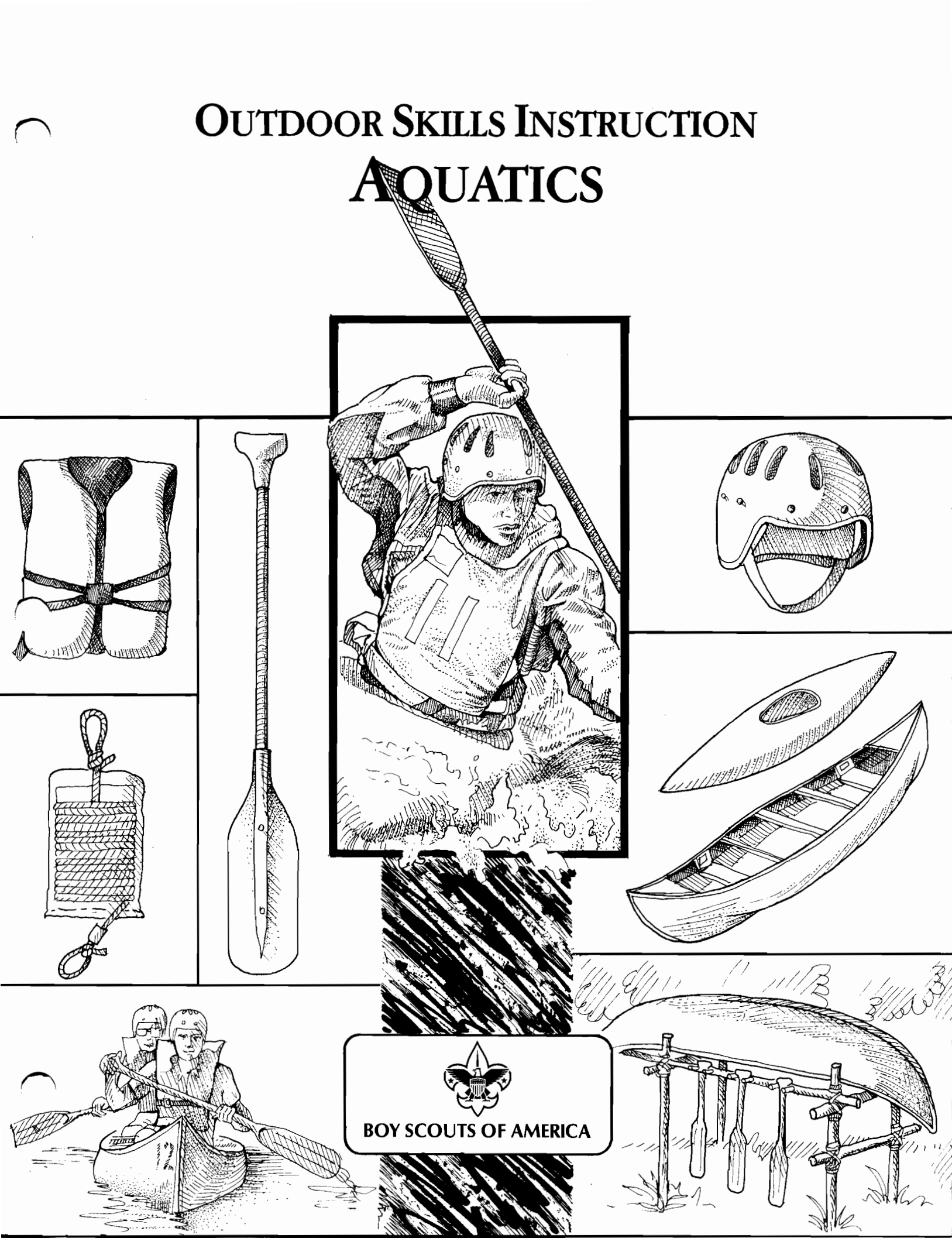
OUTDOOR SKILLS INSTRUCTION

AQUATICS



BOY SCOUTS OF AMERICA

OUTDOOR SKILLS INSTRUCTION
AQUATICS

Introduction

The Boy Scouts of America centers many of its activities around the outdoors, where Scouts and Scouters are continually seeking new ways to test their physical and mental abilities. This manual is designed to help create an awareness of the proper use of equipment and needed skills to participate in these activities. It is important that participants in this course understand the necessity of proper training and equipment use.

You will note that no time schedules are included in this manual. The training should be conducted according to the ability of the participants to complete the topics. These sessions may be conducted by any qualified Scouter. You are encouraged to recruit experts to assist in instructing. Use the outlines as guides to create a hands-on learning experience.

This is one in a series of skills manuals. Each manual covers a broad spectrum of topics; each may be used separately, or sessions may be mixed.

Outdoor Skills Instruction Manuals

Aquatics, No. 33026
Backpacking, No. 33035
Camping, No. 33003
Cooking, No. 33567
Rappelling/Rock Climbing, No. 33027
Survival, No. 33029
Team Building, No. 33004

Irving, Texas
ISBN 0-8395-3026-9
No. 33026 Printed in U.S.A.

Contents

OVERVIEW

Background

Aquatic programs have a long history in Scouting. From its earliest origins, the Boy Scouts of America has drawn on the lore and folklore of American Indians. The romance and adventure of the Native American watercraft have colored and enriched the Scouting experience for many generations.

This adventure has grown into many different areas today. Because of this growth, many safety procedures and skills need to be practiced and reviewed so that every person participating in an aquatics activity is safe and having fun. The skills instruction that will be discussed in this seminar will include canoeing, whitewater canoeing, kayaking, and rafting.

Keep in mind that this skills seminar is designed to create an awareness about aquatics activities, not to make experts in one session. Your skills will be perfected as you practice them.

Instructors

Canoeing and rafting are challenging, adventurous activities. Many Scouts today like to participate in them, and there are many instructors all across the country who can assist in demonstrating the skills necessary to participate in these activities. Those who have completed the BSA National Camping School aquatics instructor training are qualified instructors. Also, you can contact the National Canoe Association's office to secure the names of qualified instructors in your area:

National Canoe Association
8580 Cinder Bed Road, Suite 1900
Box 1190
Newington, VA 22122

You can also contact the local chapter of the American Red Cross for the names of certified instructors.

Safety

These basic procedures must be followed before even getting into a vessel:

1. Make sure all participants meet the minimum swimming ability test.
2. Know and adhere to the BSA Safety Afloat policy. (See copy in the Appendix.)
3. Know basic paddling strokes, and make sure you can perform them well before proceeding to the next level.

Clothing

Paddling may be done in a variety of weather conditions and in various locations around the country. Proper attire protects paddlers from the elements. The layering of clothing is just as important in paddling as in backpacking. As in backpacking, layered clothing will protect the paddler from the elements, help prevent hypothermia, and provide for changes in weather.

There are three basic layers to consider:

1. The *wicking layer* is closest to the skin. This layer transfers moisture from the skin to the next layers. Polypropylene and silk provide the best wicking.
2. The *absorbing layer* soaks up the moisture from the wicking layer and continues to move the moisture away from the body to the outer layer. Materials like wool and some new synthetics work well in this layer.
3. The *protective layer* protects against wind and water. This layer is usually of nylon or laminated materials like Goretex or coated nylon. It can also include wetsuits and drysuits.

   Wetsuits. Wetsuits are made of either neoprene or nylon. A wetsuit holds in the layer of water or perspiration next to the skin. Body movement heats the thin layer of water to keep the body warm.

   Drysuits. Drysuits are made of a waterproof material designed to prevent water from entering the suit. Rubber gaskets at the neck, wrists, and ankles make a water-tight seal. This reduces heat loss and keeps the paddler dry.

Equipment and Gear

Having the proper equipment is most important. Participants need to know what equipment is essential and what equipment is considered to be optional. Much of the equipment used today is specialized.

Personal Flotation Devices (PFDs)

BSA policy requires that U. S. Coast Guard-approved flotation devices (PFDs) be properly worn by all persons engaged in activity on the open water. Canoeing is certainly no exception. Before you even approach the canoe, you should learn about the different types of PFDs and their uses, how to put on a PFD, and how to check it for proper fit.

The U. S. Coast Guard has identified five different types of PFDs:

Type I—an approved device designed to turn an *unconscious* person in the water from a facedown position to a vertical or slightly backward position, and to have more than 20 pounds of buoyancy. The device will maintain a vertical or slightly backward position and therefore greatly increase chances for survival. This is the most effective PFD in rough water.

Type II—an approved device designed to turn an *unconscious* person in the water from a facedown position to a vertical or slightly backward position, provided there is some movement of the water. These must have a minimum of 15½ pounds of buoyancy. They are recommended for closer, inshore cruising, are acceptable for all size boats, and must be in good and serviceable condition and readily accessible.

Type III—an approved device designed to keep a *conscious* person in a vertical and slightly backward position; these have at least 15½ pounds of buoyancy. While these have the same buoyancy as Type II, the Type III has lesser turning ability. This makes it a comfortable design for water activities such as canoeing. Recommended for in-water sports and close

inshore operation on lakes and ponds. Acceptable for all size boats. Must be in good serviceable condition and readily accessible.

Type IV—an approved device designed to be *thrown to a person in the water, but not worn.* It is designed to have at least 16½ pounds of buoyancy. Acceptable for boats less than 16 feet long, canoes, and kayaks, and as a throwable device for boats 16 feet and longer. Must be in good serviceable condition and immediately available. Buoyant cushions and ring buoys are typical of this type of PFD.

Type V—special-purpose PFDs that carry some restrictions. Be sure to read the label.

Types II and III are acceptable for most Scouting aquatics, and Type III is appropriate for flatwater canoeing. A zip-up, belted, plastic cell-filled Type III PFD vest is comfortable to wear, it does not interfere with paddling or swimming, and it provides some padding on the shoulders when portaging. Every skill and maneuver discussed in this pamphlet can and must be done while wearing the PFD.

A typical Type III PFD vest should be worn with the label on the inside. Belt straps should be adjusted so that they fit snugly at or just above the waist, in the loops provided. A second buckle or tie strap must be used just below the collar line, unless there is a strong zipper that will secure the top front of the PFD.

Proper care and storage of PFDs are essential. All PFDs should be dried off the ground and under cover. Direct sun drying will cause the fabric to fade and wear out quickly. Buckles must be maintained and repaired as needed. All labels should be readable. If the flotation material or fabric is damaged, the PFD should be thrown away and replaced. Remember that PFDs are not to be used as seat cushions or kneeling pads.

Helmets

Helmets are primarily worn when kayaking or solo canoeing. This protects against head injury. Depending on the class river you are on, you may want to wear a helmet even when rafting. Helmets have a solid plastic or fiberglass shell with a rubber liner that helps cushion any blows to the head. It is important that the helmet fit properly so that the frontal lobe of the brain is protected.

Paddles

Paddles can be made of wood, fiberglass, metal, plastic, or a combination of these materials. Wood was the original material, and many feel that it is still the best, but good wooden paddles are becoming hard to find. A flatwater paddle is usually slightly flexible, although some canoeists prefer rigid paddles. (See the Appendix for parts of a paddle.)

Paddle length depends on how long you and your arms are. If your paddle reaches between your outstretched arms with the grip in the palm of one hand and the tip in the other, then it is about right. Another way to judge the correct paddle length is to put the tip of the paddle on your toe. The grip should reach up to about your nose. The important thing

is that the paddle feels comfortable to you, and the entire blade is in the water at the lowest point of your most comfortable power stroke. If your hand on the throat of the paddle is dipping into the water on each stroke, the paddle may be too long. The weight of the paddle is also a matter of preference, but remember that you're going to be swinging it about 20 times a minute. A strong, lightweight paddle will probably take you farther and longer.

Paddle blade width varies from 5 to 8 inches. The average paddle blade is about 5 inches wide. Wider blades are used for racing because they provide more power. For typical flatwater canoeing, a 6-inch blade is about right.

The paddle grip should fit your hand smoothly and comfortably. There are a variety of paddle grips available. Choose the one that you find most comfortable. On wooden paddles, the grip can be sanded or whittled to individual preference. Most importantly, the grip should be smooth so as not to scratch or blister the palm during prolonged use. A wooden paddle grip should be sanded periodically to keep it smooth.

Paddle styles take their names from the colorful vocabulary of our ancestral canoeists.

- **Trader.** Large blade surface, squarish end.
- **Voyageur.** Smaller blade area and longer shaft than the trader.
- **Beavertail.** Usually made of soft, light wood. Recommended for all-purpose paddling. The blade is shorter, with a rounded tip, and is normally lighter and easier to use.
- **Racing.** As the name indicates, this paddle is used in racing where long, powerful strokes are required. Because of its wide blade and square tip, it bites solidly into the water.
- **Indian.** Has a long, narrow blade and no top grip. The Indian canoeists apparently preferred a short, steady stroke with a paddle that did not move much water, but conserved energy. A good model to make at camp or in the workshop.

Whitewater Paddles

The better whitewater paddles are made of hard wood or synthetic material with an aluminum shaft. Some paddles are molded entirely of fiberglass or plastic, but these are often too flexible for whitewater paddling. (See the Appendix for Whitewater paddles.)

The trend is toward shorter paddles, about chin-height for aluminum canoes (a few inches shorter for slalom canoes with their lower kneeling position and narrower hulls). Blades should be 7 to 8 inches wide. Narrower blades waste energy, and wider blades are clumsy. The grip should be rather square or T-shaped (not rounded) so that you can feel the exact angle of your blade. These paddle specifications are not rigid, but depend on your physique and your preference.

Bent-shaft paddles are popular with some experienced paddlers. The blade of the paddle is angled forward to extend the length of the stroke in the water by keeping the face of the blade pushing back against the water. This does give some advantage on the forward stroke, but the angle can be awkward when feathering or doing other maneuvers.

A single-bladed paddle can be used in kayaking, but a double-bladed paddle is often preferred. A double-bladed paddle should have feathered blades, offset 90 degrees from each other. The offset blades will automatically feather on recovery as the opposite blade is used in the water. Double-bladed paddles range in length from 80 to 85 inches. An 82- or 83-inch length is about right for a person 5 feet 9 inches tall. Two-part, jointed paddles are convenient for storage and transportation, but be sure the joint is well-fitting and secure. Jointed paddles are not as sturdy as their one-piece counterparts. Double-bladed paddles may have either flat or spoon blades, but the flat blade is preferable for the beginner.

Canoes

There was a time when all canoes were made of natural materials. Today's aluminum, fiberglass, and plastic canoes are descendants of the birchbark, animal skin, reed, and dugout craft of the early Americans. About 1870, it was found that canvas stretched over a wooden shell made a light, strong, and beautiful canoe, and for 8 decades the canvas canoe was king. After World War II, canoes made of aluminum captured much of the market. Quality canoes are now made from a variety of synthetic materials.

Even though canoes today are made of different materials and in different styles and models, the names of the parts on all canoes are fairly standard. Canoeing terms are derived from the larger ships of the ocean. For example, *starboard* and *port* mean the right and left side of the canoe or boat. (These terms have a lot of history, and have changed over time. The port side used to be called *larboard.* The larboard side was always against the dock when the ship was in port, and over time the shorter word became the preferred term.) When you are facing forward in your canoe, port is on your left and starboard is on your right. The terms "right" and "left" are, of course, just as good.

For moving about or placing gear in the canoe, *forward* means towards the front end and *aft* means towards the back. *Amidships* is the center, and *bow* and *stern* name the front and back of the canoe.

Sides and *bottom* are obvious, and *keel* is the reinforcing fin that runs along the bottom of the canoe. *Ribs* and *planking* (in a canvas canoe) reinforce the wall of the canoe. *Gunwale* (pronounced "gunnel") is the top edge or outside rim of the canoe. *Thwarts* (pronounced "thorts") are the braces that reach across the top of the canoe.

For lake canoeing, certain features of the canoe should be considered. The bow and stern should be low to offer less surface to the wind. A small keel will lessen sideways drift. A rounded bottom will increase speed, but this is also less stable. Good lines are important, but only actual testing against other canoes will determine which is the best for your purpose. Look for a fine bow and stern to cut easily through the waves, but with some flare to push water away.

It is important to know the number of pounds of cargo and people that a canoe can safely carry. This information is usually provided by the manufacturer. If you wonder whether your canoe is overloaded, check the *freeboard.* If there are less than 6 inches between the surface of the water and the lowest point on your canoe's gunwales, your canoe is not safe for paddling. The U. S. Coast Guard measures capacity by loading the canoe

until it has 6 inches of freeboard. The sides should be high enough to keep waves out. The depth of the canoe, from center thwart to bottom, should be 12 inches or more for all canoes except the smallest 12-footers. Freight canoes may be 2 feet deep or more.

Most lake or flatwater canoes are 16 to 18 feet in length. Depending on lake and wind conditions, a flatwater canoe could be as short as 12 feet or as long as 36 feet. The big Montreal canoes that fur traders used on the Great Lakes were 35 feet long—and made of birchbark!

Whitewater Canoes

The whitewater or river canoe is similar in many ways to its flatwater cousin, but in some ways has different requirements.

- *Bow and stern.* May be a bit higher in the whitewater canoe—some "rocker" in the canoe profile may be desirable for better control.
- *Keel.* Definitely *not* desirable. You don't want underwater "handles" for crosscurrents or rocks to grab.
- *Capacity.* No significant difference—for long wilderness trips with heavy gear, higher sides may be important.
- *Bottom.* A flat or small-arched bottom is important—a round bottom will interfere with your ability to move sideways across the current.
- *Length.* For solo use, 13 to 15 feet; for tandem, 16 to 17 feet.
- *Strength, durability.* Fragile wood craft are a joy in flatwater, but on whitewater, esthetics must yield to toughness. The power of swift water is unbelievable. Any canoe, no matter how strong, can be torn up or crushed on a tough stream. Only canoes made of aluminum or synthetic materials are appropriate on moving water, and even the strongest canoe will not survive poor judgment or lack of skill.

Decked Canoes and Kayaks. On whitewater rated Class III or higher, a covered or decked canoe is needed. This is a craft that will not fill with water when crashing through high waves. These craft are either molded with a permanent top cover, or decking material is securely fastened. Paddlers sit in cockpit openings with raised coamings or collars around the cockpit opening, and usually with spray skirts attached to the coamings. You don't really ride these canoes, you wear them!

The slalom canoe, a craft specially designed for tandem paddling on whitewater, is completely decked over, with cockpits fore and aft. The paddlers wear spray skirts and seal the openings. Inside are knee straps and foot braces, and a thwart to lean against. A flat bottom and "rocker" profile give maneuverability, and an elliptical cross section and narrow beam make it easy to do an Eskimo roll. They are not intended for touring. Steerage is very limited, and the kneeling position can become uncomfortable after several hours afloat.

A relatively wide-bodied slalom kayak made of molded plastic or other synthetic material is recommended for those learning kayak skills. The kayak should be equipped with seat, foot braces, knee braces, flotation, a spray skirt, and end loops. (See the Appendix for parts of a kayak.)

Foot and knee braces should be adjustable to give a firm fit while seated. Rigid bar foot braces can trap the feet and should be avoided. The pedestal

type, or a breakaway bar type, is commonly used. Knee braces are used in conjunction with foot braces and are not adjustable. Kayak flotation bags or other flotation materials are a must. The bags displace water when the kayak capsizes, thereby saving emptying time and effort. The kayak will not otherwise float when filled with water.

The spray skirt attaches to the coaming around the cockpit and is designed to keep water out of the kayak. It should fit snugly at the midsection of the paddler with an elastic top. The bottom of the skirt fits snugly around the coaming in the same manner. Spray skirts should have an easily accessible release loop at the front. A slight pull forward and up on the loop should easily release the spray skirt from the canoe for a quick exit.

Grab loops on the bow and stern of the kayak are important for self-rescue because they provide a handle on an otherwise slippery craft. These loops can also be used to tie down the kayak for transporting.

Whitewater Canoe Construction. The materials most commonly used in the manufacture of whitewater canoes are aluminum and plastic-like synthetics. Fiberglass is used to a lesser degree. Canoes made of these materials can be stored outside and require little maintenance. The plastic canoes—at least the better brands—are generally more durable on whitewater than are the aluminum and fiberglass canoes.

The flotation in canoes composed of synthetic material is the material itself. Aluminum canoes have styrofoam flotation in the tanks at each end. Ants and termites will tunnel in styrofoam, so aluminum canoes should not be stored on the ground. Older canoes should be checked periodically to make sure they have adequate flotation.

A whitewater canoe can be made much safer and its life can be extended by placing a large styrofoam block amidship, or by putting styrofoam strips in the bilge. This causes the canoe to float much higher when swamped, thus providing additional protection to both the canoe and passengers.

Attention should be given to the construction of thwarts, seats, and seat braces. Paddlers should be able to kneel with their feet comfortably under the seat without having them pinned. Sharp edges on the underside of the seat or on the seat brace should be taped or rounded with a file.

The advantages of a good "space-age plastic" river canoe is its high-impact resistance, light weight, and general durability. A fiberglass canoe tends to be heavier, less maneuverable, and not as durable. A well-designed aluminum river canoe from a leading manufacturer is recommended for the whitewater beginner on Class I and II rapids. Aluminum is strong and tough, reasonably lightweight, and usually less expensive. On rapids above Class II, however, aluminum will soon begin to show dents and wear from contact with rocks. Additionally, aluminum is more likely to hang on rocks than synthetic material because of greater surface friction.

Painters

Painter is the nautical name for the lines secured to the bow and stern of the canoe. These lines have many uses for securing the craft at a dock or shoreline, or for towing. The painter should be long enough on each end to tie back to the nearest thwart with a clove hitch. They can also

be coiled and secured to the top portion of the breastplate. They should never be left loose in the bottom of the canoe where the paddler could become entangled.

Kneeling Pads

Kneeling pads should be used when paddling in the kneeling position. Pads can rest in the bottom of the canoe or can be secured to the paddler's legs. Several types of kneeling pads are available from gardening and sports shops. You can also make your own from cloth, styrofoam, or other materials.

Kneeling pads should not slip on the bottom of the canoe, should not soak up water, and should float. To make your own kneepads, put two layers of sponge rubber in a piece of tire tube, turned inside out. Seal the edges with a rubber cement or have them vulcanized at a tire store. Cover it with cloth, since rubber against bare skin can chafe and cause blisters. Or, fill an old hot-water bottle with sawdust, then wrap it in cloth. If you are fastening a pad to each knee, make sure you can unfasten it easily and quickly.

Yokes

When you pick up the canoe and carry it over land from one lake or stream to another, you are *portaging.* The trail you follow is the *portage.* Canoe yokes come in handy when you are carrying the canoe on your shoulders. A number of padded yokes are available and will fit a standard canoe. You can also improvise yokes using canoe paddles.

Bailers

No matter how careful or skilled you are, some water will get into your canoe. You may take in water from the waves on a lake as a result of "out and in" maneuvers, or just from your feet as you wade out into the lake to launch your canoe. The best way to get that water back where it belongs is to use a large sponge, a plastic jug (like a bleach bottle cut open), or a cup—or even, in an emergency, a shoe! Never let the water build up in your canoe, since shifting water can throw off your canoe's balance and trim, and make paddling very "tippy."

Waterproof Containers

Containers to protect equipment from water damage will always be needed for your camera, camping gear, food, or clothing, particularly on a long trip. Use simple plastic bags (like garbage can liners), plastic freezer boxes, special rubber bags, or, for very special equipment like cameras, metal ammunition boxes. Some waterproof plastic containers are sold by outfitters and other stores specifically for this purpose. Remember to tie those valuable packages to the canoe.

Shoes

Proper footgear is important in canoeing. Although shoes are not usually needed in the canoe if the weather is warm, shoes are needed for protection when launching and landing, and when carrying the canoe to and from

the water. Shallow water may hide a rough or unknown bottom with natural or man-made hazards. These hazards cannot be avoided by trying to stay dry. Canoeing is not a "dry foot" sport. The paddler determined to keep his feet dry usually gets his hair wet! Good canoeing shoes should have a non-slip tread, dry quickly, and stay secure on the foot. Some lace-up shoes with canvas tops and rubber soles work fine, but drying and comfort may be a problem. Secure-fitting sandals that do not lose their shape and fit when wet, and with good soles, are ideal. Some outfitters and sports shops carry durable plastic sandals designed specifically for canoeing. The aqua shoes are appropriate to wear while paddling.

First Aid Kit

A first aid kit should contain the basic items to meet your personal needs. Several small bandages in various sizes are especially recommended for blisters that may develop from paddling.

Rescue Equipment

Throw lines or throw bags may be necessary for rescuing people or watercraft. The average length of the line is sixty feet. Throw bags are preferred to throw lines, because there is less chance of the line getting tangled. You can make your own throw bag; see directions in the Appendix.

Conditioning

Paddling is a very physically demanding activity. You'll burn approximately 600 calories an hour when you are paddling actively. Because paddling is physically challenging, you need to make sure you are in good physical condition and eat the proper foods.

Good conditioning depends on three things: (1) how often you exercise; (2) how long you exercise; and (3) the type of exercise you do. You need to do exercises that are general in nature and work on your overall physical condition. You also need to do specific exercises that relate the the movements you will be making while paddling. These exercises should concentrate on flexibility, strength, and endurance.

