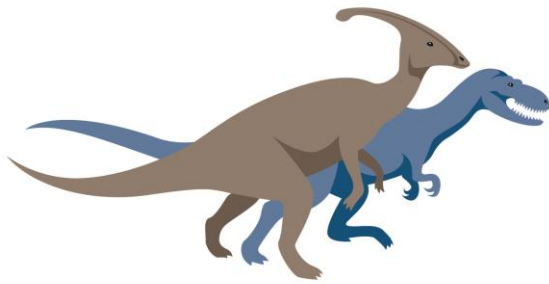


2016 Annual Report



EARTH SCIENCES
museum
UNIVERSITY OF WATERLOO

Highlights of 2016

The Earth Sciences Museum (ESM) underwent a few changes this year with a new Earth Sciences Museum and outreach coordinator replacing Corina McDonald's curator position while she was on maternity leave. The museum continued to support on campus and community events throughout the year with participation in gem and mineral shows, festivals and conventions. Museum exhibits were refurbished and new acquisitions incorporated into the museum collections.

Some of the highlights this year include:

- Development of the `Beyond Walls` 3D Augmented Reality exhibits are ahead of schedule with both the Dinosaur Puzzle and Water Cycle activities completion scheduled for the end of 2016 or early 2017;
- A new display for the Hydrothermal Mineralization exhibit was created and minerals from the exhibit were relocated to the new cabinet and new glass sliders were installed;
- Jeff Sage's 3D exploration model was demonstrated at the London Gem and Mineral Society and he and Alan Xaykongsa presented a very successful and well received workshop at the PDAC Teachers Day in March.

Museum Acquisitions for 2016

- In June the University of Guelph's Axelrod Institute of Ichthyology donated a selection of fossil fish to our museum from the Santana Formation in Brazil. The 24 million dollar collection was donated to the University of Guelph in 1989 by Herbert Axlerod and the University of Guelph, Ichthyology Department, kindly donated specimens to the University of Waterloo so that the fossils could be viewed by the general public, and made available to students taking courses in paleontology.
- The Peter Russell rock garden expanded with the addition of 5 new groups of rocks from Northwest Territories, Newfoundland, New Brunswick, Nova Scotia and Arizona.
- Personal donations of asbestos, gold ore, arrow heads have been incorporated into displays and a donation of historical geophysical equipment from the Cobalt Historical Society is being prepared for display in the Cobalt Mine tunnel.

Education

Historically the majority of ESM public programs have drawn student groups from elementary aged groups. This year there was an increase in high school participation. Several university groups and high school's participated in the

“Groundwater: Explore, Understand, and Protect” workshop. Kitchener Collegiate Institute will be visiting the University in conjunction with their SES 4U: Grade 12 University Prep Earth and Space Science course which will give the students a first year Earth Science credit.

Visitors at the Earth Sciences Museum reached over 100,000 this year. Education programs brought in 6400 students and supervisors from the Kitchener-Waterloo and surrounding regions. This includes students from the public and Catholic elementary and secondary schools as well as community groups such as brownies, beavers, home schools, libraries, special needs groups and birthday groups. The museum participated in 11 separate outreach events this year, reaching 11,276 people. Over 13,962 visitors were tracked visiting the museum through University wide events.

Overall, 2016 was an exciting, and very busy year. It was pleasure being a part of the University of Waterloo Earth Sciences Museum for 2016 and an honour meeting the dedicated staff and volunteers associated with the museum. We are looking forward to another successful year in 2017!

Sincerely,

Laura Scaife
Earth Sciences Museum and Outreach Coordinator
earthmuseum@uwaterloo.ca.ca

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Museum Overview

Vision Statement

Bringing the science of planet Earth into the lives and careers of all by sharing knowledge and raising awareness of the Earth, its history, its resources, and the environmental issues facing society.

Mission Statement

The museum, through its collections, displays and programs, aims to foster a broad and diverse appreciation for all features and processes of planet Earth for all ages both within and outside the university community.

