

Open Space and *Biodiversity* in the Central Puget Sound Region: White Paper and Recommended Actions

Presented by the ROSS Biodiversity Task Force

SECTION 1: PROBLEM STATEMENT + CONNECTION TO OPEN SPACE

What are primary challenges facing biodiversity in the Central Puget Sound?

Biodiversity can be described as the sum of all life forms and their associated biological processes — the diversity of genes, individuals, species, communities and ecosystems (King County Biodiversity Report, 2008; Washington Biodiversity Council, 2007). The Central Puget Sound's varied ecosystems, including its marine shorelines, mesic forests, and riverine and wetland systems, provide for a rich biodiversity. These ecosystems and associated species deliver key ecological services to the region: vital economic benefits in agriculture, forestry, and fisheries; health benefits such as clean water and flood control; and many cultural and recreational benefits that enrich the lives of our citizens.

In the last century, population expansion and land development in the Central Puget Sound have negatively impacted the area's biodiversity through habitat loss and ecological disruption (Hepinstall et al., 2008; Krukeberg, 1991). Many historical factors are responsible for the degradation, including: habitat fragmentation, housing growth, agricultural expansion, invasive species, logging, reduction in surface and groundwater, and shoreline armoring and pollution. As human population and land development pressures have grown, so has the need to actively manage our biological resources.

In addition to land use changes, there also are social and governmental challenges to protecting and restoring biodiversity in the Central Puget Sound. Though the residents of the region generally support species and habitat protection, the current management of biodiversity is siloed among different jurisdictions and government agencies, often making it difficult to plan for, or respond efficiently to, threats at regional scales. Some argue that planning processes, such as those afforded through the Growth Management Act and Critical Area Ordinances do not adequately address long-term biodiversity conservation. Many important biodiversity areas are located near population centers that are undergoing sprawling development on private lands. This “urban sprawl” causes loss of biodiversity and diminished ecological services, the loss of which negatively impacts society at large. Compounding these challenges is the emerging issue of global warming, widely recognized as a serious threat to biodiversity and ecological health (Staudinger et al., 2013; Travis, 2003).

Five primary challenges facing biodiversity protection in coming years in Central Puget Sound will be to: 1) understand and address threats to regional biodiversity with prioritized, results-driven actions; 2) apply ecological principals to land use management at multiple spatial scales; 3) plan for a future that conserves biodiversity as part of sustainable development; 4) identify indicators and create a monitoring system that reveals whether strategies are protecting biodiversity or not, and if not, manage adaptively to continuously improve; and 5) develop a citizenry that values protecting a rich, regional biodiversity.

What is the relationship of open space to biodiversity?

The ROSS describes open space as: “*an embracing term for a diverse spectrum of lands across a rural and urban continuum on large and small scales. Traditionally open space may be imagined as wilderness lands or public parks, but it also encompasses resource lands for agricultural and timber production, wetlands and water bodies, local and regional recreational trail systems, as well as urban green spaces like parkways, rain gardens, and green roofs.*” From the perspective of biodiversity conservation, considering open space more broadly than just wilderness lands or public parks is especially noteworthy because it expands the number of sites for biodiversity protection.

Open space as defined by ROSS provides the primary area for all species, habitat and ecological interactions. The richness and long-term health of our regional biodiversity depends both on the amount and quality of open space, and its spatial structure and configuration. Depending on design, a wide variety of open space types, ranging from wild lands to golf courses to backyard gardens, can contribute various elements to regional biodiversity (Blair, R. B, 2007; Blair and Launer, 1997; Donnelly and Marzluff, 2004; Goddard et al., 2010). Wild lands provide the best habitat for many species, but our suburban yards can support avian diversity (Marzluff, 2014), or even recreational sports fields when properly designed can provide habitat for plants, insect pollinators and many species of animals. In the Central Puget Sound it is increasingly important to conserve biodiversity across and within the entire urban to rural landscape.

In largely developed landscapes like Central Puget Sound, open space harbors most biodiversity (Crooks et al., 2004; Donnelly and Marzluff, 2004). And the species, habitats and ecosystems found in these open space lands deliver critical ecological services to the region. Current and future planners especially focus on protecting biodiversity in priority open space areas, such as rare and threatened habitats, riparian zones, floodplains, steep slopes and wildlife corridors. Planners also typically wrestle with how to design open space that balances apparently conflicting uses like recreation versus managing for biodiversity and ecological services; finding win-win designs are key.

The ecological value of individual open space lands, such as parks and protected areas, is highly dependent on both the characteristics of open space itself (e.g. size and habitat quality) and the landscape context surrounding the open space (Crooks et al., 2004; Donnelly and Marzluff, 2004; Prugh et al., 2008; Soule et al., 1988; Williams et al., 2006). The characteristics of the landscape in which open space is embedded is critical because it affects whether that space is ecologically isolated or connected to the broader ecosystem. “Ecological connectivity” is defined as “the degree to which the landscape facilitates or impedes plant and animal movement” (Taylor et al., 1993). Urban development impedes the movements of many sensitive species (Soule et al., 1988), but providing habitat corridors through developed landscapes can help protect these sensitive species (Collinge, 1998; FitzGibbon et al., 2007; Kadlec et al., 2008). This spatial concept of ecological connectivity is especially timely in the face of climate change and the growing need for species to be able to move to track suitable climates (Heller and Zavaleta, 2009). Simply put, well-managed, connected open space provides greater value to biodiversity protection and resilience than unconnected lands (Dale and Haeuber, 2001).

Open space in the Central Puget Sound is vitally important as the region continues to grow. A reduction in the amount or quality of open space will result in biodiversity loss and degraded ecological services. Loss of biodiversity would have reverberating, negative impacts on the region’s economy, health and culture – including leaving the region with less resilience for unanticipated future environmental challenges like those resulting from climate change. Additionally, there could be an added burden to public resources as more species are added to the federal or state endangered species lists.