SESSION 1

Learning Objectives

As a result of this session participants should be able to:

- Demonstrate basic paddling positions
- Launch a canoe in tandem
- Demonstrate and execute a variety of strokes

Paddling Positions

The paddling positions favored by skilled canoeists not only increase stability by lowering the center of gravity, but also permit the paddler to use his thigh and trunk strength more efficiently in conjunction with his arms. (See the Appendix for art on paddling positions.)

Most canoes today have bow and stern seats. Seats add some comfort for the inexperienced paddler, or on long treks, but they also raise the center of gravity and reduce stability. Paddling from the seat is acceptable on quiet waters, but on windy or rough water—or when racing or doing complicated maneuvers—only the novice would fail to use a kneeling position. Also, when the canoe is heavily loaded and has minimum freeboard, paddlers should always kneel.

It is easier to paddle from a kneeling position, since you can use your thigh and trunk muscles along with your arm and shoulder muscles. You can get a wider reach and a more powerful stroke, too. On a seat, only the arm and shoulder muscles are used—and they can get tired and sore fast. In a kneeling position, you and your canoe become almost one. You can better "feel" every move your canoe makes.

Kneeling positions are the same whether you are paddling alone, with a buddy, in the bow, or in the stern. The position used most often for recreational canoeing is the *cruising position.* You kneel on both knees and rest your buttocks against a thwart or the forward edge of a seat. A variation of the cruising position is kneeling on one knee, often called the *relief position* because it is frequently alternated with the normal cruising position. The paddler rests against a thwart or a seat while kneeling on one knee and extending the other leg forward. He should brace the forward foot by placing it against the edge of a rib. Always kneel on the knee that is on the paddling side.

The *upright kneeling position* is one in which the paddler kneels on both knees, with thighs and trunk erect, and faces slightly toward his paddling side. This position has the distinct advantage of allowing the paddler to change his location in the canoe, regardless of thwart or seat location. It's a good relief from other positions, makes paddling easier if there is wind, and allows a more powerful stroke.

The *high kneeling* or *racing position* is used in canoe racing or for covering distance in the shortest time with the least effort. The position is essentially on one knee and the opposite foot, with the body erect and facing slightly toward the paddling side, rather than directly forward. The leg on the kneeling side extends diagonally across the canoe with the bottom surface

of the paddler's toes, or the bottom of the toe of a soft-soled shoe, gripping the bottom of the canoe. The other leg is extended forward with only a slight bend at the knee. The foot is placed firmly on the bottom of the canoe, and the toes are pointed diagonally toward the center of the craft.

One other kneeling position is called *Indian style* or "sitting on the heels." It is not very practical for a small paddler in a high-walled aluminum canoe, but was probably ideal for the shallow dugout or bark canoe. The paddler kneels on the bottom of the canoe and sits back on the inside of his heels. This puts weight right on the bottom of the canoe, gives the paddler maximum control, and virtually makes him part of his craft. It is a very good position for single paddling, but the beginner will find it hard on his knees and ankles until he gets used to it. It should be used for short periods with a firm kneeling pad until you have become accustomed to paddling Indian style.

Loading the Canoe

The stability and handling of lightweight, shallow-draft craft such as canoes are affected by weight and weight distribution. If your canoe is trim, you run less risk of overturning and will be able to maneuver more easily.

A canoe is *trim* if it is balanced from end to end and side to side. If the canoe is trim, the center of gravity is over the keel. The center of gravity should also be below the gunwales and as near the bottom as possible.

Weight that lowers the center of gravity of the craft and adds stability is called *ballast.* A properly loaded canoe is trim with the gear serving as ballast. But too much weight can be a problem in wind and waves, or if the canoe *lists* (leans sideways) as a result of collision or movement in the canoe. Total cargo, including gear and people, should never leave less than 6 inches of freeboard (distance between the surface of the water and the gunwale amidships).

When packing your canoe, tie small items and loose gear such as shoes, camera, and fishing tackle to the canoe. Secure larger items like tenting, bedrolls, and food packs to prevent shifting.

Assuming that your canoe is trim before boarding, the heavier member of the paddling team should be in the stern. An exception to this rule may occur when paddling on a windy day. The heavier end of the canoe should be turned into the wind. If you are heading into the wind, then the bow should be slightly heavier than the stern. The wind will always tend to turn the heavier end of the canoe into the wind. This is called the *weather vane effect.*

Launching

Tandem canoeing is what you do with a companion—one person in the bow, one person in the stern. Although other people may be carried as passengers, the paddling is done by the bowman and the sternman. You should master the paddling skills of each position in tandem before attempting to learn the single man paddling skills.

Good canoeing skills are needed from the moment you first touch the canoe. This first contact should be on land. (See the Appendix for launching a canoe.)

All canoes should be properly stored out of the water, upside down on a rack that holds them clear of the ground. Ideally, the rack would be shaded and at least one and one-half canoe lengths from the water. Sun protection is essential if your canoe is made of wood, canvas, or other natural materials. Aluminum canoes are not damaged by the sun, but can quickly become too hot to handle on a sunny day. Canoes made of synthetic materials will benefit from sun protection, and the manufacturers' instructions should be followed carefully on this point.

The first task is to safely remove the canoe from its rack and carry it to the edge of the water. The best arrangement is for the canoe to be kept on a rack with open ground beside it where the canoe can be set down. Another common way of racking canoes is to have them side-by-side, without space, except when a canoe has been removed from the rack and one space is open. These two rack arrangements require different techniques in lifting and carrying the canoe.

Even if you are big enough to lift and carry a canoe by yourself, it is always easier, safer, and smarter to use a companion when lifting and carrying a canoe from its rack. Before removing a canoe from the rack, you should determine that the ground area is clear of any rocks, stakes, or other objects that could be a hazard for you or that could damage the bottom of the canoe. If you are removing a canoe from a rack where there is open ground beside the canoe, begin with one person at each end of the canoe. Lift the canoe, holding securely at each end, and step sideways until you are clear of the rack and there is open ground under the canoe. Now carefully turn the canoe until it is upright. Before turning, you should communicate with your companion to be sure both people know which way the canoe is going to be turned. It is usually wisest to roll the canoe in the direction away from the canoe rack. Then set the canoe down carefully, right side up, on the ground.

If your canoe is racked side-by-side with others, without open ground at either side, you will have to use the lift and walk technique. Begin with one person at each end of the canoe, facing each other. Lift the canoe, holding securely at each end, and turn it carefully until it is right-side up. Carefully set the canoe back down on the rack. Move to opposite sides of the canoe by the breastplates, with both people facing the water or the direction in which the canoe is to be moved. Each person then grasps the inside edge of the breastplate or the gunwale near the breastplate and lifts the canoe off the rack. Now walk forward, with the person at the rear stepping carefully over the two low beams of the rack, until the canoe is clear of the rack and can be put down. Move slowly and cautiously, for a fall here could do serious damage to you and the canoe.

If turning the canoe while holding it in the air is awkward or the individuals are too small to perform this particular maneuver, you can set the canoe down, upside down, and then turn it carefully on the ground. Obviously, in order to turn it after you set it down, you're going to need additional clear area so that you can roll it from the upside down position to right side up.

Put your equipment into the canoe, including paddles and personal items, while the canoe is on the ground near the rack. Do not heavily load the canoe at this point, as this will make it much more difficult to carry to

the water. You also do not want to load the canoe on the ground in such a way that it will flex and be damaged.

To carry the canoe to the water, you and your companion should stand on opposite sides of the canoe, in line with the edge of the breastplates or the first thwart from the bow and stern. Grasp under the breastplate or at the thwart and stand up together, lifting the canoe with your legs and back and keeping your arms straight. Then walk forward until the end of the canoe closest to the water is at the water's edge. Set the canoe down carefully.

At this time, you should decide whether the canoe is going to be launched stern first or bow first. The most stable way to launch and board the canoe from a beach is stern first. If you are going to be launching into a current or into a wind, or if the beach area is arranged such that a turn will be difficult after the launch is completed, a bow-first launch may be appropriate.

If you are going to make a stern-first launch, and the canoe is sitting at the edge of the water with the stern nearest the water, you and your companion should now stand facing each other across the canoe at the midship position. Grasp the canoe on both sides at the gunwale and lift it off the ground, using your legs and back and keeping your arms straight. You should then walk sideways until you are standing at the water's edge or in shallow water right at the edge of beach. At this point, pass the canoe toward the water, hand-over-hand, holding on to the gunwales until the stern of the canoe is supported by the water. Continue to push the canoe out, hand-over-hand, standing in the same position until you and your companion are both holding the breastplate and the canoe is supported on the water. The bow of the canoe should be set gently on the water. Make sure that the canoe is floating free with nothing under it except water. The bowman then remains at the canoe, with his hand on the breastplate or bow, while the sternman fetches any equipment that still needs to be loaded into the canoe.

Before boarding the canoe, the gear should be placed in such a way that it presents no hazard to someone boarding, and will not be broken if someone loses his balance and falls or steps on it accidentally. Paddles should be laid flat in the canoe, not leaning on a thwart. If the canoe is in water shallow enough to stand in, the sternman should walk out beside the canoe to place and secure the remaining equipment. If you're launching onto deep water, the canoe can be pulled alongside the shore for loading and boarding.

Up to this point, the launch procedure from a beach would be the same whether you were launching bow first or stern first. The procedures are quite different, however, when it comes to getting yourself into the canoe. When launching stern first from the beach, the bowman is in charge of the boarding procedure. He begins by pointing the stern out at right angles to the beach, making sure that the canoe is floating free of the bottom and any rocks. In a very shallow area, it may be necessary for the bowman to walk out into the water a few feet in order to get the canoe clear. It is most important that the bowman check to be sure he cannot see light under the canoe, indicating that the canoe is "bridging" between two points. A common cause of structural damage in a canoe is when someone

steps into a canoe that is "bridged" and puts weight on the keel or ribs without water supporting the canoe.

When the bowman is ready to begin the boarding procedure, he kneels at the bow of the canoe, with one knee on either side of the bow, and grasps cross-armed across the breastplate. Holding securely in this position will prevent the canoe from tipping to either side when his companion steps in. You may also find it helpful to use a paddle to help hold the canoe. You do this by placing the tip of the paddle in the water against the bottom with the blade flat against the side of the canoe. If there is a breeze or current, put the paddle on the downwind or downstream side of the canoe. Rest the loom of the paddle on your shoulder with the grip extending past your neck; then wrap your arm over the loom and across to hold the breastplate near the opposite side of the canoe. Your other arm reaches across the breastplate from the other side. This grip, with the help of your knees on either side of the canoe, allows you to control the side-to-side tipping of the canoe. It also helps you keep the canoe pointed out from the bank. The exact position of the paddle and hands is not as important as the bowman being confident that he has a secure hold on the canoe, and will be able to control the movement of the canoe while his companion boards.

When the bowman is in position and ready, he tells the sternman to get in. The sternman should walk into the water to a spot about even with the bow thwart and then turn and face the bowman. Leaning forward and placing a hand on each gunwale, the sternman steps in with the leg nearest the canoe and places his foot on the keel while keeping his weight momentarily on his leg that remains in the water. When his foot is placed firmly on the keel, he shifts his weight to that foot and to his hands on the gunwales of the canoe, and lifts his other leg into the canoe. As soon as he has both feet in the canoe, he should lower his back end with his head up so that his center of gravity is low in the canoe, and he is facing the bowman holding the canoe. On signal from the bowman, the sternman then backs along the keel of the canoe, stepping over the thwarts as he gets to them, and keeping his weight low with his hands on the gunwales. When the sternman gets to his position, he should kneel, get settled, and check his balance. He then puts his paddle into the water, against the bottom of the lake, with the blade flat against the side of the canoe and the loom straight up. The sternman is now going to brace the canoe so that the bowman can release his hold at the bow and get aboard. To brace the canoe in the stern position, the sternman grasps the throat of the paddle that is in the water against the canoe and hooks his thumb over the gunwale. With his other hand on the grip, he has made a post in the water and secured the canoe to that post. When he is ready in this position, he tells the bowman to board.

The bowman begins boarding by releasing his hold on the canoe and walking in shallow water to a spot even with his position in the canoe. After stowing his paddle flat in the bottom of the canoe, and out of his way, he grasps the gunwales, just as the sternman did, and steps into the canoe one foot at a time, shifting his weight in the same manner as described for the sternman. After he is in the canoe, the bowman backs up, stepping over the thwarts until he is in a position just aft of midship. This will raise the bow of the canoe off the bottom in the shallows near

the edge of the water. With the bowman in this position, and kneeling low, the sternman releases his post hold of the canoe and makes several short reverse strokes to back the canoe away from the beach. Once clear of the beach, the sternman stops paddling and holds his position steady while the bowman moves forward to his position and gets settled, retrieves his paddle, and is ready to begin paddling.

When launching bow first from the beach, the roles are reversed with respect to who gets in first and who steadies the canoe. The sternman will take the position at the beach, bracing the canoe and giving instructions to the bowman about boarding. As before, both paddlers board the canoe facing the bow, except that the bow is now facing away from the shore. This means that the bowman will enter and move forward. He will then steady the canoe with the post position while the sternman enters and moves forward to just fore of midships so that the canoe can be cleared from the shallow beach area. Once clear of the beach, the sternman will then move backward to his position, and the two-man team is ready to begin paddling.

Launching from a pier involves some different maneuvers. If the canoe is taken from the rack and then walked out onto the pier, the procedures are essentially the same, up to the point where the canoe has been set down on the pier right side up and you are ready to begin the actual launch. If the canoes are stored on the pier, it is a simple matter to turn the canoe over and begin the launch procedure.

Launching from the pier is very similar to shore launching, except you are not able to step into the water. (A pier launch is also done from a shoreline when the water immediately drops off to a depth that prevents stepping into the water to launch and board.) With the companions facing each other across the midship section, the canoe is lifted by the gunwales and passed into the water hand-over-hand, just as is done from the shore. Whether the bow or stern goes into the water first from the pier is of no importance. (See drawing in the Appendix.)

After the canoe has been placed on the water, it is turned alongside the pier with one gunwale against the side of the pier. One person then kneels or sits on the pier and holds the gunwale of the canoe steady while the other loads the equipment and secures it for boarding.

While one person continues to steady the canoe against the side of the pier, the other person sits on the pier with his feet in the canoe. He then shifts his weight to his feet in the canoe, over the keel, with one hand still on the pier while he reaches to the gunwale on the opposite side with his other hand. When his weight is in the canoe, he then moves forward or backward to his paddling position and gets settled. When he is in position, he holds the pier with one or both hands to steady and secure the canoe against the side of the pier while the other paddler boards.

The person holding and steadying the canoe is always in charge during the launching and boarding procedure. When the man in the canoe has a secure hold on the dock, he then tells his partner to get in. The partner gets into the canoe following the same procedure as his companion, and moves to his position. When the second person is in the canoe and settled, the companion holding the pier then releases and gently pushes the canoe away from the pier for sufficient clearance to begin paddling.

Paddling

Flatwater paddling is simply a matter of reaching forward, grabbing the water, and pulling the canoe along. As simple as it sounds, the first-time paddler usually experiences a good deal of frustration and may conclude that paddling is hard work. The more you understand about the paddling art, however, the easier it becomes and the more confident you will be regarding which stroke or maneuver produces the desired result.

Several basic principles of paddling should be kept in mind. First, once you have grabbed hold of the water on a paddling stroke, don't let go until the stroke is completed. Second, minimize water and wind resistance. Third, make use of your momentum. Finally, avoid wasted effort.

The first principal, *grab and hold*, is important for the power strokes, and is the most important factor in sculling and single-man pivots. You need to know which side of your blade is doing the pushing against the water. If you change the side of the paddle that is doing the pushing in the middle of a stroke, you obviously lose your power and control and have to use a lot more energy and effort to make up for that loss. This point also comes into play when you are developing your long, smooth, steady stroke—as opposed to a short, choppy stroke that is constantly releasing water and causing you to make another grab.

Avoiding *resistance* is not simply a matter of cosmetic appearance. A failure to take wind and water resistance into account can convert an easy 30-minute paddle into an hour-long struggle against the elements. We have already considered one effect of wind resistance when we discussed trim and balance and heading into the wind. When paddling into a strong wind, the bow should be pointed squarely into the wind, or the additional resistance of the wind against the side of the canoe will make controlling the direction of the canoe very difficult. If you get caught in a strong wind, the heavier end of the canoe should be pointed into the wind and you should head for the nearest shore to take the canoe off the water until weather conditions change.

Another source of wind resistance, and potential water resistance, frequently overlooked by the inexperienced paddler is the paddle. If the paddle is held out of the water, with the blade flat against the wind, it acts as a sail. Also, if the blade is held flat against the air as it comes forward to begin another stroke, it has more wind resistance, which adds to the work. You also risk being slapped by a wave, which can certainly add to the work, or even take the paddle out of the hands of the paddler. To minimize the wind resistance and the risk of losing the paddle to a wave, the paddle is *feathered* as it is swung through the air from the end of one stroke to begin another stroke. Feathering is done by turning the blade flat and parallel with the surface of the water so that it slices through the air. You want your blade to cut through the air like an airplane wing, and to cut through any wave that may slap at it while you are swinging it back to begin another stroke.

Another principal to keep in mind is *momentum*. The purpose of paddling is to get you moving, and once you are moving you have momentum. You don't want to throw away the momentum you've achieved every time you want to change direction or execute a maneuver (other than stopping). Ideally, you use the momentum to assist in your maneuver, whatever it may be. For example, if you are moving forward and want to turn to the

port, it is far better to turn underway rather than stopping and restarting your forward movement. The paddling strokes you are going to learn can be classed in two categories: (1) those that permit you to maneuver the craft without losing momentum, and (2) those that are used to reduce forward momentum, or when the canoe is stationary. Those maneuvers that fall in the first category are not to be done in such a way that momentum is needlessly sacrificed.

Now consider the fourth principal in paddling—*wasted effort.* Certainly you don't want to work harder than you have to, and the first three principles are all concerned with wasted effort. When you learn the strokes correctly, you will understand that each technique has been developed to avoid wasted effort. If you do something different from each technique, you not only look sloppy, but you are wasting energy. One good example is when you swing your paddle forward from the end of a stroke to begin the next stroke. A paddle has weight. If you swing it low above the water, you minimize the amount of strength that is being used. If you lift it high and swing it in an arc, you are obviously wasting the effort and strength that is required to lift the paddle high and swing it through a greater distance. Conserve your energy, keep the paddle low, and travel the shortest distance between two points—a straight line.

Before learning the individual strokes, you should become familiar with stroke terminology. Every paddling stroke has four parts called (1) the catch, (2) the pull (or push), (3) the feather, and (4) the recovery. The *catch* is when you first grab hold or make contact with the water. The *pull* (or *push*) is the working part of the stroke that should accomplish your objective—to make progress or do a particular maneuver. The *feather* is the twist of the wrist that aligns the blade of the paddle with the surface of the water to reduce resistance. The *recovery* is the term used to describe what happens between the time you complete the stroke and when you are ready to start another stroke. Remember catch, pull, feather, and recover—you will find them in every stroke.

Paddling Commands

Because the bow paddler can't see what the sternman is doing, there are certain commands given by the sternman to coordinate the efforts of the two paddlers. In effect, the sternman is the captain of the ship and is in charge of the paddling activity (with some exceptions). The first command is *prepare to give way,* which means that both paddlers should assume the position ready to make the catch for the first stroke. The command *give way* means to begin paddling. *Let it run* means to stop paddling and let the canoe coast. In the *run* position, the paddlers lay the paddle across the gunwales with the blade extended out over the water in the feathered position. The command *hold water* means to slow the canoe's momentum or to hold it in position. The *stop* command means exactly what it says. (The hold water and stop maneuvers will be discussed with other strokes that are not intended to maintain forward momentum.) The sternman may also call for specific bow strokes if he needs help in maneuvering the craft.

The bowman is not without responsibility, however. Obviously, the bowman is expected to watch the water in front of the canoe and to make

whatever maneuvers, and give whatever commands, are appropriate to avoid hitting obstacles such as rocks or logs. In addition, the bowman sets the pace for the strokes. The sternman matches the timing and speed of the bowman's stroke so that the strokes are done at the same time. When the strokes are done together, the canoe is much easier to control and to maneuver, and there is considerably less wasted effort.

Strokes

The first three strokes to learn in the bow position are strokes used to achieve and maintain forward progress or momentum. If you are halting your forward progress in making turns using these strokes, then you are not executing the strokes properly.

Before doing your first stroke, be sure you are holding the paddle correctly. If you are paddling on the port side, place your right hand on the grip of the paddle and your left hand on the throat. To be sure you are holding the grip correctly with your right hand, begin by laying your hand on top of the grip, palm down, with fingers outstretched. The paddle end should touch the palm of your hand right at the knuckles, with the knuckles in line with the top of the grip. You then simply close your hand so that your fingers are on one side of the grip, the base of your hand is on the opposite side, and your thumb wraps around the side of the grip.

To check the placement of your hand on the lower part of the paddle, extend your arm down and slightly away from your body with the hand open, palm down, and fingers spread. Now lay the throat of the paddle between your thumb and index finger, with the blade of the paddle turned parallel with a line between the tip of your thumb and the tip of your index finger. Now simply close your hand around the paddle so that your thumb wraps around the throat and your fingers are just below the throat, extending onto the upper part of the blade.

Bow Stroke

The bow stroke, or power stroke, is the simplest and one of the most important strokes in canoeing. It is also a good stroke to learn in order to understand certain principles that apply to other strokes.

The purpose of the bow stroke is to move the canoe forward. Paddling on the port side from a full kneeling position, the bowman leans slightly forward from the waist and extends his left arm (with his left hand on the paddle throat) forward and slightly down, keeping the elbow straight. The right hand is on the grip, with fingers facing forward, just in front of the chin. This is the "prepare to give way" or "ready" position for the "catch." The blade is perpendicular to the center line of the canoe, and extended alongside the bow. The catch is at a point as far forward as the bowman can reach comfortably without overbalancing, and very close to the side of the canoe.

The "pull" is down and back along the side of the canoe, with the right hand pushing forward on the grip while the left arm, with elbow straight, swings down and back in an arc. The grip hand supplies most of the power by pushing out in a motion like a boxer's jab. The left arm serves primarily

as a pivot point and guides the paddle in a straight line along the side of the canoe. To get the most power with the least effort, the stroke should be very close to the canoe with the blade almost straight down in the water.

Why the straight elbow? Certainly it looks good, but cosmetics do not move the canoe. For best results, the paddle has to be in the water. (Air paddling does not give much for the effort.) When you bend the elbow during the pull of the stroke, you lift the paddle and end your stroke too early. Remember, once you grab the water, don't let go. The paddle should come out of the water at the end of a full arc, with the left arm straight and fully extended behind the paddler. If you bend your arm and lift the paddle too early, you will have to make more strokes, and consume more energy, to cover the same distance. Also, when you bend your elbow and raise the paddle during the pull, you are actually pulling up on the water, or "shoveling." Lifting the water wastes energy and actually slows the momentum gained during the stroke by pushing the canoe down in the water. The idea is to pull the canoe forward by pulling the water past the canoe.

At the end of the pull, roll the grip by turning the wrist so that the finger side of the grip is down. This will feather the blade of the paddle for recovery. (The position of the hands never changes during power strokes. All movement of the grip hand is intended to move the paddle blade.) The recovery arc is to the side, left elbow straight, with the blade tip approximately 4 inches above the water surface. Recover in the feathered position all the way back to the ready point, and then roll the grip hand by turning the wrist so that the paddle blade is again perpendicular to the center line of the canoe. Now you are ready for your next stroke.

Quarter Sweep

The quarter sweep stroke turns the bow of the canoe away from the side on which the bowman is paddling. The name of the stroke accurately describes the way it is done.

The quarter sweep begins at the same point as the bow stroke. The difference is the blade angle. For the quarter sweep, the blade is turned straight up and down, perpendicular to the surface of the water. This stroke is called a "sweep" because the blade is going to travel along the top of the water, extended out in a wide arc as far as the paddler can reach. If the stroke were to be continued in one direction all the way around back to its starting point, it would draw a full round circle on the surface of the water. The term "quarter" is applied to this stroke because the full length of the stroke is one quarter of a circle.

The stroke ends at a position straight out from the side of the canoe, even with the kneeling position of the bowman. For best results, the stroke must end at this point because sweeping through the second quarter of the circle would add little additional turning effect for the effort. The first quarter pushes the bow away from the side on which the bowman is paddling; the second quarter would tend to pull the entire canoe to the side on which the bowman is paddling.

Now to put the stroke together: Begin with a catch, with the hand on the throat of the paddle extended forward as in the bow stroke, pull

through the quarter sweep with one side of the blade down in the water and the other side near the surface or slightly out of the water. When the pull is even with your kneeling position, feather as in the bow stroke and recover to your starting point.

When you are under way and have good forward momentum, one quarter sweep in between power strokes will quickly move the bow away from the side on which you are paddling. Two or three quick quarter strokes will easily accomplish a full right-angle turn.

Diagonal Draw

The diagonal draw is used to turn the bow of the canoe toward the side on which the bowman is paddling. Again, the name of the stroke is descriptive of the way it is done. The path of the stroke through the water makes a diagonal line to the side of the canoe, and the effect of the stroke is to draw the water up to and under the canoe.

