



Camp Kitigay

PERMACULTURE DESIGN

2022

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1. Introduction

Camp Kitigay (meaning “to plant” in Anishinaabe) is the first Canadian Ecosystem Restoration Camp (ERC), located in Beaconsia, Manitoba. The Stichting Ecosystem Restoration Foundation is a global organization that works to fight climate change through restoration projects that include increasing biodiversity, improving food security, and restoring water systems. This organization supports a global network of camps that conduct collaborative restoration projects on a local scale while sharing innovations and learned information throughout the network.

Some of the key requirements in the establishment of an ERC include that there be degraded land which the camp intends to restore, that there is an ecosystem restoration plan in place, that adequate and legal infrastructure exist or be in development, the camp has the ability to build and upgrade infrastructure and restoration projects, and that the work is documented. Restoration activities that Camp Kitigay intends to fulfill include water retention, tree planting, growing food, building soil, habitat creation, community building, and regenerative entrepreneurialism. The purpose of this design is to create a plan for the fulfillment of these requirements using permaculture principles that can then be used to develop programming and business models to sustain Camp Kitigay. Permaculture is a socio-ecological design system that works to shape landscapes to mimic relationships and patterns found in nature to create and manage resilient, sustainable agroecosystems. Permaculture is guided by design principles that are used as a framework for designing sustainable land use, which prioritize caring for the earth and its people, and sustainably using and producing resources to ensure a fair share for all (Krebs & Bach, 2018). Three main permaculture principles among others that will be guiding this design include:

1. Produce No Waste
2. Integrate, Don't Segregate
3. Use Edges and Value the Marginal

2. Project Goals

The following goals will work to inform this design and the development of Camp Kitigay:

- 1) To restore local ecosystems and natural resources in the immediate bioregion
- 2) To develop programming to educate participants on agroecological practices, sustainable food production and permaculture design and implementation
- 3) To establish and grow a local seed bank to use in restoration projects
- 4) To develop a plan to remove the use of fossil fuels and use renewable energy

3. Site Analysis

Camp Kitigay is located on 18 acres of land known as Beaconsia Research Station that is owned by Winnipeg filmmaker, Noam Gonick. It is located at the GPS coordinates 50.44339° N, 96.55792° W to the east of Beaconsia Beach on Lake Winnipeg.



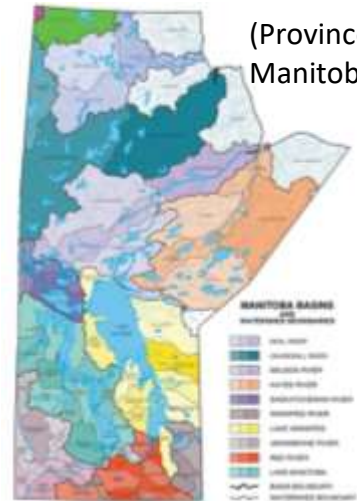
(Google Earth, 2022)

3.1. Site Characteristics

3.1.1. Site Features

Camp Kitigay is located in the southern basin of the Lake Winnipeg Watershed in Beaconia, Manitoba. The site neighbours a significant amount of fallow crown land that includes many acres of marshland. This land extends from the western side of Camp Kitigay until it meets Lake Winnipeg. The area is connected to multiple ecosystems, including marsh, fens, mixed forest, and some prairie. Native

vegetation includes jack pine, trembling aspen, willow, white spruce, balsam poplar, paper birch, dogwood, eastern white cedar, black ash, white elm, mints, raspberry, strawberry, and mixed grasses and sedges (Smith et al., 1998). There is an abundance of thistles located in the field portion of the site. Some fauna that has been observed on and around the site include geese, coyotes, heron, pelicans, frogs, fireflies, eagles, voles, and carp.



(Province of Manitoba, 2022)

TransCanada Trail

The current “driveway” to the site is the TransCanada trail. This trail borders the western perimeter of the site and provides three-season access to the site by foot or vehicle from late spring to mid-autumn. The TransCanada trail spans 28,000 km long, making it the longest connecting trail system in the world. The trail’s location means that motorised vehicles are not allowed to drive on it except for access to private property. During the winter, snowmobiles may use the trail, however, it is unploughed.

The Beaconia Well

The Beaconia Well is an artisan well located immediately across the road from the TransCanada trail access to Camp Kitigay. Originally dug in the 1960’s, local stories state that when the drill hit the water tables, a geyser shot out of the ground that extended above the treeline. Today, it is constantly flowing and free for anyone to come by and drink the purported healing water. Recently the well switched from private



land and is privately managed to the local municipality. Currently, the municipality has been met with provincial water and well regulations that require a change to the infrastructure or availability of well water to the public. The main options in consideration are to either spend money upgrading the infrastructure and limiting the well to pail-fill, or treating the water, which would likely mean the addition of chlorine and other treatment chemicals. It has been decided that the well should remain free to the public, but there is an outcry from the local community around the possibility of treating it (RM of St. Clements, 2022; personal communications, 2022).

Beaconia Beach

The beach is located approximately 1.5 km from the site or a 15-minute walk through forest and marsh. The beach is located at the very end of the main road that intersects with the TransCanada trail system. This beach is known to be popular as both a camping area and a nude beach.

Existing Infrastructure

The site has a small uninsulated cabin, referred to as “the Shack”, with a screened-in porch, a sleeping loft, and a wood stove. There is an outhouse on site that requires some upgrading. A wooden boardwalk leads from the TransCanada trail to the cabin, which also requires some repair.



3.2. Site Conditions

3.2.1. Sun

The following sun angles depict the sun directions and exposure on the summer solstice, June 21st:

Sunrise: 05:15
Sunrise Azimuth: 50°
Noon: 13:28
Noon Altitude: 63°
Sunset: 21:42
Sunset Azimuth: 310°

This shows constant sun exposure on the eastern side of the site with open field.