History

The Earth Sciences Museum started as a Centennial Project in 1967 together with what was called the Earth Sciences-Biology Museum. By the mid-1990s, the biology part of the museum ceased its activities, which left only the Earth sciences part of the museum, henceforth being referred to as the Earth Sciences Museum. The Earth Sciences Museum moved from its original location in the Biology 1 Building and was relocated in 2002 to its present position in the new EIT (Centre for Environmental and Informational Technology) Building. The Peter Russell Rock Garden was added in 1982 to commemorate the 25th anniversary of the University of Waterloo and as an outdoor extension to the indoor collections in the Museum. Over the years, the Earth Sciences Museum continued to expand its collections that are primarily on display for educational purposes and for the general public.

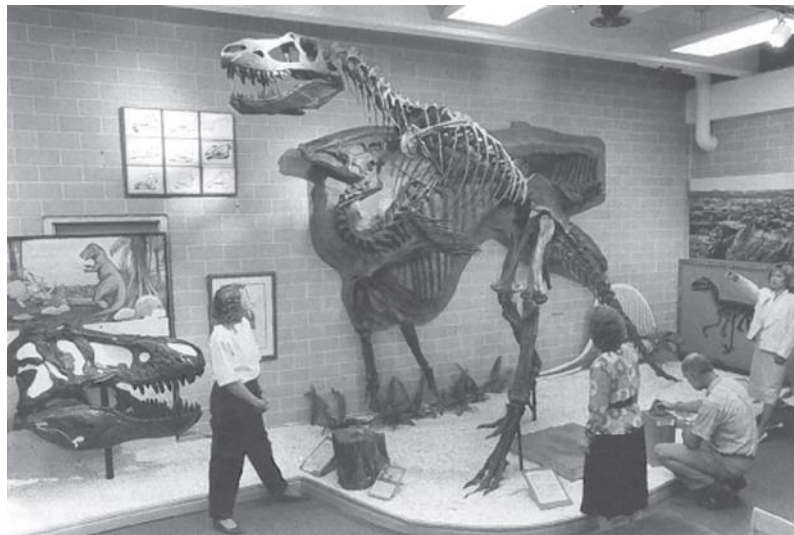


Photo: 1982 Earth Sciences Museum in Biology 1, Room 370

Role in Science

The Earth Sciences Museum is the longest standing science outreach initiative at the University of Waterloo. Over the last 48 years the museum has grown in relevance, educational importance, reputation and most importantly its capacity to engage and educate our local and greater community.

The operation of the Earth Sciences Museum works to achieve many of the current objectives set by the University and the Faculty of Science 5-year Strategic Plan:

- To be recognized as one of the most innovative universities in the world. (UW's primary goal)
- Ensure that students have an engaging, purposeful and relevant experience and serve as a model for the future of higher education. (UW's sixth area of strength)
- Increase visibility for our academic programs in order to attract the highest quality students by increasing involvement of faculty and students in on and off campus academic events and outreach activities, and by strengthening ties to high schools to support undergraduate recruitment (Science Strategic Goal 6: Visibility and Reputation)
- To foster meaningful relationships and a strong track record of engagement with alumni, on-campus partners and external stakeholders. (Science Strategic Goal 7: Community and Engagement and UW's Primary goal)

Authority

The Earth Sciences Museum is a component of the Department of Earth and Environmental Sciences within the Faculty of Science and the University of Waterloo. It operates as a unit reporting directly to the Department of Earth and Environmental Sciences. The Earth Sciences Museum has an advisory board whose primary role is to give advice and assistance to ensure programs and research remain relevant and effective. The Department of Earth and Environmental Sciences employs a curator to manage the operation and day-to-day maintenance of the museum. The Chair of the Department of Earth and Environmental Sciences attends the museum's advisory board. Both the department chair and the museum coordinator are responsible for communications between the museum's advisory board and the Department of Earth and Environmental Sciences. The curator organizes and maintains relations with subcommittees, volunteers and paid staff of the Earth Sciences Museum.

Advisory Body

The Earth Sciences Museum advisory board is composed of persons who are associated with or have expertise in various disciplines of Earth and Environmental sciences or museology. Board members are non-paid and oversee the museum's functions and provide expertise and insight towards the museum's development.

Board Members



William Taylor
Department Chair
Earth &
Environmental
Sciences



Corina McDonald
Curator
Earth Sciences
Museum
Earth &
Environmental
Sciences



Ken Dardano
Entrepreneur –
The Gneiss Guy
Business Owner &
Gem and Mineral
Vendor



Brian Kendall
University of
Waterloo Professor
Earth &
Environmental
Sciences



John Motz
Museum Volunteer
of 10 years
Retired from the
KW Record



Carol Ptacek
University of
Waterloo Professor
Earth &
Environmental
Sciences



Peter Gray
MTE
Consultants Inc.



