Mount Arrowsmith Biosphere Region BioBlitz 2019: Summary Report

MABR

MARRI

Mount Arrowsmith Biosphere Region Research Institute

VANCOUVER ISLAND UNIVERSITY

Acknowledgements

The contributions and efforts of the following members made the 2019 Mount Arrowsmith Biosphere Region BioBlitz a successful and informative event: Kayla Harris, Graham Sakaki, Mike Anderson, Carson Anderson, Olivia Murphy, Jessica Pyett, Mark Mudryck, Tyrel Samson, Ariel Verhoeks, Mandy Hobkirk, Courtney Vaugeois, Larry Williams, Caroline Josefsson, Heather Klassen, Scott Gilmore, Tanya Seebacher, Christopher Stephens, Laura Gilbert, Kate Thomas, Luke Vennard, Jesse Miller, Natalie Khtikian, Rachel McGuinness and Hitomi Kimura.

MABRRI would like to send forth a special thank you to Geoff Ball and Pamela Murray, as well as their very helpful crew at Milner Gardens & Woodland, for being so accommodating and helpful throughout the event planning process and on the day of the BioBlitz. Additionally, a very warm thank you to Vancouver Island University students and faculty for contributing their time and expertise to make the 2019 MABR BioBlitz a successful event.

Further, we would like to thank our partners, including the Nature's Trust of BC, and the Brant Wildlife Festival, with which we have held this event in collaboration and partnership with for the past four years. We would also like to thank our thoughtful and supportive local coffee sponsors who have sponsored the event for the past three years: Teresa and her team at Pacific Brimm Coffee & Tea Co. in Parksville.

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Executive Summary

The Mount Arrowsmith Biosphere Region (MABR), located on the eastern coast of Vancouver Island, encompasses an ecologically diverse range of habitats and ecosystems within its watershed boundaries. These ecosystems hold special importance to the region culturally, environmentally, and economically. Our team at the Mount Arrowsmith Biosphere Region Research Institute (MABRRI) strives to embrace and celebrate these diverse values through research, education, and community outreach, promoting environmental conservation and awareness of this beautiful and extraordinary place that we all live and share.

A BioBlitz is a rapid biological survey of flora and fauna that embraces citizen science, connecting local community members, students, faculty, knowledge holders, naturalists, and scientists to identify as many species as possible within the allocated time frame. One benefit of conducting a BioBlitz is that the data collected by participants can provide a snapshot of biodiversity and species richness within the region. Other benefits associated with a BioBlitz includes an increased regional knowledge of changes to species abundance, habitat for Species at Risk, as well as changes in invasive species distribution over time. The data collected during the annual event helps inform the management of sensitive habitats and ecosystems within the region.

The results of the participant data collected during the fourth annual BioBlitz at Milner Gardens & Woodland in Qualicum Beach include 14 different tree species, 18 shrub species, 32 species of herbs and wildflowers, 4 fern species, 2 sedge species, 6 moss species, 2 species of lichen, and 6 fungi species. Participants observed 3 species of invasive flora and 6 species of exotic flora at Milner Gardens. Furthermore, the fauna species that were observed at Milner Gardens included 3 birds of prey, 3 shore bird, 11 different waterfowl species, 14 forest bird

species, 30 species of insects, and 3 other fauna species. Of the fauna species at Milner Gardens, 2 were Species at Risk and listed as Special Concern.

The data collected from conducting biogeographic flora and fauna surveys is important for gaining sound baseline knowledge of existing biodiversity in the region. Annual biological monitoring will allow researchers to observe trends and changes over time that can indicate the fluctuations in species at risk, invasive species, and overall species richness of a region (MABRRI, 2016). Changes in habitat health from long-term climate trends and local weather patterns can have a significant impact on the state of the environment, and these changes can be detected over time with community monitoring initiatives (MABRRI, 2016). The data collected at the first annual MABR BioBlitz at Milner Gardens on April 17, 2016 has been compared to the data collected at Milner Gardens during the second and third annual MABR BioBlitzes on April 22, 2017 and April 21, 2018, respectively, as well as the most recent event, which occurred on April 13, 2019. The data was compared in order to observe changes and counts of different flora and fauna species that were identified (Table 1 and 2).

Events such as the MABR BioBlitz have the capability to expand local knowledge of biodiversity and wildlife habitat within the region while contributing to a publically available and transparent data set that will be valuable and useful for future generations and long-term species trend analysis. This research aims to promote the health and resilience of our natural systems and all the intricate and unique characteristics and relationships within these ecosystems (MABRRI, 2016). We wish to promote knowledge sharing, environmental stewardship, and critical thinking in communities beyond the academic environment to promote the longevity and relationships between people and nature. With future BioBlitz events, the aim is to expand its boundaries of the event year after year to include a greater variety of ecosystems, habitats and microclimates within the MABR. This expansion will provide an opportunity to observe and monitor trends in species inventory over a greater geographic range on Vancouver Island. Additionally, the MABR BioBlitz strives to increase student research and participation in the event coordination and grow the citizen-science based participation each year (MABRRI, 2016).

Introduction

The 2019 MABR BioBlitz was developed by student researchers at Vancouver Island University (VIU) through the biosphere reserves research institute, MABRRI, with direction from one of MABRRI's Project Coordinators. The 2019 BioBlitz event is the fourth annual event held in collaboration with the Brant Wildlife Festival, the Nature's Trust of BC, and Milner Gardens & Woodland; the goal is to promote citizen science-based research while celebrating wildlife and biodiversity within the MABR.

The MABR is a UNESCO designated biosphere reserve located on mid-eastern Vancouver Island. The MABR spans a geographic area of 1,200 km^2 and is known as a place where people live and work together in hopes of creating a sustainable future where they can live in harmony with nature (MABRRI, 2016). The MABR BioBlitz event supports these values and is designed to connect people with nature through species identification and knowledge building. The last four years of blitzing have been successful, accomplishing the goals of providing an engaging platform for community members to connect with local experts and peers while learning about their local environment. The event has successfully worked toward increasing participant's knowledge of biodiversity while equipping these individuals with basic stewardship field skills.

The Milner Gardens & Woodland BioBlitz site continued for its fourth year, hosting both the BioBlitz training session and the expert session. These sessions ran in tandem, offering individuals that are new to species identification and require some guidance from local experts, as well as local experts to participate at the same venue. The data collected annually at the Milner Gardens BioBlitz is compiled into a database for comparison over time (Table 1 and 2). The data collected is useful in analyzing trends and changes in our natural environment as well as evaluating human influences over time.