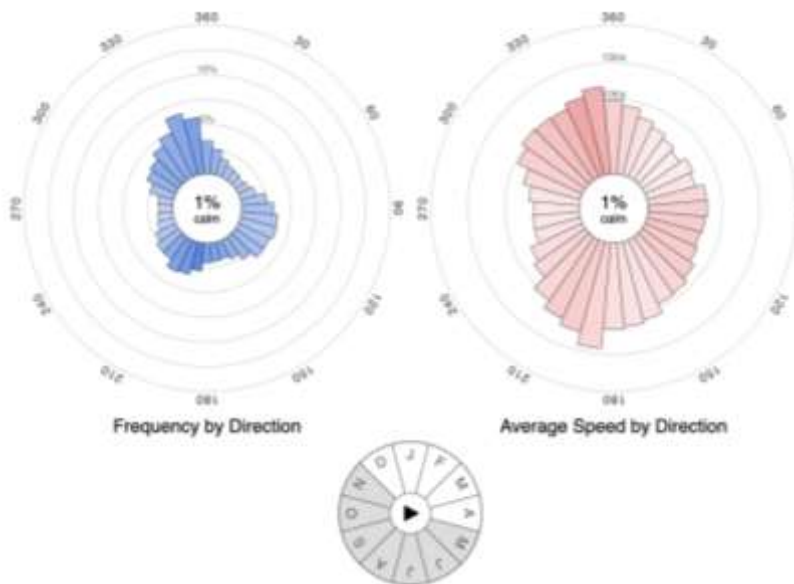


(Sun-Direction.com, 2022)

3.2.2. Wind

The treeline is well positioned to help block westerly winds coming in from the lake. According to the windrose from the nearest weather station at Victoria Beach, winds are most frequently from the north and northwest directions during the growing season, while the speed is at its greatest when coming from the southwest. Looking at the map, the treeline curves at the southern part of the site towards the east, blocking some of these strong southerly winds. Considering the treeline covers the western side of the site, it makes good protection from

these westerly winds and can partially block north winds, though further windbreaks will be necessary along the eastern border of the site. Strong winds occur at high speeds most often during the early spring and fall.

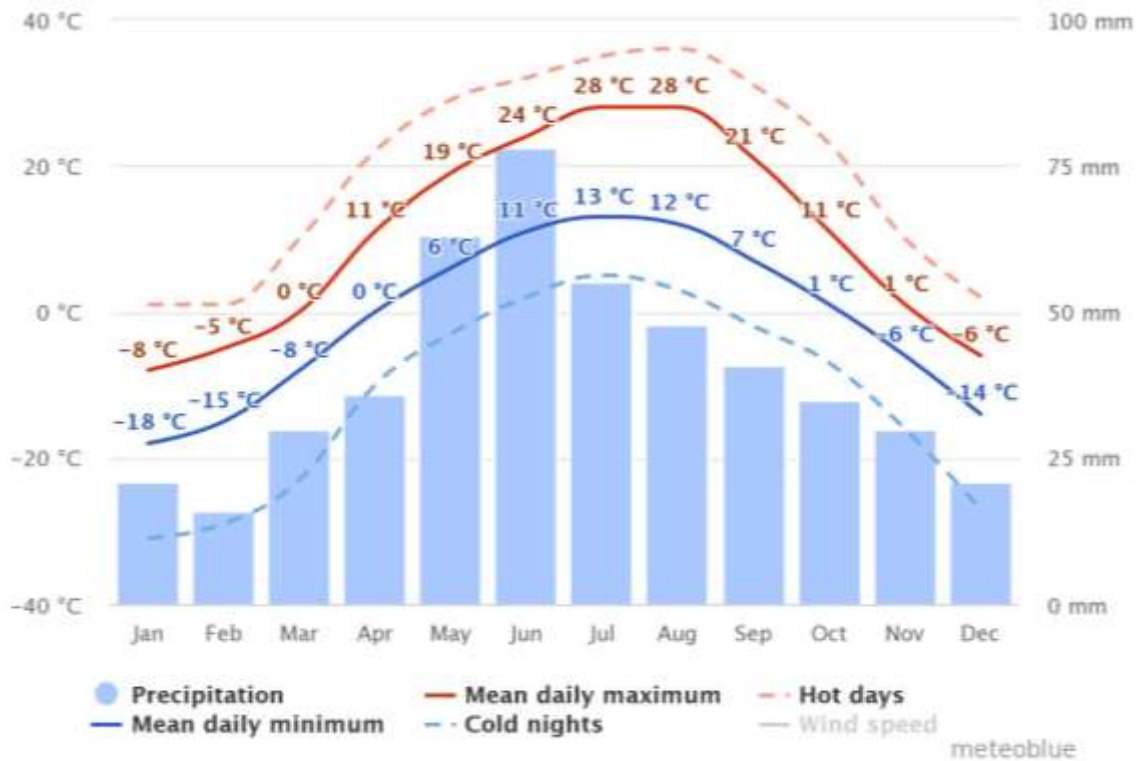


Unfortunately, there is no accurate historical wind data for Beaconia, therefore these windroses represent Victoria Beach, the closest weather station. The windrose pictured depicts an extended version of the growing season.

(Windhistory.com, 2022)

3.2.3. Temperature and Precipitation

Camp Kitigay is located in a plant hardiness zone 3b with temperatures ranging from just below -30°C to just above 30°C. Frost days are expected to continue to drop over the next 30-50 years, extending the frost-free season by up to 19.6 days. This couples with very hot days increasing from 9.7 days to 23.7 days between now and 2050. This will pose issues for drought, risk of forest fire, and crop and livestock. Interestingly, there is no real change in expected levels of precipitation. This makes planning for rainwater catchment even more critical to plan for future heat waves and drought. Luckily, with proper water management strategies, the excess water in spring will prove to be an asset for long term climate projections. While forest fire is a risk with increasing temperatures and opportunities for drought, the proximity to the lake and abundant water sources including natural water filtration systems is beneficial for mitigation.



