Territorial Acknowledgement

The author respectfully acknowledges that I learn, work, and play on the unceded territories of the Songhees, Esquimalt, and WSÁNEĆ Peoples, whose historical relationships with the land continue to this day. I gratefully recognize the longstanding stewards of the ecosystems within these territories, as well as the cultural significance of Garry oak and associated ecosystems.

Executive Summary

This is a restoration plan for the University of Victoria (UVic) campus Garry oak (*Quercus garryana*) ecosystem (GOE), developed to guide project implementation by the Ecological Restoration Club (ERC), supported by the Restoration of Natural Systems (RNS) department and a lead by a yearly work-study student. The campus GOE is a neglected natural area with compounding restoration challenges. The ERC has chosen to adopt this area for ongoing restoration, recognizing the ecological significance of the remnant ecosystem patches struggling to persist. Our primary goal is to restore the understory diversity typically associated with GOEs, a feature which has been lost within the campus natural area. We have set four main objectives for the near-term management to achieve this goal including a) Suppression of invasive plants; b) Increase the diversity and abundance of native plants through GOE-associated species addition; c) Shifting recreational use to decrease trampling and soil compaction; and, d) Increase community engagement.

The body of this report summarizes the context for restoration and includes an overview of plan particulars and concludes with requested supports from the university. Following this summary are extensive appendices which detail why management actions were chosen, how to implement the plan, and a review of the resources needed. The beginning appendices focus on activities - invasive species removal, native species addition, community engagement, and monitoring. All activities are then incorporated into appendices with a tentative schedule for the first year and a discussion of available resources, inclusive of a budget and future funding opportunities. The restoration plan was informed through a literature review, site surveys, consultations with local restoration practitioners, and incorporating ERC member insights. The plan has been developed to balance restoration science with the constraints of volunteer-led restoration to create a positive impact within this sensitive ecosystem, generate data for campus restoration, and connect with the campus and greater community.

Introduction

This restoration plan provides guidance for the ERC to implement the GOE restoration project at UVic. The ERC is a group of student volunteers that have been assisting local and campus restoration projects since 2011. Club volunteer effort is supervised by Nancy Shackelford, Academic Director of the RNS program, and lead by a revolving yearly work-study student position. Last year, club members made a joint decision to develop an on-going focal project to create an observable, consistent improvement in the campus environment. The selected site – the campus GOE – has been in decline for decades yet represents an important ecosystem with challenging restoration needs.

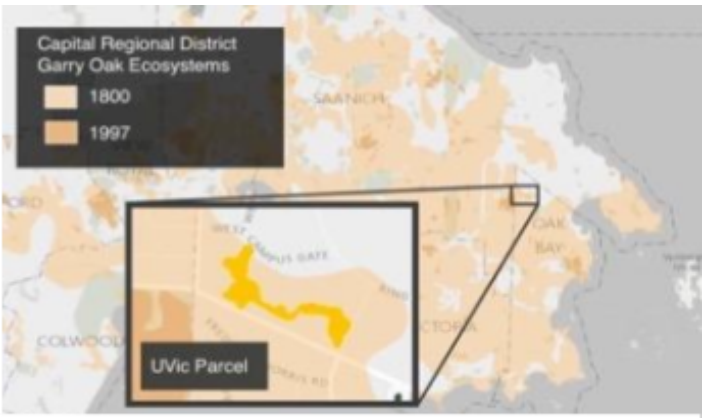

*Figure SEQ Figure * ARABIC 1: The UVic Garry oak ecosystem extent within the recent (1997) and historic (1800) Garry oak ecosystem boundaries.*

Less than five percent of the historical GOEs remain in-tact (Fuchs, 2001), and the enduring extent contributes considerably to regional ecological, cultural, and social value (Government of Canada, 2016; Pellatt & Gedalof, 2014). More than 100 species associated with these ecosystems are listed for conservation concern as habitat continues to disappear (GOERT, 2011). Degradation of GOEs has been consistent since European settlement in the mid-1800s. Previous to this recent history, Indigenous Peoples' stewardship of the landscape was foundational in GOE formation through practices including bulb harvesting and regular burning (Turner, 1999). The UVic parcel of remnant GOE (Figure 1) has endured compounding pressures from development and neglect which will be addressed through ecological restoration.

Site Conditions

The Southwest corner of the UVic Gordon Head campus is a fragmented remnant GOE (Figure 2). Not all of the land within this boundary is currently amendable to restoration, and immediate planning will focus on repairing accessible remnant GOE patches. Within the available work area are connected grassland and oak dominated woodlands with a disconnected canopy (Figure 3). Overall, this area resembles the previously fire-maintained savannahs with considerable patches of open meadow and few trees (SER, 2005). This savannah area has had many alterations to both structure and composition due to the proliferation of invasive species, detrimental recreational use, and mow scheduling.

Figure 2: A comparison of the landscape features reveals a smaller restoration work area due to development or considerable conversion to lawn.

Invasive species are the most abundant plants within this area and include exotic introduced and native hyperabundant shrubs (Pimm, 2020). This concentration of invasive plants is likely due to lack of constructive human intervention

and edge effects caused by development around the site (SER, 2005). The mowing schedule in this area further complicates the problem as it mostly considers neighbourhood approval of grass height, and eliminating fire and allergen hazards (P. Roberts, personal communication, 2020). These mowing practices have benefited the ecosystem by reducing some shrub encroachment (Baker et al., 2012), although mowing has also suppressed GOE-associated plant flowering and seed setting (BC CDC, 2014a). Additionally, patches are interrupted by desire lines established by community users which cause widespread soil compaction and native plant trampling.

Figure 3: Within the work area are different ecosystem units contributing to the heterogenous composition representative of a Garry oak ecosystem.

A GOE in good condition is able to support a higher diversity of understory plant species than is currently observed. On campus, this understory is visible as disconnected patches of camas (*Camassia sp.*) with infrequent occurences of other GOE-associated plant species. Adjacent to these camas patches are two segregated conservation-concern species associated with GOEs. These species are foothill sedge (*Carex tumulicola*) and Graceful cinquefoil (*Potentilla gracilis var. gracilis*), both high concern conservation-listed species (BC CDC, 2014a, BC CDC, 2014b). The presence of these patches, combined with historical observations, indicate the ability of this area to support a GOE. Ecological restoration will assist the recovery of the ecosystem processes by making space for the understory community and reintroducing GOE-associated plant species (GOERT, 2011).

Restoration Plan

Restoration and maintenance of GOEs requires human intervention to decrease threats that impact ecosystem integrity. The restoration activities follow recommendations outlined in *Restoring British Columbia's Garry Oak Ecosystems: Principles and Practices* (GOERT, 2011), and have been adapted for this site through consultation with local restoration practitioners, site surveys, and ERC club meetings. All activities will be primarily executed by ERC members and further supported by continued community engagement, which will target increased volunteer participation and raised awareness about this sensitive ecosystem.

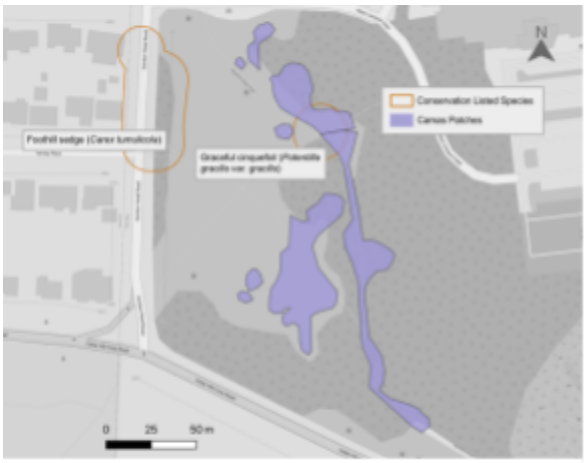

Figure 4: The presence of a remnant meadow is indicated by camas (Camassia sp.) and two conservation-concern species.

