

PAVILION LAKE, B.C. FIELD EXCURSION JULY 2008

Participant Information Package

Hi Pavilion Gang!

Hope that this finds you all enjoying the summer and doing well! This package provides logistical information for the June 21-July11, 2008 Pavilion Lake excursion.

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Introduction

Welcome to the 2008 Pavilion Lake Research Project field season!

2008 Dates: Saturday, June 21st – Friday, July 11th.

- DeepWorker (DW) operations: June 22-July 3
- Media Open House & Spaceward Bound Day: June 27
- Community Day Presentation: TBD
- Science Operations: July 5-10th

Dive Logistics Overview

We can expect to be conducting approximately 2 DW dives per sub per day at Pavilion Lake for science and exploration purposes. During the science session, we can expect to be in the water for up to 2 SCUBA dives per day as needed. We intend to visit some nearby lakes (e.g. Kelly, Pear, etc) for similar science and exploration activities.

General Logistics

A working schedule of the three weeks will be sent out once all information has been submitted. We will discuss specific day-by-day logistics once we have all gathered at the lake.

Shipping to UBC

Packages must arrive at UBC by end of day on **Monday, June 16th** in order to be transported to Pavilion Lake.

ATTN: Dr. Bernard Laval, Department of Civil Engineering, University of British Columbia, 6250 Applied Science Lane, Vancouver, BC, Canada, V6T 1Z4, Phone + (604) 822 2204

(Shipping labels are available through the PLRP website – log in required; be sure to change sender information on label).

Travel Information

The closest airport to Pavilion Lake is located in Kamloops (YKA), BC, and accessible via Calgary, AB or Vancouver, BC

Contact Information

Darlene (dlim@mail.arc.nasa.gov; 650-604-0098)

Donnie Reid (Donnie Reid reidd@vanaqua.org)

Bernard (blaval@civil.ubc.ca; 604-822-2204)

Looking forward to seeing you all up at Pavilion Lake! Safe travels this summer!

2008 Field Team Member List

Please refer to separate document titled "Team 2008" that will be sent by May 30, 2008

Website Information

www.pavilionlake.com

Our website is currently under renovations, but will be up and running by June 21, 2008. Stand by for more soon!

Lodging & Contact Information

We will be staying at five different residences at Pavilion Lake, with DW operations centered at the Brock residence, science operations being centered at Mickey & Linda Macri's home, and meals being held at the Brock residence. House and bed allocations can be found in the Team 2008 document, however we will have someone show you to your house and room when you get on site. Most participants will be housed indoors, while a few will be tenting.

Our contact information while at Pavilion Lake is as follows:

- (1) Linda and Mickey Macri: # 78 Smith Road, Pavilion Lake, B.C., Canada; Phone: 250-256-4560, Fax: 250-256-4545.
Please feel free to share this emergency contact information as needed. Outgoing calls are not recommended from this phone. Please place all outgoing calls from the Brock, Blackstock or Hermitage residence phones.
- (2) Brock residence: # 22 Smith Road, Pavilion Lake, B.C., Canada. Phone is for outgoing use only with calling card.
- (3) Blackstock/Levis Residence: # 591 Smith Road, Pavilion Lake, B.C., Canada. Phone is for outgoing use only with calling card. Space for tenting is reserved at this property if you prefer.
- (4) "The Hermitage": Smith & Stanley Road, E., B.C., Canada. Phone is for outgoing use only with calling card.
- (5) Petroski Residence: 120 Smith Road, B.C., Canada. Phone is for outgoing use only with calling card.

