Field Journal | Geena Missurelli

Wildlife Conservation Biology

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Geena Missurelli

09/28/2023 10:18

TEMP	WIND	SKY
14.4°C	0	1

Evergreen state College, WA

% cover → 47.07320, -122.99766

compass, pace, tree → 47.07180, -122.99881 lab 14 II buildings

Compass orienting, measuring distance, heights and sizes, estimating percent error

Lab partners - Avery, Ira, Henry, Rowan

estimating, pace, and distance

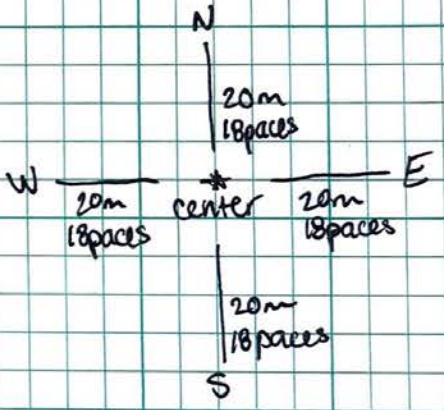
distance paced - 50m

# of paces covering distance - 44 paces

my pace - $\frac{50}{44}$ = 1.13 paces

measuring plot with paces:

- center of plot with 20m out in each direction, N S E W
- paces roughly 18 per 20m



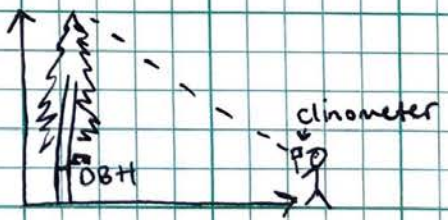
measuring DBH/circumference + estimating heights

- trees measured with clinometer for height and DBH for diameter
- measured from 100ft away | 30.48m

tree 1 111.2 ft tall
71.2 cm diameter

tree 2 73 ft tall

tree 3 98ft tall



measuring | estimating stick height

1 meter = 3.3 feet

estimate - 4 feet

measure - 3.1 feet

Geena Missurelli

09/28/2023 10:18

TEMP	WIND	SKY
14.4°c	0	1

Evergreen State College WA

compass orienting, measuring distance, heights and sizes, estimating percent error

Lab partners, Avery, Ira, Henry, Rowan

% cover → dogfoot lane 47.07320, -122.97966

compass, pace + tree → 47.07180, -122.97881

estimating percent coverage

25 meters into forest using intercept method

1st location

canopy (densiometer)		vegetation
0m	8%	herbacious, grass, huckleberry
5m	8%	sword fern, blackberry
10m	13%	sword fern
15m	16%	sparse shrub
20m	21%	shrub, salal, wild rose
25m	27%	small shrub, oregon grape

OPEN SKY ↓

2nd location

canopy (densiometer)		vegetation
0m	13%	small shrub
5m	21%	sword fern
10m	16%	shrub, huckleberry
15m	13%	shrub, salal, beached hazelnut
20m	18%	shrub, sword fern
25m	18%	shrub, blackberry

OPEN SKY ↓

Quadrates 18 x 20cm

how much of each covers the quadrate

bare wood	lichen	moss
30%	45%	57%

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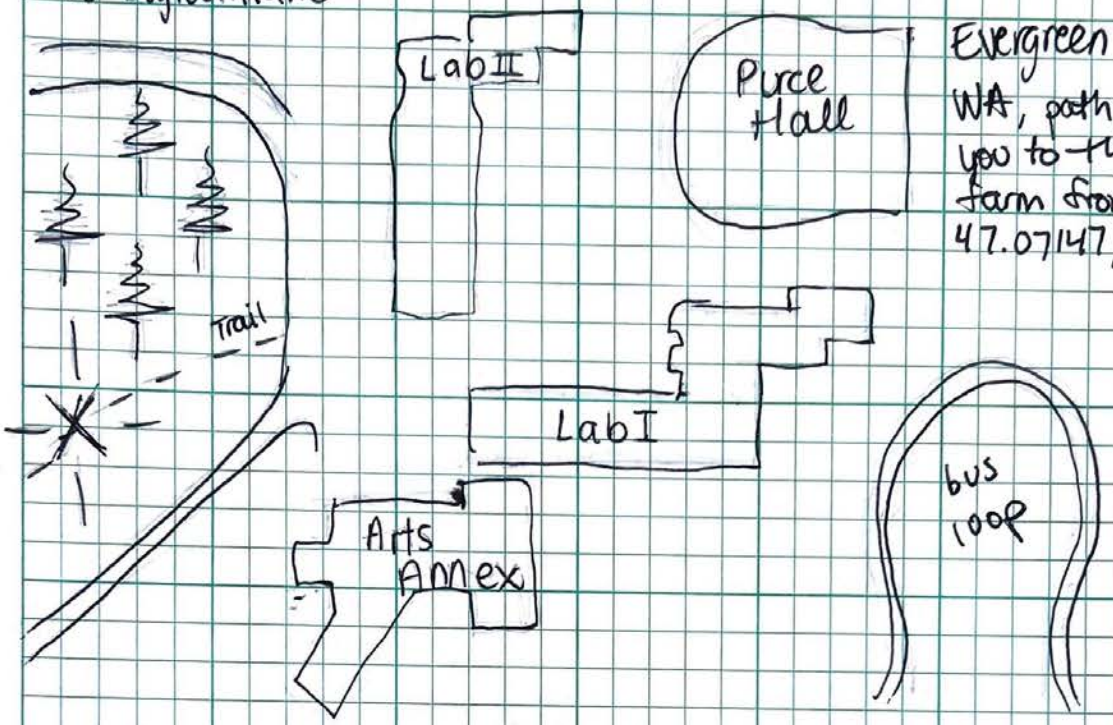
Measuring plot - habitat data sheet

09/28/2023 13:51

TEMP	WIND	SKY
14.4C	0	1

Evergreen State College WA, path that takes you to the organic farm from campus 47.07147, -122.9906



