6 ECOLOGICAL LANDSCAPE+ BIODIVERSITY

6.1 SUMMARY OF OVERALL CONDITIONS

Ecosystems play a vital role in providing a range of services in terms of supporting soil formation, providing fresh water and habitat, regulating climate, and providing education and recreational value. Biodiversity is also a fundamental part of a well-functioning ecosystem. *The Whole Systems Infrastructure Plan* outlines a vision for providing an ecologically rich and diverse campus environment and will provide additional cultural, aesthetic, and recreational value to the broader community.

Goal

Enhance and/or restore the ecological landscape of the UBCO Okanagan Campus.

The UBC Okanagan Campus sits within the ecological setting of the Okanagan Very Dry Hot Ponderosa Pine zone, which generally represents the driest woodland regions in BC, with hot, dry conditions in summer and cool conditions with little snow in winter. Sustaining and enhancing this landscape within the campus requires understanding the distribution and connections of larger natural areas such as the Ponderosa Pine Woodland the importance of wetlands, forests, and grasslands in supporting different components of biodiversity, and the role of ecological processes such as wildfire and summer drought in sustaining healthy native ecosystems. Important aspects of the ecological systems and biodiversity on campus are described below.

Ecological Zone The campus sits within the Okanagan Very Dry Hot Ponderosa Pine biogeoclimatic zone, which is the driest forested zone in BC, with hot, dry conditions in summer and cool conditions with little snow in winter. Mean annual precipitation (Kelowna Airport) is 298 mm; of which 102 mm (34%) falls as snow. Average July temperature is 19.5°C (with extreme highs in the upper 30°C) and average December temperature is -2.6°C.

Existing Ecological Assessment The *2014 Ecological Analysis* is a comprehensive review of ecological units, wildlife presence, and the occurrence of species at risk (endangered and threatened species) within the campus. It divided the campus into seven polygons representative of distinct habitat types and value for biodiversity (coniferous woodland grassland etc.). The *Ecological Analysis* also recommended general strategies for restoring and enhancing ecological values.

Species at Risk Species at risk are defined as plants, animals, and ecological communities that are of conservation concern because of rarity, restricted range, and/or population decline. Most occur in natural ecosystems. Approximately 52 species at risk may occur on the UBC Okanagan Campus including 11 plants, 14 birds, and 12 invertebrates. Noteworthy species include the Great Basin spadefoot toad, western painted turtle, American avocet, and California gull.

Ponderosa Pine Woodland The largest natural area on campus is the Ponderosa Pine Woodland on the northwest portion of campus. The forest is a remnant stand of young Ponderosa Pine that has been fragmented by activities including road and trail building, recreational uses, and adjacent development. Its primary ecological value is as a wildlife movement corridor and habitat for animals

and birds dependent on dry forests. The *2006 Wildland Fire Management Plan* recommended that the stand be thinned and canopy gaps be created to reduce wildfire risk.

The Pond The stormwater-fed wetland east of the Engineering Management Building is a hot-spot for biodiversity on the campus. Wetlands are critical for biodiversity in the arid landscape of Kelowna because they provide food, water, and cover in proximity. The wetland is particularly important for birds, amphibians, and invertebrates.

Historical Disturbance The campus has a history of disturbance from industrial use (gravel mining), grazing, and agriculture. Many of the areas proposed for future development in the Campus Plan have been previously disturbed. Invasive plants such as cheatgrass are present in most areas. Disturbed areas can also be considered as opportunities for restoring ecological values.

Landscape Connectivity Wildlife populations are sustained by resources (access to food, water, shelter, and breeding areas) that vary through time and space across the landscape. Land clearing, construction of roads, buildings and parking lots, and human use fragment habitat and reduce connectivity. Maintaining connections both between habitat areas on campus, as well as to natural areas outside the campus is essential for maintaining biodiversity. This emphasizes the importance of looking and natural areas as an overall network both within and outside the campus.

