



**SPRING 2019**

# **SITE ASSESSMENT AND MANAGEMENT PLAN**

LINFIELD COLLEGE  
ENVS 470: SENIOR CAPSTONE

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## **Introduction**

Beginning in 2016, the Environmental Studies Department (ENVS) at Linfield College started partnering with the Greater Yamhill Watershed Council (GYWC) in hopes to improve the ecological condition of the 12-acre section that Linfield College owns adjacent to Cozine Creek. The 2016 ENVS capstone class started off by creating an inventory and assessment in order to better understand the condition of the site. The next class, the 2017 ENVS capstone, then developed a management plan with goals to restore the oak and riparian woodland habitat as a way to encourage educational uses of the natural area. The 2018 ENVS capstone class was able to obtain a \$15,000 grant from the Oregon Watershed Enhancement Board to begin restoration efforts with the help from the GYWC and local restoration contractor Upshot LLC, a \$1,500 grant from the Associated Students of Linfield College to support a Cozine Stewardship Internship, and a \$2,500 grant from the Yamhill Watershed Stewardship Fund to purchase native plants.

The goal of this report is to provide an updated site assessment and management recommendations based upon the current conditions of the Cozine Creek natural area. This report will summarize current vegetative conditions, outreach and educational efforts, updates to the management plan based upon changes in ownership and permissions provided by key stakeholders. The report will also go in depth on individual projects that were conducted by students in the 2019 ENVS capstone class.





## **The Natural Environment**

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Chapter Editor: Sarah Schmidt

### **Introduction**

An important aspect of restoration projects is documenting the conditions of the site and tracking the changes over time as work progresses. This chapter summarizes the vegetation, habitat, and water quality conditions that were documented in the reports produced by previous ENVS classes including the Cozine Inventory and Assessment (2016), the Cozine Management Plan (2017), and the Cozine Restoration Grant Proposal (2018). We then provide an assessment of the current conditions resulting from implementation of restoration treatments as well as additional data from current studies of wildlife usage of the property and mapping of the riparian area.

### **Vegetation**

The Cozine Creek natural area is characterized as an oak and riparian woodland. This is due to the presence of Cozine creek, an 11.3 mile creek flowing through the property to the Yamhill river, as well as the presence of species like the Oregon Ash (*Fraxinus latifolia*) and Oregon white oak (*Quercus garryana*). The Cozine Creek property serves as a natural area in the heart of the urban City of McMinnville, Oregon. This area provides habitat to native wildlife and allows native vegetation to continue to flourish as demands increase for more residential areas in the city. As documented by the 2016 Inventory and Assessment, 87% of the trees on the property are native to the Willamette Valley, and 13% percent are non-native ornamental trees, likely planted by the College. In total, there were 26 identified tree species on the property.

There is also a significant presence of herbaceous plants on the property, in total the 2016 ENVS class identified 54 different species. The percent cover on the property from herbaceous species was 40% native, 53% exotic, and 15% invasive; whereas of the woody plant species, 46% are native, 52% exotic, and 13% invasive. In 2016, it was estimated that two-thirds of the

creek bank was covered by invasive species, much of which was Himalayan blackberry (*Rubus bifrons*). Himalayan blackberry was found to cover 22% (27,600m<sup>2</sup>) of the property area (Gernhart et al. 2016). A very important species to the Willamette Valley is the native Camas lily (*Camassia quamash*). Camas lily was a food staple for the Kalapuya, the native americans that resided in the valley. On the Linfield property, the Camas lily was documented to cover approximately 2% (2500m<sup>2</sup>) of the total property area, but was under major threat due to Himalayan blackberry, which was growing over the Camas lily patches (Gernhart et al. 2016). Another concern arose from tree core data showing Ash trees were growing three times faster than Oak trees. Ash trees represent 38.2% of the total individuals currently on the property while white oaks represent 28.2%. The Oregon White oak currently is more dominant than the Ash on the basis of having a larger mean and total dbh, but due to the growth rate of the Ash, the concern is that the Ash canopy may grow taller than the Oak and block sunlight.(Gernhart et al. 2016).

## **Wildlife:**

### *Mammals*

Mammals that have been sighted in the Cozine Creek natural area include raccoons, striped skunks, opossums, beavers, black-tailed deer, and nutria. Many of these species rely on the oak woodland habitat for its variety of trees and shrubs. The Cozine habitat is especially beneficial to the black-tailed deer due to the different varieties of shrubs providing food (e.g., Himalayan blackberry, poison oak, and creek dogwood), shelter from the trees, and had the creek as a reliable water source.

Nutria is another common mammal that has been observed in the Cozine Creek natural area. Nutria are large, herbivorous, semi aquatic rodents that are invasive to all of North America. Nutria will burrow on the banks of streams and rivers, leading to serious soil erosion, increasing sedimentation into waterways and even collapsing streambeds. Nutria will also dig up the roots of plants and shrubs when they are foraging for food.

## *Birds*

The different types of trees and shrubs in oak woodland habitats play an important role to both resident and migratory birds. Species such as mourning doves, white-breasted nuthatches, acorn and downy woodpeckers, and American goldfinches are known to have a preference for oak woodland habitat types. In the Willamette Valley a shift from oak trees to different types of conifers is having a negative effect and causing a decline in abundance on these species, especially the white-breasted nuthatch, as they rely on larger oak trees to nest in along with acorns to feed on. Other bird species including the western screech owls, northern flickers, red-bellied sapsuckers, pacific slope flycatchers, violet-green swallows, and Bewick's wrens rely on cavities for nesting within Cozine Creek natural area. Cozine Creek is also home to shrub nesting and foraging species such as song sparrows, American robins, and common yellowthroats.

## *Amphibians and Reptiles*

Very few reptiles and amphibian species have been observed in the Cozine Creek habitat. Documented species include the Red bellied newt (*Taricha rivularis*), Pacific tree frog (*Pseudacris regilla*), Common garter snake (*Thamnophis sirtalis*). All three of these species are labeled by the Oregon Department of Fish and Wildlife as commonly dispersed throughout the Pacific Northwest (ODFW 2016). Seasonal flooding may contribute to the low numbers of these species being found in Cozine Creek due to the inability to escape when flooding occurs.

## **Water Quality**

### *Parameters*

Water quality tests have been conducted by the Linfield Environmental Science Department since 2011. These tests have indicated that there are many water quality issues negatively impacting the creek, and these issues in turn can prevent the growth and survival of many aquatic species. Key points of concern that have been highlighted are that Cozine Creek

continuously shows low rates of dissolved oxygen and pH, while having high temperatures, turbidity, phosphate, coliform bacteria and biochemical oxygen demand (Colahan et al. 2011; Bailey et al. 2012; Hollenbeck et al. 2013; Fahy et al. 2014; Blanco et al. 2015). The flow rate measured in the creek has consistently been low or only minimally meeting the mark for the EPA's flow requirements for Salmon, which is 20 cm/s (Yamhill Basin Council 2004). Nitrogen levels in the creek have consistently been reported above the EPA requirement of 2ppm for salmon bearing streams. Nitrogen levels above this can lead to reduced reproduction and growth rate of freshwater fish. Phosphate and ammonia have been reportedly below the maximum levels recommended by the EPA.

### *Macroinverts*

Macroinverts are an important bioindicator of the creek, because the population growth rates of these species is linked to the pollution and environmental factors affecting the creek. Cozine Creek has had an overall trend of having low biodiversity in macroinverts, mostly being populated by pollution tolerant worm and snail species. The Pollution Tolerance Index (PTI) ranks species into three categories, pollution tolerant, moderately tolerant, and pollution sensitive. Then, it gives points based off of how sensitive the species is. Cozine Creek has very few pollution sensitive species, thus has always ranked a very poor PTI. This indicates that there is some toxin in the creek causing the die off of macroinverts. In recent years the PTI in Cozine Creek has been increasing, this growth could be a result of the restoration projects conducted by the ENVIS department and the GYWC (Gernhart et al. 2016) .

### *Storm Water*

The Cozine Creek natural area collects stormwater draining from the surrounding agricultural and residential lands. The ability of Cozine to do so allows for the residential lands to have less buildup of rainwater which puts less pressure on buildings to withstand the rainfall over the winter and spring months. Since there are restrictions on development in the floodplain, only open space and parks are allowed on the immediate land surrounding Cozine Creek. On the downstream end of the property, where the creek runs under Davis St., the average peak flow of the creek is 17.45 cubic feet per second during flooding times of the year, which is a substantial

increase compared to the relatively slow flow seen in the summer and fall months (Johnson and Sullivan 1999). Stormwater enters the property through pipe systems along the creek as well as natural channels that direct water flow to the property. It is estimated that two thirds of the stormwater in McMinnville will travel through the Cozine creek natural area, making it a crucial flood zone for the area especially with the increasing urbanization of the area. Currently, there are no requirements by the U.S. Environmental Protection Agency (EPA) on stormwater quality for the City of McMinnville. Recommendations by the EPA have been made to monitor the stream's water quality, although little action has been done because Cozine Creek is considered a lower priority than other streams in the county (Gernhart et al. 2016) .

### **Restoration Actions**

The 2017 management plan and the 2018 grant proposal identified areas on the property to be treated with a variety of methods such as manual, chemical/mechanical, mechanical/chemical, to decrease the amount of invasive species on the property. Several areas were also identified as receiving no-treatment in order to provide a buffer for adjacent landowners, the president's residence and alongside Baker Street (Figure 1.1) (Gernhart et al. 2016) (Cowell et al. 2016). The treatment prescriptions were designed as an experiment to compare various techniques (herbicides, mowing, and/or hand removal) to control invasive species and how to replant native species across the Cozine property. In 2018, the students in the Senior Capstone (ENVS 470 ) successfully wrote grants that amounted to \$19,000 from the Oregon Watershed Enhancement Board (OWEB), the Yamhill Watershed Stewardship Fund, and the Associated Students of Linfield College (ASLC) for restoration efforts in the Cozine Creek area on campus. The grant funding will pay restoration contractor (Upshot LLC) to spray and mow the property to remove invasive species. The manual removal will be done by volunteers. The grant will also pay to purchase native plants that will be planted by Linfield students and volunteers (Berg et al. 2018).

## **Treatments Types**

### *Chemical Treatment*

The Cozine property has been chemically treated with a mixture of herbicides such as, Opensight Garlon 3a, Roundup Custom, Polaris (Imazapyr), and Dyne-Amic (surfactant). These herbicides have been used to target Himalayan blackberry, English ivy, and Italian arum seen on the property. Himalayan blackberry and English Ivy in particular has been treated by spot spraying with Opensight and Garlon 3a, mowing to remove the dead plant debris, and then spot spraying once again. This whole process will be conducted over a two year period. Reed Canary grass will be removed using a herbicide mixture of OpenSight, Garlon 3a, and Imazapyr. Italian arum will be removed using Roundup. After the spot spraying has been applied the method of removal is the same process as it is for Himalayan Blackberry and English Ivy.

