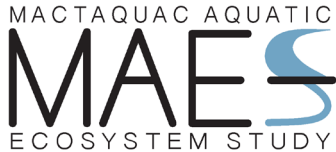


# **Maquac Aquatic Ecosystem Study Report Series 2016-30**



## **Field Safety and Best Practices**

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Canadian  
Rivers Institute



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**DISCLAIMER**

Intended use and technical limitations of the report, “Field Safety and Best Practices”. This report describes the MAES project’s field safety policies, standard operating procedures and best practices. The CRI doesn’t assume liability for any use of the included information outside the stated scope.

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## Introduction

The Canadian Rivers Institute (CRI) was founded in 2000 as a collaboration of researchers at the University of New Brunswick (UNB) at both the Fredericton and Saint John Campuses. The mandate of the CRI is to develop the aquatic science needed to understand, protect, and sustain water resources for the region, nation and the planet. The objective is to build a network of researchers with common interests in aquatic science across universities, government, and industry. The CRI uses a multidisciplinary and cross-sector approach to focus its research on societal demands for water resources while addressing the challenges of sustaining healthy aquatic ecosystems.

The Mactaquac Generating Station is a 672 MW run of the river hydroelectric facility constructed in 1968 on the Saint John River, New Brunswick and is operated by NB Power. The facility is expected to reach the end of its service life by 2030 when the powerhouse and spillway will no longer be viable because of an alkali-aggregate reaction with the concrete. NB Power has identified future options that include repowering the station with a new powerhouse and spillway, rebuilding the spillway only or removing the entire station and returning the river to its natural state. To help make an informed, science based decision for the preferred option, NB Power has engaged the CRI to conduct a large multidisciplinary aquatic ecosystem study to support their decision making process.

The Mactaquac Aquatic Ecosystem Study (MAES) is a planned, whole-river ecosystem study and manipulation. It begins with a multi-year assessment of the structure and function of a large river ecosystem, followed by a manipulation of flow, sediment load, and thermal regime with consequential effects on the ecosystem, and then a multi-year period to monitor the recovery to a new river state.

The purpose of this manual is to familiarize staff and students working with the Mactaquac Aquatic Ecosystem Study with proper procedures for conducting work in both a standardized and safe manner. While this manual provides an overview of tasks, standard operating procedures, and safety procedures, the team member is ultimately responsible for their own safety and well-being. If you feel, at any time, that something is unsafe, you're uncomfortable performing a task, or feel you haven't received sufficient training, **stop** and let someone know. You will never be expected to perform a task that is unsafe or outside your skillset.

## Health and Safety Orientation and Member Training Requirements

As part of the Mactaquac Aquatic Ecosystem Study, team members, be they staff, graduate students or summer students, must receive adequate training and orientation to perform their duties in a safe and effective manner. Not all members will be actively involved in all aspects of the project and, as such, may not require all of the training outlined below.

## Training Requirements

**WHIMIS/OHS** – All new employees and students are required to participate in the Biology Department's Workplace Hazardous Materials Information System training. All employees and students are to be given a tour of the facilities, at which time, all safety and emergency equipment

will be identified. These should include; emergency evacuation routes, first aid kits, fire extinguishers, MSDS sheets, spill kits, emergency showers, and eye washes.

**Pleasure Craft Operator Card** - all employees and students that will be in control of (driving) a boat are required by Transport Canada to hold a Pleasure Craft Operator Card. Once obtained this card must be carried with you while boating and must be presented if requested by an enforcement officer.

**First Aid/CPR** – all employees and students are required to have up to date Workplace Standard First Aid with CPR level C and AED which meets the regulations of WorkSafe NB. WorkSafe NB also requires that those holding existing Workplace Standard First Aid certification have 6 hours of practice each year and that certifications (i.e. the full course) be repeated every 3 years.

**Swiftwater Rescue Training** – Swiftwater programs are designed for those working in and around moving water environments. Employees and students that will be working in and around moving water environments may be required, at the discretion of their supervisors, to participate in swiftwater rescue training.

**Trucks/Boats/Trailers** – all employees and students are to be instructed on proper operation of trucks, boats, and trailering. This training will include; vehicle walk around procedures, proper trailer hook up, securing the boat to the trailer, launching boats, outboard motor operation and trouble shooting. All employees and students are required to have a valid driver's license to operate University owned, leased and rented vehicles as well as a Pleasure Craft Operators Card to operate powered boats.

**Field/Lab Equipment** - all employees and students are to be instructed on the proper and safe use of equipment used in the lab or field research.

**Electrofishing** – all employees and students are required to complete electrofishing training prior to operating electrofishing equipment. This requirement does not extend to others on the crew (i.e. dip netters), but is preferred. The leader of an electrofishing crew will give instruction will review safe operating procedures and techniques for all crew members before starting. All safety requirements related to electrofishing will be observed and those electrofishing will be provided with necessary safety equipment (i.e. non-breathable waders, appropriate electrofishing gloves, etc.).

**Animal User Training** - This session will introduce attendees to Animal Care practices at UNB. The presenter(s) will discuss what is reviewable by the Animal Care Committee (ACC) and how to go about submitting an application. Although this seminar is directed toward Postdoctoral Fellows and Graduate Students, anyone who plans on conducting any research involving animals should attend.

## General Guidelines and Best Practices

The following section outlines general guidelines for various tasks that may be performed during your tenure as a team member with MAES.

## Field Trip Planning and Check in Procedure

The purpose of this section is to outline proper field trip planning and check in procedures and responsibilities. Planning is an important part of field safety as well as productive field outings. By taking the time to prepare ahead of time most problems can be avoided. Proper planning also includes familiarizing yourself with the equipment you will be using before heading out and

planning for eventualities. The following outlines the responsibilities of certain members in planning and completing field work.

### Crew Leader

- Enter field plan into MAES calendar (in advance as possible).
- Be sure to notify personnel assisting with the fieldwork (in advance as possible).
- Sign out appropriate field vehicles for the dates required (i.e., truck, boat etc...)
- Be sure all required field gear is available and in good working order. If at all possible ensure that all field gear is gathered prior to the planned field work day. Being prepared eliminates delays and helps ensure that necessary equipment and materials aren't forgotten, increasing productivity in the field.
- Confirm field details with supervisor; who, what, where, departure time and expected time of return (i.e., email, text, phone etc...).
- Gather general safety gear.
- Upon returning from the field, the crew leader is to contact the designated check in person, and update their status.
- If the field trip is extended or running late, the check in person is to be notified as soon as possible.

