurcated tip (split into two parts).

Common burdock has flower heads that measure 1 cm – 2.5 cm in diameter. The flower heads are more vertically branched (in tight clusters) than greater burdock and are either stalkless or on short stalks. The flowers stick up above the bracts. Greater burdock has larger flower heads that measure 2.5 – 3.5 cm in diameter. The flower heads of both greater burdock and woolly burdock are arranged in flat headed clusters and are on longer stalks. The upper bracts of greater burdock are as long as the flowers. Woolly burdock flower heads are less than 2.5 cm across. Flowers bloom from the end of June to October.



Flower head anatomy (common burdock shown). The burdock flower head or inflorescence is comprised of purple-pink disc flowers crowded in the center, surrounded by linear floral bracts with hooked tips. Note the flower style with a bifurcated tip (split into two parts).

Photo courtesy of: Carole Beauchesne, iNaturalist. Available: https://www.inaturalist.org/observations/130639430. Licensed under CC-BY-NC.

A) & B) greater burdock, C) common burdock, D) woolly burdock
The flower heads of greater and woolly burdock are on longer stalks compared to common burdock which has stalkless or short stalks. Greater burdock has larger flower heads that are more flat-topped than common burdock, and the upper bracts are as long as the flowers). The flowers for common burdock stick up above the bracts).

Photos courtesy of: a) Jean-Paul Boerekamps, iNaturalist, Available: https://www.inaturalist.org/observations/173765691, b) iNaturalist, Available: https://www.inaturalist.org/observations/53735133, c) Carole Beauchesne, iNaturalist, Available: https://www.inaturalist.org/observations/130639430, d) iNaturalist, Available: https://www.inaturalist.org/observations/203439269. Licensed under CC-BY-NC.

Fruits/Seeds:

For the three burdock species, the hooked floral bracts dry out and form a burr. Individual flowers become achenes that contain one seed. Seeds are 5 mm – 6mm long by 2.5 mm wide, brown, wedge-shaped and curved.

A single common burdock plant can produce between 6,000 and 17,000 seeds, and each greater burdock plant can produce between 6,500 and 10,500 seeds (Gross *et al.* 1980). The burrs of common burdock are smaller and more spherical than greater burdock, which has larger burrs and is more flat-topped. Woolly burdock has abundant cobwebby hairs that cover the floral bracts below their hooked tips.

A) An immature floral seed head of common burdock B) seed heads dry out and form a burr C) cross section of common burdock burrs, with seeds visible in centre D) burdock seeds e) note the abundant cobweb hairs of woolly burdock.

A) Konstantin Samodurov, CC BY-NC https://www.inaturalist.org/observations/31722911, B) Claire O'Neill, iNaturalist. Available: https://www.inaturalist.org/observations/39624634, C) Matt Lavin, iNaturalist. Available: https://www.inaturalist.org/observations/106408785, D) Patrick Hacker, iNaturalist. Available: https://www.inaturalist.org/observations/97789753, E) Jean-Paul Boerekamps, iNaturalist. Available: https://www.inaturalist.org/observations/86872377. Licensed under CC-BY-NC.

Roots:

All three burdock species have a long, thick and fleshy taproot. The largest taproots can be as much as 8 cm thick and approximately 90 cm deep.

Burdock roots (common burdock is shown).

Photo courtesy of Jeff White, iNaturalist. Available: https://www.inaturalist.org/observations/82935533. Licensed under CC-BY-NC.

Lookalikes

Common burdock resembles greater burdock (*A. lappa*), however, it does not grow as tall and has smaller flowers. Greater burdock is also rarer in Ontario. In its first year, the basal rosette of common burdock resembles wild rhubarb (*Rheum rhabarbarum*). It can be distinguished by its leaves which have hollow petioles and leaf undersides that are covered in thick, white, woolly hairs. Common burdock in its second year may be mistaken for other plant species with similar flowers or fruit such as rough cockleburr (*Xanthium strumarium*), bitter dock (*Rumex obtusifolius*), curled dock (*Rumex crispus*) and bull thistle (*Cirsium vulgare*). It can also be distinguished from these species by its leaf characteristics (large size; hollow petioles; undersides covered in thick, white, woolly hairs), and flower/seed heads with bracts that have hooked tips.

Table 1: Key I.D. features that distinguish the burdocks from each other or separate from other similar species are in **bold**.

	Common Burdock *(Arctium minus)*	**Greater Burdock** *(Arctium lappa)*	**Woolly Burdock** *(Arctium tomentosum)*	**Wild Rhubarb** *(Rheum rhabarbarum)*	**Bitter Dock** *(Rumex obtusifolius)*
	 INVASIVE Photo courtesy of: Mark Whitcombe, iNaturalist. Available: https://www.inaturalist.org/observations/86812906. Licensed under CC-BY-NC.	 INVASIVE Photo courtesy of: Michael Hansen, iNaturalist. Available: https://www.inaturalist.org/observations/128853062. Licensed under CC-BY-NC.	 INVASIVE Photo courtesy of: iNaturalist. Available: https://www.inaturalist.org/observations/87716498. Licensed under CC-BY-NC.	 NON-NATIVE Photo courtesy of: iNaturalist. Available: https://www.inaturalist.org/observations/79764124. Licensed under CC-BY-NC.	 INVASIVE Photo courtesy of: iNaturalist. Available: https://www.inaturalist.org/observations/84437326. Licensed under CC-BY-NC.
Alternative Common Names	• Lesser burdock	• Great burdock	• Cotton burdock, hairy burdock	• Rhubarb, garden rhubarb, pie-plant, wine-plant,	• Blunt-leaved dock, broad-leaved dock
Accepted French Name	• Petite bardane	• Grande bardane	• Bardane tomenteuse	• NA	• Patience à feuilles obtuses
Ojibwe Name	• Wi'sugibug'				• Ozaawijiibik
Native Range	• Eurasia	• Eurasia	• Eurasia	• Asia	• Eurasia
Habitat	• Disturbed habitats, roadsides, fields, fencerows, farmlands	• Disturbed habitats, roadsides, fields, fencerows, farmlands	• Disturbed habitats, roadsides, fields, fencerows, farmlands	• Fields, open habitats	• Pastures, meadows, roadsides
Size & Stem	• **1 m – 2.5 m** • **Less branching than greater burdock** • Erect • Hollow • Grooved • Hairy • Green to reddish-purple	• **1.5 m – 3 m** • **More branching & sprawling than common burdock** • Erect • Hollow • Grooved • Hairy • Green to reddish-purple	• **Up to 1.3 m** • Branching similar to common burdock • Erect • Hollow • Grooved • Hairy • Green to reddish-purple	• 0.6 m – 1.2 m • **Basal clumps** • Erect • **Hairless**	• 0.6 m – 1.2 m • Erect • **Mostly unbranched** • **Ribbed** • **Hairless** • **Red** • **Enlarged at the nodes**