The central restoration goal is the re-establishment of GOE structure and composition by restoring the understory forb community (GOERT, 2011; Bakker and Dunwiddie, 2011). A series of objectives will address restoration challenges, guide the management actions, and set benchmarks for measuring success (Table 1). Monitoring the lifecycle of the project (Appendix D), will provide insight into whether re-establishing GOE-associated species and disturbances will lead to renewal of the GOE (GOERT, 2011; MacDougall, 2002). As well, monitoring information is instrumental in adapting the project to site needs and developing data for future restoration planning. ERC

members will be reviewing results from monitoring and comparing with their experiences for yearly project planning.

Objective	Initial Management Actions	Measurable Outcomes
A: Suppress invasive plants (Appendix A).	Manual removal of invasive species accompanied by trials in ongoing suppression and shifting mowing schedules.	A decrease in invasive plant abundance.
B: Increase diversity and abundance of GOE-associated plants through native species addition (Appendix B).	Seed addition following invasive species removal in fall, as well as seed collecting and bulb dividing.	An increase in GOE-associated species richness or abundance.
C: Shift recreational use to decrease trampling and soil compaction in the area (Appendix C).	Temporary signage and caging or limited fencing to protect conservation-concern species and new plantings.	Participation in surveys and positive public feedback.
D: Increase community engagement (Appendix C).	Increased advertising of club events targeted to different audiences, diversify restoration activities, and installation of temporary feedback and participation signage.	An increase in volunteer hours and educational event participation.

Table 1: The objectives, management actions, and measurable outcomes addressing the central restoration goal.

Objective A: Invasive species control

Removing invasive plants is a complex activity that will span multiple years. Ongoing success is dependent on maintaining areas from re-invasion and new invasive introductions. Initially, invasive species will be removed manually by volunteers and followed up by a series of seasonal trials in further suppression. These trials test whether native plant species addition and oak leaf mulching can limit invasive plant presence, and trials will be compared to areas without the follow-up management. Facilities Management is supporting invasive species control through committing to shifting mowing schedules to avoid conservation-concern species and accommodate GOE-associated plant flowering. This team will also assist in extracting larger invasive plants and disposing of invasive species refuse. Combining multiple methods for invasive species control follows the recommended integrated pest management approach for sensitive ecosystems (GOERT, 2011).

Objective B: Enhance native species populations

Restoring the composition and structure of the campus GOE will also depend on the addition of GOE-associated species, which will be added as a trial to decrease invasive plant re-establishment. These additions will also assist in regenerating natural processes and supplementing seed presence in the soil (GOERT, 2013; MacDougall, 2002). Volunteer activities include site preparation, seed collecting, and bulb harvesting – all of which diversify the skills volunteers can acquire. A small amount of seeds have been donated and collected to begin work. This collection is to be supplemented by restoration-focused mixes based on ecosystem characteristics as funding becomes available. An RNS student is simultaneously developing seed mixes, focusing on suiting GOE-associated species to the variety of soil conditions found on site.

Species addition is very much funding-limited, which could be avoided in future years by an initial investment into the creation of a seed plot for aggregating seed and transplants for restoration.

Objectives C and D: Shifting recreational use and increasing community engagement

Fulfillment of these ecosystem objectives is made possible through the support of members in the campus and greater community (Higgs, 2003). Community engagement will be integrated throughout the project to increase the ERC volunteer network and shift recreational uses within the campus GOE. The overarching goal of community engagement is developing informed and enthusiastic stewards (SER, 2005), an increase awareness of and care provided for this sensitive ecosystem in perpetuity. There are many opportunities for the campus and greater community to become involved in volunteering, collaborating, and self-directed research, with the support from the RNS department and the local network of restoration practitioners. Community engagement will include signage, increased advertising, and guided walks – all encouraging participation and deepening public understanding about restoration, GOEs, and related topics. Engagement activities raise awareness and care for this ecosystem, which can be further supplemented through fencing and signage to redirect recreation, especially during native plant flowering.

Restoration activities will begin in two priority areas (Figure 5), which were identified using the *General Decision Process for Managing Invasive Plant Species in Garry Oak and Associated Ecosystems* (GOERT, 2007). One area has new invasive plant encroachment, which is easier to eradicate than a fully established patch. The other area is a fairly cohesive patch with a higher diversity of GOE-associated plants to protect, including camas, broad-leaved shootingstar (*Primula hendersonii*), western buttercup (*Ranunculus occidentalis*), and fool's onion (*Triteleia hyacinthina*) (Pimm, 2020). Work will begin to stop new invasive encroachment and then continue to connect these patches by targeted species removal. An added benefit of choosing these areas is that they are separated by the Alumni Chip Trail, providing a window for the community to observe and get involved in restoration activities. Over time this work area will expand to connect all camas patches and conservation-concern species, unifying the UVic parcel of GOE.

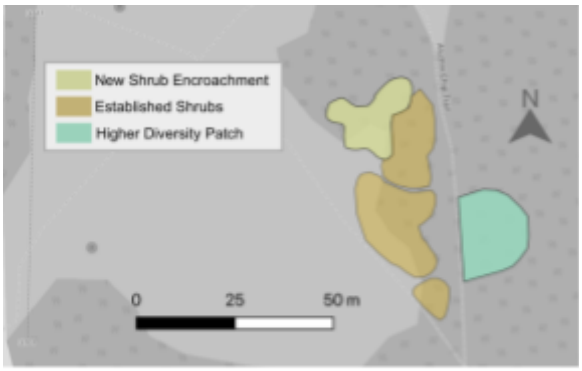

Figure 5: Restoration activities will begin in the New Shrub Encroachment and Higher Diversity patches, then continue to connect these two areas.

A multitude of restoration and engagement activities are planned each month (Appendix E). The focus of activities over the next five years will be prioritized following the progression in Table 2. A budget for the first year, including an inventory of available resources and funding opportunities, is included in Appendix F. It is possible to begin the project without funding, yet positive impacts can be amplified by investment into volunteer appreciation, species addition, conservation-concern species protection, and tools. Supplementary funding applications are being submitted to diversify activities and opportunities for engagement, as well as protecting this ecosystem into perpetuity.

Objectives	Priorities		
	Year 1	Year 2	Years 3, 4, and 5
A: Invasive plant removal	New shrub encroachment, then perimeter around patches, then established shrubs separating these two areas. Complemented by follow up trials in invasive suppression.	Remove re-sprouting invasives, then established populations that separate the two areas. Review and adapt suppression trials.	Remove re-sprouting invasives, then established populations peripheral to initial work area. Review and adapt suppression trials.
B: GOE-associated species addition	Species addition in fall following invasive plant removal.	Species addition in fall following invasive plant removal, then integrate RNS seed mix project within different ecosystem features present.	Species addition in fall following invasive plant removal, then upkeep grassland areas, then species addition peripheral to initial work area. Complemented by creation of a seed plot.
C: Shift recreational habits	Increase awareness of sensitive ecosystem and significance of understory community.	Continue with increasing awareness.	Protect ecosystem boundaries by fencing sensitive areas and installing permanent interpretive signage.
D: Community engagement	Expand the volunteer base and increase project awareness.	Continue growing the volunteer base and increasing awareness.	Integrate more individual projects into the area which build outside responsibility and continuity into the project.

