MERIT BADGE SERIES

WHITEWATER

Scouting America

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"Enhancing our youths' competitive edge through merit badges"

Scouting America

Note to the Counselor

Merit badge counselors are responsible for following the requirements, procedures, and techniques presented in this pamphlet and ensuring that each Scout earning the merit badge is able to demonstrate knowledge and skills at a level consistent with the requirements. In addition, counselors must ensure that all applicable Scouting America safety policies, including Safe Swim Defense and Safety Afloat, are followed during training, practice, and review.

Counselors for the Whitewater merit badge must be registered members of Scouting America, have current training in Safety Afloat, and be approved by the local council advancement committee. Councils with an aquatics committee should utilize that committee to coordinate with the advancement committee for approval of qualified counselors.

All counselors should have formal training in the knowledge and skills indicated by the requirements, experience in teaching such skills to youth, and experience in identifying and managing risks associated with the activities involved. For the Whitewater merit badge, appropriate credentials include American Canoe Association level 3 or higher river kayaking or river canoeing instructor certification. The council advancement committee may approve counselors with similar experience and training in knowledge, skill, safety, and instruction.

35965
ISBN 978-0-8395-3405-1

2024 Printing

Requirements

Always check www.scouting.org for the latest requirements.

1. Do the following:
   a. Explain to your counselor the most likely hazards you may encounter while participating in whitewater activities, including branches and trees in water along a shore and stretching across the stream, rocks, hydraulics over ledges or lowhead dams, strong wind, low water or air temperature, and thunder and lightning storms. Explain what you should do to anticipate, help prevent, mitigate, and respond to these hazards.
   b. Review with your counselor the prevention, symptoms, and first-aid treatment for the following injuries or illnesses that could occur while participating in whitewater activities, including cold-water shock; hypothermia; head, neck, and back injuries; heat-related illnesses; sunburn; dehydration; blisters; bruises; cuts; sprains and strains; shoulder dislocation; and submersion injuries.
   c. Discuss with your counselor the Scouting America Safety Afloat policy and the American Whitewater safety guidelines, including the use of helmets and life jackets.
2. Do the following:
   a. Demonstrate understanding of the following river features by drawing lines to show the flow of water: upstream V, downstream V, riffle, eddy with an eddy line, ledge, river bend, shallows, current at different depths, drop, horizon line, and hydraulic.
   b. Describe how waves form, including standing waves and wave trains.
   c. Explain how to tilt or edge the boat without leaning your body
      (1) When entering and exiting an eddy.
      (2) When ferrying in downstream and upstream directions.
   d. Explain when, why, and how you should scout a river while ashore and while on the river and when you should portage your boat.

3. Before doing requirements 4 through 12, earn the Canoeing merit badge if you will be using a canoe to earn this merit badge. If you will be using a kayak, earn the Kayaking merit badge. Then do the following:

   a. If you will be using a canoe to earn this merit badge, demonstrate strokes and maneuvers from the Canoeing merit badge to the satisfaction of your merit badge counselor.

   OR

   b. If you will be using a kayak to earn this merit badge, demonstrate strokes and maneuvers from the Kayaking merit badge to the satisfaction of your merit badge counselor.

4. Do ONE of the following:

   a. If you are completing these requirements as a tandem canoeist, perform the following on calm water:

      (1) Demonstrate the following strokes in the bow: cross forward, bow draw, cross-bow draw, bow pry, and sculling draw.

      (2) Demonstrate the following strokes in the stern: stern draw, stern pry, sculling draw, and forward with stern pry.

      (3) Demonstrate a high brace, low brace, and a righting pry.

   OR

   b. If you are completing these requirements as a solo canoeist, perform the following on calm water:

      (1) Demonstrate the following strokes: cross forward, bow draw, cross-bow draw, stern draw, pry, stern pry, sculling draw, and forward with stern pry.

      (2) Demonstrate a high brace, low brace, and righting pry.

   OR

   c. If you are completing these requirements as a solo kayaker, perform the following on calm water:

      (1) Demonstrate the following strokes: bow draw, rudder, and sculling draw.

      (2) Demonstrate a high brace and low brace.

5. Do the following:
   a. Explain the International Scale of River Difficulty and apply the scale to the stretch of river approved by your counselor.
   b. Identify the specific characteristics of the river that are factors in your classification according to the International Scale.
   c. Discuss how the level of flow changes a river from one class to another and what effects different flow rates have on the features of a river and its hazards.

6. Explain the importance of communication during every whitewater outing. Demonstrate knowledge and ability to use the following American Whitewater Universal River Signals, both visual and auditory: "Stop," "Are you OK?," "Help/emergency," "Run river right," "Run river left," and "All clear—come ahead."

7. Do ONE of the following:
   a. If completing this merit badge in a canoe, describe the various types of canoes used on moving water and how they differ in design, materials, and purpose.

   OR

   b. If completing this merit badge in a kayak, describe the various types of kayaks used on moving water and explain how they differ in design, materials, and purpose.

8. Review with your counselor the personal and group equipment necessary for a safe whitewater outing and how and why it is used.

9. Demonstrate your ability to read a Class II section of river approved by your counselor. Describe the most desirable paths or lines of travel as well as alternative routes and options. Point out how to use the existing water features to your advantage, and explain how to best avoid the hazards present.

10. Wearing a proper life jacket and being appropriately dressed for the weather and water conditions, perform the following skills in moving water in a properly equipped whitewater craft of your choice (tandem canoe, solo canoe, or solo kayak). If a tandem canoe is used, the skills must be demonstrated from both the bow and stern positions.

a. Launch and land.
b. Paddle forward in a straight line at least 10 boat lengths.
c. Backpaddle in a straight line at least five boat lengths.
d. Ferry upstream from both sides of the river.
e. Ferry downstream from both sides of the river.
f. Eddy turn from both sides of an eddy.
g. Peel out from both sides of an eddy.

11. Explain and demonstrate the following to your counselor:
    a. Self-rescue and procedures when capsized in moving water, including a wet exit if necessary
    b. Proper use of a throw rope to rescue a swimmer in whitewater
    c. Proper technique for receiving a throw rope as a swimmer
    d. Portaging—where portaging would be appropriate, and when and how to do it
    e. The whitewater buddy system using at least three persons and three craft

12. Participate in one or more whitewater trips using either a canoe or kayak on a Class I and/or Class II river. The trip(s) must have as a minimum a total of at least three hours of paddling. For each trip:
    a. Help to prepare a written plan, specifying the route (put-ins and take-outs), schedule, equipment, safety precautions, and emergency procedures.
    b. Determine local rules and obtain permission from landowners and land managers in advance.
    c. Explain what steps have been taken to comply with Scouting America Safety Afloat and the American Whitewater safety guidelines.
    d. Show how to protect personal and group equipment from water and how to load and secure the containers in boats to be used in the trip. Execute the plans with other paddlers.
    e. Explain to your counselor how well your plans worked for each trip taken.

Contents

Safe Fun

Safe whitewater fun demands respect—respect for the river's power, your abilities, and your companions' safety. Canoeing or kayaking safely on whitewater is a matter of developing and practicing your skills and using good judgment. Have a great time and play hard, but play safe.

Scouting America Safety Afloat

When earning any of the aquatic merit badges, it is essential that you follow safety rules and use self-discipline and wise judgment. Tackling your first whitewater adventure will be challenging and rewarding if you understand and follow the nine points of Safety Afloat outlined below. These guidelines were developed to promote boating and boating safety and to set standards for safe unit activity afloat in flatwater or in whitewater.

The complete text of Safety Afloat may be found in the *Guide to Safe Scouting* on the Scouting America website: *www.scouting.org.*

1. QUALIFIED SUPERVISION

All activity afloat must be supervised by a mature and conscientious adult age 21 or older who understands and knowingly accepts responsibility for the well-being and safety of those in his or her care and who is trained in and committed to compliance with the nine points of Scouting America Safety Afloat. That supervisor must be skilled in the safe operation of the craft for the specific activity, knowledgeable in accident prevention, and prepared for emergency situations. If the adult with Safety Afloat training lacks the necessary boat operating and safety skills, then he or she may serve as the supervisor only if assisted by other adults, camp staff personnel, or professional tour guides who have the appropriate skills. Additional leadership is provided in ratios of one trained adult, staff member, or guide per 10 participants. At least one leader must be trained in first aid

including CPR. Any swimming done in conjunction with the activity afloat must be supervised in accordance with Scouting America Safe Swim Defense standards. It is strongly recommended that all units have at least one adult or older youth member currently trained in Scouting America Aquatics Supervision: Paddle Craft Safety to assist in the planning and conduct of all activities afloat.

2. PERSONAL HEALTH REVIEW

A complete health history is required of all participants as evidence of fitness for boating activities. Forms for minors must be signed by a parent or legal guardian. Participants should be asked to relate any recent incidents of illness or injury just prior to the activity. Supervision and protection should be adjusted to anticipate any potential risks associated with individual health conditions. For significant health conditions, the adult supervisor should require an examination by a physician and consult with parent, guardian, or caregiver for appropriate precautions.

3. SWIMMING ABILITY

For activity afloat, those not classified as a swimmer are limited to multiperson craft during outings or float trips on calm water with little likelihood of capsizing or falling overboard. They may operate a fixed-seat rowboat or pedal boat accompanied by a buddy who is a swimmer. They may paddle or ride in a canoe or other paddle craft with an adult swimmer skilled in that craft as a buddy. They may ride as part of a group on a motorboat or sailboat operated by a skilled adult.

4. LIFE JACKETS

Properly fitted U.S. Coast Guard–approved life jackets must be worn by all persons engaged in boating activity (rowing, canoeing, sailing, boardsailing, motorboating, waterskiing, rafting, tubing, and kayaking). Type III life jackets are recommended for general recreational use.

5. BUDDY SYSTEM

All participants in an activity afloat are paired as buddies who are always aware of each other's situation and prepared to sound an alarm and lend assistance immediately when needed. When several craft are used on a float trip, each boat on the

water should have a "buddy boat." All buddy pairs must be accounted for at regular intervals during the activity and checked off the water by the qualified supervisor at the conclusion of the activity. Buddies either ride in the same boat or stay near each other in single-person craft.

6. SKILL PROFICIENCY

Everyone in an activity afloat must have sufficient knowledge and skill to participate safely. Passengers should know how their movement affects boat stability and have a basic understanding of self-rescue. Boat operators must meet government requirements, be able to maintain control of their craft, know how changes in the environment influence that control, and undertake activities only that are within their personal and group capabilities.

- Content of training exercises should be appropriate for the age, size, and experience of the participants, and should cover basic skills on calm water of limited extent before proceeding to advanced skills involving current, waves, high winds or extended distance. At a minimum, instructors for canoes and kayaks should be able to demonstrate the handling and rescue skills required for Scouting America Aquatics Supervision: Paddle Craft Safety. All instructors must have at least one assistant who can recognize and respond appropriately if the instructor's safety is compromised.
- Self-guided unit trips on Class III whitewater may only be done after all participants have received American Canoe Association or equivalent training for the class of water and type of craft involved. Unit trips on whitewater sections of rivers rated Class IV are only allowed in rafts with a professionally trained guide in each raft. Trips above Class IV are not allowed.

7. PLANNING

Proper planning is necessary to ensure a safe, enjoyable exercise afloat. All plans should include a scheduled itinerary, notification of appropriate parties, communication arrangements, contingencies in case of foul weather or equipment failure, and emergency response options.

Preparation. Any boating activity requires access to the proper equipment and transportation of gear and participants to the site. Determine what state and local regulations are applicable. Get permission to use or cross private property. Determine whether personal resources will be used or whether outfitters will supply equipment, food, and shuttle services. Lists of group and personal equipment and supplies must be compiled and checked. Even short trips require selecting a route, checking water levels, and determining alternative pull-out locations. Changes in water level, especially on moving water, may pose significant, variable safety concerns. Obtain current charts and information about the waterway and consult those who have traveled the route recently.

Float Plan. Complete the preparation by writing a detailed itinerary, or float plan, noting put-in and pull-out locations and waypoints, along with the approximate time the group should arrive at each. Travel time should be estimated generously.

Notification. File the float plan with parents, the local council office if traveling on running water, and local authorities if appropriate. Assign a member of the unit committee to alert authorities if prearranged check-ins are overdue. Make sure everyone is promptly notified when the trip is concluded.

Weather. Check the weather forecast just before setting out, and keep an alert weather eye. Anticipate changes and bring all craft ashore when rough weather threatens. Wait at least 30 minutes before resuming activities after the last incidence of thunder or lightning.

Contingencies. Planning must identify possible emergencies and other circumstances that could force a change of plans. Develop alternative plans for each situation. Identify local emergency resources such as EMS systems, sheriff's departments, or ranger stations. Check your primary communication system, and identify backups, such as the nearest residence to a campsite. Cell phones and radios may lose coverage, run out of power, or suffer water damage.

8. EQUIPMENT

All craft must be suitable for the activity, be seaworthy, and float if capsized. All craft and equipment must meet regulatory standards, be properly sized, and be in good repair. Spares, repair materials, and emergency gear must be carried as appropriate.

Life jackets and paddles must be sized to the participants. Properly designed and fitted helmets must be worn when paddling on rivers with rapids rated Class II or higher. Emergency equipment such as throw bags, signal devices, flashlights, heat sources, first-aid kits, radios, and maps must be ready for use. Spare equipment, repair materials, extra food and water, and dry clothes should be appropriate for the activity. All gear should be stowed to prevent loss and water damage. For float trips with multiple craft, the number of craft should be sufficient to carry the party if a boat is disabled, and critical supplies should be divided among the craft.

9. DISCIPLINE

Rules are effective only when followed. All participants should know, understand, and respect the rules and procedures for safe boating activities provided by Safety Afloat guidelines. Applicable rules should be discussed prior to the outing and reviewed for all participants near the boarding area just before the activity afloat begins. People are more likely to follow directions when they know the reasons for rules and procedures. Consistent, impartially applied rules supported by skill and good judgment provide steppingstones to a safe, enjoyable outing.

American Whitewater Safety Guidelines

Whitewater activities present new opportunities for adventure, but they also pose some additional risks that you should understand and take precautions to avoid. The following guidelines, adapted from the American Whitewater Safety Code for Personal Preparedness and Responsibility, are geared especially for Scouting-related whitewater activities and are an excellent supplement to the Safety Afloat guidelines. Together these sets of guidelines will help ensure that your outings will be both safe and enjoyable.

1. BE A COMPETENT SWIMMER.

Being a safe whitewater boater does not require Olympian swimming skills, but you should be comfortable and competent in the water and be able to handle yourself underwater.

2. WEAR A LIFE JACKET.

A properly fitted vest-type life jacket offers back and shoulder protection as well as the flotation needed to swim safely in whitewater.

3. WEAR A SOLID, CORRECTLY FITTED HELMET.

A helmet is essential in kayaks or covered canoes and is recommended for open canoeists using thigh straps and rafters running steep drops.

4. DO NOT BOAT OUT OF CONTROL.

Your skills should be sufficiently developed to enable you to stop or get to shore before reaching danger. Do not enter a rapid unless you are reasonably sure that you can run it safely or swim it without injury.

5. BE AWARE OF RIVER HAZARDS.

Whitewater rivers present many hazards, such as high water or very cold water, strainers (brush or trees in the water), dams, ledges, holes, undercut rocks, or places where broaching (hitting an obstacle broadside) is likely. If you do not think you can boat around a hazard, get out and walk.

6. AVOID BROACHING.

When a boat is pushed sideways against a rock by strong current, it may collapse and wrap. Broaching is especially dangerous to kayak and decked canoe paddlers; these boats will collapse and the combination of indestructible hulls and tight outfitting may create a deadly trap. To avoid broaching, throw your weight downstream toward the rock. This allows the current to slide harmlessly underneath the hull.

7. AVOID BOATING ALONE.

The recommended minimum party is three people in at least two craft.

For more information about whitewater safety and to view the complete American Whitewater Safety Code, visit (with your parent's permission) *www.americanwhitewater.org.*

8. KNOW THE LIMITS OF YOUR BOATING ABILITY.

Do not attempt rivers or rapids that require paddling skills more advanced than you possess.

9. BE IN GOOD PHYSICAL AND MENTAL CONDITION.

Physical and mental skills should be consistent with the difficulties expected. Make adjustments for loss of skills due to age, health, or fitness.