The catch position for the diagonal draw stroke is at a point exactly in the middle of the path of the quarter sweep stroke. The bowman extends the paddle as far as he can reach without overbalancing in this diagonal direction, with the inside of the blade facing him. The blade catches the water and pulls the water in a diagonal line straight to the paddler as though he were trying to pull the water into his lap. Just before the paddle makes contact with the side of the canoe, the diagonal pull ends and the paddle is feathered out of the water and recovered back to the catch position for the next diagonal draw.

If the draw is done effectively, the blade can be turned to the bow stroke position at the end of the diagonal pull and the stroke completed with the second half of the bow stroke. One strong diagonal draw that is finished with the pull of the bow stroke will easily turn the canoe to the side on which the bowman is paddling without losing forward momentum. Two or three quick, strong diagonal draw strokes will turn the bow to a full right-angle turn while maintaining forward momentum.

Changing Sides

An accomplished paddler can paddle with equal ease and strength on both the port and starboard sides. To balance your strength and endurance, and to develop your skills evenly, you should periodically change paddling sides while on the water. This is done on command from the sternman by continuing the recovery of your stroke over the bow breastplate, with the tip of the blade extended beyond the bow. As you swing the blade tip out over the bow in the feathered position, the hand on the throat slides up the loom of the paddle, and the grip hand releases the grip and reaches down to the throat. As the recovery reaches position for the catch on the opposite side of the canoe, the hands come to the proper positions on the grip and throat of the paddle. This procedure not only looks good, but it permits the bowman and sternman to maintain their stroke rhythm and pacing; minimizes wind and water resistance; and, when done smoothly, will not upset the trim and balance of the canoe. All of these considerations relate to momentum, resistance, and wasted effort. Another advantage of this particular method of changing paddling

sides is that no water is dripped or slung into the canoe from the blade of the paddle.

Do not change paddling sides to steer or control your canoe. Learn to use the strokes for steering and control. If you are switching back and forth to steer and control your course, you are wasting much effort and sacrificing momentum. You are also displaying your lack of skill and practice.

The bow stroke, quarter sweep, and diagonal draw are done on the starboard side exactly as they are done on the port side of the canoe, except that the left and right hand positions are reversed.

Maneuvers

You are now ready to learn the bow strokes that do not produce or maintain forward momentum. When used at the proper time, they are important and useful. These strokes—the hold water, stop, pushaway, pullover, reverse sweep, and backwater—are done the same way on the port and starboard sides of the canoe, except that the activity of the left and right arms is reversed.

Holding Water and Stopping

On command from the sternman to "hold water," the bowman puts the blade of the paddle deep into the water, even with his kneeling position, with the blade at a right angle to the center line of the canoe; he holds this position. The result is maximum water resistance without either pushing or pulling through the water. The easiest way to hold this position is to hook the thumb of the lower hand over the gunwale to lock in position and provide a pivot point. The hand on the grip then holds the blade in position in the water. If the hold water is done this way, the lower arm does not have to work against the water resistance. The work is transferred to the hand and arm on the grip, which has much greater leverage across the pivot point at the gunwale. If additional "hold" is needed, the grip hand can be pulled back.

If both paddlers hold water while under way, the canoe will rapidly lose its forward motion. It is a good way to slow to a stop. If the sternman is thinking ahead, he will give the "let it run" command, and then give the call to "hold water." This should slow the canoe to a stop just short of the dock or pier or wherever the sternman wants. If the hold water position is maintained while the canoe is stationary, it will reduce the drift and shift of the canoe.

A quick stop is accomplished on command from the sternman. On the command "Stop," the bowman reaches back to the end position of the bow stroke, catches and pulls forward quickly and hard to the hold water position, and then continues to exert forward pressure with the paddle blade by pulling back on the grip, with the throat of the paddle locked against the gunwale with the thumb of the lower hand. If done effectively, while the sternman does a stop stroke from his position, the canoe should literally "stop on a dime." At the end of the stop maneuver, the hold water position should be maintained.

Pushaway

The pushaway stroke moves the canoe sideways away from the side on which the bowman is paddling. If the bowman does the pushaway while the canoe is stationary, the bow of the canoe will swing away from the side on which the bowman is paddling. If the bowman does the pushaway at the same time that the sternman does the pullover, the canoe will move sideways while maintaining its forward heading. As before, the name of the stroke is descriptive of how it is done.

The catch position for the pushaway begins with the paddle blade deep in the water close against the side of the canoe, even with the kneeling position of the bowman. The blade is turned flat against the side of the canoe, parallel with the center line of the canoe. The "push" of the stroke may be accomplished in either of two ways. With the paddle straight up and down at the side of the canoe, the lower arm holding the throat of the paddle pushes out, with the grip serving as the pivot point. Alternately, from the same catch position, the grip hand can pull back, with the lower arm moving out as the blade travels out from the side of the canoe. The second technique will usually cause the loom of the paddle to contact the gunwale of the canoe and lever across, with the gunwale serving as the pivot point. This levering on the gunwale tends to produce a wear spot on the paddle—and on the canoe, if it is not metal. Also, if you are trying to move silently, you will want to avoid contact between the canoe and the paddle. As you master this particular stroke, you will find that you do the push naturally with a combination of pushing on the throat and pulling on the grip. Whether you use the gunwale for leverage will depend on your circumstances and purpose at the time of the stroke, and your concern about your equipment.

At the end of the push, the blade will be near the surface of the water and should be feathered for either an "in-the-water" recovery or a recovery above the surface of the water. The in-the-water recovery is more efficient and can be done silently. To recover in the water, you do not break the surface of the water with the blade. You feather the blade in the water at the end of the push by turning the fingers on the grip hand toward the stern and slicing the blade through the water back to the catch position. (You could also feather by turning your grip fingers toward the bow. Do whichever is more comfortable for you.) The push and recovery parts of the stroke follow exactly the same path through the water. At the catch position, the blade is again turned parallel with the center line of the canoe by rolling the wrist so that the knuckles are pointing to the side.

The out-of-water recovery is done by having the paddle proceed on the push until it breaks out of the water. Keeping the paddle in this position just as it comes out of the water, and with the elbow straight, swing the blade of the paddle back to a position just behind the paddler. At this point, which is approximately the same point where the regular bow stroke begins its recovery, the blade is turned parallel to the center line of the canoe and sliced down and through the water back to the catch position. Obviously, the out-of-water feather and recovery are more complicated, but may allow the paddler to do a more rapid series of pushaway strokes. It will feel awkward, because the feather position is inverted from the normal feather position. If you are having difficulty making this feather

and recovery, flip the paddle after it breaks the surface of the water and recover with the more comfortable knuckles-down feather position. This means, of course, that the blade will have to do a full 180-degree flip after completing the push part of the stroke. In most circumstances, you will find the in-the-water recovery much easier and more practical. (You do not need to master the out-of-the-water recovery in order to complete the merit badge requirement.)

Pullover

The pullover is the opposite of the pushaway. As always, the name is descriptive of the stroke. On the pushaway, you were grabbing the water and pushing it away from your canoe. In the pullover, you are going to reach out and grab the water and pull it straight to you. This stroke will move the canoe sideways to the side on which you are paddling.

The catch position for the pullover is with the paddle fully extended, straight out from your paddling position. The "pull" of this stroke starts where the "push" ended on the pushaway stroke. With the pulling side of the blade facing you, catch and pull in with the arm on the throat while the grip hand provides a lever point above the gunwale. The pull ends just before the paddle touches the side of the canoe. At this point, the blade should be deep and just slightly under the canoe. The feather and recovery are done in the water. You feather by turning the fingers on your grip hand toward the stern (or bow, if more comfortable). Recover by pulling back slightly on the grip while pushing out with the arm on the throat of the paddle. Recover straight out from the canoe, slicing through the water to your catch position. End the recovery by turning the grip hand fingers out, and you are ready for your next stroke. Using the gunwale of the canoe for leverage on the recovery will only shorten your reach out to the side of the canoe and reduce the effectiveness of your stroke. You can make an out-of-water recovery by reversing the procedure for the out-of-water recovery on the pushaway, but the in-the-water recovery is recommended.

When the bowman does the pullover at the same time that the sternman does the pushaway, the canoe will move sideways to the side on which the bowman is paddling while maintaining its forward heading. If the bowman alone does the paddling and uses the pullover, the bow of the canoe will circle to the side on which the bowman is paddling.

Tandem pivots are done with the pushaway and pullover strokes. If both bowman and sternman do the pushaway, the canoe will pivot, with the bow circling away from the side on which the bowman is paddling. If the bowman is paddling on the port side, the canoe will pivot clockwise. When both paddlers do the pullover, the canoe pivots with the bow circling toward the side on which the bowman is paddling.

Reverse Sweep

The reverse sweep is not often used in the bow position, as it tends to move the canoe backward, with the stern making a wide circle away from the side on which the bowman is paddling. The reverse sweep is an important stroke when paddling alone, and is useful when paddling in the stern position. It is done in the same manner regardless of the paddling position.

The catch for the reverse sweep in the bow position is at the point where the bow stroke ends. As on all sweep strokes, the blade is turned perpendicular to the surface of the water and sweeps in a wide arc, with one side of the blade down in the water and the other side at the surface. The power part of the reverse sweep travels in a wide arc from the catch position all the way around to the point ahead of the canoe where the bow stroke normally begins. The paddle is then feathered and recovered, following the same arc back to the catch position. During the pull and recovery, the lower elbow should be straight, with the arm on the throat extended as far out to the side as the bowman can reach without overbalancing.

Backwater

The backwater is a reverse stroke that makes the canoe back up. It is done the same way in both the bow and stern positions. The catch position is at the point where the bow stroke ends its pull. The blade angle is identical to that of the bow stroke—perpendicular to the center line of the canoe. Catch the water and push forward with a stroke that is essentially the opposite of the bow stroke. The lower arm serves primarily as a pivot, while the hand on the grip pulls back to give power to the stroke. The backwater stroke ends near the bow at the point where the bow stroke catches. The feather and recovery are the same as for the reverse sweep.

If the bowman does the backwater stroke alone, the canoe will move backward, but with a tendency to turn the stern away from the side on which the bowman is paddling. When bowman and sternman backwater at the same time, the canoe will track a straight line in reverse.

Stern Strokes Underway

You have learned a lot about the stern position while learning the bow strokes. You know that the sternman is captain of the ship, with responsibility for maintaining the direction of the canoe, partly by giving stroke commands to the bowman. An experienced sternman paddling on flatwater, however, will rarely need to give a steering command to the bowman, because the sternman can easily control the direction of the canoe using the stern power stroke. The descriptive name for the stern power stroke is the *J-stroke.* The *J* stroke is the most important paddling stroke. If the *J* stroke has been mastered, the rest comes easily.

The stern paddling position gives the paddler greater leverage over the canoe. As a result, if both bowman and sternman are paddling with equal strength using basic power strokes, the canoe will veer to the side on which the bowman is paddling. The *J* stroke is a steering stroke; it is basically the same as the bow stroke, but slightly modified to correct the tendency of the canoe to turn away from the paddling side of the sternman.

In most ways—such as the catch, feather, and recovery—the *J* stroke is identical to the bow stroke. It is the stern power stroke. The pull is only slightly different—90 percent of the pull is identical to the bow stroke; it's the last 10 percent of the pull that makes the difference.

Begin the *J* stroke by leaning slightly forward from the waist and catching at a position close to the side of the canoe and as far forward as the sternman can reach without overbalancing. The pull is done by jabbing out

with the hand on the grip from approximately the chin of the paddler, while the lower arm swings down and back with the hand on the throat, serving as a pivot point. The blade angle should be perpendicular to the center line of the canoe. The movement is identical to that of the bow stroke up to the point where the lower arm has just passed the straight up and down position. Remember that when the lower arm is in this position, the blade of the paddle is well past the straight up and down position because the grip hand has pushed out and forced the blade back against the water. At this point, the grip hand is turned from the knuckles down position to a thumb down position. This rotation of the grip hand turns the blade perpendicular to the surface of the water. The grip is then pulled slightly across in front of the paddler while the hand on the throat pushes out, forcing the blade away from the canoe and pushing the water sideways from the canoe. If the line of the paddle could be observed from directly overhead while paddling on the port side, it would draw a *"J"* on the surface of the water. (If paddling on the starboard side, the *J* would be drawn backward.)

The most common error in trying to learn the *J* stroke is the tendency to turn the thumb up in order to make the *J* part of the stroke. When this is done, the paddle releases its hold on the water and the paddler has to press sideways with the opposite side of the paddle. This sacrifices forward momentum and makes extra work for the paddler. What this incorrect maneuver attempts to do is to create a rudder. The principle of the rudder is drag, and that is exactly what is accomplished. It will correct the direction of the canoe, but it breaks the rhythm of the stroke and makes it impossible for the sternman to match the pace of the bowman unless the bowman also interrupts his rhythm. The net result is a 30–40 percent loss of stroke power. When the *J* stroke is done correctly, the paddle hold on the water is not lost, but the direction of the pressure shifts from straight back to slightly sideways.

The straight elbow on the lower arm is important in the *J* stroke. If the elbow is bent, the blade is lifted from the water too early, and the *J* motion is done out of the water. This accomplishes nothing. If the elbow is bent and the blade is kept in the water, it shortens the stroke substantially and sacrifices power.

The *J* stroke should be done in a smooth motion with the same rhythm and timing as the regular bow stroke. Once you are underway with good forward momentum, it is not necessary to put a *J* on every stroke. The sternman watches his course heading and adds the *J* to the stroke as it is needed to correct the drift away from his paddling side.

The sternman makes turns underway by varying his *J* stroke. If he wants to turn the canoe away from the side on which he is paddling, he simply omits the *J* for several strong strokes and accomplishes his turn. If he needs to turn the bow of the canoe toward the side on which he is paddling, he simply exaggerates the *J* portion of the stroke. An exaggerated or slightly harder sideways action on two or three *J* strokes will bring the bow quickly toward the side on which the sternman is paddling. The sternman can, of course, accomplish the turn even more quickly by calling for the quarter sweep or diagonal draw by the bowman, depending on the direction of the turn. If the bowman continues his steady bow stroke, however, the

turns can be made entirely through the effort of the sternman with little difficulty.

If you are not getting the intended result from the *J* portion of your stroke, you are most likely failing to turn the blade a full 90 degrees for the *J*. This frequently happens because the grip hand slips or shifts on the grip when the thumb is rolled down. You can practice this motion by simply holding the paddle in front of you, with both arms extended, and turning the wrist of the hand that is on the grip. Watch the blade until you begin to understand exactly what happens to the blade when you turn the grip hand. When turned correctly, both wrists are "humped." Remember, the position of the hand on the grip does not change on any of the tandem paddling strokes.

The second most common error on the *J* stroke results from bending the lower arm. Keep that elbow straight and you won't be shoveling or "air paddling" when you should be using a *J* to maintain your course.

If the sternman wants to make a quick sharp turn to the side on which he is paddling, he makes a hard full *J*, bringing the paddle around on a full hook to a position straight out from his side. This will turn the canoe sharply and substantially reduce the forward momentum. If the sternman wants to do a sharp turn in the direction away from his paddling side, he does this with a sweep stroke. The catch for the sweep is the same as for the *J* stroke but, as the name implies, the stroke sweeps wide near the surface of the water. The sweep in the stern position is similar to the quarter sweep, but it makes a full half circle back to the farthest aft point that the sternman can reach without losing his balance. A couple of sweep strokes in the stern position will turn the canoe sharply with limited loss of forward momentum.

The other stern strokes used in tandem paddling for stationary maneuvers—pushaway, pullover, and backwater—are the same as those done in the bow position. The hold water and stop procedures are also essentially the same in the stern as in the bow. For the stop, the sternman reaches as far back behind his position as he can, catches the water sharply, and pushes forward with a strong motion to the hold water position.

Changing paddle sides in the stern position follows the same principles as in the bow position, except that the sternman ducks his head and swings the paddle blade over the stern breastplate with the tip beyond the stern.

Changing Places

For various reasons, particularly when paddling for long distances, you and your paddling companion may decide to change places. If the canoe is fully loaded with gear in midship, you should head for shore or shallow water to make the change. If the midship is clear of gear, you can change positions while the canoe is afloat on open water, but remember to use your head—if there is a strong current or wind, go to shore to make your change.

Assuming that the circumstances are good for a change of places on open water, the first rule to remember is that the sternman is in charge. When the decision has been made to change places, the sternman holds water and directs the bowman to stow his equipment. The bowman stows his paddle flat on the bottom of the canoe where it will not trip anyone or

get damaged. The next signal from the sternman is to move back to midship. The bowman then comes up from his kneeling or seated position, keeping his weight low and his hands on the gunwales, and steps backward over the thwarts to the midship position of the canoe. He then sits flat on the bottom of the canoe with his legs extended in front of him. Throughout this movement, and while seated, the bowman keeps his weight squarely centered over the keel of the canoe.

When the bowman is settled in the midship, the sternman safely stows his paddle, and gives the command to shift weight. This command should specify in which direction he wants the bowman to shift. On the command to shift, the bowman moves his weight slightly to the port or starboard of the keel while the sternman shifts his weight in the opposite direction. Now, keeping his weight low and his hands on the gunwales, the sternman rises from his kneeling or seated position and moves forward just to one side of the keel, stepping over the thwarts so that he passes the bowman at midship and proceeds forward to the bow paddling position. When the former sternman is settled in this position, the new sternman gives the command to shift weight back to the center of the canoe. On command, both people move to reposition their weight over the keel. The new bowman then puts his paddle out in the hold water position.

Making sure that the new bowman maintains his hold water position, the new sternman then rises from his sitting position midships and, again keeping his weight low with his hands on the gunwales, moves back to the stern paddling position. When he is in position and ready, he gives the appropriate command to the bowman and the canoe is again underway.

Landing

When paddling with a companion, landing your canoe is simply the launching procedure in reverse.

If you are landing at a dock or pier, you should approach the dock at a slight angle, with your bow headed upwind or against the current. Stop the forward progress of the canoe a few feet from the dock, and then move the canoe sideways until one gunwale is against the dock. Use the pullover and pushaway strokes to move sideways, or simply drift with the wind or current. When you are against the dock, the sternman stows his paddle and holds the canoe against the dock while giving instructions to the bowman to get out. The bowman gets out of the canoe by first stowing his equipment and then reversing the process that was followed when getting aboard. Once he is on the dock, he then holds the canoe steady and tells the sternman to get out. The sternman also gets out by reversing the steps he followed when he got aboard from the pier.

While the one man continues to hold the canoe secure and steady at the dock, the other paddler removes the gear. To bring the canoe up onto the dock for storage, the canoe is turned out perpendicular to the dock with the bow or stern against the dock. The companions then face each other on the dock and hold on to opposite sides of the breastplate to lift the canoe and bring it hand-over-hand onto the dock.

When landing at a beach or lake shore, you should approach slowly and cautiously in order to avoid running aground or getting upset by an

obstruction under the water. As soon as the bow touches bottom in the shallows near the shore, the sternman should brace and steady the canoe with the "post" position while the bowman stows his paddle and steps into the water. Holding the breastplate or gunwale near the bow, the bowman then walks the canoe forward until it touches ground. At this point the sternman also stows his paddle and steps out while the bowman steadies the canoe. If the bowman is able to bring the canoe forward to just off the shore without running aground, he should then brace the canoe and give instructions to the sternman to get out, following the same procedures used when launching except in reverse order. When both men are out of the canoe, one holds the craft while the other removes the gear. The canoe is then removed from the water and stored using the same steps involved in the launch but in reverse order.

If you are landing at a bank where there is a steep drop or retainer wall, the landing procedures are essentially the same as those for a dock or pier. If you are stepping out in unknown waters, or at any place where the bottom of the lake has not been specifically cleared for use as a landing site, be sure you wear appropriate shoes and move very cautiously throughout the landing procedure.

To repeat and emphasize one point: Do not ever drive the canoe up on the shore or beach. Instead, drift up like a feather until you touch bottom.

Overboard Maneuvers

No matter how skilled and experienced you are as a canoeist, there will be occasions, both deliberate and accidental, where you will go overboard. You must learn and practice the overboard procedures before you find yourself in the water. In this way, you will have experience, knowledge, and confidence when you need it. While practicing these maneuvers, you should work with your companion, under supervision, wearing a PFD, and "fully dressed."

Your clothing should consist of long pants, proper shoes for canoeing, and a long-sleeved shirt. Wear your bathing suit under the clothing. The clothing serves several purposes. First, part of your learning experience will be getting in and out of your canoe wearing the wet clothing, and steadying the capsized canoe while undressing. Second, the clothing protects you from scrapes and scratches while you are learning out-and-in maneuvers. Your clothing need not include anything more than shirt, pants, and shoes, although you should consider that when canoeing in cooler weather you are likely to be wearing considerably more clothing.

Overboard canoeing practice should be done on open water where the shoreline is easily accessible with 25 to 30 feet. Your supervisor or lifeguard should be within 15 to 20 feet of you at all times, and the maximum depth of the water should be 12 feet. There is no need to practice in water deeper than 7 or 8 feet. The practice area must be fully explored in advance to make sure there are no stumps, rocks, or other hazards that might injure someone going overboard from the canoe.

Before you can practice overboard and reentry procedures, you have to get safely out of the canoe. The absolute rule on going overboard is that you *never* lose contact with the canoe. Begin the procedure by stopping

and steadying the canoe, with the sternman giving commands. Paddles should be stowed and all loose gear secured. You and your companion should be sure that no gear or obstruction will catch your feet when you go overboard. On signal from the sternman, both paddlers raise themselves from their kneeling or sitting position, with hands and weight on the gunwales and standing over the keel of the canoe. Your position is *tail high.* The sternman decides who goes over which side of the canoe, remembering that you go overboard on opposite sides when working with a companion. It is also important that you both move at exactly the same time, otherwise the canoe may flip over when you go overboard. The hand on the gunwale at the side that you are going to go over should be turned with the fingers inside the canoe and holding securely; the hand on the opposite gunwale should be positioned with fingers out, ready to release on the signal to go overboard.

When both paddlers are ready, the sternman gives the "jump" signal. With your weight forward on your hands, hop over the side of the canoe with both feet, keeping your feet and ankles close together. If your feet are apart, you risk hanging a heel or ankle on the gunwale as you go over. As your feet clear the gunwale, release the gunwale on the opposite side of the canoe and hang on tight with the hand on the side you're going over. (If done correctly, you will hit the water tail first.)

If you go overboard correctly, the canoe remains upright and steady, you and your companion are in the water looking toward the stern of the canoe, and you do not get your hair wet. If you fail to hold on to the canoe as you go over and enter the water; you will go under the water and the canoe will drift away from you. If one paddler loses his grip and the other holds on, the canoe may capsize.

Getting back in is not at all tricky if you and your companion work together. The easiest maneuver puts you both in the canoe at exactly the same time. With both hands on the gunwale, position yourselves so that one person is just forward of midship and the other is just aft of midship. On signal, making sure you move at the same time, both of you should kick sharply in the water (use a scissor kick or whatever works for you) to pull yourself up on the gunwale to the point where your arms are straight down and the gunwale is just below your waist. At this point, it's like standing with your hands on a table, looking at your friend who is across from you and slightly to one side. If one of you is unable to pull up, or slips off, or falls backward, the other should immediately drop back into the water to prevent the canoe from capsizing. You are able to pull your weight up on one side of the canoe only because your companion is doing the same on the other side, thus keeping the canoe balanced.

If you have both made it to this position up on the gunwale, the rest is easy. Simply lean into the canoe and roll over so that you fall in tail first, landing on the bottom of the canoe. If you have done this correctly, you end up sitting on the keel with your knees bent over the gunwale and your feet hanging outside the canoe over the water. You can now bring your feet in and return to your paddling positions. Remember, be conscious of the movement of your companion. The best approach is for one man to give commands while the other man responds. This assures that you don't accidentally shift your weight in the same direction and capsize the canoe.

If one of you is unable to pull up on the gunwale for reentry, you can crawl in one at a time. One man stays in the water, hanging on the gunwale, while the person that is having difficulty crawls over the side by whatever means. The man in the water can pull down or push up slightly on the gunwale to assist his companion. After the less agile man is in the canoe, he helps his companion by leaning to the side away from his companion to balance the canoe while reentry is completed. Sculling with the paddle can also help to balance the canoe. Although this "one at a time" reentry may require a little less in the way of agility, it takes much more time and effort. The other method is preferred and recommended.

If, in getting out and back into the canoe, you have taken on more than an inch of water, you need more practice. Water in the bottom of your canoe will affect your paddling as the water shifts and runs inside the canoe. The more water you have sloshing around, the more difficult it is to keep your trim and balance.

Capsize Procedures

There will also be times when your canoe will capsize and fill with water. The proper procedures in this situation must also be learned and practiced. To safely capsize your canoe for practice, go through the same preliminary procedures that you did when preparing to go overboard, up to the point where you are standing over the keel of the canoe with your hands and weight on the gunwales. This is the "ready" position.