### Check in person

- One person, not in the field, will be designated as the check in contact. The person designated as the check in person MUST be part of the MAES team to ensure proper communication. The designated person will be agreed upon by all parties conducting field work during the weekly meeting.
- This responsibility will be shared over the course of the field season by supervisors and technicians.
- The check in person must be available to take and respond to field crew updates (i.e. not in meetings, etc.).
- This person will receive notification of the field crew's return and confirm receipt.
- Should something happen, the check-in person is responsible for coordinating with the field crew and assisting with a timely and appropriate solution to the issue.

### Field Crew Check-in Procedure

The field crew and the designated check-in person should arrange a check-in procedure prior to departure for field activities. Check-in procedures are designed as a failsafe should something happen and you are unable to call for help. Check-in procedures should include timing and frequency of check-ins (e.g. leaving and returning, hourly, etc.) and the number of check-ins should be proportional to the hazards associated with the task, i.e. more hazardous tasks require more frequent check-ins. Both the field crew and the check-in person should agree to the mode of communication (e.g. text message, phone call, SPOT message) and the check-in person should confirm receipt of the check-in. The check-in procedure should also include what to do if a check-in is missed and the amount of time to wait before taking action. The check-in person should be aware of the location where the field crew will be so that they know where to look if something happens. They should also be aware of anticipated time of return, which should be updated with the check-in person if plans change throughout the day.

An example check-in procedure for a day on the water, in summer low flows, near town:

- Check-in with departure time, destination, and anticipated time of return (can be updated later if needed)
- Check-in when putting on the water
- Check-in at lunch time, with update if appropriate
- Check-in when taking off the water
- Check-in arrived back at Campus
- Missed check-in or failure to return on time, check-in person attempts contact, no response within 1 hour mobilizes search

An example check-in procedure for a day on the water, in spring flows, away from town:

- Check-in with departure time, destination, and anticipated time of return (can be updated later if needed)
- Hourly check in while on the water, with update if appropriate
- Check-in when taking off the water
- Check-in arrived back at Campus
- Missed check-in or failure to return on time, check-in person attempts contact, no response within 30 minutes mobilizes search

### Field Organization Board

- The field organization board is a large magnetic dry erase board located outside Dr. Allen Curry's office in Bailey Hall, UNB (room 139)
  - The field organization board has fields for filling out crew members, location, departure and return times, as well for designating which vehicles and equipment are to be used.
  - The crew leader is responsible for filling out a row on the field organization board
  - Should plans deviate from what was indicated on the field organization board the check in person should be contacted and made aware of the changes; if possible, the check in person should update the board to reflect the changes or see that someone does
  - Upon returning from the field the field crew leader should update the board to indicate that the crew has returned safely and should also contact the check in person to notify them
- The field organization board is not a sign-out board!** This board is intended to inform others of where and when, and with what, others are during field work (especially your supervisors) and does not replace prior planning or coordinating with others.

### Labs

- 2 labs will be used primarily over the summer; 169 (Allen's lab) and 109 (Charlene's lab)
- If anything is used from 169, ensure it is replaced in the same location, cleaned and dry
- Do not take anything from 109, this is a space we have been allowed to use, but none of the equipment in the lab is ours.
- Both labs must be kept clean, no one likes to work in a messy lab, so be respectful of others and clean up after yourself.
- Any chemicals used must be stored properly once you're done with them.



### Key Locker

- All truck keys are located in the upper right hand locker across from the field sign out board during the summer. Once classes restart in the fall they will be moved elsewhere, ask a technician.
- A set of building keys are also kept in the locker, a CD1 key (Outside doors and Aquaculture Wing), EJ2 key (Allen's Lab, rm 169), EJ3 key (Student Offices, rm 229) and CG3 key (Ecology Lab, rm 109)
- If you take a set of keys, return them as soon as possible when you're done with them so that they're there if someone else needs them.
- If you've taken a set of keys make sure to update the field sign out board so that others know who has the keys should they be needed

### Compound

- The compound is located at the Hugh John Flemming Forestry Center
- All boats and large field equipment is stored in the compound
- The compound is to be kept tidy and neat, nobody likes to work in a mess, particularly someone elses

### Working Alone

Working alone is defined as the performance of any work by an individual who is not directly supervised by another person, i.e. not within audible or visual range of another individual. If work must be completed alone, a second employee or student should be in the area and available to provide immediate aid and/or summon additional emergency assistance. Alternatively, a designated individual shall be notified prior to beginning and upon completion of any work involving hazards. Alternate means of communication should be available to individuals working alone (e.g. portable radio, cell phone, satellite messenger). In all circumstances working alone should be avoided.

### Personal Conduct and Ethics

As a member of the MAES team you are representing MAES and the University of New Brunswick whenever you work off campus. Therefore, it is important to conduct yourself appropriately and be respectful and courteous to others while driving, boating, interacting with the public, etc. This includes being respectful of property as well (i.e. asking permission to cross or access property for any reason). In general, being respectful and courteous to others will ensure they are respectful and courteous to you in return. Members of the public are sometimes curious; if possible, take the time to talk with them about what you're doing. That said, if they ask a question that either you don't know the answer to, or ask about something that isn't public knowledge, just tell them you don't know, do not make something up.

## Standard Safety Equipment

Standard safety equipment should be available to crews at all times, the composition of which reflects the nature of the tasks at hand and the environment in which they are working. Standard safety equipment is also a function of the vehicle(s) the crew is traveling in.

- All trucks will be outfitted with a NB *Occupational Health and Safety sanctioned* first aid kit (N.B. Kit No. 1), which is assigned to that truck and must remain with that truck and/or the crew that is using that truck. The first aid kit is to be taken along when away from the truck (i.e. on a boat) and returned to the truck upon return. If something is used from the kits be sure to replace it upon your return to ensure the kits remain complete should they be needed.
- All trucks and trailers should have a spare tire of the appropriate size, should a flat occur. The spare tire should be in good condition and should be properly inflated (See vehicle walk around procedure).
- Trucks should be equipped with a 3-way lug wrench for changing tires, this is in addition to the standard wrench that comes with the truck. Boat and utility trailer lug nuts are often a different size and the larger aftermarket wrench often provides better leverage.
- All boats are required to have a boating safety kit that meets the guidelines set forth by Transport Canada for that type of vessel (see page XX). Boating safety kits are to stay with the boat they are assigned to and at no point should they be removed. Furthermore, the equipment contained in the safety kits are only to be used in the event of an emergency and should be kept in the watertight container until they are needed. This ensures that safety equipment is kept in good working order and is dependable should an emergency occur. Safety equipment also includes paddles and/or oars which are to remain with the boat they are assigned to.
- Personal Floatation Devices (or life jackets) are to be used and each crew member on the boat is required to have one. While you are not required by law to wear it at all times while on the boat it is a MAES policy that all students and employees wear a PDF while boating. PFDs should also be appropriately sized for each individual and be worn properly to ensure they function as they should. In cold and/or fast moving water floater coats or survival suits may be more appropriate than regular PFDs.