10. BE PRACTICED IN SELF-RESCUE.

Learn and practice self-rescue techniques such as recovering from a capsize.

11. BE TRAINED IN RESCUE SKILLS.

Be able to perform CPR and first aid, including being able to recognize and treat hypothermia.

12. BE SUITABLY EQUIPPED AND PREPARED FOR EMERGENCIES.

- Wear shoes that will protect your feet.
- Carry a throw rope, knife, whistle, and waterproof matches.
- Tie your glasses on.
- Bring duct tape on short runs and a full repair kit on isolated rivers.
- Do not wear bulky clothing that could get waterlogged and hinder your ability to swim.

13. BE RESPONSIBLE FOR YOUR OWN SAFETY.

- Make thoughtful and responsible decisions about whether to participate in a trip.
- Choose appropriate equipment.
- Scout all rapids first and use your best judgment to decide whether to run or portage.
- Evaluate your own and your group's safety on an ongoing basis. Speak with anyone whose actions on the water are dangerous, whether the person is a part of your group or not.

Safety on the Water

Whenever you participate in whitewater activities, you should carry adequate safety equipment and be prepared to help out in a rescue or to perform first aid. You must be aware of safety considerations at all times and be completely alert. Do not go afloat if you are fatigued. Be sure also that your whitewater partner and those in your buddy boats are fully alert, sober, and responsible.

Life Jackets and Whistles

Your life jacket is your most important piece of safety equipment. If you go overboard, the support from your life jacket will allow you to concentrate on righting the boat and getting back underway. In an emergency situation, it might keep an unconscious paddler afloat until help arrives. In short, wearing a properly fitted life jacket helps minimize risk and saves lives.

You should wear a life jacket every time you paddle, whether on a peaceful lake, a slow-moving stream, or a whitewater river. Attach a loud whistle to your life jacket (using a very short cord or lanyard) so that you can sound it instantly, should you need help. Do not, however, tie it to the zipper where currents could catch it and inadvertently open your life jacket.

Make sure your life jacket fits correctly. To check the fit on dry land, put it on and tighten it until it is snug but not uncomfortable. Zip all zippers, buckle all buckles, tie all ties, and clinch up all side straps. Have a buddy stand behind you, grasp the material covering each shoulder, and try to pull it up straight. If the life jacket can be pulled up to ear level, readjust it. You may need to try a different style or size for a better fit. The best test is to check the fit in calm water over your head. Enter the water and relax your body while tilting your head back. Your life jacket should keep your chin well above the water. If it does not, readjust your life jacket, try a different style (one that floats you higher in the water), or use one with a higher buoyancy rating (read the label).

Check over your life jacket every year. Sun, sand, water, and age all take a toll on life jackets. Look for frayed fabric, broken or missing buckles, and poorly functioning zippers. Do not attempt to repair tears or rips in the material. Replace your life jacket if you have any doubt about its integrity or ability to keep you afloat.

U.S. Coast Guard–Approved Life Jackets

The following are brief descriptions of the five U.S. Coast Guard–approved life jackets. For recreational whitewater activities, Type III life jackets generally are worn.

The Type I life jacket is an offshore life jacket that provides enough flotation in the chest, shoulders, and upper back areas to turn most unconscious victims faceup in rough, open water. Type I life jackets are not designed for recreational paddling, but they are suitable for passengers on cruising vessels on large bodies of water.

The Type II life jacket is a near-shore buoyant vest that places all the flotation in the front and around the neck. Shaped like a horse collar and less bulky than Type I life jackets, Type II life jackets may help keep an unconscious victim faceup in calm, inland waters. It will not prevent an unconscious person from floating facedown. Type II life jackets are OK for short periods of recreational boating but are too uncomfortable to use for paddling trips.

Type III life jackets most often are used for water sports such as waterskiing, fishing, kayaking, and canoeing. The Type III life jacket is designed to keep a conscious person floating in a vertical position. It will not prevent an unconscious person from floating facedown. Generally, Type III life jackets have a zipper or buckle closure, and they may include adjustable side straps. They are comfortable and have a similar buoyancy as Type II life jackets.

The Type IV device (a circular ring, ring buoy, or seat cushion with straps used for throwing) is designed to be tossed to a person in the water. A Type IV device should never be used in place of a wearable life jacket.

The Type V life jacket is for special use only. A life jacket designed for commercial whitewater rafting with extra flotation and a buoyant collar is one example of a Type V life jacket. Other Type V life jackets, such as a rescue vest with a quick-release harness built into it, should be used only by someone who has had special training.

Helmets

A helmet is essential for whitewater canoeing and kayaking. A helmet will help protect your head from blows from rocks, paddles, or other boats or boaters. Whitewater helmets come in a variety of shapes and sizes. The helmet should protect your forehead, temple, and back of your head. It should sit no higher than the width of two fingers above your eyebrows to protect the forehead and should cover the ears to protect the temple area.

When sized and fitted properly, the helmet should be snug without any areas where it feels loose but should not be so tight that it feels uncomfortable. Helmets usually come with different size foam inserts that allow the paddler to customize the fit. The chin strap should be adjusted so that the strap cannot be pushed up and over the chin but rather stays under the jaw. There should not be a gap of more than the width of two fingers between the strap and the jaw.

To check the fit, shake your head from side to side and up and down. The helmet should remain in place without any slippage. Then with your fingers, push the front of the helmet up and back. If fitted correctly, the head and helmet will move together as one.

Helmets should always be worn while paddling on rivers that are Class II and above. This is especially important when paddling a kayak with a spray skirt or a canoe with thigh straps. While scouting or standing on shore, helmets should remain on if you are within 10 feet of the water's edge.

Throw-Rope Care. If a throw rope gets wet, hang it between two points until it is dry. Repack the rope in its bag. Store it away from heat and bright sunlight. At least once a season, inspect your throw rope inch by inch. Check that it is uncut, supple, and clean. A friend's life may depend upon it someday.

Throw Ropes

Your life jacket and helmet will help keep you safe should you flip, but an accurately thrown rescue rope can quickly pull you to safety. Throw ropes are soft floating lines approximately 60 to 70 feet in length and 5/16 inch or 3/8 inch in diameter. They often are made of polypropylene, a relatively inexpensive synthetic fiber that is strong enough to haul in swimmers. Polyethylene-based rope also works very well for this purpose, although it is somewhat more costly.

Throw ropes come in a nylon bag with, typically, a disk of closed-cell foam in the bag's end. Because the ropes float, a swimmer can easily grab them. Avoid using nylon ropes because they sink and could become a potential entrapment hazard for other paddlers. (See "Rescue Techniques" for a discussion of how to use a throw rope to rescue swimmers.)

First Aid

Although there is much you can do to avoid accidents and injuries while out on the river, you should always be properly prepared to deal with them should they occur. On every river trip, carry an easily accessible waterproof first-aid kit. The longer your trip and the farther you are from civilization, the more extensive your kit should be. Always take a personal first-aid kit to cover your own needs. On group outings, a patrol first-aid kit should be sufficient. Consult the *First Aid* merit badge pamphlet or the *Fieldbook* for kit contents.

Because whitewater paddling is a physical activity that takes place in the outdoors, participants are at risk for a range of injuries. Following the nine points of Safety Afloat will eliminate any serious risks in whitewater activities, but some minor injuries still might occur. Take appropriate precautions to be prepared for such occurrences.

If either the air or water temperature is below 70 degrees, paddlers should have thermal protection.

Cold Water–Related Illnesses

There are two primary dangers from falling into cold water. Depending on the water temperature, a paddler can experience *cold-water shock*. This can happen in water as warm as 70 degrees. The second danger is *hypothermia*. This is a gradual lowering of the body's core temperature over minutes to hours in water cooler than 80 degrees.

Cold-water shock occurs when a paddler falls into very cold water, especially below 60 degrees. The colder the water, the more rapid the onset and the more severe the effects. The body's response to cold water is involuntary and cannot be controlled by the victim.

The first response is a loss of breath control. Initially the paddler will reflexively take a deep, gasping breath, which is dangerous if the paddler is underwater. Wearing a life jacket could save the paddler's life in this case. Next the paddler will start taking many quick, short breaths—as many as three to

Dehydration can occur at any temperature if a person is sweating profusely and/or not drinking enough liquids. Avoid dehydration by drinking plenty of fluids and eating enough throughout the day. On a hot day, if someone in your group becomes weary or confused, or develops a headache or body aches, have the person rest in the shade and sip water until the symptoms subside.

Earning the First Aid merit badge provides an excellent start in preparing for medical emergencies on land or on the water.

four times the normal rate—as if panting for air. This can make the person light-headed and dizzy and feeling as if he or she is suffocating. It will also prevent the victim from holding his or her breath, which makes normal swimming impossible. These effects on breathing can last for minutes, making self-rescue very difficult.

The paddler's heart rate and blood pressure will go up quickly, increasing the risk of stroke and heart attack. Cold-water shock is also extremely painful with severe pain and cramping of the hands, arms, legs, and feet. However, within minutes, the pain will be replaced by numbness. The brain is also affected, and the paddler may experience fear or panic and be unable to think clearly or follow simple instructions.

In very cold water, the body will quickly reduce blood flow to the muscles of the arms and legs. Without blood, there is a rapid loss of muscle strength and nerve control. This incapacitation can happen very quickly, even in less than a minute. Once paddlers lose the use of their hands, arms, and legs, their ability to self-rescue or cooperate with rescuers is lost.

During the first minute of cold-water shock, the paddler should focus on staying afloat and breathing as normal as possible. In extremely cold water, the paddler will have very little time to perform self-rescue before muscle paralysis sets in, making it impossible to swim or reenter a boat.

The only treatment for cold-water shock is to rapidly remove the paddler from the water. The victim has at most 10 minutes before all of the effects of cold-water shock take effect. Once removed from the water, the victim will need to be treated for hypothermia. Take great care when paddling in very cold waters. The best prevention for cold-water shock and related injuries is to dress appropriately for the weather and stay dry. Use of a wetsuit or dry suit can be lifesaving.

Hypothermia occurs when the body's core temperature falls below the normal range. Exposure to cold, or even cool, water can lower the core temperature dangerously. Early signs of heat loss include bluish lips and shivering, followed by a loss of judgment and the inability to do simple tasks. Further chilling can lead to unconsciousness and, eventually, death.

Treatment for hypothermia involves carefully removing the person from the water, removing wet clothing, and drying him or her. Warm the person by putting warm, dry clothes on him or her and wrapping in blankets. Pay special attention to covering the head, as most heat loss occurs from the head. Warm the per-

son's trunk first, not the hands and feet as this can cause shock. If using hot-water bottles or chemical hot packs, wrap them in cloth; don't apply them directly to the skin. Place the heating sources on the chest, neck, and groin. Avoid rough handling or jerking of the person, especially if the person is lethargic or unconscious. This may cause the heart to develop life-threatening irregular rhythms. If conscious, give the person a warm drink. Avoid caffeine and alcohol. Once the body temperature begins to rise, keep the person dry and wrapped in a warm blanket. Cover the person's head and neck as well. Avoid rapid rewarming as it, too, can induce fatal heart rhythms.

A body temperature at or greater than 106 degrees Fahrenheit is a life-threatening medical condition and requires immediate medical treatment by healthcare professionals.

Heat-Related Illnesses

High temperatures can pose as much of a safety threat as low temperatures. Heat-related illnesses range from having flu-like symptoms to life-threatening hyperthermia. Heat-related illnesses result when the body cannot keep itself cool enough. One way the body can cool itself is by losing heat to either the air or water around it. As the air or water temperature outside the body approaches the body's normal temperature of 98 degrees Fahrenheit, the harder it is for the body to lose heat. When the surrounding temperatures are above normal body temperature, the body will begin to absorb heat. An important way that the body loses heat is through sweating. As the water in sweat evaporates from the skin, the process uses energy and lowers body temperature. However, if a person is dehydrated and cannot sweat or the air is already saturated with water so there is no room in the air for more water, the risks of heat-related illnesses go up dramatically.

If someone feels dizzy, faint, nauseated, or weak; develops a headache or muscle cramps; or looks pale and is sweating heavily, treat for heat exhaustion. Have the person rest in a cool, shady spot. Loosen or remove clothing to promote heat loss. Wet the skin with a damp cloth and then fan to promote cooling through evaporation. Have the victim sip water containing a pinch of table salt; sip water while eating a salty snack; or sip a diluted sports drink. Gently massage and stretch cramped muscles. If the condition worsens, get medical help. Recovery should be rapid but may take up to 24 hours.

Heatstroke can be caused by dehydration (water loss), overexercising, or both when there is a high heat index. The victim may be wet or dry but always will be flushed and hot. The pulse will be extremely rapid, and the person may be disoriented or

unconscious. Cool the victim immediately through immersion with cold packs in the groin area and armpits. Increase the body's fluid level by having a conscious victim sip water. Seek emergency help immediately.

Sunburn is an inflammation of the skin caused by too much exposure to the sun. When sunlight reflects off the water surface, it increases the chance of being burned, so it is especially important for paddlers to cover up, use a waterproof sunscreen with a sun protection factor (SPF) of at least 15 every two hours, and limit exposure time.

Shoulder Dislocations

Shoulder dislocations are one of the most serious injuries associated with whitewater activities. A shoulder becomes dislocated when the ball at the end of the upper arm bone slips out of the socket at the shoulder. This can happen when a paddler attempts a maneuver such as a high brace that involves reaching overhead to gain leverage with the paddle. Any stroke or maneuver in which the arm is fully extended and then rotated rearward so the elbow is behind the shoulder puts the shoulder joint in a vulnerable position. You can reduce the likelihood of such an injury by making sure you keep a slight bend in your elbows and by keeping your grip or upper hand no higher than your forehead.

If someone in your party should suffer a shoulder dislocation, put a sling on the arm and immobilize the area above and below the joint as for a collarbone fracture. Before applying the sling, place a pad between the arm and chest. Do not move the joint or attempt to put the arm bone back in the socket. Take measures to prevent the person from going into shock. Get the victim to medical attention as quickly as possible.

Minor Injuries

Paddlers can get insect bites or stings while afloat or when preparing to launch from the shore. The best strategies for avoiding stings and bites are to use insect repellent and wear long-sleeved shirts and long pants when in buggy areas. For typical insect stings and bites, apply first aid as described in your Scouts BSA handbook. For severe and prolonged pain, or any severe reaction, dizziness, or respiratory distress, get medical help.

Bruises are injuries that cause bleeding under the skin. Applying an ice pack to a bruise will reduce pain and swelling. Minor wounds, such as cuts, should be washed carefully with soap and water and covered with a sterile bandage or dressing to prevent infection. Deeper cuts or puncture wounds may need stitches, antibiotics, and a tetanus shot to prevent infection. For these injuries, visit a doctor as soon as possible.

Blisters form when skin is irritated, usually by friction or heat. A hot spot signals the beginning of a blister. Stop immediately and protect the tender area by cutting a piece of moleskin or molefoam and covering the affected area. If a blister forms, build up several layers of moleskin or molefoam, as needed, to take off the pressure. Blisters are best left unbroken. Treat a broken blister as you would a minor cut.

Cardiopulmonary Resuscitation

Cardiopulmonary resuscitation (CPR) is a procedure used on someone whose breathing and heartbeat have stopped. It is only for extreme emergencies. CPR is required only when someone has no pulse, indicating that the heart has stopped beating. Someone's heart may stop in the event of a heart attack or drowning. CPR includes both chest compressions and rescue breathing (mouth-to-mouth resuscitation). The procedure provides the blood circulation and breathing that could save the victim's life. CPR should not be performed on someone who has a pulse but is simply unconscious. A drowning victim may stop breathing but could still have a pulse. In this case, rescue breathing, not CPR, is the correct procedure to follow.

CPR courses are designed to teach rescuers how to recognize life-threatening conditions and respond appropriately. Check with the American Red Cross, the American Heart Association, and other similar organizations in your area to find out if they offer CPR and other first-aid training. Every river trip should include one or more persons with current CPR training. You need to know CPR before you have to use it.

Reading a River

Before you set foot in your boat, take the time to learn as much as you can about the stretch of river you will be running. Find out about the river's unique features and hazards and identify what class of rapids you will be dealing with. If possible, scout your route to avoid unpleasant and potentially dangerous surprises.