Natural Ecological Processes Fire and drought are important natural ecological processes that shape the campus ecology, but will be influenced by climate change. Reducing wildfire risk while maintaining or enhancing ecological values is necessary as campus development proceeds.

6.2 CAMPUS SCALE STRATEGIES

Five measures are proposed to restore and enhance the ecological landscape and support biodiversity:

1. Protect existing ecological features during campus development;
2. Create a compact campus core that integrates buildings and landscapes that capitalize on natural systems;
3. Collect and filter stormwater to enhance wetlands and other water features;
4. Incorporate native plant communities into the campus landscape; and
5. Enhance the use of the campus as a learning landscape.

The measures are described below and further refined into actions in Section 4.6 Implementation Plan.

BM 1—Protect Existing Ecological Features during Campus Development

The current Campus Plan focuses development in areas adjacent the campus core which have been previously disturbed. This is a logical strategy both to densify the existing campus, and to avoid further loss of natural areas. Additional measures may be needed to ensure the incremental loss of small forest patches and other natural areas does not occur as construction footprints expand. Smaller natural areas can contribute to landscape connectivity and buffer larger natural areas from the effects of urban land use.

The enhancement of vegetation structure and proposed wetlands on campus will have important benefits for supporting bird populations. As the campus develops, consideration should be given to bird-friendly building and landscape design strategies to reduce bird strikes (collisions) and these requirements should be integrated into UBCO's *Design Guidelines*.

Biodiversity Measure 1 Protect Existing Ecological Features during Campus Development	BIODIVERSITY	WATER	STORMWATER	ENERGY	WASTE

BM2—Create a Campus Core that Integrates Buildings and Landscapes that Capitalize on Natural Systems

Development and densification of the campus core creates opportunities to better integrate natural systems into building and landscape function. Three specific approaches are proposed.

1. **Increase tree cover** A 10 to 25% increase in tree cover within the campus core will reduce ambient summer temperatures, enhance building shading, and reduce summer cooling requirements. A 10% increase is a modest and achievable without conflicting with the *Wild Fire Management Plan*. Trees should consist of both native conifers (Douglas-fir and Ponderosa Pine) and a broad range of non-native deciduous trees that are suitable to the region, and should be sited and maintained to minimize fire risk. The *2006 Wild Fire Management Plan* recommends tree species with lower fire risk, and other measures (e.g., sprinklers, maintenance, etc.) to reduce fire generation. Potential sites for tree planting could include, but not limited to, the woodland patch near the Okanagan Centre, the remnant woodland patches near the campus entrance (University Way), the escarpment slope between the Commons and the main parking lot, and the margins of University Way and Alumni Avenue.
2. **Divert rainwater runoff from hardscapes into adjacent landscapes** Rainwater runoff from buildings and other hard surfaces within the campus core should be directed into adjacent landscape areas to reduce stormwater runoff, reduce irrigation requirements, and sustain landscaped areas. Raingardens, permeable paving, infiltration galleries,

and absorbent landscapes with deep organic soils are all effective design approaches for stormwater management for increasing infiltration and plant evapotranspiration.

3. **Selective green roof installation** Green roofs should be considered on a case-by case basis to improve energy efficiency by increasing insulation, reduce ambient summer temperatures, slow runoff rates during large storms, and enhance biodiversity. Green roofs are most appropriate where they contribute to improved views and vistas for highly visible roof surfaces. Green roofs should use plants suitable to the regional climate that will senesce during the summer drought, and regrow with fall and spring rains. As described below, native plant communities can be used to enhance biodiversity for pollinators, butterflies, and some birds. Green roof design should consider the range of options including intensive and extensive green roofs, as well as planters.

The following criteria should be used to determine the applicability of green roofs for new construction:

- Contribute to improving views and vistas for highly visible roof surfaces;
- Link to increasing biodiversity and stormwater functions;
- Increase productivity by providing views of nature from work and learning spaces;
- If appropriate, link the use of a green roof to support the academic program proposed for the building;
- Provide social amenity space as part of the building's program; and
- Add to energy efficiency performance goals.

