PERMACULTURE
DESIGN COURSE

Project: Skagit River

Designer: Shanna Mahan

Site Location

48º29'17"N 121º 32'07"W

55685 Martin Ranch Road
Rockport, WA, USA

Elevation: 78m

Name: Shanna Mahan
Age: 40
Educational background: BA- Elementary Education/Human Development
BFA- Illustration

How did you hear about permaculture?: I was gifted a book on Permaculture for my birthday which spawned a, hopefully, endless educational quest.

What is your background in gardening/farming/design?: I grew up on 9 rural acres, grandparents kept gardens, I have tended many gardens and most recently I worked at tree nursery.

How do you want to integrate permaculture into your life? (Highlight all that apply)

I'm always curious.
I want to use it for personal design/installation.
I want to become a designer/installer.
I want to incorporate it into my existing work?
-If so, what do you do?: Currently I am tending to a 40 acre parcel in the rural Western Cascades
I want to learn about permaculture for a change in career.
If so, what?: I would like to help others design more sustainable & self-reliant food production systems.

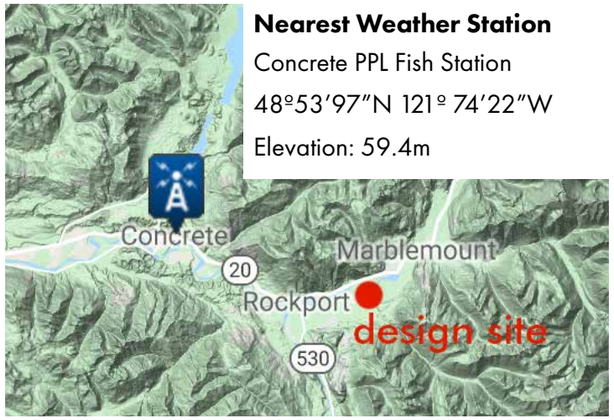
What are your goals for the course?: I would like to create a implementable design for the 40 acres to which I am currently tending.

What's success look like for you when the course ends? What will you know? What are you capable of? At the end of the course I would like to have built up a working knowledge of soil, water, plant and energy s ystems to design sustainable landscapes that support the earth and the creatures living upon it.

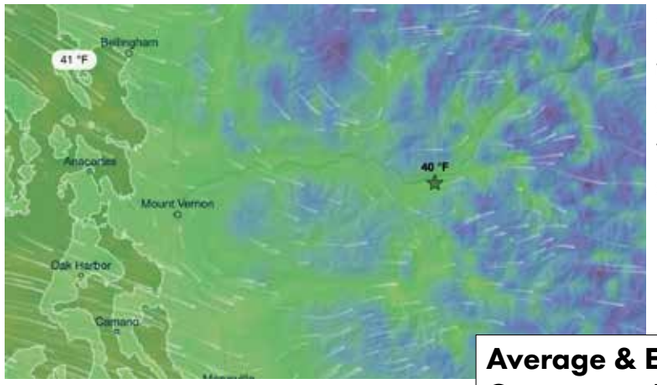
What level of interaction do you want to have with the course?: (Highlight one which applies)

Master – completing all assignments, responding to feedback, and earning my certificate

What are your expectations of this course? I expect the assignments to be relevant and cumulatively challenging, progressing towards a finished site design. I hope that the reading materials will be educationally approachable while directing towards avenues of further self- enrichment.



Nearest Weather Station
Concrete PPL Fish Station
48º53'97"N 121º 74'22"W
Elevation: 59.4m



Site is at a lower elevation along Skagit River Valley, allowing for milder temperatures, similar to those seen along coastal areas, than the sites that share a similar longitude. The valley location, paired with the cleared vegetation, create strong wind shears that blow across the site.

Site indicated with star. Graphic from Ventusky site.

02-Climate Survey
Project: Skagit River
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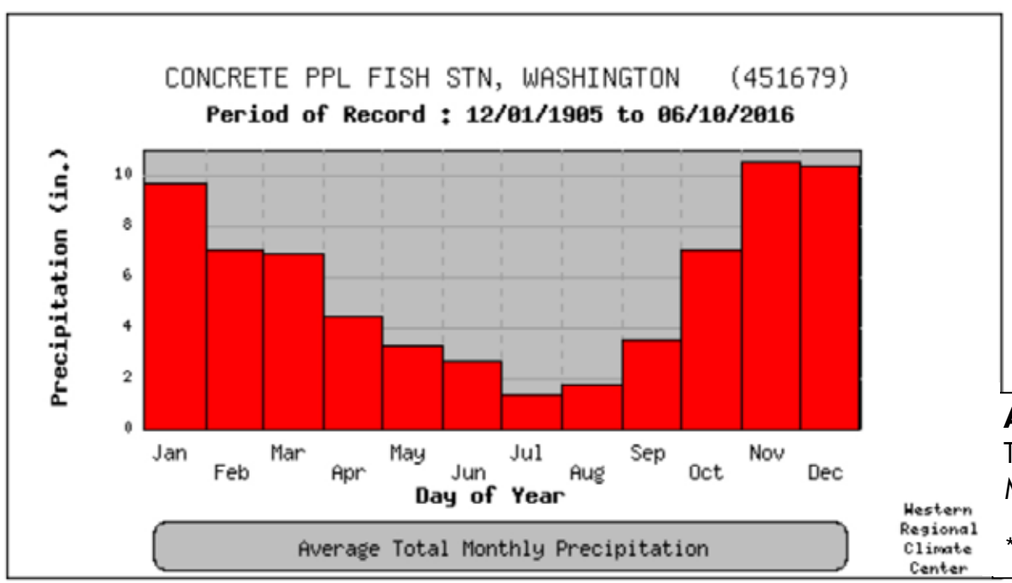
Concrete, WA (Skagit county):

Temperature	10%	20%	30%	40%	50%	60%	70%	80%	90%
Spring 32°	Apr 29	Apr 22	Apr 16	Apr 12	Apr 8	Apr 3	Mar 30	Mar 24	Mar 17
Spring 28°	Mar 20	Mar 9	Mar 2	Feb 23	Feb 17	Feb 11	Feb 5	Jan 28	Jan 18
Spring 24°	Mar 1	Feb 20	Feb 14	Feb 8	Feb 3	Jan 28	Jan 22	Jan 14	Dec 31
Fall 32°	Oct 14	Oct 23	Oct 30	Nov 3	Nov 8	Nov 14	Nov 19	Nov 26	Dec 6
Fall 28°	Nov 2	Nov 11	Nov 18	Nov 24	Dec 1	Dec 6	Dec 12	Dec 19	Dec 28
Fall 24°	Nov 20	Dec 2	Dec 9	Dec 16	Dec 22	Dec 28	Jan 4	Jan 13	Jan 30

On average the first and last frost dates are November 8th and April 8th, but with the support of probability annual agriculture can run from the second week of April to the second week of November. Making the growing season about 214 days long.

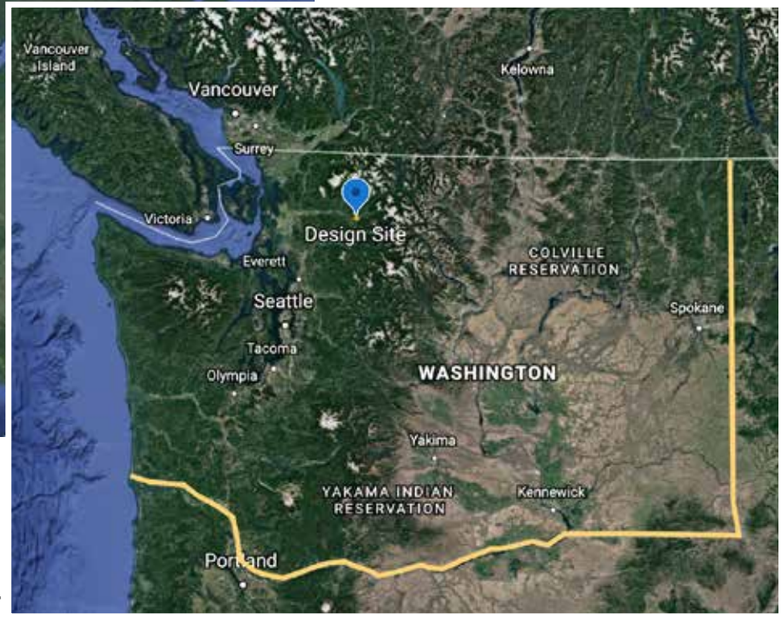


Average & Extreme Monthly Temperatures
On average, January has the coolest temperatures and August has the warmest.
The average overall temperature hovers around 50ºF.
Since the weather does sometimes dip into the teens this site is considered to be in a USDA Hardiness Zone 8.

	Monthly Averages			Daily Extremes				Monthly Extremes				Max. Temp.		Min. Temp.	
	Max.	Min.	Mean	High	Date	Low	Date	Highest Mean	Year	Lowest Mean	Year	>= 90 F	<= 32 F	<= 32 F	<= 0 F
	F	F	F	F	dd/yyyy or yyyymmdd	F	dd/yyyy or yyyymmdd	F	-	F	-	# Days	# Days	# Days	# Days
January	41.7	31.1	36.4	65	31/1940	-1	14/1907	43.0	2003	22.5	1950	0.0	2.2	15.1	0.0
February	47.2	32.8	40.0	74	28/1938	1	01/1950	47.1	1941	30.1	1936	0.0	0.4	12.1	0.0
March	53.0	35.2	44.1	82	20/1915	11	04/1955	52.9	1941	38.5	1955	0.0	0.0	8.4	0.0
April	60.2	39.3	49.8	93	23/1910	25	01/1935	56.4	1934	44.0	2011	0.0	0.0	2.2	0.0
May	66.8	44.6	55.7	96	18/1958	29	01/1915	64.2	1958	50.7	1974	0.3	0.0	0.1	0.0
June	70.8	49.4	60.1	106	25/1925	35	09/1915	69.8	1958	55.0	1981	0.4	0.0	0.0	0.0
July	76.7	52.2	64.4	102	12/1951	38	30/1953	72.9	1958	60.5	2011	1.8	0.0	0.0	0.0
August	76.9	52.6	64.7	102	20/1915	31	24/1910	69.0	1967	60.7	1975	1.4	0.0	0.0	0.0
September	71.1	49.0	60.0	102	05/1944	30	23/1926	64.7	1943	55.9	1906	0.4	0.0	0.0	0.0
October	60.7	43.3	52.0	87	04/1909	10	24/1906	58.9	1944	47.1	1906	0.0	0.0	0.8	0.0
November	49.0	37.1	43.0	77	03/1949	7	14/1955	50.9	1949	32.8	1985	0.0	0.3	6.1	0.0
December	42.9	33.1	38.0	63	02/1941	0	16/1964	44.0	1939	31.1	1990	0.0	1.1	12.7	0.0
Annual	59.7	41.6	50.7	106	19250625	-1	19070114	54.3	1941	48.2	1985	4.5	4.1	57.6	0.1

Average & Extreme Monthly Precipitation
The average annual total precipitation, as rainfall for the area is 68 inches, with most of it falling from November to March. On average 25 inches of snow falls during the winter months.

*Data Gathered from Station:(451679) CONCRETE PPL FISH STN approximately 10 miles away.

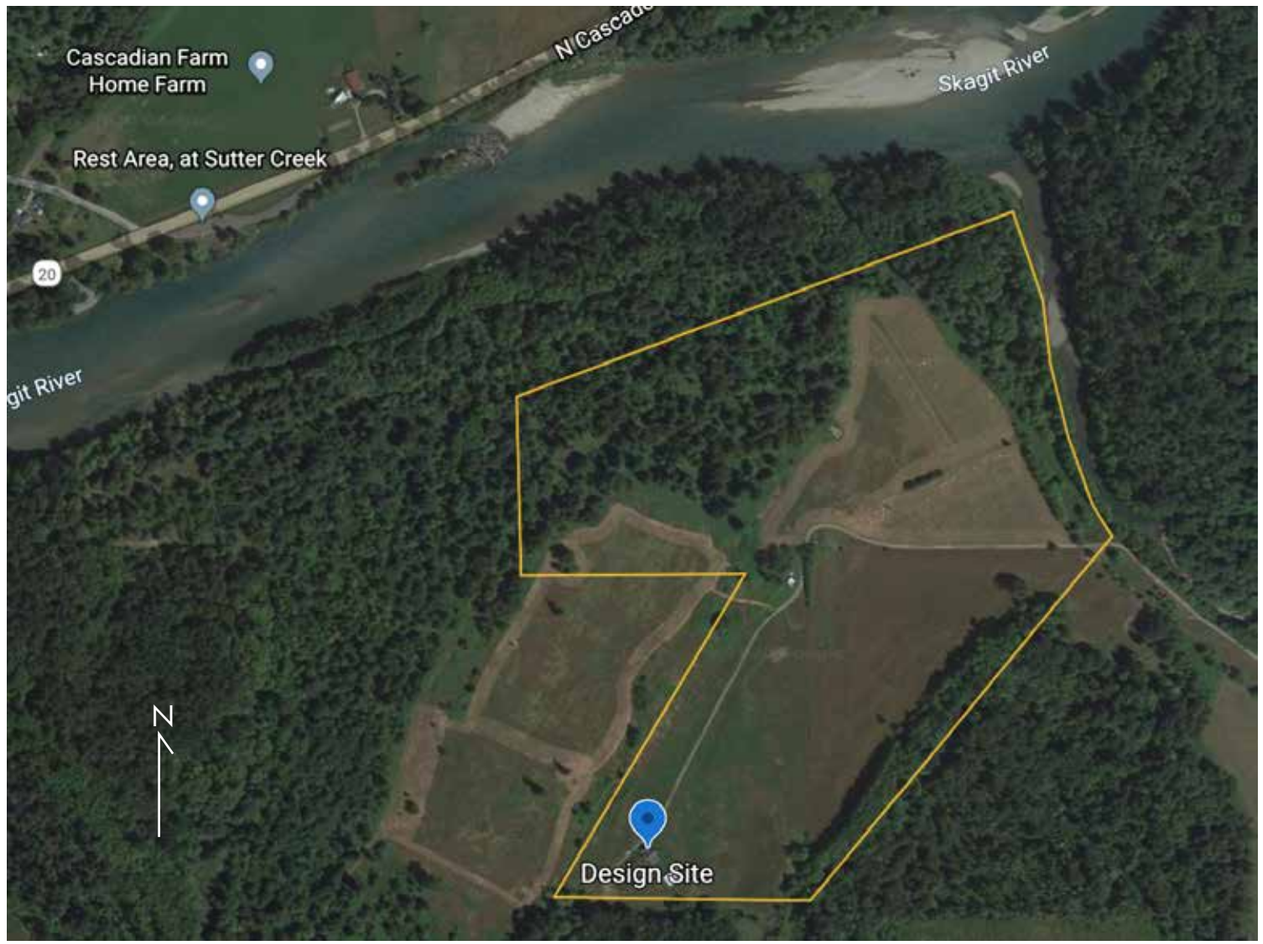


Location: This site is situated along the valley of the Skagit River in Northwestern Washington State, between the postal service recognized towns of Rockport and Marblemount. This site is bordered by the the Seattle City Lights, The Nature Conservancy, Corporate Timber land and some property of the Department of Natural Resources. Across the river is the site of the original Cascadian Farm, a company known as a major distributor of organic produce. The site is quite rural requiring a 2 mile drive to access from Martin Ranch Road, thus the postal service does not deliver mail.

Characteristics: Overall the site is leveled with a few minor altitude variations ((less that 3m). Recently this site was used for horse pasture and some of the fields are still currently tended for animal grain agriculture. The edges are bordered with large cedar forests. There is the beginnings of wetland and forest restoration on the property, implemented With the help of the Nature Conservancy and Seattle City Light. The two biggest obstacles to these projects are blackberry bush tenacity and elk foraging.
Since it occupies such a low altitude and is along the river valley, the weather falls within the zone 8 (winter temperatures not often below 10ºF). The valley also creates strong winds that tear cross the open fields, often strong enough to move furniture and objects left outside.
The wildlife is fairly abundant with sightings of elk herds, red-tailed hawks, geese, crows, moles, voles, squirrels, owls, coyotes and bald eagles (during their winter nesting) fairly common.

Utilities: The water is provided by a ground-water sourced well. Sewage is stored in a septic system. Heating for the main house is powered by both a propane furnace and a wood stove. Although this site is hooked up to the power grid, the owners of the property have installed two solar panels that provide the needed electricity for the property, allowing them to sell the surplus back into the system. A back-up generator (run on propane) allows for continued electricity during power-outages.

Misc.: There is a 25x8 un-heated domed greenhouse on site. There is also a poultry pen containing 4 geese, 5 ducks, 2 turkeys and 7 chickens.



03-Design Site

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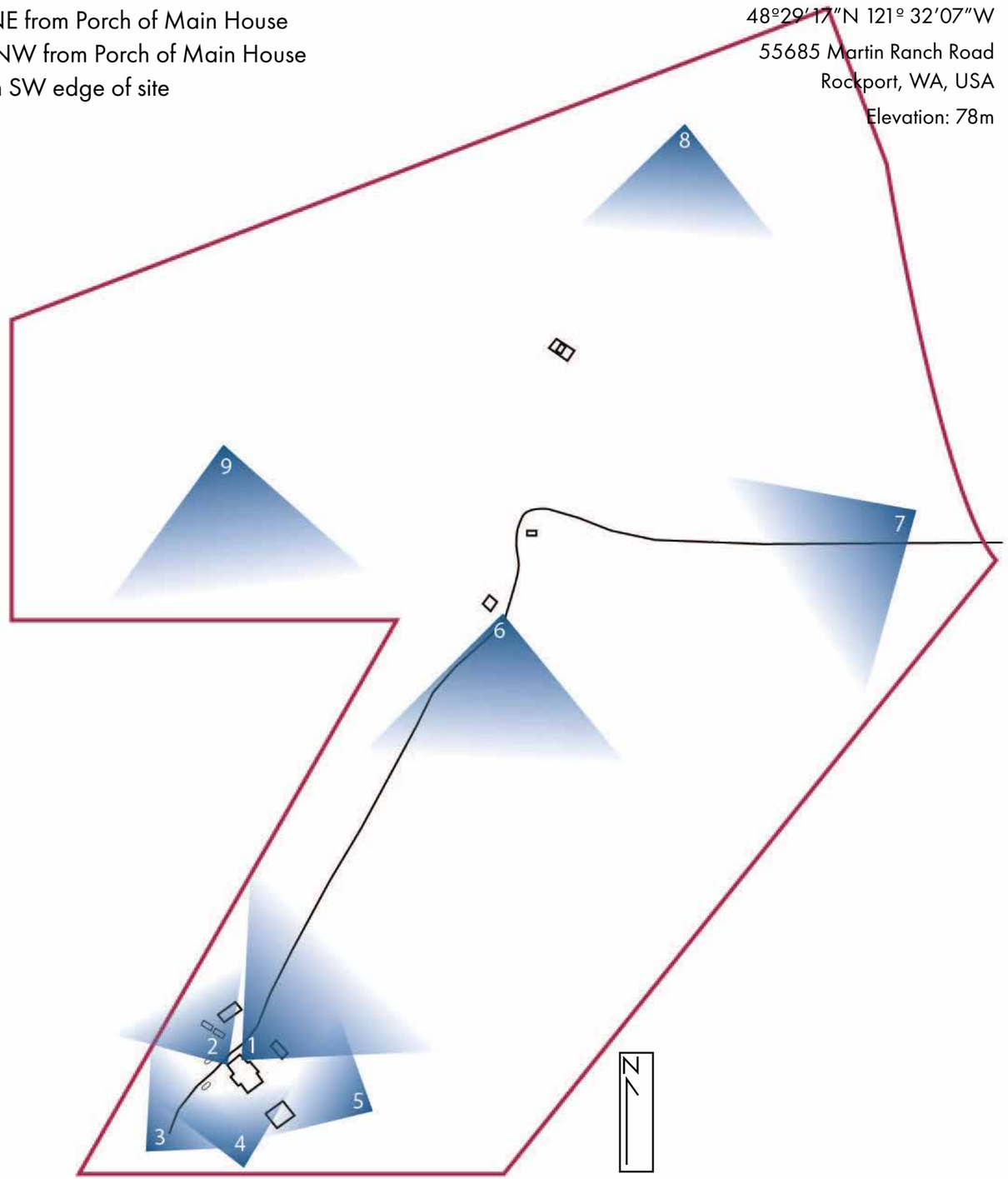
1-Facing NE from Porch of Main House

2- Facing NW from Porch of Main House

3- NE from SW edge of site



4-Facing NW from southern edge of site
5- Facing W from SE edge of site
6- Facing S and towards Main House from middle of site

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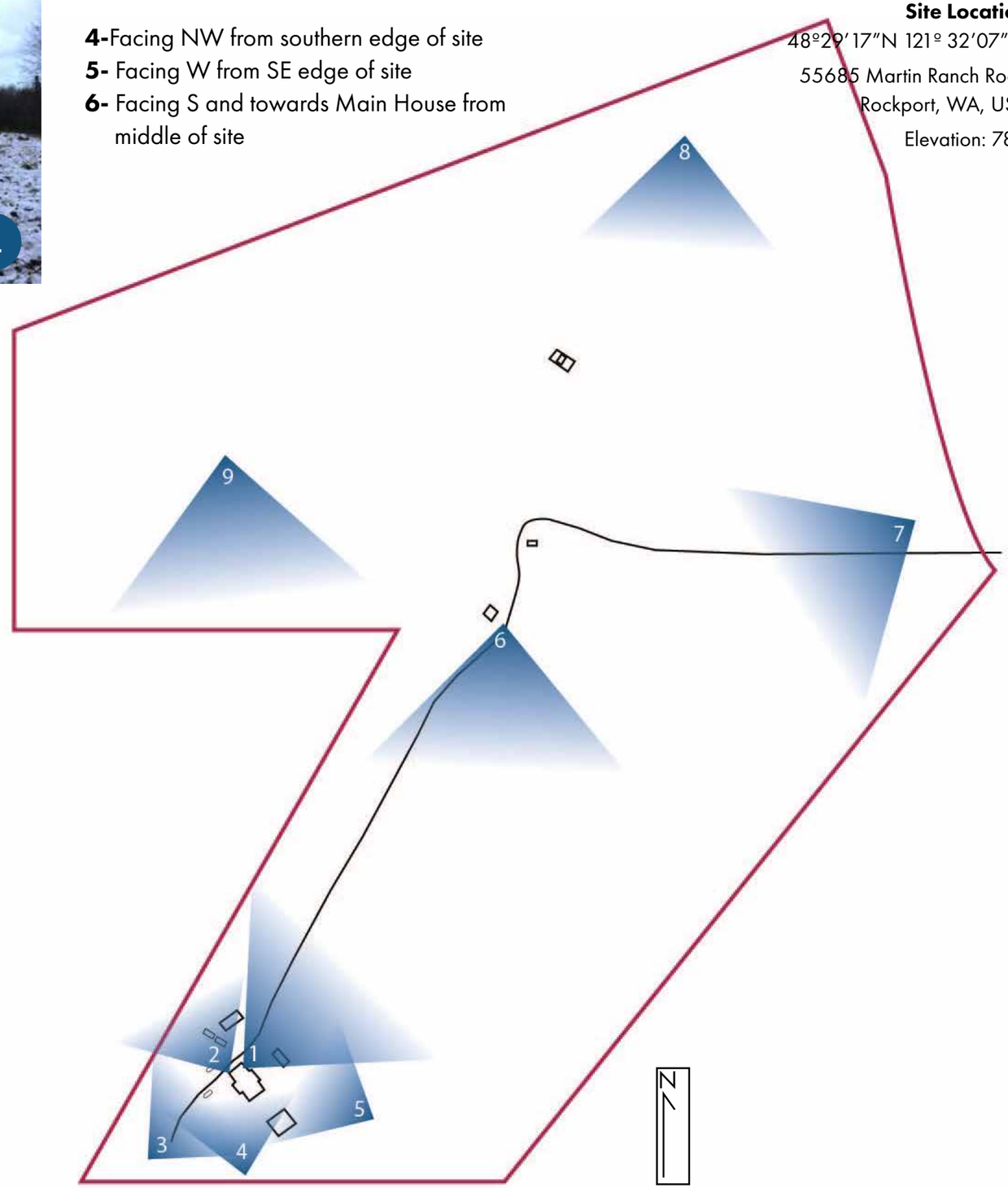

7-Facing SW from NE edge of site
8- Facing S from Northern edge of site
9- Facing S and towards Main House Western edge of site

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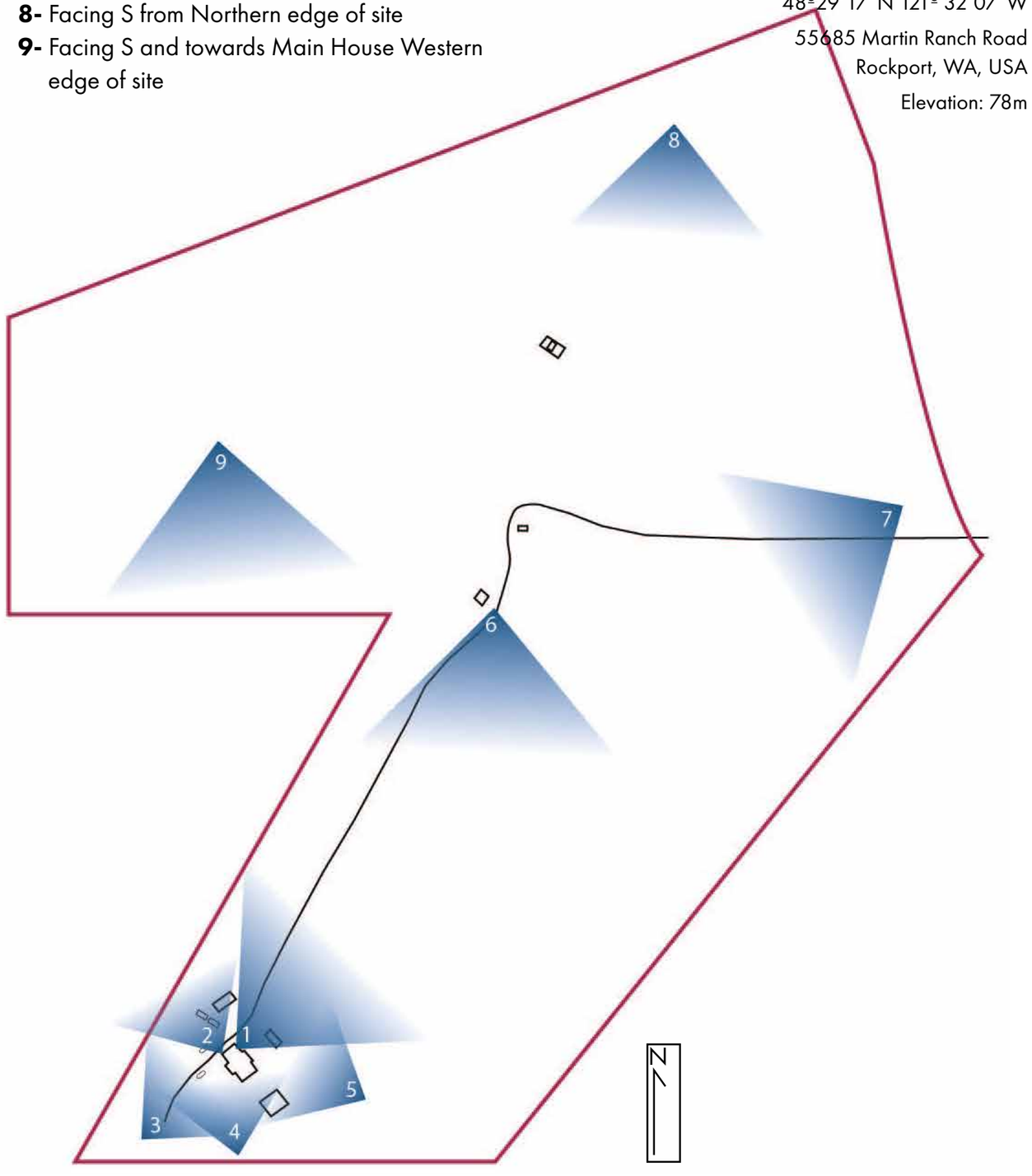

LEGEND

Site Border

Road

Electricity

Above Ground

Below Ground

Solar Panel

Electrical Box

Generator

Built Structures

1- Main House

2- 2 Freight Container Storage

3-Greenhouse

4- 3 Stall Pole Barn with Poultry Coop

Poultry Run

5- 2 sided Wooden Structure With Poured Foundation

6-Tiny Cabin on Cement Pad

Water

Well House

Water Lines

River

Seasonal Wetlands

Rain Water Run-off Direction

Septic

Tank Covers

Leech Field

Propane

Tank

Lines

Landscape

Established Trees/Shrubs

Restoration Sites with Saplings

Blackberry Brambles

Attempted Orchard

04-Base Map

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SITE RESOURCES INVENTORY

	EXISTING	DESIRED
WATER SYSTEMS	Well House that draws upon ground water and supplies water to the main house. All irrigation and outside water access is with spigot & hoses.	Any additional small dwellings will have rain collection systems in place.
LIGHTING	Porch Lighting, additional outdoor work lighting run to outbuildigns via extension cords	Any additional small dwellings will need solar panels and batteries for lighting inside. Desired shop/garage will have lighting.
STRUCTURES	Main home (2800 square foot), Barn with coop and attached poultry run, greenhouse, Small 2 sided out building, one mini cabin on concrete slab, two box containers with covering over them for wood and equipment storage, well house	Several small dwellings for community and one big garage shop
HVAC & ELECTRICITY	Propane is used for main house heating and generator running for power outage. Solar panels supply electricity.	Solar panels and heating (woodstove) for any additional structures. Owner would like to eventually have back-up generator run on stored solar power. Automatic greenhouse heating & cooling would be optimal.
UTILITY AREAS	Clothes line, in place. 1/3 of poultry barn is storage and there are two storage containers that hold most of the equipment for the site.	A shop/garage for machinery and any site construction/maintenance that needs to be done.
CHILDREN'S AREAS	Southern yard of house is grass covered, but their is no designated are for children's use.	Client is speaking with architect about the main house configuration.
LEVEL OF FOOD SELF-RELIANCE	There are a few producting peach & apple trees and raspberry bushes in the backyard, The owner has planted an orchard with apples, cherries, olives and pear trees, but has not maintained the saplings and they were destroyed by elk.	Owner would like to see raised beds for annual vegetable production, herbs and orchards.
INCOME FROM PROPERTY	none	Eventually selling products from the propertyi.e. Eggs, organic bug spray, and homemade soaps
WASTE MANAGEMENT	3 bin compost system with 2 tumblers are active. Recycling and trash are taken to the county way-station. Sanitation is a septic system with leech field.	A dry compost toilets and shower facilities will be needed for any additional small dwelling inhabitants.
LIVESTOCK & PETS	4 dogs, 1 cat, 7 chickens, 5 ducks, 4 geese and 2 heritage turkeys	The owner will probably continue to maintain the poultry for eggs, but does not envision any additional livestock, or pets.
WILDLIFE ENHANCEMENT	established forest perimeter on the property, ongoing restoration through the Skagit River Systems Co-Operative.	continued restoration of the native habitat.
WOOD LOT	none in existance	client did not express an interest in a woodlot
VEHICLES & MACHINERY	tractor, chainsaw, zero-turn mower, truck and 2 suv, some woodworking equipement	The owner does not plan to get any additional equipment for the site.