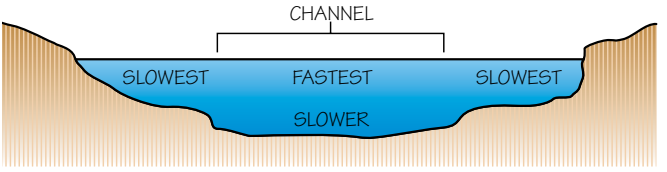
When scouting a river, be sure to wear your helmet.

River Features

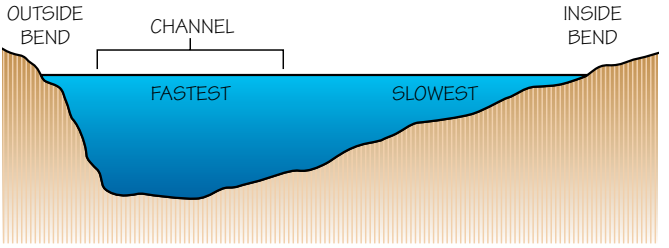
The term *whitewater* refers to a stretch of swiftly moving water that becomes white and foamy as it passes over or around obstacles. A *rapid* is a turbulent, fast-flowing stretch of river that contains obstructions above or below the water. Rapids may feature *drops* in which the water abruptly descends over rocks or a ledge.

Current describes the continuous movement of water in a certain direction. The strength of the current is affected by three things: gradient, flow, and depth. The steeper the gradient (or slope of riverbed) and the higher the volume of flow, the more powerful the current.

Water in a river flows in different layers at different speeds. In straight channels, the layers just beneath the surface and in the middle of the river flow faster than the layers on the bottom or on the sides because there is less friction with the air than there is with the river bottom or banks. As the riverbed widens and the water becomes less deep, the current slows and *shallows* (shallow areas) develop.



Speed of currents in a straight river

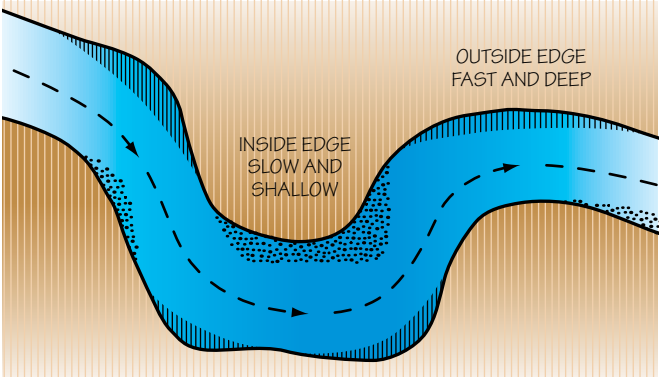


Speed of currents in a river bend

The amount of water flowing downstream changes seasonally, daily, and sometimes hourly. A river's flow is measured in cubic feet per second (CFS).

When a river turns, it forms a *bend.* The strongest, deepest, and fastest current will usually be found on the outside of bends. You usually will find the biggest waves on the outside of the curve, and the smallest waves, called *riffles,* running on the inside. Here the water is the slowest as it passes over sand or gravel bars.

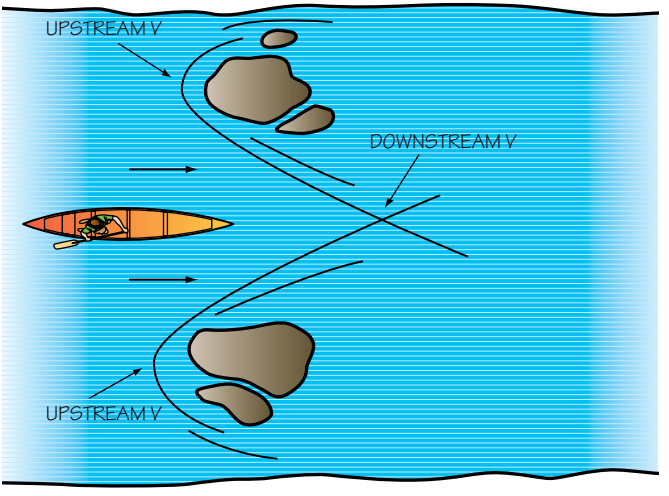
The beds of most whitewater rivers are littered with rocks, but when a paddler talks about *rocks,* he or she usually is referring to rocks jutting above the river's surface. Logs and trees just below the surface are called *sleepers.*



Ledges are rock shelves that extend from the bank into the river or are submerged. A series of ledges can form a stair-step rapid. Big ledges can create *falls,* or a drop where water free-falls at least part of the way. Ledges usually warrant a look-see before running.

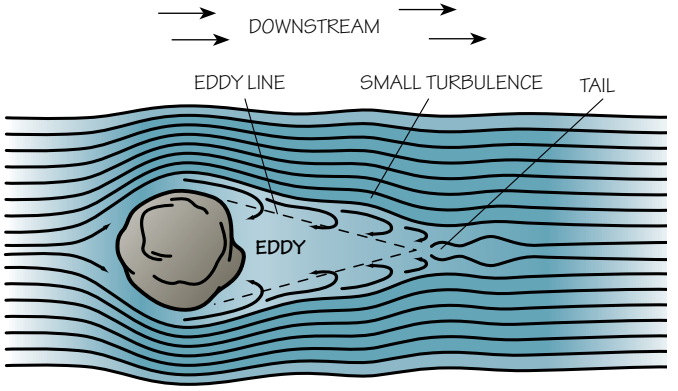
An *upstream V* is formed as water meets an object and flows around it. The point of the V, or apex, starts where the current strikes the object and the wide part of the V forms downstream as water flows around the object on each side.

A *downstream V* forms when current flows between two obstructions, such as midstream rocks or the walls of a narrow canyon. A downstream V's wide end faces upstream and its apex, or narrow end, faces downstream. It is formed from the sides of two upstream V's as the sides intersect downstream. Steep diagonal waves usually define the sides of the V, forcing boaters to the middle of the V, where the fastest current and deepest water are found. Running the downstream V can be the easiest route through a rapid, but huge waves can form at the bottom of the V. These waves can fill a canoe with water or flip a boat. Canoes with flotation bags can minimize the amount of water sloshing about in the boat.



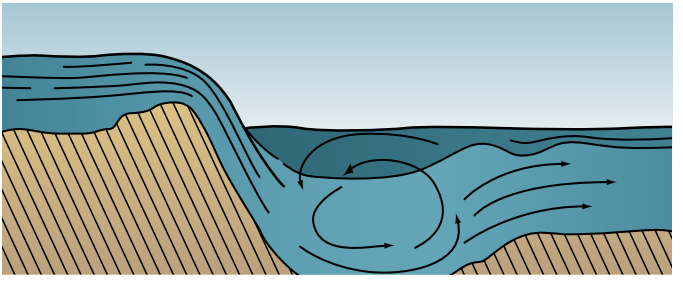
Upstream and Downstream V's

To tell the difference between eddies and holes, remember this: Water flows into eddies and then out again at the surface. Water flows into holes, recirculates for a while, then flows out along the river bottom.



An eddy can form on the downstream side of a boulder.

Eddies are relatively calm waters where the main current reverses its flow. They are found downstream of rocks, bridge pilings, jutting cliff faces, and so forth. As the current flows around a rock or other natural or artificial structure, it parts left and right, leaving a hollow area immediately behind the rock. The water behind the obstacle is lower than the water on either side, so water flows back upstream to fill the hole, running counter to the river's main current. Eddies may be several hundred feet across behind a point of land or as small as a dinner plate behind a rock.



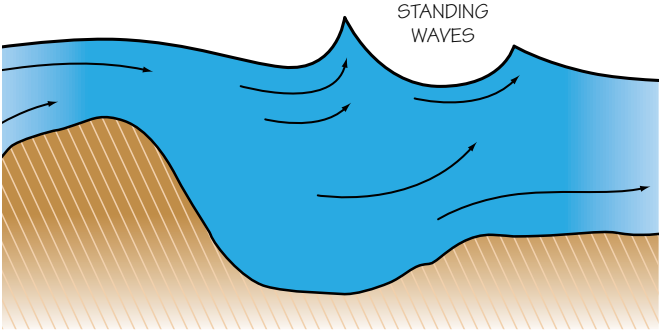
Shallow currents flow over an obstacle to create a hole on the downstream side.

Eddy lines are the often-visible lines where the downstream current rubs up against an eddy's upstream current. This forms a ridge in the water that tapers from high to low the farther downstream you move in the eddy.

Holes are areas behind obstacles where a trough forms, followed by a wave that curls back toward the hole. *Recirculating holes* are extremely dangerous holes that form over an obstruction or following a sudden drop in the riverbed, with most of their water recirculating instead of flowing back into the river downstream of the obstruction. In a recirculating hole, water flows in from all sides and flows out along the river bottom. Recirculating holes usually feature violent, aerated water and powerful tumbling current.

Waves are stationary ridges of water. Sometimes at the bottom of a rapid, waves form a series of standing waves called a *wave train*. This line of waves forms, one wave following another and gradually decreasing in size, until the falling water dissipates its energy.

Standing waves can be fun to ride. You will feel as if the river is standing still and your boat is being raised and lowered like a yo-yo. At other times, standing waves can be steep enough to overturn or fill boats.



Deeper currents flow over the obstacle to form standing waves farther downstream.

River Hazards

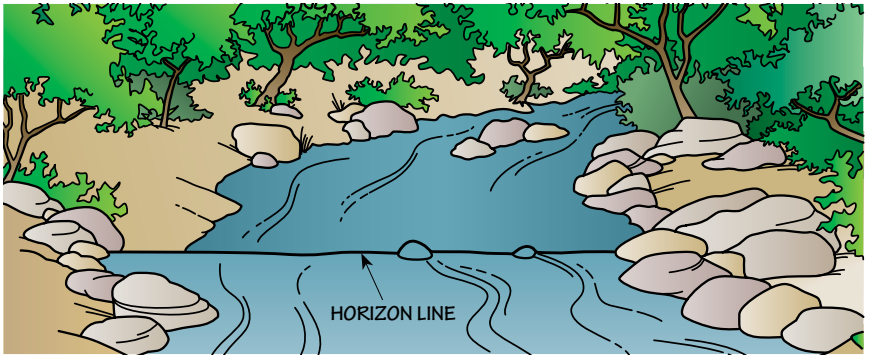
Recirculating holes and riverwide waves can be created by artificial structures such as weirs or low-head dams. *Low-head dams* (usually made of concrete or rock rubble) often stretch from bank to bank, typically without a break for the current to flow through. Instead, the river falls evenly over the structure, forming an often lethal, unbroken wave.

Never run drops formed by low-head dams or weirs. They are aptly called "drowning machines." Their symmetry forms a very dangerous recirculating hole with no defined downstream flow and no opportunity to escape downstream or to the side. Many times they are marked on maps. Identify each one during trip planning and make sure each can be and is safely portaged.

Also be on the lookout when you are out on the water for low-head dams or waterfalls that are not marked on maps. They often give themselves away by revealing an unbroken horizon line. A *horizon line* is formed when the river steepens and the rapid or falls formed by this sudden drop is below your sight line, thus marking a steep drop, a falls, or a low-head dam. Always stop and scout drops with horizon lines. Horizon lines frequently indicate a mandatory portage.

If you find your boat going sideways down the river and you are approaching an obstacle like a large rock in this position, try to avoid *broaching.* Broaching occurs when your boat is sideways to the current and gets pushed up against an obstacle. Broaching can be dangerous, especially for beginners, and is best avoided. *Vertical pinning* occurs when the boat goes over a steep drop and the bow sticks in the river bed below, usually jammed between rocks.

If you begin to broach, lean toward the obstacle and allow the current to flow underneath and around the hull. If you lean upstream, away from the obstacle, the current will usually flip



Horizon lines appear as an unbroken line, often stretching from bank to bank. You will see the river running up to this line, then disappearing, to become visible a distance downstream.

Avoid getting any part of your body between your boat and an obstacle if your boat broaches. Not only can the current's force wrap boats, but it can entrap paddlers, sometimes with fatal consequences.

Broaching

the boat upstream. If you are in a canoe, the water will fill the boat like a big tub. If you are in a kayak, water will tend to push the boat down, deeper into the water, entrapping you inside. If it looks like you are going to pin, get out of your boat—fast—and onto the obstacle.

The best way to avoid broaching is to keep the boat pointed downstream. It is better to hit a rock straight on with the bow than to try to turn in the current and end up going sideways.

Undercut rocks are rocks that have been eroded under water. They often are invisible from the surface and can entrap boats. They are very dangerous and can be fatal. Avoid undercut rocks by boating or portaging around drops with undercut rocks.

Strainers are obstacles that come in many guises but always spell big trouble. Tree limbs (also called *sweepers)* are a common type of strainer. They comb the current—stopping boats and boaters while allowing the current to flow cleanly through. Downed trees or roots also snare unwary boaters. Artificial strainers such as fencing, old cables or pipes, and chunks of concrete and rebar form severe hazards on some rivers. Portage around any strainer that you are not confident you can safely pass.

Low-hanging tree branches often create strainers.

When in Doubt, Scout!

The time of year, fallen trees, and rainfall are just several elements that can transform a normally safe route into a dangerous one. Always scout ahead, plan your run, and identify several options in case your run does not go as planned.

Before running a section of whitewater, a blind corner, or a potential drop of any sort, land your boat and scout ahead along the shore to make sure that there are no upcoming obstacles that might be beyond your ability to navigate.

When scouting a river, it is important that everyone use the same terms to describe what they see. *Downstream* describes the direction in which the current is flowing toward the mouth of the river, and *upstream* describes the direction opposite the general flow of the current. *River right* and *river left* always refer to the right side or the left side of the river as if you were facing downstream.

Scouting ahead helps you choose the safest route through rough water. Start planning your run at the downstream end and work your way back upstream. First know where you want to end up, then figure out *if* and *how* you can get there safely. Look things over to identify hazards, and discuss them with your buddies.

Note landmarks that might help you know when to begin that critical midrapid move. While walking back to your boat, stop several times to squat down and look back downstream. Try to imagine how things will look from water level. Break your run into sections. By doing so, you can break down an imposing stretch of foam and spray into a series of planned maneuvers. Identify several options to use in case your run does not go according to your original plan.

Rivers change from one day to the next. You need to know what is around the next bend or over the next drop. Normal erosion, floods, fallen trees, and new fences may transform overnight a safe route into a hazardous one. Remember that water levels rise and fall with the seasons and after rains. Sudden dam releases may lower or raise water levels drastically, dramatically changing a river's character. Don't take anything for granted.

International Scale of River Difficulty

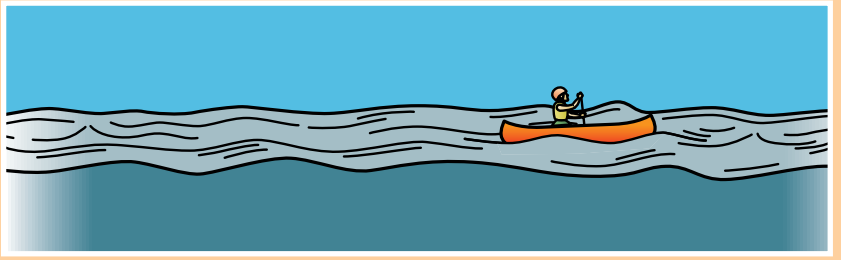
The International Scale of River Difficulty provides a standardized classification system for rating the difficulty and risks in running rapids. River runners use the scale as a rough but useful means of comparing the difficulty of one river with another. As a beginner, your paddling will be in Class I and Class II whitewater so that you can build skills in water where you can have fun with relatively low risk. In addition, you can develop new skills safely by practicing difficult moves in easy rapids.

The scale (from Class I through the extreme Class VI) is useful only if you understand your own capabilities and limitations and those of your companions. Although Class I and II rapids are good choices for beginners, you may find yourself deciding to run a rapid you portaged last time or portaging a rapid you ran previously. For instance, cold or high water can raise a rapid's difficulty by one or more levels.

In addition, you should consider a river's rating to be one class higher if the sum of the temperature of the water and air totals less than 120 degrees or if the trip is on a remote river. As you gain experience, you will learn to exercise progressively sophisticated judgment about both the river and yourself. Always choose safety and common sense when in doubt.