Biodiversity Measure 2 Create a Campus Core that Integrates Buildings and Landscapes that Capitalize on Natural Systems	BIODIVERSITY	WATER	STORMWATER	ENERGY	WASTE

BM 3—Collect and Filter Stormwater to Enhance Wetlands

Wetlands and their riparian zones are hotspots of biodiversity in the arid landscape of Okanagan: birds, amphibians, and invertebrates, including several species at risk, are drawn to the wetlands for food, water, nesting and breeding. Indeed, many stormwater features on campus have been colonized by Great Basin spadefoot toads, a threatened species. In order to support the extent and variability of wetlands and riparian areas throughout campus, and to increase ecological and stormwater management benefits, there should be minor expansion of the wetlands adjacent to The Pond as well as development of a wetland complex within the lower bench adjacent to the main parking area.

Parking lots and other large impermeable areas should be used to capture rainwater. Filtration systems such as vegetated swales, raingardens, and sand filters should be used to remove contaminants before stormwater is introduced into wetlands. In other areas of the campus, infiltration using low impact development strategies such as permeable paving, infiltration galleries, and absorbent landscapes is recommended as a strategy to reduce stormwater runoff and help recharge the aquifer.

Figure 55 and Figure 58 (in the Stormwater Section) illustrate the network of the wetland complex and possible opportunities for low impact development strategies for stormwater management.

It is recommended that UBCO's stormwater management plan be updated to integrate these recommendations and that a geotechnical study be completed to identify the most appropriate locations on campus, based on the 2015 Campus Plan, for low impact development strategies to support stormwater infiltration.

See the Stormwater section for costs related to enhancing the wetland complex on campus.

Biodiversity Measure 3 Collect and Filter Stormwater to Enhance Wetlands	BIODIVERSITY	WATER	STORMWATER	ENERGY	WASTE

BM 4—Integrate Indigenous Plants into the Campus Landscape

As much as possible, grasses, wildflowers, shrubs, and trees native to the Okanagan landscape should be brought into the campus core. Native plant communities are often better adapted to soil and climate which result in less maintenance and water to sustain them. In addition, native plant communities support a broader range of wildlife such as pollinators, butterflies, and birds compared to traditional landscapes of non-native plants. Even small patches of native grasses and wildflowers are important for native bees and butterflies if they are part of an inter-connected network across the campus.

The distinct aesthetic qualities of the Okanagan landscape can also be used to create a unique identity for the campus. Corridors of native vegetation that connect the campus core to the surrounding pine woodlands and grasslands provide another way of structuring the campus landscape, similar to the use of pedestrian spines for human movement. However, this goal should be balanced against the need to create programmed landscapes that support active social and recreational use, and social spaces that are an intrinsic part of the campus core character. Outside the campus core, there are opportunities for ecological restoration of woodland and grassland areas to promote native plant communities and the biodiversity they support.

As with all landscape design decisions on the UBC Okanagan Campus, fire risk should be considered during planning and maintenance. Actions to reduce fire

risk or spread include: fire-resistance plants should be selected, sprinklers should be installed for use in fire suppression rather than irrigation, landscape beds should be framed with fire-resistant materials to contain small fires, organic mulches (bark mulch) should not be used, and plant litter and grass thatch should be removed. Efforts should continue to implement the recommendations of the 2006 *Wild Fire Management Plan*.

Biodiversity Measure 4 Integrate Indigenous Plants into the Campus Landscape	BIODIVERSITY	WATER	STORMWATER	ENERGY	WASTE

BM 5—Enhance the use of the campus as a learning landscape

As the future academic program unfolds for the campus, consideration should also be given to how landscaped and natural areas within and around the campus core such as the Ponderosa Pine Woodland the grassland benches and the wetland serve as important resources for teaching and research. This will foster an opportunity for the campus community to engage with and learn, for example, about the Okanagan's natural systems, cultural landscapes, habitat protection and biodiversity, and how passive design can be realized through mindful landscape design. There are also opportunities for students and researchers to participate in habitat restoration, forest management, and biodiversity monitoring as part of UBC's 'Living Lab' initiative. This could also support research funding efforts for specific departments on campus or be linked to a broader donor strategy that could support the implementation of these measures.