### *Manual treatment*

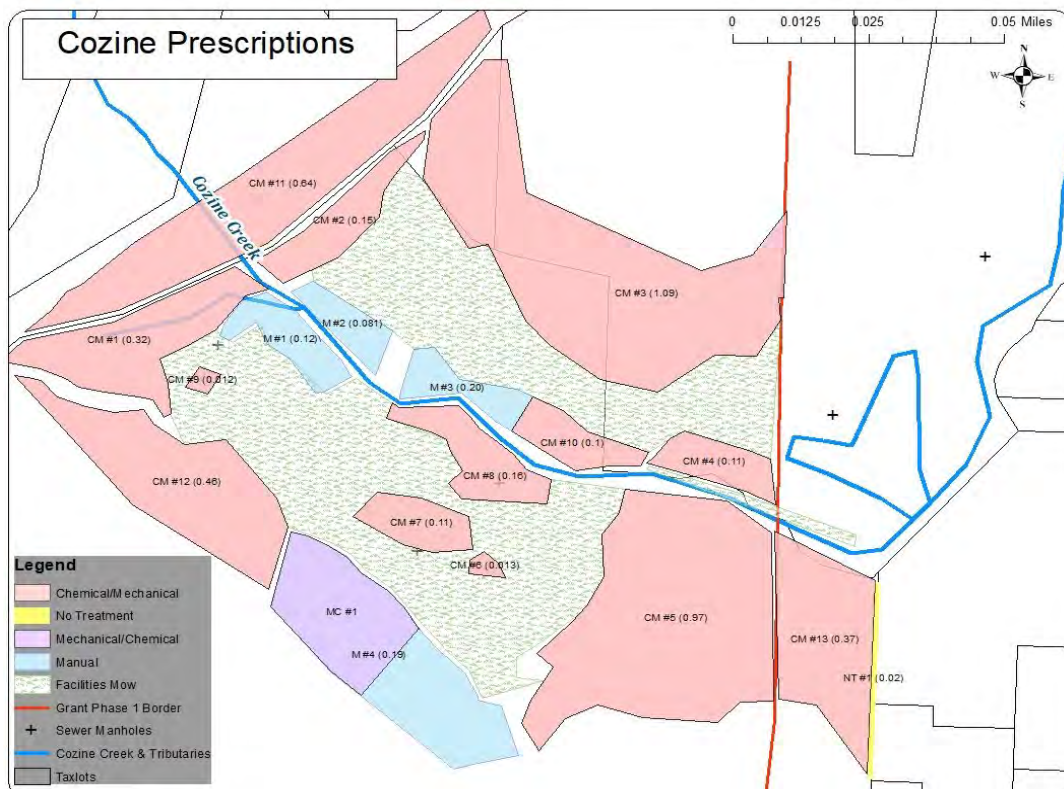
Manual treatment was used on four different sites. Most of the manual treatment as been conducted by volunteer work parties in partnership with the Cozine Conservation Corps and the GYWC. These work parties are scheduled monthly and are open to the public. Manual treatments were used on areas that were on too steep of a hill to mow. Sediment displacement is a big concern with manual removal, since pulling plant roots out of the ground creates significant soil disturbance and some erosion has been seen in these sites, particularly the Newby hill site.

### *Mechanical treatment*

Mechanical treatment has been done both by Linfield College Facilities and the GYWC. The intent of the mechanical treatment is to manage the dead plants and create a suitable area for the growth of new plants. Afterward, chemical treatment is used to kill the underbrush. A combination of mechanical and chemical treatment was recommended to be used on most of the property by the 2018 grant application.

## No Treatment

No treatment sites were left untouched, this included the area around the president's residence. However, the new president, Dr Miles Davis gave his permission and this area will now be designated for chemical/mechanical treatment starting in summer of 2019 with approval from president Miles Davis. Another site that was originally designated as no treatment, the Northside bridge area along the steep hill that leads to Highway 99 (CM #11), was treated with herbicides after the GYWC received permission from the City of McMinnville to treat the city's right of way. Mechanical treatment still needs to be performed area as the hill is too steep for the mower to access.



**Figure 1.1.** The prescribed methods for removing invasive species as of spring 2019. Map created by Sarah Schmidt.

## Assessment of Current Conditions

### *Vegetation*

Vegetation sampling was conducted on the Cozine creek property along Newby hill, North side bridge, south slide clear and burn sight areas (Figure 1.2). The 2017-2018 Senior Capstone ENVS students had collected baseline data from four different transects locations prior to any invasive species removal treatment. In the Fall of 2018, we remeasured these transects to look at the vegetation after treatment. There has been a significant decrease in the total invasive species on the property, this is mostly due to the success of English Ivy removal. Concerningly, Reed canary grass has invaded the south side clear area after the blackberry removal opened bare ground. Reed canary grass is a fast spreading invasive species that can take years to kill, requiring both mechanical and chemical treatments to fully prevent regrowth.



**Figure 1.2.** Location of the vegetation transects on the Linfield College campus. Map created by Sarah Schmidt.

Alongside removal treatments, native seedlings were planted along Newby Hill the spring of 2018. These included Oregon Grape, Snowberry, and Indian Plum. Oregon grape and Indian plum seedlings planted in the spring by ENVS students had lower survivorship than seedlings



planted by the GYWC. Snowberry seedlings survivorship on Newby Hill was found to be 129% percent in Fall of 2018, this indicates natural regeneration. The high death rate of the Oregon grape and Indian plum may be due to the weather conditions seen over the summer of 2018, which was very hot and dry. There were only four days between the months of July and August that received a trace of rain. However, this amount was not enough to be counted as a rainy day. Thus, according to the National Weather Service (NWS) this region remained dry From June 12th until September 12th, which is a new 90 day dry spell record (NWS 2018).

Since removing the Himalayan blackberry along the North Side Bridge, Burn site and South Side Clear areas, the Camas lily has quickly repopulated those areas. The camas now found in the North side bridge is flourishing, even growing into the manual treatment area along the creek side of the northside bridge area, denoted as M#2. The camas lily patch extends across the pathway and fades away at the burn site (Figure 1.3).



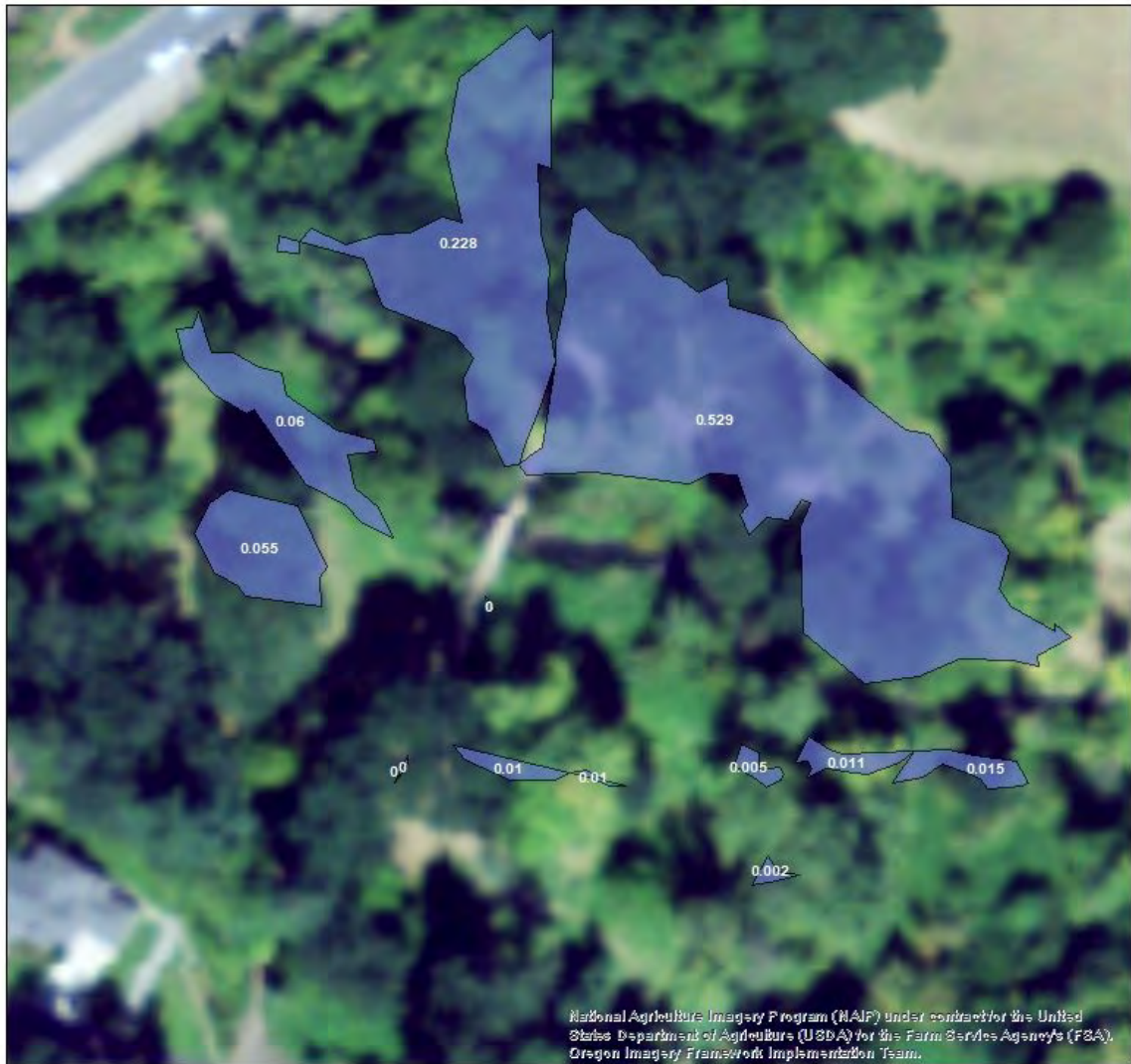
**Figure 1.3.** Camas lily in full bloom. Photo taken May 4th, 2019.

Camas repopulating the manual treatment is especially important as it will help stabilize loose soil from pulling up roots, and help to stabilize the creek bank. After the manual treatment in M#1, camas lily has repopulated the bare ground area and extending down to the creekside (Figure 1.4).



**Figure 1.4.** Camas lily patch in M#1 extending down to the creek, populating previous areas of intense erosion from the flooding season. May 9th, 2019.