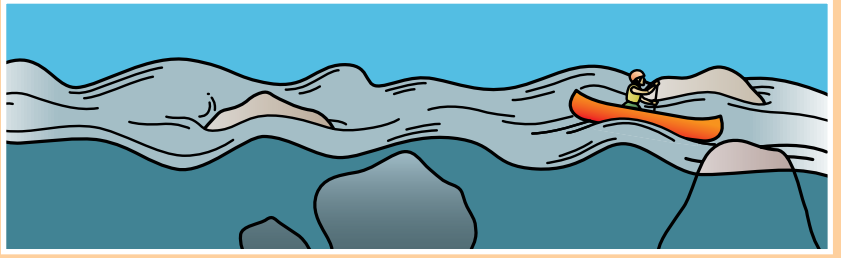
International Scale of River Difficulty

Here are the six classifications used for the International Scale of River Difficulty.

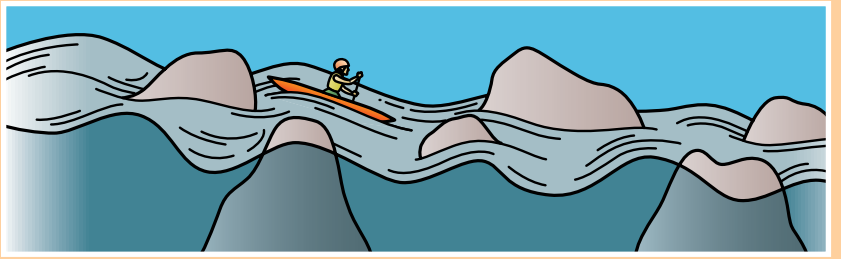


Class I: Fast-moving water with riffles and small waves. Few or no obstructions. Risk to swimmers is slight; self-rescue is easy.

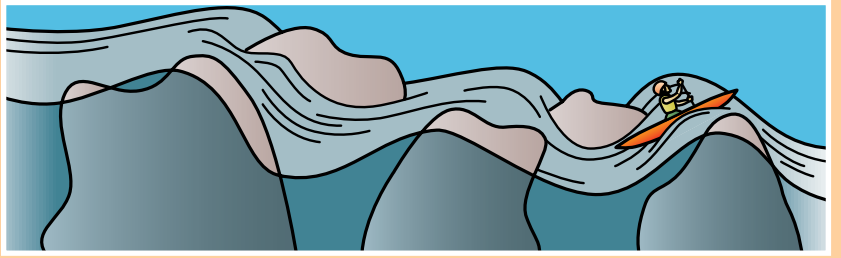
Class II: Straightforward rapids with wide, clear channels. Some maneuvering may be required, but rocks and medium-size waves are easily avoided by trained paddlers. Swimmers are seldom at risk.



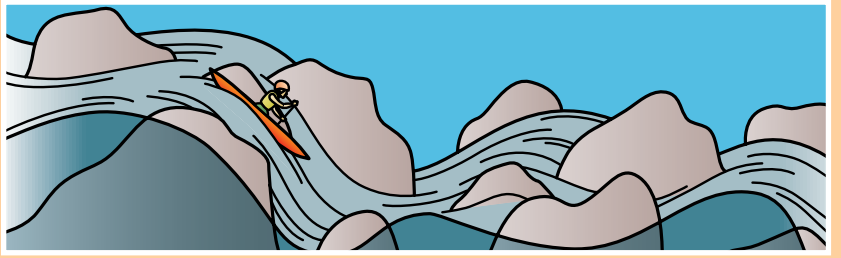
Class III: Rapids with moderate, irregular waves that may swamp an open canoe. Complex maneuvering is often required. Some risk to swimmers; group assistance may be necessary.



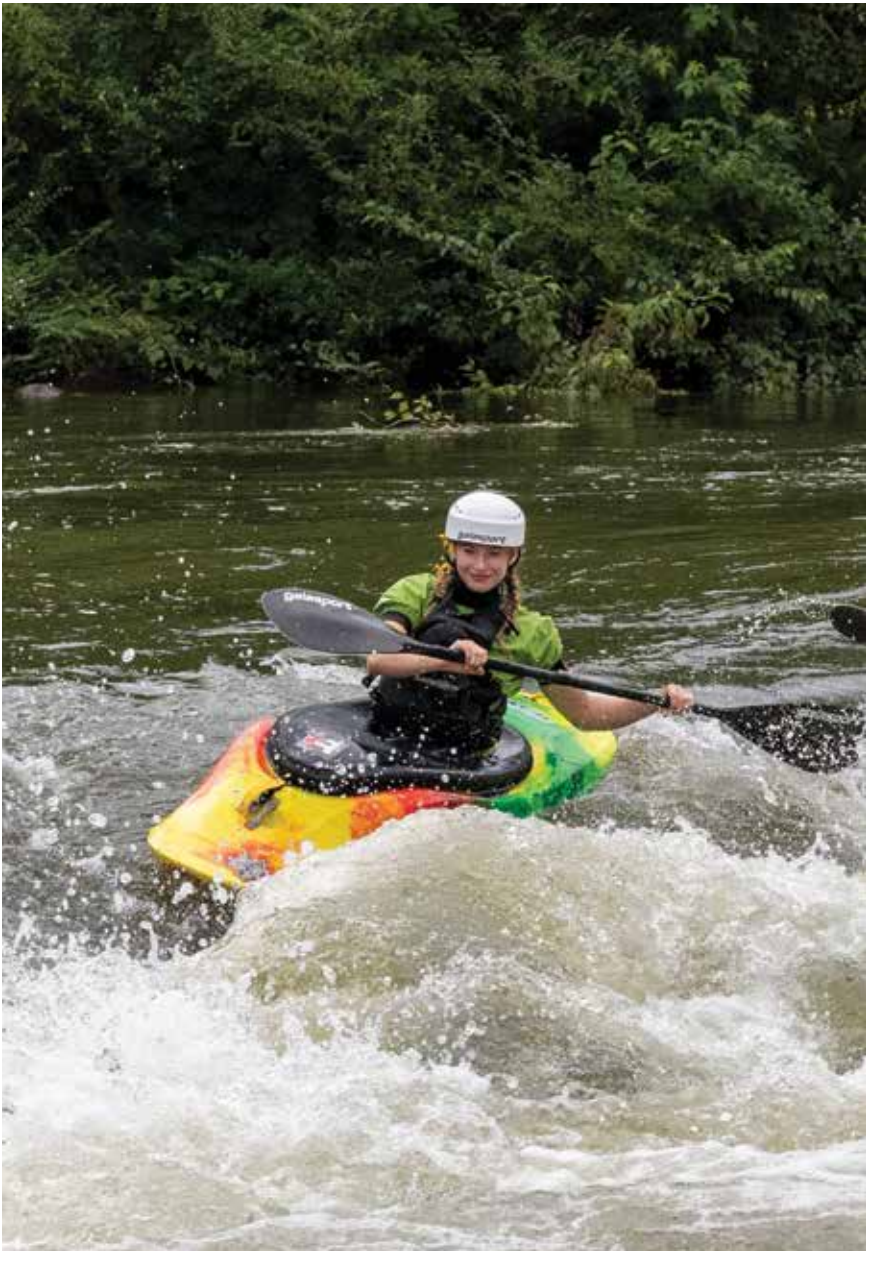
Class IV: Powerful, but predictable, rapids requiring precise boat handling in turbulent water. May feature large, unavoidable waves and holes or narrow passages demanding fast maneuvers. Risk to swimmers is moderate to high; self-rescue may be difficult and group assistance is often necessary.



Class V: Extremely long, obstructed, or very violent rapids. Drops may feature large, unavoidable waves and holes or steep, congested chutes with complex, demanding routes. Eddies may be turbulent or difficult to reach. Swims are dangerous, and rescue is often difficult, even for experts.



Class VI: These runs have almost never been attempted because they are extremely difficult, unpredictable, and dangerous. The consequences of errors are very severe and rescue may be impossible. Only teams of experts who have taken every precaution should attempt them, and only when water levels are favorable.



Boats, Paddles, and Other Equipment

Canoes and kayaks designed for whitewater are more sturdily built than those designed for flatwater. They are designed to bounce or slide off rocks, to turn quickly, and to be forgiving in turbulent water.

Boat Materials

Most whitewater canoes and kayaks are made of plastic, plastic-foam composites, or Kevlar® and carbon-fiber composites. Aluminum canoes and fiberglass canoes and kayaks were once the most popular boats for whitewater. They have been replaced by modern plastic boats but still remain very common for trips on moving water without rapids. Each material has advantages and disadvantages. When selecting a boat, you will need to consider expense, your skill level, and how well the boat material will stand up to the type of river running you will be doing.

Decked Canoes

Solo and tandem covered canoes, called C-1s and C-2s, are a treat to watch as they run heavy white water or slip through slalom gates. Like kayaks, paddlers in C-boats are decked, so paddlers wear spray skirts that allow them to stay dry in big waves and to play in holes. C-boat paddlers kneel on a pedestal rather than sit in a seat, and they use a single paddle.

The table here lists some common canoe and kayak materials and lists the advantages and disadvantages of each.

Whitewater Canoe and Kayak Materials

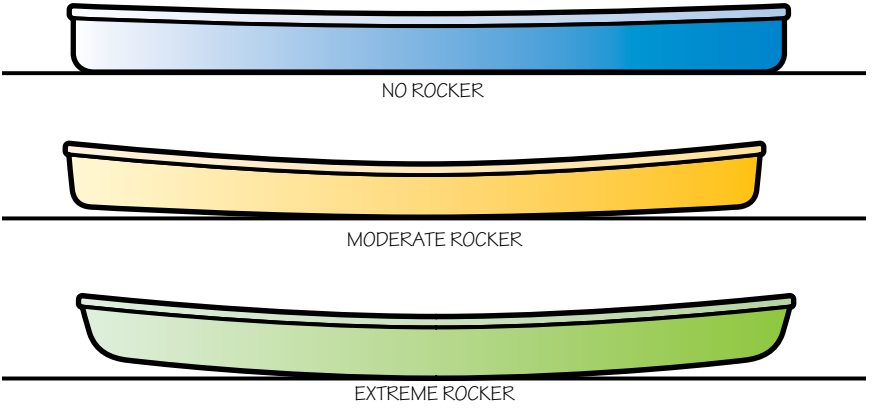
Material	Advantages	Disadvantages
ABS Royalex™ (acrylonitrile butadiene styrene), cross-linked vinyl, ABS plastic, and ABS closed-cell foam sandwiched together	Strong; flexes instead of breaks; quiet, repairable, moderately priced; the most common material used to build whitewater canoes	Heavy; dents and scratches easily; sometimes too flexible; cannot be shaped into fine bows and sterns; repairs can be difficult; heavier than fiberglass or Kevlar®
Polyethylene (plastic or plastic and foam, injected or molded in a form)	Flexes instead of breaks; quiet; least expensive; the most common material used to build kayaks	Very difficult to outfit and repair; sometimes too flexible; often very heavy
Aluminum	Strong and weatherproof; less expensive than some materials	Noisy; "sticks" to rocks; not lightweight; cannot be shaped into fine bows and sterns; external keel ill-suited for whitewater; more difficult to outfit; heavier than fiberglass
Fiberglass	Strong; lighter than ABS; can be formed into sophisticated shapes; stiff; easier to outfit and repair; moderately priced	Less durable than ABS; heavier than Kevlar®; few whitewater-specific canoes and kayaks are made of fiberglass
Kevlar®/carbon fiber	Very strong for its weight; can be formed into sophisticated shapes; very stiff; relatively easy to outfit and repair; often used for competition and elite whitewater canoes and kayaks	Most expensive; less tolerant of abuse than ABS

Differences in Whitewater and Flatwater Canoe Design

Whitewater solo canoes vary from 11 to 14 feet in length, and are usually less than 30 inches wide. Tandem whitewater canoes are 14 to 16 feet long and 32 to 36 inches wide. The average whitewater canoe's bow and stern are fuller than those designed for flatwater or ocean touring. This aids buoyancy and reduces the chance that the ends of the boat will get buried in a wave.

Whitewater canoes are built with more rocker than flatwater boats. *Rocker* is the term used to describe a boat's end-to-end profile. The bottom of the boat curves up, like a banana, toward the front and back of the boat. This shape helps whitewater canoes turn quickly. Flatwater boats have much less rocker, which helps them track in a straight line.

Another way whitewater canoes differ from flatwater canoes is that they often have higher sides to help keep out waves. Some whitewater canoes are designed with *tumblehome,* an inward curving of the upper section of the side of the canoe. On well-designed whitewater boats, tumblehome does not adversely affect the boat's stability and makes it considerably easier to paddle because the hand on the paddle shaft can be kept closer to the boat.



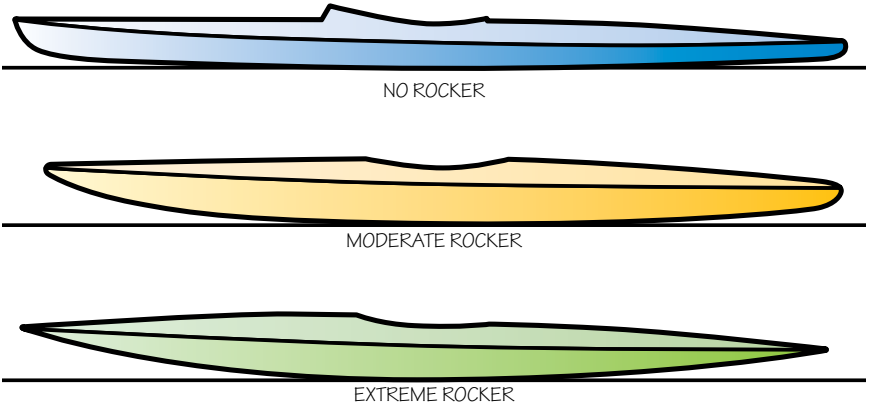
Canoe rocker

Install extra flotation (air bags or plastic foam) in your whitewater boat to ensure your boat will ride high in the water if you flip.

Types of Kayaks

Most modern kayaks are made of rigid plastics such as polyethylene, fiberglass, or Kevlar®. Kayak designs vary according to usage and construction. For example, a flatwater racer differs from a whitewater racer. Recreational kayaks are multipurpose craft suitable for a variety of water conditions. Touring kayaks are larger and have storage capacity for camping gear. They are also known as sea kayaks, due to their use around ocean shorelines. These kayaks are built long—up to 20 feet—to aid in tracking, and they often have a rudder, or *skeg.* Sit-on-top kayaks do away with the traditional cockpit and deck in favor of a recessed well that is self-bailing. Inflatable kayaks are made of the same materials as whitewater rafts and are very stable. Inflatables are open, like rafts, with the paddler sitting on the floor of the boat.

Special play boats, also called *rodeo kayaks,* are used in heavy whitewater. Some play boat designs are adapted for surfing. They are only 6 to 9 feet long and 2 feet wide, with low decks and hard chines (where the floor meets the sides). Short boats are slow boats, but what they sacrifice in speed they gain in maneuverability. Low decks make it easier to play in holes; flat bottoms make it easier to spin; and hard chines make carving turns and steering easier.



Kayak rocker

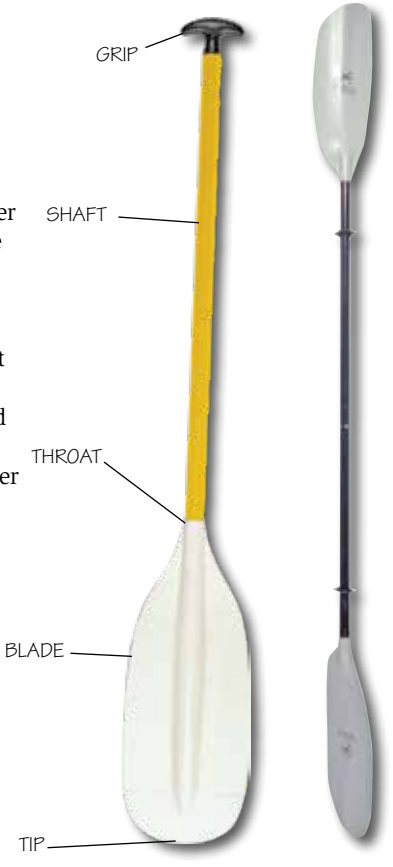
Paddles

On every trip, you will lift your paddle thousands of times, making a lightweight but sturdy paddle worth its weight in gold. The best paddle shafts are *indexed,* or oval, not round. An indexed shaft helps you control the boat and is easy on your hands. Paddle blade shape is important as well. The best whitewater paddles combine lightweight strength with shapes that "stick" in the water, then move cleanly through the water.