Milner Gardens & Woodland

Milner Gardens and Woodland consists of 60 acres of coastal and upland forests, as well as, 10 acres of developed gardens. In 1996, VIU obtained the lands from Ray and Veronica Milner and thus was given the name “Milner Gardens”; VIU must preserve the garden for education and communal purposes (About Milner Gardens, n.d.). The Milner Woodland is comprised of Coastal Douglas-fir (*Pseudotsuga menziesii*) old-growth forests with an understory of Western red cedar (*Thuja plicata*), grand fir (*Abies grandis*), and red alder (*Alnus rubra*); it is perceived as a relatively productive ecosystem (MABRRI, 2016). Due to the geographic location of the Milner Woodland, it is considered to be a “rain shadow” forest, which consists of warm, dry summers and mild, wet winters (MacKinnon, 2013). This relatively rare, yet extremely productive ecosystem accounts for 0.2% of the province of British Columbia and contains the lowest volume of old growth trees, which raises considerable concern for conservation of these forests (About Milner Gardens, n.d.). Milner Gardens & Woodland staff and volunteers are dedicated to preserving these ecosystems and the species at risk that are found within them (MABRRI, 2016).

Milner Gardens consists of meadow lawns and many varieties of rhododendrons, as well as, trees and shrubs brought home from Ray and Veronica Milner’s Travels from around the world (About Milner Gardens, n.d.). Exotic species include the red Japanese maple (*Acer palmatum*), Spanish chestnut (*Castanea sativa*), a golden chain tree (*Laburnum x watereri ‘Vossii*), Chinese dogwood (*Cornus kousa*), and a dove tree (*Davidia involucrate)* (About Milner Gardens, n.d.; MABRRI, 2016). Additionally, due to Milner Gardens possessing such rare species from around the globe, it is considered to be a place with important educational resources for research opportunities, as well as public outreach and enjoyment.

Why a BioBlitz at Milner Gardens?

Milner Gardens & Woodland has proven to be an excellent venue for the MABR BioBlitz over the past four years. There are many benefits to hosting the event at Milner Gardens, including the amazing staff and volunteers whom have been very helpful and accommodating with assisting in the organization and logistics of the event. The 2016 BioBlitz was the first ever pilot event and it was determined that Milner Gardens would be the perfect location for the MABRRI team of research assistants, experts, and volunteers to train community members to collect flora and fauna identification data. Accessibility, parking, washrooms, and other facilities that Milner Gardens have

make the location an ideal choice for community members to learn in a safe and comfortable environment. Milner Gardens is a VIU entity and has a strong relationship with the MABR and MABRRI through various collaborative student research projects. Milner Gardens will continue to be the designated training site for future MABR BioBlitz events.

Goals and Objectives

There were several key deliverables and objectives associated with the 2019 MABR BioBlitz, which built on the success of previous biological surveys. The goal is to continue to grow the event year after year, encouraging a larger group of community participants to take part in the event. The goals and objectives of the 2019 MABR BioBlitz are as follows:

1. Have MABRRI student researchers plan and host a BioBlitz at Milner Gardens and Woodland;
2. Promote VIU student research through outreach in the local community and spark interest in environmental stewardship while also increasing knowledge and understanding of the MABR;
3. Contribute to long-term monitoring of flora and fauna in the MABR;
4. Maintain Milner Gardens & Woodland as a training site for beginner BioBlitzers; and
5. Provide participants and the public with a finalized flora and fauna collection form, in report form, for species identified during the event.

Overall, the annual BioBlitz event aims to engage VIU students with the community, enhancing their research skills by bringing them together with VIU faculty, local experts, citizen scientists, and local participants to collaborate on a regional research project. While VIU students benefit from learning through teaching and engaging with the members of the community and local knowledge holders, there is a positive benefit to all participants through connections made with each other and the environment. Additionally, those participants that conducted an individual biological survey are able to contribute to the research and be part of a regional community initiative.

Methods, Tools, and Equipment Used

Local participants were self-selected by signing up for this event on the online BioBlitz Eventbrite registration page. Expert team leaders were contacted prior to the event by the MABRRI team based on their area of expertise (flora and/or fauna). On the day of the event participants joined the MABRRI team of volunteers at Milner Gardens & Woodland to participate. The day's events were separated into two sessions, one in the morning and another in the afternoon, for which participants can take part in one and/or the other. All participants were provided with clipboards and field forms for data collection of both plant and bird species. Groups were formed and separated

based on their interests, either bird or plant identification. The birding groups were able to use spotting scopes and binoculars. While the plant identification groups were provided with *Plants of Coastal British Columbia* by Jim Pojar and Andy MacKinnon, along with magnifying glasses. BioBlitz participants were initially sent to separate starting stations throughout Milner Gardens but were encouraged to branch out and navigate throughout the stations to identify a greater variety of species than one station could provide. This method appeared to work well as participants were able to Blitz in several different ecosystems around the property, increasing the number of species identified on site.

Findings

The data collected during the 2019 BioBlitz at Milner Gardens & Woodland contributes to baseline data that can be compared to data from the previous MABR BioBlitz events. The MABR BioBlitz event is a platform that allows participants to gain hands on experience and knowledge in species identification. The event aims to encourage these participants to continue to be environmental stewards in their own lives or at the very least connect them with nature within the MABR.

Comparison of Data between 2016, 2017, 2018, and 2019 Milner Gardens BioBlitzes

The collection of the following data allows Milner Gardens to update their current species inventory and contributes to long-term monitoring for the flora and fauna within the MABR, which is one of the projects main objectives. Table 1 is a complete list of flora identified within Milner Gardens & Woodland on April 17, 2016, April 22, 2017, April 21, 2018, and April 13, 2019 during the annual MABR BioBlitzes. The data was compiled into one table for ease of comparison between the four years. NOTE: invasive species are highlighted in RED, exotic species are highlighted in GREEN, and Species at Risk are highlighted in BLUE. Exotic Species identified included common foxglove (*Digitalis purpurea*), creeping buttercup (*Ranunculus repens*), English daisy (*Bellis perennis*), herb robert (*Geranium robertianum*), stinging nettle (*Urtica dioica*), and wall lettuce (*Lactuca muralis*). Invasive flora species

that were identified were English Holly (*Ilex aquifolium*), Himalayan Blackberry (*Rubus armeniacus*), and English Ivy (*Hedera helix*). None of the species identified were considered Species at Risk.