CLIENT PROFILE

05-Client Interview

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Client & Property Owners Names and Ages:
Matt-50, Kira-36, Maeve-16, Boone-11, Wyatt- 2

Occupations: Retired

Your relationship to the clients:
Currently housesitting and tending to the site and animals while the owners are living and raising their children in Portland.

Amount of time available for maintaining property:
Client does not currently live at the property, so has little time for maintenance, but has hired people to maintain it in the intrim.

Initial Budget for implementation:
Since the clients' main focus is on their residence in Portland, there will be little money available for any large project implementation.

Who has the ability to make veto decisions for the site?
Owners have full decision making ability for the property.

What are your visions for the site?
The client envisions a mostly self-sustaining (except for propane) communal property with food production, while concurrently working with the co-op -Skagit River Systems- to rehabilitate the native ecosystem.

General Lifestyle and hobbies:
The client enjoys taking lots of nature walks, birdwatching, building, gardening and yard maintenance (blackberry destruction).

Special requirements for the site:
The client would like to revitalize the native ecosystem and harmonize their wishes/needs with those of their animal neighbors.

How long do residents plan to live at this site?
Once the clients' obligations are finished in Portland they will return to this site to live here for the rest of their lives.

SUMMARY

What is the client's vision for the site?
The client eventually envisions a site that is in harmony with the natural surroundings while providing income and accommodations for additional visitors/residents. Ideally they would like to have a few acres close to the house for food production with the remainder of the property undergoing gradual rehabilitation to support the native ecosystem. There are some daydreamings about additional small dwellings and a shop/garage.

What are the challenges or limitations that you have encountered on this site?
So far the client has run into the issue of time available to maintain the site (with the ever encroaching blackberry brambles), and is limited in their knowledge on how to create an environment to grown edibles (with soil building, pest detering, plant selection and general horticultural maintenance being the biggest issues). There is also a large population of elk that roam the surrounding fields, while great for viewing they do take their share of the foliage- stripping the orchard saplings that were planted.

What are your goals as the designer for this project?
I would like to design & establish the majority of the zone 1 garden beds and set up the food production system, so that when the clients return they can ease into a streamlined food production system, with established trees and an herbal medicinal garden. I would also like to plan in the sites for future buildings and establish a nature forward children's play area, as their youngest child is only 2 and has many years to enjoy it. I would also like to design in a plan for a integrated copiced woodlot as the additional dwellings may be heated by woodstoves

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WHAT ARE THE THREE BIGGEST CULTURAL / SOCIAL / ECONOMIC CHALLENGES IN YOUR REGION

CULTURAL- Aquisition and destruction of native livelyhoods and lands. Between 1854-55 in a series of agreements, tribes in Washington State gave up millions of acres of land in exchange for "the right to take fish." Beginning in the 1970s, Washington State, sought to control where Native Americans could fish. Tribal members through civil disobediance and litigation asserted their treaty rights. To add to the growing animosity Judge Boldt's decision was that treaty Indians are entitled to 50% of each harvestable fish run. This may have been well and fine, but salmon numbers have been on a decline since 1985. Although Federal courts recently ordered Washington, by 2030, to fix most of culverts that block the passage of salmon to their spawning grounds, thus depleting their numbers, commercial interest groups, such as real estate, home building, and agriculture argue that these rulings infringe on states' rights to decide how to use their land. Sadly enough, removing the culverts may not save the Swinomish's traditional way of life — intensive agriculture, timber practices and climate change are also depleting salmon stocks

SOCIAL- The funding for education has been all over the news with countless schools in the counties voting on levies from parents to pay for programing. Since the majorities of schools in the Upper Skagit region (where this design site is located), are in the rural setting they depend a great deal on timber revenue to cover their tax base for education. Ex: (Concrete School District brought in about $309,000 in timber money between May 2018 and December 2018). With the conservation effort put forth by the Department of Natural Resources to restore the loss of forest habitat of the marbled murrelet, which is listed as threatened under the federal Endangered Species Act and the 2015-2024 sustainable harvest calculation, which dictates how much timber can be taken, the timber revenue in Concrete School districts alone dropped to $12,688 for the whole 2019 school year. Since the schools depends so heavily on timber funding they have filed a lawsuit asserting both the sustainable harvest calculation and the marbled murrelet conservation plan violate Natural Resources' responsibility to support timber beneficiaries, thus pitting environmental action versus education.

ECONOMIC- The main economic areas in the county are agriculture, dairy, fishing, logging and mining. The fact is these are majority, blue-collar labor jobs, making the median income for the county around $55k. This economic reality paired with Skagit County as one of the fastest growing counties in the state, with new developments in Anacortes and west of Mount Vernon (essentially the ever expanding I-5 / Seattle suburb corridor) is a slippery slope. So what does the arrival of golf-course communities and homes above the $300,000 range mean? It could mean smaller family farmland being sold to developers (since 9 out of 10 farm couples depend on off-farm income to keep their farms going), more deforestation and habitat destruction for box-store laden, car-dependent infastructure and the economic reality that the now working class of Skagit County will have temporary real-estate development jobs, then transition over to a lower waged, hourly-paid service based economy to serve the country-gentleman elite.

WHAT ARE THE GREATEST STRENGTHS OR OPPORTUNITIES IN YOUR REGION?

I believe the greatest strength of this area is its abundance of natural resources (fresh water, clean air, carbon sequestration, and a mild climate for growing). I think these resources, paired with a strong community education component, and moderated development, can present an opportunity for this area to be a role model for a sustainable lifestyle. The efforts to reclaim the land for the wild (through the re-assesment of the quantity needed to support humans via sustainable agriculture, and development of varied green energies industries), need not be at odds with economic solvency.

WHAT ARE THE THREE BIGGEST PROBLEMS OR WEAK LINKS ON YOUR DESIGN SITE?

So far the issues are site maintenance, poor & acidic soil conditions due to 40 years of grazing and the lack of accessability to community resources.

WHAT HAVE BEEN THE OBSTACLES THUS FAR IN RESOLVING EACH OF THESE PROBLEMS?

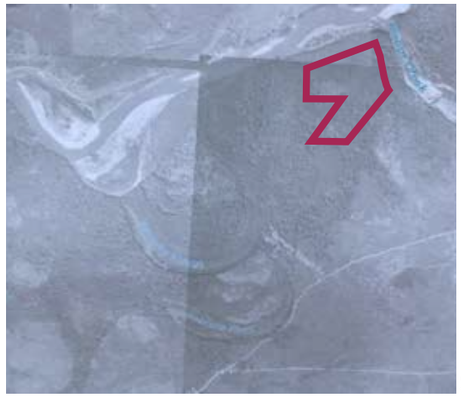
The owners are not here to maintain site and the parts re-planted by the co-op are being over run by blackberries.
The Soil - The owners have not gotten a soil test done. The nearest testing site is 40 miles away in Burlington. Local companies that provide large quanities of compost, soil, or amendments will not deliver.
Accessability- is what it is. This site is pretty rural and since I am not the owner I am not comfortable inviting the community on to the property.

WHAT'S BEEN THE COST OF THESE PROBLEMS TO DATE?

This land was cleared between 1965-1972 to make way for pastures. This continual use for grazing has stripped alot of the land costing: fertility, wildlife and biodiversity. The lack of maintenance on the on-site restoration projects have cost money and time (ie. the orchard area with saplings overrun by blackberries and elk).

WHAT ARE THE GREATEST STRENGTHS OR OPPORTUNITIES ON YOUR SITE?

Hands down the climate & water accessability are the greatest strengths. The large volume of space presents an opportunity for meaningful ecological habitat re-building.



Site 1944

Site 1972

WHAT ARE THE MOST LIKELY NATURAL DISASTERS TO HAPPEN IN YOUR REGION?

Flood, Landslide and wildfires.

WHAT ARE SOME STRATEGIES FOR RESILIENCE AGAINST THOSE NATURAL DISASTERS?

The restoration of the wild spaces.
The maintenance of:
-forest (removing ladders and excess fuels that encourage wildfire spread),
-river (removing logs and junk jams),
-land (planting erosion control species and avoiding over-harvesting of timber in sloped areas)
-home (removal of spark sources and non-bio items to fuel fires)

SOURCES: HISTORYLINK.ORG -SKAGIT COUNTY AND GOSKAGIT.COM

07-Sector Compass

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Prevailing Winds

Although the wind gusts can come from varying directions the dominant winter wind (October-March) comes from the North and the summer winds come from a South Westerly Direction.

DEFLECT

Noise

Although nothing like any kind of city noise, the main sounds of traffic come from Route 20, along the other side of the Skagit River.

Deflect

Water Flow

In the event of a 100-year flood the Skagit and surround watershed areas would flood the home site.

DEFLECT

CLOSEST: Population center w/ grocery, fuel & waste disposal & stores (Gluten Bakery, Pottery, Hiking supplies, Korean Restaurant, Diner & Pizza) : ~9 miles west - Concrete, WA
Hospital: 18 miles south - Darrington, WA
Public Space- Rockport State Park: ~4 miles west- Rockport WA

Work Flow

Many of the elements near the main house are walked to on a daily basis . ie.e green house, chicken run/coop compost pile and daily dog walks.

ENHANCE/AMPLIFY

Solar Sector

The site lies in a valley and the morning sun, once risen, makes its way over the mountain. The majority of the home site is sheltered by tall trees in the back, greatly reducing the scope of the sunlight reach during the winter months. During the summer the sun falls pretty much full day, aside from any building obstructions, for most of its transit across the property.

ENHANCE/AMPLIFY IN GARDEN
DEFLECT IN CHICKEN COOP

Views

As the main house is currently situated and the cleared nature of the land, the predominate area for wildlife viewing is facing NE.

ENHANCE & AMPLIFY

Public Entrances

The roads indicated are utilized by the Owners and the Skagit River Co-op for surrounding site maintenance. This is the main and only entrance to the site.

MAINTAIN

Elk & Coyote Range

This is the area that elk & coyote have been seen to utilize. Essentially everything but within 20’ of the Main House.

ENHANCE BUT DEFLECT FROM GARDEN

Wildfire Sector

Based on the prevailing movement of wildfires in the Northern Hemisephere the main threat from wildfires is the southeast area of the property. This area also closest to the main roads (without a river in between) and there are commercial logging sites with plantation plantings.

DEFLECT

SUNNY & OPEN

Full sun, exposed to wind, quick drying & draining soil

EDGES

Full sun to full shade, exposed to winds, draining soil

FULL SHADE

Full shade, sheltered from winds, draining soils

SEMI-ESTABLISHED LANDSCAPING

Full sun to part shade, sheltered from wind, draining soils

WETLAND

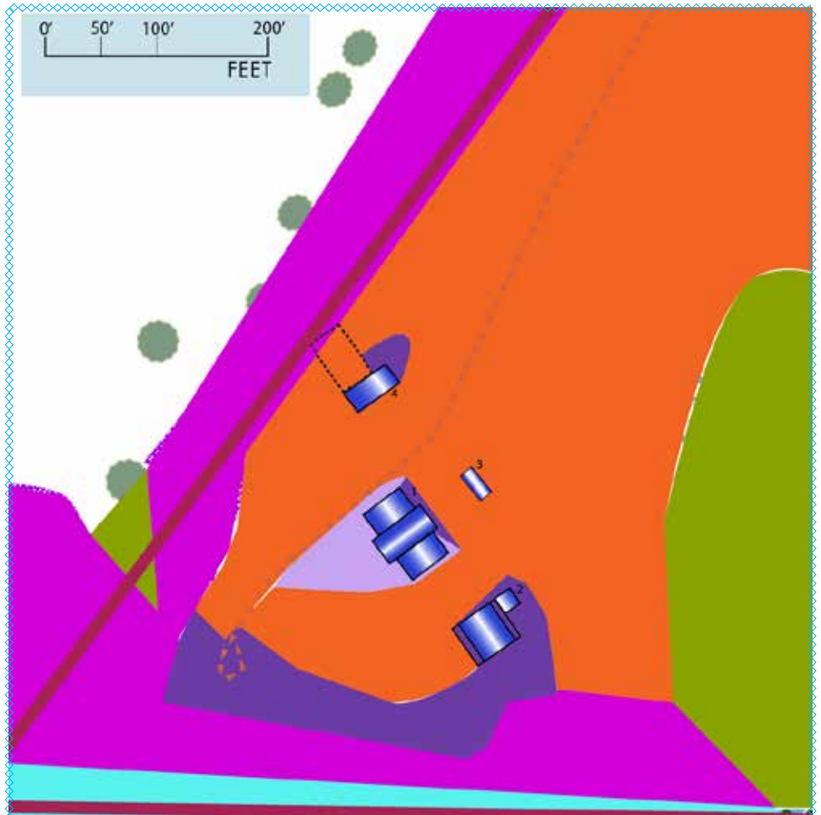
Full sun, exposed to wind, moist soils

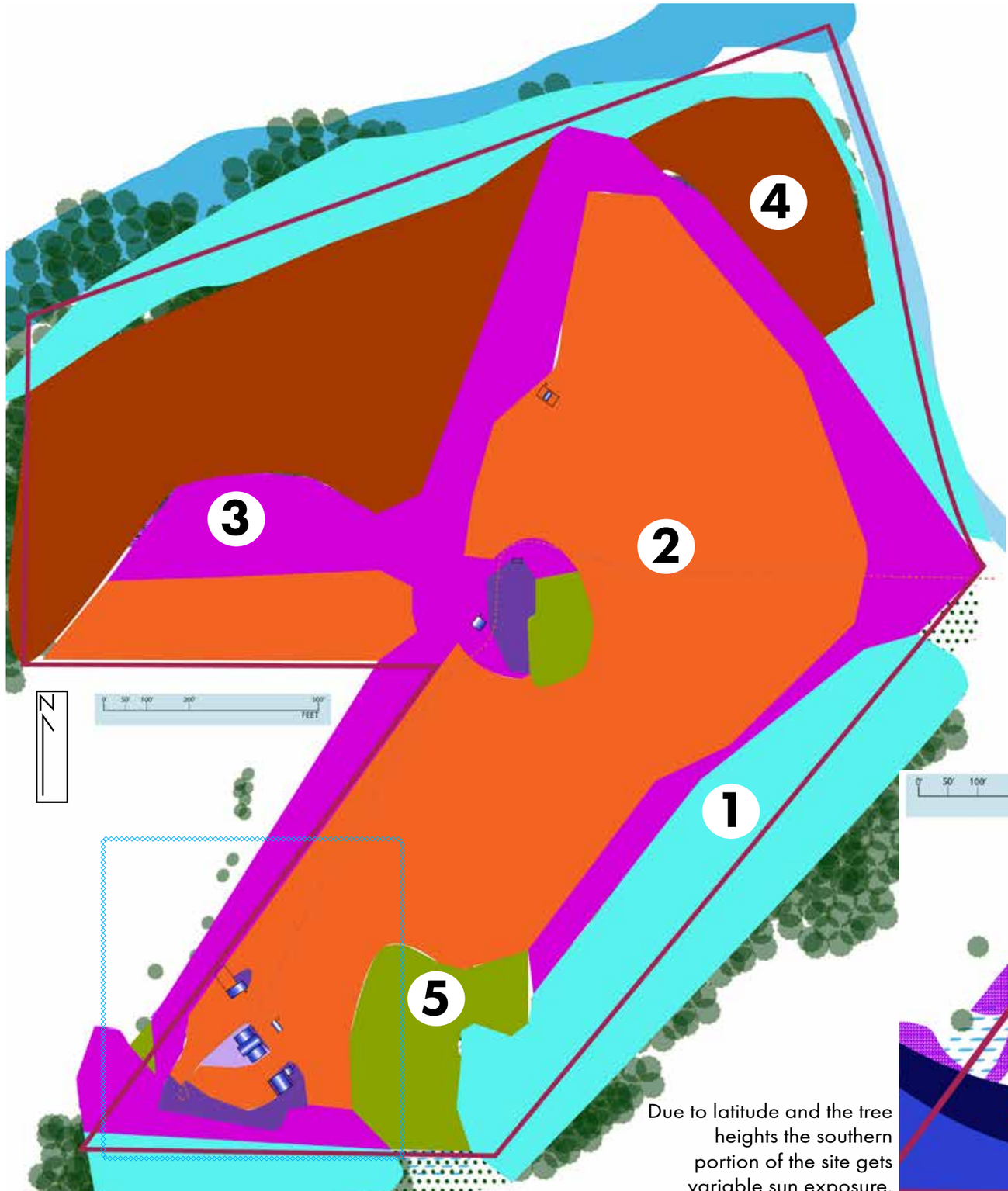
WOODED WETLAND

Part to full shade, sheltered, moist soils

WOODED

Part to full shade, sheltered, well draining soils





08-Microclimate Assessment

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Site Location

48º29'17"N 121º 32'07"W

55685 Martin Ranch Road
Rockport, WA, USA

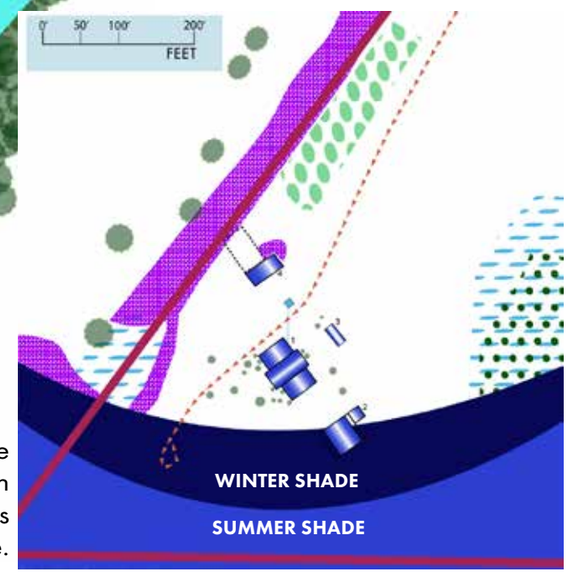
Elevation: 78m

MICROCLIMATE INDICATOR PLANTS LOCATIONS

(DESCRIPTIONS ON FOLLOWING PAGE)

1- **Red Alder**
Alnus rubra
2- **Yarrow**
Achillea millefolium
3- **Himalayan Blackberry**
Rubus armeniacus
4- **Western Red Cedar**
Thuja plicata
5-**Bog Bulrush**
Schoenoplectus mucronatus

Due to latitude and the tree heights the southern portion of the site gets variable sun exposure.



1- RED ALDER

Alnus rubra

Family: *Betulaceae*

Native- Yes

Preferred habitat- Wooded wetlands & Restorational forests.
Full Sun to Part Shade, Light Soil,
Plentiful water, wind sheltered.

Form- Tree

Edible, medicinal, useful, poisonous?
Blood purification contains salicin in the bark, which reduces pain. Herbal astringent.

Ecological function- Restorational plant for disturbed landscapes. Provides surface area for the growth of lichen and due to the presence a symbiotic bacteria of the genus *Frankia* located in nodules on the alder roots it is able to fix nitrogen. Finches eat the seeds of Red Alder. Deer and elk eat the leaves, twigs and buds of young trees. Beavers use branches for dams.

Observed microclimate companions:
Western Sword Fern
Polystichum munitum
Methuselah's Beard Lichen
Usnea longissima

Sources cited-

Chris Branam, *Nitrogen-fixing trees "eat" rocks, play pivotal role in forest health*. Oregon State University Newsroom, February 25, 2019, https://today.oregonstate.edu/news/nitrogen-fixing-trees-%E2%80%9Ceat%E2%80%9D-rocks-play-pivotal-role-forest-health

Kloos, Scott. *Pacific Northwest Medicinal Plants*. Portland, Timber Press, 2017.

Dana Kelley Bressette, Pacific Northwest Native Plants http://nativeplantspnw.com/red-alder-alnus-rubra/

A STAND OF RED ALDER TREES IN THE OREGON COAST RANGE.
PHOTO BY ANDREW BLUHM, OREGON STATE UNIVERSITY.

2- YARROW

Achillea millefolium

Family *Asteraceae*

Native-

Preferred habitat- Open Disturbed habitats Full Sun, Can tolerate drought and poor soil.

Form- Herbaceous Perennial

Edible, medicinal, useful, poisonous?
Skagit Traditional: Anti-diarrehal. Commonly used to in a tea to soothe respitory complaints.

Ecological function- Excellent companion plant as it can repell unwanted insects and attracts predatory wasps. Deep roots prevent soil errosion, so a good restoration plant.

Observed microclimate companions:
Common Nettle
urtica dioica
Bittersweet nightshade
Solanum dulcamara

Sources cited-

Moerman, Daniel, E. *American Medicinal Plants: An Ethnobtanical Dictionary*. Portland, Timber Press, 2009.

Hurteau, M. D. (2013, November 13). Common Yarrow [PDF]. USDA NRCS National Plant Data Center.

Deur, Douglas. *Pacific Northwest Foraging*. Portland, Timber Press, 2014.

3 - HIMALAYAN BLACKBERRY

Rubus armeniacus

Family- *Rosaceae*

Native- No, but naturalized to invasive

Preferred habitat-
Open Disturbed habitat, forest edge, can handle full sun to part shade can tolerate temporary flooding or drought.

Form- Shrub

Edible, medicinal, useful, poisonous?
Specify Leaves and root bark are an astringent. Berries are edible. Canes can be used for weaving.

Ecological function- Considered to be a pioneer invasive here, as it takes over after land has been cleared for pasture. It out-competes native understory vegetation and prevents the establishment of native trees. Although the berries are a great source of food for many animals and the thorny thicket provides shelter for smaller birds and mammals, it can grow so dense as to block larger animals from reaching water sources.

Observed microclimate companions-
Mullein- *Verbascum thapsus*
Evergreen Blackbery- *Rubus laciniatus*
Burdock- *Acticum lappa*

Sources cited-

Deur, Douglas. *Pacific Northwest Foraging*. Portland, Timber Press, 2014.

Moerman, Daniel, E. *American Medicinal Plants: An Ethnobtanical Dictionary*. Portland, Timber Press, 2009.

King County Noxious Weed Identification. October 2, 2018. https://www.kingcounty.gov/services/environment/animals-and-plants/noxious-weeds/weed-identification/blackberry.aspx

4- WESTERN RED CEDAR

Thuja plicata

Family- Cupressaceae

Native- Yes

Preferred habitat- Wooded Shade Microclimate Low Light, Mature, free draining loamy soil.

Form- Tree

Edible, medicinal, useful, poisonous?
Skagit Traditional Use: resin from leaves were used as a cough medicine, and is anti-fungal. The wood is resistant to rot, so was often used for homes. Small roots were used for baskets by the native people.

Ecological function- These large native trees

Observed microclimate companions-
Indian Ghost Pipe- *Monotropa uniflora*
lung lichen- *Lobaria pulmonaria*
Big Leaf Maple- *Acer macrophollyum*

Sources cited-

Moerman, Daniel, E. *American Medicinal Plants: An Ethnobotanical Dictionary*. Portland, Timber Press, 2009.

Kloos, Scott. *Pacific Northwest Medicinal Plants*. Portland, Timber Press, 2017.

Collins, June McCormick. Valley of the Spirits: The Upper Skagit Indians of Western Washington. University of Washington Press. 1974.

08-Microclimate Assessment
Project: Skagit River
Designer: Shanna Mahan

Site Location
48º29'17"N 121º 32'07"W
55685 Martin Ranch Road
Rockport, WA, USA
Elevation: 78m

5-T

Family- Cyperaceae

Native- No

Preferred habitat- Disturbed wetland. Full Sun, Moist, light Soil.

Form- Perennial Sedge Grass

Edible, medicinal, useful, poisonous?
None found. Possible plant for weaving**.** One source says used for wildlife food in the state.

Ecological function- Pioneer species that Is listed as a noxious weed, since it often takes over and is not observed in established wetland areas.

Observed microclimate companions-
Bracken Fern- *Pteridium aquilinum*
Common Reed- *Phragmites australis*

Sources cited-

https://www.invasive.org/alien/pubs/midatlantic/scmu.htm

PHOTO BY RON WILSON

ZONE 1

These are daily zones, often including trips to feed & water the poultry, trip to the compost piles and greenhouse.

ZONE 2

The southern yard behind the main house during good weather is a hang out zone with campfire pit.

ZONE 3

There is not currently a zone that would be operating as a zone 3.

ZONE 4

These are the fields that may get walked upon with the dogs a few times a week.The main fields are tended to by a local hay harvester. There are a few auxilary buildings in this area, but none used for site operations.

ZONE 5

These are the wild forest areas there is no mainentance with these zone. This also includes the areas re-forested by the Skagit River Co-op Systems.

09-Current Zones

Project: Skagit River

Designer: Shanna Mahan

Site Location

48º29’17”N 121º 32’07”W

55685 Martin Ranch Road
Rockport, WA, USA

Elevation: 78m

WHERE DOES YOUR DRINKING WATER COME FROM IN YOUR CURRENT HOME?

All the water used on site comes from a well house which is supplied by ground water.

WHERE DOES YOUR WASTEWATER GO?

Waste water is filtrated through a septic system that runs along the south east side of the main house

WHAT IS THE RECORD 24 HR RAINFALL FOR YOUR DESIGN SITE?

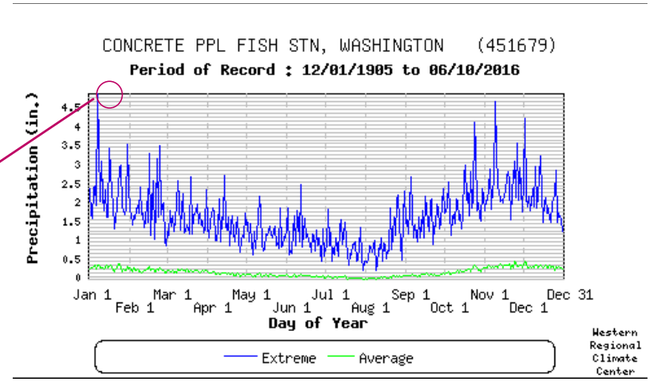
According to the weather station at Concrete Wa (8 miles away) the estimate for a 24 hour rainfall event is around 5" or .42ft

HOW IS YOUR SITE IMPACTED IN A MAJOR PRECIPITATION EVENT AND WHY?

