

PLANTING YOUR POND

A Beginners Guide to Ecoscaping
Healthy Private Ponds in Vermont





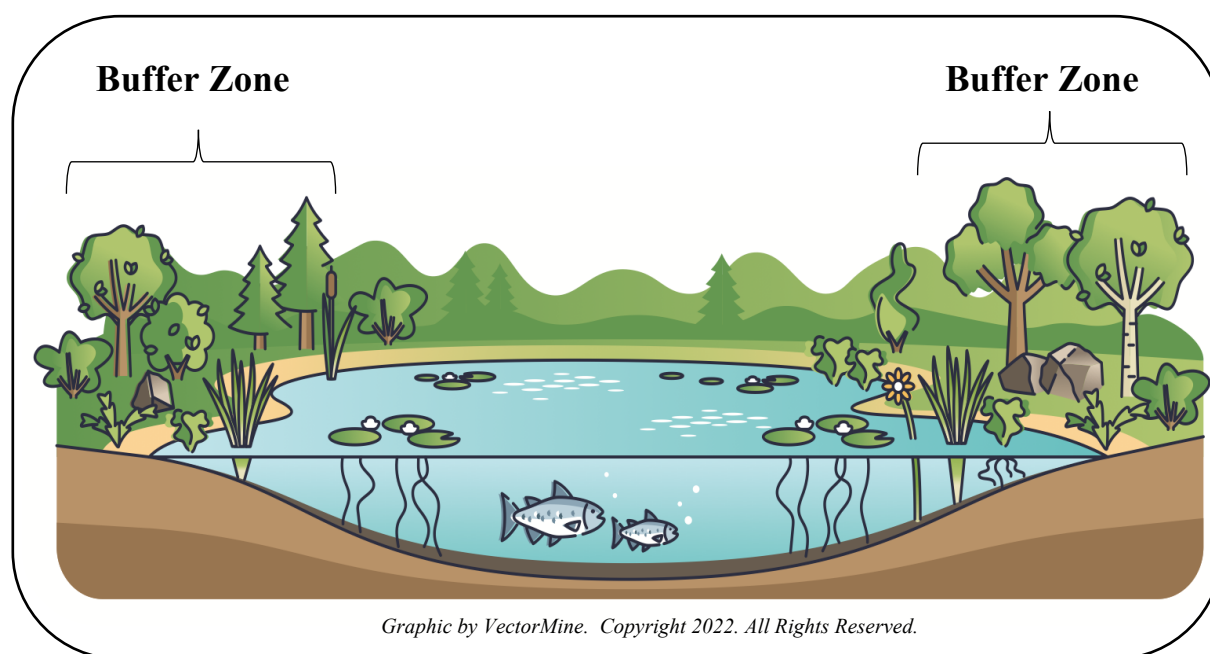
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INTRODUCTION

In the state of Vermont, there are thousands of private ponds. Many of these ponds are humanmade, built for recreational purposes, fire- suppression, or to support livestock and wildlife. A private pond is defined in Vermont as, "Ponds owned by one person or entity and located entirely on the owner's property. If natural, they may be up to 20 acres in size. Artificial private ponds may be any size."

Private ponds provide a rewarding and relaxing feature which enhance any landscape. However, private ponds can be difficult to maintain. Issues like bank erosion, algae blooms, and sediment buildup all plague landowners whose ponds lack a crucial feature: the **buffer zone**.



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All ponds have a life cycle. A pond will transition into a wetland or swamp and eventually land again as part of its natural life cycle. This is called aquatic succession. While this can take decades or years to happen in nature,



prolonging the life of a private humanmade pond begins with a healthy and well-planned buffer zone.

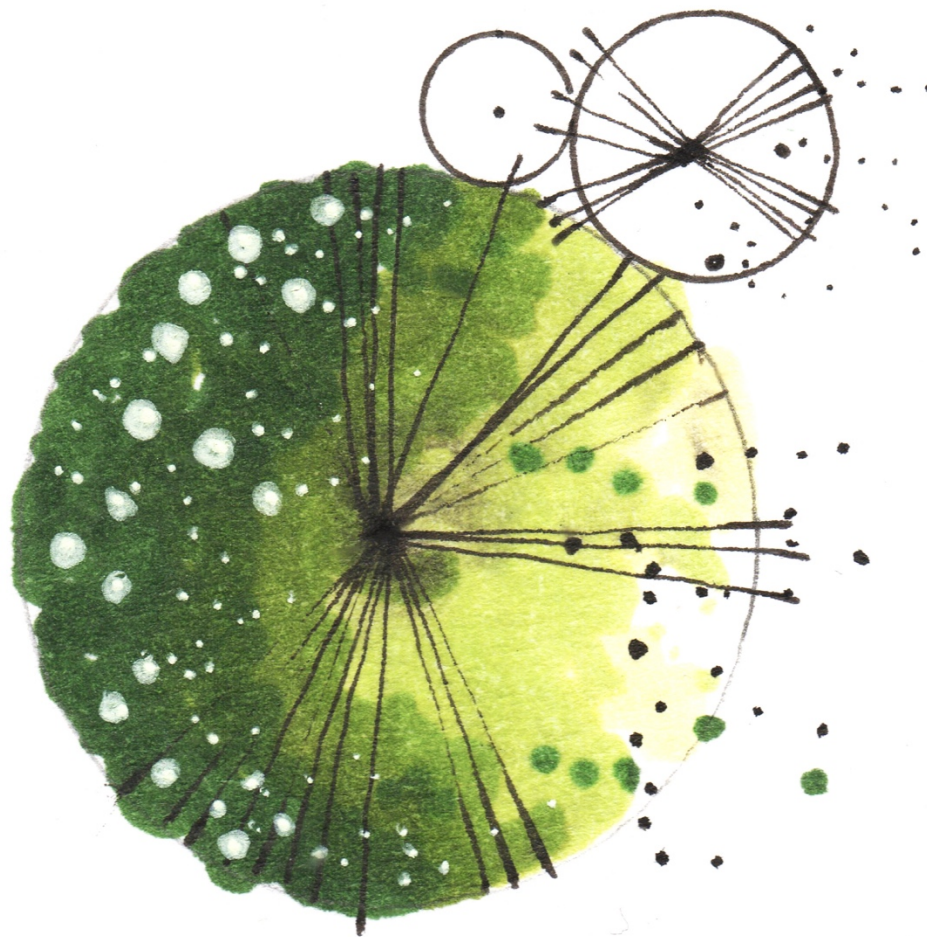
In this guide, there are several resources to help you, a private pond owner, install and maintain buffer zones around your pond in order to keep your pond healthy and useful for generations to come.