The future of biodiversity and regional sustainability can be improved by applying key ecological principles to land use planning and management (for example, see Dale and Haeuber, 2001). Open space planning guidelines that help protect biodiversity include:

- a) Provide resilience for long-term change and unexpected results.
- b) Protect the largest, most intact, and contiguous habitats possible for local plants and animals.
- c) Ensure the focus of open space protections includes ecosystems and landscape diversity.
- d) Protect connectivity by providing wildlife corridors and other connections between open space (habitat) patches for animal and plant dispersal, and long-term species migration.
- e) Preserve rare landscape elements, critical habitats, and associated species.
- f) Minimize introduction or spread of nonnative species.
- g) Manage access to and use of open space to minimize the impacts on biodiversity.
- h) Examine the impacts of local decisions in a regional context.
- i) Implement adaptive management strategies for the stewardship of biodiversity on open space.

Why is a regional approach to open space necessary in advancing objectives for biodiversity?

In the Central Puget Sound, biodiversity management of open space usually focuses on habitat and species at local spatial scales by local jurisdictions. No single location can adequately protect regional biodiversity. Rather, providing a resilient landscape that can maintain biodiversity over the long-term requires protecting a network of connected open space lands as well as managing the surrounding landscape across large spatial scales (Franklin and Lindenmayer, 2009; Margules et al., 2002). To adequately protect the breadth of biodiversity in the region—and to be true to the definition of biodiversity—one must consider a regional approach that addresses all spatial scales and levels of biological diversity, from genetic to ecosystem diversity.

The Washington Biodiversity Council (2007) commended the ongoing efforts to conserve Washington's biodiversity on the part of federal, state, and local governments as well as nonprofits, citizens, and the private sector. The most important contribution of a regional approach to open space planning and biodiversity conservation would be to better coordinate and further develop these individual efforts.

Additional advantages for biodiversity of a regional open space strategy include:

- a) Increases efficiency and reduces costs.
- b) Many threats need to be addressed at regional scales.
- c) Regionally important open space areas may differ from locally important areas.
- d) Coordinating goal setting and actions across jurisdictions can have greater impact.
- e) Linking biodiversity management to other human activities that span jurisdictions, such watershed protection and recreation can be more effective.
- f) Addressing connectivity requires working across political boundaries.

The Central Puget Sound includes four counties and over 100 municipalities that have individual policies, regulations and programs. Effective management of biodiversity in Central Puget Sound requires an approach that spans spatial scales and political boundaries. Historically, land use planning only took into account local and site-specific scales. The declining biodiversity in the Central Puget Sound (Washington Biodiversity Council, 2010) calls for better local and regional protection, especially in the context of an expanding human population and changing climate. It is especially important to understand that benefits of biodiversity reach beyond single jurisdictions. For example, Seattle residents ought to understand that they have a vested interest in biodiversity protection in the Cascade foothills of eastern King County for the economic, health and recreations benefits it brings to the city and the region.

Finally, it must be recognized that species of concern in the Central Puget Sound, such as salmon and large carnivores, require conservation efforts not only at site, local and regional scales, but also at state, national and global scales. A successful biodiversity conservation effort for the Central Puget Sound needs to connect to conservation programs beyond our regional boundaries.

Summary/Persuasive Closing Statement

Preserving open space for the support of biodiversity will require regional strategies for: knowledge management and goal setting; public engagement and support; policy-supported investments, and integrating biodiversity concepts widely across many public interest sectors. It will take an especially concerted effort to educate decision makers and key public audiences of the essential need for a regional open space strategy that fully protects biodiversity and its associated ecological services. These benefits serve the Central Puget Sound human population by, among other things, sustaining resource economies, providing clean air and water, offering recreation opportunity, and presenting a mitigation and adaptation approach to climate change impacts.

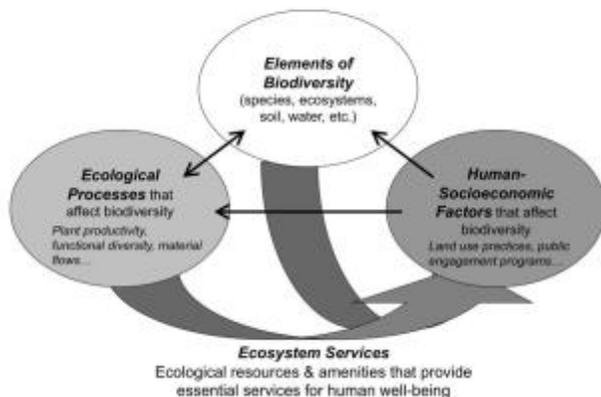
SECTION 2: SUMMARY OF METRICS, ECOSYSTEM SERVICES, CO-BENEFITS + TRADEOFFS

What are the top indicators and metrics – both quantitative and qualitative – that can be used to assess the current condition of biodiversity in the region?

Assessing biodiversity condition is inherently difficult because of its complexity, both in terms of diversity (species, populations and ecosystems) and the multiple spatial scales of concern ranging from local to global (Margules et al., 2002; Szaro and Johnston, 1996). Methods to survey living organisms at a given time and place are available for most taxonomic groups. Land managers, however, require broader “measuring and monitoring” assessment methods that are repeated periodically, in order to detect changes and trends in key biodiversity elements and ecological processes, so that management practices and policies can be adapted.

The ROSS should adopt a long-term biodiversity measuring and monitoring strategy. Many regional information sources are available to provide a foundation, including: 1) The Washington Natural Heritage Program (www.dnr.wa.gov/ResearchScience/Topics/NaturalHeritage/Pages/amp_nh.aspx); 2) The Washington Ecological Integrity Assessment Project (<http://wdfw.wa.gov/publications/01314/>); 3) King County Biodiversity Report (www.kingcounty.gov/environment/animalsAndPlants/biodiversity/king-county-biodiversity-report.aspx); 4) The Washington Comprehensive Wildlife Conservation Strategy (<http://wdfw.wa.gov/conservation/cwcs/>); 5) The Washington Biodiversity Council (discontinued in 2010, but reports remain available at www.rco.wa.gov/biodiversity/about_the_council.shtml); and 6) The Pierce County Biodiversity Alliance (<http://naturemappingfoundation.org/natmap/projects/bma/overview.html>).