Observers: Avery, Ira, Henry, Rowan

Plot ID: One
elevation: 252ft
habitat description: temperate rainforest & mixed trees
number of forest layers: 1, 2, 4
herbaceous layer% coverage: 100cm
herbaceous layer %coverage: 100%
shrub layer height: 1.3m
Shrub layer %coverage: 25%
upper canopy height: 45.7m
canopy cover: 18.9% average

habitat description cont: sword fern dominant species & douglas fir tree

narrative of experience:
It was hard to trample through sword ferns that were almost or as tall as us. Spiders habitat between the vegetation. A good amount of ups and downs (hills) in the terrain that were not visible until walking through the tall ferns.

no snags! obvious

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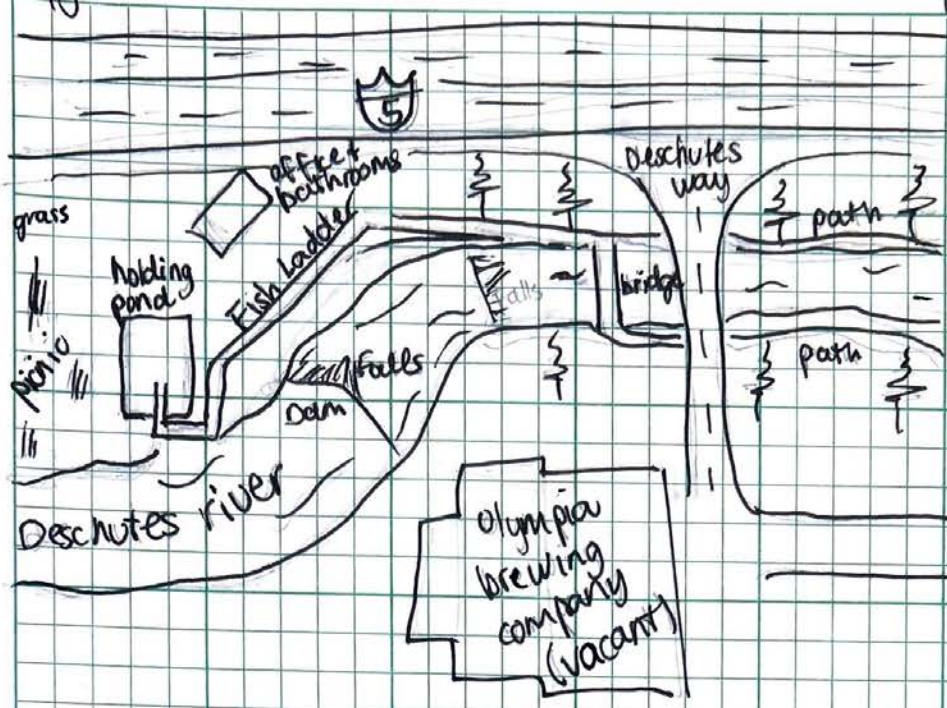


09/29/2023 10:04

TEMP	WIND	SKY
11.6°C	2	1

Brewery Park,
Tumwater, Washington

47.013880, -122.904610
elevation 28.1m
conservation landscape

Environment Description

Upon entering the park, there is a paved parking area, green cut grass, large maple trees with woodchips and picnic benches underneath the trees. Beyond is concrete paths in multiple directions — a shelter that is an office and public bathrooms, concrete structures that are holding water, grates within the concrete structure, another building with a garage door. Manicured landscape. The one building is an office for Olympia Tumwater Fondation, with educational/informational posters in windows. The other building door is stamped Fish and Wildlife, with informational posters in windows. To walk past these buildings, you slightly go down in elevation and view the Deschutes River, above it is big industrial vacant buildings. The river has loud waterfalls as you walk along. The vegetation in between the path and the water is grasses (tall), down tree stumps, blackberries, rocks with mosses. The falls are result of an old hydropower dam. Walking further along the path there emerges big trees, some native some ornamental. The fish ladder is under your feet, rushing water through the grates. The path goes up towards another vacant building, or across the river as a bridge. The concrete path surrounds the river on each side making a loop. This vegetation is seemingly more native; cedar & douglas fir trees, ferns, black huckleberries, rhododendren. Towards the lower falls the landscape is more marsh/estuary with tall grasses, alder trees. The only obvious vertebrate species is the salmon in the river, possibly raptors. some bird song of what could be raptor, some evidence of creature that took fish out of water and left behind fish eggs (rotting).

Geena Missurelli

09/29/2023 10:04

TEMP	WIND	SKY
11.6°c	2	1

Brewery Park, Tumwater Washington

47.013880, -122.904610
elevation 28.1m
conservation landscape

Environment cont.

Surrounding the park is many different road ways. Noise is either from rushing water or rushing cars. Large concrete ~~road~~ways above river & path. River is lower elevation, path is higher above, water falls drain into the river above & below the pathway. A lot of no swimming signage. Trash bins placed along path, along with dog waste bags. Donation signage with QR codes. The concrete fish ladder is along the side of the river, covered in moss. The river sediment seems to be a combination of sand, gravel & big rock. The path along the river is narrow and is cut off at the end with opening of Capitol Lake. The park widens toward the entrace, with area to host events. Overall, an urban landscape that has diverse vegetation (native to non native).

Ownership / management and Regulation

Olympia Tumwater Foundation (non profit) based on donations.

Fish and Wildlife manages fish ladder, holding pond, outside hatchery.

The park landscape is kept rather manicured. Cut grass, ornimental vegetation, native plant garden (contained). Throughout the path down to the lower falls becomes more wild & native vegetation, fenched off mostly and maintains itself. Areas where signage states no swimming or caution tape where sensitive native vegetation is growing. Benches along the path. Trash bins & dog waste bags. Signage stating the beauty of the park depends on donation.

Vertebrate Species List

Chinook Salmon / Oncorhynchus tshawytscha

Coho Salmon / Oncorhynchus kisutch

- hundreds of these species in river—holding pond
- supported & protected by keeping habitat available to them especially for their spawning process (fish ladder)
- not much visible variaty/diversity of other vertebrate species, some evidence of raptor & other birds but no sightings

Geena Missurelli

09/29/2023 10:04

TEMP	wind	sky
11.6°C	2	1

Brewery Park Tumwater Washington

47.013880, -122.904610
elevation 28.1 m
conservation landscape

Vertebrates cont.

