Nature Walk

Goals:

- To familiarize you with basic biology / ecology concepts that will help for identification and interpretation of the natural world.
- Learn from example of interpretation techniques and how to explain things in a way that is memorable.

Ecology

What is an ecosystem?

- Consider: Size, degree of containedness, boundaries and terms of reference
- Types: Terrestrial, semi terrestrial, aquatic, marine; Forest, bog, marsh, stream

Definition: A "functional unit of interacting organisms and their environment." Contains both living and non-living components. We think about this in order to examine sustainability. (if we put a dam on the inflow to a lake, will the ecosystem continue to be functional.

CLORPT (Climate Organisms, Relief, Parent Material, Time) is a way to remember the influencing factors of an ecosystem

Climate: is dynamic, includes fire, weather, wind, rain etc.(desert vs. rainforest)

- Stanley Park is in the Coastal Western Hemlock (CWH) biogeoclimatic Zone. A classification that describes the climate by indicator plant species.
- The characteristics of our climate:
  - Moderate climate influenced by the ocean, which keeps temperatures from fluctuating dramatically.
  - A long growing season, deep soils and a high diversity of life.
  - West winds, High precipitation

Organisms: We will discuss the animals and plants in greater detail later but for now;

- Producers: plants that harvest the energy they need for growth from the sun. Use photosynthesis to turn carbon dioxide, water, and the sun's energy into sugars for consumers to eat and oxygen for them to breath. (ie green plants, cyanobacteria)
- Consumers: Eat nutrients produced and stored in producers (ie. Herbavores and carnivores).
- Decomposers: break down wastes, dead animals and dead vegetation (called detritus) and return the nutrients to the soil for plants to use and start the cycle over again.

Relief = topography: the shape of the earth

- Consider the difference between dry slopes and wet depressions, these areas will have different plants and therefore different animals as well
- Relief is influenced by the underlying geology and the processes that have shaped it
- In BC glaciation is the main influence on topography: the bedrock was shaped by glaciers, the materials on top were deposited by receding glaciers and the shape of the land is further influenced by water from rainfall / streams / glacial runoff.

Parent Material: the geological processes, underlying bedrock, soils, humus layer.

- Consider an ecosystem on exposed rock will be different from an ecosystem with thick rich soil.
- Most of BC is covered in Glacial Till which is a thick, impenetrable layer left by the glaciers that covered 10,000 years ago.
- Bedrock is the exposed rock you may see that is not covered by soil (usually near the seashore)
- The surface soil is a build up of 10,000 years of decaying plants and animals, and erosion of bedrock into smaller particles.
- Soils can be acidic (under conifers), organic (under grasses), sandy (where beaches once were), rocky (where rivers once were)
- On top of the mineral soil is the Humus layer. This is the fermenting material that is dominated by a white fungus which is breaking down organic materials and is characteristic of the CWH zone that Stanley Park is a part of.
- If you learn what plants are in an area you can tell everything from what the soil looks like to what past geological process might have taken place.

Time: the succession of development of the land.

- Consider a completely burnt area after a fire; after a couple of years it will be covered by vegetation, and in 60 years a forest will stand there.

Life Cycle of Forest:

- (0-60years) A young stand or cleared area will most commonly have certain species appearing such as Red alder and Bigleaf maple, and will appear bright and full of life as a thick understory competes for available nutrients. There will also be a high diversity of bird and other animal species.
- (60-140 years) A mature or climax forest (in the CWH zone) will have more uniform ages of trees and is often dominated by Red cedar and Douglas fir. The canopy will be dense so there is less light hitting the forest floor and therefore less diversity of both plant and animal species. Most of the areas surrounding Vancouver are at this stage.
- (140-800 years) An old growth forest in the CWH zone will be dominated by Western Hemlock and you will also see huge red cedar and Doulgas fir surviving. This age will have trees falling down allowing light to hit the understory so that there is again an even higher diversity of plants and animals. Stanley park is unique in having old growth stands existing so close to an urban area. Old growth is critical to certain species such as cavity nesting birds, flying squirrels and spotted owls. Most of the Eagle nests in Stanley Park are in old growth trees.