Whitewater canoe paddles are made of wood, aluminum, plastic, and composite materials, such as fiberglass, Kevlar®, and carbon fiber. Most whitewater canoe paddles feature a T-grip for better feedback and control. Blades vary in size, but most have a medium-size blade that is steady and predictable in the water. The tip of the blade is often constructed with an insert of a durable material such as aluminum or polyurethane.

Kayak paddles have blades at both ends. Usually the blades are set at an angle to each other from 45 to 90 degrees. The offset angle allows the paddle blade out of the water to be automatically feathered. Feathering reduces the effect of wind and wave on the blade. Shafts are indexed and blades are oriented so that either your left or right hand is the control hand. Your control hand constantly grips the shaft while your noncontrol hand allows the paddle to swivel and feather between strokes. Some kayak paddles break into two shorter pieces for storage and transport.

Kayak blades in profile can be either flat or curved and either a simple oval or a complex curved shape. Kayak paddle faces can be flat or hollowed. Whitewater kayak paddles are shorter and generally more symmetrical than touring kayak paddles.



Whitewater Rafts

Rafts are inflated watercraft that come in a variety of shapes and sizes. Paddle rafts are paddled by a crew of paddlers, while oar rafts are rowed by a single oarsperson. Most rafts are 10 to 16 feet long and oval. The hulls are made of inflatable

Outfitting

Most whitewater canoes and kayaks feature special outfitting to hold paddlers securely in their boats. Foot braces, for example, help both kayakers and canoeists hold themselves in their boats with their legs and knees. Releasable thigh straps keep canoeists from falling out when the boat is tipped or upside down.

In addition, most whitewater canoes are outfitted with rigid foam or plastic pedestals (or "saddles") on which paddlers kneel astride. Pedestals offer much better control over a canoe and, by virtue of being easier to tumble off of than bench seats, are safer in the event of a capsize. Knee pads glued into a canoe keep paddlers from sliding around and ease the discomfort of kneeling.

Kayakers pad their boat's cockpit so that it will fit like a glove for the purpose of control while on moving water. Most whitewater kayaks include pillars or bulkheads made of foam to keep their decks from collapsing should they broach. Pillars, usually placed fore and aft, brace the floor and deck between kayakers' legs or in front of their feet and behind their boat's seat.

All canoe and kayak outfitting must be installed with safety in mind. Most outfitting is glued into boats with adhesives specifically designed for the task; **many are toxic.** For this reason, find a qualified outfitter who is an experienced whitewater paddler to help you make sure your outfitting is functional, properly installed, and safe to use.

tubes about 14 to 20 inches in diameter. These tubes are made of sturdy synthetic rubber or vinyl. Oared rafts are coupled to an aluminum frame that holds gear, seats, and rowlocks. Most modern whitewater rafts are self-bailing, that is, they feature an inflated floor with drain holes that allow water to flow out of the boat.

The size and weight of a whitewater raft make it a stable and forgiving craft that is ideal for carrying gear. Because whitewater rafts are big and heavy, they are slower and less agile than are canoes or kayaks when it comes to catching eddies, surfing, and playing in rapids.

Every kayaking party should have at least one spare paddle; every canoe should have one, too. Canoeists' spare paddles should be securely fastened to their boats, out of the way, but readily at hand in case they are needed.

Tubing

Tubing can be loads of fun, but there are many hazards to consider. Inner tubes are difficult to steer and they offer almost no protection in a collision. In addition, their inflation valves and stems tend to cut and scratch their riders. When tied together, tubes become a significant entrapment hazard. This is why you should only go tubing on slow-moving water. You must wear shoes and your life jacket. Take a buddy, and make sure you follow the Scouting America Safety Afloat guidelines.

Rafting Safety

Whitewater safety precautions for canoeing and kayaking apply to rafting, too. If you are in a paddle raft, always wear a life jacket and follow the other Scouting America Safety Afloat guidelines.

Rafting injuries are frequently caused by paddle contact. Remember that you are riding beside another paddler, and there is another person paddling close behind or in front of you. Keep the blade on the outside of the craft, and grip the paddle low and close to your own body. If you capsize or fall overboard while rafting, reach out to the side, grasp the grab line, pull yourself out from under the raft, and move to the upstream end.

Do not overlook the safety of others on the river. A six-person raft plowing through the rapids can run over a kayak like a bus running over a bicycle. Look ahead and be sure the rapids are clear when you begin your run.


gelaspark

Basic Whitewater Skills

If you are itching to become a great paddler, you need to practice to perfect basic strokes and form so that you will have the confidence and skill to meet the challenges of whitewater paddling.

Body Mechanics and Position

It is important to be mindful of body mechanics and form whether you are on flatwater or whitewater. Proper form will keep you safer and ensure that you get the most out of the effort you expend.

Always grip your paddle with your hands a little more than shoulder-width apart and your paddle shaft perpendicular to the water. Canoeists should keep one hand on their paddle's grip. When performing strokes like the cross draw, avoid letting your upper paddle hand rise above your head—if your paddle is yanked backward in strong current or if it strikes a rock, you are vulnerable to dislocating your shoulder.

When paddling in a solo canoe or kayak, you are, of course, solely responsible for powering and steering. Keep your eyes on your target and make lots of small corrections. Little corrections are easy and keep you moving along; big corrections are harder and slow you down.

Tandem canoeists paddle on opposite sides. This helps move the canoe in a straight line and provides tremendous stability. The bow paddler provides power, initiates many maneuvers, and provides stability. The stern paddler steers the canoe with a combination of power and steering strokes.

On flatwater, the bow paddler usually follows the stern paddler's lead. On whitewater, however, the bow paddler might have a clearer view of the river and so may direct the boat's path on the water. The best whitewater paddlers constantly communicate about where they want to go on the river.

Most of your paddling power comes from your torso—from coiling and uncoiling the large muscles of your back, stomach, and shoulders.

In a tandem canoe, the stern paddler's forward strokes will have more effect on the canoe's direction than will those of the bow paddler, and will usually cause the boat to turn away from the stern paddler's selected paddling side. The same is true when paddling solo: The forward stroke commonly turns the canoe to the paddler's offside. Efficient stern and solo paddling include a steering component at the end of each stroke. There are many different steering strokes (*J*-stroke, *C*-stroke, Canadian stroke), but to begin with, canoeists should focus on developing a dependable *J*-stroke.

Canoe paddling positions are termed *onside* and *offside.* For solo canoeists, the side on which the paddler performs the forward stroke is the onside position. The opposite side becomes the offside. In tandem canoes, the side on which the bow paddler does the forward stroke becomes the onside.

Recall that all strokes can be divided into the following three phases:

- **Catch**—In this position, the paddle blade has entered the water and the paddle shaft is perpendicular. The force of the blade applied by the paddler against the water is now equal to the water's resistance. The paddler feels the paddle "grab" the water.
- **Power**—The torso uncoils, delivering the power of the muscles of the upper body to the blade through the shaft.
- **Recovery**—The stroke has ended and now the blade is lifted out of the water, and set up for another stroke in the catch position.

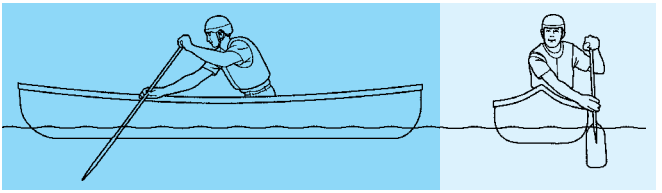
Whitewater Paddle Strokes

Practice whitewater paddle strokes and maneuvers on flatwater or on a slow-moving river. Practice slowly, working first toward precision and later adding power and speed.

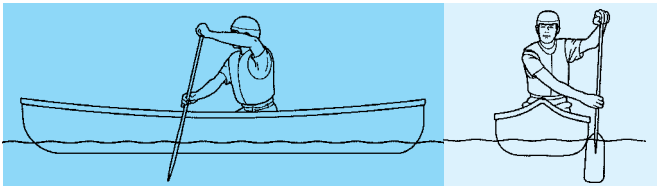
The Cross Forward—Canoe

A cross stroke is any stroke performed on the paddler's offside without switching hands. The *cross forward stroke* is a forward

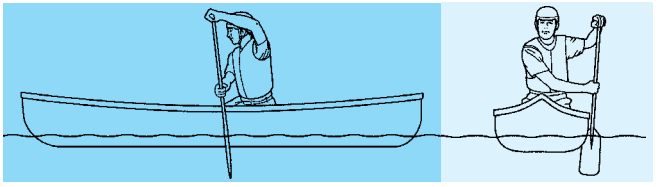
stroke done on the offside. It is frequently used by solo canoeists to keep the boat moving forward while correcting the tendency of the bow to go to the offside. The cross forward brings the bow back to the onside.



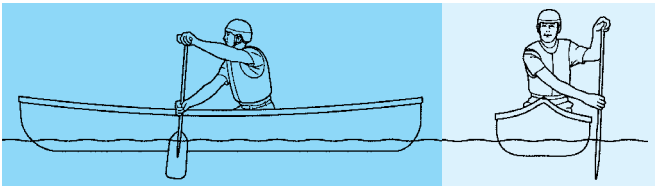
- **Catch**—Without switching hands, swing your paddle across your boat. Twist your upper body, rotating your shaft-hand shoulder forward and your grip-hand shoulder backward. Lean forward about 45 degrees, and place your blade (buried to its throat) at the ready in the water. Your grip-hand elbow will be behind your head (at about ear level), and your arms should be extended out in front of you.



- **Power**—Forcefully bring your torso to an upright, vertical position while pulling your hips toward your paddle. Your paddle should stay perpendicular to the water.



- **Recovery**—When your blade reaches your hips, rotate your grip-hand thumb forward so that your paddle's leading edge is parallel to your boat. Slice your paddle through the water back to the catch position. Rotate the blade so that it is ready for your next stroke.



Draws

When you earned the Canoeing or Kayaking merit badge, you learned to do the basic *draw stroke* to move your boat sideways toward the paddle. Whitewater boating uses several variations of the draw stroke.

Canoeists use the *stationary draw* to harness the river's power to pull the boat toward the paddle. This is an especially useful stroke for entering and leaving eddies. To execute a stationary draw from an eddy, move to the catch position with your paddle shaft vertical in the water and your blade buried to its throat. The paddle of the bow paddler or solo canoeist should be planted in the downstream current just outside the eddy line. Do not pull the boat toward the paddle. Instead, slightly tilt the up-current edge of your paddle away from your boat and hold it there. The current will grab your paddle and "fly" it; all you have to do is hang on.

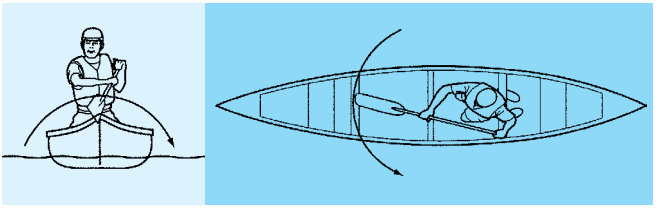
Sculling draw

Both canoeists and kayakers can use the *sculling draw* to pull the boat sideways or initiate a turn. Hold the paddle with

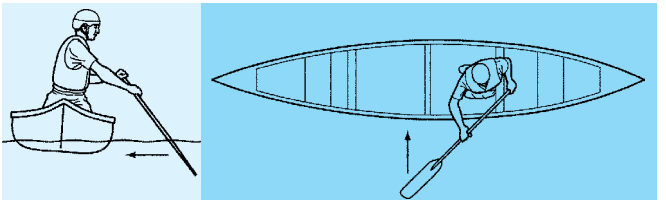
your upper or grip hand no higher than your forehead and your other hand positioned about a shoulder-width lower on the paddle shaft. The paddle shaft should be vertical and move in a path 2 to 3 feet long next to the side of the boat. Angle the blade at 45 degrees—as if you were spreading butter on a slice of bread—and move the paddle from side to side. At the end of each stroke, move the blade back in the opposite direction with the forward edge up. In the sculling draw, the paddle strokes the shape of an infinity sign (a sideways figure eight) in the water.

The bow paddler or solo canoe paddler also uses a *cross draw* to move the boat sideways or initiate a turn. Without switching hands, set up a cross draw by rotating your torso perpendicular to the keel line of the canoe.

The elbow of your grip-hand arm should be well below the level of your shoulder and rotated behind you. Your blade goes into the water with your torso still coiled.



Setting up a cross draw



Cross draw power phase

The power phase is simple—just leave your arms and hands pretty much where they are, and unwind your upper body, drawing the boat toward your paddle's blade. Be sure you do not allow the blade under your boat. The cross draw is such a powerful stroke that you can tip your boat if you do not stop in time.

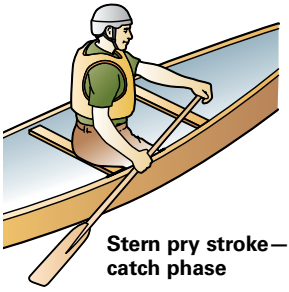
Recover by dropping your grip hand. Re-rotate and twist your torso, place the paddle back in the water, and repeat.

Pries

The *pry* stroke complements the draw. The draw moves the boat toward your paddle; the pry moves it away. The *bow pry* and *stern pry* are used by canoeists but rarely by kayakers. Instead of doing a pry stroke on one side of the boat, the kayaker can simply do a draw stroke on the other side to get the same results. Pries are powerful strokes for moving a canoe toward the paddler's offside.

- **Catch**—For the bow pry, hold your paddle perpendicular to the canoe's keel line, then place your paddle in the water with its blade buried to the throat. Keep your forearm in front of your face and your hand that is on the grip farther out over the water than your lower hand. This will position the blade slightly underneath the bow. Your lower hand must be above the gunwales or your paddle shaft must be between your hand (particularly your thumb) and the gunwales. The pry often uses the gunwales as a fulcrum, so be careful not to pinch your thumb between your paddle and the gunwales.

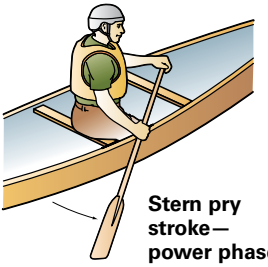
  For the stern pry, hold the paddle shaft parallel to the side of the boat and place the grip end of your paddle out over the water. Put the blade in the water to the throat so that the blade is slightly underneath the stern. The shaft hand should hold the shaft against the gunwales.



Stern pry stroke—catch phase

From the stern of a solo or tandem canoe, the stern pry is a powerful turning or correction stroke. Keep the pry stroke short and fast. Repeat the stroke if necessary.

- **Power**—Use the gunwales as a fulcrum and pull your grip hand into the boat. The power of the stroke increases with the speed you move your grip hand. Keep the stroke short—about a foot or so—since the blade quickly begins pulling your gunwales down, rather than pushing them away.



Stern pry stroke—power phase

- **Recovery**—You can do either an out-of-water or in-water recovery. The out-of-water recovery is more efficient for the stern pry and requires that you drop your grip hand down toward your lap, slicing the blade out of the water. Return to the starting point of the stroke by moving the grip hand out over the water and the blade underneath the stern. The in-

water recovery is more efficient for the bow pry. At the end of the stroke, turn the thumb of the grip hand away from you and then slice the blade back underneath the bow as you move the grip hand back out over the water.

Pry stroke for canoe

The pry stroke will move your canoe away from the paddling side. Holding the paddle as you would for a draw stroke, slip the blade back into the water next to the canoe and pry it away. Though it can be hard on the paddle shaft, you can brace the shaft against the canoe, using the gunwale as a fulcrum or pivot for leveraging the stern away from the blade of the paddle.

Braces

Braces are intended to catch you if you start to tip. The *low brace* is a stabilizing stroke that prevents you from tipping over. You can do a low brace upstream or downstream from your boat. In a canoe, you execute the low brace when your boat starts tipping toward your onside. In a kayak, you can use the low brace for either side.

Low brace for canoe

In a solo canoe or kayak, execute a low brace by quickly placing your paddle flat on the water (perpendicular to the length of your boat). Press the paddle firmly down on the water and use your knees and torso to flatten out your boat. The low brace is the preferred stroke to prevent onside capsizing.

Low brace for kayak

A *high brace* is a stroke that is used to prevent tipping to the paddler's offside. As the boat tips away from the paddler's onside, the paddler reaches out and does a quick draw stroke to right the boat. This stroke is usually less effective than the low brace, but in solo canoes, it is the only possible stroke to do if your boat is tipping away from the side you are paddling on.

