CLIMATE CHANGE AT THE ARCTIC'S EDGE MACKENZIE MOUNTAINS TEAM

Assc. Prof. Peter Kershaw
University of Alberta (Canada)

EARTHWATCH INSTITUTE

Expedition Briefing 2012

EVERYTHING YOU NEED TO KNOW BEFORE YOU GO

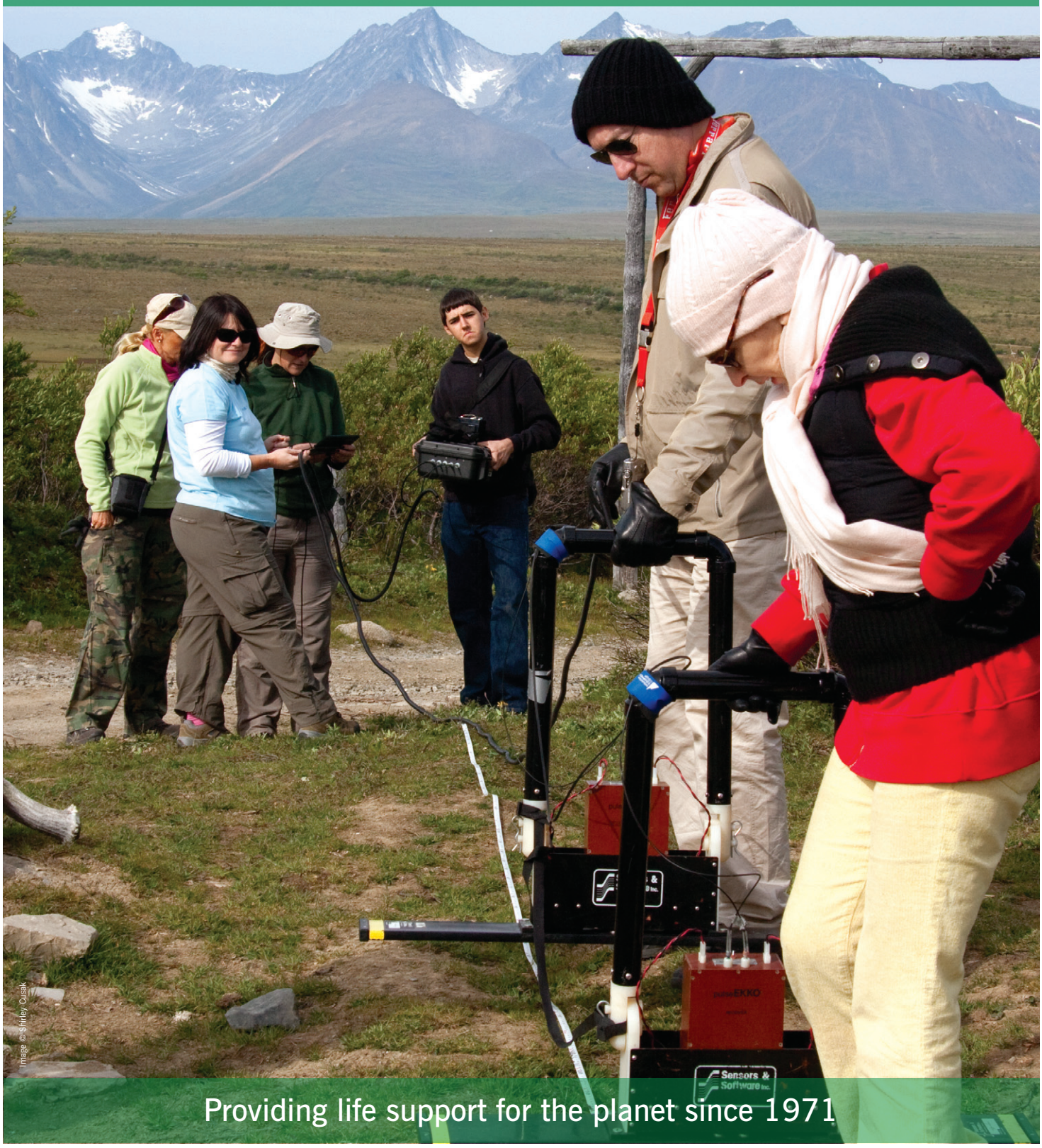


Image © Shirley Cusak

Providing life support for the planet since 1971

Timeline and Checklist

In preparing for your upcoming Earthwatch expedition, please ensure that you:

Immediately

- ☐ Read this Expedition Briefing and all enclosed materials thoroughly.
- ☐ Book an appointment with a doctor; you will need him or her to sign the Health section of your Earthwatch Participation Form.
- ☐ Make sure you understand and agree to Earthwatch policies and participant responsibilities.

At least 90 days prior to your expedition start date

Complete and return your volunteer forms. **Below are the specific forms required for this expedition:**

- ☐ Earthwatch Participation Form for Adults
- ☐ Travel Form

European volunteers can download forms on: earthwatch.org/europe/volunteerforms

US/North American volunteers can download forms at: earthwatch.org/volunteerforms

Australian volunteers can download forms on: earthwatch.org/australia/expeditions/volunteer_forms/

Japanese volunteers can download forms on: earthwatch.jp/getinvolved/condition/formdownload-i.html

- ☐ Pay any outstanding balance on the minimum contribution for your expedition.
- ☐ Book travel arrangements (see the *Rendezvous* section for details).
- ☐ If you plan to purchase additional travel insurance, note that some policies require purchase when your expedition is booked (see the *Insurance* section for more information).
- ☐ If traveling internationally, make sure your passport is current and obtain a visa for your destination country, if necessary (see the *Passports and Visas* section for more details).
- ☐ Make sure you have all the necessary vaccinations for your project site (see the *Health Information* section).
- ☐ Purchase a guide book for your destination country.
- ☐ Bring your level of fitness up to the standards required (see the *Project Conditions* section).

At least 60 days prior to your expedition start date

- ☐ Review the packing list to make sure you have all the clothing and any special equipment needed.
- ☐ Obtain any necessary prescription medications that will be needed for your travels**.**

Up to 30 days before you leave for the expedition

- ☐ Read any required reading or websites recommended by the Earthwatch scientist(s) for your expedition.
- ☐ Make sure you have enough personal funds for your expedition (see the *Travel Planning* section).
- ☐ Leave the Earthwatch emergency contact number with a friend or relative (see the *Emergency Contacts* section).
- ☐ Leave a copy of your passport, visas and airline tickets with a friend or relative.
- ☐ Confirm your travel arrangements.

Note: If you have signed up for an expedition within 90 days of the start date, you must return your fully completed volunteer forms as soon as possible.

Climate Change at the Arctic's Edge

Table of Contents

GENERAL INFORMATION 3

THE RESEARCH 6

PROJECT STAFF 8

DAILY LIFE IN THE FIELD 9

VOLUNTEER TRAINING AND ASSIGNMENTS 9
TEAM ITINERARY AND DAILY SCHEDULE 10
ACCOMMODATIONS 12
FOOD 13

TRAVEL PLANNING 14

RENDEZVOUS 14
PASSPORTS AND VISAS 14
INSURANCE 17
ADDITIONAL TRAVEL INFORMATION 18
RECOMMENDED READING 19
HELPFUL RESOURCES 20

PROJECT CONDITIONS 21

POTENTIAL HAZARDS 22
HEALTH INFORMATION 23
EMERGENCIES IN THE FIELD 24
COMMUNICATIONS 24

APPENDIX 25

EARTHWATCH INSTITUTE POLICIES & PARTICIPANT RIGHTS AND RESPONSIBILITIES 26

EXPEDITION PACKING CHECKLIST 29

General Information

Project title	Climate Change at the Arctic's Edge
Earthwatch scientist	**G. Peter Kershaw, Ph.D.,** Retired, University of Alberta
Expedition Dates	**Team 3:** Aug. 14, 2012 – Aug. 24, 2012
Expedition length:	11 days
Team size max:	11 participants
Minimum age of participation:	18 years*

***Note:** It may be possible for 16- and 17-year-olds to participate on standard teams if accompanied by a parent or guardian. Contact Earthwatch for more information and see *Volunteers Under 18 Years of Age* in the *Passports and Visas* section for traveling advice for minors.

Emergency Contacts

Emergency contact number at Earthwatch headquarters in the US:

+1 (978) 461-0081

+1 (800) 776-0188 Note: The 800-number works as a toll free call *only* for calls placed within the US.

After business hours, leave your message with our live answering service. State that you have an emergency communication and leave a clear message with the name of the field program, your name, location from which you are calling, and if possible, a phone number where you can be reached. An Earthwatch staff person will be contacted and will respond to your call within one hour.

Medical and Security Assistance Helpline Numbers

(For assistance while in the field)

When calling any of the helplines, please mention Earthwatch and policy reference number 560020011200.

CEGA Emergency Medical & Travel Assistance:

+44 (0)20 3059 8770

You may call this number collect or reverse charges if necessary in a medical emergency.

Henderson Risk Security Assistance and Advice:

+44 (0)20 3059 8772

axisenquiries@hendersonrisk.com

Dear Earthwatcher,

Welcome to Earthwatch! We greatly appreciate your decision to contribute to hands-on environmental science and conservation. As an Earthwatch volunteer, you have the opportunity to create positive change. Each year we connect thousands of people just like you with research projects—approximately 65 projects in more than 35 countries—where they can participate in the fieldwork necessary to understand and help an array of species, habitats, and cultures. These projects focus on: **climate change, cultural heritage, ecosystem services, and oceans.**

We are committed to caring for the safety of all those involved in our activities anywhere in the world. Although risk is an inherent part of the environments in which we work, through careful risk management and diligent planning we believe that all participants can have educational and inspirational Earthwatch experiences. We've been providing volunteer field experiences **for 40 years**, so you're in good hands.

It is essential that you carefully read your Expedition Briefing and fully complete the volunteer forms so that you are prepared. Your Expedition Briefing includes important information such as instructions for reaching the rendezvous point, what risks are present on the research project and how to avoid them, what to pack, what immunizations you need, how to physically prepare for your expedition, and more. It also explains the research being conducted on the project, why it's important, and what role you'll play as an Earthwatch volunteer.

