Writings from the Wild

Where the Grey Wolf Roams

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We would like to acknowledge Bill Ransom, Dylan Fischer, Jill Wilks, John McGee, Sam Green, Tim McNulty, Tom Jay, Kylin Larsson, and Duke Brady for their support and guidance. This anthology is dedicated to them and would not have been possible without their contributions.

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ABSTRACT

The Grey Wolf symbolizes the teacher; a pathfinder, who wanders away from the pack, uncovering ideas, later sharing with the clan their found knowledge. In order to effectively embrace this process, Grey Wolf bands habitually highlight the importance of individual perceptions within a larger Wolf culture. While many have segregated the fields of science and creative writing, both are quests to explore, relate and discover meanings within our surroundings. Additionally, each scientific and creative venture accentuates the importance of individual observation, with an eye in mind of schooling a larger audience. In order to pursue these expeditions, we must first know what surrounds us; that is, we must ask ourselves and others: What do you see? From there, we must note the patterns and variations we see with humans, animals and even plants. We must question and hunt down the answers, trusting that even when statistics provide a random P-value, our methods are not without merit. The following collection of written works is howled here as a means informing the pack of what we've learned. As your perception is important, we'll end suggesting how to ask these questions of yourself, even asking of you: What is it that you see?

KEYWORDS

Within you may find the **Abstracts** of the world,
Ants crawling on **Hovel** skin
Lichen growing on rock
Fire from earth,
Predation of life from life,
And even the **Scotch Broom** burns
Where the **Thatch Ants** scurry
Rhizome wearies in the unburned sand
Wisps of **Insect pheremones** abide
Where we sit and create
Writings From The Wild

INTRODUCTION

Bill Ransom and
Dylan Fischer

FOREWARD

Both scientific and poetic forms of writing require attention to parsimony and precision with words, yet people regard them very differently, so combining both in a single course led us to explore interesting territory. Ecology based science writing and poetry attempt to do something similar in their best forms. They attempt to provide unique insight into the natural world. Both encourage new thinking about the human and non-human world. However, doing both scientific writing and poetry at the same time can be rewarding and challenging. Both forms of writing require crossing a vast crevasse between the seemingly objective bedrock of science and the presumably personal and intimate realms of poetry. We discovered that the personal and intimate can infuse science writing with new life and a new audience as Creative Nonfiction. Poets discovered the strength in objectivity about emotion, in real-world images to give form to abstraction, in an orderly, scientific method of self-examination. Science writing, poetry and creative nonfiction helped us to explore the entire range of writing from nature and to reach multiple audiences with our work.

Throughout our ten interdisciplinary weeks together, the class came to bond personally through work, songs around the camp-fire, arguments, agreements, tragedy, and sharing of our most personal writing. The singer songwriter Greg Brown has said that to build community "you gotta' really need each other." We debated ecological study designs late into the 20 degree nights; we huddled against the cold together sipping tea while we deciphered our poetry from ragged field books; the wind howled across our collective faces, and the rain sometimes cleared off and left a tease of a vista; we pulled our shoes off to walk barefoot through streams. Sleepless nights, exhausted days, plenty of awkward moments, and honest efforts produced some really good work. This group came to need each other's voices, laughter, and writing to feel whole. That intellectual symbiosis should be reflected in the writing pulled together for this anthology.

The last poem in this anthology asks what you see when left alone in a wild place, with no direction. All the contributors in this anthology have felt alone during the arduous task of compiling the anthology, writing, or living

through the experiences that produced their work. While studying the natural world, we have all felt directionless. These wilderness experiences depicted are real, but the alone part is questionable. Although every contributor to this anthology certainly felt alone at some point during the production, a thorough reading demonstrates that no contributor is utterly and wholly alone. In fact, all are in good company.

Our goal for this work (and class) was to produce a document that could show scientific writing and more personal forms of writing from nature side by side. We formed a series of field studies in remote locations including Utah scrub-desert, glacial-fed rivers on Mount Rainier, western Washington prairies, and finally our own Evergreen State College campus forest. In each location we divided into groups that only had a matter of hours to form workable study designs for novel ecological questions. Then, at most a day later, we implemented their field studies. Students looked with steely-eyed clarity at the natural world to find sources of variation that proved both interesting and testable in the scientific sense. Furthermore, for many students this was their first exposure to science or to ecology. This task would comprise half of their entire evaluation and credit for the class. Despite breakdowns, tragedies, upsets, snow-fall, collapses in group dynamics, and limited prior experience in the sciences (let alone this business of designing and carrying out an entire study within only a few days) all groups pulled through. The final products of their studies are represented by the scientific papers in this anthology. Once these studies were completed, all data were analyzed and written up within the course of three days.

Their methods were written and peer-reviewed one day, the results sections were completed and peer-reviewed the next day (complete with statistical analysis and figures), and the following day they wrote and reviewed introduction and discussions sections. The brevity of these papers reflects these time limitations. Readers should be surprised and impressed to learn how quickly these final studies progressed, and the authors should be proud of the immense accomplishment of completing these studies in such limited time. This style of applied field ecology has earned the moniker “Rambo-Ecology”. These studies also provided the muse for other creative works in the anthology.

Nature writers, poets, editors and publishers brought their expertise to our classroom to provide insights into translating the wonder of nature to non-scientific audiences. They learned that their writing was strongest when based in the senses—one interpretation of "Wild Writing"—and enriched with description anchored in active verbs. Scientific writing asks for systematic observation and summary; creative writing asks for systematic observation and scene. Nature studies help poets to focus and to hone description; poetry helps ecologists pass important information to people who don't read scientific journals. Ezra Pound insisted, "Poetry is news that stays news."

Tom Jay, visiting author of the creative nonfiction piece "Salmon of the Heart," asked us to consider seriously the etymology of the words we use. The word wilderness has some interesting etymological roots. From the old English word "wildeornes," the word derives from "wildeor," meaning wild or un-tamed beast, and "-ness" (meaning condition, or place of), and literally translates to "the place of wild beasts". This view of wilderness as a somewhat raw, untamed, and unkempt home to wild things permeates Euro-American culture today. If our original goal in this anthology was achieved, the content will be somewhat raw. The poetry, science, and creative writing pieces all have a freshness about them that represents first encounters with new intellectual or physical territory. Although each piece has undergone review and revision, this process took place over a very short time, and may have resulted in wild final outcomes; this group of individuals is not a tamed bunch. So enjoy this sample of wild writing from a fantastic group of students who have worked ten hard weeks to complete field studies and to pour their souls and thoughts onto these pages, which they also designed, laid out, edited, copyedited, typeset and printed. What you have before you comes straight from nature, somewhat raw, un-kempt, untamed, and most certainly wild.

Bill Ransom and Dylan Fischer
Members of the Faculty, The Evergreen State College
Olympia, WA
June 4th, 2007

METHODS AND RESULTS

Wild Life?

I walk this land where I belong
my own true world of pleasure
with rustling leaves and whispering breeze
and trout filled streams of beauty
Where the haunting sound of the loons song
echoes across the mountain valleys
where eagles soar and otters play

I love this place - it is so pure
this piece of American splendor
But as I watch a mighty elk
with a crown of velvet antlers
struts from a wood - just like a king
before him all is still

He stops to stare across his land
and I watch in breathless wonder
he lifts his head - danger looms
the ravens screech their warning
The air is still - the bull takes flight
this mighty beast is fearful
A distant crack - a hunter's cry
The bullet flies to home

The bull is down - his eyes are closed
His breath is clearly fading
As clouds race by
the sun breaks through
but the anger in me is raging
as one last time he tries to rise
but it's clear his life's expiring
In deep despair I try to speak
but my heart is full of pain

The loon sings its mournful song
it sounds like nature's crying
The King is dead - he is no more
Oh! How I hate this land

Eagles' Domain

The eagles flew together
controlling the land and air
aloft in all kinds of weather
flying without a care

They were true lovers
flying over mountain, plain and tree
Never fearing any others
their bond for all to see

With wings straight and true
Flying across this land
With speed and power they flew
their kingdom they did command

Gliding with ease and grace
soaring over this vast terrain
This was their land, their place
this land was their domain

But out of the sky came conflict
from the black devil's of the sky
To fight, the choice, that they had picked
to dominate the sky they would try

Five ravens came in fighting
from out of the sun, flying high
Raven and eagle competing
for dominance of the sky

The eagles rose up without fear
each Raven drove home their attack
Their intent, to the eagles, was clear
this land, once theirs, to win back

Hovering, twisting, turning
they rode out the first attack
Each eagle led with talons flashing
the Ravens were the first to crack

The Ravens were soon defeated,
both eagles dispatched them all
the vanquished, had retreated
Far from this land they did fall

Both eagles flew in tandem
their power for all to see
From afar the ravens watched them
in awe of their majesty

Their bond they would not sever
As one they would always remain
Two lovers entwined forever
This was still their domain

The Wolf

Journeying through silent meadows
Haze filled night with a harvest moon rising
Winds pierce deep like remembered loneliness
As a thousand trees moan in icy wind
A lone wolf howls for his absent mate

Valleys quietly echo memories
Silence, so loud, deafening
From Mountains, the wolf arrives
Searching for his reason to live
To help ease his soulful yearning

Memories, when he led the chase
The Pack, his kindred abandoned
Driven away, by what was unexpected
Is he truly alone, incomplete and hollow?
His heart hungers for absent passion

Moonlight cleaves the choking mist
Pathways appear, some traveled before
Scents linger, teasing on the gentle wind
Muscles stretch while lungs draw deep
Daring to live he howls in challenge

Praise For The Fox

Beauty, wilderness, flame, formed into true being
the whisper drawn sharpness of the muzzle
the long shanked blackness of the legs
the whiteness of the tip that forms
the tail into trueness
the grace that brings beauty
the gaze that forever holds the wilderness
the red coat that holds the burning fire in awe
we cannot comprehend
the simple perfection of your existence
'subdued to your instincts'
but you are pure
untainted by the why's, wherefores
no evil lurks beneath
no rage burns in the complexity of your existence
you know the hunt
and make what you will of the chase
you feel the dew-drip of the grass
and see web gossamers glisten
you do not wonder, but marvel
hearing the lone eagle call
above the whispering river
you do not inquire but simply listen
you are beauty...
wilderness...
flame...
formed into true being

GRIZZLY BEAR PREDATION OF A NEONATE ELK CALF

David P. Stiles

ABSTRACT

During the morning of 08 May 2007, I observed the predation of a neonate elk calf (Cervus elaphus) by a female grizzly bear (Ursus arctos horribilis), which involved a twenty-three second chase covering an approximate distance of 200 meters through open terrain, brush and class-one and class-two deadfall timber. During the chase, the route of the elk calf from its hiding place to the kill site was chaotic, due to interference from natural barriers. The predation event took place in the area known as Pleasant Valley, inside the boundaries of Yellowstone National Park.

KEYWORDS

Grizzly, Ursus arctos horribilis, Carnivore, Elk, Cervus elaphus, Ungulate, Predation

INTRODUCTION

Studies have shown that summer predation by grizzly bears, wolves (Canis lupus), cougars (Felis concolor), coyotes (Canis latrans), black bears (Ursus americana), and golden eagles (Aquila chrysaetos) takes an average of 32% of the Northern Range elk calves each year (Yellowstone National Park. 2006). However, there are few, if any, published reports that document and detail direct observations of the predation behavior of grizzly bears in relation to elk calves. It is known that the diet of juvenile grizzly bears of both sexes and adult female grizzly bears in Yellowstone National Park (YNP) consists of 40% meat and 60% vegetation (Robbins, et. al. 2006). From late March through early May, when the bears come out of hibernation, until mid May, ungulates, primarily elk and bison, comprise a substantial portion of the grizzly bear's diet (Gunther & Renkin, 1990); this includes both winter-killed carrion and predation of neonate ungulates.

On 08 May 2007, at 08:49:07 hours, I observed a predation event involving a neonate elk calf and a grizzly sow, which lasted 23 seconds from the time the elk calf was detected. The incident occurred within the confines of YNP, between the Grand Loop Road and the Garnet Hill Loop Trail, approximately 1,500 meters north-northwest of the Tower Junction Ranger Station and 1,200 meters west-northwest of the confluence of the Yellowstone and Lamar Rivers, in an area known as Pleasant Valley (Map One, page nine). The terrain consisted primarily of a sagebrush-grassland community, with isolated and scattered stands of trees containing pockets of class-one and class-two deadfall timber.

METHODS

In order to avoid intruding into the area of a fresh kill on the day of its occurrence, I returned to the area the following day (09 May 2007) in order to obtain measurements. The ground at each point the bear had turned while chasing the elk calf was torn up, providing direct evidence and reference points for the delayed documentation of distances covered; measurements of distances during the chase were made using these reference points.

The deadfall timber was classified based on its overall appearance and decomposition rate (e.g. Maser and Trappe, 1984). The diameter of a class-one deadfall damaged during the chase was also measured.

The beginning and end times for the predation event were documented.

PREDATION EVENT

On the morning of the predation event there was no detectable wind, the temperature was 5°C, and there was no cloud cover.

I first observed the grizzly sow at approximately 08:30 Mountain Daylight Time (MDT), moving south across a grassy bench (Image One, page ten) while grazing, and accompanied by two small cubs. Positive species identification was made using distinguishing features of grizzlies, which include a concave, dished-in face profile; a distinct shoulder hump; and short, rounded ears. The area the three grizzly bears were located in has previously been documented as a high predation area of elk by carnivores, with this research occurring between November 1974 and June 1975 (Houston, 1978). During the time of Houston's study, the main

predator species in YNP consisted of grizzly bears, black bears, cougars, and coyotes; wolves had been extirpated in 1926.

The grizzly sow and two cubs continued south-southeast, towards an area of sagebrush and deadfall timber, near which was a small herd of female (cow) elk. As the bears approached closer to the herd, all of the cow elk, except for one, began moving southeast in order to maintain their distance from the bears. The single remaining elk kept staring toward a small area of deadfall timber that was partially obscured from my view. Repositioning to another vantage point, I was able to observe a small elk calf lying near a class-two deadfall and partially hidden by surrounding sagebrush. I was located approximately 300 meters southwest of where the elk calf was bedded down. For several minutes the cow elk kept looking toward the bears, then toward the calf and back to the approaching bears. The grizzly sow and cubs continued to approach the area concealing the elk calf, and at this point the single cow elk started moving toward the bears. After closing the distance to less than 5 meters from the grizzly sow, the cow elk swerved to the east and started running back towards the herd, located to her southeast. The grizzly sow and both cubs watched the elk, but made no movement towards her; the grizzly cubs seemed more interested in what their mother was doing. Unfortunately, the diversion behavior of the cow elk had a detrimental effect, as the semi-concealed elk calf shifted its body before lifting its head to watch the cow elks approach, causing movement in the sagebrush immediately surrounding it.

At 08:49:07 MDT, the young elk calf bolted when the grizzly sow grazed within 4 meters of it, running southwest from its initial position of concealment. This sudden movement caught the grizzly sow's attention and she initiated pursuit of the elk calf. The elk calf continued for 17 meters along the southern side of a class-one deadfall and then at the tip of the fallen tree it swerved right towards the northwest, traveling for another 74 meters before encountering a class-two deadfall. The bear stayed behind the elk calf, breaking off the top meter of the class-one deadfall as it turned towards the northwest. The diameter of the remaining trunk for this deadfall was measured at the break point, with a resulting measurement of 6.3 centimeters.

Turning west, the elk calf was able to leap a third, small, class-two deadfall and continue for 67 meters before encountering a class-one deadfall. The grizzly sow also leapt the small deadfall, taking out several wrist-thick branches during the maneuver. The elk calf then turned to the north, and after 43 meters it tried to leap another class-one deadfall, only to become entangled in the remaining branches during the attempt. At this point the grizzly sow caught up to, and then bit into, the left rear hindquarter of the elk calf. Using its jaws and front paws, the grizzly sow pulled the elk calf away from the deadfall, out into a clear, grassy area.

The grizzly sow completed the predation event with a final bite to the back of the elk calf's neck at 08:49:30 MDT, breaking the spine with an audible snap and stopping all movement by the elk calf. Once the predated calf stopped struggling, the grizzly sow proceeded to carry the carcass off to the northwest, towards the Black Canyon of the Yellowstone, followed closely by both cubs. I lost sight of the grizzly sow and cubs when they entered a small stand of trees, located approximately 300 meters northwest of the kill site. As the bears left the area, a single cow elk returned to the site where the elk calf had been bedded, sniffing the area. She then followed the path of pursuit, stopping to sniff the air several times while approaching the final kill site. At the final kill site, the cow elk sniffed the ground in several places, pawed the ground, looked around while stationary and then left the immediate area, returning to her herd.

DISCUSSION

Previous researchers have calculated that the carcass of an elk calf provides somewhere between 81 and 115 kilograms of food (Houston, 1978). Theoretically, this amount would provide sustenance for the sow and cubs for approximately one week, based on a 450 kg bear ingesting 10.5 kg per day (BC Ministry of Environment, 2001). I estimate that the mass of the predated calf was between 20 and 30 kg, based on its neonate status (USFWS, 2006). This amount of meat would provide sustenance for the bears for two to three days at the most, depending on the required daily caloric intake necessary to produce breast milk for the two cubs.

The predation event involved no stalking by the grizzly sow. It was strictly an opportunistic event, one where the bear took advantage of the immediate situation.

What was most interesting was that while

the elk calf attempted to use the various windthrow as a natural barrier, it had minimal to no effect on slowing or stopping the grizzly. This was clearly evident when the grizzly sow snapped off the top of a deadfall while taking the most direct route possible in order to stay behind the calf. Further evidence of failure of the natural barriers was provided when the grizzly leapt the third class-two deadfall, breaking several wrist-thick branches in the process.

ACKNOWLEDGEMENTS

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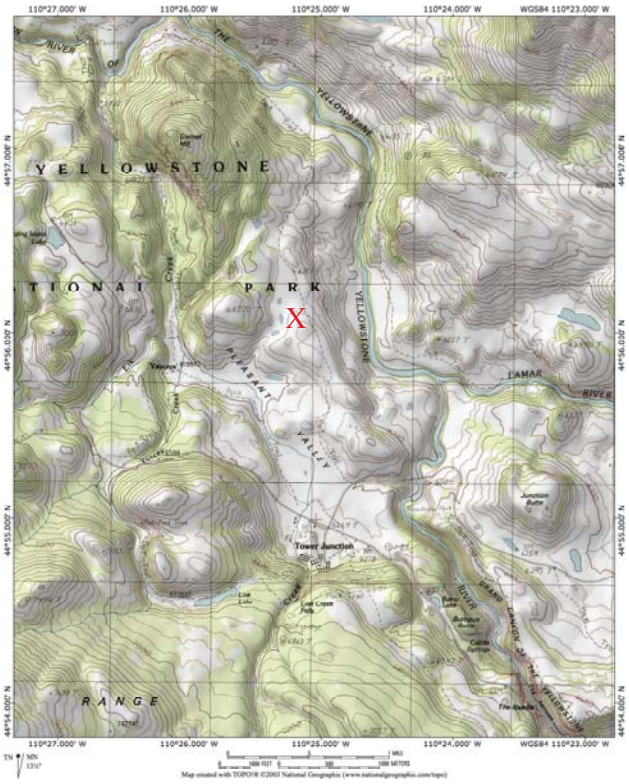
IMAGERY / MAP CREDITS

Image One - Satellite imagery courtesy of Google Maps.

Map one - Created using National Geographic Topo Software, Version 3.4.3.

Image One - Satellite image of predation site location. North is the top of the image. Red “x” marks approximate kill location.



Map One - Overall area of predation event. Red “x” marks approximate kill location.

Fragments of Utah

The softness of the earth
Feeling something concrete, durable
Signs of wear and tear
Immediate effects such as drought seen and felt.
Storms arising seen and felt
Thunderstorm a coming
Richness of sky as thunderstorm blows in
Rock. Something solid in hand. Reliable.

Lay on the rocks
Look up at the sky on amazement and the trails of red sandstone
Where the pine trees sloop down the walls
Looking like they will tumble off, tumble down. . .
Growing in what appears to be the most unlikely spot.
Thriving against all logic.
Clouds roll.

Ant hill no regurgitation or growth nearby
Fiery red ants
Green lichen on rocks
Cactus seem to grown more in burned area
Savory means not sweet.

I sat where the trees invitingly pointed me to.
Outlook over the mountain mesas
Prickly Pear Pollinators in bloom
The bark of a burn site sheds its snarl,
Outer layer,
Like a snake transforms and sheds it's outer scales.
The rock indented by wind, rain, fire, elements
Molding snuggly into the perfect lounge chair.
The wind, slightly blowing, its gentle reminder. . .
Strong wind like a hug.
Wrapped around
Engulfed in love by the mother of all nature
Feeling the ground beneath you
Ability to chew on straw.

Fragments of Utah Cont.

I'm walking in
The cryptobiotic soil
In my bare feet
I want this pattern

To leave a lasting print
Like doodles in drying
City cement.

Browse's Burn Side

Blame it on the cheat grass,
spreading hail lightning's blaze
throughout canyons of life
on this of nature's burn site.

Blame it on invasive plants,
spreading fury's gospel
rattlers of gossiping trees
those wretched root clogs.

The lizard adorns,
steps up to the rock
slithering out its tongue,
saying,
"All right, Mr. DeMille, I'm ready for my close-up".

of all rock formations blaring

Oh, desert varnish,
you desert tarnish.
Oh, black suspected residue of water
striking down,
Zion's Navajo red sandstone stage stands
ineffably
Against the algae green Babylonian spots of
mineral time

Reciting dramatic face lifts
of dark volcanic stars
Whispering windshield wiper streaks
of evolved mechanical wind rhymes
Narrating chiming wrinkle cliff tales
of eternal transforming scenery
Beating to the sedimentary beat
of visible sustainable sand carvings
Broadcasting electronic engine manuals
of plateau weather bearings
Gravitating along the forces of eroding city building rocks.

What mountain man would subdue
these majestic valley walls?
Knocking 'em down
in ego's luxury retreat?
Smashing out the windows of diverse geological freedom?

Tell me, who would even dare?
Such nonsense, dipstick. . .

In the Forest

The morning bird,
Like an old man's whistle,
While sun rides high on clouds' ridges
And wind
Aleviates the song from the bird.
There is only one all-night disco in the Northwest
It is found in the forest
Where the ferns wiggle their tips like
Tall women's arms on All Hallows' Eve.
And
Indian plum shimmers
Like the hats of Fillmore Street shine.
How the moss is a moist still guest
And doesn't like to prance around much.
While
Red huckleberry leaves move like a pianist's fingers
Sometimes sweeping themselves whole in ferocious
passion.
Where salal shimmies,
And the trees make the best of dance partners for
Some kind of romance.

A Pale Rogue

A sovereign wind rides the tips of tides,
Creates
White Warriors
The cap of experience?
Sucking in the winds generous oxygen,
Giving
White life in a bubble
Always, rushing too fast to notice
The weight behind each wave's
Exhale
Curls its lip as it beats down on the earth

Rise of Responsibility

Sun and rain clouds unravel
Like confused new parents,
Catering to new life

Reaching up for nurturing
Little bulbs
Yawn into bloom

Accept the generosity of its creators

Soon
Silky soft
Sweet seduction brings bees
Like lovers craving night
Seduced by day,
Dusk allows darkness to roll in
Exhausted,
Sun and rain clouds rise again
Breaking through sticky still moist air
To re-create the day

Dusty Snails

Weather beaten woody plant
The Ghost of spring, swathed
In white webs
Somehow - haunted acorn shaped
Brittle blooms hang, still
The fine skeletons of petals,
Spun silk
Once an intact faerie kingdom
Hang the decay of worn out wings
Old forgotten magic
Pulsing a soft story through enchanted veins
And garden snails sit long hours
Lulled,
By the faint beating of the past.

Visions from Glacial Heritage

Swallows flit through the sky
as children in the schoolyard.
Voices carry songs of their
dismissal from the night
When rain returns, voices may be lost
Burned grass crunches under boot soles, down below.
Crumpled moss still soft on the hand.
The mosquitoes sit on the window
like the rain waiting in the clouds for the perfect moment
To strike.

It's Hot and Sandy and I'm Thirsty, But I Love It

"This is the most beautiful place on earth." - Edward Abbey, Arches National Monument, Utah.

I've never been to Arches, yet I understand where Ed Abbey is coming from when he says this. The desert is a pretty inhospitable place to those who wander in unaware, just ask anyone who has wandered unprepared into Death Valley during the summer. Even in this day of helicopters and cell phones, the desert still makes the traveler acutely aware that they might just be one water bottle or misstep away from being an old photograph on the front of the local newspaper. No matter, I prefer it this way. The forests and swamps have become dirty, dirty with people and secrets, but the desert... the desert is clean. In the desert, you can see where the path is going to lead you. There's no room for secrets here; there are not enough trees.

I'm not naive enough to think that the desert remains as pure and clean as it once was, but it still doesn't leave a lot of places to hide things. The high desert is populated by plants adapted to minimize exposure to the sun, and this inevitably leaves them with less leafy material than would be found in the rain forests of the Pacific Northwest. Take a walk in the steppe, among the Joshua trees and the sagebrush; there is very little that grows to even a meter high. The Joshua trees or a few scrappy conifers may grow higher, but they are so few and far between that they hardly offer any concealment. A man could hide easily behind some sagebrush if he put his mind to it. A band of men might be able to conceal themselves if they spread out, but a vehicle or house, a tent even, would be spotted and called out immediately. Yes, yes, there are of course the rocks and the canyons, but it is bare rock; what you see is what you get. It's honest— yeah, that's a good word for it.

The desert is very frank with you; it is an easy place to die. Some of the people who come out to the desert only see the dangers of heatstroke, sunburn, or dehydration; these people are quickly dispatched to the vultures. It's too bad, but what other rights do we have as Americans if not the ones that allow us to wander into a scorching wasteland, *of our own free will*, and find out the hard way just what we're made of? Heat and sun are definitely the biggest danger of the desert, and are usually a significant factor whenever someone drops out of the race during the summer, but before it gets to that point, there is something that leaves a person trapped in the sun far from water. Big rocks: they're easy to fall off of, and kicking at that rattlesnake probably won't help out a whole lot, though it might distract from the fact that the ground is rapidly liquefying, and creeping up the shins, now the knees. Hmmm, we've got some problems now. Oh, by the way, it's also getting to be night, so good luck with those clothes wet with mud; good luck getting a fire started.