Table 1. Compiled Findings from 2016, 2017, 2018, and 2019 MABR BioBlitz Flora Species (both morning and afternoon sessions) at Milner Gardens & Woodland.

Trees					
Species Common Name	**Species Scientific Name**	**2016**	**2017**	**2018**	**2019**
Arbutus	*Arbutus menziesii*		X		
Big-Leaf Maple	*Acer macrophyllum*	X	X	X	X
Bitter Cherry	*Prunus emarginata*	X		X	X
Cascara buckthorn	*Rhamnus purshiana*				X
Douglas-fir	*Pseudotsuga menziesii*	X	X		X
Grand Fir	*Abies grandis*	X	X	X	X
Holly, English	*Ilex aquifolium*	X	X	X	X
Lodgepole Pine	*Pinus contorta*	X			X
European Mountain Ash	*Sorbus aucuparia*		X	X	
Pacific Crab Apple	*Malus fusca*	X		X	X
Pacific Dogwood	*Cornus nuttallii*	X			X
Pacific Willow	*Salix lasiandra*	X			
Red Alder	*Alnus rubra*	X	X	X	X
Sitka Willow	*Salix sitchensis*	X			
Western Hemlock	*Tsuga heterophylla*	X	X	X	X
Western Red Cedar	*Thuja plicata*	X	X	X	X
Western Yew	*Taxus brevifolia*		X	X	X
Willow	*Salix spp.*			X	X
Total Number of Species		**13**	**10**	**11**	**14**
Shrubs					

Species Common Name	Species Scientific Name	2016	2017	2018	2019
Baldhip Rose	*Rosa gymnocarpa*	X	X	X	X
Cascara	*Rhamnus purshiana*	X	X	X	X
Devils Club	*Oplopanax horridus*	X			
Dull Oregon Grape	*Mahonia nervosa*	X	X	X	X
Evergreen Huckleberry	*Vaccinum ovatum*	X		X	X
Falsebox	*Pachistima myrsinites*		X	X	X
Hardhack	*Spiraea douglasii ssp. douglasii*	X	X	X	X
Himalayan Blackberry	*Rubus armeniacus*	X	X	X	X
Nootka Rose	*Rosa nutkana*	X		X	X
Ocean Spray	*Holodiscus discolor*	X	X	X	X
Old Man's Beard	*Clemantis vitalba*				X
Red Elderberry	*Sambucus racemosa*	X	X	X	X
Red Huckleberry	*Vaccinium parvifolium*	X	X	X	X
Red-Osier Dogwood	*Cornus stolonifera*	X	X	X	X
Salal	*Gaultheria shallon*	X	X	X	X
Salmonberry	*Rubus spectabilis*	X	X	X	X
Scoulers Willow	*Salix scouleriana*		X	X	
Sitka Mountain-ash	*Sorbus sitchensis*			X	
Tall Oregon Grape	*Mahonia aquifolium*		X		X
Thimbleberry	*Rubus parviflorus*	X	X	X	X
Trailing Blackberry	*Rubus ursinus*	X	X	X	X
Western Trumpet Honeysuckle	*Lonicera ciliosa*		X		
Total Number of Species		**16**	**17**	**18**	**18**
Herbs & Wildflowers					
Species Common Name	**Species Scientific Name**	**2016**	**2017**	**2018**	**2019**
Aniseed	*Apiaceae spp.*	X			

Arrow-Leaved Groundsel	*Senecio triangularis*		X		
Bittercress	*Cardamine spp.*	X	X		X
Broad-Leaf Shooting Star	*Dodecatheon hendersonii*		X		
Broad-Leaved Starflower	*Trientalis latifolia*		X	X	X
Buttercups	*Ranunculus spp.*		X	X	X
Canadian Bunchberry	*Cornus Canadensis*		X		X
Chickweed	*Stellaria spp.*		X	X	X
Cleavers	*Gallium aparine*	X	X	X	X
Common Foxglove	*Digitalis purpurea*	X	X	X	X
Creeping Buttercup	*Ranunculus repens*	X	X	X	X
Crisp Sandwort	*Stellaria crispa*	X		X	
Daffodil	*Narcissus spp.*		X		X
Duckweed	*Lemnoideae spp.*		X		
English Daisy	*Bellis perennis*	X	X		X
English Ivy	*Hedera helix*	X		X	X
Few-Seeded Bitter-cress	*Cardamine oligosperma*			X	X
Field Chickweed	*Cerastium arvense*				X
Forget-Me-Not	*Myosotis spp.*	X		X	X
Geranium	*Geranium spp.*		X		
Herb Robert	*Geranium robertianum*	X	X	X	X
Horsetail, Common	*Equisetum arvense*		X		X
Miner’s Lettuce	*Claytonia perfoliata*	X	X	X	X
Northern Starwort	*Cerastium arvense*			X	
One-Sided Wintergreen	*Orthilia secunda*	X			
Ox-Eye Daisy	*Leucanthemum vulgare*		X		
Pacific Bleeding Heart	*Dicentra formosa*	X	X		X
Pacific Coralroot	*Corallorhiza maculata sp. Mertensiana*	X			

Pacific Trillium	*Trillium ovatum*	X	X	X	X
Pinedrops	*Pterospora andromedea*	X			
Pinesap	*Monotropa hypopitys*	X			
Pink Fawn Lily	*Erythronium revolutum*		X		
Prunella	*Lamiaceae spp.*		X		
Purple Dead Nettle	*Lamium purpureum*		X		X
Parsley-piert	*Aphanes spp.*	X	X		
Ribwort Plantain	*Plantago lanceolate*				X
Self-heal	*Prunella spp.*				X
Sitka Columbine	*Aquilegia formosa*	X			X
Skunk Cabbage	*Lysichiton americanus*	X	X	X	X
Small Bedstraw	*Galium trifidum*			X	X
Snowberry	*Symphoricarpos albus*	X			X
Stinging Nettle	*Urtica dioica*	X	X	X	X
Sweet-Scented Bedstraw	*Galium triflorum*	X	X	X	
Three-Leafed Foamflower	*Tiarella trifoliata*	X			
Trailing Yellow Violet	*Viola sempervirens*		X		
Twin Flower	*Linnaea borealis*		X	X	X
Vancouver Groundcone	*Boschniakia hookeri*		X		
Vanilla Leaf	*Achlys triphylla*	X	X	X	X
Wall Lettuce	*Lactuca muralis*	X	X	X	X
Wall Speedwell	*Veronica arvensis*			X	
Water Parsley	*Oenanthe sarmentosa*	X	X	X	X
Western Bitter-Cress	*Cardamine occidentalis*			X	X
Western Coralroot	*Corallorhiza maculata ssp. Mertensiana*		X		
Western Dock	*Rumex spp.*	X			
Wood Sorrel	*Oxalis spp.*		X		
Yellow Flag Iris	*Iris pseudacorus*		X		

