

Exploring PPSR Under Western Skies Conference Proceedings

Sept. 2014

Prepared by Rachelle Haddock



MIISTAKIS
INSTITUTE



Exploring PPSR Under Western Skies Conference Proceedings

Sept. 2014

Prepared by Rachelle Haddock

Miistakis Institute
Rm U271, Mount Royal University
4825 Mount Royal Gate SW
Calgary, Alberta
T3E 6K6
Phone: (403) 440-8444
Email: institute@rockies.ca
Web: www.rockies.ca

TABLE OF CONTENTS

Table of Contents	3
Introduction	4
Acknowledgements	5
Conference Agenda.....	6
Presentation Abstracts	9
Welcome & PPSR Landscape Session	9
Program Design Session.....	9
Evaluating PPSR Session	10
PPSR & Watershed Stewardship Session.....	11
Policy and Citizen Science Session.....	12
Poster Session Abstracts.....	13
Parks and Protected Areas & PPSR Session.....	16
Speaker Information	18
Welcome & PPSR Landscape Session	18
Program Design Session.....	18
Evaluating PPSR Session	19
PPSR & Watershed Stewardship	20
Linking citizen science to action: Case Studies in the Columbia and Athabasca - Heather Leschied, Living Lakes Canada	20
Successes and challenges of a citizen science lake monitoring program - Bradley Peter, Alberta Lake Management Society (ALMS)	20
Policy & Citizen Science Session.....	20
Parks & Protected Areas & PPSR Session.....	21
Data Management & Technology in PPSR Session	22
Participant List.....	24

INTRODUCTION

In recent years there has been a renewed interest in citizen engagement and today there is a proliferation of research projects that engage citizens to address a diversity of environmental, health and social justice challenges. The explosion of research involving the public is due to: 1) new emerging technology making communication, data collection and dissemination of information more fluid and accessible, 2) appreciation of the benefits of engaging the public in science and their potential role as concerned informed citizens and 3) the realization that the public can be a large source of experienced, free labor and in certain cases a financial contributor. There are many areas where discussion and shared learning among practitioners are important for shaping the future practices of research projects designed with citizen involvement. Although there is rapid growth of PPSR, the sharing of insights between projects and across the field is limited. Additionally, opportunities for engaging PPSR practitioners from different disciplines in Canada have been limited.

As a precursor to the Exploring PPSR Under Western Skies Conference, the Miistakis Institute held a one-day workshop in May 2013 at Mount Royal University. The purpose of this workshop was to: 1) bring together individuals and organizations using PPSR to share, explore, and discuss their respective program goals, data collection methods, challenges and successes; 2) understand through collective participation key themes/challenges facing PPSR practitioners; and 3) discuss the need for a Canadian PPSR conference. The response to the workshop was extremely positive with 34 practitioners representing academic institutions, non-governmental organizations and provincial and federal government agencies based in Alberta. A key outcome of this gathering was the identification of a need for a broader gathering of the PPSR community. This conference was organized to address that need.

The goal of Exploring PPSR Under Western Skies was to: stimulate communication, collaboration and innovation in the field of PPSR in western Canada. The objectives of the conference were as follows:

- 1) Highlight state of the art of PPSR, including:
 - a) Provide overview of the PPSR landscape
 - b) Share PPSR learnings with a focus on program design and data management

- 2) Create best practices for citizen science engagement
 - a) Explore evaluation as a means to expand PPSR
 - b) Explore role of transformative learning and civic science literacy in PPSR
 - c) Explore role of Geomatics and Technological Innovation in PPSR
 - d) Investigate the potential of PPSR in parks and protected areas

- 3) Create a network of western Canadian PPSR practitioners

One of the desired outcomes of the Exploring PPSR Under Western Skies Conference was an exploration of the idea to create a Western Canadian hub for citizen science in partnership with the newly formed [Citizen Science Association](#). To stay abreast of these developments, please visit rockies.ca/citizenscience

ACKNOWLEDGEMENTS

We wish to acknowledge our partners and funders. The conference would not have been possible without their support:



Institute for
Environmental
Sustainability



UNDER WESTERN SKIES



THE CITY OF
CALGARY
PARKS

Parks for Tomorrow



Social Sciences and Humanities
Research Council of Canada

Conseil de recherches en
sciences humaines du Canada

Canada

CONFERENCE AGENDA

Day 1 – September 9, 2014

8:30am Welcome & Session on the PPSR Landscape

This session will provide an overview of the field of practice of PPSR which includes forms of research where the public is engaged in the scientific process such as citizen science, community-based monitoring, volunteer monitoring and participatory action research. PPSR is an emerging field of practice where a diversity of disciplines are engaging the public in science to improve knowledge of the world around us, enhance the public's understanding of scientific process and inform policy and management decisions. The session will provide a global overview of the practice of PPSR, including why a bi-directional model for doing science is important, examples of PPSR approaches achieving programmatic outcomes and challenges facing PPSR. In addition, regional case studies of successful programs will be presented.

- Welcome – Danah Duke, Miistakis Institute
- Keynote – Under Global Skies: Building a Community of Practice for Citizen Science. Dr. Jennifer Shirk, Cornell Lab of Ornithology
- Can spring bloom times in Alberta save the government millions of dollars in firefighting costs? – Dr. Elisabeth Beaubien, University of Alberta
- Whose knowledge? Whose values? Citizen science and democratic engagement – Dr. Gwendolyn Blue, University of Calgary

10:05am Break & Networking

10:20am Program Design Session

This session will focus on considerations for planning, implementing and evaluating PPSR programs. PPSR programs may have multiple programmatic goals, including generating scientific information, fostering stewardship/conservation, shaping policy and/or educational learning. Depending on the program goals, practitioners need to consider the program's model for citizen engagement, mechanisms to engage and maintain volunteers, volunteer training protocols, use of technology in data collection and dissemination, and methods to measure outcomes and programmatic impacts. A number of regional case studies will be presented that outline program frameworks for achieving specific goals, such as meeting a stated scientific goal, influencing policy decisions and/or promoting transformative learning.

- Developing better analytical metrics for data collected by citizen scientists – Dr. Greg Breed, University of Alaska
- Trapper, conservationist, or both? How the desire for a sustainable harvest can motivate contributions to wolverine research and conservation efforts - Bill Abercrombie, Alberta Trappers Association, and Dr. Doug Manzer, Alberta Conservation Association
- Can citizens counting collisions lead to safe wildlife passage? - Tracy Lee, Miistakis Institute, Mount Royal University

11:50pm Lunch

12:30pm

Evaluating PPSR

As PPSR programming continues to dramatically grow each year, there is a need to evaluate the effectiveness of these initiatives. Not only do we need to understand methods to measure the outcomes and effectiveness of individual PPSR programs, there is a growing need to assess the PPSR programmatic landscape using similar techniques so we can compare successes across PPSR programs.

- Evaluating the Conservation Potential of Citizen Science: Emerging principles and practices for the 21st century - Tina Phillips, Cornell Lab of Ornithology

1:00pm

PPSR & Watershed Stewardship

There has been a long history of citizens and community organizations monitoring water and their watersheds. With decreasing government budgets for watershed monitoring and increasing levels of citizen involvement in watershed stewardship, citizen science will continue to play an important role in watershed health. This session presents a series of case studies on PPSR and watershed stewardship.

- Engaging communities in aquatic monitoring and discussion of climate change effects – Dr. Elaine Caton, Southwestern Crown of the Continent Collaborative
- Linking citizen science to action: case studies in the Columbia and Athabasca - Heather Leschied, Living Lakes Canada
- Successes and challenges of a citizen science lake monitoring program - Bradley Peter, Alberta Lake Management Society (ALMS)

2:00pm

Break & Networking

2:30pm

Policy & Citizen Science

One of the potential outcomes of a PPSR approach is its ability to influence policy and decisions. A PPSR approach can generate critical data to support a policy or decision. It can also cultivate a group of knowledgeable citizens who advocate for a policy or decision. This session features a number of case studies where PPSR can be or has been linked to policy and decision-making.

- Can we trust their data? Evaluating a citizen science program to monitor wildlife along a highway – Dr. Mike Quinn, Institute for Environmental Sustainability, Mount Royal University
- Digital Fishers: Science-oriented crowdsourcing and participatory public policy – Dr. Rod Dobell, University of Victoria
- Pennsylvania Stream Monitoring: Data Collection to Policy Action - Julie Vastine, Alliance for Aquatic Resources Monitoring (ALLARM), Dickinson College

5-6:30

Poster Session & Reception

Day 2 – September 10, 2014

8:30am Parks and Protected Areas and PPSR

In Western Canada, parks and protected areas at federal, provincial and municipal scales are developing PPSR programs to help monitor ecosystem health and meet visitor experience programmatic goals. Presentations of PPSR programs from a diversity of parks and protected areas will be presented to share experiences and lessons learned.