The Washington Biodiversity Council (2010) proposed a “Biodiversity Assessment Framework” and “Biodiversity Scorecard” as a statewide tool to measure and monitor biodiversity (Walters and Marzluff, 2010) that we recommend be further explored for use in full, or in part, by the ROSS. The conceptual framework of their tool categorizes 30 indicators (selected after reviewing 136 possible indicators) into four indicator categories (Figure 1). Walters and Marzluff (2010) described the categories as: 1) *Elements of Biodiversity* – these include indicators describing the structural and compositional components of biodiversity. Such elements include distinct populations, species, and ecological communities, as well as ecosystem stocks (e.g., soils, nutrients, and water), landscape patterns and other features that comprise the structural ecological components upon which species depend. 2) *Key Ecological Processes that Affect and Support Biodiversity* – these indicators describe processes that either promote or hinder biological diversity. Predators and pollinators are examples.



3) *Key Human-Socioeconomic Factors that Affect and Support Biodiversity* – these indicators measure human engagement in promoting or hindering biodiversity, either directly or indirectly. For example, actions to conserve or create landscape conditions suitable for potential habitat. Also included are indicators of public engagement in natural resource conservation, such as environmental education and citizen science programs. This category also includes potential risk factors, such as land use change and pollutant levels.

Figure 1. Biodiversity assessment indicator categories, with examples from the set of 30 indicators used to monitor and measure biodiversity (from Washington Biodiversity Council, 2010; Walters and Marzluff, 2010).

Walters and Marzluff (2010) suggested that the tool could be applied at state, regional or ecosystem levels by selecting and scaling metrics appropriately. They recommended that the assessments be repeated at time periods that coincide with available data, typically two to five years. They also quantified the tool by creating normative measures (0 -1) for each metric by calculating them based on relative measures (e.g. water quality index relative to 15-year maximum). Details are provided in their report; the point here is that their methods provide a relatively robust analysis with results that lend themselves to combining metrics in multiple ways, and thus, viewing the assessment from many perspectives. For example, for overall trends, sub-trends for indicator categories, or combinations of metrics measuring concepts like “resilience.”

The Biodiversity Task Force recommends an approach like that of Walters and Marzluff (2010), but if such a comprehensive effort is not possible, we suggest a subset of their indicators and metrics for consideration. Table 1 depicts select indicators from the Walters and Marzluff framework and identifies those the Task Force recommends could be particularly valuable for the open space effort. In general, the Biodiversity Task Force recommends indicators that reveal through repeated measure the success or failure of ROSS strategies, so that management practices and policies can adapt. For ROSS those indicators within the categories of biodiversity structure/composition, ecological function, and landscape characteristics that affected open space, especially those characteristics relative to biodiversity conservation focusing on:

- ✓ Amount
- ✓ Shape
- ✓ Location
- ✓ Quality
- ✓ Connectedness
- ✓ Relative value

Table 1. ROSS Biodiversity Task Force Recommended Indicators .				
Category	Indicator	TaskForce Recommended	Example Metrics	Example Data Sources
Elements of Biodiversity (Structure and Composition)	Plant and animal diversity (richness & evenness)	X	- Relative richness - Relative balance/evenness (note: requires abundance data)	- WDFW Priority Habitat and Species Database - Natural Heritage Database - Breeding Bird Atlas
	Species occurrence/abundance trends by guild	X	- Iconic species - State-designated at-risk species, by taxa	- NOAA Salmon population trends - WDFW Priority Habitat and Species Database - Audubon Christmas Bird Counts

	Plant community/ecosystem diversity (Ecological Integrity Assessment)	X	- Distribution of native vegetation - Distribution and quality of WA NHP-identified critical and/or rare systems	
	Landscape composition and pattern	X	- Percent cover - Largest patch index - Landscape diversity (Shannon landscape evenness index) - Contagion index (a measure of aggregation/connectivity) - Riparian vegetation	- 2011 National Land Cover Data (NLCD) - LiDAR - WDFW Land Cover Change Analysis (Ken Pierce) - Western Governors Association Wildlife Corridor Initiative - Land Cover Change Modeling (UW Urban Ecology Lab) - NW ReGAP maps (EPA)
	Biotic integrity		- Index of Biotic Integrity (IBI)	
	Soil organic matter		- Soil organic matter (SOM)	
Key Ecological Processes that Affect and Support Biodiversity	Functional diversity (pollinators, predators, etc.)	X	- Pollinators/seed dispersers - Predators	- WDFW wildlife corridor highway crossing data - Xerxes society
	Phenological trends		- Leaf-on/-off dates - Flowering dates - Timing of migrations	
	Plant productivity		- Net primary productivity (NPP)	
	Disturbance regimes		occurrence/abundance of disturbance- sensitive vs. –tolerant vs. –dependent bird species - Spatial extent of fire, insect outbreaks, floods & windthrows - Occurrence rates of floods and droughts	

Key Human-Socioeconomic Factors that Affect and Support Biodiversity	Land base under conservation protection	X	- Distribution & extent of public & private lands amenable to biodiversity, & NGO/trust lands for biodiversity	- County Comprehensive Plans - King Co STAR mapping - Snohomish Basin Salmon Recovery protection maps - UW Rural Technology Institute
	Land use management and planning		- Land cover composition of private land under growth management - Land cover composition of private land under critical area ordinances	
	Incentive programs		- Distribution/extent of private lands under forest stewardship certification	
	Land use/cover change	X	- Distribution/extent of land cover transitions	WDFW High Resolution Change Detection (Ken Pierce) - Land Cover Change Modeling (UW Urban Ecology Lab)
	Pollution levels		- Levels of exposure to PCB's, PBDE, Dioxins, Pesticides	
	Disturbance management		- Extent of fire suppression vs. controlled burn practices - Extent of natural pest management practices - Extent of flood mitigation - Extent of windthrow abatement (snag removal, stand maintenance)	
	Citizen science	X	- Distribution/extent & content focus of efforts within a given ecosystem type	- Washington Invasive Species Council citizen science app
	Public engagement and education	X	- Distribution/extent & content focus of efforts within a given ecosystem type	- Sound behavior index (PSP) - PSP Stewardship Team survey

What are the ecosystem services (from the MEA) that are related to biodiversity? What are the top metrics and tools used for measuring service gains or losses?