Part I of this guide focuses on getting to know and understand the elements that make up your pond's ecosystem. To help answer and record this data, there is a worksheet found in the Appendix One. This worksheet is designed to work the user through the steps of both an initial survey as well as an annual survey and maintenance log to help track important dates, storm events, seasonal changes, and any maintenance completed such as dredging, instillation of aeration, or shoreline restoration.

Part II delves into the planning and planting of buffer zones and lists other resources or testing that may be helpful or necessary to address your pond's specific needs. This section will also help you plan your long-term management goals for your pond and the ecosystem surrounding it.

Finally, a bibliography is provided which details sources used for this guide as well as others which may be of interest. Contact information for the author is also included as well as where you can go for updates to this guide.

PART I: GETTING TO KNOW YOUR POND





STEP I: ASKING THE RIGHT QUESTIONS

Every buffer zone project begins by getting to know your pond through a series of assessments. There are two crucial questions to ask as you begin these assessments:

How old is your pond?
What is its intended use?

Question 1: How old is your pond?

Many humanmade ponds in Vermont are relatively young and began as hand-dug water sources for livestock. Others were created by damming up rivers and streams to flood a low area or a hand dug basin. Some of these ponds directed outflow over dams in order to power waterwheels for grain milling and other industries. In the last 30 years, many homeowners have added private ponds to their property for other reasons, including fire suppression and recreation.

No matter how your private pond got its start, it is vital to know its history. Crucial questions include:

When was the pond constructed?
Who built it?
What was its original use?
What is its water source?
Does it have a dry hydrant for fire department access?
What was the original depth, shape, and perimeter?
Does it have a liner? If so, what type?
Has it ever been repaired, altered, or drained?
Has it been treated for infestations of invasive species?
Has it ever had sediment removed or dredging?

Even if you can't get an answer to every question, try to find out as much information from previous owners, neighbors, and other sources as you can. Many town managers and city clerks have access to the property records which might be helpful in finding out the history of your pond. (For Vermont Land Records information, go to: www.vmcta.org)

New Ponds:

If your pond has recently been constructed, make sure to record all the details you can and take photographs of it from as many angles as possible. These photographs can be crucial should you later need to do work on the pond and need to prove its original dimensions and characteristics. New ponds aren't necessarily blank slates for planting; the soil and aggregates used will have an impact on what you plant and where you plant. Get as much information about these materials as you can from your builder and be sure to record them with your worksheet.



Image 1: A new pond in Vermont awaiting its ecoscaping.



Question 2: What is your intended use?

The next step is asking how you hope to use your pond. Do you want to swim in it or is it just there for aesthetic reasons? Is it a fire suppression pond with a dry hydrant, and if so, when was it last cleaned and inspected? Ponds are an ecosystem, a living organism made up of thousands of living plants, animals, invertebrates, and microorganisms. How you plan to interact with the water, shoreline, and bottom is essential in understanding how to protect and maintain it.

Ask yourself the following questions:

Do you want to swim, boat, or fish in your pond?

Do you have or hope to add a feature such as a dock, beach, or pier?

Does your pond's water source enough to currently enable your desired usage?

Does your ponds outflow affect other properties, public or private?

Once you have answered these questions, you may need to consult other professionals in order to meet your goals. Water quality testing, local zoning requests, and state permitting may play a factor in if you can use your pond for your desired usage and what you may need to accomplish first in order to get there.

For more information on necessary permits, go to:

<https://dec.vermont.gov/watershed/lakes-ponds/private-ponds>

STEP 2: SURVEYING YOUR POND

After you have established a history of your pond and how you want to use your pond it is essential to go out and survey your pond. This can be done in any season, but to get an accurate idea of what plants are growing nearby, early summer is the best time to conduct a survey.



Image 2: A private pond owner performs a visual survey.


How to Conduct a Survey:



Image 3: Dragonfly on dead Common Reed.

A survey entails going to the pond and physically walking the perimeter to make and record observations. First, venture as close to the water's edge as you can while maintaining a safe distance. Take safety precautions when surveying your pond; wear appropriate clothing and footwear and a life jacket, even if you are a good swimmer. Always have someone with you to take

notes and make observations with you, as well as to ensure safety.



There are three parts to the survey. First, observe what animals live on or near the pond's edge. Do frogs jump in when you walk near the water's edge? Can you see any birds living in trees or bushes near the pond? Do any waterfowl, such as Canada Geese, ducks, or loons call your pond home? Can you see dragon flies or other insects flying or living around or near the pond? Write down the animals you see and make a note of any particular trees, burrows, bushes, or other plantings which seem to be teeming with animal life.

Second, take notes about how the pond appears. Does your grass grow right to the water's edge or is there exposed bank? Are there any large rocks or prominent geological features such as a waterfall, stream, or island? Is the water level lower or higher than usual? Are there downed trees or other debris protruding from the water's surface?

Finally, survey the plant life growing in three key areas: 0-50 feet from the water's edge, 50-100, and 100-200. It's ok if you don't know the species by name; several guides, apps, and websites are available to help in plant identification. For now, take pictures of the plants you observe for later identification.

Plant identification will be very important moving forward with buffer design as some species may be harmful to the health of a pond or stability of the banks surrounding the pond. The state of Vermont's Plant inventory page is a good place to start. Go to:

<https://vtfishandwildlife.com/conservation/conservation-planning/plant-inventory> for more information.

