

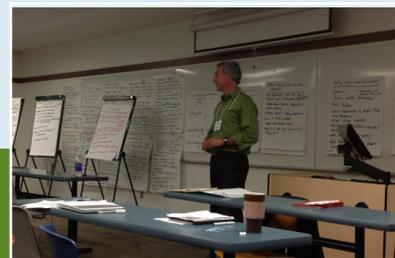
Trail Blazing: Exploring the Future of Public Participation in Scientific Research Workshop Summary

May 2013

Prepared by: Danah Duke, Rachelle Haddock and Tracy Lee



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Trail Blazing:

Exploring the future of public participation in scientific research (PPSR) workshop summary.

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BACKGROUND

Engaging citizens in environmental research has many societal benefits including promoting awareness of local environmental issues, building community capacity to enhance public involvement in stewardship, fostering an environment for a stronger public role in decision making, and the generation of data collected at a lower cost than conventional science. Many of today's environmental problems require the development of new approaches and frameworks where citizens, academics and decision-makers work jointly to understand and address environmental challenges. Recent critiques of the ability of science to provide information in a timely, efficient manner, and of a quality to address increasingly complex environmental issues, emphasize the importance of exploring alternative approaches to knowledge generation and sharing. Making science-based information and processes more accessible and fluid (the democratization of science) requires the development of mechanisms to engage citizens in research to inform environmental problems.

Certain fields, such as astronomy and natural history, have an ongoing history of engaging and being informed by citizen experts. In recent years there has been a renewed interest in citizen engagement and today there is a proliferation of research projects with a component involving citizens aimed at addressing a diversity of environmental challenges such as climate change, road ecology, invasive species, water quality, human use and wildlife monitoring. The proliferation of research involving the public is a result of: 1) new emerging technology making communication, data collection and dissemination of information more fluid and assessable; 2) appreciation of the benefits of engaging the public in science and their potential role as concerned informed citizens for addressing an environmental challenge; and 3) the realization that the public can provide a wealth of expertise, time and, in some cases, financial support.

Given the renewed interest in engaging the public in science, there is a need for encouraging shared learning among practitioners to help shape future citizen science programs. There are many challenges facing practitioners of projects where the public is engaged in science, and it is our belief that an opportunity for practitioners to share learnings is timely.

On May 22, 2013 the Miistakis Institute hosted a one day workshop called "Trail Blazing: Exploring the Future of Public Participation in Scientific Research." The objectives of the workshop were to:

1. Bring together individuals and organizations using citizen science to share, explore, and discuss their respective program goals, data collection methods, challenges and successes;
2. Understand through collective participation key themes/challenges facing citizen science practitioners; and
3. Discuss the need for a Canadian citizen science symposium.

Funding for the workshop was generously provided by the Parks For Tomorrow Legacy Fund and The Calgary Foundation.

Thirty-four citizen science practitioners convened at Mount Royal University in Calgary, AB for the workshop (see *appendix A for list of participants and bios*). The day started with a keynote presentation entitled "The State and Future Prospects for Public Participation in Scientific Research (PPSR)" given by Tina Phillips from Cornell University's Lab of Ornithology (see *appendix B for the presentation*). The remainder of the day focused on facilitated dialogue on the challenges, opportunities and future of citizen science with a view toward organizing a regional or national conference on citizen science. Appendix C contains the Agenda for the May 2013 Calgary PPSR Workshop.

EMERGENT THEMES

To develop a list of current and emergent aspects of practice in citizen science, a facilitated discussion took place involving all workshop practitioners. Participants were asked to think broadly of aspects of citizen science in practice, in order to identify dimensions of present and future PPSR activities that resonate across the variety of PPSR efforts represented by the workshop participants. Challenges and opportunities also were discussed. If practitioners were to address these aspects of practice, PPSR could be advanced.

The list of aspects of practice compiled by participants were categorized into 12 broad themes: Organizational Dimensions, Funding, Coordination within PPSR Community, Data Management, Volunteer (citizen scientist) Engagement, Policy, Transformative Learning, Emerging Technology, Data Quality, Managing Expectations, Evaluation (measuring success) and PPSR Program Design. Each theme and the specific aspects of practice contained within each theme are noted below.

Organizational Dimensions (addressing capacity)

- administration
- capacity
- perceptions of cost
- return on investment
- union issues
- dedicated personnel required
- mentoring

Funding

- program sustainability
- long-term nature of programs (multi-year funding required)
- match with research term
- established areas tend to be well funded vs. new areas of research

Coordination within PPSR Community

- prevent redundancy of tool development
- coordinating organization
- increased public access to citizen science info
- challenges of collaboration

Data Management

- storing
- development of standards
- data sharing
- analyzing
- importance of the mundane (i.e., with regard to species data collection, the importance of recording observations of species that are common)
- data maturity (time required in data collection to produce meaningful results)

Volunteer (Citizen Scientist) Engagement

- retention
- recruitment
- liability
- communication and volunteers
- role of ecotourism/"voluntourism"
- "trained volunteers" vs. citizen scientists
- student involvement
- diversity of participants
- credit program (empowerment, acknowledgement)

Policy

- how information is interpreted and communicated
- credibility of citizen science data in the political realm

Transformative Learning

- making science real
- leadership development
- citizens do better
- politicians do better
- personal & societal

Emerging Technology

- smartphones
- web delivery

Data Quality

- good data vs. volunteer experience
- importance of zero
- long-term data sets

Managing Expectations

- public value conflicts
- data use expectations
- knowing/anticipating public values
- data turnaround
- purpose of data

Evaluation

- measuring program success
- understanding the volunteers' motivations
- conservation outcomes vs. societal, individual, other outcomes
- stakeholder goals

Program Design

- multi-disciplinary design
- social and natural sciences
- goals/objectives vs. activities
- outcomes drive design

Participants were asked to rank their top three choices[need to give the context ... top choices in what respect? Relating to what?], using a dot matrix exercise, to identify the focus for discussion in the afternoon. The top three aspects discussed in breakout group sessions are highlighted in Table 1. Although the other aspects of practice were not discussed at this workshop, they will be used to help inform the agenda of a future citizen science symposium.