- impact by human use varies. This is a very urban park, with many visitors. Visitors seem to stay within regulation / not much damage done to what is being preserved here.
Because the falls were created by human use (hydropower dam), these fish are in need of human made solution to get up the river. These fish depend on the ladders to spawn. Unsure what the river was before the dam, fish may have gotten thrugh the river prior.

Education

There is signage around the park about Tumwater history, donations, and fishery / hatchery / watershed information. There are people employed to answer questions people might have around the holding pond. There is clear visuals of the fish and every process that is done with the fish. There is an office dedicated to park managment with signage talking about artesian wells, past brewery & historic district. There is not a ton of engagement with signage, although there a groups of kids in a learning setting and people excited by the fish in holding ponds. There is a native plants garden with signage of plant identification.

Thought Question

The park is designed to protect the Chinook salmon and there are ~~many~~ ways this is shown. Fish ladders help the fish swim up the previously dammed river. The riparian zone is preserved! As far as hatchery fish go on preserving the population this is controversial. What I have studied so far is that although hatchery fish have a better chance being released and making it to the ocean, (↳ survival rate) these hatchery fish are not showing the same numbers as far as return rate. My opinon on how the park manages the ecosystem is that area could use improvements. I think there could be less ornamental plants and better invasive plant management. There could be more engagement with the public about native landscape and more ecology information to educate people beyond this park specifically

Geena Missurelli

Sampling Fishes via Seining

10/12/2023 9:30

TEMP	SKY	WIND
12°C	2	0

environment description:

marine riperian zone, beach habitat with mud substrate and rocks with barnacles. salt water. Falling tide. coastel river.

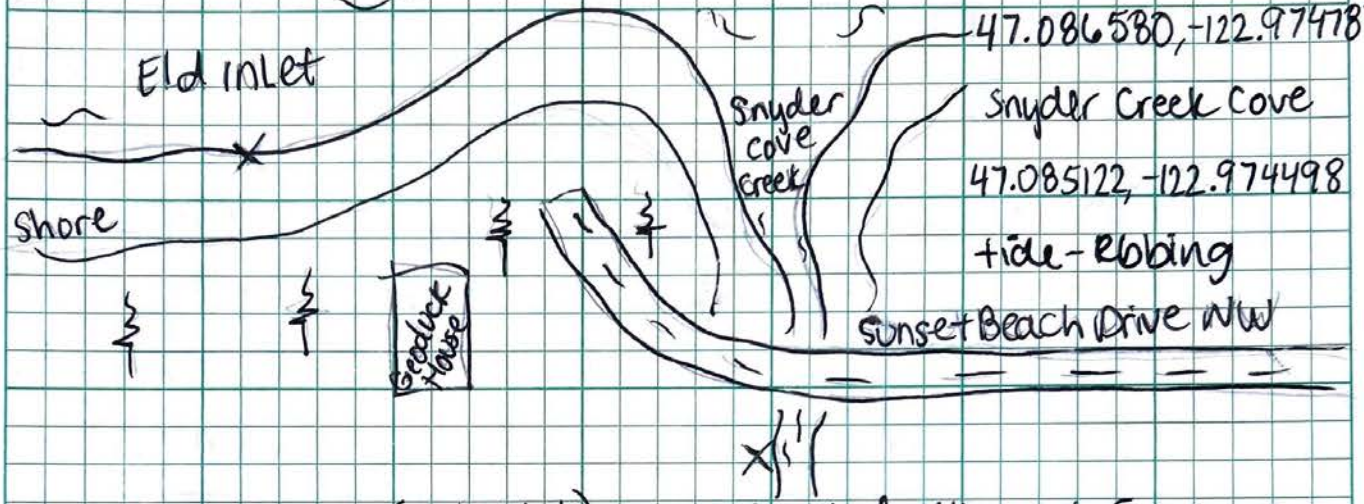
Evergreen State College, Beach Geoduck House

47.086580, -122.974787

Snyder Creek Cove

47.085122, -122.974498

tide - Robing



First Seine Tow (Eld inlet) area sampled: 40m x 6.5m

Species	number individuals
arrow gobies (clevelandia ios)	771
Sculpin (cottus asper)	0
shrimp	629
red rock crab	5
moon jelly	2
snail	42
comb jelly (phylum ctenophora)	0
medusa jelly	3

Shannon Index - N/A only 1 species found

Marine sample

bycatch species - 0.86

bycatch individuals - 0.47

Geena Missurelli

Sampling Fishes Via Seining

10/12/2023 9:30
Temp sky wind
12°c 2 0

Second seine Tow (Eld Inlet) area sampled: 21m x 6.5m

Evergreen State College Beach, Geoduck House
47.086580, -122.974787
Snyder Creek Cove
47.085122, -122.974498

species	number individuals
arrow gobies	1268
Sculpin	2
shrimp	138
crab	2
comb jelly	1
moon jelly	1
snails	14
nudibranch	21

shannon index - 1.3
Marine sample bycatch species - 0.75
bycatch individuals - 0.12