	Common Burdock *(Arctium minus)*	Greater Burdock *(Arctium lappa)*	Woolly Burdock *(Arctium tomentosum)*	Wild Rhubarb *(Rheum rhabarbarum)*	Bitter Dock *(Rumex obtusifolius)*
	 INVASIVE Photo courtesy of: Mark Whitcombe, iNaturalist. Available: https://www.inaturalist.org/observations/86812906. Licensed under CC-BY-NC.	 INVASIVE Photo courtesy of: Michael Hansen, iNaturalist. Available: https://www.inaturalist.org/observations/128853062. Licensed under CC-BY-NC.	 INVASIVE Photo courtesy of: iNaturalist. Available: https://www.inaturalist.org/observations/87716498. Licensed under CC-BY-NC.	 NON-NATIVE Photo courtesy of: iNaturalist. Available: https://www.inaturalist.org/observations/79764124. Licensed under CC-BY-NC.	 INVASIVE Photo courtesy of: iNaturalist. Available: https://www.inaturalist.org/observations/84437326. Licensed under CC-BY-NC.
Leaves: Year 1	• Basal rosette • Large; oval or heart-shaped • Long, **hollow petioles** • Very wavy margins • Underside is pale green, covered in woolly, white hairs	• Basal rosette • Large; oval or heart-shaped • Long, **solid petioles** • Less wavy margins • Underside is pale green, covered in woolly, white hairs	• Basal rosette • Large; oval or heart-shaped • Long, **hollow or solid petioles** • Very wavy margins • Underside is pale green, covered in woolly, white hairs	• n/a (perennial)	• n/a (perennial)
Leaves: Year 2	• Alternate • Basal and lower leaves large, heart-shaped. • **Leaf petioles are hollow with a slight groove down middle in the lower and basal leaves** • Middle and upper leaves, oval-shape, solid petioles • Leaves become smaller towards the top • Underside covered in woolly, white hairs	• Alternate • Basal and lower leaves large, heart-shaped • **Leaf petioles are solid throughout, more deeply grooved** • Middle and upper leaves, oval-shape • Leaves become smaller towards the top • Underside covered in woolly, white hairs • Leaves are **more rounded, slightly thinner, less wavy margins than** common burdock	• Alternate • Basal and lower leaves large, heart-shaped • **Lower leaf petioles are solid or hollow and grooved** • Middle and upper leaves, oval-shape • Leaves become smaller towards the top • Underside covered in woolly, white hairs	• Alternate • Large, heart- shaped • **Long, solid petioles, red at the base** • **Coarsely toothed margins** • **Leaf surfaces are hairless**	• Alternate • Lower leaves egg- shaped, heart-shaped base with wavy margins • **Long, solid petioles** • Coarsely toothed or smooth margins • **Leaf surfaces are hairless** • Leaves become smaller towards the top

	Common Burdock *(Arctium minus)*	Greater Burdock *(Arctium lappa)*	Woolly Burdock *(Arctium tomentosum)*	Wild Rhubarb *(Rheum rhabarbarum)*	Bitter Dock *(Rumex obtusifolius)*
	 INVASIVE Photo courtesy of: Mark Whitcombe, iNaturalist. Available: https://www.inaturalist.org/observations/86812906. Licensed under CC-BY-NC.	 INVASIVE Photo courtesy of: Michael Hansen, iNaturalist. Available: https://www.inaturalist.org/observations/128853062. Licensed under CC-BY-NC.	 INVASIVE Photo courtesy of: iNaturalist. Available: https://www.inaturalist.org/observations/87716498. Licensed under CC-BY-NC.	 NON-NATIVE Photo courtesy of: iNaturalist. Available: https://www.inaturalist.org/observations/79764124. Licensed under CC-BY-NC.	 INVASIVE Photo courtesy of: iNaturalist. Available: https://www.inaturalist.org/observations/84437326. Licensed under CC-BY-NC.
Flowers	• Head, **spherical** • **Heads more vertically branched (tight clusters), stalkless or on short stalks.** • **1 cm – 2.5 cm diameter** • Purple, disc flowers in the center • Bracts with hooked tips • **Flower stick up above the bracts**	• Head, **flat** • **Flat headed clusters, on longer stalks** • **2.5 cm – 3.5 cm diameter** • Purple, disc flowers in center • Bracts with hooked tips • **Upper bracts are as long as the flowers**	• Head, **spherical** • **Flat headed clusters, on longer stalks** • **Less than 2.5 cm diameter** • Purple, disc flowers in center • Bracts with hooked tips • **Upper bracts are as long as the flowers** • **Bracts covered in cobwebby hairs**	• **Cluster** • 120 cm diameter • **Many small, greenish white, or pink to red flowers arranged in clusters** • Stalks emerge from crown of plant	• **Branching cluster** • **Small, light green to pinkish flowers** • **Occur on terminal stalks**
Fruits	• Flowers dry out to form a “burr” • **Burrs smaller and more spherical** • Achenes open when dry and contain single brown, wedge-shaped, angular seed	• Flowers dry out to form a “burr” • **Burrs larger and more flat-topped** • Achenes open when dry and contain single brown, wedge-shaped, angular seed	• Flowers dry out to form a “burr” • **Burrs larger and more spherical** • Achenes open when dry and contain single brown, wedge-shaped, angular seed	• **No burr** • Achenes are angular, **do not open when dry**	• **A flower produces a capsule-like structure** • Fruit with **spiny wings** • Single seed, brown, teardrop-shaped, angular
Roots	• Thick, fleshy taproot (depth < 1 m)	• Thick, fleshy taproot (depth < 1 m)	• Thick, fleshy taproot (depth < 1 m)	• Thick, fleshy, reddish-brown rhizomes, yellow interior	• Long taproot (depth of 150 cm)

Biology and Life Cycle

Burdocks are herbaceous plants with a biennial life cycle (Gross *et al.* 1980; OMAFRA 2022). All three species follow a similar life cycle. In the first year, they remain in a vegetative stage and occur as a circular structure of leaves called a basal rosette from which they allocate resources, mainly carbohydrates, to their large, tough taproot (Gross *et al.* 1980; Gross and Werner 1983). The leaves develop in early spring and are often fully expanded by the end of April. In its second year, it produces an erect stem, bolting in early to mid – June. Numerous flowering stalks and heads emerge from the axils (base) of leaves. Leaves die overwinter and new ones will be produced in the spring (Nawrocki 2010). If unfavorable conditions occur, burdock may act as a perennial species, taking up to four years to flower (Gross *et al.* 1980; Montana State University 2017). They are considered monocarpic plants, as once they flower, they will die (Damalas *et al.* 2015).

Burdock species reproduce only via seed (Gross *et al.* 1980, OMAFRA 2022). As a member of the Aster family, the inflorescence of these plants is called a head and is comprised of purple disc-flowers crowded in the center of the head and surrounded by many bracts (modified leaves) that have hooked tips (Gross *et al.* 1980; Clauson 2011). The flowers begin to bloom at the end of June, lasting into October (Schutz 2021) and are pollinated by long-tongued bees such as bumblebees, honeybees, miner bees and leaf-cutting bees (Gross *et al.* 1980). The flowers begin to dry in August and produce a mature seed head called a "burr". The hooked tips of the bracts allow the seed head to cling to animal fur or clothing, where they can remain attached for several weeks, allowing for long-distance dispersal (Gross *et al.* 1980; Nawrocki 2010). They could potentially be spread via wind over snow or frozen ground (Hawthorn and Haync 1978). Flowers produce fruits called achenes which mature and are dispersed continuously throughout autumn, winter and the following spring. A single common burdock plant can produce between 6,000 to 17, 000 seeds (Gross *et al.* 1980; Gross and Werner 1983). The seeds can remain viable for up to three years and have a very high germination rate (> 95%) (Gross *et al.* 1980; Nawrocki 2010). Seeds do not require cold stratification and germinate the following spring (March – April) in areas that have been recently disturbed and often below mature burdock plants.

Common Burdock emerging in early spring as a basal rosette.

Photo courtesy of: Paul Abell, iNaturalist. Available: https://www.inaturalist.org/observations/23816945. Licensed under CC-BY-NC.

Honeybees are common pollinators of burdock flowers.

Photo courtesy of: Martha O'Kennon, iNaturalist. https://www.inaturalist.org/observations/29514278, Licensed under CC-BY-NC.

Seasonality for Common Burdock, Greater Burdock, Woolly Burdock in Ontario:

(based on iNaturalist sightings in Ontario)

Leaves: end of April (basal rosettes first appear) – October (basal rosettes and leaves of flowering stalks)

Flowering stalk: early to mid-June (begins to bolt)

Flowering: end of June – October (continuous with seed maturation)

Seed Ripening/Dispersal: August (matures), seeds held in the burrs through fall and winter until the following spring.

Dead standing growth from the previous season. Burrs frequently stay on the stems and are dispersed through the winter.

Photo courtesy of: Paul Abell, iNaturalist. Available: https://www.inaturalist.org/observations/39733949. Licensed under CC-BY-NC.