Biodiversity Measure 5 Enhance the use of the campus as a learning landscape	BIODIVERSITY	WATER	STORMWATER	ENERGY	WASTE

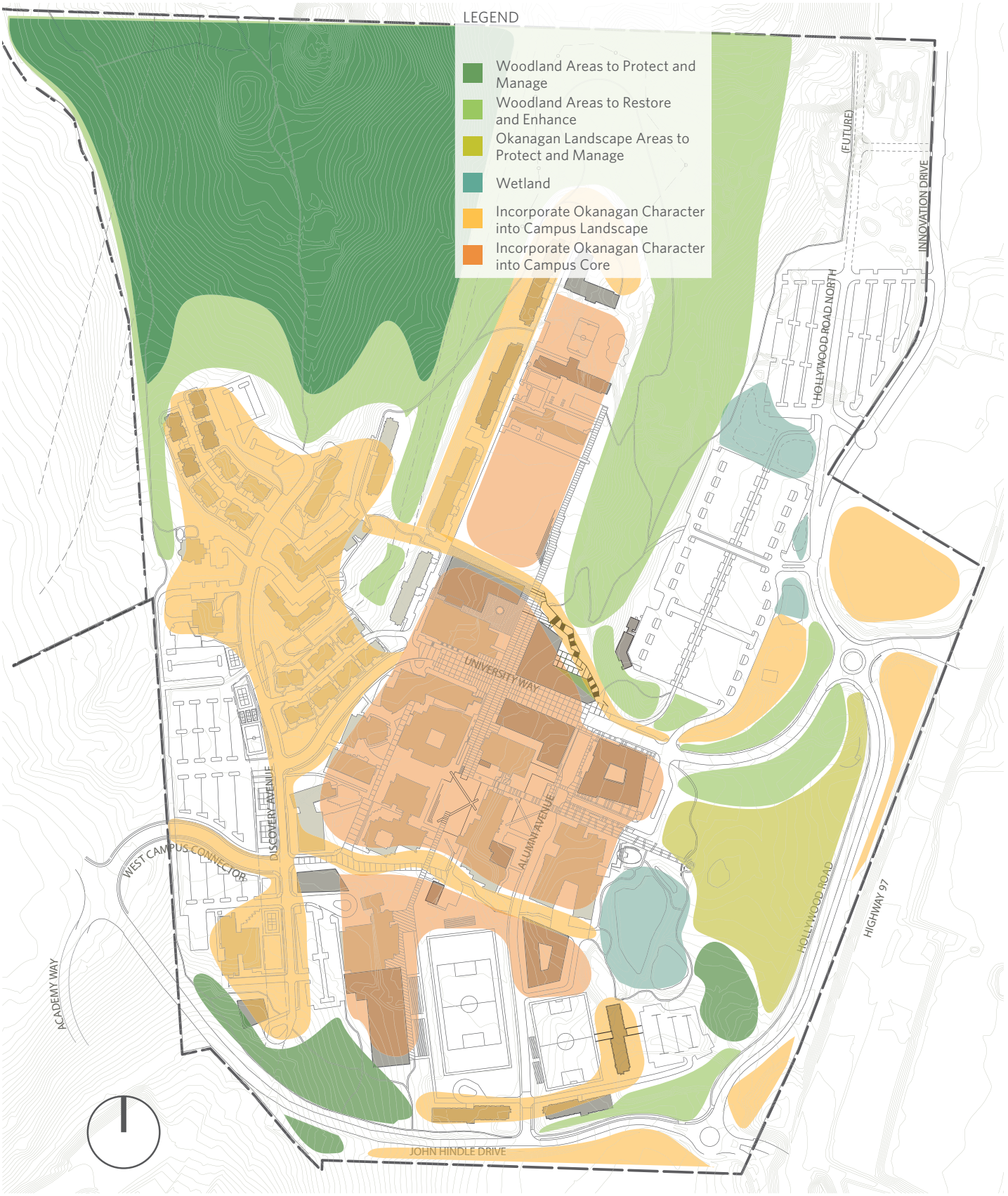

FIGURE 55: ECOLOGICAL LANDSCAPE AND BIODIVERSITY CONCEPT PLAN

6.3 BENEFITS AND CHALLENGES

In summary, there are a number of benefits and challenges with each of the overall measures presented above. In some cases, there are direct synergies with measures proposed in the stormwater section and in other cases there may be challenges associated with managing fire risk on campus. Each of these benefits and challenges, summarized in Table 54, should be weighed as UBCO moves forward with prioritizing and implementing these measures.

TABLE 54: BENEFITS AND CHALLENGES—ECOLOGICAL LANDSCAPE + BIODIVERSITY MEASURES

MEASURE	BENEFITS	CHALLENGES
BM 1 Protect Existing Ecological Features during Campus Development	• Enhanced biodiversity values of the campus • Compact campus (energy benefit) • Reduced stormwater run-off	• Development challenges on some sites (steep) • Loss of open space • Increased parking costs
BM 2 Create a Campus Core that Integrates Buildings and Landscapes that Capitalize on Natural Systems	• Enhanced biodiversity values • Enhanced campus landscape • Increased building shading • Reduced energy cost from summer cooling • Reduced long-term irrigation, maintenance requirements • Reduced stormwater runoff and potential increased infiltration • Enhanced open space and social amenity spaces • Link to academic programs	• Upfront capital and maintenance cost to establish a naturalized landscape and ensuring the landscape appears as intended rather than abandoned or neglected • Increased staff time to coordinate • Potential increase in fire risk • Consider soil requirements of xeriscaping and other plant species (campus soil very diverse)
BM 3 Collect and Filter Stormwater to Enhance Wetlands	• Diversion of runoff from increased parking lot areas • Reduced erosion + runoff • Enhanced biodiversity hotspots • Reduced fire risk	• Capital and maintenance cost to ensure landscape appears as intended rather than neglected • Increased staff time to coordinate • Creation of ecologically sensitive habitats that are difficult to maintain