Peter Russell
Curator Emeritus
Earth Sciences
Museum



Jeff Sage
Retired Earth
Science Teacher
Waterloo
Regional District
School Board



Tiffany Svensson
Senior
Hydrogeologist
BluMetric
Environmental Inc.



Barry Warner
University of
Waterloo
Professor
Earth &
Environmental
Sciences



Kathy Waybrant
University of
Waterloo Alumni
Earth &
Environmental
Sciences



Laura Scaife
*Earth Sciences
Museum and
Outreach
Coordinator*



Peter Morris
Geologist
Consultant

Programs and Tours

The museum offers curriculum based programming to elementary and high school level classes. The same programs are accessible to University visiting groups, community organizations and focus groups.



Programs offered include:

Photo: Children visiting the Cobalt Discovery Mine

Age Group	Tour Program	Description
Kindergarten and up	Dinosaurs and Fossils	Learn about Albertosaurus, Parasaurolophus, Tyrannosaurus and many other Cretaceous dinosaurs. You will see full sized skeletons and be able to touch real dinosaur fossils. (1.5 hours)
Grade 4 and up	Rocks and Minerals	Learn about minerals, rocks, and erosion. Includes touchable specimens and hands on activities. This program includes the exploration of our mine tunnel (where students get to dress up like miners) and your choice of digging for fossil fish or panning for real gold. (2 hours)
Grade 5/6	Natural Disasters	From volcanoes and earthquakes, through tornadoes, hurricanes, massive rainfall and drought. Children's groups can build their own building and we will simulate an earthquake to see how it stands up! (1.5 hours)

Age Group	Program	Brief description
Grade 9/10 SNC1D or SNC2D	The Energy Game	This action packed game teaches students about Canada's energy: type, transportation, and use. (90 minutes)
Grade 9-12 Any SNC/SVN or SES	WATER-loo conservation: Exploring surface and groundwater in the region	Waterloo Region is the largest community in Canada that is reliant on groundwater for drinking water. We show how the water is extracted, purified and distributed. Interactive components include a water-use demo, taste test and groundwater model. (120 minutes)

Age Group	Program	Brief description
Grade 12 SES4U	Groundwater: Explore, Understand, and Protect	A full-day program focused on Groundwater taking place in the field at one of the Waterloo Regional Outdoor Education Centers and in the lab at the University of Waterloo. Students will use seepage meters, conduct a stream study, log a soil core and examine a groundwater model. Document package is included. (Full-day program)
Grade 12 SES4U	Rocks, Minerals and Microscopes	A hands-on, noses-in, wide-eyed survey of minerals and their unique chemical structures and properties. Use your five senses to determine the identity of minerals, view minerals through powerful microscopes, and learn about their unique chemical structures. (90-120 minutes)
Grade 12 SES4U	Geology of Ontario	Touring the replica mine tunnel and the Peter Russell Rock Garden, learn about the Geology of Ontario, the variety of minerals that are found in this province, and the history of mining and how it has shaped the communities in northern Ontario. (60 minutes)

The Earth Science Museum offers extended high school programs to include one or many of the following options: a campus tour, science tour and/or the option of sitting in on a 1st year lecture.

Year in Review

Outreach & Events

Date	Event
February 4 th	Exploration Model Presentation to London Gem and Mineral Club
March 5 st – 9 th	PDAC – Prospectors and Developers Association of Canada – Mining Matters Branch
April 2 th , 3 rd	Brantford Gem and Mineral Show
May 6 th	Janes Walk Kitchener
May 7 nd	KW Gem and Mineral Club Annual Show
May 27 th – 2 th	Waterloo Wellington's Children's Groundwater Festival
May 28 th	ECOFest
July 12 th	Discovery Square Kitchener
July 15 th - 17 th	Sudbury Gem and Mineral Show
September 30 th - 2 nd	Ancaster Gem and Mineral Show
October 28 rd , 29 th	UW Gem and Mineral Show & Science Open House
November 4 th	David Rudkin guest speaker at KW gem club meeting
November 19 th , 20 th	London Gem and Mineral Show

Event Descriptions

Exploration Model Presentation – London Gem and Mineral Society

The London Gem and Mineral Society hold meetings on the first Thursday of each month and arrange speakers to present topics of interest for their members. The Earth Sciences museum was asked to visit and hold a workshop on their Exploration model presentation. This was an excellent opportunity for the museum to test their workshop in preparation for the PDAC.