Habitat

Burdocks are disturbance-dependent and typically found along roadsides, farmlands, pastures, fencerows, parking lots, woodland edges, and urban areas such as school yards and parks (Gross *et al.* 1980; OMAFRA 2022). Burdock plants typically grow in scattered patches with a few individuals per area (Kambo and Kotanen 2014). While they can tolerate a range of environmental conditions, there is a preference for full-sun to partial-shade areas with moist, well-drained soil that has been recently disturbed, and they are often found in riparian areas such as streambanks. Common burdock favours soils with high organic content that are rich in nitrogen, with a pH between 6.0 – 8.0 (Damalas *et al.* 2015). Greater burdock is thought to be found on more fertile soils than common burdock (Gross *et al.* 1980). While burdock species germinate in areas with recent soil disturbance, they are less likely to be found in areas with annual soil disturbance such as cultivated land and are not typically an issue in croplands (Gross *et al.* 1980). This is because burdocks are biennial species, and their vegetative stage will not survive in areas with continual soil disturbance (e.g., tilling practices).

Common burdock is usually found in association with other plant species that thrive in farmlands, pastures, woodland edges and abandoned fields such as smooth brome (*Bromus inermis*), quackgrass (*Elymus repens*), rough fleabane (*Erigeron strigosus*), creeping thistle (*Cirsium arvense*), sulfur cinquefoil (*Potentilla recta*), wild carrot (*Daucus carota*), common dandelion (*Taraxacum officinale*), common yarrow (*Achillea millefolium*) and bitter wintercress (*Barbarea vulgaris*) (Gross *et al.* 1980).

Greater burdock growing adjacent to a shed. Burdock is commonly found in farmlands, pastures, abandoned fields and woodland edges.

Photo courtesy of: Carel Jongkind, iNaturalist. Available: https://www.inaturalist.org/observations/172906172. Licensed under CC-BY-NC.

Pathways of Spread and Distribution in Ontario

Burdock species are native to Eurasia, originally brought to North America in the 1600s either intentionally for their medicinal value or accidentally. Common burdock is the most abundant of the three burdock species and is found in 49 states of the continental USA except for Florida (USDA 2014; EDDMaps 2023; iNaturalist 2023). It is listed as a noxious weed in several states including Colorado, Montana, South Dakota and Wyoming (Colorado Department of Agriculture 2009; Montana State University 2017).

Common burdock has spread throughout most of Canada and occurs in all provinces, but not in the territories (EDDMaps 2023; iNaturalist 2023). It is listed as a noxious weed in Alberta, Manitoba, Saskatchewan and British Columbia (Saskatchewan Invasive Species Council n.d.; Alberta Invasive Species Council 2014; UNIVAR 2015). In Ontario, common burdock can be found across southern Ontario, with populations extending from the eastern and western boundaries of the province. In northern Ontario, the species has been reported as far north as Moosonee (Kambo and Kotanen 2014).

Like common burdock, greater burdock is quite widespread across North America and is found in most US states and Canadian provinces, although it is less abundant (EDDMaps 2023; iNaturalist 2023; Gross *et al.* 1980). In the US it is mainly concentrated in the northeastern and midwestern states, with sparse records in the southern states. In Canada it is concentrated in southern Ontario and Quebec with fewer records in the Prairie and Maritime provinces, and like common burdock, it is not found in the Yukon, Northwest Territories or Nunavut.

Woolly burdock is much less abundant than the other two species, and records of it are sparse and likely incomplete. It is found in localized populations in Ontario, Quebec, the Prairie provinces, New Brunswick, and Nova Scotia, but not Prince Edward Island or Newfoundland. It is also found in the Northwest Territories based on a recent iNaturalist sighting (EDDMaps 2023; iNaturalist 2023), but not in Nunavut or Yukon. Alberta is the only locality in North America to list all three burdock species as noxious weeds (Alberta Invasive Species Council 2014).

Burdock species spread only via seed (Gross *et al.* 1980). The seed heads, called burrs, have hooked tips that can adhere to fur and clothing. They are difficult to remove and can remain attached for weeks, allowing for long-distance dispersal. In some parts of the world, these species are planted for medicinal and edible uses.

For up-to-date distribution information, visit EDDMapS: www.eddmaps.org/ontario or http://inaturalist.ca.

Burdock burr adhering to clothing.

Photo courtesy of: Domonique Pimpare, iNaturalist. Available: https://www.inaturalist.org/observations/35325536. Licensed under CC-BY-NC.

Impacts

A Ruby-Crowned Kinglet entangled in burdock burrs in Cherry Beach, Toronto.

Photo courtesy of: Gary James, Toronto Nature Stewards.

Ecological:

Note: Most negative ecological impacts are reported about common burdock due to its prevalence, but there is potential for both greater and woolly burdock to pose the same threats if occurring in dense populations or in association with dense common burdock populations.

Burdock species are widespread in Ontario with the potential to become invasive in disturbed sites such as roadsides, disturbed woodlands, pastures, fence rows, urban parks. Burdock can become a large plant when mature, covering an area of up to a square metre in size, with large basal leaves that can shade out and suppress the growth of surrounding plants. By outcompeting adjacent plants, soil is exposed underneath common burdock plants, which can facilitate the establishment of its seedlings (Nawrocki 2010). The density of seedlings below common burdock plants can be as much as 100 seedlings/m^2 and possibly greater (Gross *et al.* 1980). Preliminary research indicates that burdock may have some allelopathic properties. In one study the leaf and root extracts of burdock (*A. lappa*) inhibited the growth of cress and barnyard grass, but further research is needed (Suzuki *et al.* 2019).

An eastern red bat (*Lasiurus borealis*) entangled in burdock burrs in Meadow Wood Park, Mississauga.

The burrs of common burdock pose a threat to small birds and small animals (e.g., bats, mice) as they can become ensnared in burrs and die (McAlpine 1976; Brewer 1994; Mink *et al.* 2018). Birds that are most likely to become entangled tend to be small-bodied species that actively forage on burdock plants, such as warblers and sparrows during fall migration (Underwood and Underwood 2013). Other impacted species include golden-crowned kinglets (*Regulus satrapa*), ruby-crowned kinglets (*R. calendula*) (Underwood and Underwood 2013), ruby-throated hummingbirds (*Archilochus colubris*) (McAlpine 1976, Nealan and Nealan 2000), blue-gray gnatcatchers (*Polioptila caerulea*) (Brewer 1994), and least flycatchers (*Empidonax minimus*) (Hager *et al.* 2009). Common burdock may reach high densities along migratory corridors and fruit may develop during the fledgling season, increasing the risk that birds will become entangled (Mink *et al.* 2018). Small species of bats have also become entangled in the burrs of common burdock, such as little brown bats (*Myotis lucifugus*), eastern red bats (*Lasiurus borealis*), western long-eared bats (*Nyctophilus major*) and silver-haired bats (*Lasionycteris noctivagans*) (Norquay *et al.* 2010). Studies have suggested that birds and bats are more likely to become entangled while foraging for insects on burdock plants (Norquay *et al.* 2010; Underwood and Underwood 2013).

Economic:

Burdock species have several negative economic impacts, most notably to agricultural practices. The burrs can become tangled on livestock such as in the sheep wool, which can reduce its value (Gross *et al.* 1980; Damalas *et al.* 2015). Cattle that become heavily burred can experience eye or mouth injuries (Gross *et al.* 1980). If cows consume common burdock in large quantities, the dairy products produced can become bitter and unmarketable (Damalas *et al.* 2015; Mink *et al.* 2018).

Common burdock is also a secondary host for agricultural pests and diseases (Gross *et al.* 1980; Damalas *et al.* 2015). This includes powdery mildew (*Erysiphe cichoracearum*) which mainly affects squashes and cucumbers, root rot (*Phymatotrichum omnivorum*) which primarily attacks cotton and sugar beets, and root-knot nematodes (genus *Meloidogyne*) which target legumes.

It is not usually a problem in crops because burdock cannot tolerate annual cultivation (Gross *et al.* 1980; Damalas *et al.* 2015), but it may crowd out desirable forage grasses in pastures.