Paddlers in tandem canoes must learn to do a combination of braces to prevent the boat from tipping over. If the boat tips to the onside (the bow paddler's paddling side), the bow paddler would do a low brace while the stern paddler would do a high brace. If the boat tips to the offside, the bow paddler would do a high brace while the stern paddler would do a low brace.

High brace for kayak

Righting Pry

When the canoe or kayak tips toward the paddler's onside, the paddler should perform a brace to prevent the boat from completely tipping over. However, when the boat tips away from the side of the boat where the paddle is located (toward the offside in a canoe), a capsize can be prevented by doing a righting pry on the paddler's paddling side (the onside in a canoe). A righting pry is done with the paddle shaft in a vertical position next to the side of the boat. With the top hand on the canoe paddle grip or on the kayak paddle shaft, the hand is pulled forcefully and rapidly toward the center of the boat. In order to prevent a capsize, the righting pry must be done very quickly and without hesitation.

Rudder Stroke

The rudder stroke in a canoe on moving water or whitewater is the same as on flatwater with one difference. On quiet water, the thumb on the grip hand is turned down and away like it is done with the *J*-stroke. With the paddle in the rudder position next to the canoe, the rudder stroke can be followed by a stern pry, which together mimic the *J*-stroke. If the boat is not in motion, a strong stern pry will only slow or almost stop the canoe. However, when current is moving the canoe through the water, the top hand on the grip can rotate so the thumb of the hand is pointing up instead of down This is a more comfortable position for the hand and wrist. With the paddle blade vertical next to the side of the canoe, it can be moved from side to side by moving the top hand back and forth, making the blade act like the rudder on a ship.

The rudder stroke in a kayak can be used to steer the boat while it is in moving water or to keep it going straight when it is gliding on quiet water. Both hands are over the water with the paddle shaft parallel to the boat. The rear blade is straight up and down and completely in the water. With the top or upper hand on the paddle shaft, the paddler can move the hand back and forth to control the direction of the kayak. Be sure that the upper body is rotated while the head is facing straight ahead.

Whitewater Maneuvers

Savvy boaters use the river's power to take them where they want to go. Technique, not strength, is what you need to control your boat on the river.

Launching and Landing

You are as likely to upset your boat while launching and landing as you are when on moving water. If you are using a canoe, enter and exit only when your boat is completely in the water. Launch and land with your canoe parallel to the shore so that the boat is fully afloat and you can step in or out without clambering over your load.

As you step into or climb out of your canoe, keep three points of contact with the boat. Step into the center of your boat, keeping both hands on the gunwales. Stay low as you move about. In tandem canoes, one paddler should steady the canoe while the other paddler climbs in. Then, the first aboard should steady the canoe for the other paddler. In swift water, the paddler down current enters first and exits last; this makes it easier for the up-current paddler, while on land, to hold the canoe and keep it from swinging out into the stream short one paddler.

Many whitewater kayakers "seal launch," that is, they climb in on shore and push themselves and their boats into the water. This is not recommended because it can damage the kayak as well as the fragile margins of rivers.

Coaming is the raised edging around the cockpit for keeping water out.

Before you enter a kayak, put on your spray skirt. To steady yourself as you slip into your craft, place your paddle shaft against the *coaming* at the back of your boat's cockpit so that one blade is touching ground. Grasp the center of the paddle shaft and the cockpit coaming with one hand and ease yourself into the boat. Attach the spray skirt to the cockpit rim and you're ready to paddle off. Reverse this process to climb out.

Paddling Forward in a Straight Line

The J-stroke is an advanced stroke that takes a lot of practice.

In a solo canoe, the *J*-stroke allows for a smooth, continuous forward stroke that keeps the boat on course with minimum effort. Apply only as much "*J*" to the stroke as is needed to keep the canoe going straight. Too much will turn the canoe. If necessary, review and practice the *J*-stroke solo in flatwater by picking a distant target and paddling to it in a straight line. In a tandem canoe, the bow paddler should do a forward stroke while the stern paddler does a *J*-stroke to keep the boat on course.

In a kayak, forward motion is achieved with the basic forward stroke. Stroke first on one side and then on the other. Review and practice the forward stroke on flatwater if necessary.

Backpaddling

Canoeists and kayakers use backstrokes to backpaddle, that is, to slow or reverse the forward motion of the boat. You may need to backpaddle to

- Run a set of waves slowly, giving your boat's bow a chance to rise above a wave so that it will stay dry.
- Give yourself more time to turn or move your boat sideways.
- Keep control in swift water, allowing more time to move left or right or to stop.
- Slow your boat in anticipation of shallow water, rocks, or sleepers.
- Stop your boat so you can scout or take a break.
- Back ferry (or "set") to move your craft left or right in the current while still facing downstream.

Eddy Turns

As you paddle downstream, you will want to stop in an eddy to rest or to scout a rapid below. The maneuver to enter an eddy while heading downstream is called an eddy turn. Later you will learn how to exit an eddy using a peel out. When you have learned how to move in and out of eddies with confidence and ease, you will have passed a major whitewater skills milestone. Entering an eddy while moving downstream in a boat can be challenging, especially if the current is fast. The three important components of an eddy turn are angle, speed, and edge or tilt. Here are how these components are used in an eddy turn:

Step 1—Set the angle: Start well upstream and begin angling your boat so that when it reaches the top of the eddy, the boat will cross the eddy line at about a 45-degree angle. Aim the bow so it crosses the eddy line as close as possible to the top of the eddy. Avoid hitting the obstacle that is creating the eddy.

Step 2—Speed–Accelerate across the eddy line: As soon as possible after the bow crosses the eddy line, plant the paddle in the upstream current of the eddy so that the rest of the boat will swing around the paddle as the pivot point.

Tandem canoes dance from eddy to eddy by virtue of technique and communication. Bow and stern paddlers must talk to each other about where they are going and how they are going to get there. Pause at the top of a rapid and have a chat about how you want to run the rapid.

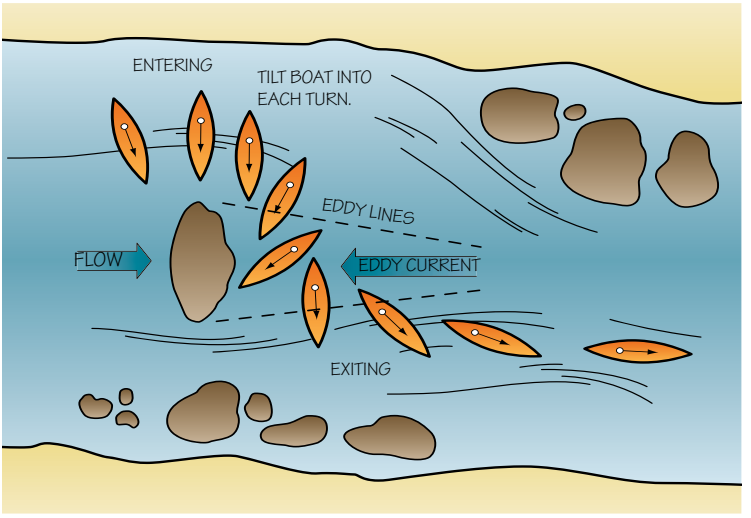
Step 3—Edge or tilt: Just before and as the boat enters the eddy, the solo paddler or tandem paddlers must tilt or lean the boat into the turn by using the lower body and shifting more weight onto one knee in a canoe or one hip in a kayak. The upper body should remain upright and move very little.

For kayakers and solo canoeists, an onside eddy turn uses the forward stroke to build up enough momentum for the boat to cross the eddy line at a 45-degree angle. As the bow and then the paddler's body enter the eddy, the bow or solo paddler does a draw to the bow followed by a forward stroke. For tandem canoeists, after the bow paddler's body has crossed the eddy line, the stern paddler does a quick draw stroke followed by a series of forward sweeps. Once the stern has entered the eddy, the bow and stern paddlers do forward strokes to move up to the head of the eddy.

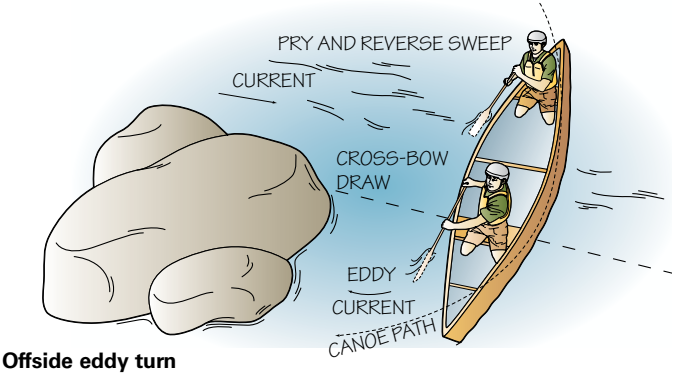
An offside eddy turn is more difficult than an onside turn. For kayakers, the offside turn is performed like the onside turn except with the other blade. Solo canoeists perform the same steps as for the onside turn, but they must use a cross draw to the bow and then a cross forward.

Tandem paddlers in a canoe use the same approach to the eddy—including the angle and lean of the boat—as for the onside eddy turn. However, instead of a bow draw, the bow paddler does a cross draw. The stern paddler does a quick pry before the boat crosses the eddy line, followed if necessary by a small reverse sweep or quick pry off the stern gunwale, sometimes combined with a low brace. When the stern has entered the eddy, the bow paddler does a stationary cross-bow draw followed by a cross-bow forward stroke. Once in the eddy, the stern paddler performs a forward stroke or *J*-stroke.

The strokes used by whitewater paddlers to do an eddy turn depend on whether the maneuver is done solo or in tandem and whether it is done in the onside or offside position. Technically, kayakers do not have an onside or offside since they have a paddle blade on each side of the boat. For the purposes of this section, the kayaker's onside position will refer to the side of the body with the dominant arm and will correspond to the onside position for solo canoeists.



Eddy turn—entering and exiting an eddy



Offside eddy turn

Peel Outs

The peel out maneuver is used to exit an eddy and reenter the main current of the river. Peel outs are easier than eddy turns since you don't have to worry about maneuvering in a fast-moving downstream current. On the other hand, you will not have the speed that comes from the current because you have to cross the eddy line to exit. When done correctly with the right combination of speed, angle, and lean, any paddler can do a smart-looking turn into the current without a set of complicated strokes.

Here are the basic steps to safely doing a peel out:

Step 1—Speed: Exiting the eddy requires the boat to have sufficient speed to clear the eddy line. Position the boat near the eddy line and toward the bottom of the eddy so that you can take several strokes before exiting.

With two paddlers in the boat, it is important to coordinate the downstream lean so both are edging the boat in the same direction at the same time.

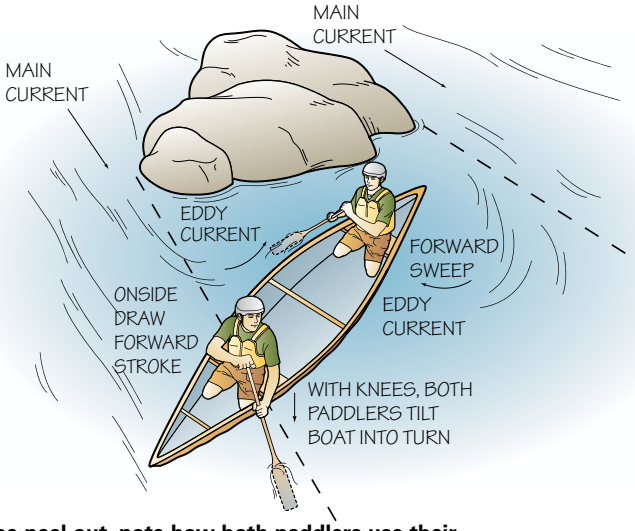
Step 2— Angle: Exit at the top of the eddy as close as possible to the start of the eddy line at about a 45-degree angle. Keep in mind: The faster the downstream current, the smaller the angle of entry.

Step 3— Edge or tilt: As the bow crosses the eddy line, tilt the boat downstream by shifting more weight onto one knee in a canoe or one hip in a kayak. Your upper body should move only slightly.

To do an onside peel out for kayakers and solo canoeists, paddle forward with enough speed to clear the eddy. Solo canoeists may need to use a combination of the cross forward stroke, forward stroke, and *J*-stroke to exit the eddy at the correct angle. As the bow begins to cross the eddy line, shift your weight to the downstream side of the boat. Keep paddling forward to maintain your momentum. Only after your body has crossed the eddy line should you do a turning stroke such as a bow draw or stern pry. In many instances—if you have the right momentum and lean—the current will turn your bow downstream without any turning stroke at all.

Tandem canoeists doing an onside peel out follow the same steps as solo canoeists, but have the advantage of two paddlers to build up speed to exit the eddy. Once across the eddy line, the bow paddler does a turning stroke such as a bow draw while the stern paddler continues to power the boat out of the eddy with forward or *J*-strokes. As the bow of the boat

begins to turn downstream, the stern paddler can do forward sweeps if there is enough speed and momentum to carry the boat out of the eddy.



In the peel out, note how both paddlers use their left knees to lean into and tilt the boat into the turn.

An offside peel out incorporates all the same features of the onside peel out except that the turning strokes are different. For kayakers, the opposite paddle blade is used for the turning stroke. After crossing the eddy line, solo canoeists can use a variety of turning strokes, including a forward sweep or cross-bow draw. Tandem canoeists use a combination of a cross-bow draw in the bow while the stern paddler does a low bracing reverse sweep or simply powers ahead with a forward or *J*-stroke.

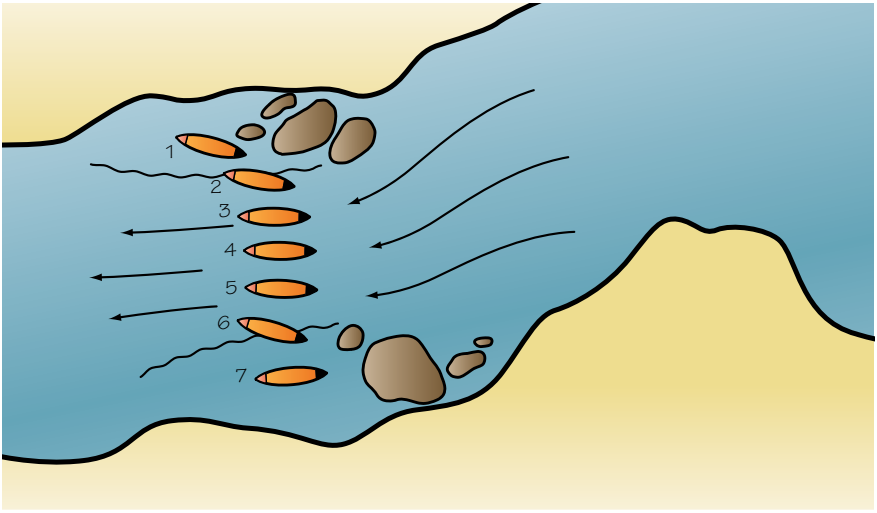
Ferrying Upstream and Downstream

Upstream (forward) ferries and downstream (back) ferries move you sideways across the current. In an upstream ferry, you face upstream and paddle forward with your bow at an angle to the current. You move across the current in the direction your bow is pointing. To perform a downstream ferry, you face downstream and backpaddle with your stern pointed upstream at an angle to the current. You move across the current in the direction your stern is facing.

To perform a successful upstream ferry, begin by turning your boat until it faces upstream. As you start paddling, adjust the ferry angle—the angle of the boat compared to the upstream—to about 10 degrees. If you are moving out of an eddy into the current, enter the current as if you were doing a peel out by exiting the eddy at about a 45-degree angle and leaning downstream. Instead of turning downstream, paddle directly into the upstream current as quickly as possible.

Kayakers and solo canoeists use the forward stroke with an occasional stern draw or pry stroke to keep them angled into the current. In a tandem canoe, the bow paddler does forward strokes while the stern paddler does combinations of strokes to keep the boat at the desired angle to the current.

Gradually increase the ferry angle by allowing the bow of your boat to point a little to one side of where the current is flowing. Use a small ferry angle if the current is fast and a larger angle if the current is slow. The smaller the ferry angle, the less your boat will drift downstream, but your crossing speed will be slower. On the other hand, if you use a large ferry angle, you will get across the river faster, but you will end up farther downstream. Your paddling counters the river's tendency to pull you downstream, and your boat's angle off the current allows the river to nudge you toward the far bank. This can be tricky, so practice by ferrying across an easy current with the goal of reducing the number of strokes needed to cross the stream.