## Working near the Mactaquac Generating Station

NB Power and the MAES team have developed 5 zones in the area downstream of the MGS. The zoned area is subject to potentially rapid changes in flow and water levels due to hydropeaking at the MGS, making working in this area potentially hazardous. To ensure the safety of members working in the area, a policy has been put in place to ensure proper contact between the NB Power control room staff at the MGS and MAES members.



**Figure 1. Safety zones related to working in the vicinity of the Mactaquac Generating Station (MGS) as part of the Mactaquac Aquatic Ecosystem Study (MAES)**

**Zone 1:** A no-go zone. The zone extends 200 linear meters in front of the MGS powerhouse and entry to this area is strictly prohibited under all circumstances and at all times. The area is affected by heavy turbulence from the turbine units, and even when seemingly calm, the area presents a hazardous area to which no entry is allowed.

**Zones 2 and 3:** The zones situated in the proximity of main spillway gates (Zone 2) and Diversion Sluiceways (Zone 3) are not to be entered until appropriate safety measures have been put into place and may not be possible at all times. The procedure entering either Zone 2 or 3 will involve the following steps:

- 1) Mr. Scott Dixon ([SDixon@nbpower.com](mailto:SDixon@nbpower.com)) is to be contacted by email at least 2 working days prior to planned work in Zones 2 or 3. This is necessary so that arrangements can be made with NB Power operations, and the feasibility of the work at the proposed time can be assessed. The entry to Zones 2 and 3 will always involve feasibility assessment that will depend on predicted weather and ultimately, predicted flow patterns at the dam at the time of the proposed work. It may be possible that the work will be denied at the proposed time if NB Power determines that the spillway/sluiceway gates cannot be locked up at the proposed time.
- 2) If the proposed time for work at Zones 2 and/or 3 seem feasible due to the predicted weather and flow patterns, then a Work Authorization Permit (WAP) will be drafted at MGS



prior to starting the work. WAP process will involve describing the work in written format with Mr. Scott Dixon (or a designate appointed by him) and the Team Leader undertaking the work on behalf of CRI and signing the WAP by both parties. This will ensure the spillway/sluceway gates will be locked and cannot physically be opened until the WAP has been signed again after the planned work has been completed.

3) After WAP is put in place, the safety procedure will follow the guidelines as described for the Zone 4 below.

4) Upon completing the work, the WAP must be signed off again by the CRI Team Leader and the NB Power designate allowing the locking off the spillgates/sluceway gates to be lifted.

It is to be noted that working in Zones 2 or 3 is generally only feasible during time periods when relatively little flow is expected at the MGS as the procedure involves locking down the spillway gates. As such the options for working in Zones 2 or 3 remain limited.

**Zone 4:** Zone 4 is divided to two separate parts (4A and 4B). The Zone 4A is upstream of overhead power lines that are immediately upstream of the Mactaquac Biodiversity Facility (fish hatchery) extending up to the red line indicated on the above map (a perpendicular line across the river starting at the corner of the parking lot at the MGS). Zone 4B is the area upstream from the red line indicated on the map but excluding Zones 1 to 3. Anyone working in these zones must first report to the control room to pick up a 2-way radio and inform the control room of work plans. A NB Power tailgate safety briefing form is to be filled and reviewed by the CRI team that is to work in Zone 4 prior to starting the work. The MGS control room will have to be notified by the 2-way radio when entering the Zone 4A and 4B for work, either from land or by boat (an example: Hello, this is CRI team Leader Mr. X. We are entering the Zone 4A by boat from downstream and intend to work in the area below the earthen dam. I will inform you when reaching zone 4B). When entering the Zone 4B (upstream of the red line behind power house), the person in charge should always contact the control room again using the two way radio to indicate their entering this location and again when leaving this location. Communication using 2-way radio should be used if significantly changing location within the Zone 4B; the intent is to keep the control room informed of the whereabouts of CRI crew in the immediate MGS vicinity (i.e Zone 4B). Control room is also to be notified when leaving the Zone 4 after work is complete. Radios and tailgate forms will be returned to the control room once work is completed.

**Zone 5:** Zone upstream of the McKinnley Ferry boat launch, extending upriver to the downstream limit of Zone 4. Access to this area requires a phone call to the control room (Mactaquac Non-Emergency: 506-462-3811) to inform them of your intentions **before** entering the zone. A second phone call to inform the control room that work is completed is also required so that they know you have left the area.

The outlines of Zones 1 to 5 will be uploaded to the MAES GPS and Lowrance Sonar units so that crews working in the vicinity of the MGS are aware of their whereabouts relative to the different Zones.

### **Personal Clothing and Personal Protective Equipment**

Appropriate clothing will depend on the conditions and safety requirements. Where risk to head, eyes, ears and toes exist proper CSA approved hard hats, safety glasses, hearing protection and steel toe boots are required as appropriate. If working in areas where hunters may be active

during hunting season blaze orange safety vests and hats that are visible in all directions are to be worn. If handling chemicals proper safety equipment such as goggles and gloves are required as appropriate. For certain activities such as setting nets loose fitting clothing or jewelry should be avoided as these could become caught during deployment and lead to a dangerous situation. Dressing in layers allows you to add or remove clothing as conditions change throughout the day, allowing you to regulate temperature and stay comfortable. It is a good idea to bring rain gear with you every day, rain and spray are a regular occurrence during field work.

## Purchases, Personal Reimbursements and Travel Claims

Occasionally, field supplies, meals, equipment, etc. will need to be purchased. The following are best practices for making purchases and receiving reimbursement. Following these will make everyone's lives easier, including yours.

### Gas Cards and Receipts

Each CRI owned or leased vehicle should have a gas card in the glove box or center console. Only gas may be purchased on these cards and only at Irving gas stations. When using the card, tell the attendant you're using a commercial card and swipe as you would a debit card. When prompted for a driver number enter "2 2 0 2", and when prompted for mileage enter "0". Make sure you get a receipt from the attendant that has the liters of gas purchased on it (either a "liter receipt" or a "detailed receipt"). Sometimes when paying at the pump the machine does not provide a receipt. In these cases, go inside and ask the attendant for one. All receipts should have the name of the project and the initials of the purchaser on the top of the receipt. At the end of the week these receipts are to be sorted by date and by project and delivered to Marni Turnbull in the main office in an envelope with the truck license plate number on it.