Third seine Tow (Snyder Creek Cove)

species	number individuals
sculpin	2

shannon index - N/A, only 1 fish species found
Bycatch N/A only one species

Gull Age Structure and Duck sex Ratio

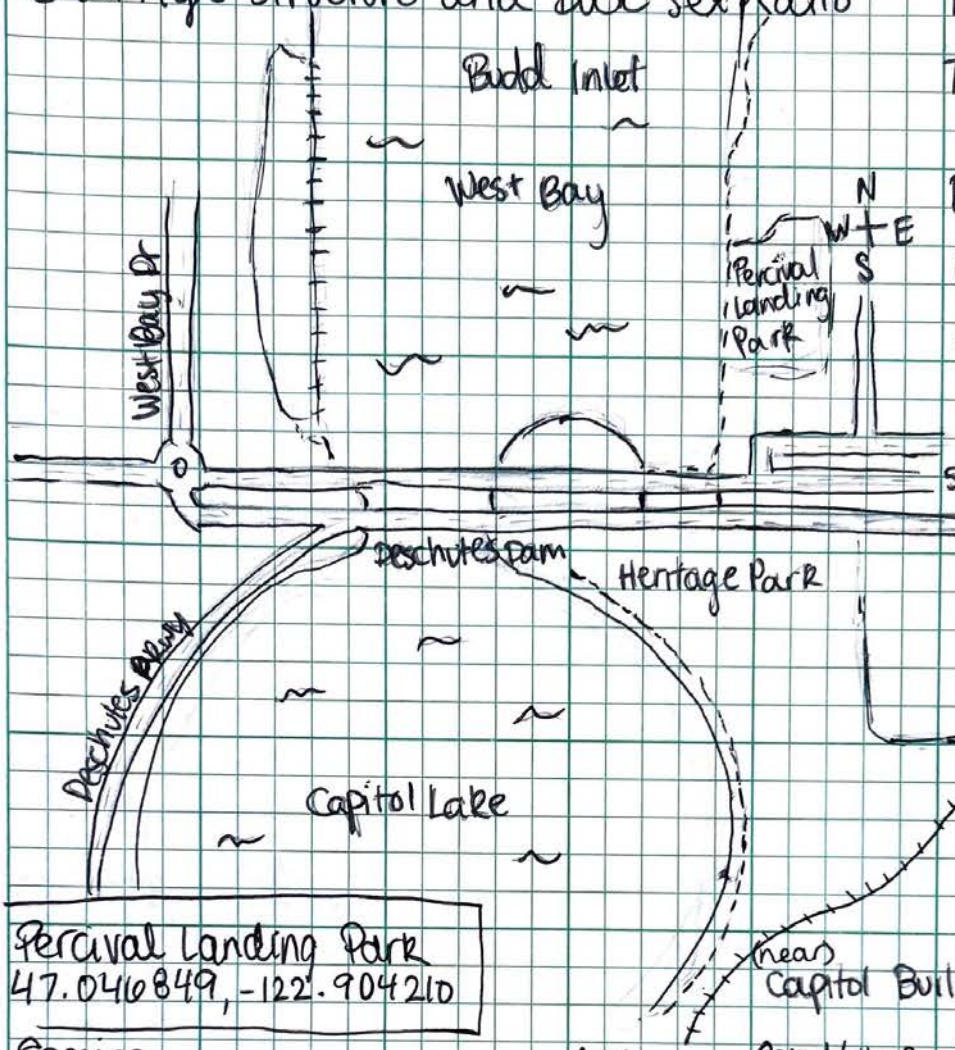
Geena Missurelli

10/19/2023 10:00

Temp 13°c | Sky 1 | Wind 2

Budd Inlet & Capitol Lake
Olympia, Washington

urban development/ urban parks



Beufort wind-felt breeze on face

Bureau sky- partly cloudy & sun

Percival Landing Park
47.046849, -122.904210

Species	Age	Count/ # of	Behavior
Larus glaucescens Glaucous-winged gull	1st cycle	4	one begging
Larus glaucescens Glaucous-winged gull	2nd cycle	1	sitting on boat barn
Larus delawarensis Ring-billed gull	>3, adult	4	standing on dock
Unidentified gull	>3, adult	~33	sitting on boat barns in the distance
Phalacrocorax auritus Double-crested comorant		1	flying

Gulls hung out on railings, docks, and boat house roofs. They often flew above our heads. Some got rather close to humans. Some communicated with other gulls. We stood on walkway, often looking out to water to spot gulls.

Geena Missurelli

Gull Age Structure and Duck Sex Ratio

10/19/2023 11:02

Temp 13°c | Wind 2 | Sky 1

Walked along docks and looked out at water and boats to find gulls. Some fly above us. The North location was mostly on the port and flying away from port.

Budd Inlet & Capitol Lake
Olympia, Washington

Percival Landing North
47.048867, -122.904188

Species	Age	Count/# of	Behavior
Unidentified gulls	>3, adult	~75	preening/sleeping/drinking at port
Unidentified gulls	1st cycle	~10	preening/sleeping/drinking at port
Ardea herodias Great blue heron		1	flew in from the west, sat on pillar

Percival Landing South
47.044822, -122.904669

Species	Age	Count/# of	Behavior
Larus occidentalis Western gull	>3, adult	1	preening on boat mast
Ardea herodias Great blue heron		1	preening/sleeping on boat mast

Capitol Lake/Heritage Park
47.043227, -122.906520

Species	Age	Count/# of	Behavior
Larus delawarensis Ring-billed gull	1st cycle	1	floating in water
Unidentified gull	1st cycle	2	flying
Unidentified gull	>3, adult	~60	floating in water
Fulica americana American coot		~15	dunking/diving/fishing

Geena Missirelli

Gull Age structure and Duck Sex Ratio

10/19/2023 12:04

Most birds were on or over the lake. some in the middle had very different behavios then some around the edges of the lake. Active vs resting/socializing.

Temp 17° | sky 1 | wind 2

Budd Inlet of Capitol Lake Olympia Washington

Capitol Lake near Capitol
47.041827, -122.904224

Species	Sex	Count/# of	Behavior
Anas platyrhynchos Mallard	male ~~15~~	~15	preening/sleeping/ interacting with other mallards & coots / standing in shallow water
Anas platyrhynchos Mallard	female	~15	
Mareca americana American wigeon		~9	
Aythya collaris Ring-necked duck	male	~6	
Aythya collaris Ring-necked duck	female	~6	
Mergus merganser merganser	male	~1	
Mergus merganser merganser	female	~2	↓
Fulica americana American Coot		~15	dunking/diving/fishing
Branta canadensis Canada goose		~10	floating on water
Megaceryle alcyon Belted kingfisher		1	sitting on branch/ hunting / calling

Geena Missurelli

Gull Age Structure and Duck Sex Ratio

10/19/2023 13:00

Many of these birds were spotted on a concrete dock/outshoot. They were on & off the structure. The other portion were more off in the distance, swimming towards & away.