The Cozine creek natural area currently holds the largest camas patch in McMinnville, covering a total of 0.92 acres of the property (Figure 1.5). In 2018, there was only 6 documented camas lily patches covering a total of 0.6 acres, thus since the start of restoration the camas lily has nearly doubled its original size, and now occupies 12 separate patches.



**Figure 1.5.** There are 12 total Camas lily patches in the Cozine creek natural area. In total Camas lily covers 0.924 Acres of the property. Map created by Sarah Schmidt

After removing the Himalayan Blackberry, the South side clear area (CM #5) is composed of bare ground, Camas lily, and Reed canary grass. Reed canary grass is growing closer to the creek banks, while small patches of camas are blooming near the tree line (Figure 1.6).



**Figure 1.6.** Two Camas Lily patches are growing in the South Side Clear area( CM #5). Previously, this area was covered by Himalayan Blackberry. Photo taken May 9th, 2019.

Small scattered Himalayan blackberry canes have resprouted in the bare ground areas, along with a few other unidentified plants. Outside of the dispersed Himalayan blackberry this area is bare ground (Figure 1.7). Currently, the seedlings could be treated manually with minimal soil damage. Volunteers are in the process of removing the downed woody debris from this area.



**Figure 1.7.** Outside of the small patches of Camas lily, the South Side clear area (CM #5) is mostly bare ground with small amounts of Himalayan blackberry regeneration. Picture taken May 9th, 2019.

Reed canary grass is regenerating in the new bare ground areas. Reed canary grass is an invasive species that is very difficult to kill. A large patch of Reed canary grass is growing south of the Cozine Creek bridge, on both the left and right side. This patch is very close and in some areas even intermixed, with the camas lily patches. Reed canary grass will take several years of chemical/mechanical treatment to kill, and if not taken care of could grow to around six feet tall, and outcompete the surrounding vegetation (Figure 1.8).



**Figure 1.8.** The south side of the Cozine bridge. A Camas lily patch is in the forefront with the Reed canary grass patch closer to the creek bank. Photo taken May 9th, 2019.

Italian arum is increasingly spreading through the areas of manual treatment such as Newby hill. Italian arum is another very hard invasive species to kill. If it is pulled out but has some roots still remaining in the ground, those roots will sprout to be a new plant. Due to this, it can very quickly spread throughout a whole area if not handled carefully. Removing Italian arum will take a combination of chemical and manual treatments over the course of several years. An area of particular concern for Italian arum is M#4, the hill behind Newby hill (Figure 1.1).

### *Water Quality*

The results of the studies conducted in Fall 2018 shows that the water quality of Cozine Creek at the Linfield College site continues to be poor and can not support a healthy salmon population. Areas of particular concern include dissolved oxygen and temperature levels because the levels salmon can tolerate were exceeded. Levels of phosphate and ammonia highlighted a problem that is most likely linked to nonpoint source pollution from urban and/or agricultural runoff (EPA 2016). Water quality variables in Fall 2018 compared to previous years showed significantly higher percent dissolved oxygen, Biochemical Oxygen Demand (BOD), temperature, phosphate, and ammonia. Turbidity and bacteria was significantly lower in 2018 than in years prior. Thus although the creek can not yet support salmon, there is evidence of improvement when looking at the trends through the years. Experiments with gravel are taking place on the pathways in hopes to reduce sedimentation and soil runoff into the creek. Sediment displacement caused by the restoration process may increase turbidity of the water. Currently, manual treatment areas are being subjected to a lot of erosion because the gaps in the soil that were created by pulling out a large amount of the root systems once keeping the banks in place. The bare ground along the creek banks created from removing the Himalayan blackberry may also cause more erosion of the creek banks, increasing sediment in the water (Figure 1.9).



**Figure 1.9.** Bare ground and Reed canary grass seen along the Cozine Creek bank in the North Side Bridge area. Frequent rains have caused the water level to rise and increased the flow of the creek. Picture taken April 11th, 2019.

### *Macroinverts*

PTI reports from Fall of 2018 showed that macroinvertebrate diversity is continuing to be poor. The majority of the individuals found in the creek were species of snail, worm, or clam all of which are pollution tolerant.

### *Wildlife*

Past reports and management plans recommended the use of wildlife cameras to surveil the usage of the property by wildlife. One of the biggest questions surrounding the topic of wildlife is how they would be affected by the change in landscape and removal of large patches of blackberry. Although Himalayan blackberry was harmful to the state of the property



as a whole, it provided significant amounts of food to herbivores and shelter for small birds and rodents. Beginning in Spring 2019 two wildlife cameras were placed down in the creek for a span of around 10 weeks switching between various locations. It has been observed that larger mammals have been utilizing the property. Examples include black-tailed deer (*Odocoileus hemionus*), raccoons (*Procyon lotor*) (Figure 1.10), and bobcats (*Lynx rufus*) (Figure 1.11). The bobcat had been caught on camera twice, and it was speculated that it may have been attracted to Cozine Creek by a decomposition study of a pig carcass that was taking place nearby.



**Figure 1.10.** Another common species found on the Cozine Creek property, raccoons foraging at night time.



**Figure 1.11.** The most surprising species discovered on the Cozine Creek property, the bobcat, making its way across in the morning.

### **President's Residence**

The 2018 restoration plan identified the area around the president's residence as a “no treatment” area. This was done because of the privacy concerns of the previous president. However, the hillslope below president's house is covered with an abundance of English Ivy. Some of the concerns include the English Ivy taking over and strangling the larger conifers that are located on the president's property. Other concerns include younger conifers growing up through the canopy and into the older oak trees and the English Ivy spreading to other areas that have been previously treated. With the recent approval from the President, the area will now be added into the treatment plan as a zone that will undergo chemical treatment in June of 2019 and mechanical treatment in July/August of 2019.

In order to identify the types of vegetation found on the property, the 2019 spring ENVS capstone class walked the property documenting the species they saw. An estimated 75% of the property is covered in invasive species. English ivy and Periwinkle (*Vinca minor*) made up most

of the ground cover on the property. Surprisingly, there were quite a few patches of Snowberry and Trillium (Table 1.1).

**Table 1.1.** Vegetation found on the president's property and amount of patches seen.

Vegetation	Patches seen on property
English Ivy	Covering 75% of property
Periwinkle	Covering 30% of property
Rhododendron ( <i>Rhododendron ferrugineum</i> )	4
Trillium ( <i>Trillium grandiflorum</i> )	4
Holly( <i>Ilex</i> )	3
Snowberry	7
Himalayan Blackberry	5
Daffodil ( <i>Narcissus</i> )	2

### **New Ownership**

Linfield college has sold a portion of the Cozine creek property to a Mid Valley Advancements (MVA) (Figure 1.12). This section of the property contains most of the area designated as CM #3, a portion of CM #10 and all of CM #4 (Figure 1.1). MVA property also includes the area west to Davis Street which was identified as Phase 2 in the Cozine Restoration Plan and was intended to be submitted for OWEB funding during the 2021 grant cycle. A meeting with MVA on April 24th, 2019 verified that MVA will allow restoration to continue on their property and will maintain the old Oak trees and camas lily patches on their side of the Cozine Creek natural area as well. MVA will not break ground on the property until 2020, but

plan to build both commercial and residential developments. MVA also expressed interest in considering the development of the existing trails throughout the Cozine Creek natural area and in order to promoting appropriate use of the area.



**Figure 1.12.** Tax lot boundaries representing the property now owned by MVAland. The flood plain area now owned by MVA remains as the phase two area of restoration project. Map created by Sarah Schmidt.

## **Recommendations**

As future classes continue to maintain and revise the previous management plans, we recommend the following actions be taken. First, we recommend continuing the use of wildlife cameras to collect data on wildlife usage of the property. Wildlife cameras are an easy method of data collection that does not cost much money and effectively shows how wildlife utilize the natural area. Second, we suggest considering methods of controlling the population of the invasive Reed canary grass (*Phalaris arundinacea*) and Italian arum (*Arum italicum*). These species will need an extensive removal plan, involving chemical/mechanical treatment over several years. The Italian arum seems to be thriving in the manual treatment area on Newby hill. Therefore, we recommended that we stop using manual treatment in this area, not only to prevent further spread from the threat of this invasive species, but also to reduce the significant amount of damage done to the soil, and erosion occurring in this area'. Instead of manual treatment, we recommend using chemical/mechanical treatment as the success of this treatment in the other areas of the property is undeniable. Third, areas such as CM#11 (Figure 1.1, Figure 1.13) still have remaining dead material from the treatment. This area along with any other dead plant material on the property needs to be removed as it is a fire hazard especially in the dry season.



**Figure 1.13.** Area along Highway 99 that was originally designated as a no treatment zone was treated with a chemical herbicide during the summer of 2018 after receiving permission from the City of McMinnville. Photo taken April 12th, 2019.

Lastly, previous classes also pointed out the concern of Oregon ash trees growing at a faster rate than the Oregon white oak trees. Although the larger Oregon ash trees should not be cut down, if new Oregon ash seedlings are spotted they could be removed to prevent the Oregon ash population from expanding and outcompeting the Oregon white oak.

## **Conclusions**

Thus far the Cozine creek natural area restoration is going as planned. The treatments proposed by past ENVIS classes have been successful in removing the Himalayan blackberry and English ivy that previously occupied property. The management plan created by 2017 ENVIS

485 class has been updated to show the new prescriptions and land ownership of the Cozine Creek natural area. Although phase two areas of the project is now under new ownership, MVA responded positively to allowing the ENVS department to continue treatments, specifically the chemical/mechanical prescription given to that portion of the property. President Davis allowing treatment on the presidents portion of the Cozine creek natural area is also a major step for restoration, as it was a previous concern that invasive species could keep spreading from that section of the property to treated areas. The expanding Camas lily population is a very positive sign for the growth of native plants on the property. Newby Hill offers signs that native plants such as Snowberry are naturally regenerating. However, the property is still in a transitional stage of restoration. As the Camas lily continues to grow along with the other native plants planted by the ENVS department, the soil will become more stable and wildlife will have more habitats. The Reed canary grass and Italian arum will have to be controlled to prevent it from over running the property like the Himalayan blackberry and English ivy did before. The water quality of Cozine creek remains in very similar conditions as years prior. Fall of 2018 data suggest that the creek is improving, but is still considered to be poor quality. Turbidity should be watched closely to see how sediment displacement from the restoration process is affecting the creek.

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## THE SOCIAL CONTEXT

*Kainoa Cuttitta and Taylor Souza*

Chapter Editor: Taylor Souza

### Introduction

The Cozine Creek natural area not only provides important habitat for native plants and animals but also serves as a vital educational and recreational resource for the Linfield campus and greater community of McMinnville. As part of creating a management plan and site assessment for the Cozine Creek natural area, it is important to understand and consider the social context. This chapter provides a summary of the previous reports produced by Linfield College Environmental Studies students describing and documenting the social context as well provides additional information about ongoing and current outreach and educational efforts. This chapter also includes new information and recommendations about potential improvements that could be made to encourage appropriate educational and recreational uses of the property.