(Meteoblue, 2022)

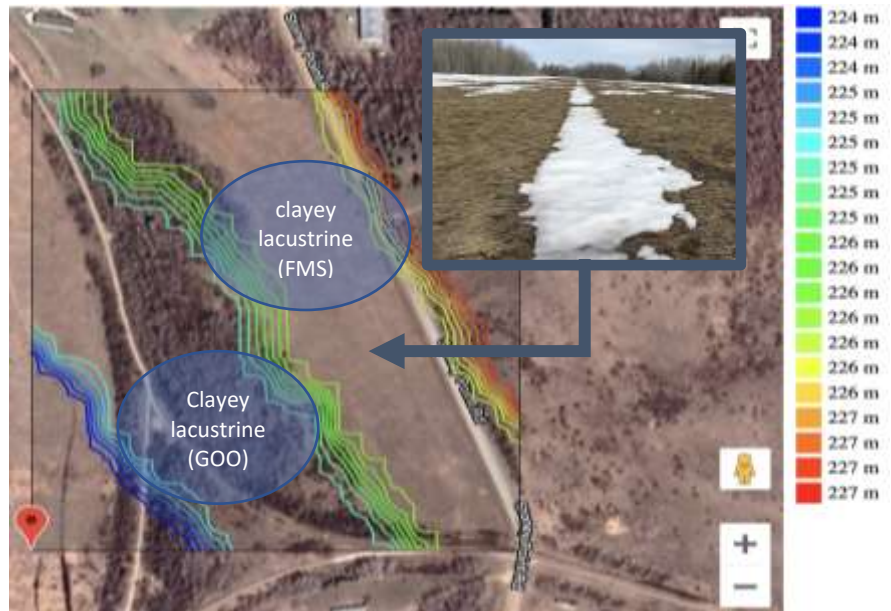
(Contour Map Creator, 2022)

3.2.4. Topography

There is a very mild slope on the landscape, varying less than 3 metres in elevation across the entire site, sloping down towards the lake from East to West. Tree cover makes up just less than half of the entire west side of the site.

3.2.5. Soil and Drainage

Two soil series exist on the site: Framnes and Glenmoor. Framnes series is found along the eastern site boundary on highway edge in the field area, making up approximately one third of the site. The permeability of this area is moderately slow in the lacustrine clay strata and variable from moderate to slow in the silty strata. The topsoil drains better than the sub soil, which therefore has the potential to hold water for longer time periods.



The Glenmoor series is found along the western two thirds of the site where the majority is treed. Here, lacustrine clay occurs in low to depressional positions of level to nearly level landscapes and has slow to moderate permeability, very slow surface runoff, and a high-water table during the growing season.

When the snow melts, water melts more quickly at the north and northeastern portions of the site than the southwestern side. Within the tree line, pockets of snow and water are held between the trees and around the cabin. There is also an existing natural swale that runs north to south in the centre of the field. In general, the site conditions are very moist to wet in the spring and early summer, and gradually dry over the course of the summer. In regard to agriculture quality, the area containing the Framnes soil series is of better quality than the Glenmoor series, which is considered to be poor. Therefore, water management strategies and plant species will be chosen to mitigate any challenges posed by the soil quality and drainage.

4. Resources

Financial capital

- University of Manitoba funding
- ECR funding opportunities for seed bank
- Grants
- Fundraising potential

Material Capital

- TransCanada trail is maintained and provides seasonal access to the site and connects it to other ecosystems

- Beaconia Well is a source of free water within walking distance
- The Shack serves as shelter for the first stages of the Camp.

Social Capital

- Nearby beach serves as a recreational facility and gathering point for the greater community
- The Beaconia Well is supported and maintained by the local community and municipality
- ECR is a global network of resources that can be tapped into for volunteers and participants
- Diverse board of directors, including partnerships between Mino Bimaadiziwin Partnership at the University of Manitoba, Kitigay Internship Program 2021 at Brokenhead Ojibway Nation, and Beaconia Research Station

Natural Capital

- Marshland acts as a water filtration system
- Artisan well nearby provides ample fresh, live, untreated water
- Cleared land reduces the need to clear site for building while treed area provides shade, western wind protection, timber, and woodland habitat.
- Nutrients in soil from 20 fallow years

Intellectual Capital

- Diversity of knowledge sets through Mino Bimaadiziwin Partnership
- Merging of Western scientific and traditional ecological knowledges
- Ecological Restoration Camp monitoring and evaluation support
- Access to experts and student researchers through partnership institutions and communities
- Several board members are avid gardeners with a broad range of plant, gardening, and ecosystem knowledge

5. Challenges

Drainage

Drainage will be an issue, especially in spring and early summer. To compensate, some swales can be built to help redirect water and used as a temporary holding area for drier times. Areas can be built up with the organic matter. Hugelkulture beds can be used in combination with the swale system. Native vegetation will be planted that can thrive in high moisture areas and help support soil building. Luckily, drainage is slightly improved in the open field, which is better suited for growing due to direct sun exposure.