Due to its elevation and location down river from the un-regulated flow of the Cascade River and the possibility of a log-jam, this site is within the floodplain of the Skagit river. More information about Skagit River Watershed flooding is found on the macro watershed page.

WHAT ARE THE ROOFING MATERIALS ON YOUR DESIGN SITE?

The majority of the roofing materials are asphalt, which is the main house and the tiny cabin. Two of the auxilary buildings have metal and the storage unit & greenhouse have plastic.



10-Water Survey

Project: Skagit River

Designer: Shanna Mahan

Site Location

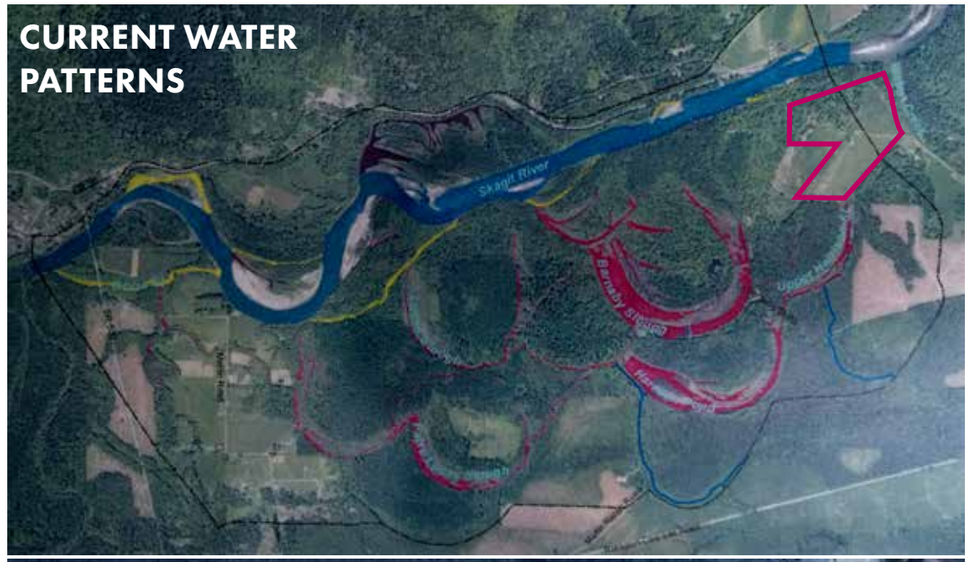
48º29'17"N 121º 32'07"W

55685 Martin Ranch Road
Rockport, WA, USA

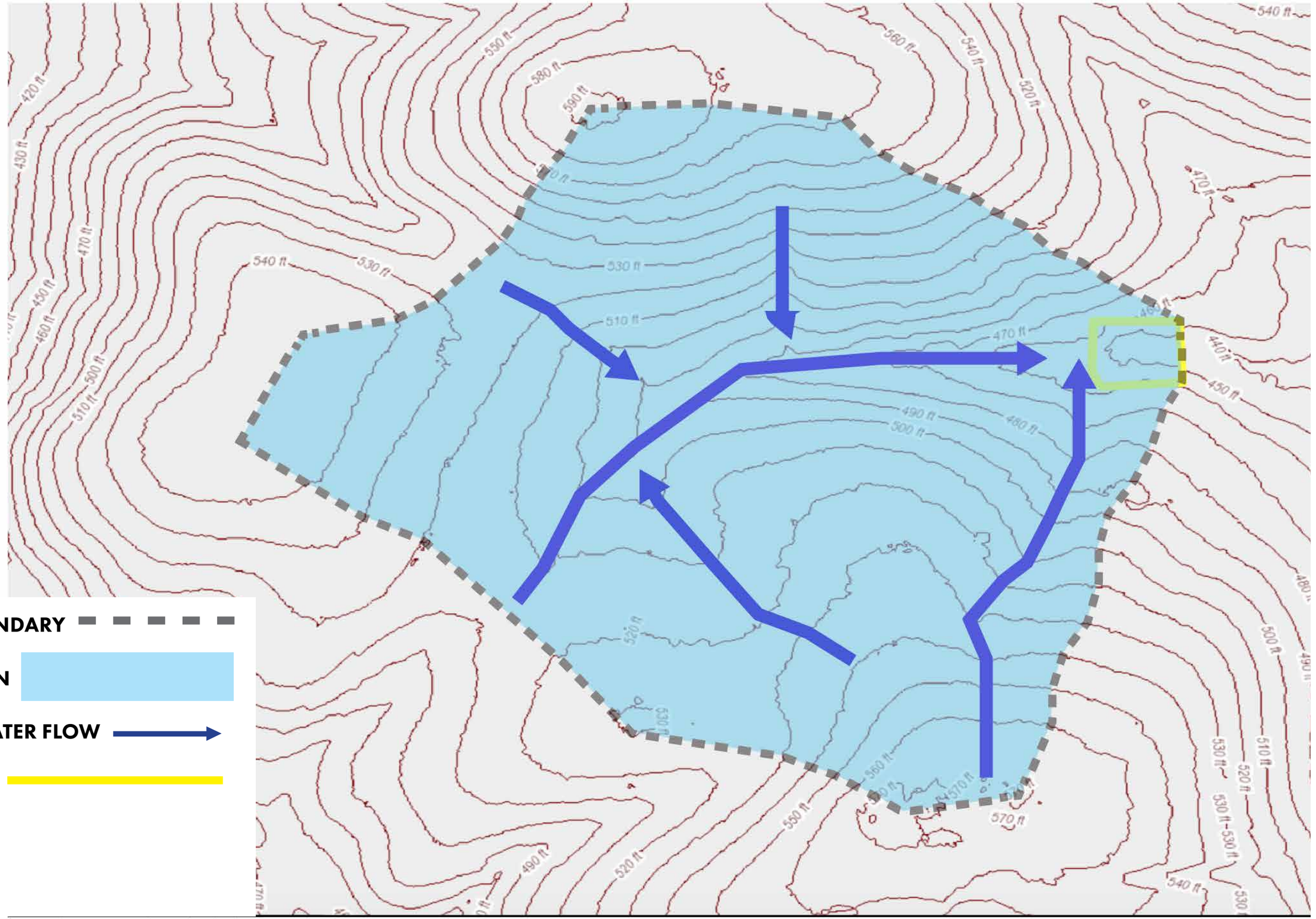
Elevation: 78m

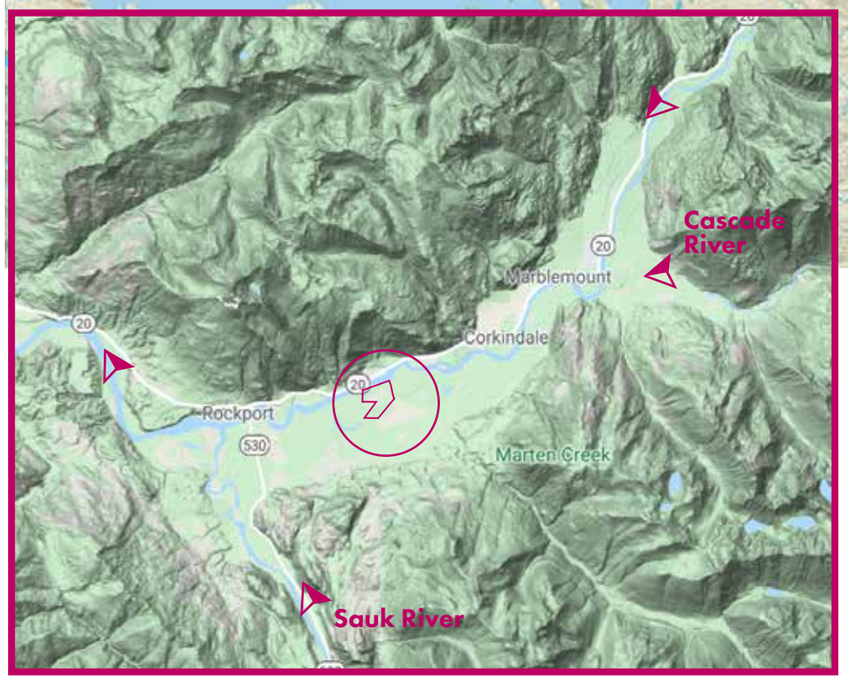
BARNABY REACH RESTORATION

This site is adjacent to the Skagit River Systems Co-op's Barnaby Reach Restoration project. The goal of this project is to re-establish the off-channels and side channels of the Skagit to allieviate the flow velocity heading downstream toward the uncontrolled Sauk River. Design Site outline. According to historical maps Barnaby Reach contains several sloughs that were once part of the main stem of the river, but have now become side channels or backwaters connectt with the river only during periods of high water. The most aggressive of four restoration options would connect Barnaby Slough with the Skagit River, rerouting a portion of the river's flow, providing habitat for fish, and mitigate flooding of nearby Rockport.



TEST


WATERSHED BOUNDARY
WATERSHED BASIN
DIRECTION OF WATER FLOW
SITE BOUNDARY



11-Water Shed Map

Project: Skagit River

Designer: Shanna Mahan

Site Location

48º29'17"N 121º 32'07"W

55685 Martin Ranch Road
Rockport, WA, USA

Elevation: 78m

MACRO WATERSHED OF SITE

The site is located on the watershed of the Skagit river. The Skagit River originates 28 miles inside British Columbia, Canada near the 8,000-foot level of the Cascade Mountains and flows south through the Cascades, crosses the US-Canadian border, passes though Whatcom County, into Skagit County, and then west to the Skagit delta where it discharges into Puget Sound through two distributaries, the North Fork and South Fork. The basin, for purposes of flooding and management is often divided into two sections, the upper basin (from origin to Sedro-Wooley) and the lower basin (Sedro-Wooley to Puget Sound).

The site is located in the upper basin between the input of the Cascade river, which enters the Skagit at Mile 78.1, just upstream of the town of Marblemount, and has a drainage area of 185 square miles, and the Sauk River which enters at mile 67.2 just before the town of Rockport. The Sauk River flows mostly north and is over 50 miles in length. It has a drainage area of 732 miles. As Wild and Scenic Rivers, the Sauk and Cascade Rivers cannot be controlled by dams or other structures making them the largest unregulated tributaries to the Skagit River. This represents just over 50% of the uncontrolled drainage area in the Skagit River basin.

Although the Skagit River basin is subject to rain and snowmelt runoff during the fall and winter,and snowmelt runoff during the spring, major floods on the Skagit River are the result of winter storms moving eastward across the basin with heavy precipitation and warm snow-melting temperatures. Flooding in the upper basin watershed area is regulated by the Ross and Upper Baker. Since this site falls between the Cascade and Sauk River the influence of flood regulation of the Ross & Upper Baker Dam do no necessarily protect this site.

Fun Fish Fact: Of all the drainages in Puget Sound, the Skagit River is the largest and produces the greatest abundance of salmonids and is the only river system in Washington that supports all six species of Pacific salmon, sea-run cutthroat and bull trout. The historic loss of tidal wetland and channel habitat at the lower basin has been identified as one of the most significant limiting factors in the recovery of Skagit Chinook.

US ARM CORP OF ENGINEERS, SKAGIT RIVER FLOOD RISK MANAGEMENT GENERAL INVESTIGATION SKAGIT COUNTY, WASHINGTON DRAFT FEASIBILITY REPORT AND ENVIRONMENTAL IMPACT STATEMENT, 2014

US ARMY CORP OF ENGINEERS, SKAGIT RIVER BASIN, SKAGIT RIVER FLOOD RISK MANAGEMENT FEASIBILITY STUDY FINAL REPORT HYDROLOGY TECHNICAL DOCUMENTATION, 2013

11-Water Shed Map

Project: Skagit River

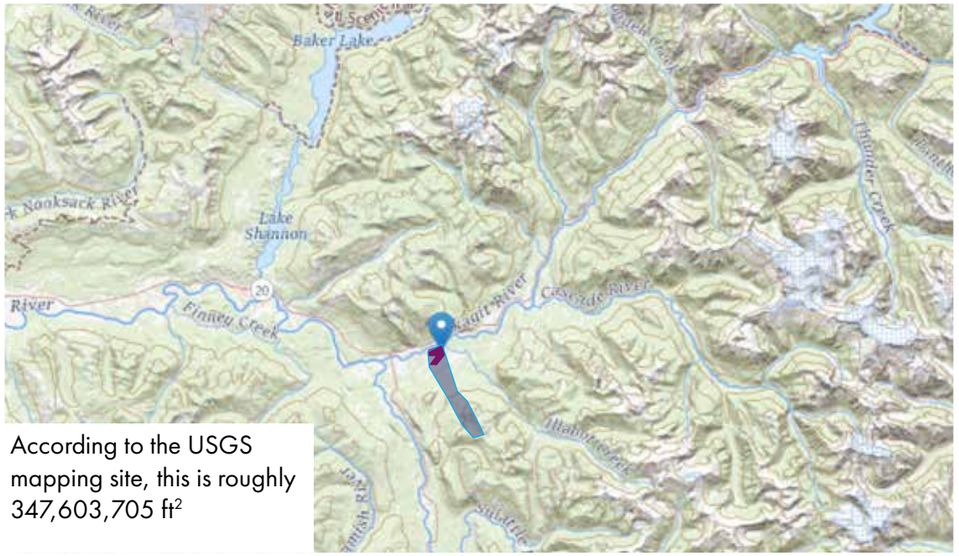
Designer: Shanna Mahan

Site Location

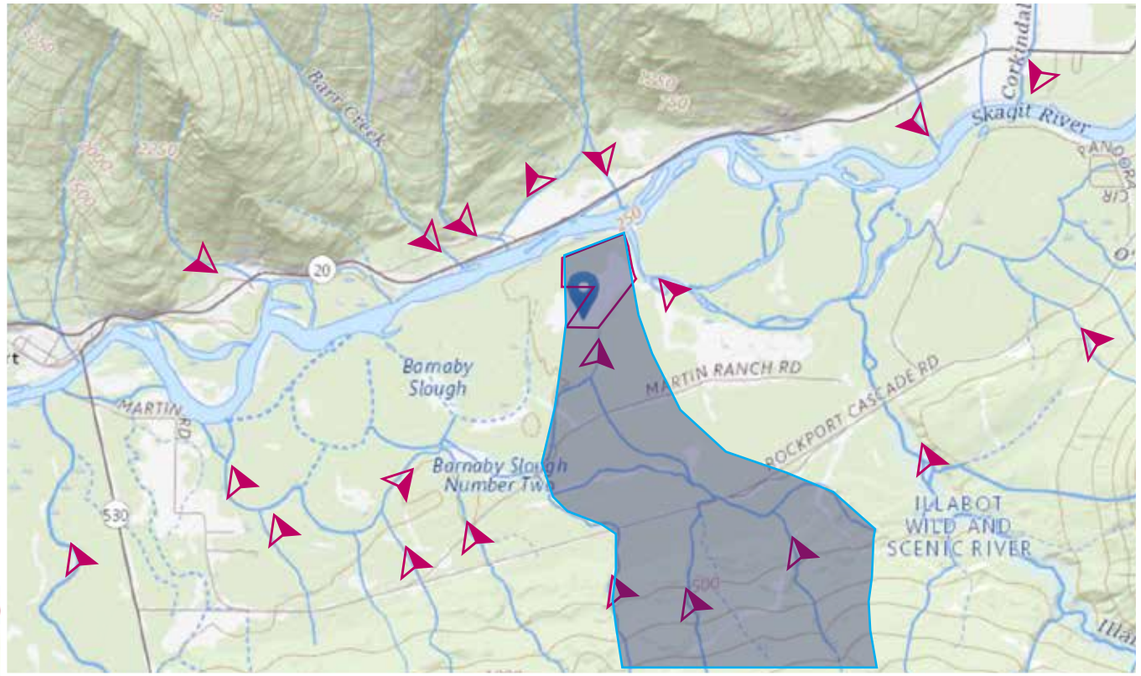
48º29’17”N 121º 32’07”W

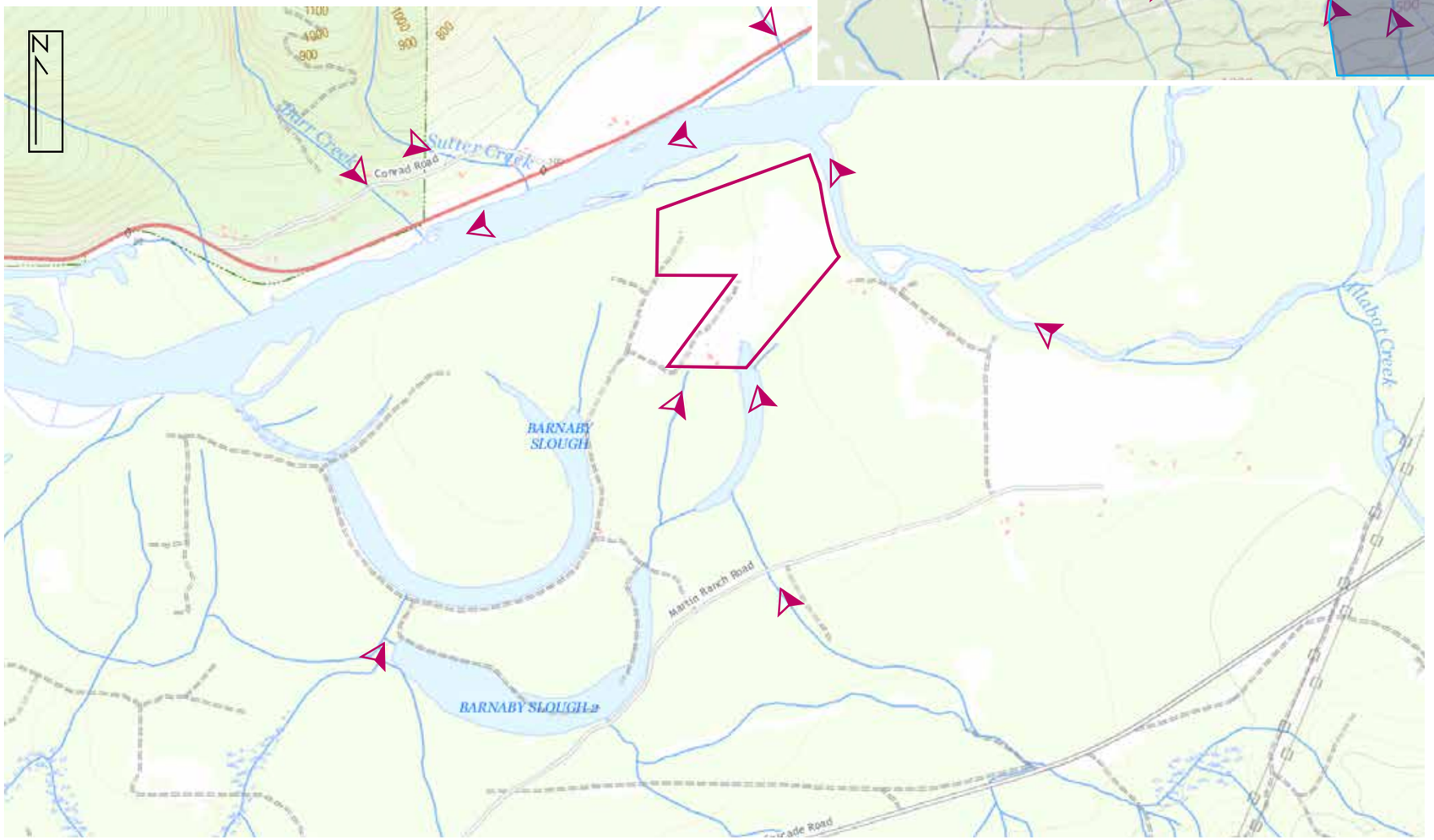
55685 Martin Ranch Road
Rockport, WA, USA

Elevation: 78m



According to the USGS mapping site, this is roughly 347,603,705 ft²





LEGEND

- **Watershed boundary**
- **Watershed Basin**
- **Site Boundary**
- **Direction of water flow**

MICRO WATERSHED OF SITE

The design site is situated in the Skagit flow from Marblemount to Concrete. This covers the flows that enter the Skagit River from River Mile 78.7 to River Mile 54.1. The major creeks that flow into this area are Corkindale Creek, Rocky Creek, Illabot Creek, Barr Creek, and Jackman Creek. This reach has a local drainage area of 173 square miles.

Zooming in, the site is bordered on the north by the Skagit and the east by Illabot Creek and the Sauk River on the far west, this places it in the drainage basin between Illabot Creek and the Sauk River. It could be effected by flooding from all sides depending on the severity of the un-regulated flow from Cascade River up-river near Marblemount.

Over time the Skagit river has migrated across this broad floodplain creating an extensive network of sloughs, wetlands, ponds, side channels and other off-channel habitats.

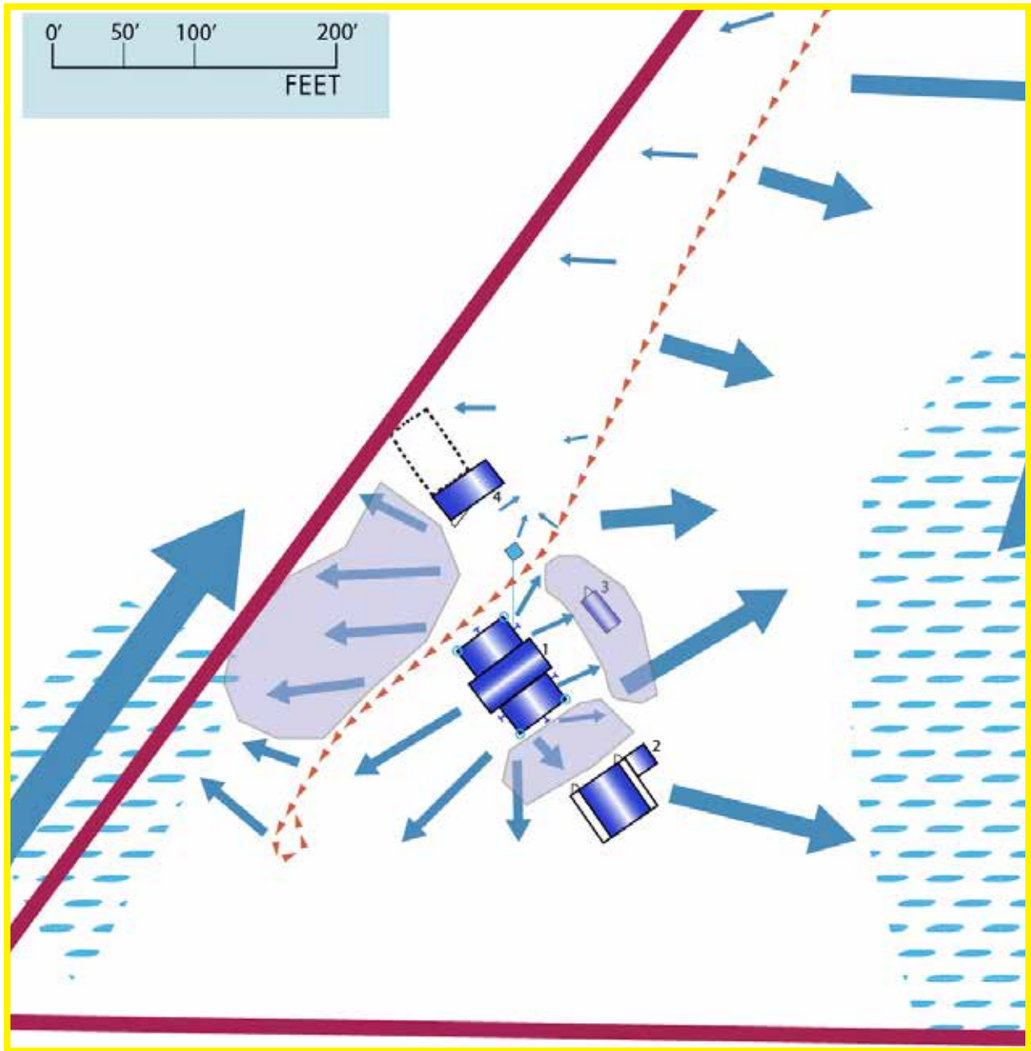
Illabot Creek Fun Fact-

Illabot Creek provides exceptional spawning and rearing habitat for summer and fall Chinook, coho, chum and pink salmon; native steelhead; and one of the largest populations of bull trout in the Skagit River watershed. Puget Sound Chinook, steelhead and bull trout are listed under the Endangered Species Act. Illabot Creek also supports the highest density of chum and pink salmon in the Skagit River watershed and provides habitat for wintering bald eagles. Eagles using the Illabot roost are a part of one of the largest concentration of wintering bald eagles in the continental United States.

LEGEND

- Water Flow
- Possible Gray Water Areas
- Seasonal Wetlands
- Spigot
- Downspouts
- Well house

0′ 50′ 100′ 200′
FEET



12-Site Water Flow Analysis

Project: Skagit River

Designer: Shanna Mahan

Site Location

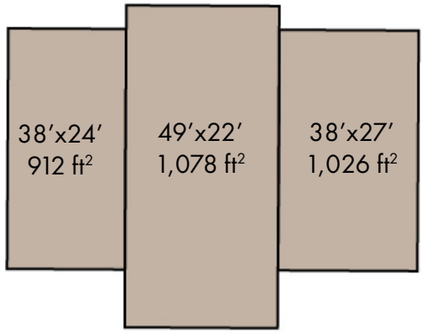
48º29′17″N 121º 32′07″W

55685 Martin Ranch Road
Rockport, WA, USA

Elevation: 78m

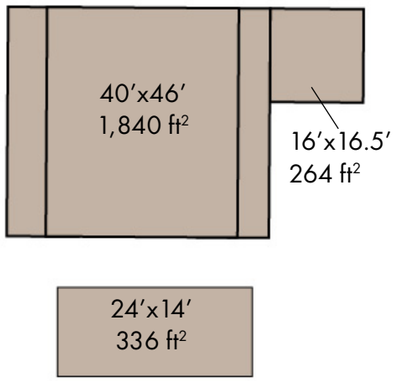
N

0′ 50′ 100′ 200′ 500′
FEET



1- MAIN HOUSE

Total roof ft²: 3,016
Annual Runoff: 127,838.19 gal
Roof material: Asphalt = .80 runoff coefficient
Annual Net Runoff: 102,270.55 gal
100 year 24-hour Runoff: 7,519.89gal

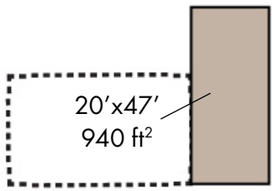


2-STORAGE UNITS

Total Roof ft²: 2,104
Annual Runoff: 89,076.63 gal
Roof material: Metal & Plastic =.90 rc
Annual Net Runoff: 80,168.97 gal
100 year 24-hour Runoff: 5,948.94gal

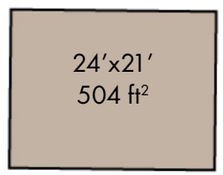
3- GREENHOUSE

Total Roof ft²: 336
Annual Runoff: 14,225.17gal
Roof material: Plastic = .90 rc
Net Runoff: 12,802.65 gal
100 year 24-hour Runoff: 950.01gal



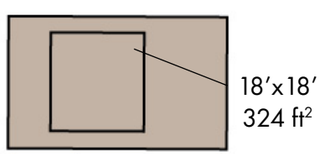
4- POULTRY BARN WITH OPEN RUN

Total Roof ft²: 940
Annual Runoff: 39,796.59 gal
Roof material: Metal = .95 rc
Net Runoff: 37,806.76 gal
100 year 24-hour Runoff: 2,805.45gal



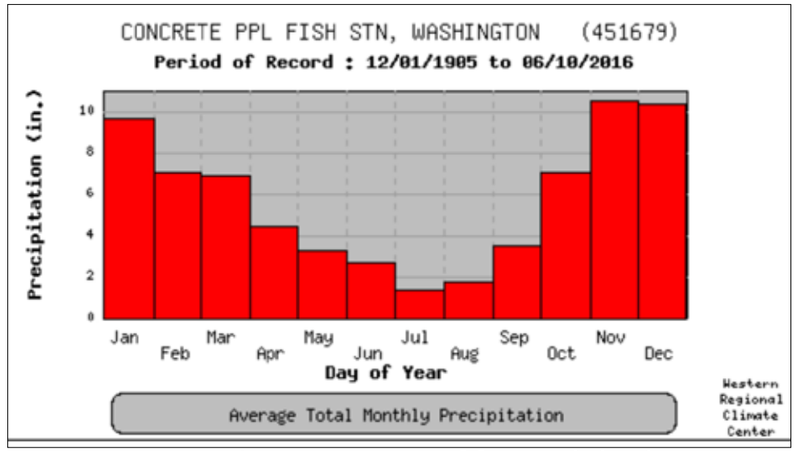
5- 2 SIDED BARN

Total Roof ft²: 504
Annual Runoff: 21,337.75 gal
Roof material: Metal = .95 rc
Net Runoff: 20,270.86 gal
100 year 24-hour Runoff: 1504.20 gal



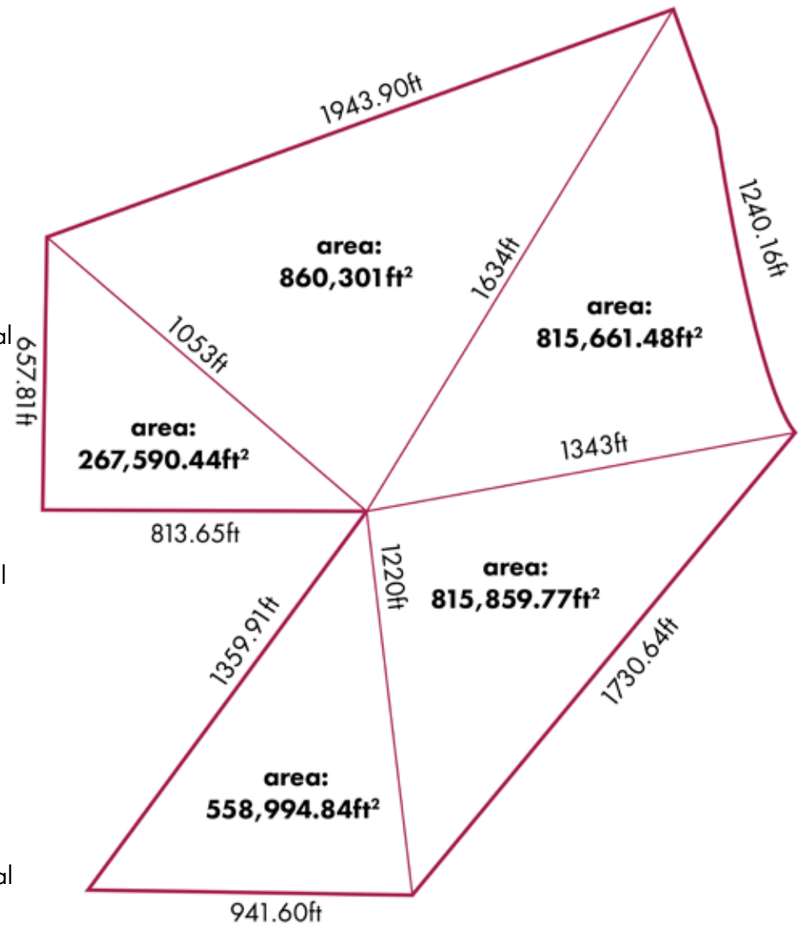
6- TINY CABIN ON CONCRETE FOUNDAITON

Total Roof ft²: 324
Concrete Foundation ft²: 720
Annual Runoff: 44,199.62 gal
Roof material: Asphalt & concrete= .85
Net Runoff: 37,569.68 gal
100 year 24-hour Runoff: 2,787.86 gal



Average & Extreme Monthly Precipitation

The average annual total precipitation, as rainfall for the area is 68 inches (5.66ft), with most of it falling from November to March. On average 25 inches of snow falls during the winter months. *DATA GATHERED FROM STATION: 451679 CONCRETE PPL FISH STN APPROXIMATELY 8 MILES AWAY.