Capitol Lake near Capitol
47.03849, -122.90578

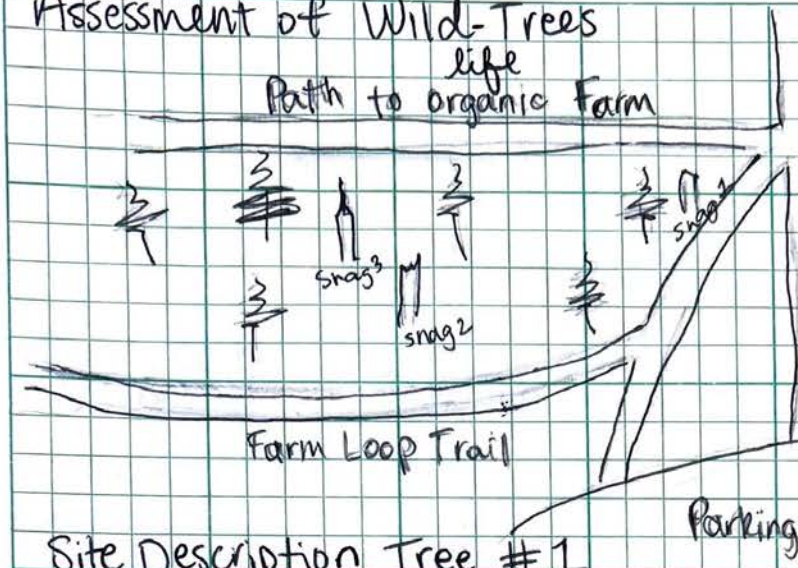
Temp 19°C | Sky 1 | Wind 2

Budd Inlet & Capitol Lake
Olympia, Washington

Species	Sex	Count/# of	Behavior
Anas platyrhynchos Mallard	Male	~27	sitting/swimming/preening/sleeping/calling with other mallards
Anas platyrhynchos Mallard	female	~19	
Mareca americana American wigeon		~12	swimming
Mergus merganser merganser	Male	~1	swimming
Mergus merganser Merganser	female	~1	swimming
Fulica americana American coot		~11	swimming
Mareca penelope Eurasian wigeon	male	~1	swimming
Mareca penelope Eurasian wigeon	female	~2	swimming
Branta canadensis Canada goose		~16	floating, sleeping, antagonizing mallards
Aythya affinis Lesser scaup		~1	floating/swimming
domestic mallard/swedish blue hybrid		~1	sitting/calling with other mallards
Phalacrocorax auritus Double-crested Cormorant		1	flying

Geena Missurelli

Assessment of Wild-Trees



CAL | 10/26/2023 10:00
TEMP 5°C | SKY 1 | WIND 0

Evergreen State College
Olympia, Washington

Arts Annex

wind Beaufort # 0, trees not rustling much, no wind felt on face

Sky Bureau # 1, partly cloudy, sun shinning

Site Description Tree #1

undergrowth - Salal, Huckleberry, trailing blackberry, Sword fern
mixed forest - Big Leaf maple, douglas fir
47.0709750, -122.9791931 - off pathway ~~from~~ in between parking lot B & lab buildings

Data Table 1a

DBH (cm)	Height (m)	snag type	species
18cm	4.7m	5	Douglas Fir/Pseudotsuga menziesii

Tree #	DBH (cm)	species	comments within 8m radius
1	32cm	Pseudotsuga menziesii	located next to path
2	39.75cm	" "	secondary succesion branches
3	25cm	" "	bottom & middle layer shed
4	38.25cm	" "	conch
5	36.25cm	" "	epicormic branches
6	29.50cm	" "	epicormic branches
7	20cm	Acer macrophyllum	tip of tree horizontal
8	57cm	Pseudotsuga Menziesii	
9	49.50cm	" "	
10	42.25cm	" "	
11	59.50cm	" "	located next to path

Data Table 2a

Bark tightness	Top Morph	Evidence Decay	Natural cavity? Approx size	relative depth	comments
P	CBV	crumble, gallery	13 x 5cm	3cm/shallow	
			2cm	2.1cm	
crevices	N/A		4.3cm	2.7cm	
see notes * (Table 3)	many bare wood patches & other bark left is covered in moss/lichen		2.1cm	2.1cm	
			3.3cm	1.5cm	

Geena Nussurelli

Assessment of Wild Trees
life

10/26/2023 | 10:00
Temp | Sky | Wind
5°c | 1 | 0

Evergreen State College
Olympia, Washington

Site Description Tree #2
Undergrowth - sword fern, salal
Mixed forest - big leaf maple, western red cedar
47.070530, -122.980172 - inner woods, off trail ~~of~~ organic farm trail heading towards

Data Table 1b

DBH (cm)	Height (m)	Snag type	species
30 cm	7.7m	4	Douglas Fir / Pseudotsuga menziesii

Snag #2

Tree #	DBH	Species	Comments within 8m radius
1	100.5cm	Acer macrophyllum	epiphyte club moss, sword fern, mushrooms, slug, ~~dying~~
2	28.25cm	Pseudotsuga menziesii	epiphyte, dying
3	34cm	" "	surveyed, club moss & other
4	30.5cm	Acer macrophyllum	epiphytes, dying snag, 2.1m height

Data Table 2b

Bark tightness	TOPNoph	Evidence decay	Natural Cavity Approx size	relative depth	comments
T1	CBV	conk, galery	3.7cm	4.1cm	possibly all made by woodpecker (visible upon site arrival)
			11.1cm	14.8cm	
			2.4cm	5.8cm	
			4.5cm	5.2cm	

see notes * crevices - approx. 1cm (Table 3)

Site Description Tree #3
Undergrowth - mostly sword fern
Mixed forest - douglas-fir, western red cedar
47.070575, -122.980323 - inner woods, headed towards from last snag

Data Table 1c

DBH (cm)	Height (m)	Snag type	Species
82.25cm	22.0m	4	Big leaf maple / Acer macrophyllum

Snag #3

Geena Nissuelli

Assessment of Wildlife Trees

Partners - Eva, Avery, Cheyenne, Ira, Henry

10/26/2023 10:00
Temp 5°c | Sky 1 | wind 0

Evergreen State College
Olympia, Washington

Data Table 1c cont.