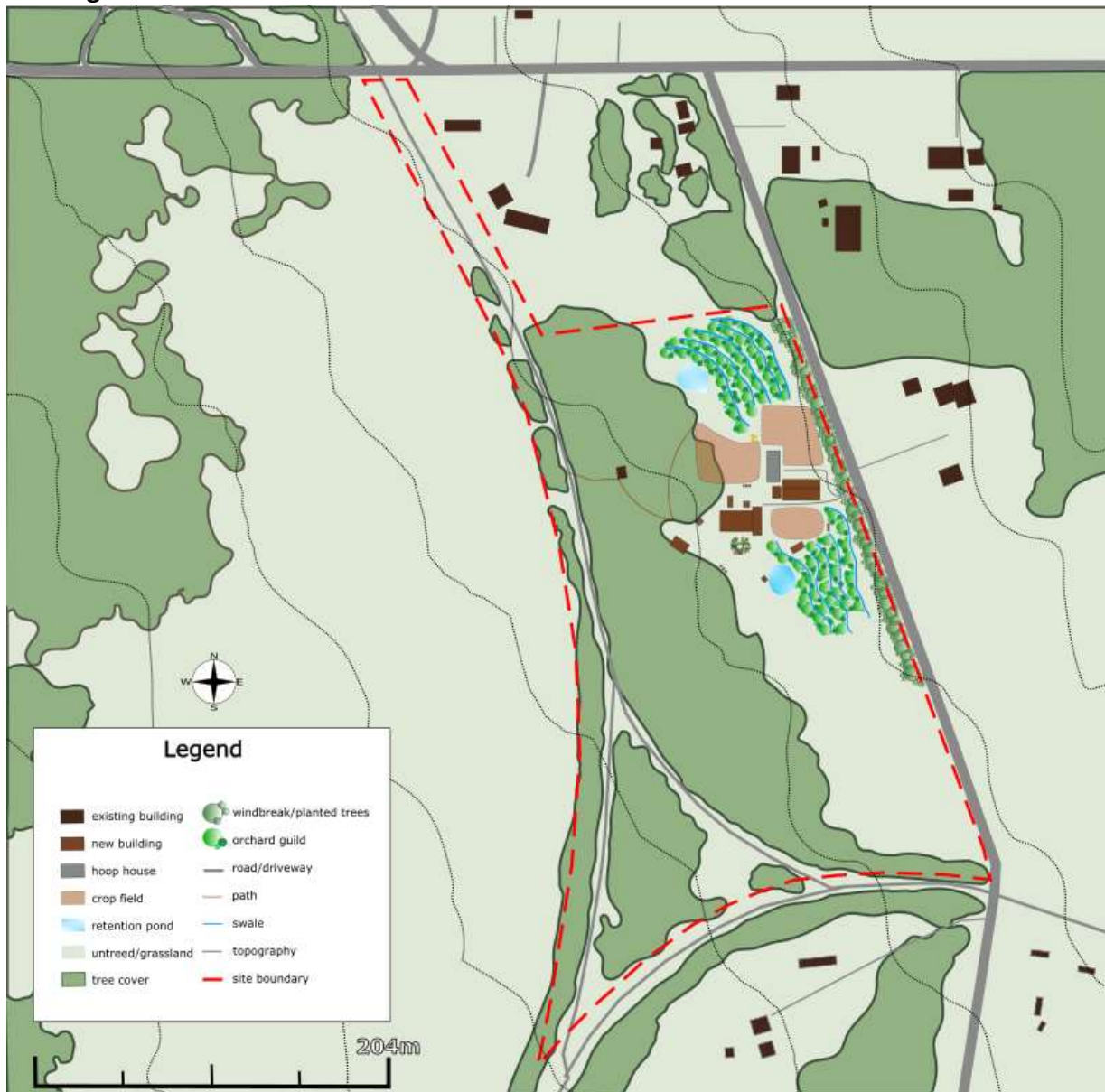
Site Access

The field is currently inaccessible by vehicle due to ditches or vegetation. An access point will be created along the eastern site to help with the development of site infrastructure.