Stanley Park

- Three general types of ecosystems in Stanley park: forest (all around), wetland (biofiltration pond, lost lagoon, Beaver Lake), bog (a small one next to Beaver Lake) and seashore (adjacent to the seawall).
- 1000 acres of temperate rainforest and seashore.
- Annual rainfall is 1.5 m
- Historically 49 species of native mammals, now 32 with 6 introduced
- There are thousands of invertebrates, 230 bird species, 12 reptiles (turtles, snakes, lizards) and amphibians (frogs, toads, salamanders and newts).

Park Etiquette

Showing respect for nature.

1. **Do not try to pick up, pet or pretend to feed park animals.**
2. **Do not pick plants, flowers, berries, leaves or mushrooms in the park**: This is the food and shelter that wild animals depend on to live. Please leave everything for them and for other visitors to enjoy.

Mammals, Amphibians, Reptiles

Basic Biology:

There are different categories of animals, and these are:

Invertebrates: no spine; all insects and much of sea life; important roles as pollinators, producers, decomposers and food sources

Vertebrates:
- **Fishes:** have scales, gills, fins, etc
- **Reptiles:** have scales, heliotherms, need warm environments
- **Amphibian:** no scales, need wet environments
- **Birds**: Endotherms, have feathers, wings and eggs
- **Mammals**: have hair, mammary glands

Listing:

BC's Conservation and Data center has listings to help monitor and protect populations of animals.

Red listed: Vulnerable to extinction or extirpation (Western Grebe)
Blue listed: Vulnerable, candidates for red list (Great Blue Heron)
Yellow listed: Secure species (Bald Eagle)

Introduced Species of Animals in Stanley Park:

- Mute swans
- Eastern Grey squirrels
- Starlings
- House Sparrows
- House Finches
- Bullfrogs
- Carp
- European slugs

Birds

Remember when bird watching to try and spot the birds making calls so that it is easier to ID them by sound.
American Robin – up down, up down meandering song
Black Capped Chickadee – "chick-a-dee-dee-dee"
Winter Wren – song to big for such a small bird
Swainson's Thrush – an upward spiral of sound starting always from the same note
Hermit thrush – Similar to Swainson's but always starts from different notes.
Song Sparrow – A preety song with lots of different notes.
Red-winged Blackbird – A single low note, then trilling upwards, and finishes with a single low note.

Plants

Classification:

Tree – Woody plants with one main stem or trunk.
Shrub – Woody plants with several stems growing from the ground.
"Hurt when they hit you"
Forb – Herbaceous flowering plants with broad leaves.
Grass – Herbaceous flowering plants with narrow leaves and jointed stems.
Succulent – Plants with thick, fleshy tissues in the leaves or stems for storing water.
Moss – Will not study Names, low growing reproduces with spores, non-vascular
Fungus – not green, no photosynthesis, the fruiting body is the only part you see
Lichen – fungus and Algae in a symbiotic relationship

Invasive Species: English Ivy, Periwinkle, Nightshade, Himalayan or Evergreen Blackberry – outcompete, low biodiversty, loss of natural habitat.

Terminology:

- **Morphology:** overall shape / look of the plant
- **Rhizomes:** underground, elongated stem, distinguished from root by nodes (where leaf or stem is attached), these grow underground and sprout up new stems so one plant may look like many plants.
- **Flower petals:** 4,5, etc.: use for ID (use picture)
- **Leaves:**
    - Evergreen vs. deciduous : *evergreen leaves stay over winter and deciduous grow new every spring.*
    - Toothed: finely, coarsely, strongly
    - Alternate vs. Opposite (use picture)
    - Shape: Lance-shaped, linear, ovate, triangular, elliptic (use picture)
    - Lobes : 5, 7 (use picture)
    - Margins, Veins parallel or originate from center (use picture)
    - Terminal vs. basal (use picture)
    - Leaflets: 5, 3 (use picture)
- **Ferns:**
    - Sori: little packages of millions of spores that are spread by the wind (use picture)
    - Pinnatness: whether one pinnate, twice etc for ID (use picture)
    - Fiddleheads: the young uncurling leaves of ferns
    - Stipes: the stalk of the fern to which the leaves attach