Upstream ferry across river to avoid obstacles.

Downstream ferries are more difficult than upstream ferries. To perform a successful downstream ferry, point the stern of your boat almost directly upstream and exit into the current. Kayakers and canoeists use backstrokes and control their angle to the current with draws and pries. Tandem canoe paddlers use the backstroke while doing a downstream ferry. The stern paddler, with occasional help from the bow paddler, is responsible for steering the boat.

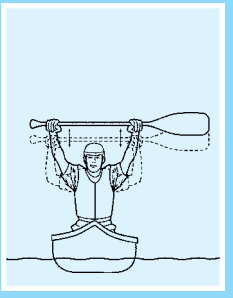
Remember: It is the angle of your boat to the current, not to the shore, that determines your ferry angle. Over time you will become skillful in reading currents, and upstream and downstream ferries will become second nature.

To keep the boat at the correct angle during a downstream ferry, the bow paddler can steer by using a combination of backstrokes with bow draws and pries.

Remember: *River right* and *river left* always refer to the right side or the left side of the river as if you were facing downstream.

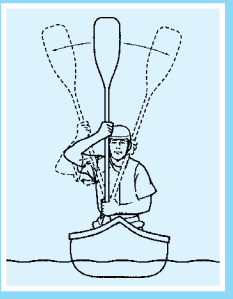
River Signals

Running rapids takes teamwork. Teammates should discuss their run on an ongoing basis and make adjustments to any plan as needed. Sometimes, however, talk is impossible. Even a small riffle can muffle words, and roaring rapids often drown out speech altogether. For emergencies or times when talk is difficult, river runners make use of whistles and paddle signals to communicate. Review river signals before the beginning of every trip.

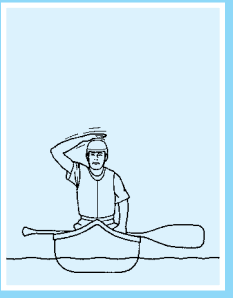


Here are important emergency and directional signals.

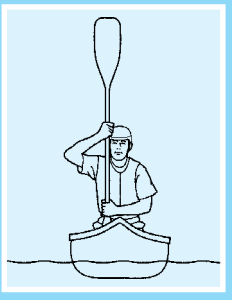
- **"Stop!"**
  Raise and lower a paddle horizontally over your head or hold both arms out at right angles to your body and wave them up and down.



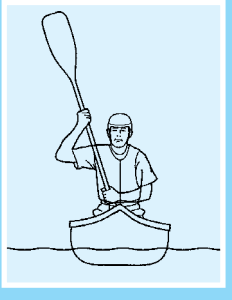
- **"Help!/Emergency"**
  Give three long blasts of your whistle while waving your paddle, your helmet (if on shore), or throw rope back and forth over your head.



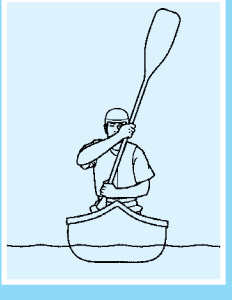
- **"Are you OK?"**
  Raise one arm over your head, bend your elbow outward, and tap your helmet with your fingertips. To respond that you are OK to someone signaling you, return the same signal.



- **"Run down the center" or "Come ahead" or "All clear"**
  Hold your paddle blade in a vertical position above your head with the blade flat for maximum visibility.

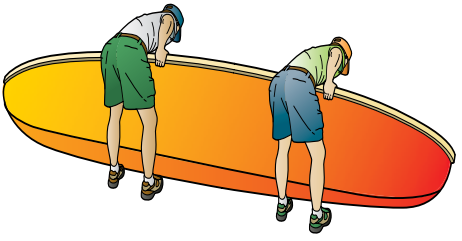


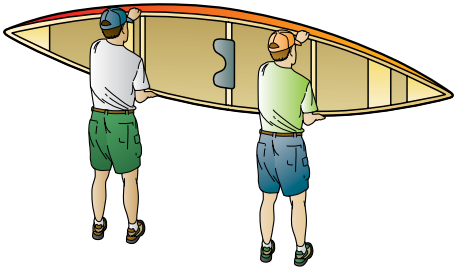
- **"Run river left"**
  As the lead paddler who has run the drop, you are facing back upstream and directing those following to run river left. Point your paddle in the direction you want others to follow, at a 45-degree angle, with the blade flat (for better visibility).

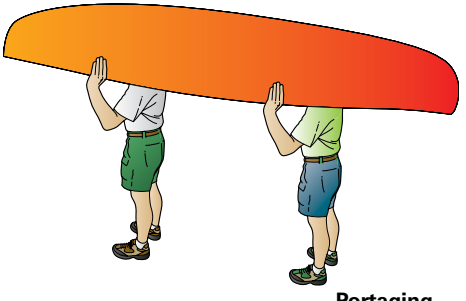


- **"Run river right"**
  As the lead paddler who has run the drop, you are facing back upstream and directing those following to run river right. Point your paddle in the direction you want others to follow, at a 45-degree angle, with the blade flat (for better visibility).

Important: Always use directional paddle signals to indicate where the safe route through a drop lies. *Never point toward hazards.*







Portaging

Portaging

Portaging is a normal part of running rivers. When you have scouted a stretch of river and determined that the rapids are impassable or beyond your capabilities or your equipment, it is time to portage (or carry) your canoe or kayak over land to a safer place on the river. Always portage around low-head dams and weirs or any sheer drop or strainer that cannot safely be avoided. Shallows may also require a portage. When assessing a rough stretch of river, a good rule is, "When in doubt, walk around."

To portage a canoe with a yoke, position yourself near the bow of the canoe and your buddy near the stern. Reach across the canoe and grasp the gunwales, then in unison lift the canoe and flip it over your heads, turning yourselves forward as you do. As your partner stabilizes the canoe, walk your hands backward along the gunwales until you can tuck your shoulders against the yoke. Your partner is free to duck out from under the canoe, and you are ready to begin a portage. Your partner leads the way as you walk, alerting you to obstacles or turns.

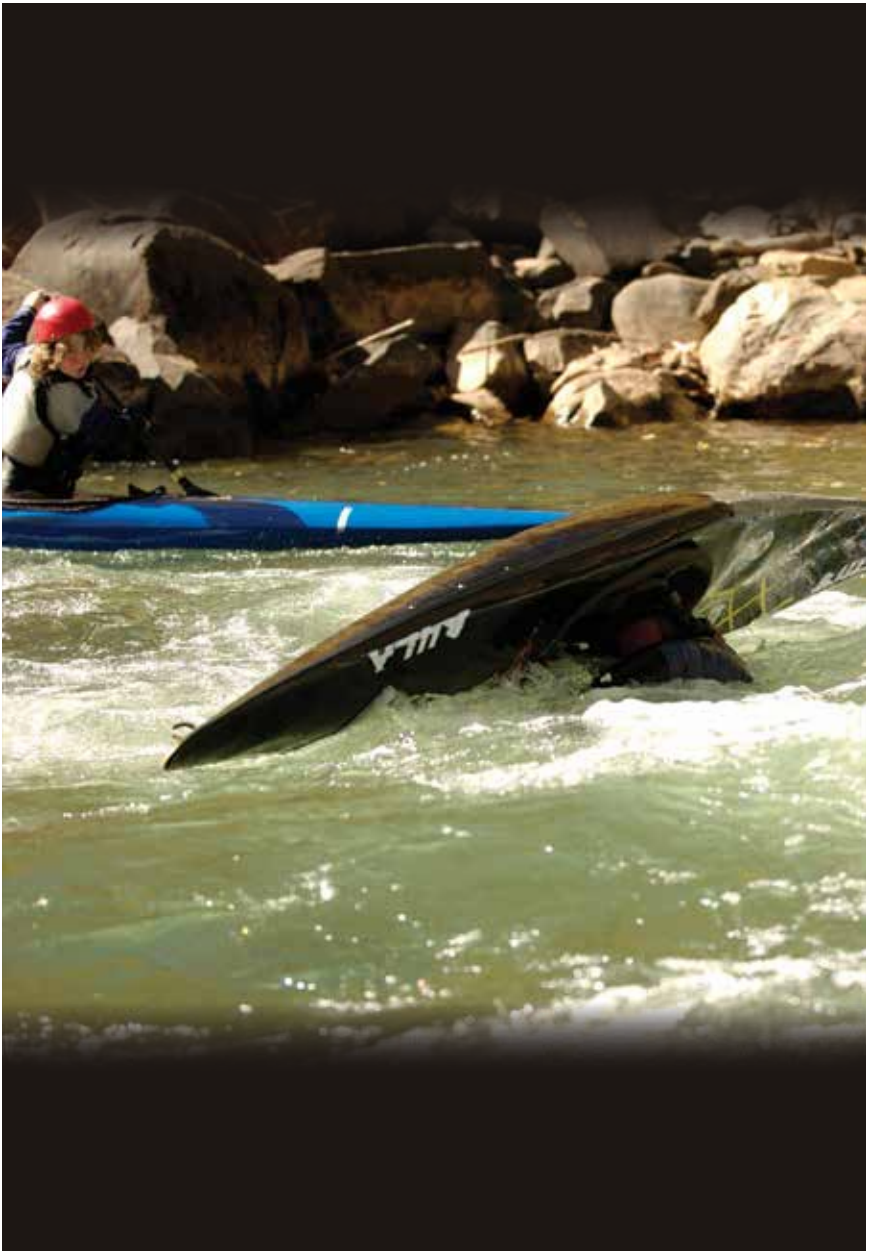
With practice, one canoeist can lift a canoe for portaging. To begin, stand at one side of the upright canoe, near the stern and facing the bow. Grasp the gunwales, one in each hand, a few feet from the stern. Turn the canoe over and lift it over your head, allowing the bow to remain on the ground. Holding the gunwales, begin "walking" toward the bow. As you reach the center of the canoe, its weight will balance over your shoulders and the bow will lift off the ground. Ease the yoke onto your shoulders to carry the canoe.

If there is no portage yoke, the canoe can be transported using a two-person carry.

Many kayaks have toggles installed at the bow and stern, positioned for two people to lift and carry a craft. For a solo carry, reach across the cockpit, lift the kayak, and flip it onto your shoulder. (If the kayak is heavy, allow the stern to stay on the ground as you lift and position it.) Shift the cockpit on your shoulder to reach the kayak's balance point, and you should be ready for a relatively easy tote to your destination.

There's an old saying that no one ever drowned on a portage.

Carrying a kayak



Rescue Techniques

Every kayaker and canoeist capsizes from time to time. Whenever you take a spill, make the safety of the people involved your top priority. Equipment and gear can be replaced; people cannot. Practice to become adept at recovering from a capsize and learn to use a throw rope to rescue other paddlers.

Self-Rescue

When you capsize, follow these steps:

Step 1—If you can, stay in your righted boat, even if it is flooded. The hull can protect you from banging into obstacles. You may be able to climb back in (assisted or unassisted by other boats) and then paddle to shore. If you are in a kayak with or without a spray skirt or in a solo whitewater canoe with thigh straps, exit the boat as quickly as possible. You may have to pop the skirt or loosen the straps to free yourself from the boat. As you become more experienced, you can learn to right yourself using an Eskimo roll. Intermediate kayakers and advanced canoeists learn how to do the Eskimo roll so that if they turn over while in their boats, they can flip back up again without having to do a wet exit.

Step 2—If you have been tossed into the water, hold on to your boat. It will stay afloat, and it will be easy for rescuers to spot. Stay upstream of your boat so you do not get caught between your fast-moving boat and a hard obstacle like a boulder.

Step 3—In the following situations, swim aggressively for shore.

a. You have been thrown clear of your boat.

b. The water is very cold.

c. You are approaching worsening rapids.

d. No rescue is forthcoming.

Step 4—If you must ride out a rapid before swimming to safety or catching a rescue line, stay on your back in fast water, keeping your feet and legs floating high and downstream so they can act as shock absorbers to fend off rocks. Use a backstroke to maneuver past obstacles and keep an eye out for an eddy that might offer protection.

Step 5—Do not stand up in swift-moving water above your knees. If your feet were to become entrapped under rocks, the current could knock you over—either backward or forward—and then force your head under the water.

Step 6—If you find yourself being swept toward a strainer, change from a feetfirst position to an active headfirst swimming position with your head out of the water. Try to climb up on top of the strainer as far as you can get, and aggressively pull yourself onto it to avoid getting sucked underneath.

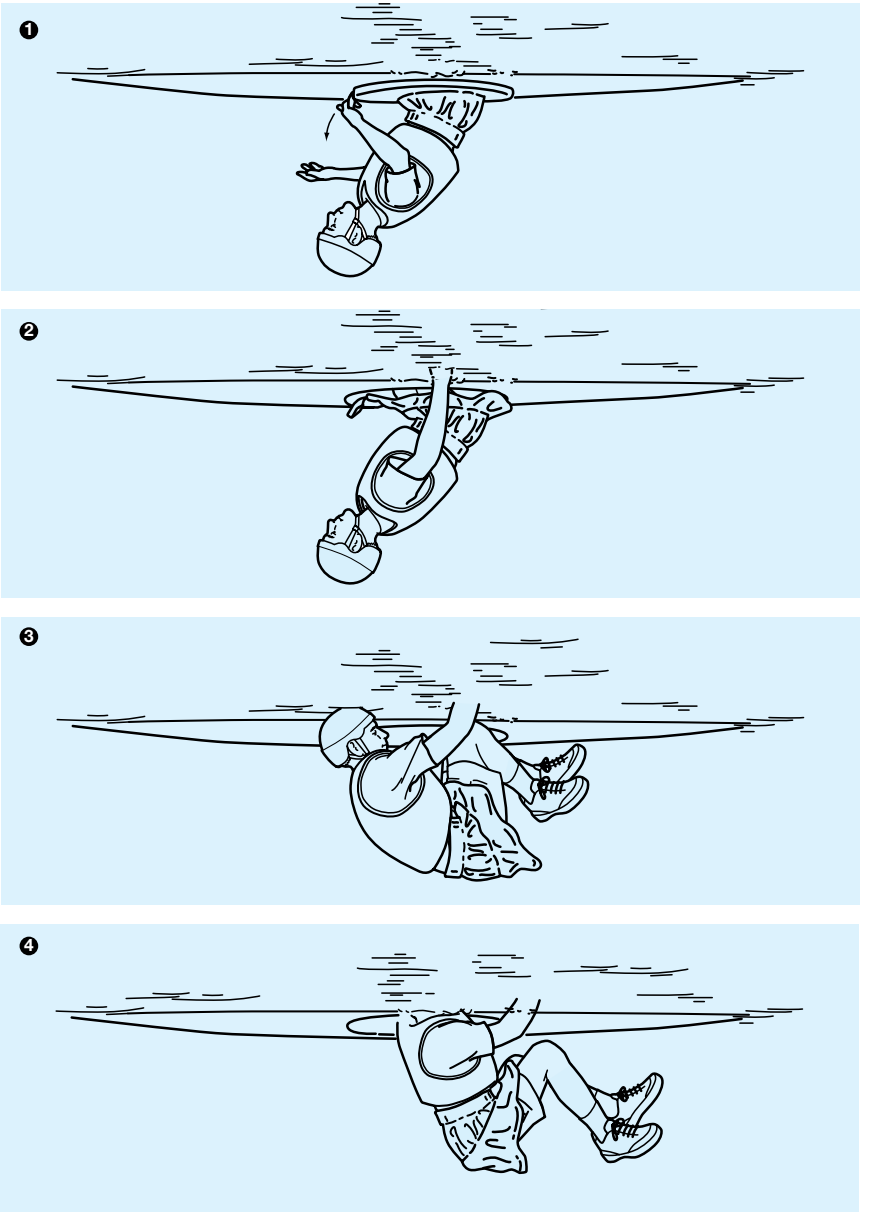
Step 7—When rescuers are trying to assist you, do all you can to help them help you.

Capsize Drills

Intentionally capsize your craft in calm water and practice recovering from the spills until your reactions become automatic.

To safely capsize a canoe, sit next to your paddling partner in the bottom of the canoe facing the same side. Let your legs hang over the gunwale. Put your hand nearest your partner on the gunwale behind you. Put your other hand on the gunwale in front of you. Rock forward and backward until the gunwale in front of you goes below the water level and the canoe begins to fill with water.