BM 4 Integrate Indigenous Plants into the Campus Landscape	• Enhanced biodiversity values • Enhanced campus landscape • Connectivity with broader ecological networks • Reduced stormwater runoff • Reduced irrigation requirements	• Potential increase in fire risk • Requires balance programmed landscapes that support active social and recreational use and social spaces
BM 5 Enhance the use of the campus as a learning landscape	• Alignment of academic program with landscape vision • Research and community stewardship opportunities • Demonstrates commitment to sustainability • Opportunity for donor funding	• Capital and maintenance cost to ensure landscape appears as intended rather than neglected • Increased staff time to coordinate

Additional Benefits

Additional qualitative benefits that may be derived from biodiversity measures which are not substantiated in the costing include:

- Increased value to UBCO's image and brand associated with leadership in biodiversity. Opportunity to demonstrate UBCO as a steward of the natural environment;
- Attraction of new students who are searching for a university that has strong demonstrated sustainability values;
- Increased employee retention by providing a campus environment which connects employees with ecosystems surrounding the campus;
- Attraction of new donors who are interesting in supporting the implementation of the biodiversity measures;
- Increased research opportunities to link academic research with government or non-governmental research based programs that are focused on ecological restoration, endangered species, climate change adaptation etc.;
- Energy benefits associated with reduced heat gain on buildings and reduced urban heat island effect in the campus core;
- Water conservation benefits associated with implementing a naturalized landscape;
- Stormwater diversion benefits associated with expanding the wetland network and infiltration strategies to manage stormwater runoff on campus; and
- Potential long-term maintenance savings with associated with transitioning to a more naturalized landscape across the campus.