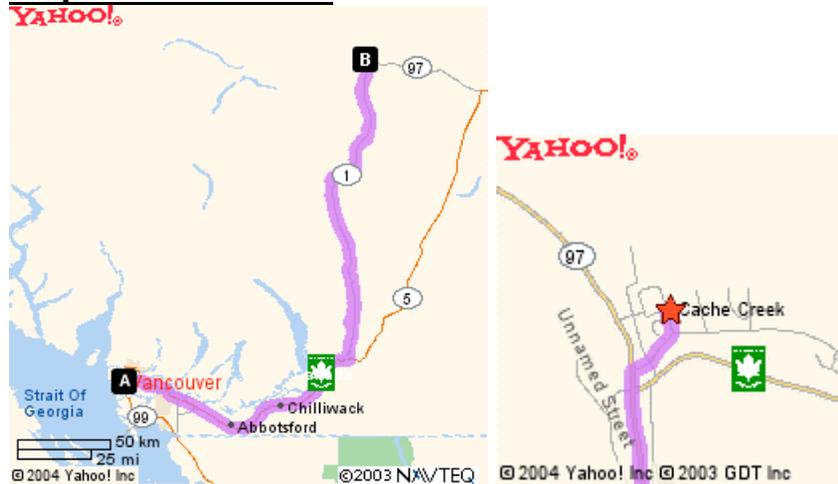
Lake Safety Requirements

All participants without exception will be required to pass the following safety and logistical check-outs prior to commencing work with PLRP during the 2008 season:

- 1) Science Diver Course (see information provided separately by Donnie Reid)
- 2) Boat Safety
- 3) Land Safety (Hiking, Driving, etc)
- 4) House Rules (Cleaning, Eating, Quiet Times, etc)

A board will be posted where all participants and visitors will be required to sign in and out, and list their activities throughout the day.

Maps & Directions



Starting from Vancouver, Arriving Cache Creek – Approx. travel time 4 hours 56 mins (Yahoo Maps)



Starting from Calgary, Arriving Cache Creek – Approx. travel time 6 hours 43 mins (Yahoo Maps)

To Pavilion Lake from Cache Creek: Go north on Highway 97 roughly 16km to Highway 99 turn left (that is at the Hat Creek Ranch). Follow Highway 99, 32km roughly south past the Marble Canyon Campground then 8km to Pavilion Lake. Past the Sky Blue resort 1.5km and turn left on to Smith Road. Turn into #78 Smith Road for Linda/Mickey Macri's place.

PLRP Field Support and Protocols

Cooking, Cleaning & Property Management:

Given that the PLRP field station is a privately owned property, due respect must be given to the family, their home and their boat at all times. Each participant is expected to help clean and maintain all aspects of the property throughout the duration of the field campaigns. All equipment and gear must also be neatly stowed at all times, and soiled shoes and garments removed prior to entering the house. Dive gear will be left outside to dry, and the use of the clothes dryer will be possible with owner permission.

The Macri basement will be set aside as a dry lab area. A wet lab will be set up outside on the main lawn.

Communications available:

- Continuous high-speed internet access *via* a Wireless LAN¹ is available.
- A landline phone is located at the private rental properties, however it is to be used for emergency purposes only. Private calls are to be kept to a minimum. Internet/email is recommended for private communications. Long distance calling cards will be available for use.

Power available:

- Continuous AC/DC 110 V/12 V power for laptop computers, other electronics and equipment.

General equipment and facilities available:

- Wireless high-speed Internet capability is provided throughout the property, which is available to all visiting scientists.
- There is dedicated fridge and freezer space for the storage of samples while in the field.
- Part of our living quarters has been designated as lab facilities where researchers can organize gear, set up science equipment, and conduct field analyses such as microscopy.
- Pontoon/dive boat will be available for access to Pavilion Lake.
- Basic power tools, standard hand tools, etc available. There are two hardware stores in nearby Ashcroft and Lillooet townships, which can be accessed should any further tools be needed.
- Portable depth sounder
- Digital camera
- AC Power Pack (for boat operation of laptops)
- Handheld GPS (PLEASE USE UTM SETTINGS)

¹ Users must bring their own wireless Ethernet equipped laptop computer.