PDAC - Mining Matters

The Prospectors & Developers Association of Canada (PDAC) represents the interests of the Canadian mineral exploration and development industry. Each year the PDAC conference, held in Toronto, brings in over 25,000 attendees. Mining Matters is a national branch of PDAC that broadens students understanding of Earth science and the vital role rocks, minerals and metals play in everyday life. It also exposes students to career opportunities in the minerals industry.

Museum staff participates with Mining Matters in teaching over 150 Greater Toronto Area elementary children about rocks and minerals at the annual conference in Toronto. This year the museum was also asked to be a key presenter in the annual Teachers Day workshop introducing the museums 3D Model Exploration activities. The museum also has a presence at the Earth &

Environmental Sciences booth and reception where many UW alumni visit and reminisce.

Brantford Gem & Mineral Show

The Brantford Lapidary & Mineral Society Award, which provides 4 hardworking undergraduate students with \$500 in their 2nd year, is made possible through the generosity of The Brantford Lapidary and Mineral Society, a long time partner and friend of the Faculty of Science. Every year the Society holds a gem and mineral show hosting close to 30 vendors and bringing in more than 1,000 people over two days. For the past 44 years the museum has provided outreach in the form of kids' activities and a mineral display case.

Jane's Walk

Jane's Walk is a movement of free, citizen-led walking tours inspired by Jane Jacobs an urbanist and activist who believed in walkable cities. The Museum held two "Rock Around Kitchener" tours presented by Peter Russell for a crowd of 40 people.

KW Gem and Mineral Club Annual Show

The Kitchener-Waterloo Gem & Mineral Club is a local club comprising mineral and fossil enthusiasts in the K-W region. Every year they run a show, which is attended by local gem & mineral vendors as well as museum staff. The museum provided an activity for the day that brought in over 500 people.

Waterloo Wellington's Children's Groundwater Festival (WWCGF)



The Earth Sciences Museum has been in collaboration with the WWCGF since the inception of the festival in 1994. The festival educates grade 2 to 5 students about all aspects of water. The Earth Sciences museum and outreach coordinator sits on the festival committee as well as the programming committee. This year the museum, in collaboration with the department of Earth & Environmental Sciences Ecohydrology Group and Groundwater, Geochemistry and Remediation Group ran 5 activities for over 4,740 children and 1,100 adults over 5 days. 591 volunteers enabled the activities to run all week long. Of those volunteers, 27

where students from the University of Waterloo and Earth Sciences Museum

Photo: Students experimenting with Porosity and Permeability volunteers.

ECOfest

The Region of Waterloo holds a yearly fun and interactive event designed to educate the public and motivate them to reduce their environmental impact.

This year was the 9th ECOfest and the Museum provided the “Frosty Minerals” activity for the day.

Discovery Square

Each Tuesday for the summer months, the city of Kitchener holds children activities in Discovery Square. This past summer the University of Waterloo’s Science Outreach Program provided science activities in which the Museum contributed a night of fossil digging, mineral match up, and gold panning.

Sudbury Gem and Mineral Show

Staff drove up to Sudbury for a 3-day Gem and Mineral show. We demonstrated and displayed the ‘I Dig Fossil Fish’ and ‘Geology Model’ activities and presented a ‘Rainbow Rocks’ display. Sudbury provided a great place to network with potential students and industry from Northern Ontario. Many local geologist where very interested in the Exploration model and provided great feedback and input with the core logging activity.

Ancaster Gem and Mineral Show

The Ancaster gem and mineral show took place during a weekend and a school day where various local elementary schools attended a variety of children’s activities focused on gem and mineral resources. Museum staff and volunteers had visitors participate in gold panning, fossil fish digging, identification of different rocks and minerals with mineral cards and learn about rock drilling, Ontario drill core and view a geology model. Laura Scaife presented 8 talks on the Rocks and Minerals to visiting school classes on the Friday of the show.