As much as I love the fire, I've got to admit that it's becoming a "problem" in the desert of late. In most cases it is much better to simply let the fire go on, as that's what it would've done in nature, but in the deserts outside of major cities, the amount of pollution in the air has become so large that it is actually fertilizing the ground and allowing grasses to spread and colonize more land. This allows isolated lighting strikes to blossom into widespread brushfires, which burn down trees that are not as adapted to flames as their wetter counterparts. Even the Ponderosa pine, which inhabits much of the dry forested land that abuts deserts is adapted to the fires that whip through every once in a while, and when trees do burn, they might be partially replaced within a century. But the Joshua trees and the junipers that call the desert home are not so lucky. These hardy desert dwelling plants take a very long time to grow, and can't just be replaced after

every fire that waltzes through the place.

Fire cleans things up, but in the desert, there's really not so much of a need to clear things out as often as in the forest. There's no mucking about like with the meter and a half of salal, Oregon grape, blackberry, sword fern and whatever else is out in wetter forests. In the desert, you see him and he sees you, whatever else happens beyond that, at least both are starting on the same page. Sure, there are some sketchy characters out in the desert; they came out there for the same reason as you did, so they might live as they want, even if it's a bit creepier than most folks. Of course these aren't the characters the desert is about, rather they are products of our modern world, made this way in the concrete jungle; at least you can see them through binoculars, instead of stumbling onto their front porch while crashing through the salal. Of course they can see you just as easily through the dry air, as can the cougars, coyotes, and vultures; there's no fox-walking across damp earth here.

Though it's not cluttered up with a whole lot of plants, it is a bit hard to see through the masses of people that have got it in their heads to come out to the desert for some crazy reason. These aren't the sort of people that come out for the spiritual side or the quest to escape society; they want to bring it with them! In any case, they don't seem too determined, so they might be driven off with minimum effort. I can't imagine a whole country of people with the will to leave their cars and mobile homes. The truth is that if the entire country really was willing and able to come out to the deserts, mountains, and parks, we'd be in a whole lot of trouble. Those out in the wild like to think that they're insolated from the rest of the world's problems, and confident that nature will conceal and protect when it comes down to that. But when the bombs start falling and the mysterious landing craft start appearing from China, these people are fleeing to deserts and mountains, and even if only a fraction make it, it will still be trouble for those who have been there all along.

In the long run, the desert is not one that is able to hold secrets either. What makes the desert the desert, a minimal amount of precipitation, is exactly what allows it to hold onto everything that it touches. In wetter climates, there is a swarm of fungus and successional species that are chomping at the bit to tear down any structure that might enter their home, be it concrete bunkers, logging trucks, or even people. These organisms, in addition to rust, tree fall, and washout ensure that whatever is brought into the forest has a very limited amount of time that it can survive without human maintenance. In the desert however, with the minimal rainfall that it receives, there are no fast growing plants, moss, or fungus that can overwhelm and break down the tailings that men leave behind when they step across, or settle the desert.

In the high desert outside of Joshua Tree Park in California, there is settlement by various people (which includes me) who thought it would be a nice place to live— which it is, even if I wish they'd move away. Anyway, there are a whole lot of homesteader cabins built on land that the government gave to GI's after World War Two. Some of these buildings haven't been lived in for over 50 years and yet they're still there, a little bit sandblasted by the wind but much more intact than if they had been abandoned in the middle of the Olympic rainforest for half a century. Out in the town of Joshua Tree, there's a (mostly dry) stream that runs across the end of what could be called a neighborhood out there. Down in this wash, there are the remains of a few cars that have been dumped there over the years. The doors and windows have long ago been ripped off by flash floods or shot out by drunken hicks (they're really actually lovely people). The thing is that all the structural elements of the car are still there, and they show no signs of leaving anytime soon; even though they're pushed around by floods every year, there's no rust

on them. The flash floods and winds push things around and might pile sand somewhere, but for everything that gets buried, there's always something that becomes uncovered, continuing the cycle. Even footsteps and tire tracks can last for years. If a foot falls or a vehicle drives anywhere but some sort of drainage, there is nothing that will sweep those footprints away, even when the rain comes. The soil crust will break even when a person stands on it, and it will be a long while before the sand builds up enough and cements itself like it has done before. Because of this phenomenon, dirt bikes and quads will leave their legacy long after peak oil has sent them to the scrap heap. Perhaps this concept would be better referred to as permanence, rather than honesty of the land, but the truth is that you really can't hide what you are doing to it The land is honest and will tell exactly what you did to it, good or bad.

People want to come out to the desert because they believe that nothing is there. These folks are wrong, and their attitudes towards those who are already out there, plants and animals included, mean that things are going to get hurt by people charging out into something they understand little of. The purity of the desert itself is not something you want to take lightly.

Nevertheless, the desert attracts a part of everyone— the desire to escape it all, to run and hide in a land of sand and rock. You can hide, though the desert is going to find you someday when your canteen has leaked all your water and you seem to have lost your own tracks way back in that maze of canyons. Well, then I suppose you'll have a number of hours to get yourselves acquainted before you do finally get to run and hide.

Miniature Highway in the Dirt

Ants are toiling on the garden path like trucks along the highway,
These dual streams of commerce flow to the bustling hive,
Chemical CB radio alerts the truckers to a decaying rat,
A dark breeze sweeps an insecticide fog across the interstate,
Bellowing horns and invisible cries cut short.
Violent kisses of steel and rubber boots,
Stomped bodies taken deep into the hill, like smashed steel towed to the scrap yard,

Live vessels emerge onto the path, and the streams flow

once more.

Ancestors' Tones

Breathe in.
Breathing music.

Those once here left,
in the air music to breathe in
use.

The violins tell their secrets in the soft wind.
Applause of the beach replies.

Two lonesome alcohol bottles,
keep me...company here.
That and a handsome leaf
dropped by a madrona.
Speckled
red, yellow, green.

And thoughts…
my own?
Or, remnants from experiences passed.
Past.

A chilling breeze sweeps, picking up sand,
muffling the air now
changing the tone.

Not many beings remain to visit today,
not even *I*
just the consistent applause.

You must be patient!

Lilacs on the dash
release a pungent, sweet, piss-like smell.

Half eaten crumb doughnuts, left here to be
forgotten,
turn stale and hard.

White vans in a line, waiting still.
Anxiously ready to be somewhere new,
unknown and beautiful.

“Are we there yet?”

Idea

The idea.
Being in one place changes your “being”
and who/what
you are.

Chemically
and
Physically.

Also your experiences in that “being”
affect, and are affected by, “beings” around you.

Note:
Meaningful relationships
cannot be selfish.

Forced to dance

Birch seed.
Caught, trapped.

Forced to dance his entire life,
stumbling with the fragmented spider's web.

Trying desperately…
to escape.
Her sticky grasp holds him tightly.

He decides to let it go.
Accept his life.

He learns the steps,
embraces the rhythm…

He carries on dancing forever.

Spiritual weather

The downpour fades
The mist runs away drifting
Up the red towers
This thick air caresses
A mystery

For awhile the sky defines the land

Then the sun pushes
Back these clouds
Reveals smooth curves
Harsh angles
Solitary groves

A new earth evident in the light

The Utah sun brings out gems after the rain
The humming bird slips slides
Through the petrified claws
Of dead grey wood
To dance with the Lobelia
Each red flower offered up
Like a communion chalice
To this tiny priest
Dressed in a jeweled green cassock

Fortune telling

The brittle limbs of these little trees lay strung on the ground
Constructing broken patterns

Every fallen stick like some means of divination
Tossed by nature herself

I stumble through the grove, new sticks fall
Changing the future as I pass.

Past Sounds

As I walk outside I am greeted
By the wind in the Bamboo.
The chill of a cutting breeze
Matches leave's harmony

No different from what I heard as a child
In the bamboo thicket on the walk from school.
Track housing has replaced my little forest
But no one can cut down such a sound.

I walk away into the sun's warmth
Both the music and the cold fade
As Curtis and I head to look at chickens.
I look back at those green stakes
Reassured they are still there.

Happiness is Houston in my rearview mirror

An unidentified E-bay buyer has agreed to pay
92 dollars for a chunk of Christmas snow from
Houston.
---Houston Chronicle (1/12/05)

Driving Home from Work
Time lingers over the stagnant bayou
Of my eighteenth year
City noise trudges through my ears
As the humid swamp air of boredom
Creeps out of the air condition vents
The subtle smells of the tense crowd
Offset by their captive silence
Project a discomfort that clings
Like the summer heat outside
The highways swarm with people
like so many mosquitoes

Urban Green Space
Bike and rider cutting through the bayou
A beam of fresh light
My mind flies out with the bats
From under Obligation Bridge
Daytime drudgery is blown away
With the night breeze
A few clean stars now shine
Through a dirty purple sky
The city's spasm of activity
Eases to a mere tremor
Peace, riding this bike
Until it is blocked
By the wall of a Suburban.

Christmas Eve 2003
A rare snow falls
Precious as manna
Covering the plastic toys
Celebrated tomorrow
Three inches of snow at Galveston
Covering the palm trees
Foreign glitter of snow drives the city out
Of their houses to grasp the cold
The people are connected in the strangeness
But in the morning they are all inside again

HOVEL FORMATION DEPENDENT UPON THE LOCATION OF RIPARIAN VEGETATION

John McGee, Christina Shimizu, Xander Demetrios, Kate Reimer, Andrew Durahm and Crystal Hatfield

ABSTRACT

The formation and abundance of leaf-litter hovels may be dependent upon flooding streams and vegetation structure. Hovels are suspended debris matted in streamside vegetation that play an important role in supporting insect biodiversity (Loeser et al., 2006). Although previous studies on hovels have occurred in frequently flooding streams of the Southwestern U.S., our research took place in the Pacific Northwest where to our knowledge, no previous studies exist. The November 2006 floods of an upland river (Nisqually River, Mt. Rainier Park) and a lowland stream (McLane Creek) granted us opportunity to record and compare hovel abundance across a range of Pacific Northwest habitats. By measuring hovel size, density and the vegetation structure in which hovels were found, we addressed basic questions about hovel presence along Pacific Northwest water courses. We suggest that basic structural factors define the relationship between the landscape, the hydrology of the waterway and hovel formation.

KEYWORDS

Riparian habitat, hovel, debris, flood regime, Thuja plicata, Alnus rubra, Acer circinatum, Rubus spectabilis, Acer macrophylum, Tsuga heterophylla, Oplopanax horridum, Pseudotsuga menziessi

INTRODUCTION

Riparian habitat is in constant flux and always vulnerable to change. Variables in riparian landscapes that affect change include variations in velocity and duration of cyclic flooding, which alter riparian landscapes annually (Bornette et al., 1997). Flooding is one of the natural processes in which we can see the physical destruction of riparian landscapes giving way to new habitats.

In systems where habitat change is recurrent due to flooding, it is common to find elevated and entangled debris deposits, termed “hovels” by Loesser et al. (2006), which may provide important ecosystem services. Channels that undergo recurrent flooding often lead to the creation of hovels, which are imperative to the diversity, and abundance of arthropod species (Loeser et al., 2006). In fact, debris which is initially swept up during flooding and then later deposited along the ground or bunched around vegetation, is a regular feature along channels where annual, flash, or heavy flooding occurs (Loeser et al., 2006). The debris formations provide an important habitat for the shelter and safety of arthropods and spiders (Loeser et al., 2006).

Although previous work has focused on the ecological significance of, termed Hovels, in Southwest flash-flood streams (Loeser et al. 2006) our study examines the presence of these structures along a major river and creek side habitat in the Pacific Northwest, where flood regimes can also be dramatic. Additionally, while Loeser et al. (2006) demonstrate the ecological importance of hovels for arthropods, it is still unclear which environmental factors are necessary for hovel formation. Ecological structure and flood regimes may be particularly important in hovel formation. We examined two sites where flooding varied in velocity and length of time during winter 2006/07. The intensity of flooding events may be a key factor in determining the density and frequency of hovels. When floodwater exceeds an active creek bank, more vegetation is flooded with debris, which may lead to greater hovel formation. Our observations along a major upland, high velocity river (Sunshine Point, Nisqually River, Mt. Rainier) and a lowland creek (McLane Creek) in the Pacific Northwest provided an opportunity to evaluate two systems subject to different flooding regimes with different riparian structural attributes.

METHODS

Study Site

Our first site was $^1/_2$ km. east of the Nisqually entrance at Mount Rainier National Park, in a stand dominated by Western Hemlock (Tsuga heterophylla) and Red Alder (Alnus rubra), and classified as an Alnus rubra/ Rubus spectabilis community type (Franklin et al. 1988). This

stand sits a quarter of a km. directly north of the Nisqually River at a elevation of 2023 ft. in mostly alluvial soil. The undergrowth is mostly comprised of mature salmon berry (Rubus spectabilis), devil's club (Oplopanax horridum), and vine maple (Acer circanatum). Woody debris, fallen trees and concrete residues remaining from Sunshine Point Campground cover the forest floor and sides of the river-bed. The stream sits half a meter deep in relation to the forest floor on either side. In November 2006, Mt Rainier National Park received 18 inches of rain in a 36-hour period. At Sunshine Point Campground flood recession carved out small stream banks and allowed for the collection of smaller streams fed by snowmelt to combine with the Nisqually River, creating a new habitat for hovel formation.

Our second site, McLane Creek, is a perennial stream that flows through a second-growth lowland forest of Douglass-fir (Pseudotsuga menziessi) and Western Red Cedar (Thuja plicata) in the south Puget Sound. Along the river-bed there is a large concentration of sword fern (Polystichum munitum), devil's club (Oplopanax horridum) and salmon berry (Rubus spectabilis). Although McLane Creek is perennial, its water level drops dramatically in the summer – near zero cubic feet per second – and it tends to flood in the winter, sometimes reaching 700 cubic feet per second (http://www.co.thurston.wa.us). McLane Creek flows from the south in Capitol State Forest (Olympia, WA.) to the north, draining in to the Eld Inlet of the south Puget Sound. Some trees have fallen into and across the stream, creating logjams that slow the flow of water in effected areas. Unlike the stream at Mt. Rainier, McLane Creek has cut a deep enough channel so that soil erosion may enable hovels to entangle in the exposed root systems of the steep embankments. While it is more common to find hovels suspended in vegetation within, or overhanging the creek channel, eddies and debris dams allow for annual flooding to effect plant-life on the forest floor.

Collection Method

At both Sunshine Point Campground and McLane Creek sites, we mapped eight, 5x10m plots parallel to the stream (Fig.1). Plots were chosen systematically within 100 meters of each other along the streambed. Sites were chosen subjectively to include a quantity of hovels in each area based on visual estimation. Larger plots were then divided into five 5x2 meter plots so that the existing 5-meter measurements continued to run parallel with the stream (Fig. 1). We thus used quadrants to group together hovels that were similar in distance from the stream. In each quadrant we recorded the circumference of each hovel, the distance the hovel was from the center of the stream, and the structure in which it was supported it (i.e. plants, root systems). In our most extensive data set for Mt. Rainier, we used a two-way ANOVA to test for the effects of sampling plot location and vegetation type on hovel formation.

RESULTS

In the 400 square meters recorded at McLane Creek there were a total of 40 hovels. In comparison, there were a total of 110 hovels recorded in the Sunshine Point Campground at Mt. Rainier (a more than two-fold difference). At McLane, 87.5% of hovels sat within 4 m from the center of the stream; 7.5% of the hovels sat between 4-6 m from the stream and

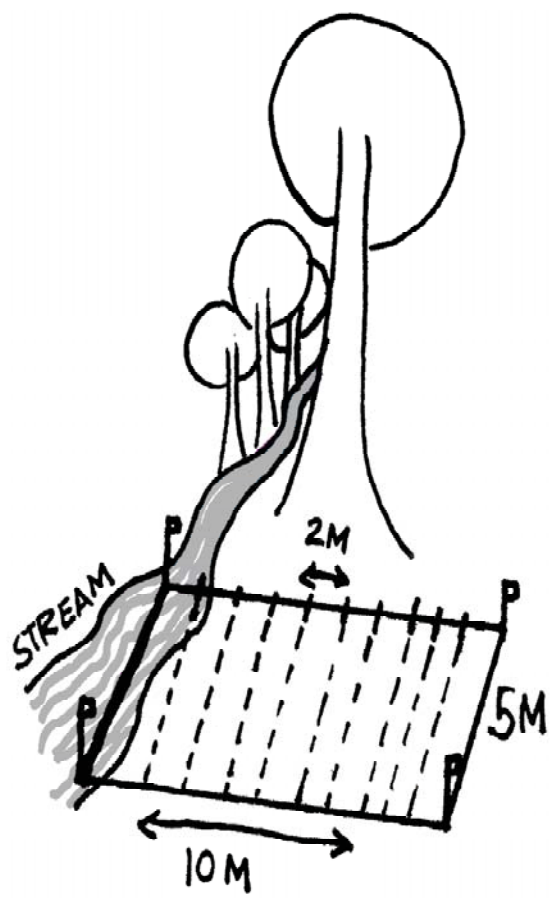


Figure 1. The configuration of plots.

5% sat beyond 6 m of the stream (Fig. 2). In eight, 5x10 meter quadrants, no hovels were found beyond 8 meters from the center of the stream, proving that most observed hovels of McLane Creek sat closest to the central water flow.

At Sunshine Point Campground a less dramatic trend was observed in hovel abundance relative to the measured distance from the center of the stream (Fig. 2). Thirty-nine percent of the hovels sat within 4 m, 50% sat between 4-8 m, and 11% were found between 8-10 m of the stream. When compared to McLane Creek, hovel abundance at Sunshine Point was more continuous over a larger

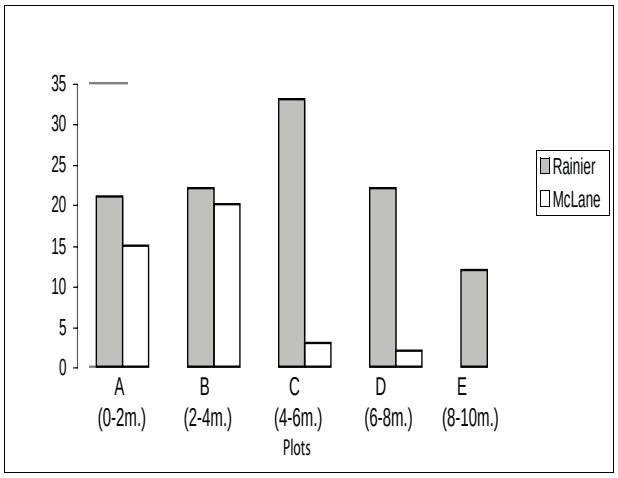


Figure 2. The total number of hovels at Sunshine Point Campground (Rainier) have a sustained existence over 10 meters while 87.5% of the hovels at McLane Creek exist in the first 4m.'s.

relative distance from the active stream.

The over-all average hovel circumference, when data from both McLane Creek and Sunshine Point are pooled, was 17.4 centimeters. The average circumference at McLane Creek was 3.4 cm smaller than the hovels collected at Sunshine Point. At both McLane Creek and Sunshine Point Campground, no collected data provided a significant correlation between the location and circumference of hovels. At McLane Creek, within 4 meters from the center of the stream, we recorded an average circumference of 15.1 cm and between 4-8 m an average of 17.8 cm (Fig. 3). The average hovel circumference at Sunshine Point within 4 m of the stream was 18.3 cm; between 4-8 m: 19.1 cm; and between 8-10 m: 21.3 cm.

Sunshine Point Campground and McLane Creek both showed similar trends in what structures supported hovels. Seventy percent of the hovels at McLane Creek were housed in the riparian shrubs, salmon berry, devil's club, sword fern, and vine maple. Almost 76% of hovels at Sunshine Point were housed in the same shrub species. At McLane Creek, 20% were suspended in the deciduous

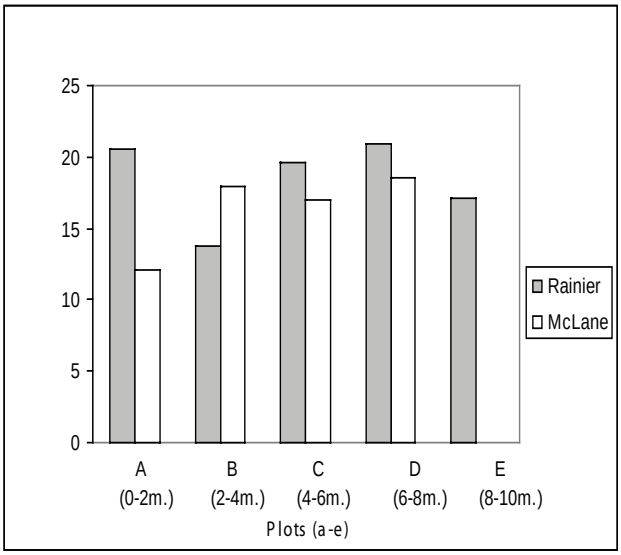


Figure 3. Sunshine Point (Rainier) averaged a larger circumference in all but one plot areas. There is no significant incline or decline of hovel size in relation to distance of the stream.

tree's, vine maple, and red alder. And at Sunshine Point, 9.5% of hovels were housed in these trees as well as the coniferous, western hemlock (Fig. 4). The size of hovels suspended in riparian shrub and exposed root systems were, on average, more than 4 centimeters larger than the average size of hovels suspended in larger coniferous and deciduous trees (data not shown). In a Two-way ANOVA that accounted for sampling plot location, vegetation type, and interactions between location and vegetation, we found no significant difference between vegetation types in the number of hovels they supported (P = 0.69).

DISCUSSION

These data do not support our original hypotheses. For example, we found no significant relationship between hovel distance with absolute distance from stream at a p-value cut-off of 0.05 (Fig. 2; P = 0.15). Size of hovel was also not significantly related to distance from stream (Fig. 4; P = 0.68). This could mean that the distribution of hovels is random and depends solely on idiosyncrasies associated with each individual flood. This would make sense since

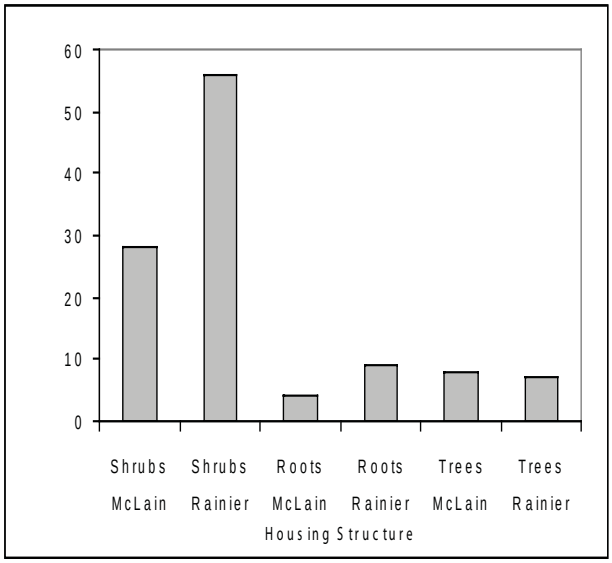


Figure 4. Riparian shrubs housed hovels significantly more than either exposed roots or coniferous and deciduous trees.

the very definition of hovels is non-discriminating as well: "litter that can persist attached to trees at varying heights above ground in frequently flooded areas."(Loser et al. 2006) However our data could also suggest that our sampling was not expansive or precise enough to demonstrate a pattern. From original observations we believed there was an observable pattern where the average circumference size of hovels decreased as their distance away from the stream increased. However, our data did not demonstrate this pattern (Fig. 3).

While our study has not yielded any statistical trends, we have observed patterns. For example, more intensive floods, such as the November 2006 floods at Mt. Rainer, may create hovels at a greater distance from the center of the stream (Fig. 2). McLane Creek's milder seasonal flooding may result in fewer hovels at a greater distance. Other factors like the amount of dense debris on stream-banks, may also contribute to hovel formation. For instance, Hax et al. (1996) describe how wood stays anchored during flooding. This anchored debris supports hovels and provides homes for invertebrates seeking refuge during floods. Vegetation type may also play an important part in hovel formation. Some plants, especially shrubs such as devil's club and salmon berry, may better facilitate hovel formation when compared to larger tree species (Fig. 4).

The waterway may be the most important force in the creation of hovels; the deeper a stream has cut itself into the ground, the less water will overflow into the surrounding landscape during flooding. Since hovels are created when floodwaters interact with thick vegetation that is usually found next to a stream instead of in it, it is essential for the water to flood its banks, so that floating debris can be deposited into riparian shrubs. The area we observed at Sunshine Point Campground in Mt. Rainier only carries water during high flood seasons. Because the flood-water inundated the streambed and highland alike, there was a large amount of vegetation for water and debris to interact with, increasing the likely hood that this debris would catch and form hovels. By observing the patterns of moss distribution on the large trees in the area, we concluded that at 0.45-0.6 meters up the tree, the water was still strong and persistent enough to remove all the moss on the sides of the trees facing upstream, signifying that the flood was at least that high.

Another asset of flooding beyond the creek's banks is that debris normally untouched by the river is picked up and added to the flow of debris. Since no water typically interacts with the untouched debris outside the normal waterway, the debris may have been compiling for a number of years. This debris outside of the channel contributes greatly to hovel formation, simply because it allows a greater amount of debris to swirl around in the water, ready to be caught up in unsuspecting branches. Also, the flow of the flood at our Mt. Rainer study site was not deep or powerful enough to carry extra large debris such as trees and boulders that would have destroyed the shrubs and plants that support hovels.

While our site in Mt. Rainier was relatively level with the surrounding landscape, McLane Creek cuts into the ground about one meter deep. For the most part, the hovels observed were confined to the immediate banks of the river, or to branches from surrounding plants that drooped into the flooded waters. In some areas, however, eddies and debris dams slowed the water to the point where it backed-up and flooded a bit of the vegetation on top of the banks. When the water receded from these dammed areas, debris was left behind, and hovels were created as usual. Even though McLane Creek did not experience the same substantial flooding that the stream at Mt. Rainier did, hovels were still formed due to debris dams.