- Safety radios
- Canoe
- YSI Handheld for *in situ* environmental assessment
- SCUBA equipment and support
 - All SCUBA equipment is rented from an outfitter in Vancouver, and will be transported to the site for the participants.
 - Dry Suits, Weights, Masks, Fins, Gloves, Boots, and other dive related equipment necessary for safe and efficient science and exploration diving of Pavilion Lake will be rented according to each participants' needs
 - Participants are encouraged to bring their own dive gear if they are already in possession of such items as a wet/dry suit, gloves, hood, etc.
 - Tanks and weights will also be provided. A compressor will be available for use only by a designated individual.
 - SCUBA and Dive Boat Safety Officers will be on hand during all dives
 - An Emergency O₂ DAN kit and trained operators will be onboard the dive boat.
- Environmental monitoring equipment – most of the following equipment will be in use at Pavilion Lake for year-round environmental data collection. Data will be available to all PLRP users. If deemed of interest to the PLRP, some equipment could also be installed in other near-by lakes.
 - Hobo Water Temp Pro recording thermometers
 - RBR TR-1050 recording thermometers (high resolution)
 - SBE19plus CTD profiler with Licor LI-193SA quantum spherical sensor
 - Li-Cor LI-193SA Spherical Quantum Sensor
 - Underwater Cables
 - Weather Station
 - Secchi Disk
- A Zeiss stereomicroscope is also available for use at the lake.

Site-specific sensitivities:

Ts'kw'aylaxw and Pavilion Lake community: Our project has only been possible with the assistance and approval of the community of Pavilion Lake, the Ts'kw'aylaxw people, and the B.C. Ministry of Water, Land and Air Protection (now called BC Ministry of Environment). As such, it is imperative that all participants are aware of these entities and respectful of the relationships the PLRP has developed which make possible our research at this site. The PLRP has established a website to provide public access and information to our research activities, and to encourage communication with the First Nations and non First Nation communities of Pavilion Lake and surrounding areas.

Media: Media interest that requires access to the field site will require prior approval. Media open house day is June 27. No media will be allowed on site prior to this date due to safety and operational concerns.

Environment: Pavilion Lake is part of the Marble Canyon B.C. Provincial Park system, and as such permission must be granted by B.C. Ministry of Water, Air and Land Protection (now called BC Ministry of Environment). Any intentions to collect samples must be discussed with Darlene and Bernard. Anyone proceeding into the field must carry a copy of the BC Parks permit with them at all time. Divers must exercise caution while in the water so as to not unnecessarily disturb the structures. Finally, research boats during field campaigns will be limited to those rented by the PLRP.

Permits and licences:

Pavilion Lake is part of the Marble Canyon B.C. Provincial Park system, and as such permission must be granted by the B.C. Ministry of Water, Air and Land Protection (now called BC Ministry of Environment). Permission to conduct science at Pavilion Lake has been obtained by the primary logistics provider. For more information on the Approved Management Direction Statement for Pavilion Lake, Marble Canyon Provincial Park, please go to:

http://wlapwww.gov.bc.ca/bcparks/planning/mgmtplns/marble_cyn/pavilion_mds.htm

The Management Direction Statement issued by the B. C. Ministry of Water, Land and Air Protection Environmental Stewardship Division details the strategic management direction specific to the Pavilion Lake portion of Marble Canyon Provincial Park. This document outlines the scientific, recreational and community interest rationale for the protection and management of Pavilion Lake. Furthermore, the zoning system developed for Pavilion Lake is also described in this document. Briefly, there are two zones: (1) Natural Environment, and (2) Special Features. The zones capture the lake surface, water column and bottom environments, inclusive of the carbonate structures. As such, any science or recreational sampling within Pavilion Lake requires a B.C. Park Use Permit.

Two scientific study sites have been designated by the PLRP along transects located in the central basin of Pavilion Lake (Three Poles (TP) and Willow Point (WP)). Science equipment and experiments have been deployed along a set transect at both TP and WP ranging from 7m to 24m in depth. Recreational diving is not permitted in these areas to avoid any tampering with scientific equipment or experiments as stated in the Special Features zoning rules for the lake. Other monitoring equipment has also been deployed in the north and south basins of Pavilion Lake, as well as in Kelly Lake.

Personal Gear Suggestions:

- Toiletries (soap, towel)
- Pillow
- Flashlight/head lamp
- Personal First aid kit (Field first aid kits will be on hand)
- Sunscreen
- Bug spray
- Sunglasses
- Rubber boots
- Camera
- Laptop (hi-speed wireless access is available)
- Swim suit, goggles (Surface temp of lake will be around 20°C)
- Warm weather clothing (shorts, t-shirts, etc)
- Sweater, cool weather clothes - temperatures will range between 15°C-25°C (60°F-80°F)
- Rain gear
- Hat

Safety – On Land and In the Water

On Land:

**In all cases, should a participant choose to leave the research station, they are required to notify one of the support staff or project PIs and provide an estimated return time, if appropriate.