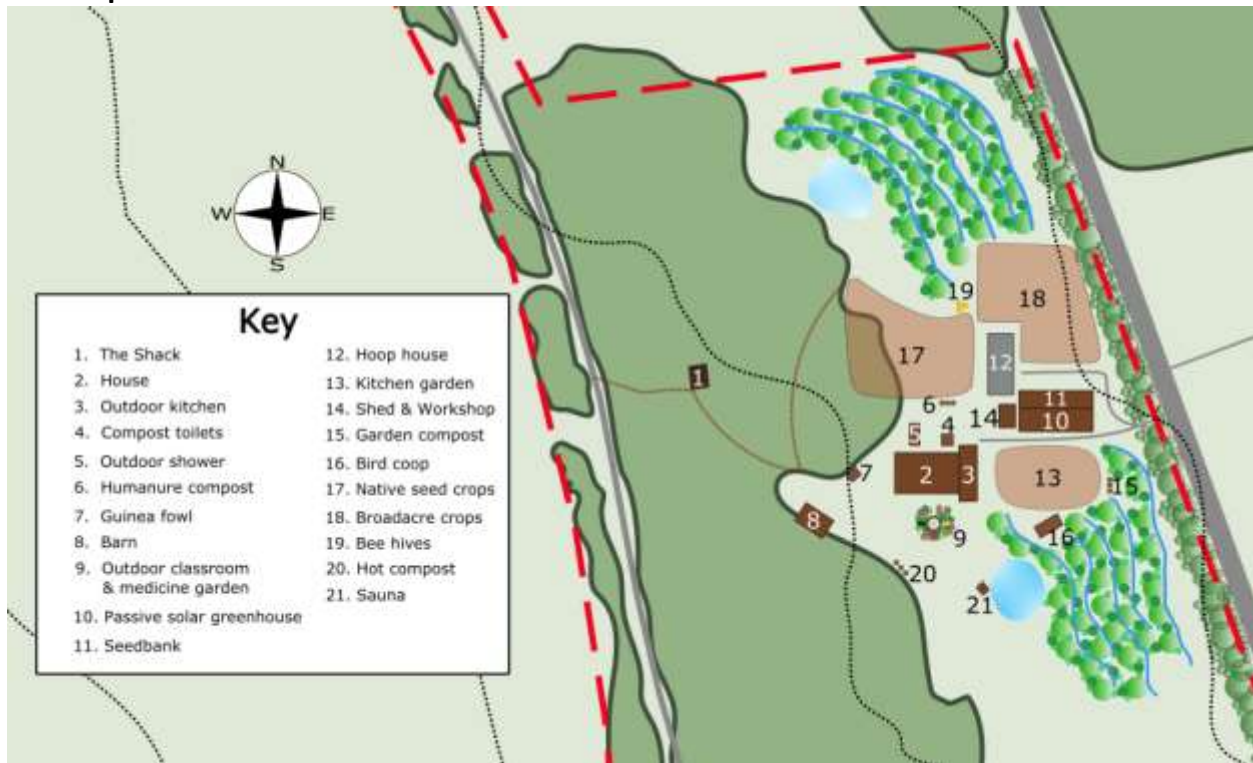
Off-Grid

The site is currently off-grid without access to electrical power or an on-site well. The Beaconia well is located within a short distance and can be used to replenish drinking and washing water supplies. Solar energy will be used for lighting, battery charging and some electric fencing. Wood will be sustainably harvested on-site for cooking and heating. Some propane or generators may be required while the camp grows. Should it be deemed necessary, the site will be connected to the electrical grid via power lines that line the eastern border. The goal will be to utilize renewable energy and maintain the ability to function well off-grid as much as possible.

6. Design



6.1. Map and Zones



6.1.1. Zone 0

The Shack (1 on map)

The existing shack is included in zone 0 as the initial teaching site as well as an alternative residence. Small upgrades need to be made, including rainwater collection, and retrofitting the existing outhouse into a composting toilet.

House (2)

Prior to constructing the house, this site will be used for tents and trailers as indicated by the firepit. This building is to house those working at Camp Kitigay and serves as a community gathering spot with a large, commercial kitchen facility (also used as the main residential kitchen) for food processing. The house is meant to be a place for workers and students to come relax, unwind, and study. It will contain a rainwater collection system to supplement bringing in water from the Beaconia Well, although, at some point in the evolution of Camp Kitigay, a well may be drilled on the site. The house will contain outdoor but sheltered composting toilets and sink (4), as well as a shower building (5). The composting toilets will be a basic bucket system that are collected and emptied at the humanure composting site (6) just north of the house. Washing water will be a combination of rainwater collection and tanks filled from the well. There will also be a private indoor composting toilet and working bathroom with tub and basic laundry facility for residents. To the north side of the building is a cold storage facility for extra seeds and vegetables.

The house is positioned on the axis where the poorly drained land and the better drained land meet. It is positioned to obtain some northwestern wind protection from the tree line, while obtaining solar gains from the south. The house is facing south and will be designed for passive solar gains in the colder months, with roof and window placement, climbing vines and pull-down drapes to block excess heat in mid-summer. In this location, the house is situated for the most efficient access to different parts of the site. It is near the shack and treed area and is closest to the most ideal agricultural locations on the site. It is also near the main road which can allow for better all-season access with the installation of a driveway, as well as potential hook up to the electric grid system if necessary. That said, the house will be heavily insulated and designed to capture solar energy both passively and with solar panels, as well as high-efficiency masonry heater for cooler months.

Outdoor Kitchen (3)

The outdoor kitchen will be an outdoor extension of the main house's kitchen. The outdoor kitchen serves as a social and communal cooking area, as well as an extended processing facility for garden crops and herbs. This is an ideal place for woodfire cooking, canning on warm days, pizza making, outdoor BBQs, and harvest events. Considering rainy days, this area will be covered and include a screened-in eating area to protect visitors from insects. This will serve as the initial gathering spot for workshops and will be used when mosquitos are particularly bad for classroom activities. Intended to be constructed prior to the main house for use by campers, eventually,

6.1.2. Zone 1

Outdoor Classroom and Medicine Garden (9)

The outdoor classroom will be designed to represent the four directions. The inner circle will contain a fire pit, seating areas, and shade sales. This area will function as a gathering area for storytelling, teaching, classroom activities and events. The inner circle will be surrounded by a medicinal herb garden with markers and plants positioned to represent the four directions according to local teachings. This garden will be used by residents, visitors, and classroom activities.

Greenhouse and Seed bank/ processing (10 and 11)

The greenhouse takes up the southern half of the building. The greenhouse will be similar in design to passive solar greenhouse at Fort Whyte Farms. It also serves as a potting and seeding station for the nursery. The building is divided by a masonry wall that holds heat from the southern windows. The north facing side of the building contains the seed bank where seed processing, storage and data entry occurs. The seed bank is expected to be off-grid and designed and sourced by Terraformation in partnership with Ecosystems Restoration Camp.

Additional Hoop House (12)

The hoop house is uninsulated and is located just north of the shed. It faces east and west. This is a basic hoop house to accompany the seed bank and can also function as a nursery. The hoop house's main function is to transition seedlings to the outdoors and to start cold-hearted

perennials. It can be used as a season-extender for planting vegetables and herbs in-ground, providing them protection from frost in the early spring and summer, as well as air-borne diseases. For example, it can grow cold-hardy vegetables and greens in the early spring and late fall, while serving as a hot house in mid-summer for tomatoes, peppers, basil, eggplant, melons, and/or cucumbers. It is also a place to store potted perennials in the winter. The hoop house is an essential component for growing in zone 3 and will have priority over the passive solar greenhouse due to its multiple functions and relatively cheaper installation cost.

Kitchen Garden (13)

This garden is located across from the outdoor kitchen. This garden will be used to grow food, with a focus on annual vegetables and herbs consisting of local, cold-hardy adaptable and heirloom seed varieties. This garden will be used to feed residents, campers, and visitors, as well as some seed collection. Horticulture and gardening workshops can occur in this garden and include methods such as swale construction, mushroom inoculations and hügelkultur builds. The garden will be fenced in and connected to the chicken/bird coop for occasional livestock integration. A solar-powered pump will carry water from the retention pond or from water containers located in the outdoor kitchen. The driveway from the road to the house will be sloped to move water towards the kitchen garden. Further water capture systems will be built into the chicken/bird coop to use in the kitchen garden. A garden compost (15) will be located at the eastern side of the kitchen garden for easy disposal of plant material.