The difference in terrain between the two sites also made it difficult to have a completely uniform study design, and likely played a major role in structuring our results.

The methods and choice of sites for our study may have also affected our results. Changing or expanding our sampling strategy could lead to a more extensive study. The Mt. Rainier and McLane sites differ greatly. There are differences in anthropogenic development, geography, and cause and type of flooding at each site. All of these diverse factors make comparing the sites difficult if not impossible. Having the two streams in a similar locale with a controlled flood would improve our study. Differences in width of the stream also may provide an unmeasured source of variation. A more systematic method of measuring hovels might also be beneficial. For example we measured size at only one point. Measuring circumference may improve our estimates of hovel size. Use of mass or area might also improve accuracy.

None of the data recorded proved significant but from collected evidence, we have derived that hovel abundance and size in the Pacific Northwest may be due to the different aspects in varied flooded terrain. To our knowledge ours is the first study of hovels in the Pacific Northwest, only beginning to prod into a relatively unknown subject matter.

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Daniel Keebler, Park Ranger, Mt. Rainier NP.

Cackling Strange Pool

Water melts down the roof
and drools into a
strange pool in the gutter,
the rain cackles
spattering the cement,
blackbirds speaking across
the canyon of two trees,
my mind churning and twisting
in the wind
as red-haired angel
strums her crooning violin
behind me.
Skyline is rippling,
as my gaze surrenders
to the stream, in the gutter.

Me, Micalea, and the Dog

I go to pee; seagull greets me over the horizon of the little
town's green and silver rooftops,
"Oh penny boo, penn penn." we name him
"I wish I had this dog's life," she claims,
the pattern in the wet sand looks like a brown marble table
closer still, dirty foam pops like corn
Micaela embraces the slender coffee-colored dog
she's just finished meditation; her blue-eyes angelic.
ancient new circle branch rests where she was
she's erect,
her frizzy blonde hair glows,
the sun smirks through the clouds,
her feet step confident,

she's confident in the 'outdoors',
I watch her dissipate into the mist, toward the ocean.

April Uncertainty

Green canopies soften threats of rain,
translucent April skies cast a day-long shadow.
Damp grass hosts dandelions,
who battle for space, white daisies.
Awakened trees, once pink with Cherry Blossoms,
on the way in, soft bright-green leaves.

A drop of rain, I fear, a near downpour-
but here a threat, of falling rain,
the element secretly adored.

Ant Babies

Squirming maggots,
you're lucky for now,
to be part of a large community.
They whisk you away,
deep underground
so that I cannot watch you,
any longer.
But what they don't know,
is that I'll find you again.
You're not safe
from my
curiosity.

Night Watcher

Stars bask overhead
and I stare up,
to catch
their glinting rays.
The party is raging
but you, darling stars,
bring me a million miles away.
If I wouldn't freeze to death outside,
I'd lay here all night,
and develop my cosmic tan.

Road 62

My car and I drudge over forest service road 62, for what
feels like a lifetime.
I quickly learn as I lift my cup of hot tea to my mouth that
Forest service road 62 is not for hot tea drinkers.
62 is for barrel aged, raw whiskey drinkers.

I Hauled Larvae

Disappointment pierces my soul like a sting from a prickly
pear cactus.
Red rocks create a shield, but not soon enough.
Tears race down my face like a spring desert rain on a
windshield pointed home.
My legs tremble inside of pants covered in three days of
red, desert clay.
Tan lines drawn on my face by the Utah sun show a once
happy face.
Selfish minds sing, celebrate and dance in their own desires,
while the gray and blue chill of death haunts my dreams.
I've been stung enough by you.

The Original Snapshot

Stoic Mt. Shasta
Surrounded by air clogged with smoke from a nearby
smoldering fire.
Purple glaciers in an 8 o'clock sun that's heading east.
A hillside glowing gold as Douglas firs draw near the
grasslands.
A gamble with a digital tint on my shiny camera presents a
new light and turns back time
to black and white.
If this were the original snapshot would the glaciers still be
the size of a whisper?
Would they be large enough to shout?
Would the encroaching forests play a larger part?
Is the nearby fire the commonality with the original
snapshot?
I am tormented with this argument in time.

The Mysterious Crossing

Creeping fog engulfed the forest.
Giant Sitkas arose out of the mist.
An eerie silence lingered over the bay.
No one dared to make a sound.
All were afraid.
What was out there?
No one knew.
This forbidding land was all new to them.
Only the terrifying tales echoed
warning them over and over again.
Beware of the *Watcher in the Woods*!
Beware!
Beware!

Mindful Tricks

The hand of darkness consumes me
Light flickers all around me
Shadows creep through the canopy
A creak of a tree top
A snap of a twig
The shadows mock me.

My throat is tight
My voice is stolen away
I step and twirl back
I duck and gaze
Is the forest laughing at me?

A crash in the distance
A moan nearby
What lies ahead?
Perhaps a maniac has found me
Maybe a black bear is charging.

My throat is dry
My palms are slick as soap
Is the temperature rising?
My mind is racing
Something is coming closer.

Do I flee for my life or take a stand?
My imagination is running wild
The world is spinning out of control
My heart is pounding faster and louder
My body is stiff
I can’t move.

Two yellow eyes blaze towards me
What could it be?
I try to move but stumble backwards
It is now only a breath away
I lunge back as the brush parts
With a missed beat, it jumps at me.

To my astonishment and relief,
It was only a chipmunk.

The Epic Sky Battle

In the distance,
a storm is brewing on the horizon.
A cloak of darkness descended from the heavens.
A battle was to ensue.
Darkness collided with the great blue.
Blue fought to maintain its possession of the sky.
It pushed back with all its might
but the struggle was in vain.
Darkness was victorious tonight.
It has conquered the light.
The collision created a vast emptiness.
Soon, yellow brilliance will burst forth
through the dark void.
Until, the two great wills meet on the battlefield again…

Wildlife Symphony

Darkness is at hand.
I step out onto the porch.
The wildlife orchestra is prepping.
The chorus is late again.
The first stars appear.
The mood is set.
I take my seat and wait.

Crickets commencing with the instrumental.
Their radiance chirping,
harmonizing like hundreds of flutes.
Thumping, the frogs bass joins in.
Croaking mingling and hanging in the air.
The pond is bursting with music.

The full moon peaks behind the clouds.
Mr. Moon desires to witness this spectacular.

The chorus has finally arrived.
The coyotes sing out loud.
They howl to Mr. Moon.
Their voices echo across the fields.
Ms. Cow moans to the beat.

Conductor owl lands on a tree.
He signals with a series of hoots.
The performance marches on.

Skeletons Row
(*In reference to the shuddered mills of Youngstown/Warren, Ohio*)

This pub was better when you could smoke inside.
It's too hard to rub elbows with a guy out in the rain.
In this place - men painted the walls with soot
Waxed the floors with sweat...
A Scrapper could punch the time clock with a shot
You know, just enough to erase the workday.

Here – Forty years ago
When a man "bellied" up to the bar
He had life in his eyes - family in his veins.
Dead beats, sobbing Joe's and the homeless
Replace the hard earned dollar of yesterday
And it's no more than a cruel joke.

Shit man, I'd fire up those ovens and paint the sky orange again
If I knew it would put bread on the table
I'd stoke the furnaces of Hell with a blind eye turned to God
Instead of watching this place turn to rust
Heaven – sorry Lord, it ain't hot enough for me.

Here - we spent a lifetime covered in sweat
Here - we laid the foundation for America
Here - we paid the price for standing up for our rights
And I'd dance a jig with the Devil to bring back the mills again.

Do you remember when the Mahoning ran hot - the color of mud?
Of course you don't.
But that's when we had a job - man
When I could light up in this pub
And cuss at the fuck next to me.

Skeletons Row Cont.

You think we won World War II?
Brother-
Think again.
Brother-
Foreign steel and send the work overseas
And I ask you this-
Are your pockets full?
Is the family fed?

Do you remember when the Mahoning ran hot?
Yes – I'm sure you do.
But now it's clean
And you're sad that you drank from it
'Cause it cost you your job
And you're hungry for more than meat…
Goddamn you wish you could smoke in this pub.

But you can't-
The pubs no longer here
They tore that one down long ago.
With a token hardhat nailed upon the wall
A lone symbol of modern day ignorance…
I was here when she screamed
My shadow stuck to the floor
And only I – showed up at her wake.

I'd leave here if I could, man, you know that…
But I won't
I'll rust away with the mills till my time dutifully come
And join the sweet devil for a drink of true molten blood.

'Cause I hear down in Hell…
You can smoke in those pubs…
And Lucifer pays time and a half.

The Muse Within

When I first met the girl, she was five or six years old, a nameless black and white picture in a photo journal. She stood barefoot against the railing of a dilapidated porch somewhere in Appalachia. Wearing a sullen expression, her eyes provided a gateway to a damaged soul. Her tattered dress hung off her frame like moss on a weathered tree, hair matted against her scalp. I fell in love with the photo of this child and adopted the haunting image as my own. Taking her by the hand and removing her from the page, I will lead her through life often kicking, always screaming. This is my muse and the story she had to tell me – the story of her life, a story that ultimately changed my direction as a writer for life. This is Esther.

The rolling hills and gentle peaks of the Appalachian mountain range stretch from Alabama to southeastern Canada. Born nearly 300 million years ago, its serene beauty is matched by little else on the Eastern Seaboard. Within the majestic sprawl of emerald hills, fall brings an explosion of colors as the trees turn their leaves; winter a soft blanket of white. Spring rains awaken wildflowers in the Appalachians and give way to summer's bouquet. Among the delicate wildflowers that cover fields, meadows, and hillsides of this region is the Shasta daisy. Esther will find comfort in the beauty of this daisy, and the daisy will ultimately save her life.

A rural town somewhere in the foothills of the Carolinas provides no opportunity for the youth. A gaunt woman with one child in her arms and several others tugging at the seams of a dirty day dress walks past the storefront of a lonely Mom and Pop.
She is on a mission to nowhere; she is dead. Her tired face a reflection of a thousand years older than her true age. A nipple on the end of a Coca Cola bottle provides sickening nourishment to her babe in arms. Her breasts are barren;, she produces no milk. The husband of the dead woman follows behind her down the dusty sidewalk ducking away at the first opportunity into a smoky pub. There he will stay for the rest of the evening. The dead woman takes no notice and knows what to expect when he stumbles home in a drunken stupor. He will fuck the dead woman, perhaps planting the seed of another wretched child. A dead woman does not protest. Unsatisfied, he opens the door to Esther's room.

A scream pierces the still summer night. Crickets stop their song. Indifferent, a crawdad snags a minnow for dinner in a nearby stream. A raccoon fishes the crawdad from the stream for a late-night snack. A whitetail comes to attention, pauses and continues on. Dew settles on the Shasta daisy. "It's the way he was brought up," the family whispers. Esther knows better. She knows much better.

Simple country folk – I guess that's what you could call the people who inhabit the Appalachian mountain range. But what is so simple about country living? Early mornings turn into long days trying to scratch a living from the land. Hour after hour in a deep, dark pit of a coal mine, unrelenting dangers surrounding one's very being. For most, education past grade school is unheard of. Deplorable living conditions, poverty, and hunger run rampant throughout the mountains. Yet society opens a blind eye and pretends it doesn't exist. Better to sweep these people under the carpet, chastise them, ridicule and poke fun at them on the silver screen. A deaf ear fails to listen to the horrors of inbreeding and hunger. It's a pill too vile to swallow. Society candy coats the pill and makes it easier to swallow.

Summer breezes bend the stems of the Shasta daisies, creating a white wave rolling across an Appalachian meadow. A young Esther runs carefree through the ocean of white. Grabbing handful after handful of flowers, she tosses them into the air and falls back onto a soft bed of earth, laughing as the daisies fall around her. I will allow her that moment, a flicker of laughter to interrupt a lifetime of screams. Looking skyward, she closes her eyes and says her first prayer. I listen in and honor it for her.

Black lungs kill the beast that was her father, setting Esther free from one demon. She walks out the door of a rundown house and never looks back. I watch Esther grow, find love, and raise a family of her own. Her eldest one, a daughter, I let live, but I kill her two sons to make sure Esther's ghosts remain nearby. I unfold the tragedy of her life and cause her to deny her Lord. I take her to the brink of sanity and back. It's Esther's mind I want to know and I will do with it as I please. The cold barrel of the gun against Esther's temple is but her savior. This is a woman trapped in a dark and lonely room with no hope of escape. "Pull the trigger, and the pain is gone," she mutters softly to her ghosts. A calm hand reaches out from within the darkness. It is the steady hand of her daughter. "Mother" is the only word spoken, but a word strong enough to remove the gun from Esther's grip.

Cool autumn air carries the scent of burning logs. "Is it oak, or is it ash?" Esther wonders. The meadows and hills, colored white during the summer months by the Shasta daisies, are now replaced by vibrant colors of fall foliage. Mother Nature is putting everything to sleep in preparation for a cold winter slumber, but Esther is just waking up. In a lonely, sterile room of an infirmary, Esther's daughter places a sweater over her mother's shoulder and whispers in her ear, "I'm here for you. Together, we can heal." The daughter is as pretty as the Shasta daisy and as wild as one too. But she is the woman who will be the survivor, the first of several generations of family that will stop the pain and heal the wounds. And I will allow her to save Esther from the hell. Esther pardons her ghosts, forgives her demons and takes the hand of her daughter to begin a new life.

Soon, the snows will melt, the frosts will fade, and the hills of the Appalachian mountain range will be covered in Shasta daisies once again, as they always have been, as they always will be. I pray Esther can forgive me.

THATCH ANTS: TERRITORIALITY OF A FORMICA SPECIES IN RELATION TO NEIGHBORHOOD AND THATCH MOUND SIZE

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ABSTRACT

Territoriality instincts in Formica obscuripes are an understood trait. Few studies have been done to further determine the variables which affect the degree of their territoriality. Our first experiment addressed the effects of mound volume and distance from a host colony where ants from a neighboring mound were introduced to a novel mound in groups of ten or more. Our second experiment consisted of pairing the ants into five groups and reciprocally measuring success of introduced ants to foreign mounds. The third experiment investigated territorial instincts in a neutral environment. Each experiment was carried out as a basis of study in order to observe territorial behavior of Formica obscuripes. This research was conducted in order to gain better knowledge of the interactions and social environment between neighboring thatch ant colonies.

KEYWORDS

Formica obscuripes, Thatch Ants, territorial behavioral traits, habitat, formic acid, alarm pheromones, threat posture, aggression, colony, death time.

INTRODUCTION

Ants may exhibit common territorial traits such as defending habitat, water and food supply and their larvae, even when interacting with genetically related individuals from proximal mounds. For example, thatch ants (Formica obscuripes), the most dominant ant species in the Northern Hemisphere, protect their interests with stinging bites and the release of formic acid from Dufour's gland secretions which serves as both defense substance and alarm pheromones (Pomeratantz, M. 1972). The substance that the ants excrete is a complex 3-Octanol which is in the mandible creating the effect of excitement and attraction that leads to a threat posture (Pomeratantz, M. 1972). This alarm mechanism is sent out over ten centimeters. If the alarm is not reinforced by additional pheromones, the signal is lost after a few minutes.

Studies which address the territorial behaviors of F. obscuripes are important because they increase understanding of reactions to, and interactions with, neighboring communities in one of the most common ant in the Northern Hemisphere. As such, studies on the territorial behavior of this species, may inform spacing of thatch mound structures, and tolerance to change and crowding where thatch mounds are densest. This is especially important because high disturbance may increase the presence of Formica thatch mounds in more fragmented habitats which are increasing world-wide. Studies on F. obscuripes have shown a degree of aggressive behavior when neighboring ants intrude on home colonies. However, we are aware of no study which observes the territorial behaviors of F. obsicuripes in a managed prairie ecosystem, which makes our research exclusive. In highly disturbed and managed ecosystems such as disturbed prairies, Formica thatch mounds may reach high densities in which neighbor mounds are closely related. Because of this close relation, it is possible there could be variation in territoriality associated with proximity of nearby mounds. Conversely, proximal mounds may represent a greater threat, and territoriality could increase in relation to proximity.

We hypothesized that we would observe an influence on time of death based on mound volume or distance from host colony in a prairie ecosystem. In a second experiment, we hypothesize that mound volume and distance of mound from neighboring ant colonies would have an effect on time of death. In a third experiment, we hypothesized that ants in one-to-one encounters on neutral territory will display little aggression.

METHODS

Site Description

Our study was conducted at Glacial Heritage Preserve near Littlerock, WA. This 1,000-acre prairie preserve (46.8921 degrees N latitude, 123.0362 degrees W longitude) is owned by Thurston County and has undergone intensive restoration efforts by

The Nature Conservancy and several partner organizations such as the DNR (Department of Natural Resources).

Biology

Thatch Ants (Formica obscuripes) are prominent in the Northern hemisphere. This particular species constructs large mounds made of small sticks, dried grass, and conifer needles. Workers are sterile, wingless females ranging in size from 1/20 inch long to approximately 1/2 inch long. They vary in size and are divided into major (large) and minor (small) workers. F. obscuripes sprays predators with formic acid as a method of self defense. F. obscuripes are identifiable by a red head and thorax, with a black abdomen.

Experiment 1 - Group Drop Observation:

We established the first visible mound near an entry road as the control colony. Ten mounds were then selected, numbered one through ten, and measured for depth, area, and distance using a fifty meter tape and meter stick from the control mound. Ten ants were collected from each colony and tagged with pink Wet and Wild enamel (#427E) on the abdomen to differentiate them from the host colony ants. Each collection of ants was dropped as a group on top of the control colony at ten second intervals; life/death behavior was recorded for each of the ten individuals as a group.

Experiment 2 - Individual Drop Observation:

Five ants were selected from each mound and tagged with enamel. The ten sample mounds were then paired into five groups, varying in distance, and cross sampled individually into their corresponding mounds. Observational data was collected in ten second intervals for each individual ant and observations were made for independent territorial reactions or non-reactions of individual subjects.

Experiment 3 - Neutral Territory Observation:

A tree stump was selected as neutral territory. Two random mounds, not included in experiments one or two, were selected and five ants were collected from each mound. Ants from mound B were tagged with enamel. One ant from each mound was placed simultaneously on neutral territory to observe potential territorial behavior, and behavioral characteristics were recorded.

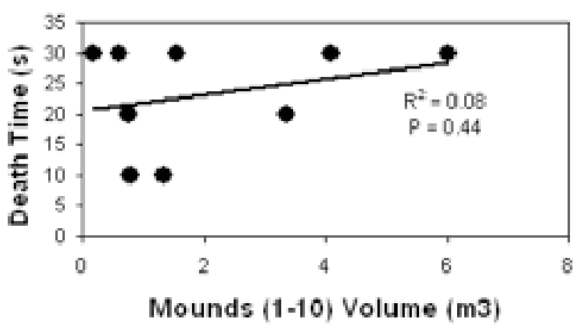

Figure 1. describes experiment one and the correlation between mound volume and agression of host F. obscuripes determined by quickness of execution of intruding F. obscuripes (death time).

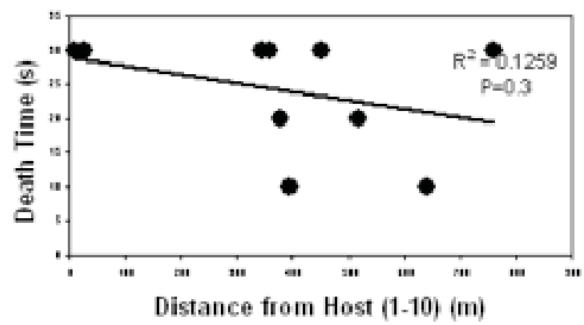

Figure 2. describes experiment one and the correlation between the distance from the host mound and agression of F. obscuripes determined by host F. obscuripes quickness to execute intruding F. obscuripes (death time).

RESULTS

Experiment 1:

We found no significant effect due to mound volume on the time of death for each group of F. obscuripes placed in the host colony (P=.44) (Fig. 1). Additionally, we found no significant effect due to distance between each mound and the time of death for each group of F. obscuripes placed in the

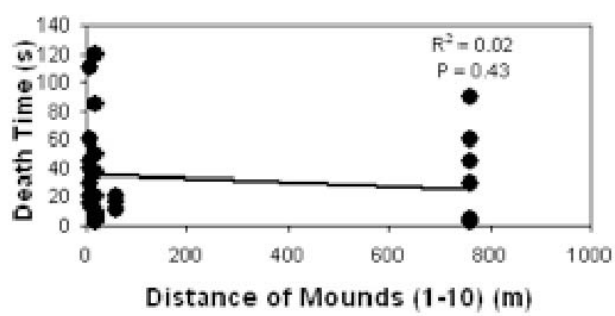

Figure 3. describes experiment two and the correlation between mound volume and agression, determined by quickness of execution (death time), of F. obscuripes in paired cross sampled mounds.

host colony (P=.31) (Fig. 2). Although we hypothesized that both variables would influence the time of death, our data suggests otherwise.

Experiment 2:

We hypothesized that both variables, distance of mound, and volume of mound would influence the time of death in experiment two. However, only mound volume was related to death time. We found no significant effect due to distance of mounds on the death time for each individual F. obscuripes in a group of five placed in any foreign colony (P=.43) (Fig. 3). We found that the mound volume in this experiment was significant (P<0.001) and approximately 22% of the data is explained by this relationship (R2 =.23) (Fig. 4.)

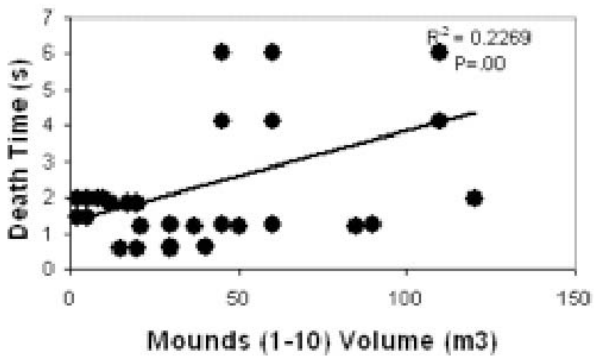

Figure 4. describes experiment two and the correlation between distance of paired cross sampled mounds, and agression, determined by quickenss of execution (death time), of F. obscuripes.

Experiment 3:

We found that out of ten pairs of ants, only in trial number four was there an assumed casualty when ant B overpowered ant A (Fig. 5). We hypothesized that ants in one-to-one encounters would show little aggression, and our results support our original hypothesis.

Trial	
1	Ran in opposite directions
2	Briefly faced each other, ran in opposite direction
3	Briefly attacked each other then ran in opposite directions
4	Briefly Briefly face each other, colony B ant attacks colony A ant, colony A ant defends itself (squares off) - Ant B overpowers Ant A (begins to drag Ant A)
5	Ran in opposite directions

Figure 5. describes the reactions of the F. obscuripes from colony A and B when placed on neutral territory.

DISCUSSION

Our data suggest that the bigger the F. obscuripes ant mounds, the more intense territorial behavior they display. However, our sample size was low, and our R2 values are too high to pronounce solid evidence for this factor concerning territorial behavior of F. obscuripes ants. The time of death was shorter for ants coming from smaller mounds. In Experiment 1, where only one host mound was used, we did not find a significant relationship between the size of mound and time of death (P = 0.44), which suggests it is likely any observed pattern was found due to chance. In Experiment 2 we tested the effect of the size of mounds among several hosts. We found that 0.23 proportion of variation was explained by the relationship between size of mound and intensity of territorial behavior. This shows evidence that size of the mounds affects the intensity of territorial behavior of F. obscuripes ants. We found a P-value of less than 0.001, from which one can conclude that this relationship was almost not found due to chance; this could suggest two possibilities. One is that F. obscuripes ants are more aggressive and display more intense territorial behavior towards ants from smaller mounds. It could also suggest that ants from bigger mounds are more capable of defending themselves, and, therefore, are more aggressive. Bigger mounds could also be more territorial, if they are more aggressive.

There is a weak correlation in regards to distance between mounds and territorial behavior. In experiment 1, no relationship was found (P= 0.30). A non-significant relationship was also found in Experiment 2, in which multiple hosts were used (P =0.43). Our evidence does not speak clearly enough to draw a conclusion. While a non-significant relationship was found, other studies have shown distance to be a stronger factor. For instance, Robin Stuart and Joan Herbers conducted a study in 2000 at the University of Vermont, in which they tested several factors pertaining to territorial behavior. It was found that distance and genetic similarity were the two most dependent factors in affecting territorial behavior (Stuart, 2000)". Therefore, a further study with a higher sample size, would be desirable.

In almost every case we noticed foreign ants becoming immobile within seconds, for when F. obscuripes become aware of outsiders they attack by "simultaneously bite[ing] with their mandibles,

[while] direct[ing] the[ir] spray forward toward the bite (Pomerantz, 72)". Thus, the following are notable exceptions. In Experiment 2, when the second ant from Mound 7 was placed into Mound 6, it was killed after one minute. The third ant in this same series successfully escaped from the mound. This ant's results could not be used, for we were measuring death time only. It should also be taken into account that these two mounds were very close to each other; only 10.8 meters away. This occurrence might suggest that relationships between mounds are more accepting when they closer to each other. Perhaps ants that are closer neighbors are more accepting of familiar smells. Or, F. obscuripes that are closer in proximity feel stronger or more comfortable in a mound that smells more familiar, giving them strength to escape. In the same nest mate recognition study referenced above, it clearly states olfactory cues are the primary way in which ants recognize nest mates (Stuart, 2000). A more in-depth study with a bigger sample size should be done to test this more specific variable of smell.

Also pertaining to ant's sense of smell, it should be noted that we wanted to rule out the possibility of the nail polish playing a factor in our results. The nail polish, as mentioned above, is used solely for the purpose of identification. Therefore, ants from several colonies were painted and then returned to their own colony to observe what would occur. At this point, ants from this colony did swarm the newly painted ant but did not attack. One could conclude, the other ants may have smelled the nail polish but still recognized the underlying smell, which was that of their own colony.