Hiking

Hiking alone is not permitted. All participants must plan to conduct any scientific exploration/mapping activities on land in pairs, at minimum. Proper footwear is recommended (i.e. hiking boots). All excursion leaders must file a departure time, location plan, and estimated time of arrival back at the research station, with one of the support staff or project PIs prior to leaving the research station. Each team must take along the following:

- First Aid Kit
- Handheld Radio(s)
- Provisions (Food, Water)
- Bear Protection
- Sun Protection
- Handheld GPS

Hikers must also consult the project PIs to ensure that their planned destination(s) do not include Crown or private land areas.

Driving

PLRP vehicles will be driven by designated personnel only.

In the Water

PAVILION LAKE RESEARCH PROJECT DIVING PROGRAM – REQUIREMENTS

All personnel intending to use diving as a tool under the auspices of the PLRP must go through the Science Diver training program with the Diving Officer prior to commencing diving operations.

Prior to commencing PLRP scientific diving activities, the candidate must fulfil the following entry requirements:

- (a) The applicant shall be at least nineteen (19) years of age.
- (b) Possess a nationally recognised SCUBA certification (such as ACUC, BSAC, CMAS, PADI, SDI, SSI, NAUI).
- (c) Have completed and submitted, to the Diving Officer
 - i. Diver Registration Form
 - ii. Proof of Diver Training and Experience
 - iii. Diving Medical Approval Form
 - iv. CAUS Level 1 Exam
- (d) Completed an Open Water Skills Evaluation
- (e) Possess DAN Medical Insurance (<http://www.diversalertnetwork.org/>)

Submission of these documents is part of the initial registration process, and does not automatically result in authorization to dive at the PLRP. Diver competency must first be established.

Age Requirement

The applicant for training and certification within the PLRP Diving Program shall be at least nineteen (19) years of age.

Diver Registration Form

All applicants must complete the Diver Registration Form and submit it to the Diving Officer, prior to commencing any diving operations.

Proof of Diver Training and Experience

As part of the application process, all prospective scientific divers shall submit, to the Diving Officer, any original diver training certification cards, as well as their personal diving logbook(s). The Diving Officer shall produce copies to keep within

the diver's personal file. The Diving Officer can request proof of additional experience in keeping with the applicants proposed diving activity or establish criteria for additional experience

Diving Medical Examination and Approval

Every PLRP diver shall have on file with the Diving Officer a current medical history form.

Diving Medical Renewal

The required diving medical history form shall be:

- i. Renewed every two (2) years;
- ii. Renewed more frequently than required by (i) if clinically indicated, and
- iii. Re-evaluated by a physician knowledgeable and competent in diving medicine if the diver is subjected to an event or has a physical condition which may affect the diver's medical status.

Non-Scientific Diving Operations for PLRP

This program does NOT apply to any occupational diving operations, such as those performed as part of a commercial diving contract with the PLRP. Such contracts shall fall outside the auspices of the PLRP and hence, shall be required to meet the regulations of the Workers' Compensation Board of British Columbia Occupational Health and Safety Regulations (Part 24) or other relevant regulations and/or criteria established by the PLRP Diving Officer or designate.

Diving Officer

The PLRP shall appoint a Diving Officer to supervise and administer the PLRP Diving Safety Programme.

Duties

The Diving Officer shall:

- Act as the operational authority and administrator of the PLRP diving programme; and
- Be responsible for all aspects of the programme including but not limited to:
 - i. Diver authorisation, training and competency;
 - ii. Equipment Inventory and maintenance;
 - iii. Maintenance of diving records;

iv. General conditions of operational health and safety in the diving programme;

Authority

The Diving Officer shall have authority to restrict, prohibit or suspend any diving operation, programme, or practice, which he/she considers unwise, or unsafe.