12-Site Water Flow Analysis

Project: Skagit River
Designer: Shanna Mahan

Site Location

48º29’17”N 121º 32’07”W
55685 Martin Ranch Road
Rockport, WA, USA
Elevation: 78m

STATISTICS

Yearly Average Rainfall 5.66ft
Total Area of Site: 3,318,407.53ft²
Total Annual rainfall on site: 140,490,756 gal
Total Area of Impermeable Surfaces: 7,944 ft²
Total Annual Net run off of Impermeable Surfaces: 290,889.47 gal
Total Area of Vegetative Surfaces: 3,310,463.53ft²
Total Annual net runoff of vegetative surfaces: 14,015,443.2 gal (ASSUMED RC OF .10)
24 hour 100 year storm event: 5” or .42ft
Rainfall on site during event: 10,342,370.1 gal

EXTRA CREDIT Water Flow

*SEE MAP ON PAGE 17 FOR MICRO WATERSHED AREA OF LAND DRAINING INTO SITE

Total Area of Site: 3,318,407.53ft²
Average Annual Rainfall: 5.66ft
Average Annual Rainfall on Site: 140,490,756 gal
Total area of land draining onto site according to USGS: 347,603,705 ft²
Total Average Annual rain falling on micro watershed: 14716428537.44 gal
Total Runoff volume draining on to site from watershed (assumed rc .15): 2207464280.68gal

100 Year 24 hr rain event: .42ft
Total Rainfall on of micro watershed during 100 year event: 1092031799.63 gal
Total runoff volume draining onto site during 100 year 24 hour event (assumed rc of .15):163804769.94 gal

100% OF SITE IS PILCHUCK LOAMY SAND

Description: Very deep, excessively drained soil on flood plains, formed in sandy alluvium.

Slopes are 0 to 3 percent. The native vegetation is mainly mixed hardwoods and conifers with an understory of shrubs.

Elevation is 20 to 500 feet.

Typical Profile: The surface layer is dark grayish brown loamy sand 3 inches thick. The upper 40 inches of the underlying material is dark grayish brown fine sand, and the lower part to a depth of 60 inches or more is very dark grayish brown gravely sand. In some areas the surface layer is sandy loam.

Composition:

95.7% sand
2.5% clay
1.8% silt

Drainage: Permeability of this Pilchuck soil is rapid.

Available Water Capacity: Available water capacity is low to moderate. Effective rooting depth is 60inches or more. Runoff is slow, and the hazard of water erosion is slight.

Farmland classification: Classified as prime farm land if irrigated, with sprinklers andt protected from flooding. In summer, due to seasonal drought, irrigation is needed for maximum production. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients.

Depth to restrictive feature: is greater than 79 inches

Depth to water table: A seasonal high water table is at a depth of 24 to 48 inches from November to April, during periods when the water level of the river is high.

Frequency of Flooding: This soil is subject to frequent, brief periods of flooding from November to April.

Available Water Capacity: .07 cm per cm

AVAILABLE WATER CAPACITY (AWC) REFERS TO THE QUANTITY OF WATER THAT THE SOIL IS CAPABLE OF STORING FOR USE BY PLANTS. THE CAPACITY FOR WATER STORAGE IS GIVEN IN CENTIMETERS OF WATER PER CENTIMETER OF SOIL FOR EACH SOIL LAYER. AVAILABLE WATER CAPACITY IS AN IMPORTANT FACTOR IN THE CHOICE OF PLANTS OR CROPS TO BE GROWN AND IN THE DESIGN AND MANAGEMENT OF IRRIGATION SYSTEMS.

Available water supply: 2.1cm of water per 30 cm (~.8 inch per foot)

AVAILABLE WATER SUPPLY (AWS) IS COMPUTED AS AWC TIMES THE THICKNESS OF THE SOIL. FOR EXAMPLE, IF AWC IS 0.15 CM/CM, THE AVAILABLE WATER SUPPLY FOR 25 CENTIMETERS OF SOIL WOULD BE 0.15 X 25, OR 3.75 CENTIMETERS OF WATER.

Hydric soil rating: 0% of the soil onsite qualifies as hydric.

Organic subsistance Rating: Mineral Soil

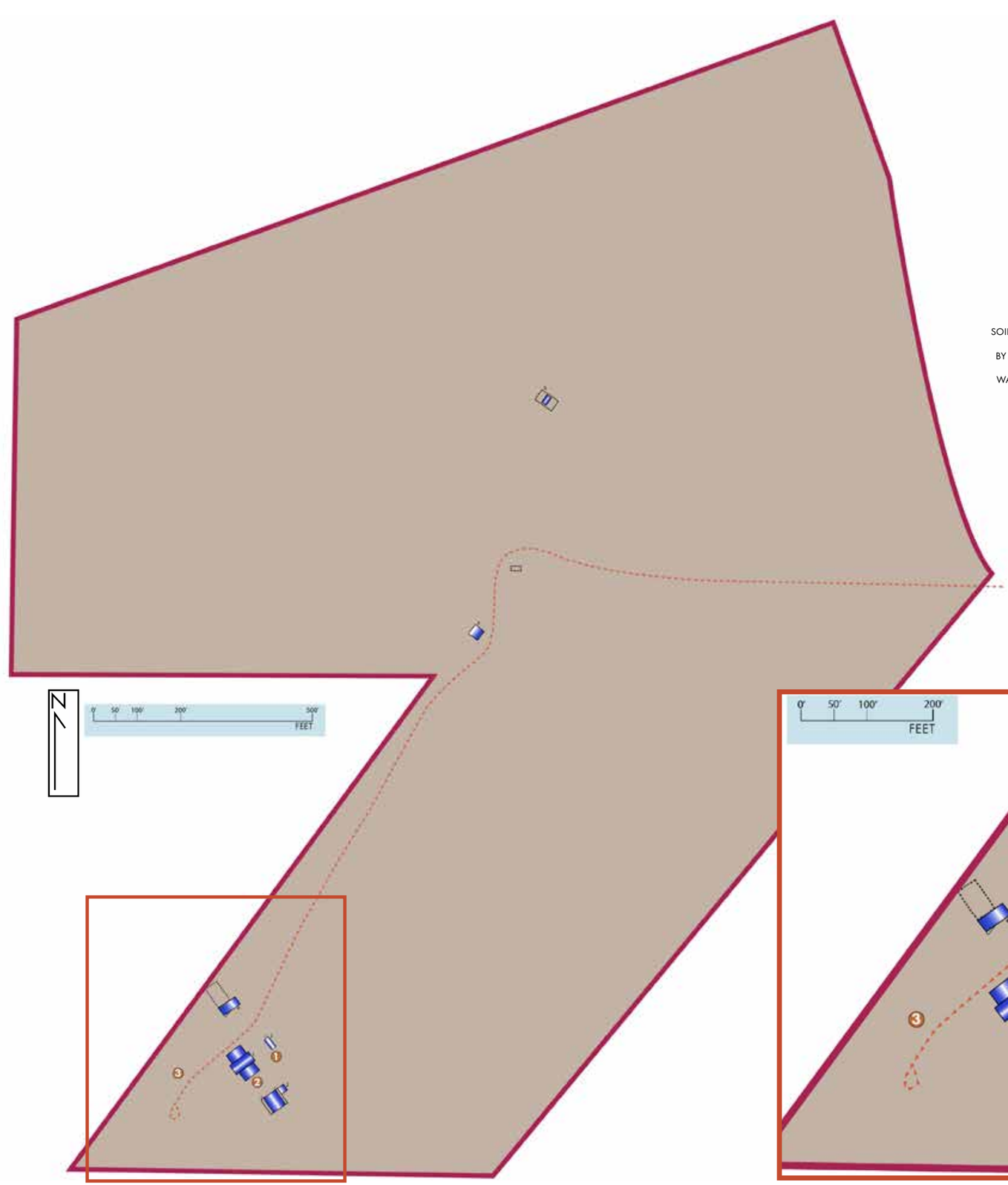
SOILS THAT ARE NOT ORGANIC ARE RATED "MINERAL SOIL". THESE SOILS DO NOT SUBSIDE DUE TO ORGANIC MATTER OXIDATION.

Hydrological group: A

GROUP A SOILS HAVING A HIGH INFILTRATION RATE (LOW RUNOFF POTENTIAL) WHEN THOROUGHLY WET. THESE CONSIST MAINLY OF DEEP, WELL DRAINED TO EXCESSIVELY DRAINED SANDS OR GRAVELLY SANDS. THESE SOILS HAVE A HIGH RATE OF WATER TRANSMISSION.

Infiltration rate: Ksat of 150.8421 micrometers per second (Very High)

SATURATED HYDRAULIC CONDUCTIVITY (KSAT) REFERS TO THE EASE WITH WHICH PORES IN A SATURATED SOIL TRANSMIT WATER. THE ESTIMATES ARE EXPRESSED IN TERMS OF MICROMETERS PER SECOND. THEY ARE BASED ON SOIL CHARACTERISTICS OBSERVED IN THE FIELD, PARTICULARLY STRUCTURE, POROSITY, AND TEXTURE. SATURATED HYDRAULIC CONDUCTIVITY IS CONSIDERED IN THE DESIGN OF SOIL DRAINAGE SYSTEMS AND SEPTIC TANK ABSORPTION FIELDS.



13-Soil Map

Project: Skagit River

Designer: Shanna Mahan

Site Location

48º29'17"N 121º 32'07"W

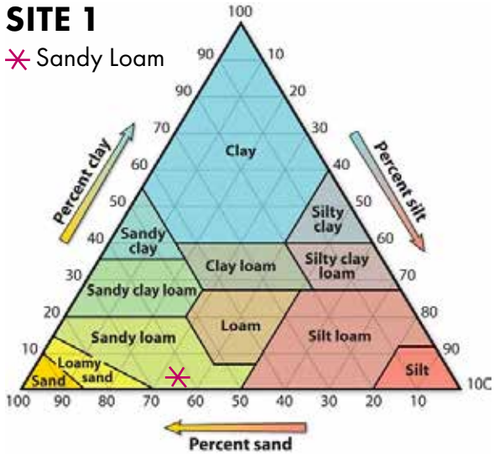
55685 Martin Ranch Road
Rockport, WA, USA

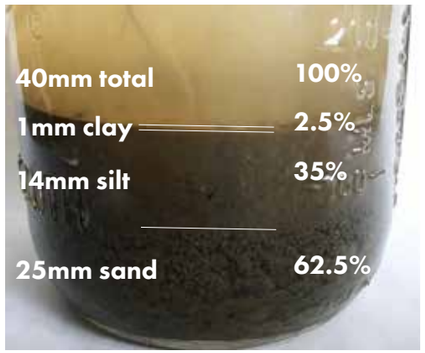
Elevation: 78m

RESOURCES:
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL SURVEY: SKAGIT COUNTY AREA, WASHINGTON (WA657)
SOIL SURVEY OF SKAGIT COUNTY AREA, WASHINGTON
BY MICHAEL W. KLUNGLAND, SOIL CONSERVATION SERVICE,
& MICHAEL MCARTHUR,
WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

SITE 1

Sandy Loam

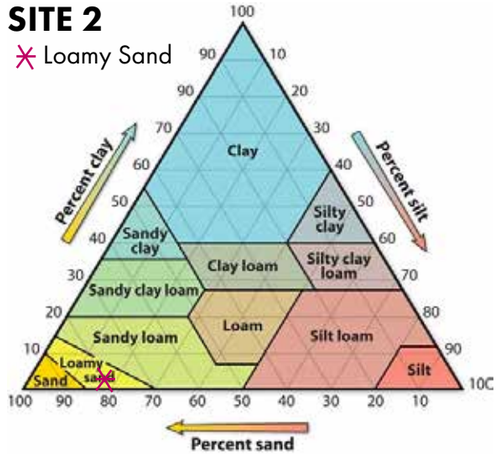


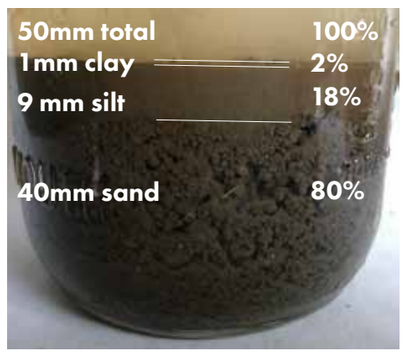


The soil of site 1 was the smoothest of the three. The clump wanted to hold together, but the ribbon did not last much more than an 1" past my hand. This site was selected because the owners had mentioned that this was one of the few spots where what they planted thrived. It is downhill from the house and adjecent to a wetland area.

SITE 2

Loamy Sand

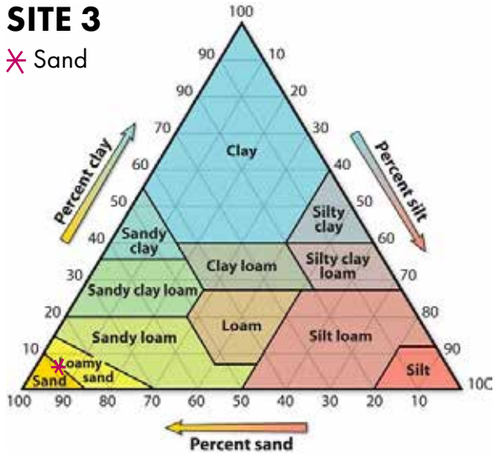


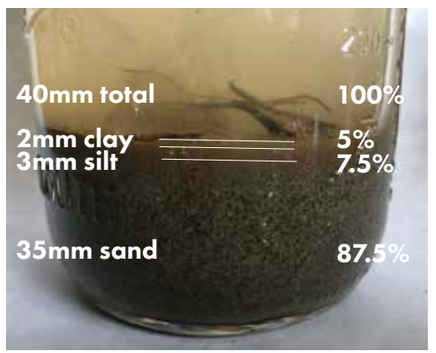


The soil of site 2 was far as texture fell right between site 1 & 3. It lacked the smoothness of site 1 but was less obviously sandy than site 3. This area was chosen based on the possible location for a zone 1 kitchen garden. The sun is full here to about mid/late afternoon.

SITE 3

Sand





The soil of site 3 visually looked like sand. One can see the grains, the hole walls did not want to stay compacted and it feels like a beach. This area was selected as it is in a good location for possible extended poultry run with a holistic orchard on a SW facing slope that had a now, seasonal wetland site.

13- Soil Test

Project: Skagit River

Designer: Shanna Mahan

Site Location

48º29'17"N 121º 32'07"W

55685 Martin Ranch Road
Rockport, WA, USA

Elevation: 78m

HOW DO YOUR SOIL SAMPLES 1-3 COMPARE WITH THE NARRATIVE DESCRIPTIONS OF THE SOILS ON THE SOIL MAPS?

Based on the Skagit soil survey description I imagined that most of the soil would be overtly sandy like site 3. Since the owners had mentioned the success of plantings in site 1 I wasn't surprised to find more silt/clay in that area, thus this site is able to retain more nutrients for the plants. I was surprised that site 3 which was the closest to the sand percentage actually had the larger clay percentage. Site 2 was closest the classification type of Loamy Sand, but still contained a fair amount of silt. Overall this site has more silt but less clay & sand percentages than surveyed. The drainage during the perc test was about as expected; Although it was raining the water drained from the holes within the hour.

OPPORTUNITIES

-light weight & loose, easy to dig in for amendments
-Doesn't compact
-Well Drained (less worry about over watering and root rot)
-Transplanted plants establish faster
-Warm up a little faster in the spring
-Can use coarser material for amendments because they break down so quickly in well drained soils, especially with heavy local rains.
-Root Vegetables thrive in loose sandy soil

CONSTRAINTS

-Doesn't hold water or nutrients very well.
-very limited use for septic tank absorbtion fields, due to flooding depth to saturation zone, & filtering capacity
-Seedling establishment is difficult due to flooding
-During dry summers the droughtiness of the surface layer reduces the survival rate of seedlings.
-Added organic matter will decompose quickly due to moisture.
-Fertilizers will leech out of soils fast
-Poorly fed plants are susceptible to diseases and pest damage.
-Poor tasting yeilds due to lack of vitamin and minerals. taste plain and they will not have a lot of vitamins and minerals in them

WHAT LOCAL MATERIALS OR TECHNIQUES CAN YOU USE FOR A SOIL BUILDING PLAN THAT CAN MINIMIZE YOUR LIMITATIONS?

Amendments- Well rotted manure or compost (including grass clippings, humus and leaf mold) will help to improve the soil the fastest. This soil will need a lot of organic matter, frequently applied, to make a difference.

Local beneficial organism (microbes, mycorrhizal fungi mycelium or mycorrhizal fungi spores) can be added from established near by forest floor.
Larger fallen branches from winter storms can be biocharred and added to soil, allowing it to hold nutrients for longer.
Used bedding from the poultry coop can be composted for a year, or sheet mulched in areas to be planted in the future.
Dredging the small waterfowl pond in the run, and its downhill run-off, can be applied to beds as a fertilizer
In the fall, collecting salmon carcasses from the river area can be applied to mounded planting beds.
Cultivating the patch of stinging nettles (perhaps propigating too) can be used as a compost tea during summer.

Mulching – For this soil type mulching is essential to get plants established since water evaporates from the surface of the soil at a much faster rate than clay soils. Applying a 2-3" layer of mulch composed of compost or other organic matter will stop water evaporation almost entirely. This helps keep the water where the plants need it, underground. A layer of mulch will also act to cool the soil during the dry summer heat and extend the life of flowers and vegetables in the garden as well as reducing temperatures overall in the garden.

Smaller fallen branches from winter storms, prunings, and blackberry canes can be mulched with a chipper/shredder on site and applied.

Watering - The key to watering sandy soils is to water less frequently but for longer each time, this encourages deeper root systems on plants and also allows them to penetrate deeper into the soil where there is more water available than there is at the surface. Since infiltration rate is high you want to water with sprinkler system to allow maximum soil surface contact before drainage. The trick is to soak, but not to rinse away nutrients.

Plants - Native shrubs and bulbs such as tulips, tree mallow, sun roses, hibiscus, salmonberry, salal, huckleberry, stinging nettles, autumn olive, lavender, rosemary and thyme. Wetland plants such as camas, wood lily and fragrant water lily can be planted in moister areas. Annual vegetable root crops like carrots, parsnips and potatoes favour sandy soils. Lettuce, strawberries, peppers, corn, squash, zucchini, collard greens and tomatoes are grown commercially in sandy soils.

13- Soil Narrative Summary

Project: Skagit River
Designer: Shanna Mahan

Site Location

48º29'17"N 121º 32'07"W

55685 Martin Ranch Road
Rockport, WA, USA

Elevation: 78m

LOCAL BIOLOGICAL FOOD CHAIN

Earthworm
Lumbricus sp.

Townsend's Mole
Scapanus townsendii

Red-tailed Hawk
Buteo jamaicensis

CLIMAX COMMUNITY

FLOODPLAIN & BOTTOMLAND OLD GROWTH FORESTS

TREES

Big Leaf Maple
Acer macrophyllum
Douglas Fir
Pseudotsuga menziesii
Black Cottonwood
Populus trochocarpa
Western Red Cedar
Thuja plicata
Western Hemlock
Tsuga heterophylla
Pacific silver fir
Abies amabilis
Mountain hemlock
Tsuga mertensiana

SHRUBS

Western Sword Fern
Polystichum munitum
Oregon Grape
Mahonia nervosa
Salal
Gaultheria shallon

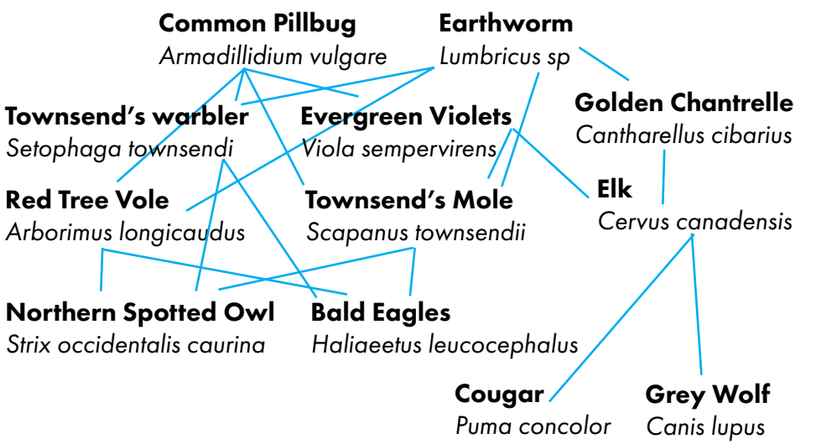
MUSHROOMS

Golden Chantrelle
Cantharellus cibarius
Red coral
Ramaria formosa

CANOPY LICHENS

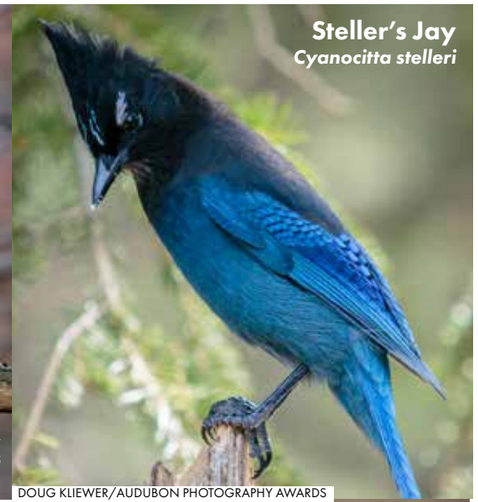
Lung Lichen
Lobaria oregana
Old Man's Beard
Usnea longissima

CLIMAX FOOD WEB



LORI ROTHSTEIN/AUDUBON PHOTOGRAPHY AWARDS

BRIAN KUSHNER/AUDUBON PHOTOGRAPHY AWARDS



DOUG KLIEWER/AUDUBON PHOTOGRAPHY AWARDS

ANDY REAGO AND CHRISSY MCCLARREN/FLICKR

5 REGIONAL BIRDS

KELLY COLGAN AZAR/FLICKR

14- Local Ecology Survey

Project: Skagit River
Designer: Shanna Mahan

Site Location
48º29'17"N 121º 32'07"W
55685 Martin Ranch Road
Rockport, WA, USA
Elevation: 78m

PIONEER PLANTS

HERBACEOUS

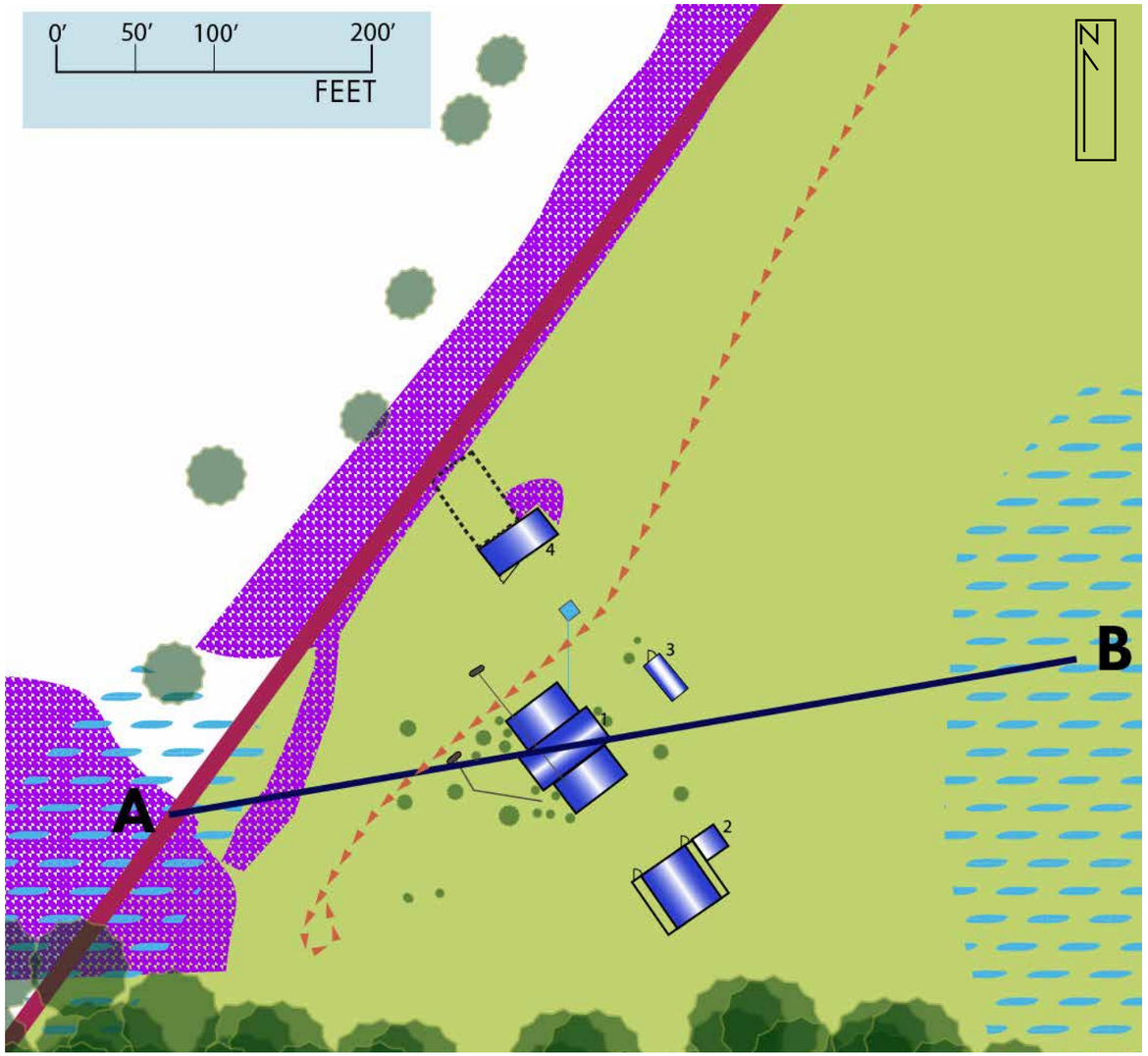
Common Stinging Nettles
Urtica dioica
Yarrow
Achillea millefolium
Plantain
Plantago sp.
Chickweed
Stellaria media