Well-prepared volunteers are better able to enjoy the unique and exciting experiences that an Earthwatch expedition offers and will be more helpful to the scientists' important work. Open-mindedness, the ability to work on a team, and a desire to learn are all keys to a successful and enjoyable Earthwatch experience. We hope this expedition will inspire you to get more involved in conservation and sustainable development priorities—not just out in the field but also when you return home. We encourage you to share your experiences with others, and to transfer your skills and enthusiasm to environmental conservation efforts in your workplace, community, and home.

If you have questions as you prepare for your expedition, contact your Earthwatch office. Thank you for your support, and enjoy your expedition!

Sincerely,

Ed Wilson
President and CEO

churchill**northern**studies**centre**

Dear Earthwatch Volunteers,

Welcome to the *Climate Change at the Arctic's Edge* expedition, a multidisciplinary research effort initiated in 1999. Since its inception, Earthwatch teams have helped establish eight Long-Term Environmental Monitoring Sites (LTEMS) and two International Polar Year (IPY) study plots. The results from these initial efforts will be used to meet the long-term objective of quantifying environmental responses associated with climate change in the region. Our efforts are directed at benchmarking current conditions in order to evaluate predicted future changes.

This project is one that requires a high investment of time in the field, something that I relish. The studies are labor intensive, and Earthwatch teams provide the people-power that makes it possible to collect large amounts of data in relatively small windows of time. Team members are provided with the necessary training, and either I or the Earthwatch field team leader will be with them at all times. The outside work can be physically demanding, and volunteers have to be able to deal with the weather that comes with this environment. The mountains are renowned for their changeable weather, but team members rise to the challenge, reach into their daypacks and bring out another layer, gloves, or rain gear as required. Regardless of the conditions, we do our work and put up with the good, the bad, and the ugly weather, knowing that Dechen la' Lodge will offer comfort, food, and shelter at the end of the day.

Between the long days of data collection, we make time for team members to walk near the lodge to check out sunsets, stars, birds, and flowers. Activities during our day off can include hikes up to local scenic areas, across to tundra streams, or along the Canol Heritage Trail. In addition, the team will take time out to catch sunsets, check out unusual birds, caribou, and other wildlife, enjoy the flowers, and generally soak up as much of the local environment as time will permit. I strive for a balance between science and opportunities for team members to immerse themselves in this unique environment.

It has been my pleasure to work with Earthwatch volunteers, and their contributions have significantly and positively affected this research project. I also treasure the interactions, the camaraderie, and the opportunity to learn from the dedicated people who selflessly contribute to this project.

Yours Sincerely,

Pete Kershaw.

G. Peter Kershaw, Associate Professor (Retired)

The Research

Climate Change at the Arctic's Edge

The primary goal of this research is to quantify the impacts of climate change on northern ecosystems. This entails gaining an understanding of the current processes and relationships driving these ecosystems, and the compilation of a detailed data archive as a benchmark for future reference.

There is evidence that climate change is affecting the physical environment in the north. Sea ice extent is shrinking (Serreze, 2009), glaciers are retreating (Klok and Oerlemans, 2004), the winter snowpack is less extensive (ACIA, 2004), the snowpack melts earlier (McBean et al., 2005), and permafrost is degrading (Kershaw, 2003a; Kershaw, 2008). Biological evidence is also mounting. For example, treeline tree growth has been enhanced (Vallée and Payette, 2004), plant community types are shifting (Tømmervik et al., 2004), and northern ecosystem characteristics are changing (Stirling et al., 1999; Harsch et al., 2009). Northern residents rely on these ecosystems, and as a consequence they are being affected (Huntington and Fox, 2005).

Permafrost underlies 24% of Earth's land mass (French, 1996), including 50% of Russia and Canada, 20% of China, and 83% of Alaska. Permafrost is defined as the condition where the ground temperature remains below 0°C for more than a year (van Everdingen, 2005). It is estimated that permafrost encases 50% of the world's terrestrial carbon stores (Tarnocai et al., 2009). Northern circumpolar peatlands, mineral soils, and deltas have 1,672 petagrams (pg) of organic carbon, and 88% of this area is affected by permafrost (Tarnocai et al., 2009). As the permafrost thaws, the organic carbon begins to decompose (IPCC, 2007). By-products of decomposition include carbon dioxide (CO_2) and methane (CH_4), which are important greenhouse gases (ACIA, 2004; IPCC, 2007). Permafrost in the Northern Hemisphere is warming (Kershaw, 2003a; Romanovsky et al., 2003; Kershaw, 2008; Osterkamp, 2008), and permafrost zones are predicted to shift poleward (Woo et al., 1992). This will result in the thawing of vast carbon stores, which will then begin to decompose (Vourlitis et al., 1993; Tarnocai et al., 2003; Tarnocai et al., 2009) and further enhance the atmospheric concentration of greenhouses gases (CO_2 and CH_4) (Hogan and Harriss, 1994; Mosier, 1998; Roulet, 2000; Smith et al., 2004; Smith et al., 2005), amplifying the warming effect in a positive feedback loop.

The project's main research goal has been to establish an environmental monitoring program that can provide baseline data against which anticipated changes in northern ecosystems can be quantified. Accomplishing this goal entails collecting data on key abiotic and biotic ecosystem components during the growing season and the "dormant" winter season. Earthwatch volunteers make it possible to obtain large numbers of samples over a short time period, and are vital to the success of monitoring program.

The Mackenzie Mountains research sites have been under study since the 1970s, with year-round monitoring beginning in 1990. Over the record period it is apparent that interannual variations can be great. Long-term studies of these highly variable systems are the most valid approach, enabling researchers to place short-term ecosystem-modifying events into their proper context. In addition, the concept of "average conditions" has little relevance in a system where it is the stochastic (i.e., random) and unpredictable extreme event that dictates the characteristics of these ecosystems.

The more than 20-year record from the Mackenzie Mountains confirms an increase of approximately 1.25°C in mean annual permafrost temperature. Information that has been collected on the treeline suggests that many trees began growing in the 1890's, and that, since then, there have been periods of recruitment. However, there are suggestions that the effects of warming have been mitigated by other factors, which could include moisture stress. Treeline and timberline ecosystems are stressed by environmental events that can significantly affect their function and status. These ecosystems, at the limit of their tolerances, are particularly susceptible to extreme

events that are often infrequent and ephemeral. Only long-term studies have the time frame to capture these unpredictable events. With each additional year of data comes a greater understanding of these systems and how they function. Many research questions remain, especially with respect to seedlings, which are required to facilitate treeline migration.

These studies will aid in the development of indicators and criteria for addressing ecosystem integrity. They will enable resource managers to make decisions with a better understanding of their consequences. We will be able to quantify the forcing factors causing changes to the abiotic and biotic components of these ecosystems involved in the dynamic response to climate change at the treeline and timberline.

The research will also make significant contributions to a number of international networks currently studying similar problems. The understanding of disturbance regimes as well as post-disturbance regeneration of forest and tundra will enable resource managers to develop methods of recovery as well as minimizing the impacts, facilitating enhanced sustainability of resource use.

Project Area

The Mackenzie Mountains research area lies above the timberline in shrub and sedge tundra. The landscape in the area of the Dechen la' Lodge (dechenla.ca/lodge_facilities.php), where the team will be based, is dominated by tundra that falls away into an extensive shrub zone interrupted by patches of spruce and accentuated by alpine slopes and snow-capped peaks. One of the world's largest herds of mountain caribou lives here, as well as moose, sub-Arctic wolves, wolverines, grizzlies, and a host of smaller creatures such as marmots, ground squirrels, pikas, and voles. More than 130 species of birds have been recorded here, including such Arctic specialists as gyrfalcons, ptarmigans (three different species), wandering tattlers, long-tailed jaegers, long-tailed ducks, and Smith's longspurs.

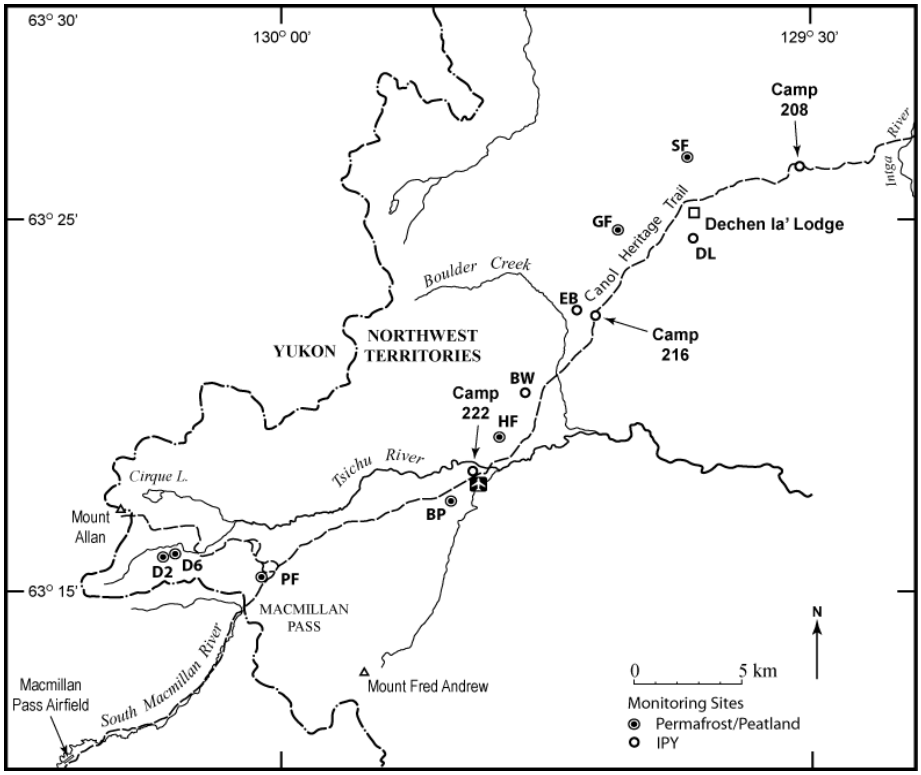


Figure 1: Mackenzie Mountains research sites are accessible off of the Canol Heritage Trail. The gravel landing strip is at Camp 222. ***BP:*** *Beaver Pond,* ***BW:*** *Bushwhack,* ***D2:*** *Dale Creek #2,* ***D6:*** *Dale Creek #6,* ***DL:*** *Dechen la' Lodge,* ***EB:*** *Edge of Barrens,* ***GF:*** *Goose Flats,* ***HF:*** *Hare Foot,* ***PF:*** *Porsild's Field,* ***SF:*** *Snow Fence.*

The lodge is perched atop the Mackenzie Mountain Barrens at 1,700 meters and overlooks a plateau populated by a patchwork of permafrost landforms (e.g., patterned ground, palsas [low, often oval-shaped frost mounds]), peat plateaus, and solifluction lobes [tongue-shaped patterns of sediment on slopes]). The top of the glacier-clad Keele Peak to the west (2,952 meters above sea level) pokes above the Continental Divide, which forms the border with Yukon Territory. Below the barrens lies the valley of the Tsichu River, which is generally below 1,300 meters, and one of the tributary valleys, Dale Creek, where tundra merges into bare scree slopes and permanent snow patches.