Table 1: Ranking of [emergent?] aspects of practice

Aspects of Practice	Votes
Program Design	15
Volunteer (Citizen Scientist) Engagement	12
Transformative Learning	10
Data Management	9
Evaluation (Measuring Success)	9
Data Quality	8
Managing Expectations	7
Organizational Dimensions	7
Coordination within PPSR Community	5
Funding	4
Policy	4
Emerging Technology	3

FOCUSED BREAKOUT GROUP SESSION RESULTS

Each of the top three aspects of practice — PPSR Project Design, Volunteer Management and Transformative Learning became the focus for discussion among three breakout groups. Each participant chose to be involved in the discussions relating to two of the three breakout groups. Workshop participants were asked to address the following topics:

- Why is this aspect of practice important?
 - What makes it critical to understand this in order to move the practice of PPSR forward?
- Develop a list of opportunities
 - What opportunities exist that, if realized, could improve the practice of PPSR?
 - Think about best practices, factors for success
- Develop a list of challenges
 - What are the obstacles (existing or potential) related to this theme that have confounded the practice of PPSR?

Findings from the discussions of the three breakout group are presented below

Program Design

WHY IS THIS ASPECT IMPORTANT?

- is a foundational component (addresses many of the other aspects of practice)
- provides a framework for developing research questions and objectives (roadmap)
- addresses needs of volunteers and requirements of volunteers
- provides credibility across different audiences
- allows you to embed your issue in the bigger picture (stimulates collaboration)
- allows for flexibility, adaptation, considers growth
- can be used as a communication tool
- forces you to address capacity, determine if you can deliver, identify outside experts needed
- addresses power and control

OPPORTUNITIES

- leads to effective evaluation
- improves funding opportunities
- can be used as a communication tool
- can drive innovation, multidisciplinary creative exercise
- can use existing best practices
- attracts more participants, can increase the project scope
- increases credibility

CHALLENGES

- need to consider data analysis up front
- defining clear, measurable, and manageable objectives (can be conflicting)
- resistance to collaboration (ownership, incentives, financial, risk aversion)
- communication between scientists/citizens, working across academic disciplines/sectors
- requires different skill sets
- simplicity is best
- capacity and time required
- what volunteers are getting vs. what you need
- balancing data needs with skills/abilities

Volunteer (Citizen Scientist) Engagement

WHY IS THIS ASPECT IMPORTANT?

- volunteers can contribute to the generation of a large volume of data
- engaging volunteers in science can help to build political will by building individual awareness of an issue
- volunteers play an important role in program sustainability (note: not all projects are long-term; terminal vs. ongoing)

- how we engage the public is an important consideration for project design; there are different levels of engagement depending on the project
- experience should be a positive one for participant to:
 - ensure retention of volunteers
 - ensure regularity of monitoring
 - recruit new volunteers
 - help secure funding
 - realize mentorship development (volunteers training volunteers)
- builds social relationships around a common cause
 - creates an informed public (improving environmental literacy)
 - potential to build communities (empowering people to make change and creates a feedback mechanism to create change)
 - knowledgeable volunteers can play an advocacy role
- volunteer participants can influence science

OPPORTUNITIES

- public getting excited about science
- developing program ambassadors and recruiters (best practices)
- increases our capacity to collect data
- large datasets can often be used to answer/address other research questions
- positive social engagement
- volunteers can become funders
- leads to environmental improvements by:
 - defeating nature deficit disorders
 - increasing support for a common case
 - fosters dialogue (minimises conflict and misconceptions about an issue)
 - fosters emotional affinity to what? valued environmental components?
 - increases acceptability toward policy change
- strengthens relationship between scientists and community (mutually beneficial relationship)
 - working with volunteers can provide new insights into research results
- new skills and new knowledge
- leads to faster turnaround for communicating results (best practices)
- increased accountability and transparency
- provides opportunity for positive media
- enriches visitor experience
- recognition of volunteers as important (best practices)

CHALLENGES

- volunteer burn-out
 - limited volunteer pool (duplication of PPSR efforts)

- volunteers not representative of community (need to engage broader section of community)
- balance between data that can be collected by volunteers and addressing a research question
- volunteer selection may be needed in certain circumstances
- training can be costly and time consuming
- evaluation: measuring satisfaction of volunteers and a volunteer's performance
- matching volunteers' skills to project needs
- on-going support of volunteers
- balance between volunteers driving the project vs. researcher driving the project
- recruitment challenges
 - how to find good people
 - diversity of people
- retention
- reliability of volunteers
- meeting volunteer expectations (potential for conflict)
- logistics
 - police checks
 - health and safety training
 - equipment
- opportunities for advancement
- process for renewal

Transformative Learning

WHY IS THIS ASPECT IMPORTANT?