SHRUBS

Himalayan blackberry
Rubus armeniacus

TREES

Red Alder
Alnus rubra



LEGEND

Site Border

Road

Seasonal Wetlands

Established Trees

Blackberry Brambles

15- Section View

Project: Skagit River

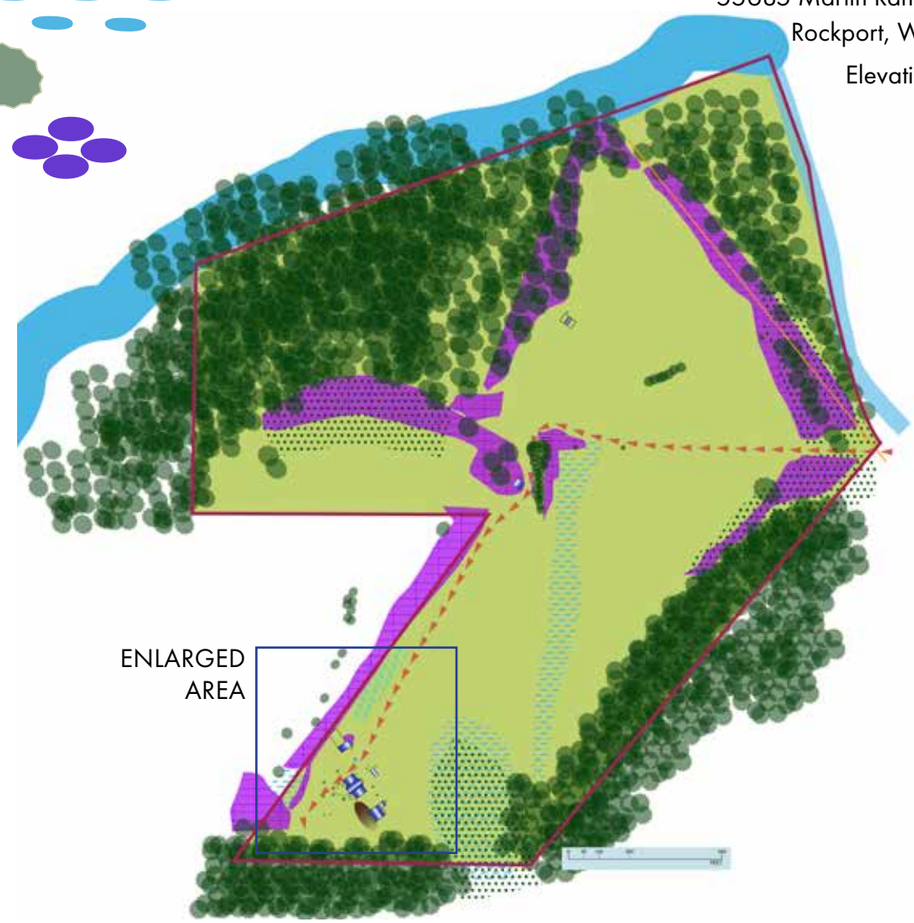
Designer: Shanna Mahan

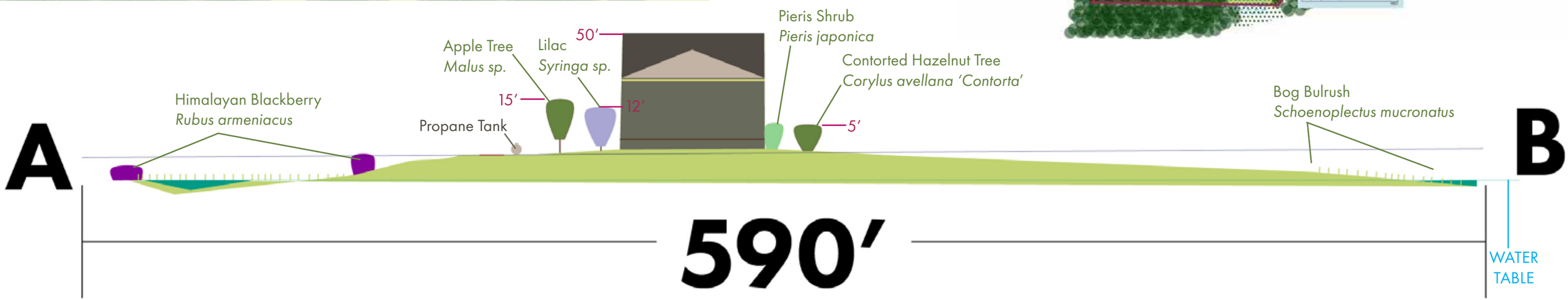
Site Location

48º29′17″N 121º 32′07″W

55685 Martin Ranch Road
Rockport, WA, USA

Elevation: 78m





FIVE NATIVE MEDICINAL PLANTS

YARROW *Achillea millefolium*- Yarrow is used for fever, common cold, hay fever, absence of menstruation, dysentery, diarrhea, loss of appetite, gastrointestinal (GI) tract discomfort, and to induce sweating. Some people chew the fresh leaves to relieve toothache.

NOOTKA ROSE *Rosa nootka* An infusion of the roots and sprouts has been used as an eyewash for sore eyes. A decoction of the roots has been used by women after giving birth and also in the treatment of sore throats. A decoction of the bark has been taken to ease the labour pains of childbirth

GHOST PIPE *Monotropa uniflora* An infusion of the root is antispasmodic, hypnotic, nervine, sedative, tonic. It is a good remedy for spasms, fainting spells and various nervous conditions. It has been given to children who suffer from fits, epilepsy and convulsions.

OLD MAN'S BEARD *Usnea longissima* Usnea is used for weight loss, pain relief, fever control, and wound healing; and to make phlegm easier to cough up. Usnea is also used directly on the skin for sore mouth and throat.

PLANTAIN *Plantago sp.* Leaves used for GI conditions such as irritable bowel syndrome (IBS), diarrhea, constipation, and hemorrhoids. It has also been used to treat hyperlipidemia and for its anticancer effects, and it may be useful for glycemic control in patients with type 2 diabetes.

TRADITIONAL SEASONAL FOOD

Each year, Lushootseed people moved through their territories, setting up temporary camps to collect the wealth of land, sea, and river. In **late January**, they gathered along riverbanks for the first runs of spring salmon, and took large rakes to the shore to comb herring out of the surf. Early spring saw men carving new canoes for the summer. By **May,** salmonberry sprouts and other greens complemented last season's dried salmon eggs. Men began hunting deer and elk, while women gathered camas and clams from prairies and beaches owned by important families. In **early summer**, steelhead appeared in the rivers and berries appeared in the forests, while tiger lilies and wild carrots provided roots from beds passed on from mother to daughter. As **summer** progressed, runs of dog, silver, and king salmon crowded into the rivers to be caught by the thousands, while tart huckleberries ripened on upland slopes. **Fall** was the time for snaring ducks in aerial nets stretched between tall poles, for hunting deer and elk, and for catching smelt on Puget Sound. By November, most of the gathering was complete, and if it had been a good year, the people would have enough food to last through the winter. And as the spirits began to arrive in the towns in December, the annual cycle began again.

Winter: Elk, Cedar Trees, herring
Spring: Salmon Berries, steelhead, deer, elk, greens, camas root, clams
Summer: Berries, Huckleberries, Salmon, Steelhead, tiger lilies, wild carrots
Fall: Acorns, beaked hazelnuts, Salmon, ducks, smelt, elk, deer

4 AREA FARMS

Cascadian Farm - over 50 years of organic growing
Rockport, WA 98283
Blue Heron -certified organic vegetables & native berries since 1979
Rockport WA 98283
Sauk Farm LLC -Small organic family farm
Concrete WA 98237
American Alps Farm Grass Fed heritage Aberdeen Angus cattle
Marblemount, WA 98267

PLANT NURSERIES

Blue Heron Farm & Nursery LLC
12179 State Route 530, Rockport, WA 98283
Christianson's Nursery
15806 Best Rd, Mt Vernon, WA 98273
Urban Forest Nursery, Inc.
15119 McLean Rd, Mt Vernon, WA 98273
Cape Horn Nursery
41920 S Shore Dr, Concrete, WA 98237

16- Local Plants Survey

Project: Skagit River
Designer: Shanna Mahan

Site Location

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55685 Martin Ranch Road
Rockport, WA, USA
Elevation: 78m

LEGEND

Cherry-*Prunus avium* **20′ Edible Fruit/ Visual**

Nishiki Willow *Salix integra ‘Hakuro Nishiki’* **10′ Visual Interest**

Siberian Pea Shrub- *Caragana arborescens* **12′ Nitrogen Fixer**

Grapes *Vitis labrusca ‘Vanessa’* **5′ Edible Fruit**

Oregon Grapes- *Mahonia aquifolium* **5′ Native Evergreen**

Witch Hazel -*Hamamelis x intermedia ‘Diane’* **10′ Visual Interest**

Nanking Cherry *Prunus tomentosa* **8′ Edible Fruit/Hedging**

Sea Buckthorn *Hippophae rhamnoides* **12′ Edible Fruit/Hedging**

Linden *Tilia tomentosa* **40′ Fragrant/Flowers**

Elderberry *Sambucus nigra* **12′ Edible Fruit/Hedging**

Black Hawthorn *Crataegus douglasii* **12′ Pollinator/Hedging**

Beaked Hazelnut *Corylus cornuta* **12′ Edible Nuts/Hedging**

Fig tree *Ficus carica ‘Desert King’* **8-12′ Edible Fruit**

Paperbush Tree *Edgeworthia chrysantha* **10′ Winter Interest**

Peach *Prunus sp.* **20′ Edible Fruit**

Apple *Malus sp.* **15′ Edible Fruit**

Mulberry *Morus nigra* **12′ Edible Fruit/Wildlife**

Autumn Olive *Elaeagnus umbellata* **12′ Edible Fruit/Nitrogen**

Blueberry *Vaccinium corymbosum* **6′ Edible Fruit**

Flowering Quince- *Chaenomeles speciosa* **6′ Visual**

Golden Currant-*Ribes aureum* **6′Edible Fruit**

Salmon Berry *Rubus spectabilis* **4′ Edible Fruit**

Goumi Berry *Elaeagnus multiflora* **6′ Edible Fruit/Nitrogen Fixer**

Lavender *Lavandula angustifolia* **5′ Fragrance/Pollinator**

Rosemary *Salvia rosmarinus* **5′ Fragrance/ Pollinator**

Santa Rosa Plum *Prunus salicina ‘Santa Rosa’* **15′ Edible Fruit**

Planned Pathways **Roadway**

Design Goal- This preliminary design focuses on the fruit producing tree & shrubs with the goal of establishing edibles, including hedging to shield the main production areas from elk. Interplanted between these structural elements will be herbaceous perennials to provide medicinal, forage for pollinators, biomass and additional edible perennials.

System Maintenance- Most of these plants, once established, need a heavy application of organic mulch material and yearly pruning.

Explain the soil fertility plan for system- This system has a 5 year to production timeline. The first year shoudl be focused on amending the soil with organic materials, to counterbalance the soil’s sandy content, and establishing the planting beds. Due to water table beds should be raised about 12′ creating sunken pathways. Then in the second season planting of established plants with a focus on irrigation.

17 – Plant System Design Plan View

Project: Skagit River

Designer: Shanna Mahan

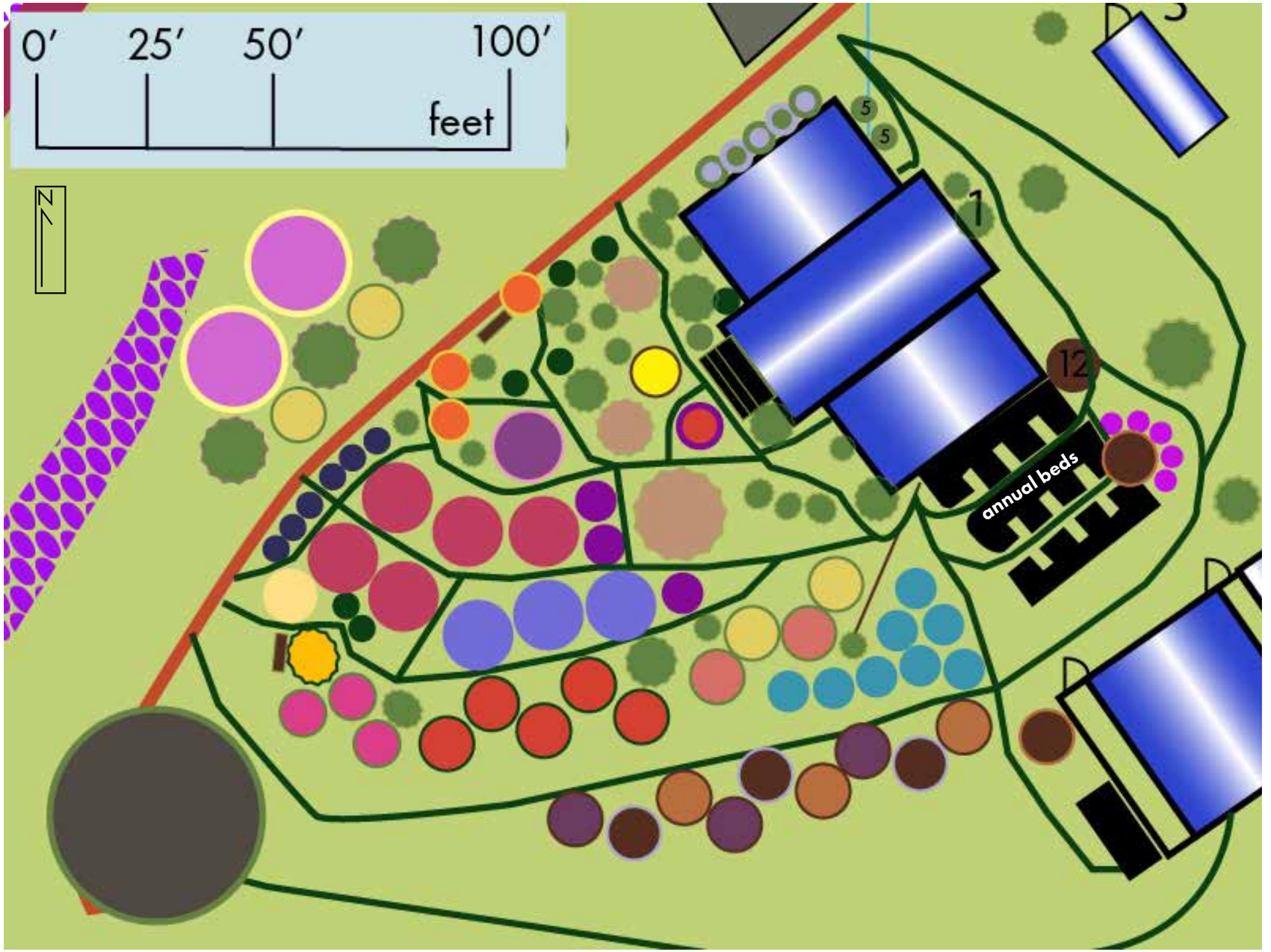
Site Location

48º29′17″N 121º 32′07″W

55685 Martin Ranch Road

Rockport, WA, USA

Elevation: 78m



17 – Plant System Design Plan View

Project: Skagit River

Designer: Shanna Mahan

Site Location

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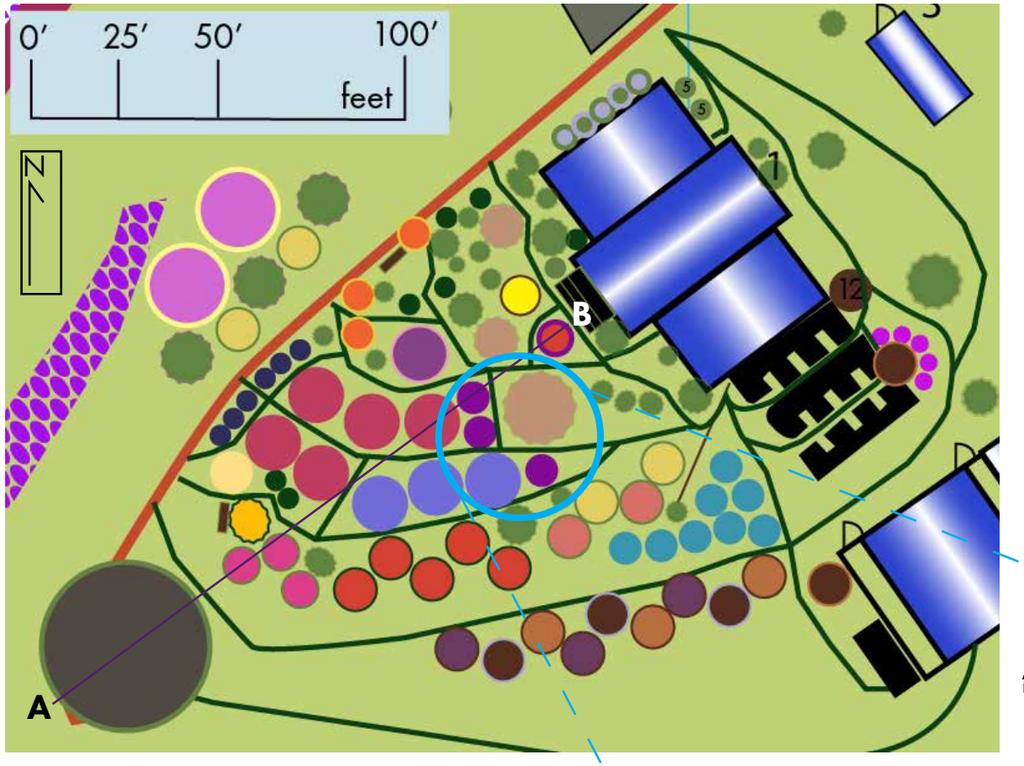
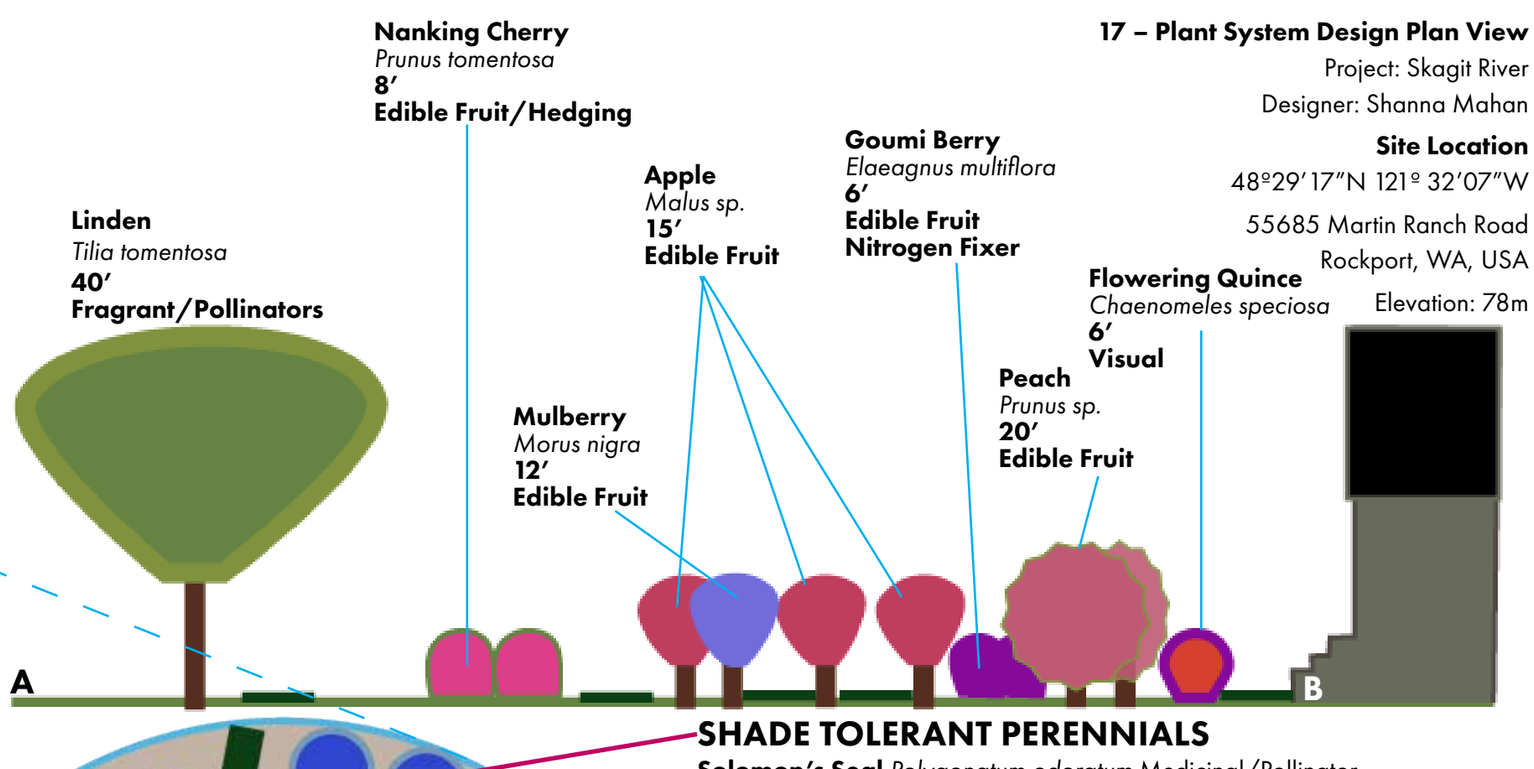




CLIMBING VINES

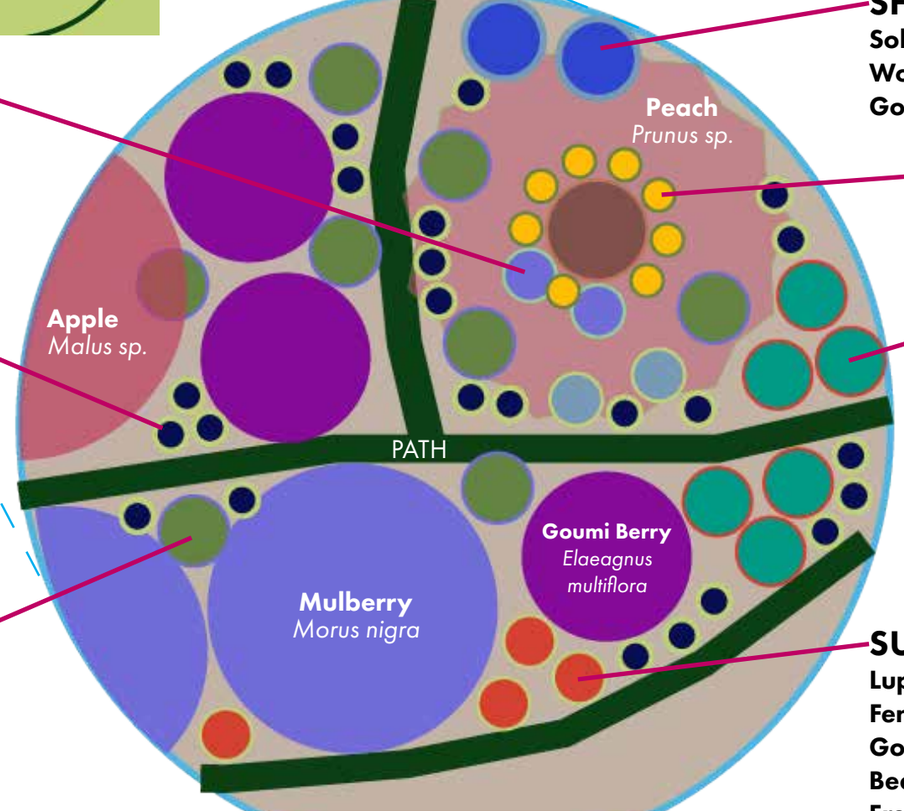
Passion Flower *Passiflora incarnata*- Edible Fruit/Visual/Med.
5 Flavor Vine *Schisandra chinensis*- Medicinal
Hardy Kiwi *Actinidia arguta*- Edible Fruit
Chocolate Vine Akebia trifoliata- Edible Fruit

GROUND COVERS

Lingon Berry *Vaccinium vitis-idae* Edible
Strawberry *Fragaria vesca Edible*
Winter Green Gaultheria procumbens -Medicinal /Edible Berry
Creeping Thyme Thymus serpyllum- Fragrance/Pollinators

MULCH PLANTS

Comfrey (Blocking 14) *Symphytum x uplandicum* - Pollinators/Biomass
Sainfoin *Onobrychis viciifolia*- Nitrogen Fixer/Green Manure
Red Clover *Trifolium pratense*- Pollinators/Green Manure



SAMPLE UNDERSTORY PLANTING

SHADE TOLERANT PERENNIALS

Solomon's Seal *Polygonatum odoratum* Medicinal/Pollinator
Wood Betony *Staychis officinalis* Medicinal/Pollinator
Goldenseal (Hydrastis canadensis) Medicinal

GRASS-SUPRESSING BULBS

Daffodils (*Narcissus sp.*) Animal Repelents
Camas (*Camassia sp.*)- Edible roots
Wild Garlic/Onions (*Alliums sp.*)- Edible

SUN LOVING MEDICINALS

Hyssop *Hyssopus officinalis*- Medicinal/Pollinator
Lemon Balm *Melissa officinalis*- Medicinal/Pollinator
Chamomile *Matricaria recutita*- Medicinal/Pollinator
Echinacea *Echinacea purpurea* Medicinal/Pollinator
Calendula *Calendula officinalis* Medicinal/Pollinator
Skullcap *Scutellaria laterifolia* Medicinal/Pollinator

SUN LOVING PERENNIALS

Lupine *Lupinus perennis* Nitrogen Fixer/ Pollinator
Fennel *Foeniculum vulgare*- Edible/Insect Repellent/Medicinal
Good King Henry *Chenopodium bonus-henricus*- Edible
Bee Balm *Monarda didyma*- Pollinator
French Marigold *Tagetes patula*-Pollinator/Insect repellent
Butterfly MilkWeed *Asclepias tuberosa* Medicinal/Pollinator

WHAT LOCAL MATERIALS DO INDIGENOUS PEOPLE USE TO CONSTRUCT THEIR HOMES?

Archaeological digs have revealed evidence of human habitation in the Upper Skagit River basin dating to 8,500 years ago. Culturally, the Upper Skagit share characteristics with the Lower Skagit, the Coast Salish, as well as the Plateau Indians from the eastern side of the Cascade Mountains.

The Upper Skagit had three major kinds of dwellings: The wooden house, the portable mat house and the sweat house. The wooden houses were winter dwelings- small houses at fishing sites and houses used for winter dance ceremonials. For the wooden houses the carpender (iyay) selected cedar trees near the river, as they were felled and floated to the building site. The walls were constructed of over-lapping wide cedar plants and cracks were stuffed with moss. There was no flooring in the house, but around the walls there was a continuous sleeping platform and shelves for storage.

Since more than one family may have inhabited the winter home woven partition mats might have beeen placed between family units within the house. Large cooking hearths for each family were situated in diffent positions, depending on the number of families in the dwelling. Other houses for temporary use were made of woven cattail mats, assembled in a lean-to fashion. Some tribes used sweat hosues, which were small circular structures with pole framwork covered with brush.

WHAT CAN WE LEARN FROM THE TRADITIONS ON THIS LAND FOR MODERN DESIGN?

The people of the Upper Skagit region were environmental managers, transforming their world through their own ecological knowledge. Consumption of resources was never for profit and were utilized to their fullest extent (multi-family dwellings of natural materials). The majority of the homes were mobile and from natural materials allowing the inhabitants to move with the seasonal harvests.

WHICH CONSTRAINTS AND OPPORTUNITIES IN YOUR AREA DID TRADITIONAL MATERIALS ADDRESS AND HOW?

Since the people were seasonally nomadic the ability to transport dwellings required that the disassembly and re-construction of these dwellings simple and able to be accomplished with a few people. The utilization of natural materials was also necessary.

ARE THERE CURRENT CONSTRAINTS THAT THESE MATERIALS WOULD HELP?

Utilizing cedar for homes here is wise as it is rot, temperature, and insect resistant (important in a rain-heavy area). Cedar is obviously completely biodegradable, making it an excellent option for green homes, but the supply of large cedar trees has been decimated since the loggin of the 1970s and is something to consider. The use of natural materials woven mats for room dividers and moss for insulation and roof sealing could be explored.

