



UNESCO Biosphere Reserves

CITIZEN SCIENCE

INTRODUCTION

Citizen science events provide meaningful opportunities for community members to come together and learn from each other, as well as from their environment. These events are intended to promote collaboration in scientific research and increase knowledge through data collection and monitoring. Citizen science events can also be used to raise awareness on UNESCO designated Biosphere Reserves. This document is intended to showcase some of the citizen science events/initiatives that are occurring in Canadian Biosphere Reserves.

There are several benefits associated with hosting citizen science events. In addition to providing meaningful opportunities for community members, events such as these enable participants to increase their scientific understanding, make direct contributions to research, and learn about environmental issues. Citizen scientists are also valuable to those responsible for conducting the research, as they can maximize the amount of data collected.

Providing data collection opportunities for citizen scientists allow them to interact with their surroundings, develop a connection with the natural environment, and contribute to

QUICK FACTS

- 18 biosphere reserves in Canada, 686 worldwide
- 2.3 million people live in Canadian biosphere reserves
- 50+ Indigenous Nations host biosphere reserves
- Areas represented by 41 Members of Parliament



• Canadian Biosphere Reserves Association
• Association canadienne des réserves de la biosphère

Biosphere reserves facilitate dialogue, showcase models of co-governance, and coordinate projects that bridge environmental, economic, social, and cultural divides.



research that they care about - but may otherwise not have an opportunity to assist with. Community engagement events or citizen science events are also great ways to engage the public. These events can be tailored towards inexperienced citizen scientists, experts, or a combination of the two.

Modern technology and apps, such as iNaturalist or eBird to name a few, also provide a unique advantage to those wishing to enter the field of citizen science. These apps, along with many others, enable participants to become citizen scientists in their own back yard, or while exploring in the woods.

The following pages includes three biosphere reserves case studies related to the theme.

MOUNT ARROWSMITH BIOSPHERE REGION (MABR): ANNUAL BIOBLITZ EVENT

The Mount Arrowsmith Biosphere Region (MABR) has been conducting an annual BioBlitz event since 2016. 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 an allocated time frame.

One of the many benefits of conducting a BioBlitz is that the data collected by participants can provide a snapshot of biodiversity and species richness within the region. A BioBlitz also provides increased regional knowledge of changes to species abundance and habitats for species at risk, as well as changes in invasive species distribution over time. Data collected during the annual event can also help inform the management of sensitive habitats and ecosystems within the region.

The MABR BioBlitz has 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. The aim of this research is to promote the health and resilience of natural systems in the MABR and all the intricate and unique characteristics and relationships within these ecosystems.

To promote the longevity and relationships between people and nature, the annual event was created with the goal of promoting knowledge sharing, environmental stewardship, and critical thinking in communities beyond the academic environment. Future BioBlitz events will aim to expand the boundaries of the event year after year to include a greater variety of ecosystems, habitats, and microclimates. As a result, researchers will be able to observe and monitor trends in species inventory over a greater geographic range on Vancouver Island. In addition, the MABR BioBlitz wishes to increase student research and participation in event coordination and grow the participation of citizen scientists each year.

During the event, participants are divided into groups; each with at least one expert in the field of flora and fauna. Generally, experts include botanists, foresters, naturalists, ecologists, entomologists, and birders - some of which are recruited faculty from Vancouver Island University. Groups spend several hours along a marked path collecting data on their species of interest as they go (presence/absence). Back at the muster station, MABR staff arrange informative displays for participants to view and learn about in between the morning and afternoon Blitzing sessions.

After each event, a summary report is posted to the MABR website to ensure that the data is transparent and publically available. Each report compares the data collected to that of previous years, and shows the number of species found each year, beginning in 2016.





BRAS D'OR LAKE BIOSPHERE RESERVE ASSOCIATION: BRAS D'OR WATCH

Initiated in 2015, Bras d'Or Watch is an annual event hosted by Cape Breton's Bras d'Or Lake Biosphere Reserve, which introduces residents and visitors to the unique Bras d'Or ecosystem. The initiative encourages families to appreciate the complex world of nature that they live in. Bras d'Or Watch is an evolving marriage between citizen science, capacity-building, and outreach.