The Mackenzie Mountains research area is bisected by the abandoned Canol Project, a World War II pipeline. It transported crude oil to a Whitehorse refinery from which other pipelines distributed fuel to Alaska at a time when four Aleutian Islands were held by the Japanese. The corridor for the pipeline was selected by Dené guides who knew the country well after generations of living in the area. They selected the route along a traditional, well-traveled trail between the Mackenzie Valley and the Yukon. The route has now become the Canol Heritage Trail, a demanding 370-km-long backpacking route for adventurous wilderness hikers.

Research Achievements

The *Climate Change at the Arctic's Edge* project has resulted in the establishment of a long-term environmental monitoring network to quantify the ecological impacts of climate change. Over the period from 2007 to 2011, funds from the Canadian federal government International Polar Year (IPY) and support from Earthwatch made it possible to collaborate with other circumpolar countries looking at the status of the altitudinal and latitudinal treeline (ppsarctic.nina.no/). The data will contribute to these global change-monitoring programs by offering baseline data as well as early impact data for climate change assessment (pps-arctic.sres.management.dal.ca/).

The treeline is a zone of ecological stress where minor changes in the environment can have significant ecological impacts. For example, warmer growing seasons can lead to a greater number of viable tree seeds produced and higher germination success, thus allowing the treeline to migrate further into the tundra. Zones such as the treeline, which are capable of responding quickly and dramatically to environmental changes, often exhibit the first indication of global-scale changes. Studies in the Churchill region and in the Mackenzie Mountains can provide these early-warning signs of global environmental change driven by climate change.

Protocols developed or refined during these studies will be applicable to other northern regions and can be incorporated into a comprehensive strategy for expanded monitoring, particularly by EMAN (Ecological Monitoring and Assessment Network) and IPY. The assessment of the ecological integrity of the region will be important in formulation of policies for use and conservation of natural systems. For example, policies on gravel removal and environmental recovery of older extraction sites can be facilitated by this study. Policies on fire management can also be formulated with the use of information from this study.

By identifying the type and nature of disturbances, the scientific community has a unique opportunity to develop criteria for assessment of ecological integrity and to determine where further research should be directed. Local communities are highly dependent on the health and integrity of natural systems for their income, food, and resources, and consequently, criteria that indicate the status of the natural environment will be of great interest to them.

PROJECT STAFF

Earthwatch scientist

Peter Kershaw, B.E.S., M.E.S. (Waterloo), Ph.D. (Alberta) is a biogeographer, disturbance ecologist, and periglacial geomorphologist specializing in the impacts of anthropogenic disturbances (e.g., borrow pits, vehicle tracks, and oil spills) and fire on tundra and forest ecosystems, in addition to permafrost landforms' responses to climate change. He was on the faculty at University of Alberta in the Department of Earth & Atmospheric Sciences since 1981, and retired in 2011. His main field sites have been in the western arctic along the Mackenzie River valley and in the Mackenzie Mountains, where he has conducted research since the early 1970s. In 2000, he began long-term studies in association with the Churchill Northern Studies Centre. He has published papers on vegetation responses to anthropogenic and natural disturbances, as well as environmental parameters (snowpack, temperature, permafrost), which largely determine the timing and type of recovery of these communities. He has also done a variety of interviews on his research for both national and local media (CBC radio, CIUT radio and The Canadian Press).

Daily Life in the Field

VOLUNTEER TRAINING AND ASSIGNMENTS

Training

Conceptual lectures pertinent to the region will cover climate change, permafrost landform evolution, community succession, and disturbance regimes. Researchers will give practical talks on snow pit measurements, plant species identification, community structure, sampling, and monitoring and census techniques, depending on the team tasks. There will also be talks on the concepts behind tree coring and dendrochronology and the use of personal digital assistant (PDA) devices, frost probes, pH/conductivity meters, clinometers, increment borers, and snowpack sampling instruments. Talks and presentations on topics of local interest could include the formation and status of local permafrost landforms, the ecology of wildlife species, and disturbance ecology, as well as the significance of the project to the community and climate change monitoring in general.

Typically the expedition starts with an introductory talk at Dechen la' Lodge, followed by in-depth demonstrations of equipment. After this, a test run is done at the lodge or at a site nearby. For the first few sites, checking of procedures and data being recorded is thorough and occurs simultaneously with the sampling. Following field sampling, the volunteers input the data to computer files and these files are reviewed by the researchers. It is common to review the day's data during the briefing on the following morning and prior to leaving for the field. Any data problems, gaps, or errors are discussed to ensure they are understood and can be resolved. If necessary, resampling is conducted.

Earthwatch scientist Peter Kershaw and his capable field staff participate in the fieldwork and provide guidance at all times. They will provide theoretical and practical training for every component of the study with which you will be associated. Questions will be encouraged, and objectives and tasks will be reviewed on a daily basis during briefings. Some knowledge of basic biology, geography, and/or ecology is helpful but not a requirement. Computer skills would be beneficial, but training can be provided on word processor and spreadsheet programs. Most important is a strong interest in natural history.

The Earthwatch scientist will give your team a more detailed on-site project briefing when you arrive.

Assignments

Groups of volunteers will be assigned specific field tasks for a portion of a day, then will conduct data entry and analysis. The amount of time at each site will vary, but participants should expect to spend about 50% of their time at the research sites. Most of the sites require travel time in a four-wheel-drive vehicle, which can vary from 30 minutes to 3 hours. Volunteers will help set up and monitor equipment and, depending on the team's tasks, collect data on permafrost, soil, vascular plants, lichens, mosses, plant phenology, annual growth rings, mammals, and birds. The necessary identification methods will be taught at each stage of the project, although some identification experience would be helpful. The equipment that volunteers will be operating is relatively easy to use, including instruments such as a pH meter, frost probe, permafrost corer, temperature meter, plant quadrat, tree borer, plant press, ground-penetrating radar, and differential GPS (Global Positioning System). In the lab, organization of the data, data entry, and production of summaries will be ongoing. In terms of administration, tested protocols are being developed into an operations manual.

TEAM ITINERARY AND DAILY SCHEDULE

Please be aware that weather and research needs can lead to changes in the daily schedule. Should this situation arise, your cooperation and understanding are appreciated.

Overview

Day 1 We'll have an introduction and orientation session, with time for volunteers to recover from travel. A meeting will be conducted to outline the objectives and methods of the team and guidelines for safety, and to provide a preliminary schedule.

Day 2 Project staff will demonstrate equipment and train you on how to use it. If this is completed in the morning, the team will practice field methods in the afternoon.

Days 3 – 10 Each day will begin with a briefing to outline the day's activities. At least half of each day will be spent at the research sites collecting data. Given the travel times involved to reach the sites, the team will picnic in the field with bagged lunches. Depending on the tasks, there might be an evening trip to catch the sunset or other excursions. Each day, there will usually be an evening briefing to review the day's activities, followed by a lecture or lab or data entry work. There will be a recreational day toward the middle of the expedition; the exact day will depend on weather and activities. Recreational day activities can include those noted at the end of this section.

Day 11 Travel day

Usually on the fifth or sixth day of the expedition, the team will have a recreational day. Dechen la' Lodge is a base for ecotourism, and those staying at the facility get an informative and activity-packed schedule. Normally activities take the form of day hikes to different sites that are accessible directly from the lodge or from the four-wheel-drive road.

On the last evening there will be a wrap-up seminar with an overview of the data, comments, recommendations, and discussion about the significance of your contributions to the overall project.

Typical Day in the Field

Time	Activity
6:45 a.m.	Morning briefing, review of assignment progress, new assignment outlined
7:00 a.m.	Breakfast and clean-up
8:45 a.m.	Prepare for daily field program
9:00 a.m.	Depart for field
12:00 p.m.	Lunch
1:00 p.m.	Depart for field if lunch was taken at a different location
2:30 – 5:00 p.m.	Return from field, begin laboratory work, data entry, etc.
6:00 p.m.	Dinner and clean-up
7:00 p.m.	Data entry, lectures, optional recreational activities
9:00 p.m.	Relax, read, socialize, go to bed, etc.

Earthwatch Recreational Time Policy

Earthwatch will generally accompany participants from the rendezvous to the end of the expedition with the exception of recreation time.

- For days when no research activities are scheduled, referred to as recreational days, Earthwatch scientists will offer either a planned team activity or a range of recreational activities that have been vetted and comply with Earthwatch standards. Participants will also have the option of remaining at camp or project accommodations to rest.

- Participants who are determined to pursue options other than those recommended by the project staff will be required to sign a release before doing so. If there is a period of time during a regular research day when no research activities are scheduled, adult participants may have the opportunity to leave the project site on their own; they will be asked to sign out of the project giving their intended destination. Not appearing for the next scheduled activity will trigger the Emergency Response Plan (ERP) regarding missing people. Earthwatch will assess the general risks of adult participants leaving the project site on their own at night after work hours, but cannot guarantee participant safety or an awareness of all issues.