University of Waterloo Gem and Mineral Show and Science Open House

The annual gem show and science open house was held on Oct 28th and 29th this year. Approximately 2,000 families attended. The gem show is coordinated by the museum and the science open house is a collaboration between Faculty of Science outreach staff and other science departments. Nine vendors attended the gem show selling rocks, minerals, jewelry and gifts to visitors on both the 28th and the 29th. The museum organized Earth Science related activities in the Environmental and Information Technology build for the Science Open House on the 29th. The museum had a great team of 38 volunteers running activities for the science open house including “Gold Panning”, “Rock Critters”, “Great Lakes”, “Mineral Cards”, “Earthquake”, “I Dig Fossil Fish”, “Frosty Minerals”, “Geology Model”, and “Mineral ID”. Volunteers also assisted with the KW rock and mineral table, All the Water in the World, Mining Matters and the Information booth. Many of the vendors were very pleased with the number of visitors they had during the show.

London Gem and Mineral Show

The London gem show is hosted at the Western Fair grounds each year. Museum staff and volunteers demonstrated and displayed the “I Dig Fossil Fish”, “Gold Panning” and Exploration model activities to visitors. There were approximately

500 visitors to our activity booth. Jeff Sage presented a talk on Exploration and drilling to the public on the Saturday afternoon.

Exhibits and Projects

Start Date	Proposed Completion Date	Completion Date	Project
May 2012	Apr. 2013	May 2013	Interactive Groundwater Driven Mineralization Exhibit
Nov. 2012	Apr. 30 th , 2013	May 2013	Mistaken Point Cast Exhibit
Nov. 2012	May 2014	Oct. 2014	GGR Outreach Project
June 2013	Jan. 2014	Apr. 2014	Copper Display Project
Jan. 2013	Mar. 2014	Sept. 2014	Augmented Reality Mastodon Exhibit
Mar. 2013	Postponed	TBD	Gold Scale Project
Mar. 2013	Feb. 2015	Nov. 2015	Petrified Wood Exhibit
Aug. 2013	Aug. 2015	TBD	Interactive Mine Tunnel Exhibit
Dec. 2013	TBD	TBD	Earth Sciences Museum Exhibit Signs
Dec. 2014	Feb. 2015	Feb. 2015	We Use That Much – Display Revision
Dec. 2014	Feb. 2015	Sept. 2015	Great Lakes Travel Display
May 2014	May 2016	TBD	Laboratory of Life Exhibit
Jan. 2015	Apr. 2017	Oct. 2017	Beyond Walls: 3D Puzzle Exhibit
Jan. 2015	May 2015	July 2015	Jade Display Update
May 2015	Oct. 2015	Dec. 2015	Refurbished display cases
Mar. 2015	Oct. 2015	July 2016	New Velociraptor
June 2016	Dec. 2016	Sept. 2016	Rapid Fossilization – Santana Fossil Fish Display
June 2015	Jan. 2016	Sept. 2016	Eocene Display
Dec. 2015	Apr. 2017	TBD	GGR Outreach Project – Part 2

Complete Exhibits and Projects

Exhibit Descriptions: Completed in 2016

New Velociraptor – The Quick Feathered Hunter

The life size velociraptor model currently displayed in the Earth Science Museum’s Conestoga Rover’s Learning Centre required updating and does not reflect the new scientific information available and requires updating. Mark Rehkopf who designed many paleo- casts and paintings for the museum over the years created a new updated velociraptor to replace the original. The new sculpture is an actual size paleo cast sculpture of the new envisioned velociraptor with feathers.

Eocene Display

Barry Warner started a course in the Earth & Environmental Sciences Department called Evolution 2: Fossil Record. To support this course he developed a new display in the Museum called ‘Eocene Great Lakes and Wetlands’. This display features specimens from the Eocene epoch (56 to 33.9 million years ago) in the Cenozoic Era ranging from fossil tree leaves and

needles to fish and stingray. The display was completed and sign erected in September 2016.

Exhibit Descriptions: Started in 2016

Rapid Fossilization -Santana Fossil Fish Display

In June the University of Guelph’s Axelrod Institute of Ichthyology donated a selection of fossil fish to our museum from the Santana Formation in Brazil. The 24 million dollar collection was donated to the University of Guelph in 1989 by Herbert Axlerod who made a fortune from selling “Tropical Fish Hobbyist” magazine. At its time this collection was the largest donation ever of its kind to a Canadian University. This collection was donated by the University of Guelph, Ichthyology Department, to make the fossils available to the general public, and students taking courses in paleontology.