In Experiment 3, in only one out of the five trials was there an example of a significant attack in neutral territory. In the other four cases, the two ants appeared to move away from each other or avoided each other, even if there was some sign of acknowledgement. This could be attributed to the strong territorial nature of ants. These observations may indicate that once F. obscuripes are placed in foreign territory, their territorial behavior is such that they immediately separate.

It's possible F. obscuripes lack any sense of autonomy; without their colonies, they have no function or purpose. A bigger sample size should be taken to further this study.

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Apathy

Why do people not care?
Have their heads been filled with lies?
Clearly in front of them they refuse enlightenment
Over consumptive ways must cease

The nation of selfishness
Taught as children to share but do not practice
Only care for their own assuagement, not the planets
Evoke destruction and exist in oblivion

If we continue to do nothing
Reflecting on our actions
Will we feel remorse and guilt for being the key to change?
Or will we still not care?

Buttercups

In the Glacial meadow
flowers emerge from the ashes
like moths peeking out after the storm.

Golden faces are smiling
for they welcome the sun breaks.
Celebrating their return to the meadow.
They dance in the gentle breeze
swaying to and fro.

On the Way to the Pictographs

Thunder rolls over the neighboring hills.
Rain on the horizon.
The sky is dark and foreboding.
There is a sense of mystery
looming in the cool moist air.
We travel along wondering if the sky
will throw it's furry upon us.

Farewell Bend

A furious wind roars down the canyon.
Forced to accompany this torment,
are the tents not yet staked down.
If not for a single passerby
all would have blown into the river.
Setting up tents in the dark is hard enough
without competition from the
fierce canyon wind playing tug of war,
yanking the nylon structures away like kites.
With each gust you hold on.
The trees above sway in an erotic frenzy
to the moan of the wind.
A faint drumbeat can be heard in the distance
over the whipping fabric.
Then the rain comes.

Hike To Ocean Edge

I

Cold wisps of salty air sweep across my sand-stained bare
legs that smell of kelp
Dense lush green trees reflect in my eyes beauty, but I know
the truth of our forest industry…
Mind melding into the Pacific Northwest, home of my
father…
She into the abyss of fragment forests and southwest
windmills, going around, around…
I, floating through the catastrophic apocalypse of time and
pressure, metamorphic and changed…

II

One long hike and my muscles weigh my arms down past
the large wheel of the bus
Mushrooms along winding trails of lush youth creation, just
a little ditty to God…
Long leg strides on board walk

One long hike that took me to the gate and the waves of the
deep introduced me
To the Snake…
My native heritage beckons me to kiss the tongue and
release the pain of my ancestors…
I step to the edge of the rock, feet firm with water washed
eyes, focus to peer into the past of the ocean…
That took my father at Two…

Caught in the tide as she grabs her shoes and lifts up her
skirt, never afraid to
Touch soft ocean sand that tells my toes the past…
Carvings, deep in the pockets of rocks that roll through the
persistence immortal ears of ancient rocks…
Taking record of what happened here so later I can tell my
children of when I was young…

Long blonde dreadlocks bow deep, but warn of steep tide
before the infamous point…
Older hikers laugh at our youth and doubt our completion
of the loop in day…
Feet stomp deep in the unforgiving sand, driftwood carved
deep by greedy waves of the water, like a moon destination
I can’t step without curiosity…

Hike To Ocean Edge Cont.

Hidden coves that shelter us from the sun, give us cover to
smoke, drink and reveal secrets to the reasons why we stay
up at night watching the stars…
Sand sinks through my torn toes, was there, now not
there…
Relative?
We reach the final point; a small vigil stands to show that
men have slept HERE before
Men who suffered, traveled and smelled the small salty air
that draws me to these waters
Of my father…
Men that influence race rapidly through my mind, many
fathers and brothers…
All giving to the product and starve for a place to exist in
their own minds
As I find mind in the deep abyss of a limitless ocean…

Driving away in the bus, the quick getaway as we steal
another day to remember…

Death is a beautiful thing … *on my windshield*

thin, white fluttering
fragile body made no match
white sedan of death

Equisetum telmatiea

My phalanges can reach
three hundred million years ago;
horsetails sprang as tall as trees,
survived dinosaurs.

My phalanges can reach
three hundred years from now;
delicate leaves and vascular stalks
survive *Homo sapiens*.

Swamp Lantern

Rising from murky water,
first blossom of the spring
passively watches while my shoe
plunges into the swamp.
Tightly folded yellow petals
do not illuminate as their name insists.

Battle Of Light and Dark

Clouds choke out the sun,
Life is smoke filling mirrors,
Sun golden plated heads for battle,
Smell of burnt ashes cloud my eyes,
Rays of light stab my soul,
Dim the sun fades away to rise again,

Waits for worth of battle,
Nothing this world can do,
Trembles fill my breathe before war,
Heart breaks and spills emptiness,
In the mind of my enemies,
Thoughts nothing more than cold chill,

Heat hungry for lust of battle,
Tragedy strikes lives as they count down,
Slain upon sunrise,
Time blown away out windows,
Trust in everything that falls apart,
Sun to rise in cold morning air.

I-90

A Peregrine perches a top his highway throne,
A lone milepost peaking the high hill,
Overlooking the barons of Royal City,

Lime the hills glow,
Illuminates like a neon sign against the dull cloud sky,
Like an adult store late into the gloomy night,
Waiting for the pretty to flinch the falcon waits.

Dead Plants

They charged the hill towards us,
like locusts in Nebraska.

Horses
Speechless
Panicked

Our stomachs squeezed tight,
our ears slammed by their war cries.

They pounced on us like a leper.
And left us like dead plants.

Our 295 bodies in the blistering Montana sun.

LICHEN ABUNDANCE IN THE BURNED VERSUS UNBURNED FOREST

Vanessa Ryder, Seanjamin Smith, Paul Porter, Gabriele Gent, Camille Mayeux, Jessie Mann

ABSTRACT

Lichens can be used as a bioindicator in forest ecosystems. Although lichen have slow growth rates, their adaptive capabilities enable them to respond rapidly to environmental fluctuations. We took samples of lichen from Mount Rose, a boreal forest in western Washington in both burned and unburned areas following a recent wildfire. We used the samples to compare the overall abundance and diversity of lichen growth in burned and unburned areas.

Introduction

Lichens are found in large numbers in many ecosystems. They have slow growth rates and various tolerances and adaptive capabilities, which enable different species to respond rapidly to environmental fluctuations (Hale 1983). This is why they have been employed as bioindicators of environmental changes, ranging from air pollution to forest disturbance (Richardson 1988).

Lichen require light, like most green plants. However, lichen differ significantly from vascular plants. Lichen is a symbiotic relationship between photosynthetic algae and fungus. Fungal tissues make up most of the lichen thallus, or body. Fungi do not have chlorophyll; to create energy they associate with photosynthetic symbionts: green algae, cyanobacteria, or sometimes both (Brook et al. 2001) The photobionts in lichens make enough carbohydrates to supply themselves and the fungi. Carbohydrates pass into the fungal tissue as glucose or sugar alcohols, which are stored in the fungus as mannitol. If the algae are isolated from the fungus the flow of carbohydrates stops.

For most lichen photosynthesis functions are best when the thallus is fifty to seventy percent saturated in water and respiration is highest when the thallus is entirely or almost entirely saturated. Photobiont cells are not permanently damaged when dry lichen is in a dormant state because it is neither using nor generating energy. Respiration will exceed photosynthesis when dry lichen absorbs enough water and the thallus is close to saturation.

Lichens grow slowly; the symbiosis of the lichen is well balanced: the fungus and the algae to grow at the right speeds in order to maintain the partnership.

Our study examined abundance and diversity of lichen in burned and unburned areas in and adjacent to a one-year-old wildfire. We predicated overall abundance and diversity of lichen to be greater within unburned area that we surveyed. We made this prediction because generally in an unburned ecosystem species maintain a stable habitat and there

Methods

Our study took place on Mount Rose located on the edge of the Olympic National Forest in Western Washington. We chose two sites to study lichen. The first site was one that had been burned within the last year. The second site was adjacent to the burn site but was unaffected by the fire, and with similar terrain and pre-burn vegetation.

We collected samples of lichen from 30 rocks in each site. We limited our samples to lichen growing on rocks larger than 20cm either in length, width or height. We used a random number table and the randomly generated walk method to find the closest rock that met our size specifications. We measured the length, width and height of each rock with a meter tape and recorded our observations. We used a sharp knife to scrape a sample of each species we found and place it in a labeled plastic bag. These samples were used to identify the individual species in the lab using McCune and Geiser (2003) and Brodo et al.(2001). We also collected smaller samples to create a reference chart to simplify our data collection in the field. Each specimen was morph typed and photographed. Total percentage of lichen coverage and the percentage of each individual species coverage on the rock were estimated visually. We also made note of any patterns that were taking place on the rock.

Results

Out of 30 samples in the unburned section, five rocks had lichen on them. The most prevalent lichen was green crustose, found covering 10% of two rocks and 5% of one rock. Gray foliose covered 5% of one rock. White squamulose, white foliose, white fruiticose and orange fruiticose each covered 1% of separate samples. The majority of non-burn samples were at least 50% covered with moss (Fig.1).

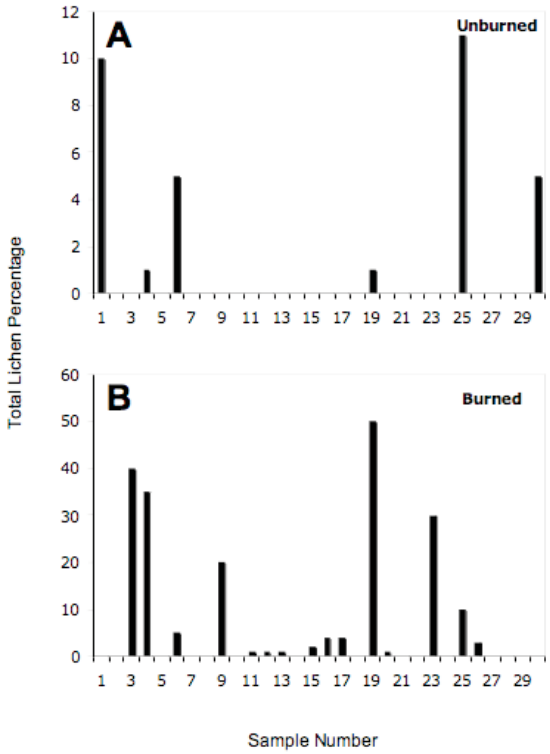

Fig. 1:
These two graphs (A, B) display the total percentage of lichen abundance in the unburned and burned areas of Mt. Rose, WA.

From 30 samples in the burned section, we found lichen on fifteen rocks. Twelve of these fifteen had gray crustose; of those twelve we had rocks categorized as 50%, 40%, 35%, 30%, 10%, 5%, 3%, 2%, and four rocks had 1% lichen coverage. Three had orange fruiticose: one rock with 2% and two rocks with 1% lichen coverage. Two samples had 1% coverage of white crustose. We did not observe any moss growing on the burned samples; however there was evidence to suggest moss had been growing prior to the burn (Fig.1).

Lichen was more abundant in the burned area, and greater lichen diversity overall was found in the unburned area (Fig.2).

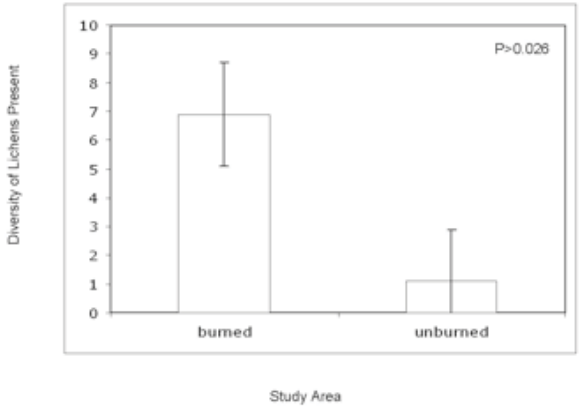

Fig. 2:
This figures displays overall diversity of lichens present in the unburned and burned areas of Mt. Rose, WA.

Discussion

Our hypothesis was that the lichen abundance and diversity would be higher in the unburned zone than in the burned zone. We came to this theory because lichen grow slowly and that led us to believe that they would be more abundant in the unburned area. However, we discovered that that the overall abundance of lichen was higher in the burned zone and the diversity of lichen was higher in the unburned area.

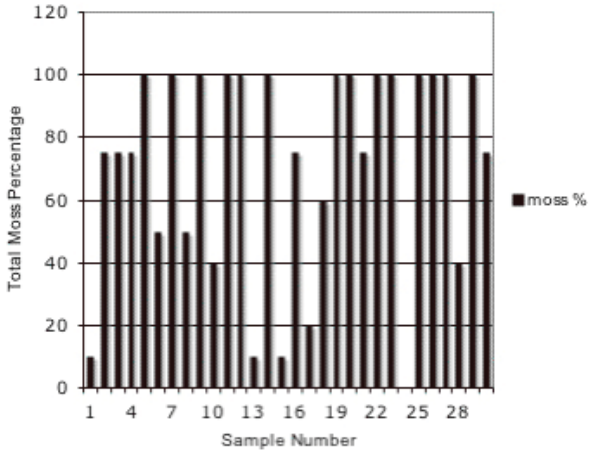

Fig. 3:
This figure displays the total percentage of moss present on each rock sample in the unburned area.

Nutrients are brought back into the soil through burning. Fire burns plant matter and leaves the topsoil with a covering of fresh organic debris that creates an excellent fertilizer for future growth. The lower canopy of the forest burns away, and the additional sunlight is beneficial for lichen growth. The fire also kills many plants that compete with lichen. However, due to slow lichen growth it is unlikely that the lichen would have time to grow back. But because the fire did not show that there was a high enough intensity to kill off all the lichen present before the burn some were able to survive.

Heavy moss growth was prevalent on the unburned side. The majority of rocks had 50% or more moss coverage (Fig. 3). Over half of the rocks studied were 100% covered by moss. These rocks had no signs of lichen growth on them. The rocks that had 50% or less of moss growth had little to no lichen growth found on them.

In the burned site there was no moss on the rocks that we studied, although there was evidence that moss grew on the rocks prior to the burn. The moss cover could slow down the rate of fire spread and enhance fire intensity. (Johansson 2005) The lack of moss after the burn could suggest that the moss is out competing the lichen in the unburned zone, or that the moss was covering the lichen on the rocks in the unburned zone.

Our data suggests lichen abundance is reduced in areas with dense canopies and vascular plant growth (Cornelissen, 2001). The rise in vascular plant population correlates to a decline in lichen population. This is due to the warming of the climate, fertilization and vascular plant shade. Due to the vascular plant growth the lichens can be out-competed for nutrient availability.

More shade in temperate climates may be related to reduced lichen presence (Cornelissen, 2001). In our site, the ground cover was very dense with vascular plants ranging from sword fern (*Polystichum munitum)* to salal (*Gaultheria shallon)*.

Large amounts of under story plant growth at the burn site may have damaged most of the lichen that had been present. However, moss ”sheltering” may have protected some of the lichens on the rocks where high moisture content moss was overlain on lichen. This “protective shield” may have protected for some of the crustose and fruiticose lichens.

Over all, we found a smaller percentage of lichen in the unburned area; while in the burned area, an area of significantly less canopy cover, lichens were more abundant. This may be due to changes in environmental conditions (i.e., a change in canopy cover or local competitors) or a sampling artifact associated with the difficulty of measuring lichen abundance when concealed by other organisms in the unburned area. However, our data suggest that even in high intensity wildfires, lichen persistence on the landscape can occur on boulder habitats. Such persistence may support colonizing populations that could be important for recovery of lichen biodiversity following disturbance. These data suggest that major disturbances such as wildfire may not be major detriments to lichen biodiversity on rocks.

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The Wind

My window was open
A wind wandered in
That fluttered the curtains
And danced cross my skin.

And “Nothing,” she told me
“Is good in this world.”
And without looking back
Out the window she swirled.

Broken Breeze

A wet breeze, like the drunkard's breath
Staggers through the window.
Ancient shadows congregate on grey walls for a final waltz.
An inescapable mist hovers over these ragged bricks.
The scent of mildew adds longing to crow's cry.
My heart, like the lone candle's flame, shudders.
And you, broken breeze, will crawl into
The solitary darkness to die.

We Will, We Will Rock Utah:
A Magic Carpet, Revelations, and the Morning After

Dear Friend,

I am drained, on a fifteen-hour fuck home to a place that doesn't deserve to be called such. A body and the sun warm my skin as I see signs that hint at our presence in Portland, but I should probably start from the top.

We took off on May Day morning, a two-week college field trip from western Washington to southern Utah for an ecological study. Forty-three students, two teachers, five vans, plenteous food, and a pile of camping gear – we were on our way. I climbed into a bulky white van (the kind used for bank robberies in the movies) and parked my backpack and pillow down in the third row, next to a glowing friend.

"It's gonna be a long ride," I said to her, even though that was more than obvious. She concurred, but we were both glad we had each other's company.

I spent the first part of the ride as follows: I pondered over pages of crosswords with my blonde neighbor, her skills triumphing over mine. I buoyed between sleep and staring out the tinted windows, playing with my beard-in-progress (a beard is a prerequisite for this particular class). I ached out of the van at every gas station stop and purchased little greasy, sugary, etc. items that make up road trip meals. I buoyed in and out of sleep some more and conversed with fellow classmates as we got more comfortable with each other while lofty hours passed.

"Would you rather…," a phrase used often in the van, "live your life with no hands, or live without everything below your waist?" someone asked.

I chose no hands, for obvious reasons, and my choice got mixed reviews. At sundown, we reached our halfway point at Farewell Bend in southeastern Oregon. We all set up our tents, ate slow dinner at a truck-stop diner, repaired our shelter from the wrath of a windstorm, and fell asleep in aural rain. The next morning we awoke early in sopping Oregon, packed up the clammy canopies, and kicked it south toward the Utah desert.

After a morning of sleepy rain driving, the sky cleared as we neared the Mormon state. Briefly after the van cut through the Utah border, we discovered the Magic Carpet. I believe it was after a gas station stop, most likely a caffeine-soaked one, when the droning sounds coming through the van speakers turned into dance music (hip-hop mostly i.e. Sir Mix-A-Lot, Vanilla Ice, Coolio, the list goes on). Nearly all of the ten passengers felt the beat in their bodies. We danced. Staring out the window became whipping heads around violently and would-you-rathers turned into sing-a-longs. After nearly two hours of dance party greatness, we were no longer on a van ride; it was magic, it was a carpet ride. I know, cheesy, but hell, we had been trapped in that white cocoon for a lifetime at that point.

The dancing died down to a joke telling session, compiled mostly of "how many [blank]s does it take to fill in a light bulb?" My memory can account for retaining zero jokes in my lifetime, so I contributed little but laughed considerably. We then came up with a Magic Carpet handshake because every significant underground society needs one of those. As we neared our final destination, sing-a-longs come back into play, this time a cappella. "Bohemian Rhapsody" was by far the most notable. The Carpet breezed in to the target campground at dusk; with urgent feet stomping and tired hands clapping, we chanted "We will, we will rock U-tah!"

On the morning of Cinco de Mayo, the third day in Utah, I breached the tent flap in winter socks and a scratchy beard to discover a desert of snow. Before this trip, I had never thought the words *snow* and *desert* could ever be used together in a sentence that wasn't describing opposites to children. I managed to slip on my icy boots and, trembling, brushed my teeth amongst nodding compadres. Even though the snow should have been a hint toward something unusual, I was still unaware of what this day would bring me.

We trekked (I in The Carpet, of course) out to our eco-study site in Dixie National Forest and poured out into the warm-milk afternoon, quite a change from the snow-cloaked morning. After some group studies, I strayed from the group to take notes by myself. My group and I were studying the population of beetles in cactus flowers between burned and unburned areas of the forest. Knelt down, penciling into a pink flower, I heard light footsteps in front of me. I looked up to discover coyotes perched not five feet from my sunburned face. It only took a glance to conclude that two husky, wild animals were staring at me. Without making too much eye contact, I stood up, turned the opposite direction, and walked – not too fast, not too slow – I just fucking walked. All I could do was shuffle and think. Were they following me? What would I do if they attacked me? I had a knife somewhere in my backpack. No, that'd take too much time to get. If they approached me, I devised a plan to swing my book bag at their heads and maybe throw some punches.

Thoughts of self-defense faded quickly, and I became panic-stricken. Moments ago there were people everywhere, now there was no one in sight. I was in a foreign place with only one way to go – away from the coyotes. I would not look behind me. My heart swelled and my intestines were in my throat. This barren land was going to be my gravesite. I began thinking random thoughts of life: I don't have to choose just one best man at my wedding, I can have my brother and my best friend be my best men. Man, I used to love baseball. I had a red plastic baseball helmet growing up. I wanted to be a fireman, like in the movie "Backdraft." I bet my firstborn would be a girl, hopefully with red hair. I love red hair. My hair is getting too long; I should get it cut soon. Shit, I'm going to die today.

After ten minutes of hopping over boulders in what I thought was a rattlesnake breeding ground, I found two of my classmates and was finally able to look behind me to discern that the coyotes hadn't followed me. It took me over an hour to regain a normal breathing pattern. Not since I was persuaded by a high school crush to climb up the underbelly of a towering bridge have I feared so terribly for my life. My body could've been desert debris right then. I told my teachers all about the incident.

"Maybe that is your power animal," one of them said.

All I could think of was it definitely had the power to scare me shitless.

I awoke the morning after to a classmate pounding on my tent and telling me we were leaving early because someone went to the hospital for drunkenly passing out in the desert, another near-death experience (and a reason why perhaps tequila should not be available in giant plastic jugs). I sat up and coughed, lungs scratched from yellowed filters. After dismantling the tent, I shoveled cold oatmeal and shit coffee into my drowsy mouth. The Magic Carpet was waiting for me. I collected my gear and shook the morning from my hair.

That evening we all stayed at a Super 8 in northern Utah to get rest for the following day's dash home. My motel roommates and I purchased icy drinks called Frazils from a nearby Texaco and hashed over the correct pronunciation of the product. I claimed that it was pronounced "frazzle" as in frazzled hair, while everyone else agreed that it rhymed with Brazil.

Either way, my Frazil was orange but tasted like coconut.

The sunset was bittersweet that night as we blocked it with curtains to get our television fix. The godsend of the day came when "Twister" was broadcast on HBO. How that flick never won Academy Awards is beyond me. My Magic Carpet neighbor and I picked our favorite tornadoes. Hers was the one that split into three and tossed cows around; mine was the one that ripped through a drive-in screening of "The Shining." Later – after pizza, cavity-causing drinks, and some "7th Heaven" – we all crashed hard in the glow of an outdated movie about a teen's suicidal friend.

An early morning wake-up call followed by half an earth's rotation of driving and here I am, drained, on a fifteen-hour fuck home to a place that doesn't deserve to be called such. A body and the sun warm my skin as I see signs that hint at our presence in Portland – we're almost done. I find solace in my blonde neighbor; her hands twitch while dreaming deeply of Helena storms. She wakes to a desert-drenched pillow in the five o'clock sun. The time of day I was born, but she wasn't— the hours we usually neglect but now cling to. We don't want to be this close to home. We don't want to return from Utah. We rocked Utah.

Sincerely,
-Casey.

15

Scarves held to mouths keeping
Gnats not swallowed
On a poison oak progress

Sisters laughing like summer
Rhubarb pulled and served with sugar

We had a choice to see
In one color, itching
I chose blue.

By the Lake

I shanked a bear by the lake today
Dylan told me not to, but I did it anyway
Apparently it was a virgin and had yet
To make young bear love, but
I found that hard to believe
Can bears even make love?
Do they fall hard and smooth?
Do bears touch paws and walk each other to class?
Do they watch Kevin Costner movies every
Thursday night with a six-pack
Of Stella Artois?
I doubt it.

I lynched a bear by the lake today
Keegan asked why and I said, “Fuck him,
He had it coming.”
A recurring childhood dream revealed
Bears as bastards
My parents would become them
In the middle of the night and chase me down
The upstairs hallway
While I tried to seek refuge
In a green Boy Scout tent and
Defend myself with a red Swiss Army knife
Though it never worked.

I snuffed out a bear by the lake today
Holly cried, but I did it anyway
All it took was a stark white pillow and
Some courage
This bear did not have the defense of
The famous football team
And when it was all over, I tried
To bury it, but couldn’t dig the hole
Deep enough
Midway through, the bear came to,
Forced me into the grave
And covered it.

A bear murdered me by the lake today
Afterward it pitched a tent
Rented “Waterworld” and
Made love.

Snapshot of Autumn

Here, this silence, like a gust of wind, spins and dies.
Smoke filled voice rise to linger ‘round the bare bulb.

Outside, scraping branches mock our attempt at
conversation.

Damn this October sky that wishbones the talking trees and
feels thin
When you reach up to it
your cigarette still clings to your fingers
like some skinny crown.

Now, no words accompany the exhale
smoke escapes unshaped.
Floats, curls, dissipates
around your face.

Collected

The moss glows.
The small hairs catch the sedated afternoon light,
each ray refracted
into a tiny aura.

I think I would like to live as this moss does,
eating the sunshine
until I emit a glimmer too.

The moss and I incandescent,
feasting on the creeping sunset,
quiet and
dense like felt in the evening.

Aryls on Martin Luther King Jr. Day

My parents took his body to the top of the hill.
The cold February cadaver,
there were no trees to lay under, only snow.

Now all his bones are gone.
All his fur is in the ground.
His eyes are no longer closed,
the flesh around them has been pecked,
has flown away.

Hail by the Harbor

Jagged shards of glass plummet from the sky
while a storm screams torrents at earth.,
on ground, a white blanket slowly melts then trickles
down into a net of ceaseless decay,
like tumbling into a grave.,
a sparrow conceals itself within branches of a pine.
A frightened child behind his mothers skirt,
as cold sheets continue to plummet.