Table 2: A summary of priorities based on objectives compared over five years.

Recommendations

This project aligns with the university's ambitions to protect and enhance biodiversity in campus natural areas, increase native species plantings, improving the "green ring" of ecological corridors, and providing habitat connections between natural areas external to campus (UVic, 2016; UVic, 2020). This project would benefit from increased support from the university following these recommendations:

1. Restoring the integrity of this culturally significant area will make space for Indigenous community members to engage with the area in whatever capacity they desire. Assistance is required to develop relationships with Indigenous community members to ensure this goal is communicated respectfully, as well as allocating support for Indigenous-led initiatives within the space.

2. The Ecological Restoration work-study position should be adapted to better support this project. This funded position has proven to be effective in initially focusing the ERC and improving stewardship initiatives on campus. However, funding comes from the limited budget of the Restoration of Natural Systems Program, and the potential of the position now exceeds available

resources. Supplementing funding from other campus sources would allow either more hours to this role or introducing a secondary position. This would ensure a comprehensive project with a strong community engagement component and would allow increased capacity for students to apply for external operational funding through community grant programs.

3. Trees planned for installation within the meadow area in Spring 2021 should be planted in consultation with meadow restoration goals, specifically in supporting remnant meadow patches through decreasing canopy coverage. UVic has planned to replace trees from the Student Housing Project by planting Garry oaks in the open meadow area. This meadow is a unique feature that has decreased in extent due to encroachment by trees and shrubs. There are many locations on campus that do not have remnant meadow patches and would benefit from the addition of oak seedlings. Potential planting areas include the nearby lawn adjacent to Finnerty Gardens or within the Campus Greenway project.

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Appendix A: Invasive Species Control Design Details

The structural and compositional heterogeneity of the campus GOE is impacted by wide-spread invasive species cover (Olden & LeRoy Poff, 2003). Invasive species establishment and persistence can be linked to many factors, so it is challenging to deduce how the current state was reached. Invasive species control will include a combination of manual removal, mulching, native species addition, and mowing; employing a variety of techniques will likely be more effective than a singular approach (Fitzpatrick, 2004). Invasive species observed on campus and removal techniques are compared in Appendices A1 and A2.

The primary method for invasive species control will be manual removal. This technique is time consuming (Nolan & Carver, 2011), yet best utilizes available volunteer labour and hand tools. Manual removal is also a strategy to protect sensitive ecosystem components by limiting invasive species cover through less pervasive methods and is aligned with best practices and the UVic Integrated Pest Management approach (GOERT, 2011; UVic, 2017). A series of seasonal trials following invasive species removal activities are planned to establish effective methods for repressing invasive species re-establishment.

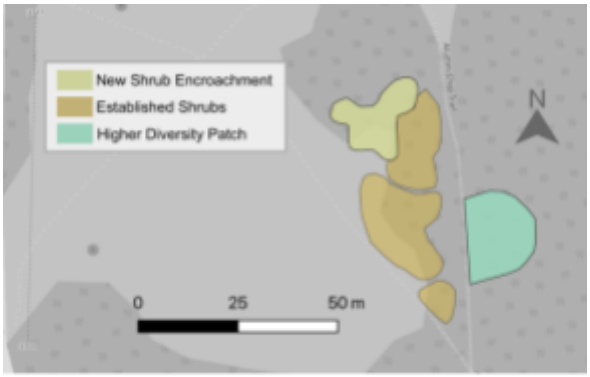

Figure 1: The area associated with the two priority patches and established shrubs separating them. Removal should begin in non-established areas and then proceed through clearing the shrub barrier between patches.

There are compounding restoration challenges associated with the variety of invasive plant species observed during the spring vegetation survey. Each observed species has a unique life history strategy, requiring different control methods and timing to limit reproduction (Appendix A2). Plants also occur simultaneously in mixed patches and need to be considered as complexes requiring varied approaches. Invasive species removal will address these challenges by targeting shrub and grass dominated patches separately and activities are scheduled to incorporate seasonal considerations (Appendix A3).

Recommendations for scheduling and carrying out manual removal activities include:

1. Shrubs and forbs
    - Remove based on establishment, prioritizing newer, smaller plants and then decreasing barriers to GOE native plant patch connectivity.
    - Removing individual forbs and shrubs can be simplified based on diameter of the plants. Activities should minimize soil disturbance and ensure removal of reproductive parts (GOERT, 2011).
        - Smaller diameter plants that don't resist pulling can be removed by hand.
        - Larger plants must be cut below the soil surface using loppers or secateurs.
        - Any plants that can't be removed will be flagged for Facilities Management to remove.
2. Grasses
    - In spring, grass species will be targeted by hand pulling and cutting clumps to reduce seed production during summer (GOERT, 2013).
    - A majority of invasive grasses on site are perennial and require the removal of all subsurface parts to be effectively eliminated.

Removing invasive plants can provide improved conditions for native species by increasing light and soil space as live plant material and litter are decreased (MacDougall, 2002), although these improved growing conditions are also amendable to invasive plants. There are three planned trials to determine what is present in the seed bank, as well as how to best suppress invasive species following manual removal.

> *Trial 1:* Fall seeding trialed in both a grass and a shrub patch. Determine whether re-seeding decreases the competitive advantage of invasive plants and increases GOE-associated plant presence (Coastal ISC, n.d.; MacDougall, 2002).
>
> *Trial 2:* Winter mulching using oak leaves, cardboard, and weights. Determine whether mulch suppresses shrub re-emergence (adapted from Catanzaro and Cotter, 2020; Nolan and Carver, 2011).
>
> *Trial 3:* No follow up activity. Observe what plants grow in the absence of invasive species.

Facilities Management has offered to remove plant refuse, assist in larger invasive plant removal, and adjust mowing schedules to assist in restoring GOE features. When notifying Facilities Management of disposal, it is important to communicate any notes for safe handling since most plant material that is disposed of is run through a chipper and turned into mulch (P. Roberts, personal communication, 2020). Plants such as Daphne (*Daphne laureola*) should be treated separately to avoid potential health consequences. As well, large-diameter invasives left behind after volunteer events will be incorporated into maintenance activities during the slow season. In addition to supporting invasive species removal, the mowing schedule will be shifted to increase native plant seed production, protect conservation-concern species, and prevent shrub re-sprouting following removal. Recommendations for adjusting the mowing schedule include:

1. Adapt the mowing schedule to accommodate GOE-associated plant establishment (Gonzales and Clements, 2010). Mowing within the area should be avoided from April through June, and the area would benefit from marking out camas patches and mowing between them during the no-mow period (J. Miskelly, personal communication, 2020).
2. Segregating conservation-concern species from mowing throughout the year to improve the campus populations (BC CDC, 2014a; BC CDC, 2014b).
3. Mowing after the initial removal of shrubs to assist in depleting the above ground nutrient stores (SER, 2005).

A selection of native plant flowering times is included in Appendix A4 to assist in developing a strategic mowing schedule.