Refurbish Interactive Hydrothermal Display

The Hydrothermal Display was relocated to the cabinet near the Great Lakes display. A shelving unit was created and the minerals were moved into the display in October 2016. New glass was installed to allow easier accessibility to the display. The interactive TV will be relocated on the wall adjacent to the display by January 2017.

Perimeter Institute Mineral Displays

The Perimeter Institute approached the Earth Sciences Museum about loaning mineral samples to have in small exhibits around their building in Waterloo. This project is on-going, but we have already contributed some large mineral samples and are currently working on installing a crystal model/mineral crystal match-up exhibit. This project has a strong focus on interactive displays, and aims to raise community awareness of the Earth Sciences Museum, and the study earth sciences in general.

Acquisitions

Item	Donor
Asbestos Samples	<i>Donated by Bruce Campbell</i>
African gold ore	<i>Donated by Bruce Campbell</i>
Santana Fish Fossils	<i>University of Guelph Axelrod collection</i>
Brantford Arrowheads	<i>Barbara Cook</i>
Oldest Rock on Earth - Gneiss	<i>N.W.T. – Robin Wyllie, Gary Vivian and Mike Power, Aurora Geoscience Ltd.</i>
St. Georges Granite	<i>New Brunswick – Atlantic Geoscience Society, Fundy Contractors Ltd. New Brunswick Department of Natural Resources and Energy</i>
Columnar Basalt	<i>Nova Scotia – Atlantic Geoscience Society, Brian Hebb and Clifford R. Stanley</i>

Student Support

Full-time cooperative students:

Alan Xaykongska – 3rd year Geological Engineering



Alan worked for the museum from the start of January to the end of April. With a passion for learning and teaching science, Alan ran the educational programs offered at the museum. Alan helped design the Exploration 3D model activity and presented the activity at the Prospectors and Developers Convention Teachers day in March. He designed the new Hydrothermal Mineralization display for his co-op project.

Alisia Mar – 3rd year Earth Sciences



In May, Alisia was hired to run all of the school and camp tours throughout the spring and summer months. She participated in the Waterloo Wellington Childrens Groundwater Festival and attended the Sudbury annual Gem & Mineral show to educate the public about Earth sciences. Alisia designed a coffee table for the STC building using rocks and minerals to create a volcanic scenic image.

Stephanie Kobylinski – 3A Earth Sciences – Geology Specialization



In September, Stephanie was hired to run all of the school and camp tours throughout the fall. She attended the annual Ancaster and London Gem & Mineral Show to educate the public about Earth Sciences. Stephanie was an integral part of the University's Gem and Mineral show and Science Open House and helped Peter Russell (curator emeritus) with updating museum exhibits. Stephanie is designing the Perimeter Institute mineral crystal display for her co-op

term project.

Stephanie with her rock and mineral collection

Website

Website data from Jan. 1st, 2016 to Dec. 5th, 2016 is reported below. There is data for the Earth Sciences Museum and Peter Russell Rock Garden websites however not for the Wat on Earth website.

Earth Sciences Museum Website 2016

Total Page Views for 2016: 117,070

Unique Page Views for 2016: 92,087

Earth Sciences Museum Website 2015

Total Page Views for 2015: **93,666**

Unique Page Views for 2015: **43,224**

Note: Unique visitors are people visiting the website for the first time

Visitor Data

The Earth Sciences Museum reached **30,755** this year. Visitors include participants for school programs, outreach programs, on campus events and tours run from the visitor's center. Because of the unique location of the museum in the heart of the University of Waterloo campus many students and visitors explore the museum but are not recorded officially.

Our education programs have brought in **5367** students in Kitchener-Waterloo and surrounding regions this year. This includes students from the public and Catholic elementary and secondary schools as well as community groups such as brownies, beavers, home schools, libraries, special needs groups and birthday groups. *Figure 1* describes where in the region groups are sourced and *Figure 2* defines what age groups attend the programs.