Garden Shed (14)

Located directly west of the greenhouse is a garden shed that stores additional tools, equipment, and other garden materials. The shed can be made larger to store machinery or other large equipment needed.

6.1.3. Zone 2

Guinea Fowl Coop (7)

The guinea fowl coop is located near the treed area which is located between the house and shack. The main purpose of the guinea fowl will be for tick management around living areas, but they will also double as a food source.

Barn (8)

The barn is situated near the treed area for protection against wind, while also being near the house for daily maintenance. It will house goats and may also include sheep, pigs, and cows. The barn has access to the southern pasture, retention pond and orchard for integrated grazing and is connected to the northern retention pond, pasture, and orchard through a trail.

Chicken/Bird Coop (16)

The bird coop will house chickens, ducks, turkeys, and/or geese. It is located near the kitchen garden and orchards for easy access to food scraps and integrated grazing. It is also located near the southern water retention pond for swimming and drinking water. The chickens will provide eggs and meat for food in addition to pest management, while the ducks will also

provide meat and eggs but be used to manage slugs and other insects that can damage crops. Turkeys and geese will provide meat, while all birds will contribute to creating on-site fertilizer.

Perennial Native Seed Crop Beds (17)

This bed is located across both poor and better agricultural area and leads into treed area. This allows for a variety of native crop plants that require different conditions in one area, ranging from medium to moist soil and full sun to shade. It is located next to hoop house, seed bank, garden shed since there will be regular commuting between these locations in a given day.

Sauna (21)

The Sauna is located near the house and southern retention pond which can be used as a swimming hole or cold plunge. The sauna will be used as a healing feature on the site and to help residents and visitors unwind after a physical day.

6.1.4. Zone 3

North and South Swales and Orchard Guild

Here is where swales, and plant guilds will make up a northern and southern food forest on the farm. These are located on both sides of Zone 0 and 1 for better proximity while also creating added wind protection for zone 0. A description on the function of the swales and plant guilds including a plant list can be found in section **5.2 Strategies and Permaculture Principles**.

North and South Retention Ponds

The retention ponds collect excess water directed by the swales. The ponds will be naturalized with water-loving plants and medicines to create habitat for waterfowl and wildlife, as well as water filtration to the pond. Trees will be planted along the edges to provide some shade for livestock. The ponds will also act as a holding area for water and will be connected to an irrigation pump to water the kitchen garden and crop fields when required.

Broadacre Crop zone (18)

This is ideal agricultural land and will be used for broadacre crops and planting guilds that mix both perennial and annual crops. This field can also be used as an overflow for some plant propagation and seed collection from the native plants. This field is located in the design near the hoop house, seed bank, and greenhouse for convenience.

Beehives (19)

The hives will be located in the centre of the northern orchard and two crop fields. They will receive protection from northerly winds by the orchard. The hive location ensures pollination for native plant beds, vegetable crops, and fruiting trees and shrubs.

6.1.5. Zone 4

Forest and Non-Timber Forestry Products

This area includes planted windbreaks and native tree and shrub vegetation, as well as existing treed areas on the site. This site will be sustainably harvested to mitigate against forest fires. It will also be used as forage for livestock and to grow and harvest non-timber forestry products.

6.1.6. Zone 5

Crown land

This area will be used for wildlife habitat, hunting and foraging, and as a reference site to assist with monitoring and evaluation of restoration activities. Some restoration activities may occur in designated areas, such as restoring wild rice stocks.



6.2. Strategies and Permaculture Principles

Passive Solar Gains (Catch and Store Energy)

The house is set with the northside close to the treeline for protection and insulation from the north while its south side is approximately 60 feet from the treeline for solar gain.

The greenhouse will be facing south to achieve solar gains while the seed bank will be located on the north side.

Water catchment (Catch and Store Energy; Integrate, Don't Segregate)

Swales are built into the landscape to assist with drainage and water capture. The swales will slow the movement of water through the orchard guild and eventually collect in two separate retention ponds that will be used to hold water for field irrigation as well as a drinking source for livestock and habitat for wildlife. The sauna is located on the edge of the southern pond which will be jointly used as a swimming hole or cold plunge.

Rainwater catchments will be incorporated into every building on the property to use for drinking and washing water, as well as irrigation for zone 0 and zone 1 plants.

Composting (Produce No Waste; Use and Value Renewables)

Several composting systems will be used on the farm. First, compost toilets will be used and have their own designated compost area, with three piles used in rotation as humanure is collected and broken down. Second, food scraps will be fed to livestock, while meat products and other organic material that cannot be used as food will be added to a hot composting system. Excess manure from livestock bedding will also be added to the hot composting system. Once broken down, all compost will be used on vegetable and broadacre crops, as well as the orchard in an annual or bi-annual application. Compost will also be used in seed starting and excess can be sold locally.

Animal-Crop Integration (Integrate, Don't Segregate; Use Edges and Value the Marginal)

The bird coop is located near the southern orchard, where they will be allowed to forage. This will help with pest management while simultaneously fertilizing the plants. Similarly, the larger livestock shelter is located near the house with access to southern pasture, with a path that leads to the northern retention pond and orchard. The livestock will be used to graze areas to help with weed suppression and rejuvenation of prairie vegetation, as well as to fertilize crops. Beehives are located at the corner of the perennial and broadacre fields, just south of the northern orchard. They are situated to benefit from the diverse food sources as well as to pollinate crops across the site. The hive location is also sheltered from northern winds by the orchard.