### Purchase Orders

There are 2 types of purchase orders: standing purchase orders and purchase orders. MAES has a standing purchase order (or house account) at Canadian Tire on Smythe Street. Purchases made on the standing P.O. are charged to MAES directly; however, UNB requires a matching receipt for every purchase in order for Canadian Tire to be paid. All receipts must be taken to Marni in the main Biology office ASAP.

Purchase orders may be obtained in order to pay for items at other locations (e.g. scientific supply company). Purchase orders require a quote from the company to be submitted along with the order form. Purchases over \$2000 require 3 quotes from different companies unless it is an item only available at that location or it is being purchased to match existing equipment. Be sure to include shipping (if applicable). Purchase order forms are to be taken to Melanie Lawson in the main Biology office.

### Personal Reimbursement

For smaller items you may wish to purchase on a personal card and receive reimbursement. This is done through the UNB "Personal Reimbursement Form". Receipts are required for purchases and multiple purchases can be placed on one form; however, if purchases are for multiple projects it is preferable to complete multiple forms. Completed forms must be signed by a supervisor and taken to the main Biology office. The personal reimbursement process is relatively slow (usually 3 weeks or more), so if you cannot afford to have your money tied up for that length of time a Purchase Order may be preferred. **Gas does not go on a personal reimbursement form!**

[http://www.unb.ca/financialservices/resources/pdf/accounts-payable/forms/personal\\_reimbursement\\_form.pdf](http://www.unb.ca/financialservices/resources/pdf/accounts-payable/forms/personal_reimbursement_form.pdf)

### Travel Expenses

If you find it necessary to purchase gas at a non-Irving gas station, you must pay with your own personal debit or credit card. Make sure you get a detailed receipt from the attendant and save it yourself. To receive reimbursement you must fill out a UNB “Travel Expense Claim Form” and have it signed by your supervisor. These are available online at:

[http://www.unb.ca/financialservices/resources/pdf/accounts-payable/forms/travel\\_expense\\_claim\\_form.pdf](http://www.unb.ca/financialservices/resources/pdf/accounts-payable/forms/travel_expense_claim_form.pdf)

For extended travel you may be eligible to claim travel expenses (i.e. meals, fuel, accommodations, etc.). Travel Expense Claim Forms may only incorporate one trip, and groups traveling together should submit all forms together. It is MAES policy that local day trips do not qualify for reimbursement for meals, only longer trips. As a general rule of thumb, if you could pack it for yourself or eat before you leave or when you get home, they don’t qualify. If you’re unsure, ask your supervisor.

### Vehicle Operation

Personnel operating a passenger vehicle must have a valid driver’s license for that vehicle. While operating a passenger vehicle it is expected that personnel adhere to the rules and regulations pursuant to the New Brunswick Motor Vehicle Act. Personnel are solely responsible for all motor vehicle or parking infractions incurred while operating the vehicle. Personnel operating a boat are expected to follow the safe boating regulations set forth by Transport Canada. Personnel operating a boat are solely responsible for infractions incurred while in control of a vessel. Any fines will be paid by the operator of the vehicle, and must be reported to a supervisor.

### Passenger Vehicles

The purpose of this section is to outline best practices regarding the operation of vehicles (i.e. trucks, boats, etc.) for university business.

#### *Passenger vehicles*

The University of New Brunswick has a single automobile insurance policy that covers all licensed university owned vehicles. This coverage includes UNB students, post-doctoral fellows, employees, officers and directors. There are no restrictions regarding the age of the driver; however, they must have a driver’s license that is valid in Canada. Volunteers and non-UNB personnel are **not** covered to drive UNB owned or leased vehicles.

New Brunswick has passed distracted driving laws intended to reduce accidents and fatalities associated with the use of handheld devices. Distraction is defined by the Canadian Council of Motor Transportation Administrators (CCMTA) as “the diversion of attention from driving, as a result of the driver focusing on a non-driving object, activity, event, or person. This distraction reduces awareness, decision-making, or performance leading to increased risk of driver-error, near-crashes, or crashes. The diversion of attention is not attributable to a medical condition, alcohol/drug use and/or fatigue.”

Under the distracted driving law to cannot make or take telephone calls when driving unless the phone is hands free or single touch. If there is an emergency, you can call 911. **Under no circumstances is texting allowed.** MP3 or other devices can be plugged in while you drive and you can listen (not with headphones); however you cannot touch them (i.e. to change the song, etc.) You are permitted to look at the screen of your GPS, but you cannot program or handle it. Display screens are fine as long as they are built into your vehicle, otherwise they cannot be in your view. The use of two way radios is acceptable only if you are driving for a commercial purpose or driving a commercial vehicle, involved in an emergency operation, or search and rescue. Drivers who violate the law can be fined a minimum of \$172.50 and 3 points from their driver's license. Distracted driving while under control of university vehicles will not be tolerated.

### *Pre-Departure Check List*

Prior to leaving with a vehicle, personnel should take the time to walk around and inspect the vehicle inspecting the following:

#### *Outside vehicle*

- Tires – check for tires that look under pressure, if unsure, check with tire pressure gauge. Tire pressure requirements can be located inside the door near the latching mechanism.
- Inspect body and windshield for damage.
- Check the vehicle registration and motor vehicle inspection for expiration. If expired, remedy prior to leaving.
- Check the status of the spare tire and be familiar with how to retrieve it
- Make sure that the lights, blinkers, windshield wipers are in good working order.

#### *Inside vehicle*

- Check for the current registration and insurance cards are present.
- Check for the standard equipment for changing a tire (i.e., jack, tire iron etc...), which should be located under the back seat.
- Check for first aid kit.
- Make all necessary seat and mirror adjustments prior to leaving.

#### *Trailers and Boats*

- Check the vehicle registration and motor vehicle inspection for expiration. If expired, remedy prior to leaving.
- Tires – check for tires that look under pressure, if unsure, check with tire pressure gauge.
- Make sure the spare tire is with the trailer and in good condition.
- Check that the trailer tongue is properly attached to the truck hitch (be sure to have the right size ball). Be sure to attach the safety chains (crossed to form an X) and insert the locking pin.
- Check that the signal, brake, and running lights are in good working order.
- Make sure all required boat safety equipment is present as outlined in the safe boating section (Page XX).