Burdock leaves can have a large basal area, which can shade out the growth of other plants.

Photo courtesy of: Jaclyn Scobie, City of Toronto.

Societal:

The burrs are a nuisance when they adhere to clothing, pets, and human hair. The sharp bristles on the burrs of burdock can become windborne and cause severe eye, skin and respiratory infections in humans and animals (Gross *et al.* 1980).

Burdock has a long and rich history of medicinal and edible use across many parts of the world (Gross *et al.* 1980; Mink *et al.* 2018). Typically, greater burdock is considered most suitable for these purposes, followed by common burdock and then woolly burdock (Thayer 2006), although they are often used interchangeably due in part to difficulties in differentiating between the species.

In the Western herbal traditions of Europe and North America, burdock is considered an alterative, meaning it supports detoxification and elimination organs in the body (Foret 2023). As such it is mainly used for treating skin, liver, and urinary conditions. The long taproot is used for chronic (or 'deep') illnesses, such as psoriasis, kidney disease, or digestive difficulties, while the seeds are short-acting and used more for acute infections (Foret 2023). In vitro studies have looked at constituents in burdock for anti-cancer effects, and fruit extracts have been studied topically for wrinkle reduction (Knott *et al.* 2008; Hsieh *et al.* 2014;). However, there are no human clinical trials that support these uses. Several North American Indigenous groups have also included burdock in their pharmacopeia of plant medicine. The Ojibwa have used it as a tonic herb, and for stomach pain (Meeker *et al.* 1994).

There are several parts that have been used for edible purposes, such as the flowering stalk, petioles, and roots. The root is cultivated in Japan and sold under the name "gobo" and in North America it is available in specialty stores and Asian grocery markets. In Chinese Medicine the burdock seeds are used more commonly than the root, for various ailments such as acute infection, red swellings (such as boils), and for gastrointestinal issues such as constipation (Foret 2023).

Applicable Legislation

(Last Updated – July 2024)

Regulatory Tools – Burdock species:

Burdocks are not federally or provincially regulated invasive plant species. **See Table 2 for details.**

Depending on the location, timing of work, and the type of management activities (e.g., mechanical/manual or chemical), permits, approvals or authorizations may be required from municipal, provincial or federal agencies before invasive plant control can be initiated. Individuals undertaking control activities for burdock are responsible for ensuring that these are obtained and complying with any applicable legislation. Please note that this is only for general guidance and is not intended as legal advice.

Additionally, if protected species or habitats are present, an assessment of the potential effects of the control project and authorization could be required. Depending on the species and its location, applications should be directed to the appropriate authorities.

While not an exhaustive list of permits or rules that may apply to invasive plant species management, the following examples are provided for consideration:

Table 2: Legislation pertaining to burdock management.

Legislation & Regulating Body	Purpose	Application to Burdock Management
PROVINCIAL		
***Invasive Species Act*, Ontario Regulation 354/16** Ministry of Natural Resources (MNR) Applicable to Terrestrial and Aquatic Environments	Prevent the Introduction and Spread of Invasive Species	Burdock is not regulated under the *Invasive Species Act*, 2015. For more information, visit: https://www.ontario.ca/page/managing-invasive-species-ontario
Weed Control Act Ontario Ministry of Agriculture, Food and Agribusiness (OMAFA)	Regulation of Noxious Weeds in Ontario	Burdock is not listed in the Schedule of Noxious Weeds under the *Weed Control Act* (WCA), 1990. The WCA is administered by the Ontario Ministry of Agriculture, Food and Agribusiness (OMAFA). The objective of the WCA is to minimize the impact of noxious weeds and weed seeds on agriculture or horticultural land. Landowners whose property contains noxious weeds and weed seeds that negatively affect agriculture or horticultural lands are responsible for weed control and associated costs. For more information on noxious weeds and what to do if you find them on your property visit: https://www.ontario.ca/page/noxious-weeds-ontario

Legislation & Regulating Body	Purpose	Application to Burdock Management
Endangered Species Act Ministry of Environment Conservation and Parks (MECP) Applicable to Terrestrial and Aquatic Environments	Protection of Endangered and Threatened Species and their Habitat	The *Endangered Species Act* (ESA) prohibits the killing, harming, and harassing of species at risk (SAR) classified as extirpated, endangered or threatened, as well as damage and destruction of the habitat of endangered and threatened SAR. Management activities that may adversely impact protected SAR or habitat may proceed in accordance with an ESA authorization (permit or agreement) or regulatory exemption. For the full list of species at risk in Ontario and for information on permit requirements consult: http://ontario.ca/page/how-get-endangered-species-act-permit-or-authorization
***Pesticides Act* & Regulation 63/09** Ministry of Environment Conservation and Parks (MECP) Applicable to Terrestrial and Aquatic Environments	Regulation of Pesticide Use in Ontario	The *Pesticides Act* and Ontario Regulation 63/09 govern the sale, use, transportation, storage and disposal of pesticides in Ontario including license and permit requirements. Most invasive species control projects will require a licensed exterminator. Only pesticides registered under the federal *Pest Control Products Act* by the PMRA can be used in Ontario. **The pesticide label is a legal document that must be followed exactly.** Exterminations on land are subject to the cosmetic pesticide ban. Other than certain biopesticides and low-risk pesticides on Ontario's "Allowable List", pesticides can only be used in accordance with an exception (e.g., agriculture, forestry, public health and safety, natural resources and other legislation) to the cosmetic pesticide ban. The licensed exterminator in charge can provide guidance regarding how the exceptions to the cosmetic pesticide ban apply to the specific extermination and any requirements that must be met to perform work under the exception. **For more information on these exceptions and the rules with respect to pesticide use visit:** https://www.ontario.ca/laws/regulation/090063
FEDERAL		
***Species at Risk Act* (SARA)** Environment and Climate Change Canada (ECCC) Applicable to Terrestrial Environments	Protection and Recovery of Species at Risk and their Habitats	For most extirpated, endangered and threatened species, the *Species at Risk Act* (SARA) applies automatically only on federal lands. This includes national parks, national marine conservation areas, national historic sites and other protected heritage areas administered by Parks Canada. For control activities on federal lands that may affect non-aquatic species listed on Schedule 1 of SARA, or which contravene SARA's general or critical habitat prohibitions, permits may be required. For more information, consult: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/permits-agreements-exceptions/permits-agreements-information.html

Legislation & Regulating Body	Purpose	Application to Burdock Management
***Migratory Birds Convention Act* & Regulations** Environment and Climate Change Canada (ECCC) – Canadian Wildlife Service (CWS) Applicable to Terrestrial and Aquatic Environments	Protection of Migratory Birds, and their Nests and Eggs	When undertaking your project, you should take precautions to avoid harming migratory birds, nests and eggs. This includes: • Understanding how migratory birds and their nests are legally protected • Consider species activity timelines (i.e. active nesting season) • Planning your activity ahead of time, evaluate if the activity may cause harm to migratory birds, and determine what measures can be taken to avoid causing this harm • Develop and implement preventative and mitigation measures, such as beneficial management practices. For more information please visit: https://www.canada.ca/en/environment-climate-change/services/migratory-birds-legal-protection/convention-act-regulations.html
Pest Control Products Act Pest Management Regulatory Agency (PMRA), Health Canada Applicable to Terrestrial and Aquatic Environments	Regulation of Pest Control Products in Canada	Before a pesticide can be sold or used in Ontario, it must be registered under the federal *Pest Control Products Act* (PCPA) by the Pest Management Regulatory Agency (PMRA) of Canada. The pesticide label is a legal document. **Follow all label directions – and ensure you have the most current label and are aware of any re-evaluation decisions.** Visit the PMRA's product label search site at https://pr-rp.hc-sc.gc.ca/ls-re/index-eng.php

Invasive Plant Management Planning

Management Considerations

It is important to consider what situations burdock should be prioritized for removal. As a ubiquitous roadside weed, it is generally left in place in favor of higher priority invasive plant species. However, if burdock is in an area where migratory birds or bats are likely to become entangled in its burrs, where it is becoming locally dominant and impeding restoration efforts, or it is impacting agricultural practices, removal should be prioritized.