On signal to capsize, you and your companion lean slowly toward the same side, with your weight pressing down on the gunwale on the side to which you are leaning while pulling up slightly on the opposite gunwale. The canoe will roll up on its side and begin to take water over the gunwale. With practice, you can learn to ride the canoe slowly down sideways until it is completely filled and then levels itself. The usual result is that, as the canoe fills, the high side will roll over, dumping the paddlers in the water. As the canoe begins to fill and roll, release your hold on the gunwale on the low side of the canoe, while holding tightly to the gunwale on the high side. If the canoe rolls over on top of you, simply pull yourself to the outside with the hand that continues to maintain contact with the gunwale.

As soon as the canoe is capsized, and you are in the water, the canoe will have a tendency to right itself even though it is filled with water. Without losing contact with the canoe, allow it to right itself and rise to the surface of the water. Check to make sure your companion is all right and is holding securely to the canoe, as you are. You cannot both hang on to the same side, as this will cause the canoe to roll. Position yourselves on opposite sides of the canoe facing each other at midship.

While hanging on to the canoe, check to see that all gear is still secured and will not interfere with getting into the capsized canoe. If there is gear floating free that you can reach without releasing the canoe, it can be put back in the canoe. Do not release the canoe and swim to recover floating gear.

Even though the canoe is capsized, you need to get back in and paddle safely to shore. You and your companion can move at the same time to

slide over the side of the canoe and roll in, bottom first. You will quickly discover, however, that a capsized canoe will roll over even more easily than one floating. Another way to reenter a capsized canoe is for one companion to remain low in the water and steady the canoe by holding on to the gunwale, while the other gets in. Then the person in the canoe leans to the opposite side to balance the canoe while his companion crawls in.

Once you are in a capsized canoe, you must sit flat on the bottom, directly over the keel, with your legs spread wide in order to get your center of gravity low enough to prevent the canoe from rolling over and throwing you out. The position for tandem-paddling a capsized canoe is for the paddlers to sit facing each other, with their feet near the center of the canoe and their backs against the paddling thwarts or seats. This helps not only with stability and paddling, but it also enables the paddlers to watch in all directions for oncoming craft. Remember that a capsized canoe is not easily seen on the water, and you need to watch carefully and be quick to signal if another boat is coming your way. Don't get run over! A paddle waving overhead can be an effective signal.

You can make forward progress sitting in a capsized canoe by using your paddle, or by paddling with your hands. Use the paddle by holding it at the grip and throat, reaching straight out with both arms extended, dipping the entire paddle just below the surface with the blade perpendicular to the water and pulling it toward you. While one companion pulls in this fashion, the other reverses the motion by starting the paddle against his chest and pushing. To change your direction, hold the grip close against your chest and sweep wide with the blade of the paddle. You can do a forward or reverse sweep depending on which direction you want to turn. By sweeping in coordination, tandem paddlers can pivot in place.

You can easily hand-paddle a capsized canoe by using your hands to pull or push the water. Sweep your hands just below the surface of the water similar to what you would do on the breaststroke or elementary backstroke. To turn while hand-paddling, sweep forward with one hand on the side you want to turn away from. Backwater with both hands to slow or stop.

It is not easy to get a capsized canoe moving, but once you are moving you will develop forward momentum even though you are moving slowly through water. This means that it will not be easy to stop suddenly because the weight of the water will carry your canoe forward with considerable force, even when you are backpaddling and trying to stop. For this reason, remember to backwater and stop your capsized canoe well short of where you want to land at the shore or dock.

When you reach your stopping place near shore, go overboard carefully, and at the same time, so as not to roll your canoe over. Walk it to shore. If you are not able to get close enough to stand up, get out carefully while maintaining contact with the canoe, and tow the canoe the last few feet while swimming. One swimmer should hang on to the gunwale near the bow of the canoe and swim with a modified sidestroke, with his upper hand on the gunwale. The other companion should get just behind the stern and push, using the whip kick, with both hands on the stern. Another option is for the swimmer at the stern to use a sidestroke, with his upper hand pushing on the stern or holding the gunwale near the stern of the canoe.

There are several ways to empty a capsized canoe. First, while standing beside the canoe, remove the gear and place it out of the water. One person should stay with the canoe while the other carries the gear to shore. When the canoe is ready to be emptied, move it away from shore until you are standing approximately waist deep in water. With you and your companion standing on the same side of the capsized canoe, roll it over on top of you by pushing down on the near gunwale and pulling the far gunwale up over you. You will then be squatting slightly in the air pocket under the canoe. With hands on the gunwales and thwart or seat resting on your shoulders, you and your companion can stand up on signal, lifting the canoe clear of the water. If you will lean it slightly as you stand to break the airlock, it will be easier to lift. If the ends of the canoe do not quite clear the water when you stand, you can walk carefully toward shore until clear, or raise the canoe higher by extending your arms over your head. After the water has drained from the canoe, raise one side high by extending one arm upward and let the canoe roll gently over onto its bottom on top of the water beside you. (Before you begin to roll the canoe, agree with your companion on which way the canoe will roll.)

If you and your companion are not able to lift the canoe completely clear of the water, or if the bottom is too rough or the area too shallow for this to be safely done, another method is to move the canoe into shallow water where one end can be rested on the bottom of the lake with the canoe upside down. Then you and your companion stand at the end in the deeper water, facing each other on opposite sides of the canoe, and lift up using the bottom of the lake to support the other end. After the canoe has been lifted and drained, roll it carefully toward one person and set it gently down on the water. If you and your companion can lift the canoe, but cannot get under it because of shallow water, you can simply roll it upside down, stand at opposite ends, and lift.

To empty a capsized canoe on a pier or dock, turn the capsized canoe perpendicular to the side of the dock. With you and your companion kneeling or lying down on the dock facing each other, roll the canoe over and lift one end up to set it on the edge of the dock. Then, while kneeling or standing, you and your companion move the canoe hand-over-hand until it is completely up on the dock and free of the water. After the canoe has drained, roll it over carefully toward one companion and then place it back in the water hand-over-hand. (This procedure is similar to emptying a canoe in a canoe-over-canoe rescue on the open water.)

SESSION 2

Learning Objectives

As a result of this session the participants should be able to:

- Solo canoe
- Maneuver an English gate
- Identify river difficulty
- Read a river

Solo Canoe Launching

Solo canoeing, or single-man paddling, is not at all difficult if you have mastered the role of the sternman in tandem paddling. Remember that when you are solo canoeing, you still must have a buddy. Although you are alone in the canoe, there should always be at least one other canoe on the water as your "buddy boat." Be sure that your buddy is always aware of your circumstances, as you are aware of his, and that you and your buddy are prepared to lend assistance if needed.

You begin the launch procedure by rolling your canoe over and setting it upright on the rack or ground. It must be positioned so that you can stand beside it and have room to lift and carry the canoe. Be sure that your path to the water is clear.

Standing beside the canoe and facing the gunwale, place your hands on the gunwale slightly outside your shoulder width. Now pull up on the gunwale so that the canoe leans away from you slightly, and walk forward until the canoe is resting against your thigh. You can now lift the canoe by pulling the gunwale toward you and squatting slightly so that one or both of your thighs are against the curve of the canoe side. In this position, you should have the canoe off the ground or rack and resting on your legs, with your arms holding it in position by pulling toward you.

Holding the canoe, you now sidestep until you are standing at the edge of the water. The next step is to tip the end of the canoe that is closest to the water down until it rests on the water surface, and the water is supporting the weight of the canoe at that end. Now pass the canoe out into the water hand-over-hand while sliding the canoe along your thigh. In this way, you are transferring the weight of the canoe to the water, and it will quickly lift off your leg as it moves further out onto the water. When you reach the end of the canoe, set it down gently at the edge of the water. Remember to maintain contact so that the canoe does not drift away from you. If you need to walk away from the canoe to get your equipment, set the canoe so that it is firmly beached. Be sure there is nothing in the water or on the shore that will damage the canoe when you set it down.

The launch procedure from the dock is essentially the same, except after the canoe is in the water you pull it alongside the dock, with the gunwale against the edge of the dock. If you have to leave the canoe in order to gather your equipment, you should tie it to the dock. If you tie both ends of the canoe, it will not drift out into the path of others, and it will be ready to load when you return with your gear.

As with tandem canoeing, secure your gear so that it will not shift out, or create a hazard for you as you move about in the canoe.

Entry

To enter the canoe from shore in shallow water, walk out to a position where the canoe is floating freely and you are standing more than knee-deep in the water. Your entry procedure is similar to what the sternman does in tandem canoeing, except you don't have the bowman to stabilize the canoe while you get in. The safest way to board is to stand beside the canoe, facing into shore, bend down, and place your hands firmly on opposite gunwales. Now, with your weight on your hands and on the leg farthest from the canoe, lift the leg nearest the canoe over the gunwale and place the foot in the center of the canoe directly over the keel. Then shift your weight to the leg in the canoe, keeping your knee bent and your weight low; lift the other leg into the canoe and immediately go into a one-knee-down kneeling position by putting the knee of your outside leg on the bottom of the canoe right next to the foot that is on the keel.

Hold this position for a few seconds to be sure you are stable and floating free. If you are stable, you can now rise up with both feet on the bottom of the canoe, still keeping you weight low, and move to a position just aft of midship. This will be your paddling position. If the canoe is not aground, you are ready to settle into your position and take up your paddle. If the canoe is slightly aground, you can move further toward the stern until the bow floats freely, make a few backward strokes, and then move forward to your proper position. If the canoe is firmly aground, you should get out by reversing the entry procedure, and move the canoe further away from shore before reboarding.

If for some reason you need to launch and enter the canoe quickly from the shore, you can face out from the shore and step into the canoe as before, pushing off from the bottom just before stepping into the canoe with your outside leg. As soon as you have pushed, you should get your weight low and centered to avoid overbalancing and capsizing. This forward entry can also be used with the push-off, as an alternative to the entry while facing the shore. It is, however, less stable, more easily grounded, and more dangerous in terms of slips and falls and shallow-water capsizing.

If launching solo from a pier, after your equipment is loaded, untie from the pier and secure your painters inside the canoe. Remember to hold on to your canoe throughout the launch so that it does not drift away from you. A good way to maintain contact is to sit on the edge of the pier with your feet in the canoe. This is also your position for entering the canoe. When you are ready to get aboard, turn slightly, position both feet in the center of the canoe on either side of the keel, place your hands on the gunwales, and shift your weight from the dock to your hands and feet in one smooth, quick motion. As you move, you will rotate your feet slightly so that you end up facing forward in the canoe. As soon as your weight shifts, squat down low in the canoe to balance and stabilize your position. Once your weight is in the canoe, and the canoe is stable, you should be able to settle right into your kneeling position and begin paddling. Dip your paddle on the side away from the dock and do a couple of pullover strokes to move clear of the dock.

Kneeling Position

If your canoe has a midship compartment, then you are ideally situated for solo paddling. Many modern canoes, however, have a thwart in the exact center of the canoe. For solo paddling in these canoes, your position should be in the compartment (the space between the thwarts) just aft of the center thwart. Any of the kneeling positions that you learned in tandem paddling can be used in solo canoeing, but the most stable position is with both knees down and your buttocks leaning back against the thwart.

You will notice that the canoe is considerably wider in the midship than it is toward the bow or stern. For this reason, you can paddle more easily if your weight is shifted slightly toward the side on which you are paddling. Position your knee away from the paddling side beside the keel, with the keel between your legs. The knee on your paddling side should be near the side of the canoe, right at the edge of the bilge. This position will lean the canoe slightly toward your paddling side, and make it much easier for you to reach the water and maneuver with the paddle straight down in the water rather than angled to the side. Your pressure on the water while you are paddling should counterbalance the slightly off-center position of your weight in the canoe.

Strokes Away

For most solo canoeing, you will need to use only your basic stroke—the *J* stroke. When paddling solo from the midship position, the *J* stroke is virtually identical to what you do in the stern position when paddling tandem. From this position, you can quickly turn the canoe away from the side you're paddling on by doing a hard power stroke without the *J* action at the end of the stroke. If you want to turn sharply away from the side you're paddling on, a full sweep from your catch position, all the way around and back behind you, will accomplish your turn. You can make a gradual turn toward your paddling side by emphasizing the *J* part of the stroke on three or four strokes. To turn sharply toward your paddling side, do a hard *J*, bringing the end of your stroke all the way up beside you so that you are almost doing a reverse sweep. This will, of course, slow your forward momentum considerably.

As you begin to get the feel of solo paddling, you will find that you can also modify certain bow strokes, such as the quarter sweep and diagonal draw, to maneuver your canoe while maintaining forward headway.

To maintain your course while paddling alone, particularly if you want to take the shortest route across a wide body of water, sight a point on the opposite shore and line that point up with the point of your bow. If you maintain your bow on that point, you will travel on a straight line.

Remember the rules about paddling in the wind. If your are heading into the wind, or if there is a crosswind that is affecting your direction, you should move to a kneeling position slightly forward of the center of the canoe and either head directly into the wind or angle into the wind while paddling on the downwind side of the canoe. You will find that you can work against a slight crosswind much more effectively with your sweep stroke on the downwind side than you can with your *J* stroke on the upwind side. Why? When you emphasize the *J* and slow your forward headway while paddling in the wind, the wind is better able to take control.

Holding Water and Stopping

You hold water and stop your canoe while paddling alone by using the same maneuvers that you learned for tandem paddling. Remember, however, that when you hold water or stop while paddling solo, the canoe is going to veer to the side on which you are paddling. You can correct this to some extent, although not entirely, by catching the water at an angle out behind you so that your stop action draws the water forward and slightly into the canoe. Viewed overhead, this stroke would look like a reverse diagonal draw stroke.

To correct the same drift while holding water when solo canoeing, stroke lightly as needed to reposition and turn the canoe.

Stationary Maneuvers

Backwater, pullover, and pushaway strokes are done in solo canoeing just as they are when paddling with a companion. Their function and purpose are also the same. If you are kneeling aft of midship you may want to reach slightly ahead of your kneeling position to do the pushaway and pullover in order to move the canoe sideways without rotation. The backwater or reverse stroke will also tend to turn the bow of the canoe toward your paddling side. This can be corrected by beginning the reverse stroke slightly out from the canoe and behind you, like a reverse diagonal draw.

Pivots

The pivot maneuvers while paddling solo are very different from what you do when paddling with a companion. An *outside pivot* rotates your canoe on the water so that the bow is moving away from the side on which you're paddling. An *inside pivot* is just the opposite—the bow moves in a circle toward your paddling side.

When compared to other strokes, the single-man pivots are unusual in several respects. The outside pivot is the only flatwater canoeing stroke where you use the paddle on both sides of the canoe to complete the maneuver. Your hands, however, do not change positions on the paddle when you're doing the outside pivot. The inside pivot is the only stroke where you are going to change the position of your hand on the grip while doing the stroke.

The outside pivot is done by combining a reverse quarter sweep on the side of the canoe opposite your paddling side with a full sweep on the paddling side of your canoe. Begin by twisting your body away from your paddling side and reaching across the canoe to a catch position straight out from your kneeling position. In the catch position, your grip hand should be slightly behind you and close to your body at about belt level. Make a reverse quarter sweep up to your canoe, then lift the paddle from the water and feather it, with fingers down, over your canoe. Now, dip the paddle again on your paddling side for the catch of a forward sweep. At the end of a full forward sweep, feather and recover all the way back to the catch position for the reverse quarter sweep on the opposite side. One strong outside pivot stroke can rotate you in a full circle. At most, you should complete your pivot with two strokes.

The inside pivot is done only on the paddling side of the canoe. The trick is to move your paddle in a circle in the water beside your kneeling position. You must keep the same side of the paddle pushing against the

water at all times. The circular path of the paddle is going to be clockwise when done on the port side and counterclockwise when done on the starboard side. Basically what you are doing is combining a reverse sweep with a forward sweep. The forward sweep, however, reaches under the canoe instead of reaching out from the canoe. If you don't reach under the canoe, you won't get any turning action from this part of the inside pivot stroke.

Begin the inside pivot by making a wide and full reverse sweep on your paddling side. At the end of the reverse sweep, turn your hand on the grip so that the pressure is maintained on the same side of the paddle blade. Lean out over the water so that you can reach far under the canoe while you do the forward sweep. As you complete the forward sweep, shift your hand on the grip again to keep the pressure on the same side of the blade, and do another reverse sweep. You will probably need to make two full pivot strokes to turn your canoe. If the canoe is only rotating on the reverse sweep part of your stroke, you aren't reaching far enough under your canoe on the forward sweep portion of the stroke. Be careful, because your weight will be well out over the gunwale while you are doing the forward sweep part of the stroke. If you fail to maintain pressure on the water, there is nothing to counterbalance your lean, and you may capsize or go overboard.

Having learned and mastered the outside and inside pivots for stationary rotation, you should now wonder if there isn't an easier way. There is. If you are paddling solo and want to head in the opposite direction, your can just turn around in your canoe. The bow of the canoe is simply the end of the canoe that is in front of you, and you can easily reverse that by reversing the direction you are facing. If your canoe has a midship compartment, you can do this in an instant. If your canoe has a midship thwart, you may have to move back over the center thwart after turning yourself in the canoe.

Sculling

Sculling is an alternative to the pullover and pushaway strokes. It can be used in tandem paddling as well as in solo paddling. The effect is to move the canoe sideways. The movement is usually slower than with the pullover or pushaway strokes, but it also requires less effort, and can be done silently and in small space. The term *sculling* in canoeing refers to the stroke that moves the canoe toward the side on which you are paddling (same as the pullover). *Reverse sculling* moves the canoe away from the side on which you are paddling (same as the pushaway). As in all other strokes, you need to keep the pressure of the water against the same side of the paddle at all times. It may help to put a mark, or a *"P"*, on one side of your paddle to remind you to always keep the pressure on that side of the paddle.

The action of the blade in the water when you are sculling is like the blade of a knife when you are spreading butter on a slice of bread. The blade makes a *"Z"* or figure eight pattern in the water, moving back and forth in a path that is about 2 feet wide and parallel to the keel. The grip hand angles the blade so that the leading edge of the paddle blade (the edge slicing through the water) on each forward and backward motion is turned slightly away from the canoe. The bottom side of the blade presses against the water at all times.

For reverse sculling, the top side of the blade presses against the water at all times, and the canoe moves away from the side on which you are paddling. Again, use the grip hand to angle the blade and to reverse the angle at the end of each forward and backward motion. For reverse sculling, the leading edge of the paddle blade (the edge slicing through the water) is angled toward the canoe.

Although sculling and reverse sculling may be confusing and awkward when first attempted, you will soon get the feel of it and find that it is easy to do if you remember to keep the same side pushing against the water at all times.

Landing

Landing solo is simply the reverse of launching. Always remember to approach the shore or dock carefully, while watching for obstructions in the water. Be careful not to run the canoe aground. When paddling alone, a rock or uneven bottom will not only damage the canoe, but can cause you to capsize or literally throw you out by suddenly lifting one side of the canoe and shifting the weight.

To remove the canoe from the water and place it on the rack, follow the same procedures you used in readying the canoe for your launch, but in reverse. You may want to begin by bringing the canoe as far up on the bank as you can before attempting to lift it on your thigh. You can, however, lift it directly from the water, while standing in shallow water. When carrying from the water, be very careful of your footing, both in the water and on land.

If you lack the size or strength to lift and carry the canoe for the solo launch and landing, get help. You should understand how to do the solo launch and landing, including carrying the canoe to and from the rack, but you do not have to be able to lift the canoe by yourself in order to pass this merit badge requirement.

Deep Water Reentry

There may be times while paddling solo when you find yourself in the water. If your canoe capsizes, you should get in, sit on the bottom, and hand paddle for shore, just as you practiced with your companion in tandem paddling.

It is also possible, however, for you to fall or be thrown out of the canoe, leaving the canoe afloat and upright. Since the canoe is far easier to maneuver when it is afloat rather than capsized, it is far preferable to get back into the canoe without capsizing it.

If you do find yourself in the water, your PFD will support you while you prepare to reboard your canoe. Remember to maintain contact with the canoe. If you momentarily lose contact when you go overboard, move as quickly as you can to get hold of the gunwale. (Remember not to pull down on the gunwale, as the canoe will flip over on top of you.) Maintaining contact is very important, since an empty canoe moves very quickly, and even in a slight breeze it may be impossible for you to swim fast enough to catch it. If you have lost your canoe in this way, swim for shore, relying on your PFD for support.

To jump safely out of the canoe in order to practice your reentry, remember to go overboard just as you did when you were with a companion. Be sure to maintain contact with the canoe. Turn your hands so that your fingers are inside the gunwale on the side of the canoe you are going over. This will make it easier for you to maintain contact. Try to hit the water tail first, like you are sitting down.

If you do have contact with your canoe, there are two ways to reenter in deep water—the arm-across method, and the "flopover." The arm-across method for reentry has been taught since the early days of canoeing, and it worked relatively well for the skilled canoeist using a heavy, narrow, wood and canvas canoe. It is virtually impossible for a smaller person using a standard aluminum canoe. The flopover technique, recently developed and introduced in Scout canoeing, is ideal for the smaller person using a standard aluminum or fiberglass canoe. If you can do the flopover reentry, you will have little use for the other method and you will have satisfied the merit badge requirement.

Canoe Rescues

A canoe is not the best rescue craft, but it can be used to assist other canoeists who have capsized. Follow the steps explained with the illustration. When using your canoe for an actual rescue, remember three important points: (1) the welfare of the people—not their canoe and equipment—is your first concern; (2) approach the people cautiously (keeping their canoe between you and them) and make sure they are not too panicky to follow your instructions; and (3) call out to quiet and reassure the victims, and tell them to hold on to their canoe.

Ignore the free-floating gear until you have the people safely back in their canoe. You can then retrieve floating gear and return it to them. You can approach a capsized canoe from either side, but if there is any wind, approach from the downwind side. Before approaching the capsized canoe, instruct the people in the water to move to the side of the canoe opposite the one you're going to approach. If there are two people in the water, they should be holding on to the gunwale on the same side of the canoe when you make your approach.

Maneuvering an English Gate

The best possible preparation for whitewater training is a strong background in flatwater canoeing. This you have gained by completing the Canoeing merit badge. Your counselor will have you review and demonstrate some basic canoeing skills before you begin your preparation for moving water activity.

Remember that in flatwater paddling your primary objectives are to get the canoe moving and to maintain your momentum under way. You will quickly discover that the objectives in moving water are very different—the water is pushing and carrying you along and your primary concerns are direction and control. The faster the water moves you, the more important it is for you to be able to quickly and efficiently vary your direction. Often, you must slow your forward progress to control your movement before attempting a turn or other maneuver.

Your first exercise in preparing for the transition from flatwater to moving water is done on flatwater using the slalom gate and a stopwatch. This is called the English Gate Test. (See the Appendix for visual instructions.) The required maneuvers and the time requirement simulate some of the demands and pressures of basic whitewater paddling. If you can complete the gate maneuver in 120 seconds while paddling tandem (two persons), you have met the minimum requirements for continuing with the merit badge instruction. But practice and improvement are the key to proficiency. Can you complete the gate run in 60 seconds? You can with *practice.* That is how you develop the skill, knowledge, and self-confidence for safe and exciting whitewater adventure.

An English gate can be constructed by hanging two poles 4 feet apart, out over the water. The bottom tips of the poles should be about 2 inches above the water. Paint the poles different colors (red and green) to help with directions and signals while you are using the gate.

Gates on lakes may also be made of floats, or floats supporting upright poles. When using floats, you will need a 4-foot spreader about 20 inches under water to keep the space open between the floats when the gate is being used.

Your "ready" position for the first pass should be in front of the gate, with your bow just outside the gate.

The maneuvers for the English Gate Test are as follows:

1. On the "go" signal, paddle through the gate, pivot right, return through the gate, pivot left, return through the gate.

2. Back up outside of the right pole, go forward through the gate, back up outside of the left pole, and go forward through the gate, curving to the left.

3. Pivot, go forward outside of the left pole, pivot left, and go forward through the gate. Pivot right, go forward through the gate, and pivot left.

4. Go forward outside the right pole, back through the gate, go forward outside of the left pole, and back through the gate to finish.

To do the gate maneuvers quickly, you must stay very close to the gate while pivoting and reversing direction. Stopping, stationary pivots using the pushaway and pullover (often called the "pry" and "draw" on running water) and forward and reverse power strokes are important strokes used in running the gate test. If you are using whitewater equipment, your time will be several seconds faster than if you are using a flatwater canoe with a keel which can slow your gate maneuvers.

Compute your official time from "go" to the moment your bow clears the gate on the last pass, plus 10 penalty seconds for every time you touched a gate pole or float with your canoe, paddle, or body.

Identifying River Difficulty

The International Scale of River Difficulty provides a standard classification system for rating the difficulty and risks in running rapids. You must remember that the scale is at best a rough estimate. It will vary depending on who does the evaluation, when the rating applies (spring runoff, summer low water, etc.), and the condition of the stream. Obviously, bank erosion, fallen trees, flood damage, and other factors can substantially affect the difficulty of a particular stretch of river within a short time.

Use the scale when planning a trip and selecting your river. Remember that the scale is useful only if you know and fully understand your own capabilities and limits, and those of others who will participate in the river outing.

In addition, if the water or air temperature is below 50⅞F (10⅞C), or if the trip is an extended trip in a wilderness area, the river should be considered one class more difficult than normal.

When you get to the river and begin your run, the most important rating is your own—using your own eyes, ears, and good judgment.