Appendix A1: Comparison of Invasive Plant Removal Techniques

Technique	Considerations	Implementation
Hand pulling	Nolan and Carver (2011): Pull early in season before seed is set. Easiest when soil is moist.	Nolan and Carver (2011): Hand pulling before plants go to seed is doable in a smaller restoration area. J. Miskelly (2020): Perennial like bunchgrasses, pull or cut.
Seed addition		J. Miskelly (2020): Replace removed grasses with seed mixes of native grasses, sedges, and rushes.
Smothering and mulching	Nolan and Carver (2011): Can be completed where there is little to no existing prairie vegetation to be concerned about. Used to sterilize ground and then start fresh with native prairie vegetation. Tanner (2011): Transport leaf mulch to areas that have recently been pulled to suffocate invasive species of oxygen and light	Nolan and Carver (2011): First apply a layer of overlapping newspaper/cardboard/plastic sheets and then a layer of mulch on top of that is three to four inches thick. Leave it in place for a full growing season. Can be done at any time of year but is best applied in winter before plants begin to grow or produce seeds. Remove when you are ready to plant. This will kill existing vegetation and prevent re-sprouting from vegetatively reproducing plants, J. Miskelly (2020): Good for annual, not perennial species. In September and October, the seeds germinating so put up a barrier to prevent growth and after six weeks these seeds will be gone.
Solarization	Nolan and Carver (2011): The heat the builds up under the plastic will kill weed seeds and leave a blank slate for planting native species the following year. J. Miskelly (2020): This will kill plants you want, except for bulbs	Nolan and Carver (2011): In spring, cover the area with a layer of clear plastic and anchor the edges. Leave the plastic in place through the summer months. Remove all layers of plastic when solarization complete. This is a full sun method that may not work well in shady or part shade conditions. J. Miskelly (2020): Use clear plastic.
Cultivation	Nolan and Carver (2011): Tilling, disking, plowing, and harrowing are often used to temporarily reduce or suppress non-native plants and prepare a seedbed prior to sowing native prairie seeds.	Nolan and Carver (2011): To follow this method, till the soil to remove unwanted vegetation. Remove grass roots. Wait for the weeds to grow back and then remove them. Repeat these steps until invasive and/or unwanted vegetation is under control, which may take more than one season.

Prescribed burning	Nolan and Carver (2011): Fire within prairie restoration mimics the historical processes which contributed to prairie establishment. Burning removes built-up thatch and stimulates weed growth, since many weeds rapidly recolonize disturbed or burned areas. Livingston et al. (2016): Benefits to the understory community such as increasing species richness, diversity and cover in oak woodlands, and shifting understory communities from forest-associated species to more woodland-associated species. Bringing back fire is complicated by persistence and abundance of non-native herbaceous plants. J. Miskelly (2020): Previous experience with burns on an ammunitions site. Could get enough support to use fire management if we tried – at least develop a solid conversation about it. J. Dick (personal communication, 2020): Fire is likely the most important missing component for maintaining meadow structure. Has many resources and contacts local and throughout west coast for burns.	Nolan and Carver (2011): Apply herbicide after weeds resprout following fire.
Herbicides	GOERT (2011): Useful for deep rooting and rhizomatous plants. Do not use if species at risk present. Use as part of an Integrated Pest Management strategy with careful timing, selection, and application methods. Shackelford et al. (2017): It is uncommon in local restoration projects to use herbicides. SER (2005): Avoid herbicides if natural or mechanical control methods are feasible. If using herbicide, use not to eliminate the target species, instead to decrease numbers to make it feasible to control with other methods.	GOERT (2011): There are some alternatives becoming available such as hot water based weed control methods. Nolan and Carver (2011): There is an extensive list of herbicide recommendations in the appendices of their report.

Mowing	Nolan and Carver (2011): Mowing can be used as a stop-gap measure for initial weed control when unable to implement other techniques. Mowing prior to seed set reduces the future weed seed bank. Repeated mowing removes the aboveground portion of the weeds and can weaken the root system over time. Fitzpatrick (2004): Post-seeding mowing can reduce invasive seed production and increase light for slow growing natives. GOERT (2011): Mowing will knock plants to ground level but doesn't disturb root system. Could kill rhizomatous invasives by depleting energy reserves.	GOERT (2011): The key to success is understanding the physiology and phenology of the invasive organism so it can be mowed at the weakest point in its life cycle. Scotch Broom and some alien perennial grasses can be managed with well-timed mowing. SER (2005): Oxeye daisy can be mowed as flowers appear in early summer. Midsummer mowing can reduce brush. Need to mow before planting if grass is dense enough to shade ground during growing season. J. Miskelly (2020): Mowing will target pasture grasses. Mow outside of the patches with native meadow plants.

Appendix A2: Invasive Species Comparison

All invasive species information, unless otherwise cited, has been gathered from the *Field Manual for Invasive Species Removal* published by GOERT from 2005 to 2013 (GOERT, n.d.a). Invasiveness classification sources: 1) GOERT, n.d.a; 2) ISC BC, n.d.a; and 3) CRD, 2019.

Species	Life History	Invasiveness Classification	Physical Control	
			Methods	Timing
Graminoids				
Soft brome (*Bromus hordeaceus*)	Winter grass that flowers in late spring; can be annual or perennial.	exotic, invasive[1]	Removing thatch accumulation can expose seeds to light and inhibit germination. Withstands mowing better than most grasses.	Hand pull in spring and early summer before seed sets.
Kentucky bluegrass (*Poa pratensis*)	Perennial winter grass which reproduces mostly vegetatively through rhizomes. Seeds readily establish on disturbed sites.	exotic, invasive[1]	Hand pulling or light hoeing.	Manual removal in spring or early summer before seed sets.
Sweet vernal grass (*Anthoxanthum odoratum*)	Perennial tufted grass which reproduces by seed. Flowers in spring and withers by mid-summer.	exotic, invasive[1]	Hand pulling or light hoeing.	Early summer before seed sets.
Orchard grass (*Dactylis glomerata*)	Perennial tufted bunchgrass which reproduces by seed. Flowers from May through September with seed scattering in fall.	exotic, invasive[1, 3]	Hand pulling or gentle hoeing. Must ensure that root system is removed.	Early summer before seed sets.
Forbs				
Creeping buttercup (*Ranunculus repens*)	Perennial forb which spread by seed and stolons. (King County, 2019a)	exotic, invasive[1, 2]	Hand-pull and dig, ensuring that all growing points are removed. (King County, 2019a; UC Davis, 2013a)	Fall through to spring when ground is moist. (King County, 2019a). Dig out early in the season (CPOP, 2015).