The museum participated in 12 separate outreach events this year, including the University of Waterloo's Gem and Mineral show connecting with approximately **17,735** people. The shows were throughout Ontario including Gem shows in London, Ancaster, Sudbury, Brantford, trade show in Toronto and also a community talk in Tobermory.

School Group Tours – By Group Source

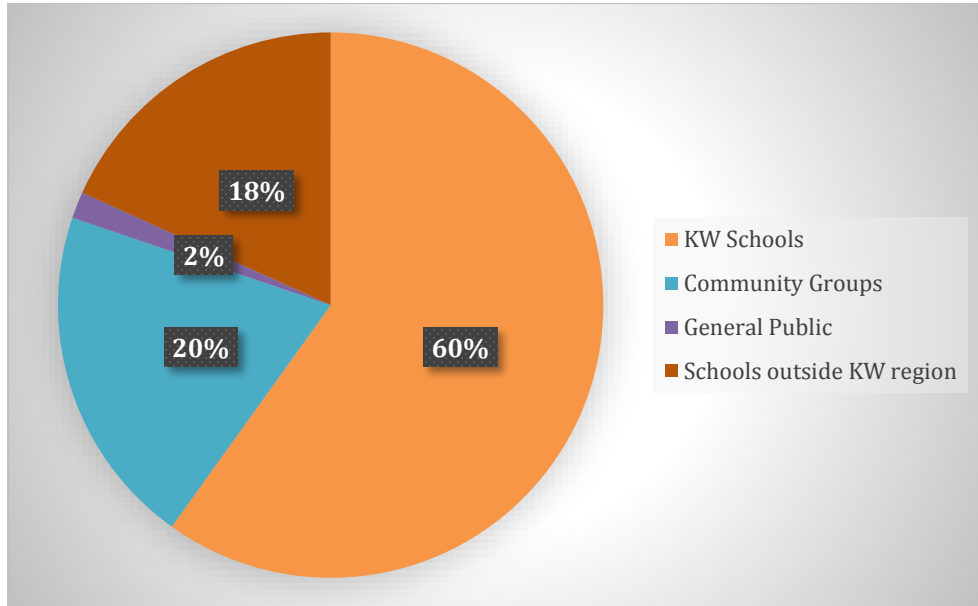


Figure 1 – Group sources in the Waterloo Region

School Group Tours – By Level

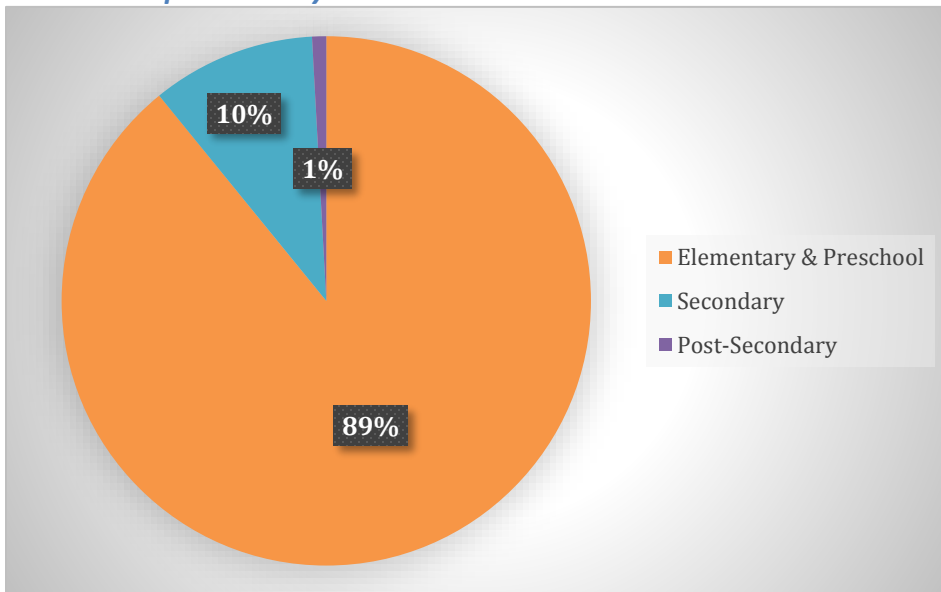


Figure 2 – Total number of students defined by school level

Community Outreach

Supporters



J.P. Bickell Foundation



Cobalt Mining Museum



Program Partners



Region of Waterloo