The six classifications used for the International Scale of River Difficulty are as follows:

Class I Moving water with a few riffles and small waves. Few or no obstructions.

Class II Easy rapids with waves up to 3 feet, and wide, clear channels that are obvious without scouting. Some maneuvering is required.

Class III Rapids with high, irregular waves often capable of swamping an open canoe. Narrow passages that often require complex maneuvering. May require scouting from shore.

Class IV Long, difficult rapids with constricted passages that often require precise maneuvering in very turbulent waters. Scouting from shore is often necessary, and conditions make rescue difficult. Generally not possible for open canoes. Boaters in covered canoes and kayaks should know how to Eskimo roll.

Class V Extremely difficult, long, and very violent rapids with highly congested routes that nearly always must be scouted from shore. Rescue conditions are difficult and there is significant hazard to life in the event of a mishap. Ability to Eskimo roll is essential for kayaks and canoes.

Class VI Difficulties of Class V carried to the extreme of navigability. Nearly impossible and very dangerous. For teams of experts only, after close study and with all precautions taken.

Reading a River

Before setting out on running water, you must understand and recognize what the water is doing, what is hiding under the water, and what the water—and whatever is in the water—can do to you.

Whitewater—rapids on a river—is produced by one or more of these conditions:

- *Rate of drop,* or the steepness of the slope down which the river is flowing.

- *Obstructions to uniform water flow,* including ledges, rocks, or falls.
- *Volume of water flow.* Variations may be caused by rainfall or lack of it—or even by release of water from an upstream dam.

The volume of water flow for any given point in a river may change from season to season or even from hour to hour. The river, therefore, is never the same. Fortunately, the surface of any river tells us almost exactly what it has in store for us: a rock, a ledge, crosscurrents, or whatever. The ability to observe the water surface and the surrounding conditions and to understand what the water is doing and what will happen to a canoe is called "reading the river." Only real experience and observation will make you a good "river reader," but there are some common signs that you can learn to look for when you approach an unfamiliar stretch of river. (See the Appendix for illustrations.)

Closed (downstream) V. This V points into the current and is dangerous. It is caused by a shallow rock or log and is a real canoe-buster. A closed V is not hard to steer around, if you see it in time. You probably won't hear it because there is too much other noise. Rocks are rarely visible to the canoeist.

Open (upstream) V. This is the canoeist's friend. Rocks on both sides or a break in the ledge let the current through in a "swoop." An open V is noisy, with a rushing sound. A "haystack" (big waves showing deepening channel) may appear below the V. They are rough. If they're small, okay; but if not, skirt the edges, and then bail.

Shoals. Broken, "dancing" water due to shallow rocks or a fast drop. Look and listen for shoals in wide valleys where the river spreads out. Ride the open Vs or, on a bend, stay close to the outside of the curve. Be ready to step out if the canoe drags bottom, but keep hold of your craft.

Deep rock. Makes quiet water boil or whirl on the surface. Little or no danger, but when current is slow, rocks show less in surface boils. In still water, a rock an inch under water won't show at all. That's where the bowman watches out. In deeper water, you're past the rock when you get into a boil.

Logs and overhanging trees. Generally found on the outside of curves, where undercutting has caused trees to fall into the stream. The current runs through the logs or branches called "strainers." This is sometimes caused by logs jamming up on an obstruction or shallow place. Very dangerous! Avoid! Keep the canoe parallel to the current. Portage around or lift the canoe carefully over the area. If you upset, float high and climb into a tree or branches. Don't try to swim through or under logs and overhanging trees. If there is room, back-ferry to the inside of the curve.

Broken drop. This is caused by several rock ledges and a steep rate of drop. It roars. Look for a broken drop where valley walls are high and the river is narrow. These rapids must be studied from the shore first. Ride the open Vs. Haystacks and rocks may be rough. It may be best for you to portage or pull your canoe from shore with ropes.

Eddy. A backwater that may be a yard or a mile long. If it is behind a large rock, it can steer your canoe, bouncing the bow away, and then sucking it in. Paddle to one side of the eddy. Larger eddies are longer, like slowed-down whirlpools, above or below the point of land. Foam shows direction of current. Rock eddies are excellent resting places.

Whirlpools, crosscurrents. Changes in the river current below big drops often cause whirlpools. These are dangerous only in large rivers. When a river curves, the top current moves across the stream, and returns along the bottom. This can drag your canoe into the shore.

Flat rock. Near the surface in broken water, a flat rock is mean. Look for a smooth black line with white foaming water—or comparatively still water—just downstream. If you hit, you'll stop, then sit there or swing sideways while the river pours in. These flat rocks also make calm-looking areas in rapids.

Sheer drop. Always portage this one. If you get caught in it, you'll spill at the lip (by turning and rolling) or at the base. If your canoe stays free, stick with it. If the canoe is caught, leave it and float with your feet downstream, head up. Hang onto the paddle. A sheer drop into deep water can create a "souse hole." This is where the surface water flows upstream and meets the falling water. Anything caught in a souse hole beneath a drop will be forced down by the falling water, then move downstream for a distance under water, come to the surface, and be drawn upstream back into the falling water. This rolling action is deadly and can quickly tear apart a canoe. A person trapped in a souse hole can sometimes escape by swimming downstream along the bottom of the river. The only smart action is to avoid these deathtraps.

Waves. A haystack is a big standing wave or series of standing waves immediately below a drop. It indicates a deepening channel and a release of velocity energy. Haystacks show good water and are the fun part of whitewater canoeing, unless they are too big. Usually you can take them right down the center, but if they are too large, avoid them just off to either side—and be sure to keep the bow light.

Heavy water. Heavy water is caused when many big waves occur just below the place where a narrowing stream bed constricts the water at a drop, when flooding conditions build up water volume, or at a constricted turn in the river. Be careful in heavy water, back-paddling when necessary, and with plenty of paddle-bracing.

Scouting a Drop

There are many occasions when the only intelligent course is onshore. When unsure, take a look from shore. You may find a safe course through the rapids, or you may recognize the need to portage.

When do you scout? Maybe the map warns you about the rapids up ahead. Maybe the warning comes first to your ears as you hear an ominous roar. Or, maybe experience tells you that when you see hills or mountains close in on the river downstream, and the fast-running water calms down and broadens out a bit, you'd better proceed more cautiously and get ready to take a look from the shore.

Begin by looking along the shore for any sign that others may have landed or portaged there. When you land, secure your craft carefully and, with eyes wide open and map in hand, hike parallel to the rapids. Stop frequently to carefully study the tumbling water below.

Look for:

1. A clear path through the uproar. If it's not entirely clear, is there room to maneuver the canoe across the current to a clearer area?
2. The presence of underwater rocks, ledges, or logs that might trip or spill you early in the run.
3. Sheer drops with back waves and souse holes.
4. Strong currents and crosscurrents that would make your path difficult or impossible.
5. Rock eddies that might furnish resting places.
6. A below-the-drop place where you can rest, wait for others, rescue capsized canoeists, or get the water out of your canoe and yourself out of trouble.

Then check again to see if your path is as easy to locate from water level upstream as it was from the bank. Preplan every move and every stroke with your partner.

SESSION 3

Learning Objectives

As a result of this session participants should be able to:

- Perform whitewater maneuvers
- Perform kayak maneuvers
- Perform basic whitewater rescue
- Portage and line a canoe
- Know the basics of rafting and tubing

Whitewater Maneuvers

The basic maneuvers on running water—in order of importance—are backward, sideways, and forward. The strokes for these basic maneuvers are generally the same for the bow and stern positions. (See the Appendix for illustrations.)

Backstroke

The backstroke is first in importance. The water is pushing you forward, and your control comes from your ability to slow or stop your headway. You will backstroke when you are back-ferrying to safety, when you need time to look ahead and think quickly, and when you want to avoid collision. When collision is certain, you will use the backstroke to soften the impact. (Only inexperienced or foolish paddlers attempt to race through whitewater. Speed is no virtue!)

The backstroke begins with the blade of the paddle reaching back and entering the water behind the paddler with the blade flat to the surface of the water. The body of the paddler should rotate toward the paddling side with the grip out over the water and the upper arm extended. The lower hand is just behind the hip line.

The paddle blade moves forcefully down and forward, parallel to the keel, as power is applied. Keeping the grip over the water, the lower arm pushes down and forward as the upper arm pulls up and back.

The backstroke ends in front of the paddler with the lower arm extended forward, the grip near the paddler's face, and the upper arm bent at the elbow. The blade is then feathered out of the water, and swung back in an arc to begin the next stroke.

Sideways Movement

On running water, you frequently need to move the canoe sideways (without turning broadside to the current or obstacle) to avoid a rock or other hazard that is ahead. You can do a sideways maneuver using the drawstroke, pushaway, or pry. Remember that in tandem paddling, when one paddler pulls or draws to move sideways, the other must push or pry.

Drawstroke. This stroke makes the canoe move sideways toward the paddling side. When done correctly, there is no turning. The canoe tends to lean away from the paddling side when the draw is done.

Begin the stroke with the paddle entering the water at full reach, straight out from the paddler and with the blade parallel to the keel line. The paddler's body is rotated toward the paddle side, with the lower arm extended and the upper arm high and close to the head. The paddle pulls toward the canoe, traveling on a line perpendicular to the keel line, with the blade parallel to the keel line. The top arm punches out over the water as the lower arm pulls toward the canoe. The paddle should remain nearly vertical throughout the stroke. The stroke ends before the paddle hits the side of the canoe.

Recovery begins when the paddle is about 6 inches from the side of the canoe, with the upper arm extended out over the water and the bent lower arm near the side. For the feather and recovery, slice the blade out of the water toward the stern by lowering the grip hand, or feather through the water directly to the start of a new stroke by rotating the paddle 90 degrees and slicing straight out through the water. The drawstroke moves the canoe sideways because the paddle pushes water under the canoe, so keep the paddle deep. If you are splashing water against the side of the canoe, you are losing power.

Pushaway. The opposite of the drawstroke is the pushaway. This stroke moves the canoe sideways, away from the paddling side. The canoe tends to lean toward the paddling side when the push is applied. When the pushaway is done correctly, there is no turning.

For the pushaway, the paddle enters the water very close to the canoe and right beside the paddler. The blade reaches slightly under the bilge to begin the stroke. The upper arm is extended out over the water, while the lower arm begins the stroke in a bent position close to the body. The stroke is made by pushing the blade away from the canoe on a line perpendicular to the keel line. The blade is parallel to the keel. The upper arm and shoulder pull in toward the body as the lower arm swings and pushes. The stroke ends when the lower arm is fully extended.

The recovery is done either by feathering the blade out of the water and swinging it in an arc toward the stern and back to the catch position, or by rotating the blade 90 degrees at the end of the stroke and slicing through the water in a straight line back to the catch position. The underwater recovery is usually faster and less awkward for this stroke. The pushaway moves the canoe sideways by pulling water out from under the canoe, so remember to reach under and keep the paddle deep.

Pry. A more powerful version of the pushaway is the pry. This stroke is more powerful because the paddle is pulled by both hands, like a lever, using the bilge of the canoe as the fulcrum. Begin the stroke with the blade parallel to the keel line and well under the bilge. The grip and upper arm are extended out over the water. Slide the lower hand up the paddle shaft about 6 inches to give the paddle more depth and extension under the canoe, and to give more leverage. Make the stroke by pulling both arms in toward the center of the canoe in a prying motion on the side of the canoe. (If you are prying across the gunwale, your catch point is not correct and you are not getting any power from your stroke.) Just as the paddle passes the vertical with the arms near your body and the paddle shaft still against the canoe side, begin the recovery.

The easiest recovery is in the water, as described for the pushaway. The lower arm holds the paddle against the canoe side while the upper arm rotates the blade and pushes out so that the paddle blade returns to the catch position under the bilge. (The pry certainly demonstrates why we need strong, rigid paddles on whitewater.) When done well, the pry moves the canoe sharply sideways, away from the paddling side, by almost lifting the canoe and setting it over. If you are not ready and steady, it can also lift you over the side and into the water.

Communication

When you are running rapids with a buddy in your canoe, the bowman is usually the first to see a problem ahead and identify the need for a particular maneuver. Communication to the sternman must be quick and precise because the river is fast, and miscommunications are rarely forgiven. Short, shouted commands such as "Right," "Left," or "Hold" are best, but usually execution of the maneuver must occur about as quickly as the command can be given. Also, the roar of the water often makes sound communication difficult. Ideally, the sternman watches the bowman and knows exactly what to do when he sees the bowman do a particular stroke or maneuver. For example, when the bowman reaches out for a quick draw-stroke, the sternman should know to do a pushaway or pry to shift the canoe sideways toward the bowman's paddling side. Under these circumstances, the sternman recognizes that the bowman has seen an obstruction or danger ahead that can be avoided by moving the canoe sideways.

Communication is important, but when rushing through rapids the communications between paddlers must be almost instinctive. There is no time for discussion or debate. For experienced paddlers, it is simply: "I know what he is doing, and I know what I should do!"

Kayak Maneuvers

The basic strokes in a kayak, using either a single- or double-bladed paddle, for backward, sideways, and forward movement are the same as those used in the open canoe. You will quickly discover, however, that the effect of every move of blade and body on the kayak is significantly greater than when paddling an open canoe. When properly "fitted" in a kayak, the paddler and his craft move as one. This is why the kayak is more maneuverable than the open canoe. Like riding a bicycle, much of the control comes from shifting the body weight. This means that mastery of the kayak can only be achieved by practicing until you "get the feel of it." And, like learning to ride a bike, you are going to have a few falls. (See the Appendix for illustrations.)

The first things to learn in kayaking are how to get in and out. In particular, you need to know how to get out when capsized in the water. This is called a "wet exit."

Boarding

Before attempting to launch your kayak, be sure your boat is a good fit. Get in the kayak on land and check to be sure that you fit firmly on the seat, with no risk of sliding from side to side or back and forth while

on the water. Knees, thighs, and feet should be well braced. The spray skirt should fit snugly.

Because of the tight fit and the instability of the empty boat, getting into the kayak in the water can be tricky. Put the kayak in the water alongside the shore or a low pier. Lay your paddle across the kayak just behind the cockpit, with the blade flat on the ground or pier deck. Sit or squat beside the boat, even with the cockpit. With the hand closest to the kayak, grasp the loom of the paddle and the back edge of the cockpit. With the other hand, hold the paddle at the throat. The paddle should be behind and slightly under you. This position will hold the kayak quite steady.

Now support your weight on your arms and hands while you extend first the leg nearest the kayak, and then the other leg, into the cockpit and forward toward the foot braces. When your legs are in, shift your body weight out over the cockpit and lower yourself onto the seat. Remember to keep your legs straight as you settle into the cockpit. If you end up with your knees sticking out, you will have to get out and start over.

To get out of the kayak, reverse the boarding procedure. If you do not have a suitable shore or pier for boarding, have your buddy steady the boat while you get in. The buddy can stand in the water holding the bow, or can hold the bow with your kayak at right angles to his own if he is already aboard.

Wet Exit

Remember that you are going to control the kayak with body movement as well as with your paddle. Practice shifting and tipping the craft with your hips. While keeping your weight over the center line of the kayak, tip the craft as far as you can to the left and right with your hips. When you are under way, the kayak will turn toward the low side when leaned or tipped by the body movement of the paddler.

If you lean your body out over the water, you will capsize. That's why you need to know how to make a wet exit. It is easy to get out of a capsized kayak if you know what you are doing and don't hurry. Practice this procedure in a pool or in shallow water until you are confident of what you are doing.

If you are properly fitted in the kayak, you will be head down under water when it capsizes. First, release the spray skirt from the coaming and take your feet off the foot braces. 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 so that your head rolls up. Keep your grip on the coaming throughout the maneuver. This will keep the boat from flipping over or getting away from you. When you are feet down in the water, bring your head up on one side of the capsized kayak.

After completing your wet exit, and without ever losing your hold on the kayak, turn the craft so you can grab an end loop. Now push or pull the kayak to shallow water by swimming with a scissor or whip kick. Keep the kayak upside down so that the air trapped in the cockpit will keep the boat floating high and easy to move.

To empty the kayak, you must seesaw it so that water runs out of the cockpit. You can do this across your thigh, or by lifting one end and then the other while the opposite end rests on the ground. The easiest way to seesaw the water out of a kayak is to have your buddy lift one end while you lift the other, and then pump up and down.

Be sure to practice the wet exit in a pool or in shallow water until you are confident and not apprehensive about what to do when you capsize. On your initial practice try, you may want to begin without wearing the spray skirt. Learn and practice one step at a time. If you are confused and unsure about what to do next, you need more practice. An experienced kayak paddler rarely capsizes, but is always prepared to make a wet exit.

Ferries, Eddies, and Braces

Two of the most useful maneuvers on running water are the ferries and eddy turns. Both take advantage of the natural forces of the moving water. Why fight it when you can use it to your advantage? The braces are primarily for stabilization. (See the Appendix for illustrations.)

Back Ferry

The ferry is a current-crossing maneuver that can be done while heading either downstream or upstream. The back ferry is used when the craft is headed downstream. Assume that you are traveling downstream in line with the current on fast water, and you want to move from the left to the right side of the river. If the sternman is paddling on the port (left) side, he gives the command to "ferry right" and pries hard to shift the stern of the canoe out across the current at about a 30-degree angle. Both paddlers then backwater while maintaining the canoe angle to the current. The backstrokes should be powerful enough to neutralize the current and stop the downriver movement. The force of the current will move the canoe sideways from left to right. When the crossing, or "ferry," has been completed, realign the canoe with the current, and resume downriver movement.

Forward Ferry

Now assume that you are in line with the current on the left side of the river (as you face downstream) and you want to move to the right side. This time, your bow is headed upstream with the sternman paddling on his port side. The sternman gives the command to "ferry left" and both paddlers pry (or bowman sweeps while sternman reverse sweeps) to turn the bow out across the current at about a 30-degree angle. Both paddlers then paddle hard forward to hold their stationary position against the current. The force of the current will move the canoe sideways across the river. When the ferry has been completed, the canoe is realigned with the current and the paddlers resume their forward strokes heading upstream.

The forward ferry may be easier to control, and is often used for crossing to a landing spot, when headed downriver. Under these circumstances, the first step is to pivot or reverse direction. You may use a forward ferry when you leave an eddy to cross the current.

Low Brace

The low paddle brace is a stabilizing, balancing maneuver that gives you, in effect, an outrigger. It is a teamwork maneuver used to compensate for unbalancing movement of your paddling partner. It can be held in position across a rough spot or applied quickly to prevent an upset.

The low brace is done by putting the paddle flat on the water straight out from the canoe. The grip hand is palm up near the side of the canoe. The hand at the paddle throat is palm down with the weight on the paddle. Both hands are in the water. Thrust straight down—hard—to counter the canoe lean toward your paddling side. The lean of your body will counter a tip to the other side.

A running low brace, with the trailing edge of the paddle blade angled slightly down, can be used more passively to give stability through rough spots.

High Brace

The high paddle brace is a combination brace, draw, and canoe lean. The high brace is used by the bowman to turn into or peel out of an eddy.

To do a high brace from the bow, the grip hand is high and above the head. Lean and reach way out from the fast-moving canoe. Jab the paddle deep at a near-vertical angle, and then "hang on" with a steady pull. (It is a bit like grabbing a post with one hand while running—you swing around!) The extreme reach and lean sharply turn the canoe. The brace comes from the angle and depth of the blade. Too much angle will spoil the canoe lean, so the grip hand must be high and the blade deep. If a sudden righting movement is needed, pull hard or drop to a low brace.

Eddy Turn

An eddy is a quiet spot in the midst of the rapids. You find eddies behind large rocks where fast water is rushing past on one or both sides. In the shelter of the rock, the water is rotating or flowing upstream from a short distance just below the rock. Getting safely in and out of an eddy may be tricky for the inexperienced, but it can provide a terrific haven for a tired canoeist or for paddlers who want a safe place to watch the action on the river, take pictures, survey the rapids, or stage rescue operations.

The eddy maneuvers are somewhat more difficult than the ferries, because you have to cross an "eddy wall" where, in the space of a few feet or even a few inches, strong currents are flowing in opposite directions.

Assume that your canoe is in the middle of heavy rapids, more or less in line with the current. The sternman is paddling on his port side. There is an eddy up ahead, and your present course will carry you to the left side of the rocks causing the eddy.

The sternman gives the command for a "right eddy turn," and both paddlers drive forward, aiming the canoe bow at the most upstream point of the eddy just below the rock. Just as the bow crosses the eddy wall, the bowman, leaning upstream, reaches out and forward to drive his paddle almost vertically into the water in the eddy just below the rock. The bowman then hangs on with a high brace while the sternman does a wide

and powerful forward sweep. The canoe will do an abrupt 180-degree turn and head upstream below the rock. Both paddlers then paddle forward (upstream toward the rock), and settle into the relatively quiet water of the eddy.

To enter the same eddy with the sternman paddling on his starboard side, the procedure is the same up to the point where the bow crosses the eddy wall. As the wall is crossed, the sternman does a strong J and ends it with a low brace. At the same time, the bowman completes his power stroke, and feathers his paddle forward, parallel with the keel to the catch position. He then pries well ahead of his hip line, holding firmly at this position. The canoe will make an abrupt 180-degree turn and head upstream behind the rock. Both paddlers stroke forward and settle in for a rest.

Peeling Out of the Eddy

Getting out of the eddy is fairly simple, but it all happens very quickly and may be tricky for the inexperienced.

If you want to peel out to the left (facing upstream) with the sternman paddling on his port side, both paddlers drive forward to cross the eddy wall close to the rock. As the bow crosses the eddy wall and enters the downstream current, the bowman pries as he leans downstream. The sternman does a low brace. The canoe bow will come around sharply and head downstream. Both paddlers stroke forward to clear the eddy, and they are under way.

To peel out to the right (facing upstream) with the sternman paddling on his port side, both paddlers drive forward to cross the eddy wall as close to the rock as possible. As the bow crosses the eddy wall and enters the downstream current, the bowman leans downstream, reaches out and forward, and plants his paddle in a firm high brace. At the same time, the sternman drives strongly forward. The canoe bow will swing around sharply and head downstream.

For any peel-out, remember that the paddler working the inside of the turn braces and leans into the turn.

Rescues and Safety

Never underestimate the power and effects of moving water. A canoe capsized and pinned against a rock in a 5-mile-an-hour current is held in place by more than a ton (2,000 pounds) of force. For most canoes, this is force enough to collapse the craft. If you attempted to stand thigh-deep in a 5-mile-an-hour current, you would be struggling against a force of 100 pounds. (See illustrations in the Appendix.)

Self-Rescue

Whitewater canoeists are always prepared for a spill. When you do find yourself in the water, move quickly to the upstream end of your canoe and hang on to the gunwale, painter, or grab loop. Get on your back with your feet up and pointed downstream. If you do not move quickly, you could be pinned against a rock by the canoe. Although there are situations where it is wise not to stay with your canoe, in most circumstances

the canoe is your best flotation device, makes you more visible and a bigger target for rescue efforts, and can provide some protection against rocks or other obstacles.

Use a sidearm stroke and strong kick to head yourself and the canoe into shore or an eddy, if possible. Otherwise, ride the current until you reach a calm stretch, or until a rope is thrown to you. When you get a rope, snub it to the upstream end of the canoe. Do not tie the rope. Hold the snubbed rope to keep it secure, but be ready to release if the rope is swinging you into trouble or if other problems develop. If you have a rope, but cannot secure it to the canoe or have to let go of the boat for whatever reason, let the canoe go and hang on to the rope to swing into shore.

Special circumstances can necessitate releasing the canoe and heading for shore. If the swamped canoe is dragging you toward greater danger, such as falls or strainers, or if you are in extremely cold water with no chance for an early opportunity to get you and the boat to shore, you should go for shore on your own.

If you are capsized in a strong current and lose contact with your canoe, get on your back with your feet up and pointed downstream. Never try to stand in fast water. If your foot becomes snagged or tangled, you will be quickly pulled under. Put your feet down only in an eddy or slow water, or when the water is too shallow for swimming. Riding the current on your back with your feet up also protects your head and enables you to see where you are going.

If you are in the water without contact with your canoe, hang on to your paddle if you can. It provides some extra flotation and protection, and can be used to steer yourself through the rapids or into an eddy.

Assisting Others

Being ready and able to assist others is part of your responsibility as a Scout. Giving assistance in a whitewater emergency requires both advance preparation and practice.

A throw rope or heaving line should be part of your basic river-running equipment. About 60 feet of $^{3}/_{8}$-inch line is recommended. The larger diameter line is easier to hold onto and belay. Natural fibers are good, but nylon is usually stronger, less likely to tangle, and longer lasting. Polypropylene is sometimes used—it floats, does not rot, and is available in bright colors for easy visibility. The polypropylene is, however, more slippery for knotting, holding, and belaying, and difficult to coil. Do not tie weights or floats on the throwing end, as these make the line more likely to snag or catch on rocks. The line is thrown like a heaving or unweighted line in lifesaving. Review and practice the throwing technique as described in the *Lifesaving* merit badge pamphlet.

The throwing bag is now popular because it is easily thrown and convenient to pack and carry, ready for use. The use of the throwing bag is also described in the *Lifesaving* merit badge pamphlet. The obvious disadvantages of the throwing bag are the bag and grommet on the end of the line, which can snag or hang up in rocks or limbs in the water, and the difficulty in recoiling for a second throw when the first attempt misses.