### Summary from Previous Reports

The Environmental Studies Department at Linfield College has played a significant role in improving the stewardship and preservation of the Cozine Creek natural area and Environmental Studies student have produced multiple reports and assessment plans regarding not only the natural aspects of the area but also the social uses of the site. These social uses have been described in the *Cozine Inventory and Assessment, the Cozine Creek Restoration Management Plan, and the Cozine OWEB (Oregon Watershed Enhancement Board) Grant and Restoration Report*. The Cozine Creek Inventory and Assessment provides the bulk of the land use history and stakeholder concerns thus far, summarizing land use history, management and uses and stakeholders. Drafted in 2016, the Inventory and Assessment begins with the history of the inhabitants of the area, including the Yamhill Indians and Kalapuya Indians which were moved to the Grande Ronde Reservation. This draft also outlines the way in which the city of McMinnville was formed and the influence of John Gordon Baker, William T. Newby, Sebastian C. Adams, and Samuel and Mahala Cozine. There are landmarks located in McMinnville named after all of them. Samuel and Mahala Cozine were particularly pivotal in the implementation of Cozine Creek at Linfield College as they donated the parcel of land that Linfield College owns, now referred to as the Cozine Creek property. In this inventory and assessment, the history of

monuments and bridges are also outlined; the most important being the footbridges that once spanned Cozine Creek and were considered the main entrance to campus. The Inventory and Assessment also includes information on past floods and the way in which flooding has been dealt with in the past as well as data on the storm water drainage system, sewer mains and the addition of lamp posts in the area. The results of a stakeholder questionnaire provided in this document has allowed the Environmental Studies Department and the Greater Yamhill Watershed Council (GYWC) to better understand stakeholder concerns and preferences associated with the property. From that feedback, the Inventory and Assessment made recommendations for increased stakeholder engagement and development of a future management plan for the property.

The Cozine Creek Management Plan, drafted in the Spring of 2018, outlined many of the short term and long term goals for the property. The document identified cultivating stewardship and facilitating educational use as an overarching social goal for the property. Students also identified stabilization of the pathways, sponsoring community-based work parties and encouraging educational uses as important objectives towards achieving that goal. Additional longer-term goals include the development of designated spaces for education and recreation and the expansion of curricular education programs. The Cozine Creek Restoration Project Grant Report (2018) includes information on outreach and education and volunteer events. In this report, students outline current stakeholder involvement efforts and potential restoration activities as part of a request for funding through an Oregon Watershed Enhancement Board (OWEB) grant. This report provides details on the role of the Greater Yamhill Watershed Council (GYWC), the Linfield College Office of Sustainability, the Cozine Conservation Corps (CCC), the Office of Community and Engagement Service, and Change Corps. All of these groups and organizations play an important role in the organization and execution of Cozine Creek work parties which include native species planting, invasive species removal and trash cleanup. The goal of work parties is to allow students, faculty and community members to be involved with the restoration of the Cozine Creek area. This facilitates stewardship by increasing the engagement and commitment of stakeholders by allowing them to see the project executed, accomplished, and the subsequent effects and impacts of their work.

## Footbridges and Monuments

Cozine Creek has been home to a few historical monuments that have impacted the way the city of McMinnville and Linfield College has formed around it. Historically, access to college from town was provided by a footbridge spanning Cozine Creek to Pioneer Hall. This was considered the main entrance to campus, and alumni from the class of 1931 have gifted the brick signpost to Linfield College (Figure 2.1).



**Figure 2.1:** Once considered the main entrance to campus, alumni from the class of 1931 built this brick signpost to commemorate their graduating class.

The second monument is a bronze plaque set on a stone that was dedicated to Storey Park in 1960 in honor of Ralph Storey, who was a professor at Linfield College (Figure 2.2).



**Figure 2.2:** Plaque dedicated to Storey Park in 1960 in honor of Ralph Storey, who was a professor at Linfield College.

### **Current Uses**

Currently, the Cozine Creek area is used as an access route to and from town and for various educational and recreational uses including bird watching and relaxation. The Cozine Creek area serves as a direct pathway between the Linfield College campus and Baker Street, which is the main highway going through the City of McMinnville. An issue that the City of McMinnville has recently been dealing with is a homeless population which has resulted in some inappropriate use of the area. With Cozine Creek being a part of the Linfield College campus, multiple classes in different departments take advantage of the educational opportunities that it has to offer. Classes that use this area are: Introduction to Biology (BIOL 210/211), Biology and Identification of Woody Plants (BIOL 350), Introduction Ecology (BIOL 285), and multiple

different environmental studies courses, such as Environmental Science (ENVS 201), Introduction to GIS (ENVS 230), Forest Ecology and Management (ENVS 360), Research Methods (ENVS 385), and Senior Capstone (ENVS 460/470). The Introduction to Biology course uses this area to study animal foraging by monitoring bird feeders. Along with the biology department, the introduction ecology course uses Cozine to measure light intensity on various leaves in order to analyze the stomata density. There is also HHPA senior thesis research being done on forensic taphonomy where they have placed a small pig carcass in order to observe its decomposition over the next several months (Figure 2.3).



**Figure 2.3:** Pig carcass enclosed in cage for observation on decomposition.

## **New Stakeholders and Ownership Changes**

### *Presidents Property*

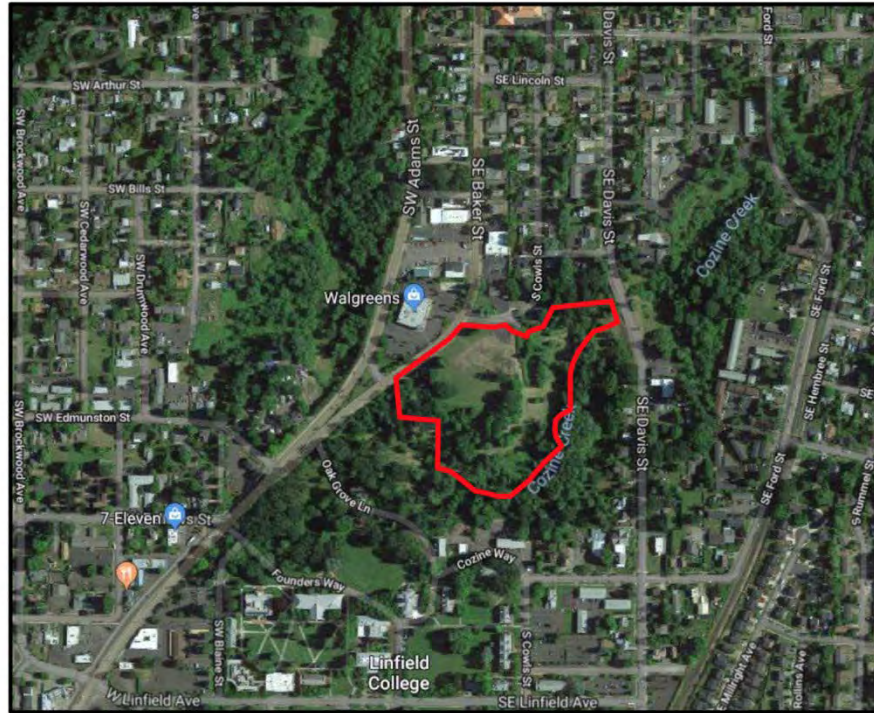
When the Cozine Creek restoration effort began, the president of Linfield College was Thomas Hellie. Presidents of Linfield College live in a house on campus bordering the Oak Grove. In the past, administrative stakeholders were supportive of using the property for educational purposes but have continuously expressed a concern about maintaining the privacy of the president's residence. Therefore, the area surrounding the President's house was prescribed to be a "no treatment" zone in order to maintain the existing vegetation as a privacy buffer. In 2018, President Thomas Hellie stepped down as President of Linfield College and Dr.

Miles Davis was inaugurated as the new president of Linfield College in 2019. Due to the change in presidential regime, Dr. William Fleeger (Visiting Senior Scholar of Environmental Policy and Sustainability) and Luke Westphal (Executive Director of the Greater Yamhill Watershed Council) met with President Davis to discuss the reincorporation of his property to the project. The meeting resulted in positive feedback from President Davis who gave his permission to include his property in restoration efforts but requested to be notified ahead of time of the days in which his property is being worked on as well as include his family (wife and daughter) in invitations to work parties and restoration events.

#### *Sale to Mid-Valley Advancements*

Recently, Linfield College sold a piece of their property known as the “old Columbus School site” to Mid-Valley (MV) Advancements an organization that provides support and employment for disabled adults (Figure 2.4). This property is on the north side of Cozine Creek and on the west side of Baker Street across from the Walgreens store. The Columbus Elementary School that once stood on this site was destroyed in an earthquake in 1995 (Gernhart et al. 2016). This sale of this property to MV Advancements will provide them with the ability to construct 24 residential units for senior citizen housing along with commercial office space. The boundaries of this property include some of the treatment areas identified in the current OWEB restoration grant as well as areas designated as Stage 2 of the Linfield Cozine restoration plan scheduled for potential funding and treatment in the OWEB 2021 funding cycle. During a meeting with Ms. Kathy Schlotfeldt, the Executive Director of MV Advancements on April 24, 2019, she expressed support for the work being performed and an interest in participating as a partner after they take occupancy of the site. Because the development is occurring in two phases with, the first phase being construction of commercial office space and the second phase will be development of residential living facilities, it will be several years before the property is fully occupied. We also discussed with Ms. Schlotfeldt the issue the trail that connects the access from Davis Street to the trail on the Linfield property, while this is not an official trail system there is a considerable amount of informal use. Although there was not any decision reached during this meeting, trail access and inclusion of the property in future restoration proposals will need to be negotiated with MV Advancements and the GYWC.