Training

The Diving Officer must:

- Be a “Teaching Status” Open Water SCUBA Instructor (or higher) with an internationally recognised SCUBA training agency;
- Have at least 200 logged dives and 100 hours bottom time, including at least 25 dives deeper than 20 meters;
- Must show evidence of training (workshop, courses, etc.) or at least 6 logged dives showing experience in the planning and use of each of the specific skills and/or equipment to be utilised;
- Be currently certified in First Aid (WCB Occupational First Aid Level 1 or equivalent) and CPR, and trained in oxygen administration; and
- Have planned and supervised at least 5 simulated diver rescue scenarios, encompassing all aspects of diver rescue including:
 - i. Site management and accident prevention;
 - ii. Self rescue skills;
 - iii. Diver rescue skills at the surface;
 - iv. Diver rescue skills underwater;
 - v. Missing diver procedures;
 - vi. Recognition and treatment of diving related injuries;
 - vii. Accident management and evacuation procedures; and
 - viii. Accident and incident reporting.

Depth Restrictions

PLRP divers can dive to a maximum depth as specified by the Diving Officer appropriate to their training and experience. But in no instance shall a PLRP Diver be authorized to dive deeper than 110ft/33.5m unless specific authorization by the Diving Officer has been granted.

Disclaimer

The Pavilion Lake Research Project, its officers, directors or appointees shall not be liable for any injury (fatal or otherwise), loss or damage sustained either directly by the PLRP Diving Program including loss or damage resulting from negligence. Each PLRP personnel engaged in diving operations (both surface support and diver) shall do so on a strictly voluntary basis and shall assume all risks, consequences and potential liability for his/her own actions.

The Pavilion Lake Research Project, its officers, directors or appointees, including property owners Mickey and Linda Macri, shall not be liable for any injury (fatal or otherwise), loss or damage sustained directly by the PLRP including loss or damage resulting from negligence. Each PLRP personnel engaged in any science or field activities shall do so on a strictly voluntary basis and shall assume all risks, consequences and potential liability for his/her own actions.

General Science Goals

PLRP Science Objectives:

The PLRP is a NASA-UBC led multi-disciplinary initiative (see <http://supercritical.civil.ubc.ca/~pavilion/> for more information). Project members have been conducting science and exploration activities in the Pavilion Lake region since 2004. The overarching goal of this research is to develop an understanding of the mechanisms of formation of the unique microbialites in the lake and the potential for associated biosignatures. This understanding will contribute to astrobiology research by providing the basis for interpretation of similar organo-sedimentary structures either on early earth (e.g. stromatolites) or potentially on other planets. The following is a list of the on-going PLRP science objectives:

1. General Limnology of Pavilion Lake and surrounding water bodies
 - Chemical and Physical characteristics
 - Stable Isotopic (C, O, H) characterization; carbon-sources; groundwater-provenance
 - Water budget and balance
2. Microbial influence on carbonate formation
 - Isotopic tracers of inorganic and organic carbon sources
 - Microscopy and molecular characterization
3. Microbialite mapping
 - Lateral and Vertical variability
 - Correlation with environmental factors (e.g. groundwater inputs, light)
4. Contextual comparison to other microbialite/carbonate rich lakes.
5. Determine the spectral (visible to thermal infrared) and erosional properties of the carbonates.

DEEPWORKER SCIENCE PLANS:

Justification for use of DeepWorkers to meet PLRP science goals:

- SONAR suggests lake bottom is covered in microbialites, however, ground-truthing of sonar imaging data from Pavilion Lake has not been accomplished, as such, the extent and variability of deepwater microbialites is not yet known.
- Further, the inability to directly access deepwater microbialites means that very limited information has been obtained on their morphology, relationship to environmental factors (e.g. temperature, light, water geochemistry) and chemical/isotopic characteristics. Understanding these variations is fundamental to understanding the mechanisms and timing of microbialite formation.
- The deep regions of Pavilion Lake are too large and deep to explore and sample efficiently and safely using conventional SCUBA, and remote (SONAR) data provide limited interpretation.
- Solution:

DeepWorker submersibles will help PLRP members reach our science goals by using an exploration mechanism consistent with the following requirements for exploring pristine, vulnerable, astrobiologically relevant environments:

1. Safety
2. Environmental Stewardship
3. Relevant Science
4. Advancing Human Exploration

DeepWorker deployment in Pavilion Lake will directly support PLRP Science Objectives 2 and 3.

Photos



Pavilion Lake



Macri House – Pavilion Lake



Macri Pontoon Boat



Cook Pontoon Boat