- there are personal and societal layers to transformative learning - every party is transformed - not just one way or two ways to learn(?)
- similar to adaptive management

OPPORTUNITIES

- taking science to a new level - this [what is this ... PPSR?] is a paradigm shift and it requires new ways of thinking
- critical thinking - learning how to look at the world and challenge one's assumptions
- transformative learning is learning with a purpose; it is collaborative and inclusive and it puts science in the hands of a greater diversity of people - opportunity to "change the world"
- leads to empowerment and it is impactful - learning and life experiences which can lead to new worldviews
- citizen science challenges the status quo - leads us to challenge how the world is presented, the role of technology, how to solve problems and to broaden our repertoire of how we solve problems

- can lead to a revolution of trans-disciplinary knowing/questioning
- can lead to a different kind of literacy - civic science literacy or science as a process that is political, cultural and social
- citizen science is about “being a citizen” - knowing what is your place in this world
- knowledge and action with a purpose
- bringing unity out of diversity and vice versa
- can increase understanding - “can’t care for what you don’t love; can’t love what you don’t know”
- there is momentum around citizen science - not so hard of a sell these days
- the issues are relevant - we can go to??their knowledge with the understanding that there are other ways of knowing that can meet humanity’s needs
- opportunity to engage whole family in citizen science - generations of citizen scientists
- fostering local environmental ambassadors - combatting nature deficit disorder
- it is empowering to learn that your knowledge is valued by experts

CHALLENGES

- apathy
- people feel overwhelmed by challenges
- institutional inertia/prejudice
- lack of leadership and institutional capacity in partnering organizations
- a citizen science approach can be disruptive and disorienting
- the political realm and philanthropic sector is risk averse and citizen science is seen as risky - need for a recognized? paradigm shift
- time required - citizen science/transformational learning can take a long time
- how to provide the outcomes we promise to funders
- talking about citizen science to the general public
- how do we change the way people look at knowledge creation/perception of knowledge
- issues of authority - citizen scientists don’t come to problems with the same definition as academic researchers owing to different worldviews - not possible to bridge this gap as there are no standards of measure. Furthermore, how do we grapple with worldview conflicts and not simply universalize knowledge - this dictates how you start a citizen science program and speaks to issues of justice
- how do you address the question of plurality in data management (i.e., when data is incommensurate as described in the previous point); how to deal with “data” conflicts amongst diverse players?
- how to get science in the hands of a greater diversity of people
- how to address the diversity of learning styles (researchers and citizen scientists)
- how to engage people across a diversity of age cohorts in transformational learning
- evaluation - it takes a long time to measure important changes and that timeline doesn’t align with the timelines for funders; and how do we articulate/measure the change that we are seeking
- “who” causes the change/spark? change does not happen out of a void

BEST PRACTICES

- evaluation/feedback - focus on if it has been transformative for participants - exit interviews
- mentorship - participating in citizen science can cause a shift in someone's career path - experience can cause people to change careers - we have an obligation to mentor the next generation of scientists
- working with a social scientist(s) who has experience understanding how transformative learning works
- cultural shift around crowd sourcing- through web-based interfaces
- flexibility in our approaches - need to use adaptive approaches and convey to volunteers that this is where we learn
- dissemination of evidence - successes, challenges and failures
- engaging print and digital/social media

NEXT STEPS

Workshop participants were asked to discuss the need for a larger national symposium on PPSR in a structured facilitated session. Overall participants expressed an interest in attending a symposium on PPSR, however thoughts differed on the most meaningful size and scope of the symposium. A regional approach was suggested if the desire was to ensure community groups and practitioners could attend. However, discourse at the national scale would also be beneficial for citizen science practitioners to share and exchange knowledge in this newly emerging discipline.

Participants were asked to express what would draw them to a symposium on citizen science. A few key comments included innovative examples of how citizen science is being used (e.g., gaming realm, discovery programs and conservation outcomes), and providing an opportunity for practitioners and program volunteers to present their experiences.

The Trail Blazing steering committee will review the findings from this workshop and discuss how to move forward with a PPSR symposium in Canada. Workshop participants will be provided with updates as we move forward. [Please feel free to contact tracy@rockies.ca if you wish to provide comment on this report or would like to provide ideas to the steering committee.

Lessons Learned

1. The citizen science framework is being used extensively in a broad set of disciplines.
2. Technology has greatly accelerated the opportunities in citizen science (data collection, reporting back to participants)
3. This newly emerging field brings many new opportunities and challenges to scientific research, and practitioners of citizen science will benefit from a continued dialogue.

4. Project design is an important component, connected to desired outcomes (e.g., use logic model)
5. There are many tools available to help us with project design, data collection and measuring success.
6. Evaluating conservation outcomes of programs is challenging and needs to be explored further.
7. There is interest in moving forward with a larger symposium on PPSR.

CONCLUDING REMARKS

Mike Quinn, Director, Institute for Environmental Sustainability, Mount Royal University

I would like to take this opportunity to thank all of you for your participation in this highly positive and engaging event. The vibrant discussion around the room during and between sessions indicates a significant appetite for more collaborative work on public participation in scientific research (PPSR).

One of the things that struck me from the discussions was the tremendous (and growing) diversity of activity that is being conducted under the PPSR banner. I suspect we will see a continued burgeoning of action as the public looks for more ways to participate and agencies develop new strategies for engagement. The role of technology (particularly Web-based tools) has proven to be a significant catalyst for growth and thematic expansion.

In my own experience with PPSR (I still like the term 'citizen science') I have seen an evolution from seeing members of the public as a vehicle to collect more data points to a goal of more engaged citizenry. Ultimately we are talking about a point of engagement that will help us to make a better world. PPSR offers a pathway to increased capacity for everyone involved. Moreover, PPSR initiatives are a valuable way for agencies and organizations to build and strengthen constituencies of interest. Having these constituencies helps to communicate the relevance of our work and can only help to protect and support future projects and programs.

Finally, as an applied researcher, I have witnessed a shift in the potential and expectations around PPSR. Initially, I think we were looking at ways to turn *citizens into scientists*, however, I think there is an equal benefit in helping *scientists to become better citizens*. This is a reciprocal process that leads to the betterment of the nature, science and society. We are really talking about the co-creation of knowledge here. I look forward to working with all of you as we proceed on the next steps of this initiative.