To practice a "wet exit" from a kayak, lean your body out over the water to cause your boat to capsize. Release the spray skirt from the coaming then lean forward with your forehead near the deck and push on the sides of the coaming with your hands. This will push you out of the kayak. When your legs and feet are clear, let them drop toward the bottom. Keep your grip on the coaming throughout the maneuver. When you are in the feet-down position in the water, bring your head up on one side of the capsized kayak. After completing the wet exit, turn the kayak so you can grab an end loop. Push or pull the kayak to shallow water, keeping it upside down so that the air trapped in the cockpit will keep the boat afloat.



Capsize drill

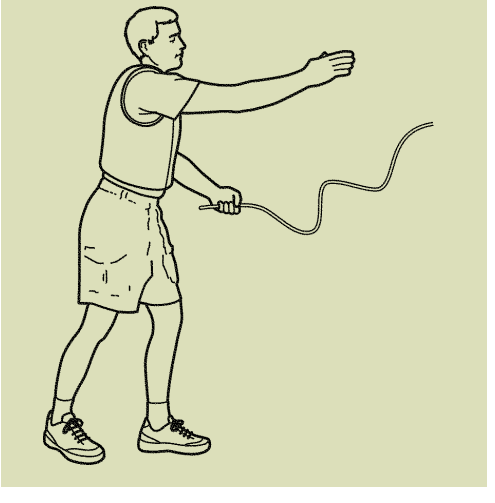
Using a Throw Rope to Rescue Others

As you will recall, a throw rope is a floating rope that is stored in a throw bag. The rope will pay out neatly when the bag is tossed. A throw bag or a neatly coiled throw rope should always be secured in your craft so that it will be handy in a rescue situation but is not an entrapment hazard.

To rescue swimmers with a throw rope follow these steps:

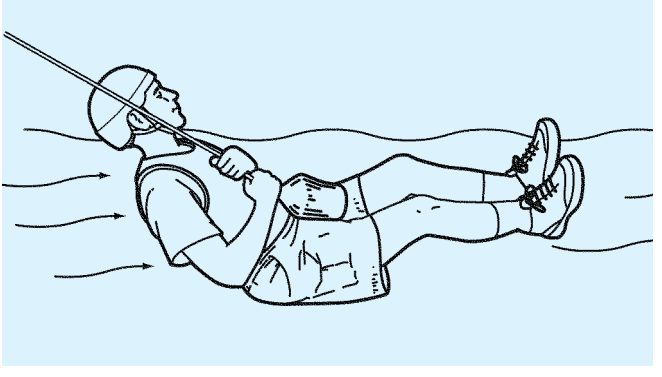
Step 1—Remove enough rope from the bag so that you can throw the bag while holding on to the loose end of the rope with your other hand. Allow the remainder of the rope to stay in the bag. It will pay out when the bag is thrown. Be sure that the mouth of the bag is only halfway open.

Step 2—Get the attention of the person in the water by yelling, "Rope!" or giving a single blast of your whistle. Establish eye contact with the swimmer.



Step 3—Grasp or step on the free end of the rope and toss the bag at the swimmer. Aim at, or slightly beyond, the swimmer's head. If you miss, quickly restuff the bag or make arm-length coils of rope and try again.

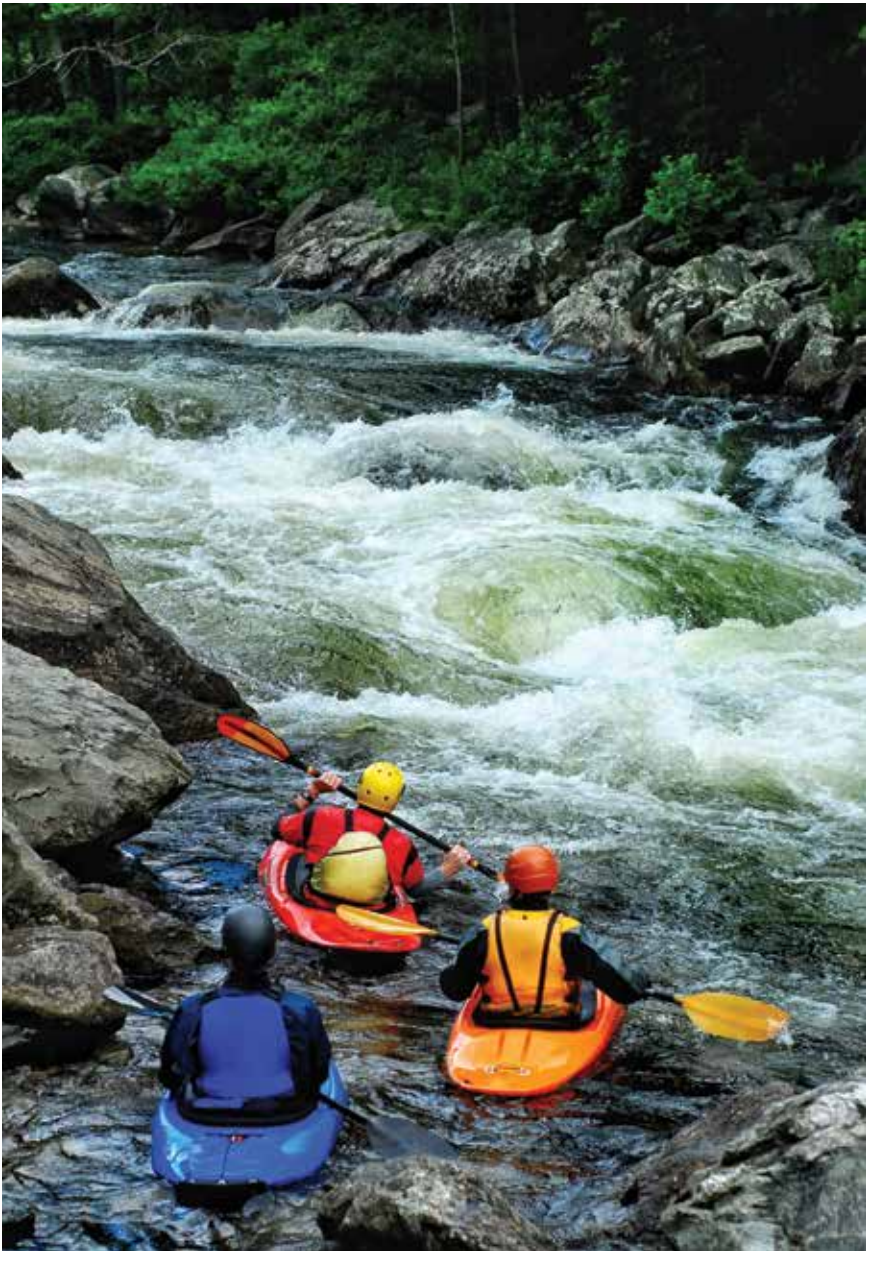
Step 4—The victim should grab the rope and roll over on the back with the rope held in the middle of the chest and the rope going over the shoulder. The victim must not wrap the rope around a hand or fasten the body in any way to the rope—just hold on. Either pull in the line to bring the person to safety, or allow the person to swing on the line to the bank. Walking your end of the line along the shore may help the swimmer cope with the current and avoid obstacles. Take great care not to be pulled into the water yourself. If necessary, sit down to help hold against the force on the line or belay the line around a tree or rock. Do not tie the rope to anything; this will help prevent the victim from being held under-water should he or she become entangled in the rope.



Practice Using the Throw Rope

Using a throw rope effectively takes practice. If you cannot practice in a controlled setting in a river, practice on land with a buddy by doing the following exercises.

1. Have your buddy pretend to be a slow-moving victim about 30 to 45 feet away. Toss the throw bag to your buddy as he or she moves slowly by you.
2. Practice what you would do if you missed the throw the first time. Retrieve the rope by making long coils. Divide the coils between your hands and throw the rope again to your buddy. Practice both short and long throws and at different speeds as your buddy pretends to be in slow and fast moving currents.



Trip Planning

Before you head out to demonstrate your whitewater skills, work with your merit badge counselor or another qualified adult to select the river course and choose group participants. Consult with your counselor to make sure that the course is within the capabilities of all participants and that the equipment you will be using is appropriate for the activity.

Research and prepare a float plan that specifies your route. Be sure to include put in and take out points. Set up a schedule in which you determine how much time you will need to safely float the stretch of river you selected. Double-check your equipment and review safety precautions and emergency procedures. Identify your options in the event of a problem with equipment, a sudden change in weather, or a medical emergency. A review of the Scouting America Safety Afloat policy and the American Whitewater safety guidelines will help you with these tasks.

Obtaining Necessary Permissions

The use of many rivers is governed by special rules and permits. Stay on the right side of the law, and get permission to float before you go. You will often find that a state or federal agency holds jurisdiction over the stretch of river you want to run. If you will be crossing private property, always get permission from the landowner. Local boating shops, river guidebooks, maps, and government-agency websites can provide information about whom you need to contact.

Personal and Group Equipment

Before you head out on the river, always double-check that you have both personal and group essentials necessary for a safe whitewater outing. This checklist provides some guidelines, but you may need to adapt it to reflect your specific needs and the purpose of your trip.

Personal Essentials

- ☐ Life jacket with whistle
- ☐ Helmet
- ☐ Pocketknife
- ☐ Spare clothing
- ☐ Rain gear
- ☐ Unbreakable water bottles filled with water
- ☐ Lunch and/or snacks
- ☐ Sun protection (including sunscreen, brimmed hat, and sunglasses with a strap)
- ☐ Map and compass
- ☐ Spare glasses (if you wear them)
- ☐ First-aid kit

Place everything that must stay dry in waterproof containers such as dry bags, boxes, buckets, or barrels. Items that need to stay dry include food, spare clothing, first-aid kits, maps, sleeping bags, tents, and other camping equipment.

Use cam straps, bungee cords, and pieces of rope to secure items and equipment so they will not fall out past the gunwales if you capsize. Dry bags are often lashed in gunwale to gunwale. All loose rope should be stowed out of the way. It is vital that your lashing does not pose an entrapment hazard.

Packing for a whitewater trip

Essential Group Equipment

Group equipment should be evenly distributed among all the boats. Here is a general list of equipment. Adjust your own list to suit the length of time you will be out and the number of people participating.

- ☐ Spare paddle (at least one per party, preferably one per boat)
- ☐ Flotation (air bags or foam) in each boat to keep the boat afloat if you capsize
- ☐ For canoes: A bailer made of a cut-out gallon plastic jug, attached to the floor of your boat with a very short length of line or webbing and a plastic fastener

- ☐ Large absorbent sponge to soak up splashes and clean up sand and mud

- ☐ For open canoes: Bow and stern lines (painters) securely attached. Use ropes at least 5 feet longer than your boat, 5/16 inch or 3/8 inch in diameter. Secure them to the canoe so that they are readily available but will not entangle feet and legs in case of a spill.
- ☐ Water filter or water treatment tablets. During a whitewater outing, you'll need as much water as you would during a strenuous hike. Having a means of treating water while afloat will help avoid dehydration.

- ☐ Throw rope in a bag
- ☐ First-aid kit
- ☐ Waterproof matches, lighter, candle, or fire starter
- ☐ Duct tape and a repair kit
- ☐ Handheld bilge pump (optional)
- ☐ Camping equipment (for overnight trips)

River Etiquette

River etiquette is simply showing courtesy and respect for people you encounter on the river including other boaters, fishers, and swimmers. Here are some common guidelines for being a good ambassador for whitewater paddling.

- Yield the right of way to crafts with less maneuverability such as rafts and boats running straight through a rapid.
- When running down a river, try to pick a path that will not interfere with another paddler playing in a hole or surfing a wave.
- Do not tailgate through a rapid. Leave plenty of space between boats.
- If an eddy is already full of boats, wait upstream until there is room or find another one downstream.
- Pass other boats with care. Do not try to pass in a rapid.
- Allow faster boats to pass.
- Stay out of other boaters' way. Pass fishers quietly and give them as much space as possible.
- Share play spots with other boaters and wait your turn.
- Do not crowd boating classes or novice boaters.

Bear in mind that river recreation often concentrates a lot of traffic into a narrow corridor. Many of our rivers are in danger of being loved to death. Take care of stream banks when you launch and land your boat, and walk gently on the land. Practice Leave No Trace principles. Respect the river so that future generations will be able to enjoy the thrill, mystery, and beauty of whitewater paddling.

Whitewater Resources

Scouting Resources

Safety Afloat; *Fieldbook*; Whitewater Rafting Scouting America Award; *Aquatics Supervision*; *Canoeing* and *Kayaking* merit badge pamphlets
Training: Scouting America Paddle Craft Safety Course–Basic and Moving Water
Video: "Reading the Rhythms of Rivers and Rapids"

With your parent's permission, visit Scouting America's official retail website, www.scoutshop.org, for a complete listing of all merit badge pamphlets and other helpful Scouting materials and supplies.

Books

Bechdel, Les, and Slim Ray. *River Rescue: A Manual for Whitewater Safety*, 4th ed. CFS Press, 2009.

Bennett, Jeff. *The Essential Whitewater Kayaker: A Complete Course*. Ragged Mountain Press, 1999.

Grant, Gordon. *Canoeing: A Trailside Guide*. W.W. Norton & Co., 2003.

Jackson, Eric. *Whitewater Paddling: Strokes & Concepts*. Stackpole Books, 1999.

Mason, Bill. *Path of the Paddle: An Illustrated Guide to the Art of Canoeing* (revised and updated by Paul Mason). Firefly Books, 1999.

Mason, Paul, and Mark Scriver. T*hrill of the Paddle: The Art of Whitewater Canoeing*. Firefly Books, 1999.

Ray, Slim. *The Canoe Handbook: Techniques for Mastering the Sport of Canoeing*. Stackpole Books, 1992.

Whiting, Ken, and Kevin Varette. *Whitewater Kayaking: The Ultimate Guide*, 2nd ed. The Heliconia Press, 2012.

Magazines

Canoe & Kayak
2052 Corte Del Nogal, Suite 100
Carlsbad, CA 92011
Website: www.canoekayak.com

Paddling Magazine
55 Red Pine Drive
Palmer Rapids, Ontario, Canada
Telephone: 613-706-0677
Website: www.rapidmedia.com

Organizations

American Canoe Association

503 Sophia St., Suite 100
Fredericksburg, VA 22401
Telephone: 540-907-4460
Website: www.americancanoe.org

American Whitewater

P.O. Box 1540
Cullowhee, NC 28723
Toll-free telephone: 866-262-8429
Website: www.americanwhitewater.org

Apps and Other Websites

ACA Paddle Quest—Interactive game for children and families. Free on the App Store and Google Play.

ACA Paddle Ready app—Float plans, weather, river forecasting, and more. Free on iPhone and Android.

American Whitewater National Whitewater Inventory—A list of all the rivers in the U.S. by state with current flow rate information: www.americanwhitewater.org/content/River/view/

American Whitewater permit information—A list of all rivers in the U.S. by state that require permits with links to the applications: www.americanwhitewater.org/content/River/list-permits/

National Center for Cold Water Safety—Information on cold water–related illnesses: www.coldwatersafety.org

Acknowledgments

Scouting America thanks Robin Pope and Richard Thomas for their leadership and expert knowledge in the revision of this merit badge pamphlet. Robin Pope is president of the American Canoe Association (ACA) and an instructor trainer educator in swiftwater rescue (level 5) and river kayaking (level 5). He was also a major contributor to the *Kayaking* merit badge pamphlet. Richard Thomas is a Scouting America Aquatics Instructor, National Camping School aquatics instructor, and ACA instructor in canoeing (level 2). He was formerly an ACA canoe instructor trainer and river canoe instructor. They were assisted in their efforts by Chris Stec, ACA chief operating officer and instructor trainer educator whitewater canoe (level 4). Scouting America also recognizes David Kurtz, Lynn Brennard, and John Brennard for their review and thoughtful suggestions.

The previous edition of this merit badge pamphlet was written by Bruce Newell with assistance from Richard Thomas. Scouting America is grateful to the late Ernest F. Schmidt for his early efforts to make whitewater activities a distinct part of the Scouting program. We also gratefully acknowledge the work of the Scouting America Whitewater Task Force, which was chaired by K. Gregory Tucker, in developing the original Whitewater merit badge requirements and first edition of the pamphlet.

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