Small hop-clover (*Trifolium dubium*)	Winter annual which grows from a taproot or fibrous roots. Germinates in fall, flowers in springs, and sets seed in summer.	exotic, invasive[1]	Hand-pull ensuring removal of entire taproot.	Fall and winter.
Bull thistle (*Cirsium vulgare*)	Biennial plant with two year growth cycle (two forms to monitor for) and spreads by seed. (King County, 2014)	exotic, invasive[2, 3]	Cut 1" below soil surface. Can create viable seeds after removal – dispose separately and off-site. Mulch after removal. (King County, 2014)	In Spring after plants bolt, but before they flower. (King County, 2014)
Hairy cat's ear (*Hypochaeris radicata*)	Perennial forb. Flowers bloom from spring to fall, seeds set shortly after flowering. Likely two rounds of flowering a year in BC.	exotic, invasive[1]	Hand-pulling difficult, but possible. Need to remove entire tap root and attached fibrous spreading roots.	Best removed when first appearing throughout spring to fall. (ISC BC, n.d.b)
Oxeye daisy (*Leucanthemum vulgare*)	Short-lived perennial forb. Reproduces by both seed and the root crown.	exotic, invasive[1, 2, 3]	Mowing and hand-pulling can be somewhat effective.	Mow as soon as flowers appear in summer.
Purple dead-nettle (*Lamium purpureum*)	Annual or facultative biennial which reproduces by both seed and vegetatively through (fragments and fibrous roots). Typically flowering from March to May, prolonged into fall if area moist.	exotic, invasive[1]	Hand pull seedling stage or cut stems prior to flowering stage to reduce seed bank addition. Mulch with cardboard and oak leaves. Dispose off-site.	Early spring before flowering.
Sheep Sorrel (*Rumex acetosella*)	Perennial forb which reproduces by seed and vegetatively through rhizomes. Flowers from May to September.	exotic, invasive[1]	Can hand pull individuals if there isn't an extensive grouping. Cultivation of top growth can be effective.	Repeated cultivation during the dry season. (UC Davis, 2013b)
Shrubs, Vines, and Trees				
Common hawthorn (*Crataegus monogyna*)	Tree which reproduces by seed and vegetatively through suckers.	exotic, invasive[1, 3]	Hand pull young shoots. Cut older trees close to the base, fray or burn to prevent resprouting. If possible, remove roots. Regenerates vegetatively, dispose of off-site.	Late spring (April-June) when at least 20% of flowers visible.
English holly (*Ilex aquifolium*)	Tree which reproduces vegetatively, by suckers and layering, and through seed. (King County, 2020)	exotic, invasive[2, 3]	Hand pull young plants. Cutting at base not effective, need to remove extensive roots. Regenerates vegetatively, dispose of off-site. (King County, 2020)	Can be removed all year, best when berries not present. (King County, 2020)
English ivy (*Hedera helix*)	Evergreen vine which reproduces vegetatively and by seed.	exotic, invasive[1, 2, 3]	Hand pull ground and tree ivy. Extra attention to remove all plant parts from soil where there is ground ivy, can resprout from fragments.	Tree ivy best removed before spring to decrease seed addition to area. (UC Davis, 2013c)

Himalayan blackberry (*Rubus armeniacus*)	Sprawling shrub that forms dense thickets. Reproduces by seed and vegetatively through layering.	exotic, invasive[1, 2, 3]	Hand pull small seedlings and plants up to one metre tall. Older plants can be cut using machetes or saws, followed by hand digging the roots.	Large patches can be controlled by cutting new growth between July and early October to prevent tips from layering.
Scotch broom (*Cytisus scoparius*)	Deciduous shrub. Flowers from February to May, fruit-setting in June, and seed dispersal as early as July.	exotic, invasive[1, 2, 3]	Hand pull small seedlings. Larger plants can be cut below the first horizontal root ensuring minimal soil disturbance.	Before fruit development in June.
Spurge Laurel (*Daphne laureola*)	Evergreen shrub which reproduces by seed and vegetatively by root sprouts. (King County, 2019b) Flowers spring and sets berries in summer. (ISC BC, n.d.c)	exotic, invasive[1, 2, 3]	Hand pull smaller plants and cut larger plants below the soil surface. Poisonous, so care must be taken to wear protective clothing and minimize breathing in fumes. Do not burn this plant during disposal. (King County, 2019b)	Likely best to remove when berries not present to discourage seed distribution.
Nootka rose (*Rosa nutkana*)	Spreading and long-lived shrub which forms loose thickets. Reproduces by seed and vegetatively through sprouts, rhizomes, and layering. Fruit matures in late summer. (USDA, 2013)	Tendency to take over landscape when regular disturbance limited (SER, 2005).	All shrubs: For oceanspray (*Holodiscus discolor*, a similar native shrub) restoration managers in the Pacific Northwest recommend mechanical removal followed by coppicing, herbicide, or allowing deer browse (CPOP, 2014).	All shrubs: Likely best to remove when fruits not present to discourage seed distribution.
Osoberry (*Oemleria cerasiformis*)	Deciduous, relatively short-lived shrub which flowers in late winter. Fruit sets from May to July. Plant spreads slowly, mostly by root suckering, also by seed. (USDA, 2009)		All shrubs: Cut shrubs or trees of at or near ground level using loppers or a hand saw for stems <2" in diameter and small areas. Many deciduous trees and shrubs will resprout if herbicide not applied after. (SER, 2005)	All shrubs: If herbicide is undesired, resprouts should be cut until food reserves are depleted. This may take numerous cuttings and many years (SER, 2005).
Snowberry (*Symphoricarpos albus*)	Deciduous shrub, often densely colonial from rhizomes. Blooms in early summer, fruit present from summer to fall. (EFlora BC, n.d.)			

Appendix A3: Calendar of Invasive Plant Removal Times

	Winter			Spring			Summer			Fall		
Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Graminoids												
Soft brome (*Bromus hordeaceus*)												
Kentucky bluegrass (*Poe pratensis*)												
Sweet vernal grass (*Anthoxanthum odoratum*)												
Orchard grass (*Dactylis glomerata*)												
Forbs												
Creeping buttercup (*Ranunculus repens*)												
Small hop-clover (*Trifolium dubium*)												
Bull thistle (*Cirsium vulgare*)												
Hairy cat's ear (*Hypochaeris radicata*) [remove as flowers appear]												
Oxeye daisy (*Leucanthemum vulgare*)												
Purple dead-nettle (*Lamium purpureum*)												
Sheep Sorrel (*Rumex acetosella*)												
Shrubs, Vines, and Trees												
Common hawthorn (*Crataegus monogyna*)												
English holly (*Ilex aquifolium*)												
English ivy (*Hedera helix*)												
Himalayan blackberry (*Rubus armeniacus*)												
Scotch broom (*Cytisus scoparius*)												
Spurge Laurel (*Daphne laureola*)												
Nootka rose (*Rosa nutkana*)												
Osoberry (*Oemleria cerasiformis*)												
Snowberry (*Symphoricarpos albus*)												

Table 3: A calendar for invasive species removal which was created using the recommendations in Appendices A1 and A2.

Appendix A4: GOE Plant Flowering Calendar

Species	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Observed Plants								
Small camas (*Camassia quamash*)								
Broad-leaved shootingstar (Primula hendersonii)								
Western buttercup (*Ranunculus occidentalis*)								
Conservation-Concern Species								
Foothill sedge (*Carex tumulicola*)								
Graceful cinquefoil (*Potentilla gracilis var. gracilis*)								
Likely Species Additions								
Idaho fescue (*Festuca idahoensis)*								
Alaska oniongrass (*Bromus sitchensis*)								
Roemer's fescue (*Festuca idahoensis ssp. roemeri*)								
Blue wildrye (*Elymus glaucus*)								
California oatgrass (*Danthonia californica*)								
Pacific sanicle (*Sanicula crassicaulis*)								
Spring gold (*Lomatium utriculatum*)								
Barestem desert-parsley (*Lomatium nudicale*)								
Blue-eyed Mary (*Collinsia parviflora*)								
Chocolate lily (*Fritallaria affinis*)								
Fool's onion (*Triteleia hyacinthina*)								
Harvest brodiaea (*Brodiaea coronaria ssp. Coronaria*)								
Satinflower (*Olysinium douglasii*)								
White fawn lily (*Erythronium oregonum ssp. Oregonum*)								

Table 4: A calendar of GOE plant flowering times for mowing schedule consideration. All plant information was collected from GOERT (n.d.b), except Foothill sedge (COSEWIC, 2008) and Graceful cinquefoil (Saanich Native Plants, n.d.).