Bundled tight for a slow shuffle towards home
a muttered curse blown away.
the last bitter words before defeat,
like retreating back to a safe harbor
to lick the wound and fade away.

Dew Running

Sun glints on dew covered leaves
rustling in the wind,
life infused falling in thick drops
down to Salal hunkered beneath the shade of giants,
leaving behind a leaf glowing green
in the searing afternoon heat.

Pulls me back to the first days of spring
smaller and overflowing with energy,
running through dense thickets
to feel the fresh air and water,
like a hot shower on a cold winter morning.

Dixie National Forest

Black and white juniper
thrusting pale fingers toward the sky.
Sandstone parched in midday waves of heat,
grey green lichen claims dusty stone
like a child unwilling to share.

Old stream run dry
hurled boulders laid to rest
like ancient skipping stones,,
while gray haired yarrow endures
dust flows down waters track.

dry grass sprouted
quivers in a cool western breeze.
from a charred shell cactus grows anew
as an old scar fades away.

failure only sweetens the scent of life.

Icarus

Often enough,
birds fly about.
Winds out.
They take me back to salty docks.
Faces blushing with sun,
smiling with happiness left.
Our quiet stares into blue lakes,
encouraging the plunge.
Will the waiting water change me?
To have wings?
Eyes down,
a bird at with orange eye.
Sloping to the ground with pained movement,
slow.
Uncomfortable exchanges with bird of flight.
I don't know where he will fly
or what tastes touch his beak.
Looking eyes,
I would take it to sky next.
Remembering cool breath over cloud faces.
Welcome, sun,
to parched wing tips.
Perched desire in winds.
Same winds carrying.
Same winds washing.
Welcome
to a revolution of bone and falling feather.
And then,
settling sound;
sweet cheeps mostly.
Wings brushing air,
painting unbroken sky-space.

Wake Up

Tragedy fueled tree tops.
Drunk.
Failing brown life.
And the brightest green,
splashing earth canvas.
Birds prancing on base and tips.
A winding road of curved branch.
Growing up and sideways.
Greening linen with glowing blonde lining.

Sight ceased.
I sit in quiet,
almost invisible.
An emergency room window with dancing leaves,
just outside.
He clears his throat.
He smells the thick room,
breathing deeper and deeper and deeper.
Sullen and dripping breath.
He is awake.
It was this morning,
surrounded by steel and stirring chills,
my brother awoke.
Pale skin exhaustion,
touching his eyes and separated thoughts.
He spoke to me and smiled.

Resting on small lips,
"I'm not even going to try to get up."

BEETLES, BEES, AND HERBIVORY: FIRE ECOLOGY IN SOUTHWESTERN UTAH

Casey Garvey, Keegan Lynch, Jen Acacia Mittelstadt, Bennett Roberts, Seth Talbot

ABSTRACT

Fire can have a substantial effect on a dry pinion pine and juniper dominated forest. We studied the effect of fire on Carpophilus pallipennis populations in the blossoms of the prickly pear cactus. Our site was located in a portion of the forest that had been burned one year earlier in a wildfire and an adjacent unburned forest. We counted C. pallipennis in the blooms of Opuntia basilaris in both sites. We also noted herbivory, the presence of other beetle species, and bees. Our results suggest that there is a greater average of C. pallipennis in burned O. basilaris than in unburned. Our data also suggest that fire may have a negative effect on the prickly pear cactus by increasing abundance of a parasitic beetle. This beetle uses the flower for shelter and rearing larva, without benefiting the flower through pollination.

KEY WORDS:

Opuntia basilaris, Carpophilus pallipennis, prickly pear, Apis mellifera, fire ecology.

INTRODUCTION

Fire often changes these ecosystems' capacity for plant and animal life by limiting resources and alters species interactions. Our study was conducted within Dixie National Forest in southwestern Utah. There is a clear, unburned area within the same vicinity and the differences between the two are stark. We observed interaction between Apis mellifera (local honeybees) and the flowers of the prickly pear cactus (Opuntia basilaris).

Prickly pear cacti have had a long history of adapting to fire rich environments. Fire itself has been a major contributing factor to its evolution and development (Benson et al., 1965). Although fire does not necessarily destroy established plants, it can decrease individual plant size and diminish the presence of surrounding ground cover (Hoffman, 1996). Other relationships we investigated represented a parasitic interaction. These included plant-animal interaction where one organism used another without benefiting it in return. Our study focused on a unique relationship found between a small beetle (Carpophilus pallipennis) and O. basilaris. C. pallipennis are parasites by nature; they eat the fruit found within the flowers of plants and are difficult to control with pesticides (Dixon, 2005). The Rhodantha blossoms of the prickly pear were the focal point of our study.

The C. pallipennis rely on the Rhodantha blossoms solely for survival. As the blossom dies, the larvae continue to develop in these decaying flowers. It appears that the C. pallipennis experience their entire existence within the confines of the Rhodantha blossom, unless they outlast the blossom or are disturbed enough to fly away (Grant et. al, 1978).

The history of fire on our study site influenced the abundance and properties of the O. basilaris and, as a result, had a direct impact on the C. pallipennis. To determine the impact of fire on C. pallipennis as well as the Rhodantha blossoms, we examined samples in both a burned and unburned community. Corresponding with this focus, we also documented the presence of A. mellifera in order to better understand the correlation between beetle count and bee presence.

METHODS

Study site descriptions¬. – The Dixie National Forest in southwestern Utah commands two million acres. Throughout the area there are dramatic climate variations. Precipitation, for example, ranges from over 40 inches at higher elevations to 10 inches in the lower regions. Temperature also varies during changing seasons. Summer highs can surpass 100 degrees Fahrenheit while winter drops below negative 30 degrees (http://www.fs.fed.us/r4/dixie/dixie.html, accessed May 14th, 2007).

Dixie National Forest lies at an elevation of 1246m, with a latitude of 37° 17'90.13" N. and a longitude of 113° 18'34.58" W (Google Inc. San Jose, CA, http://earth.google.com/). This site was located in a juniper and mesquite rich area. Low vegetation was dominated by cheatgrass (Bromus tectorum L.), an invasive species (http://plants.usda.

gov, accessed May 16th, 2007).

Field Studies. – To assess the relationship between fire and beetle populations we studied in May of 2007 in two sites. These two sites differed in that one had been burned a year prior, while the other remained unburned. This type of burning occurs either of natural causes or to control an invasive species.

We used a random number generator to select individual prickly pear cacti. We counted the number of C. pallipennis found residing within the blossoms. This was crucial to our study in order to properly ascertain the larger beetle populations in both sites as well as determine how they were different. We also documented the presence of A. mellifera and made note of flowers that were particularly pollen-heavy. This was important in order to determine whether increased beetle population had an impact on the amount of pollen.

RESULTS

Our results show that fire can have an effect on beetle population. We counted 136 individual O. basilaris blossoms. Blossoms observed in the burned area appeared to have larger populations, an average of 10.28 beetles per flower. The blossoms observed in the unburned area, had an average of 6.19 beetles per flower (Fig. 1). This information supports our original hypothesis that fire affects the population of beetles within O. basilaris blossoms.

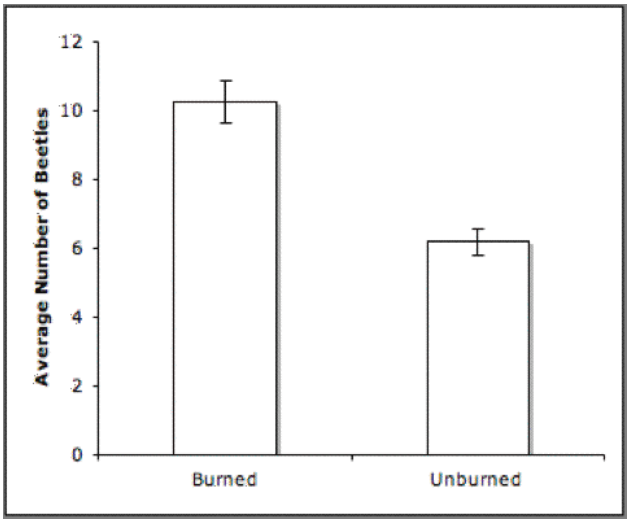

Fig. 1. – Average number of C. pallipennis found within O. basilaris flowers in both the burned and unburned environments.

We observed and documented the number of C. pallipennis per flower in both burned (Fig. 2) and

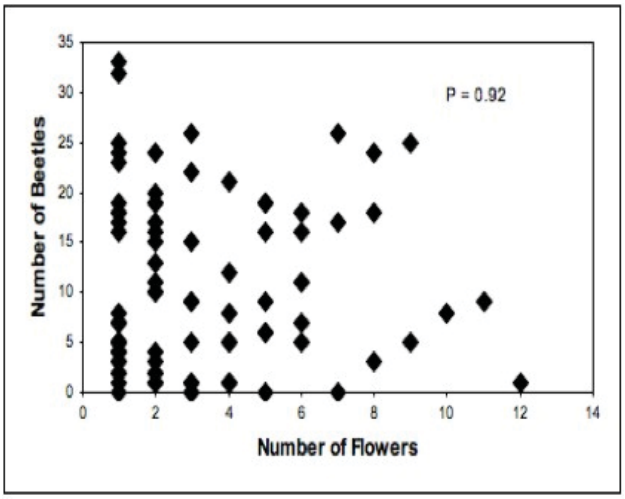

Fig. 2. – Number of O. basilaris flowers to the number of C. pallipennis in a burned environment.

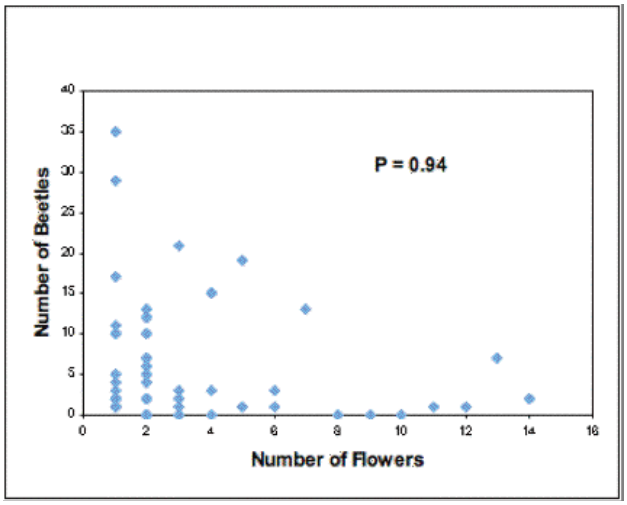

Fig. 3. – Number of O. basilaris flowers to the number of C. pallipennis in an unburned environment.

unburned (Fig. 3) areas. These figures help illustrate the subtle change in C. pallipennis population density dependent on their location. We also analyzed the number of A. mellifera to the number of C. pallipennis in both the burned and unburned sites (Fig. 4). Finally, our group focused on was that of animal browsing taking place on the flowers of O. basilaris (Fig. 5).

DISCUSSION

Our original question asked whether or not there was a distinct difference in C. pallipennis population in a burned or unburned environment. We anticipated that there would be a significant variance dependent on which location the beetles were in. We found that there was an average of ten beetles per flower in the burned site, while there was an average of six beetles in the unburned site.

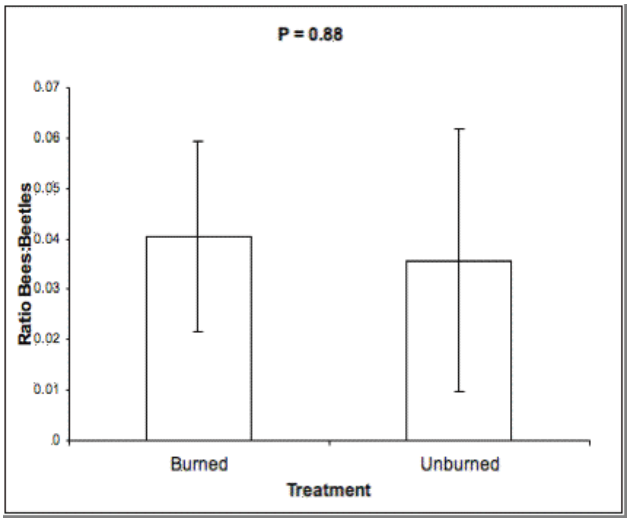

Fig. 4. – Relationship of A. mellifera with C. pallipennis in both the burned and unburned environments.

These data suggests difference in population averages.

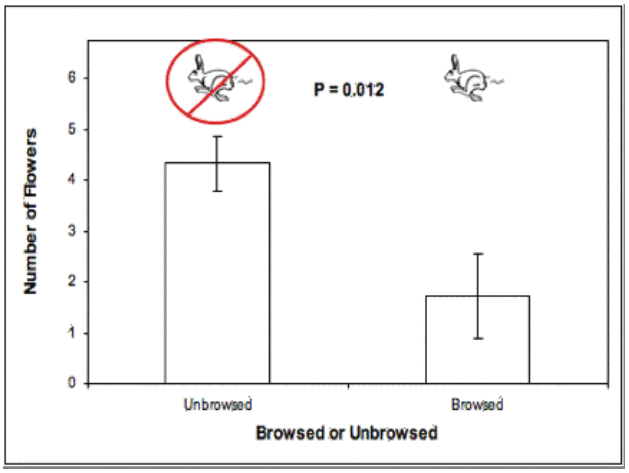

Fig. 5. – The presence of animal browsing taking place on O. basilaris flowers.

Overall, in the burned area, there were more O. basilaris than in the unburned area. If we were to redo our study, it would be beneficial to take the same number of samples from both sites. A more accurate study would involve collecting data on a clear day. The majority of the data collected was on an overtly windy morning and this may have compromised some of the information.

Although a fire can be beneficial to an ecosystem, such as increasing re-generation rates in vegetation, it can have negative effects on certain species (Bailey et al, 2001). This became apparent while we found a higher average of C. pallipennis in the burned area's blossoms. This increase of beetles in burned areas can have a negative impact on the O. basilaris, and its ability to spread seeds (Grant et. al, 1979). The interaction between C. pallipennis and O. basilaris represents an important and interesting ecological relationship.

ACKNOWLEDGEMENTS

We conducted this study with the help of many others. We would like to offer our thanks to Dylan Fischer, Bill Ransom, Jill Wilks, Liza R. Rognas, Duke Brady, the USDA Forest Service – Dixie National Forest, Cedar City, Utah, Southern Utah University shower facilities, Dave "Grey Wolf" Stiles, the McGregor family, and the Wild Side Writers.

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The Shop Window

A pristine sandy beach
untouched by mankind
The land was bought for its resources
and it quickly became a quarry

The sand was rich in silica
it was sold to a glass factory
a hardware store needed a window

Many years later the hardware store
changed ownership
and the window displayed the inside
of a karate dojo

A swift elbow shattered the window
the glass was cleaned up
and thrown away

The trash was taken to a landfill
which used to be a quarry
it welcomed the glass home
and it returned to the sand

The Forest of Consciousness

The forest stands as still
as a wary chameleon

vigilant trees are frozen
in anticipation

they begin to let the heavy rain
slip through their branches

the wind begins to roar
and eardrums pop

the storm cloud flies away
like a toddler in sight of a new toy

silence reigns once again
the trees return to stalking
the wanderer

Concrete and Sewage

As a child, they couldn't keep me from storm drains. There's a creek in the yard of my family's rural house, and under our driveway there are two tunnels carrying it underground to the other side. One is metal, the other concrete. The concrete tunnel never has water init unless there's a flood - an emergency drain - and it's big enough for a person to fit. In fact it's full of cracks on the inside that bugs live in. You climb in one side and there in front of you is a green, tinkling dot in the center of everything, calling for proof that if you crossed the dimmer middle part, you could really get to the outside again.

At least once my mom explained to me, that it was unsafe to play in that tunnel because a flash flood could happen and I might get trapped and drown. The highest risk, she said, was in the spring. I saw this as possible at the time but ruled it very unlikely. The creek ran from a pond about a quarter-mile uphill, which sometimes took on a few feet of rainwater, but you'd almost definitely be able to see or hear it coming. The only time I saw that tunnel fill was much later, when I was in high school, and hurricane Isabel hit parts of Maryland.

When I grew a few years older and started playing in the neighborhood most of my school friends lived in, I stayed with drains and tunnels. Most of the ponds around had concrete sheds, half submerged, caged around the tops. They were always near to the shore – if you could get across the little channel standing in your way, you could get on top of them. My favorite one had bars spaced wide enough apart that you could squeeze through them and climb a ladder, rungs of bent rebar, to the bottom. It was always dry down there because that pond had never risen enough to overflow into the shed.

I played there with my friend Eric, whose house was a few blocks away, and our friend Paul sometimes came too. Once in spring or summer Eric's dad got him a two-hundred-count bag of firecrackers. Not M-80's but the legal M-100's. M-100's are thick cardboard tubes, an inch long and a half-inch wide, sealed at the ends with clay and epoxy and stuffed with gunpowder. That pond and all its spheres of life took a number of those little bombs, tied to rocks, along with a stabbing of dissolved sulfur and smoke. Sometime when we weren't under any grown-up's watch we tested the echo of an M-100 going off inside the submerged shed. It shook.

I think it was the same day he got that bag - we climbed up on top of the shed to try some out, and the thing was all covered with sideways bird droppings. Instead of round splatters there were streaks as long as my head, all running in the same direction.
Nowadays, I've been taught about momentum and how when a bomb is dropped on a city, the bomber has to let it go a small ways ahead of target. My current guess is that something like this happened with a passing flock, but it was ponderous at the time. In what I was looking at was mystery that paused my mind. I remember other similar encounters in life – sudden, pointed surges of curiosity – almost hearing the instructions, "stop everything and figure this out." In times like those, there's this sense that even though you can't see all or any of an explanation yet, one is possible. Already exists. You just have to look at it right, distill it out from all the other facts you know. All the little pieces of reality must fit together. There's a faith in this. However, I think we eventually gave up that puzzle. I considered that maybe some geese had been float-

ing on the pond then all took up and flew away. If they all flew up at an angle toward the shed, and they'd all let go as they were flying away… it seemed unlikely. I'd seen geese take off from a pond all at once, but I'd never seen one drop a shit the moment it took off, that would make it seem like it was sick or something. Maybe they do it all the time and it's just something I would've had to watch for. I think after considering this scenario, my mind was tired and returned, delighted, to fuses.

That shed, though, was part of a larger drainage system – at its dry floor there was an opening in the wall. This led underground, through a hill to some woods, where one could more easily enter and exit the space, given time to cross the length of the tunnel. It was probably 15 yards, but it took longer than usual because you had to walk crouched. In a game of manhunt the spot was invincible.
If you looked through the bars out across the water, you saw the mouth of another tunnel. That one fed off the storm drains along the curbs of Eric's street, runoff trickling out of it. A lip around the bottom carried what came out over a few rocks and into the pond. Algae and street funk slimed the whole thing up, and stained it brown. That smell still finds me in my dreams sometimes. Not a smell of sewage, really - just water, slime, and old wet concrete. Maybe a few minor elements of litter. A few cigarette butts, soda cans, spiders.

One of the times Paul was with us, we planned an expedition into that tunnel.
It would have been fall, to play it on the safe side. That time of year everything around the pond would have been a dry, sunny shade of tan. Eric had told Paul and I about a pair of brothers who used to live in the neighborhood, called The Troops. They'd gone in once, and were the only ones he'd heard of who made it to the farthest end of the line. They went deep enough to climb out through an opening onto the street somewhere else in town. Our plan was to get as far as we could and to make a map, which Paul was in charge of. Before that day, we had each gone a few times but not as far. At a certain distance in there was no light except the pinpoint behind you, and no cue to tell how much farther you could go.

Eventually our company got to a place where more tunnels split into other directions, but only one of them big enough to fit in. The little room opened up with a street drain ceiling that could be climbed out of, and brick walls, as opposed the concrete everything else. That next stretch of tunnel turned away from the first stretch, so if you kept going you'd be in complete darkness. But we had flashlights, and Paul recorded this all on the map as we went. We crossed the second stretch to another identical split room, but we climbed out onto the street there while it was still light outside. I don't remember why we didn't continue on, we were probably hungry.
In the light I actually saw that, trying to draw a good map, Paul had to just wing it – hopefully moving the pen at an even pace as we walked. Our map is lost now, and I don't think we ever used it again. We may have added to it a bit that week but we never went as far as the Troops, unless Eric went by himself sometime. Goddamn shame, too.

While on a walk from my apartment to downtown the other day, I passed a sewer cover with finger-sized holes in it that you could hear running water through. That sound buried under the street caught me; it achieved a true pleasantness. It sounded like it could have been piling up and pouring over a brick box. Of course, from the sidewalk, the only picture that logistically ac-

companies that sound is the blackness under the holes in the iron disk-cap. Now, I already know pretty much what's down there.

Usual-size red bricks, in my experience, have a rare ability to make a certain impression that no other material makes. I'm sure it has something to do with the color and the pattern made by many little rectangles. But to me, it's half-tied to something more general – a more definitive indicator of civilization or at least human presence. Especially when you see a wall or a building made of an impossible number of them, even more so when they are laid to give the illusion of curvature. I can't remember certainly, but I don't think the short walls in the split rooms were curved. Even though you couldn't stand in them, those rooms had a small way of being comforting when you got there.

Dandy Lion

Torn to pieces by a gentle breeze
Seeds scattered to the winds
Never knowing what the future will bring
Never fated to find fertile ground

Boy I like haikus
It's hard to get them right, though
This last line has far too many syllables

The things are so few
That you can't have too much of
But silence is one

Puppet

Let this puppet fall
Cut these strings
They've held me for so long
And I am weary of their pull

And if I fall onto a silk, feather pillow
I'll be nothing but a wooden toy
Because, even though you didn't break me
I never wanted to be built in the first place

And if I fall into a fire
I'll burn with a smile on my face
Because, no matter how hard you try
You'll never retie those strings to my ashes

Your skin is like lily petals
Kindness is all that it knows
Lightning arcs through me every time we touch
A wonderful jolt goes running down my spine
And there is only the warmth of joy
Your smile is like a full, strong hug
When you have collected every last specimen
Where will you find that species?
When you cut down every last tree
Where will you find a forest?
When you have examined every last anomaly
Where will you find a surprise?
When you have measured every last pattern
Where will you find beauty?

PATTERNS AND CHANGES IN FORMICA OBSCURIPES ANT TRAILS

Erik Moen, Asa Hurst1, and Miles Brouard

ABSTRACT

We observed ant trails at The Evergreen State College and looked for drift in location over time, and if their pathways are organized into separate lanes for different directions. Two trails each from three colonies were observed over two days, and each trail was observed at three spaced points for 20-minute intervals. Patterns found in the data may indicate other aspects of the organization and overall structure of these and other ant colonies.

INTRODUCTION

Most ant species release a pheromone when they locate a food source which is too large for that ant to retrieve on its own. As it returns to the colony, it continues to release that pheromone onto the ground in a broken-line pattern, leaving a trail that subsequent ants can follow to find that food source. Depending on how desirable the food source is, and how difficult it would be for that ant to retrieve the food source, the subsequent ants leave their own trails of varying strengths to indicate those variables to other ants. The trails to plentiful, nutritious foods tend to be larger than the trails to less desirable foods, and as a plentiful resource dwindles in availability, the ant's pathway back to the food source dwindles also.(Vander Meer 1983).

At several sites containing ant colonies, we observed that the paths of ants leading to and from the ant colonies appeared to have discernable organization. In fact, observations suggested the ants had arranged themselves in such a way that there was a degree of separation between ants moving towards and ants moving away from their colony, forming different general lanes.

Our questions for this study were: 1) Are ant trails directional? And 2) do ant trails drift over short periods of time? Studies have shown that worker ants leave trails for other worker ants to follow by excreting specific pheromones that lead towards food sources (Mailleux 2003). We hypothesized that those pheromones could be direction-sensitive. For example, the ants may use different signals to indicate "towards the colony" as opposed to "away from the colony". We also hypothesized the trails might be subject to radial shift over time due to wind or inefficiencies, or errors in subsequent attempts by ants at re-marking the original pheromone trails.

METHODS

Data Collection

Formica Obscuripes, also known as the Western Thatching Ant, was chosen as the object of this study for its local abundance. Three colonies were observed on the campus of The Evergreen State College. They were located at the college's Organic Farm, parking lot 'F', and parking lot 'C', hereby referred to as Site A, Site B, and Site C, respectively.

At most of the colonies, two or more high-traffic pathways of ant movement were observed leading away from the central mound. At colony C however, only a single, less coherent trail was observed. At all sites it was inferred that such high-traffic pathways were indicative of pheromone trails.

Along each pheromone trail, three measurement strips were placed on the ground perpendicularly to the line of ant travel. Each measurement strip was 210mm long, and marked in increments of 7mm. Strips were positioned at distances of one, two, and three meters from the edge of the central mound. At Site C, the colony without a second discernable trail, this procedure was done a second time along a line pointing in a random direction from the central mound.

Every time the above procedure was done, three observers watched separate strips simultaneously for a continuous span of 20 minutes, divided into 5-minute intervals. Whenever an ant crossed a measurement strip, the location of its crossing, its direction, and the present time interval was recorded. Ant crossing locations were rounded to the nearest 7mm unit. In most cases, ground cover prevented the strips from laying directly on the soil, and as a result, ants mostly moved under the strips.

Explanation of Methods

By recording locations of ant crossings, concentrations of traffic within individual pathways could be observed. Recording ants' direction of travel at each crossing made it possible for directional trends to be seen and compared with traffic trends. Dividing the twenty-minute time spans into five-minute increments allowed analysis of changes in traffic or directional trends over time. Simultaneously observing the same pathway of traffic in three locations allowed observation of variation in traffic trends over larger distances. High-traffic positions along measurement strips were inferred to indicate higher concentrations of pheromones.