- Citizen Science in Banff National Park – finding the right match - Bill Hunt, Parks Canada
- Designing a Citizen Science Program for Monitoring Long Term Ecological Change in BC Parks – Dr. Pamela Wright, University of Northern British Columbia & Dr. Tory Stevens, BC Parks
- The Role of Citizen Science in Developing and Implementing Biodiversity Policy – Chris Manderson & Vanessa Carney, City of Calgary Parks

10:00am Break & Networking

10:30am Data Management and Technology in PPSR

The recent proliferation of PPSR programs can be partially attributed to new and emerging technology making communication, data collection and dissemination of information more fluid and accessible. Data management involves databases and backups but also issues around data quality, policies, sharing, integration, and stewardship. An overview of data management will be provided along with case studies where technology has played a prominent role in the PPSR program.

- The Zooniverse, the challenges of building an online platform for citizen science - Dr. Stuart Lynn, Adler Planetarium, Chicago, IL
- Citizen Science and Technology: a Corporate Application - Ariane Bourassa, Cenovus Energy
- Contributions to ecosystem health assessment in Calgary's urban natural areas through technology-enabled citizen science – Jessica Paquette, Dr. Lynn Moorman, Dr. Dorothy Hill, & Alice Liboiron, Mount Royal University

12pm Closing Address & Looking Forward

- Danah Duke, Miistakis Institute

PRESENTATION ABSTRACTS

Welcome & PPSR Landscape Session

UNDER GLOBAL SKIES: BUILDING A COMMUNITY OF PRACTICE FOR CITIZEN SCIENCE, DR. JENNIFER SHIRK, CORNELL LAB OF ORNITHOLOGY

Citizen science has emerged from different traditions and disciplines. Today, once-isolated projects are beginning to rally around the shared endeavor of public participation in scientific research, and to embrace the multi-disciplinary nature of this social-scientific practice. New organizations such as the Citizen Science Association aim to advance citizen science as a field of practice, and to do so are striving to identify and give voice to the many issues and opportunities facing a diverse community of practitioners. This talk will invite a conversation about how we can all engage to foster innovation and inclusion, uphold high standards for research and education, and explore how collaboration can open new avenues for discovery and action.

CAN SPRING BLOOM TIMES IN ALBERTA SAVE THE GOVERNMENT MILLIONS OF DOLLARS IN FIREFIGHTING COSTS? – DR. ELISABETH BEAUBIEN, UNIVERSITY OF ALBERTA

Spring plant phenology (definition: study of the timing of life cycle events) is one of the most sensitive, immediate, and easily-observed responses to climate variability in temperate and boreal regions. Tracking spring bloom dates is well suited to volunteers. Over the 26 years 1987 to 2013, volunteers for Alberta PlantWatch (<http://plantwatch.naturealberta.ca> and www.plantwatch.ca) reported over 55,000 records. Most of this data was contributed by observers who participated for more than a decade. These data combined with historic phenology records reveal considerable shifts to earlier blooming in response to increasing winter temperatures. A current project will predict the timing and length of the spring wildland fire window in Alberta. With forest green-up, the spring fire danger ends, and we will predict this timing two weeks in advance, using known spring plant timing and forecasted weather data.

WHOSE KNOWLEDGE? WHOSE VALUES? CITIZEN SCIENCE AND DEMOCRATIC ENGAGEMENT – DR. GWENDOLYN BLUE, UNIVERSITY OF CALGARY

Citizen science and public participation in scientific research (PPSR) are increasingly in popularity in North America and abroad. From a democratization perspective, citizen science enables the public to be involved in shaping authoritative knowledge in varying degrees, from contributing data to co-creating knowledge. The overarching goal is to empower people to contribute to the formation of knowledge as well as the articulation of values for decision making in policy, management, and environmental issues. This talk argues that the democratic potential of citizen science and PPSR rest on cultivating modest virtues that underlie the long term success of both science and democracy: an experimental turn of mind, skeptical questioning, respect for diversity, recognition of uncertainty and, above all else, the acceptance that truth is provisional. The democratic potential of citizen science can be compromised by the conventional assumption that science is, or ought to be, value free. This assumption places 'values' in the realm of the public, rather than as an integral component of emerging forms of citizen science.

Program Design Session

DEVELOPING BETTER ANALYTICAL METRICS FOR DATA COLLECTED BY CITIZEN SCIENTISTS – DR. GREG BREED, UNIVERSITY OF ALASKA

Data on species distributions and occurrence are often collected and reported by citizen scientists, but skepticism over the quality of these data persist. I review basic considerations in designing monitoring programs to reduce bias, control effort, and limit mistakes in data collected by citizen science programs. Using an example from my own work as well as two other recent studies, I illustrate quantitative approaches for detecting biologically important trends in population trajectories, occupancy and range by overcoming common problems in citizen science data. I used list-length analysis to analyze 19,779 species lists reported by amateur naturalists from the Massachusetts Butterfly Club between 1992 and 2010 to address a common problem of effort control and estimate population trajectories of New England Butterflies. I also illustrate how to account for non-detection and misclassification when estimating occupancy parameters. Approaches to cope with sampling errors and effort control are not uncommon even with trained biologists, and ageing birders (whether

citizen or professional scientists) can sometimes miss high-frequency songs due to age-related hearing loss. I show that adjusting for observer age can reduce or remove downward bias this can cause. When appropriate statistical advances are developed and implemented for citizen-science data, the enormous potential to detect even small changes in populations becomes possible because of the large quantity of citizen collected data already archived. In addition, because citizen science organizations can mobilize groups of observers quickly to collect large amounts of focused data, better statistical methods for these data will also allow quick assessment of new conservation challenges as they arise.

TRAPPER, CONSERVATIONIST, OR BOTH? HOW THE DESIRE FOR A SUSTAINABLE HARVEST CAN MOTIVATE CONTRIBUTIONS TO WOLVERINE RESEARCH AND CONSERVATION EFFORTS - BILL ABERCROMBIE, ALBERTA TRAPPERS ASSOCIATION, AND DR. DOUG MANZER, ALBERTA CONSERVATION ASSOCIATION¹

In 2011, the Alberta Trappers' Association approached the Alberta Conservation Association with the idea of developing a citizen science project that would (1) engage trappers in collecting information on a "data-deficient" wolverine (*Gulo gulo*) population in one of Canada's western provinces, (2) make a legitimate contribution to the scientific understanding of the species and (3) produce sound management actions that would ensure a sustainable harvest long into the future. We present the results of our analyses of provincial harvest records for wolverine and traditional ecological knowledge from over 100 participating trappers. We also discuss trapper motivation behind volunteering time and equipment to maintain camera stations across large geographic areas when they are not actively trapping. We compare and contrast this project with other citizen science initiatives in North America and Scandinavia.

CAN CITIZENS COUNTING COLLISIONS LEAD TO SAFE WILDLIFE PASSAGE? - TRACY LEE, MIISTAKIS INSTITUTE, MOUNT ROYAL UNIVERSITY²

To better understand and address safe passage for wildlife along a busy transportation corridor that bisects the Canadian Rocky Mountains and fragments wildlife populations, the Miistakis Institute has used a citizen science approach. Through the development of two projects, Road Watch in the Pass and Collision Count the institute has informed highway mitigation and developed a community of concerned citizens. Road Watch in the Pass is a long standing citizen science program, with over 5,000 citizen observations that have helped to inform the location of wildlife vehicle collision hotspots. Collision Count is a new citizen science project where volunteers report road kill observations using a smart phone app at identified transportation mitigation sites. In association with other partners citizen scientists have helped transportation planners better understand why, where and how to ensure safe passage for wildlife.

Evaluating PPSR Session

EVALUATING THE CONSERVATION POTENTIAL OF CITIZEN SCIENCE: EMERGING PRINCIPLES AND PRACTICES FOR THE 21ST CENTURY - TINA PHILLIPS, CORNELL LAB OR ORNITHOLOGY

Citizen science, or public participation in scientific research (PPSR), is increasingly being used as a collaborative method between scientists and the public to advance our understanding of natural systems and to influence conservation outcomes. Citizen science exists in many forms, from local, community-driven efforts, to large-scale, institutional projects that span the globe. Few projects, however have evaluated outcomes beyond program output and individual learning. Here I report on emerging efforts, exemplar cases, and promising practices for evaluating conservation outcomes across citizen science, which in addition to site and species management, can include education, research, policy, and community outcomes.