Appendix A: Participant List and Bios

	First name	Last Name	Affiliation	Email
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Tina Barzo, Leader of Volunteer Engagement, Parks Canada Agency, Banff Field Unit

My background is in Marketing and Ecotourism Management, and I have over 15 years work experience in Ontario, British Columbia, and Alberta, for conservation non-profits, private companies and now the government. The majority of my work has been in volunteer program development and management although I have also been involved in outreach, communications, fundraising, and membership and community engagement. I am the 2009 recipient of the Leader in Volunteer Management Award.

My most recent experience with public participation in science and research (what I refer to as citizen science) has been working in Banff National Park, with Parks Canada and third party researchers on a number of projects, where volunteers from all walks of life (a very important point to me) have assisted with the following: Bear DNA research, ShrubWatch (forest & elk monitoring) , CABIN (water monitoring), ToadWatch (amphibian monitoring), Elk Pellet Counts at the Ya Ha Tinda, Pika Research, Wildlife Camera Maintenance, Wildlife Crossing Structure Maintenance, Wildlife Photo Classification, Wildlife Fence Monitoring, Harlequin Duck monitoring, Bird Counts, Invasive Plant monitoring and Winter Wildlife Tracking.

Mark Bennett, Executive Director, Bow River Basin Council

Mark enjoys the privilege of being the Executive Director of the Bow River Basin Council and has held the position for the past 13 years. In this role he is blessed by the opportunity to work with great colleagues, both staff and volunteers. Working with the Council offers both challenges and rewards and is never boring. The Council is a non-profit, multi-stakeholder organization, which deals largely with the development of water management planning and policy advice to decision makers; and also the promotion of water management education and awareness. The Council acknowledges that the water resources represent our lifeline and must be conserved and protected. It seeks to ensure that multiple uses are balanced and the needs of all stakeholders are met. But above all a healthy ecosystem is paramount. The Council's ultimate goal is to participate in or promote activities that will help the Bow River Basin achieve the highest water quality of any highly populated river basin in Canada. The BRBC works with partners to establish the Bow River Basin as the best managed watershed in the world.

Mark has worked as the Deputy Director of the Manitoba Emergency Measures Organization and as the Emergency Program Coordinator for the City of Winnipeg during the historic flood of 1997. Prior to his Emergency Management work Mark worked for 4 years with Manitoba Environment doing various environmental monitoring projects and was a Hazardous Materials Inspector. Through the early years of his career Mark had an assortment of interesting positions that saw him work in every province except New Brunswick. Mark attended Queen's University, where he received an undergraduate degree in biology. He has both a Certificate in Public Sector Management and a Masters in Public Administration from the University of Manitoba. He also held the designation of Certified Emergency Manager from the International Association of Emergency Managers from 1996 to 2007. Mark's recent studies include the pursuit of an Environmental Management Certificate from the University of Calgary and a Non-Profit Management Certificate from Mount Royal University.

Gwendolyn Blue, Assistant Professor, Department of Geography, University of Calgary Gwendolyn Blue is an assistant professor in the Department of Geography at the University of Calgary. Her research interests lie with civic science, public engagement with techno-scientific issues such as climate change as well as post-humanist, material approaches to public engagement. She is currently working on a SSHRC funded research project on citizen participation in environmental governance, with a focus on climate change.

Susan de Caen, VP Operations, Glenbow Ranch Park Foundation

For over 10 years, Sue has been involved in the development, delivery and management of public education programs in Southern Alberta. As VP Operations for the Glenbow Ranch Park Foundation, her office is located at Glenbow Ranch Provincial Park, where the view from her window is unrivaled! Sue is involved in the daily operations and planning of the Park, and has the pleasure of managing the vibrant Park Stewards' Program and overseeing Visitor Services Operations for the Park, including on-park interpretive programs and tours, the management of the hands-on *Discover Archaeology* school program. With a strong belief in hands-on learning, Sue volunteers her time to teach human bone identification skills courses to law enforcement and Search and Rescue groups in both Canada and the United States.

Sue has bachelors' degrees in Zoology and Archaeology and a Master's in Environmental Design (Environmental Science) from the University of Calgary. With a passion for both natural sciences and historical resources, she would like to increase the involvement of park visitors and volunteers in citizen science in both of these areas as a means by which to ultimately protect these resources.

Victoria Campbell-Arvai, Postdoctoral Fellow, Department of Communication and Culture, and Department of Geography, University of Calgary.

Victoria has a Masters in Zoology from the University of British Columbia and a PhD in Environmental Science and Policy from Michigan State University. Her Master's thesis research focussed on documenting changes in nest predation in response to forest fragmentation. Following completion of her Master's degree in 1995, Victoria took a Lab Faculty position in the First Year Biology Program at UBC and, after a move to the United States, continued to teach introductory biology at a community college in Columbus, Ohio. However, in order to better position herself for a career in interdisciplinary research and teaching (with an emphasis on the human dimensions of environmental issues) she returned to graduate school in 2006 to undertake a PhD in Environmental Science and Policy at Michigan State University. She is currently a Postdoctoral Fellow in the Department of Communication and Culture and the Department of Geography at the University of Calgary. Her research interests include Information provision and behavioural interventions to motivate and facilitate pro-environmental behaviour; public perceptions and knowledge about environmental issues – including resource development; and the role of values, attitudes, beliefs and norms in pro-environmental behaviour. She is interested in citizen science initiatives because of the potentially significant role they can play in the formation and development of attitudes, beliefs, and knowledge towards and about environmental issues.