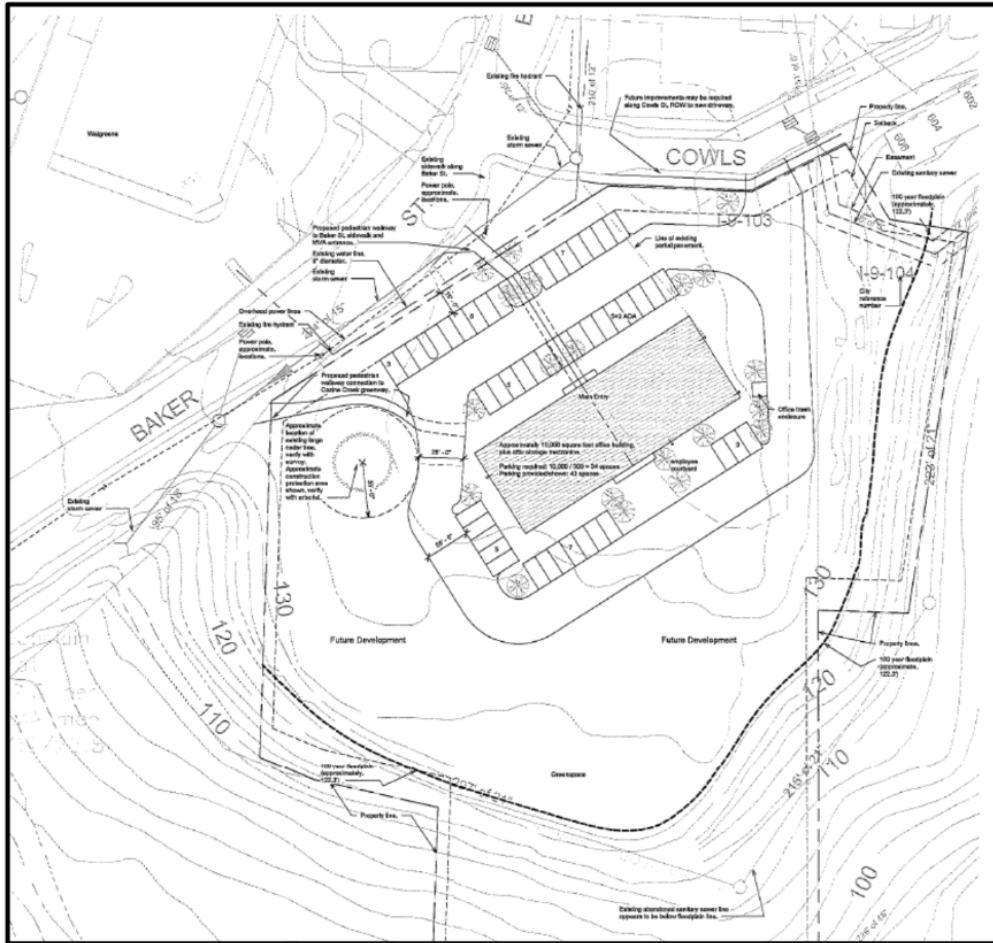




**Figure 2.4:** “Old Columbus School” Site Reference map. Obtained from the City of McMinnville, Planning Commission Minutes 12-20-18, Ordinance No. 5061.

As an organization that provides social services to individuals who experience disabilities, the proximity of the site to Cozine Creek could potentially open doors and facilitate partnership between MV Advancements and Linfield College by extending work-party invitations to the disabled populations that would not only be beneficial to the Cozine Creek area and Linfield college, but also to residents of MV Advancements who would be allowed to cultivate the landscape and participate in stewardship in their own backyard.

When questioned of their intentions of development in the floodplain, the City of McMinnville expressed that “based on the wetland, flood plain, and topographic maps, it is estimated that approximately 50% of the site is usable (124,575 square feet, 2.86 acres)” (City of McMinnville, date). The applicant responded that “they aware that Linfield College in conjunction with the GYWC has plans to restore the Cozine Creek property between the Linfield campus and this property, to its original, native plant species,” and have submitted a tentative conceptual development plan for the proposed area which depicts potential office and multiple family residential uses they anticipate construct (Figure 2.5). It is MV Advancements intent to full cooperate with this restoration (City of McMinnville, 22 January 2019).



**Figure 2.5:** Tentative conceptual development plan (non-binding) for the site produced by MV Advancements. This concept plan shows the development of approximately 10,000 square feet of office building and identifies areas of “future development” where up to 24 multiple family dwelling units are intended to be constructed. City of McMinnville, Planning Commission Minutes 12-20-18, Ordinance No. 506.

In an in-person meeting with students of ENV5 470, Dr. William Fleeger, Luke Westphal (GYWC) and Kathy Schlotfeldt (Executive Director of MV Advancements), Kathy expressed that while development of MV Advancements at the Old Columbus site is far out, MV Advancements is committed to not developing in or disturbing the floodplain, with a philosophy of do no harm. Kathy expressed that as MV Advancements develops the site, and especially the residential area, Cozine Creek will be a, “wonderful space to welcome people and bring in the type of people that MV advancements supports” (Schlotfeldt, in-person communication). At the

end of the day, MV advancements aims to be good neighbors and be a partner to Linfield College.

## **New and Ongoing Outreach Efforts**

### *Volunteer Days*

Once a month, the ASLC sponsored club, Cozine Conservation Corps, organizes a work party to get people to volunteer and help the club with their efforts on improving ecological quality of the area. The volunteers at these work parties pick up and remove debris, weed, and remove invasive species. In the Fall of 2018, Cozine Conservation Corps held five events with a total of 48 participants that all together put in 126 hours of work. Three events were held in the Spring of 2019 with 31 participants that all together put in 93 hours.

### *SOIL*

In previous years, Linfield has offered a pre-orientation program to incoming first-year students called SOIL (Sustainably Oriented Interconnected Living). The SOIL project took place over the length of a week and taught students about sustainable living and how to apply that to their daily lives. Through this program, students had the opportunity to engage with other students and the local community through volunteering, activities and field trips. Incoming students spent half a day learning about the Cozine Restoration Project and performing service projects to control invasive species, clean up litter and plant native vegetation. For the 2019 pre-orientation program, Linfield will be replacing SOIL with a program called WILD, which stands for Wilderness Immersion and Leadership Development. In the current program plan created by Janet Peterson, the pre-orientation program will not be using Cozine Creek as a restoration area, but instead using it as an area for wilderness medical scenarios for the participants as they get Wilderness First Aid Certified during the program.

### *Website and Video*

Currently there is a Cozine Creek tab being added to the Environmental Studies page on the Linfield College website. This addition to the department page will help increase awareness about the Cozine Restoration Project and everything the property has to offer as a resource. The Cozine Creek tab includes a general Cozine Creek video with shots of the natural areas, different

ways to utilize it, and volunteer days. Along with the general Cozine Creek video, there is also a video displaying the history of the Cozine Creek area that contains historical photos and a voice over that describes the history and importance of the property. There are also dates of the volunteer events organized by the Cozine Conservation Corps and contact information for the current club officers. Along with information about Cozine Creek, the tab will also contain previous reports done by ENV5 470 students discussing past accomplishments and future plans.

### *Educational Use and Structures*

As part of individual project, we explored the potential for the addition of structures to the Cozine Creek natural area. Currently the property is used primarily by both the biology and environmental science departments, but the addition of structures could encourage use from other departments and facilitate greater levels of educational use. Because the property is located in the floodplain, the structure would have to incorporate flood proof design and also have zero to low maintenance costs. To facilitate this project, permissions will need to be gained from College Public Safety (CPS) and the Linfield College Facilities office.

In the City of McMinnville, floodplain areas have their own zoning district named the Floodplain Zone (F-P zone). In the F-P zone, recreational facilities and structures are classified as conditionally permitted uses. A conditional use in the F-P zone is described as an “open land recreation facility requiring the use of any structure”. The process of obtaining a conditional use permit includes the execution of a neighborhood meeting, submission of a land use application, and a review in a public hearing. The application for the addition of a structure to the floodplain includes a map with plans drawn to scale, a 100-year flood projection elevation of Cozine Creek, property boundaries and dimensions, ground elevations shown by contour lines, existing and proposed structures, dimensions and elevation of existing and proposed fill, a profile showing the slope of the bottom of the creek, specifications on fill material, grading, channel improvement, maintenance plans, and restoration plans for the completed project. These plans and drawings do not have to be completed by a professional, but must be accurate in their depictions. The timeframe for the overall process is approximately eight months. A more detailed description of the conditional use permitting process as well as potential structure design options and a cost analysis can be found in the appendix.

## **Conclusions and Recommendations**

Cozine Creek is a hidden gem of Linfield College's campus that has benefitted positively from increased campus awareness and increased restorative action. As the Environmental Studies Department continues to regularly monitor and assess the area, Cozine Creek will flourish as an important habitat for native plants and animals, as well as a vital educational and recreational resource for the Linfield College campus and the greater community of McMinnville. By assessing current management practices and evaluating new and ongoing outreach efforts, Cozine Creek will benefit in regards to the social context, as long as short term and long term goals and efforts are continued.

### *Short term goals*

Currently, the most recent documentation of the number of participants at the work parties was August, 2017. A short term goal would be to implement a better documentation system of the service hours by creating a running spreadsheet of each event. This spreadsheet would document participant names, quantify total hours spent working, as well as the individual goals and accomplishments of each work party. This spreadsheet could be managed by the Cozine Conservation Corp and overseen by a willing professor in the Environmental Studies department.

With the recent changes to staffing in the Sustainability and Community Service offices, the lines of communication have not been as strong or as effective as they have been in the past. Our goal for the summer and fall semester would be to reestablish those lines of communication and build relationships with the new staff members. In lieu with service hours, a working goal of the Environmental Studies department and the Cozine Conservation Corps will be to create more publicity of work-parties and events across campus so that there are more participants in weekend work-parties of the area.

### *Long term goals*

Since the process of obtaining a conditional use permit to have a structure placed in the F-P zone takes eight months, we are making this a long term goal for the next Environmental Studies Senior Capstone students. Another long term goal would be to create and place signage to help facilitate identification of native species and the local history. With the lack of knowledge

about the existence of the Cozine Creek natural area's existence, our last long term goal would be to work with Linfield College to get this part of campus included on the official campus map so members of the Linfield community are aware of it.

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## APPENDICES



# City Park Vegetation Cover

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## Introduction

In 2011, the Linfield college Environmental Studies Department started monitoring the water quality of Cozine Creek as it flows through the Linfield property. Additionally, the college has taken steps to restore the surrounding oak and riparian woodland habitat to a more natural and native state. Thus far the college has found the creek to have poor water quality due to the increase of urbanization and long-standing presence of agriculture in McMinnville, Oregon. Cozine Creek is a tributary to the Yamhill River, which provides habitat for key native salmon populations. The presence of urbanization and agricultural pollutants in the river have detrimental effects of salmon populations, thus the Yamhill River and all creek tributaries are assessed based on their ability to support native salmon populations. Current trends show Cozine Creek to have low rates of dissolved oxygen and pH, while having high temperatures, turbidity, phosphate, coliform bacteria and biochemical oxygen demand. All these parameters are outside of the EPA's recommended levels to support healthy salmon populations (Colahan et al. 2011; Bailey et al. 2012; Hollenbeck et al. 2013; Fahy et al. 2014; Blanco et al. 2015).