¹ Complete list of authors: Bill Abercrombie (ATA), Neil Kimmy (ATA), Brian Bildson (ATA), Shevenell Webb (ACA), Robert B. Anderson (ACA), and Doug Manzer (ACA)

² Complete list of authors: Tracy Lee, Danah Duke & Ken Sanderson, Miistakis Institute, Mount Royal University

PPSR & Watershed Stewardship Session

ENGAGING COMMUNITIES IN AQUATIC MONITORING AND DISCUSSION OF CLIMATE CHANGE EFFECTS - ELAINE CATON³, SOUTHWESTERN CROWN OF THE CONTINENT COLLABORATIVE

Changing climate conditions can have direct and immediate effects on streams. The amount and timing of flows, water temperature, and associated water quality variables can be particularly vulnerable to change in mountain snowmelt streams. Communities in the Southwestern Crown of the Continent depend on such streams and the lakes they feed for natural, recreational, economic, and aesthetic values key to community vitality, sense of place, and way of life. Yet there is limited information available to those communities on the amount and quality of the water and of any trends in water supply. We have developed a network of citizen science stream monitoring sites in and around three of the largest communities in the Southwestern Crown. Our goals are to engage people in assessing natural resources in their communities; collect long term data that can be useful in making decisions about water use, fisheries management, and land use and restoration; and promote awareness of the potential impacts of climate change in the region. Students and teachers work with community members to collect intensive, high quality data on streamflow, temperature, and turbidity in important streams in their area. Associated curriculum helps students understand why and how to collect data and how to analyze them to make sense of the information. Community volunteers also collected nutrient and turbidity data on 11 additional streams. We intend to integrate this information into a series of ongoing community discussions on climate change.

LINKING CITIZEN SCIENCE TO ACTION: CASE STUDIES IN THE COLUMBIA AND ATHABASCA - HEATHER LESCHIED, LIVING LAKES CANADA

Protecting and conserving Canada's lakes, rivers and wetlands is a top priority for water stewardship groups. These groups face many challenges developing and implementing monitoring plans that are appropriate for addressing concerns in their watersheds. With increasing industrialization, urbanization and climate change pressures on our landscapes and infrastructure, impact events such as spills or sedimentation are occurring more frequently. One of the greatest challenges for these community-based water stewardship groups is accessing the skills and knowledge to respond appropriately. Living Lakes Canada supports and trains groups in federally accredited monitoring protocols, developing sampling plans, data interpretation and taking appropriate action. This session will focus on three case studies: the Flathead River; Windermere Creek, a tributary of the Columbia River; and, the Upper Athabasca. These case studies have a variety of applications from supporting parks and protected area efforts, to rapid response for impact events.

SUCCESSES AND CHALLENGES OF A CITIZEN SCIENCE LAKE MONITORING PROGRAM - BRADLEY PETER, ALBERTA LAKE MANAGEMENT SOCIETY (ALMS)

The Alberta Lake Management Society (ALMS) is a non-profit, charitable organization which was founded in 1991. One of ALMS' main programs, the LakeWatch program, is a volunteer-based lake water quality monitoring program which has monitored over 100 unique lakes throughout Alberta. Rather than train citizen scientists to complete the monitoring independently, nearly all LakeWatch data is collected by trained staff working alongside citizen scientists. While this model allows for the collection of highly technical data, it can also act as a limitation in terms of capacity (number of lakes) and reach (geographical range of lakes). Despite this limitation, working with citizen scientists has resulted in better usage of LakeWatch data, as volunteers take ownership of the data and are more likely to use it in the creation of Lake Watershed Management Plans. In addition, one of LakeWatch's greatest assets is its partnership with Environment and Sustainable Resource Development. This partnership allows for LakeWatch data to be uploaded into the provincial government database, making it available for use by government limnologists and researchers. Recently, ALMS has begun using citizen scientists in lake-ice monitoring, zebra and quagga mussel monitoring, and water clarity monitoring programs.

³ Complete list of authors: Elaine Caton, Bruce Rieman, Cory Davis & Gary Burnett, Southwestern Crown of the Continent Collaborative

Policy and Citizen Science Session

CAN WE TRUST THEIR DATA? EVALUATING A CITIZEN SCIENCE PROGRAM TO MONITOR WILDLIFE ALONG A HIGHWAY – DR. MIKE QUINN, INSTITUTE FOR ENVIRONMENTAL SUSTAINABILITY, MOUNT ROYAL UNIVERSITY

One of the most common questions posed by scientists considering the use of citizen scientists is 'can the quality of the data be trusted?'. This presentation reports the results of study to investigate whether the opportunistic observations of live animals by volunteers along a 46-km section of Highway 3 in the Crowsnest Pass area ("RoadWatch in the Pass" data collection program) in Alberta, Canada, had a similar spatial pattern as systematically collected data by the researchers along the same road section. A permutation modeling process that compared the number of observations between the two datasets for each 1-km segment, a randomization method that tested for and compared 'hot spot' observation locations, and a bivariate Ripley's L1.2-function analysis along a continuum of spatial scales all showed spatial agreement between the two data sets. There was spatial agreement at a scale between 1 and 4 km, and three clear hotspots of wildlife observation activity were identified for both processes. The results confirm that the data collected by the volunteers are reliable and robust enough to be used to help identify road sections that may require mitigation measures. In addition, volunteers proved to be able to collect a sufficient number of observations relatively quickly. Within one year, 24 volunteers collected 640 wildlife observations, and using only 150 or more of these observations always resulted in spatial similarity with the systematic observations collected by the researchers. This research clearly demonstrates that high quality data can be collected by adequately trained citizen scientists.

DIGITAL FISHERS: SCIENCE-ORIENTED CROWDSOURCING AND PARTICIPATORY PUBLIC POLICY – DR. ROD DOBELL, UNIVERSITY OF VICTORIA⁴

Digital Fishers offers an example of science-oriented crowdsourcing. In this application, video clips from the ocean floor are distributed on the Internet in order to be viewed and annotated by anonymous voluntary participants to enrich a database accessible to scientists and others around the world. A growing body of evidence supports increasing confidence in the quality of such annotations from the crowd for scientific purposes. But software agents are becoming more effective in pattern recognition and analysis of large bodies of text or images. Citizen science might therefore move toward real-time monitoring of compliance with regulations or covenants directed toward ecological integrity. As well as increasing awareness of pressing issues in ocean governance, engagement in such activities also promotes more effective participation in web-based consultation and policy formation (e.g., British Columbia's Water Act Modernization process leading toward watershed governance, or coastal and marine governance at local scale). This presentation sketches a link from citizen science to the prospects for such web-based inclusive participatory governance.

PENNSYLVANIA STREAM MONITORING: DATA COLLECTION TO POLICY ACTION - JULIE VASTINE, ALLIANCE FOR AQUATIC RESOURCES MONITORING (ALLARM), DICKINSON COLLEGE

Pennsylvania has more stream miles per land area than any other state in the United States. As a result of its water rich landscape, Pennsylvania has a long history of its communities being concerned about the protection and restoration of its water bodies. For three decades, volunteer stream monitoring has been used as a tool to examine the health of waterways faced with a myriad of issues, ranging from coal drainage to agriculture, and now hydraulic fracturing. But what are the results of these efforts? This presentation will chronicle Pennsylvania's water monitoring history and then explore three case studies that demonstrate how volunteer data are used as tools for policy change and action, as well as the steps needed to navigate Pennsylvania's policy and agency structures to ensure that the stories in the volunteer data are heard, respected, and responded to.

⁴Complete list of authors: Rod Dobell, Justin Longo and Jodie Walsh, University of Victoria

Poster Session Abstracts

ALBERTA FUNGAL DATABASE – MARTIN OSIS, ALBERTA MYCOLOGICAL SOCIETY

The Alberta Mycological Society was formed in 1987 by a group of Albertans who are interested in mushrooms and other fungi. Fungi are one of the most critical organisms that clean our land, water and act as symbiotic partners to plants which clean air and sequester carbon. Since fungi are collected for recreational purposes and regularly consumed for food and medicine it is critical that proper identification of fungi by made. Many fungi are often cryptic, having accurate identification are critical. In 2005 the Alberta Mycological Society started a database of all the known fungi in the Province. With some grant assistance from the Alberta Conservation Association the Society developed a database and gathered fungal information from all known herbaria and publications including those of the Society. In 2008 this information was made available on line through the Society website. In 2005 the Society launched its “Great Alberta Mushroom Foray” initiative. This program was developed to gather reliable and new material for the Database and engage the amateur members of the Society in the process. Mycologists were invited from across North America and beyond to verify the collections made by Society members. The collections were documented, photographed and selected collections were sent to herbaria across Canada. In 2013 the Society started gathering DNA samples for sequencing. This was started in response to a proposal by the Mycological Society of America and the North American Mycological Association to create a North American Mycoflora. The North American Mycoflora proposed that DNA sequences should verify all collection.