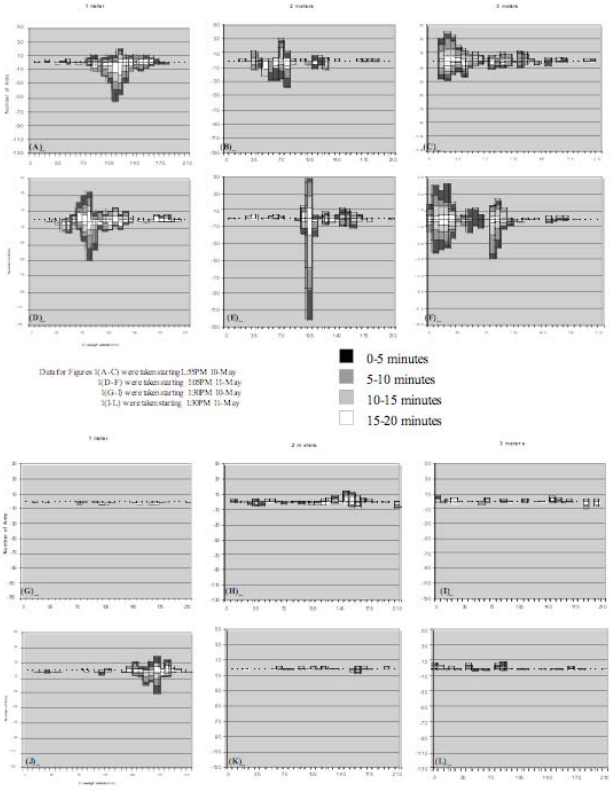

Figure 1

RESULTS

The data collected is represented by graphs (fig. 1-3) depicting individual observation periods. These graphs show how many ants crossed the measurement strips, where they crossed, and what direction they crossed. The downward direction depicted on each graph indicates movement away from the nest and the upward direction represents movement toward the nest. Some paths show very distinct high-traffic areas, but directional trends are much less clear. Although ant trails were variable in width and intensity of use, we did not detect discernable shifts in ant trail location during the sampling periods.

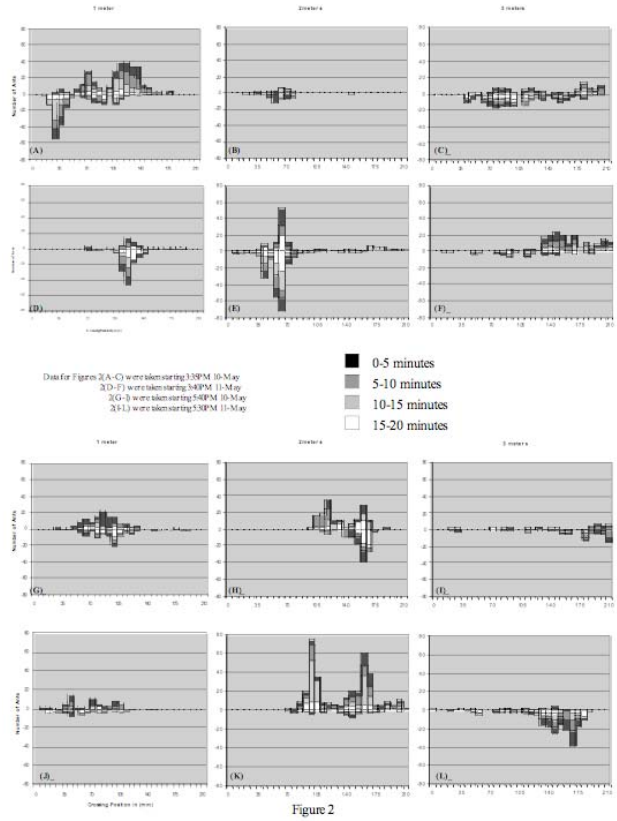

Figure 2

DISCUSSION

The three ant colonies studied on the Evergreen campus were located at the college's Organic Farm, F-lot, and C-lot, hereby referred to as Colonies A, B, and C, respectively. The colonies A and C were approximately equal in size and shape; each was cone shaped, between two and three feet tall, and around three feet in diameter. The colony B was a shorter mound, only one foot tall, and one to two feet in diameter. Colony A was located at the edge of a well-traveled footpath along a wooded area. Colony B was between a wooded area and a parking lot. Colony C was built on a grass island in the parking lot.

Mathematical models have been developed that describe trail laying behavior in other studies. Ant pheromone deposition and signaling processes is complex, and different varieties of pheromone are used within single colonies, achieving a mix of purposes (Holldobler 1995). One of those purposes is to lead members of the population to food sources. When a scouting ant finds a food source, it may consume a portion of it. If more than a certain threshold is consumed, it most often triggers the

ant to deposit a pheromone trail leading back to the nest. Scouts that don't find food or consume beyond the threshold continue searching. (Holldobler 1995). Trails are deposited through an organ called the gaster, located at the tip of the abdomen (Mailleux 2003). The gaster is dragged on the ground while the ant walks, resulting in a series of scent smears on the terrain (Vander Meer 1983). Workers are equipped with pheromone sense receptors on their antennae, which are stimulated by varying concentrations of pheromone.

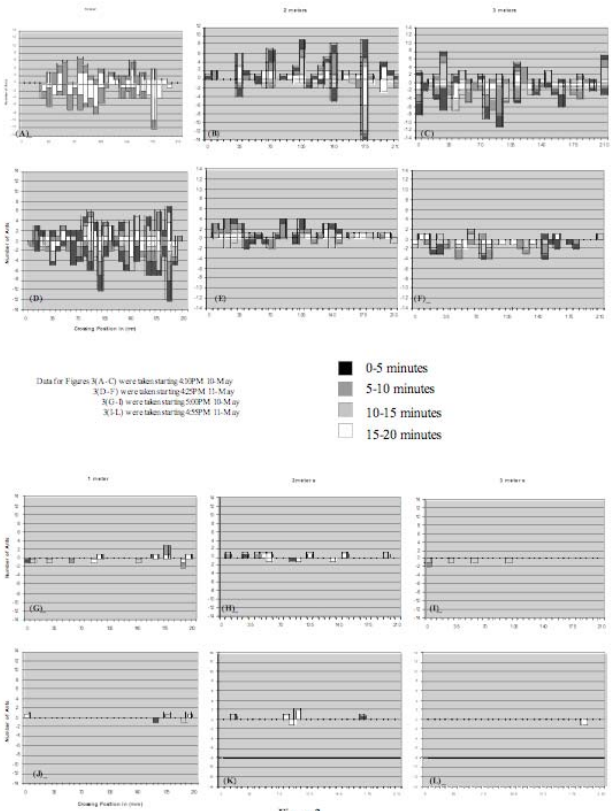

Figure 3

Ant pheromones are known to evaporate or decompose, often in short periods of time. According to one model, workers following pheromone trails find their way via to the sensations received through their antennae – following the direction of greatest stimulation (Couzin, Franks 2003). If workers follow previously laid trails away from the nest toward food sources, then the concentration of pheromone must increase with distance from the nest. Thus, assuming a constant rate of pheromone decomposition, a returning ant must decrease its secretion the further it gets from the food source.

Directionality

We expected at least some bias in directionality of trails, and some shift in trail structure over time. Our data indicated that often, where there is a concentration of ant traffic, travel is predominantly one-directional (see figs 1(A, E, H) and 2(A, G, I, K). However, we did not observe this to be the general case. In many cases, single pathways were divided into somewhat ordered, directional lanes. This is most apparent in figures 2(A, E) and 3(A-F). In each case where a concentration of ant traffic moved exclusively in one direction, ants did not seem to continue their one-way movement over distances larger than two meters. This is especially clear in fig 2(J-L), where ants at a distance of two meters nearly all appeared to be moving toward the nest, yet ants three meters away nearly all appeared to move away from the nest. It was not directly observed at the site, but this data seems to suggest that between two and three meters away from the central mound along the travel pathway show in fig. 2(J-L), ants were joining the major traffic heading back to the mound. Such a trend was not present the previous day at the same site, at the same time of day. In fig. 2(A-C), significantly denser traffic can be seen at one meter and three meters away from the central mound than at a distance of two meters away. This could be due to a similar dynamic of ants leaving the main traffic-way between one and two meters, and joining it between two and three meters. However, here, at each successive distance from the mound, traffic flowed in both directions. At the site shown in 2(A-C), ground cover prevented a clear view of much area of the terrain. It's also possible that we failed to notice that there was a bend in the pathway between one and three meters extending beyond our sampling range.

If the data collected in fact reflects the event of ants joining the midpoint of a major travel pathway on their path back toward the nest, the question remains as to why they are attracted or pulled to it when they are theoretically capable of finding their way back from wherever they go.

It may be that the phenomenon of one-directional ant traffic is unrelated to a mode of signaling and simply the result of many ants following the same scent trail, making it difficult for travelers in the opposite direction to walk along the same path. A future study could address this question by transporting ants from areas where they don't seem to be actively following trails, to areas near active trail pathways and observing which direction they choose to go in.

The Unexpected

While two meters away from Colony B in the first direction, one incidence of repeated use of the same exact line of travel over large periods of time was suggested. In a patch of moss that the ants' pathway crossed over, there was actually a small trench worn in, perhaps by ants, about an inch wide. Data from this area can be seen in fig. 2(B- E), which does not indicate a strong trend in a single direction. The phenomenon wasn't noticed in the other five ant pathways that were observed.

When a travel pathway remains in the same general position over a longer period than the time required for a single pheromone trail to evaporate or decompose, it may be assumed that the actual scent smears themselves are repeatedly deposited by multiple ants. This creates a situation where the position of the trail "moves" chaotically over time, but stays anchored within the same general pathway.

Apparently, it is possible for trails to become structured to the degree that the ants traveling them walk (relatively) single file. If such behavior continued in the same spot long enough to wear a trench in a patch of moss, it likely happened for longer than the normal decomposition time of a single ant's pheromone trail. It would probably also have moved in only one direction at a time, due to space constraints.

Acknowledgements

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The Old Forest

Looking through the smoke
A woman I met long ago
The licks of flame in her eyes
Tell of her excitement
But the weariness on her face
Tells me she has had too much

She didn't know me
Before she saved me
We both remember the stars
And the sirens
But the hour escapes us

She begins to smile
I must be staring too much
Wondering what she's thinking
But already knowing
The owls are out tonight

We sit listening to the wind
Batter the fir needles about
The flickering flame tires
The moon is dim
The scent of a bog swirls about
Drifting into our dreams

New Planet

Dawn breaks
Cleansing the world of darkness
Soft dew has settled
Where tears fell the night before
Refracting the light
Into a dazzling array of color

Few thought of those as our last
The days we woke and smiled
And covered the life giver
With the baleful curtain
Of industry and war

Vapor Tectonics

A silent avalanche
Churning into the pale blue sky
Cloud upon cloud

There were always shapes in them
I was told
A lingering meaning
That I couldn't see

I felt sorry for them
The clouds weren't allowed
To be themselves

Arachnophobia

The Spidey-Sense tingles,
alerting you to the barely audible tapping of eight pointy
feet
neck hairs rise, cold sets in
roving eyes seek out the trespasser
the spider moves into view.
It is black, a ubiquitous indoor spider
small enough to fit on a nickel or quarter,
looming in your mind like Godzilla over Tokyo.
Which starts first?
Twitching, a vague itchy feeling that settles around the
joints, back
laces that are hard to scratch
shallow breathing, afraid to alert the monster to your pres-
ence,
or the frozen panic.
Moments later it's gone, back outside.
But you can still feel its phantom feet
tip-toeing across your consciousness.

Silver Dollar

Green fins fluttering, finicky,
A huckleberry rides the storm.

The foliage reminds of a
Silver dollar given to me by my
Long dead grandfather.
His stench of stale cigarettes
Crowding my mind with memory.

But for now the huckleberry is
Just a part of the greater scheme,
Safe from life's bitter scrutiny.

Morning Dew and Pleasant Poison

Dew on yellow Scotch broom flowers,
The grass glistens in a red dawn,
Bloody knives and a quicksilver messenger.

Thoughts on the Perimeter of a Square of Red

The sun has escaped Winter's cloudy prison
Spring begins to show her face in places once dark,
From each of her steps sprouts life,

Amidst this unhindered life,
Gnarled sycamores sit,
Ritualistically cut by men
They came with their tools and
Turned the trees into sad scarred examples.

Wild trees watch in terror
Rooted with fear
Same fate for them if they helped
Trees watch here while wealthy white men do the same
Horrific scarring Spring could never heal.

Subconscious Reality

Mountain goats
Scamper across the prairie
Disguised as cheetahs
The albino horned cats
Graze on a dead vulture
My eyes wish to see no more

Back to another dimension
So called reality
Our van is still moving
Adjacent to the broken white line
I stretch my neck from side to side
It crackles like ramen
Tim Tennis is selling property

Nature's Compromise

Sun plays peek-a-boo behind the hills
Scruffed of Douglas fir
The day's last glow
Of our most local natural light
Paints a picture on the water
Of life above the surface

Yesterday's wind
Today is touring someplace else
Allowing the water to rest
Flies beg to continue the party
I veer away from the sunset
A tree's overhanging branches
Waltz in the bay's reflection

Stripmall Sidewalk

Two slabs of concrete sidewalk
Divided by a ditch
To an ant, the Grand Canyon
Filled with a rainforest of Eurasian plants

On one side
A tired man begs for a nickel for a bus ride
And a screaming kid
Begs mom for a jawbreaker

I cross that line
An open door to a bagel shop
Acts as an advertisement
I use my right to smell good things
While it's still legal and free

Traveling

From here I can see
The curvature of the earth
The way the sky bends
As it wraps its blanket of clouds
Around the soft fleshy hills

From here I can see
Sagebrush like beads
Pressed into a Guatemalan bowl
Forming monochromatic patterns
That never knew human hands

From here I can see
A concrete factory
Utterly destroyed by nature
Windows and walls blown out
Girders and silos shorn away

From here I can see
Aspen leaves glitter
As they shiver in the wind
Which whips down the hills
Like a pack of wild dogs

From here I can see
An oasis of emerald green
Against the slate-gray sage
Struggling to stay afloat
Amid the oceans it pumps to live

From here I can see
The hierarchy of clouds
Small hills of cotton
Groveling at the feet of tall feathers
Mountains of down far above

From here I can see
Rusted train tracks laid long ago by men
Whose hands have long since withered away
And faces have passed from memory
A reminder of mortality

From here I see
Fields of gold and lilac
Lupin raising their arms to the sky
A thousand dancers
Their delicate hands fluttering

LIFE AFTER BURN— HERBACEOUS DIVERSITY AND COMMUNITY COMPOSITION AT GLACIAL HERITAGE PRESERVE

Mango Kucera, Brian King, Sasha Dillman, Melissa Vanderwerf, Tez Stair, and Julian Perry

ABSTRACT

In Western Washington (USA) lowland prairie habitats, fire was once a common occurrence. In relatively recent times however, fire has been excluded from this ecosystem. We studied the differences in herbaceous plant diversity and community composition between a burned and unburned site at Glacial Heritage Preserve near Littlerock, WA. We hypothesized that an annually burned site would support greater diversity and fewer invasive species compared to an unburned site. Our results showed that species diversity was significantly different between the two sites; a higher diversity of species was found in the burned site than the unburned. In addition, community composition varied between sites with the unburned site showing a greater presence of the invasive species Hypochaeris radicata. Our findings show that fire may increase species diversity in a lowland prairie ecosystem.

KEYWORDS

Lowland prairie, disturbance, fire, richness, evenness, invasive species

INTRODUCTION

Every ecosystem is subject to some level of disturbance, and the organisms within an ecosystem have adapted over time to cope with these disturbances. Some species even rely on a high level of disturbance to survive. Our study focuses specifically on fire disturbance effects on prairie lands. Disturbances such as grazing and burning were historically important and high-frequency components in the evolution of North America's grassland prairies (Collins, 1987). Native plant communities may be particularly accustomed to fire disturbance due to historically frequent exposure. Fires may reduce or eliminate aboveground biomass, which makes space, nutrients, and light available to species lower in the competitive hierarchy (Safford et al., 2003). Today, due to fragmentation and increased human population, fires cannot spread as easily across the landscape as they once had, and this could place native plant communities at a competitive disadvantage.

Our study aims to determine whether or not fire has an effect on the overall diversity of plant life within a prairie. There are countless studies that focus solely on the effects of fire on a single species, but fewer studies examine the effects on the plant community as a whole. The site we chose for this study is ideal in that the burned and unburned treatments are adjacent and would be hypothetically identical if the same treatment was applied to both. The central question of this study was: does fire have an effect on herbaceous diversity and community composition in lowland prairies? In addition, a minor question of the study is whether fire is an effective means to control invasive species. We hypothesized that the burned site would have greater diversity and fewer invasives than the site left unburned due to historical associations between native species and fire disturbance.

Study Site Description

We conducted our study on herbaceous diversity within a lowland prairie of the Pacific Northwest. The study was conducted at Glacial Heritage Preserve, a 1,000 acre burned and unburned prairie located on the western edge of Thurston County near Littlerock, Washington. The burned and unburned areas were separated by a service road. The vegetation in the area of study consisted primarily of small perennial plants less than eighteen inches tall and there were less than ten trees within the sites. The site was largely dominated by Camassia quamash (Common Blue Camas), Hypochaeris radicata (Hairy Cat's Ear), native and non-native grasses, mosses, and lichens.

Natural History

In the past, local Native American tribes frequently burned the prairie primarily to preserve open grounds for game and aid in the production of camas root (Storm et al., 2006). The prairie was burned regularly until the natives were removed

from their land and relocated to reservations farther out on the peninsula. It was not until recently that the practice was revived by ecologists in an attempt to determine whether or not burning had a positive or negative impact on the ecosystem, focusing on plant diversity in particular. Though the Glacial Heritage Preserve was officially created only 21 years ago in 1986, we have found no records about when the burnings occurred and have no information about when our unburned control site was last burned.

Field Study

Our study was conducted on May 9 and 14, 2007 at two adjacent sites of prairie land within the Glacial Heritage Preserve that have the same general topography. The burned site was subject to a single controlled burn during Fall 2006, and the control site was unburned. To assess herbaceous richness between the two sites, we identified and recorded the presence of every species in 100 haphazardly located one-meter plots; we collected 50 samples in the burned and 50 samples in the unburned. To assess evenness between the sites, we estimated every species' overall abundance within the plots on a scale from 0 to 6. Zero represents absent, 1 represents 1 to 5% (trace), 2 represents 6 to 19%, 3 represents 20 to 39%, 4 represents 40 to 59%, 5 represents 60 to 79%, and 6 represents 80 to 100%. To determine the placement of the plots, we used a random number table that dictated our movement in terms of direction and number of paces.

Species List	
BURNED	UNBURNED
1. *Camas quamash*	1. *Camas quamash*
2. *Hypochaeris radicata*	2. *Hypochaeris radicata*
3. *Rumex acetocella*	3. *Rumex acetocella*
4. *Lomatuim utriculatum*	4. *Lomatium utriculatum*
5. *Achillea millifolium*	5. *Achillea millifolium*
6. *Teesdalia nudicaulis*	6. *Teesdalia nudicaulis*
7. *Cytisus scoparius*	7. *Cytisus scoparius*
8. *Vitica sativa*	8. *Vitica sativa*
9. *Lotus micranthus*	9. *Lotus micranthus*
10. *Viola adunca*	10. *Viola adunca*
11. *Campanula rotundifolia*	11. *Campanula rotundifolia*
12. *Prunella vulgaris*	12. *Prunella vulgaris*
13. *Microseris lacinata*	13. *Microseris lacinata*
14. *Hypericum perforatum*	14. *Hypericum perforatum*
15. *Chrysanthemum leucanthemum*	15. *Chrysanthemum leucanthemum*
16. *Eriophyllum lanatum*	16. *Eriophyllum lanatum*
17. *Ranunculus occidentalis*	17. *Ranunculus occidentalis*
18. *Plantago lanceolata*	18. *Plantago lanceolata*
19. *Trifolium dubium*	19. *Trifolium dubium*
20. *Viola sempervirens*	20. *Viola sempervirens*
21. *Hieracium albiflorum*	21. *Hieracium albiflorum*
22. *Solidago Canadensis*	22. *Lupinus lepidus*
23. *Solidago spathulata*	23. *Pteridum aquilinum*
24. *Arctostaphylos uva-ursi*	24. *Senecio vulgaris*
25 *Crepis capillaris*.	25. *Unidentified sp. b*
26. *Campanula scouleri*	
27. *Unidentified sp. a*	

RESULTS

A total number of 33 different species were identified throughout the study in addition to separate categories for grass and moss/lichen (Table 1). Twenty-seven different species were found in the burned site and 25 different species were found in the unburned site plus bulk categories of grass and moss/lichen; 21 species were shared between

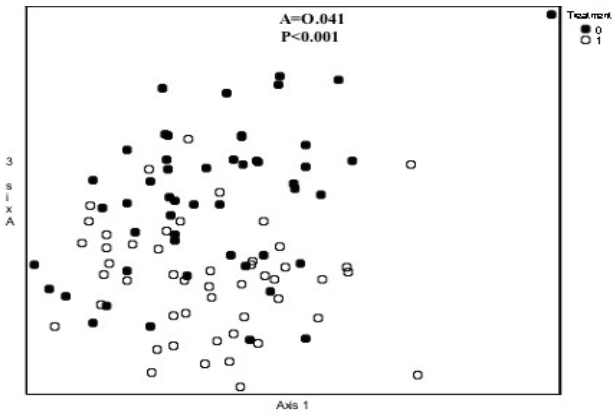

Figure 1, A NMS ordination representing the differences in community composition and abundance of species generated by a MRPP analysis. Each point represents a plot; black points represent plots sampled in the unburned site and white points represent plots sampled in the burned site

sites. A Multiple Response Permutation Procedure (MRPP) for community analysis indicated that communities are significantly different between the burned and unburned site (Fig. 1; A=0.041, P<0.001).

We used ANOVA on diversity indices Shannon's H, Simpson's D, richness, and evenness to test differences between the burned and unburned sites. All four tests showed significant differences between the sites. The Shannon's index value was 1.91 (+/- 0.042) for the burned site and 1.71 (+/- 0.042) for the unburned (Fig. 2A; P=0.001); the Simpson's index value was 0.83 (+/- 0.007) for the burned and 0.79 (+/- 0.007) for the unburned (Fig. 2B; P=0.001). The richness value was 7.74 (+/- 0.309) for the burned and 6.5 (+/- 0.309) for the unburned, not including grass and moss/lichen (Fig. 3A; P=0.006), and the evenness value was 0.96 (+/-

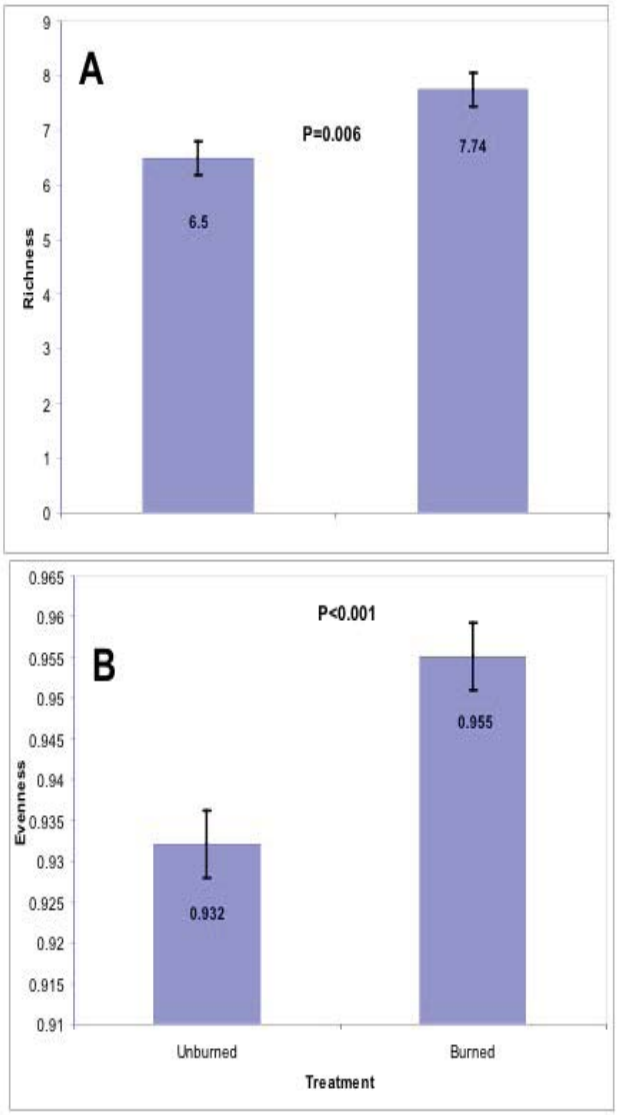

Figure 2. Shannon's (A) and Simpson's (B) values for the burned and unburned sites. Error bars represent ± one standard error from the mean. The greater values represent the more diverse site.

0.004) for burned and 0.93 (+/- 0.004) for unburned (Fig. 3B; P<0.001). In all four of these tests, the burned site had larger values than the unburned site.

The average evenness of Hypochaeris radicata was 2.22 in the burned site and 3.24 in the unburned site (Fig. 4; P < 0.001). H. radicata was absent in four plots in the burned site and absent in only one plot in the unburned site.

DISCUSSION

We hypothesized that there would be more plant diversity in the annually burned portion of Glacial Prairie than the unburned. The data clearly

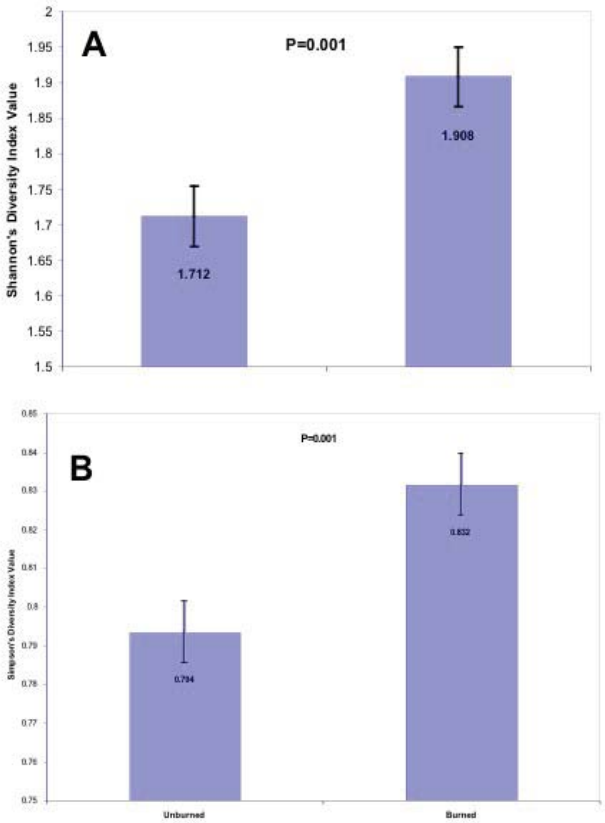

Figure 3 compares species richness (A) and evenness (B) between the burned and unburned sites. Error bars represent ± one standard error from the mean. The greater values represent the more diverse site.

suggest there is indeed a difference in diversity and community composition between the burned and unburned sites. All the statistical tests used show that the burned site was significantly more diverse, and the low P values indicate that the pattern found is almost certainly not by chance ($p < 0.05$). The high A value calculated by the MRPP indicates that the two communities also differ in composition.