Total Number of Species		**28**	**36**	**25**	**32**
Ferns					
Species Common Name	**Species Scientific Name**	**2016**	**2017**	**2018**	**2019**
Bracken Fern	*Pteridium aquilinum*	X	X	X	X
Deer Fern	*Blechnum spicant*	X	X		X
Green Spleenwort	*Asplenium viride*		X	X	
Lady Fern	*Athyrium filix-femina*	X	X	X	X
Licorice Fern	*Polypodium glycyrrhiza*	X			
Oak Fern	*Gymnocarpium dryopteris*	X		X	
Spiny Wood Fern	*Dryopteris expansa*	X	X	X	
Sword Fern	*Polystichum munitum*	X	X	X	X
Total Number of Species		**7**	**6**	**6**	**4**
Sedges					
Species Common Name	**Species Scientific Name**	**2016**	**2017**	**2018**	**2019**
American Bulrush	*Schoenoplectus americanus*			X	
Pale Sedge	*Carex livida*			X	
Sedges	*Cyperaceae spp.*		X	X	X
Slough Sedge	*Carex obnupta*	X	X	X	X
Small-Flowered Sedge	*Lipocarpha micrantha*		X		
Total Number of Species		**1**	**3**	**4**	**2**
Grasses					
Species Common Name	**Species Scientific Name**	**2016**	**2017**	**2018**	**2019**
Bitter Grass	*Calea ternifolia*	X			
Reed Canary Grass	*Phalaris arundinacea*	X	X		
Sweet Vernal Grass	*Anthoxanthum odoratum*	X			
Total Number of Species		**3**	**1**	**0**	**0**
Mosses					

Species Common Name	Species Scientific Name	2016	2017	2018	2019
Badge Moss	*Plagiomnium insigne*	X	X	X	
Bent Leaf Moss	*Rhytidiadelphus squarrosus*	X	X		
Broom Moss	*Dicranum scoparium*	X	X		
Capillary Thread-Moss	*Bryum capillare*		X		
Cat Tail Moss	*Isothecium myosuroides*	X	X	X	X
Clear Moss	*Hookeria lucens*			X	
Coastal Leafy Moss	*Plagiomnium insigne*	X	X		X
Coiled Leaf Moss	*Hypnum circinale*		X		
Common Witch's Hair	*Alectona sarmentosa*	X			
Cord Moss	*Leptobryum pyriforme*		X		
Crane's Bill Moss	*Atrichum selwynii*		X		
Curly Thatch Moss	*Dicranoweisia cirrata*	X		X	
Cylindric Beard-Moss	*Didymodon insulanus*		X		
Douglas' Neckera Moss	*Neckera douglasii*	X			
Dusky Fork-Moss	*Dicranum fuscescens*	X	X	X	
Electrified Cats-Tail Moss	*Rhytidiadelphus triquetrus*	X	X	X	
Fan Moss	*Rhizomnium glabrescens*	X	X	X	
Flat Moss	*Pseudotaxiphyllum elegans (buckiella)*	X			
Fragile Fork Moss	*Dicranum tauricum*		X		
Golden Short-Capsuled Moss	*Brachythecium frigidum*			X	
Green/Herzog's Pocket Moss	*Fissidens viridulus/limbatus*		X		
Hairy Screw Moss	*Tortula ruralis*		X		
Hanging Moss	*Antitrichia curtipendula*		X		X
Juniper Haircap Moss	*Polytrichum juniperinum*		X		
Lanky Moss	*Rhytidiadelphus loreus*	X	X		

Large Hair Moss	*Oligotrichum parallelum*			X	
Lovers Moss	*Aulacomnium androgynum*	X			
Lyell's Bristle Moss	*Orthotrichum lyellii*		X		
Magnificent Moss	*Plagiomnium venustum*	X			
Menzies' Neckera	*Metaneckera menziesii*			X	
Menzies' Tree Moss	*Leucolepis acanthoneuron*	X	X	X	
Moss	*Dicranum spp.*	X		X	
Nocktooth Leafy Moss	*Mnium spinulosum*	X			
Nuttall's Homalothecium Moss	*Homalothecium nuttallii*		X		
Oregon Beaked Moss	*Kindbergia oregana*	X	X	X	X
Pale-Fruited Thread Moss	*Pohlia annotina*		X		
Palm Tree Moss	*Leucolepis acanthoneuron*	X	X		
Park Moss	*Zygodon rupestris*		X		
Pipe Cleaner Moss	*Rhytidiopsis robusta*		X	X	
Plume Moss	*Dendroalsia Abientina*	X			
Red Mouthed Mnium	*Mnium spinulosum*		X	X	
Red Roof Moss	*Ceratodon purpureus*		X		
Rough Moss	*Claopodium crispifolium*		X		
Shaggy Moss	*Rhytidiadelphus triquetrus*		X		
Silky Forklet-Moss	*Dicranella heteromalla*		X		
Slender Beaked Moss	*Kindbergia praelonga*	X	X	X	
Small Leaf Moss	*Pseudotaxiphyllum elegans*		X		
Soft-Tufted Beard-Moss	*Didymodon vinealis*		X		
Spear Moss	*Calliergonella custpidata*		X		
Step Moss	*Hylocomium splendens*	X	X	X	X
Tall Clustered Thread Moss	*Bryum pallescens*			X	
Tangled Moss	*Heterocladium procurrens*	X			