Invasive Species

One of the biggest challenges facing waterbodies all over Vermont is the threat of invasive species. An invasive species is defined in Vermont as: “**Any plant or animals which are not native to Vermont and have negative effects on our economy, our environment, or our health.**”¹


Unfortunately, many waterbodies in Vermont, including private ponds, have been affected by invasive species. Several of these plants were originally introduced from outside North America in order to control erosion, dry up wet soil, and for ornamental purposes. However, these plants quickly took over, pushing out native species along the way and leading to ecosystem collapse in many places.



Image 4: Dead Common Reed lies among Yellow Flag Iris.

In this Vermont Pond, two invasive species, **Yellow Flag Iris** and **Common Reed**, have led to over-sedimentation and poor soil quality around the pond and in the bottom layers of the pond itself. The water level also dropped significantly as a result of the water demands of the dense populations of the invasive plants.

¹ Source: https://anr.vermont.gov/about_us/special-topics/invasive-species



In 2012, the State of Vermont updated its rules regulating the importation, sale, possession, movement, cultivation and/or distribution of plants which are, “Known to adversely impact the economy, environment, or human or animal health.”² This is called the ‘Noxious Weed’ Rule.

The State of Vermont defines a noxious weed as:


“Any plant in any stage of development, including all current and subsequent subspecies, varieties, and cultivars, and parasitic plants whose presence, whether direct or indirect, is detrimental to the environment, crops or other desirable plants, livestock, land, or other property, or is injurious to the public health or the economy generally.”³

It is essential to prevent new introduction of these species to your private pond’s shore. Planning a healthy buffer zone can help prevent invasive species from taking hold, but these invasive plants have many strategies which help them out-compete native plant life. Therefore, it vital to identify these plants in order to determine if they are already growing near or on the shore of your private pond or if they start to. Several resources exist within the state of Vermont to help you identify invasive species if you think you may have some growing on your property:

1. Vermont Invasives is a multi-agency web resource which helps streamline the reporting of invasive plants on land and in water as well as invasive

² “Invasive & Noxious Weeds in Vermont.” *Invasive & Noxious Weeds in Vermont* | Agency of Agriculture, Food and Markets, Vermont Agency of Agriculture, Food, and Markets, <https://agriculture.vermont.gov/public-health-agricultural-resource-management-division/plant-health-and-pest-management/plant-2>.

³ Source: <https://agriculture.vermont.gov/public-health-agricultural-resource-management-division/plant-health-and-pest-management/plant-2>



insects. They are also an excellent source for photos and descriptions which can help you learn more about invasive plants.

Website: <http://vtinvasives.org>

- 2. The VT Department of Conservation: Aquatic Invasives** division provides resources which help identify invasive species as well as management solutions if your waterbody does in fact have them present.

Website: <https://dec.vermont.gov/watershed/lakes-ponds/aquatic-invasives>

- 3. The VT Agency of Natural Resources: Invasive Species** department provides details about invasive species as well as additional reporting resources. The Agency of Natural Resources can also help property owners find financial resources to pay for the management of large-scale infestations.

Website: https://anr.vermont.gov/about_us/special-topics/invasive-species

- 4. The VT Fish & Wildlife Department** focuses primarily on aquatic invasive species and prevention of transmission of aquatic invasive species between infested and non-infested waterbodies. They offer helpful guides on decontamination of watercraft, fishing tackle, and outdoor gear in order to prevent the spread of invasive species as well as public signage.

Website: <https://vtfishandwildlife.com/node/539>

Managing Invasive Species

Managing invasive species can seem overwhelming at first. However, if an infestation is small, it is much easier and more cost effective to deal with it right away before it becomes an infestation too large and expensive to contain. Doing nothing, however, is a terrible idea. Invasive species will negatively impact the ecosystem that keeps your pond healthy, usable, navigable, safe, and around for many years.



Image 4: An Aquatic weed managers uses an amphibious machine to remove dense beds of invasive waterlily.

Several methods for management exist, but not every management technique may be right for every pond, the plant, or pocketbook. Consult with state agencies or private invasive species control companies for help figuring out how what management solutions are best for you.

A Note About Herbicides:

In Vermont, an Aquatic Nuisance Permit is required to use herbicides or pesticides on or near a wetland or waterbody. For questions and permitting, go to <https://dec.vermont.gov/watershed/lakes-ponds/permit/control/aquatic-nuisance-control>

Every herbicide is regulated and registered for use with the Environmental Protection Agency. For more information, go to <https://www.epa.gov/pesticide-registration>.

6 Most Common Invasives:

Six invasive perennial plants are commonly found growing near or on the shore of many Vermont private ponds:

1. Common Reed (*Phragmites australis*)

Description: Common Reed, or 'Phragmites', is a perennial grass that grows along the edges of ponds, lakes, rivers, and streams. It can live in drainage ditches, fields or natural areas that are frequently flooded or naturally moist.

Common Reed grows naturally in Europe and parts of Asia. It was most likely introduced to North America by seeds that traveled in inadvertently through ship ballasts tanks in the 18th century. Unfortunately, it has also been introduced to gardens for its ornamental qualities or used to control the edges of lawns or fields prone to excess moisture.



Image 5: Phragmites australis.



Image 6: A large dense infestation of Common Reed along a pond.

This plant can grow in excess of 16 feet tall and is often found growing in large dense stands. Its narrow, tapered leaves can grow to lengths over 20 inches

long. Its distinctive pinkish-purple flowers grow in plume or brush-like structures 5 to 15 inches long. In the winter, the Common Reed is easily identifiable by its light brown to tan dry reed stalks and paled flowers.



Image 7: Common Reed covered in frost in late fall.

Impacts: This plant will take nutrients and water from native plants and sends toxins out into the soil which inhibit or kill the root structures of several native plants and trees.⁴ Because this plant can reproduce through seeds, stem fragments, and reproductive roots called rhizomes, Common Reed can quickly take over an area and become the dominant plant, creating a monoculture.

Insects, birds, and amphibians struggle to feed, reproduce, or nest in dense areas of Common Reed growth, and fish stocks suffer premature egg and juvenile death as a result of the plant's ability to steal resources and promote sedimentation.⁵

Management:

Common Reed is controlled by cutting and removing stems and roots. Some herbicides can also help treat infested areas. If you suspect your pond has common reed, report it immediately and make sure to take pictures of it.