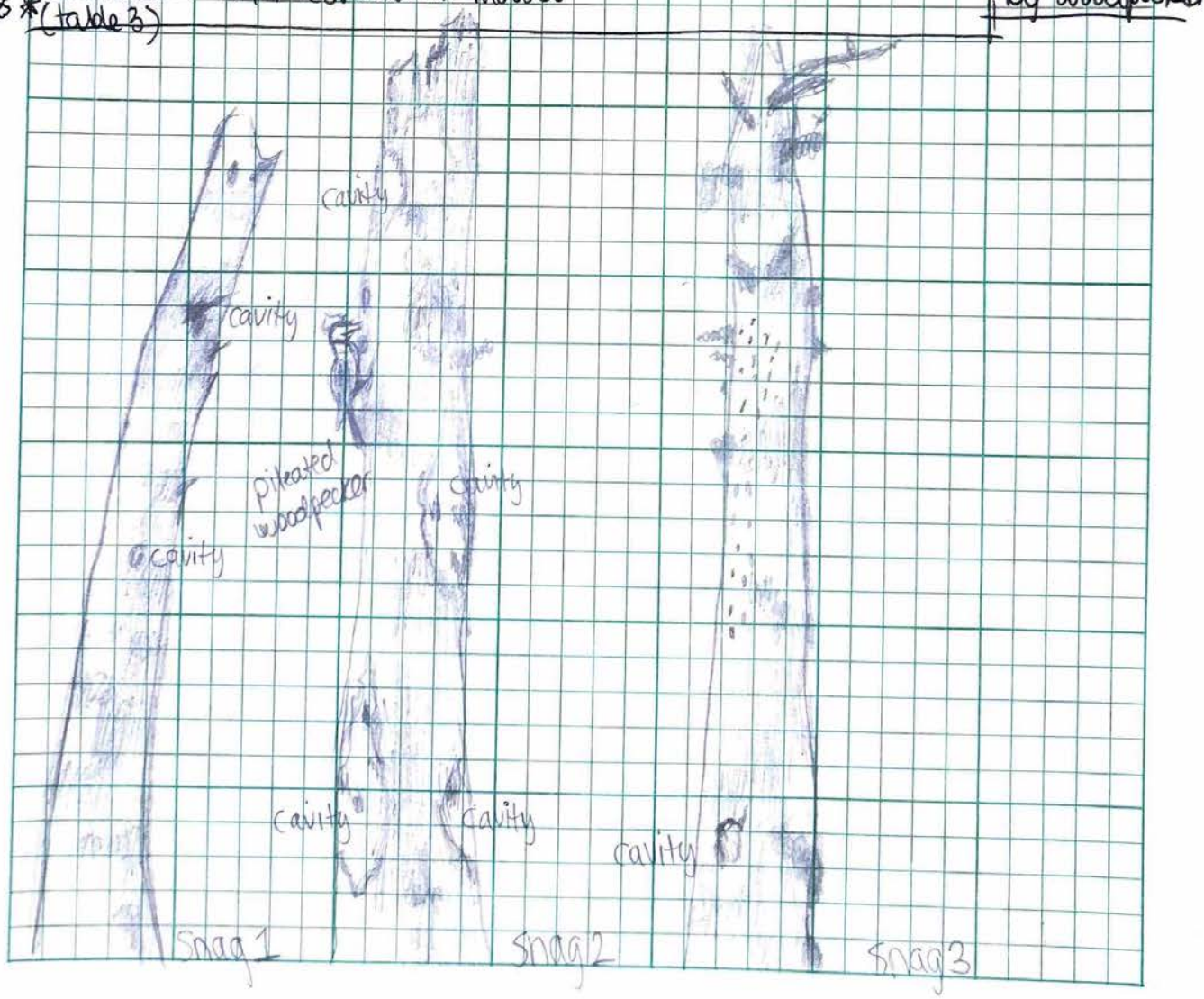
Tree #	DBH (cm)	species	comments	within 8m radius
1	34cm	Pseudotsuga menziesii	sway, dying/dead	
2	70cm	"	light epiphytes	
3	28.25cm	"	epiphytes, dying	
4	40cm	"	epiphytes, moss, lichen, mushroom	
5	79cm	Acer macrophyllum	BIG, epiphytes on branches	

Table 2c

Bark tightness	Top Morph.	evidence decay	Natural Cavity: Approx. size	Natural Cavity: relative depth	Comments
T1	C1	gallery	9cm wide	7cm	below transect height, made by woodpecker

Crevices - N/A covered in mosses

see notes *(table 3)



Geena Missurelli

Assessment of Wildlife Trees

10/26/2023 10:00
TEMP SKY WIND
5°c 1 0

Evergreen State College
Olympia, Washington

*Table 3 notes- My group was confused with the difference between crevices & cavity. We took many cavity measurements and mistaked them for crevices. I ended up moving that data into Table 2 and reassessing what notes are jotted down by crevices from pictures we took of each snag.

Questions

1. Wildlife value by characteristics.

Snag 1 DBH is about 18cm, seems a bit small for bird or small mammal use. There were no significant cavities either but the shallow cavities could be good for small organisms like insects, with plentiful moss & lichen nesting on this snag.
Snag 2 had a larger DBH of 30 cm, a little bigger & suitable for a woodpecker to find food solice. It was there when we arrived hoping around to the different cavities it created. (I dont actually think size has to do with resource availability, but it might) This might be more appealing for wildlife because of location; it was deeper in the woods compared to snag 1. Snag 2 was also surrounded by other dead or dying trees, that could have an appeal to wildlife aswell. Snag 3 was near snag 2 and had more branches or stubbed branches. These could be useful as bird perches. There was not much for cavities in this tree around breast height although closer to the ground it appeared the woodpecker had gotten to it.