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Appendix B: Native Species Addition Design Details

GOE restoration sites tend to be seed limited (Fitzpatrick, 2004), so simply removing invasive plants is unlikely to restore understory composition and structure. To resolve this limitation, addition of GOE-associated species is planned to decrease invasive plant re-establishment, assist in regeneration of natural processes, and supplement native seed presence in the soil (GOERT, 2013; MacDougall, 2002). There are trials planned for incorporating native seed post invasive species removal, as well as trials in collecting seeds and bulbs from the Campus Community Garden plot. All trials have been created to diversify restoration activities and increase the variety of skills volunteers can acquire.

Potential species (Appendix B1) have been selected based on ecosystem units occurring within the work area - open meadows, woodlands, and rock outcrops (GOERT, 2011). This list of potential species will be further refined based on recommendations when the Restoration of Natural Systems student seed mix project is completed in 2021. In the interim, a plant mix will be developed based on species that perform well in restorations. Species additions are being obtained from local sources to preserve genetic diversity and ensuring site compatibility for each plant (GOERT, 2011).

GOE-associated species will be added predominantly as seed. This is a cost effective approach which can aggregate further seed and transplants for future restoration (GOERT, 2011). With our current seed collection (Appendix F), seed addition is planned following invasive plant removal in fall, with more variety incorporated as resources become available. Eventually, building a seed plot is planned to provide more plants for ongoing restoration activities (GOERT, 2013). Seed will be added to the work area in order of the following priorities:

1. Replace bare soil remaining after invasive plant removal activities in fall.
2. Trial interseeding in adjacent grassland areas to displace invasive grasses (SER, 2005).
3. Create and populate a seed plot.

The addition of seed will follow the steps for interseeding (SER, 2005), modified by recommendations from Fitzpatrick (2004) as follows:

1. Prepare the ground by mowing and raking to decrease litter accumulation.
2. Hand broadcast the seed throughout the area using a seed mixed 50/50 with perlite.
3. Incorporate the seed into the soil using hand tools to a depth of between ½" to ¼".
4. Strategic mowing for one to three years after planting to keep existing turf from shading out the slow-growing young seedlings.

Seed collection and bulb dividing are two other volunteer activities planned to increase native plant resources for the project. When collecting seed, it is recommended to follow the "1-in-20 rule" where no more than 5% of any plant material removed (GOERT, 2011; GOERT, n.d.). A bulb dividing trial will also take place in the ERC's Campus Community Garden plot (GOERT, 2011). It is recommended that bulbs be dug up from underneath, buried soon after dividing, and have the flowering blooms cut off if present (GOERT, 2011).

Appendix B1: Species Addition Recommendations

Site Conditions	Suggested Species
Forest and woodland with open overstory (Fairbarns, n.d.).	- Long-stoloned sedge (*Carex inops*) - Blue wildrye (*Elymus glaucus*) - Alaska oniongrass (*Melica subulata*) - Pacific sanicle (*Sanicula crassicaulis*)
Grass-herb understory on shallower soils (Fairbarns, n.d.).	- California Brome (*Bromus carinatus*) - Blue wildrye (*Elymus glaucus*) - Idaho Fescue (*Festuca idahoensis*) - Pink honeysuckle (*Lonicera hispidula*) - Pacific sanicle (*Sanicula crassicaulis*)
"At Cowichan, most abundant native flora in the understory includes... (GOERT, 2011)."	- Camas (*Camassia quamash and leichtlinii*) - Spring gold (*Lomatium utriculatum*) - Broad-leaved shootingstar (*Primula hendersonii*) - Western buttercup (*Ranunculus occidentalis*)
General meadow additions (W. Thomas, personal communication, 2020).	- Western rush (*Juncus occidentalis*) - Graceful cinquefoil (*Potentilla gracilis*)
Meadow additions which are typically successful in restoration (J. Miskelly, personal communication, 2020).	- Seed mix to include native grasses, sedges, and rushes - Common camas (*Camassia quamash*), California oat grass (*Danthonia californica*), Pacific woodrush (*Lazula comosa*), Barestem desert-parsley (*Lomatium nudicaule*) [performs well from seed in restoration projects], and *Western buttercup* (*Ranunculus occidentalis*).
General meadow addition (Erickson and Meidinger, 2007).	- Early season communities include camas (*C. leichtlinii and C. quamash).* - Communities dominated by grasses such as blue wildrye (*Elymus glaucus*) or Roemer's fescue (*Festuca idahoensis ssp. roemeri*).
Open meadow (GOERT, 2013).	- Grasses: California brome (*Bromus carinatus*), California oatgrass (*Danthonia californica*), blue wildrye (*Elymus glaucus*), Roemer's fescue (*Festuca idahoensis ssp. roemeri*), and Alaska oniongrass (*Medica subulata*). - Herbaceous (forb) plants: Yarrow (*Achillea millefolium*), hooker's onion (*Allium acuminatum*), nodding onion (*Allium cernuum*), pearly everlasting (*Anaphalis margaritacea*), red columbine (*Aquilega formosa*), harvest brodiaea (*Brodiaea coronaria*), common camas (*Camassia quamash*), harebell (*Campanula rotundifolia*), field chickweed (*Cerastium arvense*), blue-eyed Mary (*Collinsia grandiflora*), Menzies' larkspur (*Delphinium menzeisii*), fireweed (*Epilobium angustifolium*), wooly sunflower (*Eriophyllum lanatum*), white fawn lily (*Erythronium oregonum*), woodland strawberry (*Fragaria vesca*), chocolate lily (*Fritillaria affinis*), small-flowered alumroot (*Heuchera micrantha*), small-flowered woodland star

	(*Lithophragma parviflorum*), tiger lily (*Lilium columbianum*), spring-gold (*Lomatium utriculatum*), two-coloured lupine (*Lupinus bicolor*), satin-flower (*Olsynium douglasii*), sea blush (*Plectritis congesta*), broad-leaved shootingstar (*Primula hendersonii),* western buttercup (*Ranunculus occidentalis*), Canada goldenrod (*Solidago canadensis*), fool's onion (*Triteleia hyacinthina*), and meadow death-camas (*Zygadenus venenosus*).
Woodland (GOERT, 2013).	- Grasses: California brome (*Bromus carinatus*), California oatgrass (*Danthonia californica*), blue wildrye (*Elymus glaucus*), Roemer's fescue (*Festuca idahoensis ssp. roemeri*), and Alaska oniongrass (*Medica subulata*). - Herbaceous (forb) plants: Great camas (*Camassia leichtlinii*), yarrow (*Achillea millefolium*), spring-gold (*Lomatium utriculatum*), broad-leaved shootingstar (*Primula hendersonii*), satin-flower (*Olsynium douglasii*), Pacific sanicle (*Sanicula crassicaulis*), blue-eyed Mary (*Collinsia parviflora*), Western buttercup (Ranunculus occidentalis), Menzies' larkspur (*Delphinium menziesii*), Chocolate lily (*Fritillaria affinis*), white fawn lily (*Erythronium oregonum*), harvest brodiaea (*Brodiaea coronaria*), and fool's onion (*Triteleia hyacinthina*).
Rock outcrop (GOERT, 2013).	- Grasses: Roemer's fescue (*Festuca idahoensis var. roemeri*), California oatgrass (*Danthonia californica*), and blue wildrye (Elymus glaucus). - Herbaceous (forb) plants: Yarrow (*Achillea millefolium*), nodding onion (*Allium cernuum*), thrift (*Armeria maritima*), common camas (*Camassia quamash*), wooly sunflower (*Eriophyllum lanatum*), chocolate lily (*Fritillaria affinis*), spring-gold (*Lomatium utriculatum*), licorice fern (*Polypodium glycyrrhiza*), broad-leaved shootingstar (*Primula hendersonii*), lance-leaved sedum (*Sedum lanceolatum*), Oregon stonecrop (*Sedum oregonum*), broad-leaved stonecrop (*Sedum spathulifolium*), and small-flowered alumroot (*Heuchera micrantha*).