When throwing any line, remember to play the current. To hit a moving target, you must lead the line of travel when aiming your line. When throwing to a stationary target, such as someone stranded on a rock, you can aim your throw upstream and let the current sweep the line to your target.

Once you have made line contact with someone in the water, belay the line quickly. When the river takes up the slack, there will be a tremendous pull. To avoid being dragged into the river, use a hip belay. Put the rope around your hips and sit down quickly where you can brace your feet. The hand on the rope merely steadies it, and keeps it on the hips. The other hand holds tight, with the elbow straight. If the swimmer needs more line, let the rope slide through your grip a little at a time.

You can also belay by looping the line around a limb or rock. If you have a capsized canoe on your line, belaying on a secure limb or rock may be necessary. One loop around will belay securely.

Be prepared to give assistance. On difficult rapids, have people with throw ropes stationed at several vantage points downstream before anyone begins the run. Remember that spills on whitewater are not rare occurrences—they are part of the fun and experience! By planning ahead and being prepared, you prevent danger or tragedy from interrupting the fun.

If the river is relatively calm, you can give assistance from your canoe on the water. Review the discussion of giving aid to a swimmer and canoe-over-canoe rescues in the *Canoeing* merit badge pamphlet.

Equipment Recovery

As soon as all people are safe, you can start retrieving equipment. You might be able to nudge a loose canoe into an eddy or into shore using the bow or side of your canoe, tugboat style. Catching a painter and bringing a loose canoe in by ferrying to shore is a relatively easy maneuver. Catching up with and returning floating gear (paddles, PFDs, etc.) is always appreciated.

Retrieving gear from the river bottom in rapids, or recovering a canoe pinned on a rock in rapids, is work for rescue professionals and experienced personnel using safety lines and other special equipment. In these circumstances, offer your assistance to the person in charge and do only what you are told to do.

Whitewater Buddies

The BSA Safety Afloat standards require that every person engaged in activity afloat have a buddy, and that every boat on the water have a buddy boat. The use of the buddy system is nowhere more important than on whitewater.

We know from our experience with the BSA Safe Swim Defense that the principal commandment and intent of the buddy system is *never go alone.* There should always be at least one other person who knows your situation (where you are and what you are doing) at all times, and who can give immediate assistance or get help to you when needed.

The buddy boat rule recognizes that when a canoe needs assistance on the water, the companions in the canoe are likely to have the same difficulty

and need the same kind of assistance at the same time. In other words, their ability to help one another may be limited by the situation. For this reason, a buddy boat is needed.

You must have a buddy, but in some situations your buddy might not be in the boat with you or in another boat. For example, if you are going to kayak solo through a difficult run, your buddy could be stationed at a strategic point along the river with a throw rope. Indeed, this could be the best situation for the person who is supposed to know where you are and what you are doing, and to be ready to give assistance.

If you and one or two of your friends are going on the river in one canoe, you are not meeting the safety standard. Two canoes, one tandem and one solo, are recommended for a three-man outing. Better yet, find a fourth companion and make it a safer and easier trip for all. Two companions paddling solo can have a safe river outing if they are conscientious and alert about both their buddy and buddy boat responsibilities.

Three individual buddies or three buddy boats could be a bit awkward, since it is sometimes difficult to look two ways at the same time. Nevertheless, three craft can work as a "buddy unit" if all understand and adhere to their responsibilities.

Buddy pairings for river running should match individuals and boats of roughly equal ability and experience, provided that no run is attempted that is beyond the experience and ability level of the least-experienced member of the buddy unit. For instructional purposes, someone of less experience or ability may be paired with a strong canoeist/instructor, if the ability of the stronger canoeist will be sufficient to respond to and overcome any problems that may arise.

Portages and Lining

Often the smartest maneuver for both the novice and the experienced canoeist, when confronted with a rough stretch of river, is to "take a hike." The canoeing term for packing or carrying all of your gear over land is "portaging."

When to Portage

When you have scouted a drop and determined that the rapids ahead are impassable or beyond the capabilities of you or your equipment, it is time to portage. If you are uncertain as to whether you and your equipment can safely navigate through a particular stretch of river, you should portage. "When in doubt, take it out"—portage around trouble.

Always portage around any sheer drop or strainer that cannot be safely avoided on the water. Unnavigable shallows may also require a portage, although some shallows can be walked or lined. For all other rapids, the simple rule is *know your limit!* For example, only a fool tries to shoot Class IV rapids in an open canoe loaded with gear. But even Class III rapids can be treacherous and risky in an open canoe if the paddlers do not have many hours of whitewater experience.

How to Carry

Portaging means backpacking or carrying your gear up the trail. Always pack wisely so you can easily unload your canoe and backpack with a minimum number of trips back and forth. If you have packed wisely, you and your buddies should be able to make the portage in one trip.

Obviously, the biggest (though not always the heaviest) item to portage is the canoe. If the portage is short, it may be easy to have two people lift the canoe at the bow and stern breastplates and walk it across. In this situation, it may not be necessary to take the gear out of a lightly loaded canoe. For any serious portage, however, you need to get the canoe up where the weight is carried primarily on your shoulders, with the leg muscles doing most of the work. Carrying above your shoulders lessens the work, avoids interference with your stride, and gives you a clear view of your footing.

When carrying the canoe alone, the centerline of the canoe should be on or just behind your shoulders. The midship thwart of a two-seat, 17-foot standard canoe is usually set at this point. This enables you to balance the canoe on your shoulders while standing erect. If properly balanced, the canoe will be slightly heavier to the rear. You counterbalance by holding the gunwales on either side, just ahead of your shoulders. The weight of your hands on the gunwales, or just a light downward pull, should give you easy control of the balance and tilt of the canoe. By tipping the back end slightly down, you give yourself a clear view ahead.

The load rests a bit easier if your canoe is equipped with a good portaging yoke. A yoke is basically a midship thwart that has been modified for use when portaging. Yokes can be improvised using canoe paddles, if necessary. Review the discussion and illustration of yokes in the *Canoeing* merit badge pamphlet.

There are several ways to get the canoe positioned on your shoulders for a portage. One maneuver, not generally favored, is to capsize the canoe in waist-deep water, roll it over bottom-up on top of you, get it positioned on your shoulders, stand up, and walk out. The disadvantages of this approach are that you have to get neck-deep in the water, you wet the inside of the canoe, you may have a long walk out from the water where footing can be unknown and treacherous, and footing on the trail is going to be complicated (at least early on) by water draining from the canoe (not to mention trickling down your collar).

Another way to get the canoe positioned for portaging is to have two of your companions lift the canoe, turn it over, and then hold it while you get in position under the yoke. You can do this in shallow water or on land. This, of course, requires a minimum of three people, but much the same can be done by having only one end lifted while the other (the rear end) rests on the ground or in a few inches of water. If necessary, you can lift one end by yourself and rest it securely (bottom-up) on a rock or limb, and then get under the yoke and lift.

If you are going to be a serious canoeist, you should learn and practice how to get a canoe in position for portaging single-handedly. Begin in waist-deep water, with plenty of room and open water around you. Stand beside the empty canoe at a position just ahead of the yoke, facing the

point on shore where you plan to walk out. The bow of the canoe should be aimed at this same point. With your hand that is nearest the canoe, press down on the near gunwale so that the far gunwale is raised. Now reach across with the other hand and grasp the yoke brace just inside the raised gunwale with your knuckles toward the stern. With this upper hand, pull the canoe up on its side with the lower gunwale just above the water. Crouching slightly, release the lower gunwale, and reach under and around the side of the canoe that is in the water.

If you are in the correct position, the next step will roll the canoe yoke onto your shoulders without shipping any water. Lean your head and shoulders sideways into the canoe as you roll the canoe over onto your shoulders by pulling across and down with your hand near the raised gunwale. The other arm keeps the canoe steady and prevents the lower gunwale from going under water. As soon as your shoulder touches the yoke, straighten your back and legs, shift your hands to the balance position, and begin walking.

After one or two misses, you will begin to get the feel of this single-handed canoe lift, and discover that it is the quickest and simplest way to begin your canoe portage.

When you are on a long portage, stop and rest before you get so exhausted you risk a fall. Ease the bow of the canoe onto a rock, ledge, or tree limb where it will rest securely with the stern on the ground, then step out from under the yoke. When you are rested enough to continue your trek, it will be easy to get back under the canoe.

Lining

An alternative to portaging in some situations is "lining"– towing the canoe through water from the bank, using 50- to 100-foot lines. Conditions where lining may be appropriate include:

- Water too shallow for paddling, with a bottom too rough or uncertain for walking.
- Rough waters requiring a portage but where there is no trail for carrying equipment, or the portage trail would be so difficult that lining appears to be safer and easier.
- You are traveling upstream and the current is too strong for paddling.

One advantage of lining is that you can often leave your gear secured in the canoe. If you are trying to get through shallows, you may have to lighten the canoe by removing some of the heavier gear. A canoe that is loaded trim will usually be easier to control while lining than an empty canoe.

Lining, of course, requires a shoreline or bank where you can stand or walk to handle the lines. You will need 50- to 100-foot lines with one secured at the bow and another tied at the stern paddling position. Control the canoe from upstream with one person on each line, or with one man handling both lines. You can also work with one line harnessed to the bow and bow thwart, but control is much better with two lines.

By adjusting the angle of the canoe against the current you control the position and direction of the canoe on the water. You can usually keep the canoe away from shore by angling it upstream and out from shore. Note that you usually line with the stern headed downstream.

Rafting

The increasing popularity of whitewater rafting is due in part to the less-demanding skill requirements for rafting participants, the development of tougher rafts, and the number of commercial outfitters offering raft trips. The risks of moving water are just as real when rafting as they are in canoeing and kayaking, and the skills and safety principles learned in canoeing should be carefully followed.

Equipment

Whitewater rafts are inflated, bulky craft that come in a variety of sizes and shapes. Four-to-six-person rafts are most common on eastern rivers and popular whitewater runs. Much larger rafts with motor-mounts, rear-mounted sweeps, or oar frames are used on some major western rivers. If you are not using a commercial outfitter and guide service, Scout rafting should be limited to the four-to-six-person equipment.

A whitewater raft must be durable and easily patched. It should have at least two separate inflation chambers. Every raft must have a grab line around the full outside perimeter of the craft, and should have a bow painter of 10 to 15 feet in length.

Most modern rafts are made of neoprene, nylon, vinyl, waterproof canvas, rubber, or a combination of these materials. Although tough and flexible, these materials can tear or puncture. Sharp objects—both in the raft and in the water—must be avoided. On-the-spot repair kits supplied by the raft manufacturer should be carried on every outing.

A raft should not be taken from the water and left in the sun unless some air has been released to prevent a seam split or "blowout." After a raft is used, it should be thoroughly dried before being partially deflated and stored. Storing the raft partly inflated helps prevent rotting and mildew. The first part of a raft to be damaged is usually the bottom. Thus, the life of a raft can be greatly extended by gluing a piece of rubberized canvas to the bottom with waterproof contact cement. Any hole should be repaired immediately.

Standard single-blade paddles are used in rafting. PFDs are always used. Helmets should be worn on rough water (Class III or greater). Bailers, rescue lines, shoes, proper clothing, and spare equipment items are as important in rafting as in canoeing. For obvious reasons, knee pads are not a concern.

Safety

The whitewater safety precautions for canoeing and kayaking apply to rafting. There is some greater risk of finding yourself under the craft if you capsize or fall overboard while rafting. If this occurs, reach out to the side, grasp the grab line, pull yourself out from under the raft, and move to the upstream end.

Rafting injuries are frequently caused by paddle contact. Remember that you are riding beside another paddler, and there is another person paddling relatively close behind or in front of you. Keep the blade on the outside of the craft and the grip low and close to your own body. A flailing paddle can be dangerous when the raft is bounding through rough water.

The inflated perimeter or "ring" of the raft is for flotation, to absorb impact, and to protect the passengers. Sit on the seats or floor of the raft. If you are sitting up on the ring, you are likely to be thrown or swept overboard by a wave or sudden shift of the craft.

Rafters should not overlook the safety of others on the river. A six-man raft plowing through the rapids can literally 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. Changing direction to avoid another craft is more difficult in a raft than in a canoe or kayak, so you must make your course adjustments earlier, or hold back until the way is clear.

Maneuvers

Most of the paddle strokes used in canoeing—with a few notable exceptions—are used in rafting. The J-stroke is of little use in the bulky and less maneuverable raft; and the pry is of little value across the flexible ring of the craft.

The forward and reverse strokes, sweeps, and draws are the primary strokes to be used to control the craft. Coordination is the key, and one person in the rear of the craft must be in charge and give commands. If you are not traveling with a professional guide, then the individual with the most skill and experience should be designated to give commands and control the raft. Before going on the rapids, be sure all paddlers understand and agree on the commands and the proper response by each paddler.

The paddler giving the commands will also supply the rudder when needed to control the craft. Using a paddle as a rudder over the stern of a raft is not only acceptable, it is often essential for control and steering.

Tubing

Tubing is not a whitewater sport. Only a foolish daredevil would attempt to run rapids on a tube. But tubing down a lazy flowing stream on a warm, sunny day may be a pleasant way to pass the time with friends if your taste for adventure or excitement is at a low ebb.

If you are going tubing on a smooth river with a slow current, remember to wear shoes and your PFD. If there are any rocks in the stream, a helmet is recommended because your head is sticking out to the side, unprotected. Sun protection is also important. Be sure you have a buddy and stay close to him. The BSA Safety Afloat standards certainly apply to tubing and should be carefully followed. If you are not a strong swimmer, do not go tubing on deep water. If you do not have smooth, slow-moving water, do not go tubing.

The tube itself should be specially made or adapted for river floating. The valve stem on an inner tube can scrape or puncture bare skin, and sudden deflation can be a hazard if you are using recycled equipment. The better equipment will have a mesh or net cover across the opening for protection and to hold whatever gear you may carry. Also, like a raft, a tube should have a perimeter grab line.

You control the tube with your feet and hands. Before floating on the river, get in a pool and practice hand-paddling and kick-paddling. Your strongest stroke will probably be going headfirst with a version of the flutter

kick and back-paddling with your hands. While moving with the current you can rotate yourself and angle yourself across the current by using your feet and hands as rudders. A small paddle may give you greater control and power if needed. But if you are drifting lazily down a slow-moving stream, you probably do not need it; and because stowing a paddle is a bit difficult on a tube, you will get tired of holding it.

The hazards of tubing in rapids should be obvious. You are not protected from impact, you have very limited control of your speed and direction, and you can be easily upset and thrown off the tube. Getting back on a tube without assistance in deep water can be difficult even on still water. You need a buddy to hold one side down to counterbalance your weight as you climb over the opposite side. This is one reason your buddy should always be within a few feet of you on the water.

Tying yourself to the tube will increase the danger in rapids. You risk becoming entangled beneath the tube if you flip over. If the tube is secured to you by a line and snags in rapids, you can be pulled under by the current.

Tying several tubes together, raft-like, can add stability on a slow-moving stream, but reduces maneuverability. Running rapids on tubes tied in a cluster guarantees disaster. With arms, legs, and heads sticking out in all directions, and all trying to avoid banging on the nearest rock, control is impossible. When the whole mess capsizes or flips—and it will—there is the inevitable tangle of tubes, lines, and bodies.

Remember, only a fool runs rapids on a tube.

SUMMARY

Now that you have completed these sessions, you have the basics in canoeing and whitewater. These sessions were designed to give you these basics and help you have successful aquatics outings.

In planning your outing, you must still use the same processes that you would for any other trip and, in addition, use the Safety Afloat plan. It is now up to you to perfect your skills and have fun on the water.

APPENDIX A

QUALIFIED SUPERVISION

A responsible adult must supervise all activity afloat and must be experienced and qualified in water safety (BSA Lifeguard or lifeguard or lifesaver certified by a recognized agency) and in the particular skills related to the watercraft being used, or use assistants so qualified. Ability to meet current requirements for Canoeing, Rowing, Small-Boat Sailing, or Motorboating merit badge qualifies a person in respect to safe handling of that watercraft. One adult supervisor is required for each ten people with a minimum of two adults for any one group. All adult supervisors must complete Safety Afloat and Safe Swim Defense training, and at least one must be certified in CPR.

For Cub Scouts: The adult supervisor *must* be experienced and qualified in water safety (BSA Aquatics Instructor; BSA Lifeguard counselor; BSA Lifeguard; or American Red Cross Lifeguard). The ratio of adult supervisors to Cub Scouts is one to five.

PHYSICAL FITNESS

All persons must present evidence of fitness by a complete health history from a physician, parent, or legal guardian. Adjust all supervision, discipline, and protection to anticipate any potential risks associated with individual health conditions. In the event of any significant health conditions, a medical evaluation by a physician should be required by the adult leader.

SWIMMING ABILITY

A person who has not been classified as a "swimmer" may ride as a passenger in a rowboat or motorboat with an adult swimmer, or in a canoe, raft, or sailboat with an adult certified as a lifeguard or a lifesaver by a recognized agency. In all other circumstances, the person must be a swimmer to participate in an activity afloat. Swimmers must pass this test:

Jump feetfirst into water over the head in depth, level off and begin swimming. Swim 75 yards in a strong manner using one or more of the following strokes: sidestroke, breaststroke, trudgen, or crawl; then swim 25 yards using an easy resting backstroke. The 100 yards must be swum continuously and include at least one sharp turn. After completing the swim, rest by floating. This qualification test should be renewed annually.

PERSONAL FLOTATION EQUIPMENT

Properly fitted U.S. Coast Guard approved personal flotation devices (PFDs) must be worn by all persons engaged in activity on the open water (rowing, canoeing, sailing, boardsailing, motorboating, water skiing, rafting, tubing, kayaking, and surfboarding). Type II and III PFDs are recommended.

BUDDY SYSTEM

All activity afloat necessitates using the buddy system. Not only does every individual have a buddy, but every craft should have a buddy boat when on the water.

SKILL PROFICIENCY

All participants in activity afloat must be trained and experienced in watercraft handling skills, safety, and emergency procedures. (a) For unit activity on white water, all participants must complete special training by a BSA Aquatics Instructor or qualified white water specialist. (b) Powerboat operators must be able to meet requirements for Motorboating merit badge or equivalent. (c) A minimum of 3 hours training and supervised practice is required for all other unpowered watercraft.

For Cub Scouts: Canoeing and rafting for Cub Scouts (including Webelos Scouts) is to be limited to council/district events on *flat water* ponds or controlled lake areas free of powerboats and sailboats. Prior to recreational canoeing, Cub Scouts are to be instructed in basic handling skills and safety practices.

PLANNING

Float Plan. Obtain current maps and information about the waterway to be traveled. Know exactly where the unit will "put in" and "pull out" and what course will be followed. Travel time should be estimated generously. Review plan with others who have traveled the course recently.

Local Rules. Determine which state and local regulations are applicable, and follow them. Get written permission to use or cross private property.

Notification. File the float plan with parents of participants and a member of the unit committee. File float plan with council office when traveling on running water. Check in with all those notified when returning.

Weather. Check the weather forecast just before setting out and keep an alert weather eye. Bring all craft ashore when rough weather threatens.

Contingencies. Planning must identify possible emergencies and other circumstances that may force a change of plans. Appropriate alternative plans must be developed for each.

For Cub Scouts: Cub Scout canoeing and rafting does not include "trips" or "expeditions" and is not to be conducted on running water (i.e., rivers or streams), therefore, some procedures are inapplicable. Suitable weather requires clear skies, no appreciable wind, and warm air and water.

EQUIPMENT

All equipment must be suited to the craft, to water conditions, and to the individual; must be in good repair; and must satisfy all state and federal requirements. Spare equipment or repair materials must be carried. Appropriate rescue equipment must be available for immediate use.

DISCIPLINE

All participants should know, understand, and respect the rules and procedures for a safe activity afloat. Rules for safety do not interfere with fun when fairly applied.

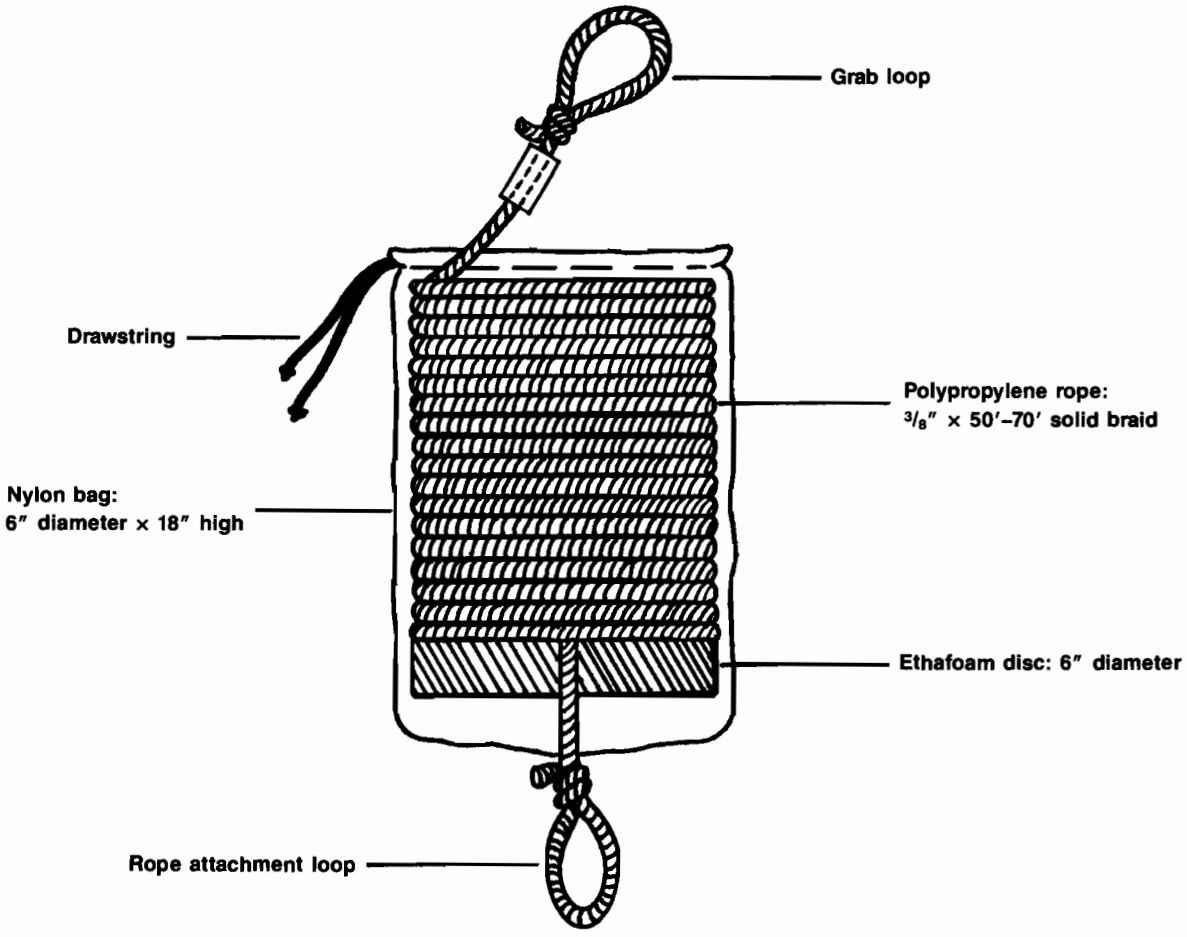
Note: For cruising vessels (excluding rowboats, canoes, kayaks, and rafts, but including sailboats and powerboats greater than 20 feet long) used in adult supervised unit activities by a chartered Explorer post/ship specializing in watercraft operations, or used in adult-supervised program activity in connection with any high-adventure program or other activity under the direct sponsorship and control of the National Council, the standards and procedures in the *Sea Exploring Manual,* No. 3239, may be substituted for the "Safety Afloat" standards.

For a more complete statement of Safety Afloat standards, see Section 4, Aquatics, Camp Program and Property Management, No. 20-920, pages 7–8.

APPENDIX B
THROW BAG

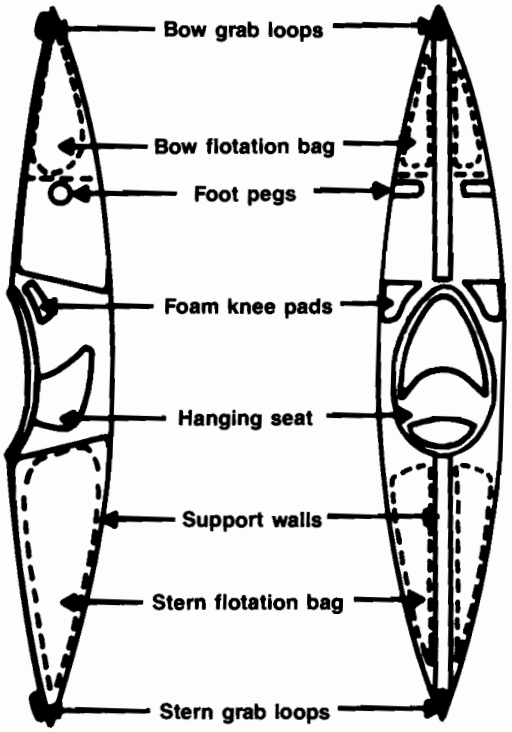
Making a throw bag is both easy and inexpensive. The bag is 6″ × 12″, of medium-weight nylon, and has a 1-inch thick Ethafoam disc at one end. This disc helps keep the bag afloat, shapes it for rope storage, and helps to anchor the rope without undue stress on the bag.