⁴ *Common Reed (Phragmites Australis)*, <https://www.invasive.org/alien/pubs/midatlantic/phau.htm>.

⁵ "Vermont Invasives: Common Reed (Phragmites Australis)." *Gallery of Land Invasives | Vermont Invasives*, <http://vtinvasives.org/gallery-of-land-invasives>.

2. Japanese Knotweed (*Fallopia japonica*)

Description: Japanese Knotweed is a woody perennial shrub that grows in dense stands near water sources. It can also be found in any disturbed locations, such as roadsides, ditches, drainage ponds, and decaying structures.



Image 8: Japanese Knotweed that has infested a riverbank.

It's distinct 'swollen joints' which appear where the leaf and stem meet are a key feature in identifying the plant, especially when no leaves or flowers are present. Several shoots are produced, and the stems are thick, hollow, and almost appear to grow in a zig-zag pattern. Japanese Knotweed can grow to heights of 10-15 feet tall. Its leaves are oval shaped that tapers towards the tip and alternate from the stem in a similar zig-zag alternating pattern.



Image 9: Flowering Stem of Japanese Knotweed.

The plant produces several small white flowers that crowd in sprays along small branches called panicles.

Japanese Knotweed produces unique seeds that are winged, meaning their seeds have lobes on them which make them more easily dispersed on the wind and

water. Their spring stems are bright green in color with red tipped leaves and sheaths.



Image 11: Japanese Knotweed Shoots



Image 10: Seeds of the Japanese Knotweed.

Impacts: Because Japanese Knotweed is able to endure a variety of conditions, it will often displace native plants in the riparian zone, or the place between a water's edge and dry land. Japanese Knotweed will exploit the damage caused to native plants during flooding events and will move in quickly, eventually choking waterways.⁶ This leads to erosion on the land side that transitions to sedimentation build-up within the waterbody.

Management: Japanese Knotweed is very difficult to manage because it reproduces through stem fragments, rhizomes, and seeds. Cutting or mowing the plants can help to control it, but root and rhizome removal is crucial for a decline in the population. There are herbicide treatment options, but herbicides must be applied by properly trained applicators in order to be effective.

⁶ "Vermont Invasives: Japanese Knotweed." *Knotweed, Japanese* | *Vermont Invasives*, <http://vtinvasives.org/invasive/knotweed-japanese>.

3. Purple Loosestrife (*Lythrum salicaria*)

Description: Purple Loosestrife, *Lythrum salicaria*, is a perennial wetland plant, most easily identified by its long pinkish-purple flowering spike. It can be found in a variety of water bodies and wet areas, including roadsides, disturbed fields, byways, and trails. Purple Loosestrife can grow in a variety of condition, from brackish tidal rivers to cold mountain stream banks. The leaves of this plant are arrow-like in shape and grow opposite from each other in a whorled pattern ascending the stalk towards the flowering stem.



Image 12: A wetland being taken over by invasive Purple Loosestrife.



Image 13: Purple Loosestrife emerging from the brackish tidal waters of the St. Lawrence River in Canada.

Originally introduced to New England in the early 19th century mostly likely through ship ballast, Purple Loosestrife was later intentionally introduced by settlers for due to its value as medicinal plant and ornamental favorite of horticulturalists.⁷ The plant moved with settlers and is present into the upper

⁷ Munger, Gregory T. "Fire Effects Information System (FEIS): *Lythrum Salicaria*." *Lythrum Salicaria*, 2002, <https://www.fs.fed.us/database/feis/plants/forb/lytsal/all.html#INTRODUCTORY>.

Midwest, especially along canals and irrigation systems.⁸

Impacts: Purple Loosestrife is an extremely aggressive invader that reproduces in two ways. First, it is a notorious seed producer, with each flower spike producing between 100,000 and 2.5 million seeds per stem, depending on that stem's age. The stems of the plant grow woody with age and can persist through wintering conditions, living two to three years. Purple



Image 14: Purple Loosestrife flowering stem.

Loosestrife also reproduces by producing new stems from buds which form on top of the rootstock.⁹ The plant will take over waterbodies, depleting essential nutrients for native plants and animals. One study suggests that due to its tendency to take over, waterfowl who depend on the seeds of native plants are especially impacted by Purple Loosestrife. It is unclear what if any nutrition is gained by birds that consume the seeds, yet their consumption of the seeds has also contributed to the spread of the plant.

Management: Purple Loosestrife is difficult to manage, especially in large areas of infestation. Removing new shoots prior to seed production is useful, but labor intensive, as it has to be done by hand; mowing the plant can spread it and encourage regrowth. Some herbicides, applied properly, can be effective, and biocontrol insects have worked to control large areas of infestation.¹⁰

⁸ Ibid.

⁹ Ibid.

¹⁰ "Vermont Invasives." *Loosestrife, Purple* | *Vermont Invasives*, <http://vtinvasives.org/invasive/loosestrife-purple>.

4. Reed Canary Grass (*Phalaris arundinacea*)

Reed Canary Grass, *Phalaris arundinacea*, is a unique invasive grass. First, based on where it is growing, this grass can look differently. The plant can grow from six inches tall to six feet tall; the leaves are long thin arrow shaped leaves that range in length from one inch to four feet. The flowering seedhead can be green, brown, purple, tan, or whitish.¹¹

Reed Canary Grass can be found growing just about anywhere in Vermont, but most prolifically around the edges of wetlands, in disturbed areas such as road ditches, and agricultural areas. It can grow in shaded areas with little moisture, or with its roots fully submerged along the banks of a waterbody in full sunlight. Seeds can lie dormant in the soil for extensive period of times, adding to it's ability to take over.

Impacts: Reed Canary Grass was introduced to North America as a forage plant for grazing livestock in the early 20th century. It was also used specifically to help prevent erosion, however it has the opposite effect in both cases.