It may also be decided to remove burdock as part of a broader restoration strategy where other invasive plants are also being prioritized and controlled. When undertaking a management project, it is important to use a control plan that incorporates Integrated Pest Management (IPM) principles. This entails using existing knowledge about each invasive plant (e.g., its biology and life cycle), and its surrounding environment. This often requires more than one type of control measure to be successful.

Mapping

If you are planning a restoration project on your property, conducting an ecological survey is a beneficial way to document current and future distribution of invasive and weedy plants that might be present, such as burdock.

Conservation authorities or municipalities which manage large land areas may hire contractors or qualified volunteers to conduct ecological surveys. However, private landowners with smaller properties may be able to conduct their own surveys or hire a contractor. Survey the entire property to locate invasive plants that might be impacting your goals for restoration at a site.

Because leaf-out and germination occurs early in common burdock, it is often easiest to locate for mapping in early spring (April – May) by looking for the basal rosette. For detailed information on mapping techniques consult the Landowners Guide for Managing and Controlling Invasive Plants in Ontario.

Landscape Level Management

A more detailed management strategy is likely to be needed if multiple invasive plant species have established on your site and/or there are extensive population sizes. A strategic, landscape-level approach to management should be undertaken to bring together partners, landowners and land managers. This approach is designed to work towards common and shared goals that consider both site-level needs in conjunction with wider landscape considerations. It makes it easier to use resources efficiently, coordinate management activities and accomplish strategic goals. Failure to consider a broader landscape context by only focusing on individual or local challenges may increase management costs, be more labour intensive and may not produce desired results across larger areas. Effective management of burdock requires repeat treatments and the combination of control methods (i.e., hand pulling or digging and herbicide use). It is important to determine the land use objective and desired plant community because it is not always realistic, especially for larger populations, to eliminate the entire infestation at once. From here, develop an appropriate IPM strategy.

Setting Priorities

Establishing your highest priority locations for control prior to management will help to determine your best course of action. Therefore, when developing a management strategy, it is important to consider the following considerations to help inform control decisions:

1. Protect federally, provincially, and regionally rare species and communities by removing invasive plants and ensuring rare species are not negatively impacted by control efforts. You are responsible for ensuring that your project follows provincial, federal, and municipal laws, including the provincial *Endangered Species Act*, 2007 (ESA) and federal *Species at Risk Act* (SARA). For species-specific information consult: https://www.ontario.ca/page/species-risk-ontario
2. Ensure all landowners have been identified and consulted before control takes place.
3. **Contain:** If you have limited resources, try to remove the outlying populations of invasive plants first (isolated plants or satellite populations), to prevent further spread. Protect areas where invasive plants are absent or just appearing. When action is taken early it can significantly reduce the cost of control. For burdock species, targeting new populations while they are still in their basal rosette form can help to reduce seed source and spread.
4. **Work inward:** If you have more resources, working from the outlying or satellite populations inward into larger, "core" populations of invasive plants and reducing the quantity of seeds can prevent spread into uninfested areas. In many cases, resource limitations may prohibit the immediate removal of entire core populations. Under these circumstances, core areas should be prioritized and addressed strategically.
5. **Consider sensitive ecological areas:** Concentrate on preventive strategies in high-priority ecological areas or areas where invasive plants are going to cause the most problems in terms of spread. Such as the most productive or sensitive part of an ecosystem, along a creek, near species at risk, or a high-quality natural area. When prioritizing burdock removal, consider areas that are bird hotspots, such as migratory stopover sites where birds may become entangled in the burrs. Pay special attention to disturbed sites which can be quickly colonized by invasive plants. Reduce the spread of invasive plants and burdock by following the Clean Equipment Protocol and removing invasive plant material (such as burdock burrs) from boots, clothing, and animal fur.
6. **Logistics and costs:** Review the different control options and costs with consideration to surrounding water, habitat, time of year, and type of land use (i.e., high-traffic recreational areas, agriculture, etc.).
7. Consider dedicating a certain time each year to control efforts and make it a joint effort with neighbouring landowners and/or land managers.
8. Begin to assess whether regeneration or restoration is appropriate, and if seeding or planting of native plants is needed to help jump-start natural succession and increase biodiversity in the area.
9. Follow-up monitoring is crucial to remove new invasive plants or address resprouts that may emerge after initial control efforts.

Prioritizing within a Control Area

(This section is modified from *The Landowners Guide to Managing and Controlling Invasive Plants*, published by Credit Valley Conservation).

1. Focus on large blocks of un-invaded areas and keep them free of invaders.
2. Control small, younger, outlier (satellite) populations first.
3. Reverse the invasion, expand the cleared area outward and ensure that un-invaded areas are kept free of invasive plants (with regular monitoring).

This flow chart can help land managers choose where to first focus control efforts if controlling satellite populations due to limited resources:

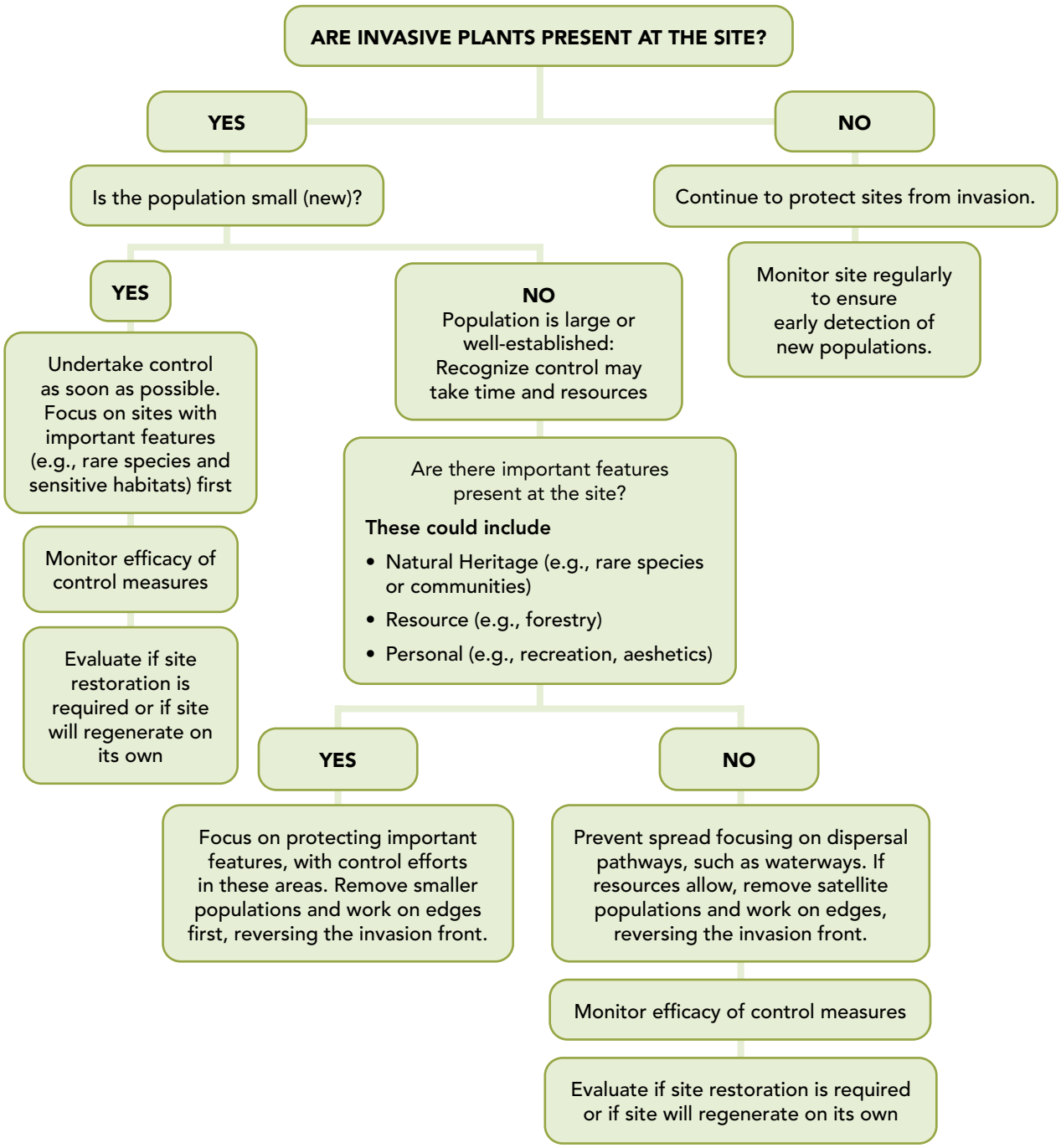


Figure 1: How to prioritize restoration sites for effective control of invasive plants.