In collaboration with the Atlantic Coastal Action Program (ACAP) Cape Breton and Unama'ki Institute of Natural Resources (UINR), the event is hosted several times at different locations throughout Cape Breton. In 2019, events occurred in Ben Eoin, Baddeck, Ross Ferry, Grand Narrows, and St. Peter's.

Bras d'Or Watch includes a field day in July, where scientists and local community members welcome citizen scientists at several sites around the estuary. The Bras d'Or Watch Field Day is an annual event that brings together scientists, naturalists, families, and community leaders to celebrate one's place in the Bras d'Or Lake Biosphere Reserve. It includes family friendly activities which help collect valuable information about the lakes, scientists eager to share their knowledge, and lots of opportunity to meet new friends. Attendees learn more about the natural environment of the nearshore and develop a 'report card' on ecosystem health at one point in time in several sites around the estuary. Data collected during the events includes water temperature and the presence and type of invasive species, which can then be used to determine possible climate control issues, or if an ecosystem is being overrun by an invasive species. During the events, data is collected while participants have a chance to observe animals in their natural habitat, explore lagoons, and touch fish specimen collected in Ben Eoin using a beach seine (a type of net).

Bras d'Or Watch also includes a 'Meet the residents' forum that can be found on the Bras d'Or Lake Facebook page and in their newsletter. Bras d'Or Watch is also expanding to include other citizen science programs, such as turbidity (water clarity) monitoring in the lakes, as well as a forest watch program. The organizers and researchers involved in the event also hope that by teaching youth about the ecosystem through hands-on learning, they will want to protect it as well.

WATERTON BIOSPHERE RESERVE: NORTHERN LEOPARD FROG PROJECT

The Waterton Biosphere Reserve (WBR) Northern Leopard Frog Project began in 2017, and aims to support northern leopard frog conservation as part of the Species at Risk Action Plan (2015-2018). The project encourages citizens to submit observations of the northern leopard frog and share stories of where they may be found in the WBR, past or present.

From 2017-2019, the WBR solicited local knowledge about past and present northern leopard frog occurrences, identified possible locations for habitat improvement or future reintroductions, completed visual and environmental DNA (eDNA) surveys (testing for certain species' DNA in water samples) at several wetlands on private lands within the WBR, and leveraged interest into opportunities to educate on other amphibian species at risk, associated wetland habitats, and their stewardship in the WBR. Citizens were asked to look for habitats where the northern leopard frog may live, watch and listen for them, take photos/recordings of their observations, note the locations, and submit this information to the Biosphere Reserve.

Why northern leopard frogs? Amphibians are the most threatened group of organisms on the planet; it is estimated that 40% of all amphibian species are threatened with extinction. Frogs also control populations of insects and other invertebrates, some of which are pests or carry disease. Tadpoles can also limit algae growth and oxygen depletion, which can cause death of other wetland species. These are some of the many reasons why these frogs are important and contribute to ecosystem functioning, and should therefore be monitored and conserved. Dramatic declines in northern leopard frog populations began in the late 1970s, and have resulted in extirpation of the species from parts of its historic range in Western North America. This includes much of the WBR, where the frog was historically present along major rivers and tributaries, lakes, springs, and irrigation reservoirs.

The northern leopard frog is the largest frog in Alberta, and is either green or brown with a pale white belly. They can be identified easily by large dark spots bordered with pale rings. To attract females during mating season, the males' call is low-pitched and sounds similar to a door creaking open, followed by several clucking or grunting noises. Their active season runs from April to October, and the frogs are most active in warm, wet weather, or at dawn or dusk if the climate is not too cool.





Following suit of successful frog reintroduction to Beauvais Lake Provincial Park and Magrath in recent years, Waterton Lakes National Park is working toward establishing a self-sustaining northern leopard frog population. The WBR project aims to create public awareness on the importance of northern leopard frogs in the ecosystem and to create opportunities for WBR residents to help improve their status in the area.