Planting Guilds (Use Edges and Value the Marginal; Integrate, Don't Segregate; Obtain a Yield)

Planting guilds are used to maximize the yield obtained, to integrate different plants in ways that are supportive to one another, and to maximize the ecological benefits from edge effects. To maximize on using edges, the orchard will be planted as a guild along the swale system. This will allow for better irrigation, as well as nutrient build up as livestock is allowed to forage between the rows. The goal of the orchard is to diversify the different fruits and nuts that are

produced with as minimal input as possible. The following plant list will be used for the planting plan, with additional functions noted:

Layer 1- medium and large trees

- Apple- cold heart cultivars
- Pear- cold-hearty cultivars
- Crabapple- native and cultivars
- Apricot- cold-hearty cultivars
- Cherries- sour cherry cultivars
- Plum- native and cultivars
- Hawthorn- native and cultivar
- Butternut- native Ontario variety
- Seabuckthorn- cultivar, acts as nitrogen fixer

Layer 2- small trees and fruit shrubs

- Cranberry- native and cultivars
- Saskatoon- native and cultivars
- Aronia- cultivars
- Elderberry- cultivars
- Hazelnut- cultivar (native will be planted in Zone 4)
- Currants- native and cultivars
- Gooseberry- cultivar
- Goji- cultivar
- Haskap- cultivar
- Raspberries- cultivar (natives located in Zone 4)

Layer 3- edible perennials (cultivar unless indicated)

- Rhubarb
- Lingonberry
- strawberries
- Asparagus
- Sunchokes- helps break up compacted soil
- Sorrel
- Horseradish
- Egyptian "Walking" onions
- Welsh onion
- Lovage
- Chicory
- Tarragon
- Thyme
- Borage- reseeding annual, attracts pollinators
- Chives- repel insects, anti-fungal, attracts pollinators, cut flower
- Yarrow (*Achillea millefolium*)- native, smother weeds, repel insects, medicinal, fix nitrogen, cut flower
- Bee balm (*Mondarda fistulosa*)- native, repel insects, ground cover, medicinal, attract pollinators, cut flower
- Lemon balm (*Melissa officinalis*)- medicinal, tea, ground cover,
- White clover (*Trifolium repens*)- nitrogen fixing, pollinator attractor, ground cover
- Comfrey (*Cynoglossum virginianum*)- medicinal, fixes nutrients, beneficial insects

- Hyssop (*Agastache foeniculum*)- native, medicinal, attract pollinator, builds soil cut flower
- Chamomile- reseeding, anti-fungal, medicinal, ground cover, pollination, cut flower
- Stinging nettle (*Urtica dioica*)- shade tolerant, moist soil, high iron, edible, medicinal, soil builder tolerates moist conditions (ideal for bottom of swales)
- Wild mint (*Mentha arvensis villosa*)- native, spreads by root system, ground cover, tea/medicinal, pollinators, tolerates moist conditions so ideal for bottom of swales

Layer 4- vines

- Grapes- native and cultivars
- Arctic Kiwi- cultivar
- Hops- various cultivar
- American groundnut (*Apios americana*)- native or cultivar, nitrogen fixing

Pollination & Soil Building Plants

- Goldenrod (*Solidago*) (all native varieties)- native, late season pollination, medicinal. Flat top (*Euthamia graminifolia*) tolerates wet conditions (ideal for bottom of swales)
- Meadow or dotted blazing star (*Liatris ligulistylis* or *Liatris punctata*)- native, deep root systems, pollinator attractants
- Smooth (*Symphotrichum laeve*) or New England aster (*Symphotrichum novae-angliae*)- native, important late summer/fall pollinator food source.
- Marsh marigold (*Caltha palustris*)- native, tolerates moist to wet conditions (bottom of swales). Blooms early for pollinator food, used medicinally by First Nations peoples
- Dandelion- early pollinator food, builds nutrients, edible/medicinal, helps break up compacted clay
- Joe Pye Weed (*Eutrochium purpureum*)- pollinator plant, medicinal properties
- Culver's Root (*Veronicastrum virginicum*)- pollinator plant, medicinal uses
- Swamp Milkweed (*Aclepias incarnata*)- important food source for monarch caterpillars
- Switchgrass- (*Panicum virgatum*)- versatile growing conditions, host for skippers and seed or birds
- Tufted hairgrass (*Deschampsia caespitosa*)- medium to wet conditions, soil building
- Big Bluestem (*Andropogon gerardii*)- versatile growing conditions, soil building
- Blue vervain (*Verbena hastata*)- long blooming for pollinators, medicinal properties
- Iris (*Iris versicolor*)- water-loving, nectar for hummingbirds
- Helenium (*Helenium autumnale*)- pollinator plant



- Ironweed (*Vernonia fasciculata*)- Rare native plant, pollinator plant, host or painted lady butterfly caterpillars.

Other Nitrogen fixers:

- Russian olive (*Elaeagnus angustifolia*)
- Silverberry (*Elaeagnus commutate*)- native
- Dwarf false indigo (*Amorpha nana*)- native
- Indigo bush (*Amorpha fruticose*)- native
- Canada milkvetch (*Astragalus canadensis*)- native
- Red clover (*Trifolium pratens*)
 - **Native alternative:** Purple prairie clover (*Dalea purpurea*)
- White clover (*Trifolium repens*)
 - **Native alternative:** White prairie clover (*Dalea candida*)

6.3. Implementation Plan

Year 1: Learn the Land (*Permaculture Principle 1. Observe and Interact*)

- I. Conduct Site Analysis using Ecosystem Restoration Camp Monitoring and Evaluation Guidelines
 - a. Integrate these activities into workshops
- II. Seed Bank Collection
 - a. Begin to gather, document, and organize seeds
- III. Organize workshops to collect more data while offering opportunities for education
 - a. Plant identification guide
 - b. ERC Sampling day: conducting site samples
 - c. Medicinal and Edible Wild Plant workshops
 - d. Contouring: Learning tools to identify contours and elevations on the land to plan for swales
 - e. Site preparation
 - i. Mark out and identify areas for future sites
 - ii. Planting native and edible perennial plant species
 - f. Fundraise for infrastructure projects
 - g. Annual review of progress and activities