Long-term Management and Monitoring

A long-term management and monitoring plan should be developed prior to control efforts to help prevent the re-establishment of invasive plants or weedy species. By monitoring after the initial control measures, this will enable the assessment of effectiveness and determine the need for follow-up treatments. Ongoing management is essential to the success of a control project because after removal a site is at risk of reinvasion from nearby populations or other invasive plants.

Monitoring can be simple or complex ranging from taking photos or performing visual assessments to conducting extensive vegetation surveys. In general, annual control of common burdock is needed and should focus on removing individual plants or small, isolated populations as they appear. This will help ensure that the invasive plant population remains under control while allowing for the regeneration of desirable native plant species.

For detailed information on monitoring consult the Landowners Guide for Managing and Controlling Invasive Plants in Ontario.

After Management: Assessing Regeneration vs. Restoration

Consider the following factors:

1. **Level of disturbance at the site:**
   - Was this a heavily invaded site (e.g., was much disturbance caused during control measures)?
   - Will it continue to be disturbed (e.g., through urban management activities or recreational use)?
2. **Biology of the invasive species removed:**
   - Is there a seed bank to consider?
   - Are there seed banks from other invasive plants in the area?
3. **Re-invasion risk:**
   - Are there invasive species nearby that could re-invade the site from nearby trails, watercourses or other pathways of introduction? Burdock seeds can disperse long distances as the seed heads can cling to animal fur or clothing.
4. **Existing native vegetation:**
   - Will any native vegetation that still exists on the site regenerate quickly?
   - Does the existing native vegetation need help? Species with specific habitat requirements or reproductive strategies resulting in low fecundity, including species at risk, may require re-introduction. The majority of plant species should be able to recover naturally, especially if healthy populations exist adjacent to the controlled area.

If you answered **Yes** to most of the questions under 1 to 3, it is most likely that (a) the site will be re-invaded before it has a chance to regenerate on its own or (b) that invasive plants will continue to invade and be present among the native species so that annual control may be required. Restoration will be needed to reduce the risk of re-invasion. If you answered **Yes** to the questions under 4, your site may have a lower risk of invasion but could still require some restoration measures to help re-establish native vegetation.

Control Measures

Common burdock control in a park.

Photo courtesy of: Stephen Smith, Urban Forest Associates.

In general, burdocks are considered ubiquitous roadside weeds and left in place. Control may be required in areas where populations have become locally dominant and are impeding restoration efforts, where they are impacting agricultural practices, or where hotspots for birds have been identified. Common and greater burdock are the most frequently controlled due to their abundance, while woolly burdock is infrequently controlled as it is more sparsely populated and its invasiveness within Ontario is likely limited at present. Regardless of which burdock species is present, they are managed in the same way.

Burdock can be successfully controlled using a combination of methods. Since these plants reproduce exclusively via seeds and the seeds only last a short time, the goal of management should be to prevent seed production and to deplete the seed bank. Control efforts should focus on: 1) removing new seedlings to prevent them from overwintering and producing seeds in the following year; and 2) preventing second year plants from going to seed. Survey for seedlings and first year plants (basal rosettes) in early spring to plan management action.

Manual and mechanical control can be quite effective on young plants because their taproots have not yet fully developed. The best approach is to remove young plants early in the spring when they are small, either by digging into the soil or spading to sever the root belowground. Burdocks send a thick, long taproot deep into the soil, which becomes more difficult to remove as the season progresses and can break off easily while pulling and digging, making eradication challenging. Mature plants may need a combination of methods (i.e., manual control combined with herbicide use). Cutting immature flower and seed heads while they are still green, although labor-intensive, can be effective at reducing further seed spread and reducing the hazards burdock poses to birds and other wildlife.

Several herbicides are available for the control of burdock (see Table 2). Systemic herbicides that are translocated to the root and which kill the entire plant are most effective. They can be applied generally for various broad-leaved species including burdock at a site or for mature, hard-to-control burdock plants. Note that burdock can be effectively controlled without the use of herbicide, through manual and mechanical control as well as planting with competitive native species to prevent the germination of weed species from the seed bank.

The site should be monitored periodically for several years, and any new growth should be removed as required.

Manual

Hand Pulling or Digging:

A) Digging out a common burdock plant and B) Exposed taproot.

Photos courtesy of: Frederick Schueler, Fragile Inheritance Natural History.

Small infestations of burdock in its vegetative (basal rosette) stage can be effectively managed by a combination of hand pulling and digging. Hand pulling is rarely effective on its own unless the plants are very young in early spring, due to their thick, deep taproots which break off easily and are difficult to remove entirely. To hand pull, grip the plant at the base and pull slowly, pulling out as much of the root as possible. These methods are best in early spring once the leaves have expanded and when the soil is moist as this will help remove the root. For very young plants a digging tool like a dandelion digger may be effective. Ensure that you are wearing gloves as contact with this plant may cause dermatitis. Note that the largest taproots can be as much as 8 cm thick and about 90 cm deep.

To dig out the taproot, use a sharp shovel with a long, thin point (such as a Root Slayer) or a post hole digger and dig a deep hole running parallel alongside the root. Dig until you have just reached the tip, and then carefully loosen the root by hand. If the root still goes a few cm's deeper than your hole, extract by pulling upwards slowly and steadily (not jerking). If the root breaks during pulling, use a shovel to dig down to the bottom of the root and remove it. If it is not possible to remove the root entirely, the root can be severed from the root crown using a sharp shovel with a long, thin point, at a depth of 8 cm – 10 cm. This method can help reduce growth (but will not eradicate) and is best applied in the basal rosette stage in spring or early summer (Clauson 2011).

Continue to monitor the site throughout the growing season. Any new growth should be removed by digging. Note that manual removal efforts will cause soil disturbance that can promote the germination of invasive plant seedlings from the soil seedbank and could damage desirable plant species (Miller *et al.* 2015). These impacts can be reduced by tamping the soil down and encouraging the re-establishment of desirable grasses and forbs.

Cutting Flower or Seed Heads:

Cutting flower or seed heads may help to prevent the spread of burdock and reduce hazards to birds and other wildlife. It is best to remove seed heads while they are still immature and green (end of June to October, depending on individual plant growth and site conditions), as mature dried burrs release a lot of seeds and may contribute to spread. Tools such as loppers or pruning shears work well to clip the flower or seed heads. Note that this method alone will not kill the plant. Since a smaller flowering stalk will often emerge after the primary stalk is cut, this should also be cut to prevent further seed production. Care must be taken to prevent dispersal of any seeds that mature after the stalks are cut.

Mechanical

Cutting or Mowing:

Small to large infestations of burdock can be effectively managed by mowing above-ground vegetation. For smaller infestations or where more selective cutting is required around other native species, cut the plants using a brush cutter. A mower such as a brush hog can be used for larger infestations or larger plants. The goal of this method is to prevent seed production and spread. Mow plants after bolting (early – mid June) but before flowers open (July – September). Defoliated plants have been found to produce fewer flower heads and therefore fewer seeds (Gross and Werner 1983). This method reduces the number and size of leaves on the plants, lowering photosynthesis and depleting the plants' carbohydrate reserves.