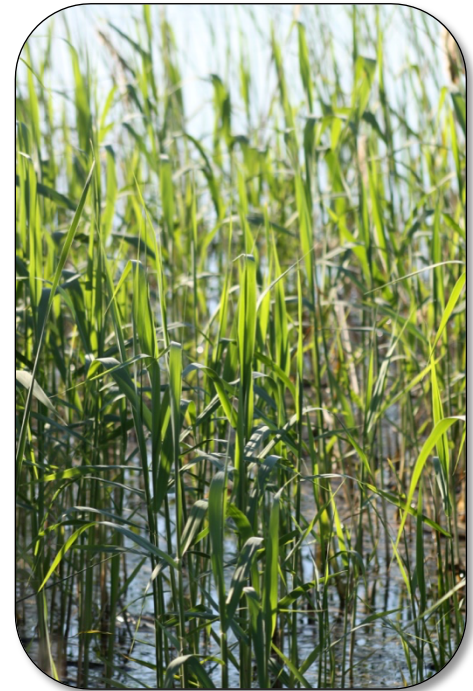


Image 15: Reed Canary Grass growing emerging from the waters of a pond.

¹¹ Wisconsin Reed Canary Grass Management Working Group. 2009. Reed Canary Grass (*Phalaris arundinacea*) Management Guide: Recommendations for Landowners and Restoration Professionals. Accessed April 2, 2022 at https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_035064.pdf.



Image 16: Reed Canary Grass growing alongside Cattails in a wetland area.

The plant is especially course, causing grazing livestock to avoid its tough shoots and sharp leaves. It is also has little to no value for native animal species, and takes over where vital native species once lived.

Reed Canary Grass takes over quickly, especially after flooding events, disturbances to the soil, and nutrient changes such as exposure to fertilizers, road salt inflow, manure runoff from farmland, and other similar events.¹² Its dense root mats clog waterways and lead to sedimentation. Yet, these mats encourage erosion in areas of regular or intense waterflow.

Management: Management of Reed Canary Grass is tricky because the plant is known to respond to treatment with regrowth instead of decline. Mowing, covering with black plastic, and removing the root mats are effective if practiced according to a dedicated schedule.¹³ Reducing the seed bank is key and mowing or removing the plant before the plant releases its seeds is crucial to stemming an infestation. Herbicide treatment of small areas can be effective, but a combination of other strategies is most effective for managing Reed Canary Grass.

¹² Ibid.

¹³ “Vermont Invasives.” *Reed Canary Grass* | *Vermont Invasives*, <http://vtinvasives.org/invasive/reed-canary-grass>.

5. Reed/Rough Manna Grass (*Glyceria maxima*)

Reed or Rough Manna Grass, *Glyceria maxima*, is a semi-aquatic perennial grass that is a relatively new invader to Vermont, having only been positively identified in the state in the early 2000's. It can grow up to eight feet tall, with long thin arrow shaped leaves that have small hairs on the edges, and grows in single stems as opposed to grasses that grow with branched stems. Its flowering stem is triangularly shaped and multi-branched, with seeds form along each individual stem.

Reed/Rough Manna Grass has many different common names, and is often confused with a native species of grass known as American Manna Grass, *Glyceria grandis* S. Wats., because of its similar height, color, and location. However,



Image 17: Reed/Rough Manna Grass growing along the edge of a pond.

the flower of American Manna Grass appears to droop, its flowering branches hanging down towards the ground, unlike the upright flower of Reed/Rough Manna Grass.

Impacts: Reed/Rough Manna Grass, while it is often found growing and disrupting wetlands, ponds, riverbanks, and lakes, can also grow in irrigation

ditches, roadside ditches, and disturbed areas that are subject to wet conditions.

The extent of Reed/Rough Manna Grass infestation in Vermont is unclear. However, where it has managed to infest in greater numbers, Rough/Reed Manna Grass directly impacts native plants and animals.

This plant produces seeds, however its primary method of reproduction is through rhizomes. More than 50% of the plant's mass is found in the root structure, and large mats of roots linked by rhizomes quickly dominate native plants for resources.¹⁴ The plant offers very little nutritional value native insects, birds, amphibians, or grazing livestock, robbing the entire ecosystem of its invaluable cast of participants.¹⁵



Image 18: Reed/Rough Manna Grass in the late fall alongside a river.

Management:

Management of Reed/Rough Manna Grass is most successfully accomplished with an aggressive campaign of mowing and actively removing the root structures. Black Plastic can be used to cover the root mass after mowing and help to prevent regrowth. Flooding of mowed areas can also be effective, as well as an application of an appropriate herbicide.¹⁶

¹⁴ “Vermont Invasives.” *Reed Manna Grass* | *Vermont Invasives*, <http://vtinvasives.org/invasive/reed-manna-grass>.

¹⁵ “Weed of the Week: Reed Mannagrass - Invasive.” *Invasive.org*, Produced by the USDA Forest Service, Forest Health Staff, Newtown Square, PA., 20 Feb. 2006, <https://www.invasive.org/weedcd/pdfs/wow/reed-mannagrass.pdf>.

¹⁶ *Ibid.*

6. Yellow Flag Iris (*Iris pseudacorus*)

The Yellow Flag Iris, *Iris pseudacorus*, is a flowering perennial that is valued for its bright, yellow, showy blossoms. The plant grows an average of 3.5 feet tall, with long sword shaped leaves that can measure up to 2 feet in length. In the fall, the plant produces fruits that are football shaped and encapsulate about 120 seeds that go from white to brown as they age.¹⁷ The plant



Image 19: Yellow Flag Iris blossom.



Image 20: Fruit of the Yellow Flag Iris with seed showing.

also reproduces through rhizomes and these rhizomes can become dormant in times of water insecurity or severe drought. The Yellow Flag Iris, (sometimes call the Pale Yellow Iris), can grow in a variety of conditions, from brackish tidal areas to dry sandy soil. It is able to adapt to growing in areas with high organic matter to areas that are rocky and arid.¹⁸

¹⁷ *Pale Yellow Iris, Yellow Flag Iris: Iris Pseudacorus (Liliales: Iridaceae): Invasive Plant Atlas of the United States*, Invasive Plant Atlas of the United States, 2018, <https://www.invasiveplantatlas.org/subject.html?sub=5853>.