Tree Id

When identifying trees, you will need to determine whether they are conifers or deciduous trees.
Conifers: Seeds are in cones, often referred to as softwoods, u*sually* having needles that stay green throughout the year. Examples are pines, cedars, spruces and firs.
Deciduous: Seed is surrounded by the ovule (think of an apple or helicopter), often referred to as hardwoods, they have broad leaves that *usually* change color and die every autumn. Oaks, maples and dogwoods are examples of deciduous trees.

Leaves either grow on opposite or alternate sides of a twig. If they are growing on opposite sides of a twig, there is a very good chance that the tree is a maple or dogwood.

Individual leaves can also be classified as either simple or compound (several to many leaflets per leaf). Simple Leaves have a single leaf blade. Compound leaves have several leaflets attached to a rachis.

The shape of the leaf is very important in helping identify a particular tree. Leaves in the same family will, sometimes, look very similar and have similar common names. Leaves can grow on conifers as either scales, single needles, or in groups. Cedar leaves grow as scales. Spruces, firs, hemlocks as well as others grow single needles. Pines grow needles in groups.

Tree bark can vary greatly throughout the life of a tree, often becoming rougher as a tree grows. Only a few trees retain smooth bark throughout their life. Furrowed bark means bark that has deep grooves in it.

All trees produce fruit. They come in a wide variety of shapes, colors and sizes. They can often be used to identify the tree. Be sure to always look carefully on the ground and in the tops of trees for fruit. Even small parts (like an acorn cap) can be helpful. Catkins are common fruit in Alders, and "helicopters are common in maples.

Form refers to the overall growth pattern of a tree. Some trees grow very straight with narrow branching, while others may be short with very wide branching. To examine the form of a tree, it is best to stand a short distance away. It is also important to realize that the same tree species can have different forms depending on whether or not it is growing in the open or in a crowded forest.

Nutrient Cycle

Decay:

Red Cedar	- inside out	Hemlock	- all over
Douglas Fir	- outside in	Hardwoods	- break down fast

Disease: ***Dwarf Mistletoe*** is a fungus that affects hemlock trees causing them to have weird tumor shaped growths and clumping branches

Microbes: fungus decompose leaf litter, bacteria used to fix nitrogen (available for plants to use), mycorrhizae are a fungus in the rhizosphere that are connected to all trees at the root level in a symbiotic relationship.

Microfauna: single celled organisms

Mesofauna: visible organisms

- Spiders/mites – feed on insects, fungi, bacteria
- Beetles / larvae – feed on leaf litter
- Ants – specialized wood and plant decomposers
- Centipedes – carnivores
- Millipedes – herbivores

Macro fauna: also contribute to soil structure

- Earthworms – decompose vegetation and even break the soil down further
- Snails / slugs – omnivores and can digest cellulose

Nurse stump/log: Trees that have died and are in the process of decay, are called "nurse" when plants or trees grow out of them. When the wood is broken down by fungus and bacteria it becomes sponge like and can hold lots of water, helping seedlings get a good start.

Wildlife Trees: These are standing trees that are dead or dying and have woodpecker holes. These holes house many of the parks birds and mammals, hence the name wildlife tree. The holes are excavated by Woodpeckers looking for insects to eat, sometimes the Woodpeckers themselves will nest in these holes, or they will be used by squirrels, wood ducks, song birds and others.