18-Building Survey

Project: Skagit River

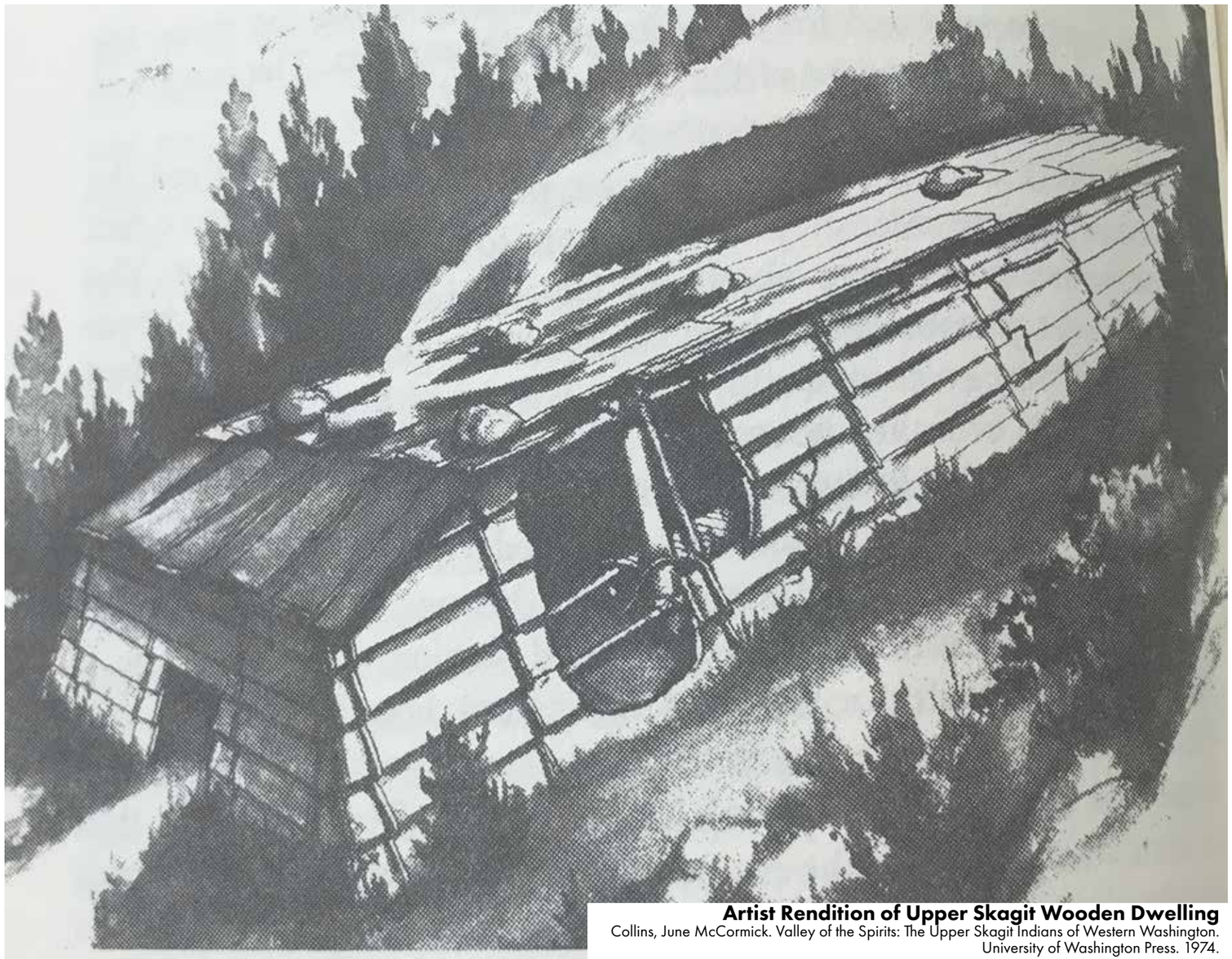
Designer: Shanna Mahan

Site Location

48º29’17”N 121º 32’07”W

55685 Martin Ranch Road
Rockport, WA, USA

Elevation: 78m



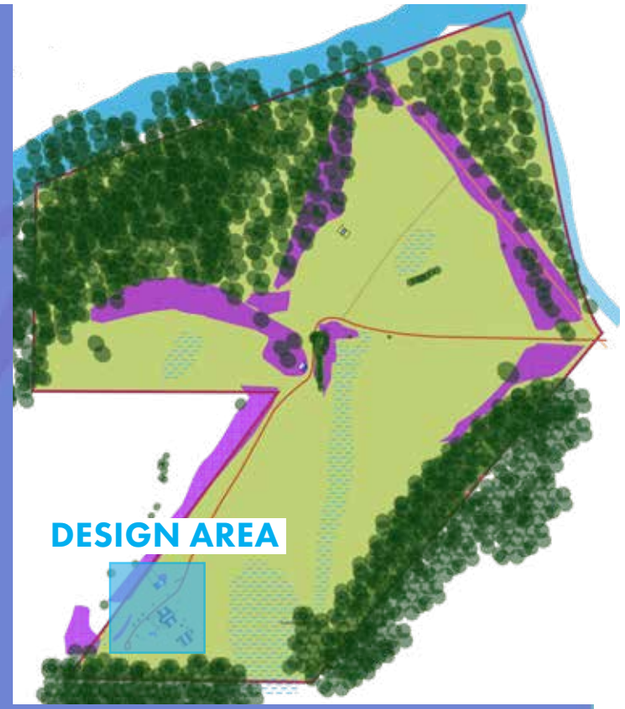
Artist Rendition of Upper Skagit Wooden Dwelling

Collins, June McCormick. Valley of the Spirits: The Upper Skagit Indians of Western Washington. University of Washington Press. 1974.

SECTION 3

SECTION 1

SECTION 2



19-Zone 1 Re-Design
Project: Skagit River
Designer: Shanna Mahan

Site Location
48º29'17"N 121º 32'07"W
55685 Martin Ranch Road
Rockport, WA, USA
Elevation: 78m

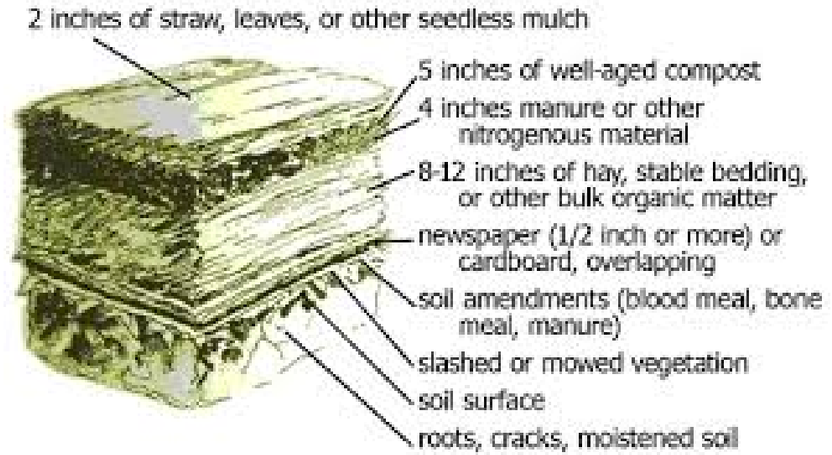
ZONE 1

Due to large area covered by the daily visits to the poultry coop, the Zone 1 re-design is broken down into 3 sections. Each sections specific designs will be explained in the following pages.

GENERAL

Soil Fertility- Due to the sandy nature of the soil, organic amendments will have to be added yearly (hopefully with self-sustaining supplies as plantings mature). Application (every 2-3 weeks) of aerated brewed compost tea during the growing season, especially in annual beds, will help planting get established and supply nutrients than may drain off due to soil porosity.
Initial Planting Establishment- I recommend sheet mulching for primary bed establishment as this will eliminate the soil deterioration that comes with tilling and elevate the planting beds to help with drainage.
Mulching- a yearly thick layer of mulch (composed of shredded ramial hard-wood -branches of < 2" diameter) will foster a fungal soil. Thick mulching of this sort will also aid in weed suppression and help slow irrigation evaporation.
Planting Focus- Perennial fruit producing tree & shrubs with the goal of establishing lower maintenance edibles, including hedging to shield the main production areas from elk. Interplanted between these structural elements will be herbaceous perennials to provide medicinal, forage for pollinators, biomass and additional edible perennials. A small intensive annual bed section closest to the house will allow for ease of maintenance (i.e slug control).

SHEET MULCHING DIAGRAM

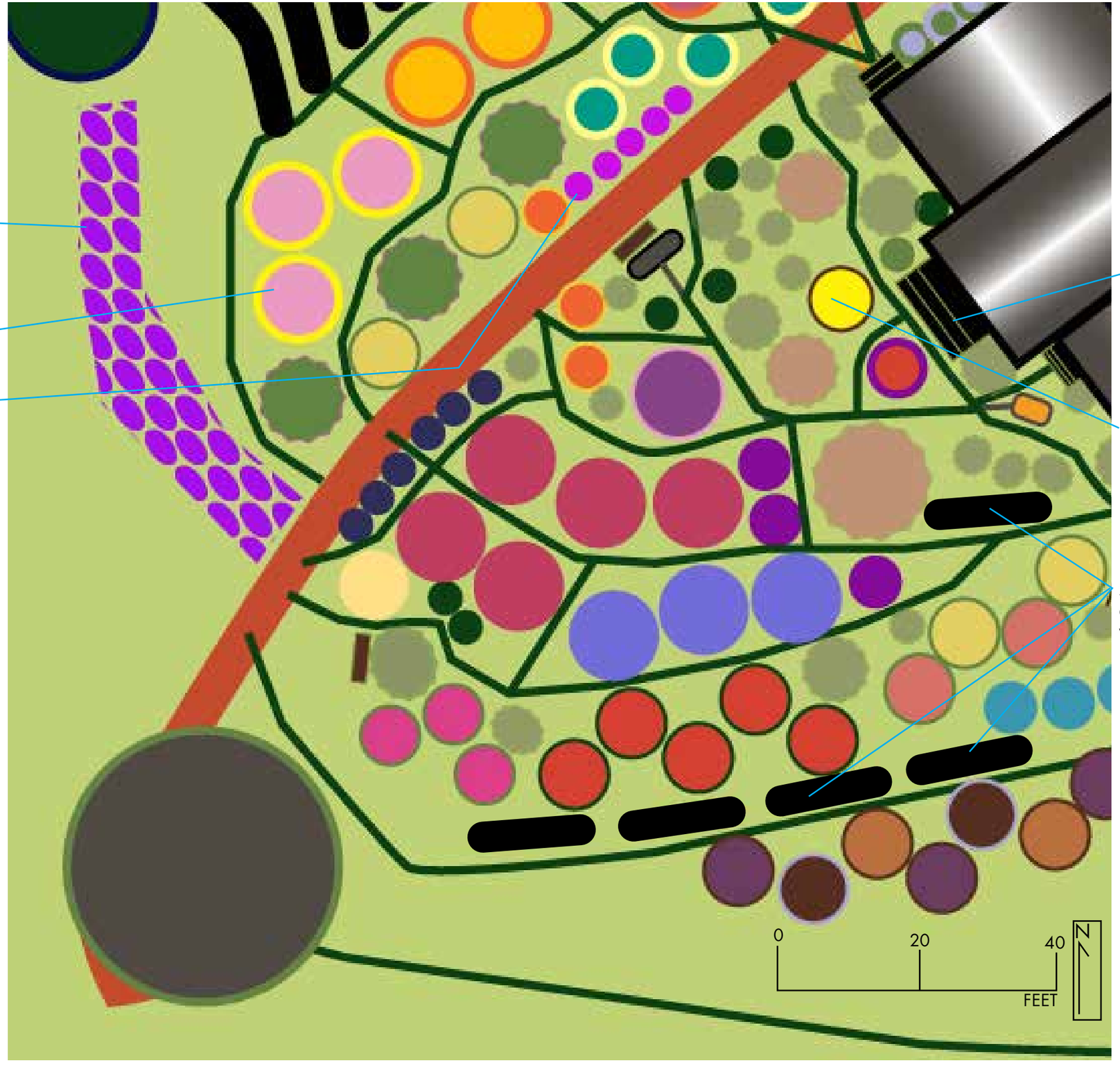


* The majority of the plantings and understory companion plantings in this section were described on page 26 with any additions described here.

Blackberry *Rubus armeniacus 4'*
Utilizing these as a hedging to deter elk

Cherry-*Prunus avium* 20'
Edible Fruit/ Visual

Raspberry *Rubus idaeus* 4'
Edible Fruit



19-Zone 1 Plantings (section 1)
Project: Skagit River
Designer: Shanna Mahan

Site Location
48º29'17"N 121º 32'07"W
55685 Martin Ranch Road
Rockport, WA, USA
Elevation: 78m

Construction of wide stairs off main backporch, This allows for greater access to the main garden, sites for seating and places for smaller decorative plants in pots and edible greens/ herbs out kitchen door.

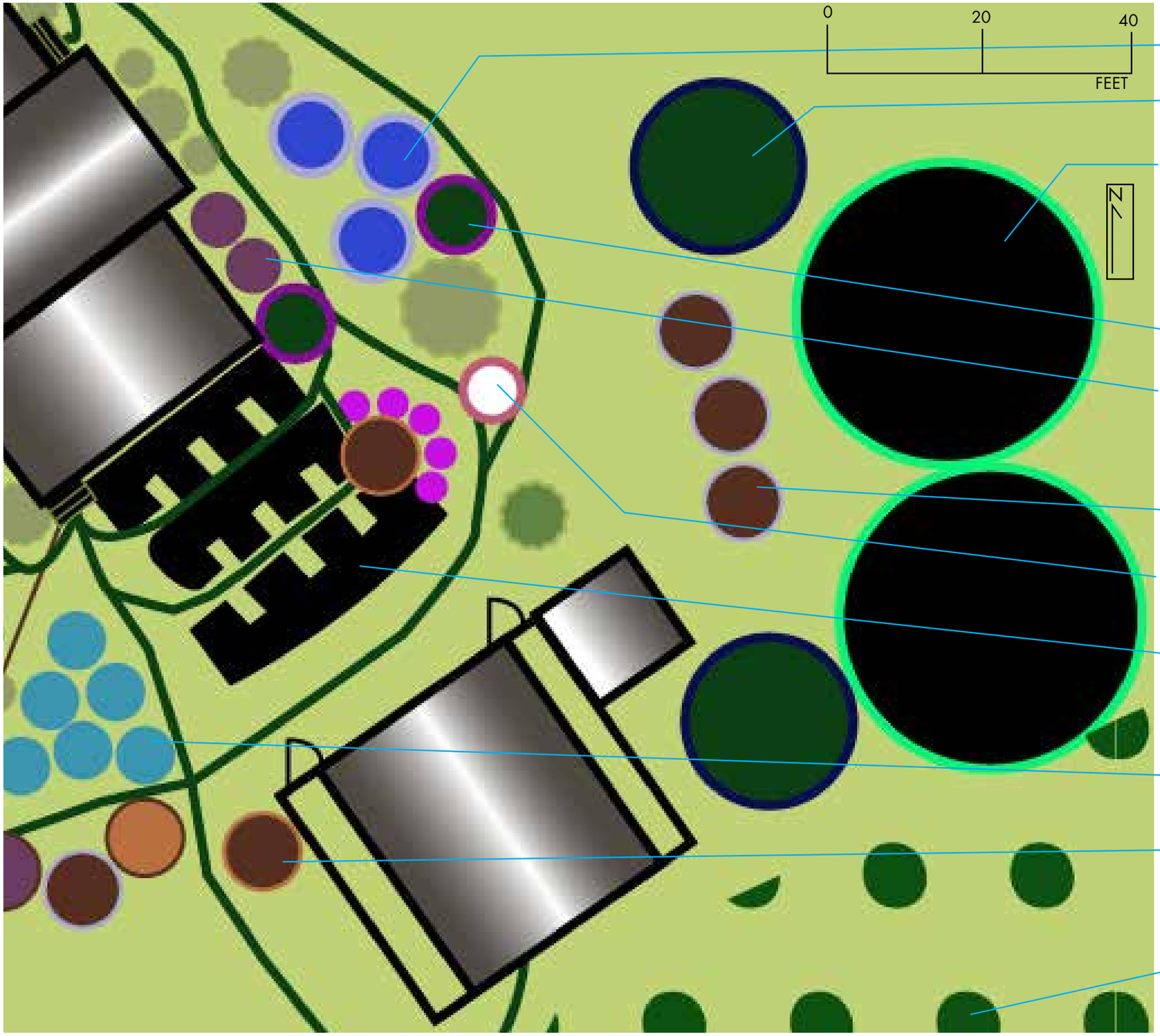
Paperbush Tree
Edgeworthia chrysantha 10'
Winter Interest
*I would move this from the East side of the house so that you can look at it and enjoy it's blooms during the late winter

Small intensive Annual Cut Flower Beds
Visual Interest & can be changed annually

IMPLEMENTATION

As far as establishment of the dense plantings in the Zone 1 design, I would focus on the elk deterent hedging in all sections to help with the establishment of a barrier. A temporary fencing may be necessary for establishment. While these hedges are coming to their own each of the areas for planting should be established at least a year prior to planting. This will raise the site for drainage and create essentially an organic sponge that can retain water & nutrients longer. The trees should be planted with a selection of companion plants (see page 26's sample)- make sure each selection has an additional function (ie. edibility, biomass, pollination).

Cost: To help with initial cost all of the plants can be started in the greenhouse and over-wintered until ready for planting.
Mulching materials can be gathered from blown down branches while on daily dog walks and shredded/chipped in the spring.



19-Zone 1 Plantings (section 2)

Project: Skagit River

Designer: Shanna Mahan

Site Location

48º29'17"N 121º 32'07"W

55685 Martin Ranch Road

Rockport, WA, USA

Elevation: 78m

Serviceberry Amelanchier alnifolia 10'
Native, Wildlife, edible berries

Sitka Spruce Picea sitchensis 40'
Native evergreen

Black Locust *Robina pseudocacia* 40'
Useful firewood, Pollinator

Evergreen Huckleberry *Vaccinium ovatum* 6'
Native, Edible Fruit, Shade Tolerant

Aronia or Chokeberry *Aronia melanocarpa 4'*
Native Edible, Shade tolerant

Black Hawthorn *Crataegus douglasii* 12'
Pollinator/Hedging

Mock Orange *Philadelphus lewisii* 6'
Native, Visual, Fragrance

Annual Garden Beds
with keyhole layout to maximize space. Can have Trellis between beds to support vining annuals. Recommend crop rotation and yearly application of composted materials and heavy mulching. These can be built as raised beds with edging in copper to deter slugs.
Ringed on the northside with Salmon Berries to shield from Elk

Blueberry V*accinium corymbosum* 6'
edible fruit

Fig *Ficus carica* 8'
Edible Fruit *Select cultivar with cool climate tolerance, although this is against the southern side of a metal shipping container creating a microclimate.

Reforestation Area Working with Skagit River Systems Co-op-
Western Red Cedar *Thuja Plicata*
Douglas Fir *Pseudotsuga menziesii*

EXTENDED POULTRY RUN

with edible tree & shrubs. Prevents over grazing and provides food & shade for birds

Pacific Crabapple *Malus fusca 25'*
Native with edible berries

Paper Birch *Betula papyrifera 25'*
winter interest, fall folliage,water site, native

Mulberry *Morus nigra 10'*
Edible Berries

Aronia or Chokeberry *Aronia melanocarpa 4'*
Native Edible, Handles Wetland Sites

Goji berry *Lycium barbarum 5'*
Edible Fruit

Nobel Fir *Abies procera 25'*
Evergreen Windbreak & shield herb garden from harsh western summer sun.

Bamboo *Fargesia rufa 8'*
Sunset Glow clumping shelter from north winter winds

Poultry Run Compost Bin
for soiled coop straw

Site for Workshop/Garage-Auxilary Compost Toilets, possible communal cooking/gathering area. This location allows for access from the main road. Also possible additional solar panels mounted on roof. Rainwater from roof can be funneled to the duck/geese pond in the poultry run.

Satomi Red Dogwood *Cornus Kousa 20'*
Spring Bloom

Siberian Pea Shrub- *Caragana arborescens 12'*
Nitrogen Fixer

Small Grove of edible nuts
Beaked hazelnuts *Corylus cornuta 10'*
Almond Tree *Prunus dulcis 10'*

Cornealian Cherry Dogwood *Cornus Mas 20'*
Edible Berries and visual interest

Pacific Dogwood *Cornus nuttallii 20'*
Native, Spring Bloom, Fall Folliage

Plum trees *Prunus sp. 12'*
edible Fruit

Camilla *Camellia sasanqua 10'*
Winter Bloom

Aromatic Border
Lavender-*Lavendula sp. 3'*
Rosemary *Rosmarius officinalus 3'*

0 10 25
FEET

N

19-Zone 1 Plantings(section 3)
Project: Skagit River
Designer: Shanna Mahan

Site Location
48º29'17"N 121º 32'07"W
55685 Martin Ranch Road
Rockport, WA, USA
Elevation: 78m

Commercial Perennial Medicinal Herb Beds
Establishment of income from sale of medicinal herbs

Apricot Trees *Prunus armeniaca 10'*
Edible fruit

Pinapple Quince Tree *Cydonia oblonga 10'*
Edible fruit, Winter Interest

Gooseberry *Ribes grossularia 5'* Edible fruit

Relocation & additional greenhouses
Closer to propane and electricity for establishing temperature regulation features. Also removes it from main wildlife viewing are out N window.
Uses: Annual seedling starts
Winter production of edible greens.

Relocation of Compost Bins
Saves energy as it is on the way to daily poultry coop duties

Small intensive Annual Cut flower Beds
Visual Interest

LOCAL PERMACULTURE SITES

SKAGIT Co.

Analisa Lee 2101 E Viewmont Drive, Mount Vernon, WA 98273
E: beingbeauty@gmail.com T: 360-224-3323
Urban permaculture landscape yard (.17 acres) with a particular emphasis on beauty and incorporating pollinator habitat for wild bees and hummingbirds in the Skagit Valley.
Childs Creek also offers training and education to the public about permaculture. For more information, visit www.childscreekfarm.info

WHATCOM Co.

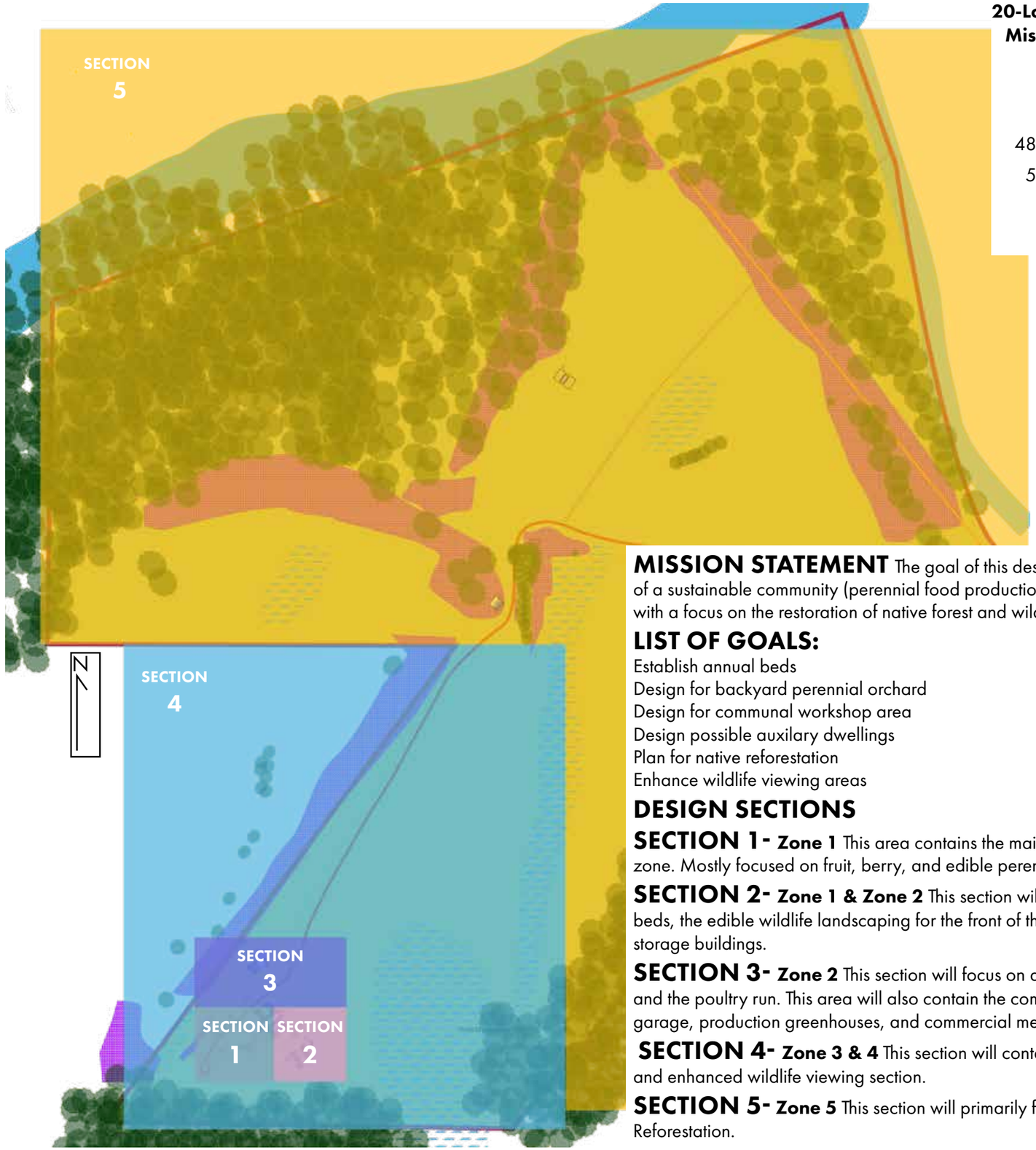
Brian Kerkvliet - Inspiration Farm 619 E laurel Rd.
E: info@inspirationfarm.com T: 360 398 7061 W: www.inspirationfarm.com
Inspiration Farm is a model of holistic integrated homestead style regenerative systems. Benefiting from successes and mistakes, we share our lessons of regenerating the land through workshops, tours, media and by example.

ISLAND Co.

Christine Pace PO Box 71 Bayshore Drive, Oak Harbor, WA 98277
E: imagineapermacultureworld@gmail.com T: 360-720-6053
W: www.imagineapermacultureworld.com
Co-founder of Imagine - Oakharbor's first food forest. EST. 2012. Non-profit since 2014.

AREA EDUCATION OPPORTUNITIES

Skagit Valley College Environmental Sciences 4-year degree program
North Cascades Institute an education non-profit organization that empowers people to revere the wildlife of the Pacific Northwest
Skagit Watershed Council Broad-based initiative to empower folks to protect our natural environment and our communities through knowledge, dialogue and the motivation to act



20-Local Network Survey/ Mission Statement/Goals

Project: Skagit River
Designer: Shanna Mahan

Site Location

48º29'17"N 121º 32'07"W
55685 Martin Ranch Road
Rockport, WA, USA
Elevation: 78m

MISSION STATEMENT The goal of this design to establish a locus of a sustainable community (perennial food production, auxilary buildings) with a focus on the restoration of native forest and wildlife areas.

LIST OF GOALS:

Establish annual beds
Design for backyard perennial orchard
Design for communal workshop area
Design possible auxilary dwellings
Plan for native reforestation
Enhance wildlife viewing areas

DESIGN SECTIONS

SECTION 1- Zone 1 This area contains the main edible production zone. Mostly focused on fruit, berry, and edible perennials.

SECTION 2- Zone 1 & Zone 2 This section will contain the annual beds, the edible wildlife landscaping for the front of the house, and auxillary storage buildings.

SECTION 3- Zone 2 This section will focus on auxilary food production and the poultry run. This area will also contain the communal workspace garage, production greenhouses, and commercial medicinal planting beds.

SECTION 4- Zone 3 & 4 This section will contain the auxillary housing and enhanced wildlife viewing section.

SECTION 5- Zone 5 This section will primarily focus on Native Species Reforestation.

WATER SUMMARY

Overall the site has minimal elevation changes and the freely draining soil (+8"/hour) makes runoff minimal. The main seasonal wetland areas can be enhanced with plantings for wildlife viewing. The re-distribution of greywater from roof run-off could be utilized for irrigation and filling the poultry pond.