Using a brush cutter or hog mower, cut the vegetation close to the ground. Mowing may cause the plant to branch out. Therefore, this method must be repeated several times during the growing season to remove regrowth. This method should not be used if plants have gone to seed as this will spread the seeds and result in new plants the following year. Mowing is a non-selective control measure. Care needs to be taken to reduce impacts to desirable native species and should not be conducted in environmentally sensitive areas where species at risk may be present.

Tilling:

ONLY FOR AGRICULTURAL APPLICATIONS.

As burdocks are biennial plants, they require habitats that will not be annually disturbed and are intolerant of cultivation. Tilling the soil annually prevents newly germinating plants from surviving and pulls the tops off bigger plants so they never flower. This method is only useful in agricultural applications where tilling is usually practiced.

Cultural

Grazing:

NOT RECOMMENDED.

Some livestock (mainly sheep) will consume burdock in its vegetative stage. However, this is not recommended as burrs can lead to mouth and eye injuries to livestock, and if consumed by cows, can cause milk to become bitter and unmarketable. Grazing can also lead to trampling of native plants species, especially in riparian areas.

Prescribed Fire:

NOT RECOMMENDED

While burning can be effective in controlling biennial weeds if the fire reaches a high enough intensity, the basal rosettes of burdock often survive (Renz and Drewitz 2008). Plants that are actively growing in early spring will not burn and moist sites will not become hot enough to control burdock. Depending on the ecosystem type, burning may also damage desirable native species and create disturbance encouraging the establishment of burdock seedlings and other invasive plants.

Chemical

The management of pesticides is a joint responsibility of the federal and provincial governments. The federal government, through the Pest Management Regulatory Agency (PMRA), is responsible for approving the registration of pesticides across Canada under the *Pest Control Products Act*. Ontario regulates the sale, use, storage, transportation and disposal of pesticides including issuing licenses and permits under the *Pesticides Act* and Ontario Regulation 63/09. Federally registered pesticide products are assigned one of four product class designations (i.e., Manufacturing, Restricted, Commercial or Domestic). The class of pesticides determines who can sell or use the pesticides products as well as what restrictions are placed on its use (e.g., requires a license and/or permit). Most invasive species control programs using a pesticide will require an appropriately licensed exterminator.

The use of pesticides on land is subject to the cosmetic pesticide ban. Other than certain biopesticides and low-risk pesticides on Ontario's "Allowable List", pesticides can only be used if the use is permitted under an exception to the ban. Depending on the specifics of the extermination, invasive plant control may be permitted in accordance with exceptions for forestry, agriculture, public health and safety (e.g., plants poisonous to humans by touch and plants that affect public works and other buildings and structures) and compliance with other legislation (e.g., control of noxious weeds where required by the *Weed Control Act*). There is also an exception for the management, protection, establishment or restoration of a natural resource that may be considered if other exceptions do not apply. The requirements that must be met for pesticide use under each exception are set out in Ontario Regulation 63/09 and may include conditions such as certification in integrated pest management, a letter from the relevant Ministry (MNR or MECP) and/or others. The appropriately licensed exterminator in charge can provide guidance on requirements that apply to the specific extermination under consideration.

Herbicide Selection and Application

Pesticide applications can be an effective method for burdock management when used as part of an integrated pest management program and in consideration of the species biology and site-specific information. Pesticides must be applied in accordance with the federal *Pest Control Products Act*, the Ontario *Pesticides Act*, Ontario Regulation 63/09 and all label directions. Most invasive species control programs using a pesticide will require an appropriately licensed exterminator. The availability of pesticides to control burdock may change over time, as may the label directions on how to use the pesticide so that it does not endanger human health or the environment.

Before using any pesticide, ensure you have the most current label. Pesticide labels can be accessed using the PMRA's label search tool, which can be found by searching "PMRA label search" in any major search engine. Always read and follow all directions on the label. The label is a legal document that must be followed exactly, including any applicable buffer zones. Using a pesticide to treat a species not listed on the label, or in a manner other than specified on the label violates the *Pest Control Products Act* and may incur penalties.

Chemical Control and Burdock:

Several systemic herbicides have been shown to be effective at managing burdock species. These include glyphosate, triclopyr, imazapyr, 2,4-D, aminopyralid, and dichlorprop-P. Herbicides must be applied in accordance with the federal *Pest Control Products Act*, the *Ontario Pesticides Act*, Ontario Regulation 63/09 and in accordance with all label directions. The easiest way to find a chemical label is by using the Pesticide Management Regulatory Agency (PRMA) label search tool which can be found here: https://pr-rp.hc-sc.gc.ca/ls-re/index-eng.php. Consult this tool to ensure you have the most current label and are aware of any re-evaluation decisions.

Foliar Spray:

Chemical application may be done using a foliar spray method. Systemic herbicides that are translocated to the roots and kill the entire plant are the most effective chemical control for burdock. The table below summarizes herbicides that are effective at controlling burdock. **It is important to note that most of these herbicides are listed as Restricted (Class B) or Commercial (Class C) herbicides under the Ontario Cosmetic Pesticide Ban. Because of this, herbicide application must be done by a licensed professional. Always read the product label to ensure that the herbicide is registered for use on burdock species in Canada by the Pesticide Management Regulatory Agency.**

Herbicides are most effective when they are applied to actively growing plants in the vegetative (basal rosette) stage. Many herbicides will need repeat treatments because new growth may appear from the roots. Spray the leaves until wet but not to the point where the herbicide drips off the leaves. It is important to consider impacts to non-target plant species as many of these herbicides are non-selective. When applying to agricultural land, ensure that the herbicide will not also kill desirable crop species. Some herbicides may also remain active in water and it is essential to observe specified buffer zones to avoid contaminating groundwater and toxic effects to aquatic organisms. Review the product label and Safety Data Sheet (SDS) for full product details.

Table 2. Herbicides effective at controlling burdock that may be applied using a foliar spray method.

Herbicide	Application/Timing	Herbicide Class	Benefits	Cautions
Glyphosate	Apply to basal rosette stage when plants are actively growing. Can be applied up to 2 times a growing season.	Commercial *Only licensed professionals may apply this herbicide.*	Low rate of persistence in the environment, low toxicity	Observe required buffer zones. Non-selective herbicide, avoid contact with non-target plants. Avoid application if heavy rain is forecasted. Visual effects may take longer (7 to 10 days).
Triclopyr	Apply to basal rosette stage, when plants are actively growing. Apply only once a year.	Commercial *Only licensed professionals may apply this herbicide.*	Little to no impact on grasses, fast acting (3–5 days).	Observe required buffer zones. Non-selective herbicide, avoid contact with non-target broadleaf weeds and woody plants.
Imazapyr	Apply to basal rosette stage, when plants are actively growing.	Commercial *Only licensed professionals may apply this herbicide.*	Quicker drying time and higher uptake. Low spray volume.	Observe required buffer zones. Can take several weeks for visible signs of damage to show. Non-selective, avoid drift or contact with non-target plants. Avoid spraying where tree roots are nearby as it can kill trees.
Aminopyralid	Apply to basal rosette in the spring (April – May) when plants are actively growing. Apply only once a year. The addition of a surfactant can help with absorption.	Commercial. *Only licensed professionals can apply these herbicides.*	Small amounts are effective on most broadleaf weed species.	Observe required buffer zones. Avoid application if heavy rain is forecasted. Application is less effective when weeds are experiencing drought stress.
2,4 – D + dichlorprop-P	Can be foliar sprayed during May or early fall, may require a second treatment.	Commercial *Only licensed professionals may apply this herbicide.*	Manages glyphosate-resistant perennial weeds.	Observe required buffer zones. Non-selective, avoid contact with non-target plants. Avoid application if heavy rain is forecasted.

Biological

Leaf mining damage on common burdock.

Photo courtesy of: Frederick Schueler, Fragile Inheritance Natural History.