6.4 COST ANALYSIS

Creating the business case for the Ecological Landscape + Biodiversity measures is challenged by the fact that there is not the same financial return on investment as may be gained from measures focusing on water or energy conservation. Rather, a broader set of direct and indirect benefits associated with these measures should be considered as part of the overall evaluation and how a long-term commitment to enhancing and restoring the campus ecology will benefit the university. The benefits and challenges of the biodiversity measures presented above were considered as part of the overall evaluation of each measure.

For the purpose of this study, the economic modelling analysis presents an order-of-magnitude capital cost for the various measures and strategies presented above (see Table 55). In addition, some unit rate costs are presented for the low impact development strategies in the stormwater section. The costs for these

measures do not account for ongoing operational and maintenance costs. Based on industry experience, there is not an anticipated cost premium for maintaining a naturalized landscape with native plants as compared to a conventional landscape and the following maintenance guidelines are provided:

- for native plant communities in maintained landscapes in the campus core to require 100% of the costs of conventional plant communities, and potentially 50% less water requirements but same amount of weeding and mulching, etc.
- for more natural areas outside the campus core, maintenance is estimated to be 25% of conventional (i.e., meadow communities that are not actively maintained once established).

TABLE 55: SUMMARY OF ECOLOGICAL LANDSCAPE + BIODIVERSITY MEASURES COSTS

DESCRIPTION		QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
Ecology Measures					
Woodland Areas to Protect and Manage	Forest Restoration—thinning (50% of forest area)	12.1	ha	1.5	$175,800
Woodland Areas to Restore and Enhance	Forest Restoration—invasive (25% of forested area)	7.2	ha	3.6	$261,500
Okanagan Landscape Areas to Protect and Manage	Meadow Restoration (25% of Forest Area)	1.0	ha	4.4	$44,600
Tree Planting	One tree per (40 m^2 of landscape area)	256	ha	$1,160	$297,100
Okanagan Character to Incorporate into Campus Landscape	Landscape (20% of total area)	12,064	m^2	$72.5	$874,700
Okanagan Character to Incorporate into Campus Core	Landscape—Community Garden (2% of total area)	2,969	m^2	$130.5	$387,500
				Total Ecology Measures	**$2,041,200**

Note: See Stormwater section for costs related to enhancing the wetland complex on campus.

Evaluation Criteria

Based on the four evaluation criteria established for the project, overall the Ecological Landscape and Biodiversity measures are highly supportive of:

1. Contributing to meeting the following whole systems infrastructure study goals by 2050;
2. Minimizing life cycle costs;
3. Being relatively easy to implement and maintain; and
4. Contributing to the long-term adaptability and resiliency of the campus.

A summary of the evaluation is presented in Figure 56 Evaluation of Ecological Landscape + Biodiversity Measures.

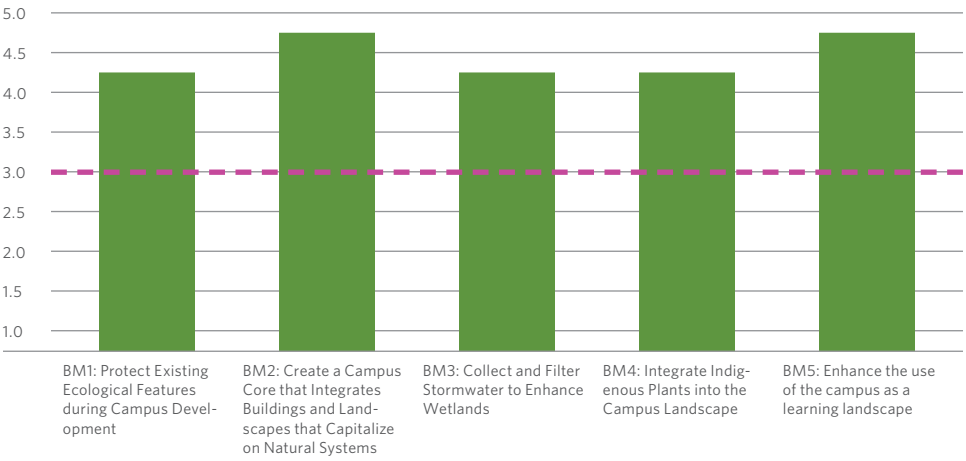

FIGURE 56: EVALUATION OF ECOLOGICAL LANDSCAPE + BIODIVERSITY MEASURES

Funding Mechanisms

A multi-pronged approach to funding the biodiversity measures is required and will necessitate a combination of private-public partnerships, capital project funding, and donor funding.