¹⁸ Gervazoni, Paula, et al. "The Alien Invasive Yellow Flag (*Iris Pseudacorus* L.) in Argentinian Wetlands: Assessing Geographical Distribution through Different Data Sources." *Connecting from off Campus - UF Libraries*, Biological Invasions, 2020, <https://link-springer-com.lp.hscl.ufl.edu/article/10.1007/s10530-020-02331-4>.

Impacts: Yellow Flag Iris can quickly dominate the habitat where it is introduced by creating large colonies of plants in just a few growing seasons. After it pushes out native species, it can be difficult to bring back under control, especially in wetlands and marshes. Handling the plant or seed pods presents a danger to humans and animals due to a chemical admitted by the plant through the roots, stems, and fruit. Yellow Flag Iris produces a toxin that causes skin irritation to humans and can be especially harmful to dogs and grazing mammals that ingest the rhizomes or fruit.¹⁹



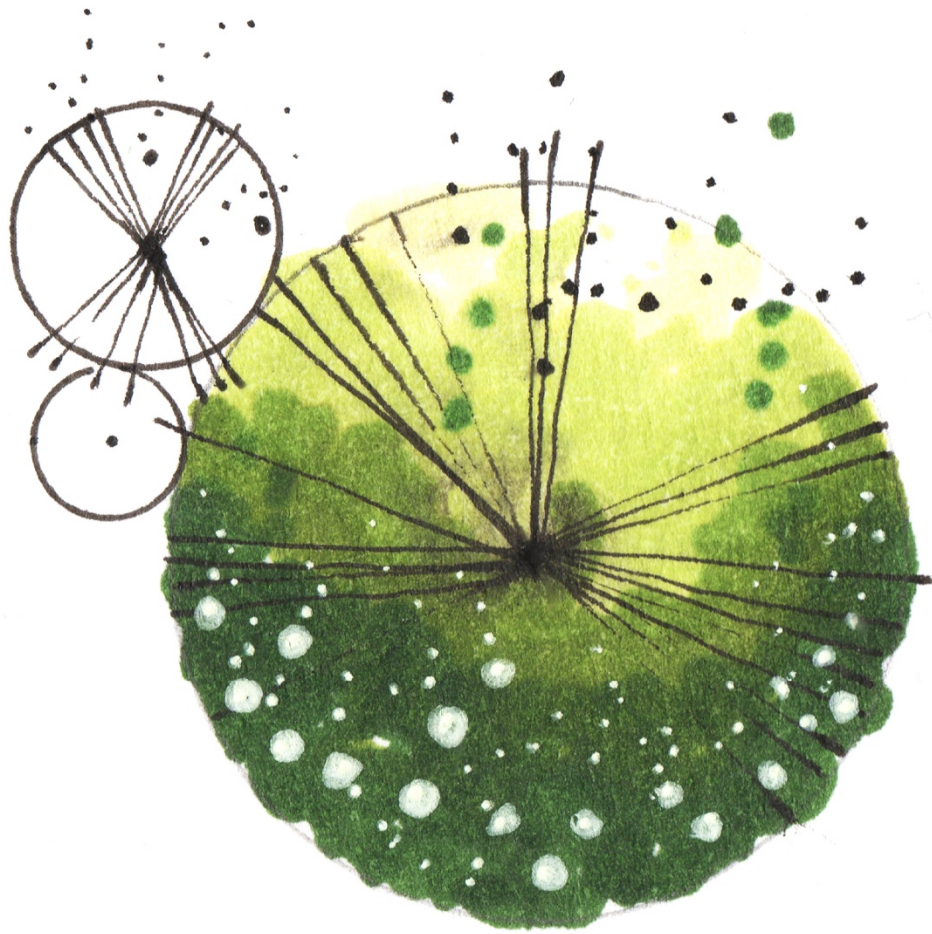
Figure 21 Yellow Flag Iris that have taken over a pond shoreline.

Management: Management of the Yellow Flag Iris can be tricky due to both its toxic chemistry and its highly resilient rhizomes; wearing protective clothing is a must. Digging up small infestations, making sure to get as many roots and rhizomes as possible, is very effective for control. This may need to be repeated if some rhizomes persist. Also, controlled burns can be effective for larger infestations.²⁰

¹⁹ “Pale Yellow Iris, Yellow Flag Iris *Iris Pseudacorus* L.” *Invasive.org*, University of Georgia - Center for Invasive Species and Ecosystem Health, USDA Animal and Plant Health Inspection Service, USDA Forest Service, USDA Identification Technology Program, and USDA National Institute of Food and Agriculture, 2018, <https://www.invasive.org/browse/subinfo.cfm?sub=5853>.

²⁰ “Vermont Invasives.” *Yellow Flag Iris* | *Vermont Invasives*, <http://vtinvasives.org/invasive/yellow-flag-iris>.