The WBR's Northern Leopard Frog Project had a successful third season in 2019. Visual surveys and environmental DNA (eDNA) (testing for certain species' DNA in water samples) were used in search of northern leopard frogs and other amphibians. The focus of the field work was on private lands near Beauvais Lake Provincial Park, Waterton Lakes National Park, and Magrath, where northern leopard frog re-establishment efforts are in progress or have been successful, and on other areas with historical records. In addition to the five new documented sites in 2018, northern leopard frogs were found in 2019 at one site not previously documented. Five other amphibians that call the Biosphere Reserve home were also observed: tiger salamander, long-toed salamander, western toad, striped chorus frog, and Columbia spotted frog.

The WBR is now working on a stewardship plan for northern leopard frogs in the WBR. This plan will build on previous landowner outreach activities and site surveys, review best management practices, and compile advice from local and regional experts.



RESOURCES

There are a number of resources available to those interested in developing citizen science events or initiatives. Some available resources include guides on how to plan events, presentations that have been prepared and can easily be replicated, and video tutorials on how to conduct events such as those listed earlier in this document. National Geographic has developed a resource library which includes lessons, maps, educational units, etc. that are free for download and use, and include a wide array of subjects.

Other examples of resources include easy to use apps, such as iNaturalist or eBird, which are available to the public to download for free on any tablet or smartphone. Software such as these are user-friendly, and also have options for a group of individuals to pool observations into one easy-to-find page. Another example is LeafSnap, a free app that allows users to take pictures of plants and upload them, while the app then identifies the plant of interest for the user. This app would be especially helpful during a BioBlitz event for example.

FUNDING

Citizen science can be a cost-effective approach to collecting data, conducting a study, or monitoring the population of a species of interest. However, these initiatives still require resources in one way or another. For example, funding is often required to hire an event coordinator, develop promotional and training materials, and cover project supplies.

Many citizen science or community engagement events are highly dependent on grants. The options of funding, or list of revenue sources, however, can be lengthy and overwhelming. Depending on the type of citizen science initiative, the search for funding could either be broad or have a specific focus, such as funding for youth, biodiversity, conservation, research on bird species, etc.

Some starting points for sourcing funds may include municipalities, academia, or provincial and federal granting streams. Many organizations who fund projects annually will include a list of grant types on their website, and often include deadlines and due dates in their newsletters – which individuals can sign up for.

The Government of Canada offers several funding programs, which are categorized based on funding type: agriculture, arts, culture and sport, business, environment, for Indigenous peoples, gender equality, health, international development, jobs or apprenticeship training, research, etc. They also have a “portal” dedicated to citizen science.



SPONSORS

Many citizen science events are sponsored by a local organization or business within the Biosphere Reserve. Fresh coffee and cookies at an event could be an effective incentive to bring citizen scientists together - especially if the event is in the morning or on a weekend.

Recognizing sponsors for their generous donation is crucial, and can take several forms. Sponsor logos can be included in all promotional material leading up to and used during the event. An alternative route is to list the organization as a gold, silver, or platinum sponsor on pamphlets or brochures. If the organization has any promotional material such as brochures and pamphlets, these could also be given out at the event.

SUGGESTIONS AND TIPS

Promotion

Promotion of citizen science events should begin early on, and again, this can be done in many ways. The method of promotion may be dependent on the target audience for the event or initiative. If the audience is a youth or student demographic, social media channels may be more appropriate (Facebook, Twitter, Instagram, and LinkedIn). However, if the target audience are members of the local community, then local newspapers, radio and news/TV channels may be more effective. Digital newsletters and websites can also be effective to use for a more broad audience. Posters can be effective ways of promotion as well, and can be tailored towards your desired participants. Posters can be distributed to schools, universities, local billboards, coffee shops, and local businesses, to name a few.

Capturing the event

Taking pictures whenever the opportunity is presented is a great tool for promoting future events. Photo release forms are recommended as a quick way to discover who is, and who is not, comfortable with having their picture taken. These forms are very useful to have when using photos for larger scale promotion as well. Pictures can also be useful to include in a report back to funders, pamphlets or brochures, posters, for use on social media, etc. Today's smart phones make capturing these moments very achievable. With great cameras and editing abilities, collecting high quality pictures at these events comes with ease.



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