Tree Moss	*Climacium dendroides*	X		X	X
Wavy Leaved Cotton Moss	*Plagiothecium undulatum*	X	X	X	
Wet Rock Moss	*Dichodontium pellucidum*		X	X	
Yellow Moss	*Homalothecium fulgescens*		X		
Total Number of Species		**26**	**40**	**21**	**6**
Liverworts					
Species Common Name	**Species Scientific Name**	**2016**	**2017**	**2018**	**2019**
Blue Pouchwort	*Calypogeia azurea*		X		
Crescent-Cup Liverwort	*Lunularia cruciate*		X		
Hanging Millipede Liverwort	*Frullania nisquallensis*		X		
Hard Scale Liverwort	*Mylia taylorii*		X		
Ladle Liverwort	*Scapania bolanderi*		X		
Lesser Featherwort	*Plagiochila porelloides*		X		
Little Hands Liverwort	*Lepidozia reptans*		X		
Lophocolea cuspidate	*Lophocolea cuspidate*		X		
Snake Liverwort	*Conocepalum conicum*	X			
Tree Ruffle Liverwort	*Porella navicularis*	X	X		
Two-Horned Pincerwort	*Cephalozia bicuspidate*		X		
Yellow-Ladle Liverwort	*Scapania bolanderi*	X	X		
Total Number of Species		**3**	**11**	**0**	**0**
Lichens					
Species Common Name	**Species Scientific Name**	**2016**	**2017**	**2018**	**2019**
Antlered Perfume	*Evernia prunastri*	X	X		
Bark Barnacle Lichen	*Thelotrema lepadinum*		X		
Beaded Bone	*Hynogymia enteromorpha*			X	
Bitter Wart Lichen	*Pertusaria amara*		X		
Camouflage Lichen	*Melanelia spp.*		X		

Cumberland Rock-Shield	*Xanthoparmelia cumberlandia*		X		
Dotted Bush Lichen	*Ramalina farinacea*		X		
Dust Lichens	*Lepraria spp.*	X	X	X	
Forking Bone	*Hypogymnia inactiva*			X	
Frog Pelt	*Peltigera neopolydactyla*	X		X	
Gold Dust Lichens	*Chrysothrix spp.*		X		
Herringbone Beard	*Usnea filipendula*		X		
Lichen	*Cladina spp.*	X			
Lichen	*Cladonia spp.*	X			
Lichen	*Usnea spp.*	X			
Lipstick pixie	*Cladonia macilenta*		X		
Lungwort Lichen	*Lobaria pulmonaria*	X	X		X
Membranous Dog Lichen	*Peltigera membranacea*		X		
Methuselah's Beard	*Usnea longissima*			X	
Nit Beard	*Usnea subfloridana*		X		
Oak Moss Lichen	*Evernia prunastri*		X		
Rag Bag Lichen	*Platismatia glauca*	X	X	X	X
Rose-Bud Pert	*Pertusaria subambigens*		X		
Sarea resinae	*Sarea resinae*		X		
Saucer Lichen	*Ochrolechia laevigata*		X		
Shield Lichen	*Parmelia sulcate*		X		
Script Lichen	*Graphis scripta*		X		
Speckled Horsehair	*Bryoria fuscescens*			X	
Tattered Rag Lichen	*Platismatia herrei*	X	X	X	
Tree Lungwort	*Lobaria pulmonaria*		X		
Tree Pelt	*Peltigera collina*		X		
Trumpet Lichen	*Cladonia fimbriata*		X		
Total Number of Species		**9**	**24**	**8**	**2**

Fungi					
Species Common Name	**Species Scientific Name**	**2016**	**2017**	**2018**	**2019**
Artist Conk	*Ganoderma applanatum*		X		X
Bird's Nest Fungus	*Nidulariaceae spp.*		X		
Bitter Iodine Polypore	*Albatrellus hirtus*		X		
Cedar Needle Blight	*Didymascella thujina*		X		
Coccomyces dentatus	*Coccomyces dentatus*		X		
Dasyscyphus bicolor	*Dasyscyphus bicolor*		X		
Deer Mushroom	*Pluteus cervinus s.l.*		X		
Dye Polypore	*Phaeolus schweinitzii*		X		
Heterotextus luteus	*Heterotextus luteus*		X		
Jelly fungus	*Dacrymyces spp.*		X		X
Leaf Fungus	*Stereum spp.*		X		
Lichen Agaric	*Lichenomphalia umbellifera*		X		
Needle Rust	*Pucciniastrum goeppertianum*		X		
Ochre Spreading Tooth	*Steccherinum ochraceum*		X		
Panther Cap Mushroom	*Amanita pantherina*	X			
Red Belt Conk	*Fomitopsis pinicola*		X		X
Red Edge Bonnet	*Mycena rubromarginata*		X		
Ringed Conocybe	*Conocybe filaris*		X		
Saprotrophic Mushrooms	*Mycena spp.*		X		
Turkey Tail	*Trametes versicolor*		X		X
Western Varnished Conk	*Ganoderma oregonense*		X	X	
Witch's Butter	*Tremella mesenterica*			X	X
White Green-Algae Coral	*Multiclavula mucida*		X		
White Marasmius	*Marasmiellus candidus*		X		
Wood Ear	*Auricularia auricular-judae*				X

Total Number of Species		**1**	**22**	**2**	**6**
Slime Molds					
Species Common Name	**Species Scientific Name**	**2016**	**2017**	**2018**	**2019**
Scrambled Egg Slime Mold	*Fuligo septica*		X		
Tapioca Slime	*Brefeldia maxima*			X	
Total Number of Species		**0**	**1**	**1**	**0**
Total Number of Flora Species at Milner Gardens		**107**	**171**	**96**	**84**

Table 2 is a complete list of fauna identified within Milner Gardens & Woodland on April 17, 2016, April 22, 2017, April 21, 2018, and April 13, 2019 during the annual MABR BioBlitzes. The data was compiled into one table for ease of comparison between the four years. NOTE: invasive species are highlighted in RED, exotic species are highlighted in GREEN, and Species at Risk are highlighted in BLUE. None of the fauna species found were considered invasive or exotic. However, there were 2 species identified that are considered Special Concern under the Species at Risk Act, including the Horned Grebe (*Podiceps auritus*) and the threatened Western Grebe (*Aechmophorus occidentalis*).

Table 2. Compiled Findings from 2016, 2017, 2018, and 2019 MABR BioBlitz Fauna Species (both morning and afternoon sessions) at Milner Gardens & Woodland.