Note: If your vehicle becomes stuck, avoid spinning the tires. Get out and put branches or rocks (or a device made especially for the purpose) under the tires and shift into 4 wheel drive. You might be able to get out by backing back and forth several times, but you might also become more stuck. Stand clear of the vehicle; sticks and things placed under the tires are liable to fly out from under the spinning wheels. Make sure everyone is out of the way

before pulling out. Come-alongs and winches are also useful to help you get unstuck, but be very careful around the ropes or cables when they are under tension, these could break and lash back causing injury. Wear gloves when handling cables as they can be frayed and cut your hands. If all else fails contact someone to help get you out, spinning your tires will only get you more stuck. The best policy is not to get stuck in the first place; if it is questionable, don't make the call from the driver's seat. Get out and have a good look before proceeding. The best advice is to keep the truck in 2 wheel drive, if you get stuck then you can usually use 4 wheel drive to get out; if you get stuck in 4 wheel drive, you're really stuck.

### **Vehicle Maintenance**

If damage to a vehicle (i.e. trucks and boats) or trailer is observed, or safety equipment is missing in a truck or boat, it should be repaired or replaced as appropriate. Under no circumstances is it acceptable to remove safety equipment from another truck or boat, this only passes the problem to another and may create an unsafe condition for others in the event it is needed. If unsure of where to have repairs/maintenance completed or where to purchase necessary safety equipment, ask a supervisor.

The operator(s) of the vehicle are responsible for its condition and maintenance. As the operator of the vehicle, they are most aware of problems should they develop (i.e. shaking, unusual noises, oil life, tire wear, difficulty starting, etc.) In many cases, remedy of small maintenance issues (i.e. getting tires balanced, rotated, oil changed, etc.) can prevent larger issues from developing. Should maintenance issues arise, contact a supervisor. It is not the responsibility of supervisors and technicians to perform vehicle maintenance for you; however, they may help remedy issues and/or help choose appropriate maintenance options.

## **Accidents and Damage Reporting**

### **Accidents and Medical Emergencies**

The following section outlines proper procedures should accidents or medical emergencies occur.

#### **Medical Emergencies**

##### *On Campus*

##### **Employees (includes student employees)**

If an accident occurs that results in personal injury, the employee's immediate supervisor is required to complete the UNB University Accident Report Form. The form must be completed for all accidents, regardless of severity. The form will be signed by the employee's Department Head and copies will be forwarded to the Security Office, the Environmental Health and Safety (EHS) Office and the Budget Office within 24 hours of the accident. In the case of a serious accident or trauma the Security Office should be contacted by phone (Fredericton: 506-453-4830) as soon as possible. The Security Office will inform the Associate Vice-President of Human Resources, who will inform the President and the Director of Development as is appropriate.



### Non-employees (e.g. students and visitors)

If an accident occurs which results in the injury of a student or other non-employee, the person in charge of the area where the accident occurred will complete the UNB University Accident Report and forward copies to the Security, Safety and Budget Offices within 24 hours of the accident. In the case of serious injury or trauma the Security office should be contacted by phone (Fredericton: 506-453-4830) as soon as possible. Security will then inform the Director of Student Affairs, who will inform the President and the Director of Development and Public Relations as appropriate.

**Note:** Any injury which involves fatality, loss of limb, occupational disease, admission to hospital; or any accidental explosion, exposure to a biological agent (chemical or physical), whether or not injury has occurred, is required to be reported by the administrative head of the department to the Safety Office, as well as to the Chief Compliance Officer, N.B. Workplace Health Safety & Compensation Commission (WHSCC) within 24 hours of occurrence at (506) 453-2467 or 1-800-442-9776 after regular office hours.

### *Off Campus*

If a medical emergency occurs off campus and the injury is severe, stop work and call 911 immediately. Contact the designated check-in person to notify them of the emergency. If the emergency is not severe contact the designated check-in person immediately and seek appropriate medical attention. For minor injuries treat the victim or seek appropriate medical attention (i.e. outpatients, removal from field activities, etc.). Use common sense and best judgment to assess the severity of an injury and always air on the side of caution.

### Near Miss

A near miss is an incident where an individual could have sustained serious injury or where corrective action should be taken to prevent another incident of the same type should be reported to your supervisor. An Internal Accident Report must be completed by the individual and signed by the department head. Copies must be distributed to Security, Environmental Health and Safety and the Budget Office within 24 hours of occurrence. The UNB Internal Accident Report Form is available in all departmental offices or from Environmental Health and Safety.

### Motor Vehicle Accidents (University owned or leased vehicles)

Each vehicle insured on the UNB insurance policy is issued a small plastic folder that contains the insurance card and the motor vehicle registration. Instructions on what to do in the case of an accident are attached to the inside of this folder. In the event of an accident or damage to a vehicle **do not admit liability or discuss any settlement**. Procedures involving accidents and/or damage are different depending on if they occur on or off campus and are outlined below.

### *On Campus*

In the event of an accident on campus notify the Security Office by phone immediately (UNBF: 453-4830, UNBSJ: 648-5675). If there are injuries call 911 immediately. You are required to notify Risk Management within 24 hours of the accident. Furthermore, a "Vehicle Damage Report" must be requested from Risk Management and submitted within 48 hours of the accident.

### *Off Campus*

In the event of an off campus accident call 911 immediately. If possible exchange driver, vehicle and insurance information immediately, as well as the names of any witnesses, passengers etc.

As with an on campus accident you are required to notify Risk Management within 24 hours of the accident and the “Vehicle Damage Report” must be requested from and submitted to Risk Management within 48 hours of the accident.

### Rental Vehicles

Vehicles which are rented or leased for less than 31 days are not covered under the university owned vehicle insurance policy, but instead under a policy that covers both liability and vehicle damage for vehicles rented in Canada and the United States. As with UNB owned vehicles, volunteers and non-UNB personnel are not covered under this policy. While UNB's non-owned vehicle policy does not have age restrictions for drivers, the rental agency's insurance may. For rentals the rental company's liability coverage is primary EXCEPT when the driver is excluded by the rental company's insurance policy (e.g. under 25 years of age). No insurance card is issued for rental vehicles unless requested from Risk Management.

Whenever possible rentals should be performed through UNB purchase orders or paid for using an American Express Corporate Card (for those that have one). The UNB insurance policy states that coverage applies only to vehicles rented for university business, and the purchase order provides proof of this, allowing the university's liability coverage to be triggered should the rental agency's insurance policy be insufficient to cover the claim in the event of an accident. If the rental agency requires proof of insurance contact Risk Management and they will assist in providing the appropriate proof of insurance.

Whenever possible, do NOT return a rental vehicle after the rental agency has closed, instead returning it the following morning as soon as they open. A rental agency employee should accompany you to perform a visual inspection of the vehicle before you leave. These recommendations are based on a number of instances when vehicles were damaged after they were returned; however, as there was no proof that the damage occurred after the vehicle was returned, the university was required to cover damages.