- In some cases, due to local conditions, it may be advisable to restrict adult participants to the project camp or accommodation after dark. This will be clearly communicated in the on-site safety briefing. However, if the local conditions are such that adult participants can go out at night under their own recognizance, there will be a sign-out process through which participants should state their proposed destination and estimated return time. Participants will be given twenty-four-hour contact information for project staff should assistance be needed. The sign-out is informational only and will not be used to enforce a curfew on adult participants. Adult participants should understand that unless contacted for help, project staff will not start a search for a missing participant unless he or she fails to appear the following morning or for the next scheduled research activity.

ACCOMMODATIONS

Dechen la' Lodge (left; (dechenla.ca/lodge_facilities.php) is the only lodge in the vast northern wilderness between the Selwyn and Mackenzie ranges, which lie between the Yukon and Northwest Territories. Its name comes from an aboriginal word meaning "The land at the end of the sticks." This was a special place to both the Kaska and Sahtu aboriginal people, the traditional land stewards of the area. In more recent times (1972), this area was identified by a group of eminent scientists, under the auspices of a United Nations program, as a place of unique and outstanding natural heritage. They called this place the "Mackenzie Mountain Barrens," in reference to its lack of trees.

The lodge is situated on lake-dotted tundra nearly at the westernmost end of the Canol (Canadian Oil) Heritage Trail, and serves as a staging area for hikers and back-country sojourners. The Canol Heritage Trail is a 231-mile (372-km) route that begins across the Mackenzie River from the Northwest Territories town of Norman Wells. From there, it winds through the Mackenzie Mountains to Macmillan Pass on the Yukon border.

Please note: The team could stay several nights at the facilities at Camp 222, about 9.5 miles (15 km) from the western study sites and 10 miles (16 km) from the main lodge buildings. It can take an hour to travel from Camp 222 to the furthest study sites and an hour and a half to take a four-wheel-drive vehicle to the lodge. This more rustic camp is equipped with bunk beds with bedding provided, and sleeps up to four in a room. There is no running water (as at the main lodge) or heat, and there is a dry toilet.

Sleeping

Dechen la' Lodge has a series of cabins on either side of the main lodge building, which includes the dining, kitchen, and communal lounge areas. The cabins accommodate two volunteers each in single beds. Couples can be accommodated with advance notice.

Bathrooms

Each cabin has an indoor dry toilet, two single beds, a wood stove, and storage areas. Large windows on the front of each cabin look out over the picturesque Mackenzie Mountain Barrens. Water is limited, but hot showers are available on demand. A wood sauna can even be arranged, given sufficient advance notice. There are also three free-standing pit toilets with pump-out tanks.

Electricity

Electricity (North American standard, 110 volts) is provided by solar cells and a gas-powered generator, which is run on demand. The generator is on approximately 2 to 3 hours daily, usually before and after dinner. The project does not have a reliable source of electricity through the night.

Internet and Communications

There is no Internet service on site.

Facilities and Amenities

Water must brought into the area, so depending on the current supply, laundry opportunities (aided by a good old-fashioned ringer washer) could be limited or unavailable. Bedding and towels will be provided. The Earthwatch scientist provides a couple of laptop computers for data entry and word processing, but you are also encouraged to bring your own laptop. Volunteers wishing to share photos by burning CDs or DVDs should bring along blank discs or external memory devices (4GB minimum). If you use a digital camera, remember to bring spare batteries, chargers, and interface cables to upload photos to laptops for sharing.

Distance to Field Site

Travel time from the main lodge to the westernmost research sites is about 3 hours, depending on road conditions. Access to the sites is first by a four-wheel-drive vehicle, then by foot. Walking can be trying on one trail, which is dominated by dense, tall shrubs, while other trails offer challenges due to standing water; however, no sites are more than 30 minutes from the trail head.

Smoking

No smoking is allowed inside any buildings.

FOOD

Cooks prepare breakfast and dinner, and volunteers fix their own lunches from food provided. Volunteers, scientists, and staff eat together. Offers to assist in cleanup are never refused. Below are examples of the foods you might expect in the field. Please bear in mind that variety depends on availability. This list is intended to provide a general idea of food types, but it is very important that volunteers be flexible.

Breakfast:	Eggs, bacon, toast, porridge, pancakes, French toast, sausages, fresh or preserved fruit
Lunch:	Sandwiches, cookies, squares, fruit
Dinner:	Meatloaf, spaghetti, roast beef, turkey, lasagna, fish, potatoes, pork chops, pizza, chicken, salads, Jell-O, cake, pie, fresh fruit
Snacks/Other:	Leftovers, fruit, hot chocolate
Beverages:	Juice, milk, coffee, tea, hot chocolate, water (if you want alcoholic beverages while at the lodge, you should purchase them in Whitehorse)
Water:	Large beverage containers cannot be brought in to Dechen la' Lodge because of the isolation of the site. Water at the lodge is collected from a nearby mountain stream.

Special Dietary Requirements

Please alert Earthwatch to any special dietary requirements (e.g., diabetes, lactose intolerance, nut or other serious food allergies) as soon as possible, and note them in the space provided on your volunteer forms. Accommodating special diets is not guaranteed and can be very difficult due to availability of food, location of field sites, and other local conditions.

Special note to vegans: Please be aware that it is often difficult to accommodate vegans. If this is an issue, then participation on this Earthwatch expedition should be carefully considered.

Travel Planning

You are encouraged to register your travel itinerary with your embassy. For information on embassies around the world, see embassyworld.com.

- Citizens of Australia may register online at: orao.dfat.gov.au.
- British citizens may register online at: fco.gov.uk/en/travel-and-living-abroad/staying-safe.
- Citizens of the United States may register online at: travelregistration.state.gov.
- Citizens of other countries are encouraged to check with their appropriate embassy or consulate regarding registration.

RENDEZVOUS

The rendezvous and departure information for this project has been removed from this web version of the expedition briefing. It is only available in the printed version of the briefing. Please do not make any travel arrangements to join an expedition without having full and up-to-date travel information from Earthwatch. Full rendezvous details, including places and times are available from Earthwatch upon request prior to registration for an expedition. Please use the “Contact Us” button on the top right-hand corner of the website to get in touch with an Earthwatch representative, who will be very happy to help you.

PASSPORTS AND VISAS

Passport Information

Most volunteers traveling from outside the host country will require a passport valid for at least six months beyond the dates of travel.

Visa Information

Citizens of the US, EU, Australia, and Japan **do not** need a tourist visa for entry. Citizens of other countries should check with their travel agent or a visa agency for specific visa and entry requirements. Travelers are advised to check visa regulations well in advance of traveling.

Note: If you are traveling from outside the US to Canada, Mexico, Latin America, South America, the Bahamas or the Caribbean and have a stopover in the US, you are required to register through the ESTA program.

Electronic System for Travel Authorization (ESTA)

Online registration is now mandatory for all visitors traveling to the United States without a visa. The Electronic System for Travel Authorization (ESTA) is used to screen short-term visitors who are citizens of the 36 countries eligible for the US Visa Waiver Program (for a list of participating countries, see travel.state.gov/visa/temp/without/without_1990.html).

Visitors are required to complete ESTA **at least three days before traveling to the US**. Once approved, the authorization will be valid for up to two years if the individual’s passport does not expire in the meantime.

Applications can be submitted through the ESTA website esta.cbp.dhs.gov/esta. **Note:** As of September 2011, ESTA costs approximately US$14.00.

Citizens of countries covered by the Visa Waiver Program (VWP) traveling to the US for tourism or business for 90 days or less do not need to obtain a visa provided they have a valid passport (for exceptions see the VWP Quick Reference Guide on travel.state.gov/pdf/VWP-QuickReferenceGuide.pdf).

For Volunteers Requiring Visas ONLY: Essential Information

Type of Visa	Volunteers requiring a visa must get a **TOURIST VISA**.
Where to Get a Visa	Contact the nearest **Canadian embassy or consulate** to find out how to apply for your visa. Please note that this process can take weeks or more. We strongly recommend using a **visa agency**, which can both expedite and simplify the process. See below for a list of visa agencies.
Required Information	You will need to send your **passport** (valid for at least six months beyond your stay), a **Visa Application and Immigration Form, 2-4 passport-size photos, and payment** to the embassy or visa agency (if applicable). Please be sure that your passport is valid for at least six months beyond your stay.
Contact Information	You may be required to list the following contact information on your Visa Application and Immigration Form: Norman Barichello Box 10461 Whitehorse, YT, Y1A 7A1 Canada +1 (867) 667-2639
Cost of a Visa	Generally between US$40-100, but varies from country to country and can potentially cost **up to US$180**. A visa agency will charge an additional fee.

Note: The purpose of your visit is for vacation, holiday or travel. Foreign immigration officials do not always understand the concept of a "working vacation" or "volunteering." Words such as "working," "volunteering," "research," or "scientific expedition" can raise questions concerning the country's foreign labor laws and/or prompt questions about official scientific research permits and credentials, etc., to which volunteers on their own will not be equipped to respond. All required research permits for the project are in place and have been approved by the proper authorities.

Visa Agencies

In the United States	In Europe	In Australia
Travisa* 290 5th Avenue, 4th Floor New York, NY 10001 Tel: (212) 613-2223 Fax: (212) 613-2287 Hours: 9:00 AM to 5:00 PM EST Web: travisa.com (*See the website for additional offices)	CIBT, Inc.-UK 25 Wilton Road Lower Ground Floor Victoria SW1V 1LW Tel: 0844-736-0211 Fax: +44 (0) 207-828-5411 Calling from Europe outside UK: +44 (0) 207-802-1000 Email: info@uk.cibt.com Web: uk.cibt.com (has alternate address for urgent requests)	Ask your travel agency if it can send your visa application on your behalf.