Birds of Prey					
Species Common Name	**Species Scientific Name**	**2016**	**2017**	**2018**	**2019**
Bald Eagle	*Haliaeetus leucocephalus*	X	X	X	X
Cooper's Hawk	*Accipiter cooperii*				X
Barred Owl	*Strix varia*		X	X	
Red-Tailed Hawk	*Buteo jamaicensis*				X
Sharp-Shinned Hawk	*Accipiter striatus*		X		
Total Number of Species		**1**	**3**	**2**	**3**
Shore Birds					
Species Common Name	**Species Scientific Name**	**2016**	**2017**	**2018**	**2019**

Belted Kingfisher	*Megaceryle alcyon*	X	X		X
Black-Bellied Plover	*Pluvialis squatarola*	X	X	X	X
Black Turnstone	*Arenaria melanocephala*	X	X		
Dunlin	*Calidris alpina*	X	X		X
Greater Yellow Legs	*Tringa melanoleuca*	X			
Total Number of Species		**5**	**4**	**1**	**3**
Waterfowl					
Species Common Name	**Species Scientific Name**	**2016**	**2017**	**2018**	**2019**
Bonaparte's Gull	*Chroicocephalus philadelphia*	X	X	X	
Brant	*Branta bernicla*		X	X	
California Gull	*Larus californicus*	X		X	X
Common Loon	*Gavia immer*	X	X	X	X
Common Merganser	*Mergus merganser*	X	X	X	
Common Murre	*Uria aaige*		X		
Glaucous-Winged Gull	*Larus glaucescens*	X	X	X	X
Greater Scaup	*Aythya marila*		X		
Horned Grebe	*Podiceps auritus*	X	X	X	X
Long-Tailed Duck	*Clangula hyemalis*				X
Mallard	*Anas platyrhynchos*		X	X	X
Marbled Murrelet	*Brachyramphus marmoratus*	X	X		
Mew Gull	*Larus canus*	X	X		X
Pacific Loon	*Gavia pacifica*	X	X	X	
Pelagic Cormorant	*Phalacrocorax pelagicus*		X	X	
Pidgeon Guillemot	*Cepphus columba*	X	X	X	
Red-Breasted Merganser	*Mergus serrator*	X	X		X
Red-Necked Grebe	*Podiceps grisegena*	X	X	X	X
Rhinoceros Auklet	*Cerorhinca monocerata*		X		

Surf Scoter	*Melanitta perspicillata*	X	X	X	X
Western Grebe	*Aechmophorus occidentalis*	X	X	X	X
Western Gull	*Larus occidentalis*			X	
White-Winged Scoter	*Melanitta fusca*		X	X	
Yellow-Billed Loon	*Gavia adamsii*			X	
Total Number of Species		**14**	**20**	**16**	**11**
Forest Birds					
Species Common Name	**Species Scientific Name**	**2016**	**2017**	**2018**	**2019**
American Robin	*Turdus migratorius*	X	X	X	X
Anna's Hummingbird	*Calypte anna*	X	X	X	
Band-Tailed Pigeon	*Patagioenas fasciata*		X		
Bewick's Wren	*Thryomanesbewickii*			X	
Black-Capped Chickadee	*Poecile atricapillus*	X			
Black-Throated Blue Warbler	*Setaphaga caerulescens*		X		
Black-Throated Gray Warbler	*Setophaga nigrescens*	X	X		
Brown Creeper	*Certhia americana*		X		
Bushtit	*Psaltriparus minimus*		X	X	
Chestnut-Backed Chickadee	*Poecile rufescens*		X	X	X
Common Raven	*Corvus corax*	X	X	X	X
Common Yellowthroat	*Geothlypis trichas*				
Dark-Eyed Junco	*Junco hyemalis*	X	X	X	
Downy Woodpecker	*Picoides pubescens*	X			
European Starling	*Sturnus vulgaris*		X	X	X
Golden-Crowned Kinglet	*Regulus satrapa*		X	X	X
Golden-Crowned Sparrow	*Zonotrichia atricapilla*		X	X	
Hammond's Flycatcher	*Empidonax hammondii*		X		

Hutton's Vireo	*Vireo huttoni*	X	X	X	
Northern Flicker	*Colaptes auratus*	X	X	X	
Northwestern Crow	*Corvus caurinus*	X	X	X	X
Nuthatch	*Sittidae spp.*	X			
Orange-Crowned Kinglet	*Regulus satrapa*		X		
Orange-Crowned Warbler	*Oreothlypis celata*		X	X	
Pacific-Slope Flycatcher	*Empidonax difficilis*		X		
Pacific Wren	*Troglodytes pacificus*	X	X	X	X
Pileated Woodpecker	*Dryocopus pileatus*		X	X	
Pine Siskin	*Spinus pinus*		X	X	X
Purple Finch	*Haemorhous purpureus*		X	X	
Red-Breasted Nuthatch	*Sitta Canadensis*		X	X	X
Red-Breasted Sapsucker	*Sphyrapicus ruber*		X	X	
Ruby-Crowned Kinglet	*Regulus calendula*			X	
Rufous Hummingbird	*Selasphorus rufus*	X	X	X	X
Rufous-Sided Towhee	*Pipilo erythrophthalmus*	X	X		X
Song Sparrow	*Melospiza melodia*		X		
Spotted Towhee	*Pipilo maculatus*	X		X	X
Townsend's Warbler	*Setaphaga townsendi*		X		
Tree Swallow	*Tachycineta bicolor*			X	
Varied Thrush	*Ixoreus naevius*			X	
Western Tanager	*Piranga ludoviciana*		X		X
Winter Wren	*Troglodytes hiemalis*	X			
Yellow Warbler	*Setaphaga petechial*		X		
Yellow Rumped Warbler	*Setaphaga coronata*		X	X	X
Total Number of Species		**16**	**33**	**26**	**14**