In the Millennium Ecosystem Assessment (MEA, 2005), biodiversity's contribution to ecosystem services that benefit humans directly or indirectly is described within the context of multiple levels of organization (genes, species and ecosystems) and at spatial scales ranging from local to global. The MEA states that these services contribute to human well-being, for example, by providing basic materials for a good life, security and health. The MEA categorizes ecosystem services as: provisioning, regulating, cultural and supporting. In general, biodiversity should be protected in the interest of maintaining all four categories of ecosystem services.

In the Central Puget Sound, residents enjoy and depend on ecosystem services that biodiversity helps make possible. Provision of drinking water, food crops, timber, salmon and other wild game depend on healthy populations of plants and animals. Regulating and supporting services assist ecosystems to function and be resilient to change; these regulating benefits are provided for example when plants clean air and filter water, bacteria decompose wastes, bees pollinate flowers, tree and plant roots hold soil in place to prevent erosion and reduce flooding damage. In addition to the provisioning and regulating services, the residents of the Central Puget Sound place great importance on natural areas, the species that live there, and the experience that people have either simply knowing those areas exist, enjoying recreation on site, or using the areas as an education tool. In this sense, some of the most treasured ecosystem services enjoyed by residents of the Central Puget Sound are within the cultural category and include aesthetic, recreational, educational and spiritual values. These cultural benefits can be enjoyed in open space areas along the entire urban to rural gradient. Since biodiversity is inexplicitly linked to all ecosystem services, the best tools for measuring any particular ecosystem service are the biodiversity metrics (see Table 1) most relevant for the service under consideration.

What are the cross-pollinations, co-benefits and tradeoffs related to other task force topics?

Biodiversity has a support role and relationship with each of the other task force topics. Relating biodiversity to the topics below through the lens of open space is an emerging science and many of the connections are still being explored.

Climate Change – Climate change has the potential to greatly impact biodiversity. Having a more intact native fauna will likely make many systems more robust and resilient to global warming and climate change.

Public Health – Biodiversity and health are linked in many ways, the details of which are often unknown. Species and ecosystems, for example, play critical roles in disease regulation and psychological health and well-being. Of course, some species cause disease and create human-wildlife conflict. Managing these negative elements will be part of sustaining biodiversity in open space systems in developed regions such as the Puget Sound.

Social Equity – The links between biodiversity and social equity continue to be explored and suggest a deep intersection that should not be ignored in regional open space planning. Biodiversity – and its protection - is a critical component of many of the region's cultural and economic assets (salmon for example), upon which many marginalized tribal populations depend. The environmental justice movement sheds light on the disproportionate distribution of pollution and environmental hazards – also major threats to biodiversity – being placed in poor, historically underserved communities impacting long-term human health and creating crippling community development challenges. While traditional open space planning has prioritized biodiversity and majority's enjoyment of connected recreational areas, elevating social equity as a tenant of open space planning reveals that thoughtful planning can create co-benefits for all.

Economic Development – On a global scale, the elements that make up biodiversity play an extremely important provisioning role in providing food, building materials, fuel and medicinal services, all of which

can be brought to market for sale. The regulating services that open space and elements of biodiversity provide, if preserved, also can substitute for expensive and highly engineered solutions. Finally, elements of biodiversity in open space improve human well-being and happiness, and are often a draw for those looking to appreciate the environment where they work – the “Rainier effect” is real business for the region. However, due to legacy decisions and ongoing growth patterns, progress in the name economic development often trumps safeguarding biodiversity and the expansion of human-dominated environments often reduces biodiversity to unsustainable levels.

SECTION 3: PRELIMINARY RECOMMENDED ACTIONS (2-3 pages)

Preserving open space for the support of biodiversity will require regional strategies for: knowledge management and goal setting; public engagement and support; policy-supported investments, and integrating biodiversity concepts widely across many public interest sectors. These strategies should aim to address five key challenges facing biodiversity protection in the Central Puget Sound to: 1) understand and address threats to regional biodiversity with prioritized, results-driven actions; 2) apply ecological principals to land use management at multiple spatial scales; 3) plan for a future that conserves biodiversity as part of sustainable development; 4) identify indicators and create a monitoring system that reveals whether strategies are protecting biodiversity or not, and if not, manage adaptively to continuously improve; and 5) develop a citizenry that values protecting a rich, regional biodiversity. Many of our recommendations listed here were shaped by the work of the Washington Biodiversity Council (2010) and should be consulted for additional details.

Recommended Initial ROSS Actions Promoting Biodiversity Conservation

1. Knowledge Management and Goal Setting: Centralize Knowledge and Develop Spatial Goals

Objective: Implement an open space strategy that protects ecological functions by monitoring key metrics and adaptively managing biodiversity toward goals based on both the status (e.g. habitat quality and key species population numbers) and spatial distribution (e.g. minimizing fragmentation) of biodiversity elements.

Priority Actions:

- Reconstitute the Washington Biodiversity Council or create a new entity with statewide focus within the Governor's office.
- Centralize and archive existing information on the status of biodiversity in Central Puget Sound.
- Through the statewide entity, develop guidance on a spatial approach that would deliberately maximize native biodiversity in the central Puget Sound, given the current status of the landscape.
- Produce regional base maps for critical open space areas relevant to biodiversity protection.
- Develop regional measures of functional diversity (e.g. spatial, taxa, structural).

2. Pubic Engagement and Support: Increase Public Will for Biodiversity Conservation

Objective: Deliver customized messages about the importance of biodiversity for Puget Sound residents that are personal enough to promote behavior change.