A drawstring at the other end can be adjusted so that the rope feeds smoothly from the bag. The rope is generally a 3/8-inch-thick, brightly-colored ploypropylene line that floats.

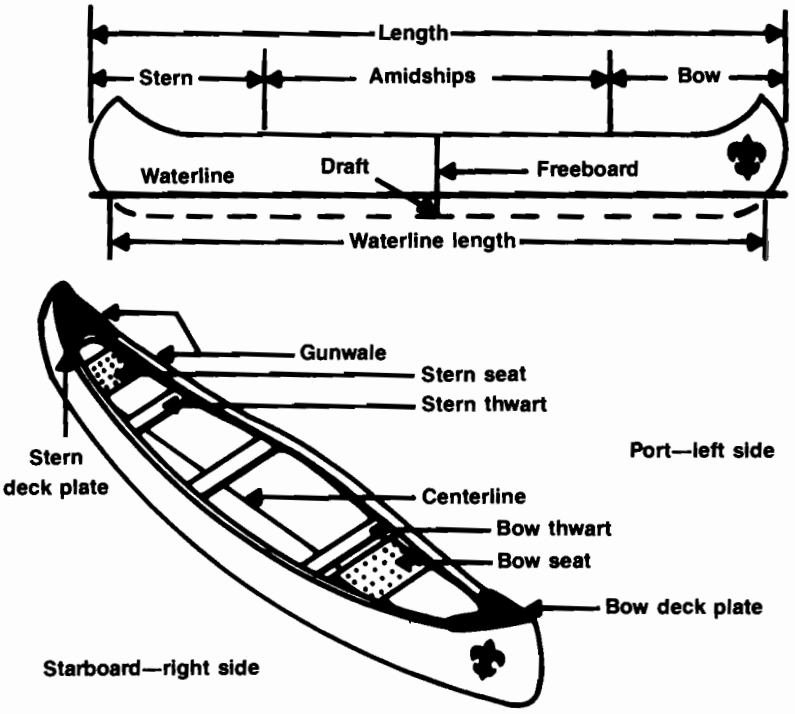


APPENDIX C
PARTS OF A CANOE, A KAYAK, AND A PADDLE

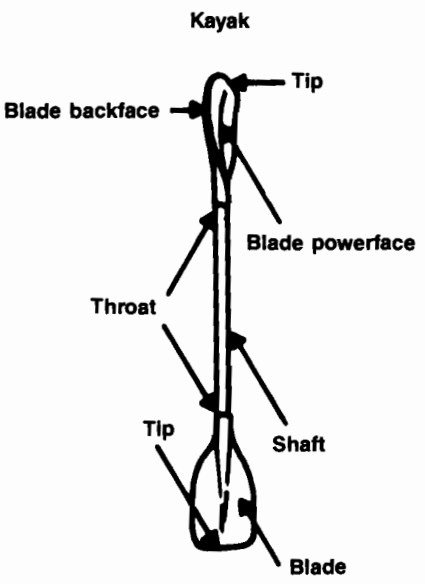
Parts of a Kayak

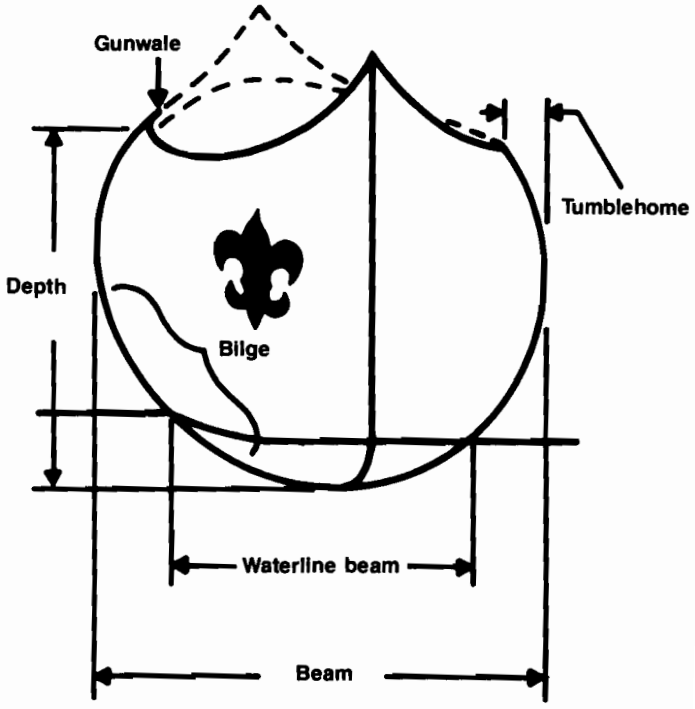


Parts of a Canoe

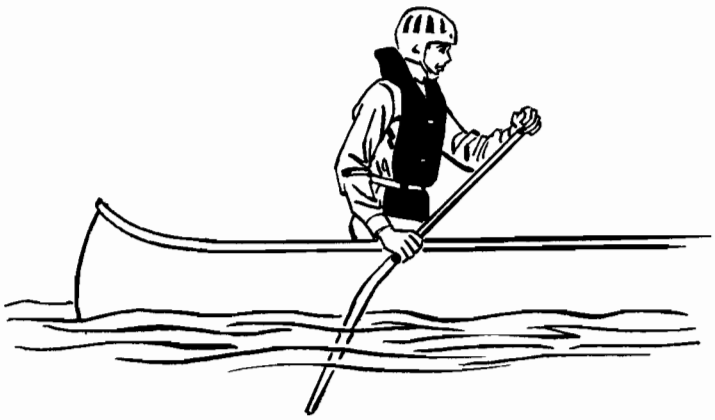


Parts of a Paddle

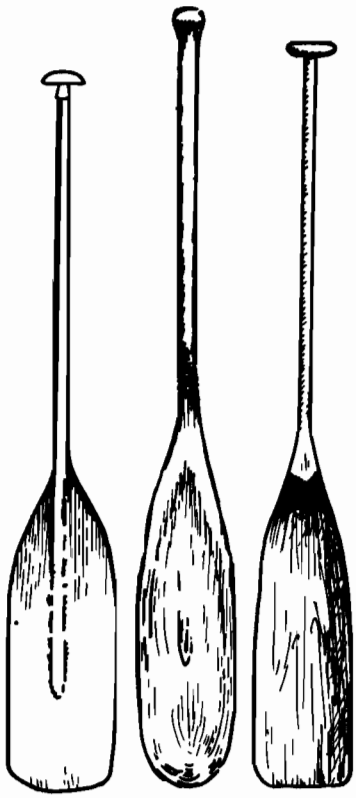




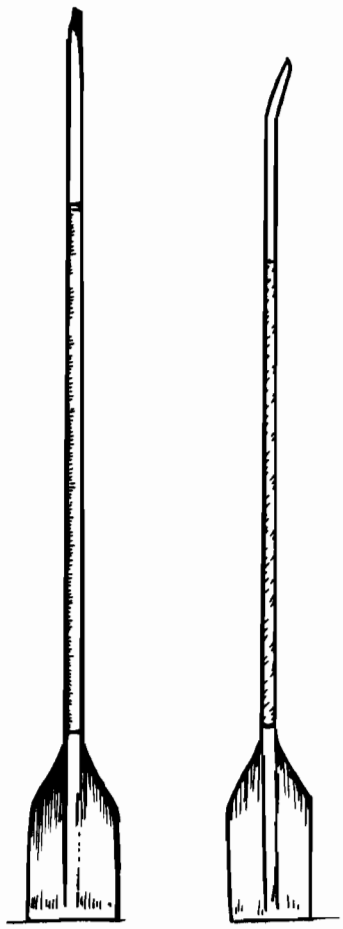
APPENDIX D
WHITEWATER PADDLES



Bent-Shaft Paddle

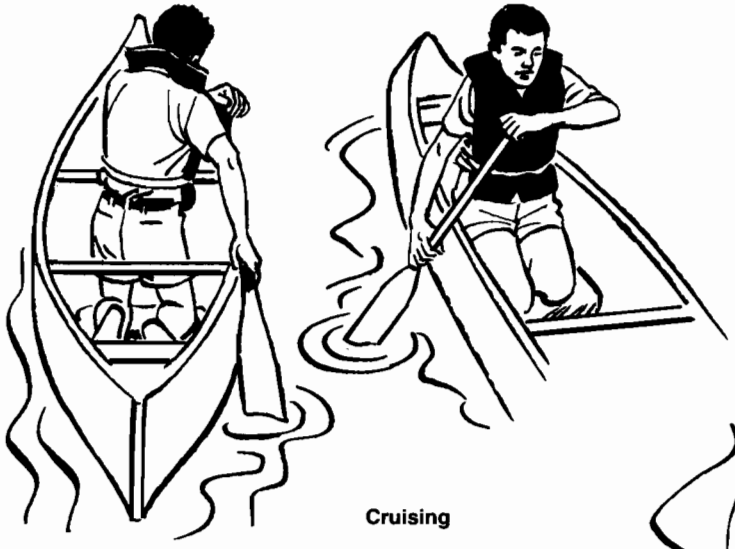


Single-blade Paddles

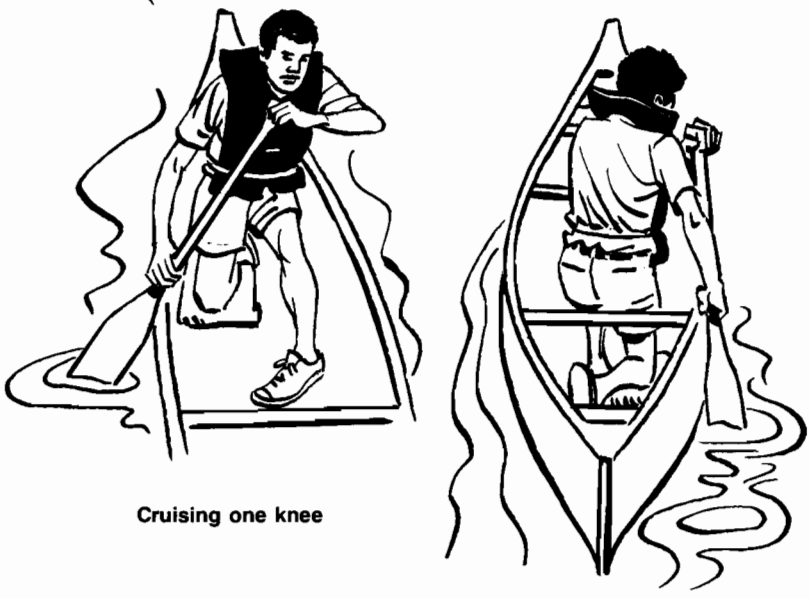


Double-blade Paddles

APPENDIX E
PADDLING POSITIONS

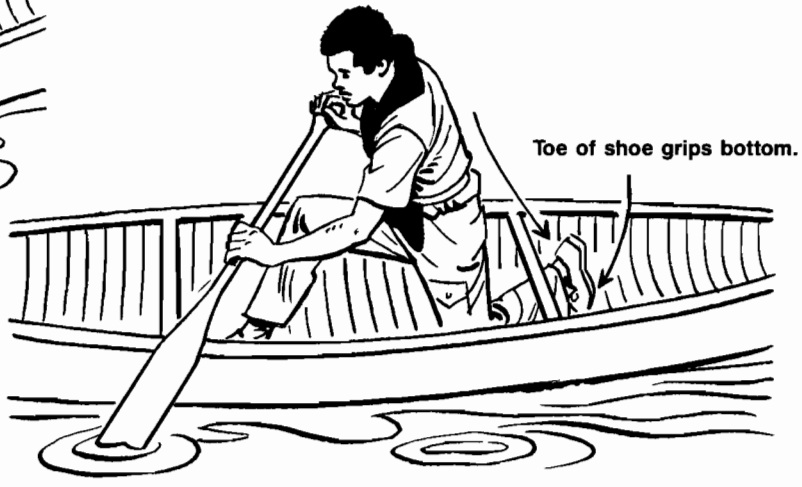


Cruising



Cruising one knee

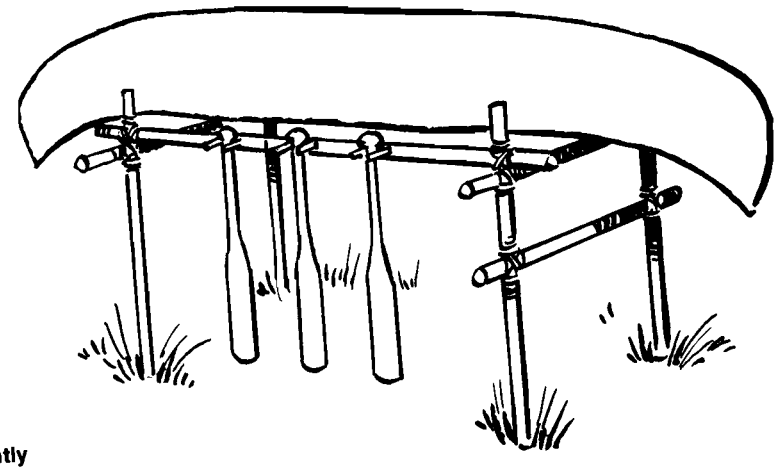
Upright Kneeling



Toe of shoe grips bottom.

Kneeling leg extends diagonally across canoe.

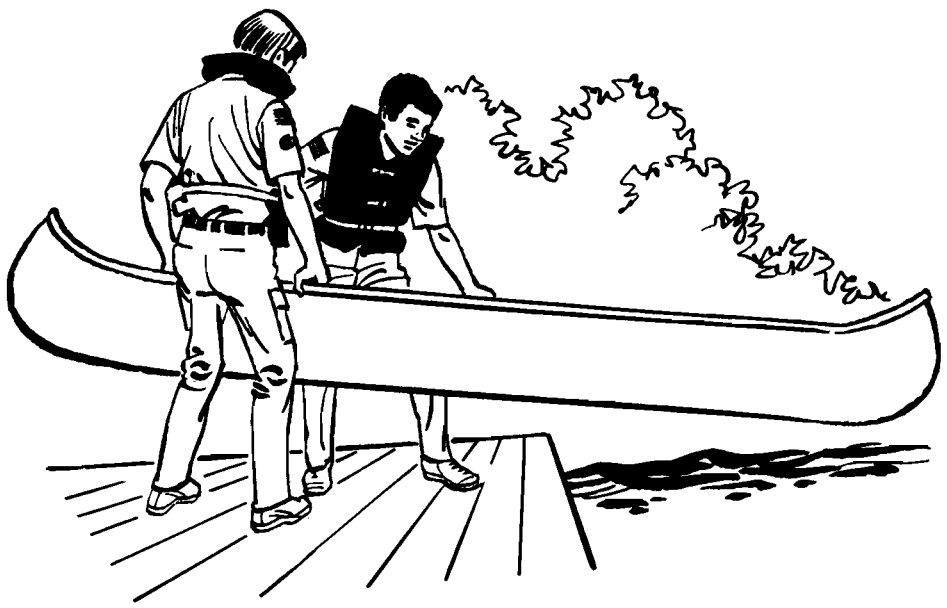
APPENDIX F
LAUNCHING A CANOE



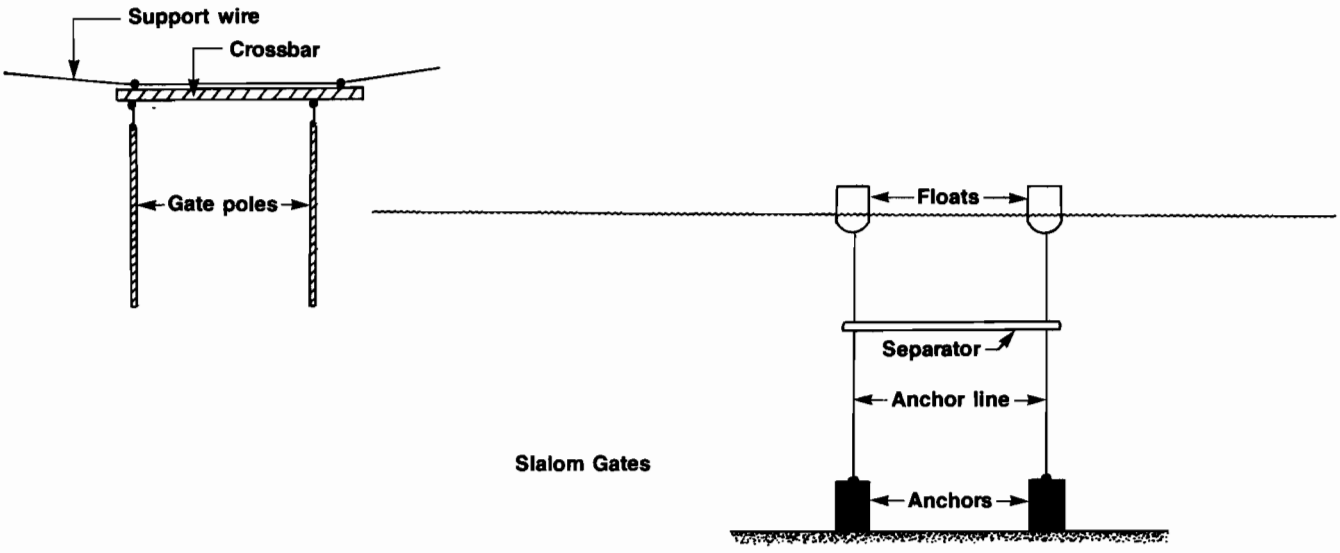
Canoe on Dry Land

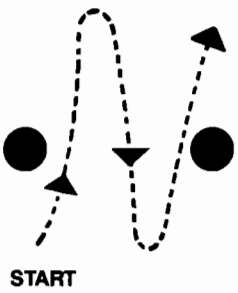
Canoe
1. Inverted on rack
2. In the shade
3. Out of the water
4. Good repair
5. Clean out dirt and sand frequently