Insects					
Species Common Name	**Species Scientific Name**	**2016**	**2017**	**2018**	**2019**
Beetle	*Dyslobus granicollis*				X
Boreal Lady Beetle	*Coccinellidae spp.*				X
Bristletail	*Archaeognatha spp.*				X
Brown Lined Looper	*Neoalcis californiaria*				X
Bumblebee, Fuzzy Horn	*Bombus mixtus*				X
Chironomid Midge	*Chironomidae spp.*				X
Click Beetle	*Elateridae spp.*				X
Damsel Bug	*Nabidae spp.*				X
Earthworm	*Lumbricina spp.*				X
Elongated Springtail	*Collembola spp.*				X
Geometer Caterpillar	*Geometridae spp.*				X
Globular Springtail	*Sminthuridae spp.*				X
Jumping Spider	*Salticidae spp.*				X
Leaf Hopper	*Cicadellidae spp.*				X
Millipede	*Diplopoda spp.*				X
Mothfly	*Psychodidae spp.*				X
Nut Leaf Weevil	*Curculio nucum*				X
Obscure Root Weevil	*Sciopithes obscurus*				X
Oribatid Mite	*Oribatida spp.*				X
Painted Lady Beetle	*Coleomegilla maculata*				X
Red-cross Shield Bug	*Elasmostethus cruciatus*				X
Roly-poly	*Armadillidium vulgare*				X
Rove Beetle	*Staphylinidae spp.*				X
Salal Leaf Miner Moth	*Gaultheria shallon*				X
Skunk Cabbage Rove Beetle	*Pelecomalium spp.*				X

Strawberry Root Weevil	*Otiorhynchus ovatus*				X
Twenty Spotted Lady Beetle	*Psyllobora vigintimaculata*				X
Waterstrider	*Gerridae spp.*				X
White micromoth	*Microlepidoptera spp.*				X
Wrinkled Snail	*Xeroplexa intersecta*				X
Total Number of Species		**0**	**0**	**0**	**30**
Other Species					
Species Common Name	**Species Scientific Name**	**2016**	**2017**	**2018**	**2019**
Banana Slug	*Ariolimax spp.*		X	X	X
Black-Tailed Deer	*Odocoileus hemionug columbianus*			X	X
Harbour Seal	*Phoca vitulina*			X	
Red-Backed Salamander	*Plethodon cinereus*		X		
Red Squirrel	*Tamiasciurus hudsonicus*			X	X
Total Number of Species		**0**	**2**	**4**	**3**
Total Number of Fauna Species at Milner Gardens		**36**	**62**	**49**	**64**

Participant Feedback and Recommendations

Without the assistance, participation, and support of VIU students, local experts, citizen scientists and community members, the MABR BioBlitz would not have been such a great success. Through participant feedback and recommendations, the event and coordination is able to improve each year. With continued improvement and increased interest, the event is able to welcome and support more public participation and knowledge sharing within the MABR. Feedback from participants at Milner Gardens & Woodland showed that the event was unanimously a positive experience. Some stated that they enjoyed the tranquility of the outdoor forested environment, while others enjoyed learning from the knowledgeable experts. Many expressed their excitement due to having an insect expert at the event this year. Several participants felt that the event was well organized. Further, many found it very engaging because of the small group sizes. Overall, the feedback from the 2019 MABR BioBlitz was positive and constructive.

Future Blitzing

Our future goals are to expand the MABR BioBlitz further across the MABR to include core areas such as Wildlife Management Areas, and Provincial, Regional and Municipal parks; these areas maintain some level of protection and may be able to be consistently surveyed year after year to allow for a proper comparison between species data. The marine survey that was conducted during the 2017 MABR BioBlitz at Oak Leaf Drive Park was a success and could be implemented again for future BioBlitz

The MABR is a stunningly beautiful and diverse region with countless species to discover and steward. The incredible vertical range of the MABR allows for 2100m of discovery from the highest peak of Mount Arrowsmith to the depths of the Salish Sea. The MABRRI team is inspired and eager to explore, engage, and educate one another and the community about these important ecosystems and habitats that we all live in and share. The MABR BioBlitz has proven to be a success within the community and our team at MABRRI looks forward to expanding the event throughout the MABR for future years to come.

List of References

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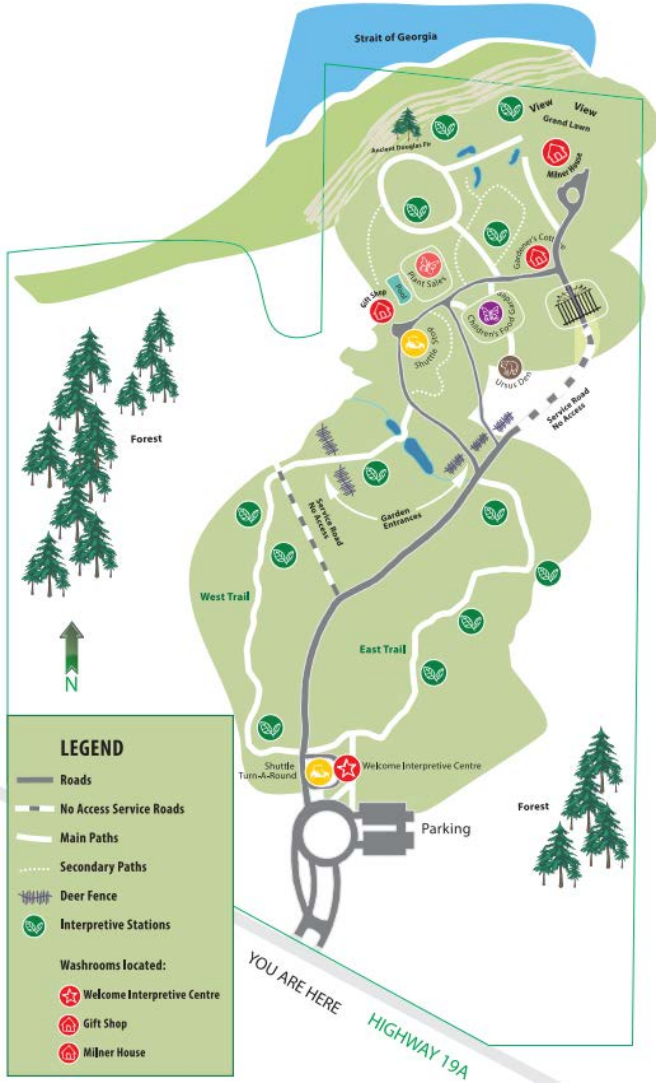
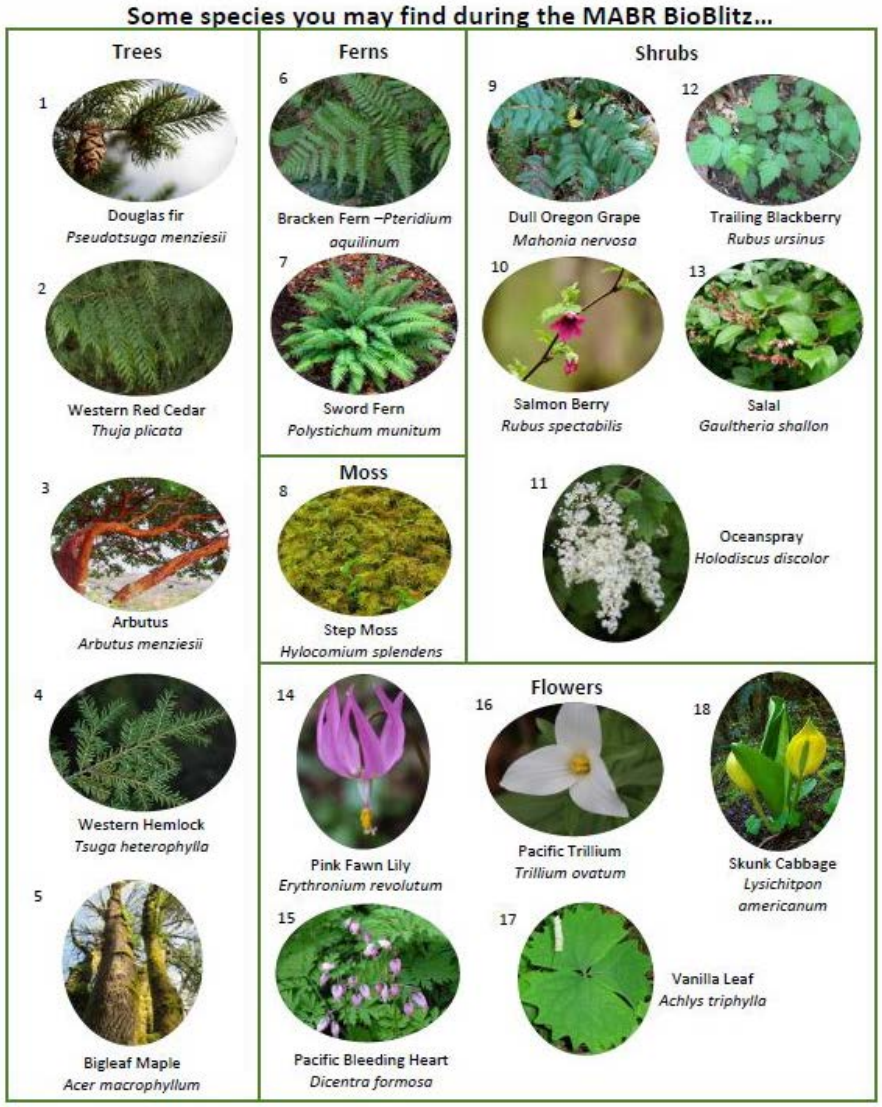
Appendix A: Map of BioBlitz Sites for the Milner Gardens BioBlitz