AN IPAD APPLICATION TO SUPPORT LONG-TERM ECOLOGICAL MONITORING DATA COLLECTION AND STORAGE - DR. TORY STEVENS, BC PARKS

In the spirit of running the Long-term Ecological Monitoring (LTEM) program without additional funding, BC Parks worked with the Camosun College Computer Systems Technology Capstone Project to develop a field monitoring application. This application integrates GPS and camera to cut down on equipment required in the field; uses real time validation to prevent the submission of incomplete or incorrect data; includes auto look-up of both protected area names and plant taxonomy; streamlines data entry; and provides automatic transcription of export data to avoid transcription errors and save huge amounts of office time. The application is available to government employees and (apparently) to citizen scientists who are maintaining LTEM plots. Two of the nine protocols are currently available.

A RAPID FOREST ASSESSMENT METHOD FOR MULTI-PARTY MONITORING - CORY DAVIS, TRAVIS BELOTE, MATT WILLIAMSON, AND ELAINE CATON, SOUTHWESTERN CROWN OF THE CONTINENT COLLABORATIVE

Collaborative natural resource management has emerged as a new form of adaptive co-management of public forest lands. Citizen scientists are being increasingly used for multi-party monitoring efforts on public lands. Some of the challenges to using citizen scientists are capacity for sustained coordination and participation, limits of participants’ expertise, and reliability of data. Given limited financial, time, and personnel resources there exists a tradeoff in any monitoring program between the numbers of variables measured, or detail of measurements, and the number of sites sampled. We developed a Rapid Forest Assessment (RFA) approach for monitoring key characteristics of conifer-dominated forests that reconciles the tradeoffs between extensive and intensive data collection and capitalizes on the growing interest for citizen science-driven monitoring. We chose our variables and methods to maximize field efficiency while maintaining ease of analysis and understanding. We reduced the number of variables that need to be precisely measured by “binning” or categorizing responses into a few classes. Variables measured include trees, fuels, woody debris, understory, horizontal cover, weeds, and soil disturbance. We tested the methods with several school groups and have developed curriculum around several of the variables focused on forest ecology and management. We found the data could be used in forest simulation models to provide comparable outputs to more precisely collected data. Since the RFA plots are less intensive they can be deployed more extensively and with a higher frequency of return visits. The simplicity and efficiency of the RFA make it a useful tool for multi-party, landscape forest monitoring.

CREATING A HABITAPP TO SPATIALLY ENABLE CITIZEN SCIENCE - JESSICA PAQUETTE, DR. LYNN MOORMAN, DR. DOROTHY HILL, ALICE LIBOIRON, MOUNT ROYAL UNIVERSITY

Recent advancements in Geographic Information Systems (GIS) technologies are propelling mobile data collection capabilities. Esri’s Collector application for handheld devices allows for online or offline collection of both spatial and attribute information with customizable data-driven menus to streamline the collection process. Seeing a synergy between the affordances of the technology, and the wishes of the City of Calgary to engage citizens in greater stewardship of urban

natural areas through ecological data collection, a collaborative project between Mount Royal University's Institute for Environmental Sustainability and the City of Calgary was initiated to test the Collector application's suitability in a citizen science context.

Data collection menu design for the HabitAPP was an iterative process that required expertise from specialists in both ecology and GIS, taking into account the potential users' knowledge and what type of collected data would be most useful for the City, as well as the application's affordances and constraints. Results from initial user testing and technology restrictions in levels of data that could be collected, changed the scope of the project from a comprehensive ecological mapping tool to populate City datasets, to a mechanism for citizen engagement, through specifically focused applications. An example is the Disturbance HabitApp, which enables the general public to record the location and type of natural and anthropogenic disturbances they discover in Calgary's natural areas. The application allows for automatic location detection through the user's own device, predetermined drop-down lists for data entry to minimize entry error, choice of imagery or cartographic basemaps, online or offline data collection, and automatic uploading of spatial and attribute data to the City. The collected data can be visualized and analyzed through ArcGIS Online to further citizen engagement.

DEVISE – TINA PHILLIPS, CORNELL LAB OF ORNITHOLOGY

The challenges of measuring learning outcomes from citizen science are numerous. For example, diverse projects occur in a variety of informal settings, evaluation is often too costly or time consuming to take on, and participants are typically self-selected, and often come in with a higher level of science and environmental understanding than the general population. DEVISE (Developing, Validating, and Implementing Situated Evaluations) was conceived to decrease some of these challenges and address the need for improved evaluation quality and capacity across the field of citizen science. Through an examination of existing literature, measurement tools, and the needs of citizen science practitioners, DEVISE has developed a framework for evaluating learning outcomes from citizen science. Additionally, we have developed contextually relevant instruments to measure learning in citizen science and other informal learning environments. DEVISE is currently working with practitioners to disseminate these instruments and build a community of practice for conducting evaluations of citizen science projects.

LEAVE IT TO BEAVERS – RACHELLE HADDOCK (MIISTAKIS INSTITUTE), JEN ROSS (ANN & SANDY CROSS CONSERVATION AREA) AND AMANDA HALLAWELL (COWS AND FISH)

The Ann & Sandy Cross Conservation Area, Cows and Fish, Connect (formerly the Calgary Science School) and the Miistakis Institute came together to create a citizen science program that engages students in collecting data before and after beaver reintroduction to demonstrate the role of beavers in watershed stewardship. The citizen science program was paired with a formal monitoring program carried out by Cows and Fish involving riparian health inventories. It was our goal to use the results of this collaborative research project to create a local example of a watershed stewardship strategy that can be used by landowners, land managers, and policy makers in Alberta and beyond.

MAPPING AND COMMUNICATING LIGHT POLLUTION ISSUES USING CITIZEN SCIENCE PROJECTS, R.G. DECHESNE⁵, ROYAL ASTRONOMICAL SOCIETY OF CANADA, CALGARY CENTRE

The Globe at Night and the Great World Wide Star Count citizen science projects allow people around the world to gauge the brightness of their nighttime skies via simple constellation comparison charts. Since specialized equipment is not necessary to contribute, many casual stargazers and students are encouraged to participate, thereby spreading broad awareness of the night sky and of light pollution issues among participants. But, can these projects and their data be leveraged for specific local goals, including communication with non-participants and government officials? How much local data is needed to make a compelling argument to these audiences? A broader question worth asking, "Is the emphasis of astronomical measures the best way to engage non-astronomers in light pollution abatement?"

⁵ Additional authors include: L. Ward (2Director, Great World Wide Star Count), W. S. Donaldson, E.J. Reddy, R. W. King, & L. Kameda (Royal Astronomical Society of Canada, Calgary Centre)

ROAD WATCH IN THE PASS – LORETTA & ROB SCHAUFLELE, ROAD WATCH IN THE PASS

Road Watch in the Pass is a successful cutting-edge Citizen Science Project, located in the Crowsnest Pass, Alberta. We endeavor to protect the diverse wildlife species in the Southwestern Rocky Mountains, and to reduce the negative impacts of Hwy#3. The highway restricts movement of wildlife, thereby reducing wildlife connectivity. It also increases wildlife mortality from wildlife vehicle collisions. Wildlife Vehicle Collisions pose a major safety issue to both wildlife and humans. Road Watch strives to increase safe passage for wildlife and people. We work towards the implementation of proven/effective highway mitigation strategies, to reduce Wildlife Vehicle Collisions, and restore wildlife connectivity. With ongoing outreach work, we increase the local community's knowledge and engagement in wildlife movement issues. Road Watch in the Pass works with Citizen Scientists, to succeed in its endeavor to have vehicle wildlife mitigation strategies implemented in the Crowsnest Pass area. We use data collected by local community members (Citizen Scientists) and advocate for the construction of wildlife crossing structures at key "Hot Spot" locations located along Highway # 3.