Volunteers Under 18 Years of Age

Entry to Foreign Countries

It may be possible for 16- and 17-year-olds to participate on standard Earthwatch teams *if* accompanied by a parent or guardian. However, in an effort to prevent international child abduction, many governments have initiated procedures at entry/exit points to protect minors. Thus, if a minor will be traveling with only one guardian, or if for any reason they will be traveling alone (such as for a Teen Team), it may be necessary to have a notarized letter from all legal guardians stipulating that they may travel unaccompanied or in the presence of a single guardian. This letter must give an explanation for why only one parent or someone other than a parent is signing the letter. For example, if one parent is deceased, only one parent has legal guardianship, or someone other than the parents are legal guardians, the letter should state that.

Airline Documentation Requirements

Airlines may also have documentation requirements for unaccompanied minors. Parents of minors are responsible for checking with each airline that their child will be flying to ensure that sufficient documentation is provided. This could include a copy of a birth certificate or a notarized letter stating that the minor has his or her parent's permission to travel alone or with only one parent.

Note: Requirements by specific countries and airlines vary and change frequently. You MUST keep informed of the requirements on your own to avoid problems at immigration. If a letter is not available, the volunteer under 18 can be refused entry into the country or on a flight. There is nothing Earthwatch Institute can do to help in this circumstance.

Additional Passport and Visa Resources

- For Japanese citizens: rainbowt.jp/travel/visa_top.html
- For Australian citizens: passports.gov.au and dfat.gov.au/visas/index.html
- For US citizens: passportvisasexpress.com
- Travel Document Systems: traveldocs.com/index.htm

INSURANCE

MedEvac assistance, advice, and insurance are included in the contribution you pay to Earthwatch. This covers trip cancellation and your travel medical risks, including medical expenses and emergency medical evacuation, while you are traveling. This coverage is valid in the country of your Earthwatch expedition (**Note:** For US volunteers, as long as the expedition is over 100 miles from your place of residence) and during travel to and from your expedition. Please see the Earthwatch website for more information on insurance provision.

If you have additional vacation time before and/or after your Earthwatch expedition that forms part of your overall time away from your place of residence, this additional vacation time is not covered under this policy. If you are in any doubt as to whether your travel plans before and/or after your Earthwatch expedition constitute additional vacation time, please contact the insurance provider.

This insurance policy is secondary to your existing health insurance policy (e.g., the NHS in the UK).

If you signed up through Earthwatch UK/Europe, or Earthwatch Japan:

Details of the included insurance policy can be found at earthwatch.org/europe/insuranceinfo.

Please refer any queries regarding this policy to Earthwatch's Operations department at +1 978 450 1232 or insurance@earthwatch.org**.**

You can find information about additional insurance available to UK residents for coverage before or after your Earthwatch project at earthwatch.org/europe/insuranceinfo. Should you have any questions about whether you require coverage for your travel plans, please review the policy summary and the FAQs at the website above.

If you signed up through Earthwatch US:

Details of the US insurance policy can be found at earthwatch.org/insurance.

Please refer any queries regarding this policy to Earthwatch's Operations department at +1 978 450 1232 or insurance@earthwatch.org.

You can find information about additional insurance available for coverage before or after your Earthwatch project at earthwatch.org/insurance. Should you have any questions about whether you require coverage for your travel plans, please review the policy summary and the FAQs at the website above.

Emergency Medical and Evacuation Assistance (For All Volunteers)

Emergency medical and evacuation assistance is available for all Earthwatch participants from CEGA Medical, a twenty-four-hour international emergency medical and evacuation service. Please see the contact information on the *General Information* page.

For non-emergency information from CEGA, such as advice on visa and vaccine requirements, you may call the CEGA Non-Emergency Medical & Travel Advice helpline at **+44 (0) 20 3059 8770.**

ADDITIONAL TRAVEL INFORMATION

Luggage

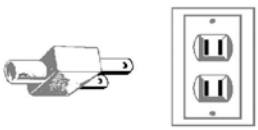
- *General considerations:* Do not bring more luggage than you can carry and handle on your own. If traveling by air and checking your luggage, you are advised to pack an extra set of field clothing and personal essentials in your carry-on bag in case your luggage is lost and/or takes several days to catch up with you. Many airlines have strict baggage policies. Please check with your airline(s) on baggage weight limits, liquid restrictions, fees for checked baggage, etc.
- *Checking luggage:* Please note that if you will be taking an international flight that has one or more connections within the country of your destination, it will be necessary to collect any checked bags at the airport where you first arrive in the destination country. After proceeding through customs, you will have to recheck your luggage before flying on to your final destination.
- *Baggage limits:* The charter flight from Whitehorse normally has the same baggage restrictions as commercial carriers. However, it is recommended that you only check one bag, since luggage must be transported in the field as well.

Money Matters

- *Local currency:* Canadian Dollar (CAD). See xe.com/ucc for currency information and exchange rates.
- *Personal funds:* You will be able to access and spend money in Whitehorse before and after the expedition, but while in the field there will NOT be any stores, restaurants, cash machines, etc. Dechen la' Lodge sells T-shirts for approximately $15CAD. Depending on availability, wine and beer may occasionally be available for purchase; otherwise you'll have to bring alcohol for personal consumption from Whitehorse. Overall, US$50 of spending money at the field site should be more than enough.

Your Destination

- *Language:* The two official languages of Canada are English and French, although the degree of fluency in each varies depending on the province. Both Manitoba and the Northwest Territories are primarily English-speaking.
- *Cultural considerations:* You will probably meet First Nations (aboriginal people of Canada) citizens either at the Dechen la' Lodge or in hunting parties. Pay respectful attention to what they have to say, and closely heed any advice about their customs.
- *Electricity*: 110 volts AC, 50 hertz. Plugs are two flat parallel prongs (NEMA 1) or two flat parallel prongs and one cylindrical grounding prong (NEMA 15). For additional information, see kropla.com/electric2.htm.



Plug Type A

Plug Type B

- *Time zone:* Pacific Time Zone: GMT/UTC -8 (-7 Daylight Savings Time). For time worldwide with GMT/UTC, see worldtimeserver.com.
- *Telephone Dialing codes:* When calling Canada from another country, dial the country's international dialing code, followed by (1) and the number. When calling Canada from the US, dial 1 followed by the area code and number. When calling within Canada, omit the (1) and dial (011). When calling another country from Canada, dial (1), followed by the other country's country code and the number. **Note:** you should check with your cell phone provider to obtain any carrier-specific dialing codes you may need; many providers have dialing procedures that may differ in whole or in part from these directions. For additional information see kropla.com/dialcode.htm.

Country Information

- UK Foreign and Commonwealth Office: fco.gov.uk/en/travel-and-living-abroad/
- Country information from around the world: countryreports.org
- National Geographic Map Machine: plasma.nationalgeographic.com/mapmachine
- US State Department: state.gov
- Online unit conversions: onlineconversion.com
- Worldwide weather: wunderground.com or tutiempo.net/en
- ATM locator: visa.via.infonow.net/locator/global/ or mastercard.com/atmlocator/index.jsp

RECOMMENDED READING

Below are additional recommended materials for those interested in further preparing for the expedition. Some may be purchased online through popular vendors. See the *Helpful Resources* section for suggested vendor websites.

Scientific media

Books

- Sturtevant, W.C. (ed.) *Handbook of North American Indians*. Volume 6: Subarctic and Volume 7: Arctic. Washington, D.C.: Smithsonian Institution, 1981.
- McGhee, R. *Ancient People of the Arctic*. Vancouver: UBC Press, 1996.

Journals

- *Permafrost and Periglacial Processes*
- *Climatic Change*
- *Arctic, Antarctic and Alpine Research*
- *Arctic*

Articles

- Huntington, H., G. Weller, E. Bush, T.V. Callaghan, V. Kattsov, and M. Nuttall. "Chapter 1: An Introduction to the Arctic Climate Impact Assessment." In Arris, L. (ed.), *Arctic Climate Impact Assessment—Scientific Report,* 2-19. Fairbanks: ACIA Secretariat and Cooperative Institute for Arctic Research. **Available at:** acia.uaf.edu/PDFs/ACIA_Science_Chapters_Final/ACIA_Ch01_Final.pdf.
- Overpeck, J.T., K. Hughen, D. Hardy, R. Bradley, R. Case, M. Douglas, B. Finney, K. Gajeswski, G. Jacoby, A. Jennings, S. Lamoureux, A. Lasca, G. MacDonald, J. Moore, M. Retelle, S. Smith, A. Wolfe, and G. Zielinski. "Arctic environmental change of the last four centuries." *Science* 278 (1997): 1251-1256.
- Smith, W. K., M.J. Germino, D.M. Johnson, and K. Reinhardt. "The altitude of alpine treeline: A

bellwether of climate change effects." *Botanical Review* 75 (2009): 163-190.
- Tarnocai, C., J.G. Canadell, E.A.G. Schuur, P. Kuhry, G. Mazhitova, and S. Zimov. "Soil organic carbon pools in the northern circumpolar permafrost region." *Global Biogeochemical Cycles* 23 (2009) .
- IPCC. "Climate change 2007: the physical science basis. Contribution of Working Group I to the fourth assessment report of the Intergovernmental Panel on Climate Change." Cambridge and New York: Cambridge University Press, 2007. **Available at:** ipcc-wg1.ucar.edu/wg1/wg1-report.html

Popular media

Books

- Arno, S. F., and R.P. Hammerly. *Timberline: Mountain and Arctic Forest Frontiers*. Seattle: The Mountaineers, 1984.
- Pielou, E. C. *A Naturalist's Guide to the Arctic*. Chicago: University of Chicago Press, 1994.
- Mowat, F. *Never Cry Wolf*. Toronto: Seal Books, 1973. (Also *Lost in the Barrens* and many others by this author.)

Field guides

- Kershaw, L.J., J. Pojar, and A. MacKinnon. *Plants of the Rocky Mountains*. Edmonton, CA: Lone Pine Publishing, 1998.

Project-related websites

Project-related

- Earthwatch scientist Kershaw: aculty.eas.ualberta.ca/kershaw/
- Dechen la' Lodge: dechenla.ca/
- Climate science information: realclimate.org

Project Field Report

Each Earthwatch Institute-supported project submits a report on the past year's research and results to Earthwatch, generally on an annual basis. The most recent field report for this project is available online through earthwatch.org/FieldReportpdf/Kershaw_FieldReport2009.pdf. **Note:** Reports are not available for all projects.