Projects to improve the ecological landscape and biodiversity are typically funded using five methods:

1. **Public- Private Partnership Funding** Many biodiversity projects are suitable for partnerships with outside funders both from senior levels of government, and from the private sector. Species at risk conservation is suitable for a range of federal funding sources. The partnership opportunities could build upon UBC's vision for the campus to be a 'Living Lab' from which direct learning results can benefit the larger community, policy makers and industry as it relates to ecological preservation and restoration.
2. **Major Project Funding** Large projects (>$100k) such as new wetlands for stormwater management can be funded as capital projects under UBCO's long-term budget process. They can either be stand-alone projects or linked to capital projects focused on the development or retrofitting of the landscape.
3. **Smaller Project Funding** Smaller projects (<$25k) are implemented incrementally with community, student, and faculty involvement in both the planning and implementation. In addition, both large and small projects can be implemented with existing staff under operational budgets. For example, changes to the campus landscape to incorporate native plants and support native biodiversity can be completed in phases by existing staff using moderate, annual budgets.

4. **Donor Funding** As part of the broader effort to secure donor funding for the Campus Plan, discrete ecological landscape and biodiversity measures should be identified as part of a donor campaign program.

6.5 IMPLEMENTATION PLAN

A long-term view should be taken when implementing the biodiversity measures as the benefits will take time to accrue as landscapes are established, wildlife species establish themselves in new habitat, and as academic and community stakeholders become active participants within the landscape.

Many projects are also suitable for phasing; in fact, there are substantial benefits for using adaptive management principles to test suitable methods before they are implemented on a larger scale. Forest management actions to improve biodiversity and reduce fire risk, for example, can be phased over three to 10 years. Similarly, habitat restoration focused on grassland restoration would typically occur at a scale of 0.5 to 1 hectare.

An overall recommendation for implementation is to develop a landscape vision for the campus that integrates the Ecological Landscape and Biodiversity measures that places a priority on protection, restoration, and long-term management of the native landscape.

Table 56 presents a range of implementation actions to support each of the five overarching Ecological Landscape and Biodiversity measures.

TABLE 56: IMPLEMENTATION PLAN OF ECOLOGICAL LANDSCAPE AND BIODIVERSITY MEASURES

Ecological Landscape + Biodiversity Measures	<5 years	5-10 years	10-20 years
BM 1—Protect Existing Ecological Features During Campus Development.			
Continue to densify and focus development in the campus core.	●	●	●
Avoid incremental loss of natural areas including woodlands and indigenous grasslands during campus expansion.	●	●	●
Update the *2011 Stormwater Management Plan* to address rainfall capture and wetland creation, and consideration of and changes in the 2015 Campus Plan.	●		
Consider underground parking under new buildings to limit surface area parking.		●	●
Develop habitat restoration plans for the escarpment slope, eastern meadow slope, and pine woodland.		●	
Update UBCO *Design Guidelines* to include requirements to protect and enhance bird habitat during campus development.	●		
BM 2—Create a Campus Core that Integrates Buildings and Landscapes that Capitalize on Natural Systems			
Update UBCO *Design Guidelines* and *Project Design Briefs* to include requirements for integrating naturalized systems into new construction and landscape projects, along with performance requirements to use LID methods, and consider on a project per project basis green-roof feasibility.	●	●	●
Where possible, increase tree cover by 10% in the campus core while balancing requirements of the 2006 *Wild Fire Management Plan.*	●	●	●
Continue to implement the recommendations of the 2006 *Wild Fire Management Plan.*	●		
Increase tree planting in and adjacent to parking area to provide summer shading.	●	●	
Develop staff training to support best practices including irrigation and soil management.	●	●	
Test best practices for expanding naturalized areas in order to determine costs of transitioning to this landscape typology.	●		
Plant trees in areas such as the escarpment slope which do not increase fire risk near buildings and infrastructure.		●	
Review opportunities to grow plant material campus (i.e., on-site plant nursery) for use in landscaping and restoration activities.		●	
BM 3—Collect and Filter Stormwater to Enhance Wetlands			
Update the *2011 Stormwater Management Plan* to address rainfall capture, infiltration, and wetland creation.	●		
Expand the number of and range of wetlands types associated with parking areas or other larger impermeable areas for biodiversity enhancement (open water, marshes, willow thicket, seasonally flooded areas) and stormwater management.	●	●	
Monitor stormwater quality within the campus drainage system.		●	