SASKATCHEWAN PLANTWATCH - LACEY WEEKES, NATURE SASKATCHEWAN

PlantWatch is a citizen-based volunteer monitoring program that enables people of all ages and skill levels to participate in climate change research by watching selected plants bloom in the spring and reporting those dates. Since plants flower largely in response to the amount of warmth they are exposed to, earlier flowering occurs after warmer winters and later flowering occurs after colder winters. Simply by watching flowers bloom, participants help contribute to an understanding of how and why our natural environment is changing. Collection of long-term data helps scientists track biological responses of plants to climate change over many years.

SITUATING CITIZEN SCIENCE IN MULTIPLE SOCIAL WORLDS: THE JOURNALIST-RESEARCHER INTERACTION – DR. TODD SUOMELA, UNIVERSITY OF ALBERTA

"Social worlds are collections of actors with shared understandings and shared institutionalized arrangements that convene, communicate, and coordinate behaviors on the basis of some shared interest." (Demerath, 2014) The social world's perspective developed during the 1970s in sociology, growing out of work by Anselm Strauss and other sociologists to enhance symbolic interactionism. Social worlds operate at many levels from the micro to the macro. They help to manage conflict and negotiate agreements around shared interests and organizations. The degree of participation in a social world can range from insiders who are deeply invested in a shared interest to outsiders who are just observers of the interest. At the same time, individuals may participate in multiple social worlds across many temporal and spatial scales.

Citizen science negotiates between the multiple social worlds of scientific researchers, science writers, volunteers, funders, and the public-at-large. One of the key channels of communication between citizen science projects and the public are journalists. Journalists are driven by professional standards to present news in certain typified genres, such as the event announcement, the feature story, or the personal profile. These generic constraints influence and shape the presentation of science to the public. Scientists have their own generic forms, such as the journal article, monograph, or software. Translating between these different generic objects presents a challenge for citizen science projects.

This poster presents some of the multiple positions occupied by scientists, project staff, and journalists as they negotiate the meaning of citizen science and its framing for the public. The results are based on interviews with scientists, project staff, and journalists conducted in early 2014. Citizen science projects must take into account multiple audiences in order to communicate their message.

THE GEOLOGICAL BUMBLE BEE PROJECT: A CITIZEN SCIENCE PROGRAM EXAMINING 70 MILLION YEARS OF CLIMATE CHANGE - NATHAN SCHERGER (MOUNT ROYAL UNIVERSITY), JESSE HAMILTON, CALGARY GRADE 2-4 STUDENTS, AND DR. KATHERINE BOGGS (MOUNT ROYAL UNIVERSITY)

The Geological Bumble bee (GBB) project is a citizen science program coordinated by Mount Royal University faculty and students using Calgary grade 3-9 students to build multi-dimensional longitudinal environmental models of Calgary green spaces. The GBB is designed to actively engage children in "hands-on" science, exploring multiple authentic scientific

questions. Geology permits us to examine the climate back 70 million years, while the present climate change is examined using bumble bees.

During the pilot project over the summer of 2013; ~1/3 of the 120 boxes installed by two schools groups (~100 students) were occupied. Two further schools (~210 students) joined the program in 2013/2014, building and installing a further 280 boxes. Boxes have been installed in a local provincial park, at Camp Gardner, in the Anne and Sandy Cross Conservation Area and in the Spyhill Landfill site, in addition to numerous families' backyards. Roughly 300 rocks have been described. While contributing towards completely describing these glacial tills, these students are learning how to identify rocks and minerals (part of the grade 3 Alberta science curriculums).

Parks and Protected Areas & PPSR Session

CITIZEN SCIENCE IN BANFF NATIONAL PARK – FINDING THE RIGHT MATCH - BILL HUNT, PARKS CANADA

Banff National Park has been developing an active Citizen Science program over the past 5 or more years. I will present an overview many different projects such as: Harlequin Duck monitoring, fisheries restoration, aquatic invertebrate monitoring, invasive vegetation programs, bear/cub index, DNA hair snares, wildlife crossing structure monitoring, avian productivity and survivorship, pika monitoring, wildlife occupancy (remote cameras), winter occupancy (tracks), and estimating wolf density. Many of these projects utilise volunteers in very different ways, so I will discuss the considerations for engaging volunteers in stewardship, research, monitoring, and active management.

DESIGNING A CITIZEN SCIENCE PROGRAM FOR MONITORING LONG TERM ECOLOGICAL CHANGE IN BC PARKS – DR. PAMELA WRIGHT, UNIVERSITY OF NORTHERN BRITISH COLUMBIA & DR. TORY STEVENS, BC PARKS

Global climate changes are impacting the entire landscape and although intended as ecological reservoirs and refugia, parks and protected areas are not immune to these changes. Provincially, BC Parks' staff identify stressors and threats in conservation risk assessments and have identified myriad challenges amplified by climate change. The role of monitoring in protected areas management in general, and with respect to climate change in particular, is identified as central to most assessment and adaptation strategies. This presentation describes our work in the development and implementation of a province-wide long-term ecological change monitoring (LTEM) program that can be conducted using a hybrid scientific/citizen-science model. The intent is to help understand a) the state of ecological integrity of BC Parks on a provincial scale and b) long-term ecological change of which climate change is one of the leading causes.

THE ROLE OF CITIZEN SCIENCE IN DEVELOPING AND IMPLEMENTING BIODIVERSITY POLICY – CHRIS MANDERSON & VANESSA CARNEY, THE CITY OF CALGARY PARKS, URBAN CONSERVATION GROUP

The City of Calgary is developing a policy for the conservation of biodiversity. A key element of this plan is to develop an approach to conservation and urban ecosystem management that extends beyond the borders of natural environment parks into the City itself. In this presentation we will discuss some of the elements of this policy and the key role that open data, Citizen Science and monitoring will take in monitoring ecosystems, informing management decisions and raising awareness of urban environmental issues.

THE ZOONIVERSE, THE CHALLENGES OF BUILDING AN ONLINE PLATFORM FOR CITIZEN SCIENCE - DR. STUART LYNN, ADLER PLANETARIUM, CHICAGO, IL

Over the past 4 years the Zooniverse has grown from Galaxy zoo: a single online citizen science project to classify the morphology of 1 million galaxies, to a collection of over 27 projects spanning subject areas from cancer research to exoplanet discovery. We now enable a global community of over 900,000 citizen scientists to meaningfully contribute to science and make genuine discoveries. In scaling to meet this growth we have faced organizational, technological and scientific challenges and have established a number of best practices for infrastructure, data integrity and community. I will discuss our approach and philosophy to citizen science online and the challenges we face in the future where we have to deal with many more projects and the threat of an even larger data deluge from future telescopes and experiments

CITIZEN SCIENCE AND TECHNOLOGY: A CORPORATE APPLICATION - ARIANE BOURASSA, CENOVUS ENERGY

The presentation will use the development and implementation of the WildWatch program at Cenovus as a case study for the integration of citizen science within a corporation. The presentation will explore the central role technology played in

further developing a participatory science program within an innovation driven corporation. Challenges, successes and learnings from the program will be shared.

CONTRIBUTIONS TO ECOSYSTEM HEALTH ASSESSMENT IN CALGARY'S URBAN NATURAL AREAS THROUGH TECHNOLOGY-ENABLED CITIZEN SCIENCE – JESSICA PAQUETTE, DR. LYNN MOORMAN, DR. DOROTHY HILL, & ALICE LIBOIRON, MOUNT ROYAL UNIVERSITY

Monitoring biodiversity and assessing ecosystem health is essential in the preservation of native ecosystems and the services they provide. The City of Calgary maintains a number of types of recreational spaces for Calgarians to enjoy, including several “natural areas” which help protect and maintain local biodiversity and ecosystem integrity. However, these popular, high-use natural areas are vulnerable to disturbances which can ultimately affect ecosystem function and result in biodiversity loss. The City of Calgary would like to engage the public in data collection through a citizen science approach. Our team at Mount Royal University is customizing Esri’s ArcGIS Collector Application, a spatial collection tool, to collect, manage, and analyze ecological data for Calgary’s natural areas. In collaboration with the City of Calgary, working categories were developed using various inputs, including existing paper-based data collection protocols, specialist knowledge, and technological requirements and constraints. We then examined variability in category choice among a small group of novice (non-expert) observers. Novice observers varied greatly in estimating tree height, distances, percentage of vegetation cover, and species identification, even when provided with few category choices. This suggests that a citizen science approach may not be appropriate for specialized ecological data collection when novice observers are involved. Training or testing observers for specialized data collection may help address these reliability issues. Nonetheless, even novice observers without training can participate in general data collection, such as the documentation of human disturbances in natural areas (e.g., trash) or the uploading of photographs. Citizen science participation in this type of general data collection can be used to engage the general public and foster a sense of stewardship for Calgary’s natural areas