Appendix B: Common Species-BioBlitz Handout



Appendix C: Birds You May Expect to Find at Milner Gardens

Most Likely Birds Seen and Heard at Milner Gardens and Woodland

by Sandra Gray

Listed below are predominantly forest dwelling birds that can be seen or heard during your visit to Milner Gardens and Woodland throughout the seasons. In addition, many species of ducks, shorebirds, and gulls visit the shoreline of MGW during migration or may winter over along the East Coast of Vancouver Island. With binoculars or spotting scope you may be able to add quite a few to 'your list' while on site. Over 250 species of birds have been recorded in the Parksville Qualicum Beach Checklist Area.

S Usually a seasonal visitor; may be seen during migration; may nest locally or on site.

C Common visitor or resident; can be seen most of the year but may be migratory; may nest locally or on site.

The following list is in the scientific order used by most field guides.

☐ Mallard	S	☐ Rufous Hummingbird	S
☐ California Quail	C	☐ Belted Kingfisher	C
☐ Great Blue Heron	C	☐ Red-breasted Sapsucker	C
☐ Turkey Vulture	S	☐ Downy Woodpecker	C
☐ Bald Eagle	C	☐ Hairy Woodpecker	C
☐ Sharp-shinned Hawk	C	☐ Northern Flicker	C
☐ Cooper's Hawk	C	☐ Pileated Woodpecker	C
☐ Red-tailed Hawk	S	☐ Pacific-slope Flycatcher	S
☐ Merlin	C	☐ Hutton's Vireo	C
☐ Peregrine Falcon	S	☐ Warbling Vireo	S
☐ Killdeer	C	☐ Steller's Jay	C
☐ Band-tailed Pigeon	C	☐ Northwestern Crow	C
☐ Great Horned Owl	C	☐ Common Raven	C
☐ Barred Owl	C	☐ Tree Swallow	S

2179 West Island Highway, Qualicum Beach
For more information call 250-752-6153 or email *milnergardens@shaw.ca*.

Most Likely Birds Seen and Heard at Milner Gardens and Woodland

by Sandra Gray

S Usually a seasonal visitor; may be seen during migration; may nest locally or on site.

C Common visitor or resident; can be seen most of the year but may be migratory; may nest locally or on site.

The following list is in the scientific order used by most field guides.

☐ Violet-green Swallow	S	☐ Black-throated Gray Warbler	S
☐ Northern Rough-winged Swallow	S	☐ Townsend's Warbler	S
☐ Chestnut-backed Chickadee	C	☐ Western Tanager	S
☐ Bushtit	C	☐ Spotted Towhee	C
☐ Red-breasted Nuthatch	C	☐ Chipping Sparrow	S
☐ Brown Creeper	C	☐ Fox Sparrow	C
☐ Bewick's Wren	C	☐ Song Sparrow	C
☐ Pacific (Winter) Wren	C	☐ White-crowned Sparrow	C
☐ Golden-crowned Kinglet	C	☐ Dark-eyed Junco	C
☐ Ruby-crowned Kinglet	C	☐ Black-headed Grosbeak	S
☐ Swainson's Thrush	S	☐ Red-winged Blackbird	C
☐ Hermit Thrush	C	☐ Brown-headed Cowbird	S
☐ American Robin	C	☐ Purple Finch	C
☐ Varied Thrush	C	☐ House Finch	C
☐ European Starling	C	☐ Red Crossbill	S
☐ Cedar Waxwing	S	☐ Pine Siskin	S
☐ Orange-crowned Warbler	S	☐ American Goldfinch	S
☐ Yellow-rumped Warbler	S		

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