21 – Final Design -Water

Project: Skagit River

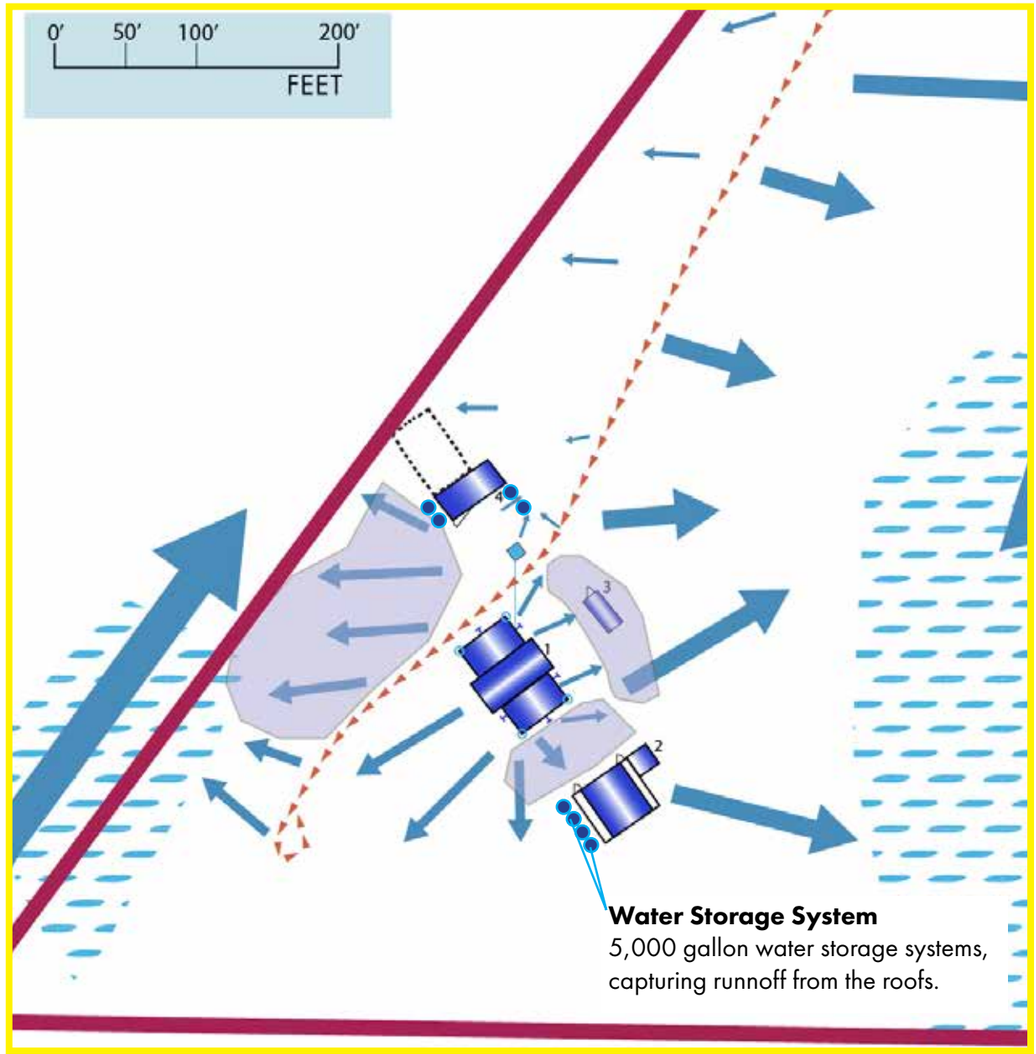
Designer: Shanna Mahan

Site Location

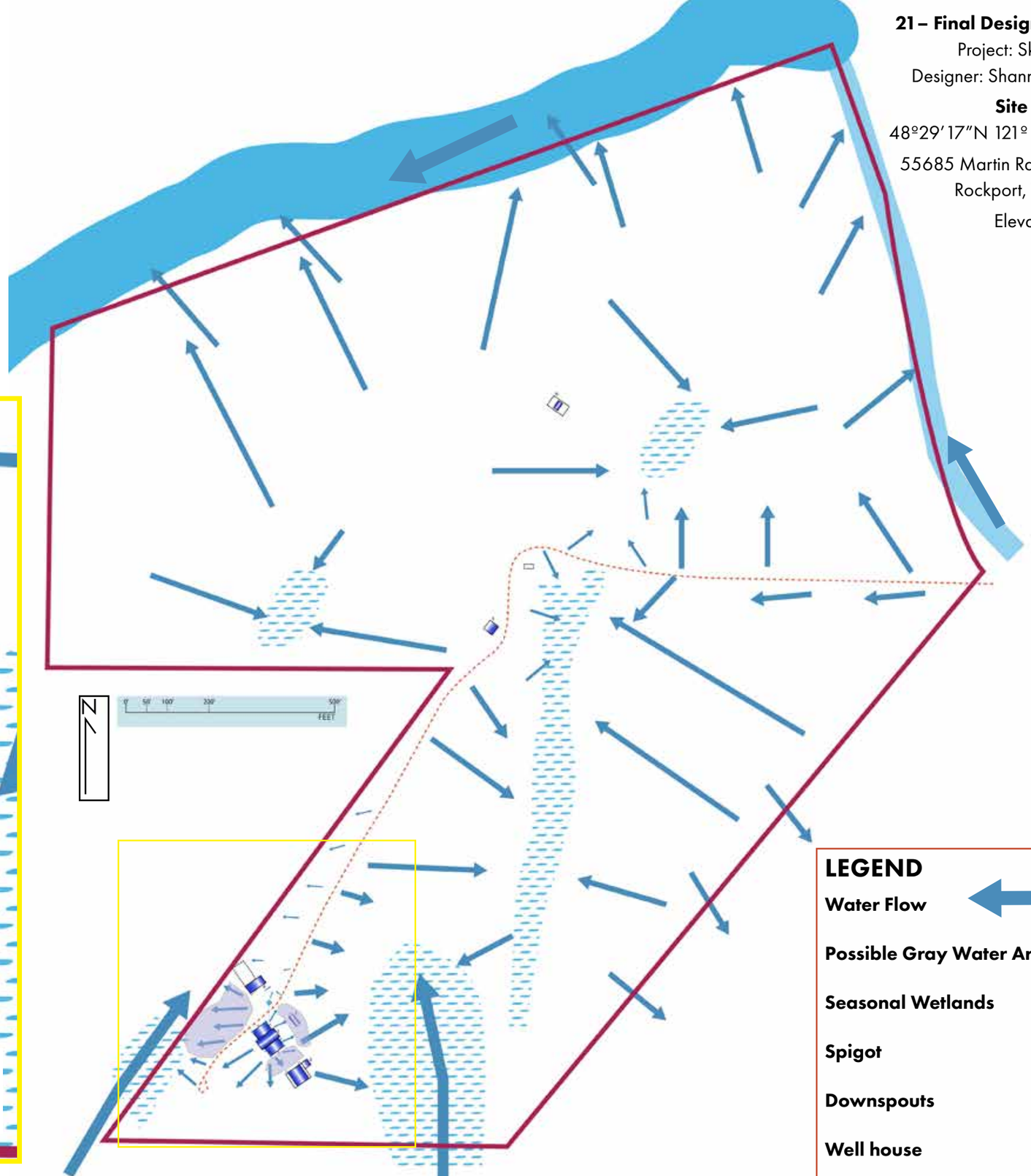
48º29'17"N 121º 32'07"W

55685 Martin Ranch Road
Rockport, WA, USA

Elevation: 78m



Water Storage System
5,000 gallon water storage systems, capturing runnoff from the roofs.



The focus of this section is the **PERENNIAL FOOD PRODUCTION ORCHARD**

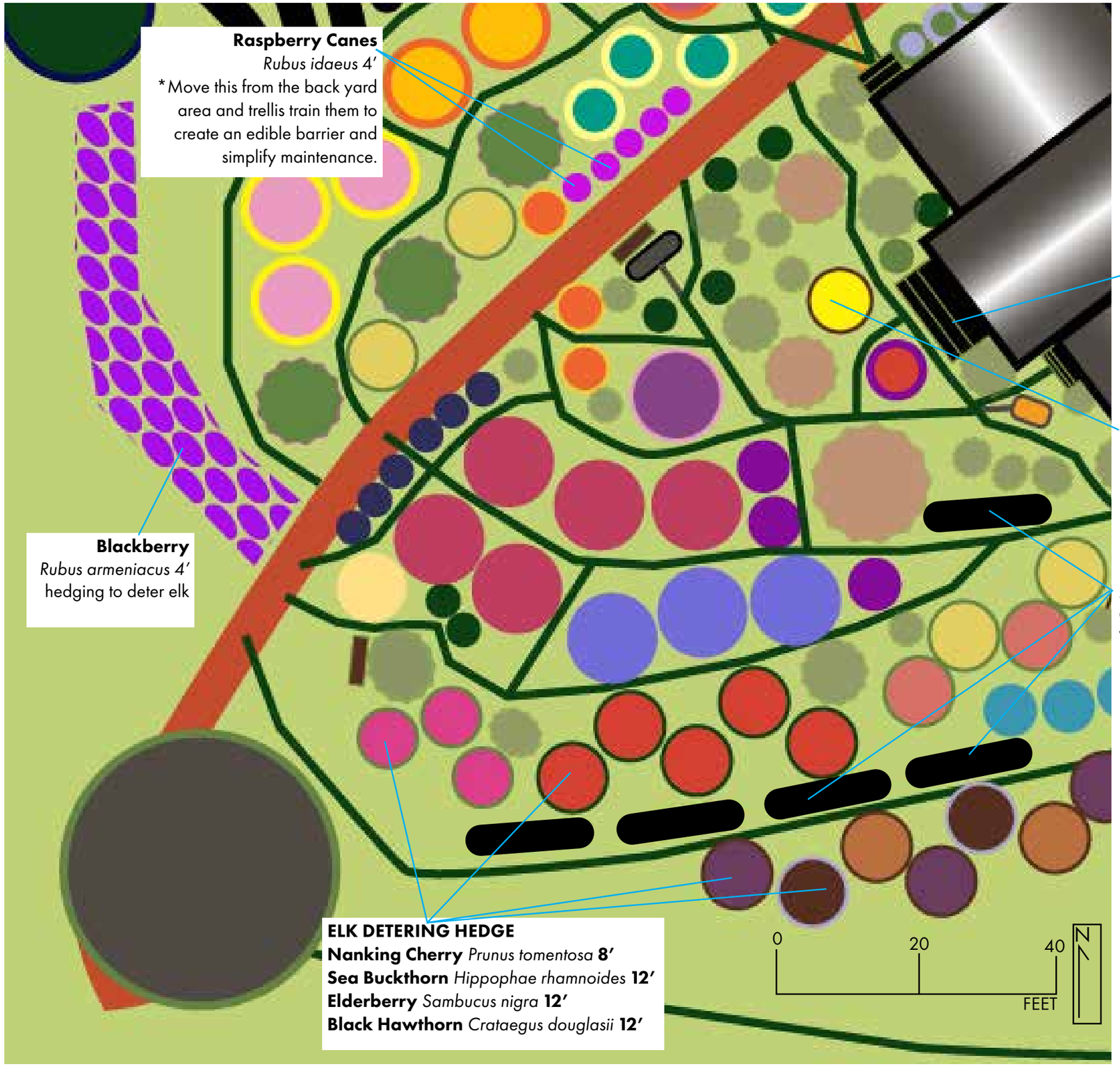
Timeline: This section's projects a 5+ year timeline to considerable establishment.

Challenges: The biggest challenge to establishment of landscaping is Ungulates (i.e. ELK) and drought mortality for plants.

Support for Success:

To help with initial cost all of the plants can be started in the greenhouse and over-wintered until ready for planting. For bed establishment the mulching materials can be gathered from blown down branches while on daily dog walks and shredded/ chipped in the spring.Soiled chicken straw can be used in the sheet mulch as well as the brown paper bag their feed comes in. establish planting beds prior to planting. The initial focus should be on the establishment of elk deterent hedging in all sections to help with the establishment of a barrier. A temporary fencing may be necessary for establishment. While these hedges are coming to their own each of the areas for planting should be established at least a year prior to planting. This will raise the site for drainage and create essentially an organic sponge that can retain water & nutrients longer. The trees should be planted with a selection of companion plants (see tbe following pages for details)- make sure each selection has an additional function (ie. edibility, biomass, pollination).

*SEE DESIGN SECTION 5 FOR DETAILED STRATEGY OF PLANTING.



21 – Final Design -Section 1

Project: Skagit River

Designer: Shanna Mahan

Site Location

48º29'17"N 121º 32'07"W

55685 Martin Ranch Road
Rockport, WA, USA

Elevation: 78m

Construction of wide stairs off main backporch, This allows for greater access to the main garden, sites for seating and places for smaller decorative plants in pots and edible greens/ herbs out kitchen door.

Paperbush Tree
Edgeworthia chrysantha 10'
Winter Interest
*move this from the East side of the house so that you can look at it and enjoy it's blooms during the late winter

Small intensive Annual Cut Flower Beds
Visual Interest & can be changed annually

LEGEND

Cherry-*Prunus avium* **20′ Edible Fruit/ Visual**

Nishiki Willow *Salix integra ‘Hakuro Nishiki’* **10′ Visual Interest**

Siberian Pea Shrub- *Caragana arborescens* **12′ Nitrogen Fixer**

Grapes *Vitis labrusca ‘Vanessa’* **5′ Edible Fruit**

Oregon Grapes- *Mahonia aquifolium* **5′ Native Evergreen**

Witch Hazel -*Hamamelis x intermedia ‘Diane’* **10′ Visual Interest**

Nanking Cherry *Prunus tomentosa* **8′ Edible Fruit/Hedging**

Sea Buckthorn *Hippophae rhamnoides* **12′ Edible Fruit/Hedging**

Linden *Tilia tomentosa* **40′ Fragrant/Flowers**

Elderberry *Sambucus nigra* **12′ Edible Fruit/Hedging**

Black Hawthorn *Crataegus douglasii* **12′ Pollinator/Hedging**

Beaked Hazelnut *Corylus cornuta* **12′ Edible Nuts/Hedging**

Fig tree *Ficus carica ‘Desert King’* **8-12′ Edible Fruit**

Paperbush Tree *Edgeworthia chrysantha* **10′ Winter Interest**

Peach *Prunus sp.* **20′ Edible Fruit**

Apple *Malus sp.* **15′ Edible Fruit**

Mulberry *Morus nigra* **12′ Edible Fruit/Wildlife**

Autumn Olive *Elaeagnus umbellata* **12′ Edible Fruit/Nitrogen**

Blueberry *Vaccinium corymbosum* **6′ Edible Fruit**

Flowering Quince- *Chaenomeles speciosa* **6′ Visual**

Golden Currant-*Ribes aureum* **6′Edible Fruit**

Salmon Berry *Rubus spectabilis* **4′ Edible Fruit**

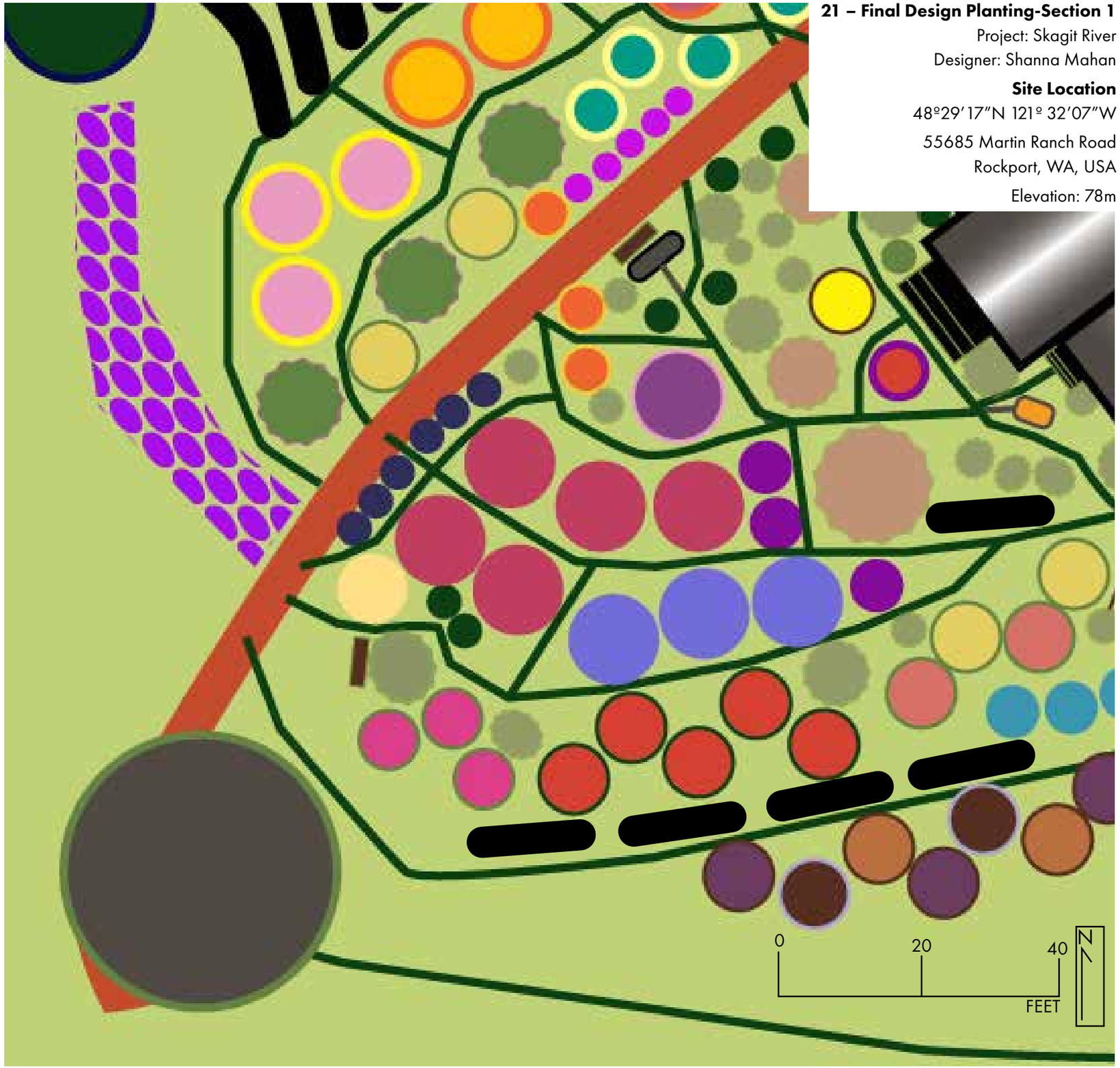
Goumi Berry *Elaeagnus multiflora* **6′ Edible Fruit/Nitrogen Fixer**

Lavender *Lavandula angustifolia* **5′ Fragrance/Pollinator**

Rosemary *Salvia rosmarinus* **5′ Fragrance/ Pollinator**

Santa Rosa Plum *Prunus salicina ‘Santa Rosa’* **15′ Edible Fruit**

Planned Pathways **Roadway**



21 – Final Design Planting-Section 1

Project: Skagit River

Designer: Shanna Mahan

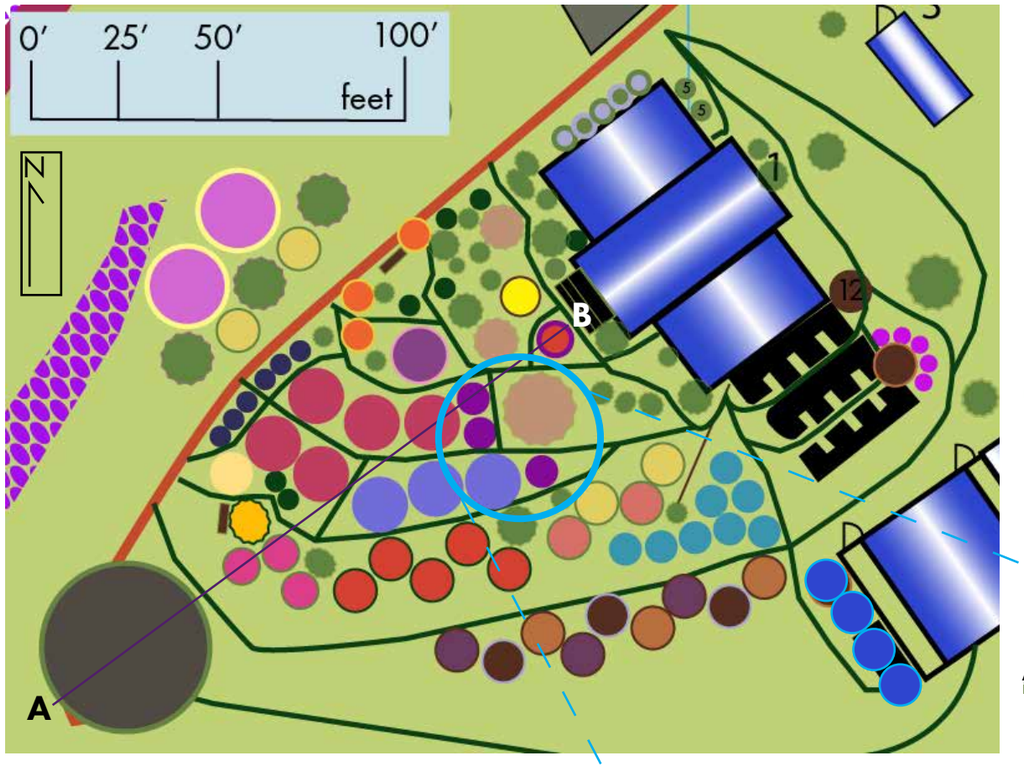
Site Location

48º29′17″N 121º 32′07″W

55685 Martin Ranch Road

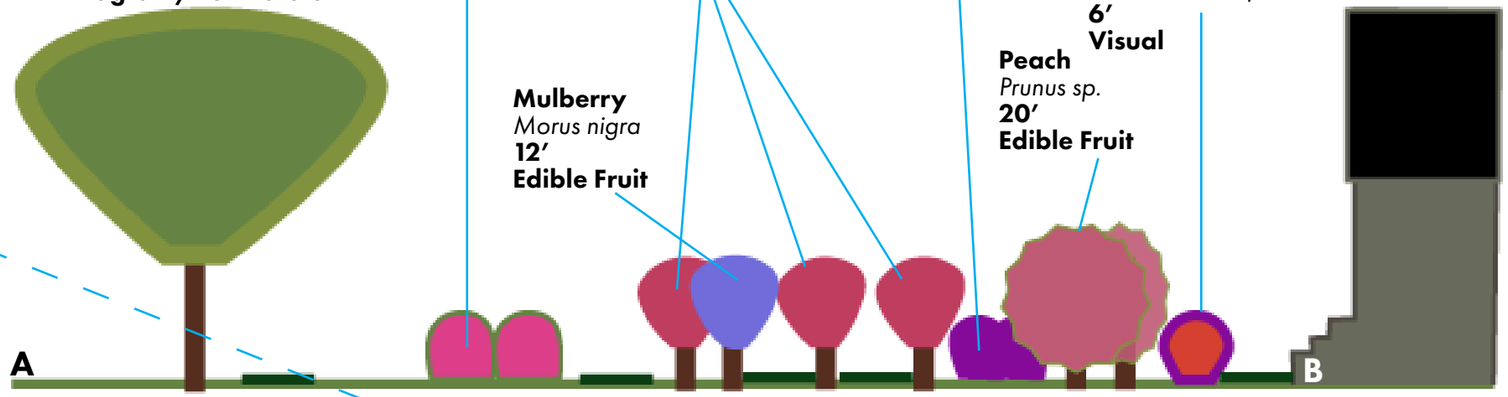
Rockport, WA, USA

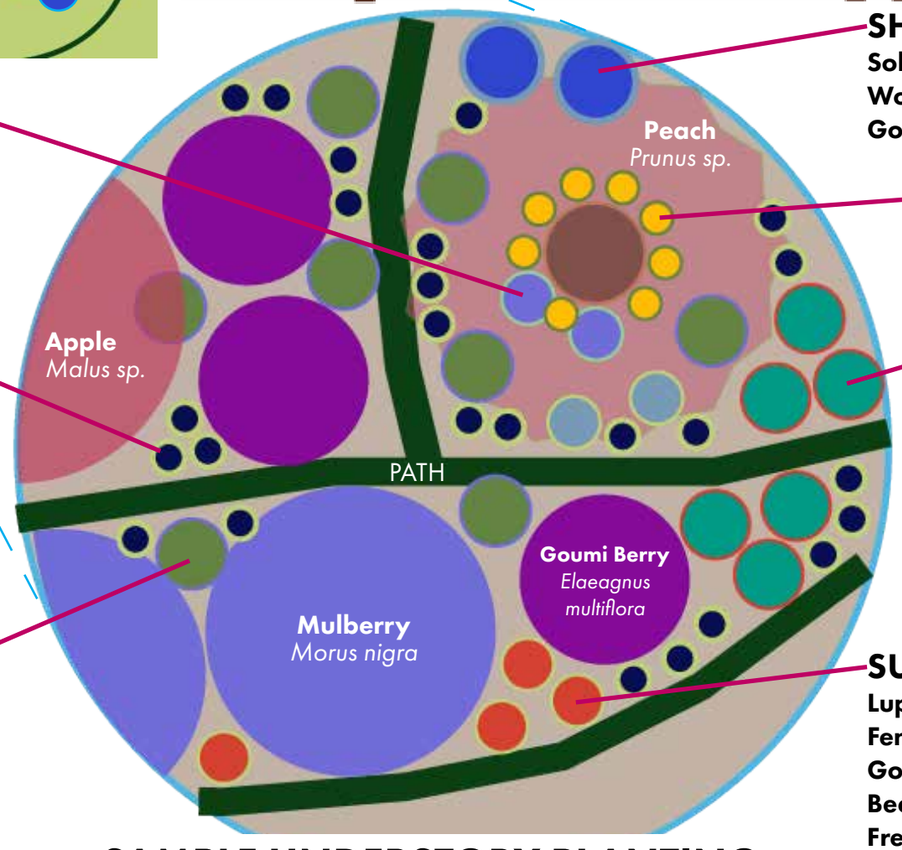
Elevation: 78m



21 – Final Design Companion
Planting Sample-Section 1
Project: Skagit River
Designer: Shanna Mahan

Site Location
48º29′17″N 121º 32′07″W
55685 Martin Ranch Road
Rockport, WA, USA





SAMPLE UNDERSTORY PLANTING

CLIMBING VINES
Passion Flower *Passiflora incarnata- Edible Fruit/Visual/Med.*
5 Flavor Vine *Schisandra chinensis- Medicinal*
Hardy Kiwi *Actinidia arguta*- Edible Fruit
Chocolate Vine Akebia trifoliata- Edible Fruit

GROUND COVERS
Lingon Berry *Vaccinium vitis-idae* Edible
Strawberry *Fragaria vesca Edible*
Winter Green Gaultheria procumbens -Medicinal /Edible Berry
Creeping Thyme Thymus serpyllum- Fragrance/Pollinators

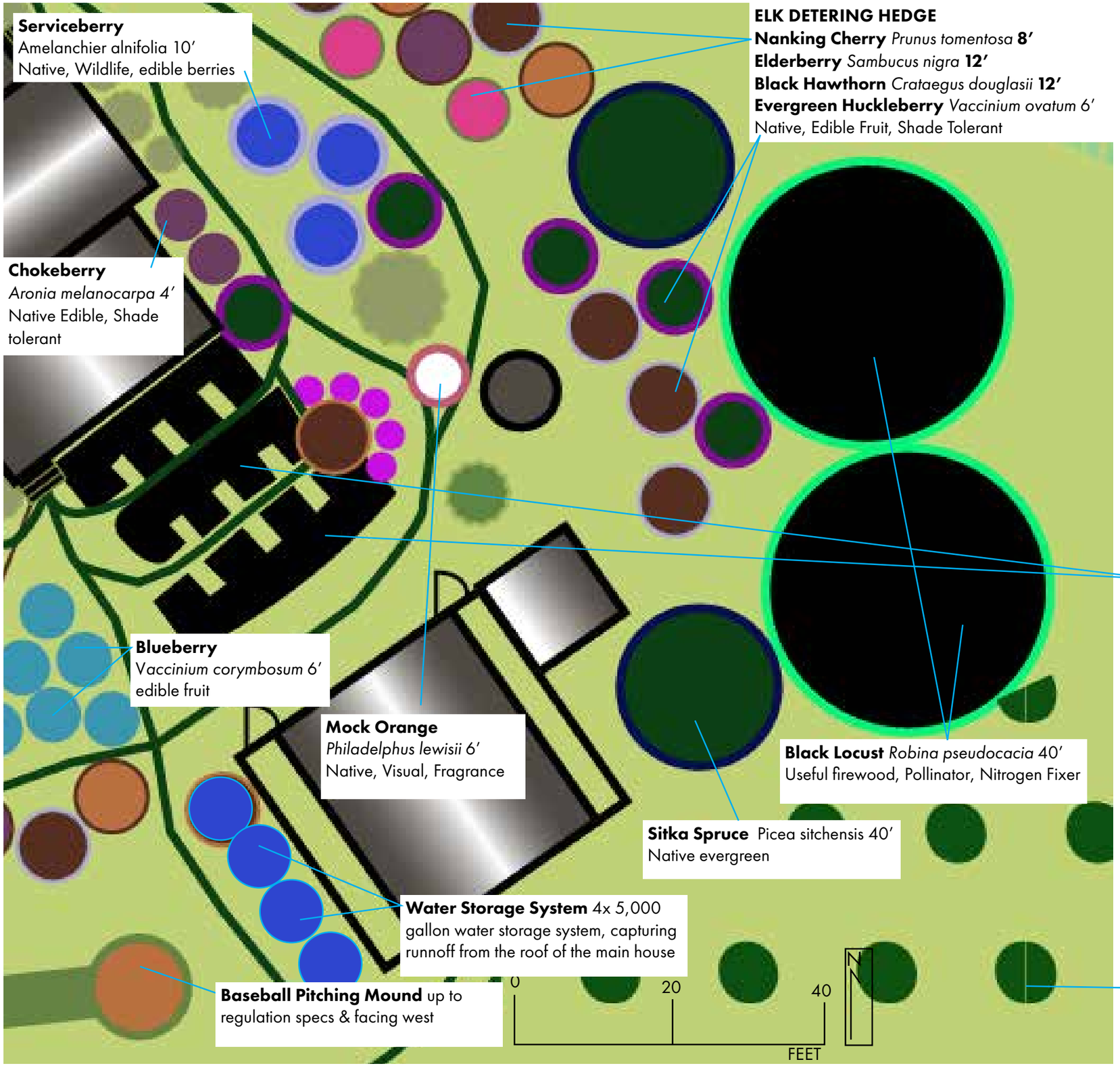
MULCH PLANTS
Comfrey (Blocking 14) *Symphytum x uplandicum* - Pollinators/Biomass
Sainfoin *Onobrychis viciifolia*- Nitrogen Fixer/Green Manure
Red Clover *Trifolium pratense*- Pollinators/Green Manure

SHADE TOLERANT PERENNIALS
Solomon's Seal *Polygonatum odoratum* Medicinal/Pollinator
Wood Betony *Staychis officinalis* Medicinal/Pollinator
Goldenseal (Hydrastis canadensis) Medicinal

GRASS-SUPRESSING BULBS
Daffodils (*Narcissus sp.*) Animal Repelents
Camas (*Camassia sp.*)- Edible roots
Wild Garlic/Onions (*Alliums sp.*)- Edible

SUN LOVING MEDICINALS
Hyssop *Hyssopus officinalis*- Medicinal/Pollinator
Lemon Balm *Melissa officinalis*- Medicinal/Pollinator
Chamomile *Matricaria recutita*- Medicinal/Pollinator
Echinacea *Echinacea purpurea* Medicinal/Pollinator
Calendula *Calendula officinalis* Medicinal/Pollinator
Skullcap *Scutellaria laterifolia* Medicinal/Pollinator

SUN LOVING PERENNIALS
Lupine *Lupinus perennis* Nitrogen Fixer/ Pollinator
Fennel *Foeniculum vulgare*- Edible/Insect Repellent/Medicinal
Good King Henry *Chenopodium bonus-henricus*- Edible
Bee Balm *Monarda didyma*- Pollinator
French Marigold *Tagetes patula*-Pollinator/Insect repellent
Butterfly MilkWeed *Asclepias tuberosa* Medicinal/Pollinator



The focus of this section is the **ANNUAL FOOD PRODUCTION AND EDIBLE FRONT WILDLIFE HEDGES**

Timeline: This section's projects a 3+ year timeline

Challenges: he biggest challenge to establishment is detering munching by elk and slugs and drought mortality for plants.