Our results are ecologically relevant as they support findings that fire is an important factor in maintaining prairie diversity, and potentially keeping invasive species at bay. Other studies have shown that small-scale native richness increases or remains stable in burned sites and declines or remains stable in unburned sites, whereas invasive richness increases in unburned sites and declines in burned sites (Bowles et al., 2002). We found similar findings when comparing the very abundant invasive species H. radicata in burned versus unburned; H. radicata was less abundant in the burned site. Therefore, annual burning may aid in lowering the numbers of this invasive species.

Fire introductions may aid in maintenance of diversity in Western Washington prairie ecosystems. Our work adds to a growing body of literature suggesting that fire effects may increase species diver-

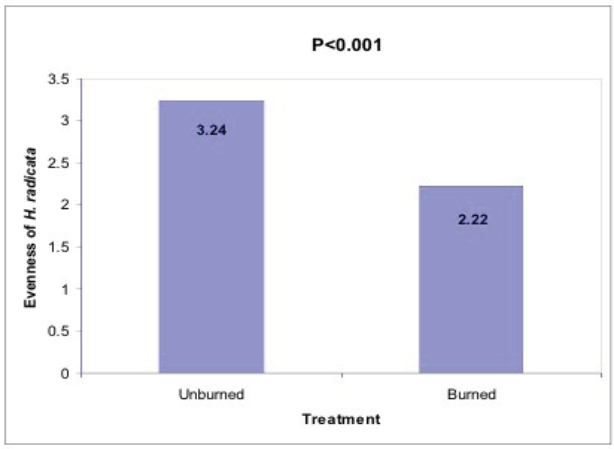

Figure 4 shows the average abundance of Hypochaeris radicata in burned vs. unburned.

sity in prairie ecosystems in general, and in Western Washington prairies in specific. Positive responses to fire by native herbaceous species may indicate adaptation to fire disturbance, while invasive species not accustomed to fire may suffer. This study and others like it help inform the public that not all land disturbances are unhealthy for ecosystems, and in fact fire may play a critical role in maintaining diversity on the landscape.

ACKNOWLEDGEMENTS

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Untitled

Whispered words of sadness fall
Too many
To catch

I wonder about friendships gone
I wonder and that's all I do
I can't remember
But I remember
You

Eyes and teeth and whiteness
Burning, confusing love
A father, a brother
A lover
I take as I can

A sparrow's carcass
Sings no song

All these novelties
Spill and catch and lie in bone.

Grandfather and the Seedling

In the woods there is a clearing where long ago an old grandfather tree once stood: a stump, bigger than a kitchen table, rests in the center. The blazing sun shines down onto the clearing where nothing grows. The brush and saplings keep their distance out of respect for the wise tree that once made his resting place there. In his absence the near by cedar and maple trees lean into the grove; bowing with respect but hesitant to enter. All is still. Far away, deeper in the forest, a seedling struggles through undergrowth for the sky. As a seed it was blown into that thicket from that very same grandfather tree. If it could only reach the sky it would grow to the height of the tallest, strongest tree in the woods. If it could only reach the sky.

I met Grandfather in the deep Western Washington forests near Arlington. I lived in the woods back then. I lived for the woods. The deep canvas of greens and deep blues was my playground and my escape. I would run to the woods and speak to everything because the forest was the only one who would listen. Listen and never tier.

I met Grandfather in a deep wood of maple and cedar where the sun broke through in the center; creating a ring of green light on the forest floor. The light shown down on him, in a way that I can only describe as surreal.

I was running from life, from fear, from pain and sorrow. I came over a log, not looking where I was going, and ran right into him. I fell; he stood strong in front of me. He looked at me in a way that plainly asked, "What is wrong granddaughter?" He asked me to tell him everything and so I sat down near his base and opened my heart to the only one who would listen.

I told him that I was sixteen and I was loosing my home. I was only sixteen and I was loosing everything I had ever known. The cruel hands that touched me were still cruel hands of a familiar; the cold heart that hurt me was still one I could understand. My fears were still my fears and my heart was still mine to be broken.

I told him that all the lies I'd ever known were all I ever had known and the tears I cried every night were all that I could comprehend. In the darkest hours of my years I still had familiarity, I still had knowledge of what was happening to me and I could still control that it would always be the way it was. That I could bare, that I could work through.

Now it was all going to change. I would be thrust into a life of chaos, of wandering and uncertainty that seemed unreal. As the bedrock of my life washed away I couldn't help but believe that this was the end. I couldn't go on. I came to the forest to say goodbye. I came to the forest to die.

I pulled out my knife and showed him the blade. I could feel him weeping. I told him that this was not the life a girl should have. I told him that no one feels these things. My life was a jigsaw of abuse and untruths. Whatever lay within the walls of my mind there was nothing of comfort, cure or light. It was all confusion and hurt. What kind of life was this I asked him?

There was a long silence and I stood up; sure that I was right to be so ill of heart. But a warm breeze touched me and pulled me in to brush closely to his trunk. Bows bent and I felt branches brush my back. I was being held by him. I leaned in and stretched my arms around his rough bark. As the wind blew on it brought me deeper into an embrace that was so alive I could almost hear his heart beat.

When I leaned back and looked up into his branches I could feel him smiling. I smiled back.

I left the woods that day very much alive and with a new resolve. I promised to always remember that my Grandfather loved me and my pain was his. I could never let myself forget that wood and I could never forget Grandfather.

I moved a week later; away from the forest and everything I had ever known. I moved to more fears, more pain, and more heart ache. Yet I also moved to new life, new hopes, new dreams and a world that was much brighter and safer than any I had ever known. Grandfather was right, I would be alright.

Two years later I returned to my old home and traversed through the trees; following a dim memory and a sorrowful recollection. I picked through the underbrush and clambered through seedlings grown astray. As I neared what I new to be Grandfathers grove I broke through a thicket to bare earth. I looked ahead and my eyes were burnt with broken ground and a rapped trail through stumps and fallen trees. Screaming; someone was screaming. I closed my throat to catch hot breath and realized it was me.

I found his stump. It was the biggest in the long stretch of deadwood. When I lay down upon it my feet stuck out behind me. I wept as I embraced what was left of the wisest being I had ever known. I rubbed my face into his stump and covered myself with his blood. It was so fresh. It must have been only a few weeks sense he fell.

After hours of grief and regret I sat up and placed my palms on him. I whispered to myself in comfort but felt none. I took out that very same blade I had brought to him those few years ago. The same blade I had told myself I would burry in his roots as a promise to Grandfather that I would never try and hurt myself again. I gently ran my finger along the blade but knew I couldn't do it. Grandfather saved me forever. I would never look at a blade with longing again.

I kissed him goodbye and left the ravaged land behind; dove back into the green virgin wood. I walked along almost blindly for several miles when I stumbled on a long and fell face forward into brush.

Getting up I looked into what I had landed in and noticed a seedling peeking through the thick Sal ale. I quickly started ripping away the brush near her and clearing her path to the sky above. Thorns and sticks tore my hands but I worked in a furious frenzy that could not be abated even by night. When the moon rose overhead I stepped back to see the clear blue haze reflect off her tiny leaves. I smiled and knelt to give her a gentle hug. I told her not to be afraid of the light and her newfound freedom. I told her to open up her branches and embrace the sky. I told her to grow with the knowledge that she could save her own life and many others if she could just bow with the wind; bow and embrace.

I buried the knife at her base and walked away through the night. I watched my feet and watched the wood. I felt a freedom from long ago. I knew what hurt, I knew what I feared but instead of being afraid of loosing all to confusion I welcomed the chaos of the coming day. I looked back; memorizing the path as best I could. I knew I would be returning.

Staring at her now I see she has grown but a little; only reaching my eyes. Yet her base is stronger, her roots are deeper and she is reaching for the light. I look up and know that I'm reaching to.

The Storm

A bed of beach lies out ahead
Smooth as babies newly birthed
And ripples disturbed by waves
Making sheet-like layers on the surf

I curl my toes around the sand
Grasping grainy life in its purest form
The sky looks up and I look down
Denying the coming storm

Long strands of grief sting my cheeks
Locks of hair falling from my mind
And ocean spray in tears of pain
Latch to air and earth combined

My hands are numb and as I sit down
Water I never knew was there
Encroaches in upon my skin
The chill is just enough to bear.

Ice cold water all around me
Now I see the blackened sky
And, like a bruise can bleed,
Rain leaks down into my eyes

I'm sleeping on the bed of sand
That stretches all around me
My body is the ocean that feels
My spirit knows, and is the sea.

Slow Steady Streaming

The water and me, both go kur-plunk
against the rock
downward movement is best
learn to follow the path of least resistance
stop to take breaks and pool up
then continue to stumble and amble out
when things get more exciting

Yellow save me from Hell

Twenty below zero takes over feelings inside
like blue die lurking through
a glass of fresh water.
Frost climbs black spruce
as rays of sun peek barley rising
above the icy horizon
leaving an iridescent glow.
Frozen air is crisp and blank of smell
but carries the sound of a snapped twig,
ravens scream at one another
like my fingers screaming they are freezing.
The yellow bus will save me
from this frozen hell seeping in.

Dreaming in Clouds

Cotton Candy up
Blows in the wind long ago
greet it once again

Another beautiful daydream
created to fit the sky

Losing the cloud I stand on

Lying alone on a concave bed,
All is at peace except for her head,
From treetop above a blue jay cries,
She is hiding pools under closed eyes,
Bird glides down and lands on her spine,
Above the fluttering heart too free to be mine…

A Revelation in the Sun

The sky is bleeding.
After the longest day this earth has ever seen
the scorching sun has finally been swallowed up –
lost over the edge of the world
where sky meets sea.
In its wake it has left the sky
an infected open wound.
It is beautiful.
Fiery layers of crimson rage and soft pink purity,
fluorescent yellow exploitation and blazing orange manipu-
lation,
these realities are blurred together beyond my tears,
softened only by thin splashes of calm blue forgiveness.
This entire country shares the same wound,
and its sublimely satanic rainbow
fragments my understanding of humanity –
After so much pain, after enduring so much hatred,
They are able to *love*
with more strength than anyone
I will ever know.

Bittersweet Nostalgia

Shadows waltzed across the barren scape
beneath thrashing pink clouds.
The open space was lost in vulnerability
and the forgotten freedom of entrapment.
I wondered if the clouds would spring back
like soft piles of moss.
You told me you missed the way things were.
You asked me if I loved you.
I said nothing
Knowing the limits of my words
would only bring limits to my honesty.
I saw the fractals in your eyes, and listened
to the wind earn its name.
Those moments with you were A-minor,
the spoiled honey of the sun –
and your words,
chubby fingers of a child,
held the silent potential of frets on a guitar.

The Poem

The poem moved through me like wind through the grass,
– calm and familiar – just another rhythm of words –
leaving me thinking I was unchanged by its passing.
But this tepid wind was pure deception.
Once the words had stopped singing their subtle insistency,
a bitter taste of urgency began
oozing down my throat
like malignant cough-syrup.

I had been littered with seeds unseen.
I had been assaulted by revelation.
My tongue burned like a branding iron
that had just marked my imagination –
A force herding me toward some windblown course

plagued by word seeds.
I was left desperately revolting
against every genuinely tepid wind
and calm land I had ever known before.

GROWTH OF *PTERIDIUM AQUILINUM* IN VARYING HABITATS

Zack Davis, Katy DeLong, Rebecca Hapke, Claire Hanson, Song Israel

ABSTRACT

Our study examined growth variations in Pteridium aquilinum in three different sites. *Pteridium aquilinum*, also known as the western bracken fern, exists naturally on six continents and is known to thrive following disturbance. The data we collected focused on plant size and number of blades. We measured forty random individuals in each of the three sites and concluded that P. aquilinum had different growth patterns in the varying habitats. Our data suggest that the *P. aquilinum* we observed limited vertical growth once access to sufficient sunlight was attained, and began to produce more horizontal blades to maximize photosynthesis. The fern blades tended to uncurl at an advanced rate in the sites with less sunlight. While many variables between the three sites prevented this study from finding any specific cause-effect relationships, we were able to conclude patterns in growth appeared different at the three sites.

INTRODUCTION

Pteridium aquilinum, commonly known as the western bracken fern, has proven itself to be a very resilient plant. It is found globally in a wide variety of climates and soil types, succeeding even in disturbed areas (Pojar, 1994). Its ability to thrive in challenging environments results in a dominantly invasive fern, causing substantial impact on the land it invades. Our study addressed the question how does growth of *P. aquilinum* differ between three distinctly different habitats.

Evidence from fossils suggests that the *P. aquilinum* has had over 55 million years to evolve and cultivate advanced anti-disease and anti-herbivore mechanisms (Page, 1986). *Pteridium aquilinum* competes for soil nutrients and water with other species effectively and often invades disturbed areas (Crane, 1990). As the *P. aquilinum* establishes itself, it impacts much of the plant life around it. The plant's rhizomes, horizontal underground stems, may spread underneath the roots of other vegetation and sprout fronds to prevent sunlight from reaching those plants. Fire is almost always a dominant factor in the biology of plant communities, and because of this we choose to include it as a factor in our own study (Dansereau 1957, Ahlgren and Ahlgren 1960, Spurr 1964, Daubenmire 1968, Mutch 1970) . When the fronds, the body of the plant visible above ground, die each year, they often crush the underlying plant life (Crouch, 1974). While hindering some, these fronds also protect and promote growth in certain species and seedlings (McCulloch, 1942). *Pteridium aquilinum* have interesting responses to natural disturbances. During a fire, dead fronds act as a thick blanket of dry fuel, but ironically, most vegetation are obliterated by fire except the fern rhizomes, which stay protected underground (McCulloch, 1942). This allows the bracken fern to dominate recently burned habitats, assisting in the reestablishment of the area by preventing erosion (Tiedemann, et. al., 1976).

These underground rhizomes not only allow *P. aquilinum* to survive fire, but also cold winters in which they shed their fronds early, leaving the rhizome intact until spring when they send up new immature, curled fronds (Crane, 1990). Mature fronds usually grow to in between two to six feet in length, but can grow up to ten feet in length depending on their environment (Hitchcock, 1969). Variations in frond size and the plant's deciduous nature, in combination, allow one to observe the yearly growth of ferns in significantly different habitats.

Pteridium aquilinum is a vital and active component in ecosystems around the world. Its adaptability and resilience to changing environments allow *P. aquilinum* to be studied in different habitats and disturbances. In fact, measurements of *P. aquilinum* growth may be an important indicator of changes within an ecosystem, particularly in areas recovering from disturbances. Our study investigated three different environments (a burn, a trampled area, and a clear-cut), each providing different microclimates, and each impacted by at least one human disturbance. We

evaluated each site's impact on this year's growth and measured the success of *P. aquilinum* in the various sites. By investigating size differences occurring among *P. aquilinum* in these three sites, we were hoping to find distinct differences in growth patterns.

The sites were not standardized with respect to slope, aspect, site history, or vegetation type. Thus, our investigation focused exclusively on size variations of the plant among samples, and aimed at representation of the range of some variation found at sites, without specifically representing all burned, trampled, or logged areas.

METHODS

Study Site Description

We selected three sites influenced by different disturbances; one a burn, one a trampled area, and the other a logged zone. We located site A within the area scarred by the Bear Gulch II fire at the base of Mt. Rose which occurred July 25, 2006. This fire was primarily a brush fire, causing little damage to the canopy. Located towards the bottom of a steep slope and near a stream, this area was dominated by Maple, *Acer macrophyllum*, and Douglas fir, *Pseudotsuga meuziesii*, trees with a sparse under story. Site B, a few miles east of Sites A and C, was severely impacted by recent logging activity; specific dates of the logging could not be found and there was no evidence of replanting (i.e. saplings). As few as twenty trees were left standing in patches around the flat field, leaving most of the area completely exposed to sunlight. There was no visible stream and practically no under story aside from grasses. Site C was next to site A and on the same steep slope as A but it was outside the burned area. Site C was heavily impacted by two way-trails, most probably trampled by firemen fighting the Bear Gulch II fire. No stream was visible, and the area was populated again mostly by *P. menziesii* and *A. macrophyllum*, but with a dense under story of salal, *Gaultheria shallon*, and deer fern, *Blechnum spicant*. We gathered samples from between the trails, which were roughly seven yards apart, and up to five yards away from the trails on either side.

Field Studies

We conducted field studies on May 9th-11th, 2006. At each site we selected forty random samples. In order to document the growth patterns in each area, we assessed size of each plant by focusing on three measurements. First, we noted the distance between the stipe's protrusion from the ground and the tip of the frond. Second we counted the number of paired blades that had developed to a length of one inch or more, and measured the length of the longest blade. Third, we recorded whether the blades of the plant were still curled open or if they had already fully matured. The deciduous nature of the species also allowed us to study this years new growth exclusively. We assumed all green matter was current year's growth (since winter 2006-2007).

RESULTS

Height success

The deviation in average heights across the three sites were the most significant of the observations made. The *P. aquilinum* found in Site C grew the tallest, reaching an average height of 31.213 inches. In Site A we found ferns reaching an average of 23.694 inches, a substantial 7.5 inches shorter. In Site B we encounter another drop in height, an average of only 13.911 inches (Fig. 1).

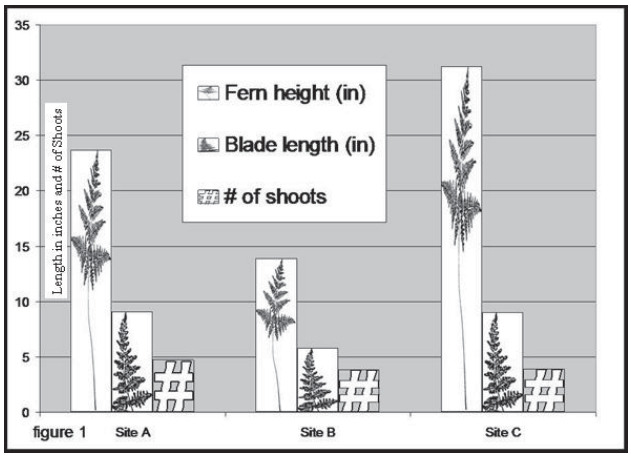

Figure 1
Averages of measurements taken in sites A, B and C.
Percentages of uncurled P aquilinum.
Ratios of plant height to number of frond pairs and length of longest frond in sites A, B and C.

Number of Blade Pairs

The difference in the number of frond pairs between the three sites was minimal, the means varying only from 3.84 to 4.75. However, these data are possibly due to chance (P = 0.059); Fig. 2).

Blade Length

The averages of the plants' longest blade lengths were very similar in Sites A and C, reaching 9.118 inches and 9.025 inches respectively. Site B,

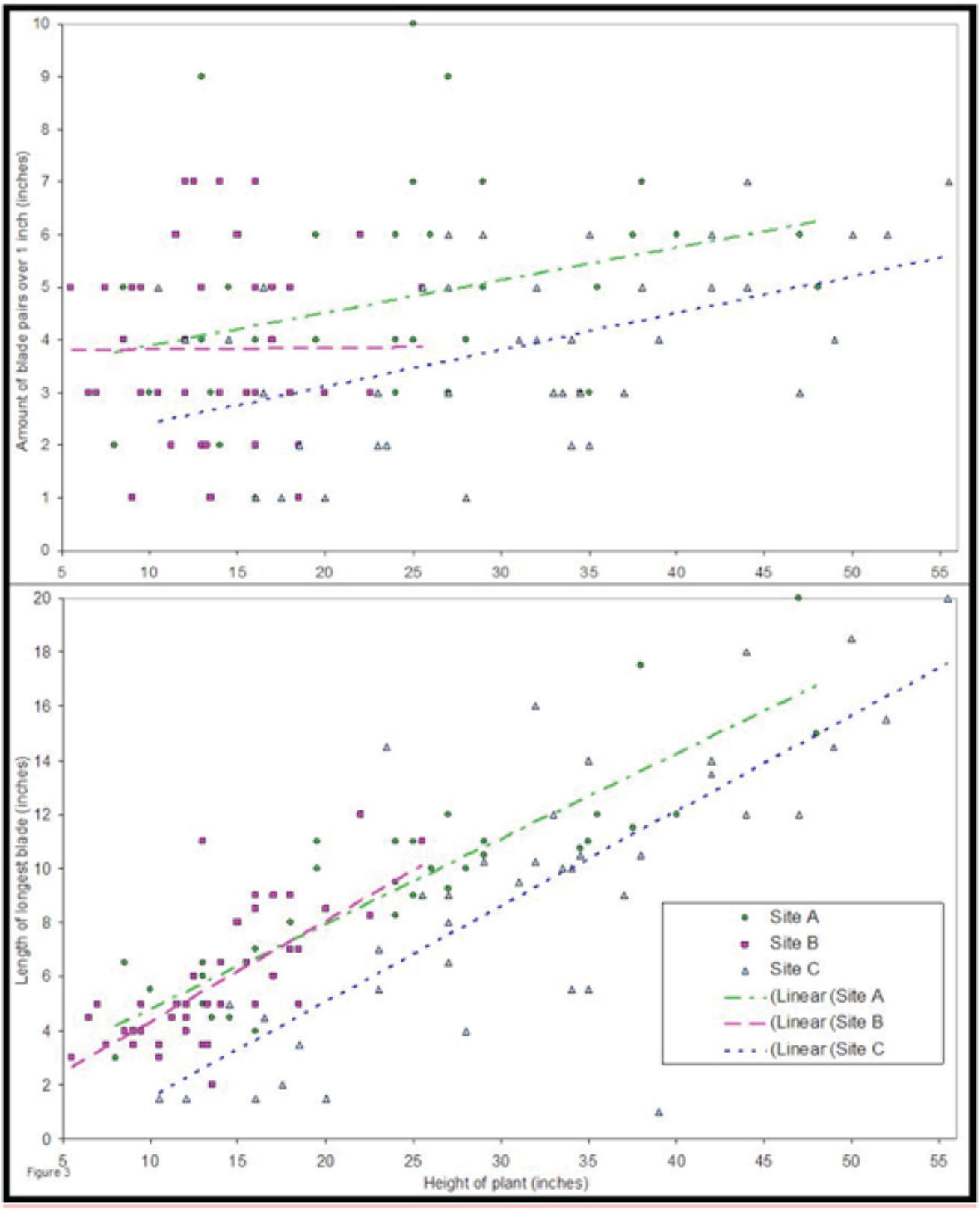

Figure 2
Correlation between height of P aquilinum and length of the plants longest frond in sites A, B and C. and Correlation between number of frond pairs of P. aquilinum and height in sites A, B and C

Table 1	Site A (Burn)	Site B (Logged)	Site C (Trail)	P value
Mean blade length	9.118 in.	5.792 in.	9.025 in.	0.0002
Mean height	23.694 in.	13.911 in.	31.213 in.	0.0001
Mean # of blade pairs	4.75	3.84	3.9	0.0585
% Un-curled	26%	12%	30%	0.0932
Height of plant (in) per pair of blades	4.9	3.6	8	
Height of plant (in) per inch of blade	2.6	2.4	3.4	

Table 1
Comparison of plant success (height, longest frond length, number of pairs) in sites A, B and C.

however, showed a much lower average of 5.792 inches (Fig. 3).

Percent Curled

We found the most curled ferns in Site B, with only 12% of its individuals having uncurled blades. Site A had less curling, with 27% of its population having uncurled blades. The greatest number of uncurled plants was found in Site C, with 30% of the plants having fully developed. However, like the number of blade pairs, these patterns are possibly due to chance (P = 0.093;Fig. 2).

Ratio of Height to # of Blade Pairs

The greatest ratio of plant height to number of frond pairs was seen in Site C, with eight inches of overall height per blade. This indicates that individuals in this area were growing more in height for each blade pair they produced than individuals in other sites. In Site B, the ratio was only 3.6 inches, and only 4.9 inches in site A, showing much shorter heights for a comparable number of blades.

Ratio of Height to Longest Blade

The ratio of plant height to the plant's longest blade averages out very similarly among the three sites. Site A showed a ratio of 2.6, Site B a ratio of 2.4, and Site C a ratio of 3.4 (Fig. 2).

DISCUSSION

The average height of the *P. aquilinum* at the three sites was substantially different, while the average number of blades was fairly consistent. Although no tests were run to evaluate the amount of sunlight in each area, we noticed that average height was much shorter in areas that appeared to have more sun, specifically in the logged area, site B, where no real competition was present. *Pteridium aquilinum* appeared to grow much taller in areas with less light, like sites A and C, before producing blades. When the minimum height necessary to attain adequate sunlight is reached, *P. aquilinum* may concentrate energy on blade production to achieve more photosynthesizing blades earlier in the season. Other studies have drawn similar conclusions, reporting that the fronds of shaded ferns are often fewer and thinner, but also longer than those in open areas (Daniels, 1986).

Another possibility for the difference in height, and no substantial difference in blade pairs, may be the amount of undergrowth present in an area. In areas with greater undergrowth, the *P. aquilinum* tended to grow taller than they would in areas with minimal undergrowth. This may be due to the need for *P. aquilinum* to reach a height greater than that of its main competitor, in this case the salal, in order to effectively compete both for space and sun, before beginning to produce blades.