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Appendix C: Community Use and Engagement Planning

Gaining the support of the campus and greater community is integral to successful restoration as this increases participation in campus stewardship, improves ecosystem recovery, and develops project continuity (Higgs, 2003; Cairns et al., 2012). The goals for community engagement are to increase participation and improve stewardship within the campus GOE. Increasing participation in the project benefits volunteers as there are many opportunities built into the restoration plan, examples include support for self-directed projects and networking, activities involving hands-on experiential learning in an outdoor setting, and the benefits associated with contributing to the improvement of community natural areas. Communication will be focused on advertising these opportunities so that more people can benefit from participation. Including more people can also improve the likelihood of project continuity, diversify project inputs, and enhance the quality of restoration. Efforts will encourage involvement from both the campus and greater community and encouraging communication between people interested in restoration and providing avenues for collaboration.

Education components are included throughout the restoration plan. Previous volunteers have shared feedback that a substantial reason for attending events is the learning opportunities provided. During restoration events, knowledge sharing happens informally through conversation and collaboration, spanning across the different experiences and backgrounds participants have. Materials and experiences are being developed which amplify these connections and incorporating links to restoration science. All restoration activities and outreach are meant to develop informed stewards that are prepared with tools to meaningfully engage in ecosystem recovery and increase responsibility for natural areas.

Below are planned activities for connecting to a wider audience and developing the volunteer base.

Campus activities

1. Increase advertising by speaking with classes at the beginning of each semester and communicating in new formats, such as writing an article in the Martlet or hosting a plant sale.
2. Collaborate with other clubs.
3. Improve communication with faculty.

Community-wide activities

1. Host restoration events that are advertised as community days, with information posted outside of campus.
2. Invite school groups to participate in restoration.
3. Utilize the ERC mailing list to cross-advertise external community initiatives.

Increasing participation and improving awareness is also the interim method for decreasing impacts from recreation, namely plant trampling, soil compaction, and garbage dumping. This is supplemented by temporary signage and fencing which remind people about the project and protects the work areas. Eventually, more permanent barriers and interpretative signage will be added as the project becomes more established and restoration boundaries are defined. Priorities for areas to protect are 1) Protect conservation-concern plants; 2) Provide support for newly restored GOE areas to establish; and, 3) Permanent protection of restored areas.

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Appendix D: Monitoring

Project success will be measured by monitoring progress compared to the objectives, with monitoring also measuring the resources and labour used to implement restoration. Each year, the effectiveness of activities will be considered in scheduling and management actions will be adapted to site needs. A combination of qualitative and quantitative monitoring is planned with activities including:

Spring vegetation survey.

- Observe whether invasive plants are suppressed, including reinvasion or new introductions, and if native species recovering.
- Completed in areas with and without management actions. The survey areas are 1) Trial with seed addition; 2) Trial with oak mulch; 3) Trial with no follow-up suppression; and, 4) Area with no management action taken.
- Record percent cover and species occurrence within quadrats and line transects, measuring for abundance and species richness.
- Intensive process that is likely to be completed every other year.
- The success of native species additions might not be obvious following the first growing season (SER, 2005).

Conservation-Concern species scavenger hunt.

- Determine whether campus populations of conservation-concern species are still present. If occurring, provide protection from mowing, trampling, and herbivory. Both species' locations are included in Figure 4 in the main report.
    - Graceful cinquefoil (*Potentilla gracilis var. gracilis*) was found near a lamppost close to a paved trail in meadow area in 2013 (BC CDC, 2014a).
        - Locate individual plants and protect. Goal is to assist on-site habitat expansion for this red-listed species.
    - Foothill sedge (*Carex tumulicola*) has multiple observations between 1997 and 2009. Most clumps are less than one half meter in extent and located in four places along the Alumni Chip Trail (BC CDC, 2014b).
        - Locate individual plants and protect. Goal is to remove native shrub encroachment surrounding.

Qualitative photo point monitoring.

- Observe ecosystem responses to management actions by documenting compositional and structural changes over different time scales.
- Photos will be taken with a visual reference for estimating height consistently throughout photos (GOERT, 2011).
- General site photos at the beginning and end of each semester; restoration activity photos before and after each work party.

Monitoring labour resources needed to complete management actions.

- Post work party measurements of area controlled, types of plants removed or introduced, and volunteer effort applied.

Monitoring community involvement by tabulating responses to the survey and recording number of volunteer hours committed.

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Appendix E: Detailed Timeline

The following schedule includes all activities mentioned throughout the report. This calendar provides guidance for the first two years of activities, including the initial invasive species removal and subsequent maintenance. All activities and timing are based on available restoration data and ERC member feedback. Restoration events have better participation during the school year, so more hands-on activities are planned during the school year.

Month	Restoration Activities	Engagement Activities	Monitoring	Preparation
All	- Invasive shrub/forb removal, unless otherwise noted.	- Post on social media and email list.	- Photo point: before and after event. - Participation: volunteers, hours, area, and what removed.	- Keep all fence-worthy woody debris for building in spring. - Record invasive plants removed for facilities management to safely dispose of.
September	- Seeding prep in new shrub establishment patch over rock outcrop.	- Compile survey responses. - Advertise to classes and connect with faculty.	- Photo point: beginning of school year.	- Prepare seed mix for rock outcrop. - Create class list for presentations. - GVSCU grant deadline September 30.
October	- Follow up shrub and forb removal with seeding. - Bulb dividing trial at Campus Community Garden plot.	- General campus community outreach (Martlet, poster, etc.). - Connect with campus clubs.		- Prepare seed mix for shrub area. - Contact chosen media for campus outreach and prepare. - UVic Sustainability Fund October 15.
November	- Follow up shrub/forb removal with seeding.	- Community restoration day.		- Prepare seed mix for shrub area. - Rake oak leaves for mulching next month. - Advertise community restoration day.
December	- Follow up shrub/forb removal with oak mulching.	- Guided walk: invasive plants.		- Gather cardboard and weights for mulching. - Develop guided walk material (if COVID-restricted, make a video or pictures for social media). - Brink/Mclean (grant) call for proposals.
January	- Follow up shrub/forb removal with oak mulching.	- Advertise to classes. - Connect with campus clubs.	- Photo point: mid-point of school year.	- Gather cardboard and weights for mulching. - Create class list for presentations. - Email clubs.

				- Oak Bay grant deadline January 31.
February	- Follow up shrub/forb removal with oak mulching.	- General campus community outreach (Martlet, poster, etc.).		- Gather cardboard and weights for mulching. - Contact chosen media for campus outreach and prepare piece. - Victoria Foundation grant deadline nearing.
March	- Pull re-sprouting Scotch broom and small shrubs.	- Invite a school group for work party.		- Invite a school group to work party (if COVID restricted, create a virtual activity for a class). - PCAF grant deadline nearing.
April	- Hand pull or cut perennial grasses. - No follow up to invasive plant removal – leave bare. - Collaborative review of year's work.		- Photo point: end of school year.	- Compile monitoring data to guide club review. - GVSCU grant deadline April 30.
May	- Hand pull or cut perennial grasses. - No follow up to invasive plant removal - leave bare.	- Guided walk to observe wildflowers.	- Spring vegetation survey.	- Develop guided walk material (if COVID-restricted, make a video or pictures for social media).
June	- Fence building with discarded woody debris.		- Scavenger hunt for the conservation-concern species.	- Prepare visual aids for scavenger hunt.
July	- Seed collecting	- Community restoration day.	- Scavenger hunt for the conservation-concern species.	- Advertise community restoration day. - Prepare visual aids for scavenger hunt.
August	- Fence building with discarded woody debris.	- General campus community outreach (Martlet, poster, etc.).		- Contact chosen media for campus outreach and prepare piece.