2. Birds, specifically insectivores were obviously & evidently benefiting from the snags 2 & 3, for food resource. Small microorganisms could benefit from snag 1.

Geena Missurelli

Soundscapes

Practice at Evergreen

11/02/2023 10:15

Temp	Sky	Wind
14°c	8	2

wind felt on face and drizzling consistently

Evergreen State College Campus Olympia, Washington

Sound Recording 1 Loud site

47.071490, -122.979105

Habitat - Mixed forest, mostly douglas fir, undergrowth salal, huckleberry, sword fern

DBH (cm)	tree 1	Tree 2	Tree 3
	78.6cm dougfir	65.7cm doug fir	16.5cm red alder

Canopy cover	side 1	side 2
	98.8% west	97.76% east

understory vegetation	Side 1	side 2
	10% west	30% east

Sound Recording 2 Quiet Site 10:36

47.070106, -122.979983

Habitat - Mixed forest, douglas fir and ~~fir~~ big leaf maple. understory salal, sword fern, young red ~~cedar~~ alder

DBH (cm)	tree 1	tree 2	tree 3
	46.1cm doug fir	60.1cm doug fir	75.4cm big leaf maple

Canopy cover	Side 1	Side 2
	98.8% west	98.8% east

understory vegetation	Side 1	Side 2
	~~98.8%~~ 20% west	~~98.8%~~ 20% east

Geena Missurelli

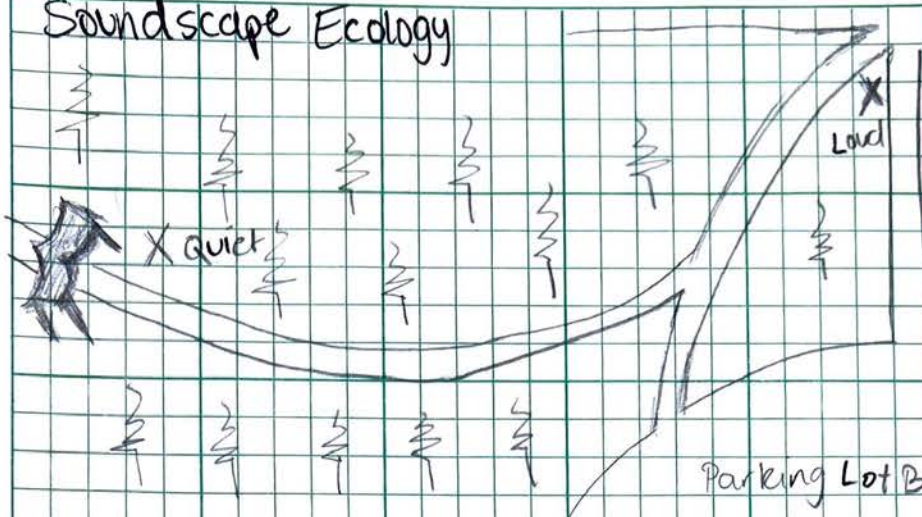
Soundscape Ecology

11/02/2023 10:15

TEMP	SKY	WIND
14c	8	2

wind felt on face, raining consistently, overcast

Evergreen State College
Olympia, Washington



Sound 1 LOUD 47.071490, -122.979105

DBH (cm)

Tree 1	Tree 2	Tree 3
78.6	65.7	16.5
doug fir	doug fir	red alder

Canopy cover

side 1	side 2
98.8%	97.76%
west	east

Understory vegetation

side 1	side 2
10%	30%
west	east

habitat- Mixed forest, majority douglas fir, understory salal & sword fern, concrete path from parking lot to campus

Recording sounds- include geophony; rain falling, biophony; ravens calling, anthrophony; work machines buzzing, & shell jacket swisshing

Sound 2 Quiet 47.070106, -122.979983 10:36

DBH(cm)

Tree 1	Tree 2	Tree 3
46.1	60.1	75.4
doug fir	big leaf maple	big leaf maple

Canopy cover

side 1	side 2
98.8%	98.8%
west	east

Understory vegetation

side 1	side 2
20%	20%
west	east

habitat- mixed forest, doug fir, big leaf maples, understory sword fern, salal, wooden archway in middle of dirt & rock walking path