Another significant difference was seen between the average blade lengths of the three locations. Sites A and C were very similar, while site B's average was substantially less. This may suggest that in areas where constant sunlight is available, for example due to the logging in site B, ferns do not need to grow as long in order to guarantee enough sunlight, because there is no competition with other plant species, specifically the under story.

There were several other important factors that need to be considered in understanding the different growth patterns found. Slope may have played a large role. The fronds of *P. aquilinum* are frost sensitive, which is one reason they usually are found on the sides of hills (Watt, 1969). Site B had very little slope, which may be a reason why the ferns found there were smaller than in other locations; these fronds were not protected from early spring frosts, and may have had to restart after the frost.

In addition to the impact of different slopes, water may have been an influence on the growth of *P. aquilinum*. The water levels in the soil at the

three locations were not tested, but may be different. The dramatic slopes of sites A and C increase water drainage, which has been seen to assist the growth of ferns (Brown, 1986). However, these areas were also protected from sunlight and heat by heavy canopies. Site A had the added impact of a nearby stream, which undoubtedly affected water levels in the surrounding soil. Site B was on flat ground, which meant no natural drainage, but this area was also exposed to direct sunlight and heat.

Although *P. aquilinum* rapidly recovers from trampling (Burden 1972), it is unclear weather the *P. aquilinum* at site C grew the tallest as a result of the way trails or a developed under story. A study relating trampling pressure to environmental effects could answer this question, and at the same time be influential in the formulation of management policies for recreational areas (Burden 1972).

Other unmeasured hidden factors may also be responsible for the patterns we observed. For example, soil types or nutrient levels of the different locations could affect plant growth. Additionally, fire could have affected the soil of site A, and altered plant growth. We also did not examine the rhizomes below ground, and therefore cannot know if one area had more established underground systems than others. The overall condition of the rhizomes may have impacted frond sizes in different locations. Similarly, other studies have shown that in shaded areas fronds can appear earlier than in sunny areas, which may also have affected our results (Hellum et al 1966). Beyond what we have listed, there are others variables that may have been key players in determining the success of *P. aquilinum*.

Our study explored how substantially variant fern growth can be, given different conditions. They demonstrate significant variation, even among relatively proximal disturbed localities. For our data to be fully interpreted in terms of what specific effects most impact the growth of *P. aquilinum*, much further study will be necessary, in which different variables are independently controlled.

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To Fall in Love with a Wild Woman

A man stumbles in the woods.
He is far from home.
He searches for the Sacred One, the Wild Woman.
The one who digs for bones,
the river beneath the river.

In a dark patch of woods
he sees her waiting.
He asks for her secrets,
he wants her magic.

She opens her mouth to speak
and out blasts her stabbing shrieks
her lightning madness.
The skies open with wild horses.
The man runs in horror.

The Wild Woman stays in the woods.
She keeps her secrets to herself.
But they keep asking for her secrets.
They keep wanting her magic.

And they still run in horror.

Anything but Black!

There are: Queen orchids,
Bird's Nest orchids,
Double-Tail orchids,
Warty Hammer orchids,
Japanese Wind orchids,
& Blue-Babe-in-a-Cradle orchids.

But no Black orchids.
I guess the Orchid Spirit doesn't have a Dark Side.

11:16 A.M. 12/29/2004

A beautiful sonnet,
Like soft flowing breeze through the orchards,
The sun awakening the earth,
Forever like you it shall be.

11:56 A.M. 02/07/2005

The sky is clear but black,
With brightened stars guiding the way,
Through the darkened forest of memory,
Wind hits my face from unknown direction,
Its softness comforts my dream.

Fairybells

Fairybell flowers shimmering in the sunlight
Would they be solid if touched,
Or would my fingers pass right through?
Would they taste like ice cream?
Vanilla and blueberry and strawberry
Melting petals on my lips
Scent of teenage lip-gloss
on the kisses of girls with frosted hair and eyelids
Soft candy eyes
With fairybell flowers tucked behind their ears

Haiku

Forest smells tangy
Uncooked apple pie filling
Granny smiths and cloves

Crayons

The plants of spring are a box of crayons
Spring green, forest green, sky blue, periwinkle
Bubblegum pink and sunshine yellow.
Instead of pollen and nectar
I smell wax and paperboard.

haiku

between new blades of
grass, a spider swimming through
the air upside down

indian plum

fresh yellow-green leaves
perched at the tips of each branch,
every cluster looks
like a faerie with perked wings
peering down at me below

gottcha!

This mosquito bobs and lunges
circling me like a boxer
as if it can't decide which part of
me will be the tastiest
until ..... SLAP!
I catch it in my notebook preserving
its carcass along side the
story of its final moments.

Its last words were
"szzzissizsuh..."

THE EFFECTS OF FIRE ON SCOTCH BROOM

Star Bjorge, Renée Davis, Peter Howard, Megann Schmitt

ABSTRACT

Scotch broom (Cytisus scoparius) is an invasive species on glacial outwash prairies of Western Washington, and ongoing attempts to restore prairies to their natural state are hindered by its rapid spreading habits. We studied the effects of fire on Scotch broom to determine if it was an effective means of elimination of the plant. A random number and walking process was used to determine which plants would be selected for recording variables. A similar random process was used to determine which shoots and leaf clusters were counted. We found that although some growth variables were unaffected by the burn, variables such as leaf count and new growth length showed a strong negative response to the burn. Since leaf count and new shoot length are key to a plant's overall health, our research indicates that fire negatively affects the Scotch broom. Our research revealed that a controlled burn treatment did effect on new shoot length and leaf count, though it did not appear to affect other variables measured and the burn did not eradicate the plant from the prairie.

KEYWORDS

Scotch broom, Cytisus scoparius, prairie, restoration, burn, fire, exotic, non-native, shrub

INTRODUCTION

Scotch broom (*Cytisus scoparius*) is an invasive species on Pacific Northwest prairies, which crowds out native species and accelerates succession. This European native first arrived in the Pacific Northwest in 1850 when Captain Walter Colquhoun Grant planted seeds that he had acquired in the Sandwich Islands. The shrub has since spread from this initial planting in Vancouver Island along the west coast and into central California (Pojar 1994, Parker 2000). As a legume, Scotch broom can fix nitrogen in the soil, changing the soil chemistry which encourages trees to grow sooner, converting prairies into forests (Haubensak et al. 2004). Glacial Prairies are important to protect because they are a unique ecosystem that is very rare in Western Washington (Dunn, 1998).

Prairie restoration techniques include attempting to remove invasive plants through herbicide applications, mechanical cutting and pulling, and prescribed burns (Alexander and D'Antonio, 2003). One of the reasons that Scotch broom is difficult to eradicate is because its seeds remain viable for a very long time. Seeds can stay dormant in the soil for up to 70 years, which results in a very large seed bank. Burning scarifies the protective coating on the seeds encouraging them to germinate the next year (Boyd 1995).

We studied the effects of fire on Scotch broom. Studying the robustness, growth, and reproduction of Scotch broom in burned and unburned sections of an otherwise equal prairie could indicate the effectiveness of these treatments for future restoration efforts.

METHODS

Site Description

Our field site was the Black River-Mima Prairie Glacial Heritage Preserve, a 1,100 acre park in Thurston County, Washington. Glacial Heritage contains one of the best remaining examples of Mima Mounds, a unique geographical phenomenon comprised of mounds of soil several meters tall throughout the prairie. Glacial also contains a diverse prairie plant community, including camas (*Camassia quamash*), Scotch broom (*Cytisus scoparius*), lomatium (*Lomatium utriculatum*), and a variety of grasses, lichens, and mosses.

The Nature Conservancy has done extensive prairie restoration at Glacial Heritage, including controlled burns and herbicide applications, as well as tree and invasive plant removal. In order to examine the effect fire has on Scotch broom, we compared plants from a portion of the prairie that had been treated with a burn two years ago in 2005, and an unburned area that served as a control. Though Scotch broom has been specifically targeted for eradication on other sections of the prairie, to our knowledge both sites had not been treated, though herbicides had been used nearby.

Field Methods

We sampled 30 plants from the two-year old burn and 21 plants from a section of unburned prairie. Plants were chosen using a randomized walk and selecting the nearest plant. We measured

growth characteristics, flowering intensity, and general robustness of the Scotch broom in both burned and unburned areas.

First, we measured the overall height of each plant and, when possible, plants were extracted from the soil and root length was measured. To assess the plant's reproductive activity we counted the number of flowers and buds on each Scotch broom. We measured the lengths of 10 haphazardly chosen shoots per plant and counted the number of leaf clusters per shoot on another 10 shoots as an index of overall plant performance. When there were insects, larvae or eggs present on the plant, we recorded it. We also measured the distance to the nearest Scotch broom from the base of the shrub being sampled, as well as the number of plants within a one meter radius in order to record the population's density.

RESULTS

The influence of fire on scotch broom studied in a two-year-old burned and unburned environment had noticeable effect on both the plants' new growth length (i.e., new shoot length) and leaf production (Table 1). Plants in the two-year burn site had an average of 35 leaf clusters per shoot. In contrast, plants in the unburned site produced an average of 53 leaf clusters per shoot (Table 1), which is 56% greater than those on the two-year burn (Fig. 1). The presence of fire also had a marked effect on the lengths of randomly selected new growth shoots from plants in both the burned and unburned sites. Shoots on plants in the unburned site had an average length of 32 cm, however, shoots on plants in the two-year burn site only had an average length of 21 cm (Table 1). This presents a difference of eleven shoots between the two populations with 50% more growth on the unburned site (Fig.2).

	Two-Year Burn	Unburned	P-value
Leaf clusters per shoot	34.9358 ± 3.83	52.8571 ± 4.58	0.004
Shoot length (cm)	21.3100 ± 0.96	32.2237 ± 1.21	<0.001
Height (cm)	49.2667 ± 3.17	56.1 ± 3.88	0.18
Flowers per plant	308.933 ± 100.6	451.74 ± 120.2	0.367
Nearest Scotch broom (cm)	51.993 ± 18.524	132.048 ± 22.141	0.008
Number of Scotch broom within a one meter radius	10.4 ± 1.4899	2.2381 ± 1.7807	0.001

Table 1. Growth characteristics of Scotch Broom in burned and unburned areas. All variables are mean ± SE.

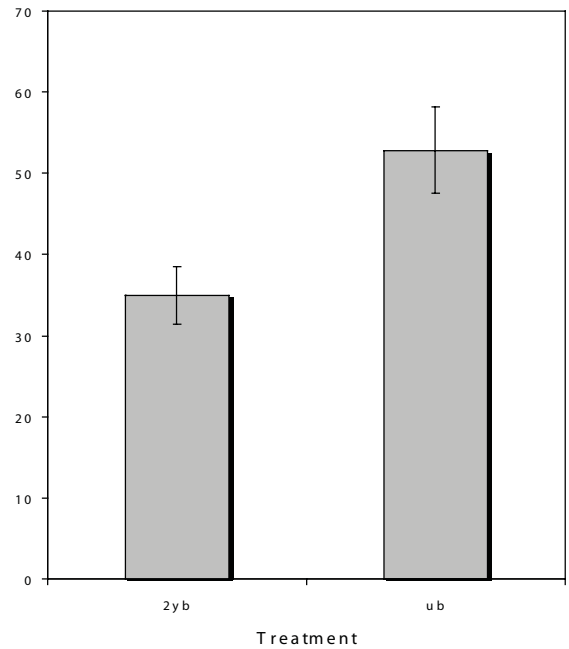

Fig.1 – Leaf clusters per shoot on Scotch broom plants in two-year burn (2yb) and unburned prairie (ub).

There was also a significant difference in the density of Scotch broom growing on the two different sites. On the burned prairie the nearest plant of the same species was much closer to the plant being sampled, on average, than the ones on the unburned site. Similarly, there were generally more plants within a meter radius of the selected plant on the burned side than the unburned side (Table 1, Fig. 3).

The effects of fire on other variables, however, were inconclusive. The data collected on both height of the plant and total number of flowers per plant were not significantly different between sites (Table 1). We recorded root lengths when possible, but on many occasions roots either broke off or the plant simply could not be extracted from

the soil. We thus did not have enough data to make a solid comparison. Likewise, while we noted a variety of insects, our findings were not complete enough on this issue to make any inductions (Data not shown).

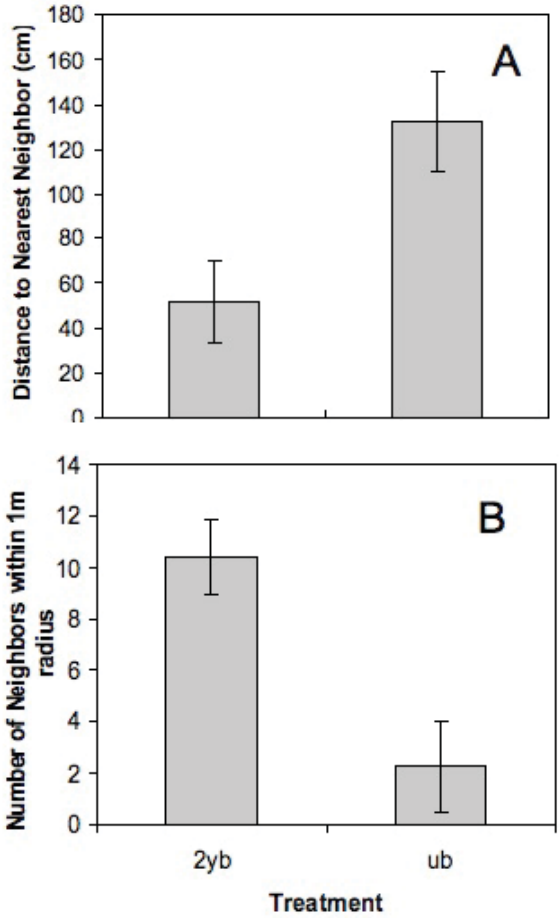

Fig. 2 – New growth on Scotch broom plants in two-year burn (2yb) and unburned prairie (ub).

Fig 3. – Proximity and Density of Scotch broom plants in two-year burn (2yb) and unburned prairie (ub).

DISCUSSION

In our research with Scotch broom, we noticed a few important trends. In the unburned site, the Scotch broom had more leaf clusters and longer shoot length in comparison to the burned site. Other variables observed (flower buds, root length, presence of insects) did not reveal conclusive patterns. Scotch broom in the unburned site were further apart from one another, and this may contribute to the increased growth and reproduction that we observed. The Scotch broom in the burned site may be more abundant in comparison to the unburned site as a result of the effects of fire on the seed banks. Fire flushes the seeds out from the bank and provides an opportunity for them to germinate and sprout (Dunn, 1998).

Previous research has shown a trend that where there is an adequate water supply after a burn treatment, plant production typically increases for the next 3 years, and then sharply decreases (Risser, 1982; Hadley and Kickhefer, 1963). The pattern we observed may be a result of this trend. Although Scotch broom was more abundant in the burned site, plants in the unburned site showed more signs of healthy growth and reproduction.

Though our information gathered on root length was inconclusive, we did notice that many of the plants we examined on the burned site had woody bases and branches that could not have grown in only two years time. There were even some that still showed evidence of charring. Clearly, the fire was not successful in killing all of the plants.

This data has many uses in prairie restoration and application of burn treatments. The implications of our research suggest that while fire may temporarily increase production, burn treatments are useful in restoring native species in their respective ecosystems over a longer period of time.

We have several recommendations for further studies. First, a larger sample size might yield more significant data. Also, given the fact that Scotch broom can branch out in different patterns, plant height doesn't always give the best indication of the size of a plant. Branch number, length, and diameter could be measured in addition to height and shoot length. Shoots can also branch out, so recording the branches and the total number of shoots would also help get a more complete picture of the plant. Other studies identified this as a problem and have instead estimated the biomass of the plant rather than recording information on the height, branches, and shoots (Parker 1999, Parker 2000).

The method we used to select plants tends to favor isolated plants. Another method such as the variable-area transect method would avoid this problem and may give a more accurate picture of the density of Scotch broom (Myers and Bazely 2003).

Despite our inconclusive data, it is clear that a single burn was not effective in eradicating Scotch broom. After two years, some plants had grown back and many new seedlings took root and flourished. Other studies speculate that a series of burns would be required to eliminate Scotch broom. Cutting the plants down to just a couple of inches above the soil may help the plant matter burn better. It is also helpful to burn or at least cut the plants before their seeds are produced and added to the already plentiful seed bank (DiTomaso 2006). Planting annual grasses between burns also creates more fuel for fires and helps them to burn at hotter temperatures (Boyd 1995).

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California Sunset (a love song)

The highways have been mended
And the hills have all turned brown
The summertime has ended
And the winter's coming 'round

In the twilight of the evening
I see a shooting star
And I think of long-lost lovers
And friends from near and far

In the California sunset
I one time dreamt of you
And I didn't know the meaning
Or if it could come true

So for now I'll just wander
And maybe find a way
To walk out of the darkness
Into a brand new day

The Chronicles of Rain

Thunder tumbles
across the low dusty hills
The first raindrops
spatter the trail before me
Disturbing the leaves
of the overarching oak trees
Lofting the dust of summer
into the atmosphere
And awakening the seeds
of next year's spring

Just another chapter
in the Chronicles of Rain

Mountain Summer

A road winds itself along a baking mountainside
A diminutive car labors up into the great range

Occasionally tiny villages pass by
Each a testament to the determination of humanity

A small reservoir lies below the camp
Its shores washed by the wind's waves

Cold mountain nights follow long hot afternoons
Hiking through scents of lodgepole and juniper

Wading through cool highland streams
On round rock stepping stones in a mossy river

Telling stories around the evening fire
With the stars winking like fireflies

Infinity seems so close from here
One mountain summer in the High Sierra

Eternal Satisfaction

Even in my short life
I have found that satisfaction can be eternal

Although any success
Brings with it a tragic loss of striving

Waiting Out the Storm at Camp Heliotrope on a Mid-Spring Afternoon

Wind and rain subsided for now
Sunlight and blue sky appear in small doses
Mist and clouds lift from valley floor
Up and over pine covered mountains.

From the tent door
rocks and grasses scuff the land
Patches of blue sky and big clouds puff out
Overhead, hear the hum of the lone airplane
Behind the tent, icy mountain,
Nooksack is the Native name,
Stands taller than surrounding peaks.

My partner ties his boots
And zips his rain-pants
Next he will put on gaiters
And leave the tent to look out
Scope the climbing route.

If the weather clears, we'll go for it, taking our packs, ice-axes, food and water, and leaving the rest at camp. All together, the climb will take six hours or so, depending on route conditions and weather.

We have spent the day in the tent, bundled up in sleeping bags of down, munching and nuts and fruit, like squirrels. We take turns reading Chinese poetry from Five T'ang Poets.

"I'll be right back," you tell me.

I stay behind to write.

These mists in the mountains remind me of China. I feel like a hermit in the hills. My mountaineering boots sit in front of me, holding my coffee cup. The sun grows warmer and brighter out, but drops of frozen rain still pound down on the tent. I feel the wind's cold tongue and my muscles tense up.

The cloud from the valley floor rises and grows. I see it closing in all around. This is what today has been like. Waiting for the mountain to give us a clear answer
"Yes you may climb me," or "no, not today."

Already today three parties have headed back down the mountain. Two climbers made their way up past our camp, braving frozen air. The natural inhabitants of this land have adapted to harsh weather. Red-headed starling swoops away down into thick clouds. Curious Ptarmigans stop by to beg for food. A black spider crawls outside the tent. She has a large round belly that looks like a miniature black pearl.

Misty mountains
Cold spring wind
Rattles the cook stove

Waiting for one window
Of clear weather signal
To ice-ax and crampon
Slow path along a glacier
To be challenged
If the weather clears
A panoramic view reveals
The border of Canada
The city of Vancouver.

Wind rustled tent
Clean mountain air
Cold, crisp condensation
Coalescing misty clouds
Afternoon stretches on
Time passes slowly
Almost
Vacantly
Startling starling sings a song
Pearl bellied spider crawls along,
Black bird! A raven?
Flies off toward horizon.

Two boots at tent's edge
And a water hose
Red, wet bandana
Wind rustling tent
Gray clouds arise from
Valley floor
Full of dense, foggy mist
Shifting and rising
Over expanse of mountain
Pines with snowy patches
Two trekking poles next to
Gray speckled rock,
Tufts of golden grasses,
Sounds of wind rising,
Up from the chorus
Of distant pine trees
To envelope this
Snowy tundra.

At the base of Nooksack
Frozen, bluish glaciers
Moving ever so slightly

Waiting Out the Storm... Cont.

Not within eyesight
But in conscious knowledge
Glaciers are melting
Ever so slowly
Scientists say
Glaciers will be extinct
By mid century
Climate changing thoughts
All the white space
Surrounds this poem,
All the glacier space
Of all that isn't said.

Wind picks up
Blows the tent flap in
Cold wind chills fingers
Specks of ice spatter the tent
With machine gun quality
The news of war is everywhere
Even here on this mountain,
So far away from everything.
Cry for those who
Have died
Memorial Day
And think of soldiers
And get lost in this
stretch of time

A cooking pot,
Some climbing gear,
Two helmets,
All in the vestibule
Unused as of today
This trip, this journey,
This waiting game.

How long will we wait before
Glacier Lilies emerge?

Dandelion

Yellow mandala
Warm and soft in spring's sunlight
Bees dance around you

Memory of Grandpa's wine
Wind caresses your petals

DISCUSSION

WRITING WILD: A UNIQUE FORM OF EXPRESSION

Abstract

The following is an in-depth analysis of the `Wild Writing' concept put forth in previous discussions by Dylan Fischer and Bill Ransom. This paper is organized with a sense of parody towards technical papers. For the sake of humor, it (somewhat) follows the ESA format for article submissions.

The analysis put forth in this piece is a subjective interpretation of the above term, `Wild Writing,' and should in no way be taken as significant in terms of research or general scientific knowledge. It is intended for entertainment purposes only.

Keywords

Funny essay, college scandal, wild writing

Introduction

`Wild Writing' is a term used by faculty members and students alike on the Evergreen State College campus to refer both to the sense of a natural emphasis in creative non-fiction and poetry and to the significant play of the environment in current Northwestern literary culture. In this paper I discuss my personal interpretation of what the phrase itself implies to me and its connotations regarding my recent work on the Evergreen campus. The Methods section will be short and to the point, given that there was little physical research involved in this interpretative analysis. The Results section will include a listing of the significant points that I have determined to be major sources of inspiration for my analysis. Finally, in Discussion, I will bring all my data together and interpret the term and its significance to me as a human being, as a student, and in this environment.

Methods

To examine what I have about Wild Writing, I sat alone for a time on damp grass in the sunlight on campus and deeply pondered the fundamental nature of primal existence and the effect the environment has on intelligent existence, i.e. human consciousness.

I used my prescribed psychotropic medication to calm and control myself for this stage of analysis(but I would not recommend attempting to recreate my results through similar techniques). I also played music matched to the mood I perceived on a digital player during the session.

Results

I discovered that the dampness of grass and the warmth of the sunlight tended to create a somewhat euphoric and dichotomous sensation of the variability of the natural world, causing my thoughts to turn outward towards the expression of emotion and the communication of various animals, including humans and their domestic companions.

The medication employed for test stabilization caused a more introverted sense of the `self' as it conforms to and alters its environment in both minute and wide-ranging ways, applying both to the inner identity of an individual and to the effects that individual has on interpersonal relationships.

Lastly, I noticed that the music was

soothing and brought me to a state of contemplation regarding artistic endeavors and the social consequences implicit in artistic communication, along with a bridge of thought towards the implications of scientific communication to the general public.

Discussion

The natural world seems to have tendencies towards variability, and this appears to be reflected in communication between both individuals of a species and between species themselves. Through the contemplation of nature's constant evolution, its constant quest to perfect and elevate forms of life, I found that it may be said that species-specific adaptations apply readily to forms of communication. Human modes of writing – writing being one primary method of our species' communication – seem to adapt and change along with the natural environment, either reflective of it or in some other way connected to it.

Individually, our experiences seem to be stored to memory through the means of the five senses, whether mechanically assisted or not, and through our mental filtering and analysis. This unconscious analysis may be affected by past experiences and previous memories, and therefore it is possible that learning is an ongoing, ever-changing process for every individual. In pondering the effect of the environment on a being's sense of self and on society, I came to the rough conclusion that the filtered bias with which we perceive nature has a major impact on how our writing is presented and therefore how it is received.

Through contemplation of different forms of communication (including scientific essays and the other ends of the spectrum, poetry), it occurred to me that everything imparted by one individual or group of individuals to another is subject to personal bias on both ends and also to rebuttal. Given this, the nature of writing and other forms of communication is in no way discrete in its employ, but rather is an ongoing spectrum of this-versus-that. Consequences of artistic license and scientific research all come together in the format in which they're shared with the world. Thus, the concept of writing and therefore of `Wild Writing' is one of a continued discussion regarding a general topic that affects every individual – the natural world.

So, to put it all together: `Wild Writing' is, to me, an essence of communication that touches upon both the formulaic human interpretation of language and literary convention and the primal urge to dissect, analyze, and, most importantly, share (communicate) our observations of the natural world. Whether for practicality's sake (as in a medical article about a fungus that assists cancer patients) or for artistic expression (like a poetic rendering of that mushroom's appearance or its effect on the psilocybin-addled mind), humans appear to require, and to crave, communication. We seem to be, to some extent, an adaptive species that embraces new knowledge as a stepping-stone to our advancement, whether individually or as a group.

`Wild Writing' is, to me, a vibrant and unique way of sharing our individual and cultural views with each other as they pertain to the natural world that we all live in and are all affected by.

In conclusion, `Wild Writing' isn't just a term coined for an Evergreen program – it's an aspect of literature that combines forms to create something unique and special that will hopefully open new avenues for communication about the wilds of our world.

Close your eyes.

Imagine
that we are explorers stumbling
across a great flat basin
for days on end.

Water vanquished and hunger
running high.

Imagine
no one had told you,
defined for you,
plotted out boldly
before you,
this wild side of
nature.

This place
where the grey wolf
always roams.

Now tell me,
What do you see:

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Writings from the Wild:
Where the Grey Wolf Roams

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