Priority Actions:

- Develop value proposition messaging for specific Central Puget Sound audiences, including: urban residents, rural residents, planners, foresters and farmers.
- Review, synergize and link current outreach campaigns for biodiversity messages.
- Encourage connection between ROSS-related outreach and regional citizen science projects.

3. Policy-supported Investments: Strengthen Governing Policies with Biodiversity Concepts

Objective: Implement biodiversity relevant policies, including financial funding legislation, to increase public incentives and government agency priorities for protecting biodiversity and ecological services.

Priority Actions:

- Identify update opportunities (PSRC, Comprehensive Plans, GMA, SMP, and PSP Action Agenda).
- Incorporate biodiversity goals from the WA Biodiversity Council in agency mandates.
- Implement additional public incentives to conserve biodiversity on private lands.
- Develop funding needs and financial models for regional biodiversity management.
- Encourage the development of a formal regional planning body/authority.

4. Adopting Biodiversity Conservation Principles Widely: Integrate Biodiversity Concepts into (Non-Conservation) Public Interest Sectors

Objective: Maximize opportunities of cross-pollination across public interest sectors; environmental protection needs to be considered across all public sector areas.

Priority Actions:

- Identify multi-objective planning efforts that could incorporate biodiversity information (e.g. land use, transportation, healthcare, public safety, economic development).
- Identify cost avoidance opportunities based on protecting biodiversity (e.g. flood control; reducing endangered species listings).
- Promote social equity, smart growth and urban health by creating new natural areas in cities that also protect biodiversity
- Consider new strategies that link urban development with more distant protected areas (e.g transfer of development rights).

APPENDIX A: DRAFT IMPLEMENTATION PLANS (2-3 pages for each draft plan)

Draft Implementation Plans: January 2015

Biodiversity Considerations in the ROSS Context: Challenges, Regional Needs, Guidelines

The Challenges for Preserving Biodiversity:

- a) To understand and address threats to regional biodiversity with prioritized, results-driven actions
- b) To apply ecological principals to land use management at multiple spatial scales;
- c) To plan for a future that includes both sustainable development and the conservation of biodiversity;
- d) To create a monitoring system that reveals whether strategies are protecting biodiversity or not, and if not, manage adaptively to continuously improve;
- e) To develop a constituency that understands the value of protecting a rich, regional biodiversity.

Regional Needs:

- a) A system-wide regional approach that increases efficiency and reduce costs.
- b) Regional scale approach to addressing threats.
- c) Acknowledgement that important open space areas may differ from locally important areas.
- d) Coordinated goal setting and actions across jurisdictions for greater impact.
- e) Linked biodiversity management to other human activities that span jurisdictions, such watershed protection and recreation.
- f) Coordination across jurisdiction to address connectivity concerns
- g) Regional communication on how biodiversity serves the human population through sustaining resource economies, providing clean air and water, offering recreation opportunity, and presenting a mitigation and adaptation approach to climate change impacts
- h) Systematic outreach that helps private landowners understand what they can do to restore and protect biodiversity

Guidelines for Conserving Biodiversity in an Open Space Strategy:

- a) Provide resilience for long-term change and unexpected results.
- b) Provide largest, most intact, and contiguous habitats as possible for local plants and animals.
- c) Ensure the focus of conservation to include ecosystems and landscape diversity.
- d) Provide wildlife corridors and their connections between open space (habitat) patches for animal and plant dispersal, and long-term species migration.
- e) Preserve rare landscape elements, critical habitats, and associated species.
- f) Minimize introduction or spread of nonnative species.
- g) Manage access to and use of open space to minimize the impact on biodiversity.
- h) Examine the impacts of local decisions in a regional context.
- i) Implement adaptive management strategies for the stewardship of biodiversity on open space.

Recommended Metrics:

Elements of Biodiversity (Structure and Composition)

- Increase plant and animal diversity (richness & evenness)
 - Relative richness

- Relative balance/evenness (note: requires abundance data)
- Plant community/ecosystem diversity (Ecological Integrity Assessment)
 - Distribution of native vegetation
 - Distribution and quality of WA NHP-identified critical and/or rare systems
- Landscape composition and pattern
 - Percent cover
 - Largest patch index
 - Landscape diversity (Shannon landscape evenness index)
 - Contagion index (a measure of aggregation/ connectivity)
 - Riparian vegetation

Key Ecological Processes that Affect and Support Biodiversity

- Functional diversity (pollinators, predators, etc.)
 - Pollinators/seed dispersers
 - Predators

Key Human-Socioeconomic Factors that Affect and Support Biodiversity

- Land base under conservation protection
 - Distribution & extent of public & private lands amenable to biodiversity, & NGO/trust lands for biodiversity
- Land use/cover change
 - Distribution/extent of land cover transitions
- Public engagement and education
 - Distribution/extent & content focus of efforts within a given ecosystem type

Connections to Other TF Topics:

- Climate - Biodiversity is increasingly at the heart of many climate change strategies
- Health - Disease regulation and feelings of wellbeing, but wildlife-human conflict.
- Equity – links between biodiversity and social equity continue to be explored - critical component of many of the region's cultural and economic assets largely depended upon by marginalized tribal populations (a notable example being salmon).
- Economic Development - elements which make up biodiversity play an extremely important provisioning role in providing food, building materials, fuel and medicinal services, all which can be brought to market for sale. substitute for expensive and highly engineered solutions - a draw for those looking to appreciate the environment where they work

Recommended Actions:

- 1) Knowledge Management and Goal Setting: Centralize Knowledge and Develop Spatial Goals
- 2) Public Engagement and Support: Increase Public Will for Biodiversity Conservation
- 3) Policy-supported Investments: Update Governing Policies with Biodiversity Concepts
- 4) Adopting Biodiversity Conservation Principles Widely: Integrate Biodiversity Concepts into (Non-Conservation) Public Interest Sectors