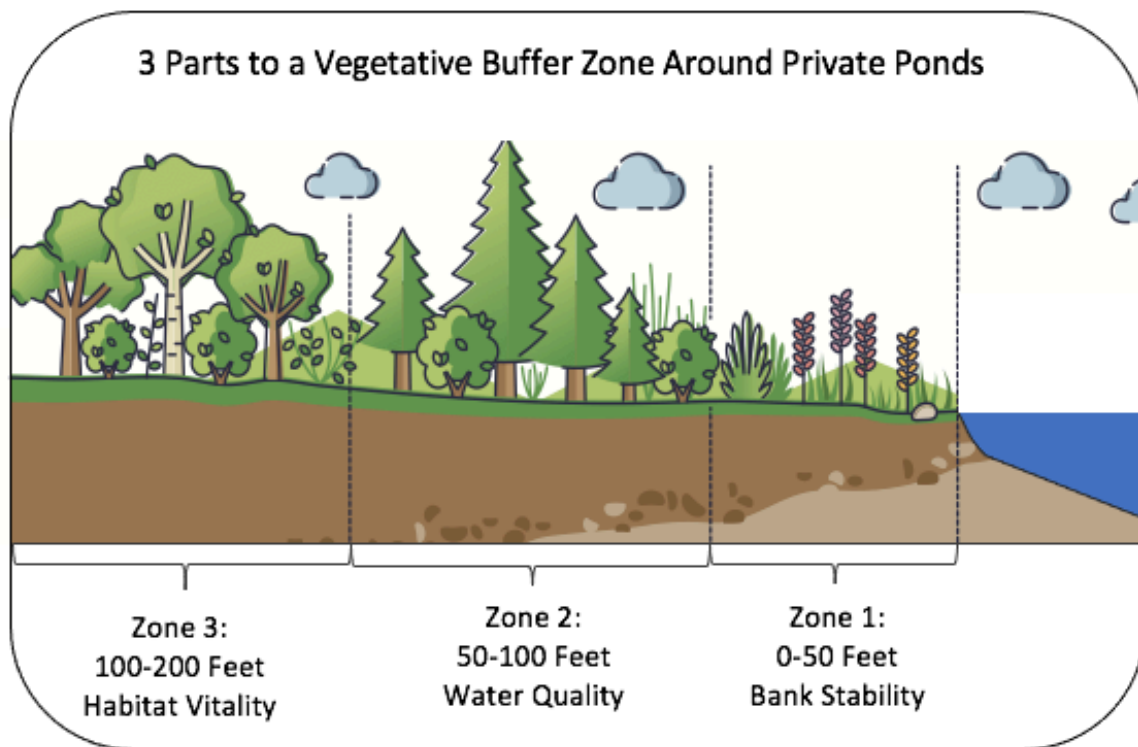
PART II: PLANTING YOUR POND



STEP I: PLANNING YOUR BUFFER ZONE

Buffering zones are vital for the long-term health and success of every pond because they help prevent erosion, maintain water quality, and support the natural ecosystem which will help keep your pond health for years to come.

As you begin to plan your pond's buffer zone, use the information you gathered in your survey to help you identify what areas may already be functioning as a buffer zone and what areas need work. Remember, you want to consider at minimum a 250-foot strip of land that encircles your whole pond. This entire Buffer Zone is broken into three sections according to their function²¹:



Graphic Created by [HKSotak](#) with [Vectormine](#). Copyright 2022. All Rights Reserved.

²¹ Kashanski, Catherine. "Native Vegetation For Lakeshores, Streamsides, and Wetland Buffers." *Vermont Native-Friendly Plants*, Vermont Department of Environmental Conservation, 1996, https://dec.vermont.gov/sites/dec/files/wsm/lakes/Lakewise/docs/pl_native-veg.buffer-manual.1994.pdf.

Zone 1: 0-50 Feet Bank Stability

Often times, private pond owners like to grow lawn right to a pond's edge. This may look aesthetically appealing, but grass species used in landscaping encourage erosion and sedimentation due to their shallow rooting system.



Image 22 This private pond that has experienced catastrophic bank collapse due to poor buffer zone design and heavy ground water flow.

No-Mow Zones

The first step in addressing bank stability is to create a 15-25 foot no-mow area encircling as much of the waterbody as possible.²² Native plants will often move in quickly to these un-mowed areas, and intentional planning of native shrubs and wildflowers can add both an aesthetically pleasing and habitat-enriching buffer around your pond.²³

²² “The Vermont Shoreline Conservation Act: A Handbook for Shoreline Development.” *Federation of Vermont Lakes and Ponds*, Vermont Department of Conservation Watershed Management Division, Apr. 2015, https://dec.vermont.gov/sites/dec/files/wsm/lakes/docs/Shoreland/lp_ShorelandHandbook.pdf.

²³ *Ibid.*

(NOTE: It is crucial to keep a watchful eye on the no-mow area as some invasive species may have existed unseen due to chronic mowing.)

In addition to a no-mow zone, choose areas in this first zone where native shrubs and flowers can be planted in order to create both an aesthetically pleasing site above ground and strong rooting structures below ground that will help hold soil in place to prevent erosion. It is also important to consider the potential height of the plants you chose in this section, and whether they will obstruct an important line of sight or a treasured view.



Image 23: This homeowner has created a no-mow zone in varying widths according to their recreational needs.



Zone 2: 50-100 Water Quality

In this second zone, the focus is on preserving and enhancing water quality. Deep rooting trees and shrubs are vital here to ensure that excess nutrients are filtered out of the ground water and soil prior to finding their way into your pond.

It is important to again consider what purpose your pond is serving. If this second zone is pastureland for grazing livestock, waste from these animals will add to the nitrogen and phosphorous in the soil. While nitrogen and phosphorous are also needed by aquatic plants and animals in your pond, excess levels will contribute to algae blooms, aquatic invasive and nuisance plant growth, and a rise in bacteria levels in the water. ²⁴

Also consider if your driveway or a building inhabits some of this space. What chemicals may be entering the ground water due to paint, road salt, fertilizers, or other factors? Choosing trees and shrubs requires a careful consideration of the usage of this space to ensure root structures don't disrupt foundations or roads or pose a risk of damage should the tree be uprooted in a storm.

Zone 3: 100-250 Habitat Vitality

A buffering zone in zone three provides many benefits for the habitat of your pond. First, plantings here help to maintain both groundwater quality and provide erosion control and support the two zones between it and the pond

²⁴ Haycock, Nick, et al. "Proceedings of 1996 Conference." Haycock Associated Limited, *Buffer Zones: Their Processes and Potential in Water Protection*, 2021, [http://www.biodiversitysouthwest.org.uk/docs/BufferZones\(locked\).pdf](http://www.biodiversitysouthwest.org.uk/docs/BufferZones(locked).pdf). Accessed 6 Mar. 2022.

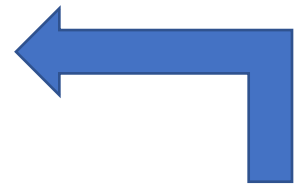
edge. A vegetative buffering zone here also provides food, shelter, and nesting sites for many different species' reproduction. Tall native trees and shrubs help to redirect and reduce wind-born erosion, as well as provide barriers for light and sound that come from human activities.



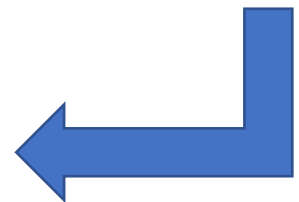
Figure 24 Ornately Ecoscaped Pond.