Hydrology

Riparian Zones: sensitive but resilient areas along stream and lake edges.
- They are critical habitat for many animals by providing shade, cover and forage.
- Salmon rely on the vegetation that covers streams to cool the water enough for them to survive, and to provide woody debris for them to use as cover.
- common plants are Red alder, Black cottonwood, Salmonberry, Red elderberry

Watershed: The term for the area that drains into a specific waterbody.
- For example, all of the land that drains into Beaver Lake is one watershed, all of the land that drains into the Fraser river is a watershed

Wetland: Important to all ecosystems and environments because;
- They capture and store fresh water (2.8% of earth's water is fresh and 76% of that is trapped in ice). They are like giant sponges which slowly release water back into the watershed.
- They stabilize climates especially soil moisture and air humidity (influenced by evaporation)
- Contain plants that create food, create oxygen, and fix nitrogen.
- Plants like the cattail can break down nutrients including fertilizers.

Bog: We will only talk briefly about bogs because there is a small one next to Beaver Lake.
- Bogs are acidic and nutrient poor.
- Instead of soil or mud they always have a type of moss called sphagnum, which can be up to 6 meters deep.

Wetland Plants:
- Hardhack
- Willow
- Buckbean
- Twinflower

"Rushes are round, sedges have edges, grasses are hollow with nodes"

Beaver Lake Notes

Called "Ahka-Chu," or "the little lake" by the native people of this area, Beaver Lake is a wildlife haven in the middle of Stanley Park. Beaver Lake is indeed little, and getting smaller each year.

The natural process that turns an inner-forest lake into forest is called succession. It occurs in all forest lakes to some degree, though it can often take hundreds and maybe even thousands of years to complete the process. It starts with lake vegetation rotting, using a certain amount of oxygen in the process; the more organic material rotting, the more oxygen it takes. But when the demand for oxygen outgrows the supply, vegetation begins to build up on the lake bottom, because it cannot decompose. As the lake gets shallower, there is less water to hold oxygen, decreasing the supply again.

Here in Beaver Lake, this process is being sped up because of the introduction of the **water lilies**, in 1937. Brought here to "beautify" the lake, they are so abundant now that they grow and die a lot quicker than the lake can naturally process. It is thought that it may take only another 50 years for Beaver Lake to return to the forest. Although the lilies are hastening the end of the Lake, they also provide a safe haven for waterfowl, brown bullheads, catfish and cutthroat trout, which all thrive in the "little lake."

Despite the fact that Beaver Lake is slowly disappearing, it is home to many forms of life. Some of the most abundant are the many different kinds of **aquatic insects**. There are the insects that live in the water full time, and the ones that are in the water at a certain stage of their lives.

Besides the insects, there are, of course, **fish** in Beaver Lake. Back in 1916 the Vancouver Angling Society established a salmon and trout hatchery at the Lake. The program was abandoned in 1946, but there are still cutthroat trout surviving. Brown Bullheads are very prosperous fish, and can survive in almost any situation. They are bottom feeders, and Beaver Lake is prime real estate with its plethora of bottom loving bugs and vegetation.

Frogs are also common around Beaver Lake. The most commonly heard frog is the Pacific Tree Frog, recognizable by its loud RIBBIT. This small native frog is very agile and can easily climb trees with help from suction cups on each toe. This frog, like a chameleon, can change colour in relationship to temperature and humidity, in order to stay camouflaged. The change is caused by skin pigment contracting or expanding. Pacific Tree frogs are obvious by the black stripe extending from the nose to the shoulder. They eat crawling and flying insects in low bushes and shrubs. The process from egg to adult frog takes about one year, and although they can lay up to 1,000 eggs at a time, they have about a 1% success rate.

Bullfrogs were introduced to Eastern Canada for frog farming, their meaty hind legs being a delicacy. As they made their way West, they have wreaked havoc on many a native frog populations. They are 18-20cm long, much larger than any native frog, and they eat anything from insects to ducklings, mice and other frogs. Their call is a deep, "burp"-like sound, which can be heard in the evenings around the Lake.

Pond dipping can help with identifying how polluted a lake or pond is, as some species live only in the freshest, pure water and some can live in cesspools. A dip in Beaver Lake will show you that it is moderately polluted, as the most common bugs indicate.