Recommended Biodiversity Initiatives	Key Objectives	Potential Project Lead	Target Implementation Start
<p>Knowledge Management and Goal Setting: Centralize Knowledge and Develop Spatial Goals</p>	<ul style="list-style-type: none"> • Centralize data, identify regional biodiversity goals 	<p>New WA Biodiversity Council (state level) or equivalent</p> <p>Or, continued involvement of the ROSS biodiversity task force in the development of the Trust for Public Land mapping tool</p> <p>Or, Puget Sound Institute (ROSS Region)</p>	<p>2015</p>
<p>Public Engagement and Support: Increase Public Will for Biodiversity Conservation</p>	<ul style="list-style-type: none"> • Advance education/advocacy • Ensure stewardship/maintenance 	<p>Combined effort with leadership from ROSS + environmental education partners</p>	<p>2015</p>
<p>Policy-supported Investments: Update Governing Policies with Biodiversity Concepts</p>	<ul style="list-style-type: none"> • Provide recommendations for related governance • Support policy development • Support regulatory revisions 	<p>ROSS + consultants</p>	<p>2016</p>
<p>Adopting Biodiversity Conservation Principles Widely: Integrate Biodiversity Concepts into (Non-Conservation) Public Interest Sectors</p>	<ul style="list-style-type: none"> • Support policy development • Support regulatory revisions • Ensure stewardship/maintenance 	<p>ROSS + biodiversity partners</p>	<p>2016</p>

1. Title:
 Knowledge Management and Goal Setting: Centralize Knowledge and Develop Spatial Goals

Champion(s):
Reconstituted Washington Biodiversity Council (state level) and Puget Sound Institute,

Organizational Home:
 Governor's Office, Washington Department of Fish and Wildlife, or designated State Agency for the Council (state level) and Puget Sound Institute.

Description + Motivation: [Provide a description of the action, its regional significance, and its connection to TF priorities identified in the white paper.]

From early 2000s to 2010, the Washington Biodiversity Council (WBC) worked to describe the status of biodiversity in Washington State (including the Puget Sound) and prescribe strategies that could protect biodiversity goals. The Council was disbanded in 2011 due to funding and the hope was that implementers across the state would adopt their recommendations.

The first recommendation of this task force is that the WBC be reconstituted in an appropriate state agency or public-private institution to serve as a biodiversity knowledge and information hub, support the development of spatially explicit goals, and update baseline information and develop a limited suite of biodiversity status and trends metrics for the state (including the Puget Sound Region). There will need to be considerable thought as to the most appropriate mechanism to guarantee the long-term function and security of a new WBC. The 2010 WBC report provided a good first step in describing the state of biodiversity across WA and suggesting actions that would protect future biodiversity. However, the information has not continued to be collected or centralized, resulting in a smorgasbord of data and efforts throughout the Sound. The Biodiversity Task Force recognizes the usefulness of understanding how biodiversity is changing over time. Once trends are presented, the WBC could more strongly recommend spatially explicit actions. Finally, a smaller list of priority regional indicators is recommended for ongoing monitoring. The idea is that once the WBC is reestablished it would provide regional information to Puget Sound Institute or a similar body to implement work in the ROSS region.

If the WBC is not an option, ROSS could convene biodiversity experts together to add spatial data to the recently developed Trust for Public Land mapping tool. This tool is intended to describe the condition of biodiversity (as well as the other task force topics) in the Central Puget Sound. It would be useful to have data summarized in one place, however the tool would not allow for the development of goals but could be used by various land use managers to identify spatially explicit actions.

Objectives:

Short term: Reconstitute WBC and establish a new institutional home for it. Establish an implanting lead organization for ROSS to utilize information from the WBC. Select indicators to describe baseline and changing conditions for both the status (e.g. habitat quality and key species population numbers) and spatial distribution (e.g. habitat fragmentation) in order to better achieve a functioning open space system in the Puget Sound biodiversity.

OR

Engage experts in the development of the Trust for Public Land mapping tool to describe baseline conditions for both status and spatial distribution in order to help land managers make better decisions around how the central Puget Sound open space system supports biodiversity.

Long term ROSS Goal: Maintain baseline information about biodiversity status and trends, including spatial distribution, to inform open space strategies and management.

Key Obstacles + Impediments: [Identify funding constraints, political barriers, etc... that are likely to affect implementation and outline a strategy to overcome these barriers]

Key constraints: Funding, lack of an effective organizational structure and consistent data at both state level and within the ROSS region.

Strategy to overcome constraints: Improved public mandate and funding for biodiversity management in Washington, and especially the rapidly growing Central Puget Sound region.

Available Resources: [Existing + needed funding, partnerships and resources such as technical expertise, endorsements or regulatory/policy decisions by elected officials, advocacy/education, & stewardship.

Existing Resources: Washington Biodiversity's 2010 report and recommendations, Puget Sound Partnership's Vital Signs, Updated land cover information, technical expertise from agencies that previously participated in the Biodiversity Council (WDFW, UW, TNC, Counties, etc.).

Needed Resources: Funding for capacity/staffing, funding for monitoring and data assessment.

Political will and funding will be necessary to reconstitute the WBC and assess trend data for biodiversity metrics. Additionally, in the previous WBC effort, scientists and managers donated their time to participating on the council. The importance of revisiting the WBC work, in light of ROSS, will be important to message in order to ensure continued participation.

There may be opportunity to capitalize from additional GIS and field data collected since 2010. Organizations such as the Puget Sound Partnership, the Puget Sound Ecosystem Monitoring Program and The Nature Conservancy (?) have made significant progress in assembling information for key indicators and may be able to provide new information and thinking from the last 5 years.

Key Outcome(s)/Result(s): [Identify (measurable) performance indicators for the action]

Short-term benchmarks include the approval from the Governor's office to revitalize the WBC, state legislature support, the selection of a priority suite of status and spatial indicators, information on trends, and spatially explicit recommendations for the protection and/or restoration of biodiversity in the Puget Sound.

OR

The addition of data and information in TPL's mapping tool that shows more specific information on the central Puget Sound's biodiversity baseline.

Long-term benchmarks should show that managers at the federal, state and local scale are adopting the WBC recommendations and improving biodiversity within their jurisdictions. Measures would be specific to the recommendations.