Vanessa Carney, IPM Technician, Parks Natural Areas, City of Calgary

Vanessa Carney is an entomologist with a Master of Science degree from the University of Lethbridge and a background in wildlife biology. Most of her career has focused on scientific research pertaining to weed and insect crop pest management, having primarily worked for Agriculture Canada and Texas A & M University. Vanessa's always had a keen interest in bringing science to the public, as well as developing and delivering scientific programming to non-scientists. Over the years, she has been a volunteer science presenter with various children's events like the Classroom Agriculture Program, Royal Botanical Gardens, Niagara Parks Bug Safari, Ag Field Days and Insect Expo.

Shifting away from a research career, Vanessa spent a year managing the business and outreach activities for the not-for-profit Alberta Invasive Plants Council before joining the City of Calgary's Parks department as an Integrated Pest Management biologist. Vanessa has worked on various public awareness and community-based social marketing projects for the City, including a partnership with local garden centres and greenhouses to end the sale of regulated weeds.

Vanessa's current projects centre on the development of strategies to assess and monitor urban biodiversity and ecosystem health within Calgary parks. Joining other cities around the world in a commitment to preserve urban biodiversity, Calgary has recently joined the Local Action for Biodiversity program. Vanessa is part of a team creating the biodiversity monitoring framework for Calgary's Local Action commitment and is collaborating with the City Parks Education and Environmental Initiative group on a new Citizen Science bird monitoring pilot scheduled to begin later this month.

Don Carruthers Den Hoed, Provincial Inclusion Team Lead/Kananaskis Regional Public Engagement Team Lead, Alberta Tourism, Parks, and Recreation

Don Carruthers Den Hoed is PhD candidate in the Interdisciplinary Graduate Program at the University of Calgary. His studies focus on transformative learning for environmental stewardship, values of parks and protected areas, and therapeutic effects of experiences of nature. Don holds an MA in Educational Research focused on the inclusion of persons with disabilities in parks.

Don is currently on part-time education leave from his employer, Alberta Tourism, Parks and Recreation, under the agreement that his work will lead to recommendations for social research across the province. He has been a public educator with Alberta Parks for over twenty years and leads the information, marketing, interpretation and education, and public participation programs in the Kananaskis Region west of Calgary. He oversees several volunteer programs aimed at citizen engagement, including the Wildlife Ambassador program and Watershed Educator Internships, and has worked with local and provincial cooperating societies to create several collaborative public participation programs.

Don is also implementing the Parks Division's Inclusion Plan to foster greater involvement of diverse and underserved populations in parks as visitors, participants, leaders and partners. This work has led to roles as *Chair of the Canadian Parks Council Youth Engagement Working Group* and a Director of the *Child and Nature Alliance of Canada*. The inclusion plan is underpinned by several social research projects,

notably on fostering community engagement and removing barriers to participation for persons with disabilities, youth, and immigrants.

Dianne Draper, Professor, Department of Geography, University of Calgary

Dianne Draper is a Full Professor in the Department of Geography (and an Adjunct Professor of Planning in the Faculty of Environmental Design) at the University of Calgary, Alberta. She is recognized for her research in sustainable tourism, ecotourism and tourism growth management, as well as planning and policy in water resources management, including coastal zone and fisheries management. She is the founding author of *Our Environment: A Canadian Perspective*. Her current research focuses on governance and quality of life issues in tourism communities as they are working toward sustainability, and on managing tourism growth and its impacts on communities, water resources, and parks and protected areas. Public participation has been a vital component of much of her research.

Dianne is a Member of the College of Fellows of the Royal Canadian Geographical Society; a Fellow of the Society for Applied Anthropology, a Research Fellow with LEaP (Land, Environment and People) Research Centre, Lincoln University, Christchurch, New Zealand; and a Research Fellow, Centre for Military and Strategic Studies, University of Calgary. Past Head of the Geography Department (1999-2007), she has served as Chair of the City of Calgary's Environmental Advisory Committee, as Chair of Calgary's River Valleys Committee, and as a member of the imagine Calgary Steering Committee.

Danah Duke, Executive Director, Miistakis Institute, Mount Royal University

Danah has been the Executive Director of the Miistakis Institute for the past 13 years. As ED of Miistakis, Danah oversees multiple projects ranging from the development of conservation planning tools, road ecology, wildlife corridors and the facilitation of collaborative initiatives. Danah has been involved in several citizen science projects at Miistakis over the past several years and continues to be intrigued by the role that citizen engagement can play in scientific and conservation initiatives. Danah has a B.Sc. in Biology from McMaster University and a M.Sc. in Ecology and Environmental Biology from the University of Alberta. Danah is also a Board member of Alberta Ecotrust. Danah lives in Calgary with her husband and two young daughters.

Isreal S. Dunmade, Associate Professor, Environmental Science, Mount Royal University

Israel S. Dunmade is an Associate Professor in the Environmental Science Department at Mount Royal University, Calgary, Canada. He has B.Eng. degree in Agricultural Engineering, M.Sc. in Mechanical Engineering, and PhD in Environmental Engineering. He is a professional engineer. He is a member of the American Society for Agricultural and Biological Engineers, and Canadian Society for Bioengineering. His research interests and publications are mainly in the areas of Sustainable design, Lifecycle Sustainability Analysis, Green manufacturing, and Renewable resources.