Year 2:

- I. Monitoring and Evaluation (year 2)
- II. Site building and preparation (as workshops and community events):
 - a. Planting native and edible perennial plant species
 - b. Construct outdoor kitchen
 - c. Construct composting toilets
 - d. Design and plan outdoor classroom and medicine garden
 - e. Install seed bank
 - f. Construct hoop house
 - g. Fundraise for infrastructure projects
 - h. Develop camp policies and decision-making processes
 - i. Annual review of progress and activities

Year 3:

- I. Monitoring and Evaluation (year 3)
- II. Site building and preparation (as workshops and community events):
 - a. Build shelter and fencing for livestock implementation
 - b. Construct outdoor shower facilities and rainwater collection

- c. Fundraise for infrastructure
- d. Prepare kitchen garden- include fencing
- e. Prepare and plant perennial beds for native seed crops
- f. Get livestock
- g. Annual review of progress and activities

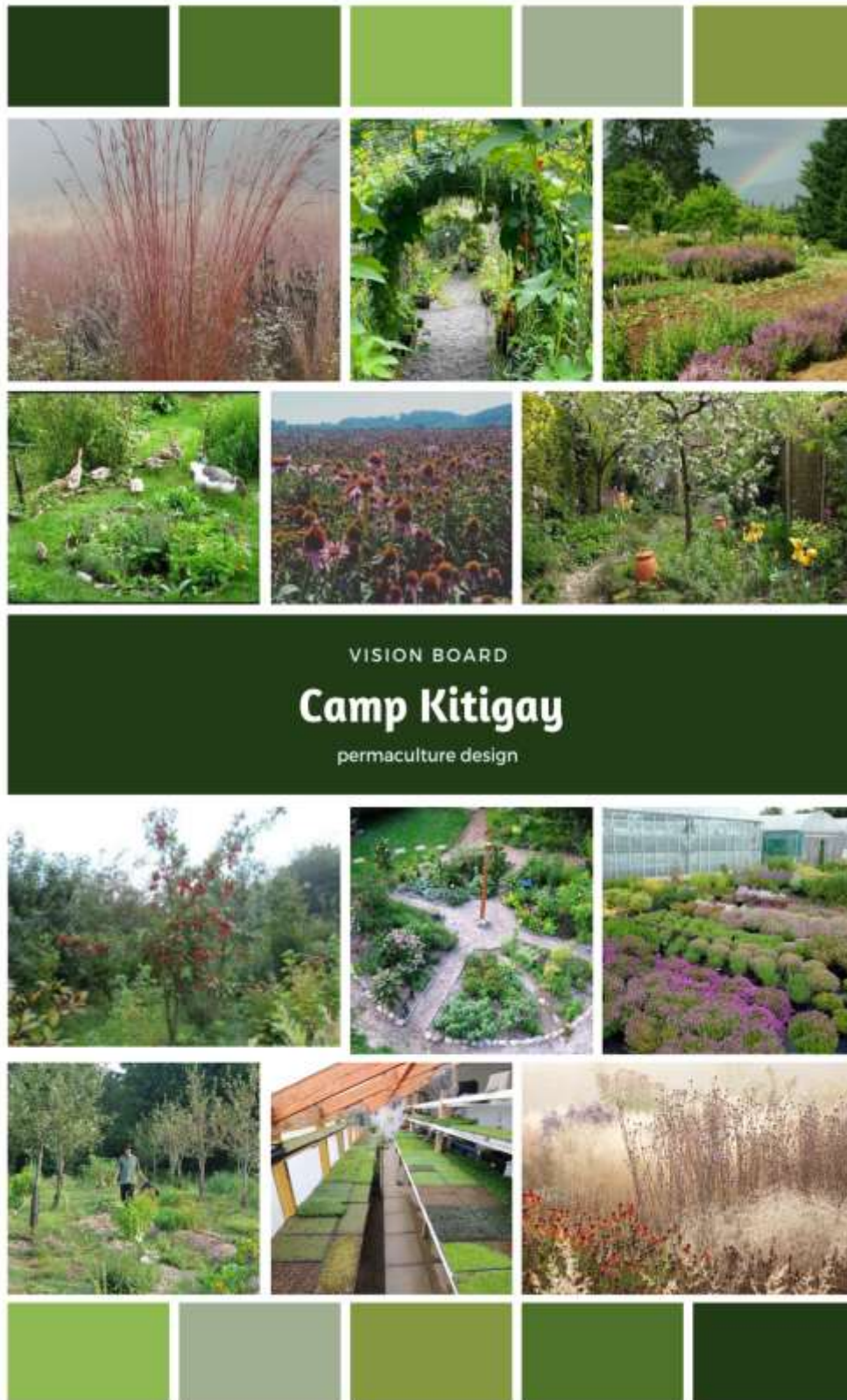
Year 4:

- I. Monitoring and Evaluation (year 4)
- II. Site building and preparation (as workshops and community events):
 - a. Southern swale and berm construction
 - b. Construct shed/workshop
 - c. Plant kitchen garden
 - d. Dig southern retention pond
 - e. Continue planting southern orchard
 - f. Fundraise for infrastructure
 - g. Build outdoor classroom and plant medicine garden
 - h. Annual review of progress and activities

Year 5:

- I. Monitoring and Evaluation (year 4)
- II. Site building and preparation (as workshops and community events):
 - a. Fundraise for house and passive solar greenhouse
 - b. Build additional livestock shelter and fencing
 - c. Dig northern retention pond, swales, and berms
 - d. Plant northern orchard guild
 - e. Get bees
 - f. Build sauna
 - g. Begin design for house
 - h. Begin design for passive solar greenhouse
 - i. Annual review of progress and activities
 - j. Review policies, re-evaluate and plan next 5 years.

7. Vision Board



8. References

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