Up until recently, the Cozine Creek natural area was overrun with invasive species such as Himalayan blackberry (*Rubus armeniacus*) and English ivy (*Hedera helix*). Herbicides, hand removal, and mowers have been used to remove these species, and continuous efforts are still being carried out today. Vegetation data along with the water quality testing data collected every year by Linfield college provides a lot of information about the state of the natural area on the Cozine Creek property. However, little is known about the areas of the creek outside of the property, including areas directly above and below the study site. The creek eventually flows into the Yamhill River, which is home to salmon populations such as the native coastal cutthroat trout (*Oncorhynchus clarkii*), Willamette winter steelhead (*Oncorhynchus mykiss*), and Coho salmon (*Oncorhynchus kisutch*), making it critical to know the water quality of creeks contributing to the water flowing through the river (Chione, 2019).

This project focuses on mapping and assessing the vegetative conditions of the riparian areas on properties owned by the City of McMinnville, downstream from the Linfield study site. Mapping the types of vegetation along the stream banks will help to analyze the condition of the downstream property and document what kind of vegetation is growing there. This data will be presented in GIS ArcMap by splitting the property into areas where the majority of vegetation cover is 75%, 50% or 25% invasive species. The purpose of this project is to make an overall assessment of the quality of the riparian area downstream to the Linfield study area.

## **Background**

The Willamette Valley is a 120-mile-long level alluvial plain located in the Pacific Northwest. The Willamette River flows through the entire length of the valley bordered by the Coast Range to the west and the Cascade Range to the east. Historically, the region was composed of riparian woodlands, wet prairies, oak savanna, and open grasslands. Today, large areas of the Willamette Valley are residential areas, vineyards, and farms. Many native flora and fauna species are threatened by the decline of open land caused by agriculture and urbanization. The rich clay soils in the Valley make it an ideal area for farming, thus it has become a major producer for international trade of grass seed, wine grapes, hops, nuts and grains. Urbanization has led to habitat fragmentation, nonpoint source pollution, and the decline of many native species populations. For this reason, the remaining natural forested and grassland areas are all crucial to maintain the health of this region, and to continue providing habitat for native species (The Oregon conservation strategy, 2019).

A key natural function of the Willamette Valley floodplain is its ability to store water during seasonal floods. Due to this, riparian woodlands are a very critical ecosystem to maintain in the Valley. Riparian woodlands are the forested areas adjacent to a body of water, providing a key linkage between terrestrial and aquatic ecosystems. Being a transition zone makes it an area of high biodiversity for both flora and fauna species, which is an important characteristic of a healthy riparian ecosystem. Riparian land serves as a floodplain, and through the months of October to April can experience long periods of frequent high water and flooding. In the summer, these areas are subjected to drought. This continuous change of climate means the

vegetation within riparian zones must be able to withstand the seasonal weather fluctuations (Naiman and Decamps, 1971). Tree and shrub species such as Willow (*Salix spp.*), Snowberry (*Symphoricarpos albus*), Oregon ash (*Fraxinus latifolia*), are all common species seen in healthy riparian habitats that are well adapted to the seasonal changes. Plant species like the Camas lily (*Camassia quamash*), and many grass species are critical for stabilizing sediment during periods of high water (Robinson, Bennett, and Ahrens, 2011).

Riparian areas have a high level of fauna biodiversity. These areas are an important habitat for different species of amphibians, reptiles and birds. The Cozine area has a very large bird population, however lacks amphibians and reptiles. The only documented amphibian or reptile species in the Cozine Creek natural area are the Red bellied newt (*Taricha rivularis*), Pacific tree frog (*Pseudacris regilla*), Common garter snake (*Thamnophis sirtalis*). Mammals like the native White-tailed deer (*Odocoileus virginianus*) are frequently seen in riparian zones, as well as the increasingly growing population of invasive species such as the Nutria (*Myocastor Coypus*). Due to the areas high biodiversity it serves as a natural corridor, where wildlife and plant vegetation can survive alongside human development (ODFW, 2019).

Although the immediate area adjacent to a stream in a riparian zone is off limits to development due to flooding events, the greater area surrounding the floodplain has been increasingly used for residential development. Urbanization has created unique problems for riparian ecosystems including increased amounts of litter which introduces toxins to the stream as well as creates barriers for wildlife and stream flow. Human development near preserved natural areas can also cause an increase in the amount of chemicals found in the water, including anthropogenic substances such as medical waste, sunblock, fertilizers and disinfectants. Pollutants can increase the nutrient levels such as ammonia, nitrogen, and phosphate in streams. Additionally, these toxins can have a significant impact on fish physiology and contribute to the decrease in pollution sensitive species in the creek. Urbanization contributes to erosion, sedimentation, and channelization. Rehabilitation projects such as replanting native land cover, removing invasive species, maintaining adequate waste and stormwater management systems and restoring streams to their natural complexity have all been shown to help minimize human impact on riparian areas (American Fisheries Society, 2019).

## Methods

The field research of this project was completed on March 20<sup>th</sup> and April 10<sup>th</sup> 2019 in partnership with the Greater Yamhill Watershed Council. Together, we walked through the targeted city park areas, starting below the Linfield study site at the Davis St. culvert. Using a Garmin GPS, we tracked a line of the creekside, taking notes and specific data points for when there was a major change in vegetation making up the majority of the land cover (Figure 1). We then took coordinates of important native flora to document and analyze the amount of native vegetation that is on the property versus invasive vegetation. Invasive vegetation, like Himalayan blackberry, was mapped by tracking a line around the vegetation or taking coordinates along edge points of a cluster of invasive. After the coordinates are gathered, the data was downloaded into ArcMap, and percent cover of invasive vegetation was identified along the creek banks.



**Figure 1.** Luke Westphal collects data points on his GPS along the Cozine Creek streambank.



**Table 1.** List of the species making up a majority of the vegetation found in each zone.

75% Invasive species	50% invasive species	25% invasive species
Himalayan Blackberry	Himalayan Blackberry	Rush
Reed Canary Grass	Rose	Trillium
English Holly	English Holly	Meadow Rue
Red Alder	Red Alder	Bleeding Heart
English Ivy	Native Blackberry	
Dogwood	Spirea	
	Snowberry	

On the right side of the property from Davis St., there is a large hillslope covered in grass with an outer vegetation line of Himalayan blackberry and dispersed patches of Reed canary grass. The Himalayan blackberry created a barrier between the residential developments to the city park grassland area before the creek (Figure 3). The Himalayan blackberry and Reed canary grass were thick and dense around the perimeter of the city park, a lot of birds were flying around the area, suggesting that they live inside the Himalayan blackberry.





**Figure 3.** Dense Himalayan blackberry thickets before start of grassland around perimeter of the city park area.

On the right side of the creek there was a large population of wildflowers, like Bleeding hearts (*Dicentra formosa*), Meadow Rue (*Thalictrum rochebruneanum*) and Trillium (*Trillium ovatum*), which were growing over a deer trail near the creek banks (Figure 2). Yellow flag iris (*Iris pseudacorus*) was found on both sides of the creek as well as through the middle (Figure 4). Yellow flag iris is a semi aquatic species that populates creek banks and spreads into the creek, clogging the waterway and reducing stream flow. The dense root systems can prevent other seeds from germination and will most likely crowd out surrounding nearby vegetation if left to continue growing (personal communication with Luke Westphal from GYWC).



**Figure 4.** Yellow flag iris growing on both sides of the creek bank and through the middle of the creek.

Beaver chew was seen on many trees near the creek side, this indicates an active beaver in the area, but no beaver dens were seen. Ducks and many other bird species were on the property, as well as evidence of deer through deer trails and droppings.

Tents, sleeping bags, shopping carts, clothes, and food wrappers indicate that this area was recently(if not currently) being used as shelter by a homeless community. Multiple sleeping bags and shopping carts were inside the creek caught on a tree branch or rock and preventing stream flow.

A overflowing or broken pipeline created deep eroded tunnels for water channels to flow through to Cozine Creek (Figure 5). Multiple channels were found dispersed throughout the property. The tunnels often eroded into the land near an area of inappropriate use, thus some

litter was being carried to the creek through these tunnels as well. The water overflowing the eroded tunnel flooded many sections of vegetation and created a swamp like environment higher above the creek edge.



**Figure 5.** Eroded channel from pipeline next to littered clothing.

## **Conclusion and Recommendations**

The city park area was made up of mostly invasive species as expected. The species of highest concern for restoration are Yellow flag iris, Reed canary grass and Himalayan blackberry. All of these species will need intensive treatment to remove, such as being mowed and sprayed with chemical herbicides. The Yellow flag iris will need to be watched closely during restoration because small fragments of the root can regenerate into a separate plant. A homeless community was not present at the time of data collection, but the presence of litter,

tents, and sleeping bags show that that area is or was recently being used for shelter. This litter would need to be picked up by volunteer workers prior to any restoration beginning. Needles and other evidence of drug use was found all throughout the property which is a safety concern for volunteers and anyone walking through the property. It may be appropriate to leave a notice when future classes will be present in that area, and for classes to wear appropriate footwear and clothing to be walking through uncapped needles.

I would recommend a water quality test to be conducted on the property. This data would indicate if the water downstream from the Cozine Creek natural area increases or decreases in its ability to bear salmon as it flows away from the Linfield restoration projects. The amount of litter seen throughout the city park property is particularly concerning as it may be heavily polluting the water. The water quality parameters meeting safe salmon bearing limits is particularly important because the water is closer in proximity to the conjunction of Cozine Creek and the Yamhill river, which is an important waterway for Coho salmon along with Coastal cutthroat trout, Willamette winter steelhead and many other Oregon native fish.

For future vegetation cover projects, I would also recommend taking GPS coordinates on multiple devices. In this project data was taken on a garmin GPS as well as a GIS phone app and GPS from GYWC. The garmin GPS used had technical issues and the data stored on it was unable to be accessed, thus the devices that were going to be used as backup became the primary source of data collection. I would recommend downloading the data on to a computer rapidly after data collection so errors or technical issues can be caught early and redone.

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**Cozine Creek Website**  
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**Introduction**

When prospective students are in process of deciding what schools to attend, departmental web pages are a key mechanism in providing those students with information on what majors and extracurricular activities that the school has to offer. Along with gaining the attention of prospective students, departmental pages help to raise awareness of current students. The current Environmental Studies page on the Linfield College website has minimal information about the Cozine Restoration Project and the work that students have done to improve this campus natural area. Adding a Cozine Creek tab with a video showing everything Cozine has to offer, a video of the history of Cozine and the surrounding area, and the previous reports done by the Environmental Studies students could help increase awareness about the Cozine Restoration Project and the benefits this area provides to the campus and larger community of McMinnville. The goal of this project is to feature the work of ENVS students involved in the Cozine Restoration Project on the departmental web page and to create informational videos that can be used increase student awareness about the natural area and attract interest from prospective students who might be interested in majoring or minoring in Environmental Studies.