HELPFUL RESOURCES

Please see Earthwatch's Volunteer Resources pages for additional information on:

- Travel agencies with whom Earthwatch volunteers can get preferential rates
- Recommended kit and clothing providers
- Recommended travel booksellers

Volunteers who sign up through our US office, visit: earthwatch.org/volunteerresources
Volunteers who sign up through our UK office, visit: earthwatch.org/europe/volunteerresources

Project Conditions

Please show this section to a doctor when he or she is completing the Health section of your Earthwatch Participation Form. Be sure to discuss vaccination requirements with the doctor well in advance of your departure date. See the Health Information *section for vaccination information.*

To the doctor:

This patient has volunteered to join a field research team that has specific physical demands of which you and the patient should be aware. **We need your accurate evaluation of this patient's ability to meet the conditions detailed below in order to care for his or her health and safety, and to assess that he or she can participate fully and effectively.**

General Conditions

Weather in the Mackenzie Mountains area is unpredictable; winds can shift from calm to strong, rain can turn to snow, and 20°C (68°F) can drop to -5°C (23°F) very quickly. At this time of year, there could be nighttime frosts, and even with daytime temperatures of 10 to 15°C (50 to 60°F), the wind can give a "feels like" temperature close to 0°C (32°F). Rain can become horizontal if the wind picks up.

The weather in August is expected to vary within the limits below:

Humidity	20 to 100%
Temperature	-5°C to 25°C (23°F to 77°F)
Altitude	1,100 to 1,700m (3,608 to 5,577 ft)
Rainfall	0 to 20 mm (.79 in)

Eligibility Criteria

All participants must be able, independently or with the assistance of a companion, to:

- ☐ Follow verbal and or visual instructions.
- ☐ Wear all protective equipment recommended or required by industry standards. Please pay close attention to the Expedition Packing Checklist at the end of this briefing.
- ☐ Enjoy being outdoors all day in all types of weather and in the potential presence of wild animals and insects.
- ☐ Tolerate cold weather, including extreme wind chills.
- ☐ Carry personal daily supplies, such as lunch, water, and some small field equipment, of up to 9 kg/20 lbs.
- ☐ Get low enough to undertake ground-level activities such as soil sampling, permafrost coring, frost probing, and vegetation sampling, up to 2 hours per day
- ☐ Hike on on flat to undulating terrain. Total time hiking is up to two hours per day.
- ☐ Promptly alert project staff about any injuries or discomfort (bruising, difficulty breathing, etc.) as soon as it occurs.
- ☐ Travel seated with seatbelt on in a 4WD vehicle over unpaved roads, which can sometimes be bumpy, for up to 5 hours a day. Note that this can be uncomfortable for individuals with back problems.

POTENTIAL HAZARDS

Hazard Type	Associated Risks and Precautions
Transportation in the field	Travel is along the Canol Heritage Trail, an abandoned gravel road bed, navigable by four-by-four vehicle. Dechen la' Lodge has a number of four-by-four vehicles, one of which can carry the entire team. All drivers hold licenses required by the Canadian government, and vehicles meet provincial safety standards, with the addition of radios.
Walking/Hiking/ Climbing	Walking and hiking along the unmarked trails to the research sites varies from firm footing to unstable with tall shrubs to open hard ground. Trail sections can also be very wet, with holes deeper than the tops of rubber boots. Grizzly bears occupy the area but have never threatened groups of people.
Terrain	All volunteers will be trekking in the field, and there is risk of strains, sprains and breaks due to falls. The terrain can be slippery, and tall shrubs that can restrict movement at some sites. You must wear rubber boots due to sections of wetlands at several sites and the
Wildlife	This is a wilderness area with lots of wildlife. Grizzly bears and other large mammals may be seen, but have never been a problem. Grizzlies are hunted in the area and are very reclusive. The Earthwatch scientist and project staff (NOT volunteers) will carry bear deterrents.
Climate/Weather	The sun can be quite intense. Even on an overcast day, you are at risk for sunburn. You should bring good-quality sunblock. You will also want to have sun and wind protection for your lips. The environment is dry year-round, so be sure to drink plenty of water to avoid dehydration.
Insects	Mosquito and black-fly populations can be a nuisance in the summertime. There is no evidence of West Nile virus in the region. Volunteers should take precautions to prevent mosquito bites by using insect repellent and wearing long sleeves or bug jackets or head nets while in the field. Black flies bite and inject an anticoagulant, and are generally very irritating. If you suspect you might have an allergic reaction to their bites, be sure to bring an antihistamine.
Traveler's diarrhea	Traveler's diarrhea affects 20-50% of all international travelers. Always wash your hands with soap and water or a hand sanitizer before eating. You should also carry an over-the-counter anti-diarrheal medication in your personal first aid kit. Ensure all food is well cooked before consumption. Speak to your doctor about other options for treating traveler's diarrhea and see the US Centers for Disease Control and Prevention (CDC) (cdc.gov) website for advice on avoiding this condition.

HEALTH INFORMATION

Routine Immunizations

All volunteers should make sure to have the following up-to-date immunizations: DPT (diphtheria, pertussis, tetanus), polio, MMR (measles, mumps, rubella) and varicella (if you have not already had chicken pox). Please be sure your tetanus shot is current.

Project Vaccinations

Medical decisions are the responsibility of each volunteer and the following are recommendations only. While Earthwatch can provide details regarding suggested vaccinations, we are not a medical organization and decisions about which vaccinations to receive should be made between you and a doctor. Health conditions around the world are constantly changing, so keep informed and consult your physician, a local travel health clinic, the CDC (cdc.gov), and the World Health Organization (who.int) for the latest health information for travelers. Please consult a physician for guidance on vaccinations if you intend to travel to other parts of the country.

If traveling from a country or region where **yellow fever** is endemic, a certificate of vaccination is required.

Advice Regarding Diseases

Please see the CDC (cdc.gov) or WHO (who.int) websites for more information.

- *Giardia* (travelers' dysentery, called "Beaver Fever" in Canada) may be present in lake and creek water, so please do not drink the water. The tap water is filtered and perfectly safe to drink, but retains some of its peaty coloration.
- *Tuberculosis:* WHO estimates that one-third of the world's population is infected with the bacterium (*Mycobacterium tuberculosis*) that causes tuberculosis. The incidence of tuberculosis is higher in developing countries, particularly in Asia, Africa, the Caribbean, and Latin America. In general, approximately 10% of persons infected with *M. tuberculosis* are at risk for developing active tuberculosis during their lifetimes. Tuberculosis is considered highly treatable with medications that are of relatively low toxicity and cost. Volunteers returning from developing countries are encouraged to have a (PPD)-tuberculin skin test to screen for potential infection.

Additional Health Information Resources

- Travel health website: mdtravelhealth.com
- The Travel Doctor: tmvc.com.au
- Australian Department of Health and Aging: health.gov.au
- Hospital for Tropical Diseases: thehtd.org
- Traveller's Healthline Advisory Service Tel: (020) 7950-7799
- MASTA Travelers' Healthline (UK) Tel: (0906) 8-224100 (within the UK)

EMERGENCIES IN THE FIELD

Field staff members carry hand-held radios to communicate with the lodge, where someone would call EMS for guidance in an emergency. A number of first aid kits are maintained at the lodge and in their vehicles. Anyone with a medical emergency will be evacuated directly to the nearest hospital. If the injury is severe, a helicopter can be used to transport the injured person. In the event of a dangerous encounter with a grizzly bear, the animal will be deterred using standard procedures by project staff, and the team will leave the area immediately.

Proximity to Medical Care	
Physician, nurse or EMT on staff	Project staff are not medical professionals
Staff certified in safety training	Peter Kershaw: Heartsaver AED (Level C), Medic First Aid
Nearest hospital and/or clinic	Whitehorse General Hospital #5 Hospital Road Whitehorse, Yukon Y1A 3H7 Tel: (867) 393-8700
Distance	Approx. 450 km/280 mi by air or approximately three hours

COMMUNICATIONS

Emergency Communications in the Field

Satellite phones are carried by lodge staff, and walkie-talkies provide communication between groups and the lodge.

The emergency contact number at Earthwatch in the US is +1 (978) 461-0081 or +1 (800) 776-0188 (see *Emergency Contacts* for calling instructions).

Personal Communications

Cell phones do NOT work in the Dechen la' Lodge area, even though they may work in Calgary or Vancouver. Please plan accordingly. Emergency communications will be available via the lodge's satellite phone. The lodge is also equipped with a mobile radio phone, which can be used for emergencies and personal communications. If a volunteer wishes to use this phone for personal calls, it will be at his or her own expense. Internet access is not available.

Family and friends of Earthwatch volunteers should be aware that personal communication with outsiders is not always possible while participating in an expedition. Earthwatch encourages volunteers to minimize outgoing calls; likewise, family and friends should restrict calls to urgent messages only. Measures have been taken to ensure that appropriate communication tools are available in cases of emergency.

Contact Information

This information is available in the print version of the briefing only.

Appendix

ACIA. *Arctic Climate Impact Assessment: Impacts of a Warming Arctic*. Cambridge: Cambridge University Press, 2004.

French, H. M. *The Periglacial Environment*. 2nd ed. Essex, UK: Addison Wesley Longman Limited, 1996.

Gamon, J. A., G. P. Kershaw, S. Williamson, and D.S. Hik. "Microtopographic patterns in an arctic baydjarakh field: Do fine-grain patterns enforce landscape stability?" *Environmental Research Letters* 7 (2012).

Harsch, M. A., M.S. McGlone, and R.P. Duncan. "Are treelines advancing? A global meta-analysis of treeline response to climate warming." *Ecology Letters* 12 (2009).

Hogan, K. B., and R.C. Harriss. "Comment on 'A dramatic decrease in the growth rate of atmospheric methane in the northern hemisphere during 1992' by Dlugokencky et al." *Geophysical Research Letters* 21 (1994): 2445-2446.