If a rental vehicle has been involved in an accident or has sustained damage and the damage is significant or if there are injuries call 911 immediately. If the damage is minor first contact the rental agency and notify them of the damage and then notify Risk Management. As with UNB vehicles you will be required to complete a “Vehicle Damage Report” for the university's insurer as well as any reports required by the rental agency.

### Relevant Contact Information

Financial Services – Risk Management

Trev Gonnason, Director, Risk Management: 458-7831, [trevorg@unb.ca](mailto:trevorg@unb.ca)

Lori Daniels, Risk Management Assistant: 458-7504, [lori.daniels@unb.ca](mailto:lori.daniels@unb.ca)

## Work Environments

### Water

Working safely around water allows team members to not only complete task effectively and reduce down time, but helps ensure that you get to go home at the end of the day. In many cases using common sense and good judgment can minimize hazards associated with working on and

around the water. According to the Transport Canada Safe Boating Guide, roughly 150 people die every year in boating accidents, and tragically most of those were preventable. Like taking a driver's education course to learn the rules of the road, taking a boating safety course and obtaining a Pleasure Craft Operators Card will help you learn the rules of the water, how to identify dangers and what to do in the event of an emergency. By law, anyone operating a powered vessel in Canada must obtain the proper training and certificates (i.e., Pleasure Craft Operators Card or Small Vessel Operators Proficiency), appropriate for that vessel. The operator must be prepared to present it if they are checked on the water by a law enforcement officer.

### **Small Vessel Regulations and Enforcement**

As the owner or person entrusted by the owner, you violate the Small Vessel Regulations if you operate a pleasure craft that does not have the required safety equipment on board or if it is not in good working order. Small Vessel Regulations also prohibit the careless operation of a vessel and regulations are covered by the Canada Shipping Act, Boating Restriction Regulations and the Criminal Code of Canada. Many provinces, including New Brunswick, can ticket offenders on the spot for offences such as disobeying speed limits, careless operation of a vessel, operating without a Pleasure Craft Operators Card or having an insufficient number of approved and appropriately sized flotation devices, etc. Fines for such offenses could cost you over \$200 and you, the operator, are responsible for the offense.

Powered vessels (with outboard motor) less than 6 meters in length (19' 8") require:

- one Canadian-approved personal flotation device or lifejacket of appropriate size for each person on board,
- a buoyant heaving line no less than 15 meters (49' 3") in length,
- One manual propelling device, or anchor with no less than 15 meters (49' 3") of cable, rope or chain in any combination,
- One bailer or one manual water pump with sufficient hose to enable a person to pump the water from the bilge over the side of the boat,
- A watertight flashlight or three Canadian-approved flares of type A, B or C (parachute, multi-star or hand-held)
- A sound signaling device or appliance (e.g. whistle)
- Navigation lights that meet applicable standards set out in the Collision Regulations if the pleasure craft is to be operated after dark or in periods of restricted visibility

Note: Most of the vessels operated by the MAES group fall into this category; however, if the vessel is larger or is to be operated out of sight of navigational marks, additional safety equipment may be required. Furthermore, these requirements are current as of the publication of this document and may be subject to change. For more information and to ensure up to date information, consult [www.boatingsafety.gc.ca](http://www.boatingsafety.gc.ca)

### **Self-Rescue and Swiftwater Work Environments Primer**

The following section is a quick primer to familiarize students and employees with swiftwater safety and is not intended to be a primary source of information or to replace formal swiftwater rescue training.

Working in flowing water environments present additional hazards that aren't always present in standing waters, making flowing water environments a more dynamic work environment. When on or near a river you must be able to assure yourself that you are prepared to be safe, protect

yourself and be able to rescue yourself should the need arise. This includes both sufficient training and equipment to be prepared to do so, as well as to rescue your teammates or assist in their rescue should the need arise. Always put your own rescue above that of others or especially equipment; you won't do anyone any good if you become a victim yourself.

Should something happen and a rescue from moving water is necessary, move through your rescue options from lowest risk to highest risk. This is the risk to you, not others, remember to put yourself first to avoid becoming a victim. Start from the lowest risk option (usually land based) and move upward from there, but do not exceed your fitness or training level. Can you reach with something or throw a line? This is usually the safest option, while wading or rescue swimming techniques are considered more high risk and should only be considered if safer options have failed and the rescuer is trained and familiar with these techniques. Similarly, simple options are faster (e.g. throwing a throw bag) than complex actions that require multiple steps (e.g. setting up pulley systems).

According to the International Rescue Instructors Authority (I.R.I.A.) Swiftwater Operational Code your chances of surviving after being swept away in a swiftwater environment are marginal at best without:

1. Being physically fit
2. Taking an appropriate performance based training and certification course
3. Having practiced and gained experience operating in this environment with
4. the proper equipment
5. Making objective, informed, critical decisions in this swiftwater environment

#### Swiftwater Safety Matrix

1. Assure you are prepared to be safe, to protect yourself, and rescue yourself should the need arise
2. Ensure safe rescue practices for your teammates, and assist in their rescue if able and should the need arise
3. Ensure bystanders/public are controlled and behind the rescue lines
4. Rescue the subject(s) within reasonable rescue options
5. Recover equipment

Note: Sometimes rescues are not possible because they present great danger to yourself. Training and being prepared is important, but good judgment is key. Sometimes not putting yourself in the situation is the best way to ensure that bad days don't happen. If you aren't confident that you'd be able to rescue yourself and your teammates should something happen, you probably shouldn't be there.

#### I.R.I.A's Swiftwater Absolutes

1. Never operate in swiftwater/flood conditions in which you are not prepared to self-rescue.
2. Always wear your Personal Protective Equipment within 5 meters of any swiftwater/flood environment.
3. Always carry a throwbag.
4. Never put your feet down when you are swept away in current.
5. Never tie into a rope system without personal release capability.
6. Always have a constant look around and assess the swiftwater/flood environment before initiating any task.

7. Always have a backup plan.
8. Never tension a line at right angles to the current vector.
9. Never count on the subject to help in their own rescue.
10. Never lose the subject once contact is made.
11. Always apply the swiftwater safety matrix.
12. Always operate within your level of training and within the absolutes.
13. Always be pro-active and recognize and avoid danger.

Debris in moving waters can be dangerous, particularly if the flow is fast and the water is carrying large debris such as large branches or tress etc. This debris could complicate your ability to self-rescue or to rescue others should a crew member be swept away. Debris can also accumulate in slower or recirculating areas creating hazards (e.g. strainers, log jams, brush piles) that can trap someone against or underneath the debris. Working in rivers during times of high debris load should be avoided if possible to reduce potential hazards to field crews. If work is to be conducted during times of high debris load, crews should prepare and be equipped according to the conditions and the hazards they expect to face.