Ecological Landscape + Biodiversity Measures	<5 years	5-10 years	10-20 years
BM 4—Integrate Indigenous Plants into the Campus Landscape.			
Update UBCO *Design Guidelines* and project *Design Brief*s to incorporate requirements for native planting for new construction projects.	●		
Test native and adaptive planting and maintenance strategies in order to increase the use of these species.	●		
Work with UBCO faculty to design landscape areas and develop planting strategies to benefit specific species or species groups such as native pollinators, butterflies, and birds which are compatible with developed areas.	●		
Showcase the use of the Okanagan landscape as part of the campus identity.	●		
BM 5—Enhance the Use of the Campus as a Learning Landscape.			
Develop an education, awareness and outreach program that communicates the measures and benefits of the *Whole Systems Infrastructure Plan's* Ecological Landscape and Biodiversity measures.	●		
Expand opportunities and resources to use natural areas as part of the campus' research and learning program, and seek opportunities to align with UBCO's academic program.	●	●	●
Identify student research projects that support the implementation and monitoring of the biodiversity measures in order to establish baseline metrics and goals for improvement.	●	●	●
Test opportunities for an internal (faculty/staff) or external (broader community) garden or collaborative agriculture.	●	●	●
Provide funding for student research on priority topics such as campus bird populations, species at risk enhancement, and monitoring pollinator and butterfly use of native plant communities.	●		
Develop community volunteer programs to help support the long-term stewardship of the biodiversity-based programs (i.e., trail building & maintenance, community gardens, species monitoring etc.).	●	●	●
As part of developing a Public Benefits and Stewardship Plan for UBCO, integrate biodiversity measures that place a priority on protection, restoration, and long-term management of the native landscape	●		

Performance Metrics

A number of metrics can be used to measure and monitor the success of the ecological landscape and biodiversity measures. An overall recommended metric for measuring UBCO's biodiversity performance is:

- Amount hectare (ha) of natural areas across the campus.

This metric will capture the larger ecological units (Pine Woodland) as well as smaller landscaped areas in the campus core. The term "natural areas" is meant to be flexible enough to capture the range of sites and areas that would support biodiversity.

It is recommended that researchers from UBCO work with local scientists, building upon the *2014 Ecological Analysis*, to establish a baseline metric and target. Additional metrics for benchmarking and tracking UBCO's efforts in this area may include some of the following:

Metrics for natural areas / native habitats

- Percent tree canopy (not always as suitable in a partially non-forested landscape).
- Amount (ha) of natural or constructed wetlands
- Amount (ha) of native plant communities within campus core (as a measure of bringing the Okanagan landscape into the campus)
- Amount (ha) of restored ecosystems (grasslands, forest, etc.)

Metrics for landscaped areas

- Amount or percent of pervious landscaped area
- Amount or percent of non-irrigated landscape area
- Amount or percent of landscape area with native species

Metrics for biodiversity

- Bird diversity on campus
- Butterfly diversity on campus
- Species at risk populations on campus

Metrics social engagement

- Research projects using natural areas on campus
- Participation of students (by group, by number of individuals) in ecological restoration or biodiversity projects