Huntington, H., and S. Fox. "The changing Arctic: Indigenous perspective." In *Impacts of a Warming Arctic - Arctic Climate Impact Assessment*. London: Cambridge University Press, 2005: 61-98.

IPCC. *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge and New York: Cambridge University Press, 2007.

Kershaw, G. P. "Permafrost landform degradation over more than half a century, Macmillan/Caribou Pass region, NWT/Yukon, Canada." *Proceedings of the 8th International Conference on Permafrost* (2003a): 543-548.

Kershaw, G. P. "Snow and temperature relationships on polygonal peat plateaus, Churchill, Manitoba, Canada." *Proceedings of the Ninth International Conference on Permafrost* 1 (2008): 925-930.

Klok, E. J., and J.. Oerlemans. "Climate reconstructions derived from global glacier length records." *Arctic, Antarctic, and Alpine Research* 36 (2004): 575-583.

Mamet, S. D., and G.P. Kershaw. "Subarctic and alpine treeline dynamics during the last 400 years in northwestern and central Canada." *Journal of Biogeography* (2011).

Mamet, S. D., and G.P. Kershaw. "Radial-growth response of forest-tundra trees to climate: Western Hudson Bay Lowlands." *Arctic* 64 (2011): 446-458.

Mamet, S. D., and G.P. Kershaw. "Age-dependency, climate and environmental controls of recent tree growth trends at subarctic and alpine treelines." *Dendrochronologia*, In Press.

McBean, G., G. Alekseev, D. Chen, E. Førland, J. Fyfe, P.Y. Groisman, R. King, H. Melling, R. Vose, and P.H. Whitfield. Arctic climate - past and present." In *Impacts of a Warming Arctic - Arctic Climate Impact Assessment*. New York: Cambridge University Press, 2005: 21-60.

Mosier, A. R. "Soil processes and global change." *Biology and Fertility of Soils* 27 (1998): 221-229.

Osterkamp, T. E. "Thermal state of permafrost in Alaska during the fourth quarter of the twentieth century." *Proceedings of the 9th International Conference on Permafrost* 2 (2008): 1333-1338.

Romanovsky, V. E., D.O. Sergueev, and T.E. Osterkamp. "Temporal variations in the active layer and near-surface permafrost temperatures at the long-term observatories in Northern Alaska." *Proceedings of the Eighth International Conference on Permafrost* 2 (2003): 989-994.

Roulet, N. T. "Peatlands, carbon storage, greenhouse gases, and the Kyoto protocol: Prospects and significance for Canada." *Wetlands* 20 (2000): 605-615.

Serreze, M. "Arctic climate change: Where reality exceeds expectations." *Witness The Arctic* 13 (2009): 1-4.

Smith, L. C., G.M. MacDonald, A.A. Velichko, D.W. Beilman, O.K. Borisova, K.E. Frey, K.V. Kremenetski, and Y. Sheng. "Siberian peatlands: A net carbon sink and global methane source since the Early Holocene." *Science* 303 (2004): 353-356.

Smith, L. C., Y. Sheng, G.M. MacDonald, and L.D. Hinzman. "Disappearing Arctic lakes." *Science* 308 (2005): 1429.

Stirling, I., N.J. Lunn, and J. Iacozza. "Long-term trends in the population ecology of polar bears in western Hudson Bay in relation to climatic change." *Arctic* 52 (1999): 294-306.

Tarnocai, C., J. Kimble, and G. Broll. 2003. "Determining carbon stocks in Cryosols using the Northern and Mid Latitudes Soil Database." In *Permafrost, Proceedings of the Eighth International Conference,* edited by Philips, M., Springman, S. M., and Arenson, L. U. Lisse, Switzerland: A.A. Balkema Publishers, 1999: 1129-1134.

Tarnocai, C., J.G. Canadell, E.A.G. Schuur, P. Kuhry, G. Mazhitova, and S. Zimov. "Soil organic carbon pools in the northern circumpolar permafrost region." *Global Biogeochemical Cycles* 23 (2009).

Tømmervik, H., B. Johansen, I. Tombre, D. Thannheiser, K.A. Høgda, E. Gaare, F.E. Wielgolaski. "Vegetation changes in the nordic mountain birch forest: The influence of grazing and climate change." *Arctic, Antarctic, and Alpine Research* 36 (2004): 323-332.

Vallée, S., and S. Payette. "Contrasted growth of black spruce (*Picea mariana*) forest trees at treeline associated with climate change over the last 400 years." *Arctic, Antarctic, and Alpine Research* 36 (2004): 400-406.

van Everdingen, R. O. *Multi-Language Glossary of Permafrost and Related Ground-Ice Terms*. Boulder: International Permafrost Association, National Snow and Ice Data Center/World Data Center for Glaciology, 2005.

Vourlitis, G. L., W.C. Oechel, S.J. Hastings, and M.A. Jenkins. "The effect of soil moisture and thaw depth on CH_4 flux from wet coastal tundra ecosystems on the North slope of Alaska." *Chemosphere* 26 (1993): 329-337.

Woo, M. K., A.G. Lewkowicz, and W.R. Rouse. "Response of the Canadian permafrost environment to climate change." *Physical Geography* 13 (1992): 287-317.

Earthwatch Institute Policies & Participant Rights and Responsibilities

This document contains important information concerning Earthwatch Institute policies and participant rights and responsibilities for inclusion on an Earthwatch expedition. Please read this document thoroughly and sign the Liability Release section of your Earthwatch Participation Form to indicate that you understand and accept the risks inherent to your expedition and the policies, rights, and responsibilities enumerated in this document. Participants will not be permitted to partake in an expedition until Earthwatch has received the signed release form.

Intellectual Property Rights

It is permissible to share photos, videos, and stories of your expedition with family, friends, local media, and in a public forum. Sharing your new perspectives and experiences is welcomed and encouraged.

However, please recognize that all information, data, and images shared or gathered in the course of your expedition's field work become the intellectual property of the Earthwatch scientist (ES). Co-opting or plagiarism of data, images or information gathered during an expedition for use in a scientific thesis, masters or PhD work, or for profit or for the academic or business use of a third party without the permission of the ES is strictly prohibited. Please be aware that data gathered during the interviewing of local people becomes the intellectual property of the ES. Earthwatch scientists have the right to place additional restrictions on your ability to share data or certain research-related images.

Conversely, an Earthwatch scientist may give written permission to use data and images for academic or profitable activity. Please be sure to ask what is acceptable to the Earthwatch scientist.

Fellows or scholarship recipients are sometimes required to submit a written report reflecting what they have learned on a project, sometimes as a step toward developing a curriculum. Earthwatch scientists have the right but not obligation to review and edit materials involving information gathered on one of their expeditions.

Discrimination

Earthwatch does not discriminate on the basis of race, religion, ethnicity, national origin, gender, sexual orientation, or any other reason prohibited by applicable law and respects participants' right to privacy. However, you must be aware that local laws in countries in which Earthwatch operates may not be anti-discriminatory and that the possibilities exist that local residents may not have an awareness of best practice regarding discrimination.

Discrimination on the basis of race, religion, ethnicity, or sexual orientation will not be tolerated on Earthwatch teams. Disruptive behavior, or verbal, physical or any other type of abuse or harassment will also not be tolerated. Violation of Earthwatch's non-discrimination policy is grounds for expulsion from the program without a refund.

Intimate relationships

Earthwatch scientists, their staff, their colleagues, and their associates are prohibited from becoming romantically involved with participants during the entire duration of the period that the team is in the field. Romantic relationships that may otherwise seem permissible may eventually create an unpleasant or unproductive work environment and are therefore strongly discouraged for the duration of an Earthwatch project.

Sexual Harassment

Please recognize that the relationship that exists between Earthwatch scientists and staff and participants is analogous to the student-teacher relationship. Therefore, please be aware of the following policies.

Sexual harassment of participants by the Earthwatch scientist or Earthwatch staff is prohibited. Likewise, sexual harassment of other participants, Earthwatch field staff, or local people by participants is also prohibited.

Sexual harassment infringes on an individual's right to an environment free from unsolicited and unwelcome sexual overtones of conduct either verbal or physical. Sexual harassment does not mean occasional compliments of a socially acceptable nature.

Sexual harassment refers to conduct which is offensive, which harms morale, or which interferes with the effectiveness of Earthwatch expedition teams; such conduct is prohibited. Lewd or vulgar remarks, suggestive comments, displaying derogatory posters, cartoons or drawings, pressure for dates or sexual favors and unacceptable physical contact or exposure are examples of what can constitute harassment. No one should be touched in areas that otherwise would be covered by a bathing suit. It is important to realize that what may not be offensive to you, may be offensive to participants, the local population, and Earthwatch field staff.

Any individual who feels subjected to sexual harassment or has any knowledge of such behavior should report it at once to his or her PI or to Earthwatch staff members. All Earthwatch scientists and Field Team Leaders (FTLs) will notify Earthwatch immediately when an accusation of sexual harassment or abuse is made or witnessed.

All reports of sexual harassment will be handled with discretion and will be promptly and thoroughly investigated. Any participant who is found to have engaged in conduct constituting sexual harassment will be immediately removed from the expedition at his or her own expense. If a minor is immediately involved in allegations of sexual harassment, his or her parents will be contacted.

Drugs

Laws on drug use in most countries are severe and may carry lengthy imprisonment or death penalties. I understand and accept that the manufacture, possession, use, purchase and/or sale of illegal drugs or other illegal substances while on an Earthwatch expedition is strictly prohibited. Prescription drugs may only be purchased and used by the individual indicated on the prescription in keeping with their intended use guidelines.

Alcohol

Local statutes, customs, practices, ordinances, and regulations with regard to the use, possession, sale, or purchase of alcohol are applicable to all participants and project staff in Earthwatch expeditions. Participants and project staff on Earthwatch expeditions must comply with the law of the country in which a project is located regarding the minimum age required to consume alcohol. In addition, restriction on the use, possession, sale, or purchase of alcohol may be set by the Earthwatch scientist. Any restrictions on the consumption of alcohol should be clearly outlined by the project staff in the briefing to participants at the start of the project, and in the Expedition Briefing.