Paddles
1. Off the ground
2. In the shade

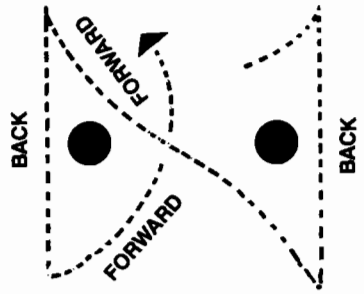


APPENDIX G
MANEUVERING AN ENGLISH GATE

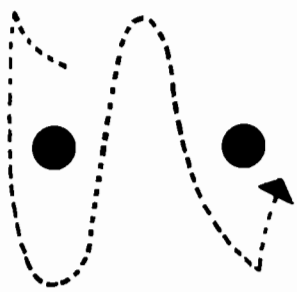




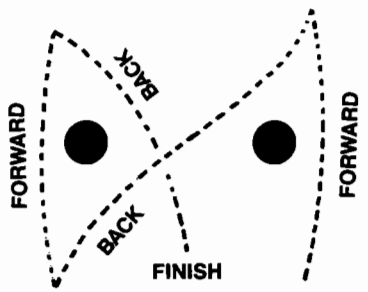
1. Forward pivots



2. Back on outside, forward diagonals.



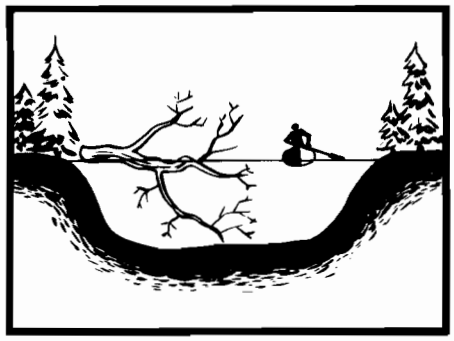
3. Back pivots



4. Forward on outside, back diagonals.

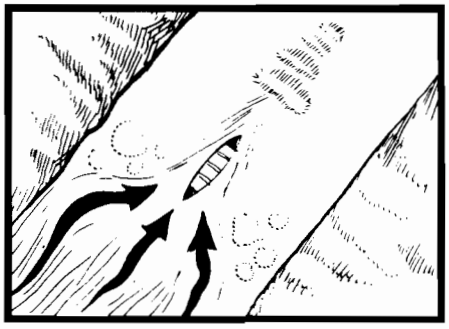
APPENDIX H
READING A RIVER

Closed (downstream) V

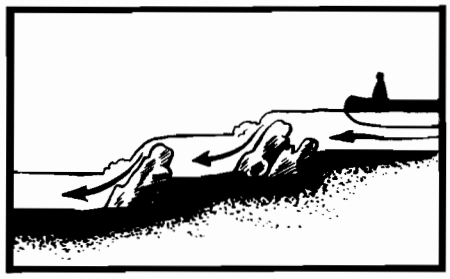


Logs and overhanging trees

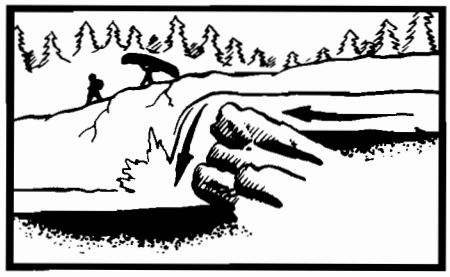
Flat rock



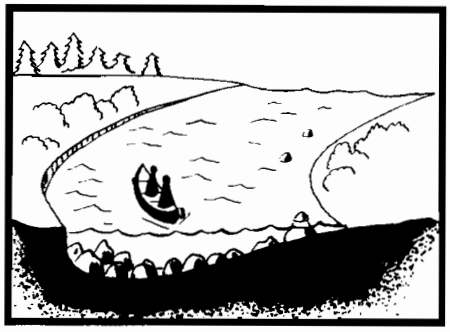
Open (upstream) V



Broken drop

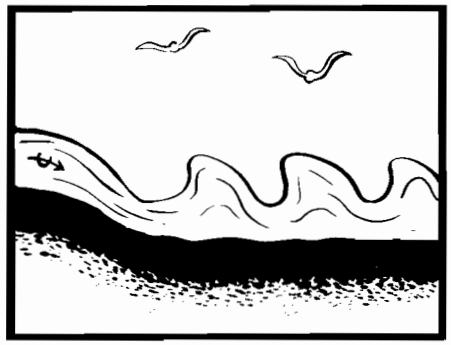


Sheer drop

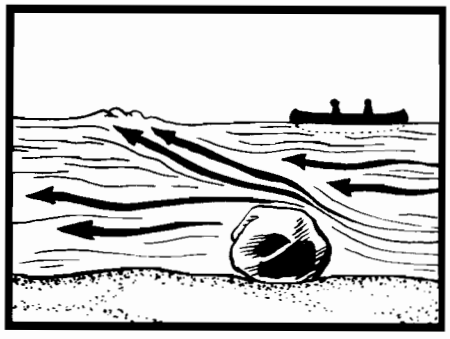


Shoals

Eddy

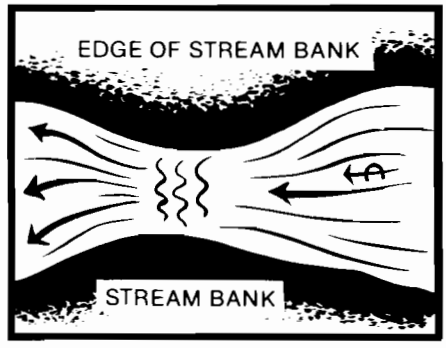


Waves



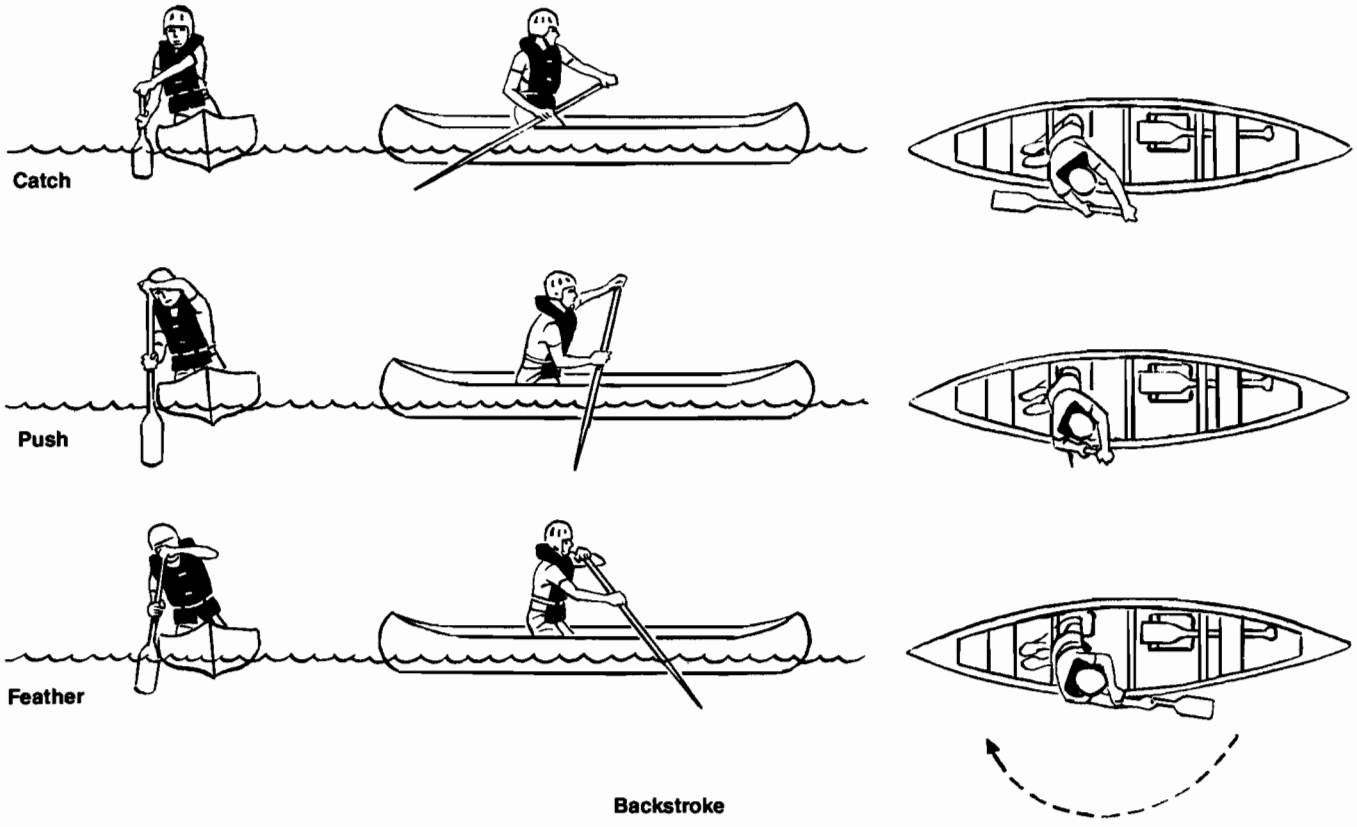
Deep rock

Whirlpools, crosscurrents

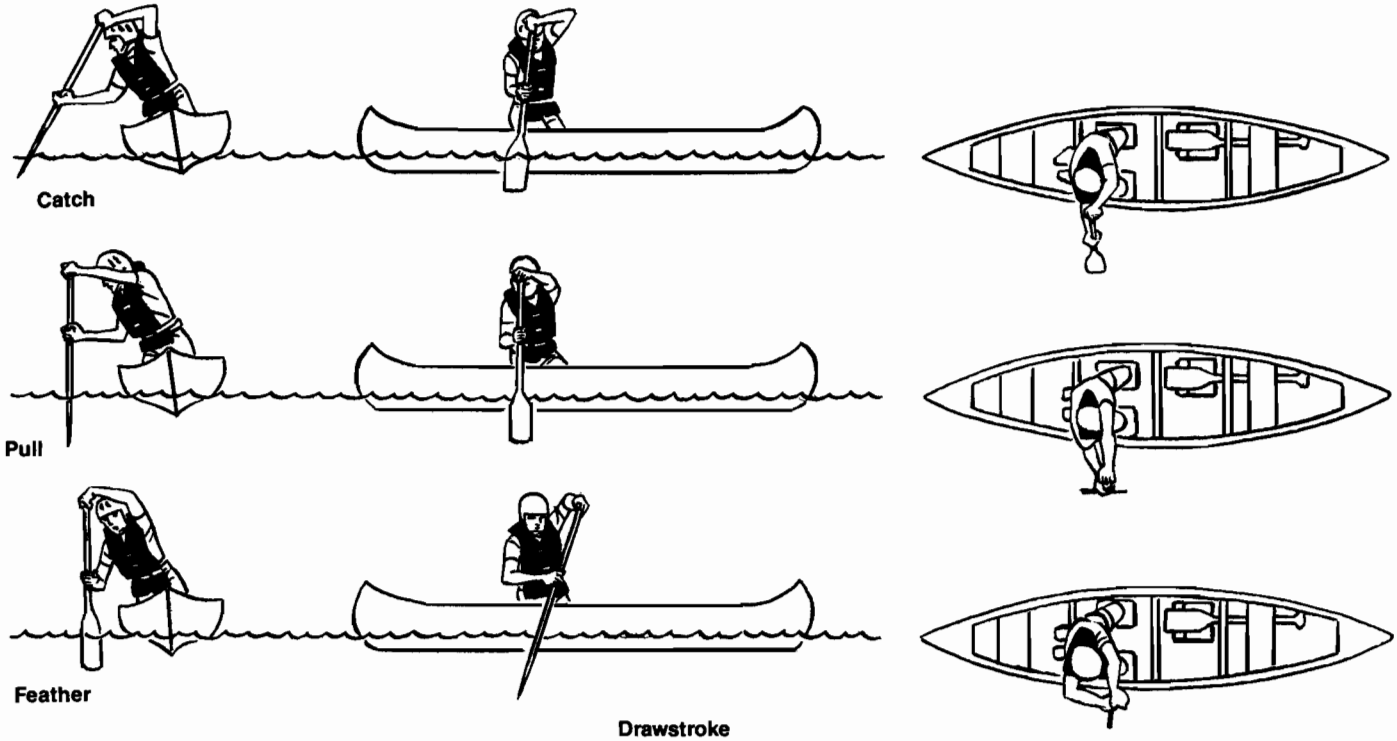


Heavy water

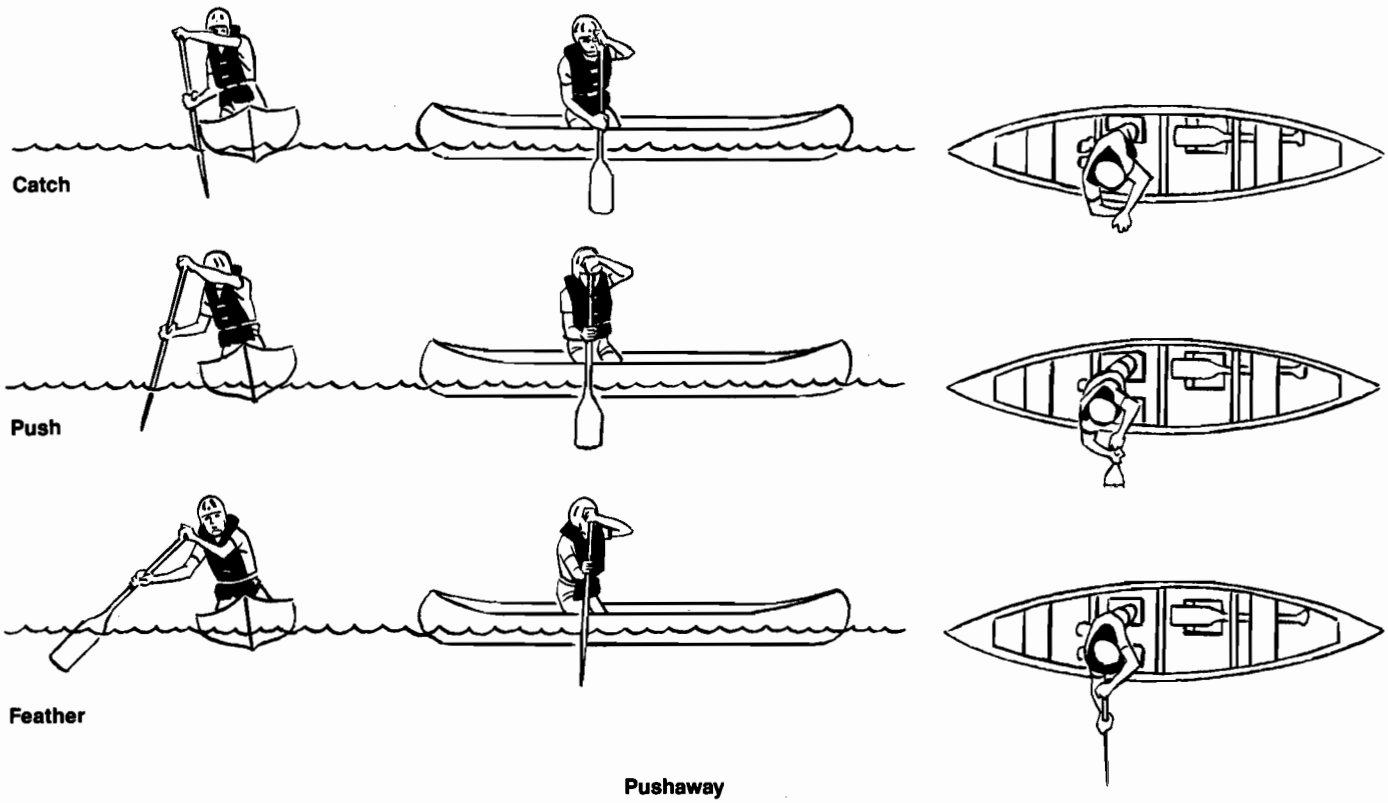
Appendix I
Whitewater Maneuvers



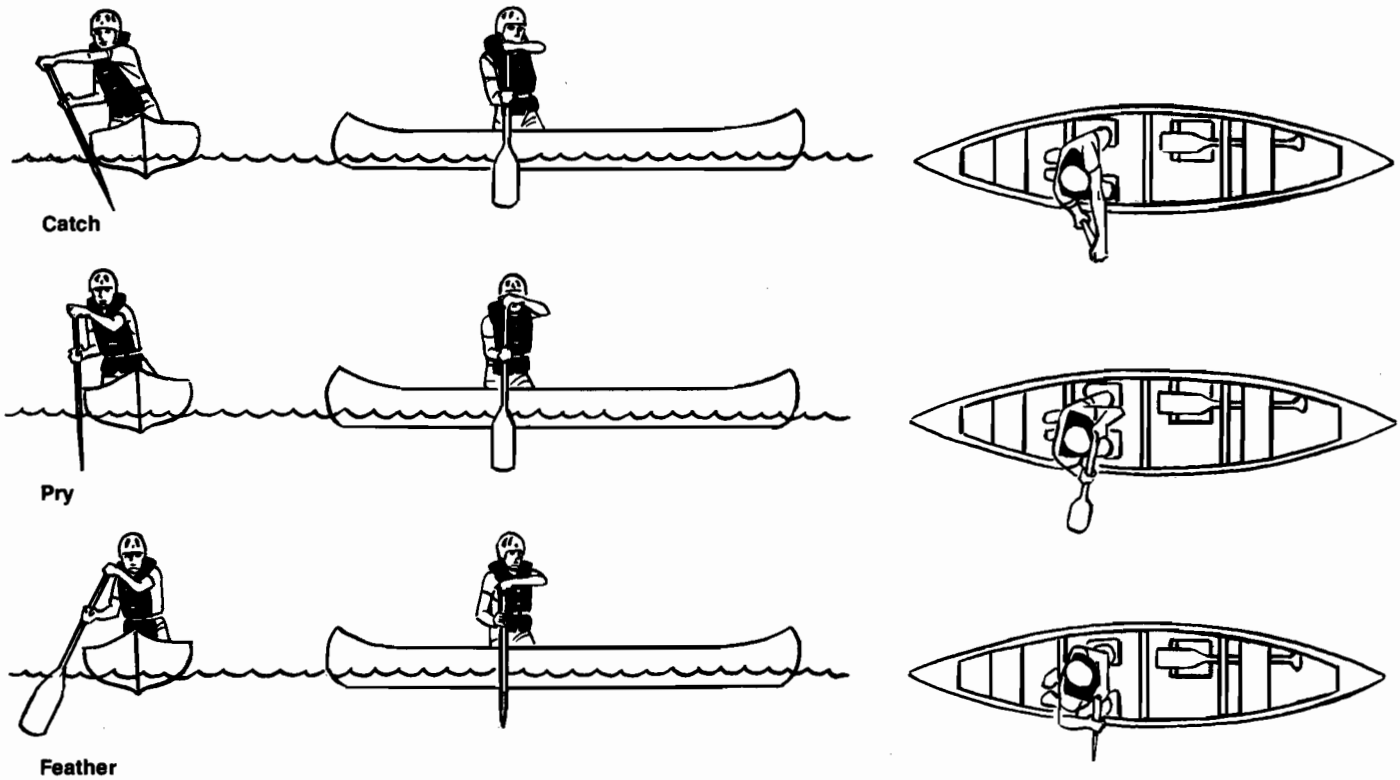
Backstroke



Drawstroke



Pushaway



Pry

APPENDIX J
KAYAK MANEUVERS

Boarding

WET EXIT
(Underwater View)

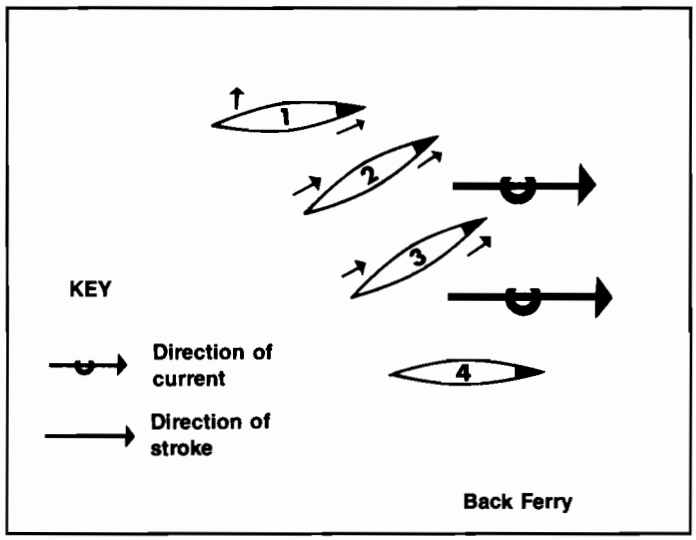
Release spray skirt; lift feet off braces; lean forward.

Push against the coaming.

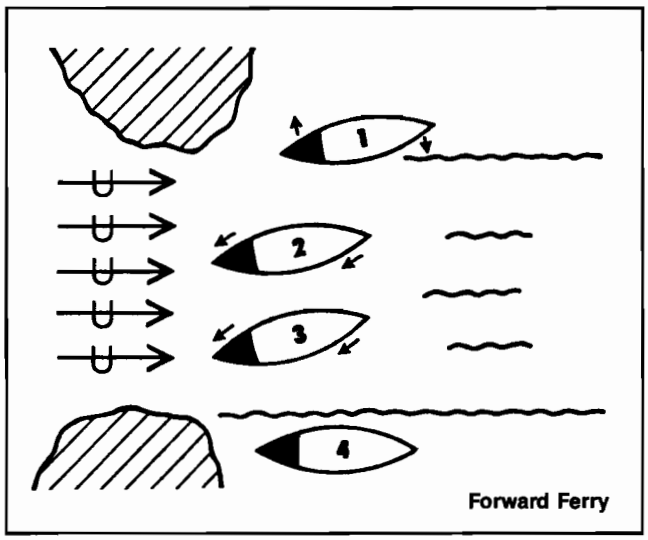
When feet clear, somersault feet down;
do not release coaming.

Bring head above water on one side of kayak.

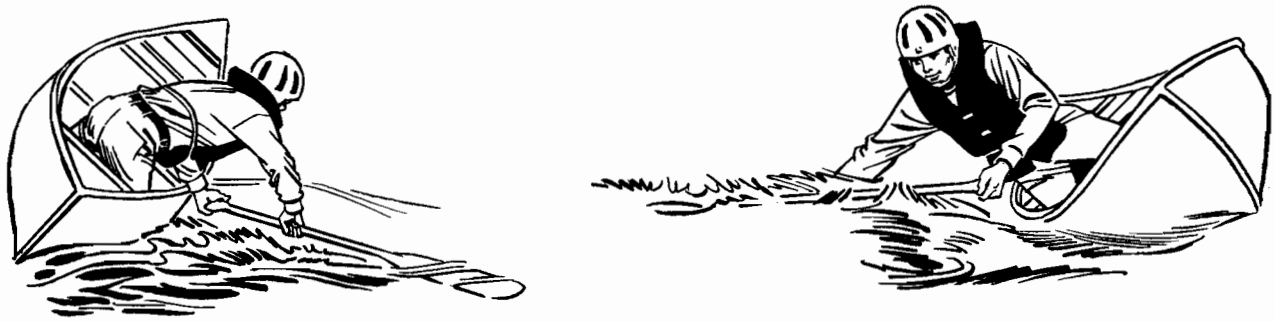
APPENDIX K
FERRIES, EDDIES, AND BRACES



Back Ferry

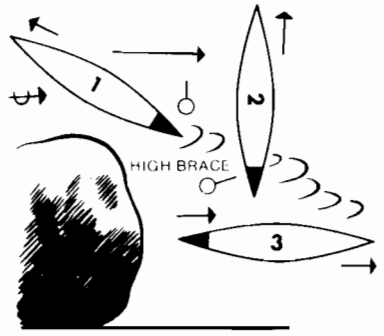


Forward Ferry

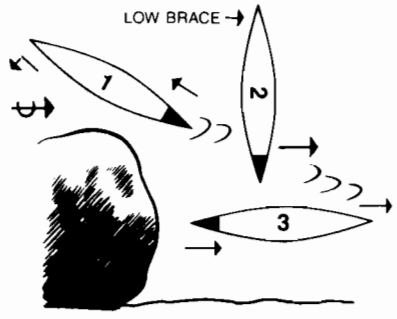


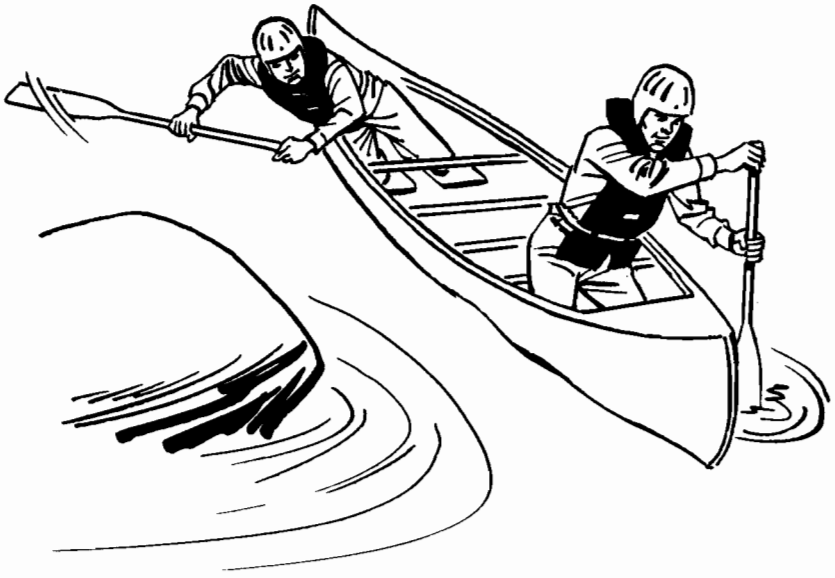
Low brace in stern

High brace in bow

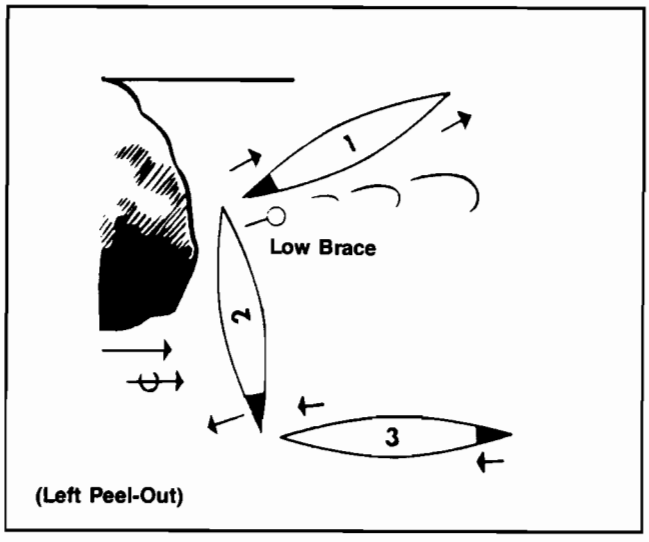


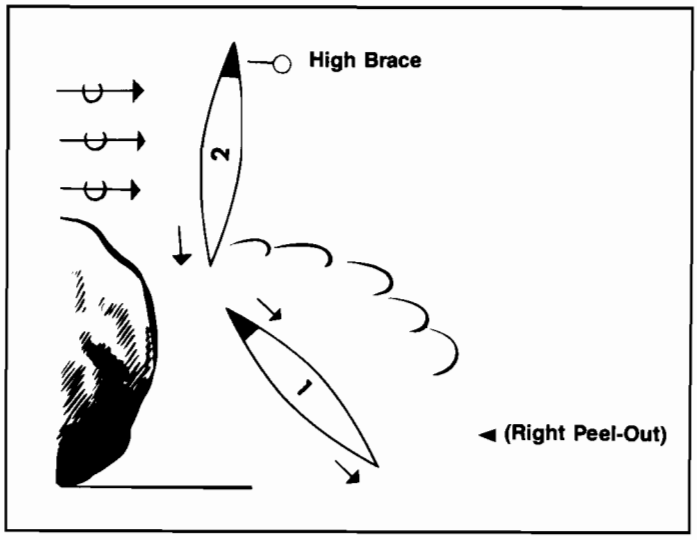
Eddy Turn with High Brace



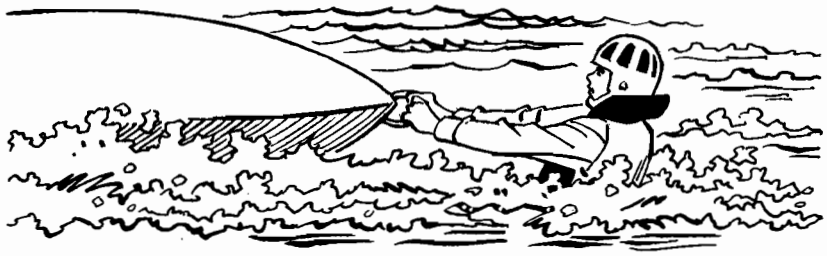


Eddy Turn with Low Brace

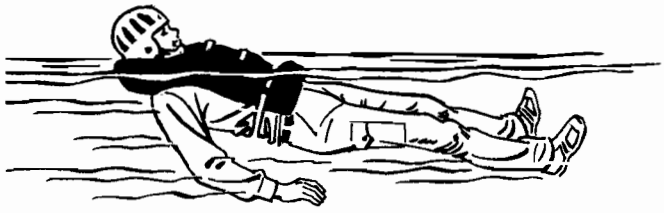




APPENDIX L
RESCUES AND SAFETY

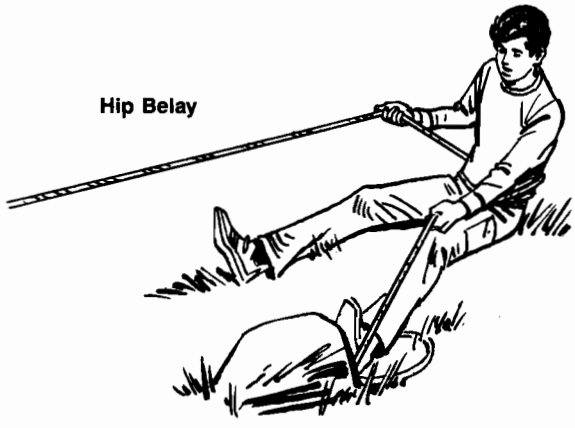


Hang on at upstream end



Self-rescue

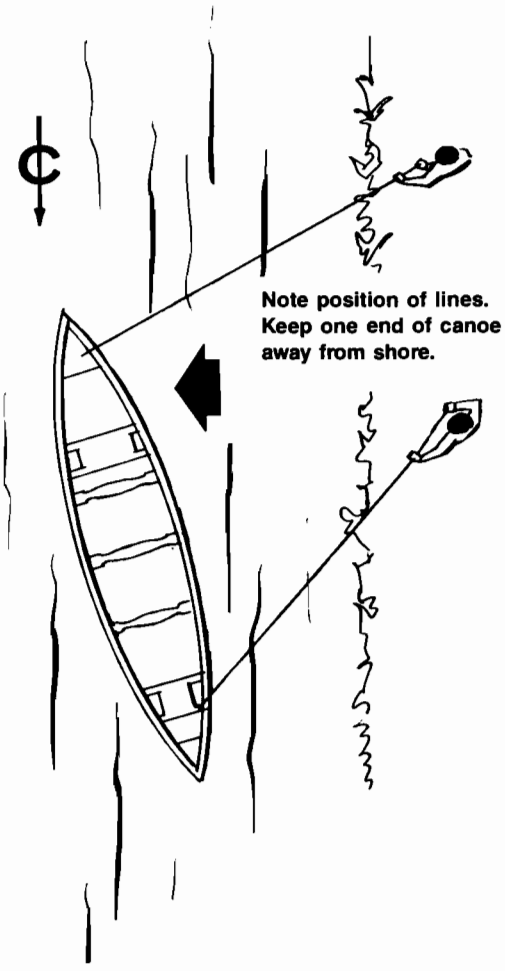
Hip Belay



Assisting others

APPENDIX M
LINING

LINING



2 LINES UPSTREAM

1 LINE UPSTREAM