If you are swept away in current, **NEVER** put your feet down, your feet might become trapped in debris or on the bottom (i.e. entrapment) and lead to drowning. Roll onto your back with your feet up and facing downriver, using your arms and body to direct your movement while your feet help you to push off obstacles (e.g. strainers, rocks) if needed. In some situations it may be appropriate to switch to offensive swimming and roll over onto your stomach, especially if it means reaching calm water where you can exit the river (e.g. an eddy).

### Life Jackets and Personal Floatation Devices (PFDs)

Life Jackets and PFDs are the most important piece of gear one can wear in a swiftwater environment. While there is a distinction between life jackets and PFDs the main function is to provide floatation that helps someone that has entered the water to remain on the surface. The primary difference between life jackets and PFDs is that life jackets are designed with the majority of the floatation in the front to keep the user face-up should they be rendered unconscious. Life jackets; however, tend to be very bulky and may impair swimming ability in moving water, reducing the user's ability to avoid obstacles. By contrast, PFDs usually have floatation which does not usually assist in turning the user face up, but offer increased mobility and do not impede self-rescue swimming. The choice of a lifejacket vs. a PFD comes down to operating environment and mobility requirements; however, lifejackets are preferred in most MAES operating areas for their ability to keep an unconscious victim face-up.

### Ice

Working on ice cover presents both the obvious hazards of breaking through the ice, but also risks associated with working outside in the winter. Planning winter field work should not be taken lightly and planning should include travel logistics, check in procedures, personal protective equipment, rescue gear and survival gear. Simple issues (i.e., getting wet) that might be more of an inconvenience in the summer months suddenly become life threatening in the winter months, planning, safety and good judgment all the more important.

### Check in Procedure

Those working on ice should develop a check in procedure in conjunction with a team member (or team members) that is not involved in the field work. This person should be able and willing

to receive and confirm receipt of check-ins on a pre-arranged schedule. Furthermore, this person should be willing and able to mobilize appropriate resources should the field crew fail to check-in by the pre-arranged time or contact that person to notify them of an emergency situation. Check-in procedures might be as simple as notifying the person(s) when going onto and coming off of the ice as well as regular check-ins during the time on the ice (i.e. hourly, bi-hourly, etc.). An additional check-in when the field crew arrives back safely from the day's activities might also be appropriate.

Regardless of the check-in procedure, the check-in person(s) should be informed of the objectives and schedule of the day and both parties should agree on the check-in procedure and procedures to be followed should a check-in be missed. The length of time after a check-in has been missed before the procedures are set in motion should also be discussed. An appropriate mode of communication should also be chosen (i.e. cell phone, satellite messenger for remote areas, radio, etc.).

A check-in procedure might entail checks when going onto the ice and when coming off the ice as well as hourly check-ins on the hour during the time on the ice. The check-in person might attempt to contact the field crew should check-in be missed by 15 minutes to confirm they are ok, with response returning them to the hourly check-in schedule and no response mobilizing a second group to go check on the first. In the event of an emergency the check-in person will aid the field crew in coordinating an appropriate course of action. Depending on the severity of the incident rescue might entail another group going to render aid or contacting professional rescue services (i.e. police, fire, search and rescue, etc.).

### **Personal Protective Equipment (PPE)**

Working on ice requires proper Personal Protective Equipment, and tasks in the winter may require additional PPE than they do in the open water period. Generally, working on the ice includes cold temperatures, and certain modes of transportation may require specific PPE (i.e. snowmobiles).

Working on the ice (as well as working outside in the winter months) requires appropriate clothing to keep warm and dry. Dressing in layers allows one to adjust their clothing to suit the temperatures and activity level as they change throughout the day. These can act not only to keep one comfortable but can also help morale. Ideal clothing choices include a base layer against the skin that transfers moisture away from your body to be absorbed by your middle layer(s), keeping you dry and warm. The middle layers should be warm; multiple middle layers allow you to remove or add depending on the weather and your activity level. The outer layer should be capable of repelling water and blocking the wind, keeping you dry and warm. When working on the ice the outer layer should be a highly visible garment that provides floatation and warmth even when in the water (i.e. survival suit, floater coat, etc.) A warm hat and face protection should also be considered as a large proportion of heat is lost through the head and neck area. Sunglasses help to protect your eyes from the harmful reflection of light off ice and snow on sunny days. Warm, waterproof gloves or mittens keep your hands warm.

PPE that is important should the ice fail include a whistle to call for help and signal others nearby and buoyant heaving rope to assist someone who has fallen through the ice. Ice rescue picks help grip and move along the ice in order to complete self-rescue should the ice fail beneath you. An ice auger, axe or chisel allows you to test the thickness of the ice. Communications devices



(i.e. two-way radios, phones, satellite messengers) allow you to stay in contact with the team as well as call for help should it be needed. Warning devices (i.e. pylons, reflectors, flags, etc.) can be used to warn others of unsafe conditions and danger close areas as well as attract the attention of others in the event of an emergency.

Winter field work involves extra hazards, either on or off the ice, that require equipment should an emergency such as a team member going through the ice, a snowmobile breakdown, etc. which results in a wet and cold individual or the need to survive outside overnight. In the summer months an unprepared night spent outside might be uncomfortable, but an unprepared night outside in the winter might be deadly. If working near civilization within easy walking distance or in good contact with help, should it be needed, being prepared to spend the night outside might not be necessary; however, if the area is remote and/or it is difficult to contact help in the event of an emergency it would be prudent to bring along supplies to make a night spent outside more comfortable.

These items might include shovels to make a shelter, matches to start a fire, lighting to see after dark, sleeping bags or blankets for warmth, emergency food and a method of heating it, a metal pot or mug to melt snow to make drinking water, a first aid kit for injuries, etc. Not only might this equipment come in handy for surviving a night outside, but it would be useful to keep someone who had gone through the ice warm while they were transported out of the field. At a bare minimum, anyone working on the ice should bring additional warm clothes, regardless of the situation.

### **Ice Thickness Guide and Recognizing Hazards**

Working on the ice starts with being able to recognize hazards and knowing how to handle them. When working on the ice the hazards lie not only with the ice, but with the weather as well. Extreme cold also affects your equipment; care should be taken to check user manuals and other available data for minimum operating temperatures to ensure your equipment will be useable in the forecasted temperatures you will be working in. Extreme cold affects the personal safety of you and your coworkers; be aware of signs of frostbite and hypothermia. Exercise good judgment. Eyes and ears are safety tools. Pay attention to what is going on around you.