Appendix F: Available Resources, Budget, and Funding Opportunities

Below are the resources and budget needed for implementing restoration activities over the next two years.

1. Available resources 2020-2021

   Labour
   Between 180 to 360 volunteer hours, able to clear between 360 to 720 m^2 of invasive plants over eight work parties in a year. Additional volunteer hours will be committed to project tasks such as seeding, ecological monitoring, cooperative plan adaptation, and community engagement.
   - The amount of volunteer hours has been estimated based on hosting monthly two hour work parties during the school year, with attendance ranging from 15 to 30 volunteers.
   - The Greater Victoria Green Team estimates that volunteers are able to clear about $2m^2$ of invasive plants per person hour (N. Shackelford, personal communication, 2020).
   - Summer work parties have not been included in this estimate as in previous years volunteer activity low during this time.

   Seeds
   - Collected: common camas (*Camassia quamash*), great camas (*Camassia leichtlinii*), fool's onion (*Triteleia hyacinthina*), and nodding onion (*Allium cernuum*).
   - Donated: chocolate lily (*Fritillaria affinis*), and Roemer's fescue (*Festuca idahoensis ssp. roemeri*).

   Equipment
   - Many pairs of secateurs, loppers, and work gloves.
   - Some larger tools such as different shovels and a rake.
   - Equipment for site, soil, and vegetation surveying.

   Hand tools from the ERC and RNS equipment lockers. The RNS equipment library can be accessed via: https://docs.google.com/spreadsheets/d/1415kzq6O4s_Jzj88NGB6MM8EIjSRpxEzhp4vQA40FOc/edit

2. Budget 2020-2021

This is an adapted budget in anticipation of applying for funding from the Campus Sustainability Fund for work happening between November 2020 and November 2021.

Category	Cost	Item	Cost Analysis
Volunteer Appreciation	$480	Refreshments for volunteers at restoration work parties.	$40/event over 12 events.
	$500	Year-end celebration and project review.	$200 in prizes to award dedicated volunteers, $300 for refreshments.
Native species addition	$721.05	Seed mix.	Native plants will be seeded in 1/3 of the area cleared from invasive plants as a trial in ongoing suppression. 165m^2 x \$4.37/m^2 = \$721.05, based on most diverse GOE seed mix available from Saanich Native Plants (Saanich Native Plants, n.d).
Tarping trials	$163.38	Brown, heavy-duty tarping.	Tarping will be trialed as a method of suppressing invasive plants and preparing areas for seeding. 4 x 11m^2 tarps x \$36.47/tarp = \$163.38, when tarps purchased at Home Depot and including taxes (Home Depot, n.d.a).
Fencing	$391.80	Heavy-gauge wired fence	This fencing will be self-supporting and protect: 1) Two areas of conservation-concern plant species within the campus GOE, foothill sedge (*Carex tumulicola*, federally endangered) and graceful cinquefoil (*Potentilla gracilis var. gracilis*, provincially endangered). A 12 m perimeter of fencing is proposed to protect these two areas totalling 3m^2. 2) About a third of the seeded areas will be protected with fencing to discourage deer browsing. Number based on fencing three 4.3 m x 4.3 m plots, totalling 55m^2. Total fencing needed is 64 m. Five rolls of fencing (5.08 cm x 10.16 cm x 122 cm x 1524 cm) is \$391.80 if purchased from Home Depot (Home Depot, n.d.b).
Tools	$122.65	3 Hori hori knives	A gardening tool that will be used in invasive species removal and native species planting activities. Cost is based on prices from Lee Valley tools (Lee Valley, n.d.a).

Category	Cost	Item	Cost Analysis
Volunteer Appreciation	$480	Refreshments for volunteers at restoration work parties.	$40/event over 12 events.
	$500	Year-end celebration and project review.	$200 in prizes to award dedicated volunteers, $300 for refreshments.
Native species addition	$721.05	Seed mix.	Native plants will be seeded in 1/3 of the area cleared from invasive plants as a trial in ongoing suppression. $165m^2$ x $\$4.37/m^2$ = $721.05, based on most diverse GOE seed mix available from Saanich Native Plants (Saanich Native Plants, n.d).
	$139.95	5 Thatch Rakes	Rakes used for preparing soil for planting and mulching. Cost is based on prices from Canadian Tire (Canadian Tire, n.d.a).
	$55.95	5 Leaf Rakes	Rakes used for gathering leaves for mulching trials and cleaning up after restoration work parties. Cost is based on prices from Canadian Tire (Canadian Tire, n.d.b).
	$137.20	5 Root Knives	Root knives are used for removing invasive grasses. Cost is based on prices from Lee Valley Tools (Lee Valley, n.d.b).
Supplies	$50	Paper and printing	An estimated amount to create posters for advertising events.
Total	$2765.98		
Total with 10% contingency	$3042.58		

The application for the Sustainability Fund should be supplemented by additional funding to cover the base costs for following years. Additional funding should also incorporate unique project components such as expanding the restoration area, establishing funding for student projects and increasing the work study position(s), and creating a seed plot. Funding options have been assessed as:

1. Public Conservation Assistance Fund - Spring 2021 (HCTF, n.d.).
    - Grants between $2500 and $20 000 over the life of a project, must have matched contributed of volunteer labour, materials, or other allowable donations.
    - Preferred projects have long-range benefits, involve as many volunteers as possible, offer opportunities for organizational capacity building, and raise community awareness about public conservation.

2. Greater Victoria Saving and Credit Union Legacy Fund (GVSCU) - April and September 30, 2020 (VanCity Community Foundation, n.d.).
    - Grant mean amount $5000. Funding is available for environmental support groups.

3. The Victoria Foundation - February 2021 (Victoria Foundation, n.d.).

- The Vital Grants category supplies between $16 000 and $40 000 to expand, replicate, or adapt an existing project.
- Funding is available for environmental sustainability projects which increase community inclusion and belonging.

4. Brink/Mclean Grassland Conservation Fund - proposals in December (Nature Trust of BC, n.d.).
   - Last year the award was $2500.
   - Dedicated funding for grasslands projects which includes GOEs.

5. District of Oak Bay Grants - January 31 (District of Oak Bay, n.d.).
   - Award amount not listed, instead preference that this isn't the primary funding and is only a one-time allocation.
   - Projects should align with official community plan which includes climate change mitigation and adaptation, natural environment protection and enhancement, and neighbourhood building.

6. University of Victoria Student Activity Grant - July 6, October 5, and January 25 (UVic, n.d.a).
   - Awards range from $500 to $1500.
   - Grant for individual student projects within the GOE restoration.

7. University of Victoria Campus Sustainability Fund - <$1000 no deadline, >$1000 February and October 15 (UVic, n.d.b).
   - Up to $10 000 in funding available.
   - Committee actively wants to fund student projects which address sustainability on campus.
   - In the past, numerous RNS program projects have been awarded this grant.

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