**Background**

On the current Environmental Studies page there is little mention of Cozine Creek and no mention of the research that the Senior Capstone students have done and are doing. On the current department page, there is a tab that has the Cozine Creek Restoration (Figure 1), but no mention of the reports done by students. The previous Cozine Creek Restoration tab stated, “Linfield College owns a section of Cozine Creek as it flows north of campus. The ENVS department committed to institute a major restoration project on our property a few years ago after conducting water quality studies in the creek beginning in 2011. In 2016, the students in the capstone course completed an inventory and assessment of the area; in 2017, the students wrote a management plan; and in 2018, the students wrote and received a \$15,000 OWEB (Oregon Watershed Enhancement Board) grant to fund restoration work (control of invasive species and subsequent planting of native species) in the area.” (Environmental Studies Major). The existing web page is dull and does not give enough information that would be of interest to prospective students (Figure 2). With the current decline in enrollment at Linfield College, there needs to be an update to departmental web pages to appeal to high school students that are exploring their options for college. By having this webpage, it will improve the image and increase awareness of not only the department but the College. By informing prospective and current students about the ongoing partnership between the Greater Yamhill Watershed Council (GYWC) and the ENVS Department to improve the Cozine Creek natural area, it could attract students with an interest in acquiring a major in Environmental Studies.



**Figure 1:** The current tabs on the department page.



# Environmental Studies at Linfield

Environmental Studies is an interdisciplinary study that centers on the relationships between humans and the planet Earth. It seeks to help students develop a deep awareness of the complex, highly dynamic nature of the world we inhabit, including interactions among human populations, the biological and physical environments, resources, technology, social organization and culture.

The Environmental Studies Department has [2 full time faculty and a lab coordinator](#).

We offer a major in Environmental Studies with three focus areas so students can specialize more in one area; we also offer a minor in Environmental Studies.

## Environmental Studies Focus Areas

- [Environmental Science](#)
- [Environmental Policy](#)
- [Environmental Humanities](#)

All students in Environmental Studies take a core of courses including Environmental Science, Environmental Governance, and the full year senior capstone sequence (Environmental Research and Environmental Project).

The ENVS faculty are committed to giving our students hands on learning experiences, especially in the capstone sequence, in collaboration with community partners such as the Greater Yamhill Watershed Council and the Yamhill Soil and Water Conservation District.

**Figure 2:** Environmental Studies Department homepage.

## Methods

- Work with Linfield ITS to gather access and training to editing the Linfield website.
- Use the Linfield Archives to gather historical images.
- Reference previous reports to write the history script and bio for web page.
- Take photos and video footage to create the video for the website.
- Create Environmental Studies department YouTube account to upload videos to.

## Results/Outcomes

The narrative for the main section of the Cozine Creek tab will say, “As part of the Greater Yamhill Watershed, The Cozine Creek natural area is a 12-acre Oak and riparian woodland located on the north side of campus. Home to a variety of wildlife, this inviting natural area spans Cozine Creek and contains walking paths, historical monuments and a regionally significant population of camas lily. The Cozine Creek natural area offers learning opportunities and recreation as well as an area for students to escape and enjoy the natural beauty that it offers. For the past four years Linfield students and the Greater Yamhill Watershed Council (GYWC) have worked together to restore the property by controlling invasive species, primarily

English Ivy and Himalayan Blackberry and planting native plants to improve the ecological health of the natural area for the generations to come.” Along with this narrative, I will add photos from various projects, activities that have taken place at Cozine, and a video showing Cozine Creek and its natural area, the link to the video can be found here:

<https://youtu.be/TcEFm4zpqDU>. For the history of Cozine Creek, the video will have historical photos with a voice over that tells the history. Along with the narrative and videos, there will also be a list of the volunteer scheduled by the Cozine Conservation Corps.

On a subtab of the main Cozine Creek page there will be the previous reports done by the Environmental Studies students with an introduction that states, “Starting in the Spring of 2016, students in the Environmental Studies capstone course completed an inventory and assessment of the area; in 2017, the students developed a restoration and management plan; and in 2018, the students used the restoration plan as a basis for a successful grant application to OWEB (Oregon Watershed Enhancement Board) for \$15,000 to fund restoration work (control of invasive species and subsequent planting of native species) in the area. The students in 2019 spent the semester updating the management plan and inventory based on what has been accomplished during the beginning phases of restoration as well as the sale of a portion of the Cozine Creek property to Mid Valley advancements. Below, you will find the previous reports done by the Environmental Studies students.” Along with the previous reports, there will be a photo gallery with photos from the restoration volunteer days and students using the area.

The photos and videos included on the web page can be used in social media posts to publicize the ENVS Department and everything the students have done and are currently doing. By uploading the past years project reports on the web page, it will show students that the ENVS Department takes pride in the work that the ENVS students do. The projects to be included are: *Cozine Inventory and Assessment*, *Cozine Creek Restoration Management Plan*, and *Cozine OWEB (Oregon Watershed Enhancement Board) Grant and Restoration Report*. To keep the web page up to date with current content and looking fresh, I recommend that a faculty member in the department or another ENVS student obtain access to web page editing from ITS.

## References

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# **Increasing Awareness of Cozine Creek through the Implementation of Media and the Addition of an Outdoor Learning Space**

Taylor Souza  
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## **Introduction**

The Cozine Creek property is a significant, yet an underutilized resource for Linfield College. The low utilization of the Cozine Creek natural area is due to lack of accessibility, low integration into curricular activities, and an overall low awareness of the space by Linfield faculty, staff, and students. Of these issues, awareness of the space and integration into curricular activities go hand in hand. If Cozine Creek natural area had facilities or an area that could make it accessible to learning, this could increase awareness of the space on campus. In addition, social media could serve as a valuable tool to communicate to the Linfield Community that the resource is there. The goal of this project is to improve knowledge of the area, while also facilitating access and educational use.

## **Background**

Making up a significant portion of Linfield College's campus, Cozine Creek is not even included on the Linfield College campus map. It is no wonder that many students, as well as some faculty and staff, are not aware of the resource and its value. In a study conducted by Rachel Gernhart in 2015, Gernhart surveyed stakeholders on campus to identify their perspectives of the Cozine Area. Results were mixed, but the general consensus was that the college did not seem to value the property or consider it to be a part of the campus. As recommendations, students and faculty responded with suggestions to increase the safety of the area and increase the quality and quantity of walking paths. Many responses suggested that students that are aware of it do consider it a valuable resource, but feel it needs better maintenance and management.

Student survey responses suggest that awareness of the property primarily comes from classes that use the property as part of the curriculum. Currently, multiple Linfield College classes utilize the Cozine Creek property for educational purposes. Both the Biology and Environmental Studies departments often utilize the area for scientific testing, bird watching, ecology lessons etc. Unfortunately, the Cozine natural area does not contain benches, picnic tables, structures, or any type of hard surface that could facilitate educational use or make the space more inviting. During class trips to Cozine Creek, students taking notes often have to put their materials on the (usually) muddy ground. With the addition of picnic tables and/or benches, there will be an increased interest and increased convenience in educational use of the area. Many students express that Linfield College has a lack of outdoor study spaces. With less than 10 picnic tables and outdoor seating spaces dispersed around campus, Linfield students are constantly looking for an outdoor place to study. By adding picnic tables to the Cozine Creek property, students would have a reason to go to the Creek as well as a quiet place to study. In

addition, increased student use of the area could help persuade campus leaders to invest in making improvements in the area. Those improvements could encourage more student and faculty use, thereby helping to achieve educational and stewardship goals.

The Environmental Studies Department at Linfield College in partnership with the Greater Yamhill Watershed Council (GYWC) has obtained funding from the Oregon Watershed Enhancement Board (OWEB) to conduct a major restoration project in the natural area. However, much of what is being done to improve the property remains largely unknown by students, faculty and staff (all stakeholders of the property). The main form of information dissemination using social media on campus that is utilized by students is Instagram and Twitter. The Associated Students of Linfield College (ASLC) run an Instagram account, @aslcpublicity, delivers students up to date information of events, opportunities, and the most recent news on campus. With over 1,150 followers, ASLC publicity delivers information all across campus. Linfield College also has a Twitter account, @linfieldcollege, that has over 4,000 followers. The Linfield College Twitter profile, often posts videos and media of campus events, beautiful photos of the campus, and “cute” posts about the Linfield Community. Linfield College uses their Twitter account to draw in students as most of their photos are of the beautiful campus. They also post short, student-made videos on the “power of a small college”. The average ASLC publicity video gets approximately 800 views on Instagram, and the Linfield College Twitter videos get approximately 1,000 views. These two platforms would be the best place to share information about Cozine Creek. A short (less than 1 minute to fit into Instagram and Twitter’s allotted time frame) informative commercial style video of Cozine Creek will be an effective way to generate student awareness, without students having to go out of their way to seek information about this campus resource.

## **Methods**

### ***Outdoor Learning Space***

- Met with facilities director and groundskeeper to identify concerns and suggestions for the placement of the outdoor learning space. The meeting addressed questions of maintenance requirements, opinions on location etc.
- Determined which types of structures are best for the floodplain (bench, picnic table, etc.) by researching which types of structures have been used in other floodplains (examples including George Fox and McMinnville City Park). Other considerations taken into account included which type of structure would be most beneficial for student and class use (whether it be picnic table or bench), and whether or not special adaptations would need to be made to the structure to accommodate flooding.
- Investigated the permitting requirements for the addition of a structure to the floodplain by contacting the City of McMinnville Planning Department.
- Determined potential costs for all options, including construction costs and methods of payment (including fundraising and solicitation of donations), and drafted a timeline of building and set up.

- Evaluated and considered design alternatives including identifying areas for potential placement considering issues of topography, road noise, solar exposure, maintenance and convenience by answering the questions:
  - Where is level enough?
  - Where would be the most convenient for students?
  - In the shade or in the sun?
  - Where are noise levels lowest?

### ***Informational Video***

- Recorded different shots of Cozine Creek from different angles, in different settings (early in the semester/cloudy and late in the semester/sunny).
- Created a script for a video voice over explaining the history of the site, the importance of the site, significant plants and species and the biodiversity of the area, and the importance of the floodplain. Within the voiceover, also included information about how students can utilize the area today (Cozine Conservation Corps, trail to Walgreens, potential plans for picnic tables and benches).
- Created multiple drafts of video, obtain feedback from Senior Capstone class members, peers, and professors.
- Contacted ASLC Publicity and Linfield Marketing to post video on social media platforms, including the new Cozine Creek tab of the Linfield College Environmental Studies webpage.