SPEAKER INFORMATION

Welcome & PPSR Landscape Session

UNDER GLOBAL SKIES: BUILDING A COMMUNITY OF PRACTICE FOR CITIZEN SCIENCE – DR. JENNIFER SHIRK, CORNELL LAB OF ORNITHOLOGY

Jennifer Shirk works to advance citizen science as a field of practice through the Cornell Lab of Ornithology's Department of Program Development and Evaluation. Through the website CitizenScience.org, she supports a community of practitioners who lead, manage, implement, and research projects that involve public participation in scientific research. Jennifer has helped coordinate major networking events for the field including the 2012 PPSR Conference in Portland, Oregon and the 2007 Citizen Science Toolkit Conference. She has also contributed to landmark documents including the 2009 inquiry report on informal science education outcomes of Public Participation in Scientific Research (funded by the National Science Foundation's Center for the Advancement of Informal Science Education), and the subsequent 2012 Ecology and Society article, *Public Participation in Scientific Research: a Framework for Deliberate Design*. In collaboration with colleagues from a wide range of institutions, she is helping to lay the groundwork for a new Citizen Science Association (CSA), serving on the CSA's Steering Committee. Jennifer has a B.A. in Conservation Biology from Bard College, an M.S. and Ph.D. in Natural Resources from Cornell University, exploring the scientific and civic engagement work of scientists involved in citizen science.

CAN SPRING BLOOM TIMES IN ALBERTA SAVE THE GOVERNMENT MILLIONS OF DOLLARS IN FIREFIGHTING COSTS? – DR. ELISABETH BEAUBIEN, UNIVERSITY OF ALBERTA

Elisabeth studied biology in Ottawa and then worked as a naturalist and environmental educator for the Gatineau Park and various national parks. She did her M.Sc. and Ph.D. in plant phenology at the University of Alberta. Since 1987 she has coordinated Alberta PlantWatch, encouraging citizens to report on blooming and leafing times for native plants. She acts as science advisor for Canada PlantWatch, which has coordinators in many provinces and territories. She currently works as a Research Associate in the Renewable Resources department of the University of Alberta, in the Wildland Fire Science Group. The project involves modeling spring plant response timing and weather to predict duration of the spring fire danger period in Alberta. For fun she likes to hike, paddle or cross-country ski.

WHOSE KNOWLEDGE? WHOSE VALUES? CITIZEN SCIENCE, SCIENTIFIC CITIZENSHIP AND DEMOCRATIC ENGAGEMENT – DR. GWENDOLYN BLUE, UNIVERSITY OF CALGARY

Gwendolyn Blue is an Assistant Professor in the Department of Geography at the University of Calgary. Formally trained in cultural studies, her research interests center on public engagement with environmental and health issues, particularly as these unfold in unconventional political realms such as lifestyle politics and emergent dialogue-based democratic initiatives. She was the lead researcher on a Social Sciences and Humanities Research Council funded project on Global Public Participation and Climate Change and is currently working with a community – university research alliance called Alberta Climate Dialogues.

Program Design Session

DEVELOPING BETTER ANALYTICAL METRICS FOR DATA COLLECTED BY CITIZEN SCIENTISTS – DR. GREG BREED, UNIVERSITY OF ALASKA

Before receiving any formal training in science, Greg was an engaged naturalist with a particularly keen interest in butterflies. He received B.Sc. degrees from the University of Minnesota in Ecology and Plant Biology, an M.Sc. in Biological Oceanography from Texas A&M working on eutrophication in the Gulf of Mexico and Mississippi River, and a Ph.D. from Dalhousie University studying grey seals on Sable Island. Greg continued working on marine mammals as a postdoc at the University of California Santa Cruz, then moved to Harvard University to begin lines of work on butterflies, including working closely with the Massachusetts Butterfly Club. Most recently he was a Banting Fellow at the University of Alberta and has just joined the faculty of the Institute of Arctic Biology at the University of Alaska.

TRAPPER, CONSERVATIONIST, OR BOTH? HOW THE DESIRE FOR A SUSTAINABLE HARVEST CAN MOTIVATE CONTRIBUTIONS TO WOLVERINE RESEARCH AND CONSERVATION EFFORTS - BILL ABERCROMBIE, ALBERTA TRAPPERS ASSOCIATION, AND DR. DOUG MANZER, ALBERTA CONSERVATION ASSOCIATION

Doug Manzer holds the position of Senior Scientist and Wildlife Program Manager for Alberta Conservation Association where he provides direction for more than a dozen wildlife conservation projects. Part of his role is to ensure these projects are credible and, just as important, that they're relevant for stakeholders in Alberta. He holds a Ph.D. from University of Alberta and a Masters from University of York (UK), but says his real education and wonder for wildlife began much earlier while on numerous expeditions for butterflies – in the backyard. Much later, and as the new Coordinator for a development project in Africa Manzer challenged the top-down approach in play and implemented an interactive planning effort that fully engaged the local community. He is a strong proponent of community driven initiatives as the surest means of creating long-term meaningful change. He's a dedicated life learner and unashamedly seeks out those smarter than himself to learn something new. He has provided training on a diverse range of topics from participatory planning and wildlife population modeling, to planning kid-friendly expeditions and ways to improve farmland for wildlife. He resides with his wife and family in the Crowsnest Pass.

Bill has been a professional hunter, trapper and wilderness guide for 40 years. He is a Director for the Alberta Trappers Association and he is the President and CEO of Bushman Inc.

CAN CITIZENS COUNTING COLLISIONS LEAD TO SAFE WILDLIFE PASSAGE? - TRACY LEE, MIISTAKIS INSTITUTE, MOUNT ROYAL UNIVERSITY

Tracy is a senior project manager at the Miistakis Institute, a research institute affiliated with Mount Royal University. The institute brings people and ideas together to promote healthy communities and landscapes. Tracy acquired her B.Sc. from University of Victoria in biology and environmental design and her M.Sc. from the University of Calgary, Resources and the Environment Program. Tracy's graduate work, in association with the Miistakis Institute, focused on the development and assessment of a citizen science project to monitor wildlife movement across a major highway. Tracy is also a founding member and director of The Ssubi Foundation, a non-profit organization that aims to alleviate poverty through educational initiatives in Uganda, East Africa.

Evaluating PPSR Session

EVALUATING THE CONSERVATION POTENTIAL OF CITIZEN SCIENCE: EMERGING PRINCIPLES AND PRACTICES FOR THE 21ST CENTURY - TINA PHILLIPS, CORNELL LAB OF ORNITHOLOGY

For the past 15 years, Tina Phillips has been a leader in the field of citizen science, where she has been able to combine her passion for science, education, and conservation. Currently the Evaluation Program Manager at the Cornell Lab of Ornithology, Tina has extensive experience in developing, managing, and evaluating citizen science projects and is spearheading an effort to build evaluation capacity for citizen science. She is also leading a large-scale NSF-funded research project to examine the relationship between engagement in citizen science and outcomes related to knowledge, attitudes, skills and behavior. Recently, she has begun examining challenges and opportunities for realizing the conservation and social-ecological implications of citizen science programming. Tina currently holds a Master's in Education from Cornell University and is currently pursuing a Ph.D. at Cornell. When not working, she enjoys bird watching, hiking, gardening, skiing and spending time with her husband and two children.

PPSR & Watershed Stewardship

ENGAGING COMMUNITIES IN AQUATIC MONITORING AND DISCUSSION OF CLIMATE CHANGE EFFECTS - ELAINE CATON SOUTHWESTERN CROWN OF THE CONTINENT COLLABORATIVE

Elaine received a Ph.D. in Ecology from the University of Montana, and studied avian ecology in Glacier National Park, the Florida Everglades, Mexico, and western Montana. Elaine then spent two years as a National Science Foundation Postdoctoral Fellow in Science Education at UM, and developed and led classes for teachers, designed science programs for K-12 schools, and wrote curriculum on a variety of science topics. She currently works as a science education consultant in western Montana. She is especially interested in citizen science, and in working with K-12 educators to develop effective, process-based science instruction.

Linking citizen science to action: Case Studies in the Columbia and Athabasca - Heather Leschied, Living Lakes Canada

Heather is based in the Kootenay Region of British Columbia, and has been involved in stewardship efforts in the Canadian Columbia Basin for nearly 10 years. She works with individuals and groups to increase capacity and knowledge to better protect our watersheds. Under this guidance, her organization's water programs have won awards by foundations and industry, and been recognized by the federal government as a best practices example in community based monitoring. Heather is actively involved in the BC Lake Stewardship Society, East Kootenay Integrated Lake Management Partnership, Columbia Basin Watershed Network, and is a member of the Leadership Team for the Roundtable on the Crown of the Continent. She is a certified Streamkeepers Instructor and field lead for the Canadian Aquatic Biomonitoring Network.