There are two major types of ice: clear ice which is formed by freezing water and snow ice which is formed when snow that is saturated with water freezes on top of clear ice. Snow ice is not as strong as clear ice. The color of the ice can also give an indication of how strong it is, with clear "blue" ice being the strongest. White opaque ice (snow ice) has a lot of air bubbles in it and its strength is dependent on its density. Grey ice indicates the presence of water from thawing and should be avoided as a load bearing working surface. Snow can provide an insulating blanket over the ice and can cause the ice to freeze very slowly even in cold temperatures. A heavy snow cover before any significant ice cover growth can cause the ice to remain unsafe for work throughout the entire winter. Sudden changes in temperatures should be avoided when choosing times to work on the ice, with ideal conditions being after 2 to 3 days of consistently cold temperatures.

There should be at least 10 cm of good, clear, ice before a single person can walk on it. If you intend to stay in the same place for more than 2 hours the ice should be a minimum of 15 cm thick. Ice thickness can vary a lot, particularly near the shores and snowbanks and around the bends of rivers. If there is open water in your vicinity particular care should be taken.

Before driving any vehicle onto the ice one should be aware of the weight of the vehicle, including fuel, equipment and the people in the vehicle. A snowmobile (i.e. Total Weight < 500 Kg) needs at a minimum 18 cm of clear, good quality ice when moving less than 10 km/h. Faster speeds require even more ice as pressure waves sent through the ice by rapidly moving vehicles can crack the ice. Ice in rivers may be quite variable because of river currents and extreme caution should be taken when working on river ice. If the load is to remain in the same location for more than 2 hours the ice thickness required is increased because the ice sags, leading to cracking that may cause ice failure. The following guide should be used as minimum ice thickness for any work, but particularly for loads in place for more than 2 hours.

**Table 1. Safe working ice thickness for loads in place for between 2 hours and 7 days (from Work Safe Alberta Field Guide to Working Safely on Ice Covers). The values are for good quality ice with little variability in thickness and quality over an area and values should be increased accordingly for ice of lower quality.**

<b>Load Parked or Stationary &gt;2 hours &lt; 7 days</b>	<b>Minimum Ice Thickness</b>
Person standing	15 cm
Snowmobile, rider and gear <500 kg	25 cm
Loaded vehicle 500 to 1000 kg	32 cm
Loaded vehicle 1000 to 2000 kg	41 cm
Loaded vehicle 2000 to 3000 kg	46 cm
¾ ton vehicle (up to 5000 kg)	55 cm

Ice cracks in a variety of ways, with each type being indicative of a different condition and cause for alarm. Dry cracks do not reach through the ice and are caused by the ice bending due to weight or sudden temperature changes. Wet cracks reach through the ice cover, allowing water to reach the surface. While wet cracks are more hazardous, both should be avoided. Radial cracks resemble the spokes on a bicycle wheel while circumferential cracks form a circle around the load and warn that the ice is overloaded and the load might soon break through. If radial or circumferential cracks are observed, leave the area immediately. When circumferential cracks join with radial cracks to form pie shaped wedges the ice has failed and any load that hasn't already broken through will in short order. Leave the area immediately.

Ice thickness can vary greatly over an area, particularly in areas with swifter currents, near the shore or around islands and near springs. Dangerously thin areas in otherwise safe ice can be found in areas with swift currents or inlets or outlets of lakes and reservoirs.

### Self-Rescue in Freezing Water

If you fall through the ice, try not to panic, you have time to save yourself. Upon entering the water your body reacts violently and for about the first minute you'll gasp for air and you'll struggle to control your breathing. Do your best to keep calm and keep your head above water and wait for the initial shock to subside. After about a minute this feeling lessens, after which you have about 10 minutes to get out of the water before your body will no longer have the energy to do so.

Try not to panic and resist the urge to gasp as you might take in water. Slowly tread water or grasp the edge of the ice to keep your head above water and calm yourself down. Use a kick and pull method to get yourself up on the ice: keep your arms on the ice and kick with your feet to



bring your body horizontal and parallel to the ice. Once you're there kick and pull to pull yourself up onto the ice using your ice picks. Do not stand up. Keep your weight spread out and crawl, roll or slide your way to ice that can support your weight.

After about 10 minutes your body will no longer have the energy or strength to pull yourself out. Eventually, generally after about an hour, you will lose consciousness. If your arms are not frozen to the ice you will slip below the water and drown. If you manage to hold on to the ice and freeze yourself there, rescue is still possible after about 2 hours; however, after that your heart will stop from the lowering of your core temperature.

If something happens to you or someone on your team while working on the ice, stop work immediately. Rescue the victim if it is safe for you to do so and provide first aid and CPR as needed. Do not go too close to the area where the victim broke through as you may end up a victim yourself. Instead reach with a long pole, throw a rope, etc. from a safe distance on ice that can support your weight, or preferably (if possible) from shore. Becoming a victim yourself will in no way improve the situation. Once rescued, take steps to prevent hypothermia by changing the victim into dry clothes and keeping them warm with sleeping bags, blankets and warm liquids. Call for help immediately and get the victim to the nearest medical facility as quickly as possible. Mark and close the area where the incident occurred to prevent someone else from straying into the dangerous area.

## References

- Safety Guide for Operations Over Ice – Raven Rescue <http://ravenrescue.com/faqs/safety-guide-for-operations-over-ice>
- Working and Driving on Ice-Covered Water, Government of Canada Labor Program [http://www.labour.gc.ca/eng/health\\_safety/prevention/alerts/ice.shtml](http://www.labour.gc.ca/eng/health_safety/prevention/alerts/ice.shtml)
- Field Guide for Working Safely on Ice Covers, Work Safe Alberta, [http://work.alberta.ca/documents/WHS-PUB\\_sh011.pdf](http://work.alberta.ca/documents/WHS-PUB_sh011.pdf)
- Ice Safety Awareness – A practical guide to Ice Safety, U.S. EPA, <http://www.epa.gov/emergencies/docs/oil/fss/fss09/karellaice.pdf>
- <http://canadianriversinstitute.com/cri/about/>
- <http://canadianriversinstitute.com/research/mactaquac-aquatic-ecosystem-study/>
- [www.boatingsafety.gc.ca](http://www.boatingsafety.gc.ca)
- <http://www.mfri.org/studentzone/pdf/ntgres2132011.pdf>
- Nevada County Sheriff's Search and Rescue Swift Water and Flood Rescue Safety and Awareness: <http://www.ncssar-nc.org/Training/Materials/NCSSAR%20SWIFTWATER%20SAFETY%20COURSE2.pdf>