Implementation Steps: [Provide a summary of the phases/steps, sub-steps of the action]

Once the WBC has been reconvened, the following steps should be taken:

- Analyze current barriers to managing for biodiversity, organizational structures, funding opportunities
- Update the baseline information for metrics described in the 2010 report
- Winnow indicators to a small set that describe species and spatial characteristics
- Update the baseline information for those metrics indicators and report trends
- Develop spatially specific goals and strategies using 2010 WBC principles
- Include strategies in relevant multi-objective management plans, including the Puget Sound Partnership Action Agenda
- Monitor status and trends metrics

Timeline: [Break out by step, identify key individuals/organizations for each step, + timeframe]

2015 - 2017: Re-establish mandate for WBC or similar entity and establish liaison structure for ROSS.

OR

If no action has been taken on the reconstitution of the WBC by mid-2016, experts should be convened to work with the mapping tool.

2018 - 2020: Create products and processes within ROSS to utilize WBC data and monitoring products.

2. Title:
 Public Engagement and Support: Increase Public Will for Biodiversity Conservation

Champion(s):
 Puget Sound Environmental Education Organizations (e.g. Woodland Park Zoo, Seattle Aquarium, The Nature Conservancy, Audubon Society, Sierra Club)

Organizational Home:
 An Alliance of Puget Sound Environmental Educational Organizations

Description + Motivation: [Provide a description of the action, its regional significance, and its connection to TF priorities identified in the white paper.]

The first goal of this action is to bring together the various environmental organizations working in the region to create a collaborative framework aimed to engage the citizenry of Puget Sound – including urban residents, rural residents, planners, foresters and farmers – to recognize the benefits and services that biodiversity provides them as an individual and as communities. Traditionally, biodiversity conservation was for the sake of a species or system. This action will turn the tables and focus on the ways that biodiversity supports the human population in multiple ways, including economic, physical and psychological, and social and cultural health.

The second goal is to provide guidance to individuals for how they can adjust their behavior to support biodiversity. Encouraging a connection to biodiversity could include opportunities for residents to connect to their local species and ecosystems by participating in citizen science.

Objective:

Deliver customized messages – coordinated among the many regional environmental organizations and public schools -- about the importance of biodiversity for Puget Sound residences that are personal enough to fully engage citizens and promote behavior change. This change should also increase public will for greater societal investment in biodiversity conservation.

Key Obstacles + Impediments: [Identify funding constraints, political barriers, etc... that are likely to affect implementation and outline a strategy to overcome these barriers]

Key constraints: Local environmental organizations lack will and funding for coordinated effortst.

Strategy to overcome constraints: Higher sense of priority for this work by individual organizations and funding agencies.

Available Resources: [Existing + needed funding, partnerships and resources such as technical expertise, endorsements or regulatory/policy decisions by elected officials, advocacy/education, & stewardship.

In 2012, PRR prepared a report for the Puget Sound Partnership entitled “Sound Behavior Index and Social Capital Index – 2012 Survey Report.” In this report, information on practices that affect water quality and aquatic environments, ranging from yard, vehicle and home maintenance to septic and boat care was presented. The report also presented an assessment on the social capital or connectedness of communities across the Sound.

The same year, Resource Media produced a report entitled “Ecosystem Services Messaging: Needs Assessment and Initial Messaging Recommendations” to the Bullitt Foundation. This report focuses on how conservation practitioners can more effectively convey the value of their work. Challenges specific to Northwest issues are included.

In combination, the reports are good first step to develop new ways of accessing Puget Sound residents’ interest in changing their behavior to maintain the things that provide them with individual and community value.

Key Outcome(s)/Result(s): [Identify (measurable) performance indicators for the action]

- Studies or surveys that show what connections residents currently make between themselves and biodiversity and the benefits of biodiversity.
- Messaging appropriate for several categories of resident (urban homeowner to resource managers) that describes their connection to biodiversity and benefits provided.
- Recommendations for individual behavior change that could promote Puget Sound biodiversity
- List of how current campaigns include messages about the benefits of biodiversity with recommendations on how to improve those campaigns.
- Increased engagement in Puget Sound citizen science.

Implementation Steps: [Provide a summary of the phases/steps, sub-steps of the action]

- Review current survey and assessment information and recommendations.
- Develop messaging on services provided by biodiversity.
- Test messages on different audiences.
- Integrate messages into existing campaigns.
- Assess behavior change results.

Timeline: [Break out by step, identify key individuals/organizations for each step, + timeframe]

2015: Pull together leading education organizations to assess the possibility of working together.
 2016: Develop key messages for collaborative promotion and outreach.
 2016 – 2020: Carry out an educational campaign in the ROSS region.

3. Title:

Policy-supported Investments: Strengthen Biodiversity Protection in Governing Polices, Planning and Regulation

Champion(s):

ROSS + Consultants

Organizational Home:

Following recommendations from a policy analysis conducted by consultants, ROSS (or whatever body is responsible for ROSS implementation) will interact with governing bodies that include state agencies, PSP, PSRC, and local counties, cities, tribes, and ports.

Description + Motivation:

Integrating biodiversity into the policies and plans that guide decision-making around development, conservation, and watershed planning throughout the state can help establish mandates for local action. Existing policies and plans that affect or are affected by open space preservation include the Growth Management Act,¹ city and county comprehensive plans, city/county Shoreline Master Programs,² hazard mitigation plans, and WRIA plans.

Though one of the primary recommendations of the WBC 2010 report was to integrate biodiversity protection more widely into governing incentive programs, policies and regulations, there has been no comprehensive review of existing policies and/or changes since 2010 to show whether or not progress has been made. Though there are an increasing number of incentive programs being provided at all levels of government, there has not been an evaluation of the efficacy of these programs with recommendations on how to improve their participation, funding and overall impact.

Objective:

Implement biodiversity relevant policies, including funding legislation, to increase public incentives and government agency priorities for protecting biodiversity and ecological services.