Consumption or possession of alcohol or smoking is not permitted on any Earthwatch Teen Team, regardless of local law.

Excessive consumption of alcohol by staff or participants is not acceptable on any Earthwatch project. Intoxication can jeopardize personal safety, in addition to the safety of the team. It can also cause delay, and hinder response in the event of a crisis or emergency situation.

Earthwatch staff and the Earthwatch scientist have the discretion to remove individuals from the project who consume alcohol in a time and manner that endanger the safety and/or productivity of the expedition.

Minors

Earthwatch considers participants under eighteen (18) years of age to be minors. Minors are not permitted to participate on any of Earthwatch's standard teams unless accompanied by a parent or legal guardian in which case the minimum age is sixteen (16). Minors on regular teams do not receive additional guidance or supervision from Earthwatch beyond what is offered to the adult participants. The number of minors on regular teams is limited to two (2) per team. Earthwatch has developed teams specifically for 16 and 17 year olds ("Teen Teams") as well as teams specifically for families ("Family Teams") with children as young as 10 years old. These teams focus on the same research activities and have the same expectations as our regular teams, but with more facilitation and support. Exceptions for some projects are made at the discretion of Earthwatch and the Earthwatch scientist. Due to a more in-depth screening process for certain programs that select candidates based on school year rather than age, there may be 18 year olds fielding on the same team as 16 and 17 year olds. Please be aware that some Earthwatch projects do not allow participation by minors in any circumstance.

Participants and Driving

Participants are not allowed to drive project vehicles or aircraft during an expedition. In select circumstances, participants may be able to drive boats under the direct supervision by project staff. These circumstances are pre-determined by project staff in collaboration with Earthwatch. Participants must respect the restrictions for boat driving in place for each project.

If a project environment is such that participants can drive their own vehicles to the rendezvous, those who have driven themselves to the project may not drive their own vehicles to, from or for project activities, including the transport of project equipment after arriving at the site.

Participants who have driven themselves to the project may choose to utilize their own vehicle during recreational time, but project staff will brief them on the driving restrictions. All driving during recreational time is done at your own risk.

Please be advised that the only exception to the above driving restrictions is emergency situations.

Riding in other participants' vehicles is not covered under the participants' insurance policy for the expedition. Riding in another participant's vehicle is done at a participant's own risk.

In the Event of an Emergency

In the event of emergencies, judgments must be made by Earthwatch field staff and participants. While Earthwatch makes an effort to ensure that qualified people make the most informed decisions possible, occasionally first aid may be administered and other immediate steps taken by expedition participants who are not licensed medical providers.

Each Earthwatch expedition has safety protocols and emergency procedures in place. Earthwatch encourages team members (the field staff and participants) to exercise their best judgment with regard to their own safety and the safety of other team members. Other participants may perform "Good Samaritan" actions, or actions taken to assist fellow participants during emergency situations in the field. However, Earthwatch does not encourage or expect you to jeopardize your own safety or that of others in attempting to rescue or assist your fellow team members.

Right of Refusal

Earthwatch reserves the right to refuse an applicant's participation on Earthwatch projects at any time and to terminate any work being done by a participant and require the participant to vacate the project site if any of the Earthwatch Expedition Team in his or her absolute discretion considers it appropriate. In this event, the participant (and his/ her parent/ guardian, if appropriate) will be responsible for arranging and paying for any accommodation, travel or other arrangements which may be necessary following the termination of a participant's involvement in a project, for whatever reason and may not be eligible for a refund.

Earthwatch and the project staff may not refuse a participant for discriminatory reasons (race, religion, ethnicity, national origin, sexual orientation, or any other reason prohibited by applicable law). However, participants may be denied in the interest of team compatibility. Earthwatch will make reasonable efforts to accommodate participants with disabilities and the organization endeavors to find appropriate expeditions for those participants that have physical limitations. Refusal of a participant is an unusual event and is generally due to either an applicant's failure to meet the essential eligibility requirements of a particular project, or in the interest of team compatibility. In the event that an applicant is refused participation for health reasons, Earthwatch will refund in full any deposit or payment made toward the expedition.

Earthwatch scientists have the right to refuse special requests, such as media visits (film, photography or print), special groups or teams (students, donors, etc.), if they conflict with Earthwatch scientist schedules, safety, research objectives or general performance of the team.

Any participant found in violation of any of the policies described in this document ("Earthwatch Institute Policies & Participant Rights and Responsibilities") is subject to removal from the team at their own expense. By signing the Liability Release section of your Earthwatch Participation Form, participants are indicating that they have read and understand the policies in this document. Removal of a participant from a team is at the discretion of the Earthwatch scientist or Field Team Leader and Earthwatch staff. In addition, Earthwatch will support the right of the scientist to send participants away from a project once in the field should their behavior compromise the safety, research objectives or general performance of the team, or if the participant has violated a stated policy. In the event that a minor is dismissed from a project, Earthwatch will contact the participant's parents or legal guardian prior to their dismissal. Should a participant be removed from a team, he or she is responsible for any or all costs associated with departure from the team and will receive no refund of the share of costs of the expedition nor any expenses incurred in participation on the expedition.

Expedition Packing Checklist

Required Items

- ☐ **This Expedition Briefing**
- ☐ **Photocopies of your passport, flight itinerary, and credit cards in case the originals are lost or stolen; the copies should be packed separately from the original documents**
- ☐ **Passport and/or visa (if necessary)**
- ☐ **Certification of vaccination (if necessary)**
- ☐ **Documentation for travel by minors (if necessary)** (see *Volunteers Under 18 Years of Age* in the *Travel Planning* section)

Clothing/Footwear for Fieldwork

Note: Lighter colors, especially yellow, gold, and white, are the best to keep insects away; the worst are black and navy blue. Lighter colors need to be washed more often, but it's worth it!

- ☐ Rubber boots (the taller the better)
- ☐ Hiking boots or sturdy walking shoes (cross-trainers will do)
- ☐ Full rain suit (top and bottom)
- ☐ Hat with wide brim for sun protection
- ☐ Cotton work gloves or light leather ones (neoprene can be good in cold or wet weather, and mittens or insulated gloves can come in handy during cold weather in any season)
- ☐ Windbreaker and pants if you don't want to use rain gear for this purpose
- ☐ Three or four different layers of clothing to deal with the range of temperatures
- ☐ Bug jacket and/or head cover (such as the fine-screened types or the ones on which you put repellent)

Clothing/Footwear for Leisure

- ☐ Be sure to bring your Earthwatch T-shirt and remember to wear it, as appropriate, throughout your expedition
- ☐ One set of clothing to keep clean for end of expedition
- ☐ Clothing and footwear (e.g., sneakers/trainers or slippers) for use indoors

Field Supplies

- ☐ Medium-sized daypack or rucksack
- ☐ Dry bag or plastic sealable bags (good for protecting equipment such as cameras from dust, humidity, and water)
- ☐ Two (2) 1-liter water bottle(s)
- ☐ Whistle
- ☐ Sunglasses
- ☐ Insect repellent (the two kinds that work best and longest are those with high DEET content, such as Deep Woods Off and Repex, and some strong brands of Citronella, though it usually dries the skin)
- ☐ Calamine lotion and possibly antihistamines if you suspect you will react to insect bites

Bedding and Bathing

- ☐ Bedding and towels will be provided.
- ☐

Personal Supplies

- ☐ Personal toiletries (biodegradable soaps and shampoos are encouraged)
- ☐ Antibacterial wipes or lotion (good for "washing" hands while in the field)
- ☐ Personal first aid kit (e.g., anti-diarrhea pills, antibiotics, antiseptic, itch-relief, pain reliever, bandages, blister covers, etc.) and personal medications
- ☐ Sunscreen lotion with SPF 30 or higher

Miscellaneous

- ☐ Spending money
- ☐ Camera, film/memory card(s), interface cables, extra camera battery, battery charger, and a flash drive (≥4 GB) or external hard drive (USB) for exchanging pictures
- ☐

Optional Items

- ☐ Flashlight or headlamp with extra batteries and extra bulb
- ☐ Earplugs
- ☐ Binoculars
- ☐ Field guides
- ☐ Bike helmet for free-time mountain biking
- ☐ Blank CD or DVD or flash drive (≥ 4 GB) or external hard drive (USB) for sharing digital photographs at the end of the expedition
- ☐ Books, games, journal, art supplies, etc. for recreational/rest time and travel

***Note**: Required and Optional Items lists are accurate to the best of Earthwatch's knowledge at the time of publication.*

Our Mission

Earthwatch engages people worldwide in scientific field research and education to promote the understanding and action necessary for a sustainable environment.

We believe that achieving a sustainable future requires objective scientific data from the field—and that the scientific process must engage the general public if it is to change the world. To that end, we involve people from all walks of life directly in global field research.

We invite you to join us.

Earthwatch Institute
114 Western Avenue
Boston, MA 02134 USA
info@earthwatch.org
www.earthwatch.org
Toll-free: +1 (800) 776-0188
Phone: +1 (978) 461-0081
Fax: +1 (978) 461-2332

Earthwatch (Europe)
Mayfield House
256 Banbury Road
Oxford
OX2 7DE
UNITED KINGDOM
info@earthwatch.org.uk
www.earthwatch.org/europe
Phone: +44 (0) 1865-318-838
Fax: +44 (0) 1865-311-383

Earthwatch (Australia)
126 Bank Street
South Melbourne
VIC 3205
AUSTRALIA
earth@earthwatch.org
www.earthwatch.org/australia
Phone: +61 (0) 3-9682-6828
Fax: +61 (0) 3-9686-3652

Earthwatch (Japan)
Sanbancho TY Plaza 5F
Sanbancho 24-25, Chiyoda-ku,
Tokyo 102-0075 JAPAN
info@earthwatch.jp
www.earthwatch.jp
Phone: +81-(0)3-3511-3360
Fax: +81-(0)3-3511-3364

An international nonprofit organization founded in Boston, Massachusetts in 1971