Successes and challenges of a citizen science lake monitoring program - Bradley Peter, Alberta Lake Management Society (ALMS)

Bradley Peter is the current Acting Executive Director of the Alberta Lake Management Society (ALMS). In 2010, Bradley graduated from the University of Alberta with a Bachelor of Science degree in Ecology. Since then, Bradley has coordinated the LakeWatch Program, collaborating with volunteers, researchers, and field technicians to collect data from lakes across the province. Bradley has an interest in the eutrophication of freshwater systems and with ALMS has had the opportunity to work on lake-phosphorus budgets and paleolimnology, all with the assistance of citizen scientists.

Policy & Citizen Science Session

CAN WE TRUST THEIR DATA? EVALUATING A CITIZEN SCIENCE PROGRAM TO MONITOR WILDLIFE ALONG A HIGHWAY – DR. MIKE QUINN, INSTITUTE FOR ENVIRONMENTAL SUSTAINABILITY, MOUNT ROYAL UNIVERSITY

Mike Quinn is the Talisman Energy Chair of Environmental Sustainability and Director of Mount Royal University's Institute for Environmental Sustainability. Mike has had a long-time association with the Miistakis Institute and is currently the Board Chair. His research and teaching interests span a broad range of environmental related topics. Mike has deep roots in citizen science including organizing the world's largest Christmas Bird Count.

DIGITAL FISHERS: SCIENCE-ORIENTED CROWDSOURCING AND PARTICIPATORY PUBLIC POLICY – DR. ROD DOBELL, UNIVERSITY OF VICTORIA

Rod Dobell (BA, MA, UBC; PhD, MIT) is now Emeritus Professor of Public Policy at the University of Victoria School of Public Administration, and Senior Research Associate at the University's Centre for Global Studies and the POLIS Project on Ecological Governance. Following a five-year appointment as Assistant Professor of Economics at Harvard he returned to Canada to become Professor of Political Economy at the University of Toronto. Subsequently he served as Special Advisor to the Deputy Minister of Finance for Long- Range Economic Planning and then as Deputy Secretary to the Treasury Board in the Government of Canada, Director of the General Economics Branch at the Organization for Economic Cooperation and Development, Director of Research for two Parliamentary Task Forces, and as President of the Institute for Research on Public Policy, 1984-1991.

More recently he has served as Principal Investigator in the Clayoquot Alliance for Research, Education and Training (a SSHRC-CURA project), as Co-investigator with the Georgia Basin Futures (MCRI) Project and as a founding member of the national Ocean Management Research Network (OMRN).

As a member of the National Statistics Council (appointed by the Minister of Industry Canada) for fifteen years, he was particularly interested in the long-term success of Statistics Canada in building, in consultation with users, a rich array of middleware transforming dead warehouses of data into decision-relevant information for a wide range of users, and building capacity in civil society to forge solid foundations for evidence-informed participation in deliberations on public policy.

PENNSYLVANIA STREAM MONITORING: DATA COLLECTION TO POLICY ACTION - JULIE VASTINE, ALLIANCE FOR AQUATIC RESOURCES MONITORING (ALLARM), DICKINSON COLLEGE

Julie is the director of the Alliance for Aquatic Resource Monitoring (ALLARM) at Dickinson College in Carlisle, Pennsylvania. A native of the Chesapeake Bay, Julie enjoys working with community organizations to build their capacity to monitor, protect, and restore water quality in Pennsylvania. Julie has worked in the volunteer monitoring field for twelve years and was recently appointed to the National Water Quality Monitoring Council as the co-volunteer monitoring chair.

Parks & Protected Areas & PPSR Session

CITIZEN SCIENCE IN BANFF NATIONAL PARK – FINDING THE RIGHT MATCH - BILL HUNT, PARKS CANADA

In his current role, Bill leads a diverse team of highly skilled and motivated park ecologists who are responsible for inventory, monitoring, research and ecosystem restoration projects focusing on aquatics ecosystems, wildlife, and fire and vegetation management. He also oversees Banff's Visitor Safety program where specialised staff forecast and manage avalanches, deliver educational programs aimed at preventing accidents and conduct search and rescue on glaciers, mountains, forests and rivers. Bill started his career as a young backcountry warden in Jasper National Park and in the past 25 years has worked in various roles and capacities including mountain search and rescue, law enforcement, aquatic and wildlife biology, regional dive officer, media relations, and visitor services. He has had the pleasure of working in Jasper, Banff, Yoho, Kootenay and even filling in for the Chief Park Warden in Haida Gwaii on the northern west coast of Canada. Bill has a B.Sc. in Zoology from the University of Alberta and completed his M.Sc. at Simon Fraser University in Burnaby where he studied the effects of commercial whit-water rafting on the breeding success of Harlequin Ducks in Jasper National Park.

DESIGNING A CITIZEN SCIENCE PROGRAM FOR MONITORING LONG TERM ECOLOGICAL CHANGE IN BC PARKS – DR. PAMELA WRIGHT, UNIVERSITY OF NORTHERN BRITISH COLUMBIA & DR. TORY STEVENS, BC PARKS

Pam is an Associate Professor in the Ecosystem Science and Management Program at UNBC. Her research focuses on conservation-based approaches to protected areas design, planning and management; managing and monitoring the ecological integrity of protected areas; and the social and ecological impacts and benefits of tourism and recreation on wild spaces.

Tory has been working for BC Parks as a protected areas ecologist for 12 years. She focuses on the role of parks in landscape ecology and connectivity. Prior to working for government she was a consultant for the ministries of forest and environment and for the private sector. Her background is in Wildlife Ecology (Ph.D., University of Washington).

THE ROLE OF CITIZEN SCIENCE IN DEVELOPING AND IMPLEMENTING BIODIVERSITY POLICY – CHRIS MANDERSON & VANESSA CARNEY, CITY OF CALGARY PARKS

Chris joined Calgary Parks in 1998 and has worked in Natural Area Management and Planning throughout his 16 years at the City. He is currently leading the Urban Conservation group in Calgary Parks and is responsible for urban ecosystem management, including planning and policy, natural area management and habitat restoration. Chris has a degree in Botany from the University of Alberta. Prior to joining the City of Calgary, Chris worked for over 10 years in environmental consulting as an ecologist, with a particular interest in wetlands, plant community ecology and lichenology.

Vanessa is an entomologist with a Master's degree from University of Lethbridge. Most of her career has focused on applied biological control research with Agriculture Canada and Texas A&M University. Vanessa joined The City of Calgary

in 2009. In her current role with City Parks, Vanessa supports the management of Calgary's Natural Environment Parks and open space planning through landscape analyses. Using GIS and other tools, she and the City's Urban Conservation team are developing an ecological benchmarking system for Calgary's open-space network. Under Calgary's new biodiversity strategy, Vanessa is also exploring ways to expand the City's existing open data framework to more directly involve citizens in data collection, sharing and appreciation of Calgary's ecological capital.

Data Management & Technology in PPSR Session

THE ZOOVERSE, THE CHALLENGES OF BUILDING AN ONLINE PLATFORM FOR CITIZEN SCIENCE - DR. STUART LYNN, ADLER PLANETARIUM, CHICAGO, IL

Stuart initially studied mathematical physics at Edinburgh University before deciding astronomy was prettier and easier to explain in bars and obtained a Ph.D. in astrophysics. He currently works at the Adler Planetarium as the technical lead of the Zooniverse: the largest collection of online citizen science projects. He is passionate about getting everyone involved in doing real science and making real discoveries online.

CITIZEN SCIENCE AND TECHNOLOGY: A CORPORATE APPLICATION - ARIANE BOURASSA, GENOVUS ENERGY

Ariane is originally from Montreal, Quebec, where she initiated her Masters in Environmental Sciences at University of Quebec in Montreal. Throughout her studies, she focused on environmental law and policy development and had a keen interest for environmental management. Ariane moved to Calgary in 2008, where she completed her degree and entered the oil and gas workforce as an environmental management consultant. In her previous experiences, she focused on the development of an environmental management system, audits and environmental protection plans for an upstream oil and gas company. In her current position at Cenovus, she is responsible for the oversight of environmental compliance of oil sands project areas and conventional oil plays. She also leads stand-alone environmental company wide initiatives such as the development of the WildWatch program that aim to improve Cenovus' environmental performance and stewardship.