Adult water animals include:	**Aquatic larvae or juveniles include:**
*Water Strider	*Damselfly Larva or nymphs
*Diving Beetle	*Dragonfly Larva or nymphs
*Water Boatman	*Diving Beetle Larve "Water Tiger"
Common Backswimmer	*Mosquito Larva
Whirligig Beetle	Mayfly Larva
*Copepods	Caddisfly Larva

*Water mites
*Water Flea
*Skud

Two common and very interesting bugs are the **Mosquito and Dragonfly larvae**:
A female **mosquito** can lay up to 500 eggs, which she arranges into a raft that will float on the water. Mosquito larvae will hatch after a few days to be free swimming. At this stage, they breathe through a tube at the end of their abdomen. Larvae feed on phytoplankton until they are ready to become a pupa. At this point they stop feeding and a hard shell protects their body while they are transforming themselves into a flying mosquito. Once they are ready to fly, the mosquito will use the hard pupa shell as a floating device to get out of the water without wetting their precious wings. A few days later the female will find a person, or other creature, whose energy rich blood she can suck. She is attracted to people by the warmth and carbon dioxide we put out. The male, however, will feed on pollen and nectar and survive for about two weeks. The female can live up to four months.

Dragonfly nymphs, or larvae, live in their watery homes for nearly five years! Their lower lip is actually a long organ that has a grappling hook on the end. They use this to seize prey. They are voracious eaters, often preying upon insects, tadpoles and even small fish they can hook. They have three tails at the end of their body, which also act as gills. The end of their body is hollow, which allows them to bring water in and push it back out again, in order to propel themselves through the water. Before changing into an adult dragonfly with wings, a nymph will crawl up onto land and sunbathe until it's outer skin cracks and allows the adult to escape. Once out of the water, dragonflies will only survive until the end of the summer…just enough time to breed.

Beach Ecology

Intertidal Marine

The intertidal (between the tides) zone along the coast is rich in both animal and vegetable life. It is an environment in constant transition, from high tide to low tide and back again. Changes occur in temperature, light, salinity, pressure and oxygen content. As this area is the most accessible of the sea, it is very vulnerable. By understanding all of the different organisms and how they are all interconnected, it is easy to appreciate this incredible environment. Each organism is best suited for the environment in which it lives.
Here, in Stanley Park, some of the most common critters you'll come across are barnacles, crabs, mussels, seaweed and seastars.

Barnacles: cover most rocks along our shores, but we rarely see anything but their hard outer shell. Inside this shell is a small animal, related to crabs. When they open up at high tide, barnacles let their feathery appendages sway in the current. These sieve the water and find the tiny organisms they call food.

Crabs: Our most common crabs are the small Purple and Green Shore Crabs. They are the ones that go scurrying away to find a new hiding spot when you turn over a rock. At night they comb the beaches feeding on leftovers and bits of algae. There are also Hermit Crabs, who borrow shells from marine snails, as their own soft shell provides little protection. Occasionally you'll come across a Dungeness or Edible Crab, the big ones that hide in the sand. These like to hide in eel grass and wait for unsuspecting prey. All crabs grow or molt out of their shells, and the cast-offs can be found lying on the beach, perfect replicas of the living crabs.

Mussles: Edible Mussels are plankton eaters, siphoning it from the seawater. You can see their blue shells everywhere, attached to rocks, broken on the seawall or in clumps on the beach. They are also the favorite food of gulls, crows, sea stars and people, too.

Seaweed: There are numerous kinds of seaweed found along our beaches and shoreline, all of them quite prolific. On the beaches you are likely to see, Sea Lettuce, Rock Weed and Nori. Sea Lettuce is the thin green alga that tends to cover the rocks at low tide, making everything very slippery. Rock Weed is most identifiable through its gas filled sacs at the tips of its blades. These act as buoys, helping the plant get as much light as possible at high tide. You can tell how healthy a plant is by how many of the sacs are full. Nori also likes to cling to rocks at low tide, but it differs from Sea Lettuce in colour, Nori is a dark purplish brown. It is what is commonly used in sushi.