Support for Success:
Start all future landscape plantings seedlings in greenhouse, establish planting beds prior to planting, provide alternative edibles for elk, or deter with temporary fencing.

*SEE SECTION 5 FOR DETAILED STRATEGY OF PLANTING.

Annual Garden Beds
with keyhole layout to maximize space, these beds will be the most labor intensive year after year, hence their location directly off the house. This location also receives full day sunlight, but is sheltered from the harsh western summer sun.. Can have Trellis between beds to support vining annuals. Recommend crop rotation and yearly application of composted materials and heavy mulching. These can be built as raised beds with edging in copper to deter slugs.
Ringed on the northside with Salmon Berries to shield from Elk

Reforestation Area Working with Skagit River Systems Co-op
Western Red Cedar *Thuja Plicata*
Douglas Fir *Pseudotsuga menziesii*

*SEE SECTION 5 FOR DETAILED STRATEGY OF PLANTING.

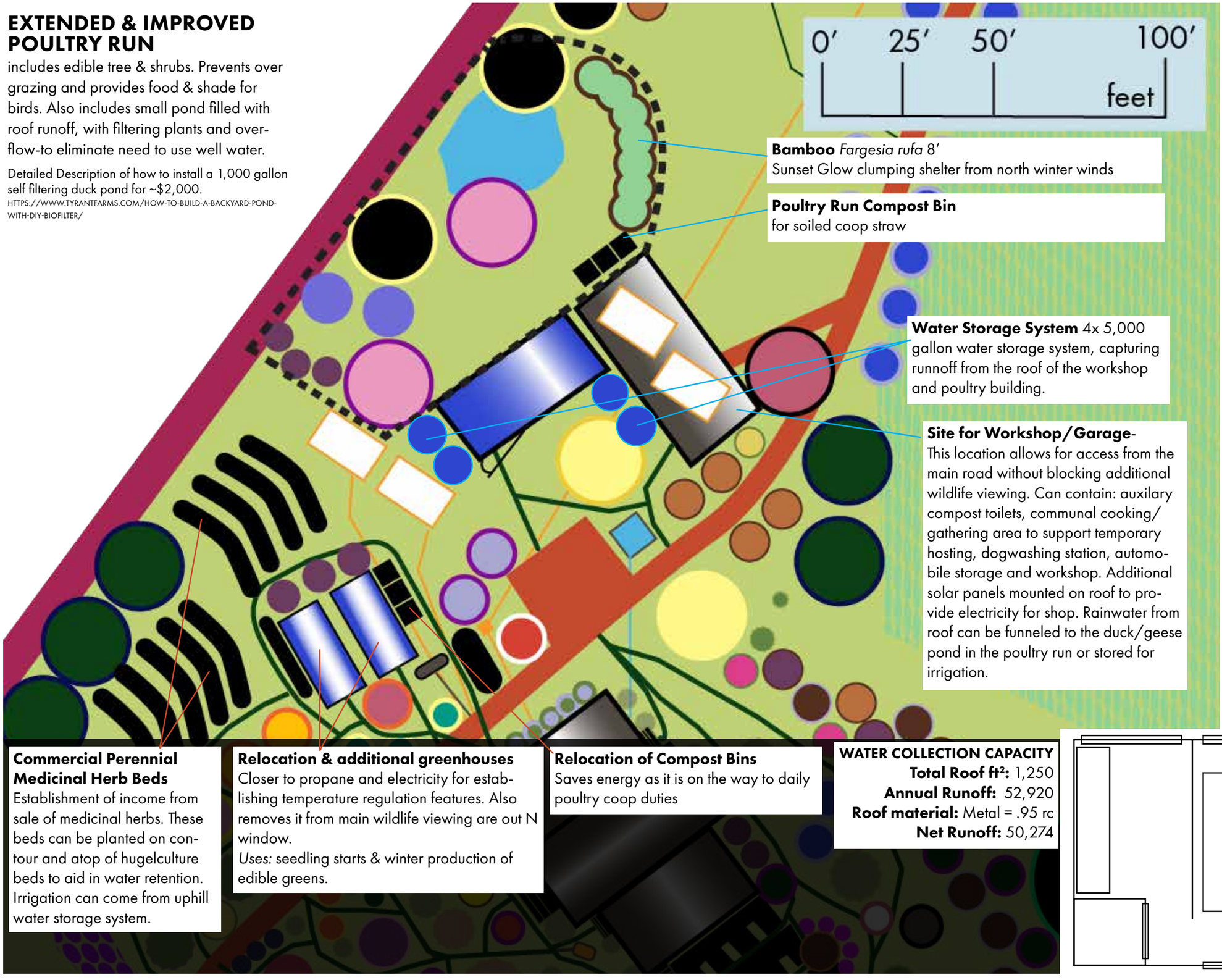
21 – Final Design -Section 2
Project: Skagit River
Designer: Shanna Mahan

Site Location
48º29'17"N 121º 32'07"W
55685 Martin Ranch Road
Rockport, WA, USA
Elevation: 78m

EXTENDED & IMPROVED POULTRY RUN

includes edible tree & shrubs. Prevents over grazing and provides food & shade for birds. Also includes small pond filled with roof runoff, with filtering plants and over-flow-to eliminate need to use well water.

Detailed Description of how to install a 1,000 gallon self filtering duck pond for ~$2,000.
HTTPS://WWW.TYRANTFARMS.COM/HOW-TO-BUILD-A-BACKYARD-POND-WITH-DIY-BIOFILTER/



Bamboo *Fargesia rufa* 8′
Sunset Glow clumping shelter from north winter winds

Poultry Run Compost Bin
for soiled coop straw

Water Storage System 4x 5,000 gallon water storage system, capturing runnoff from the roof of the workshop and poultry building.

Site for Workshop/Garage-
This location allows for access from the main road without blocking additional wildlife viewing. Can contain: auxilary compost toilets, communal cooking/ gathering area to support temporary hosting, dogwashing station, automobile storage and workshop. Additional solar panels mounted on roof to provide electricity for shop. Rainwater from roof can be funneled to the duck/geese pond in the poultry run or stored for irrigation.

Commercial Perennial Medicinal Herb Beds
Establishment of income from sale of medicinal herbs. These beds can be planted on contour and atop of hugelculture beds to aid in water retention. Irrigation can come from uphill water storage system.

Relocation & additional greenhouses
Closer to propane and electricity for establishing temperature regulation features. Also removes it from main wildlife viewing are out N window.
Uses: seedling starts & winter production of edible greens.

Relocation of Compost Bins
Saves energy as it is on the way to daily poultry coop duties

WATER COLLECTION CAPACITY
Total Roof ft²: 1,250
Annual Runoff: 52,920
Roof material: Metal = .95 rc
Net Runoff: 50,274

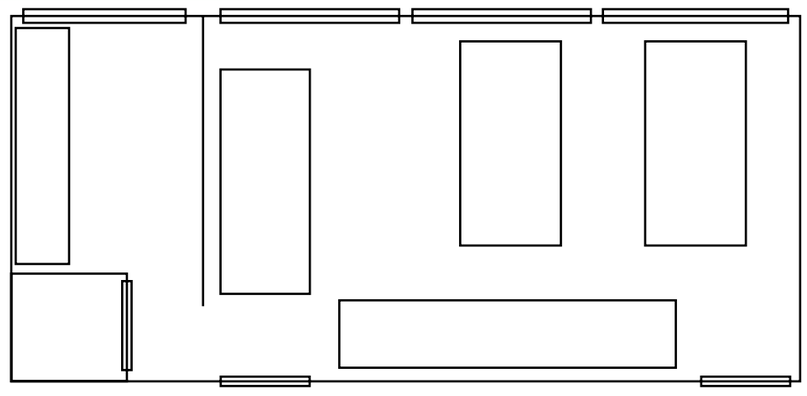
21 – Final Design -Section3
Project: Skagit River
Designer: Shanna Mahan

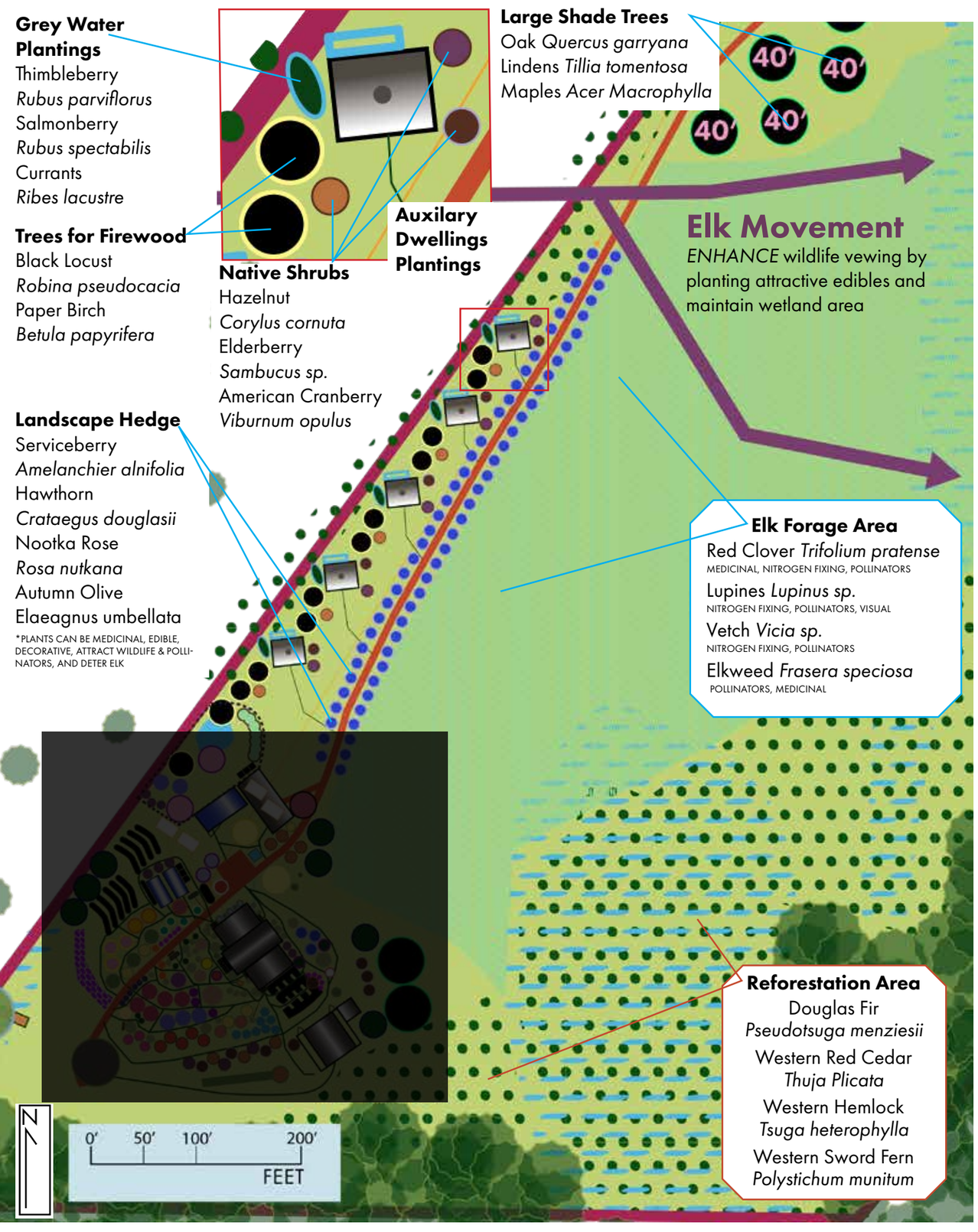
Site Location
48º29′17″N 121º 32′07″W
55685 Martin Ranch Road
Rockport, WA, USA
Elevation: 78m

The focus of this section is the **EFFICIENT DESIGN FOR COMMUNITY.**
Timeline: This section's projects a 3+ year timeline
Challenges: The biggest challenge to establishment of landscaping is elk damage and drought mortality for plants. Initial cost of communal workshop building, relocation of greenhouses, and implementation of poultry run enlargement with pond installation.
Support for Success:
Start all future landscape plantings seedlings in greenhouse, establish planting beds prior to planting, provide alternative edibles for elk, or deter with temporary fencing.

*SEE SECTION 5 FOR DETAILED STRATEGY OF PLANTING.

PROPOSED COMMUNAL WORKSHOP
50′ X 25′
Materials: Cedar, Metal, Glass
Design Elements: 2 car garage, Workshop benches, Dry Compost Toilet, Communal Cooking area, Grey Water System, Roof-Mounted Solar Panel





The focus of this section is the **ESTABLISHMENT OF SUSTAINABLE AUXILARY DWELLINGS AND ENHANCEMENT OF WILDLIFE VIEWING.**

Timeline: 3+ year to tconsiderable establishment.

Challenges: The biggest challenge to establishment of landscaping is elk damage and drought mortality. Initial cost of auxilary dwelling establishment for sustainability (solar panels, water storage and woodstove, compost toilet).

Support for Success: Start seedlings in greenhouse, establish/amend planting beds prior to planting, provide alternative edibles for elk, or deter with temporary fencing/ hedging. Heavy mulching for all plantings (minimum 4" in a 1' radius around plants)*

*SEE SECTION 5 FOR DETAILED STRATEGY OF PLANTING.

21 – Final Design -Section 4

Project: Skagit River

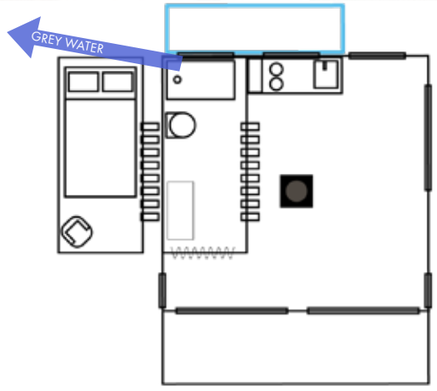
Designer: Shanna Mahan

Site Location

48º29'17"N 121º 32'07"W

55685 Martin Ranch Road
Rockport, WA, USA

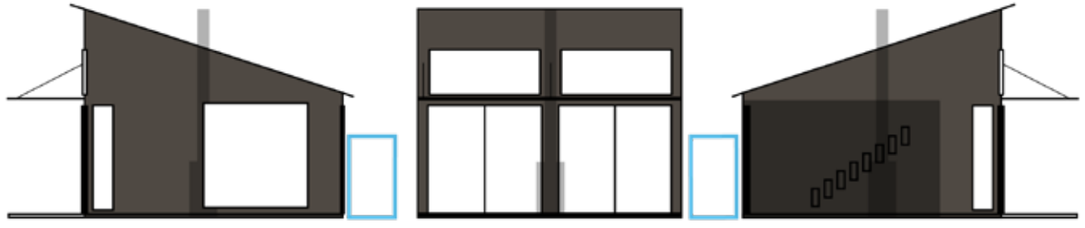
Elevation: 78m

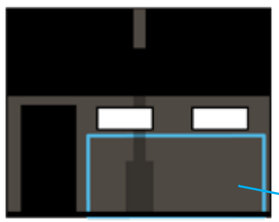


PROPOSED AUXILARY DWELLING

21'X 24' SMALL CABIN

Orientation: Southern
Materials: Cedar, Metal, Glass
Design Elements: Central Woodstove, Lofted Sleeping Area, Dry Compost Toilet, Grey Water System, Individual Solar Panel, Large windows for wildlife viewing of elk forage area.

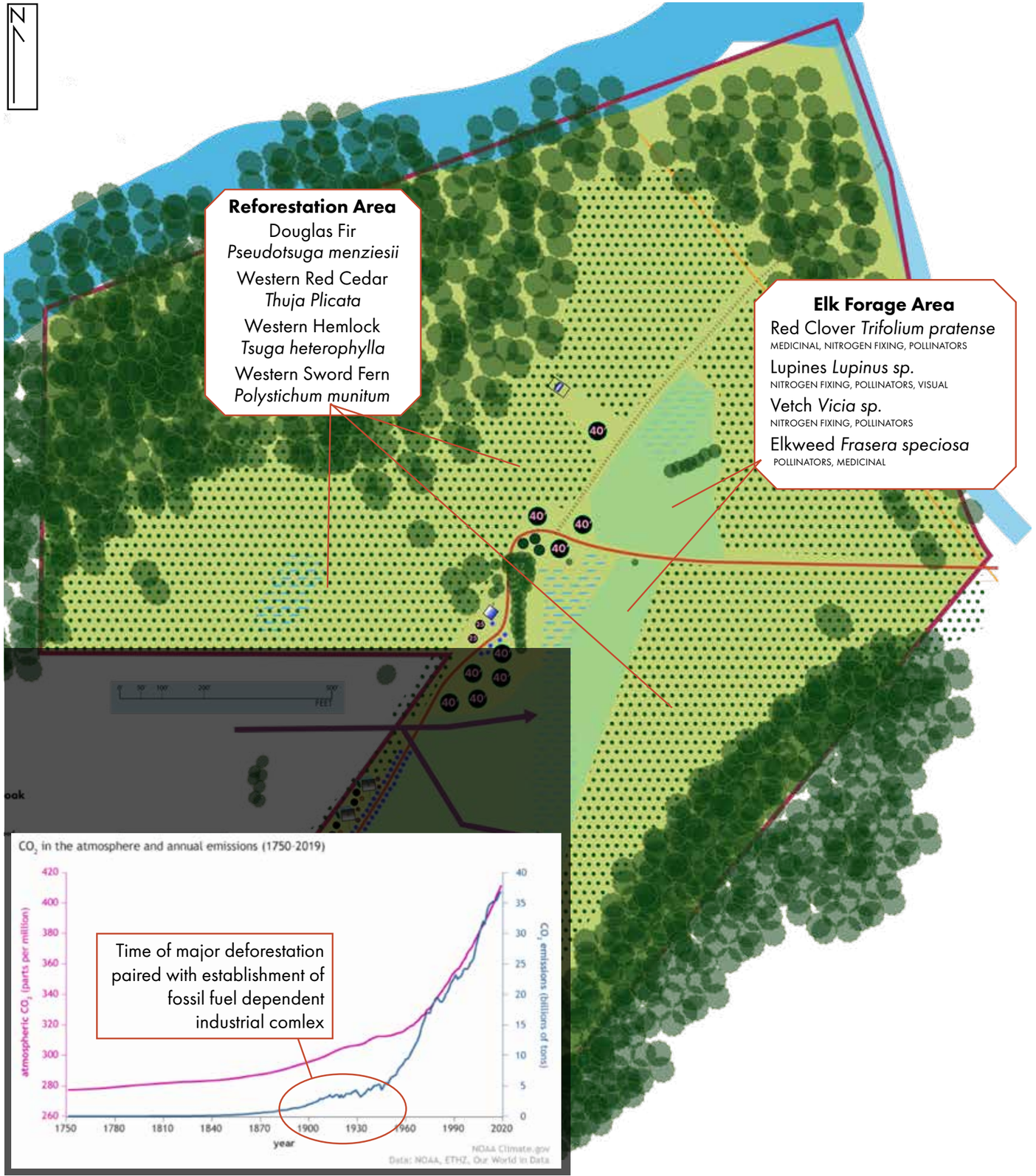




WATER COLLECTION CAPACITY

Total Roof ft²: 504
Annual Runoff: 21,337.75 gal
Roof material: Metal = .95 rc
Net Runoff: 20,270.86 gal

Water Storage Tank



The focus of this section is **NATIVE SPECIES REFORESTATION.** With atmospheric carbon at climate changing levels re-establishment of carbon sequestering forest eco-systems is the most socially conscious action one can take. Not only do established native forests provide much needed carbon sequestration, they also provide protected habitat for local species such as the endagered Spotted Owl.

Timeline: This section's projects a 25+ year timeline to considerable establishment, since Western Red Cedar, Western Hemlock and Douglas Fir have growth rate of 20"/year.

Challenge: The biggest challenge to re-forestation is seedling survival rate. For example, until their roots become well-situated seedlings very vulnerable to summer drought. Seedlings also have to survive animal devastation (i.e. elk). Slow growing trees also have to contend with faster growing pioneer species (blackberry brambles).

Success Support: Although this will require more consideration than plopping a plant in the ground and walking away, seedling survival can be supported by an number of informed interventions.

GREENHOUSE PROPIGATION: Direct seeded trees have a 31% germination, while greenhouse propigation rates are 81%. 2 year-old seedlings stand a better chance. In 1.5 years seedlings averaging 23 centimeters in height and 1.0 cm in caliper can be produced.

SOIL/BED ESTABLISHMENT: Areas to be planted can be sown with nitrogen fixing legmes and nutrient mining plants a year prior, and tilled under as a green manure. A minimum 3 inch layer of compost/manure mixed into soil. This will help retain moisture and nutrients (an issue with the sandy-loam soil). Luckily a lot of the same plants can be utilized for the Elk Forage Area allowing for large area plantings.

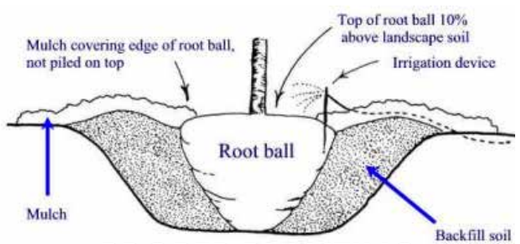
TIMING: Plant seedlings during cool weather, this will allow for root establishment before seasonal summer drought.

PROTECTION: Temporary fencing or application of elk deterent (blood spray) is an option. As well as planting seedlings with a companion plant (such as the spruce) to physically deter nibbling until the seedling can survive on its own. Also planting plenty of alternate material for elk to eat in the forage area can reduce the stress on the seedlings.

MAINTENANCE: A yearly application of 2 to 6 inches of wood chips under the tree to conserve moisture in the area and thwart competition from weeds would be ideal. Physical removal of any invasive competitors. Watering during the first few years of establishment would be highly beneficial, but labor intensive.

Soil Amending Plants

Agricultural mustard *Brassica spp.*
Fodder radish *Raphanus sativus*
Vetches *Vicia sp.*
Nettles *Urtica urens*
Sainfoin *Onobrychis viciifolia*



PROPER PLANTING TECHNIQUE

21 – Final Design -Section 5

Project: Skagit River
Designer: Shanna Mahan

Site Location

48º29'17"N 121º 32'07"W
55685 Martin Ranch Road
Rockport, WA, USA
Elevation: 78m

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	BEYOND	YEARLY
SECTION 1	-Sheet Mulch planting areas -Install Elk Detering Hedge plants or Fencing -Establish pathways	-Plant Annuals -Widened Stairs off backporch -Start Seedlings for Orchard	-Start companion plantings seedlingst -Plant Annuals	-Plant one half of orchard with companion plantings -Plant Annuals	-Plant Annuals -Plant remainder of orchard	-Plant Annuals	-Mulch (+4") with woodchips -Prune & Shred damaged limbs -Apply Compost to planting beds -Plant Annuals
SECTION 2	-Plant Annual Beds -Reposition Blueberries -Start Perennial, shrub & tree seedlings in greenhouse -Establish pathways	-Plant Annuals with bed rotation -Install Water Storage Tanks	-Plant Annuals with bed rotation	-Plant Annuals with bed rotation	-Plant Annuals with bed rotation	-Plant Annuals with bed rotation	-Mulch (+4") with woodchips -Prune & Shred damaged limbs -Apply Compost to planting beds -Plant Annuals
SECTION 3	-Move Greenhouse -Extend Poltry Run -Plant Bamboo Shield in poultry run. -Install bio-filter pond -Start Seedlings -Establish Compost	-Sheet Mulch and amend soil in future planting areas -Establish temperature regulation on greenhouses -Install additional greenhouse	-Build Communal Workshop -Plant Seedlings -Install Water Storage Tanks	-Install Solar Panels on Communal Workshop -Plant Annual Beds	-Plant Annuals	-Plant Annuals	-Mulch (+4") with woodchips -Prune & Shred damaged limbs -Apply compost to planting beds -Plant Annuals
SECTION 4	-Start Seedlings for edible landscaping	-Establish planting beds for elk forage area		-Build Auxilary Dwellings -Install Solar Panels on buildings	-Establish Greywater plantings for auxilary dwellings		-Mulch (+4") with woodchips -Prune & Shred damaged limbs -Apply Compost to planting beds
SECTION 5	-Start seedlings in greenhouse	-Establish planting beds for reforestation	-Plant seedlings -Mulch (+4") with woodchips	-Plant seedlings -Mulch (+4") with woodchips	-Plant seedlings -Mulch (+4") with woodchips	-Replace damaged/ dead plants	-Mulch (+4") with woodchips -Replace damaged/ dead plants

21 – Final Design -Timeline & Principles

Project: Skagit River

Designer: Shanna Mahan

Site Location

48º29'17"N 121º 32'07"W

55685 Martin Ranch Road
Rockport, WA, USA

Elevation: 78m

5 PERMACULTURE PRINCIPLES

OBTAIN A YIELD- The majority of the proposed plantings yield edible fruits and berries, medicinal, pollinators.

INTEGRATE DON'T SEGREGATE- The design maximizes re-establishment of the native landscape and plans for high-density planting in the closest zones.

USE AND VALUE DIVERSITY- The design focuses on increasing planting diversity to foster wildlife diversity.

CATCH AND STORE ENERGY The design utilizes greywater storage and solar energy. The goal of reforestation also looks to maximize carbon sequestration.

USE AND VALUE RENEWABLES- The proposed design utilizes greywater plantings. The yearly mulch and compost can be site generated in 3 years.

SOCIAL & CULTURAL CONDITIONS

-Native Reforestation - carbon sequestration
-Commercial Medicinal Planting beds
-Use of sustainable materials
-Sustainable communal living