CONTRIBUTIONS TO ECOSYSTEM HEALTH ASSESSMENT IN CALGARY'S URBAN NATURAL AREAS THROUGH TECHNOLOGY-ENABLED CITIZEN SCIENCE – JESSICA PAQUETTE, DR. LYNN MOORMAN, DR. DOROTHY HILL, & ALICE LIBOIRON, MOUNT ROYAL UNIVERSITY

Lynn is an Assistant Professor at Mount Royal University, in Calgary AB. She teaches in the Department of Earth Sciences and in the Department of General Education providing courses in spatial analysis (Mapping, Remote Sensing, and GIS), and scientific literacy. Her research integrates both disciplines of education and geography, looking at geospatial literacy and the practice of geographic education, both in post-secondary and K-12 (kindergarten to Grade 12) educational environments. Lynn is an active member of Mount Royal's Institute for Environmental Sustainability and is the Post-Secondary representative for CGEd (Canadian Geographic Education), the educational arm of the Royal Canadian Geographical Society.

Jessica is an alumna of Mount Royal University with a Bachelor of Arts (Honours) in Anthropology. Her honours thesis examined the effects of maize beer (chicha) consumption on the sociopolitical sphere in the Peruvian Andes during the Middle Horizon (ca. AD 550-1000). She is currently a Master of Geographic Information Systems student at the University of Calgary, where she is examining the application of Unmanned Aerial Systems for the detection of archaeological sites in Arctic Canada. Her relevant research interests include the utility of remote sensing, GIS, and spatial analyses of archaeological sites and the distribution of artefacts and features such as tools, ceramics, rock art, and production workshops (e.g. Breweries and Kilns).

Alice is a 4th-year undergraduate student at Mount Royal University studying General Science with a focus on Biological Sciences as they pertain to ecosystem function, wildlife ecology and zoology. Although she began her degree with an interest in Veterinary Medicine, involvement in her first major research project has her beginning to explore new opportunities for postgraduate work and education.

Dorothy is an Associate Professor in the Department of Biology at Mount Royal University, in Calgary AB. She has developed and taught courses in ecology, conservation biology, evolution, and scientific literacy. Her doctoral research interests in the behavioural ecology of birds soon expanded to a passion for conservation biology as she witnessed her

once-abundant study species decline to the point of being classified as being threatened by the Committee on the Status of Endangered Wildlife in Canada. Her current academic interests include experiential learning and student engagement through involvement in scientific research.

PARTICIPANT LIST

First name	Last name	Affiliation	Email address
Bill	Abercrombie	Alberta Trappers Association	albertabushman1990@gmail.com
Haley	Anderson	Mount Royal University	hande504@mtroyal.ca
Dave	Baines	Shell	Dave.baines@shell.com
Chantelle	Bambrick	Foothills Landscape Management Forum	cbambrick@foothillsri.ca
Tina	Barzo	Parks Canada Agency	tina.barzo@pc.gc.ca
Elisabeth	Beaubien	University of Alberta	e.beaubien@ualberta.ca
Janis	Belgum		jbelgum@telus.net
Gwendolyn	Blue	University of Calgary	ggblue@ucalgary.ca
Ariane	Bourassa	Cenovus Energy	Ariane.Bourassa@cenovus.com
Greg	Breed	University of Alaska	gabreed@alaska.edu
Vanessa	Carney	City of Calgary	Vanessa.Carney@calgary.ca
Elaine	Caton	Southwestern Crown of the Continent Collaborative	woodpecker@blackfoot.net
Kirk	Davis	Foothills Land Trust	kirk@wildlifeshow.com
Roland	Dechesne	Royal Astronomical Society of Canada	Roland.Dechesne@cnrl.com
Rod	Dobell	University of Victoria	rdobell@uvic.ca
Danah	Duke	Miistakis Institute	danah@rockies.ca
Brian	Eaton	Alberta Innovates - Technology Futures	Brian.Eaton@albertainnovates.ca
Ian	Esplen	Mount Royal University	iespl123@mtroyal.ca
Lorne	Gould	Gould Environmental Ltd.	lornegould@shaw.ca
Laura	Griffin	Ann & Sandy Cross Conservation Area	lgriffin@crossconservation.org
Rachelle	Haddock	Miistakis Institute	rachelle@rockies.ca
Todd	Hebert	Blue Lake Forest Education Society	toddhebert@bluelakecentre.com
Dorothy	Hill	Mount Royal University, Dept. of Biology	dphill@mtroyal.ca
Brenda	Hopkin	Hopkin Forest Mgt Consulting Ltd.	brenda@kootenays.ca
Bill	Hunt	Parks Canada	bill.hunt@pc.gc.ca
Sean	Kinney	Foothills Research Institute (FRI)	skinney@foothillsri.ca
Hannah	Kobluck	Conference Volunteer	hmkobluk@gmail.com
Cal	Kullman	Riverwatch Institute of Alberta	riverwatch@shaw.ca
Justine	Kummer	University of Alberta	kummer@ualberta.ca
Tracy	Lee	Miistakis Institute	tracy@rockies.ca
Heather	Leschied	Wildsight	heather@wildsight.ca
Alice	Liboiron	Mount Royal University	alibo114@mtroyal.ca
Claudia	Lipski	Ellis Bird Farm	clipskic@rttinc.com
Stuart	Lynn	Adler Planetarium	stuart@zooniverse.org
Chris	Manderson	City of Calgary, Parks	Chris.Manderson@calgary.ca
Doug	Manzer	Alberta Conservation Association	doug.mazner@ab-conservation.com

Barbara	McNicol	Mount Royal University	BMcNicol@mtroyal.ca
Maria	Michails		mariamichails@gmail.com
Rene	Michalak	ReThink Red Deer	purephoenix@shaw.ca
Julia	Millen	Alberta Parks	julia.millen@gov.ab.ca
Brandi	Mogge	Alberta Biodiversity Monitoring Institute	bmmogge@gmail.com
Lynn	Moorman	Mount Royal University	lmoorman@mtroyal.ca
Katie	Morrison	Cpaws Southern Alberta	kmorrison@cpaws.org
Martin	Osis	Alberta Mycological Society	martin@cris-se.com
Dianne	Pachal	Parks Canada	dianne.pachal@pc.gc.ca
Jessica	Paquette	Mount Royal University	jessicapaquette83@gmail.com
Dale	Paton	Anatum	ptarmig@telusplanet.net
Myrna	Pearman	Ellis Bird Farm	info@ellisbirdfarm.ca
Vicki	Perkins	Alberta Tourism, Parks & Recreation	vicki.perkins@gov.ab.ca
Bradley	Peter	The Alberta Lake Management Society	bradley.j.peter@gmail.com
Tina	Phillips	Cornell Lab of Ornithology	tina.phillips@cornell.edu
Michael	Quinn	Institute for Environmental Sustainability, MRU	mquinn@mtroyal.ca
Robert	Schaufele	Road Watch in the Pass	rob.roadwatch@telus.net
Loretta	Schaufele	Road Watch in the Pass	lsdmad@telus.net
Nathaniel	Scherger	Mount Royal University	nscherger@gmail.com
Kailey	Setter	Nature Conservancy of Canada	kelsey.setter@natureconservancy.ca
Brian	Sevick	Mount Royal University	bsevick@mtroyal.ca
Jennifer	Shirk	Cornell Lab of Ornithology	jls223@cornell.edu
Connie	Simmons	Oldman Watershed Council	connie@oldmanbasin.org
Tory	Stevens	BC Parks	connie@oldmanbasin.org
Peg	Strankman	Barbwire Consulting	strankmanp@gmail.com
Todd	Suomela	University of Alberta	suomela@ualberta.ca
Jill	Swingler	Inside Education	jswingler@insideeducation.ca
Joey	Temple	Red Deer River Watershed Alliance	outreach@rdrwa.ca
James	van Leeuwen	Ventus	vl@dusk.ca
Julie	Vastine	Alliance for Aquatic Resource Monitoring	vastine@dickinson.edu
Jennifer	Vogel		jvogel@ckipc.ca
Lacey	Weekes	Nature Saskatchewan	lweekes@naturesask.ca
Elyse	Williams	Alberta Biodiversity Monitoring Institute	ecwillia@ualberta.ca
Pamela	Wright	University of Northern BC	Pamela.Wright@unbc.ca
Jessica	Yarnell	Cenovus	Jessica.Yarnell@cenovus.com