Bull Kelp: Further out, in the water, Bull Kelp and Sugar Wrack sway in the currents. Bull Kelp is hard to miss as it has a large gas filled buoy floating at the surface with long flowing blades attached. Inside the bulb is enough toxic gas to kill a chicken. Bull Kelp fastens itself to rocks by a holdfast, or root system, and can grow up to 80ft and sometimes grows 1ft a day. Sugar Wrack is named for it's sweet flavour. It attaches its root system to other organisms, such as Bull Kelp. From the holdfast starts a small stipe (branch-like part) and then comes one long single blade. With maturity, the blade becomes "corrugated" down the middle.

Sea stars can be seen at low tides, often hiding on the overhung sides of rocks, or in tide pools. The most common are the Purple or Ochre Sea Stars, who move around on tiny little suction cup feet on their underside. They use these to pry open mussels and then insert their stomach to digest the food inside. Gulls like to eat sea stars and if one happens to bite off an arm or two, the sea star can re-grow those arms as easily as we re-grow fingernails.

Fish: There are several kinds of common fish to be found in the intertidal zone. Sea Perch are among the most common, but one can also find Pipefish, Sculpins, Snake fish, and flat fish (several kinds of sole). It's hard to spot fish in the moving water, but if you happen upon a tide pool, you are sure to see some very small Sculpins darting around very quickly.

Birds: One of the greatest spots in North America to see migratory waterfowl (winter)

- Pelagic Cormorants (colony under Prospect point if you look up from seawall)
- Double crested cormorants
- Pigeon Guillemots
- Glaucous-winged Gulls
- Mew Gulls
- Ring-billed gulls

- **Dead Seals:** If you find dead seals call the Park Rangers
- **Baby Seals:** left by mother when off feeding, leave alone and keep an eye out for public wanting to rescue it, if it has been removed from the beach by a member of the public contact the Park Rangers and they will call the aquarium if necessary.

Zone: Spray zone
Height: above 2m
Adapted to: exposure to air: able to retain water for long dry periods
Organisms: Black lichens, algae, limpets, barnacles

Zone: High tide zone
Height: 1-2m
Adapted to: more air than water: usually uncovered except in extreme high tides
Organisms: Sea lettuce, Barnacles, Rock crab, Limpets (and snails), Rock weed

Zone: Mid tide zone

Height: 0-1m
Adapted to: the rhythms of the tide: typically covered and uncovered two times daily, Permanent tide pools occur in this zone.
Organisms: Plants and animals here are very abundant; Blue mussels, purple sea star

Zone: Low tide zone
Height: 0 to–1m
Adapted to: Unaccustomed to the tidal rhythms and cannot exist higher up; normally covered except during extremely low tides
Organisms: Oyster, Kelp crab, Sea urchin – a primary indicator of this zone

Zone: Sub tidal zone
Height: –1m
Adapted to: more constant conditions: never completely dry
Organisms: Bull kelp, Besides fish, the main organisms here are seaweed and other vegetation.

Biofiltration Pond

Major Components in Treatment Process:

- plants
- detritus
- soils
- bacteria
- protozoa
- and higher animals

Runoff includes:

- leaf litter
- air-borne dust
- sand
- metals (arsenic, copper, and especially lead)
- low levels of oil, fuel, and exhaust-gas by-products

Purpose of wetlands is to remove these contaminant and concentrate them in one place

- **oil-water separator "Stormceptor"**
  - function is an oil trap
  - 3 of these along causeway
- **sedimentation forebay** [3]
  - settles out silt, sand and gravel, as well as contaminants bound to them
  - sink to bottom under their own weight
- **marsh terraces**
  - contains plants and soil that remove contaminants too fine to settle out in the forebay
- **deep pools**
  - provide a diversity of habitats
  - enhance the natural look of the wetland