Kevin Gedling, Partnering & Engagement Officer, Jasper National Park

Kevin is new to working in Jasper, but not to the Rockies themselves! Raised in Calgary and Invermere, the Rockies were always the doorstep throughout the growing years. Kevin has been an interpretive tour and hiking guide for various companies in Yellowknife, Banff, Jasper and elsewhere since 2001. He is a

certified heritage interpreter through CTHRC and Professional Interpretive Hiking Guide through the Interpretive Guides Association. Most recently, Kevin is returning to the Rockies after a three year stint as the Product Developer for Fort St James National Historic Site, with successes in renewing the historic site's volunteer programs and in developing successful methods to use public outreach education as promotional marketing- helping to bring a 25% increase in visitation from 2010-2012. Kevin now coordinates volunteer programs and partnerships in Jasper- where a renewal of the National Park's volunteer programs is also underway. Outside of working for Parks Canada, you will find Kevin outside exploring his new park home with his wonderful family. Kevin enjoys hiking, photography, skiing and general exploring. You can reach him at 780-883-0486 or emailing: kevin.gedling@pc.gc.ca

Joyce Gould, PhD, Science Coordinator, Parks Division, Alberta Tourism, Parks and Recreation (TPR)

Joyce currently coordinates science and research within the Parks Division of Alberta TPR (Alberta Parks) and is responsible for the implementation of its *Science Strategy*, a strategic document that speaks to the linkage of science to management. While Parks does not currently have an organized, provincial program for public participation in research, it does recognize the value and need. In her role as Science Coordinator, she works with staff involved in delivery of interpretive and environmental education programming as well as with those coordinating volunteers to assist with the communication of key messages.

Joyce has a PhD in conservation biology from the University of Alberta, and an MSc in Botany from the University of Toronto and BSc (Honours) in Botany from the University of Alberta.

Rachelle Haddock, MEds, Research Associate, Miistakis Institute

Rachelle is a Research Associate with the Miistakis Institute. Her work with citizen science is centered on a multi-year collaborative project called "Leave It To Beavers." Leave It To Beavers involves Calgary Science School students in monitoring changes to the landscape and water quantity/quality following beaver reintroduction at the Ann & Sandy Cross Conservation Area. Project partners include: the Ann & Sandy Cross Conservation Area, Calgary Science School, Cows and Fish and Miistakis.

Dorothy Hill, Assistant Professor, Dept. of Biology, Mount Royal University

Dorothy teaches a variety of courses at MRU including introductory biology, ecology, conservation biology, and general education. She has noticed an increase in student engagement when assignments have "real life" applications or when students have the opportunity to contribute to ongoing research projects. However, undergraduate courses are only 13-14 weeks in length, which makes it difficult to execute a research project from start to finish. Public participation in scientific research (PPSR) projects seems like an ideal vehicle to engage students in the research process. Dorothy's interest in PPSR could be summarized as "Undergraduate Students as Citizen Scientists".

Dorothy's informal introduction to PPSR was during her own undergraduate education when one of her ecology professors at UBC, Charley Krebs, had students collect data to contribute to an ongoing study of

succession at the Hope Slide. Dorothy holds a BSc (Zoology) from UBC, an MSc (Zoology) from University of Manitoba, and a PhD (Ecology) from University of Calgary.

Bill Hunt, Resource Conservation Manager, Banff Field Unit, Parks Canada.

I manage the Resource Conservation program which delivers a wide range of inventory, monitoring, active management and restoration projects in Banff National Park. Many of these projects involve the use of volunteers, in various capacities. Many lessons learned over the years have helped shape our current approaches to Citizen Science in order to make sure that projects are safe, effective and meaningful for parks staff, the Parks Canada Agency and project participants. I have worked with Parks Canada since 1989, and began using Citizen Scientist's for my own MSc research, back when they were just called volunteers. I look forward to learning about other lessons learned and success stories in hopes that I can adopt many other best practices to our operations here in Banff.

Paul Jones, Senior Biologist, Alberta Conservation Association, Lethbridge

Paul Jones is a senior biologist with the Alberta Conservation Association, a not-for-profit, non-government registered charity largely funded by Alberta's hunters and anglers through license levies, and a growing number of corporate partners. He has been with the Alberta Conservation Association since 1998 and is responsible for project planning and delivery of wildlife programs including work with pronghorn, species at risk and native prairie. Paul has a B.Sc. degree from the University of Lethbridge and a M.Sc. degree from the University of Alberta.

Cal Kullman

Cal taught outdoor and environmental education in Calgary junior and senior high schools for a quarter century – a career that made him old but young at heart. Majoring in zoology, Cal worked two summers as a field research assistant in population studies of dippers in Kananaskis Country and blue grouse on Vancouver Island. Cal's efforts to make the outdoors a valued place to learn have been recognized with the Prime Minister's National Award for Teaching Excellence. The creation and development of the non-profit organization "RiverWatch" has been his career-calling and life-work.

Arin MacFarlane Dyer, General Manager, Alberta Lake Management Society

Arin is the General Manager for the Alberta Lake Management Society. The Society's vision is to see Albertans enjoying the benefits of healthy lake and aquatic environments, with an understanding of the responsibilities needed to achieve those benefits. We hope for a future in which Albertans appreciate and work together to ensure sustainable and healthy lake and aquatic ecosystems.

We work to achieve our vision by involving citizens in monitoring of Alberta's surface waters; we currently operate two community-based water quality sampling programs called LakeWatch and Alberta Water Quality Awareness Day (AWQA Day). LakeWatch involves volunteers in collecting class-a water quality data on Alberta's lakes whereas AWQA is focused on increasing awareness and understanding of water resources in general, while also promoting stewardship and personal involvement in the protection of local waterways, using basic water quality test kits. We are actively working to expand our LakeWatch

program to include streams and hope to start collecting meaningful data on nutrient loading using citizen scientists.