recording sounds- geophony, rain on ground puddling, some wind

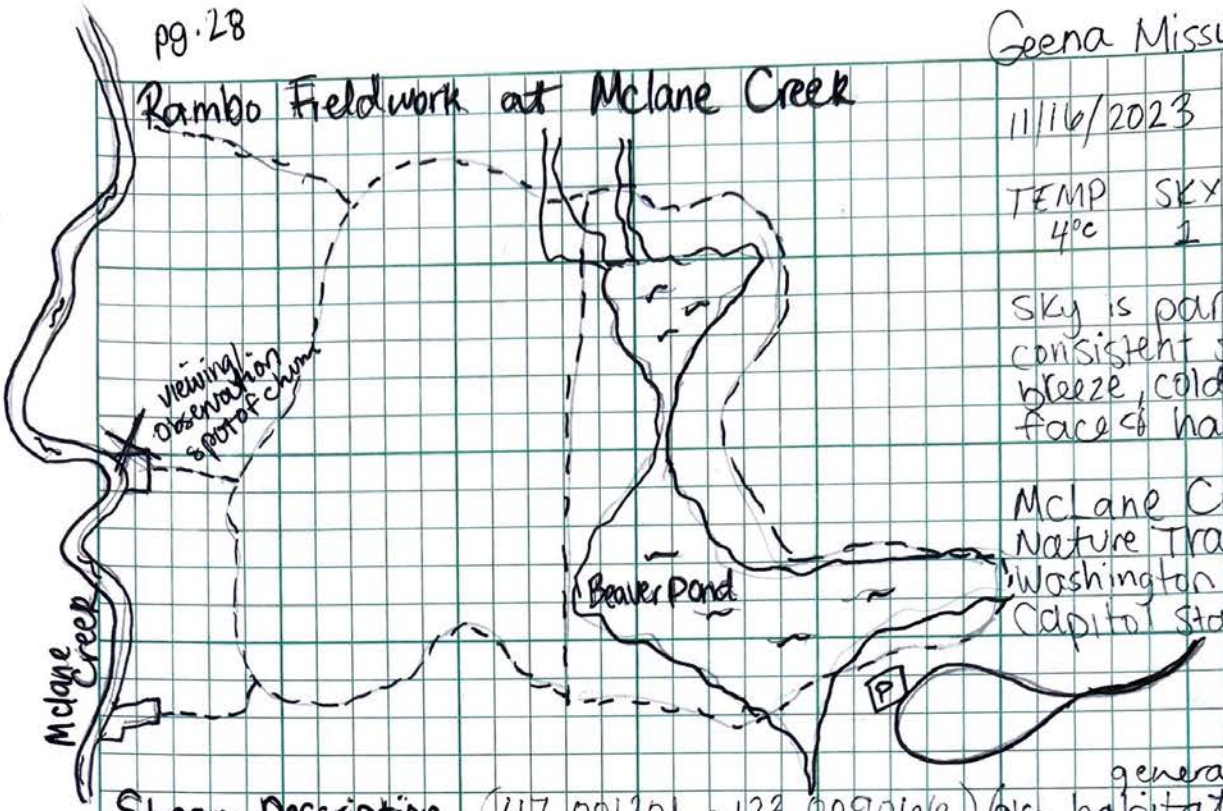
Geena Missurelli

Rambo Fieldwork at Mclane Creek

11/16/2023 10:00

TEMP	SKY	WIND
4°c	1	0

Sky is partly cloudy, consistent sun, slight breeze, cold air on face & hands



Stream Description (47.001301, -123.009066) (also general habitat)

Riparian Zone
~10-12 feet wide, shallow, cobble/medium size rocks, rifts
mixed forest; cedars, maples, doug firs leaf litter down logs along stream mostly edges undergrowth; mixed shrubs, sword ferns devils club second succession dead fish, chub salmon ~3-5 years old
anthropony; people walking on trails, distant planes geophony; creek water rushing, fish splashing biophony; bird songs possibly Ringlet & chickadee

Chum salmon behavior

female	black ~~fins~~ marking along lateral line, often redding in one place, sideways digging/digging red, sideways swimming, slower swimming
male	swift swimming, aggressive with other males, back & forth swimming around female dorsal fins
both	swimming upstream, redding, floating down stream, splashing, spawning behaviors

Questions

what is the function of female side swimming? Not in terms of red digging

Why do male & female tred edge of stream (super shallow areas compared to middle of stream redders / deeper waters?

What % of spawning is actually successful?

Is survival behavior associated w/ location in stream?

Geena Missurelli

Rambo Field Work at McLane Creek

11/14/2023

Time	Behaviors					# of fish
	Aggressive	digging red	swimming upstream	floating downstream	other	
10:57		X			tread	8
						2
			X			1
10:58			X			1
	X					1
10:59	X					1
		X				4
11:00			X			3
11:01		X				1
11:03	X					3
					swim down	1
11:04				X		3
					tread	15
			X			3
11:05				X		1
			X			1
	X					2
		X				2
11:06			X			2
		X				3
11:07		X				4
			X			1
11:08		X				2
			X			2
11:09					tread	9
	X					2
		X				1
11:10		X				8
11:11			X			2
	X					1
		X				2
			X			1
11:14		X				2
11:15		X				2
					tread	14
		X				3
	X					3
			X			1
11:16		X				4
	X					2
11:18					tread	16
		X				1
	X					2
			X			1
		X				1

- Notes during observation -

- aggressive behavior (biting, thrashing, chasing) tend to be male fish

- floating downstream looked to be dead or almost dead fishes, sometimes looked to be a tactic to get to another spot downstream

- males tend to be in the quicker moving parts of stream, females are in both deeper/quicker water & on the sides in shallow/slower waters

- treading seem to be baseline behavior

- Hypothesis -

If a fish is in shallow and slower moving water, then where they are slowly tredding, then this fish is losing energy and life. ↓

Fish that were in the shallow

Females & males

Digging red (females)

Treading (slow)

Fish NOT in shallow

Aggressive behavior (mostly male)

Swimming upstream

floating downstream

Treading (average pace)

Geena Missurelli
11/16/2023

Rambo Fieldwork at McLane Creek

TIME	BEHAVIOR: Aggressive	Dig Red	Swim upstream	Float downstream	other	# OF FISH
11:19		X				1
	X					1
		X				1
11:20	X					1
		X				3
11:21		X				3
11:22		X				2
				X		2
			X			1
11:23	X					1
11:24			X			1
				X		1
		X				1
	X					2
11:25			X			3
	X					2
11:26				X		1
					tread	16
				X		1
			X			1
11:27	X					4
11:28			X			1
11:29			X			1
11:30		X				1
11:31		X				3
			X			1
				X		1
	X					1
			X			1
11:32		X				1
			X			1
11:33		X				3
			X			2
11:34		X				2
11:35					tread	22
		X				1
	X					4
11:36			X			1
		X				1
	X					2
		X				2
11:37		X				3
11:38		X				2
11:39		X				3
	X					4
11:40		X				1
					tread	20
		X				4

- Hypothesis cont. & narrative -

~~According to what ~~behaviors~~ was and wasn't seen~~

Behaviors that were and were not observed in shallow edges of stream tells the hypothesis to be true. swimming upstream, aggressively interacting with other fish and treading in faster water all require energy from the fish. it could be said that the fish in the shallow go there to retreat, and possibly die. Another behavior that happens in shallow is red digging, so the shallow sides could also be good spawning sites. other observations about shallow water-fish tend to have greyish-white coloring (signs of decay) and bodies are out of water (partially) for seemingly long periods at a time, indicating possible lack of submersion need for survival.

Overall, the diversity in chum behaviors observed were vast. The process of spawning and dying seems like a long and hard period of time in these fishes' lives.

The location seemed to be well preserved and often visited by humans, with a whole bus load of kids on the trails with us. Biodiversity seems to be rich.