Key Obstacles + Impediments: [Identify funding constraints, political barriers, etc... that are likely to affect implementation and outline a strategy to overcome these barriers]

Key constraints: Funding, alteration of existing mandates, political/institutional will, timing (e.g. local

¹ Washington’s Growth Management Act coordinates state and local government decision making in order to achieve environmental and socioeconomic sustainability by identifying and protecting natural resource lands and critical areas, designating urban growth areas, and providing guidance on the preparation and implementation of comprehensive plans. <http://apps.leg.wa.gov/rcw/default.aspx?cite=36.70A>

² Shoreline Master Programs are shoreline-specific comprehensive plans aimed at managing activities, use, and modifications of local shoreline districts. These plans help manage competing uses of local shorelines while aiming to promote public access and use of water-oriented and water-dependent activities. <http://www.ecy.wa.gov/programs/sea/shorelines/smp/>

comprehensive plans have already been updated or are now underway and it will be important to understand when to advance particular proposals at the city and county scale),

Strategy to overcome constraints: A mechanism to help achieve this initiative is to secure resources for the development of a policy analysis/regulatory toolkit to support biodiversity-informed actions specific to open space designed in partnership with and geared toward key decision makers.

Available Resources: [Existing + needed funding, partnerships and resources such as technical expertise, endorsements or regulatory/policy decisions by elected officials, advocacy/education, & stewardship.

Existing – institutional partners/leaders and regulatory/policy bridge to to PSRC, PSP, + Counties
Needed – institutional partners/leaders among state agencies and cities, funding, commitments by elected officials

Key Outcome(s)/Result(s): [Identify (measurable) performance indicators for the action]

- Review of opportunities to increase protection or improve planning for biodiversity
- Recommendations for specific changes across local, state and federal policies and regulations
- Identification of the process needed to integrate improved policies and recommendations
- Identification of appropriate incentive programs and potential funding sources
- Changed policies and regulations
- Implemented incentive programs + regulatory toolkit to support biodiversity integration developed for and used by decision makers/planners

Implementation Steps: [Provide a summary of the phases/steps, sub-steps of the action]

- Identify consultant to do review
- Identify all local and state plans and policies that affect regional open space decision making. Identify conservation mandates across central Puget Sound management authorities
- Identify stakeholders and decision makers (state, local, tribal; public, private) to act as “ambassadors” for biodiversity integration into plans and policies
- Create a stakeholder-driven regulatory toolkit to support biodiversity-informed actions
- Conduct outreach to encourage toolkit use in planning, policy development, and regulatory reform
- Review examples from other areas/countries/programs and develop recommendations for Puget Sound
- Identify gaps and key opportunities for Puget Sound.

Timeline: [Break out by step, identify key individuals/organizations for each step, + timeframe]

- **2016 - 2017:** Consultant Review – Month 1-3
 - ID target stakeholders and decision-makers – Months 2-6
 - Regulatory Toolkit – Months 7-12
 - Advance on mandates/incentives for biodiversity integration – Months 12-24
 - Conduct outreach to encourage toolkit use – All – Months 15-24
- 2018 – 2020: Continue working on implementation on new policies, regulations and plans.**

<p>4. Title:</p> <p>Adopting Biodiversity Conservation Principles Widely: Integrate Biodiversity Concepts into (Non-Conservation) Public Interest Sectors</p>
<p>Champion(s):</p> <p>ROSS Ecosystem Services, staff and supporters</p>
<p>Organizational Home:</p> <p>ROSS (or whatever body is responsible for ROSS implementation)</p>
<p>Description + Motivation: [Provide a description of the action, its regional significance, and its connection to TF priorities identified in the white paper.]</p> <p>In recent years, public health representatives have been more fully integrated into transportation infrastructure decision-making and a variety of other topical arenas. This has ensured that scoring criteria and policy directives are more informed by the perspective of health agencies and relevant data that had not been included in prior decision-making. This was achieved by ensuring that leadership and staff were deeply embedded into various boards and committees managing major public investments in infrastructure. A similar approach is needed in biodiversity in which the data and perspective from key staff and leadership working on biodiversity issues can inform non-conservation decisions.</p>
<p>Objective:</p> <p>Maximize opportunities of cross-pollination across public interest sectors and incorporate biodiversity as a value in multi-benefit conservation planning and non-conservation decisions.</p>
<p>Key Obstacles + Impediments: [Identify funding constraints, political barriers, etc... that are likely to affect implementation and outline a strategy to overcome these barriers]</p> <p>Key constraints: Funding, data showing multi-benefits, ability to collect data on widespread metrics</p> <p>Strategy to overcome constraints: ROSS Regional Strategy</p>
<p>Available Resources: [Existing + needed funding, partnerships and resources such as technical expertise, endorsements or regulatory/policy decisions by elected officials, advocacy/education, & stewardship.]</p> <p>The ROSS will be identifying open space throughout the Puget Sound that provides benefits to biodiversity, public health, social equity, economic development, and climate change mitigation and adaptation. This information can be used to increase the support for open space systems by demonstrating a wider range of recipients for the preservation of a wide array of open space types.</p> <p>The ROSS can also provide events and other forums that address multi-benefit conservation planning as well as facilitating connections between biodiversity experts and information with experts and decision-making for broader public interests.</p>

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Key Outcome(s)/Result(s): [Identify (measurable) performance indicators for the action]

- Better understanding of how open space designed to support biodiversity will contribute to other public interest outcomes
- Specific examples of where biodiversity can be optimized with other public sector goals
- More consistent inclusion of biodiversity information in multi-objective planning efforts and non-conservation investment decisions.

Implementation Steps: [Provide a summary of the phases/steps, sub-steps of the action]

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Timeline: [Break out by step, identify key individuals/organizations for each step, + timeframe]

2016:

Increase participation of staff/leadership at agencies and organizations addressing biodiversity on key boards, committees, and task forces managing infrastructure, growth, and economic development investments.

2017 – 2020::

Ensure that data that highlights biodiversity priorities are more fully integrated into performance metrics and investment scoring processes outside of conservation.

APPENDIX C: AUTHORSHIP + CITATIONS

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