Arin complete her undergraduate and Master of Science degrees in Environmental Biology at the University of Alberta. Her research background is in integrated land management and she has a strong interest in cumulative effects management. She is interested in helping to develop and sustain meaningful awareness and planning initiatives to allow Albertans to be better informed about water and land use issues (and to think holistically about solutions) in order to protect our lakes and aquatic ecosystems.

Alessandro Massolo, University of Calgary Veterinary Medicine.

Dr. Massolo is a wildlife biologist with expertise in ecology (including the behavioural ecology of medium- and large-sized mammals), radio-telemetry methodologies, and quantitative analysis. His research has spanned from the fields of animal behaviour, physiology, applied mathematics, information technologies, and allergology. Since joining UCVM, he has founded the Wildlife Ecology and Spatial Epidemiology Lab (WEASEL) and co-founded the interdisciplinary Wildlife Disease Ecology Group (iWEG).

His research program examines A) wildlife ecology and gastrointestinal parasites at the interface with domestic animals and humans, and B) the effect of climate and land use changes on parasite distribution. He is coordinating an interdisciplinary project on coyote ecology and gastrointestinal parasite (*Echinococcus multilocularis*, *Giardia* spp., *Cryptosporidium* spp.) transmission risk at the interface with dogs and people in urban landscapes. He is also modeling the distribution of *Culicoides* spp. in Alberta and of winter tick in the NWT.

He teaches 3 graduate courses (Spatial Ecology and Epidemiology, Advanced Statistics, Research Design) and 1 undergraduate course (VMED451).

Doreen McGillis, External Relations, Waterton Lakes National Park, Parks Canada

Doreen is a long-time employee of Parks Canada, and has been the manager of External Relations for 3.5 years in Waterton Lakes Field Unit (which includes Bar U Ranch National Historic Site). As such, she is responsible for the Volunteer and Citizen Science programs, in addition to those components for a major Action on the Ground Project. Her team also handles media relations, partnering engagement, outreach and education and internet and digital media.

Prior to going to Waterton Lakes National Park, she worked for several years in Mount Revelstoke and Glacier National Parks, as well as other mountain parks in various capacities.

Tracy Lee, Senior Project Manager, 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 BSc from University of Victoria in biology and environmental design and her MSc 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. Recent projects include development of a landowner monitoring program in SW Alberta called Cowboys and Carnivore, developed to document interactions between carnivores, humans and cattle.

Robin E. Owen, Professor, Department of Biology, Mount Royal University

Robin Owen graduated from the University of Toronto in 1977 with a B.Sc. in zoology and then continued at the U of T for his Ph.D. (1982). After a two-year postdoctoral fellowship at LaTrobe University in Melbourne, Australia he moved to Alberta where he held a five-year NSERC (Natural Science & Engineering Research Council) University Research Fellowship at the University of Calgary.

He joined Mount Royal College as a full-time instructor in 1989, and was chair of the Department of Chemical, Biological & Environmental Sciences from 1995-2000. As department chair he became involved in the Environmental Technology Diploma program as Advisor and through teaching the statistics course. He had considerable input on the development of the Applied Degree in Industrial Ecology.

His thesis research was on the evolutionary genetics of bumble bees, and he has 47 refereed publications and four book chapters in this and related areas. Robin has taught and teaches courses in introductory biology, genetics, invertebrate zoology, evolutionary biology and statistics. His research interests are centered on the evolutionary genetics of the Hymenoptera and include: bumble bee genetics, ecology and taxonomy; theoretical population genetics of X-linked and haplodiploid systems; evolution of eusociality; and insect mimicry.

Tina Phillips, Evaluation Program Manager, Cornell Lab of Ornithology, Cornell University

Tina Phillips has extensive experience in developing, managing, and evaluating informal science education projects, with a particular interest in public participation in scientific research (PPSR). She is currently the Evaluation Program Manager at the Cornell Lab of Ornithology where she is leading DEVISE, an NSF funded project committed to building evaluation capacity within the PPSR field.

As part of this effort, she is working collaboratively with evaluators and practitioners to provide guiding frameworks and contextually appropriate instruments for evaluating individual learning outcomes. She has written many articles on evaluation and was one of the authors of a landmark CAISE report: Public Participation in Scientific Research: Defining the Field and Assessing its Potential for Informal Science Education. Other areas of concentration include formative and summative evaluations of machine learning experiences, website usability testing, and emerging research on understanding socio-ecological outcomes of PPSR.

Tina holds a Master's in Education from Cornell University and is currently a PhD candidate at Cornell examining the relationship between citizen scientists participation and outcomes related to knowledge, skills, and behavior.

Nicole Puckett, Graduate Student, Department of Geography, University of Calgary

Nicole Puckett is originally from Vancouver Island, holds an Honours BA in Environmental Management from the University of Toronto, and has spent time volunteering as a citizen scientist in Ontario and Tanzania. Nicole is currently enrolled as a graduate geography student at the University of Calgary under the supervision of Dr. Dianne Draper and Dr. Kathy Rettie. Her research interests center around people's relationships with, and perceptions of, the natural environment.

Nicole's current research explores the experiences of youth under the age of eighteen volunteering as citizen scientists at two Canadian parks. The project investigates pathways youth take to citizen science volunteering, and the motivational factors that sustain their volunteer commitment. Young citizen scientist's affective and cognitive perceptions of parks and the environment, and potential links between citizen science participation and the development of a pro-environmental ethic, are also explored.

Becky Mitchell – Skinner, Acting/Public Outreach Education Officer, Waterton Lakes National Park, Parks Canada

My name is Becky Mitchell – Skinner, and I am the new Acting/Public Outreach Education Officer with Parks Canada in Waterton Lakes National Park(WLNP). I am excited to now be a part of the WLNP External Relations team delivering Educational Outreach Programs and coordinating the Volunteer Program for Citizen Science. Prior to that, I worked in Waterton's Resource Conservation office as the Administrative Assistant for 5 years.