## **Results**

### ***Outdoor Learning Space***

In a meeting with Linfield College facilities, facilities expressed that they are supportive in the placement of structures at Cozine but expressed concerns of maintenance. Due to the fact that the area is only mowed twice a year, there will have to be little to no maintenance. They also expressed that they believe that the structure should not use any wood and be completely flood proof. Possible options include metal and cement. Fred Erickson, Linfield College Building Trades Manager, can be contacted for the bench and picnic table catalog that Linfield currently uses. Facilities suggested the flat area near Newby Hill due to accessibility by students and campus safety and grassy terrain.

Communication with Chuck Darnell, Senior Planner for the City of McMinnville, made clear that obtaining a permit for the addition of a structure for the floodplain is a multi-step, multi-month process. In McMinnville, the floodplain areas are designated as their own zoning district, named the Floodplain Zone (F-P Zone). The F-P zone chapter of the zoning code states that the high level of permitting is required due to the fact that the floodplain is considered hazardous due to periodic flooding, and all precautions are taken to “protect the community from financial burdens through flood damage losses”. The lengthy process aims to “protect natural floodways

and drainage ways from encroachment by uses...and set aside [as an] area which shall, for the most part, be preserved in its natural state or farmed to provide open spaces, natural habitats, and recreational places” (City of McMinnville Zoning Code 17.48.005).

A permitted use in the F-P Zone is a public park and recreation facility, not requiring the use of any structure. Because of this, an open land recreation facility requiring the use of a structure is considered conditional use. The application for a recreational Conditional Use Permit requires:

1. An accurate map, with plans drawn to scale
2. 100-year flood projection elevation of the subject site
3. Property boundaries and dimensions
4. Ground elevations shown by contour lines (to the same scale as map plan)
5. Existing and proposed structures
6. Dimension and elevation of existing and/or proposed fill
7. Location of stream channel in relation to areas described in 1-6
8. A typical valley cross-section showing the channel of the stream, elevation of land areas adjoining each side of the channel, cross-sectional areas to be occupied by the proposed fill and high-water information.
9. Profile showing the slope of the bottom of the channel or flow line of the stream
10. Specifications of fill material, grading, channel improvement or maintenance plans, dimensions, and restoration of completed project.

The first step in the process for a Conditional Use Permit is to first hold a neighborhood meeting, followed by the submission of a land use application for review. The application will then be reviewed by the Planning Commission during a public hearing. The timeframe for the overall review process is expected to be about 3-5 months (1-2 months to hold the neighborhood meeting, and 2-3 months once a complete application is submitted to get through the Planning Commission review). If and when we are ready to submit an application, it is critical that we begin that process well ahead of time as there are certain timeframes that are required to be followed in terms of scheduling the public hearing and providing notices to surrounding property owners.

The land use application requires for a plan to be drawn up and submitted. In this plan, the City of McMinnville requires a plan that identifies the whole site where the use is being proposed and the site plan should include any improvements being proposed. In this case, it would include just the benches and tables although typically it would also include buildings, landscaping areas, parking areas, access drives, roads etc. The City of McMinnville does not require plans to be drawn by a professional, such as a surveyor or architect, and instead just requires for the plan to be to scale, identifying all of the site features accurately (Chuck Darnell, e-mail communication).

**Table 1: Proposed initial costs and maintenance costs of various recreational structures**

Item	Brand	Initial cost
Metal/Steel Bench 	Upbeat Site	\$465
Metal/Steel Picnic Table Rectangular (seats 8) 	Kirby Built	\$728.85
Metal/Steel Picnic Table Circular (seats 12) 	Kirby Built	\$818.85
Metal/Cement Bench 	Upbeat Site	\$845
Cement Picnic Table Circular 	Upbeat Site	\$1056



**Figure 1:** Theoretical area of structure placement. Location: behind Newby Hall on the north side of road.

### ***Informational Video***

The results of the informational video produced two videos, one video (1 minute), that highlights the beauty and advertises Cozine Creek. The second video is 3 minutes long and outlines the history, current usage, and restoration efforts of the area. Both of the videos are posted to the new and improved Cozine Creek page, made by Kainoa Cuttita, a sub-page of the Environmental Science Departments page ([insert link here](#)).

### **Outcomes and Discussion**

While the implementation of a structure in the floodplain could facilitate a greater level of use at Cozine Creek, the process is quite lengthy. My recommendation is that if this were to be executed, it would need to be started in the first semester (fall ENVS 460) and aimed to be completed in the second semester (spring ENVS 470). In addition, a maintenance plan needs to be made so that there is not disjointed maintenance in the summer and after students graduate. The maintenance plan should be developed in collaboration with the facilities office to ensure implementation even when students are not present. The first step in ensuring that students will actually use the space is to generate awareness of the area around campus. While a recreational structure would be great, it serves no purpose if students do not know about the area or do not want to/have the need to go down to the site. The informational video serves to create a greater awareness.



Possible sources of funding of the improvements could come from Student Body fees that are allocated to the sustainability department, as well as reaching out to the community for donation and grants. By working with Linfield College's Institutional Advancement office, various networks could be reached out to gain alumni involvement with the chance for naming opportunities. With the adjacent property being bought by MV Advancements, the Environmental Studies department and Linfield College can engage their company to possibly participate in the project and assist with funding. The structures could be used as areas for their disabled community to engage with Linfield Students and participate in work parties. With the addition of picnic tables and/or benches, the area is much more inviting for communities that have difficulties, such as the population at MV Advancements.

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[www.mcminnvilleoregon.gov](http://www.mcminnvilleoregon.gov)



# **Wildlife Camera Trapping and Trail System Experiment**

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## **Introduction**

The Cozine Creek natural area that is a part of Linfield College's campus, consists of different habitat types that are important to the school, the City of McMinnville, and Yamhill County. Natural areas provide the opportunity to view and interact with wildlife and connect with nature. Having a natural area on campus also provides an opportunity for students to have access to a living laboratory for practicing a variety of scientific field methods and experimenting with natural resource management techniques. The purpose of this project is to look at two different natural aspects of the natural area, the wildlife usage and the current trail system. I see these projects as being related in the following two ways. The first is to establish an ongoing practice of monitoring wildlife usage of the natural area using camera trapping techniques. The second is to facilitate educational access and use of the property by improving and stabilizing the trail system. Hopefully through this personal project I will be able to make recommendations for future students to either maintain or enhance the ecological values of the natural resources available on Linfield College's campus.

## **Background**

The different habitat types in Cozine Creek offer various components that should be appealing to wildlife whether it be food, water, cover, and shelter. Worldwide, wildlife plays a role in maintaining ecological balance throughout the environment even in an area like Linfield College's Cozine Creek property. In past assessments of the habitat in the Cozine Creek natural area there has been much less emphasis on the presence of wildlife such as birds, mammals, and

reptiles then there has been on the presence of different types of vegetation, and for good reason. It is much easier to take inventory of trees and plants than it is to inventory wildlife that may not come out until night time, might migrate, or might burrow underground or under brush. In previous assessments, the inventory of wildlife was done either by occasional sightings of the species or by identification of its tracks. The Cozine Creek Restoration Management Plan (2017) recommended that wildlife cameras be set up to get a better sense of the wildlife that live in or use the natural area's habitat. Camera trapping is a low cost method for better understanding of wildlife usage of the property.

The current trail system includes an access road that comes down from behind Newby Hall and from the eastern end of the old Columbus School site. There are also established and lighted footpaths that connect to entrance points adjacent to the President's residence and to the western side of the Columbus school site across the street from Walgreens. There is an additional unlighted path that connects to the entrance located adjacent to the Davis Street culvert. Improving the trail system is important for two reasons. First, improving the conditions of the trails will improve accessibility to the creek for both recreational and educational purposes. The eroded trail ways are not useful if students, faculty, and other members of the community are unable to enter because of the uneven surfaces or if there is nowhere to walk due to the muddiness of the pathways. Second, an improved trail system can help lower the impact of sedimentation into the creek, improving water quality. This is a problem as eroded soil carried to streams cause excess turbidity that harms aquatic life and makes the water less useful for recreation (Marion 2006).

## Methods

Two Browning wildlife cameras were placed down in the Cozine Creek natural area. The first camera was placed facing a decomposition experiment using a deceased juvenile pig that was set up as a project by the Health and Human Performance Department. This was seen as an ideal placement for a camera as it was predicted that the experiment would attract wildlife. The second camera has been moved weekly to capture different aspects such as larger open areas and the creek itself. The cameras were placed beginning in mid-February and were checked at least once a week until mid-May. Photos recovered from the cameras are time and date stamped and uploaded onto a shared Google Drive for storage.

Actions to improve the trail system included securing permission from the Linfield facilities office to experiment with placing  $\frac{3}{4}$ " inch minus gravel in selected areas of the trail system. After gaining permission, three cubic yards of gravel were delivered to the site and with the help of the facilities office, gravel was placed along a ten yard long section of trail coming down from the access path adjacent to the President's residence (Figure 1A and 1B). The remaining gravel was placed near the intersection of the lighted footpath on the north side of the bridge and the access road coming down from the old Columbus school site (Figure 2A and 2B).



Figure 1A and 1B. Before and after photos of the trail coming down from the access path adjacent to the President's residence.



Figure 2A and 2B. Before and after photos of the trail placed on the intersection of the north side of the bridge and the access path coming down from the Columbus school site.

## Results

The use of the wildlife trail cameras has provided a better understanding of the usage of the Cozine Creek natural area by mammals. Documented photos of these species can be seen in the appendix. The list of mammals observed through the cameras include:

Black-tailed deer (*Odocoileus hemionus*)

Raccoon (*Procyon lotor*)

Bobcats (*Lynx Rufus*)

Opossums (*Didelphimorphia*)

Striped Skunk (*Mephitis mephitis*)

The black-tailed deer are frequently sighted during both the day and the night at the Cozine Creek natural area. The other species such as raccoons and opossum are also common but not seen as frequently due to their nocturnal habits. Capturing the bobcat on camera was a surprising result (Figure 3). It was only caught twice at the beginning of the study which suggests that it is not a frequent user of the area but might have been attracted to the decomposition experiment. This also helps to show the natural areas importance as an area of connectivity between urban areas.



Figure 3. The bobcat captured roaming the Cozine Creek natural area.

## Outcomes

The placement of the wildlife trail cameras was a cost efficient way to monitor the usage of the natural area by various different mammals. I recommend that the use of these cameras continue over the next few years to give a better sense of the natural areas use by wildlife during different seasons.

Also with the purchase of the 3 cubic yards of gravel and with the help of facilities, we were able to place about 90 feet worth of gravel along the trails. Future classes should monitor the gravel placement over the winter, especially after flood events, to see how the pathways have held up.



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<https://www.parks.ca.gov/pages/1324/files/f10602%20marion&olive.pdf>

# Appendix

## Wildlife Camera Photos