Sedimentation removal is typically the major purpose of wetland designed for treatment of urban stormwater flow from parking lots, streets, and landscapes. It is, in essence, a stormwater retention basin with vegetation. The water is static between storm events, and water quality will continue to improve. When a storm event occurs the entering flow will displace some or all of the existing volume of treated water before overflow commences

Constructed wetlands of this type are capable of :

- reducing total suspended solids by >80%
- lead by 75%
- other metals by 40-60%
- phosphorus by >50%

Maintenance:

- contaminants will remain in the facility until they either are cleaned out or decay through natural processes
- with decreased pollutant-binding capacity of the soil, it could be 'refreshed' by tilling and replanting

Benefits of Wetlands:

- filter out pollutants, trap sediment, and improve water quality and clarity
- provide a length of shoreline inaccessible to park users, thus improving protection and nesting habitat for waterfowl
- provide essential water, food and protective cover for wildlife
- increase plant and habitat diversity in the lagoon
- restore part of Lost Lagoon to its original marshy state
- provide visual interest and diversity for the enjoyment and interpretative benefit of park users

General Statistics:

- Over 70,000 vehicles use the Stanley Park Causeway on normal weekdays
- Construction and planting was completed in April 2001
- Wetland is designed to handle 25 litres/sec (based on historical data of rainstorms in Vancouver of the last 50 years)
- At maximum flow level the water is meant to be retained within the wetland for 24 hours
- The BC Transportation Financing Authority is funding the wetlands, as requested by Park Board staff as part of Causeway Improvement scheme approved early 2000.
- The project has been reviewed and has received environmental approval by the Burrard Environment Review Committee, the Vancouver Port Authority, and the Department of Fisheries and Oceans.

Wetland Plants

Sedges (70% of planting area)

ID - sod-forming plant, height of 0.5m-12m
- leaves are whorled around a solid, 3-sided stem
- complex network of creeping root stalks

Location - prefers saturated soils (can tolerate slight to moderate changes in water level)

Ecological significance - shelter and nesting sites for water birds and wetland dependent perching birds
- shelter from weather and predators for turtles and garter snakes
- attachment site for amphibian eggs

Bulrush *(20*% of planting area)

ID - stems hard, round, 1-2cm at base tapering to point
- grows from scaly, creeping roots, to height of 1-3m
- flowers cluster of greyish-brown spikelets on short branch close to top of stem

Location - tolerates alkaline conditions and wide range of soil types

Ecological significance - cover and nesting habitat
- seeds are food for birds
- attachment site for amphibian eggs

Yellow Waterlily

ID - green, leathery, heart-shaped leaves, 10-40cm long
- attached to thick submerged stalks (as long as 2.5m)
- showy, yellow, bowl-shaped flowers (in spring and early summer)

Location - prefer water depth >1m

Ecological significance - seeds for water birds
- habitat for aquatic invertebrates

Common Cattail

ID - grows 1-3m in height
- large spongy brown spike, atop a stiff round stem

Ecological significance - cover, nesting, and feeding habitat for birds (eg. Red-winged Blackbird) and muskrats
- highly effectively removes excess nutrients from water

Black hawthorn

ID - large, deciduous shrub up to 10m tall
- numerous thorny branches
- thick, leathery, dark green leaves with jagged-edged tips
- white flowers April-May that develop into little black or purple, apple-shaped fruits

Ecological significance - food and nesting site for perching birds
- protective canopy for ground nesting water birds (eg. gadwall)

Red-osier Dogwood

ID - shrub growing 1-4m in height
- many branches changing from bright red to brownish colour with age
- green oval leaves, with sharp point and prominent veins.
- clusters of small white to greenish flowers that develop into whitish-blue, berry-like fruits

Location - moist to wet soil, found on edge of wetlands, often with willow

Ecological significance - escape and nesting cover for perching birds
- stabilises banks from erosion
- important shrub because it is easily propagated from cuttings

Skunk Cabbage

ID - large forb, 3-150cm in height
- broad, green, elliptical leaves, up to 120cm long

Location - saturated, organic soils

Ecological significance - odour attracts insects