My professional background includes a Bachelor's degree in Education from the University of Calgary, followed by 15 years as a teacher working with children and their families. In 2003, my husband and I moved back to my home stomping grounds in the ranching community just outside of Waterton. I served as the Manager of the Waterton Natural History Association for two years before joining Parks Canada.

Kathy Rettie, Adjunct Associate Professor, Department of Geography, University of Calgary.

Kathy is a social anthropologist and Adjunct Associate Professor in Geography at the University of Calgary. Her research focusses on parks and protected areas; human interaction and use of the landscape, connection to place and the social relevance of nature. Kathy has over 30 years' experience with Parks Canada; from 2005 – 2012 she conducted numerous visitor and resource based research projects including an extensive trail use monitoring program for the mountain national parks. She works with Canadian and overseas universities, providing field assistance and supervision to post graduate and under graduate research students. She has a PhD from the University of St. Andrews and an MA from Resources and the Environment at the University of Calgary. Kathy is a Fellow of the Royal Geographic Society and a Fellow of the Royal Anthropological Institute.

Mike Quinn, Director of the Institute for Environmental Sustainability, Mount Royal University

Mike Quinn is the inaugural Talisman Energy Chair for Environmental Sustainability and the Director of the Institute for Environmental Sustainability at Mount Royal University. The mission of the Institute is to improve environmental health and sustainability through scholarship that integrates diverse academic disciplines, student learning and community engagement. Mike works in the interdisciplinary interface

between the social and natural sciences. His work focuses on approaches to complex problems with the ultimate goal of sustaining social-ecological systems. Most recently he finds himself drawn to the thought and literature emerging under the banner of 'resilience' analysis. This is an exciting field of inquiry and practice that addresses the complex and dynamic features of our shared world. He applies this thinking to problems associated with environmental sustainability, protected areas, road ecology, regional ecohydrology, human-wildlife conflict and transboundary ecosystem management. Mike is a full professor and holds a PhD from York University in Environmental Studies.

Shevenell Webb, Wildlife Biologist, Alberta Conservation Association

Shevenell Webb is a Wildlife Biologist at the Alberta Conservation Association (ACA) in Sherwood Park, where she is responsible for assisting with wildlife program delivery and the planning and execution of applied ecological studies such as ungulate habitat selection modeling, habitat restoration, and population inventory surveys. Shevenell's background is diverse and includes the capture and handling of mammals, conducting ground and aerial wildlife inventories, coordinating education and outreach opportunities, and interacting with stakeholders.

Currently, Shevenell plays an important role in coordinating a new research initiative to inventory wolverines in Alberta. This project is unique because of its grassroots approach led by trappers, whereby traditional knowledge and volunteers are incorporated into scientific research. Shevenell works closely with trappers and other researchers to use multiple approaches to document wolverine occurrence including questionnaires, historical harvest trends and fieldwork. She aims to develop scientific protocols that can be implemented easily by trappers in remote corners of the province. Much of her time is spent working closely with trappers in order to gain a unique perspective that often times gets overlooked by scientists, thus setting up the building blocks of trust required to ensure this research is a success.

Shevenell obtained her BSc degree in Wildlife Ecology from the University of Maine. She earned her MSc degree in Environmental Biology and Ecology from the University of Alberta, studying fur harvests and trapper attitudes in west-central Alberta. In her free time, she stays busy in the garden or in pursuit of fresh air in the mountains and foothills with her biologist husband, chatty toddler and giant Chesapeake Bay Retriever.

Appendix B: Tina Philips Keynote Presentation: “The Current State and Future Prospects for Public Participation in Scientific Research (PPSR)”

Please use the following URL to download Tina’s presentation:

https://www.dropbox.com/s/uwc6xd2ger0uar5/Tina_Phillips_keynote_FINAL.pdf

Appendix C: Workshop Agenda

**Trail Blazing: Exploring the future of Public Participation in Scientific Research
May 22 2013, Mount Royal University (MRU), Room E161**

Introduction and Context Setting

8:30 Welcome and workshop objectives -*Danah Duke, Miistakis Institute*

8:35-8:45 Agenda overview. *Facilitator - Guy Greenaway, Miistakis Institute*

8:45-9:15 Introduction of participants

9:15-10:00 What is PPSR? *Presenter-Tina Phillips, Cornell University*

10:00- 10:20 Break

Identifying PPRS themes

10:20-11:35 Facilitated group discussion to develop a list of PPSR themes -*Facilitator - Guy Greenaway*

11:35-11:45 Break

11:45-12:00 Ranking PPSR themes for discussion (dot matrix- top 3 for further discussion)

12:00- 1:00 Lunch

1:00-1:30 Poster Session

Exploring PPSR themes

1:30-1:40 Instructions on break-out session. *Facilitator - Guy Greenaway*

1:40-2:10 Break-out session 1 (3 groups). *Facilitators – Tracy, Rachele and Danah, Miistakis Institute*

- Why is this theme important?
- Develop a list of challenges
- Develop a list of Best Practices/ Factors for Success

2:10-2:35 Break-out session 2

2:35-2:50 Break-out session 3

2:50-3:00 Break

3:00-3:30 Report out from facilitators on each theme *Facilitators – Tracy, Rachele and Danah*

PPSR Conference in Canada

- 3:30-4:00 Facilitated discussion on need for larger conference on PPSR in Canada. *Facilitator - Guy Greenaway*
- 4:00- 4:20 Closing summary. *Tina Phillips*
- 4:20-4:30 Closing remarks. *Mike Quinn, Mount Royal University*