Figure 25 Simply ecoscaped pond.



Healthy Buffering Zones can be ornate or simple. What matters most is that a buffer zone is created to protect the ecosystem of the pond.



STEP 2: CAREFUL CONSIDERATIONS

The Unique Environment

It is important to remember that every pond is unique, from its intended use, to its **geological**, and **hydrological** characteristics.

Intended Usage

This is where your intended usage of the pond comes into play. If some areas need to stay open for access to fire suppression dry hydrants, livestock watering, boat launching, or other forms of recreation, make sure to choose key areas away from these sites that can become designated for buffer zones.



Image 26 A spring stream that runs through a forest only during spring runoff.

Geology

Considering the geological features surrounding your pond is vital. Are there hills or mountains that arrive near or at your pond's edge? Is your pond held in place with a berm? Are there streams, rivers, or springs flowing into your pond or up from the bottom of your pond? Do large boulder or ledge fringe your pond naturally or have they been intentionally placed? These questions are all vital as you plan.



Hydrology

Often times, streams and creeks seem to arise from nowhere. However, many of these water channels exist with little or no flow all year round except in the spring when snow from higher elevations begins to melt, or when heavy rain events occur. These areas may be a part of regulated wetlands. You can check if streams, creeks, and other wetland areas exist near or on your property by going to the Vermont Agency of Natural Resources natural resources atlas: <https://anrmaps.vermont.gov/websites/anra5/>

Be sure to have your property **SPAN number** on hand as you begin your search. You can also contact the Vermont Department of Environmental Conservation for questions on how waterways and wetlands may affect your property.

Strategic Plantings of Native Species

There are considerations when choosing plants for this buffering zone area²⁵:

1. Choose plants that grow best in the hardiness zone where you pond is.
(Go to <https://www.uvm.edu/news/extension/garden-planning-plant-hardiness-zones> for more information.)
2. Choose plants carefully: do they produce fruit or leaf litter that will be a nuisance to clean up? Can they offer aesthetic benefits outside of their flowering and leaf

²⁵ “The Vermont Shoreline Conservation Act: A Handbook for Shoreline Development.” *Federation of Vermont Lakes and Ponds*, Vermont Department of Conservation Watershed Management Division, Apr. 2015, https://dec.vermont.gov/sites/dec/files/wsm/lakes/docs/Shoreland/lp_ShorelandHandbook.pdf.



bearing season? Do the species you have chosen have particular nutrient, light, or water needs?

3. Variety is the spice of life and is invaluable in an ecosystem. Choose different types of plants as well as different species. Ground cover, native grasses, flowering perennials, shrubs or bushes; combining diverse species is always best.

4. Plant in clusters, avoiding straight lines or rows. Place tallest plants in the center or back edge and work outwards so as not to create unwanted shade for shorter plants. Also, make sure to leave room between plants as they will fill out as they grow.

Plantnative.org is an online resource which lists all native species, their growing zones, and preferred conditions. Go to <https://www.plantnative.org/rpl-nen.htm#sh> for a full list of Vermont trees, shrubs, perennial flowers, and ferns.

Water and Soil Testing

While not vital, getting soil and water testing can be helpful in understanding what challenges might face your pond and the surrounding environment. Knowing the pH, chemical characteristics, and bacterial levels of your soil and water will help establish inform your decisions of how to plant your pond now. The University of Vermont provides soil and water analysis options for residents. For more information, go to <https://www.uvm.edu/extension/agricultural-and-environmental-testing-lab>



Closing Remarks:

Owning a private pond takes dedication, but the rewards are plentiful. Don't get overwhelmed; many resources exist to help you meet your goals for your private pond.

Landscapers, nursery owners, state agencies, master gardening clubs, private pond builders, town managers, and many other agencies, companies, non-profits, and individuals stand ready to help.

When you begin to break ground on your project, make sure to keep a journal of your progress to reflect on your progress looking back as well as to help you build a maintenance schedule. Always record storm incidents or changes such as fallen trees or the introduction of invasive species, even if brought under control immediately.

Remember that your pond is a crucial habitat for all of the plants and animals who call it home; learn the rhythms and signs of the symbiotic relationships that nature builds without our help.

About the Author:

Hannah K. Sotak is the owner of Ondine Freshwater Consultants, LLC. She is also an active minister in the United Methodist Church. Her love for science and the natural world drives her passion for private pond ecoscaping and science. Visit her for more information and resources at HKsotak@ondinefwc.org or go to www.Ondinefwc.com.



APPENDIX I: POND SURVEY WORKSHEET

Part 1: Pond Details

Pond address/ GPS: _____

Critical Questions:

When was the pond constructed or is it a natural pond?

Who built it?


What was its original use?

What is its water source?

Does it have a dry hydrant for fire department access?

What was the original depth, shape, and perimeter?

(Sketch a rough idea of the pond shape and depth here:



Does it have a liner? If so, what type?

Has it ever been repaired, altered, or drained?

Has it been treated for infestations of invasive species?

Has it ever had sediment removed or dredging?

Do you want to swim, boat, or fish in your pond?

Do you have or hope to add a feature such as a dock, beach, or pier?

Does your pond's water source enough to currently enable your desired usage?

Does your ponds outflow affect other properties, public or private?



Part 2: Pond Survey

Date of Survey: _____

Season: _____

Weather Observations:

Survey Notes:




1 Inch

Draw out your pond here and a 250-margin surrounding it to sketch the plants, objects, and land features which exist in this margin.

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The DEC thanks the following contributors: Greta Brunswick, Northwest Regional Planning Commission Warren Coleman, MacLean, Meehan & Rice, LLC Ginny Garrison, Federation of Vermont Lakes and Ponds Kim Greenwood, Vermont Natural Resource Council Sarah Hadd, Town of Colchester Planning and Zoning Office Representative Robert Krebs, Grand Isle-Chittenden Chip Paison, Lake Dunmore/Fern Lake Association Jackie Sprague, Federation of Vermont Lakes and Ponds

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