There are no approved biological control agents for any burdock species in Canada. However, in Ontario common burdock is attacked by a wide range of generalist and specialist herbivores, both native and non-native, with potentially high levels of leaf and seed damage in certain areas* (Kambo and Kotanen 2014, Lee and Kotanen 2017). Although this damage is usually not enough to kill the plant, it likely reduces seed fecundity and helps limit its spread. Herbivore damage is greater in open habitats compared to understory habitats (Lee and Kotanen 2017) and greater in southern Ontario where herbivores are concentrated (Kambo and Kotanen 2014). Further north, common burdock experiences significantly less damage particularly at its range limits, where plants escape many of their usual enemies further south. For example, in Ontario seed parasitism drops from more than 85% in southern sites to less than 25% in northern sites (Kambo and Kotanen 2014).

Examples of insect herbivores include generalist leaf chewers, leaf-mining flies such as *Calycomyza flavinotum* and the burdock leafminer (*Liriomyza arctii*), native folivores such as Keeler's spur-throat grasshopper (*Melanoplus keeleri*), stem-borers such as the burdock borer moth (*Papaipema cataphracta*) the introduced meadow spittlebug (*Philaenus spumarius*), and the native bold-feathered grass moth (*Herpetogramma pertextalis*). Seed predators include tephritid flies that lay eggs in the capitula, where their larvae consume the seeds, and the burdock seedhead moth (*Metzneria lappella*) (Kambo and Kotanen 2014). The burdock seedhead moth is an introduced moth found in the native range of common burdock and the only *Arctium* specialist found in North America (Gross *et al.* 1980; Lee and Kotanen 2017). The larvae consume multiple burdock seeds, form a pupal case with damaged seeds and over-winter, emerging as adults in late June or early July (Gross *et al.* 1980, Kambo and Kotanen 2014). Other non-insect herbivores include wild turkeys (*Meleagris gallapavo*), who consume the seeds as part of their winter diet. These seeds are particularly favored by them in deep snow when the seeds are more readily accessible (Fred Scheuler, personal communication).

**Data on herbivore damage is available for common burdock in the literature and assumed to be similar for A. lappa and A. tomentosum.*

Disposal

After Control

Small basal rosette plants can be piled on-site with the roots exposed and in full-sun where they can dry out completely. Ensure that all viable plant material (burrs and seeds) are properly disposed of. Viable plant material should be placed in thick garbage bags, left in the sun for 2-3 weeks, and disposed of in a landfill. If there are no burrs, the material from solarized bags can be composted at home or piled, and any germinating seedlings controlled on site. Check all clothing and equipment to prevent the accidental spread of burrs.

Removal of burdock from a site.

Photo courtesy of: Jaclyn Scobie, City of Toronto.

Do not backyard compost

Backyard composters do not reach the temperatures necessary to kill seeds. Do not compost any viable plant material (i.e., burrs and seeds).

Municipal compost

Large-scale municipal composting facilities where the compost pile reaches temperatures high enough to kill living plant material can be used to dispose of viable plant material. Ontario composting facilities are required to routinely monitor the compost process and meet strict, provincially regulated time-temperature parameters for pathogen kill. Consult your local municipality to determine if this is an appropriate course of action.

Solarize

Place all plant material into thick plastic garbage bags. Seal the bags tightly and leave them in direct sunlight for 2 - 3 weeks. This will "cook" or kill viable plant material. The rotten material can then be composted or disposed of in a landfill.

Restoration

Following control measures, consider restoring the site to encourage the re-establishment of native plant species. Consider the following two restoration practices:

Seeding:

Seeding the site with native plant species immediately following plant control can help prevent the establishment of new invasive plants. This method can help native plants re-establish themselves. Seeding should only be done after management activities are completed to prevent new native plants from being damaged or killed. It is best to spread seeds from local native plants into the area.

Planting:

Once invasive plants including burdock have been successfully removed from a site, planting site-appropriate native species can help them out-compete invasive seedlings. This is especially important if there are nearby invasive plants that can colonize the sites. If management activities will be conducted in subsequent years, wait until all management is completed prior to planting to avoid damaging or killing newly planted stock. Consider site characteristics such as light availability and amount of space when choosing plant species for restoration as this will affect growth and soil conditions. A diverse mix of plants should be tailored to the region based on the site's growing conditions. Consider transplanting mature individuals from surrounding good quality habitat. Ensure that any plants brought into the habitat come from an appropriate ecoregional source. For burdock, consider native species that are similar in size (i.e., native shrubs) so they can be competitive with weedy and invasive seedlings.

See the **"Long-term Management and Monitoring"** on page 26

Burdock infestation at a prairie site.

Photo courtesy of: City of Toronto.

Preventing the Spread

Prevention and early detection are the most effective tools for controlling the spread of invasive plants and everyone can help by following these suggestions:

☑ Watch for it.

Learn to recognize invasive plants and then monitor property boundaries, forested areas, fence lines, and trails. Early detection can make it easier and less expensive to remove or control them.

☑ Stop the spread.

Inspect, clean, and remove mud, seeds and plant parts from clothing, pets (including horses), vehicles (including bicycles, trucks, ATVs, etc.) and equipment such as mowers and tools. Clean vehicles and equipment in an area away from natural areas where plant seeds or parts are not likely to spread (e.g., wash vehicles in a driveway or at a car wash) before travelling to a new area. See the Clean Equipment Protocol for more details.

☑ Keep it natural.

Try to avoid disturbing soil and never remove native plants from natural areas. This leaves the soil bare and vulnerable to invasive species.

☑ Use native species

Try to use local native species in your garden. Encourage local garden centers and nurseries to sell non-invasive or native plants. The Grow Me Instead guide lists alternative species to plant instead of invasive species. For more information on alternative species to plant instead of invasive species, consult the Grow Me Instead guide at https://www.ontarioinvasiveplants.ca/resources/grow-me-instead/.

Additional Resources

How to Identify Common Burdock, *Arctium minus* – Wild Edible and Medicinal Plant Identification [video]
https://www.youtube.com/watch?v=qXiqq66fgow

Common Burdock Identification [video]
https://www.youtube.com/watch?v=m8zJ3ogIoyI

How to Remove Burdock [video]
https://www.youtube.com/watch?v=YEVd5sTmIko

Best Management Practices Document Series

Autumn Olive
Black Locust
Buckthorn
Dog-strangling Vine
Erect Hedge-parsley
Eurasian Water-milfoil
European Black Alder
European Frog-bit
Flowering Rush
Garlic Mustard
Giant Hogweed
Goutweed
Invasive Honeysuckles
Japanese Barberry
Manitoba Maple
Multiflora Rose
Norway Maple
Purple Loosestrife
Reed Canary Grass
Scots Pine
Spotted Knapweed
White Mulberry
White Sweet Clover
Wild Parsnip
Yellow Iris

Technical Bulletin Series from the OIPC

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Dog-strangling Vine
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European Buckthorn
Garlic Mustard
Giant Hogweed
Himalayan Balsam
Invasive Honeysuckles
Invasive Phragmites
Japanese Knotweed
Purple Loosestrife
Reed Canary Grass
White Mulberry
White Sweet Clover
Wild Parsnip

Additional Publications from the Ontario Invasive Plant Council

A Landowner's Guide to Managing and Controlling Invasive Plants in Ontario

A Quick Reference Guide to Invasive Plant Species

Clean Equipment Protocol for Industry

Creating an Invasive Plant Management Strategy: A Framework for Ontario Municipalities

Grow Me Instead! Beautiful Non-Invasive Plants for Your Garden, a Guide for Southern Ontario, Edition 3, 2020 (EN)

Grow Me Instead! Beautiful Non-Invasive Plants for Your Garden, a Guide for Southern Ontario, Summer 2017 (EN, FR)

Grow Me Instead! Beautiful Non-Invasive Plants for Your Garden, a Guide for Northern Ontario

Invasive Aquatic Plant Species: A Quick Reference Guide

Invasive Terrestrial Plant Species: A Quick Reference Guide

The Landowners Guide to Controlling Invasive Woodland Plants

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